A re-evaluation of the northern distributional limit of the grey-headed flying-fox, Pteropus poliocephalus

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Flying-foxes (family Pteropodidae) forage at night, roost during the day in large communal camps and routinely move large distances (100s of kms) in response to changing food availability. The Grey-headed Flying-fox (*Pteropus poliocephalus*) is a nationally vulnerable species endemic to coastal eastern Australia. *P. poliocephalus* is a highly mobile animal that regularly moves between campsites across an expansive range. It has been frequently suggested that the distribution of this species has changed considerably during the past century. Several articles state that the northern limit of *P. poliocephalus* has contracted by over 750 km since the 1900s and that the current breeding range does not extend north of Maryborough in south east Queensland (Tidemann 1999, Tidemann and Nelson 2004, van Dyck and Strahan 2008). This contraction in the northern part of *P. poliocephalus* range has been variously cited as evidence for the emerging impacts of climate change (Tidemann 1999, Hughes 2003, Tidemann and Nelson 2004, Welbergen *et al.* 2007), and attributed to increased competition with the southward-expanding *P. alecto* (Tidemann 1999, Hall and Richards 2000, Eby 2006, van Dyck and Strahan 2008). However, these changes to the distribution of *P. poliocephalus* have not been examined systematically, and the extent of change is unclear.

Here we re-assess the nature and extent of historical change to the northern limit of *P. poliocephalus* and assess whether the results support a conclusion that its range has contracted to the north. Locality records near the northern limit of *P. poliocephalus* distribution were collated from museum records, wildlife atlases, ABBBS and literature records. Records were scrutinized for accuracy and filtered to include only those coastal from the escarpment

and north of 26^{O}S (see Figure 1). As records within this part of the species range are limited, possibly due to large areas being unpopulated and inaccessible, the present distribution was obtained from field surveys including a current satellite telemetry study initiated in south-east Queensland. The results suggest that any change in the northern limit of *P. poliocephalus* is questionable. Past records show that there have been consistent observations of *P. poliocephalus* using the mid-northern extent of their range, from Mackay to Bundaberg (Table 1). Close scrutiny of records in the far north of the species range (north of Mackay) revealed that these are either questionable or incorrect. For example, the 1895 museum specimen collected on the Herbert River was found to be misidentified (Figure 2), and this record had contributed greatly to the impression that *P. poliocephalus* once occurred further north than at present.

Table 1. Summary of the key records of *P. poliocephalus* in its northern range (north of latitude 26^{O}S).

Source	Year	General Locality	Lat	Long
Australian Museum[a]	1895	Herbert River	-18.5167	146.3000
Dobson 1878	1843	Cape Upstart, Bowen	-19.7654	147.8252
WILDNET[b*]	1990	Whitsunday Springs Resort, nr Bowen	-19.9512	148.1178
WILDNET[b**]	1990	Proposed resort site, Midge Point	-20.6561	148.7067
WILDNET	1882	Seaforth, nr Mackay	-20.8984	148.9594
QLD Museum	1991	Eungella	-21.0800	148.2900
Collett 1887	1882	Mackay	-21.1443	149.1886
Ratcliffe 1932	1929	Byfield	-22.8205	150.6514
Ratcliffe 1932	1929	Barmoya, nth Gladstone	-23.1195	150.5580
SA Museum	1930	Fitzroy River, Fitzroy Valley	-23.3330	150.4167
EPA survey	1990	Rockhampton region	-23.3651	150.4511
Ratcliffe 1931	1929	Rockhampton	-23.3755	150.5124
Nelson 1963	1960	Rockhampton	-23.3755	150.5124
Ratcliffe 1932	1929	Raglan	-23.6621	150.8176
ABBBS	2002	Targinie, 20km nth Gladstone	-23.7167	151.1000
Ratcliffe 1932	1929	Yarwun, nr Gladstone	-23.8174	151.1259
L Hall survey	1990	Wiggins Island Gladstone	-23.8226	151.2111
L Hall survey	1995	Gladstone	-23.8439	151.1747
WILDNET	2002	10km NW Gladstone CBD	-23.8439	151.1747
Birt 2005	2000	Turkey Beach	-24.0843	151.6499
WILDNET	1997	Eurimbula National Park	-24.1544	151.7715
WILDNET	1982	1770-Agnes Water area	-24.1984	151.8927
WILDNET	1975	Eurimbula beach-Agnes Waters area	-24.2068	151.8761
WILDNET	1998	Deepwater National Park	-24.2818	151.9177
WILDNET	1975	Deepwater National Park	-24.3151	151.9427
WILDNET	1983	Miriam Vale	-24.3734	151.9594
Ratcliffe 1931	1930	Baffle Creek	-24.4597	151.9488
WILDNET	1995	Granite Creek, general area	-24.5740	151.5370
Ratcliffe 1938	1930	Watalgan	-24.6367	152.0041
Birt 2005	1998	Bundaberg	-24.8734	152.3469
EPA survey	2003	Harriot Island, Bundaberg	-24.8734	152.3469
Nelson 1965	1961	Bundaberg	-24.8830	152.2670

a. This museum specimen was found to be misidentified (see Figure 2). The specimen is not a Grey-headed Flying-fox (*P. poliocephalus*) due to the lack of any fur on the lower legs. This specimen is more likely a Spectacled Flying-fox (*P. conspicillatus*).

b. Record questionable as collector and detail of the observation not available. Both records also from an unpublished consultant report related to the development of a resort.

