North American Bird Bander

Volume 31 | Issue 4 Article 1

2006

Vent Size as an Indicator of Sex in Nesting Killdeer

Bette J. S. Jackson

Jerome A. Jackson

Vent Size as an Indicator of Sex in Nesting Killdeer

Bette J. S. Jackson
Department of Biological Sciences
Florida Gulf Coast University
10501 FGCU Blvd. South
Ft. Myers, FL 33965

Jerome A. Jackson
Dept. of Marine and Ecological Sciences
Florida Gulf Coast University
10501 FGCU Blvd. South
Ft. Myers, FL 33965

ABSTRACT

Killdeer (*Charadrius vociferus*) appear sexually monomorphic and thus it has been difficult to study sex-related differences in foraging or care of eggs and young. Using dummy eggs substituted for the real clutch (to prevent damage), the birds can be trapped at the nest. During incubation and for a brief time after hatching, measurement of the size of the vent opening can be used to identify reliably the sex of individual birds. The female's vent is larger as a result of stretching during egg-laying.

INTRODUCTION

Killdeer (*Charadrius vociferus*) appear sexually monomorphic and thus it has been difficult to study sex-related differences in foraging or care of eggs and young. Although we found no significant differences between the sexes of adults in standard wing, tail, and bill measurements, we have found that during the nesting cycle usually we can identify the sexes by measuring the width of the relaxed, but closed, opening of the vent. Cloacal characteristics have also been used to sex columbids (Miller and Wagner 1955, Swanson and Rappole 1992), penguins (Richdale 1957), petrels (Serventy 1956), Fork-tailed Storm-Petrels (*Oceanodroma furcata*), American Coots (*Fulica americana*), and Magellanic Penguins (*Spheniscus magellanicus*; Boersma and Davies 1987) among others. Boersma and Davies (1987) used a technique similar to ours.

METHODS AND STUDY AREA

Our Killdeer work was done in Oktibbeha Co, MS, between 1976 and 1997. Description of habitats and other details concerning this population are presented in Schardien (1981). The cloaca photos shown in Fig. 1 are of a nesting pair captured on Sanibel Island, FL.

Fig. 1. Cloaca of members of a pair of Killdeer captured on Sanibel Island, FL, about four days after initiation of incubation, showing the distinctively larger cloacal opening of the female (left).

For individuals considered here, the sex of color-marked birds was later confirmed by observation of copulation. We compared vent measurement data for males and females using a t-test for data with separate variance estimates.

RESULTS

Forty-nine male and 53 female Killdeer were captured, color-banded, measured including vent width, and ultimately identified as to sex by observation of copulation. These include 28 pairs in which both pair members were color-banded. General appearance of the vent region in both males and females was similar except that it appeared more flaccid in females. The region appeared swollen in both sexes. With both members of a pair in hand, the difference in vent width was often readily evident without measurement (Fig. 1). Such comparisons were made after measurements had been taken and immediately before releasing the birds.

