



Individual moult in Bar-tailed Godwits from digital photography

Jesse R. Conklin



New Zealand Bar-tailed Godwits

Breed in Alaska
Migrate ~30,000 km
Three non-stop flights

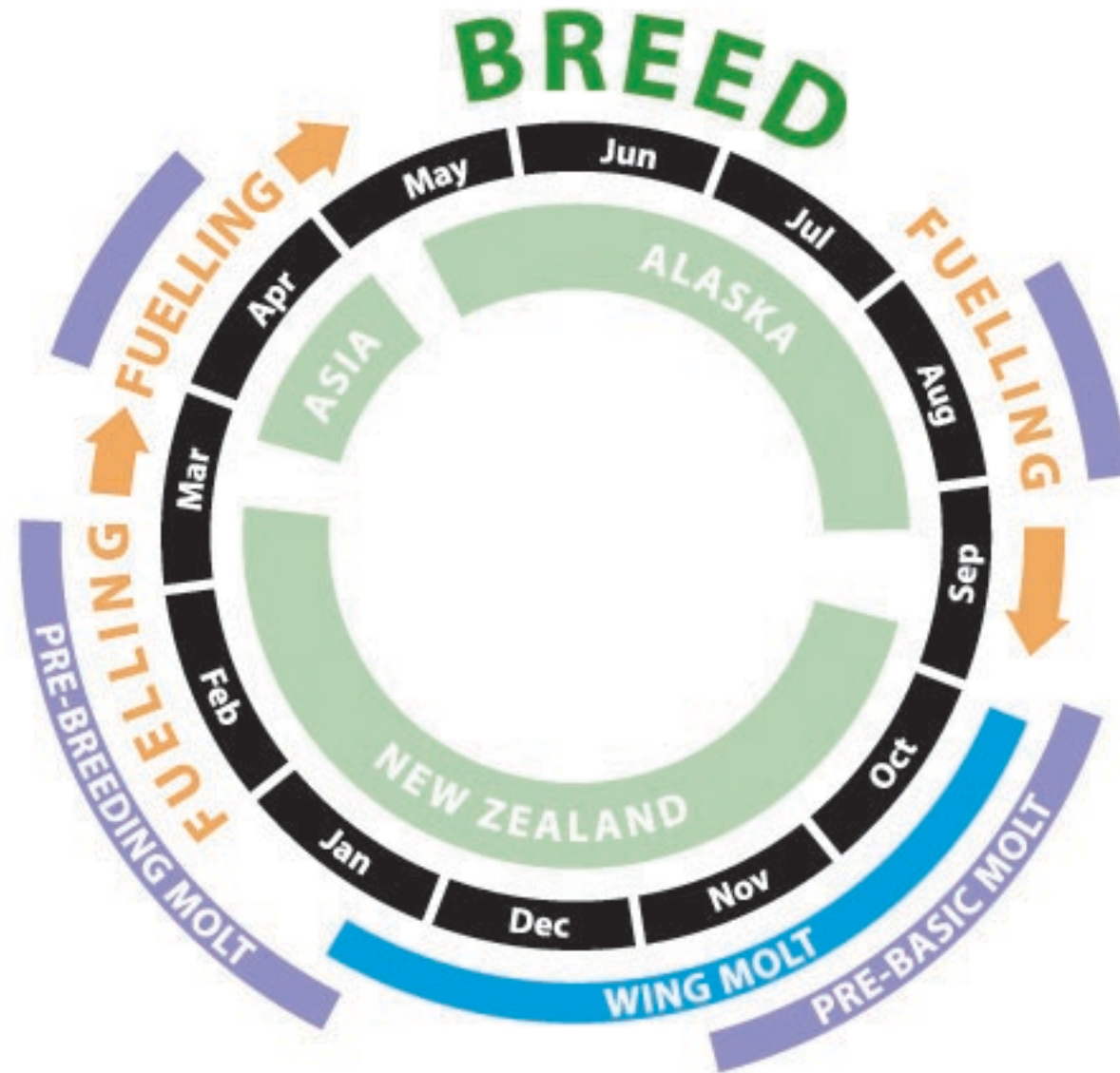
Moult Workshop 2025



Only 3 weeks
of flying

Fit into busy
annual cycle

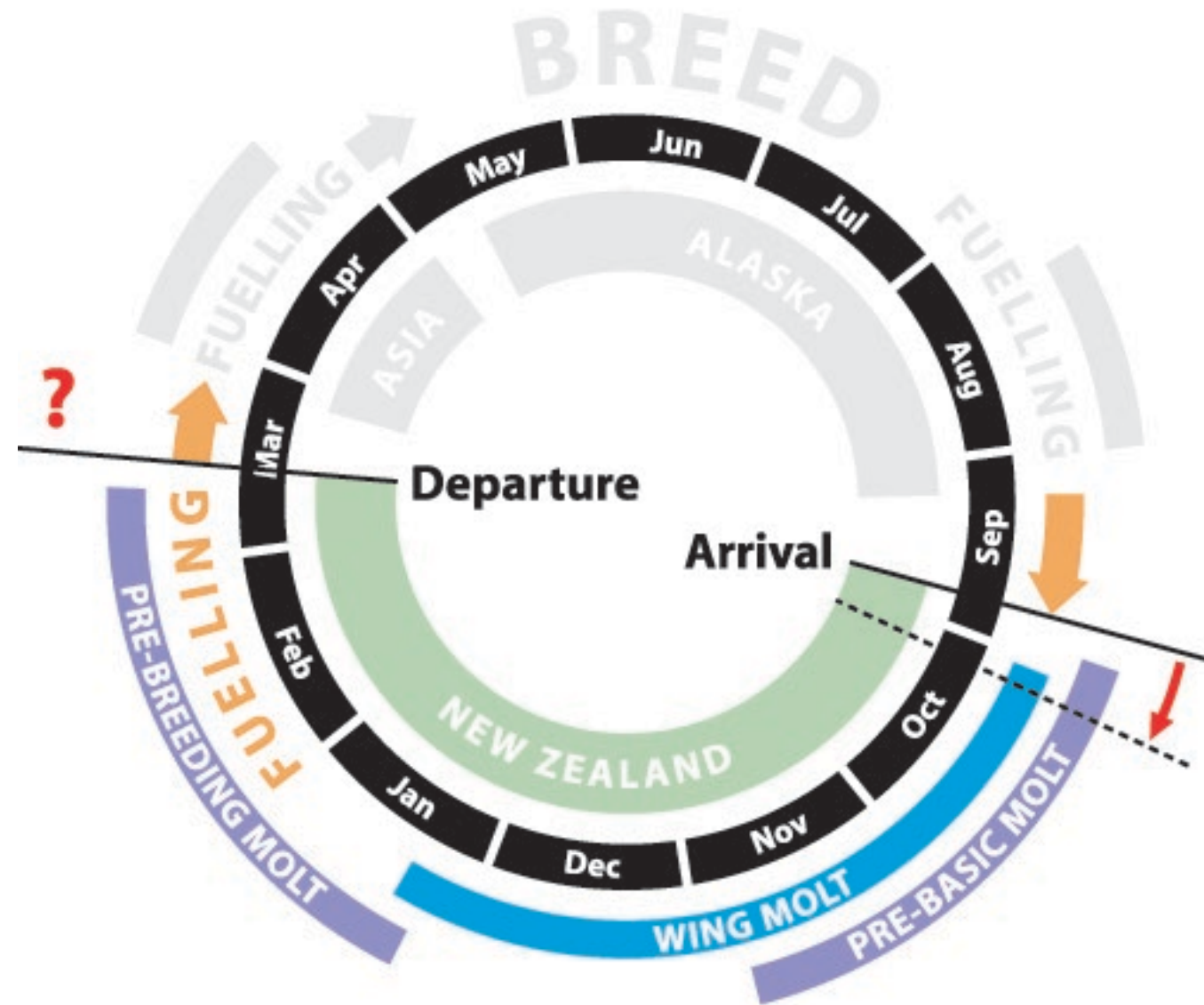
How do individuals
manage schedules?



