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Pied Imperial Pigeon numbers on North Brook Island, Queensland, after Cyclone Yasi: Do they reflect forest recovery on the Australian mainland?

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Abstract. Eleven years after Category 5 Tropical Cyclone Yasi caused extensive structural damage to coastal rainforest of north-eastern Queensland, Pied Imperial Pigeons *Ducula bicolor*, counted in the evening return flight to their North Brook Island breeding colony from their mainland feeding grounds, are still significantly fewer. Counts were made from a boat anchored off the north-western spit of the island, starting at 1530 h and continuing until dusk. We consider that the most likely explanation is that the rainforest in the Pigeon's mainland feeding grounds has not recovered to pre-Yasi maturity, thus reducing the crop of fruit, which is the primary food source for the Pigeons.

Introduction

It has long been recognised that "The catastrophic effect of cyclones on rain-forests overrides the usual ecological factors, and, in such areas, even without human interference, a stable forest climax is not attained" (Webb 1958, p. 220). Repeated cyclones can influence the species composition of trees (Metcalfe *et al.* 2008), encourage disturbance and weed species (Turton 2012), and modify general forest structure (Turton 2008a,b). These ecological effects can be complex. Lugo (2008) considered that in the Northern Hemisphere the six principal effects of hurricanes are to: (1) change the ecological space available to organisms; (2) set organisms in motion; (3) increase the heterogeneity of the landscape and the variability in ecosystem processes; (4) rejuvenate the landscape and its ecosystems and redirect succession; (5) shape the structure of forests, influence their species composition and diversity and regulate their function; and (6) induce evolutionary change through natural selection and ecological creativity through self-organisation.

Little is known, however, about long-term post-cyclonic effects on fauna. The immediate effects on rainforest fauna have been documented by several authors after the passage of Cyclone Larry across northern Australia in March 2006. Freeman *et al.* (2008) reported variable diet-dependant responses by birds – frugivores declined and insectivores increased, but both regained pre-cyclonic abundance 7 months after the disturbance. There is some evidence that frugivorous birds track fruit resources (Price 2004), so reduction in abundance of these birds at their feeding grounds post cyclones is a valid response for species that may be sensitive to any reduction in fruit availability. In contrast, numbers of folivorous arboreal mammals were not significantly reduced though some alteration in sizes of home ranges was documented (Kanowski *et al*. 2008; Wilson *et al*. 2008).

Longer-term data are constrained to a single study. In North Queensland, a long-term study of activity of Tooth-billed Bowerbirds *Scenopoeetes dentirostris* at leks of courts following Cyclone Larry was undertaken (Freeman *et al.* 2018). Activity at two groups situated in the eye – Topaz and Jaggan – was reduced to <40% within months following the cyclone and neither had recovered to >60% after 11 years. The authors postulated (p. 345) that "differences in the level of recovery may relate to one or more of the following factors: the number of bowers in each lek before the cyclone; the number of initial losses as a result of the storm; and the availability of resources following the storm". Subsequent monitoring of one of these leks – Jaggan – showed the beginnings of a recovery after 11 years and approaching 100% recovery after 12 years (A. Freeman pers. comm. 20 August 2022).

Since 1965, Pied Imperial Pigeons *Ducula bicolor* have been counted as they move between mainland foraging areas and nesting colonies on North Brook Island, Queensland (Thorsborne *et al.* 1988; Winter *et al*. 2016a). Three severe tropical cyclones have impacted their nesting and mainland spring–summer feeding grounds over the count period: Cyclone Winifred (Category 3) crossed the coast on 1 February 1986, Severe Cyclone Larry (Category 3) on 20 March 2006, and Severe Cyclone Yasi (Category 5) on 2 February 2011.

The late Margaret Thorsborne visited North Brook Island during the counts from their beginning in 1965. She witnessed several cyclones, including Winfred and Larry, each affecting the island. She observed that after cyclones before Yasi, damage to the forest was minimal, involving loss of mainly branches and only the occasional tree. She described the catastrophic impacts of Yasi, when much of the canopy had been dumped on the ground, making it difficult to walk through the forest (Margaret Thorsborne pers. comm. 17 November 2011). Queensland Parks and Wildlife Service staff estimated from aerial images that for Yasi >80% canopy damage occurred over most of the feeding grounds of the North Brook Pigeon colony (JW unpubl. data 2011).

This paper documents a pause in the recovery of the Pied Imperial Pigeon nesting colony on North Brook Island following Tropical Cyclone Yasi and suggests a possible cause. We examine the count data for the 11-year period following Yasi, which crossed the Queensland coast on 2 February 2011.

Methods

Study site

Counts of Pied Imperial Pigeons were undertaken from the north-western point of North Brook Island (18°08′15″S, 146°16′39″E), in Bandjin/Girramay country. This 64-ha island is the largest in the Brook Islands National Park, which lies 30 km off-shore east of Cardwell on the north-eastern coast of Queensland. It is the site of one of the large Pied Imperial Pigeon colonies along the eastern coast of Queensland (King 1990).

