Morphometrical Studies on Scapula of Bluebull (*Boselaphus tragocamelus*)

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Abstract

The gross morphometrical study was carried out on the scapula of six adult Blue bulls. The scapula of was flat and triangular in shape, consisting of two surfaces, three borders and three angles. There was no significant difference in between the right and left scapulae procured from same animal. The lateral surface was divided by the scapular spine into a small and elongated supra-spinous fossa and a much larger and triangular, infra-spinous fossa. The spine was sharp and wavy in outline. The acromian process was pointed, tuber spine was indistinguishable and sub-scapular fossa was marked deep. The tuber-scapulae were small and the coracoids process was ill developed. The glenoid cavity was shallow, oval shaped and a small glenoid notch was present over glenoid cavity.

Keywords: Bluebull, Morphometrical, Scapular spine, Scapula.

1. Introduction

The Blue bull or Nilgai (*Boselaphus tragocamelus*) is the largest Asian antelope. Blue Bull is a Schedule - III animal of the Wildlife Protection Act (1972), in India and is in the “Least concern” category as per the IUCN Red Data List assessed by Mallon (2008). The aim of this study is to investigate scapula of Blue bull, in the vetero-legal cases, fails to identify the bones of this animal from those of some other small ruminants. This investigation will be helpful to the field veterinarians as well as zoo veterinarians.

2. Material and Method

In this study six specimens of adult Blue bull (*Boselaphus tragocamelus*) were used which were studied at Bikaner zoo. Three of the specimens were of male and three of female. The sex was confirmed by the history taken from the persons engaged in burying the dead animals in the zoo premises. These osteological specimens were studies to record their gross morphological features. Different parameters of scapula were measured and subjected to routine statistical analysis (Snedecor and Cochran, 1994). The following studies were conducted on the collected specimens. Scapular index (SI) was calculated as the average ratio between the length and breadth of scapula.

\[ SI = \frac{\text{Maximum length}}{\text{Maximum breadth}} \times 100 \]  
(Miller *et al.*, 1964).

3. Result and Discussion

The scapula (Fig. 1 & 2) was a flat triangular and relatively wider bone at the dorsal end and narrower at the ventral end, which is similar to the findings of Raghavan (1964) in ox, Miller *et al.* (1964) in dog, Getty (1975) in horse, Jangir (2010) in Chinkara, Nzalak *et al.* (2010) in Lion, Choudhary *et al.* (2013) in Chital, Gupta and Deshmukh (2014) in dromendary camel, Choudhary and Singh (2016a) in Blackbuck. The lateral surface (Fig 1) was divided by the scapular spine into a smaller supra-spinous fossa and a much larger, infra-spinous fossa which was in agreement with Raghavan (1964) in ox, Getty (1975) in horse, Jangir (2010) in Chinkara, Nzalak *et al.* (2010) in Lion, Choudhary *et al.* (2013) in Chital, Gupta and Deshmukh (2014) in dromendary camel and Choudhary and Singh (2016a) in Blackbuck but was in disagreement with Miller *et al.* (1964) in dog.

The average ratio of the maximum lengths of supra-spinous fossa to infra-spinous fossa was 1: 3.03, while ratio of area was 1:4 for ox (Raghavan, 1964) 1:4.23 for Chinkara (Jangir, 2010), 1:4.15 for Chital (Choudhary *et al.*, 2013), 1:3.21 for Blackbuck (Choudhary and Singh, 2016a). The spine (Fig. 1 & 2) of the scapula extended up to the level of neck as acromian process similar to the findings of Raghavan (1964) in ox, Jangir (2010) in Chinkara, Choudhary *et al.* (2013) in Chital, Gupta and Deshmukh (2014) in dromendary camel and Choudhary and Singh (2016a) in Blackbuck. However, in contrast, it was stated by Getty (1975) that the spine of the scapula subsides at –

the neck of the bone in horse. Moreover, the acromion process was prominent and plate like as met-acromion process according to Miller et al. (1964) and Nzalak et al. (2010) in Lion. The tuber spine was indistinguishable which was in accordance with the findings of Rhagvan (1964) in ox, Miller et al. (1964) in dog, Jangir (2010) in Chinkara, Choudhary et al. (2013) in Chital and Choudhary and Singh (2016a) in Blackbuck, but it was prominent in horse (Getty, 1975). On medial surface (Fig 2), the sub-scapular fossa was deep which was simulated the findings of Raghavan (1964) in ox, Jangir (2010) in Chinkara, Choudhary et al. (1964), very shallow in the dog (Miller et al, 1964). A small glenoid notch was present over the rim of glenoid cavity in Blue bull, which is similar to Getty (1975) in horse, Miller et al. (1964), who noted it to be located on the junction of ventral border of spine and scapula properly in dog. In the present study, the glenoid cavity was shallow and oval or heart-shaped in Blue bull which is similar to the findings in Chinkara (Jangir, 2010) and in Chital (Choudhary et al., 2013), in dromedary camel (Gupta and Desmukh, 2014) and in blackbuck (Choudhary and Singh, 2016a); whereas it was mostly circular and deep in Black Bengal goat Siddiqui et al., (2008), oval in outline in horse (Getty, 1975), shallow and circular in outline in ox (Raghavan, 1964), very shallow in the dog (Miller et al, 1964). A small glenoid notch was present over the rim of glenoid cavity in Blue bull, which is similar to Getty (1975) in horse, Miller et al. (1964) in dog and undeveloped in ox (Raghavan, 1964), in Chinkara (Jangir, 2010), in Chital ( Choudhary et al., 2013), in dromedary camel (Gupta and Desmukh, 2014) and in blackbuck (Choudhary and Singh, 2016a).

