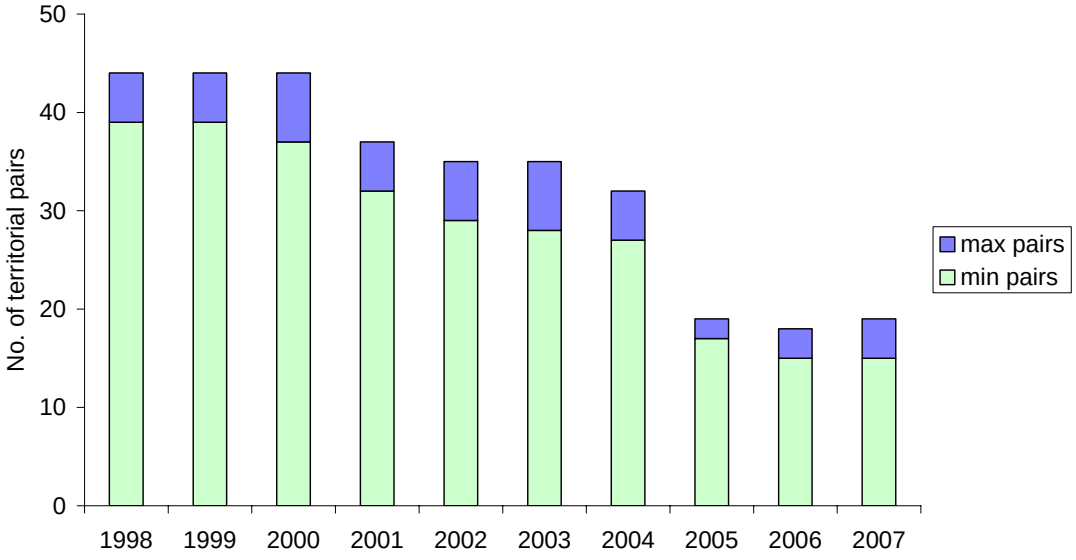
Understanding Ring Ouzel declines

Innes Sim, Graham Rebecca & Sonja Ludwig

Number of territorial pairs in the core study area



Have we caused the decline?

- Re-surveyed part of Glen Callater, where no adult catching & only occasional ringing
- No. of territorial pairs fell from 6 (1998) to 1 (2007)
- 62% decline in Clunie, but 83% decline in Callater
- No evidence that intensive study has caused the decline in Glen Clunie

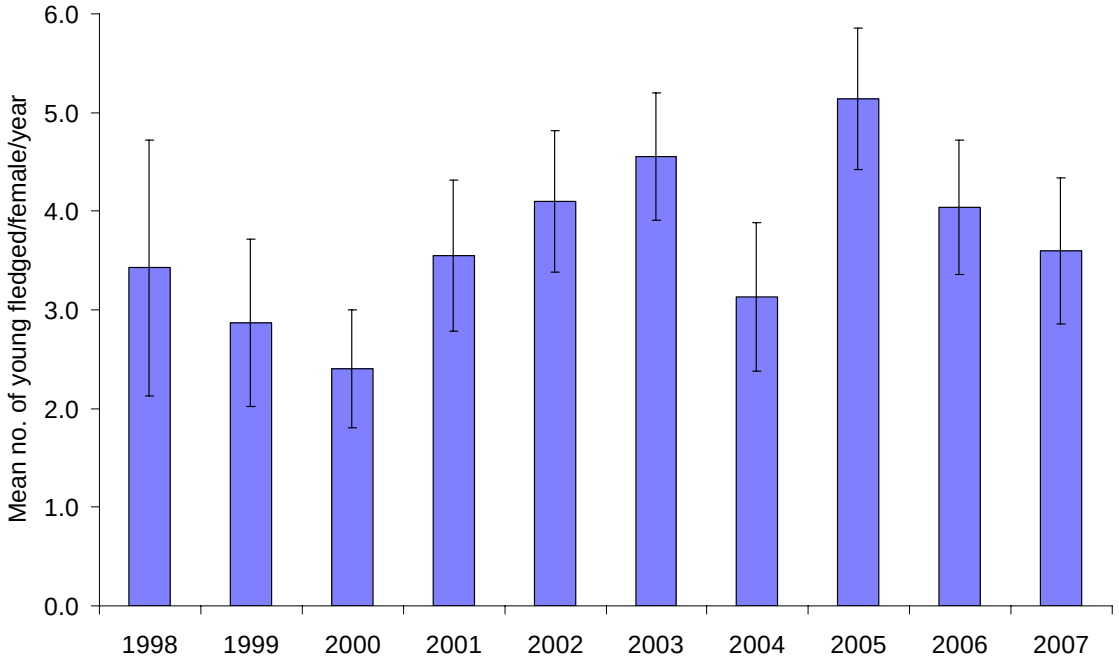
What's driving the decline?

