Photographic assessment of Campbell and Grey-headed Mollymawk populations on Campbell Island, November 2019

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Mixed-species colonies—Campbell Mollymawk (*Thalassarche impavida*) and Grey-headed Mollymawk (*Thalassarche chrysostoma*)—are a feature of the northern coasts of Campbell Island


Grey-headed Mollymawk

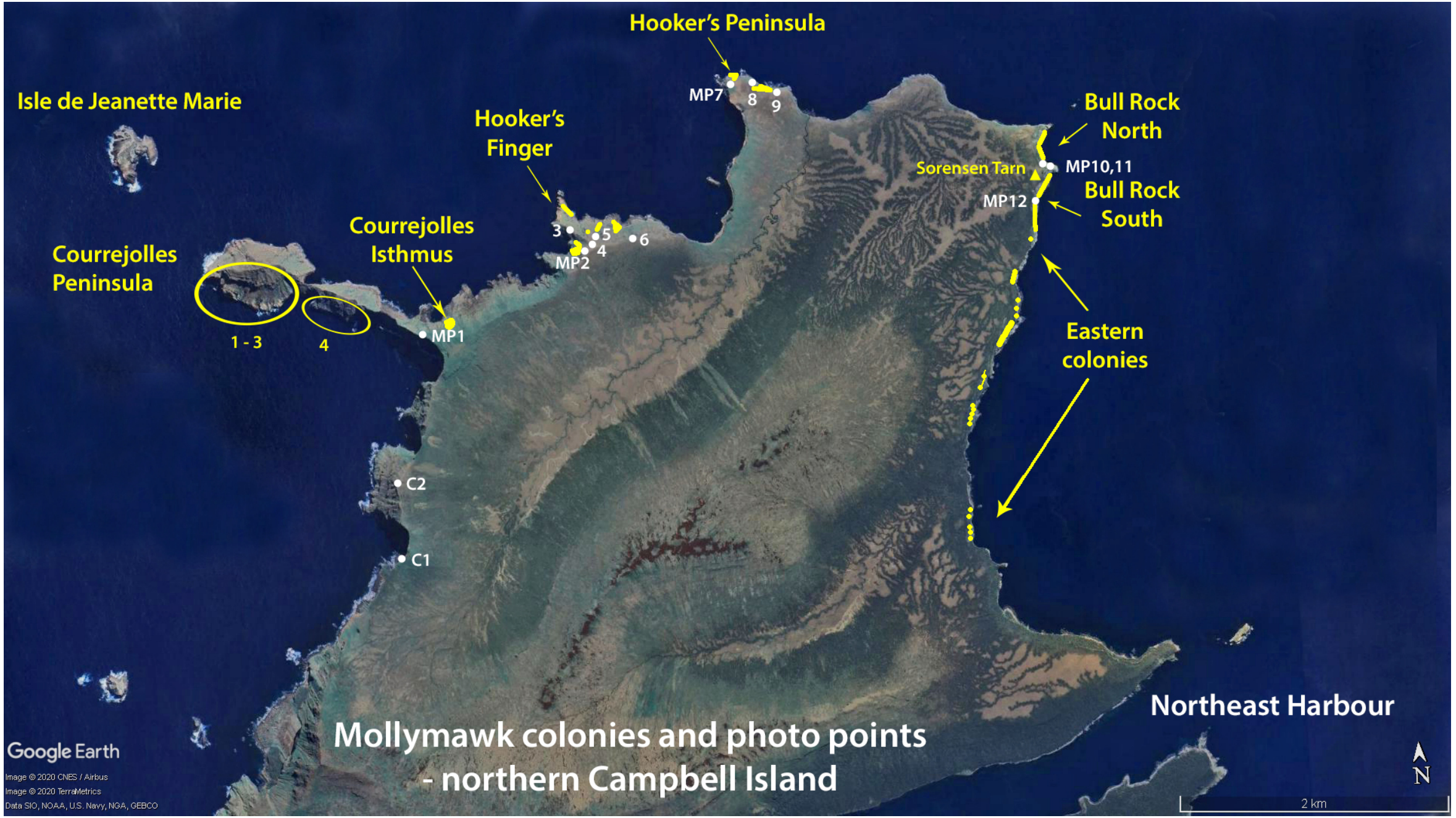
Circumpolar, biennial breeder; c. 96,000 breeding pairs globally

Campbell I c. 8600 pairs (early 2000s) – 9% global total; declining


Bull Rock South colony


Campbell Mollymawk

Endemic, c. 22,000 pairs breeding annually (early 2000s); apparent decline 1940s– 1980s; uncertain slow recovery since then?

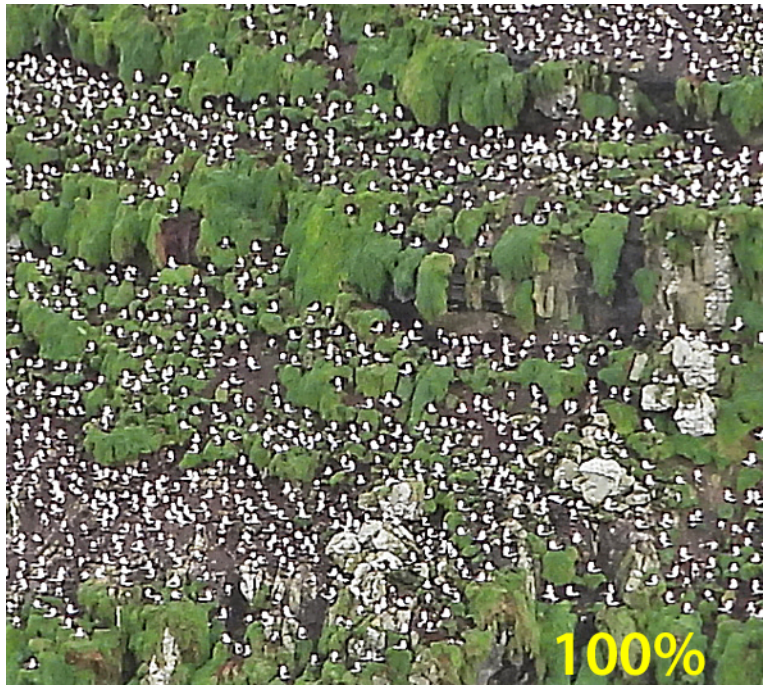

Hooker's Peninsula
Isle de Jeanette Marie
MP7
8
9
Hooker's Finger
Bull Rock North
Sorensen Tarn
MP10,11
Bull Rock South
MP12
Courrejolles Isthmus
3
5
6
4
MP2
Courrejolles Peninsula
1 - 3
4
MP1
Eastern colonies
C2
C1
Northeast Harbour
Mollymawk colonies and photo points
- northern Campbell Island
Google Earth
Image © 2020 CNES / Airbus
Image © 2020 TerraMetrics
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
N
2 km

