

Marine wildlife stranding and mortality database annual reports 2013-2015

Dugong



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Foreword

The Department of Environment and Heritage Protection (EHP) monitors dugong, strandings and mortality along the Queensland coast via StrandNet, the marine wildlife strandings and mortality database. StrandNet records sick, injured, incapacitated or dead wildlife in Queensland from reports received by the Department of National Parks, Recreation and Sport (NPRS), EHP, the Great Barrier Reef Marine Park Authority (GBRMPA) and the Department of Agriculture and Fisheries (DAF), in addition to those received directly from the public and rehabilitation facilities. This 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@ehp.qld.gov.au.

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List of acronyms and abbreviations

COD	Cause of death
COS	Cause of stranding
<i>Cwlth</i>	Commonwealth
DAF	Department of Agriculture and Fisheries
DPA	Dugong Protection Area
NPRS	Department of National Parks Recreation and Sport
EHP	Department of Environment and Heritage Protection
GBRMPA	Great Barrier Reef Marine Park Authority
JCU	James Cook University
Qld	Queensland
QBFP	Queensland Boating and Fisheries Patrol
QSCP	Queensland Shark Control Program
SOCI	Species of Conservation Interest
UQ	University of Queensland

General summary

This report summarises dugong strandings and mortalities in Queensland waters from 2013 to 2015. A total of 42 cases were reported in 2013 (including four that were rescued or escaped alive), with 49 in 2014 (including three that were alive) and 21 in 2015 (including two that were alive), which represented a decline from the average over the past 10-year period. The total number reported in 2015 was the lowest since comprehensive reporting of strandings commenced in 1996.

Across the reporting period a total of nine carcasses were examined by staff or veterinarians (2013: three necropsies and one post-mortem examination; 2014: two necropsies and one post mortem examination; 2015: two necropsies). In 2013, the cause of death was identifiable in 12 cases; in 2014, the cause of death was identifiable in 29 cases and in 2015 the cause of death was identifiable in nine cases. Overall, the main identified cause was indigenous hunting (30 records), followed by net entanglement (two mortalities and two released alive), vessel strikes/fractures (four mortalities), disease (three mortalities), predation (two mortalities), incidental catch in the shark control program (two mortalities) and entanglement in a crab pot (one released alive). An additional six mortalities were suspected to have been caused by a human activity based on evidence such as linear cuts and/or rope securing the carcass.

Introduction

Dugongs are conservation dependent because of a low reproductive potential, high investment in offspring, a dependence upon coastal seagrasses and other life-history traits (Marsh 1984; Marsh *et al.* 2011).

Under the *Nature Conservation Act 1992* (Qld) all native marine mammals in Queensland are protected and the dugong is listed as a vulnerable species by the Nature Conservation (Wildlife) Regulation 2006 (Qld). It is also protected nationally as a migratory species under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).

Within State and Commonwealth waters, the *Marine Parks Act 2004* (Qld) and the *Great Barrier Reef Marine Park Act 1975* (Cwlth) also 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. The Great Barrier Reef was rezoned in 2004 (Fernandes *et al.* 2005), greatly increasing the dugong habitat protected from gill netting (Dobbs *et al.* 2008).

The two-tiered Dugong Protection Area (DPA) system was declared under the *Fisheries Act 1994* (Qld) by the Fisheries Amendment Regulation (No. 11) 1997 (Qld). Zone A DPAs represent significant dugong habitat where foreshore set nets and offshore set and drift nets are prohibited (except in the Hervey Bay-Great Sandy Strait Protection Area, where specialised fish netting practises are allowed to continue with modifications). Mesh netting is permitted in Zone B DPAs, but with restrictions on the type, size and locations of nets, and requirements for net attendance. The *Nature Conservation (Dugong) Plan 1999* (Qld) was implemented under the *Nature Conservation Act 1992* to reduce the mortality of dugongs in commercial gill net fisheries in Queensland waters. A series of management arrangements specific for the East Coast Inshore Fin Fish Fishery also provides protection for dugongs in Queensland.

Monitoring the incidence of dugongs that are sick, injured or dead assists in assessing the effectiveness of the above legislation for maintaining sustainable dugong populations. StrandNet is the database where these data are recorded in Queensland. This report presents a summary of the dugong strandings¹ data recorded from 2013-2015. Cetacean, pinniped and marine turtle strandings for the time period are reported elsewhere. The focus of the current report is on presenting case histories and summaries. Detailed analyses are undertaken elsewhere (e.g. Meager and Limpus 2014).

¹ The term 'stranding' is here used to include sick, injured, incapacitated or dead marine wildlife which were washed ashore or encountered at sea; in addition to animals 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).

Methods

All records of sick, injured, incapacitated or dead marine wildlife reported to the Department of Environment and Heritage Protection (EHP) are entered into the StrandNet database (<https://www.derm.qld.gov.au/strandnet/application/>). From 2013 to 2015, most dugong strandings were reported by staff from the Department of National Parks Recreation and Sport (NPRS). Other records were received from the Great Barrier Reef Marine Park Authority (GBRMPA), university researchers, directly from the public or via state-wide stranding telephone hotline (1300 264 625). Records from the Queensland Shark Control Program (SCP) were received from the Department of Agriculture and Fisheries (DAF). Officers from NPRS, EHP, GBRMPA or DAF inspected carcasses that were accessible.

Records were lodged in StrandNet by registered users via a web-based interface and each record was assigned a unique alphanumeric identifier. A record that could not be confirmed as a dugong, 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. Additional details that were recorded included 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 and necropsy reports were attached to the record. Age class and maturity was estimated from total body length following Marsh *et al.* (2011) unless other data were available (e.g. examination of gonads).

Records were then verified by a NPRS regional stranding coordinator. This process was overseen by the EHP state-wide stranding coordinator to ensure that records were accurate, complete and consistent. Records that occurred outside of Marine Parks were entered directly by the state-wide stranding coordinator. Where possible, the cause of death (COD) or stranding (COS) was established by (1) the circumstances of the incident, (2) examination of carcass or photographic records, (3) post-mortem examination by trained staff or (4) necropsies². The level of certainty to the COD/COS assignment was also recorded, as 'confirmed' or 'suspected'. 'Confirmed' diagnoses were the most probable and parsimonious based of the available evidence. In contrast, in 'suspected' diagnoses there was evidence for the COD/COS assignment, but either the mechanism was substantially unclear or there was considerable uncertainty (see Moore *et al.* 2013 and references therein for a further discussion of uncertainty in necropsies). Where there was limited or no evidence, the COD/COS was recorded as 'unknown'.

It is recognised that StrandNet represents only a proportion of sick, injured or dead dugongs 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 dugong may drift substantial distances from the location before stranding. It is acknowledged that coverage is less comprehensive in sparsely populated areas or where there are no regular ranger patrols (i.e. outside of marine parks).

