



Endemic fly (*Xenocalliphora antipodea*)

### **Invertebrates – a fly on the wall**

Fast breeding insect species are a good indicator of change. Anecdotally, flies, moths and spiders appear to have bounced back in a big way. Previously the endemic fly *Xenocalliphora antipodea* was rarely seen. This summer it was common, often seen on flowers. The large number of flies also caused somewhat of a problem inside the hut when the weather was “warm”!

Moths and their large caterpillars were also abundant, providing a juicy meal for pipits, which have been deprived of the choicest food items for more than 100 years.

The insects collected in pitfall traps will be counted and identified so that species composition and abundance can be compared to previous years and to future sampling. This work is part of a wider study also using data sets from before and after rodent eradications on Macquarie Island and Campbell Island. The results will be published in a PhD by Mellissa Houghton, supported by the University of Auckland and the Australian Antarctic Division.

Larger insects, such as beetles, are slower at reproducing and will take time to recover. At least two beetle species (*Loxmerous n. sp.* and *Tormissus guanicola*) have been wiped out from Antipodes Island by mice and some others were reduced to small populations on a single rock-stack. Fortunately, these species are still present on Bollons Island to the north and may yet recover to detectable levels on Antipodes Island with time.



Pipit with moth caterpillar, Antipodes Island. Photo by F. Cox

### **Land birds**

Survey results since 2013 show despite some impacts to land birds from the operation, the adverse effects have been short lived. As expected, the populations of pipits and

parakeets have rapidly recovered in the absence of mice. With mice now permanently out of the picture, all land birds are expected to significantly benefit.

The population density of both species of parakeets are now similar to or higher than the estimates made prior to mouse eradication in 2016. Pipits have responded strongly with very large year on year increases following mouse eradication and resultant increases in reproductive output and survival.

Long term, we expect these land bird densities to continue to grow as the birds flourish in their new mouse-free environment.

Note that the estimates based on small sample size (n) should not be relied upon (particularly the August 2014 counts) and is reflected in the large error bars (95% confidence intervals).

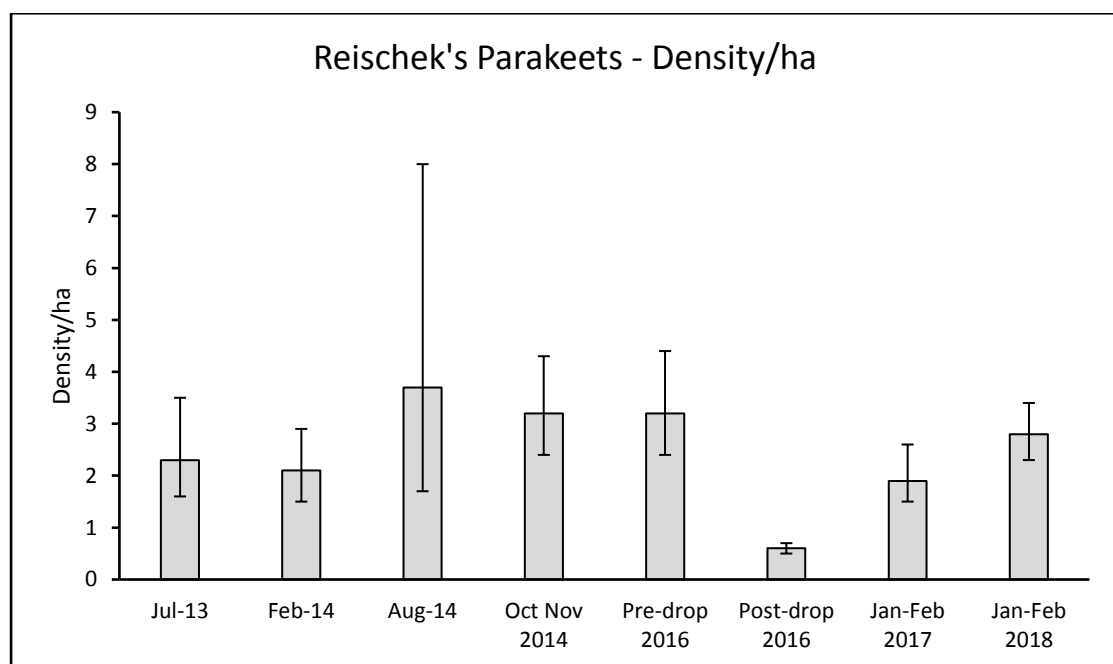


Figure 1: Population density estimates of Reischek's parakeet on Antipodes Island