Counting procedure

Counting took place from a boat moored off the north-western spit. Two teams of a counter and recorder covered a northern and southern arc. Counting started at 1530 h and continued until dusk. The attempted standard number of counts per season was three – October, November and December. This was not always possible because of either inclement weather or lack of suitable transport to the island. This period covered the build-up of numbers to the December count, which is the one used for yearly comparisons (Thorsborne *et al.* 1988). In most years post Yasi, a February count was also made at a time when the Pigeons had started their migration north to their wintering grounds. For a full description of the counting procedure see Winter *et al.* (2016a,b).

Analysis

Predicted recovery rate (RR) is taken to be the same rate that occurred between 1985 and 1992, mainly post Cyclone Winifred, which appeared to have no discernible impact on the Pigeon numbers on North Brook Island, when numbers increased from 13,827 to 29,818, a similar starting number for the post-Yasi bounceback number of 21,088. This was assumed to be from seasonal breeding of the population on North Brook Island. To explore trends in December counts on North Brook Island for the pre-Yasi period of 18 counts from 1992 to 2009 and for the post-Yasi period of 11 counts from 2012 to 2022, we used linear regressions, and then tested for differences in these two regressions using a *t*-statistic, as described by Quinn & Keough (2002).

Results

Twelve counts of Pied Imperial Pigeons have taken place since Yasi (Table 1). The December 2011 count that followed Yasi was a low 5311 but increased to 21,088 the next year. December counts reached a high of 28,761 in 2017, approaching the pre-Yasi level. However, the highest December count for the years following 2017 was 21,645 in 2022, with a mean for the years from 2012 onwards of 21,727 ± 1070 (Table 1, Figure 1).

Table 1. Pied Imperial Pigeon numbers in afternoon counts in October–December at North Brook Island for the 19 years before Yasi and the 11 years post Yasi: summary statistics; and mean and standard error (SE) for 1992–2009 (pre Cyclone Yasi), and for 2012–2022 (post Yasi). Mean and SE do not include data for pre-Yasi 2010 and Yasi year 2011, when numbers were exceptionally low.

Year	*October*	*November*	*December*
Pre Yasi			
1992	19,318	23,123	29,818
1993	19,663	26,967	29,792
1994	25,285	31,627	45,134
1995	15,221	26,994	28,998
1996	25,338	35,676	33,427
1997	28,940	24,675	33,000
1998	29,690	36,268	29,630
1999	1602	28,496	31,100
2000	28,968	34,043	27,223
2001	22,089	31,204	33,995
2002	23,628	31,372	36,555
2003	21,550	26,914	30,495
2004	21,215	31,296	33,034
2005		27,067	24,029
2006		25,535	31,695
2007			34,977
2008	23,889	27,319	47,168
2009	21,793		30,740
2010	31,623	28,861	9967
Mean			**31,620**
SE			**1742**
Post Yasi			
2011	275	2433	5311
2012		17,931	21,088
2013	10,930	20,151	22,494
2014	15,974	19,340	18,076
2015	19,225	22,172	25,523
2016	19,023	22,336	19,881
2017	21,909	23,837	28,761
2018	2813	23,124	16,282
2019	13,804	21,083	20,391
2020	17,955	21,227	21,459
2021	22,261	21,916	17,757
2022	16,331	12,725	21,645
Mean			**21,214**
SE			**1070**

The slope of the linear regression line for the predicted RR recovery rate is highly significantly different from zero ($P = 0.002$: Figure 2). The pre-Yasi (1992–2009) and post-Yasi (2012–2022) trend lines do not differ significantly from zero (pre-Yasi $P = 0.65$, post-Yasi $P = 0.54$). However, the pre- and post-Yasi trend lines do differ significantly from each other ($P < 0.001$, based on a *t*-statistic) (Figure 2).

The December 2010 count, 50 days before Yasi, was a low 9967. This did not indicate a population low for the