Aims

- Collate and analyse various sets of photographs taken in November 2019 (‘Operation Endurance’) covering all the nesting colonies of the two species and estimate their current breeding populations
  - Ground-level photographs taken from 14 fixed-point vantage sites covering all colonies except those along the north-east coast (‘Eastern colonies’), 20–23 November
  - Aerial photographs taken during two Navy helicopter flights along the coast, 18 and 24 November, covering all colonies east of Hooker’s Peninsula (and only scattered points beyond that)
  - Imagery of Courrejolles Peninsula colonies taken from a DJI Mavic Pro drone, 23 November
- Assess current trends in these populations, both overall and by colony, where possible

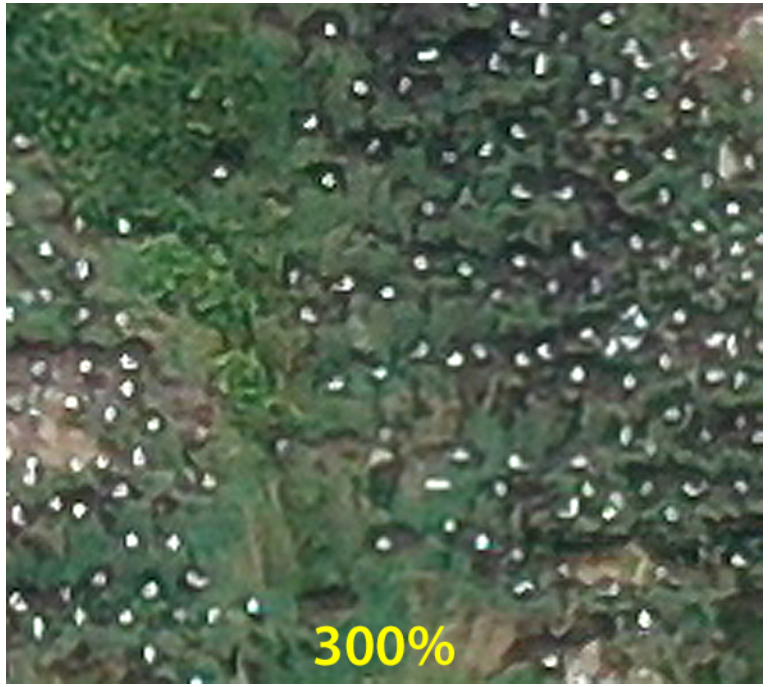
Images from helicopter flypasts

NH90 (18 November)
Focal length 18 mm (35 mm equivalent: 27 mm); could [just] count individual birds but little else



Sea Sprite (24 November)
Focal length 6.3 mm (35 mm equivalent: 35 mm); could count individual birds and often assess activity

Courrejolles Peninsula: drone and telephoto images (same day)



Hasselblad L1D-20c (from drone)

Focal length 10.3 mm (35 mm equivalent: 28 mm). Individuals and some activity could be documented but little else

Canon EF-75-300mm (from C2)

Focal length 300 mm (1:1 crop factor). In Area 4, many birds identifiable to species; most activity could be documented

Counting ground-based images

Individual images (60 mm focal length) cover only a restricted area

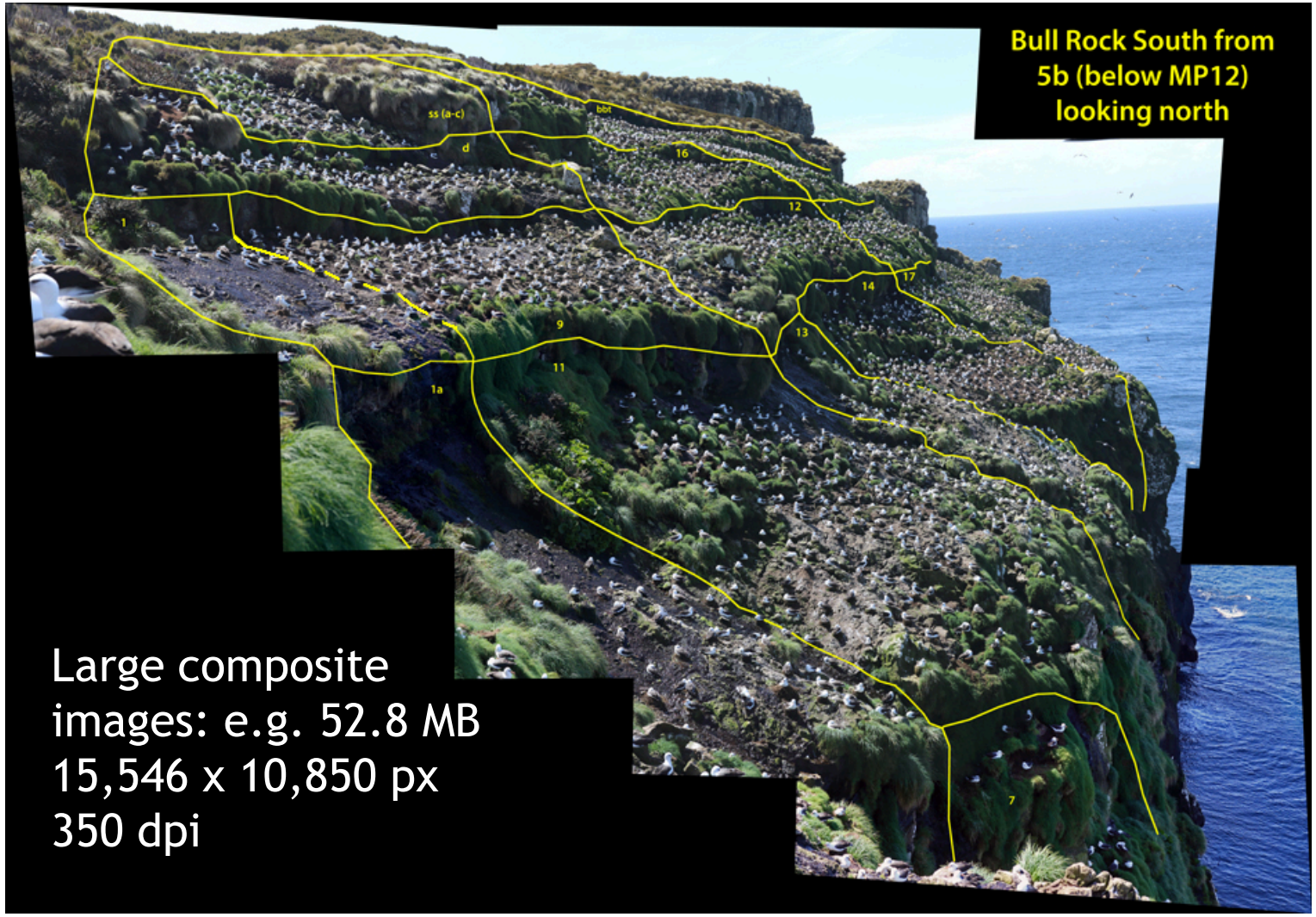
Composites created by stitching multiple images together (v. large files)