It is also acknowledged that most hunting of dugongs is not reported to StrandNet. There are very few records of hunting in the Torres Strait, for example, where a high level of hunting occurs (Marsh *et al.* 2004). Illegal hunting in Queensland is only generally reported when encountered by NPRS or GBRMPA staff. 'Legal hunting' refers to hunting by Aboriginal or Torres Strait Islander people which is allowed under various State or Commonwealth laws, and is reported voluntarily.

Further, it is acknowledged that fisheries bycatch records in StrandNet may be incomplete. Dugongs 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 dugongs in their Species of Conservation Interest (SOI) logbook. Where available, bycatch records were downloaded from the Queensland Government Open Data portal (<https://data.qld.gov.au/dataset/total-number-of-species-of-conservation-interest-interactions-with-released-conditions>) and cross-referenced against records in StrandNet.

² For the purposes of this report, a necropsy is defined as a systematic procedure to gain insight into the cause of death of an animal whereby gross observations are first generated to establish a differential diagnosis. Subsequent tests (such as histopathology) are then used to eliminate diagnoses until an etiology is established (Pugliari *et al.* 2007). This procedure is usually undertaken by a veterinarian or in consultation with a veterinarian.

Results

Annual trend

The number of strandings and mortalities of dugongs for the current reporting period was less than the long-term average, representing a decline from 2011 (Figure 1). Overall, 42 cases were reported in 2013, 49 in 2014 and 21 in 2015, compared to a long-term average of 69.2 ± 59.7 (mean \pm 1 standard deviation) from 2003 to 2012.

Case histories

In the following summarised case histories, the alphanumeric number (e.g. W230093) is the unique identifier. The coordinates of the reported position are in parentheses and the measurement in metres represents standard length. Species names are provided in Table 1. Carcass condition: D1, alive by subsequently died; D2: dead, fresh carcass; D3: decomposing but internal organs intact; D4: advanced decomposition; D5: skin holding bones together; and D6: disarticulated bones.

2013

Strandings and mortality from natural causes

Disease

1. W230077. 18-Jun-13. Townsville (146.82711°E; -19.24557°S). D2. Septicemia. Emaciation with severe subacute multifocal necrotising hepatitis and severe pulmonary oedema with multiple intralesional colonies of *Vibrio metaschikovii* in liver and lungs. Underlying cardiac fibrosis. Adult female, 2.65 m. Necropsy: James Cook University (JCU).

Shark attack

2. W230052. 12-Feb-13. Moreton Bay (153.1965°E; -27.3538°S). D2. Suspected shark predation. Left *in situ*. Staff unable to access to determine if shark damage was pre or post mortem. The approximate length of the torso suggested that it was adult size. Sex unknown.

Anthropogenic causes of strandings and mortality

Unknown anthropogenic cause.

3. W230133. 23-Sep-13. Bowling Green Bay (147.11031°E; -19.39756°S). D4. Suspected anthropogenic source based on clean cuts to carcass. Samples taken. Sex, length and age class unknown.
4. W230193. 16-Dec-13. Townsville (146.6102°E; -19.1554°S). D4. Suspected anthropogenic source. Anchored with rope around caudal peduncle. Cut open ventrally. Adult male, 2.3 m
5. W230199. 31-Dec-13. Magnetic Island (146.7933°E; -19.1592°S). D4. Suspected anthropogenic source. Tied by rope. Sex, length and age class unknown.

Fisheries interactions

6. W230057. 26-Feb-13. Mission Bay (145.88°E; -16.9°S). D4. Suspected to have drowned in a net. Dumped at sea. Approximate 2 m in length. Sex, length and age class unknown.
7. W230111. 02-Aug-13. Moreton Bay (153.235°E; -27.4736°S). DZ. Released alive from a commercial net. Approximately 2.8 m length. Sex and age class unknown.
8. W230110. 02-Aug-13. Moreton Bay (153.235°E; -27.4739°S). D2. Suspected to have drowned in a commercial net. Recovered near the adult female described above (W230111, presumed to be mother) that was released alive from a net. Large subcutaneous abscess on back of neck. Equivocal interstitial pneumonia. Parasites and mild serous atrophy. Necropsy: the University of Queensland (UQ). Female calf, 1.63 m.
9. W230227. 12-Dec-13. Mapoon (141.8934°E; -11.95361°S). D3. Drowned in a net. Fate of carcass unknown. Sex, age and length unknown

Interactions with vessels

10. N85828. 22-Apr-13. Burnett River (152.3896°E; -24.7591°S). D1. Vessel strike. Four propeller cuts on dorsal side (34 cm, 36 cm and 19 cm long. 19 cm apart, 1-3 cm deep). Hit by a 12 m vessel with an inboard motor. Buried off site. Adult female, 3.03 m.

Queensland Shark Control Program (QSCP)

11. W230181. 05-Oct-13. Mooloolaba, Sunshine Coast (153.12201°E; -26.68128°S). D2. Drowned in a shark control net. Dumped at sea. Approximately 2-2.2 m in length. Sex, age and body length unknown.

Indigenous hunting

12. W230134. 10-Aug-13. Great Sandy Strait (152.9345°E; -25.62021°S). Suspected Traditional Owner hunting. Age, sex and length unknown.
13. W230150. 01-Aug-13. North Stradbroke Island (153.44263°E; -27.39158°S). Suspected Traditional Owner hunting. Reported by the public. Age, sex and length unknown.

