

Scotland's Rural College

## Nest site variables and breeding progress of *Phalacrocorax aristolelis*

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Daniel Plunkett

Nest site variables and  
breeding progress of  
*Phalacrocorax aristoleleis*  
on the Isle of Lunga

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MSc Countryside Management



# Distribution

- World Population = 230,000-240,000
  - (Wetland International, 2015)
- British Isles Population = 34.1% of Global population
- Treshnish Population = 2.1% of British Isles Population
  - (Mitchell, et al., 2004)
- Rather sedentary:
  - Adults usually not moving more than 100km
- Three subspecies recognised within its range:
  - *P. a. aristotelis*
  - *P. a. desmarestii*
  - *P. a. riggenbachi*



# Niche

- Diving bird
- Opportunistic feeder, apart from breeding season
- Feathers especially adapted, plumage is “Wettable”



# Aim

- To determine the impact of nest exposure on the breeding progress (measured by the stage of development of brood at time of surveying) of *P. aristotelis*.
- determine if there are any relationships between any of the variables measured, chiefly between the nest site variables (i.e. exposure, altitude above sea level and aspect of main entrance) and the biological brood variables (i.e. brood size, stage of development & average weight), but also between brood variables themselves.

Exposure Level 2



○ Nest site exposure

● Lateral cover

● Overhead cover

● (adapted from Velando and Freire, 2003)

Exposure Level 3

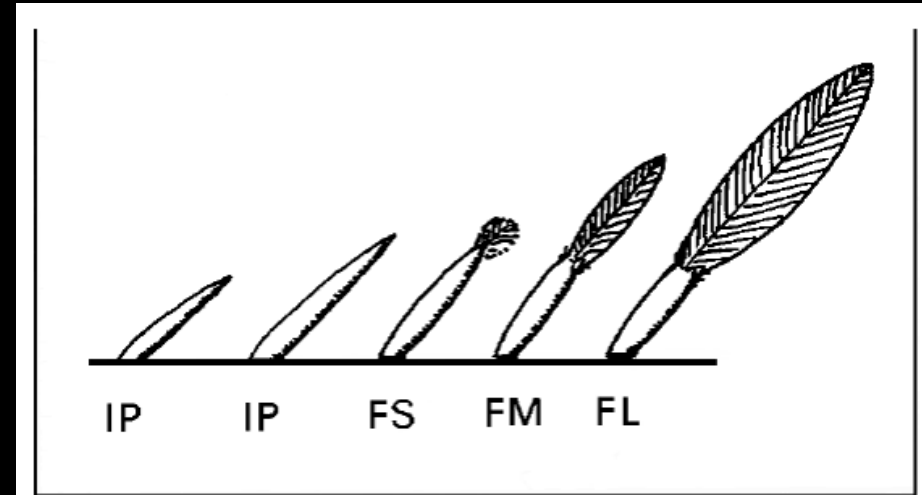


Exposure Level 4



# Methods

- Development Stage:
  - BTO Nest Record Scheme
- Weigh the chicks
  - Note brood size
- Altitude / GPS
- Data analysis:
  - Correlation coefficients
  - Kruskal-Wallis test



FS/FM/FL Primary feather growth stages.



# ● ● ● | Chicks and eggs

- Chicks per brood:
  - Most common: 3
  - Least: 1
- Eggs laid:
  - Most common: 3-4





# ● ● ● | Brood Variable Relations

- Stage of Development: Average Weight
  - Highly significant
- Brood Size / Average weight
  - No significant correlation
- Weight is very variable and not just about resources
  - A well-positioned brood may have twice the resources but three chicks
  - A poorly-positioned brood may only have one chick to feed, so a higher weight per chick
- Shags lay and incubate their eggs asynchronously
  - Age gap between chicks in same brood
  - Complicates weights and brood size