* Sinclair Knight & Partners (1989). Whitsunday Springs Resort - Initial Advice Statement on Environmental Effects. Unpublished report to Roach Investments Pty Ltd.

** Gutteridge Haskins & Davey (1990). Saro's Resort - Impact Assessment Study Report. Unpublished report to Pioneer Shire Council for Whitsunday Gold Pty Ltd.

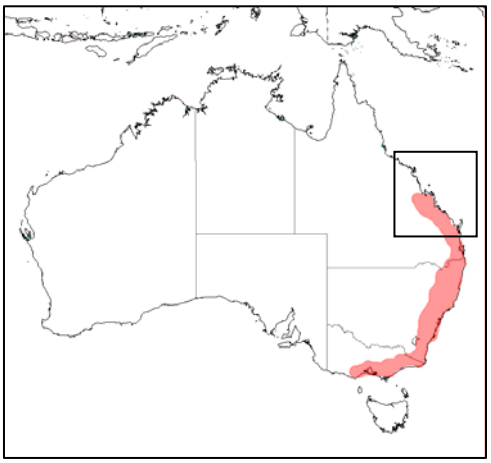

Figure 1 Distribution of the Grey-headed Flying-fox (*Pteropus poliocephalus*) in eastern Australia (Map © Wikipedia). The study area in the northern extent has been highlighted.

Recent field surveys and satellite telemetry have confirmed that *P. poliocephalus* continue to use this far northern part of its distribution (Table 2).

In October 2008, 500 *P. poliocephalus* were observed in Finch Hatton (1 hr west of Mackay) including males and females with young. There are additional data by the landholders to suggest that *P. poliocephalus* have used this site annually since 1990 (D. Lowe, *pers. comm.*). Recent satellite telemetry also shows *P. poliocephalus* using camps as far north as Turkey Beach (in the Gladstone region) between July and October 2008. At the time of publication (31/10/08) four of these tagged *P. poliocephalus* remained north of latitude 26^{O}S. This confirms that the records in the northern limit are not just occasional records and that *P. poliocephalus* continued to use the full extent of its historical distribution as recently as 2008. To help ensure the conservation of northern populations, there is need for further investigation into the location, composition and temporal usage patterns of flying-fox camps in the Mackay region.

To summarise, there is no evidence of a change in the northern distributional limit of *P. poliocephalus*. However, it is unknown if this species' frequency of use of its northern range has changed over time. Analyses of past and present patterns of occurrence of *P. poliocephalus* throughout its latitudinal extent are under way, and these findings will be published elsewhere.

Table 2. List of recent (2008) records of *P. poliocephalus* in the northern part of its distribution.

General Locality	Lat	Long	Comment
Finch Hatton, near Mackay	-21.1984	148.6011	Five hundred *P. poliocephalus* incl. females with young observed 29/10/08. Additional reports of *P. poliocephalus* occupying this camp annually since 1990 typically between July and May; numbers fluctuate.
Turkey Beach	-24.0843	151.6499	One tagged *P. poliocephalus* used this camp for 4 days in July. Also reports of large numbers of *P. poliocephalus* in April 2007 and 2008.
Miriam Vale	-24.3734	151.9594	Two tagged *P. poliocephalus* camped in this area during August and September, and stayed for 31 and 35 days.
Agnes Water	-24.1984	151.8927	Two tagged *P. poliocephalus* used this colony briefly in July and August, and stayed for 2 and 7 days.
Baffle Creek	-24.4597	151.9488	Five tagged *P. poliocephalus* used this camp between July and September. Number of days at this camp ranged from 2 to 50.
Bundaberg	-24.8734	152.3469	*P. poliocephalus* regularly occupies this camp. Fifty *P. poliocephalus* present on 16th October. Records of up to 500 *P. poliocephalus* using this camp annually since 1998.
Woocoo	-25.6388	152.3289	Tens of thousands of breeding *P. poliocephalus* observed on 15th October. Five tagged *P. poliocephalus* have used this camp since the beginning of July and the numbers of days at the camp has varied between 2 and 119 days. Four of these tagged bats currently (as of 31/10/08) using the camp.

Figure 2. Photo of a museum specimen stated to be a Grey-headed Flying-fox (*P. poliocephalus*) collected by A. J. Boyd in 1895 from the Herbert River in Qld. The specimen is not a *P. poliocephalus* due to the lack of any fur on the lower legs. From the size and markings on the face this specimen is likely to be a Spectacled Flying-fox (*P. conspicillatus).*

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