Cause of mortality unknown

14. QA4224. 12-Jan-13. Moore Park (152.44417°E; -24.79906°S). Rescued and re-stranded. Euthanised and buried off site. Samples taken. Male calf, 1.12 m.
15. W230070. 10-May-13. Great Sandy Strait (152.97489°E; -25.77108°S). D4. Left *in situ*. Length of the remaining torso (2.7 m) suggests adult. Sex, age and length unknown.
16. W230072. 17-May-13. Double Island (145.68368°E; -16.72635°S). D4. Decomposed carcass found in commercial net. Approximately 2.5 m in length. Sex, age and length unknown.
17. W230082. 18-Jun-13. Great Sandy Strait (152.9418°E; -25.28759°S). D3. Left *in situ*. Sex, age and length unknown.
18. W230085. 18-Jun-13. Clairview Beach (149.59945°E; -22.3969°S). D6. Left *in situ*. Sex, age and length unknown.
19. W230121. 30-Jul-13. Moreton Bay (153.3965°E; -27.2857°S). D3. Left *in situ*. Sex, age and length unknown.
20. W230115. 31-Jul-13. Cairns (151.29905°E; -23.73982°S). D5. Left *in situ*. Sex, age and length unknown.
21. W230106. 08-Aug-13. Townsville (146.65775°E; -19.171°S). D2. Gross and microscopic review failed to identify an underlying cause of death. An apparently healthy animal. Large granulomas in the liver and lung but gram-stained sections failed to identify bacteria. Necropsy: JCU. Adult male, 2.29 m length.
22. W230116. 09-Aug-13. Mackay (148.84038°E; -20.90499°S). D4. Left *in situ*. Sex, age and length unknown.
23. W230118. 09-Aug-13. Clairview (149.54532°E; -22.11721°S). D1. Left *in situ*. Adult female, 2.4 m.
24. W230117. 11-Aug-13. Clairview (149.53643°E; -22.11754°S). D1. Buried on site. Immature male, 2.05 m. Samples taken
25. W230109. 15-Aug-13. Moreton Bay (153.3345°E; -27.5257°S). D3. Left *in situ*. Samples taken, Adult male, 2.7 m length.
26. W230124. 23-Aug-13. Great Sandy Strait (153.0394°E; -25.8588°S). D2. Left *in situ*. Approximately 2 m in length. Sex, age and length unknown.
27. W230123. 29-Aug-13. Gladstone region (151.22685°E; -23.80046°S). D2. Adult female, 3.05 m. Post-mortem examination by NPRS. Samples taken.
28. W230120. 31-Aug-13. Moreton Bay (153.21849°E; -27.4637°S). D2. Dumped at sea. Adult male, 2.85 m.
29. W230142. 07-Sep-13. Urangan (152.90729°E; -25.28512°S). Carcass state unknown. Buried on site. Adult female, 2.97 m length.
30. W230129. 12-Sep-13. North Stradbroke Island (153.48861°E; -27.41777°S). D3. Orphaned calf, died of starvation. Cause unknown. Sex unknown, 1.80 m. Buried off site. Genetic samples taken.
31. W230147. 25-Sep-13. Great Sandy Strait (153.05984°E; -25.80914°S). D3. Buried on site. Post-mortem shark damage. Remains 2.4 m in length. Adult, sex and length unknown.
32. W230135. 26-Sep-13. Burnett River (152.39739°E; -24.75841°S). D3. Left *in situ*. Dorsal vertebrate damaged by propeller, either ante or post mortem. Post-mortem scavenging by sharks. Remains 3.4 m in length. Adult male, length unknown.
33. N97701. 01-Oct-13. Mackay (148.7117°E; -20.6362°S). D3. Left *in situ*. Adult, sex unknown, 2.5 m length.
34. W230174. 06-Oct-13. Moreton Bay (153.16471°E; -27.09651°S). D5. Left *in situ*. Length of remains 1.5 m.

Adult, sex and length unknown.

35. W230244. 15-Oct-13. Shoalwater Bay (150.42413°E; -22.49728°S). D3. Left *in situ*. Adult sized, sex unknown and length unknown.
36. W230185. 25-Oct-13. Mission Bay (145.53746°E; -16.51798°S). D3. Left *in situ*. Sex, age and length unknown.
37. W230178. 03-Nov-13. Toogoom Beach (152.71493°E; -25.26207°S). Carcass state unknown. Buried on site. Sex, age and length unknown.
38. W230194. 12-Dec-13. Cairns (145.46631°E; -16.47402°S). Carcass state unknown. Dugong head floating offshore. A group of 50 false killer whales seen in the area, but the head was not recovered for examination. Sex, age and length unknown.
39. W230208. 30-Dec-13. Cairns. (145.73663°E; -16.83132°S). D4. Buried off site. Subadult, sex unknown, 2 m length.

Cause of stranding unknown

40. W230018. 12-Jan-13. Moore Park (152.28721°E; -24.71933°S). Re-floated. No sign after two hours and assumed rescued. Male calf, 1.07 m .
41. W230128. 21-Jul-13. Moreton Bay (153.3679°E; -27.1609°S). Release via natural escape. Report from the public of an adult-sized dugong in poor condition with a large fresh cut. Approximately 3 m in length. Sex, length and age class unknown.
42. W230191. 08-Dec-13. Great Sandy Strait (152.9226°E; -25.71219°S). Release via natural escape. Stranded on the beach. Reported by a member of the public who attended until it swam off at high tide. Adult sized, sex and length unknown.

Unconfirmed reports

43. W230073. 26-May-13. Cairns (145.63471°E; -16.71133°S). Report of dugong carcass on a beach from a member of the public, received three days later. Staff did not attend.

2014

Anthropogenic causes of strandings and mortality

Unknown anthropogenic cause.

1. W230275. 19-Aug-14. Yeppoon (150.49347°E; -23.35808°S). Carcass state unknown. Buried off site. Adult size, sex and length unknown.

Interactions with vessels

2. W230221. 05-Jan-14. Moreton Bay (153.3588°E; -27.4125°S). Escaped alive. Suspected vessel strike by NPRS vessel during patrol. The area was searched and the animal was not subsequently seen again. Left *in situ*. Adult size, sex and length unknown.
3. W230241. 20-Apr-14. Moreton Bay (153.41245°E; -27.41896°S). D1. Suspected propeller cuts. Adult male, 2.52 m. Samples taken.
4. W230278. 18-Sep-14. Cape Cleveland (147.00922°E; -19.18099°S). D3. Fractures and lacerations. Generalised autolysis, crepitant liver and haemoglobin imbibition. Fractured ribs on the left side, midline fracture (near pons), haemorrhage within calvarium and displacing the brain from the caudal perspective. 66 kg in weight. Calf, male, 1.52 m length. Necropsy: JCU. Samples taken

Indigenous hunting

5. W230209. 15-Jan-14. Starcke Beach (145.0206°E; -14.78833°S). D6. Suspected intentional capture of 20 dugongs for food. A total of 20 skulls (tusks removed) found behind the mangroves at Starcke Beach. Dugong bones and sections of skin also found. Fat layer on some of the skin suggested some of the hunting was relatively recent. Age, sex and length unknown.

6. W230248. 19-May-14. Starcke Beach (145.21502°E; -15.2363°S). Carcass state unknown. Suspected intentional capture for food. Butchered with meat removed. Left *in situ*. Age, sex and length unknown.
7. W230292. 12-Nov-14. Starcke Beach (145.02058°E; -14.78634°S). D5. Suspected intentional capture for food. Left *in situ*. Rope around tail. Linear cuts through bones suggest the carcass had been butchered. Age, sex and length unknown.
8. W230293. 12-Nov-14. Starcke Beach (145.02058°E; -14.78634°S). D5. Suspected intentional capture for food. Remains from a second dugong. Age, sex and length unknown.
9. W230319. 22-Dec-14. Burrum Heads (152.61406°E; -25.18303°S). D2. Suspected intentional capture for food. Left *in situ*. Report of hunting observed in the area the day before. Dugong intestines found, dissected by NPRS officers and were full of seagrass. Age, sex and length unknown.

Strandings and mortality from natural causes

Shark attack

10. W230251. 09-Jun-14. Moreton Bay region (153.37028°E; -27.18387°S). D2. Suspected shark attack. Buried on site. No necropsy undertaken. Length of remains suggest adult (2 m length without head or flukes). Age, sex and length unknown.