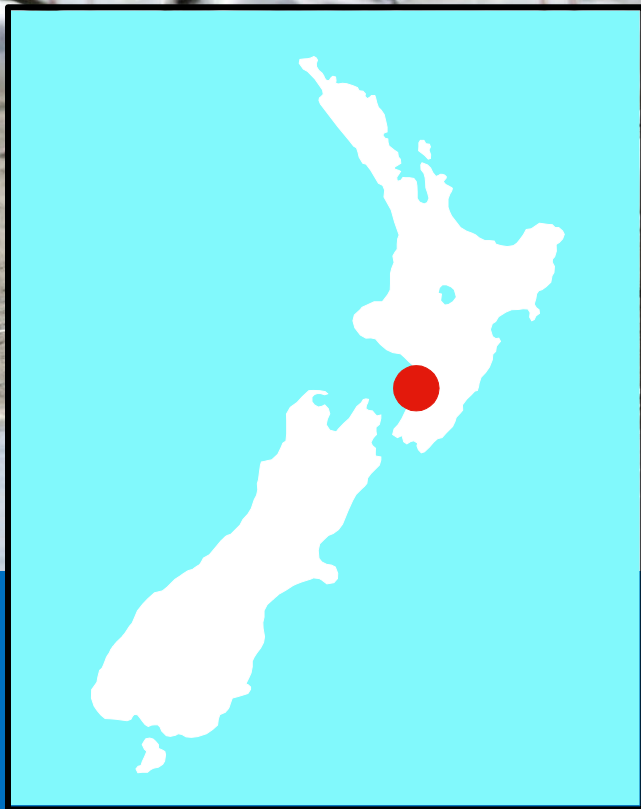
In New Zealand:

How do delays
in migration arrival
affect departure
six months later?

Reference:
Conklin & Battley
2012 *J. Avian Biology*



Manawatu River Estuary



Small estuary
Small population <300
Site-faithful



Weekly visits
September through February
Daily in March

Documented progression of
contour moult using digital
photography



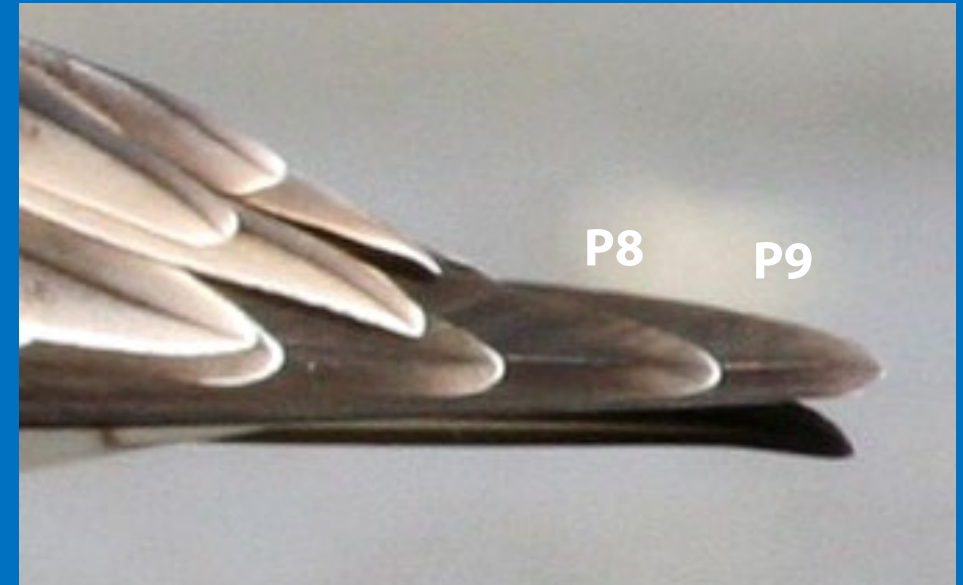
6YRRB

Collected incidental photographs of outstretched wings
Scored primary moult 0-50
Estimated unseen feathers based on historical in-hand database



