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Notes and Records

Weights and measures of lions*

Introduction

It is often important to know the weights of large mammals in the field. Studying food requirements, calculating energy budgets, or determining the dose rates of drugs administered all depend on knowing how heavy animals are. But it is not always considered possible or convenient to weigh them, even when they are immobilized and at the scientist's feet. Estimates of weight are made instead, and in the absence of calibration these may become extremely inaccurate. This note attempts to reduce such inaccuracies: first, by describing a convenient weighing system; second, by providing a rough calibration of weight against linear dimensions for lions; and third, by outlining a scale of visual estimates of stomach size for assessing the stomach weight of animals which eat rarely but hugely.

Weighing system

Weighing large animals does not necessarily require huge tripods, trees, spring balances and teams of assistants. I am grateful to Dr J. M. King for suggesting the use of bathroom scales for weighing immobilized lions. I carried six lengths of angle iron and four wooden planks 30 cm wide; all were 120 cm long, and so fitted conveniently into a small vehicle. These components could be bolted together in 4 min to produce a platform roughly 120 cm by 200 cm. This was placed close to the back of the immobilized lion, which was then rolled over onto it and pushed to the centre of the platform. A set of low flat bathroom scales was placed underneath each end. With the platform with lion then balanced on the two sets of scales, the reading of each scale was taken; their sum, minus the weight of the platform, gave the weight of the lion.

With this system, it was possible for me to weigh a lion of 200 kg alone and without assistance, and with a minimum of disturbance. A slightly larger platform with four sets of scales would enable one to weigh considerably heavier animals.

Weights and linear measurements

For lions immobilized or dead, I took measurements of length of head, body, tail, and limbs, and circumference of neck and chest. Some of these lions were also weighed, and I have tried to find linear measures, or derivatives of them, which would serve as reasonably reliable indicators of weight.

Limb measurements proved unsatisfactory since they were very unreliable except with completely relaxed animals; even then they were somewhat inaccurate and arbitrary. Body length or total length depended greatly on the posture of the animal; repeat measurements of the length of the same animal were not consistent. Head length

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and neck circumference were more consistent but were unreliable as indicators of weight. Chest circumference (heart girth) proved the best weight indicator; repeat heart girth measurements of the same animal were consistent with one another, and could be obtained from unrelaxed animals. Heart girth correlated moderately well with corrected weight, as is shown in Fig. 1.

A volume measure was also tried. The lion was considered to be cylindrical, and the calculated cross-sectional area of the chest multiplied by the body length was plotted against weight. This gave no better correlation with weight than did the heart girth measurement alone, and was therefore discarded as being a less convenient measure.

The curve in Fig. 1 shows that the weight of a lion can be deduced roughly from

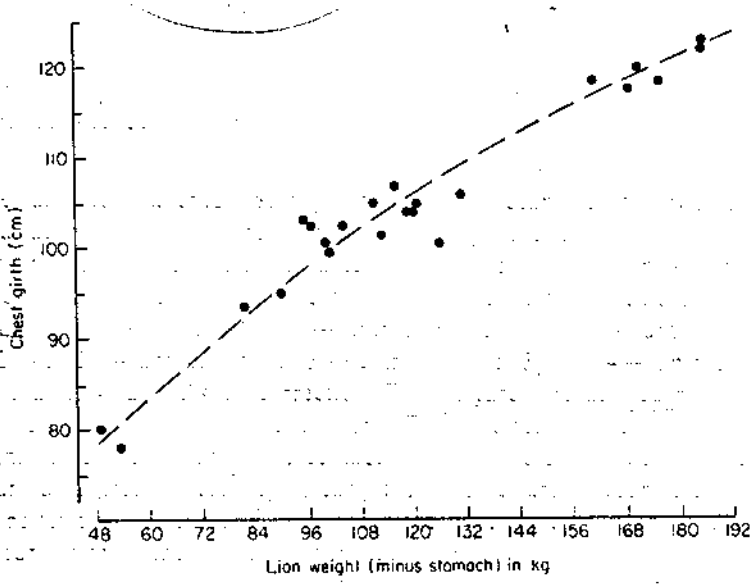

Fig. 1. The relation between heart girth and corrected body weight for twenty-three Serengeti lions.

its heart girth. This curve is intended to provide an approximate method of calibration only. One must expect lions to vary in shape, and therefore no single linear measure can possibly give an exact value of weight. However, with this curve as a starting point, it should be possible to get closer to a real weight figure for a given lion than would be possible by a visual estimate alone. Allowances can be made for condition, for very unusual shape, and for stomach size.

Stomach size

Lions can eat huge amounts of food at one meal; there are reliable reports of quantities equivalent to between a quarter and one-fifth of a lion's body weight being consumed within a very few hours. A lion with one-fifth of its weight in its stomach is considerably swollen. I made a rough visual estimate of the size of the stomach of each lion seen (including all those immobilized), and classified these on a 1 to 5 scale (Fig. 2). A lion with stomach Class 1 has an extremely distended stomach, greatly swollen sideways and downwards; it is unusual for it to be as full as this. Stomach 3 is average.

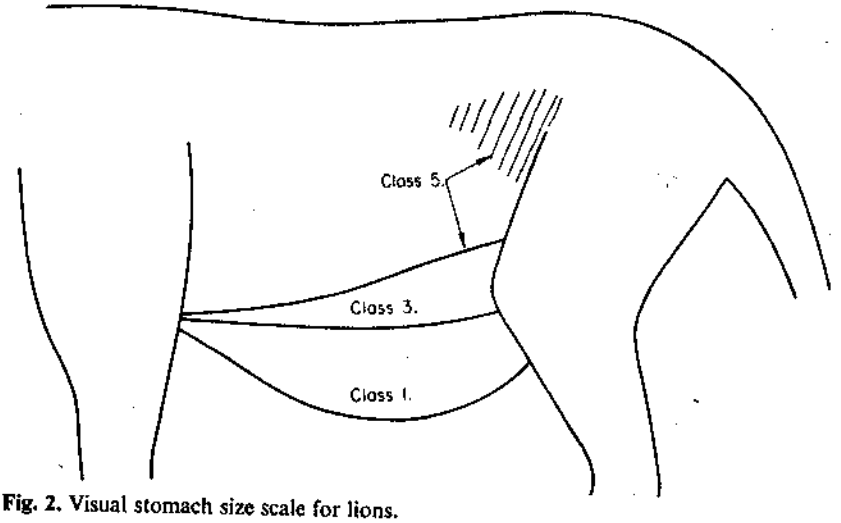

Fig. 2. Visual stomach size scale for lions.

or just on the full side of average. Stomach 5 is very noticeably empty, with a well-marked lateral depression in the abdomen just in front of the femur.

The weights plotted in Fig. 1 are the values of the weight of the lion (as obtained from the scales) minus the estimated weight of the stomach. I have used the following corrections. Lions with stomach Class 1—subtract 30 kg; Class 1½—subtract 25 kg; 2—subtract 20 kg; 2½—subtract 15 kg; 3—subtract 10 kg; 3½ and 4—subtract 5 kg; and stomach Classes 4½ and 5—no correction. These figures are derived partly from a few repeat weighings, partly from guesswork. They are reasonable only for adult lions. I felt that to express them as percentages of body weight would be to try to achieve a spurious degree of accuracy. Clearly these figures are inaccurate estimates, but they are better than no correction. Without these weight corrections, the points in Fig. 1 are further from the best curve through them.

The use of a rough stomach size scale for lions enables one to compare (albeit imprecisely) their food intake in different places or at different times, and to relate aspects of their movement, reproduction, and behaviour to their feeding.

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