Cause of mortality unknown

11. W230204. 05-Jan-14. Fraser Island (153.31168°E; -24.95499°S). D1. Unsuccessful rescue. Taken out to sea by NPRS but subsequently re-stranded dead. Adult female, 3.10 m length. Sample taken.
12. W230222. 07-Feb-14. Mackay (149.29275°E; -21.26434°S). D3. Left *in situ*. Adult female, 2.5 m
13. W230245. 04-Apr-14. Shoalwater Bay (150.28116°E; -22.39811°S). D6. Left *in situ*. Adult sized. Sex and length unknown.
14. W230246. 20-Apr-14. Shoalwater Bay (150.252°E; -22.39655°S). D6. Left *in situ*. Adult sized. Sex and length unknown.
15. W230242. 29-Apr-14. Crocodile Creek (146.9775°E; -19.309°S). D4. Left *in situ*. Age, sex and length unknown.
16. W232422. 22-Apr-14. Hervey Bay (152.88271°E; -25.28121°S). D4. Buried on site. Age, sex and length unknown.
17. W230291. 19-May-14. Coolooloi Creek (153.03537°E; -25.78817°S). D3. Left *in situ*. Calf size, sex unknown, 1.06 m length. Sample taken.
18. W230253. 30-Jun-14. Moreton Bay (153.37419°E; -27.00297°S). D2. Left *in situ*. Sub-adult size, sex unknown, 2 m length.
19. W230252. 03-Jul-14. Moreton Bay (153.40498°E; -27.34741°S). Carcass state unknown. Left *in situ*. Age, sex and length unknown.
20. W230262. 12-Jul-14. Moreton Bay (153.37131°E; -27.18195°S). D4. Buried off site. Adult male, 2.42 m.
21. K10189. 25-Jul-14. Port Clinton (150.67806°E; -22.52859°S). D2. Left *in situ*. Adult male, 3.07 m. Post-mortem examination by NPRS. Samples taken.
22. W230268. 31-Jul-14. Port Clinton (150.67987°E; -22.50616°S). D4. Left *in situ*. Adult sized, sex and length unknown.
23. W230269. 31-Jul-14. Port Clinton (150.52489°E; -22.52489°S). D5. Left *in situ*. Adult sized, sex and length unknown.
24. W230267. 04-Aug-14. Port Clinton (150.68338°E; -22.53754°S). D5. Left *in situ*. Age, sex and length unknown.
25. W230263. 06-Aug-14. Starcke River beach (145.02358°E; -14.79576°S). D6. Left *in situ*. Age, sex and length unknown.
26. W230279. 10-Sep-14. Townsville (146.33181°E; -18.62163°S). D4. Left *in situ*. Adult sized male, length unknown.
27. W230280. 03-Oct-14. Redcliffe (153.11156°E; -27.24523°S). D2. Lactating female, report of calf in vicinity. Calf not found by NPRS officers. Adult female, 2.60 m. Necropsy: UQ.
28. W230286. 08-Oct-14. Moreton Bay (153.36617°E; -27.18258°S). D2. Small wound on head suggesting trauma but not necropsied to determine if damage was ante or post-mortem. Buried off site. Adult male, 2.75 m length.

Cause of strandings unknown

29. W232421. 21-Nov-14. Burrum Beach (152.64233°E; -25.22071°S). Release via natural escape. Dugong in poor condition with a large scar healed from a suspected shark bite. Re-floated itself on the incoming tide. Adult, sex unknown, 2.41 m length.
30. W230285. 26-Oct-14. Bribe Island (153.16902°E; -27.10058°S). Rescued. Member of public pushed dugong back out to water. Left *in situ*. Age, sex and length unknown.

2015

Strandings and mortality from natural causes

Disease

1. W232423. 19-Mar-15. Pumicestone Passage (153.0734°E; -26.9815°S). D2. Haemopericardium, with resultant cardiac tamponade considered the cause of death. Parasites: trematodes in trachea, moderate to large amount of helminths in stomach. Adult male, 2.66 m. Necropsy: UQ
2. W232461. 16-Sep-15. Pumicestone Passage (153.123°E; -27.05833°S). D2. Suspected disease. Adult male, 2.75 m Necropsy: UQ.

Anthropogenic causes of strandings and mortality

Unknown anthropogenic cause.

3. W232414. 07-Mar-15. Yeppoon (150.80891°E; -23.28701°S). D4. Suspected anthropogenic mortality. Rope around tail stock and large cut down length of abdomen. Left *in situ*. Adult, sex unknown, 2.90 m
4. W233143. 04-Sep-15. Great Sandy Strait (152.82795°E; -25.24793°S). D4. Suspected anthropogenic mortality, based on apparent linear cut to tail. Buried off site. Remains 2.3 m in length. Adult male, length unknown.

Entanglement in ropes

5. W232460. 29-Sep-15. Moreton Bay (153.35501°E; -27.64041°S). Rescued from entanglement in a crab pot (circular commercial pot). Released in good condition, with minor cuts and bruises. Age, sex and length unknown.

Queensland Shark Control Program (QSCP)

6. W233261. 21-Oct-15. Mackay (149.226°E; -21.12133°S). D2. Drowned in shark mesh. Dumped at sea. Adult female, 2.95 m.

Fisheries interactions

7. W233145. 13-Oct-15. Townsville (146.4827°E; -19.00443°S). Released alive from a net. Age, sex and length unknown.

Hunting

8. W232451. 29-Jul-15. Burrum River (152.62337°E; -25.1786°S). Carcass state unknown. Suspected intentional capture for food. Reports in the area and remains found. Age, sex and length unknown.
9. W232452. 17-Jun-15. Burrum River (152.62337°E; -25.1786°S). Carcass state unknown. Suspected intentional capture for food. Remains found. Age, sex and length unknown.
10. W233141. 13-Apr-15. Burrum Heads (152.65331°E; -25.19133°S). D3. Suspected intentional capture for food. Remains found. Age, sex and length unknown.
11. W232424. 25-Apr-15. Amity (153.44115°E; -27.39195°S). D3. Suspected mortality from intentional capture for food, based on suspected spear wound from photos examined by JCU (Helene Marsh) and EHP (Col Limpus). A peduncle belt had been attached from satellite tracking research by JCU and EHP. Post-mortem damage from sharks. Buried on site for later examination. Genetic samples taken. Calf, sex unknown, 1.70 m length.