Areas demarcated following Moore (1999)

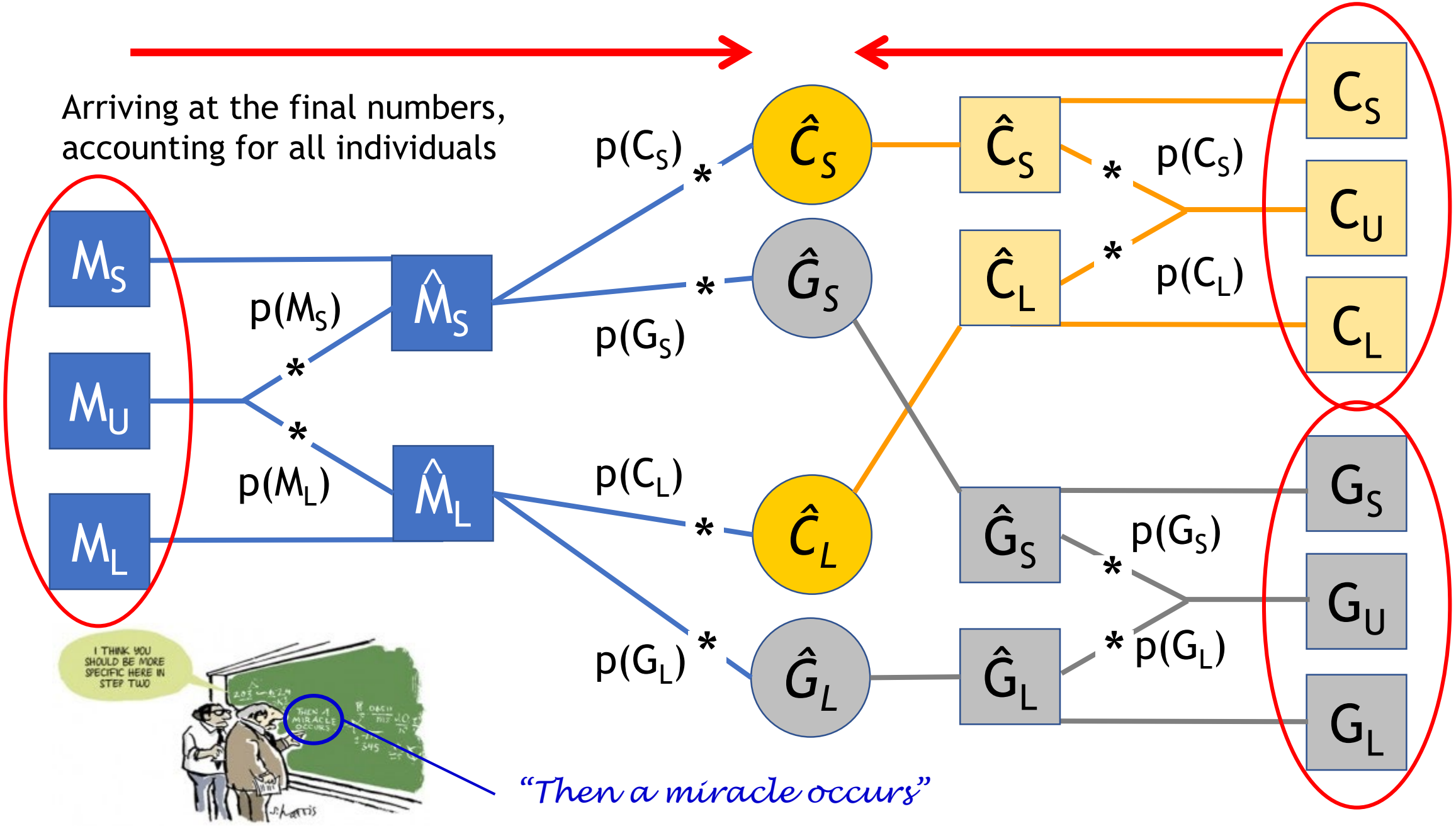
Counts within areas:

Species (CM, GHM, ?)

Activity (sitting; loafing [partners; pre-breeders; others standing around])



Arriving at the final numbers, accounting for all individuals



"Then a miracle occurs"