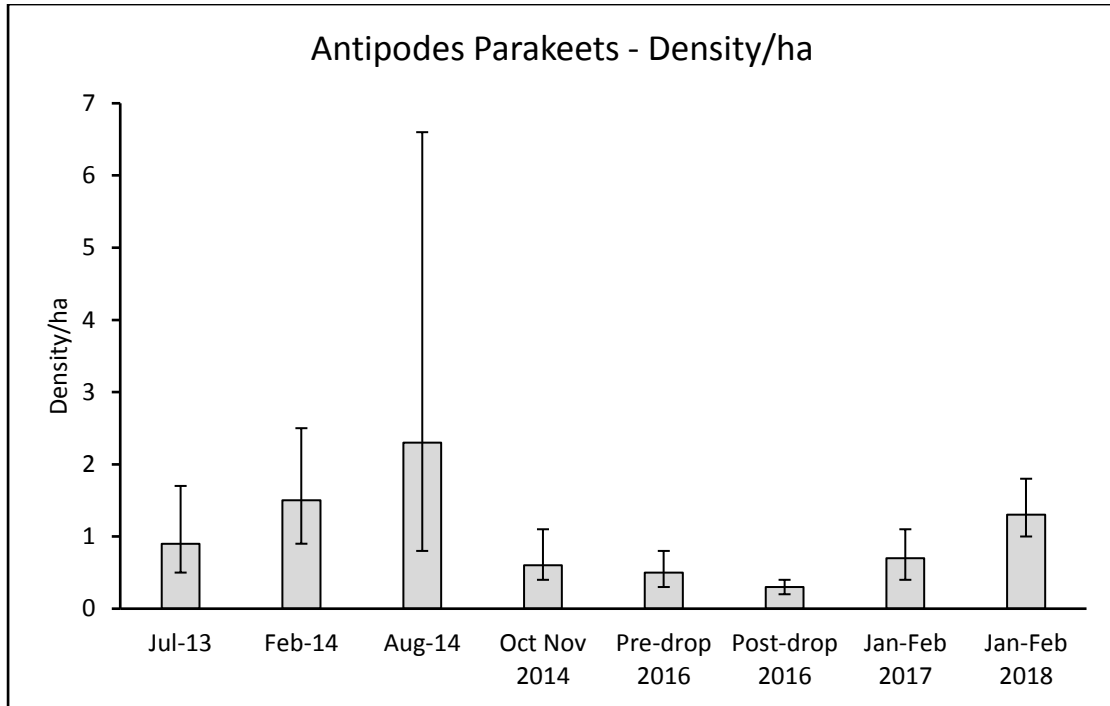


Figure 2: Population density estimates of Antipodes parakeet on Antipodes Island

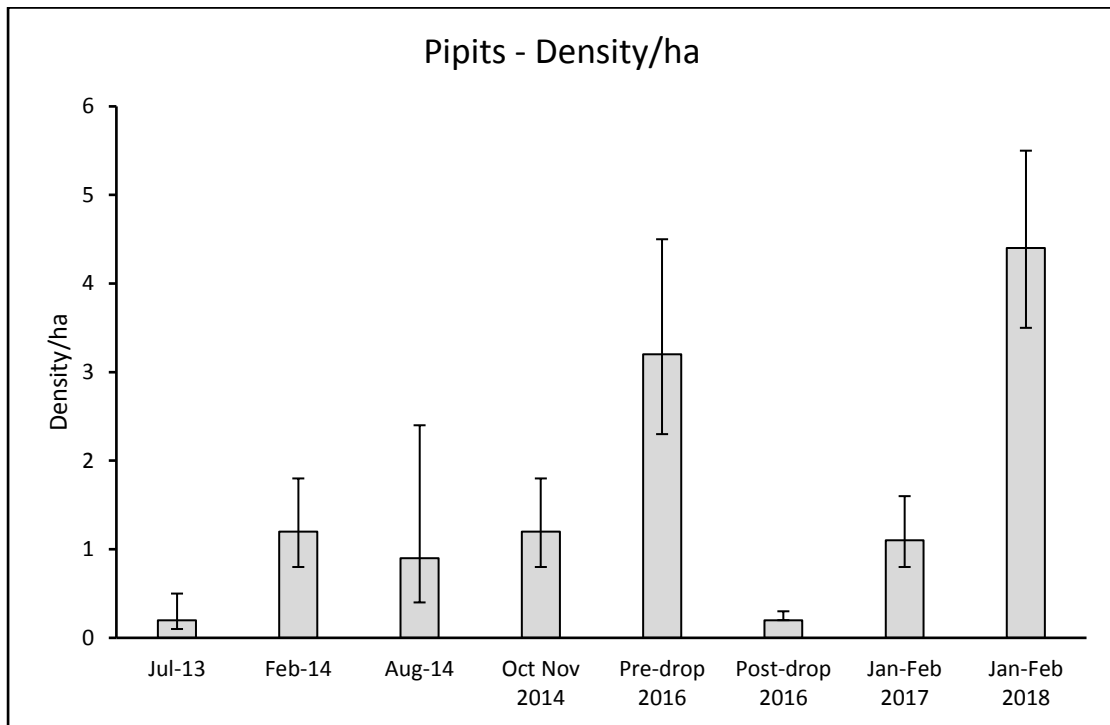


Figure 3: Population density estimates of pipits on Antipodes Island

The high pre-eradication estimated for pipits in 2016 is thought to be biased by an increased sampling effort at abandoned penguin colonies – where we now understand pipit and parakeet colonies congregate in winter. Previous samples, including the winter 2013 sample, were largely taken in the island’s interior. Variation in sampling effort are largely because of the restricted timeframes involved.

