

Addendum to Chapter 3

Measuring Flamingos

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Introduction

Morphological measurements of flamingos are used by WWT to ascertain differences in body size that can be related to differences in mating and reproductive success, and in condition and survival.

WWT has developed a guide to describe and standardize the terminology and methodology for various external linear measurements that may be taken from live flamingos under field conditions. The guide seeks to reduce the variation and the detail with which measurements are reported.

The WWT guide defines and illustrates those measurements, which have proven useful and practical for flamingos in captivity. With practice, all of the measurements can be taken from live birds quickly and humanely. The guide is largely based on that for measuring geese, developed by Duzbin and Cooch (1992).

What Measurements to Take?

The measurements that are useful for a study aimed at differentiating populations may be different from those needed to characterize the condition of the individual birds. Therefore, a researcher must decide how the morphometric data is to be used before deciding which measurements to record. In general, the researcher should aim to take a sufficient number of different measurements from each individual bird to characterize its overall structural size.

As a minimum, three hard measurements (see below) should be taken, since three dimensions are the minimum needed to define a 'geometric space'. Hard measurements are those of variables/characters, which do not change in magnitude within individuals as a function of age, length of time a bird is held, or when during the annual cycle the bird is measured. Typically, skeletal bones, such as tarsus are hard characters. In contrast, soft variables/characters can change significantly due to a variety of factors. For example, the body mass of the bird is significantly affected by the stage in the annual cycle at which it is measured: a bird weighed immediately after breeding may be significantly lighter than one caught immediately prior to spring migration.

Nevertheless, body mass is a soft character that is regularly recorded since it is easily measured and provides useful information on the condition of a bird. However, body mass alone cannot not be used as a measure of body size, as body mass will, in part, be a function of structural size. Additionally, body mass is more susceptible to short-term variations than other soft or hard characters, with, for example, variation attributable to handling time before weighing or time of last feeding.

For birds measured during their first year, all characters are soft because in flamingos there is significant growth of all characters during this time. Thus, comparisons of measurements are meaningful only if the age of the bird is known.

The WWT guide recommends that researchers attempt to measure at least the following characters:

Hard measurements
head length
total tarsus length
sternum length

Soft measurements
flat wing (a.k.a. wing chord) length
ninth primary length
body mass

This set of measurements can be taken from a bird in under three minutes.

This minimum set of measurements should be supplemented with as many other measurements as possible. The minimum set contains both hard and soft measurements. If time does not allow for the minimum set of measurements to be recorded, then only the hard characters should be taken. In general, the hard characters are more repeatable than the soft characters (with the exception of body mass, which is highly repeatable). This is because not only are soft characters more variable over time, but they are also more 'malleable' in hand - subtle variations in caliper pressure may cause considerable variation in the measurement. Despite the problems associated with measuring soft characters, there is considerable value in taking such measurements. Soft characters are often the most sensitive indicators of variation in the condition of a bird.

Basic equipment

Equipment needs include a set of digital or Vernier calipers, a steel rule for the linear measurements (long enough to at least measure the length of the ninth primary), and a scale (Pesola™, Salter™ or electronic) for body mass. The measurement board is useful for measurement of total length and flat wing (see the wing chord photographs for an example of an easily constructed measurement board). All equipment should be checked and calibrated against known standards prior to use in the field.

Definitions and Techniques

culmen: The chord of the upper mandible length, measured medially from the lowest point of the forehead at the midpoint of the upper bill, where the integument meets the horny portion of the mandible, to the distal tip of the bill.

bill-nares 1: Diagonal length of the upper bill measured from the anterior edge of the nostrils to the distal tip of the upper mandible.

bill-nares 2: Diagonal length of the upper bill measured from the posterior edge of the nostrils to the distal tip of the upper mandible.

bill depth: Diagonal depth of the mandibles from the lowest point of the forehead at the midpoint of the upper bill, where the integument meets the horny portion of the upper mandible, to the lower edge of the bottom mandible.

gape: The length of the upper mandible from the posterior end of the gape to the distal tip of the nail along the mouth line.

- total tarsus:** The diagonal distance from the posterior junction of the tibiotarsus and tarsometatarsus to the distal junction of the tarsometatarsus at the base of the middle toe.
- tarsus bone:** The diagonal length of the tarsometatarsus bone only, along the outside edge.
- mid-toe:** The length of the middle phalanx along its dorsal surface from the proximal articular surface at the juncture of the tarsometatarsus to the distal end of the toe at the base of the claw.
- nail:** Also known as claw. The length of the chord of the claw from its base to its tip. Fig. 11.
- wing chord:** The maximum measurement from the bend of the closed wing to the end of the longest primary, with the wing flattened and the longest primary straightened against a vertical border attached to the edge of the measuring surface. Fig. 12.
- ninth primary:** The total length of the outermost primary feather from the insertion of the remige calamus at the skin surface to the distal end of the feather (with the ruler placed between the 8th and 9th primaries). Fig. 13.
- sternum:** The length of the sternal ridge nearest the skin, including the skin and feather from the distal to proximal end of the sternum. Fig. 14.
- tail length:** The maximum length of the entire tail fan from the point of insertion of the calamus on the skin of the center rectrix to the tip of the longest rectrix (usually the third or fourth inward from the most lateral rectrix). Fig. 15.
- head length:** The length of the skull from the external occipital ridge (at the back of the head) to the distal tip of the bill nail (including skin and feathers). Fig. 16.
- total length:** The length of the bird from the tip of the bill to the distal end of the longest tail feather - usually the 3rd or 4th from the most lateral feather. This is measured with bird laid on its back on a flat surface. Fig. 17.
- body mass:** Mass in grams of the entire bird measured with spring balance or electronic scales. Figs. 18 and 19.

References

- Dubin, A. and E.G. Cooch. 1992. Measurements of Geese: General Field Methods. California Waterfowl Association, Sacramento, CA. 20pp