- Reduced productivity?
- Reduced survival?
- Combination of both?

Are there temporal trends in productivity measures?

- No trend in mean laying date for early or late nests, or re-nest interval
- No trend in mean clutch or brood size
- No trend in rate of double-brooding (ratio of late:early occupied terrs.)
- But nest survival at the egg stage (and overall) has increased as the popn. has declined

Overall productivity has not declined



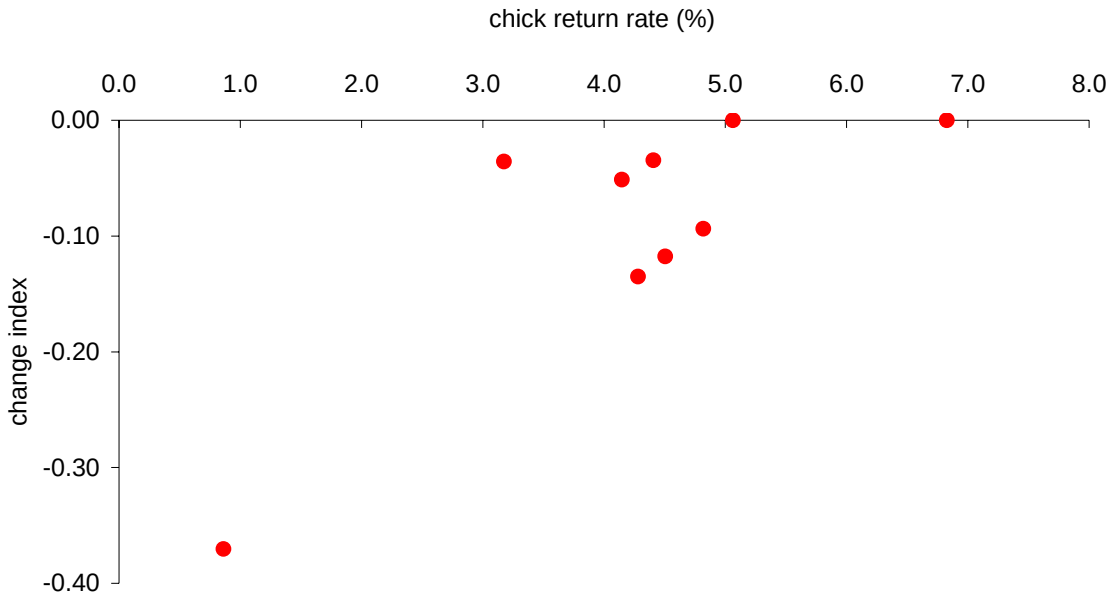
Are there temporal trends in survival/return rates or Body Condition Indices?

- No temporal trend in chick return rates
- No temporal trend in adult survival, but males have higher survival (or fidelity) than females
- Chick BCI = log (weight)/wing length during linear growth phase (6-11 days old)
- Adult BCI = weight/wing
- No temporal trend in either BCI

What's driving the decline?

- Tested for possible effects of productivity and chick & adult BCI in previous year, and chick & adult return rates in current year, on annual change index
- Only one variable selected - chick return rates...