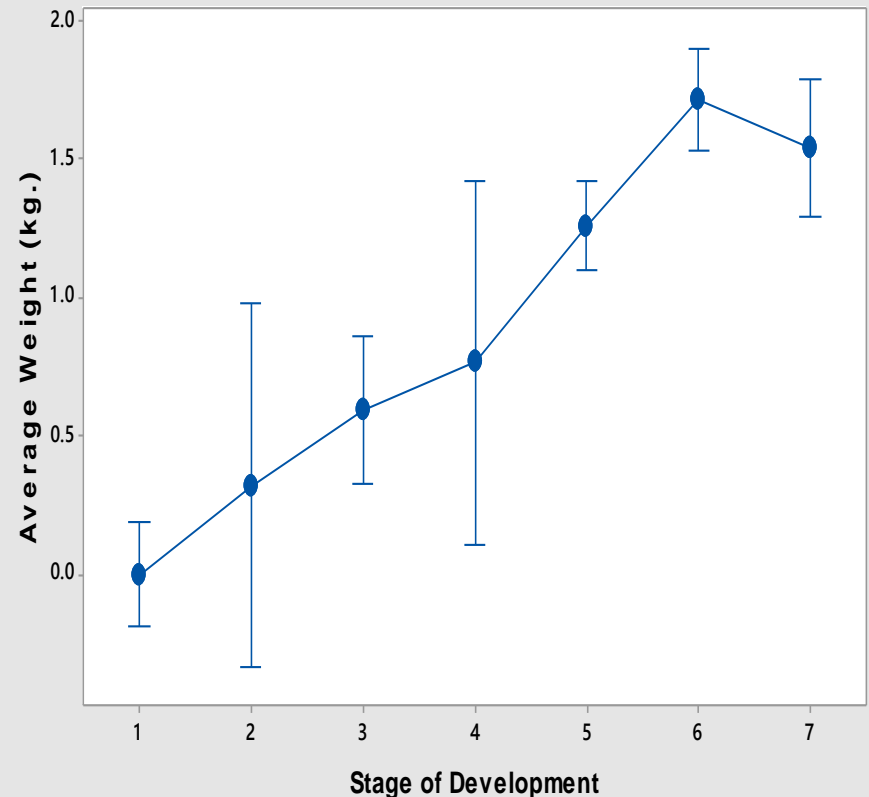
# Results: Brood Variable Relations

Relationship	R-value	P-value
Stage of Development: Average Weight	0.880	<u>0.000</u>
Stage of Development: Brood Size	-0.193	0.193
Brood Size: Average Weight	0.082	0.546

highly significant ( $P < 0.01$ ) result:  
average weight correlates with  
stage of development

# Results: Brood Variable Relations

- As chicks **develop**
  - **Average weight rises** until the Feathers Medium (6) stage.
  - Then average weight **falls**



The pooled standard deviation was used to calculate the intervals.

95% CI for the Mean

# Nest Exposure's Relationship with Breeding Progress

## Relationship

Exposure: Stage of Development

Exposure: Average Weight

Exposure: Brood Size

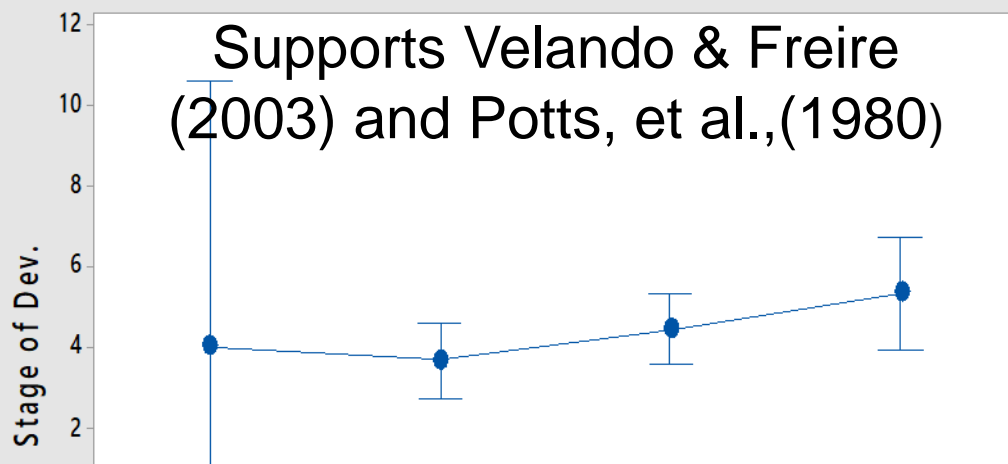
## Altitude

- No significant correlation

Relationship

Exposure: Stage of Development

(adjusted for ties)



Relationship	H	DF	P-value
Exposure: Stage of Development	6.45	3	0.092
(adjusted for ties)	6.79	3	0.079