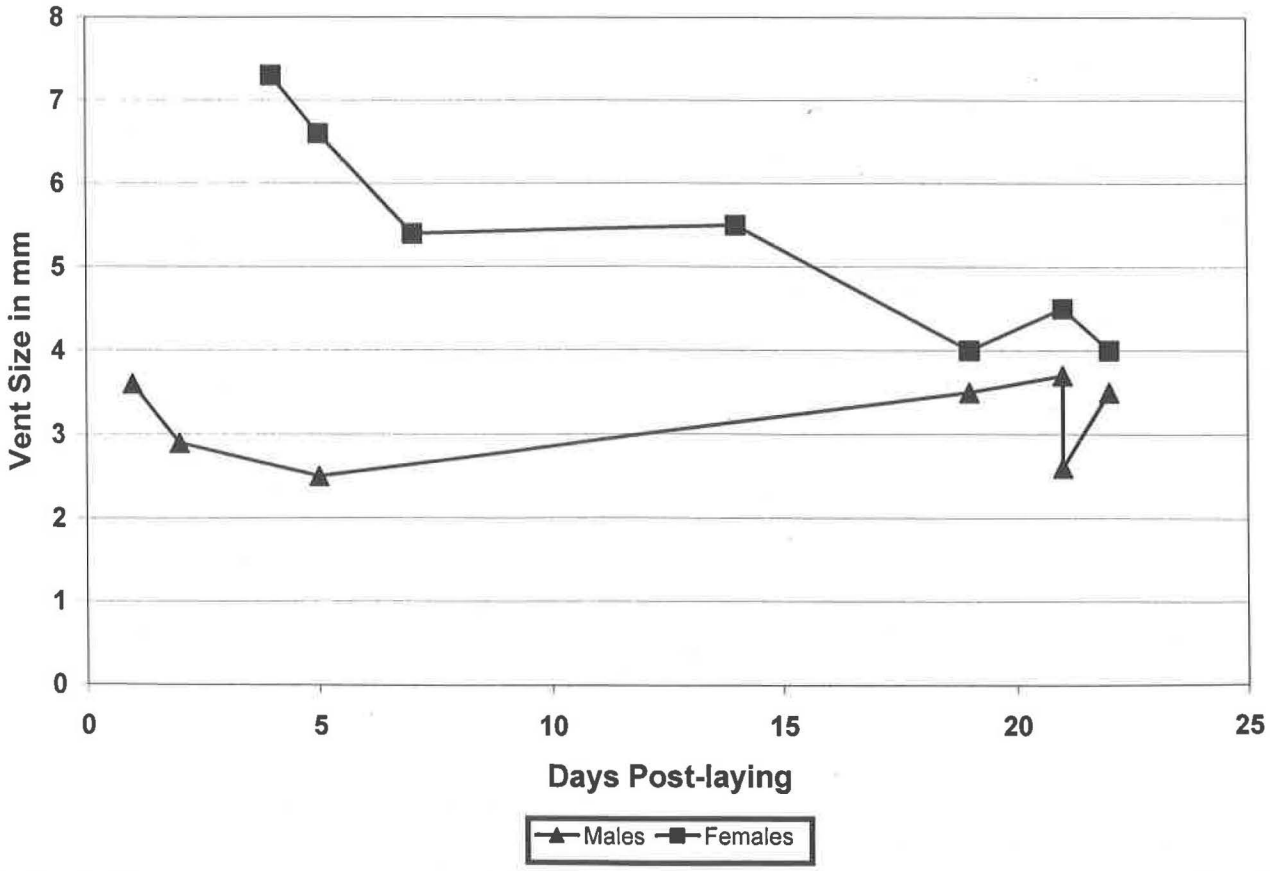
Table 1. A comparison of cloaca width (mm) between male and female Killdeer.

Cloaca size in Killdeer where both pair members were measured (pair members on same line measured on same or consecutive days).		Cloaca size in Killdeer where only one member of the pair was measured (measurements on same line are independent).	
Males	**Females**	**Males**	**Females**
3.0	4.2	2.5	4.7
2.5	4.5	4.3	4.0
3.5	5.2	3.1	4.8
3.7	5.2	4.1	5.2
2.9	4.8	2.9	5.1
3.5	4.0	4.5	5.0
2.6	6.6	3.2	4.4
3.5	4.8	2.9	4.3
3.6	4.0	2.6	4.5
2.9	7.3	4.0	4.3
3.2	5.0	3.7	6.0
3.6	4.9	2.8	3.1
2.8	5.4	2.5	4.9
4.0	4.9	2.7	5.2
2.9	4.3	3.5	3.7
2.6	3.1	2.9	3.3
2.8	4.0	2.5	4.8
2.6	3.8	2.6	3.7
2.9	5.5	3.3	3.0
3.5	5.0	3.0	4.5
2.7	4.9	2.5	8.0
4.1	4.3		5.5
3.0	4.0		4.0
2.2	5.1		3.9
2.9	3.8		5.1
4.1	4.0		4.6
3.2	8.1		
2.3	4.9		

Table 2. Basic statistics for Killdeer cloacal measurements.				
	Number of Cases	Mean (mm)	Standard Deviation	t-test
Males (both pair members measured)	28	3.11	.525	
Females (both pair members measured)	28	4.84	1.067	t = -7.67, P <0.001
Males (only one member of pair measured)	21	3.15	.635	
Females (only one member of pair measured)	25	4.6	1.029	t = -5.86, P < 0.001
Males (combined)	49	3.13	.569	
Females (combined)	53	4.73	1.047	t = -8.73, P >0.001

Data on cloacal size in males and females are presented in Table 1. Statistical summaries are provided in Table 2. Vent width of females averaged significantly greater than that of males in those birds in which both pair members were measured (N = 28 for males and females, t = -7.67, P < 0.001), those in which measurements were only available for one member of the pair (N = 21 males and 25 females, t = -5.86, P < 0.001), and in the combined sample (N = 49 males and 53 females, t = -8.73, P < 0.001). All but eight females had a vent width of 4.0 mm or greater, and all but six males had a vent width of 4.0 mm or less. The greatest differences between the sexes were evident in birds captured shortly after egg-laying, with differences decreasing through incubation and care of young. This is indicated by seven male and seven female birds that were captured at nests where the date of completion for the clutch was known (Fig. 2). Nonetheless, the sexes of some birds with newly hatched chicks could be identified by vent size differences. The much greater variation in females (SD = 1.047 for females versus 0.568 for males) is likely a result of the stage in the nesting phenology at which the measurements were made.