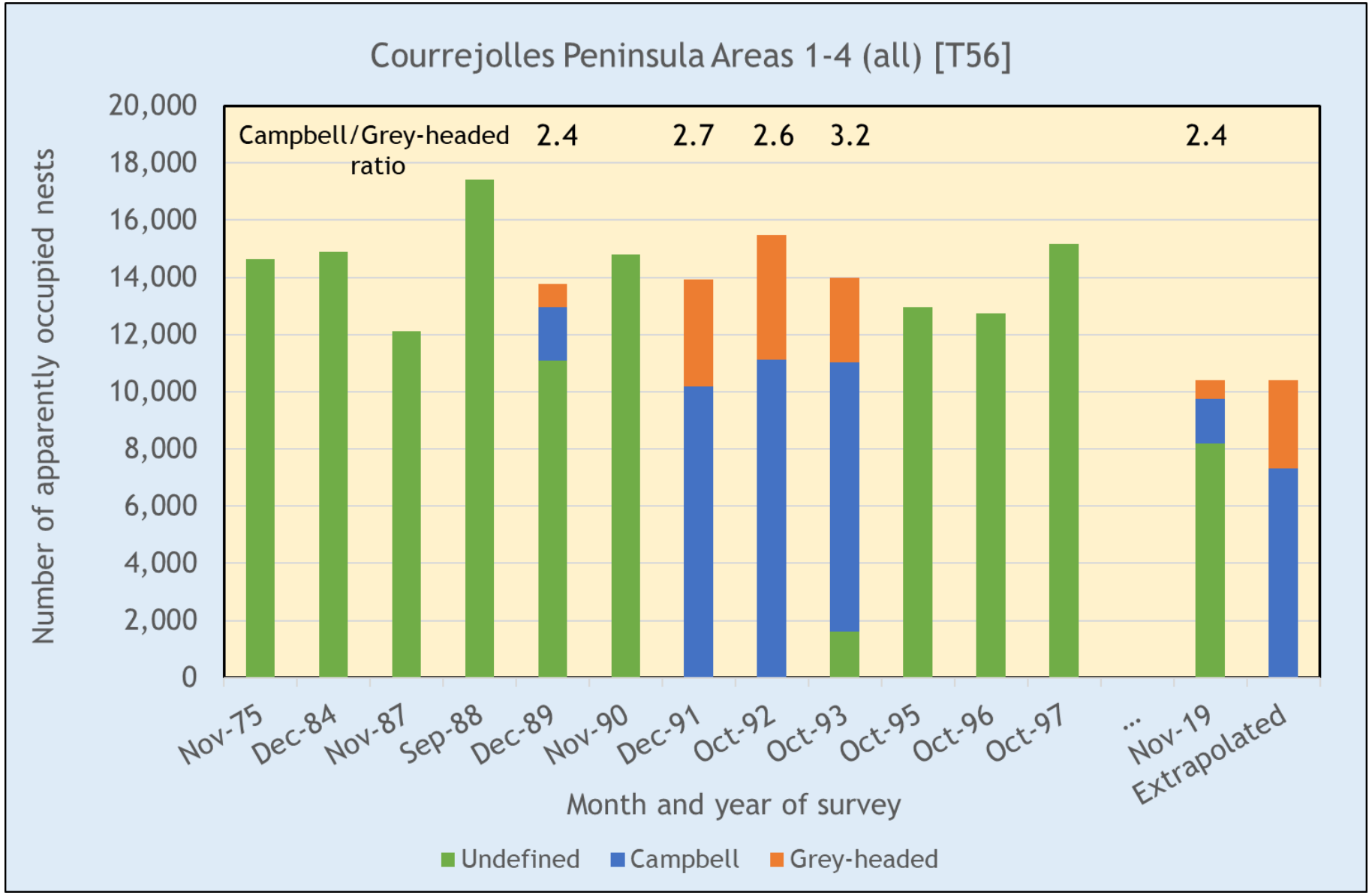
Overall results

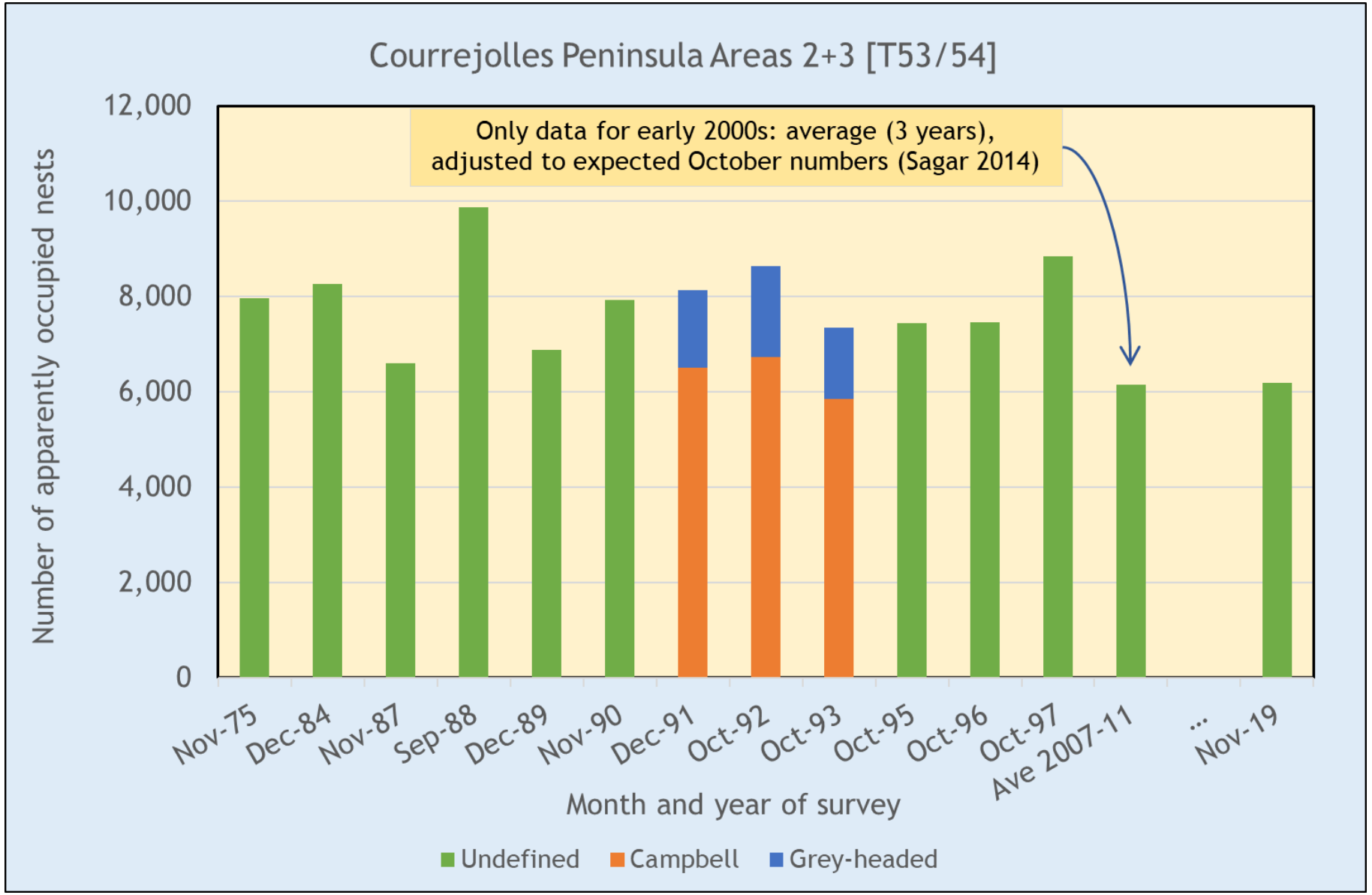
Area	Method(s)	Campbell Mollymawk		Grey-headed Mollymawk	
		Sitting	Loafing	Sitting	Loafing
Courrejolles Peninsula	AC, GC	7303	1435	3085	744
Courrejolles Isthmus	GC	133	44	130	88
Hooker's Finger	GC	1201	162	815	130
Hooker's Peninsula	AA, GC	459	94	342	99
Bull Rock North	AA, GC	3596	398	407	49
Bull Rock South	AA, GC	8261	1920	416	80
Sorensen Tarn	GC	140	42	0	0
Eastern Colonies	AA	2519	487	126	20
Total		23,612	4582	5311	1210

