Monitoring work 1998-2019

- Assess number of breeding pairs by surveying all areas at 1-2 week intervals during April to July
- Attempt to find as many nests as possible, and monitor their contents at weekly intervals
- Individually colour ring all chicks, plus as many adults as possible
- Attempt to re-sight all returning birds in subsequent years

Monitoring in 2019

- 2019 was our 21st year of full monitoring during 1998-2019
- In 2017 we monitored only 1st breeding attempts and metal rings only were fitted
- Anthony was employed from April to July 2019 to help us trap GPS-tagged adults from 2018, and to fit more tags to breeding adults

Population has declined by 26% during 1998-2019
Are there any trends in breeding parameters?

- No significant linear temporal trends in early (4.0) or late (3.9) clutch size
- No trends in early (3.6) or late (3.6) fledged brood size in successful nests
- No trends in early (0.71) or late (0.65) nest survival rates
- No trends in mean laying dates, although they may be getting later

Mean (± S.E.) early clutch size 1998-2019

![Graph showing mean early clutch size from 1997 to 2019](image)

F = 1.26, p = 0.28
Mean (± S.E.) early fledged brood size 1998-2019

![Graph showing mean early fledged brood size with F = 0.33, p = 0.57.](image)

Mean nest survival rates 1998-2019

![Graph showing mean nest survival rates early and late with F (early) = 0.88, p = 0.36 and F (late) = 1.80, p = 0.20.](image)
Mean (± S.E.) early nest laying dates 1998-2019

![Graph showing early nest laying dates from 1998 to 2019 with a trend line. The p-value is 0.10.]

Could later laying dates be a problem?

- Around 60% of ouzels make 2 breeding attempts per year
- If their early nests are getting later, they may have less time to have a 2\textsuperscript{nd} attempt
- Relatively few colour-ringed females marked at early nests
- Thus, used the ratio of late:early territories occupied as a surrogate measure of double brooding ($r = 0.58$)
Are rates of double brooding declining?

- So, the proportion of pairs double brooding may be declining
- Does this influence overall reproductive success (ORS)?
- ORS = (early NSR * early Fledged Brood Size) + (late NSR * late Fledged Brood Size * DB rate)
Are there any trends in return rates?

- No linear trend in adult male (46%) or female (37%) return rate
- No linear trend in early (6.8%) or late (3.1%) brood return rates
Adult return rate by sex 2000-2019

F (male) = 0.01, p = 0.92  
F (female) = 1.95, p = 0.18

1st year return rate

F (early) = 3.59, p = 0.08  
F (late) = 0.97, p = 0.34
Can we explain change in breeding numbers?

- Examined annual change in breeding numbers in relation to:
  - Overall Reproductive Success (ORS) in the previous year
  - Adult return rates
  - 1st year return rates

ORS predicts population change reasonably well

\[
\text{adj } R^2 = 0.26, \ p = 0.02
\]
Adult return rate does not predict population change

1st year return rate predicts population change most accurately
Conclusions

- Some evidence that laying dates are getting later
- As a result, double brooding may be becoming less common
- However, ORS has shown no decline through time
- ORS in the previous year explains annual population change with reasonable accuracy
- However, 1st year return rate explains annual population change most accurately