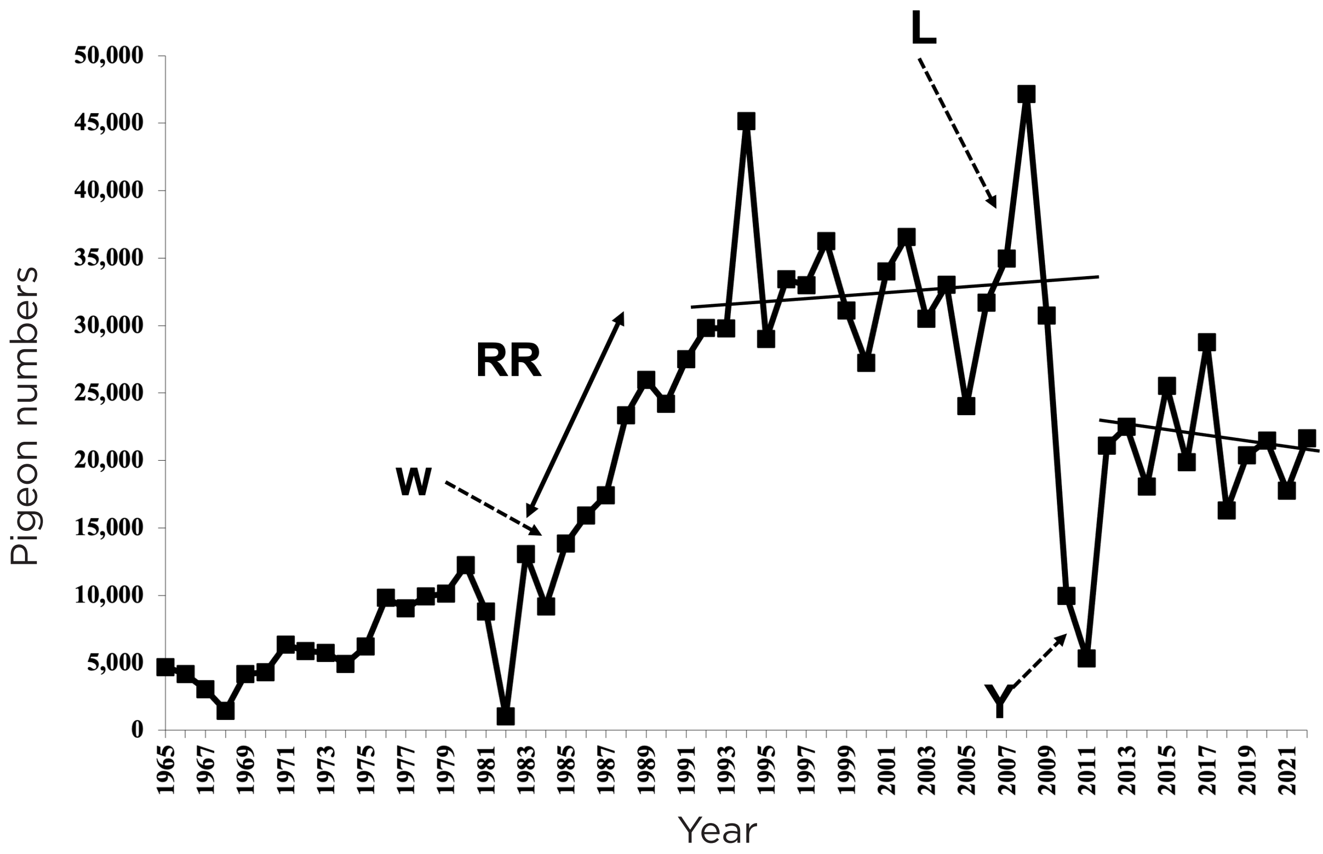

Figure 1. The December afternoon incoming numbers of Pied Imperial Pigeons to North Brook Island, Queensland, over 57 years. Y = Cyclone Yasi, L = Cyclone Larry, W = Cyclone Winifred, RR = recovery-rate section used to predict post-Yasi growth rate, nearly horizontal lines = approximate trend lines shown in Figure 2.

season because the October and November counts were a high of 31,623 and 28,861, respectively (Table 1). This was interpretated as an early departure of the Pigeons attributed to a poor fruiting season in their feeding grounds (Winter *et al*. 2016a).

Discussion

Possible causes for North Brook colony decline following Cyclone Yasi

Not surprisingly, Pied Imperial Pigeon numbers on North Brook Island in the season following Cyclone Yasi were exceptionally low, with a December count of 5311 (Table 1). However, numbers bounced back the following year, a recovery that was too large to be a result of recruitment (Winter *et al*. 2016a). This was interpreted as the Pigeons having spent the post-Yasi season elsewhere and returning to North Brook the following season.

Winter *et al*. (2016a) could only speculate where the Pigeons might have spent the previous cyclone-affected season if they did relocate. They found no spike in other regularly counted colonies (Low Isles, Green Island, Stephens Island). There is anecdotal evidence of increased numbers on the mainland in the Cairns area following Yasi. Hazel & Venables (2017) started monitoring a 'newly formed urban colony' along the Cairns Esplanade in 2012. Although no counts were made before 2012, Brian Venables (pers. comm. February 2023), a Cairns resident interested in the Pigeons over many years, was not aware of any build-up of numbers before monitoring was started, although this might have occurred in late 2011. Another possibility was that the Pigeons remained at their wintering grounds but this could not be checked (Winter *et al*. 2016a).

Irrespective of where or why the Pigeons might have spent the season following Yasi, it does not explain why numbers appear to have reached a maximum in the 20,000s when pre-cyclone numbers were regularly in the 30,000s and 40,000s (Table 1). Winter *et al.* (2016a) predicted that it would take 4 years for the post-Yasi number of 21,088 (in 2012) to recover to 30,000. This appeared to be on track in that 4 years after Yasi the December count had reached 25,523, and 6 years after Yasi it was 28,761 (in 2017). However, counts have remained <21,500 in subsequent years, with an overall mean of 21,727 for the years from 2012 (Table 1, Figure 1).

We can only speculate why Pigeon numbers on North Brook Island have remained where they are as there has been no detailed study undertaken on the habitat damage caused by the cyclone.