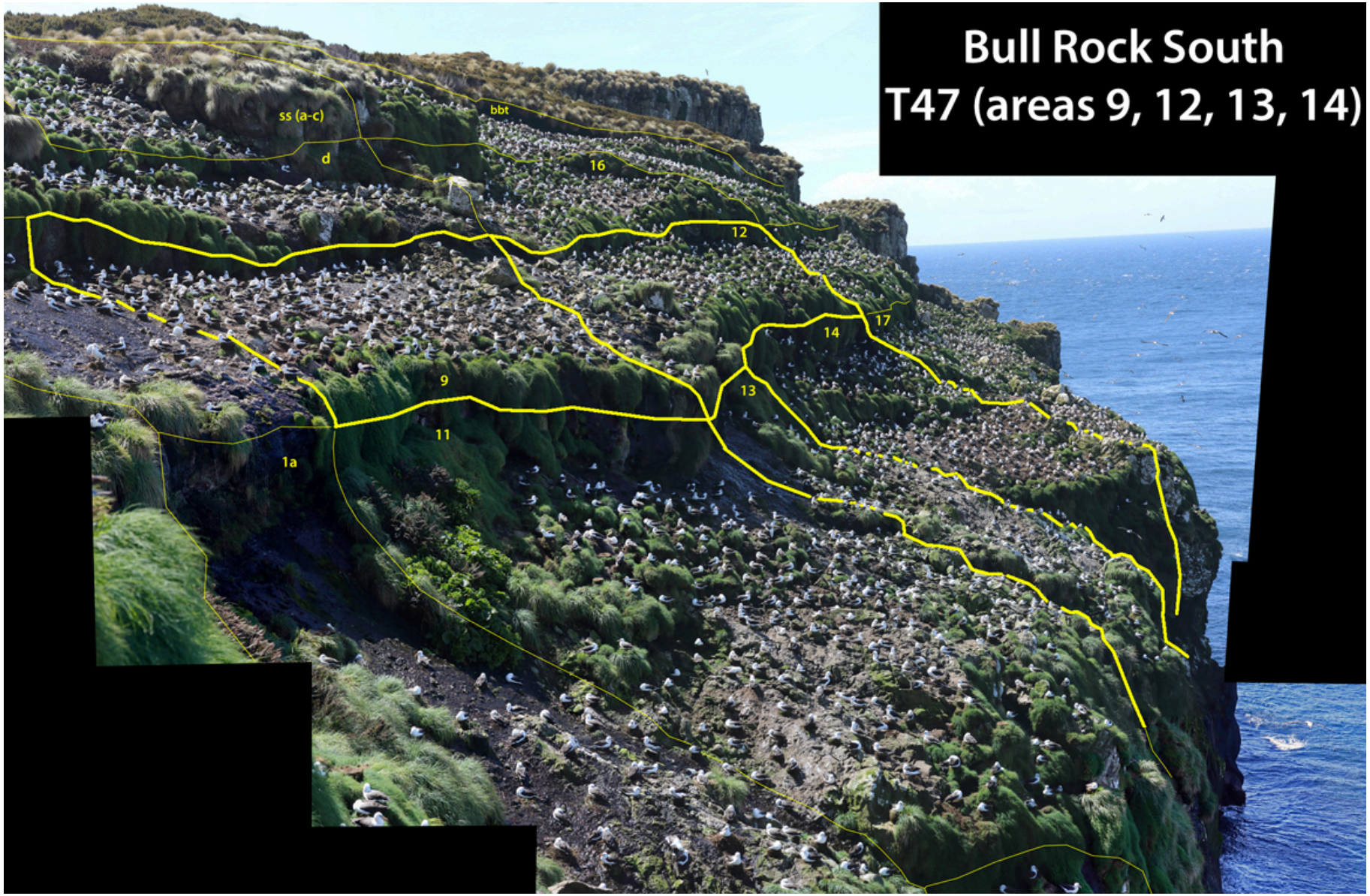
Changes in numbers of apparently occupied nests through time