Causes of strandings and mortality unknown

12. W230318. 12-Jan-15. Yeppoon (150.75113°E; -23.13697°S). Euthanised. Orphaned calf in very poor condition.

- Rescued by NPRS but no sign of mother and subsequently re-stranded. Female calf, 1.20 m.
13. W230326. 06-Feb-15. Cairns (145.73838°E; -16.81131°S). Carcass state unknown. Left *in situ*. Floating. QWPS undertook vessel search and were unable to locate. Age, sex and length unknown.
 14. W232428. 01-Jun-15. Fraser Island (153.13416°E; -24.81458°S). D2. Left *in situ*. Adult female, 2.76 m. Sample taken.
 15. W232431. 29-Jun-15. Cardwell (146.025°E; -18.263°S). D3. Adult, sex unknown, 2.18 m. Sample taken.
 16. W232454. 06-Sep-15. Mackay (148.88867°E; -20.87762°S). D4. Adult, sex unknown, 2.56 m. Sample taken.
 17. W233142. 07-Sep-15. Dundowran (152.83259°E; -25.31369°S). D4. Buried on site. Adult, sex and length unknown.
 18. W233254. 02-Sep-15. Bargara (152.475°E; -24.837°S). D3. Carcass removed. Adult male, 2.83 m.
 19. W232467. 21-Oct-15. Mackay (149.2917°E; -21.4494°S). D4. Left *in situ*. Adult sex and length unknown.
 20. W233147. 20-Oct-15. Lamberts Beach (149.2281°E; -21.0777°S). D3. Buried on site. Age, sex and length unknown 1.5 m.
 21. W233215. 10-Oct-15. Moreton Island (153.43015°E; -27.14841°S). D2. Buried on site. Subadult, sex unknown, 1.9 m.

Species of special conservation interest (SOI) logbook data

- DAF do not release individual level data on the location and date of commercial bycatch to StrandNet, but summaries are available at <https://data.qld.gov.au/dataset/total-number-of-species-of-conservation-interest-interactions-with-released-conditions>. There is therefore no way to cross-reference records with StrandNet.
- In 2013, five dugongs were reported to have been caught in nets and released alive.
- In 2014, one dugong was reported to have been caught and released alive.
- No dugongs were reported in 2015.

Discussion

The total number of stranded or dead dugongs has declined since 2011 (Figure 2). The number of cases recorded in 2015 (21) was the lowest since comprehensive reporting commenced in 1996. A previous study has demonstrated a strong link between sustained river discharge and dugong mortalities in Queensland (Meager and Limpus 2014), which was attributed to loss of seagrass foraging pastures. Since 2012, the average rainfall across the Queensland has been below the long-term annual average (1961-90) (Australian Bureau of Meteorology trend data, accessed from <http://www.bom.gov.au> on 5/12/16), suggesting the low stranding rate of dugongs in recent years has been related to improved availability of seagrass pastures since the severe weather events of 2010-11 (Meager and Limpus 2012). However, a detailed understanding of the long-term trends requires analyses of cause-specific trends on subregional basis, which is outside the scope of this data report (but see Meager *et al.* 2013; Meager and Limpus 2014; Fuentes *et al.* 2016). Fluctuations in the number of reports between years can also be associated with factors such as changes in reporting effort, changes in local population size, vulnerability/health and other external drivers.

There were no notable changes in trends of cause-specific mortality for anthropogenic or natural causes. A total of five net entanglements (including two released alive) were recorded in StrandNet from 2013-2014, compared to eight in 2012, three in 2011 and eight in 2010. An additional five dugongs (three in 2013 and two in 2015) had indications of human interference (linear cuts and/or anchored carcass) but it was uncertain how they died. Unless they are reported directly by a fisher or an observer, it is difficult to determine if dugongs have drowned in a net without a necropsy because external markings from nets can be subtle. Dugongs can also become disentangled after they drown or entangle after they have died from another cause. Monitoring bycatch therefore depends on a robust system of incident reporting across agencies and jurisdictions, coupled with carcass salvage and necropsies where net entanglement is suspected.

The number of reports received for indigenous hunting in 2014 (24) was elevated compared to other years, and reports were received for three areas, the Starcke River, Moreton Bay and Hervey Bay regions. Even though StrandNet provides an indicator of when and where hunting occurs, these data are not intended for analysis of trends because Traditional Owners are not obliged to report hunting. Further, even with a compliance

investigation it is not always clear whether or not poaching or legal hunting occurred.

The spatial distribution of stranded or dead dugongs from 2013 to 2015 was similar to previous reports, with most strandings and mortalities in the Moreton Bay, Hervey Bay-Great Sandy Strait, Rockhampton-Shoalwater Bay, Townsville and Cairns regions (Flint and Limpus 2013; Table 1, Figure 1, Figures 3-5). These 'hotspots' represent medium-very high density dugong habitat (Grech *et al.* 2011; Sobotzick *et al.* 2012) where strandings and mortalities are likely to be reported because of regular NPRS patrols and/or frequent public visitation. The notable exception was in the sparsely populated Starcke River region, where reports were attributed to indigenous hunting.

Indigenous hunting and net entanglement occurred in both near urban and remote locations. In contrast, collisions with vessels only occurred close to major urban centres (Brisbane, Bundaberg and Townsville), where the density of vessels is the highest. Although StrandNet can provide an indication of the effectiveness of protection measures such as designated Go Slow areas, it is generally difficult to determine where a vessel strike has occurred because carcasses or injured dugongs float with wind and water currents. The exception to this is when reports are received directly from an observer or skipper.

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Table 1. Geographical distribution of dugong strandings in Queensland, 2000 to 2015 (refer to Figure 1 for latitudinal block locations). Subscripts denote stranded dugongs that were released or left to natural processes. ^h, hunting (legal or illegal); GC, Gulf of Carpentaria; ?, unconfirmed report; * summaries from previous stranding reports.

Year	GC	Qld (east coast in 1° latitude blocks)																				Total
		9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
2000*							1	6 ₁	2	12 ₃	18 ₁	2	2	1	2	5	11 ₁	4	17 ₂		83 ₈	
2001*	2					1		1	1?	11 ₁ +1?	8		1	1	2 ₁	6	9+2?	1	6+1?	1?	49 ₂ +6?	
2002*							1			1	3	3		1+1?	3	3	6 ₁ +1?	1	19+1?		41 ₁ +3?	
2003*	1			1				1 ₁ +1?		2+2?	1+3?	2	4	1+1?	4	1	9		11		38 ₁ +7?	
2004*						2	1	1+1?		2	2+1?		1	2	4		4	1	18 ₁ +1?		38 ₁ +3?	
2005*						1	1	4		2+1?	4	1			9 ₁ +1?	2	4		8+2?		36 ₁ +4?	
2006*	1							3	1	1	3	1	2+1?	3	3		4		14+1?		36+2?	
2007*		3					1	4+1?		2	8+2?	1+1?	3	2	2	1	2+1?	1	10+2?		40+7?	
2008*	1							1	1	2	5+1?		3	3	4+1?		7	3	11		41+2?	
2009*	2							12 ₁ +1?	1	7	12 ₁ +3?		1	3 ₁	1	2+1?	13+1?		9		63 ₃ +6?	
2010*	1	2 ₁						17 ₁	6	5	18+3?	2+1?	2+1?		3 ₂	2	9	1	17		85 ₄ +5?	
2011*	33 ^h						23 ^h	3	12 ₁	2	22	53+8?	19 ₁ +2 ^h +1?	4	8	11 ₁	2	21	2	21+1?	238 ₃ +10?	
2012	1					2+3 ^h	2	5 ₁			3 ₁ +1 ^h	1 ₁	1	7+1 ^h	10	2	5 ₁	2	9		54 ₄	
2013	1							5+1?			5	2		4	2	3 ₁	6 ₁ +1 ^h	1	7 ₂ +1 ^h		38 ₄ +1?	
2014						23 ^h	1 ^h			1	2		1	6	1	1	2 ₁ +1 ^h		7 ₂		46 ₃	
2015								1		1	1	1	3		2	2	2+3 ^h	1	2 ₁ +1 ^h		19 ₂	

Table 2. Summary of dugong strandings by year and identified sources of mortality for Queensland, 2000–2015. ?, unconfirmed report. Numbers in parentheses were released or left to natural processes.