Snipe have been monitored each summer since 2013 and were more abundant in 2018 than ever before. The dramatic decline in snipe between January 2015 and January 2016 occurred before the mouse eradication and is therefore not related to the baiting operation. In contrast, the dramatic increase in snipe between 2017 and 2018 might well be from increased nesting success and survival resulting from increased invertebrate abundance.

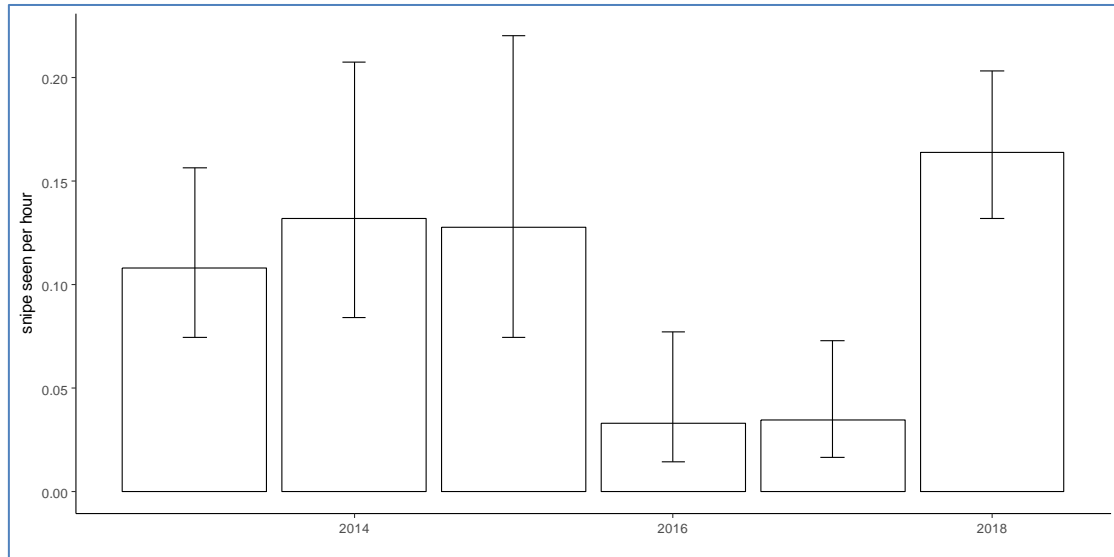


Figure 4: Changes in encounter rate of snipe on Antipodes Island

Table 1: Between year changes in snipe abundance

Year	Snipes seen per hour	Between year change (%)	95% confidence intervals		p
2013	0.1079				
2014	0.1322	123	68	220	0.4938
2015	0.1279	97	48	196	0.9267
2016	0.0330	26	9	71	0.0085**
2017	0.0345	105	34	325	0.9373
2018	0.1640	475	219	1033	0.0001***

We aim to repeat distance sampling each summer to learn more about the long-term benefits for these species. Every five years we'll aim to repeat invertebrate monitoring to see how beetles have recovered, conduct wide-spread surveys for land birds and re-measure vegetation plots.

## Appendices

Species	Survey Date	n	Density/ha (CI)
Reischek's	July 2013	29	2.3 (1.6-3.5)
	Feb 2014	46	2.1 (1.5-2.9)
	Aug 2014	9	3.7 (1.7-8.0)

	Oct Nov 2014	61	3.2 (2.4-4.3)
	Pre-drop 2016	63	3.2 (2.4-4.4)
	Post-drop 2016	173	0.6 (0.5-0.7)
	Jan-Feb 2017	63	1.9 (1.5-2.6)
	Jan-Feb 2018	125	2.8 (2.3-3.4)

<b>Species</b>	<b>Survey Date</b>	<b>n</b>	<b>Density/ha (CI)</b>
Antipodes	July 2013	16	0.9 (0.5-1.7)
	Feb 2014	37	1.5 (0.9-2.5)
	Aug 2014	7	2.3 (0.8-6.6)
	Oct Nov 2014	22	0.6 (0.4-1.1)
	Pre-drop 2016	22	0.5 (0.3-0.8)
	Post-drop 2016	116	0.3 (0.2-0.4)
	Jan-Feb 2017	31	0.7 (0.4-1.1)
	Jan-Feb 2018	88	1.3(1.0-1.8)

<b>Species</b>	<b>Survey Date</b>	<b>n</b>	<b>Density/ha (CI)</b>
Pipits	July 2013	4	0.2 (0.1-0.5)
	Feb 2014	39	1.2 (0.8-1.8)
	Aug 2014	4	0.9 (0.4-2.4)
	Oct Nov 2014	108	1.2 (0.8-1.8)
	Pre-drop 2016	101	3.2 (2.3-4.5)
	Post-drop 2016	40	0.2 (0.2-0.3)
	Jan-Feb 2017	62	1.1 (0.8-1.6)
	Jan-Feb 2018	227	4.4(3.5-5.5)