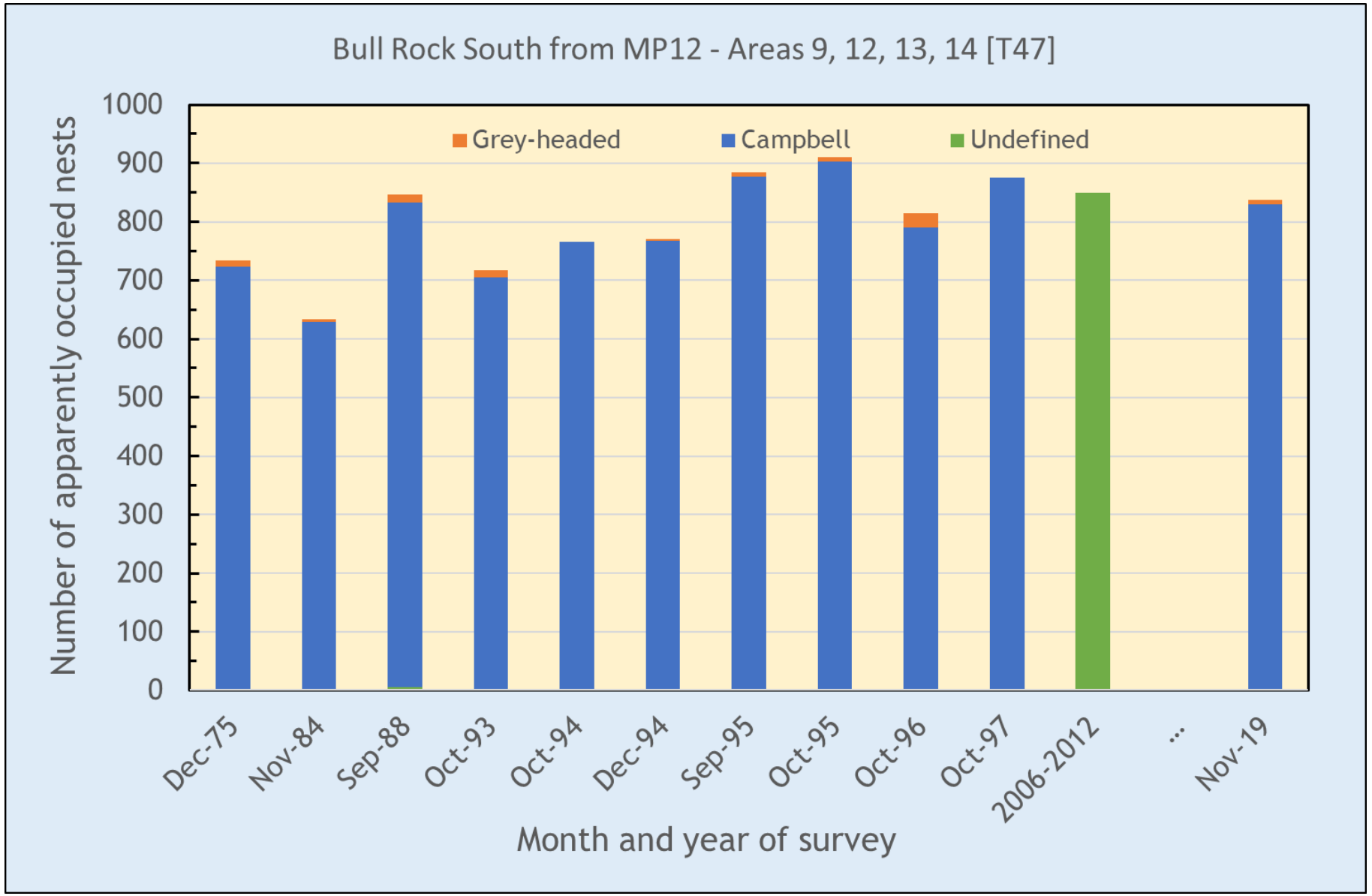
Period	Campbell Mollymawk	Grey-headed Mollymawk	Comment	Source
1940s	*31,300*	*43,000*	Estimates from mean proportional change in nest numbers from photo-points at GHM-dominated colonies and Bull Rock North (for CM) extrapolated from mean total nest estimates 1995-97	Moore 2004
1960s	*34,800*	*35,000*		Moore 2004
1970s	*26,600*	*22,200*		Moore 2004
1980s	*19,300*	*9,400*		Moore 2004
1990s	24,600	7,800	Ground counts of nests 1990-97	Moore 2004
2006-12	21,648	8,611	Eastern colonies excluded?	Sagar 2014
2019	23,612	5,311	Occupied but empty nests not accounted for.	This study
2019 (adjusted)	26,682	5,683	Adjusted to early October estimate	This study

