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Confirmation of a new breeding area for humpback whales (*Megaptera novaeangliae*) in the central South Pacific

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ABSTRACT

Small numbers of humpback whales (*Megaptera novaeangliae*, Borowski 1781) have been visiting Pitcairn Island in the central South Pacific annually since the early 1990s. The whales have been observed between the months of June and November in mixed groups including adult males, mothers with calves and escort whales. More recently, similar small groups have also been observed at neighbouring Henderson Island, 200km ENE of Pitcairn. The sightings of mothers with very young calves, the observations of surface-active behaviours and the witnessing of (unrecorded) singing bouts, strongly suggest that the waters around these two islands are being used as calving and mating habitats during the austral winter and spring. Recent photographs and videos taken during visits to both islands confirm that calves are of a size that would suggest they have been born at either Pitcairn or Henderson Islands. Further work is required to assess how these small breeding whale groups may relate to larger groups further west, centered on Mo'orea and Rurutu in French Polynesia, which constitute part of the Cook Islands-French Polynesia Breeding Stock F. As no identification of individuals has yet been undertaken at the Pitcairn Islands, it is too early to determine whether there is any exchange of individuals with these more established groups.

KEYWORDS: SOUTH PACIFIC OCEAN; BREEDING GROUNDS; REPRODUCTION; DISTRIBUTION; MIGRATION; CONSERVATION

INTRODUCTION

Humpback whales (*Megaptera novaeangliae*, Borowski 1781) undertake seasonal migrations from high-latitude feeding areas to mating and calving grounds in tropical or sub-tropical waters (Dawbin, 1966; Reeves *et al.*, 1999; Townsend, 1935). At least five breeding sub-stocks of humpback whales are recognised by the International Whaling Commission (IWC) in the South Pacific (IWC, 2011): East Australia (Ei); New Caledonia (Eii); Tonga (Eiii); French Polynesia (F) and Columbia/Ecuador (G). Sub-stock F (Olavarria *et al.*, 2006) encompasses groups of humpbacks which occur each austral winter around the Cook Islands (Group F1) and French Polynesia (Group F2). Sub-stocks Eii, Eiii and F together comprise the Oceania sub-population that was classified by the IUCN in 2008 as being Endangered on account of its small size and slow growth rate (Childerhouse *et al.*, 2008), a situation confirmed by Constantine *et al.* (2012); most other humpback whale sub-stocks are considered Least Concern (Reilly *et al.*, 2008). The Pitcairn Islands lie at the eastern extreme of the Oceania region, defined as lying between 160°E (west of New Caledonia) to 120°W (east of French Polynesia), and between 0° and 30°S (Bettridge *et al.*, 2015). Whilst the feeding area(s) for Oceania sub-stocks E and F remains uncertain, it is believed to be predominantly within IWC management Area VI⁶ (170° to 120° W) of the Antarctic, with probably also eastern Area V and western Area I (Garrigue *et al.*, 2010; Hauser *et al.*, 2010; Robbins *et al.*, 2011).

The Pitcairn Islands are a group of four, widely separated, islands in the central South Pacific and are a British Overseas Territory. Pitcairn itself, the only inhabited island and barely 4.5km² in area, lies just south of the Tropic of Capricorn at 25°04'S, 130°06'W (Fig. 1). The largest island in the group is Henderson (43 km²) which lies 200km ENE of Pitcairn at 24°21'S, 128°19'W (Irving and Dawson, 2012). Travelling to Pitcairn is difficult and expensive (there are no flights and supply ships visit just once each quarter). Access to Henderson is even more challenging, requiring a dedicated vessel charter. Survey effort at both islands has thus been extremely restricted and limited to opportunistic occasions, varying in length from a few days to several months at a time.

The only dedicated humpback whale study at Pitcairn was in 2007 (Horswill and Jackson, 2012), when daily observations were recorded between 8 June and 31 August 2007. An observer spent two hours each day (one hour in the morning and one in the afternoon) actively scanning the nearshore waters for whales from various vantage points on the island. During August that year, the presence of calves was noted and '...a possibility that the in-shore waters [at Pitcairn] may be used for breeding and calving' was suggested (Horswill and Jackson, 2012).

In 2014, under the auspices of a UK Darwin Initiative project⁷, the study was resurrected as a citizen science project, with several of the island's small community (45 persons) voluntarily participating as data recorders. The project was run in collaboration with the Pitcairn

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⁶ For a description of IWC management Areas see Donovan (1991).