Cause of stranding or mortality	Year		
	2013	2014	2015
<i>Natural causes</i>			
Disease and ill health	1	0	2
Predation/predator attack	1	1	0
Stingray barb	0	0	0
<i>Anthropogenic causes</i>			
Vessels strike/fractures	1	2(1)	0
Entanglement in float lines and ropes	0	0	(1)
Netting	3(1)	0	(1)
SCP	1	0	1
Hunting	2	24	4
Undetermined	3	1	2
Undetermined causes	26(3)	18(2)	10
Total	38(4) + 1?	46(3)	19(2)

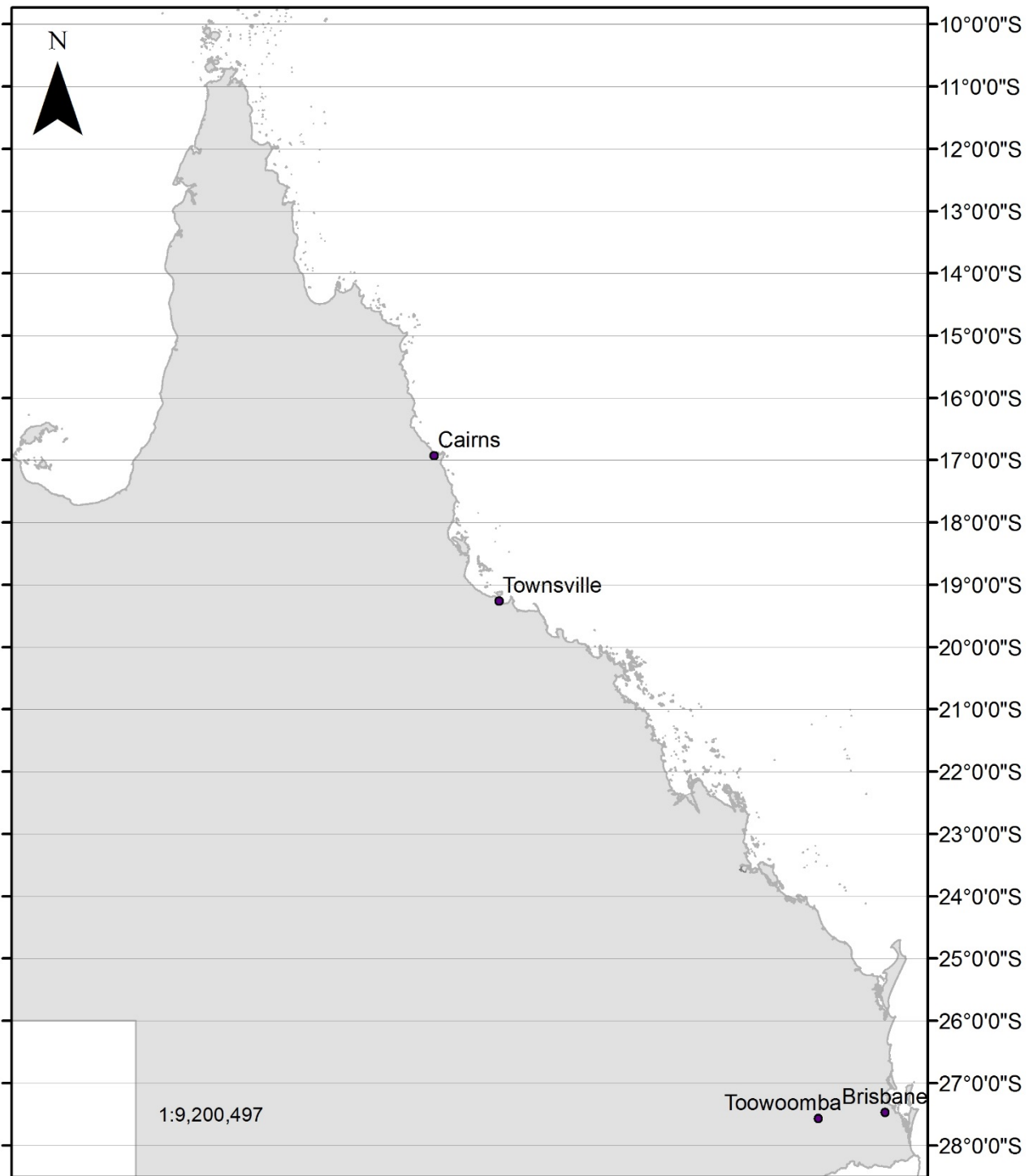


Figure 1. Latitudinal block locations used in Table 1.