Structural damage to the North Brook Island forest caused by Yasi is unlikely to have reduced available nesting sites because the Pigeons are adept at nesting in a wide range of sites at many levels. On Low Isles, they nested in mangroves at an average height of 2.9 m above the ground (Crome 1975). On Dunk Island, Banfield (1908, p. 116) described the Pigeons as nesting "on all sorts of trees, in all sorts of localities. Palms and mangroves, low bushes, rocky ledges, saplings, are all

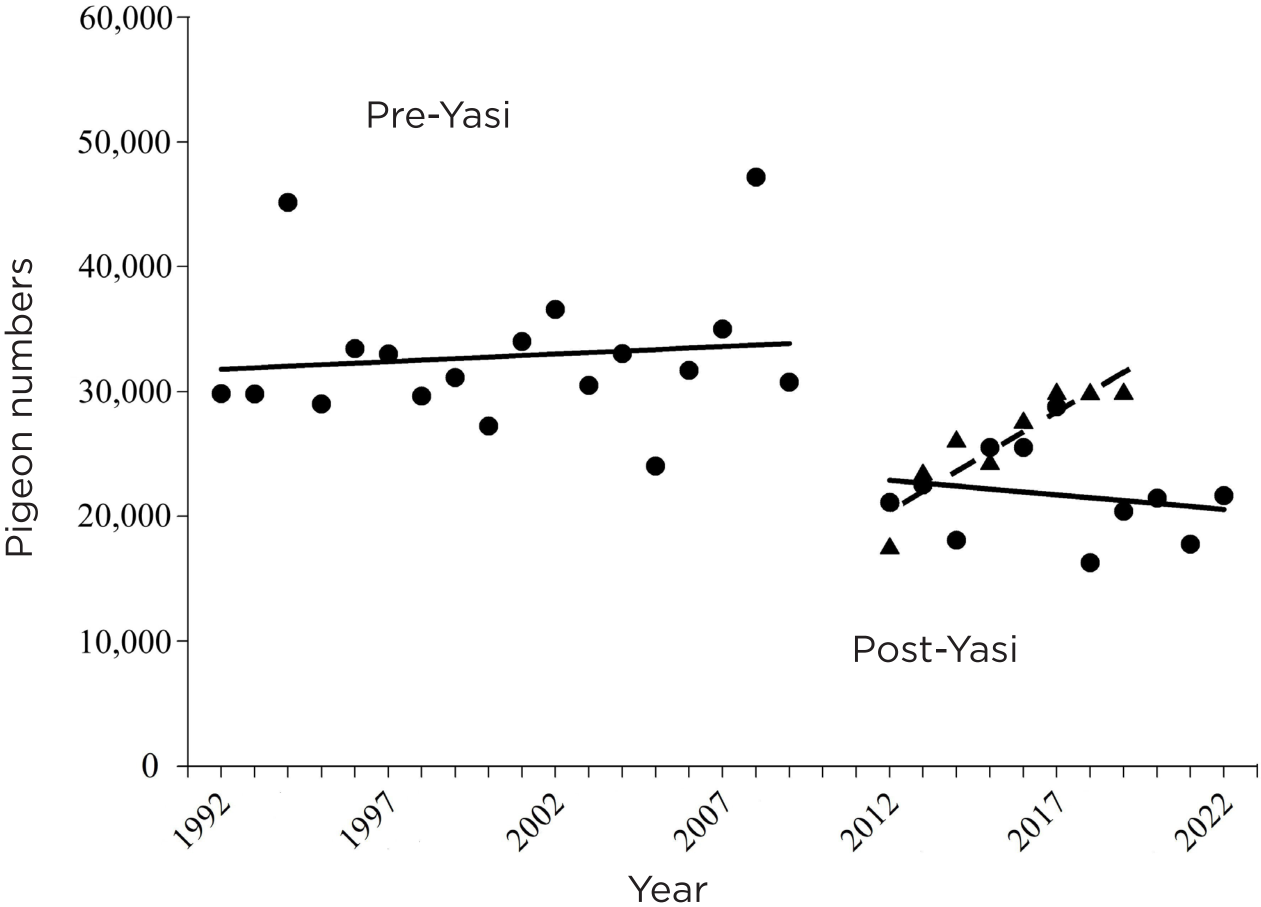

Figure 2. Evening counts of Pied Imperial Pigeons in December, North Brook Island, showing trend lines for the pre-Yasi years 1992–2009 (y = 12.3X + 7698, r^2 = 0.0002), post-Yasi years 2012–2021 (y = – 303.8X + 23407, r^2 = 0.0544) (solid lines) and predicted recovery rate (y = 1593.3X + 18813, r^2 = 0.8224) (triangles = numbers from pre-Yasi 1985–1992 counts, dashed trend line).

favoured, no particular preference being shown." He recorded them even nesting on the ground. Likewise, in a visit to one of the Family Islands, near North Brook Island, Campbell described the Pigeons nesting "every-where – at foot of fig-trees, on vines and palm-fronds, in "nest-ferns," and even on bushes near high water mark" (Campbell & Barnard 1917, p. 6).

