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An Evaluation of Pelvic Bone Shape in Beef Carcasses

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Summary

Pelvic bones from the right side of twenty five beef carcasses were collected and analyzed to characterize the variation in bone shape. Two heifer and two steer carcasses were selected from five 100-pound weight ranges, starting at 600 lb. Aitch and hip bone pelvic pieces were weighed and 12 linear measurements collected. Weight of the hip bone, aitch bone, and total pelvic bone increased with increasing carcass weight. Aitch bone and pelvic lengths were longer for steers than heifers. Location of the cut separating beef sides had a major impact on shape of the exposed aitch bone. Inconsistencies in carcass splitting make it difficult to use differences in aitch bone shape as anatomical landmarks for altered carcass fabrication.

Introduction

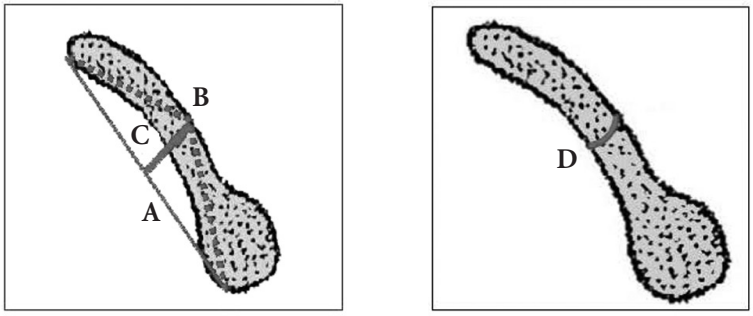
Alternative cuts of beef are highly sought in the market place by both consumers and retailers. Muscle profiling work (*2011 Nebraska Beef Cattle Report,* pp. 105-107) suggests the beef round has potential for the development of new cuts; specifically those that focus on single muscle fabrication. A defined anatomical landmark would be necessary for alternative fabrication methods in the beef round to occur. The anatomical location of the aitch bone (pelvic bone) is one of the visible indicators available in the round. Variation in pelvic bone shape and size in the beef carcass has not been characterized.

Procedure

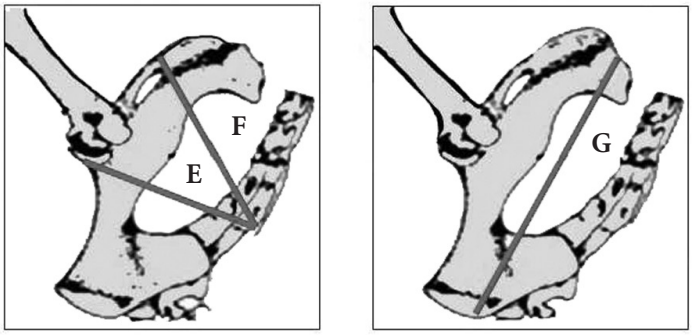
Pelvic bones from the right side of 25 A-maturity beef carcasses were collected to characterize the variation in bone shape due to gender and BW of animal at harvest. Carcasses were railed off to the re-grade bay and the pelvises from respective carcasses were identified. All 25 carcasses entered commercial production, and were split into round and sirloin primals. After fabrication of boneless round and sirloin cuts, two pieces of the pelvis were obtained — the hip portion from the sirloin and the aitch portion from the round — and transported to Loeffel Meat Laboratory at the University of Nebraska – Lincoln for measurement and analysis.

Prior to evaluation, both the hip and aitch bone pieces had additional connective tissue and lean removed. All hip and aitch bone pieces were then weighed and measured to determine the three-dimensional shape of the pelvis. Measurements were defined (Figure 1) prior to data collection with intentions to capture the true dimensional shape of the pelvis. In measurement definitions, aitch bone is the cut surface of the pelvic and *Symphysis pubis,* a result from splitting of the carcass. All hip and aitch bone dimensions were measured using a cloth measuring tape (in). Anatomical terms to describe measurement locations were assumed similar to those in a beef carcass hanging from the Achilles tendon.

Weights of the hip and aitch bone portions, as well as all of the dimensional measurements were analyzed independently using the PROC GLM procedure of SAS (SAS 2002-2008, Version 9.2. Cary, N.C.). CONTRAST statements were used to test for significance ($P \leq 0.05$) between sex, weight, and weight* sex interactions.



Linear measurements: A, aitch bone length; B, aitch bone depth; C, aitch bone angle; D, *symphysis pubis* circumference.



Linear measurements: E, pelvic depth 1; F, pelvic depth 2; G, pelvic length.

Figure 1. Anatomical locations of pelvic bone linear measurements.

