A new population estimate for Gibson's wandering albatross

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6 ways to get a whole island count

- Estimate based on old 1997 whole island count and counts of parts of the island every year thereafter.

- Low resolution photomosaics

- High resolution photomosaics

- Aerial transects

- A new ground count

- Combination of aerial and ground

Estimate based on old count

- We counted the whole island in 1991, 1995 and 1997
- Counted all the nests in 3 blocks containing 12% of the population every year thereafter.
- The three blocks vary have different densities of birds - high medium and low – but they vary in parallel – we conclude that the whole island varies in parallel
- We've a good estimate!
- Costs nothing – gets done as part of the population study

Low resolution photomosaic

- Barry's method
- Hand-held camera take oblique and near vertical photos out the door of a helicopter
- Stitch the photos together by eye
- Count the birds on the photomosaic
- Because its hard to stitch by eye, can't handle too many photos
  - Go higher or use smaller lens
  - End up with a lower resolution photomosaic
- cannot distinguish between nesting and non-nesting birds – you just count the dots.

Simulated low resolution photomosaics

- Need a correction factor
  - Birds on eggs / total number of birds
- Every time we've visited the study are on Adams Island over the last 20 years we've counted
 - Birds on nests with eggs
  - All other birds
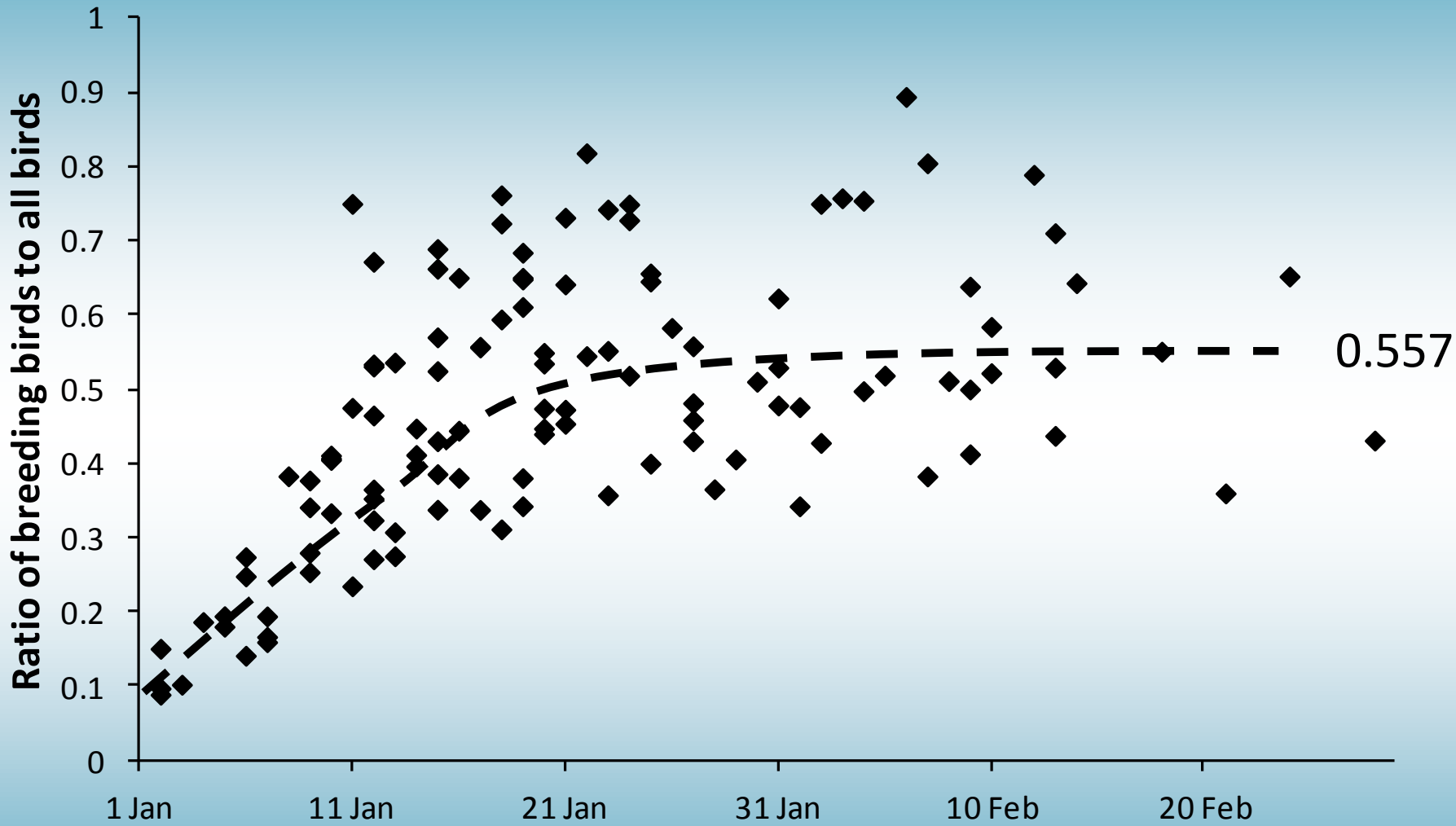
High resolution photomosaic

