

## RELIABILITY OF MORPHOLOGICAL MEASUREMENTS IN SEXING NEWLY HATCHED WILD GADWALL DUCKLINGS

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**Abstract.**—Ninety-seven Gadwall (*Anas strepera*) ducklings, including 47 females and 50 males, were weighed and measured at hatch in the wild during a study of the breeding ecology of the Gadwall in southern Manitoba. Discriminant analysis procedures were used to investigate morphological differences between the 2 sexes. The results indicate considerable overlap of character measurements with classification success only slightly better than expected by chance alone. Sexual dimorphism is not readily apparent in wild Gadwall ducklings at this early age and cloacal examination may be the best method of sex differentiation.

### CONFIABILIDAD DEL ANÁLISIS MORFOMÉTRICO PARA DETERMINAR EL SEXO DE NEONATOS DE *ANAS STREPERA*

**Sinopsis.**—Durante un estudio sobre la ecología del pato *Anas strepera*, llevado a cabo en Manitoba, se midieron y pesaron al nacer 47 hembras y 50 machos, cuyo sexo se determinó mediante examen de la cloaca. Se utilizó un análisis discriminatorio para tratar de determinar si existían diferencias morfológicas entre los sexos al nacer. Se encontró un solapamiento notable en los parámetros medidos y el éxito en separar los sexos fue un poco mejor de lo esperado por mera probabilidad. Los datos sugieren que no hay dimorfismo sexual en neonatos del pato estudiado.

Few methods are currently available to separate the sexes of ducklings in the field. Several workers have reported the weights and measurements of young waterfowl at various stages of growth and development, however, most investigations are based on ducklings reared in pens (see Greenwood 1974, Smart 1965, Southwick 1953, Weller 1957; more recently, Lightbody 1985, Lightbody and Ankney 1984) with few studies based on ducklings captured or collected in the field (Dzubin 1959, Reinecke 1979). Furthermore, little information is available concerning the utility of such measurements in identifying sexes of ducklings, particularly at early ages. This note presents an analysis of weights and other morphological data from wild Gadwall (*Anas strepera*) ducklings measured in southern Manitoba from 1972 through 1975 and evaluates the reliability of such information on sexing ducklings at hatch.

Fifteen Gadwall nests were observed at the time of hatch, and 97 ducklings, 47 females and 50 males, were weighed and measured before the female moved them from the nest site. Weights in 1972 were obtained by using a triple-beam balance accurate to the nearest 0.1 g; in 1973-1975, a Pesola field scale, accurate to the nearest 0.5 g, was used. Culmen

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TABLE 1. Body weight, culmen length, and tarsus length of newly-hatched wild Gadwall ducklings in southern Manitoba, 1972-1975.

	Body weight (g)	Culmen (mm)	Tarsus (mm)
Male	30.8 ± 0.4 <sup>1</sup>	12.6 ± 0.1	19.8 ± 0.2
(n = 50)	(22.1-35.0) <sup>2</sup>	(10.8-13.9)	(17.5-23.3)
Female	30.5 ± 0.3	12.7 ± 0.1	19.4 ± 0.2
(n = 47)	(26.2-35.5)	(10.8-15.0)	(17.1-21.4)

<sup>1</sup> Mean ± SE.<sup>2</sup> Range.

and tarsus lengths were taken with vernier calipers to the nearest 0.1 mm and followed the guidelines presented by Baldwin et al. (1931). Ducklings were sexed externally by the presence or absence of a rudimentary penis (Hochbaum 1942). Standard two-sample comparisons were made using "Student's *t*" as outlined in Steel and Torrie (1960). A stepwise discriminant analysis (Dixon 1983) was used to investigate morphological differences between the sexes at the time of measurement, using body weight, culmen length, and tarsus length as the discriminating variables. This method calculated a discriminant function by forming a linear combination of the morphological characters such that the differences between sexes were maximized. In this analysis, the Wilks' lambda criterion was used in a stepwise selection process to provide the greatest overall separation between groups. Discriminant scores for the first canonical variable were then calculated from the data on each duckling. The likelihood of misclassification of ducklings, or error rate, was determined using the jackknife method (see Dixon 1983, Lachenbruch and Mickey 1968).

No significant sexual differences (all  $P > 0.05$ ) were detected in weight, culmen, or tarsus measurements of wild Gadwall ducklings (Table 1). The similarity in body size of male and female ducklings was further apparent when these measurements were used in a discriminant analysis. Using all 3 variables, the analysis failed to provide a significant discriminant function that distinguished the sexes. Attempts to classify each duckling, based on the discriminant scores, again indicated that considerable overlap of character measurements existed between sexes. Only 54% of the ducklings were placed into the proper category as determined initially by external examination and this level of success was only 7% better ( $\kappa = 0.074$ ) than the value expected by chance alone (see Titus et al. 1984).

Body size as a function of weight, culmen length, and tarsus length in newly-hatched Gadwall ducklings does not appear to be a reliable indicator of sex. Weller (1957) and Dzubin (1959) found little or no difference between the sexes in Redhead (*Aythya americana*) and Canvasback (*Aythya valisineria*) ducklings, respectively, at hatch or shortly thereafter. Weller (1957) noted that by the second week, males were heavier than females and remained heavier throughout life. Dzubin (1959)

suggested sex differences in body weight upon reaching the Class II plumage stage (about 26–32 d). Among Blue-winged Teal (*Anas discors*) ducklings reared at the Delta Waterfowl Research Station, Dane (1965) found sexual divergence in body weight as early as 1 wk after hatching. However, no data were presented for ducklings at hatch. Oring (1968) showed similar weights of 1-day-old Gadwall ducklings and subsequent divergence between sexes, but only 1 duckling of each sex was measured at hatch. Finally, Lightbody (1985) found no significant differences in size (weight, tarsus, and culmen length, and other morphological measurements) of male and female Redhead ducklings from hatch up to 1 week after fledging.

Data from this study suggest that sexual dimorphism is not readily apparent in wild Gadwall ducklings at hatch and measurements of weight, culmen length, and tarsus length are of little use in distinguishing the sexes in the field. Cloacal examination of newly-hatched ducklings for the presence or absence of a penis in determining sex requires experience and care. However, evidence from this investigation and others suggests that, in those instances in which it is necessary to sex young waterfowl, cloacal examination may be the best method of sex determination as various morphological measurements do not differentiate the sexes.

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## NOTES AND NEWS

The North American Loon Fund announces the **THIRD NORTH AMERICAN CONFERENCE ON LOON RESEARCH AND MANAGEMENT** to be held in cooperation with the Cornell Laboratory of Ornithology on **Sept. 18 and 19, 1987** in Ithaca, NY. The Loon Fund invites both papers and posters about loon research and management. For guidelines for submission of papers; contact DR. JUDITH MCINTYRE, *Dept. of Biology, Syracuse University at Utica, Utica, NY 13502*. For other information and registration materials; contact SCOTT SUTCLIFFE, *Laboratory of Ornithology, 159 Sapsucker Woods Rd., Ithaca, NY 14850 (607) 255-4288*.

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