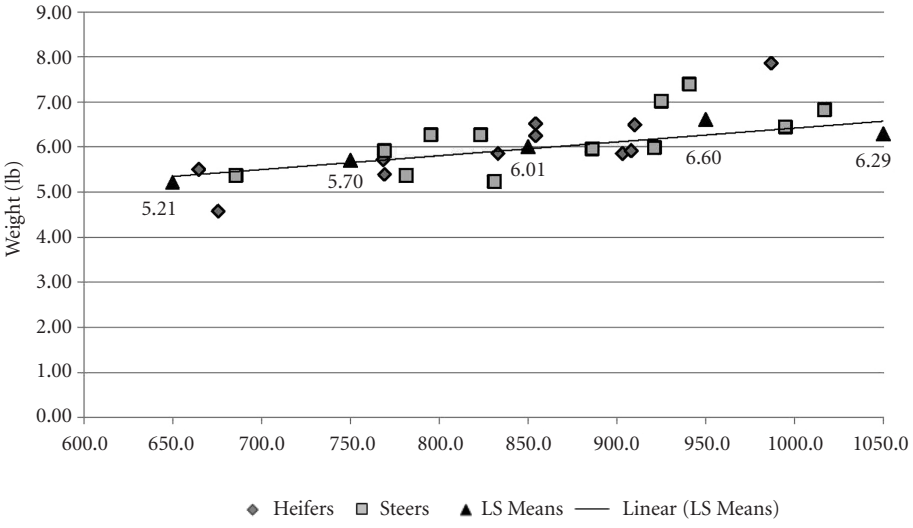


Figure 2. Least square means for total pelvic bone weight.

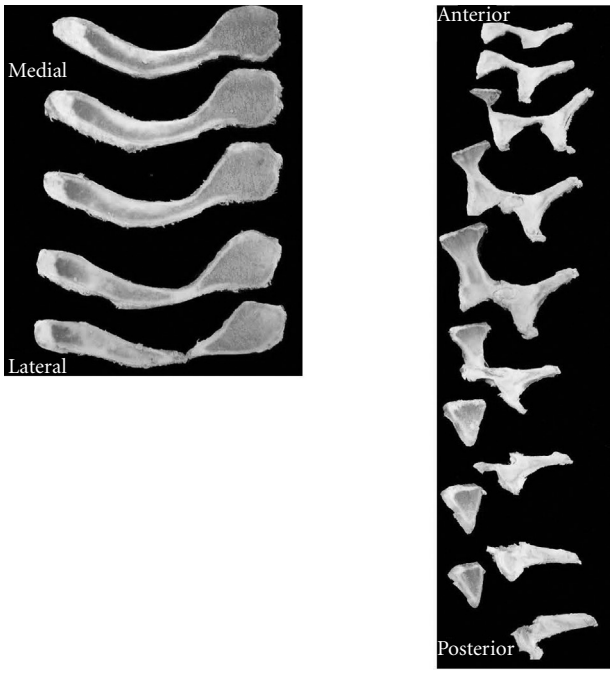
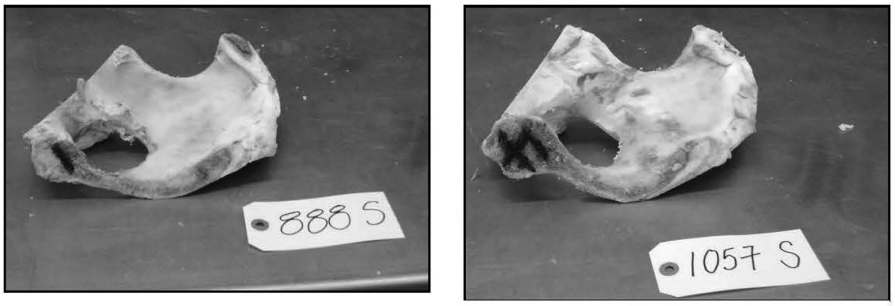


Figure 3. Differences in shape of aitch bone ball and angle of aitch bone from aitch bone pieces sliced parallel and perpendicular to the face of the aitch bone.



Above left: aitch bone shape resulting from inaccurate splitting of the beef carcass. Above right: aitch bone shape resulting from accurate splitting.

Figure 4. Differences in shape of aitch bone ball and angle of aitch bone as influenced by carcass splitting accuracy.

Results

Weight of the hip bone, aitch bone, and total pelvic bone increased linearly with increasing carcass weight (Figure 2). Carcass sex did not have an effect on weight of the pelvic bones. No difference existed between heifers and steers for aitch bone depth, aitch bone angle, *symphysis pubis* circumference, hook width, pin width, pelvic depth 1, and pelvic depth 2. Longer aitch bone length was observed in steers when compared to heifers (5.9 and 5.6 in, respectively). In addition, an increase in pelvic length was observed in steers when compared to heifers (15.4 and 14.3 cm). Carcass weight had no effect on any measurements.

Pelvises exhibiting extreme shape and size variation were sliced into ¼-in slices using a band saw, either perpendicular or parallel (Figure 3) to the face of the aitch bone. Perpendicular slices exhibited changes in the width of the aitch bone portion, and changes in pelvic width due to accuracy of carcass splitting. Similarly, slices parallel to the aitch bone face exhibited changes in the shape of the aitch bone (curved vs. planar), and shape of the aitch bone ball (circular vs. oblong) due to accuracy during carcass splitting. As the split progressed laterally from the true pelvic midline, the shape of the ball became distorted changing from circular to oblong in nature. Similarly the angle of the aitch bone increased, becoming more planar. These data suggest aitch bone shape is influenced by accuracy of carcass split (Figure 4) and gender differences are reflected in the pelvic bone characteristics. Due to great variation in the shape of the aitch bone, it is not feasible to use the ball of the aitch bone as a suitable anatomical landmark for alternative carcass fabrication.

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