- Computer controlled camera in a pod slung under a helicopter
- GPS unit integrated with system
- Draw up a flight plan
- Automatically takes large numbers of photos
- Computer stitches the photos together
- Count the birds on the photomosaic
- Can take many pictures and stitch together a high resolution image where you can distinguish nesting from non-nesting birds.

Simulated high resolution photomosaics

- Need a correction factor
  - Birds on eggs / birds on nests
- Made 30 visits to the study areas on Adams and Antipodes Islands this year.
- During each visit counted:
  - Birds on eggs
  - Birds sitting on empty nests
  - Birds sitting on the ground
  - Birds standing
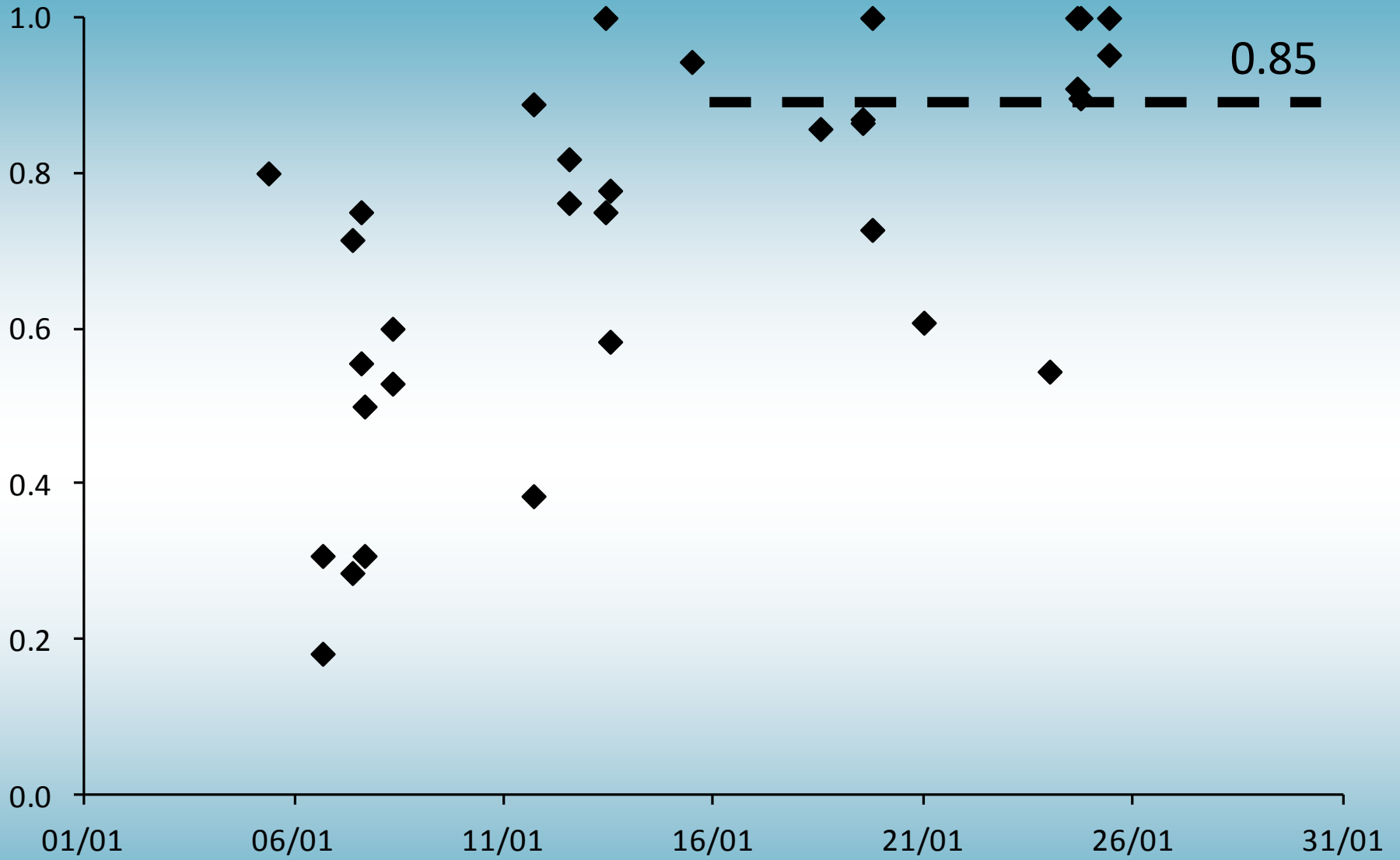
Simulation to compare precision