Pied Imperial Pigeons winter in New Guinea and neighbouring islands. Local pressures there such as habitat loss through clearing or fire, starvation as a result of drought, or increased hunting may have adverse effects on these Pigeons. If so, one would expect population-wide reductions in Pigeon numbers. This would be reflected in the Green Island population counts (Green Island is north of North Brook Island), but numbers there have not undergone a similar decline (C. & G. Webb unpubl. data). Similarly, count data for Stephens Island (see Figure 3), South Barnard Islands, has remained at pre-Yasi levels (Figure 4). Further details on this colony are discussed below.

Pied Imperial Pigeons are frugivorous, as indicated by plants germinated from seeds in their droppings collected below nests on North Brook Island (unpubl. data). Their diet consists exclusively of fruit from rainforest plants, predominantly trees (Appendix 1). Consequently, damage caused by Yasi to the mainland rainforests, the main feeding grounds of the North Brook Pigeons, is bound to have an impact on Pigeon numbers.

We suggest that the main reason for reduced Pigeon numbers on North Brook Island is that mainland forest has not fully recovered from Cyclone Yasi and there is not yet sufficient food available for the Pigeon population to continue to grow. Habitat and animal populations can take many years to fully recover from a major cyclone (Xi 2015; Freeman *et al.* 2018). Freeman *et al.* (2018) postulated that the availability of resources following Cyclone Larry was a contributing factor to the recovery rate of bowers of Tooth-billed Bowerbirds. The reliance of the Pigeons on rainforest fruits (Appendix 1; see also Crome 1975) means that they will be sensitive to any reduction of availability of fruits within their feeding grounds.

Observations by participants in the Pigeon counts who live within lowland daytime feeding grounds of the Pigeons suggest that the forest has not recovered to its pre-Yasi state.

JM lives in continuous rainforest on lower slopes of Walter Hill Range north-east of Tully and is Project Support Officer to the Cassowary Coast Regional Council's plant nursery. After Yasi, she observed that the forest seemed to have plenty of fruit but there might have been limited fruit preferred by the Pigeons. Would this be sufficient to support the Pigeon population? Many of the larger old trees were gone. In the first few years after Yasi, the shift in forest composition was quite apparent: some species (especially those more easily damaged by the cyclone) were less numerous and hard to find or the trees were young and

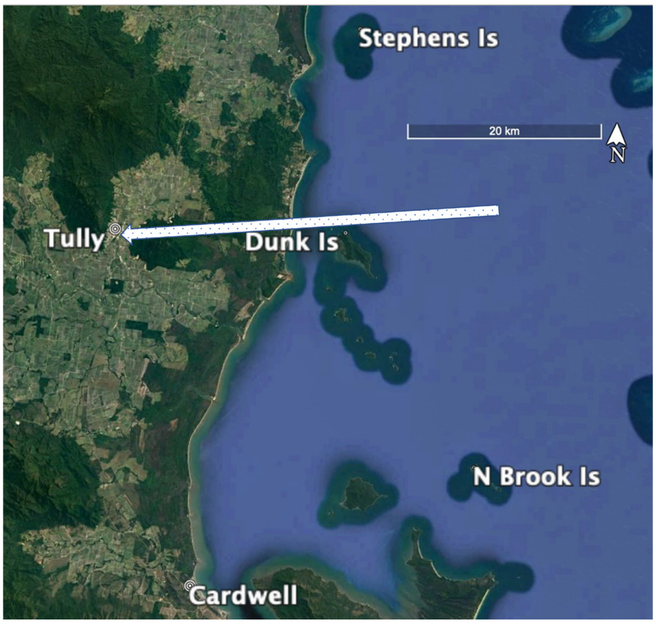

Figure 3. Stephens and North Brook Islands in relation to the eye of Cyclone Yasi (arrowed).

had little or no seed, including trees with fruits known to be favoured by the Pigeons, e.g. Native Olive *Chionanthus ramiflora*, Yarrabah Satinash *Syzygium angophoroides* and Northern Laurel *Cryptocarya hypospodia*. JM also noticed the change in fruiting trees in her forest at home, e.g. several large Grey Bollywood *Neolitsea dealbata* trees (whose fruit is favoured by fruit-eating birds including pigeons) were severely damaged or uprooted by Cyclone Yasi. Although Grey Bollywood is now re-establishing here (2021 was the first year that this species was observed fruiting), Norton's Oak *Helicia nortoniana* is yet to bear fruit.

Daryl Dickson and Geoff Moffatt (pers. comm. February 2022), who live in riparian forest along Meunga Creek, north of Cardwell, informed us that

> PIPs [Pied Imperial Pigeons] could be heard in our forest in the seasonal creeks and towards Meunga Creek… ooming was part of the forest sound in the latter part of each year. Our observations of PIPs following Cyclone Yasi in the Kennedy Valley seem to indicate they are now flying to the back of the valley to feed. We have only heard them feeding in our woodland once this season and not seen them locally in any numbers. It's interesting too that in recent times we have not seen flocks of top-knot pigeons [Topknot Pigeons *Lopholaimus antarcticus*] in the area either. We used to see them specifically in the very top of the very big rainforest trees along Meunga Creek here but many of those trees were swept away in the cyclone. Maybe the loss of riparian forests and all the large old feed trees have made a significant difference.