Folded wings were
also informative

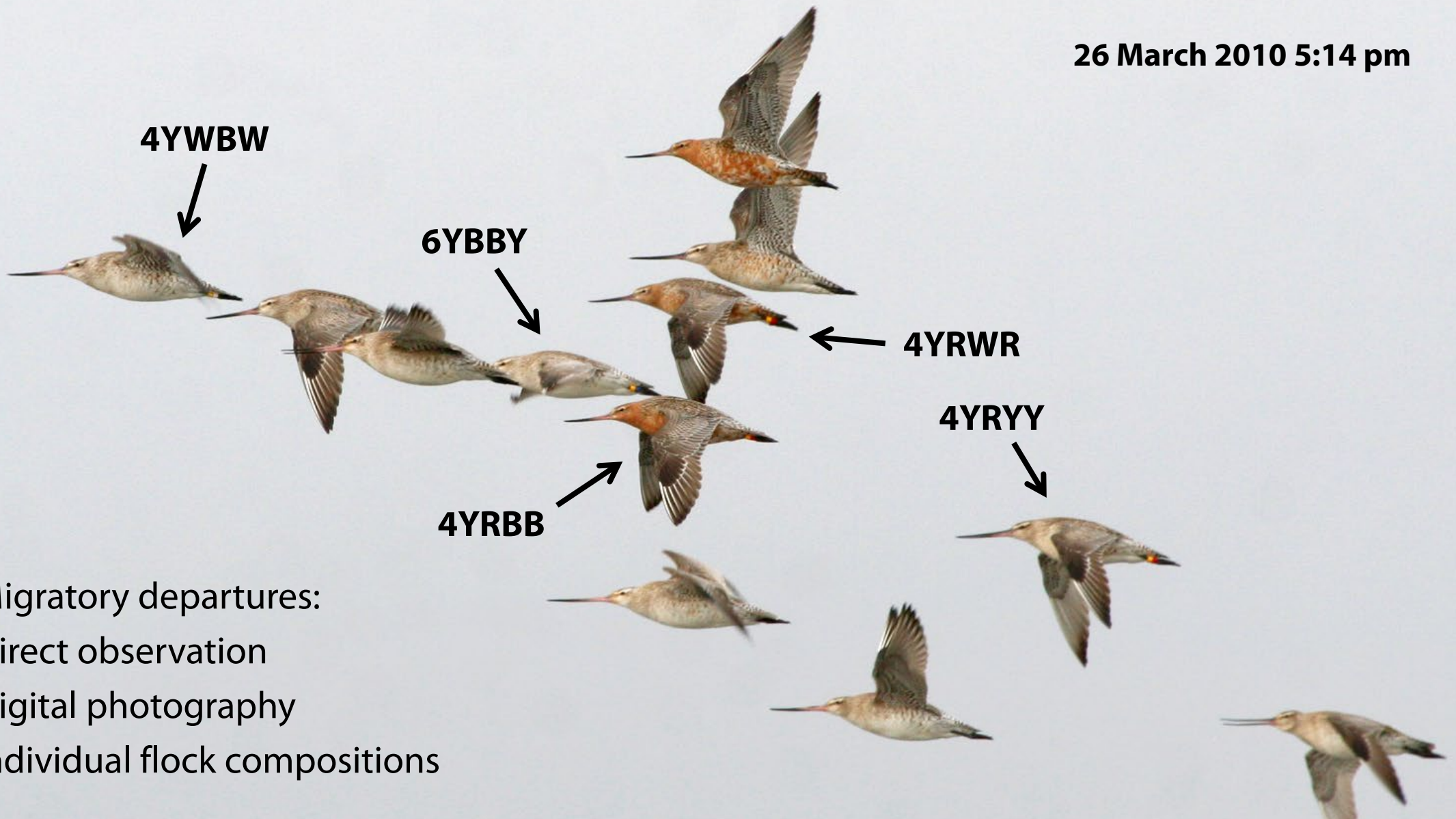
16 Jan



26 Jan



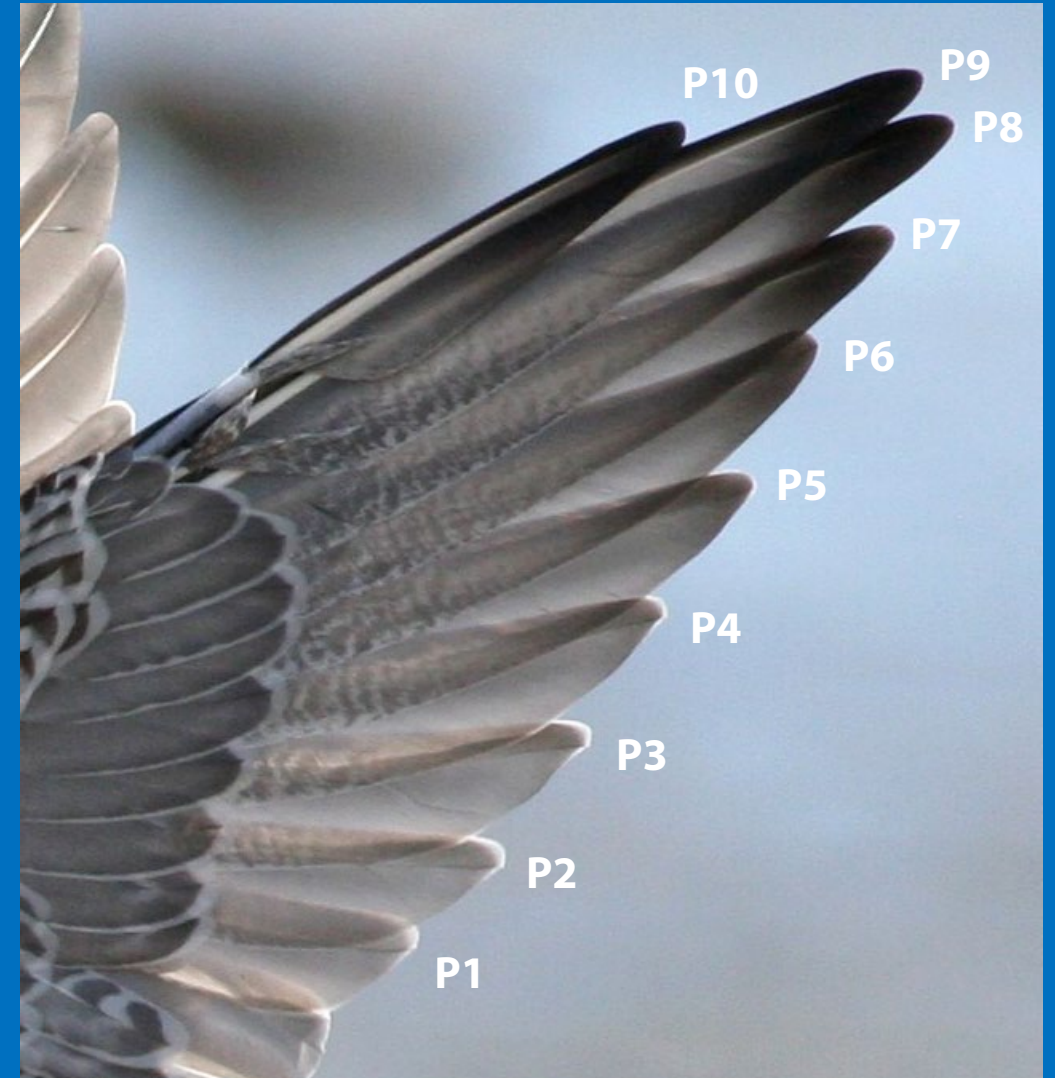
26 March 2010 5:14 pm



Migratory departures:
Direct observation
Digital photography
Individual flock compositions

Need individual moult regressions to estimate start and end dates

Problem: moult scores are not linear!
Convert to Percentage Feather Mass Grown (PFMG)



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Derived from godwit specimens:

P1 = 3.5% total mass	Score 1 = 10% grown
P2 = 4.4%	Score 2 = 25%
P3 = 5.6%	Score 3 = 50%
P4 = 7.2%	Score 4 = 80%
P5 = 8.7%	Score 5 = 100%
P6 = 10.5%	
P7 = 12.2%	
P8 = 14.1%	
P9 = 16.0%	
P10 = 17.6%	

