

8-2012

Age-specific breeding probabilities of Mountain Plovers in Montana

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Recommended Citation

Skrade, Paul D. B. and Dinsmore, Stephen J., "Age-specific breeding probabilities of Mountain Plovers in Montana" (2012). *Natural Resource Ecology and Management Conference Papers, Posters and Presentations*. 11.
http://lib.dr.iastate.edu/nrem_conf/11

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Age-specific breeding probabilities of Mountain Plovers in Montana

Abstract

The age of first reproduction is important in both life-history theory and conservation biology. It can have a large impact on individual fitness, which in turn influences population dynamics. Evolutionary theory predicts that organisms should reproduce as early as they are capable of doing so, although there are potential tradeoffs if breeding is costly.

The Mountain Plover (*Charadrius montanus*, Knopf and Wunder 2006) is a shorebird of conservation concern that nests in disturbed areas of the Great Plains and Great Basin. It is a moderate-sized bird (90-110 g) that is sexually monomorphic and drably-colored and usually has a three-egg clutch. Mountain Plovers have an uncommon parental care system where both male and females tend individual nests unaided. Males arrive at the breeding grounds in early to mid-April, establish loose territories, and compete for females. Mountain Plovers are capable of breeding at age one but not all do so, even with the potential increase in fitness. This may be a consequence of individuals delaying breeding to gain additional experience. Mountain Plovers have the opportunity for multiple reproductive attempts since they are fairly long-lived with several birds documented living > 10 years..

Disciplines

Natural Resources Management and Policy | Ornithology

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Introduction

The age of first reproduction is important in both life-history theory and conservation biology. It can have a large impact on individual fitness, which in turn influences population dynamics. Evolutionary theory predicts that organisms should reproduce as early as they are capable of doing so, although there are potential tradeoffs if breeding is costly.

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Methods

We monitored Mountain Plovers in an approximately 3000 km² area located in Phillips County in north-central Montana from mid-May until August during the 1995–2010 breeding seasons

- Hatch-year plovers were captured by hand, weighed, and individually marked with a unique four color leg band combination and USGS aluminum band for subsequent resighting, and feather or blood samples were collected for molecular sexing

We created an encounter history for each bird and designated whether it was breeding at age one (*F*), a later age (*B*), or not breeding (*N*)

- Birds were considered breeding if they were found on a nest or attending young
- Once birds were classified as *F* or *B* they were classified as *B* in subsequent years

We developed a set of three-state mark-resighting models in Program MARK to generate maximum-likelihood estimates of apparent survival (ϕ), encounter probability (p), and transition probability (ψ) of Mountain Plovers among breeding states

- Some breeding state transitions were biologically impossible and so their probabilities were fixed to zero
- For example, a 2+ breeder (*B*) could not revert back to an age one breeder (*F*)

We began with a reference model of annual survival using the factors that Dinsmore (2008) found important

- These included the effect of $\log_{10}(\text{mass})$ of the plover chick at capture on juvenile survival and the effect of drought (Palmer Modified Drought Index) on adult annual survival
- We assumed constant capture probability for all breeding states
- We examined the effects of sex and drought on the probability of breeding at age one (ψ^{NF}) or in subsequent years (ψ^{FB})

Literature Cited

Dinsmore, S. J. 2008. Influence of drought on the annual survival of the Mountain Plover in Montana. *Condor* 110:45–54.

Knopf, F. L. and M. B. Wunder. 2006. Mountain Plover (*Charadrius montanus*). In *The Birds of North America*, no. 211 (A. Poole and F. Gill, Eds.). Academy of Natural Sciences, Philadelphia, and American Ornithologists' Union, Washington, D.C.

Results

Of the 850 Mountain Plovers banded as chicks:

112 were found in the study area as adults with 38 individuals confirmed breeding at age one (33%)

Seventeen females of 40 resighted (43%) bred at age one

Thirteen males of 34 resighted (38%) bred at age one

The top model had a sex effect on ψ^{NF} with females more likely to breed at age one than males, but it was poorly estimated (CI for the β overlapping zero)

The probability of breeding at age one (0.28) was lower than the probability of remaining a non-breeder (0.65) but greater than the probability of first breeding at 2+ years of age (0.07)

Discussion

While reproducing at an earlier age can result in an increase in fitness and lifetime reproductive success, delaying recruitment can be favorable if the costs of reproducing early (such as reduced survival or limited future reproduction) outweigh the benefits. Mountain Plovers are able to breed at one year of age but according to our study most of them delay their first reproductive attempt. Our estimates of breeding probabilities are likely biased low, as we selected a conservative designation for breeding by only assigning birds to breeding states (*F* and *B*) if they were found tending to eggs or chicks.

In this system males and females both have a high degree of parental involvement and so it is not unsurprising that the sexes would exhibit similar behaviors related to breeding. However, if female plovers are able to distinguish first-year males it may be that the decision to reproduce is not up to the males. Similarly, further research must be conducted to determine if one year old females are producing eggs for males but not creating a nest of their own, which would allow them to increase their fitness and accumulate breeding experience without the costs of incubating eggs and tending to young.