⁷ <http://www.darwininitiative.org.uk/project/20-006>.

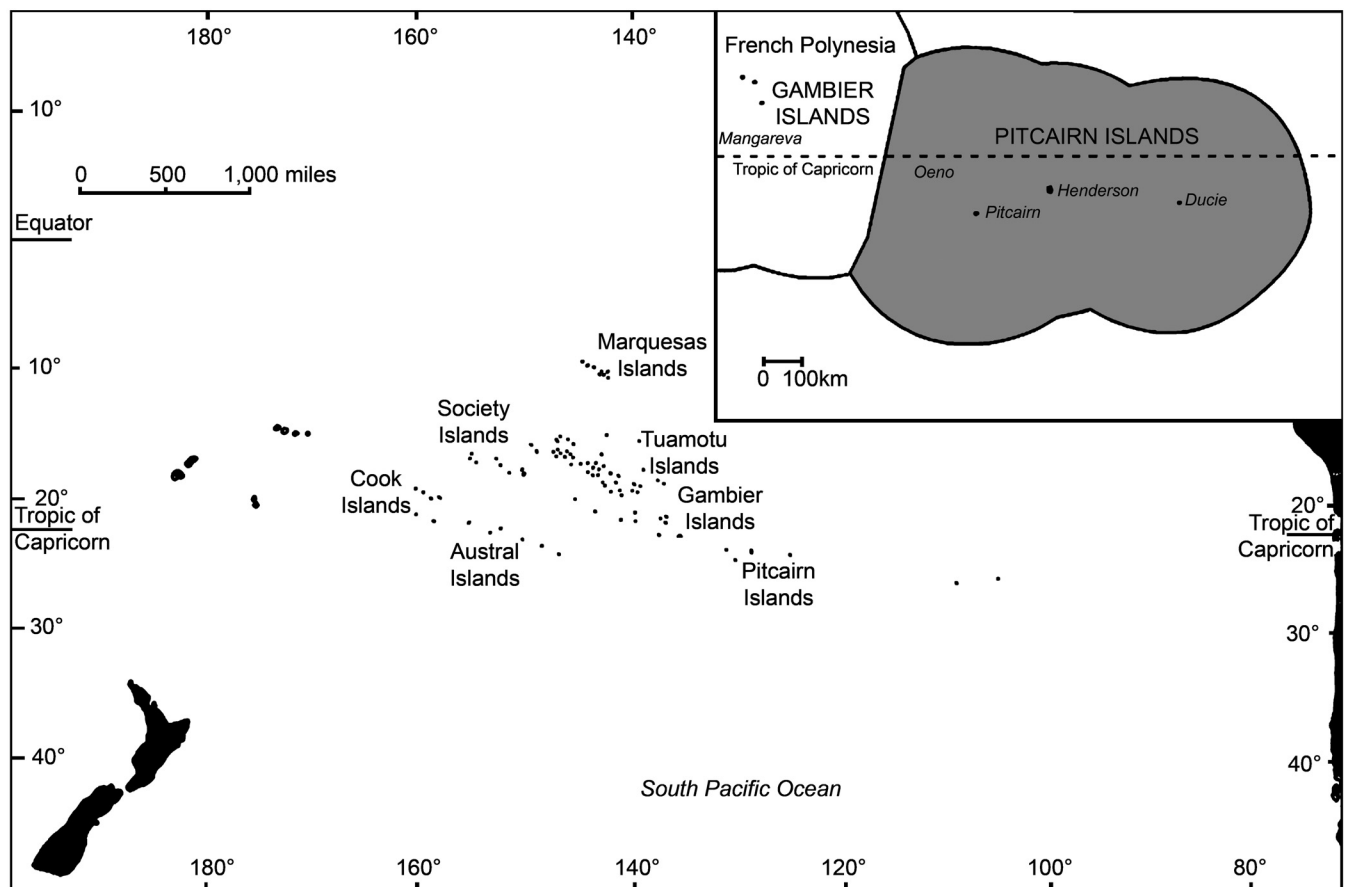


Fig. 1. The main island groups of the central South Pacific with (inset) the location of Pitcairn and Henderson Islands within the Pitcairn Islands group EEZ.