Score 47 = PFMG 90%



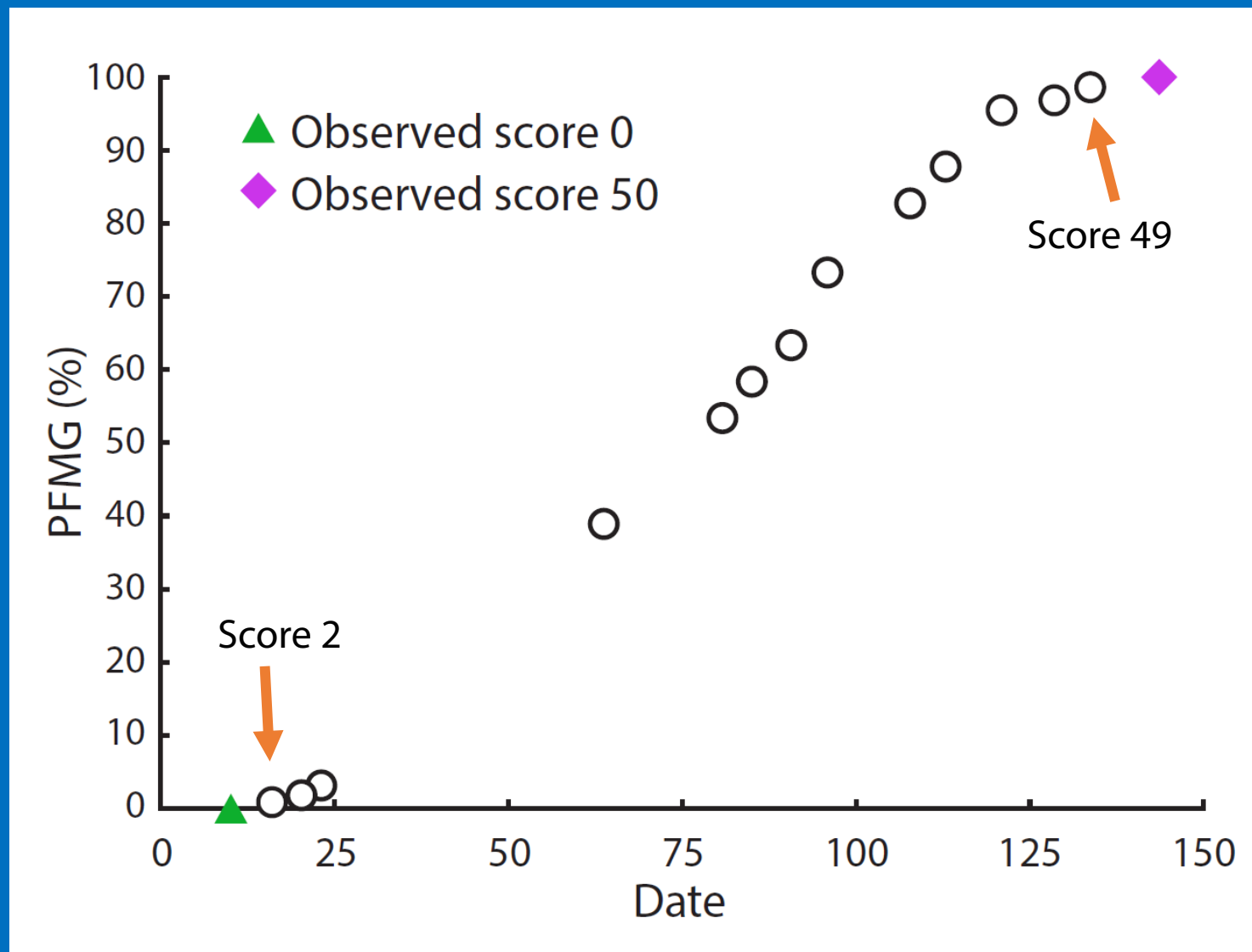
Example:

13 in-moult scores

Including scores 2 & 49

Plus observations at score 0 & 50

So: duration between 119 & 134 d



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13 in-moult scores

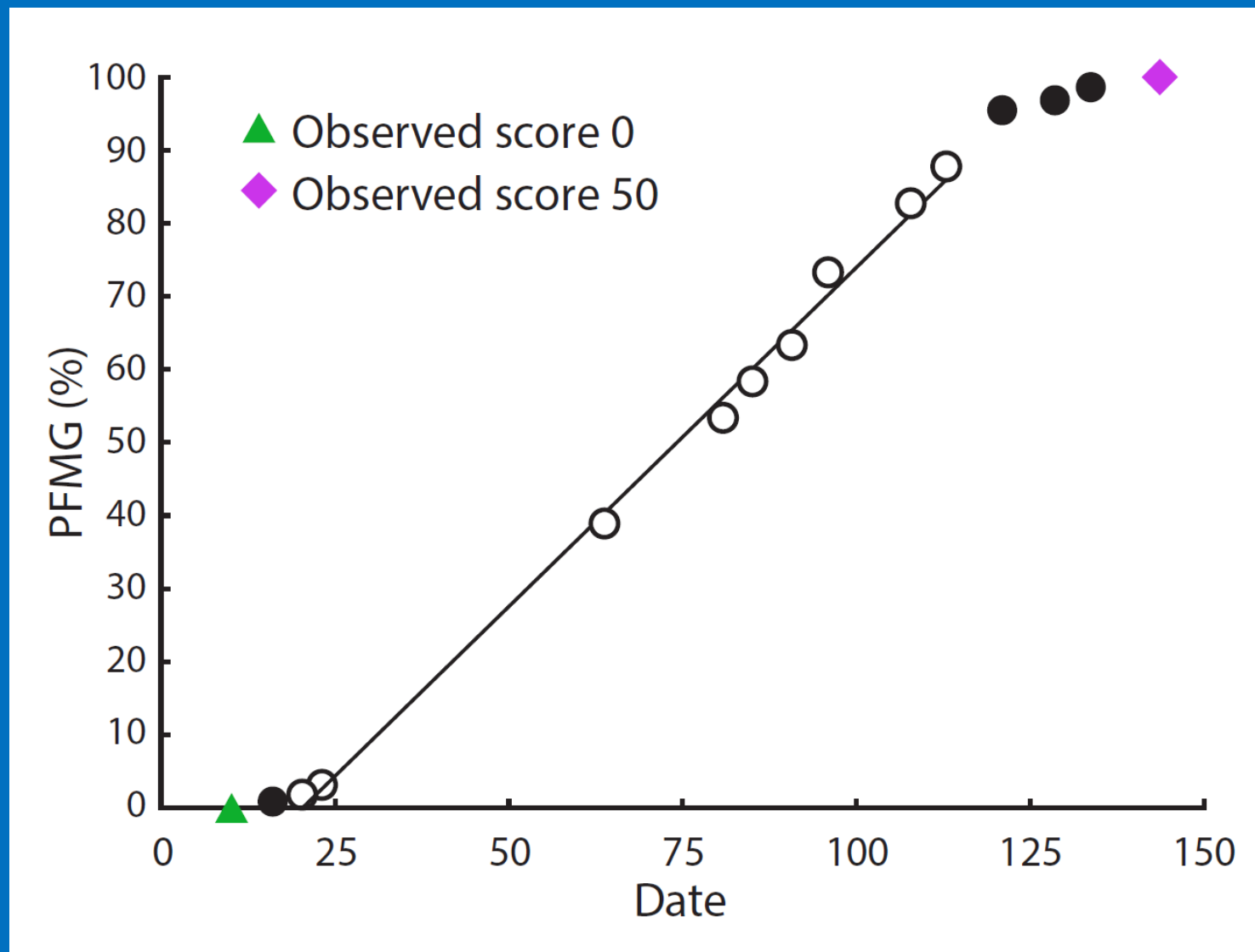
Including scores 1 & 49

Plus observations at score 0 & 50

So: duration between 118 & 134 d

PFMG linear increases scores 4-47

But slower before or after



Example:

13 in-moult scores

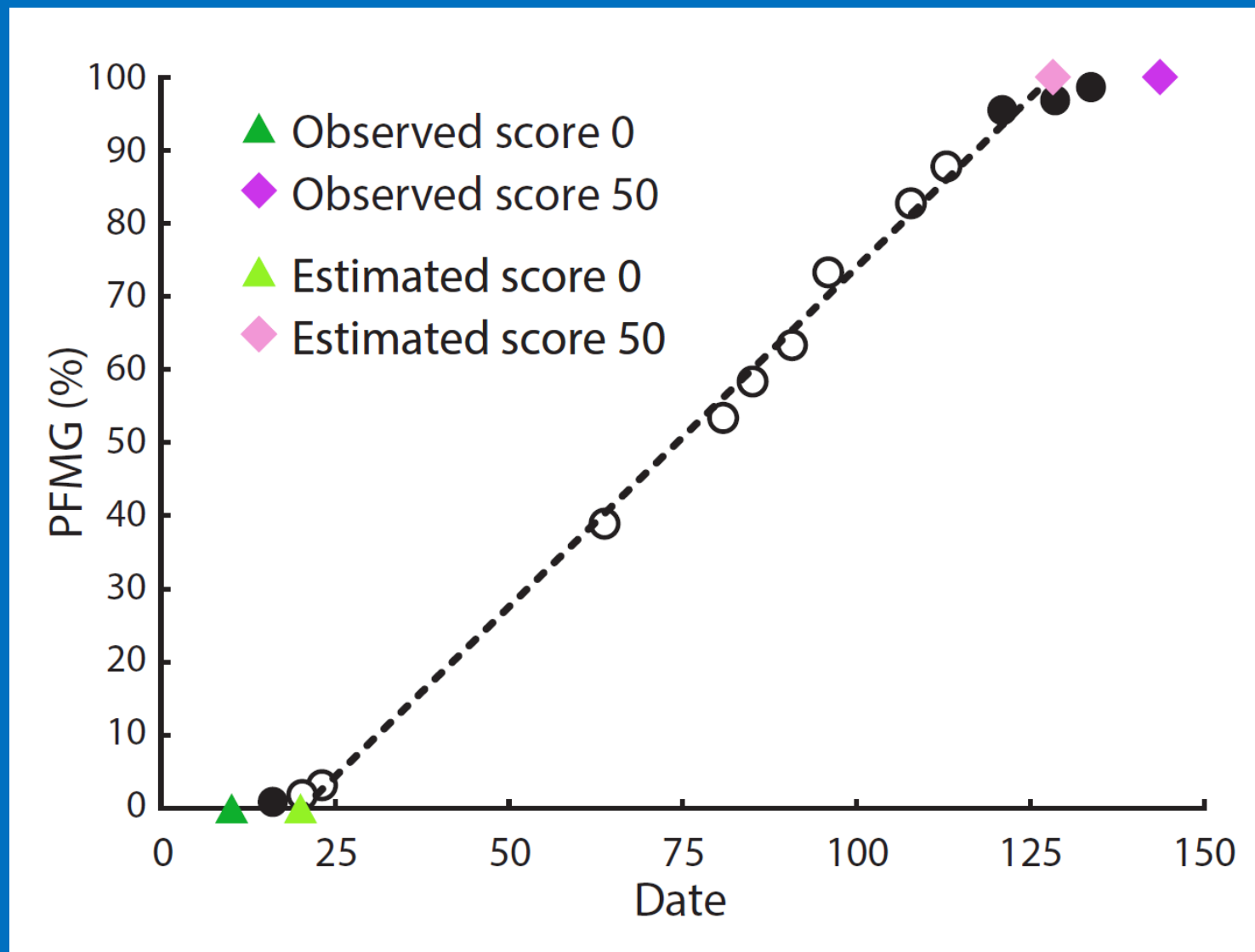
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PFMG linear increases scores 4-47
But slower before or after

Linear predicts 108 d duration
Demonstrable underestimate



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Including scores 1 & 49

Plus observations at score 0 & 50

So: duration between 118 & 134 d

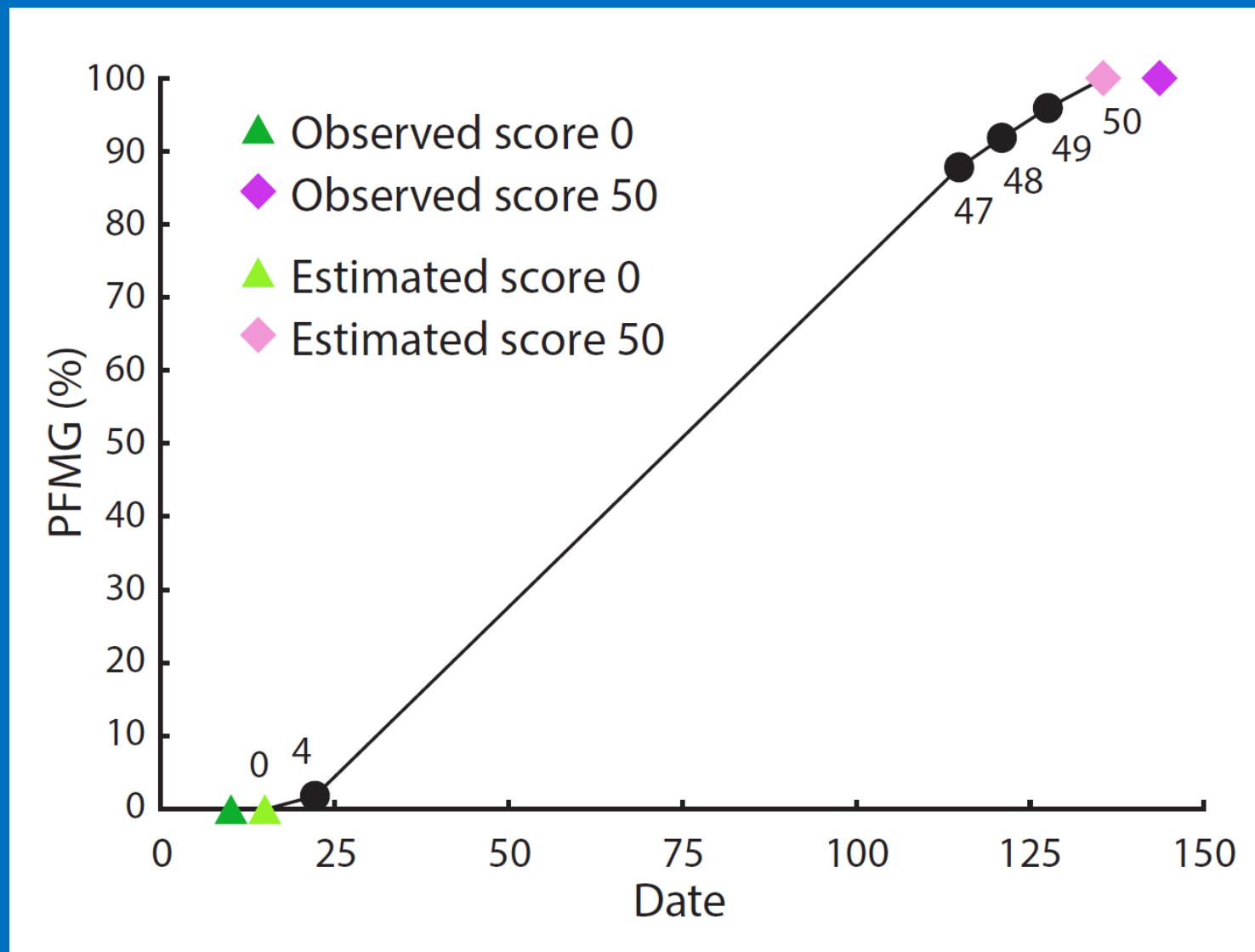
PFMG linear increases scores 4-47
But slower before or after