Although anecdotal, these observations add credence to the theory that Pigeon numbers have been restricted by food availability post Cyclone Yasi.

Stephens Island, South Barnard Islands

A series of Pied Imperial Pigeon counts on Stephens Island, South Barnards Group, provides an insight into how localised the impact of Cyclone Yasi can be on the North Brook colony, 45 km south of Stephens Island (Figure 3). Apart from a steady rise in numbers on Stephens Island over the years, Cyclone Yasi had no obvious negative impact on Pigeon numbers (Figure 4). There was no massive drop in numbers in the December 2012 count there following Yasi, but instead a slight increase with a continuing climb in numbers in 2013 and 2015. The eye of Yasi passed over

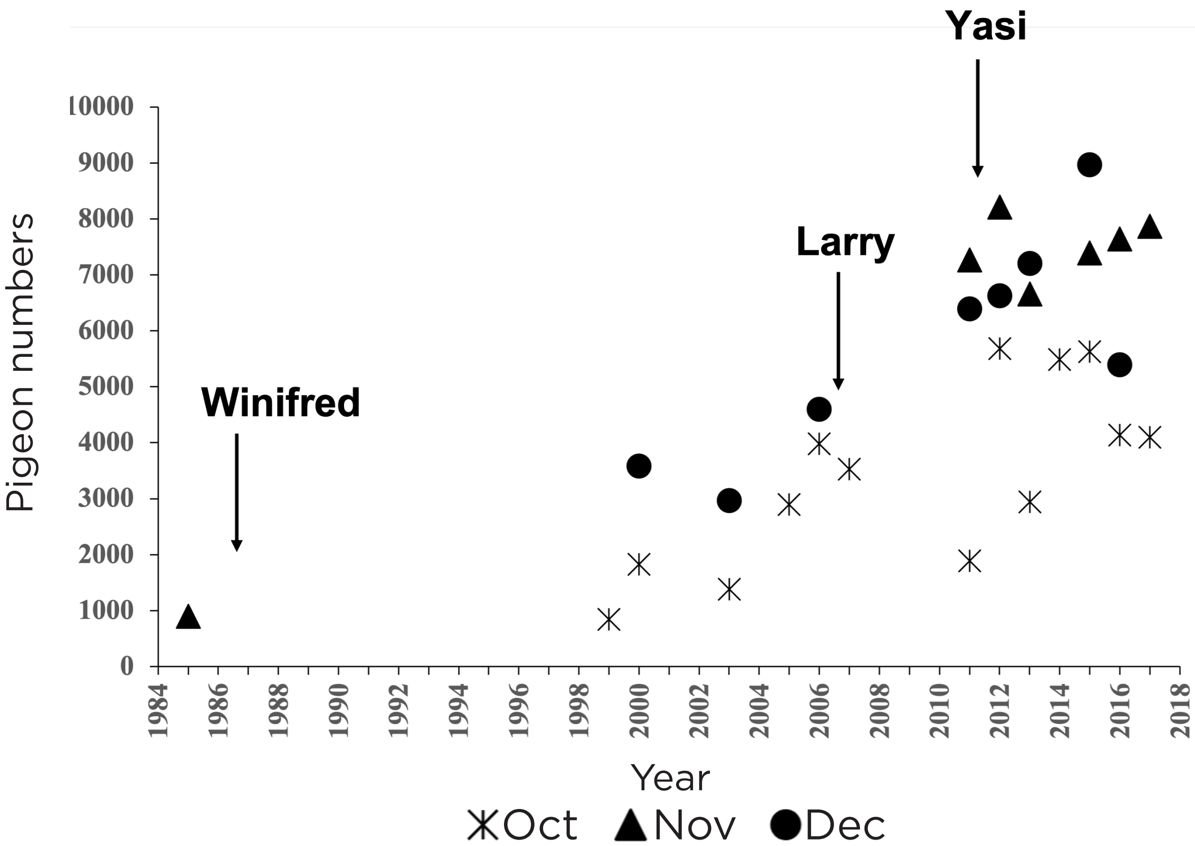

Figure 4. Evening counts of Pied Imperial Pigeons, Stephens Island, South Barnard Group.

Dunk Island and Tully (Bureau of Meteorology 2023), which meant that North Brook and Stephens Island were 25 km and 21 km distant, respectively, from the eye's path (Figure 3). As winds rotate clockwise around the eye of a cyclone in the Southern Hemisphere, these two islands (and their corresponding mainland rainforest areas) were subjected to different wind forces. It is generally recognised that in Australia destructive winds are greater along the southern than the northern side of a cyclone. This was confirmed by the statement "As expected, the major impact from TC Yasi occurred to the coast on the southern side of its track" (Queensland Government 2012, p. 17). It is assumed that the impact of Yasi on both the nesting and the mainland feeding grounds of the Pigeons was less for the Stephens Island colony than the North Brook colony.