	Lower 95% CI	Estimate	Upper 95% CI
Low resolution photomosaic	3380	5000	9604
High resolution photomosaic	3672	5000	7831

Aerial transect

- Fly and photograph some transects.
- Stitch together the photos
  - Only have to stitch in one direction
- Count the birds on the photos
- Estimate the size of the strips
- Scale up to the whole island

- To produce a whole island estimate we need to know the spatial extent of the albatross colonies
- Need a whole island ground or aerial survey to get the whole extent.
- Less precision than any other technique
  - Correction factor
  - Sampling error with transects
  - Error in the spatial extent

Ground count

- Can do it better than in the past – GPS
- No need for a correction factor
  - check every bird to see if it has an egg
  - better precision than aerial methods
- The scrubby areas at the fringes of the colonies are a killer.
- Cost about $65,000

Combination of aerial and ground

- Count the easy bits on the ground
- Fly and photograph the difficult fringes.
- 2/3 of the population is in the easy bits so the lack of precision in the aerial counts isn't so much of a problem
- Might be difficult to demarcate the ground and aerial bits

How many counts to make

10,000 breeding females

	Count of nests	Proportion breeding
2016	5,000	50%
2017	6,000	60%
2018	9,000	90%

Method		$	Precision
Estimates based on old count	Free		2
Low Resolution photomosaic	Flying costs Counting on photos		5
High Resolution photomosaic	Flying costs Counting on photos Camera	$32,000	4
Aerial transects			6
Ground counts		$65,000	1
Combination ground and aerial	Flying costs Counting on photos Ground count	$32,000	3

How many counts to make?

- Not all the birds breed every year
  - Normal solution is to count for several years
- The proportion of birds that breed varies
- If you average the number of breeders over several years you get the average number that bred – not the size of the breeding population
- Can only get an estimate of the size of the breeding population if you know the proportion breeding