Government's Environmental, Conservation and Natural Resources Division (ECNRD). The aim was to record the presence and surface behaviours of humpback whales during their annual visits (June to October/November) to Pitcairn. During 2015, opportunistic observations of humpbacks were also recorded at Henderson Island during a small scientific expedition to the island.

In 2009 the UK Government (on behalf of the Pitcairn Islands) signed a Memorandum of Understanding (MoU) for the Conservation of Cetaceans and their Habitats in the Pacific Island Region (CMS/SPREP, 2006). Additional protection for cetaceans within the Islands' Exclusive Economic Zone (EEZ) has recently been made possible with the designation by the UK Government of the Pitcairn Islands highly protected Marine Protected Area in September 2016 (UK Government, 2016), following its intention to do so as recorded in March 2015 (Dawson, 2015).

METHODS

Observations of humpback whales at Pitcairn were recorded using data forms which were distributed to the islanders in May 2014. Data fields included: date; time; name of observer; location of sighting (estimated with an 'x' on a map); location of observer; number of whales seen; duration of observation; notable behaviours (spouting/flipper splashing/tail flapping/full breaching/other); weather conditions; sea conditions; wind direction and approximate strength; and if photographs/video were taken). Forms were completed whenever a whale or whales were seen and submitted monthly to the office of the ECNRD. These were then

scanned and e-mailed to the lead author in the UK for analysis. Sightings were opportunistic and not time-restricted in any way. The community was routinely encouraged to complete the forms by a community member employed part-time as a Marine and Fisheries Officer through the Darwin Initiative project.

At Henderson, survey forms were not used but daily observations of whales were recorded on a spreadsheet. The expedition's camp was positioned almost mid-way along the north coast of the island, and it was from here, and along the 2.5km length of the North Beach itself, that most observations were undertaken. Occasional observations were also made from the top of a 30m high cliff behind the camp area, which provided a greater field of view. Impenetrable scrub severely restricts access to other parts of the Henderson coastline.

RESULTS

Spatial distribution of sightings

A total of 37 sightings of humpbacks were recorded at Pitcairn in 2014; 20 in 2015; and 96 in 2016 (Fig. 2a–c). The major increase in sighting numbers in 2016 was due to an increase in survey uptake/effort. The majority of sightings were off the island's northeast coast reflecting the fact that most of the island's properties look out onto this sector and it is also the side of the island where most day-to-day activities take place, not necessarily the actual distribution of the whales.

At Henderson, a total of 26 sightings of humpbacks were made by two observers principally off the north coast from 15 June until 29 August 2015. The positions of these

