Egg volumes of male- and female-tended Mountain Plover clutches

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Abstract
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In this system the male sets up a territory and displays to attract a female. After mating she lays a three-egg clutch and leaves. He incubates the eggs and tends to the chicks by himself. The female has the opportunity to mate with other males but ultimately she lays another three-egg clutch and cares for those entirely by herself.

Disciplines
Natural Resources Management and Policy | Ornithology

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Egg volumes of male- and female-tended Mountain Plover clutches

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Introduction

Mountain Plover (Charadrius montanus)

The Mountain Plover is a shorebird of conservation concern that breeds in disturbed areas of the Great Plains and Great Basin (Knopf and Wunder 2006). It has an uncommon mating system known as a “Rapid multi-clutch” where male and female plovers tend to separate nests. In this system the male sets up a territory and displays to attract a female. After mating she lays a three-egg clutch and leaves. He incubates the eggs and tends to the chicks by himself. The female has the opportunity to mate with other males but ultimately she lays another three-egg clutch and cares for those entirely by herself.

Maternal investment

With the pattern described above, most Mountain Plovers would have a clutch size of six eggs. This happens over a relatively short time period (~8 days) and so there is a potential for physical strain on female as Mountain Plovers lay relatively large eggs in relation to their body size. These physical demands could potentially cause differences in egg size through time.

Egg size and chick survival

None have looked at differences in male- versus female-tended clutches

• Female-tended broods had higher survival than male-tended

• Dinsmore and Knopf (2005)

Objectives

Three primary study objectives:
1) Quantify the size of Mountain Plover eggs and chicks
2) Model egg volume in relation to sex of the tending adult, date, and year
3) Examine relationships between egg volume, laying order, and the size of the resulting chicks

Methods

Data collection

Nest searched in Phillips County, Montana summers 2006 – 2010

Measured to the nearest 0.01 mm maximum length and width of all eggs

Captured and individually marked the nest-tending adult

Determined age of the nest and the onset of incubation using egg floatation

Molecular techniques to determine the sex of the adult from feather samples

Marked eggs found during laying stage to determine laying order

Captured and weighed chicks within 24 hours of hatch

Data preparation

Set the overall earliest calendar day of nest initiation as Day 1 of season

Egg volume from equation previously used for Semipalmated Plovers

Nol et al. (1997): (0.4402 x Egg Length x Egg Width^2) – 0.269

1000

Statistical analysis

MIXED procedure in SAS

• Individual birds as a random effect

• Fixed effects of sex of the tending adult, date of nest initiation, interactions of sex x initiation, and year

• Effects were examined using F tests (n = 0.05)

Linear regression of mean chick mass (g) in relation to mean clutch volume (cm^3)

Results

We found 407 nests during five field seasons:

194 female-tended nests of 131 individuals

• Mean egg volume = 13.17 cm^3 (n = 567, SE = 0.04)

213 male-tended nests of 148 individuals

• Mean egg volume = 12.20 cm^3 (n = 620, SE = 0.03)

Egg volume differed by:

Sex of tending adult (F_1,786 = 5.53, P = 0.02)

Day of nest initiation

• Linear F_1,780 = 6.93, P = 0.01

• Quadratic F_1,758 = 7.29, P = 0.01

Interaction of sex x initiation* (Fig. 1, F_1,780 = 6.45, P = 0.01)

Egg volume did not differ:

Across years (F_4,113 = 1.24, P = 0.30)

Within clutches (Fig. 2)

Larger eggs produced larger chicks (Fig. 3)

Discussion

Potentially multiple female strategies

0-1 males = large early eggs

Many males = smaller early eggs

Within-clutch variability

Field observations indicated high degree

No significant differences in egg volume

Other shorebird studies found slight negative effects of laying order

Lislevand et al. (2005)

Others have found no differences in egg size variability

• Nol et al. (1997)

Further work:

Within-female differences

• Unknown mothers of male-tended clutches

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Literature Cited


Please email questions to skradaepa@iastate.edu!