Using Dentition Measurements for Sex Determination of the Small Indian Mongoose *Herpestes javanicus*

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Abstract

The purpose of this study was to determine if measurements are useful in sex determination of the Small Indian Mongoose (*Herpestes javanicus*). Eight measurements on 53 male and 36 female adult mongoose skulls were taken. Data were analyzed with a discriminant analyses and three measurements were found to be significant (p<.05) (the width of the maxilla from the widest points on the zygoma immediately lateral to the socket, the width of the maxilla of the lingual aspect of the most posterior molar sockets, and the distance from the mesial aspect of the 1st premolar socket to the distal aspect of the last molar socket on the maxilla). Selection pressures such as dietary choice between the sexes may be responsible for these differences.

INTRODUCTION

Tooth and dentition measurements have been used to determine sexual dimorphism in a wide variety of mammals. Studies of the bobcat (*Lynx rufus*) showed that root width and thickness of the permanent canines with open root canals (PC-OR) differed significantly between males and females, as did the difference in the ratio of total length/maximum root canal diameter (Johnson et al. 1981). Polar bears (*Ursus maritimus*) from the Svalbard (Spitsbergen) region exhibited sex-related differences in the length of the upper and lower molar tooth rows (Larsen 1971). Size differentiation of the lower canine teeth between male and female northern fur seals (*Callorhinus ursinus*) is so distinct that the sex of the seal can be determined by simple visual inspection (Huber 1994). In the Japanese macaques (*Macaca fuscata*) lower premolars and molars are sexually dimorphic (females smaller than males) (Anezaki et al. 2006). Dentition measurements on adult rabbits (*Oryctolagus cuniculus*) demonstrated that the width of the lower arch from the lingual aspect of the right 1st bicuspid socket to the lingual aspect of the adjacent left 1st bicuspid socket on the mandible differed significantly between sexes (Barney 2004).

Sexual dimorphism has been reported in skull morphometrics of the Small Indian mongoose (*Herpestes javanicus*) (Bruner 1988, Davis 1994). Simberloff et al.(2000) found the diameter of the canine in the Small Indian Mongoose (*H. javanicus*) to be sexually dimorphic. The purpose of this study was to determine if the sex of the Small Indian Mongoose (*H. javanicus*) can be determined by additional dentition measurements.
METHODS

The average weights of the male and female specimens were calculated. Dentition measurements were recorded for eight characteristics (Barney 2004) using a digital caliper on the 89 adult Mongoose skulls (53 males and 36 females) (Bruner 1988). The data were analyzed by discriminant analysis. The measurement numbers and descriptions are:

1. The width of the lower arch from the lingual aspect of the right 1st bicuspid socket to the lingual aspect of the adjacent left 1st bicuspid on the mandible.
2. The width of the maxilla from the widest points on the zygoma immediately lateral to the socket.
3. The length of the mandible from the lingual tip of the incisor socket at the midline to the mesial aspect of the 1st premolar socket.
4. The length of the mandible from the lingual tip of the incisor socket at the midline to the most distal aspect of the last molar socket.
5. The width of the maxilla of the lingual aspect of the most posterior molar sockets.
6. The width of the lingual aspect of the most posterior molar sockets located on the mandible.
7. The distance from the mesial aspect of the 1st premolar socket to the distal aspect of the last molar socket on the mandible.
8. The distance from the mesial aspect of the 1st premolar socket to the distal aspect of the last molar socket on the maxilla.
RESULTS

The means of the eight measurements evaluated were calculated (Table 1, Figure 1). Three measurements varied significantly between the sexes; Measurement #2, the width of the maxilla from the widest points on the zygoma immediately lateral to the socket (32.83(mm) ± 2.437 for males and 30.39(mm) ± 0.943 for females), Measurement #5, the width of the maxilla of the lingual aspect of the most posterior molar sockets (9.819 (mm) ± 0.443 for males and 9.315(mm) ± 0.566 for females), and Measurement #8, the distance from the mesial aspect of the 1st premolar socket to the distal aspect of the last molar socket on the maxilla (19.29(mm) ± 0.788 for males and 17.95(mm) ± 0.493 for females). The average weight of the male specimen was 666.9g, and the female was 480.2g.

Table 1. A Comparison of the means (±SD) of dental measurements in Small Indian Mongoose (mm)

<table>
<thead>
<tr>
<th>Measurement*</th>
<th>Male</th>
<th>Female</th>
<th>Significance</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.015 ± 0.794</td>
<td>3.657 ± 0.287</td>
<td>ns</td>
<td>0.8558</td>
</tr>
<tr>
<td>2</td>
<td>32.83 ± 2.437</td>
<td>30.39 ± 0.943</td>
<td>p&lt;0.5</td>
<td>0.0026</td>
</tr>
<tr>
<td>3</td>
<td>5.317 ± 0.476</td>
<td>4.891 ± 0.481</td>
<td>ns</td>
<td>0.3656</td>
</tr>
<tr>
<td>4</td>
<td>26.36 ± 0.917</td>
<td>25.02 ± 1.061</td>
<td>ns</td>
<td>0.5398</td>
</tr>
<tr>
<td>5</td>
<td>9.819 ± 0.443</td>
<td>9.315 ± 0.566</td>
<td>p&lt;0.5</td>
<td>0.0057</td>
</tr>
<tr>
<td>6</td>
<td>10.68 ± 0.499</td>
<td>10.09 ± 0.456</td>
<td>ns</td>
<td>0.2514</td>
</tr>
<tr>
<td>7</td>
<td>21.26 ± 0.699</td>
<td>20.44 ± 0.550</td>
<td>ns</td>
<td>0.4522</td>
</tr>
<tr>
<td>8</td>
<td>19.29 ± 0.788</td>
<td>17.95 ± 0.493</td>
<td>p&lt;0.5</td>
<td>0.0458</td>
</tr>
</tbody>
</table>

*Description of measurement found in methods section

Figure 1. The means (±SD) of eight dentition measurements of male and female Small Indian Mongoose.
CONCLUSIONS

Barney (2004) was successful in distinguishing the sex in adult domestic rabbits by measuring the distance from the lingual aspect of the right 1\textsuperscript{st} bicuspid socket to the lingual aspect of the adjacent left 1\textsuperscript{st} bicuspid socket on the mandible. In this study three measurements differed significantly between the sexes. These data differ from those of Barney (2004) which was expected due to the fact that rabbits and mongoose are in different orders. The average weights of the specimens clearly indicate that the males are overall larger than the females. This is a possible explanation for the significant differences found in the three measurements between the sexes. A study of the diet of \textit{H. javanicus} in Mauritius found that females on average eat more insects and fewer rats than do males (Simberloff et al. 2000). The diversity in dietary choice between the sexes could drive evolutionary responses and specialization, accounting for the sexual dimorphism in the anatomical characteristics related to mastication.

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