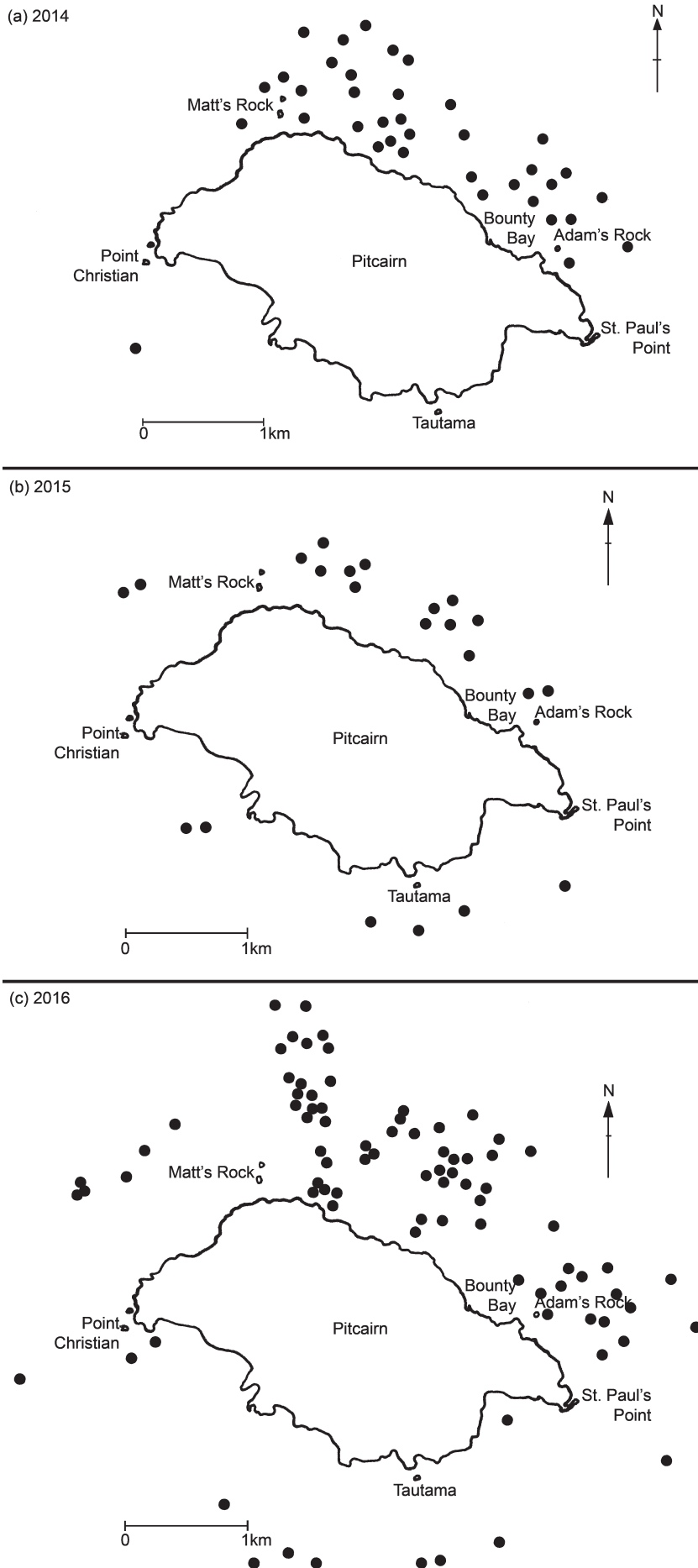


Fig. 2. The distribution of humpback whale sightings made from Pitcairn Island in (a) 2014; (b) 2015; and (c) 2016.

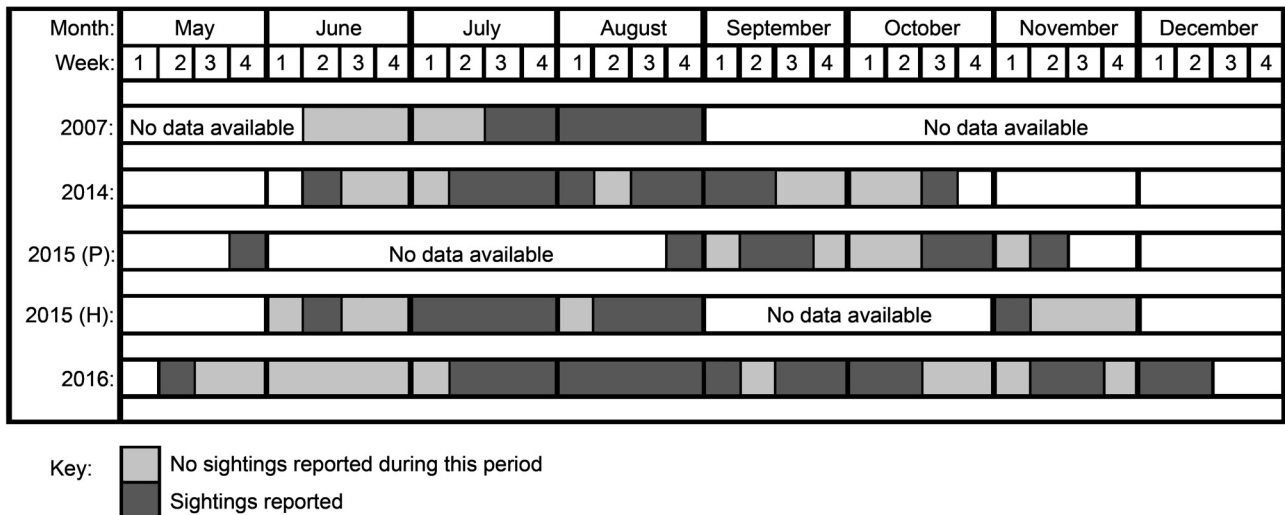


Fig. 3. A temporal representation of humpback whale sightings at Pitcairn and Henderson Islands, 2014–2016.

sightings were described but not mapped. Whales continued to be present beyond the end of August, but no details of these sightings are available.