Annual decline more likely when chick return rate is low



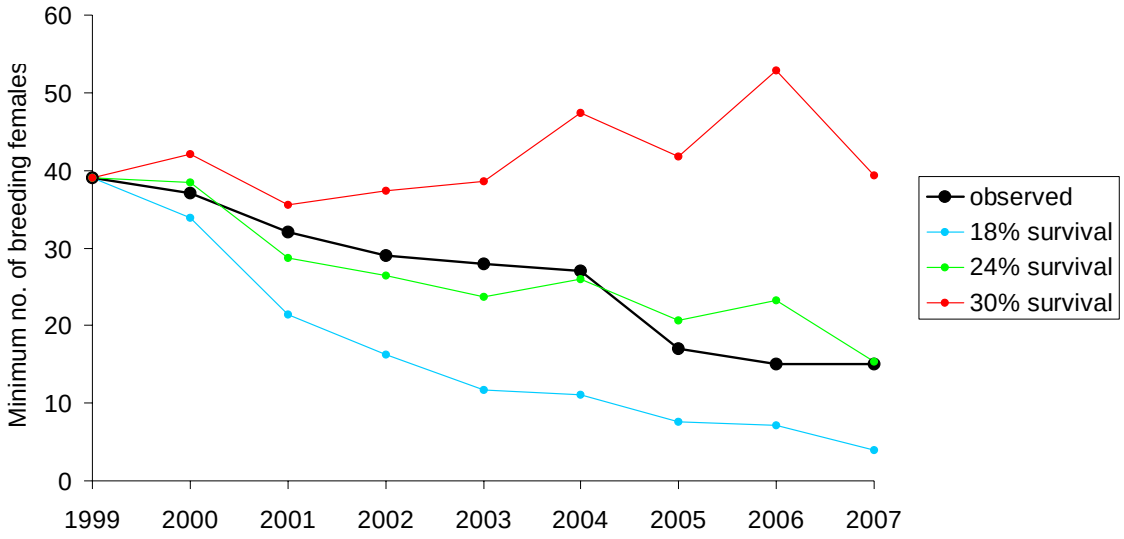
Summary of demographics

- Productivity is influenced mainly by nest survival rates, not brood size or no. of breeding attempts
- Productivity is density-dependent & predation, not starvation, is main cause of nest failures (most occur at the egg stage)
- Popn. declining despite no decrease in productivity in recent years - suggests that reduced survival is driving the decline
- No change in adult survival but some evidence that popn. trend is driven by chick return rates

Population models

- Based on female survival parameters
- Mean adult annual survival 2000-2007 = 36%
- Post-fledging (4 weeks) survival (mean of early & late broods in 2007) = 56%
- Mean annual productivity 2000-2007 = 4.25 young/female
- Figures used to model various scenarios...

Comparison of observed and predicted population trends by varying 1st year survival



How do these figures compare with other species?

Post-fledging (4 weeks) survival

	% survival	method
Ring Ouzel (Clunie)	56	radio tracking
Ovenbird (USA)	55	radio tracking
Wood Thrush (USA)	42	radio tracking
Song Thrush (UK)	64	ringing

Overall 1st year survival

	% survival
Ring Ouzel (Clunie)	24 (estimate for obs. decline)
Song Thrush (UK)	26 (ringing, decline)
Ring Ouzel (Clunie)	30 (estimate for stability)
Song Thrush (UK)	31 (ringing, stability)

Adult survival

	% survival
Ring Ouzel (females)	36 (observed decline)
Song Thrush (both sexes)	57 (ringing, decline)
Ring Ouzel (females)	48 (stability)
Song Thrush (both sexes)	57 (ringing, stability)
Swainson's Thrush (both sexes)	56 (capture-recapture)

Productivity (no. young fledged/female/year)

Ring Ouzel	4.2 (observed decline)
Song Thrush	3.7 (decline)
Ring Ouzel	5.2 (stability)

Summary of popn models

- RZ post-fledging survival appears 'normal'
- RZ 1st year survival estimate similar to ST during ST decline
- Increase in RZ 1st year survival required to stabilise the popn is similar to that observed for ST
- So, problem is likely to be survival of birds outwith the breeding season
- Currently investigating the hypothesis that warm (dry) late summer periods may reduce survival