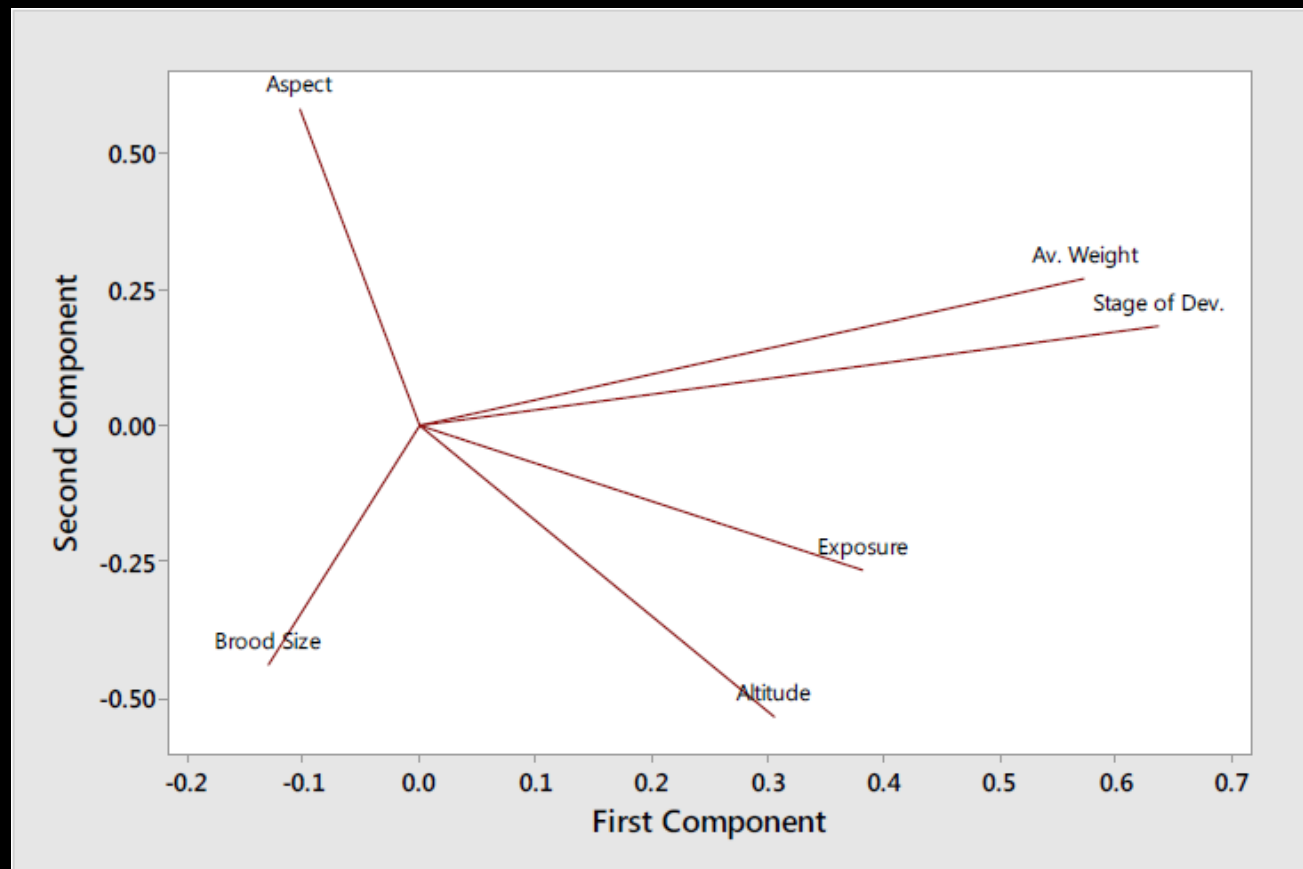
Kruskal-Wallis: no significant difference on the stage of development at different exposure levels



# Principal Component Analysis

- Average weight and stage of development are closely related (Group 1)
  - Directly linked to age
- No strong relationship with any other variable

# Principal Component Analysis





# Conclusions

- Highly significant correlation between the stage of development and the average weight of the brood, with a strong positive linear relationship
- No significant relationship between brood size and average weight
- No linear relationship with nest exposure and fledging success
  - Best sites equate to more success in hatching
  - More exposure likely to increase predation