Although the Pied Imperial Pigeon colony on North Brook Island shows no sign yet of regaining its pre-Yasi level, this can reasonably be expected to occur once the forest has regained its pre-cyclone maturity if our hypothesis is correct. This could be years, as indicated by continued monitoring of one of the Tooth-billed Bowerbird leks (Jaggan) affected by Cyclone Larry; this lek began to recover after 11 years and was approaching 100% recovery after 12 years (A. Freeman pers. comm. 26 January 2022). Although the rainforest of the Wet Tropics of Australia shows remarkable ability to recover (Turton 2012), a stable rainforest climax may never be reached (Webb 1958).

The North Brook Island Pigeon counts highlight the value of long-term counts (defined as regular collection of data over ≥10 years: Lindenmayer *et al.* 2012). Long-term data sets are critical in providing insights into environmental change (Lindenmayer *et al.* 2012) and in their ability to distinguish between anthropogenic and ecological causes (Magurran *et al.* 2010). The North Brook Island counts have demonstrated the positive recovery after large-scale shoots were stopped in the early 1970s (Thorsborne *et al.* 1988) and the detrimental impact of a major cyclone (Yasi, in 2012: Winter *et al.* 2016a). Our paper highlights the possible long-term effects of a cyclone on rainforest, measured by the slow recovery of Pied Imperial Pigeon numbers. Tropical cyclones are part of the ecosystem dynamics of rainforests in the Wet Tropics of Australia (Turton 2012) but, with a changing climate, their frequency may decline and their strength may increase, with a predicted interval of 70 years based on past occurrence of Category 4 or 5 cyclones (Turton 2012). Continued monitoring of the North Brook Island Pied Imperial Pigeon colony will help determine whether numbers return to pre-Yasi levels as the rainforest reaches maturity and, if not, whether severe cyclones have a lasting effect on the rainforest or if some other factor is preventing this recovery.

Long-term ecological studies are not particularly common in Australia and are subject to several issues mitigating against their continuation, including the relatively short working lifespan of those involved (Lindenmayer *et al.* 2012). This is particularly the case for the North Brook Island Pigeon counts, which have relied almost entirely on minimal funding and on volunteers, many of whom have died or are approaching the end of their active involvement. The count is at a critical stage, requiring either individuals or organisations to step up in ensuring that this long-term count continues.

Acknowledgements

This paper is dedicated to two people who were champions in the establishment and continuation of the Pied Imperial Pigeon counts on North Brook Island: Margaret Thorsborne AO and Suzie Smith. Margaret, with her husband Arthur Thorsborne (died on 25 January 1991), started the counts in December 1965. Until her death on 16 October 2018, she continued as the driving force ensuring that the counts took place and participating in almost every one until prevented by ill health in her late eighties. Suzie, founder and executive member of the Cassowary Coast–Hinchinbrook branch of the Wildlife Preservation Society of Queensland and long-term supporter and contributor to the counts on North Brook Island, died on 27 December 2021.

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Appendix 1. Seeds from Pied Imperial Pigeon droppings collected under their nests on North Brook Island by Dave Green and others between 1992 and 2006 and germinated in the Cassowary Coast Regional Council's plant nursery, Tully, and Girringun Aboriginal Corporation's plant nursery, Cardwell, Queensland. Plant names follow Cooper & Cooper (2004).