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Radio-tracking

- Hill-type harness, used successfully on Blackbird and Song Thrush
- 5 tags shed due to weak link breaking after 11-66 days
- Range generally 2-4km, but up to 10km with line of sight from high vantage point on the ground
- Range 8km using Yagis inside light aircraft
- Some recovered tags still working after 5 months

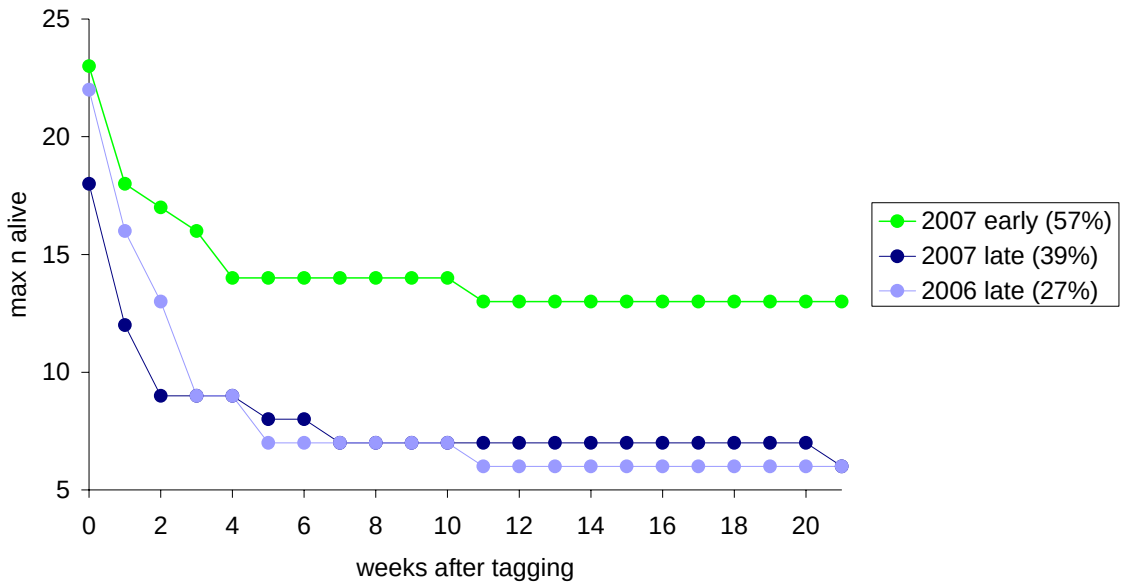
Radio-tracking fledglings

- 2006 - 22 (11 broods) late nest chicks tagged
- 2007 - 23 (14 broods) early nest & 18 (9 broods) late nest chicks tagged
- No apparent negative effects
- Recovered birds showed no signs of damage to patagium
- Foraging behaviour/cause of death established