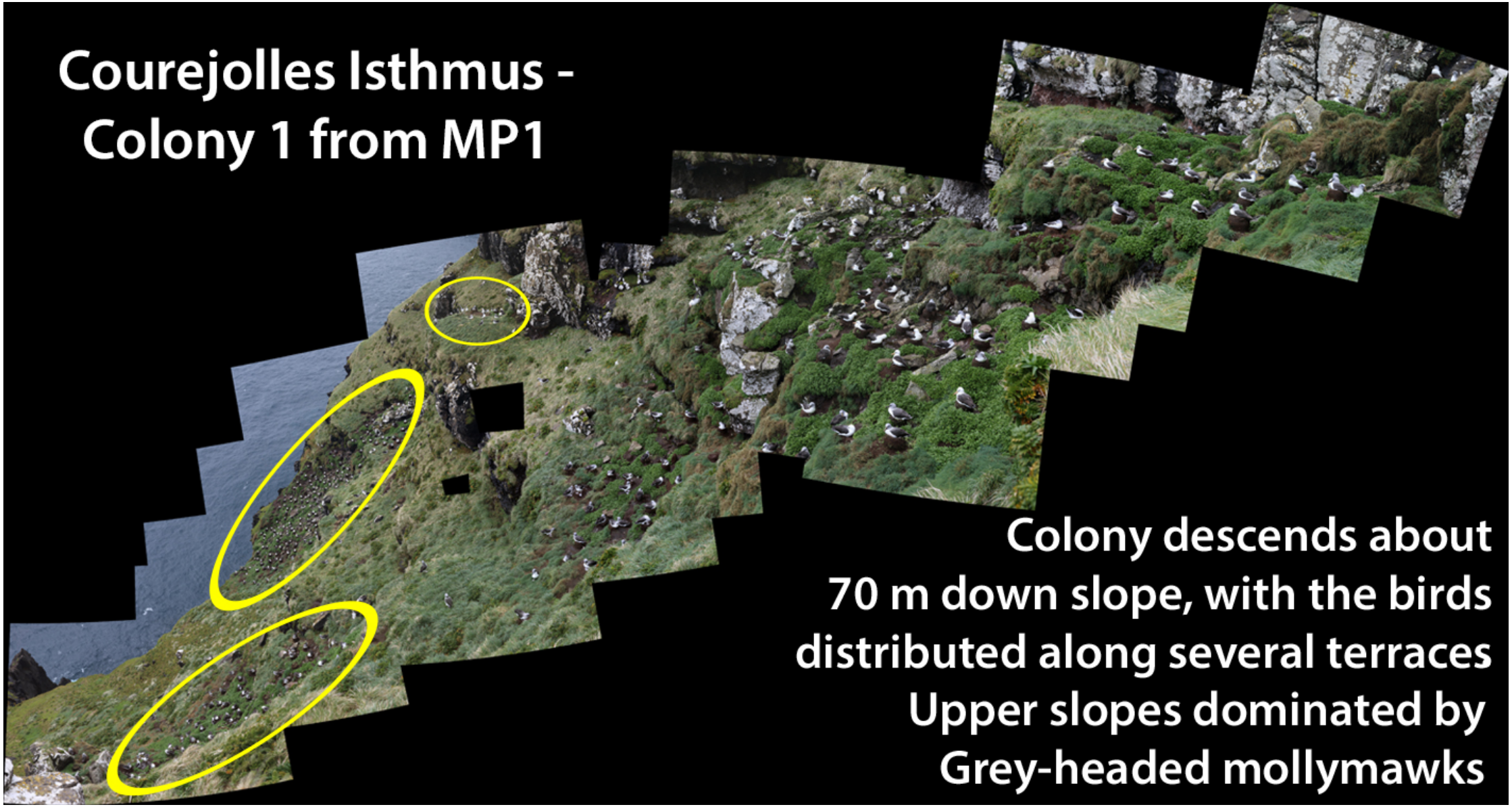

Courrejolles Peninsula
Isle de
Jeanette Marie
Area 1
Area 2
Area 3
Area 4

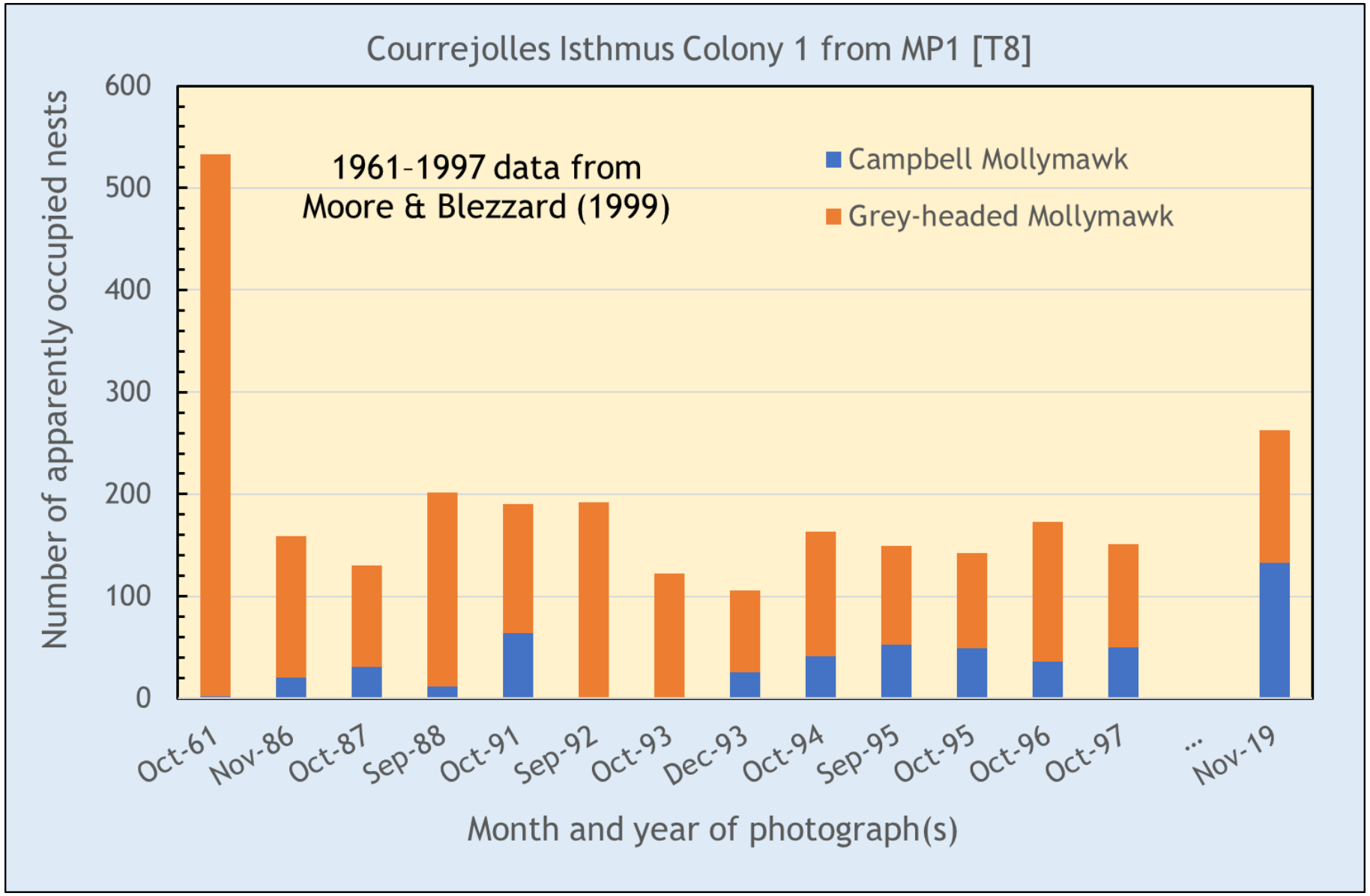

Courrejolles Peninsula Areas 1-4 (all) [T56]
Number of apparently occupied nests
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Campbell/Grey-headed ratio
2.4
2.7
2.6
3.2
2.4
Nov-75
Dec-84
Nov-87
Sep-88
Dec-89
Nov-90
Dec-91
Oct-92
Oct-93
Oct-95
Oct-96
Oct-97
...
Nov-19 Extrapolated
Month and year of survey
Undefined
Campbell
Grey-headed