Family	*Common name*	*Scientific name*	*Form*
Anacardiaceae	Buchanania	*Buchanania arborescens*	Rainforest tree
Anacardiaceae	Pink Poplar, Ribbonwood	*Euroschinus falcata*	Rainforest tree
Anacardiaceae	Burdekin Plum	*Pleiogynium timorense*	Rainforest tree
Anacardiaceae	Sumac, Wedding Tree	*Rhus taitensis*	Rainforest tree
Apocynaceae	Chain Fruit	*Alyxia spicata*	Rainforest shrub or climber
Araliaceae	Ivory Basswood	*Polyscias australiana*	Rainforest shrub or tree
Arecaceae	Hairy Mary or Lawyer Cane	*Calamus australis*	Rainforest vine
Arecaceae	Solitaire Palm	*Ptychosperma elegans*	Rainforest palm
Boraginaceae	Glue-berry Tree	*Cordia dichotoma*	Rainforest tree
Burseraceae		*Canarium acutifolium*	Rainforest tree
Burseraceae	Scrub Turpentine	*Canarium australianum*	Rainforest tree
Burseraceae	Scrub Turpentine	*Canarium muelleri*	Rainforest tree
Burseraceae	Canarium	*Canarium vitiense*	Rainforest tree
Clusiaceae	Alligator Bark	*Calophyllum sil*	Rainforest tree
Combretaceae	Damson Plum	*Terminalia sericocarpa*	Rainforest tree
Ebanaceae	Australian Ebony	*Diospyros compacta*	Rainforest tree
Ebanaceae	Brown Ebony	*Diospyros cupulosa*	Rainforest tree
Elaeocarpaceae	Blue Quandong	*Elaeocarpus grandis (angustifolius)*	Rainforest tree
Elaeocarpaceae	Kuranda Quandong	*Elaeocarpus johnsonii*	Rainforest tree
Euphorbiaceae	Brown Macaranga	*Macaranga mallotoides*	Shrub or small tree, rainforest
Euphorbiaceae	Needle Bark	*Macaranga subdentata*	Rainforest shrub or small tree
Flacourtiaceae	Brown Birch	*Scolopia braunii*	Rainforest tree
Icacinaceae	Buff Beech	*Gomphandra australiana*	Rainforest tree
Lamiaceae	White Beech	*Gmelina dalrympleana*	Rainforest tree
Lauraceae	Blush Walnut	*Beilschmiedia obtusifolia*	Rainforest tree
Lauraceae		*Cryptocarya exfoliata*	Rainforest tree
Lauraceae	Northern Laurel	*Cryptocarya hypospodia*	Rainforest tree
Lauraceae	A laurel	*Cryptocarya melanocarpa*	Rainforest tree
Lauraceae	Murray's Laurel	*Cryptocarya murrayi*	Rainforest tree
Lauraceae	Rose Walnut	*Cryptocarya onoprienkoana*	Rainforest tree
Lauraceae	Brown Laurel	*Cryptocarya triplinervis*	Gallery forest tree
Lauraceae	Northern Laurel	*Cryptocarya vulgaris*	Rainforest tree
Lauraceae	Northern Rose Walnut	*Endiandra hypotephra*	Rainforest tree
Lauraceae	Buff Walnut	*Endiandra sideroxylon*	Rainforest tree
Lauraceae	A walnut	*Endiandra wolfei*	Rainforest tree
Lauraceae	Bollywood	*Litsea leefeana*	Rainforest tree
Lauraceae	Big Leaf Bollywood	*Litsea bindoniana*	Rainforest tree
Lauraceae	Grey Bollywood	*Neolitsea brassii*	Rainforest tree
Meliaceae	Ivory Mahogany	*Dysoxylum gaudichaudianum*	Rainforest tree
Meliaceae	Spurwood, Cairns Satinwood	*Dysoxylum pettigrewainum*	Rainforest tree
Menispermaceae	Laural-leafed Hypserpa	*Hypserpa laurina*	Rainforest vine
Moraceae	Rusty Fig	*Ficus destruens*	Rainforest tree
Moraceae	Hairy Fig	*Ficus drupacea*	Rainforest tree
Moraceae	Atherton Fig	*Ficus leptoclada*	Rainforest tree
Moraceae	Sandpaper Fig	*Ficus mollior*	Rainforest tree
Moraceae	Superb Fig	*Ficus superba*	Rainforest tree
Myristicaceae	Native Nutmeg	*Myristica globosa*	Rainforest tree
Myristicaceae	Native Nutmeg	*Myristica insipida*	Rainforest tree

Appendix 1 continued

Family	*Common name*	*Scientific name*	*Form*
Myrtaceae	Beach Cherry	*Eugenia reinwardtiana*	Rainforest shrub
Myrtaceae	Yarrabah Satinash	*Syzygium angophoroides*	Rainforest tree
Oleaceae	Native Olive	*Chionanthus ramiflora*	Rainforest tree
Podocarpaceae	Northern Brown Pine	*Podocarpus grayae*	Rainforest tree
Rhamnaceae	Hairy Sarsaparilla	*Alphitonia incana (philippenensis)*	Rainforest tree
Rhizophoraceae	Corky Bark	*Carallia brachiata*	Rainforest tree
Rubiaceae	Crimson Berry	*Antirhea tenuiflora*	Rainforest tree
Rubiaceae	Wenlock Gardenia	*Larsenaikia ochreata*	Rainforest tree
Rubiaceae	Tree Ixora	*Tarenna dallachiana*	Rainforest tree
Sapindaceae	Scaly Ash, Daintree Hickory	*Ganophyllum falcatum*	Rainforest tree
Sapotaceae	Cairns Pencil Cedar	*Palaquium galactoxylum*	Rainforest tree
Sapotaceae	Dugulla	*Pouteria chartacea*	Rainforest tree
Sapotaceae	Yellow Boxwood	*Pouteria myrsinodendron*	Rainforest tree
Sapotaceae	Yellow Boxwood	*Pouteria obovata*	Littoral rainforest tree
Solanaceae	Wild Tobacco	*Solanum mauritianum*	Introduced shrub
Solanaceae	Devil's Fig	*Solanum torvum*	Introduced shrub
Symplocaceae	White Hazelwood	*Symplocus cochinchinensis*	Rainforest tree
Ulmaceae	Rough Trema	*Trema orientalis*	Rainforest tree
Ulmaceae	Silky Celtis	*Celtis paniculata*	Rainforest tree
Vitaceae		*Cissus* sp.	Vine
Zingiberaceae	Native Ginger	*Alpinia caerulea*	Rainforest herb