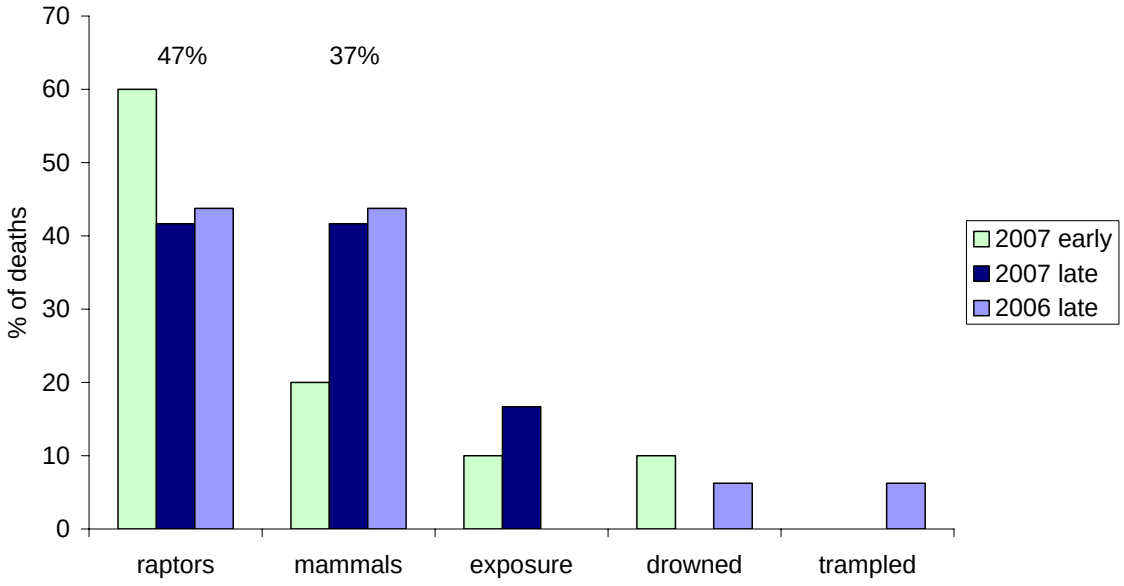
Measuring survival

- 10-fig GPS location every 2-3 days initially (i.e. birds actually seen)
- 2 tags proved to have stopped working
- Usually possible to establish cause of death

Maximum survival of radio-tagged chicks



Cause of death of 38 radio-tagged chicks



Why do 2nd broods have lower survival?

- Higher predation rate?
- Poorer body condition – no evidence
- Lower food supply – no evidence
- Lower parental care effort?

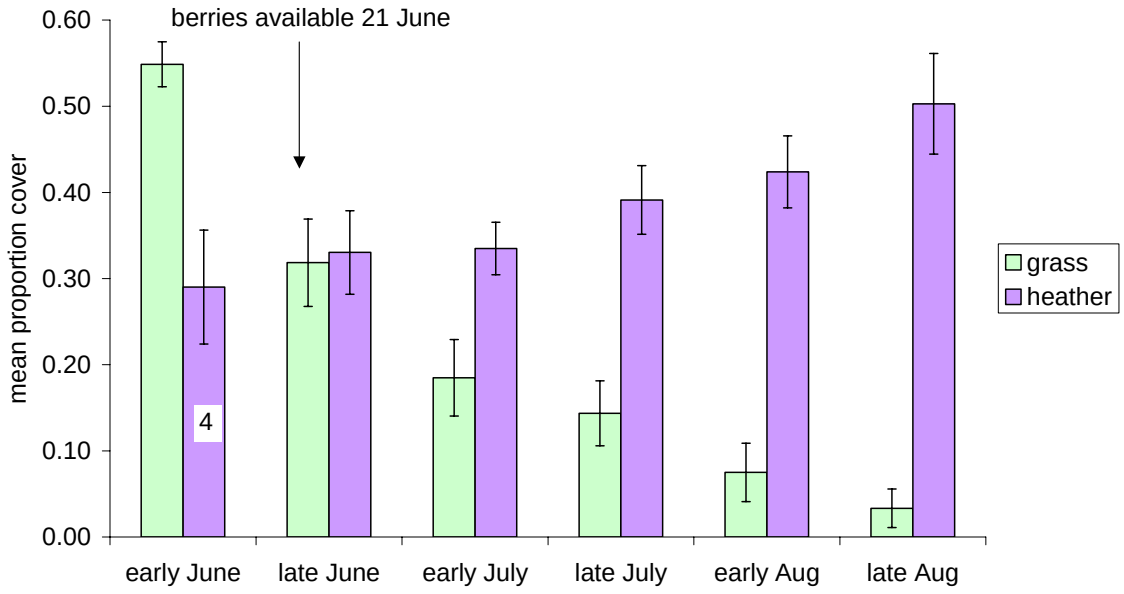
Measuring dispersal

- Birds with which contact lost were assumed to be alive but have dispersed out of study area
- Birds dispersing out of study area not searched for until late July/August
- Dispersers found in Glens Ey, Callater, Muick, Clova and on Cairngorm plateau
- Dispersal began 4 weeks after fledging

Habitat selection & foraging 2007

- 15 grass/grass-heather & 15 berry (heather-dominated, 480-770m altitude) reference plots randomly selected by placing 500m grid over satellite habitat map
- Foraging plots compared with either g/gh reference or berry reference plots, depending on foraging behaviour of birds
- Measured habitat composition, vegetation height & density, soil moisture content and invert. biomass (soil cores)
- Reference plots visited 6 times (every 2 weeks) from late May to mid-August