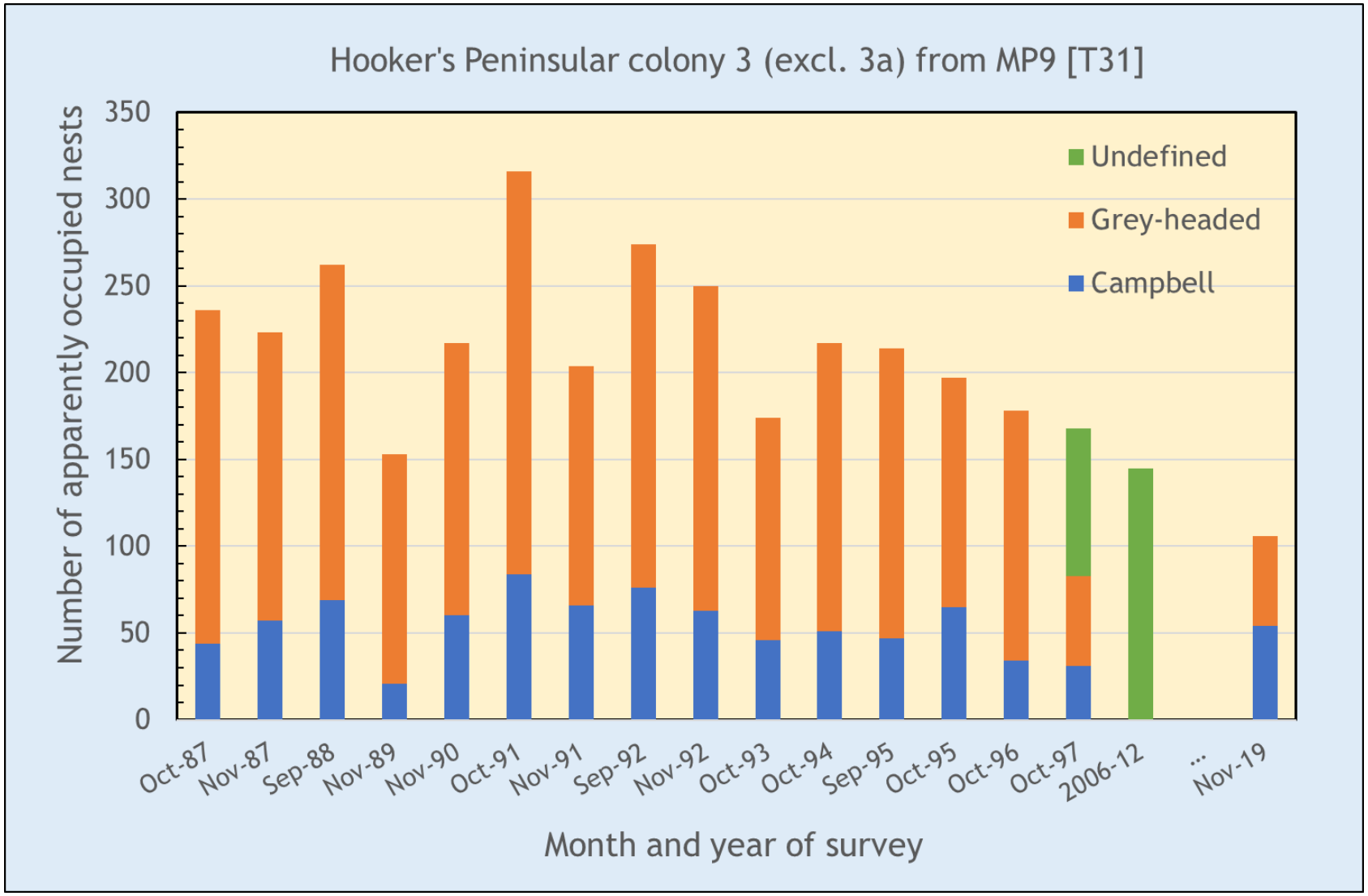

Courrejolles Peninsula Areas 2+3 [T53/54]
Only data for early 2000s: average (3 years), adjusted to expected October numbers (Sagar 2014)
Number of apparently occupied nests
12,000
10,000
8,000
6,000
4,000
2,000
0
Nov-75
Dec-84
Nov-87
Sep-88
Dec-89
Nov-90
Dec-91
Oct-92
Oct-93
Oct-95
Oct-96
Oct-97
Ave 2007-11
...
Nov-19
Month and year of survey
Undefined
Campbell
Grey-headed


Bull Rock South
T47 (areas 9, 12, 13, 14)
ss (a-c)
d
bbt
16
12
17
14
13
9
11
1a


Bull Rock South from MP12 - Areas 9, 12, 13, 14 [T47]
Number of apparently occupied nests
1000
900
800
700
600
500
400
300
200
100
0
Grey-headed
Campbell
Undefined
Dec-75
Nov-84
Sep-88
Oct-93
Oct-94
Dec-94
Sep-95
Oct-95
Oct-96
Oct-97
2006-2012
...
Nov-19
Month and year of survey


Courejolles Isthmus -
Colony 1 from MP1
Colony descends about
70 m down slope, with the birds
distributed along several terraces
Upper slopes dominated by
Grey-headed mollymawks


Courrejolles Isthmus Colony 1 from MP1 [T8]
1961–1997 data from
Moore & Blezzard (1999)
Campbell Mollymawk
Grey-headed Mollymawk
Number of apparently occupied nests
600
500
400
300
200
100
0
Oct-61
Nov-86
Oct-87
Sep-88
Oct-91
Sep-92
Oct-93
Dec-93
Oct-94
Sep-95
Oct-95
Oct-96
Oct-97
…
Nov-19
Month and year of photograph(s)


Hooker's Peninsular colony 3 (excl. 3a) from MP9 [T31]
Number of apparently occupied nests
350
300
250
200
150
100
50
0
Undefined
Grey-headed
Campbell
Oct-87
Nov-87
Sep-88
Nov-89
Nov-90
Oct-91
Nov-91
Sep-92
Nov-92
Oct-93
Oct-94
Sep-95
Oct-95
Oct-96
Oct-97
2006-12
...
Nov-19
Month and year of survey


3b(i)
3b(ii)
3a
3d
3c(i)
2c
3c(ii)
2d
3e
Hooker's Peninsula
colony 3 [T31/32]

Concluding thoughts

- *Caveat*: several assumptions involved; 'final numbers' are a moving target
- Campbell Mollymawk population: more-or-less stable?
- Grey-headed Mollymawk: apparently still declining (potentially by −32 to −38% over the past 23–25 years (≈annual rate of decline: 1.7–4.7%)
- If real, losses may be due to attrition of the population across all colonies, rather than being concentrated spatially or in time.
- Possible reasons:
  - environmental change: affecting food availability, foraging efficiency and interaction with fisheries, especially during extended juvenile life stage (cf. juvenile survival [ø = 0.162–0.235] with high adult survival [ø = 0.953]) ?
  - added mortality from bycatch in pelagic trawl and long-line fisheries ?
  - competition with Campbell Mollymawk for nesting space (but does this explain concurrent declines in other populations) ?
- Need for continued periodic population surveys, on ground and from the air

Acknowledgements

- Kalinka Rexer-Huber and Kevin Parker, who took the vantage-point and drone photographs and provided essential background information
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