Linear predicts 108 d duration

Modified projection 0-4 & 47-50

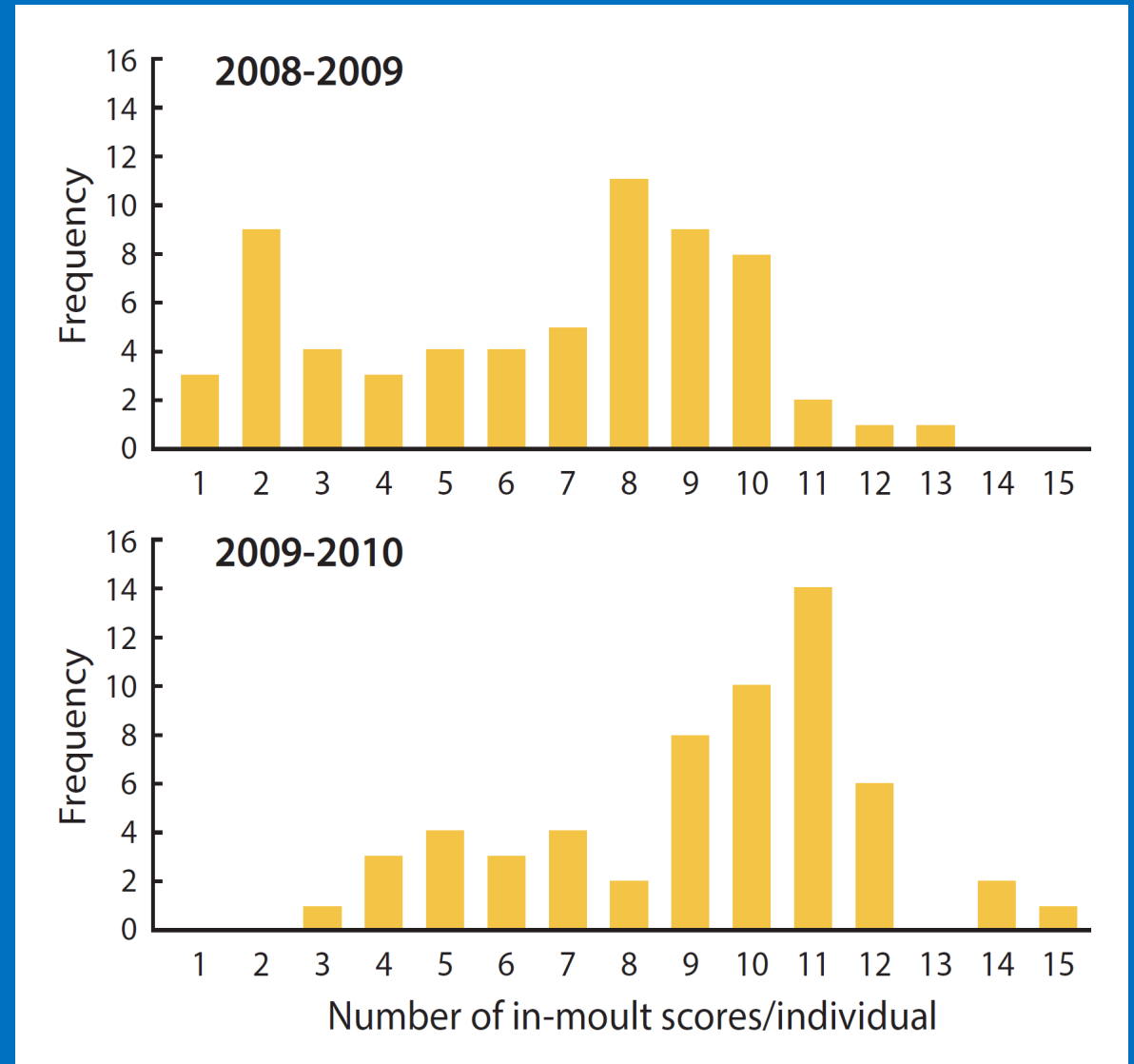
Estimated duration: 121 d

Moult rate 4-47: 0.945 PFMG/d



2008-2009 = 64 individuals
2009-2010 = 58 individuals
1-15 in-moult scores per individual

40 individuals good data both years
16 males, 24 females
Compare initiation, duration, moult rate