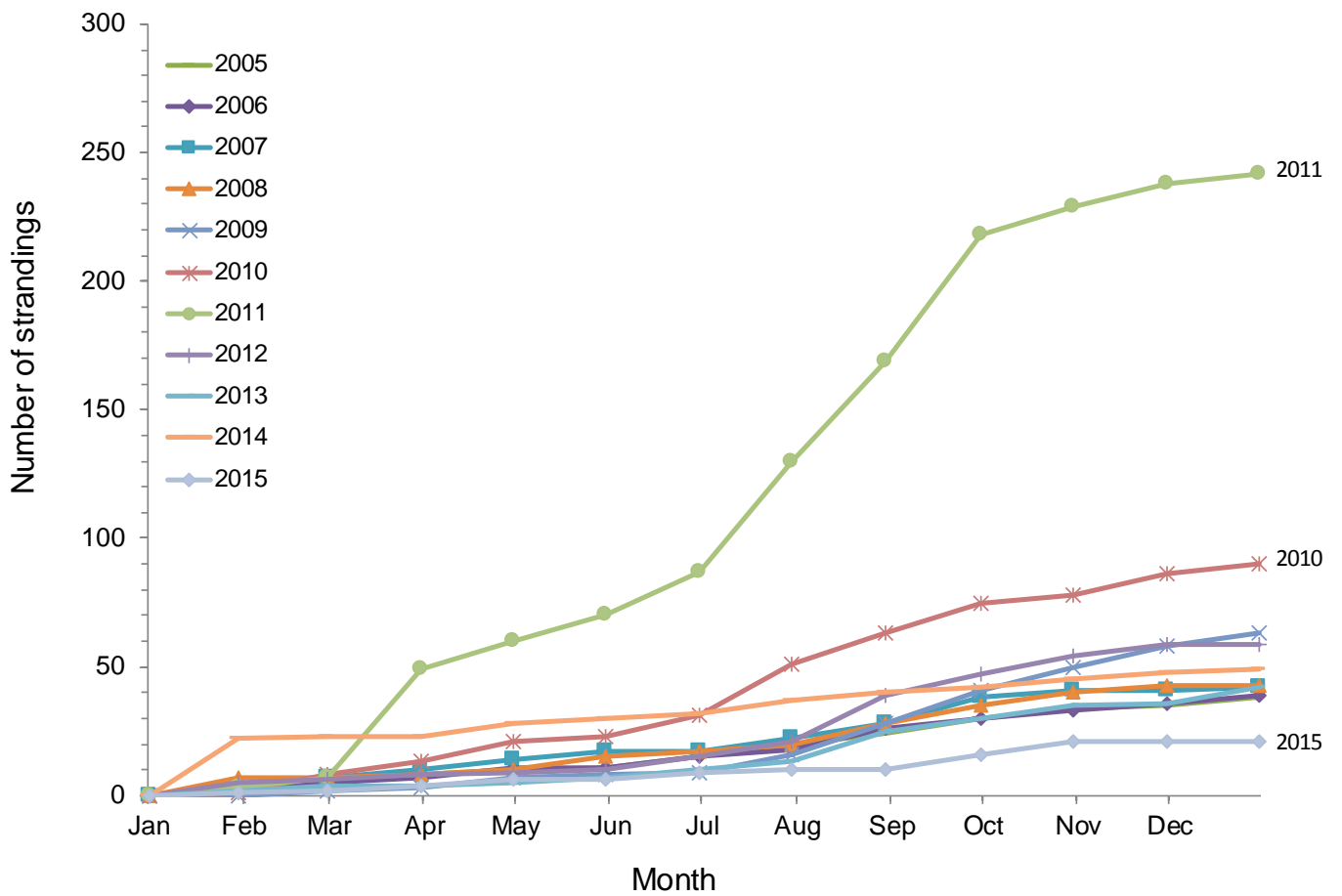


Figure 2. Monthly cumulative dugong strandings by year for Queensland (2005-2015). Only confirmed cases are included.

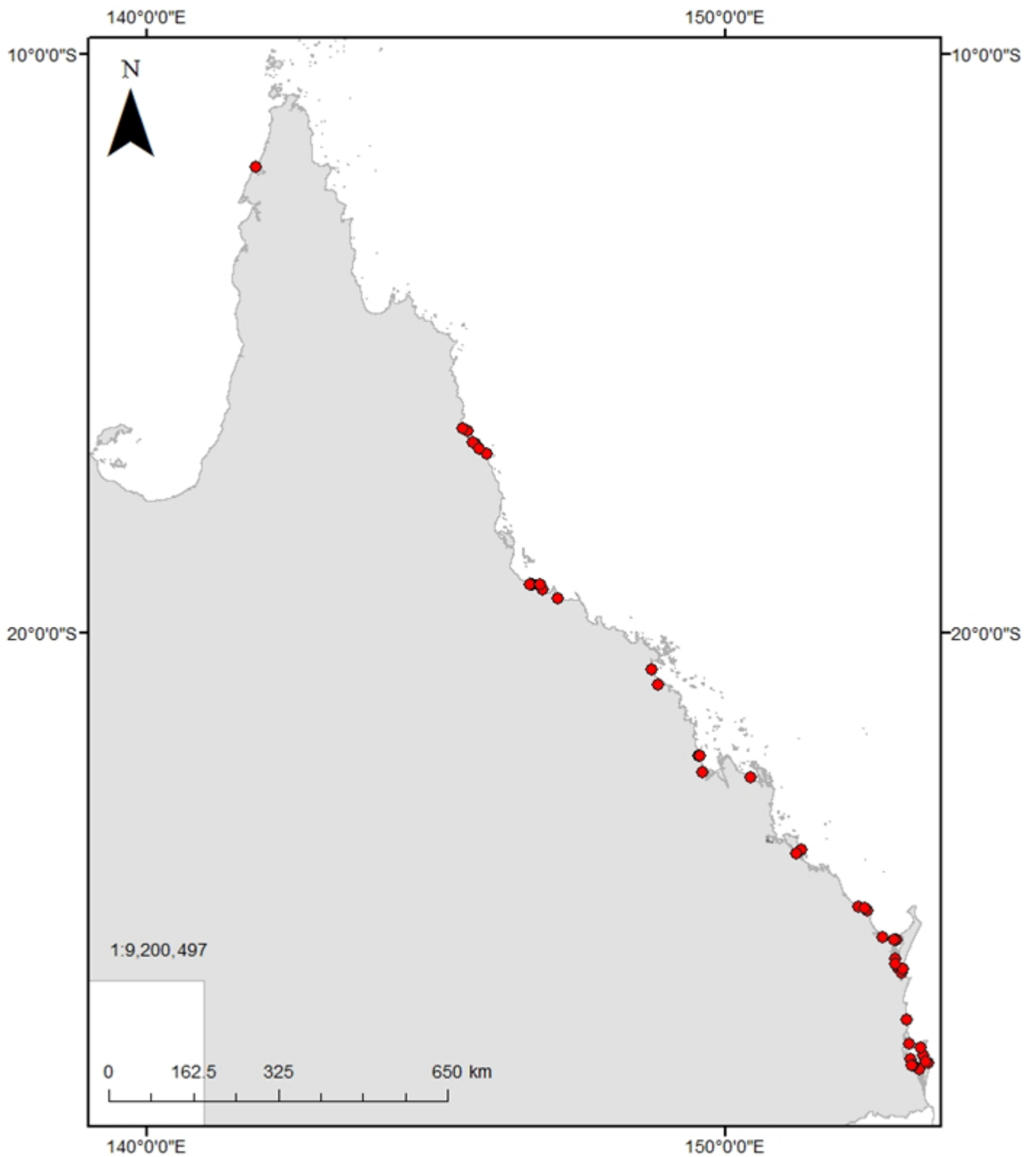


Figure 3. Distribution of dugong strandings in 2013. Only confirmed records are included.