Seasonal trend in grass & heather cover on foraging plots in 2007



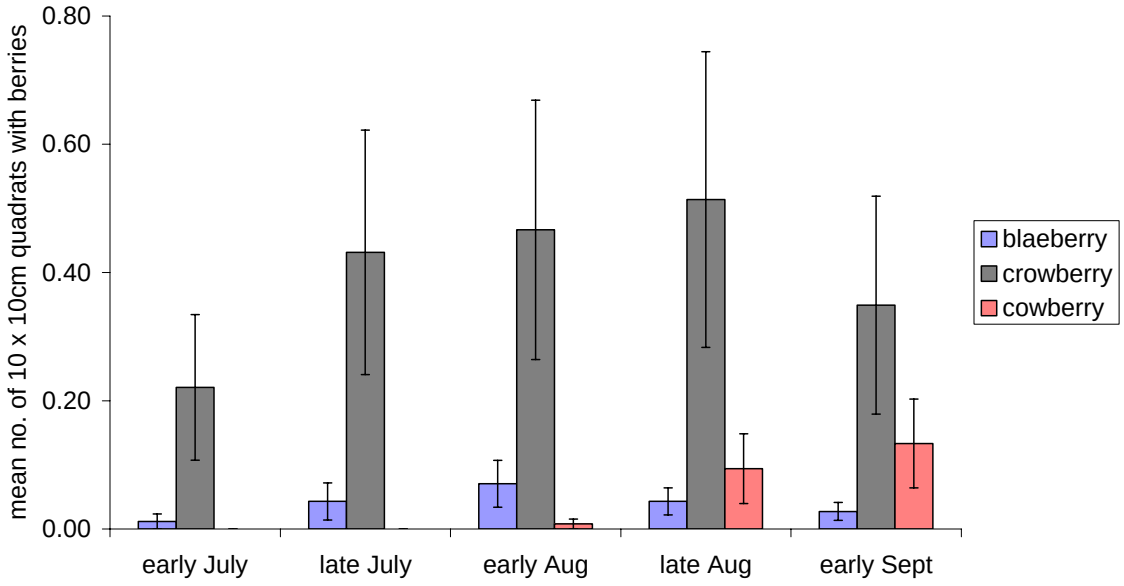
Grass foraging plot selection

- Logistic regression model - 27 foraging plots v 15 ref. plots
- 3 variables selected (invert. abundance, % grass cover, % heather cover)
- Selection for areas with high invert abundance, <40% grass cover & low heather cover

Berry plots

- Habitat composition, height and density measured at 40 points
- Presence/absence of blaeberry, crowberry & cowberry plants & unripe berries recorded in 17 50cm x 50cm quadrats
- Abundance of ripe berries scored in 25, 10cm x 10cm quadrats within each 50cm x 50cm quadrat
- For each plot, take the mean no. of 10cm x 10cm quadrats containing ripe berries
- Reference plots visited every 2 weeks from early July to mid September

Seasonal trend in ripe berry abundance on reference plots



Berry foraging plot selection

- Logistic regression model - 71 foraging plots v 15 ref. plots (using mean July-Aug variable values since 92% of foraging data from this period)
- 3 variables selected (abundance of berries of crowberry, blaeberry & cowberry)
- Selection for areas with high berry abundance, especially crowberry

Do berries alone provide all nutritional needs?

- Smith *et al* (2007) suggest that migrant songbirds in USA need both berries and insects to meet their dietary requirements
- May be that RZ don't switch completely from inverts. to berries
- Alex Foy (Hons. student) saw birds foraging for both in one part of the glen
- Need more faecal samples in July/Aug and/or more detailed foraging observations

Conclusions

- Survival of 1st broods 1.5 - 2.1 x higher than 2nd broods
- Predation in first 4 weeks after fledging main cause of death - no evidence that body condition at fledging is important
- Fledglings select invert.-rich, grass-heather patches for foraging until late June
- No seasonal trend in soil moisture or invert. abundance, but 2007 very wet!
- From late June, switch to berry-rich areas at higher altitudes (but may not be feeding exclusively on berries)

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