Temporal distribution of sightings

The presence of humpback whales off Pitcairn Island was first noted in the early 1990s, although the precise year was not recorded (Horswill and Jackson, 2012). The present results found humpback whales at Pitcairn from late May to early December. In 2014, the sightings window lasted for 20/21 weeks (from 15 June to ‘early November’); in 2015 for 23/24 weeks (from 31 May to 11 November); and in 2016 for 30/31 weeks (from 11 May to 15 December). Within these windows, there were periods when no sightings were reported (Fig. 3), possibly due to poor weather/rough seas, a lack of observational effort or for other reasons. Most sightings were made during July and August (Fig. 4).

Sightings usually lasted at least several minutes, with some surface activity lasting several hours. At both Pitcairn and Henderson, whales were either seen singly, in pairs, in mother/calf pairs, in mother/calf/escort groups, or sometimes in larger groupings (loosely defined as individuals being within 100m of each other). The largest groupings reported in each year were of 7 individuals on 17 July 2014; ‘more than 3’ individuals on 16 September 2015; and 8 individuals on 24 August 2016.

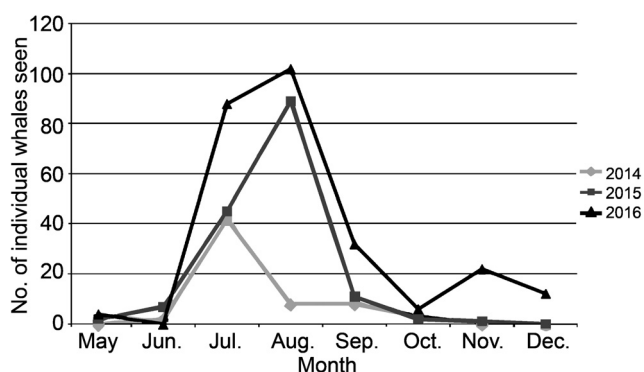


Fig. 4. The total number of humpback whales recorded from Pitcairn Island in 2014, 2015 and 2016. Note that in 2015, records from Henderson have also been included in the total shown.

At uninhabited Henderson Island, the earliest verifiable records of humpback whales are from July to August 2003 when a small number of ornithologists visited the island (M. Brooke, pers. comm., 2016.). Humpbacks were also encountered at Henderson in 2009, 2011, 2012 and 2013 (O’Keefe and Warren, unpublished data). It is assumed that the seasonality of humpback visits at Henderson is similar to that at Pitcairn.

In 2015, the first whales at Henderson were seen on 13 June 2015 and the last in early November, a sightings window lasting 20/21 weeks. The total number of sighting events up until the end of August 2015 was 26. The largest grouping sighted consisted of 15 individuals on 18 August (which included one cow/calf pair) and the second largest of 10 individuals on 13 August (which included three cow/calf pairs).

Observed behaviours

In addition to the presence of individuals or groups of whales, observers were asked to note surface active behaviours including breaches (either partial or full emergence from water), flipper/pectoral slapping and tail/fluke smacking. Such behaviours are often associated with courtship/mating (Darling *et al.*, 1983). At Pitcairn, surface active behaviours were observed on several occasions between 17 July and 1 September in 2014; between 1 August and 11 November in 2015; and between 11 July and 15 December in 2016. In addition, two other behaviours (bubbling and tail standing) were observed at Henderson during July and August 2015. Bubbling behaviour in particular, and occasional bouts of singing heard at both islands (some lasting hours at a time), are associated with aggressive interactions between males seeking mating opportunities (Tyack and Whitehead, 1983).

At Henderson, surface active behaviours were noted on 13 days between 27 July and 24 August 2015. Singing bouts were heard on several days, throughout daylight hours and into the evening, but those heard on 22, 23 and 24 August were particularly noticeable. The songs heard on 23 and 24 August were so loud as to cause the ground to vibrate within the expedition camp area (50m from the beach) and were even heard approximately 1km inland.



Plate 1. Humpback whale mother and new-born calf, off Pitcairn, September 2012 (Photo: M. Jolly).

Presence of new-born calves

At Pitcairn Island, the presence of very young calves (perhaps a week or two old) has been confirmed by underwater photographs and video, as shown in Plate 1. The available evidence suggests calves are being born from early/mid-August through to mid-September. Sightings of older calves/juveniles, typically seen alongside adult whales, are more common. At Henderson, the first positive sighting of a new-born calf was on 11 August 2015, seen swimming with its mother less than 200m from the beach. Sightings of mother/calf pairs (the most seen at one time was three pairs) continued until 21 August in that year.

