SEX DETERMINATION IN THE BARN OWL (*Tyto alba*) USING SKELETAL MEASUREMENTS

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ABSTRACT

Reversed sexual dimorphism is common in predatory birds with females being the larger sex. This difference in size can be attributed to sex-role partitioning and predatory behavior. Sexual size dimorphism was investigated in the Barn Owl (Tyto alba) using skeletal measurements of ten females and four males. In all measurements (length of the femur, tibiotarsus, tarsal metatarsus, humerus, ulna, radius, and sternum, cranial length, interorbital constriction, temporal width, and synsacral width) females averaged larger than males, but the variance was not significant. The small sample size in this study may be a factor. Variation in age and specimens from a broader array of populations may yield different results. Tarsus length and foot measurements should also be examined.

KEYWORDS: reversed sexual dimorphism – sex determination – sexual size dimorphism – skeletal measurements – Barn Owl – Tyto alba

INTRODUCTION

In sexually dimorphic species, including many birds, mammals, and even some reptiles, males are often larger than females (Sergio et al. 2007). This difference in size is typically attributed to the assumption that larger size corresponds with greater strength (Amadon 1959) which can provide an advantage for males in competition over resources and mate selection (Sergio et al. 2007). Even though males are often the larger sex, reversed sexual dimorphism is present in many species (Sergio et al. 2007), including birds of prey where it is common for the females to be the larger sex (Earhart and Johnson 1970). Three principle parameters may explain reversed sexual dimorphism: reproduction, sexual selection, and food distribution (Marti 1990). Before laying eggs, female raptors increase in weight (Wheeler and Greenwood 1983). This increase may decrease flight performance and hunting success and may require that males provide food during the breeding period (Widén 1984). Females may prefer smaller males if they are capable of hunting more proficiently (Marti 1990) as this would create greater success in raising offspring. Sexual dimorphism is also thought to decrease intraspecific competition for food as sexes can utilize different resources (Moors 1980). Despite the
various selective advantages used to explain reversed sexual dimorphism in raptors, the primary
selection pressure is a difference in predatory behavior (Amadon 1959).

Barn Owls (*Tyto alba*) are sexually dichromatic (Roulin et al. 2013). They exhibit sexual
dimorphism in body mass (Marti 1990), but not in tarsus diameter (Ivins 1975) and wing chord length
(Roulin et al. 2013). The purpose of this study was to determine if a series of *Tyto alba* skeletal
measurements could be used to determine the sex of specimens in the Brigham Young University-
Hawaii Museum of Natural History collections.

METHODS

A total of 20 disarticulated Barn Owl skeletons from the Brigham Young University-Hawaii
Museum of Natural History, ten female, four male, and six whose gender was unknown, were
measured in this study. A digital caliper (± 0.01 mm) was used to make 11 skeletal measurements
(Figures 1-4) including the length of the femur, tibiotarsus, tarsal metatarsus, humerus, ulna, radius,
sternum, cranial length, interorbital constriction, temporal width, and synsacral width. Not all of the
measurements were recorded for each specimen due to missing or broken bones.

Means were recorded (± standard deviation) for each skeletal measurement according to
gender. Data were analyzed using two-tailed t-tests for each mean measurement. A *P*-value <0.05 was
considered significant.
**Figure 1.** The *Tyto alba* cranial length, temporal width, and interorbital constriction measurements.

**Figure 2.** The width of the sacrum in *Tyto alba*.

**Figure 3.** The length of the sternum in *Tyto alba*.

**Figure 4.** The length of the femur (6), tibiotarsus (7), tarsal metatarsus (8), humerus (9), ulna (10), and radius (11) in *Tyto alba*. 
RESULTS

For all eleven measurements females were larger than males. T-tests found no significant
difference between sexes ($P<0.05$). Cranial length varied more in females (Figure 5) and tibiotarsus
length varied more in males (Figure 6). Humerus length was similar in both sexes (Figure 7). Sternal
length varied the most with males smaller than females (Figure 5).

**Figure 5.** The results of five skeletal measurements in the Barn Owl (*Tyto alba*). Female cranial length
measurements had greater variation (third quartile was more elongated).

**Figure 6.** The results of four skeletal measurements in the Barn Owl (*Tyto alba*). Male tibiotarsus length
measurements had greater variation (third and first quartiles were more lengthened).
Figure 7. The results of two skeletal measurements in the Barn Owl (*Tyto alba*). Male and female humerus measurements were similar in length and variation. Female tarsal metatarsus measurements had greater variation.

**DISCUSSION**

Sexual size dimorphism is common in raptors and other predatory birds because of sex role partitioning (Andersson and Norberg 1980) and predatory behavior (Amadon 1959). Owls are known to exist at lower population densities which allows for less competition for mates and resources (Marti 1990). These same selection pressures occurred within a monomorphic population of raptors (Sergio et al. 2007) showing that while significant sexual dimorphism is common, it is not essential in all species.

The eleven skeletal measurements in this study were unable to distinguish sex in the Barn Owl. The absence of significant differences supports Earhart and Johnson’s (1970) statement that the Barn Owl exhibits less sexual dimorphism than most owls. They came to this conclusion based on a small sample size of 16 males and 21 females. The smaller sample size of this study may also be a factor in the results of this study. Adding foot measurements could aid in determining gender of unknown specimen as Marti (1990) found significant results. Variation in age and specimens from a broader array of populations may also yield different results (Marti 1990).
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LITERATURE CITED