Table 1: Different measurements of Scapula

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Description</th>
<th>Maximum height (Hm)</th>
<th>Maximum breadth (Bm)</th>
<th>Maximum length of spine (Ls)</th>
<th>Maximum breadth of Neck (Bn)</th>
<th>Maximum breadth of glenoid cavity (Dg)</th>
<th>Maximum breadth of supra-spinous fossa (Bs)</th>
<th>Maximum breadth of infra-spinous fossa (Bi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Female -1</td>
<td>Left 29.40</td>
<td>14.80</td>
<td>25.62</td>
<td>6.30</td>
<td>4.50</td>
<td>3.25</td>
<td>11.70</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right 29.45</td>
<td>14.75</td>
<td>25.65</td>
<td>6.20</td>
<td>6.20</td>
<td>3.20</td>
<td>11.75</td>
</tr>
<tr>
<td>2.</td>
<td>Female -2</td>
<td>Left 29.00</td>
<td>14.45</td>
<td>25.60</td>
<td>6.15</td>
<td>6.15</td>
<td>3.30</td>
<td>11.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right 29.10</td>
<td>14.50</td>
<td>25.62</td>
<td>6.20</td>
<td>6.20</td>
<td>3.25</td>
<td>11.40</td>
</tr>
<tr>
<td>3.</td>
<td>Female -3</td>
<td>Left 29.60</td>
<td>14.80</td>
<td>25.50</td>
<td>6.80</td>
<td>6.80</td>
<td>3.15</td>
<td>11.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right 29.65</td>
<td>14.70</td>
<td>25.52</td>
<td>6.75</td>
<td>6.75</td>
<td>3.10</td>
<td>11.10</td>
</tr>
<tr>
<td>4.</td>
<td>Male -1</td>
<td>Left 33.25</td>
<td>16.75</td>
<td>27.75</td>
<td>7.50</td>
<td>7.50</td>
<td>4.45</td>
<td>12.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right 33.28</td>
<td>16.80</td>
<td>27.72</td>
<td>7.45</td>
<td>7.45</td>
<td>4.90</td>
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<tr>
<td>5.</td>
<td>Male -1</td>
<td>Left 33.38</td>
<td>16.55</td>
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<td>7.10</td>
<td>4.85</td>
<td>12.35</td>
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<td></td>
<td></td>
<td>Right 33.45</td>
<td>16.50</td>
<td>27.78</td>
<td>7.00</td>
<td>7.00</td>
<td>4.80</td>
<td>12.40</td>
</tr>
<tr>
<td>6.</td>
<td>Male -1</td>
<td>Left 33.60</td>
<td>16.35</td>
<td>27.80</td>
<td>7.25</td>
<td>7.25</td>
<td>4.25</td>
<td>12.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right 33.65</td>
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<td>27.82</td>
<td>7.30</td>
<td>7.30</td>
<td>4.30</td>
<td>12.15</td>
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<tr>
<td>Mean</td>
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<td>26.67</td>
<td>6.83</td>
<td>6.68</td>
<td>3.9</td>
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<td>SD</td>
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<td>0.51</td>
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<tr>
<td>SE</td>
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<td>0.62</td>
<td>0.29</td>
<td>0.33</td>
<td>0.15</td>
<td>0.24</td>
<td>0.22</td>
<td>0.14</td>
</tr>
</tbody>
</table>

Chinkara, Choudhary et al. (2013) in Chital and Choudhary and Singh (2016a) in Blackbuck, but it was in disagreement with Miller et al. (1964), who noted it to be located on the junction of ventral border of spine and scapula properly in dog. In the present study, the glenoid cavity was shallow and oval or heart-shaped in Blue bull which is similar to the findings in Chinkara (Jangir, 2010) and in Chital (Choudhary et al., 2013), in dromedary camel (Gupta and Desmukh, 2014) and in blackbuck (Choudhary and Singh, 2016a); whereas it was mostly circular and deep in Black Bengal goat Siddiqui et al., (2008), oval in outline in horse (Getty, 1975), shallow and circular in outline in ox (Raghavan, 1964), very shallow in the dog (Miller et al, 1964).
observations of Gupta and Deshmukh (2014) in dromedary camel where it was well developed.

The average maximum length and breadth of scapula (Table 1) in Blue bull was 31.40 ± 0.616 cm and 15.62 ± 0.29 cm respectively, which was 13.94 ± 0.30 cm and 6.62 ± 0.11 cm in Black Bengal goat (Siddiqui et al. 2008); 20.46 ± 0.03 cm and 11.94 ± 0.03 cm, in chital (Choudhary et al., 2013) and 12.35 ± 0.12 cm and 6.94 ± 0.06 cm in chinkara (Jangir, 2010). The scapular index in the present study was 49:74 for Blue bull which was 82.05 for tiger, 72.82 for leopard, 67.34 for Sambar, 65.83 for sheep, 62.43 for buffalo, 57.51 for deer, 55.74 for pig, 52.59 for ox, 45.86 for horse and 43.62 for goat as per calculations of Dalvi et al. (1997), 57.78 for Chinkara (Jangir, 2010), 58.35 for Chital (Choudhary et al., 2013) and 61.05 for blackbuck (Choudhary and Singh, 2016a). The average maximum length of spines, breadth of necks of scapulae and breadth of glenoid cavities were 26.67 ± 0.33 cm, 6.83 ± 0.148 cm and 3.9 ± 0.217 cm, respectively.

4. Summary

The scapula was a flat triangular bone with two surfaces, three borders and three angles. The lateral surface was divided by the scapular spine into a small and elongated supra-spinous fossa and a much larger and triangular, infraspinous fossa. The acromion process was pointed, tuber spine was indistinguishable and sub-scapular fossa was deep. The glenoid cavity was shallow, oval shaped and glenoid notch was present over rim of glenoid cavity.

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