but notably, there is no clear association between egg size and female condition (Christians, 2002).

Egg Size variation paper

Intro:

* Scramble competition in a polyandrous breeding system:
  + Females face trade-offs between
    - Current metabolic demands (i.e., seasonal variation in food availability)
    - Time for multiple sequential breeding attempts (i.e., season length)
  + Egg size
    - A pure intrinsic measure of a female’s current investment
    - *Assumption*: A female should always lay the largest egg possible given her
      * structural size (constant over season and lifetime)
      * her current condition (variable over season and lifetime)

Rational:

Female scramble competition in a polyandrous breeding system:

The timing of breeding is dependent upon multiple traits Breeding phenology are often seasonally variable, with environmental conditions creating the space needed for breeding and the

Limited habitat available at start of season (quadratic seasonal trend: increase at start of seasons as winter flooding recedes, but decreases at end of season when flooding moves in. Competition among males to secure early territories, and competition among females to aquire early breeding attempts. These elements translate into variation in lay dates among females, which creates asynchrony in the breeding schedules of individuals in the population.

In Ceuta, the breeding season is long enough for sequential breeding attempts:

The "time-out" for a nesting male is ~2 months (i.e., a period that includes courtship, incubation, and brood care) versus ~1 to 2 months for a nesting female (i.e., a period that includes courtship and incubation, BUT variable amount of brood care). Thus, there is intra-female variation in "time-out", but constant intra-male variation in "time-out". Females tend to desert broods to pursue sequential mates after successful nesting attempts, but this varies depending on the amount of time left in the season: females desert if there is enough time for a second attempt, but stay if there is not enough time.

Relationship between lay date and polyandry:

Taken together, the seasonally dependent "time out" period of females and the scramble competition described above means that the liklihood of a female being polyandrous is dependent on the lay date of her first breeding attempt.

Trade-offs with laying early:

Assumption: if given the chance, all females should lay as early as possible in order to be polyandrous.

Assumption: females that lay early are making a trade-off between the quality of the current breeding attempt and the future prospect for multiple breeding attempts. The rational is that by laying early, the quality of the attempt will be poor (given the post-winter physiological state of the female, and current resource availability) but it will give her time to have a second attempt.

Measure of "quality of the current breeding attempt":

Egg volume - a pure intrinsic measure of a female's current investment.

Assumption: A female should always lay the largest egg possible given her 1) structural size, and 2) her current condition.

Assumption: egg size is positively associated with chick survival

Age-specific variation:

disposable soma theory suggests an age-dependent compromise between survival and reproduction. Reproductive performance should decline at older ages.

How does egg size vary with age? Expectiation: there is a peak age

of egg volume and it declines later in life.

Potential confounding effects:

- Does lay date of first nest vary wih age?

- Does liklihood of polyandry vary with age?

Figures:

1. Egg morphometric distributions and the “chick weight ~ egg volume trend”
2. Sample size distribution of ages and polyandry (i.e., same as in the original manuscript, but with the extra data added). For visual purposes I will show only females that have two or more years of observations (i.e., including the singletons will make the figure unwieldly).
3. Season dynamics: top panel is the “P(polyandry) ~ lay date trend”, middle panel is the mating behaviour distributions according to laydate, and the lower panel is the “egg volume ~ lay date trend”.
4. Age dynamics: top panel is the “egg volume ~ age trend”, bottom panel is the “lay date ~ age trend”
5. A four panel forest plot of the effect sizes for the four models:
   1. Chick weight ~ egg volume
   2. P(polyandry) ~ lay date
   3. Egg volume ~ lay date + age
   4. Lay date ~ age
6. Heat map showing spatiotemporal variation in first lay date across the study site (i.e., overlay a gradient colored surface over the satellite imagery showing how the nests start on the edge of the salina and move north west with the retreating waterline – this would show how space is limited at the start of the season and emphasize the female-female competition over resources).

Tables:

1. BaSTA model selection (same as what was presented in the original ms)