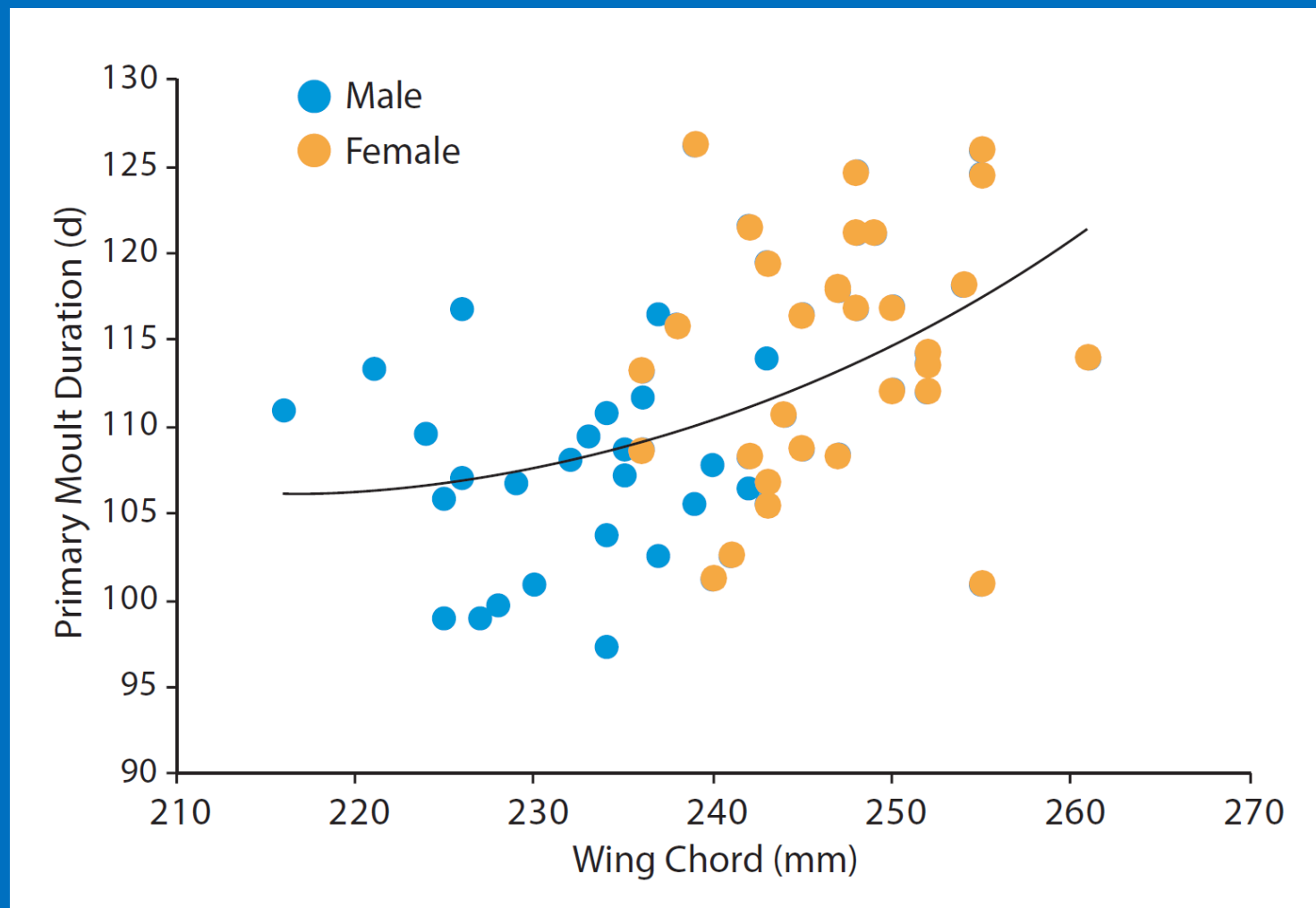
Moult initiated 3-29 d after arrival

Duration 96-128 d

Males: mean 107.4 d

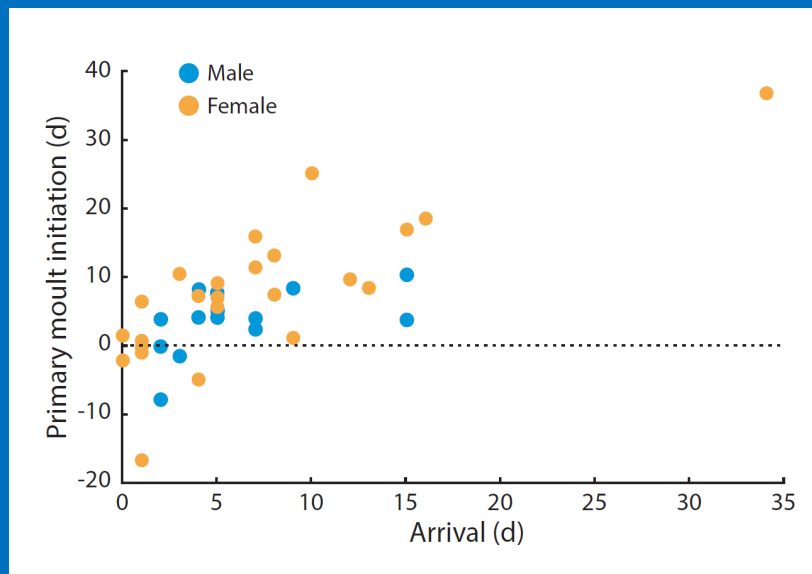
Females: mean 114.7 d

Positively related to wing chord



Within-individual comparison

1 d later arrival =
1 d later moult initiation

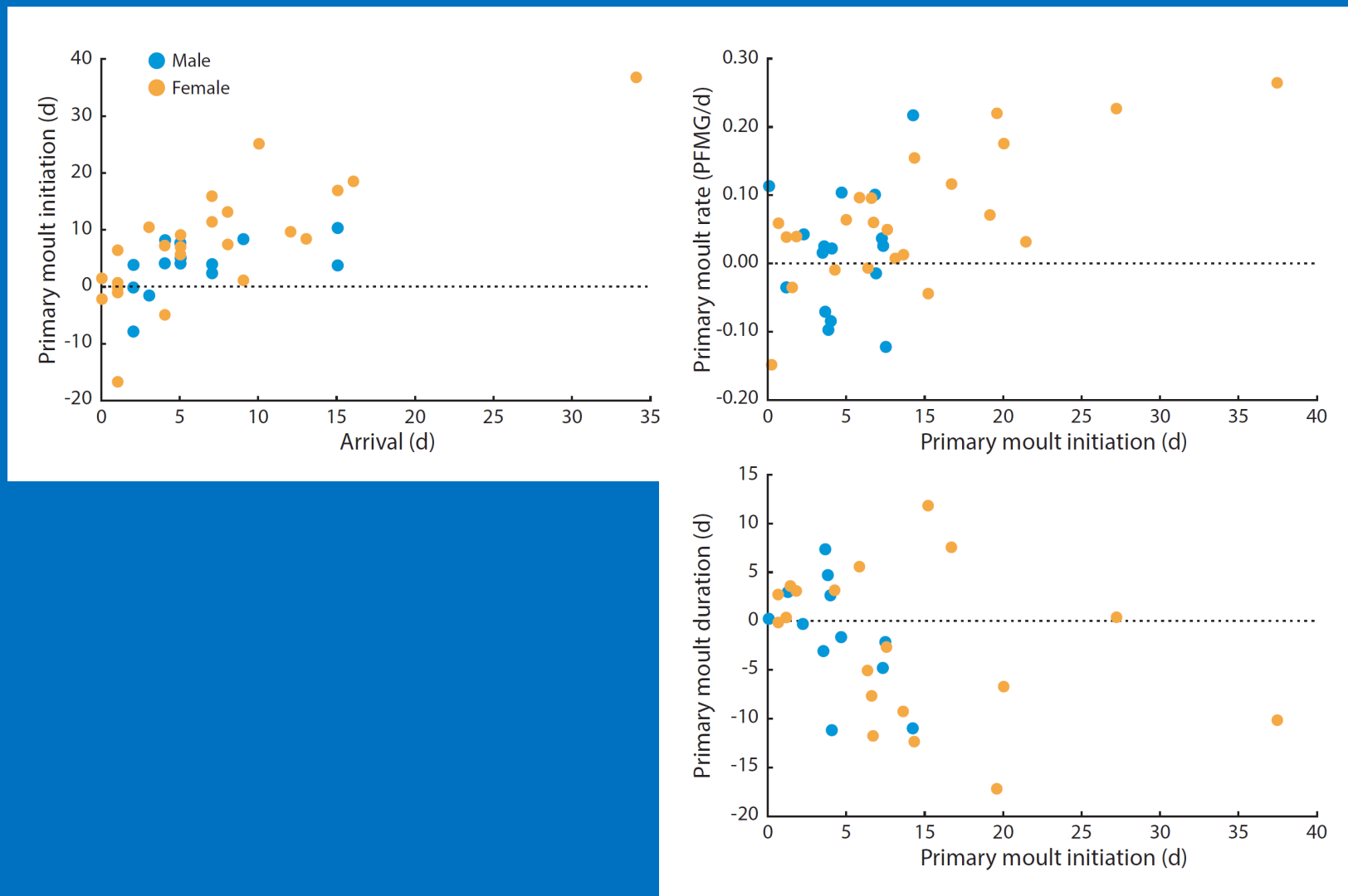


Within-individual comparison

1 d later arrival =
1 d later moult initiation

Later moult initiation =
faster moult rate
shorter moult duration

Incomplete compensation
1 d later start =
0.32 d shorter duration

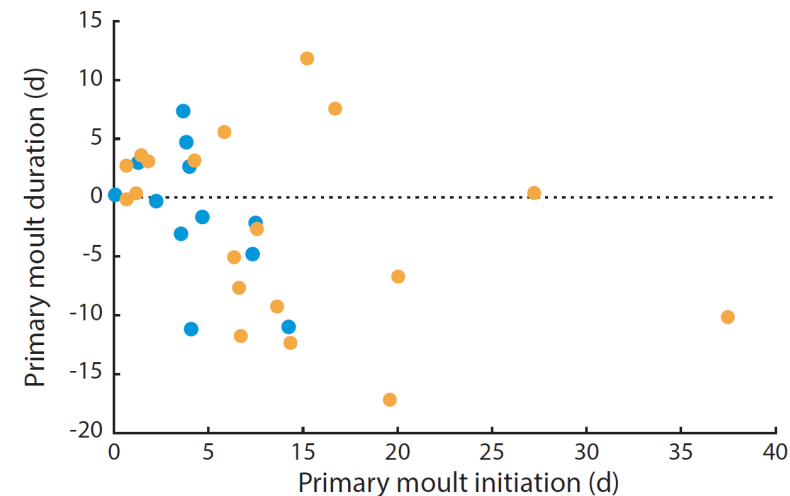
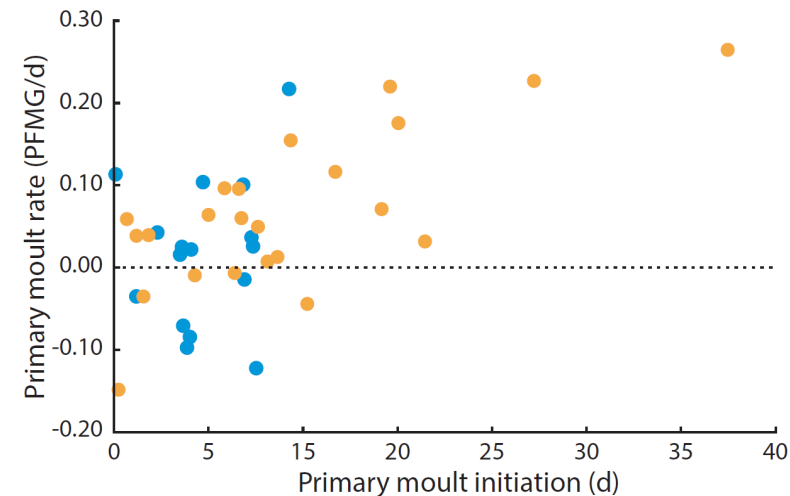
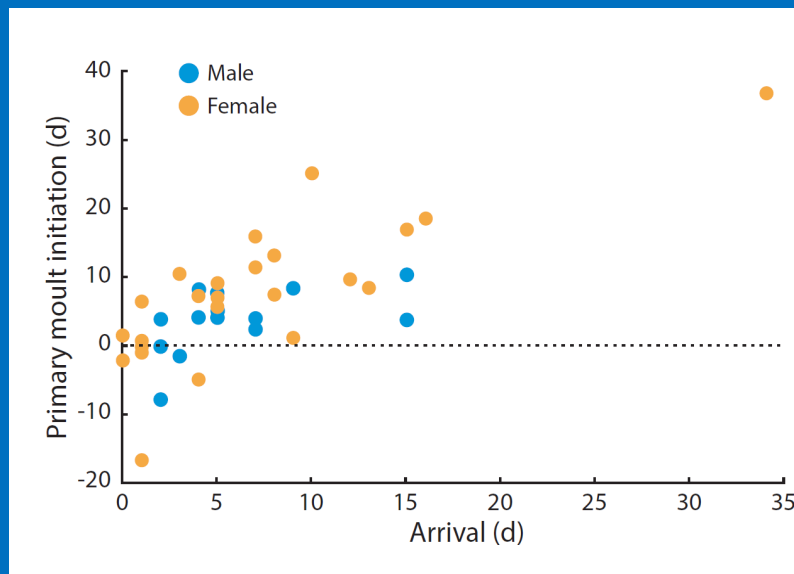