Fig. 2. **Vent width of members of seven pairs of Killdeer captured in Mississippi at known intervals post initiation of incubation.**



DISCUSSION

Frequently, researchers have used protuberance of the cloaca to identify males of many species of passerines (Wolfson 1952, Pettingill 1985), but this feature is not evident–or at least not conspicuous–in Killdeer. The possibility of using vent size as an indicator of sex was suggested by Mason (1938). In discussing identification of sex in passerine birds, he noted that in the female, "the cloacal region tapers off gradually to the vent, and the orifice itself often will be found to be dilated." It is intuitive that the flaccid, larger vent opening of the female is a result of stretching during egg-laying. We did not expect to see such enlargement in males, but there was some suggestion (Fig. 2) that minimal enlargement may occur at about the time of egg-laying and again at about the time of hatching. If confirmed by additional data, this would seem to be an adaptation to facilitate sperm transfer during copulation. Killdeer in Mississippi can lay up to six clutches in a season, and we have some indication that vent size and flaccidness in females may increase with successive clutches. More data are needed to confirm this.

A similar cloacal measurement technique was used by Boersma and Davies (1987) for penguins. They took two vent measurements: the transverse measurement that we took and also a cranio-caudal width. We do not feel that the latter measurement is useful in birds as small as the Killdeer. Our measurements also differed from that of Boersma and Davies in that they swabbed the vent with 10% alcohol, a procedure we feel is not needed and which could irritate sensitive tissues. They also specifically measured the vent under conditions of muscle contraction–a minimal size–and we specifically measured the vent in a more relaxed state.

We feel that sexes of southern Killdeer can be identified reliably, at least during the breeding season, when vent width measurements are 4.5 mm or more for females or 3.0 mm or less for males. Comparison of vent measurements of both members of a pair can provide support for determinations. It seems likely that careful measurement of vent size may be useful in determining sex in other species, particularly large birds or those laying relatively large eggs.

ACKNOWLEDGMENTS

We thank Kelly Chen for statistical advice.

LITERATURE CITED

Boersma, P.D. and E.M. Davies. 1987. Sexing monomorphic birds by vent measurements. *Auk* 104:779-783.

Mason, E.A. 1938. Determining sex in breeding birds. *Bird-Banding* 9:46-48.

Miller, W. J. and F.H. Wagner. 1955. Sexing mature Columbiformes by cloacal characters. *Auk* 72:279-285.

Pettingill, O. S., Jr. 1985. Ornithology in laboratory and field. Fifth edition. Academic Press, Inc., New York, NY.

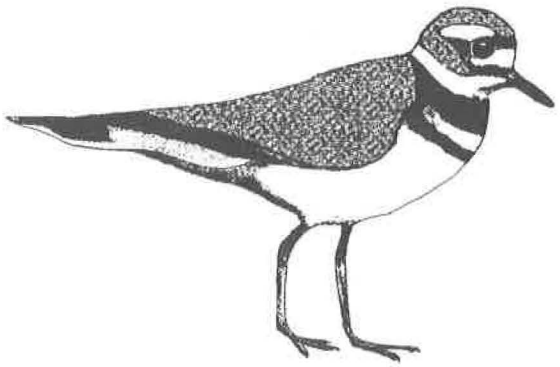
Richdale, R.E. 1957. A population study of penguins. Oxford Univ. Press, Oxford, UK.

Schardien, B.J.1981.Behavioral ecology of a southern population of Killdeer. Ph.D.diss., Mississippi State University, Mississippi State, MS.

Serventy, D.L. 1956. A method of sexing petrels in field observations. *Emu* 56:213-215.

Swanson, D.A. and J.H. Rappole.1992. Determining the sex of adult White-winged Doves by cloacal characteristics. *N. Amer. Bird Bander* 17:137-139.

Wolfson, A.1952. The cloacal protuberance–a means for determining breeding condition in live male passerines. *Bird-Banding* 23:159-165.



Killdeer
by George West