DISCUSSION

This study provides the most comprehensive collation of information on humpback whales in the Pitcairn Islands to date. Data are challenging to compile for a number of reasons: the islands are extremely remote and it is expensive for outsiders to reach them; Pitcairn is the only inhabited island of the group yet has a very small population; and there is a dearth of vessels in the region which can act as observation platforms.

The available data suggest that small numbers of humpbacks (probably no more than 15 in any one year) have been visiting Pitcairn since the early 1990s. A similar number may have also been visiting Henderson on a regular basis since at least 2003 and, although not yet confirmed, we consider it likely that there is interchange between the islands (e.g. Garrigue *et al.*, 2007). It is apparent that the near-shore areas off the north-east coast of Pitcairn and the north coast of Henderson (Irving and Dawson, 2013) provide shallow, sheltered and undisturbed habitats in which birthing and immediate post-natal care can safely take place. The observations of occasional large groups and a variety of

surface behaviours at both locations suggests competitive activity between males, with bubble-blowing and bouts of singing indicating the active pursuit of mating opportunities.

What remains unclear at this stage is whether the small number of humpbacks at the Pitcairn Islands should be regarded as being an extension of sub-stock F2 (French Polynesia). Their presence at Pitcairn and Henderson may be indicative of range expansion, reflecting either recent population growth or a possible response to environmental factors (as proposed by Horswill and Jackson, 2012). Early whaling records from the 19th century show very few humpback whale catches in eastern Polynesia (Beale, 1839; Mackintosh, 1942; Townsend, 1935), suggesting that either humpback whales were formerly absent from these regions or that the locations of their primary concentrations were unknown to early whalers. However, recent genetic analysis supports the hypothesis that the eastern Polynesian population of humpbacks is a relic sub-population, distinct from known neighbouring breeding grounds (Olavarria *et al.*, 2007). Given the uncertainty as to which sub-stock these whales belong to, further work should include photo-identification and genetic sampling that would facilitate both an assessment of connectivity (or lack thereof) to other sites in the Oceania/South Pacific region. This would also allow an appraisal of individual site fidelity and an exploration of individual migratory behaviour.

Within the French Polynesia (F2) sub-stock of Oceania, Baker *et al.* (2006) estimated there was a mean abundance of 1,057 humpback whales for the period 1999–2004 (using photo-identification only); while Constantine *et al.* (2010), for the same F2 sub-stock, provided an abundance estimate of 934 (using microsatellite genotypes) for the period 1999–2005. Both studies concluded there was no significant trend in abundance in Oceania overall, contradicting the recovery

seen in most other populations throughout the world (Constantine *et al.*, 2012) and confirming their IUCN Endangered status (Childerhouse *et al.*, 2008). Typically, humpbacks are seen in French Polynesia between July and December (Gannier, 2004), although they have been sighted in the Society Islands as early as May (Poole, 2006), so a very similar timeframe to their occurrence at Pitcairn. Regular sightings are made of small numbers of humpbacks within the Gambier Islands (the closest archipelago to Pitcairn and Henderson) during July and August (Gannier 2004; Poole *et al.*, 2013). It seems logical that this would be the area from which to start investigating the possibility of shared individuals between the two groups.

A small number of humpback whales have been recorded in recent years during the austral winter period at Easter Island (Rapa Nui), located some 2,000km east of Pitcairn Island (Hucke-Gaete *et al.*, 2014), although sightings are irregular. Their appearance here may well be the result of simply exploratory journeys by individual whales (Garrigue *et al.*, 2011), which may derive from the west or the east. A southeastwards extension of the breeding range of humpback whales from the French Polynesia (F2) group would certainly not be unexpected, as their numbers slowly build throughout the whole Southern Hemisphere.

CONCLUSION

The available data suggest that the waters around both Pitcairn Island and Henderson Island are regularly being used by small numbers of breeding humpback whales during the austral winter and spring. Further work is required (1) to identify individual whales through the use of photographs of fluke patterns and flank markings in order to assess individual inter-island connectivity and annual site fidelity; (2) to investigate the relationship of whales using the Pitcairn Islands with those of other areas of eastern Oceania, through the use of photo-id, genetic sampling and the analysis of songs; and (3) to assess migratory movements using telemetry.

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