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Limited flexibility?

Limited benefit?

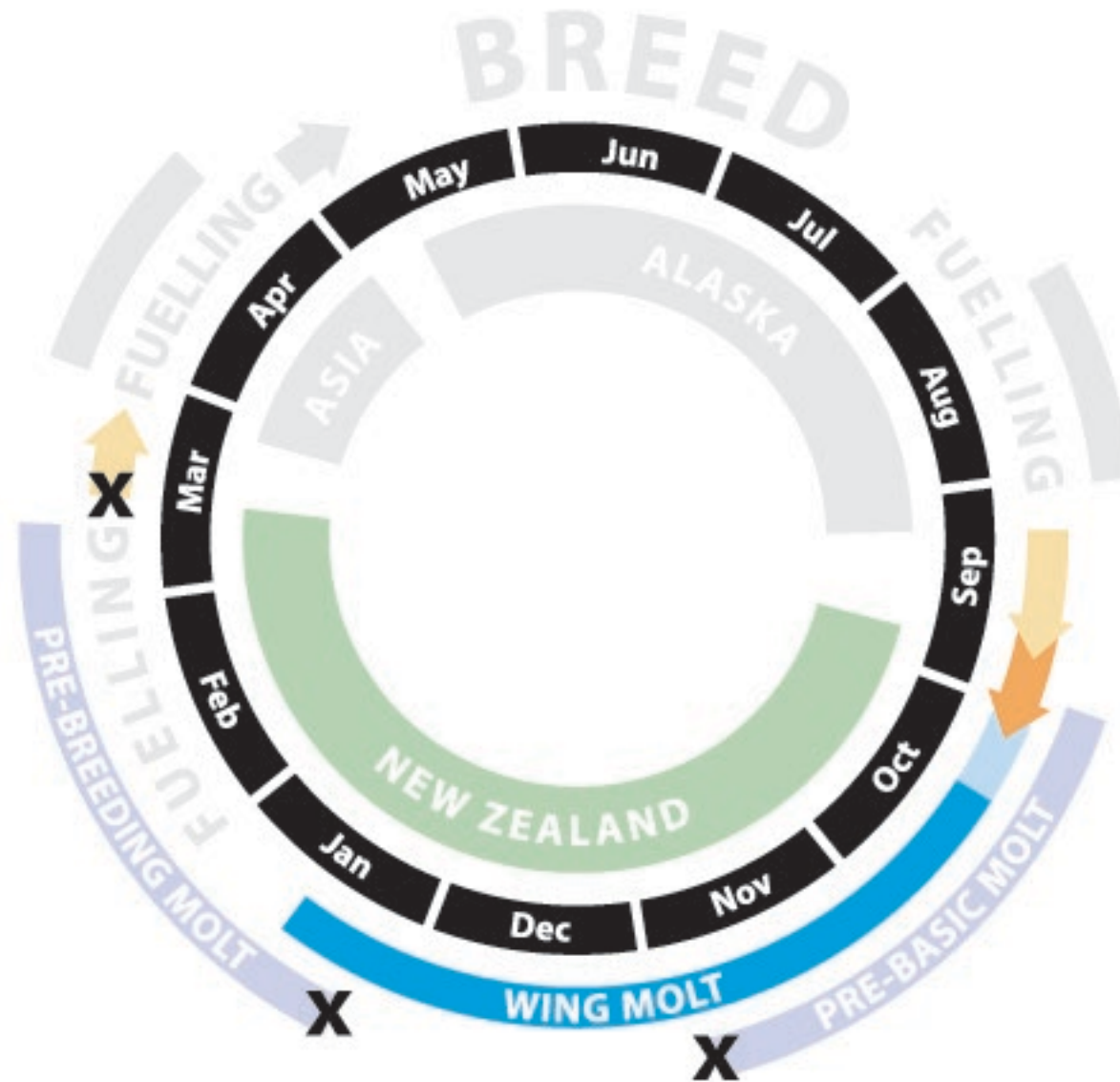
Condition-dependent?

Summary

Later arrival in New Zealand led to later and faster wing moult

But no effects on:
timing of body moult
plumage at departure
timing of departure
likelihood of return

So: no apparent carry-over effects of southward migration on subsequent northward migration



Thanks!



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Captures

David Melville
Ralph Powlesland
Adrian Riegen
Rob Schuckard
Graham Taylor

Historic capture data

New Zealand Wader Study Group

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