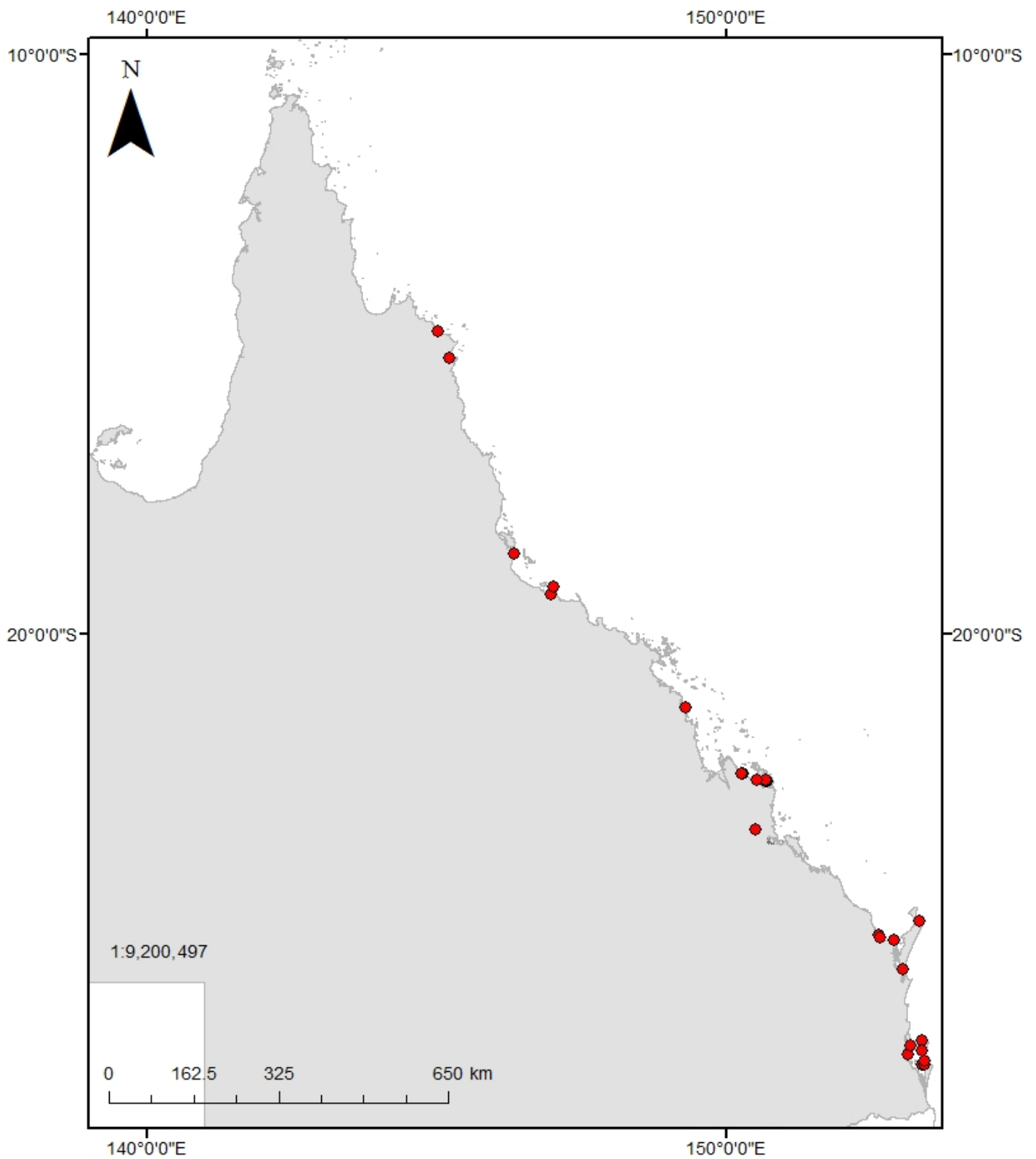


Figure 4. Distribution of dugong strandings in 2014. Only confirmed records are included.

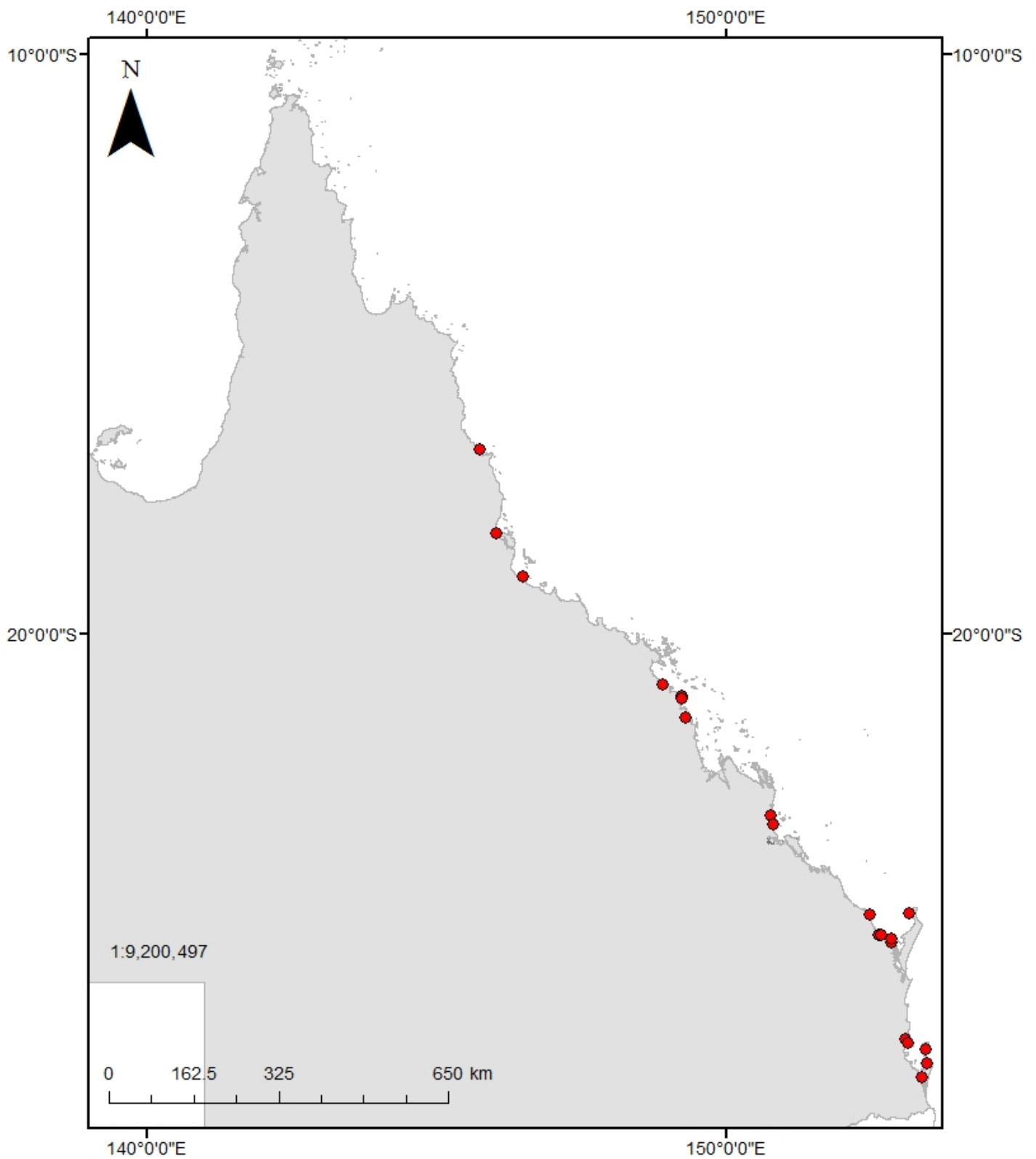


Figure 5. Distribution of dugong strandings in 2015. Only confirmed records are included.