

TECHNIQUES

GETTING THE BALANCE RIGHT – WHEN LAST DID YOU CALIBRATE YOUR SCALES?

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"As I sit and write this, the feelings of total frustration are both overwhelming and completely indescribable. Under these circumstances the written word is in itself inadequate. After much deliberation, I have come to the conclusion that all previous monitoring of chick weights thus far carried out on Bird Island by me has been a waste of time and effort. Having spent the last two days trying to calibrate, or I should say, trying to determine the error in the old scales, I have now realised that these scales, with which I started out my projects, are beyond any calibration. They have no constant error due to corrosion."

Excerpt from the headman's diary on
Bird Island, Algoa Bay, 10 November 1992

As it stands, Safring requests few biological data from bird ringers when reporting their activities but in the fifth column of the Schedule 1 form, ringers are being asked to fill in the mass of the banded bird. Together with the rest of the data the values for the mass are incorporated into the national database and from there they may eventually find their way into handbooks of avian biology, as averages and ranges for a species. But how good are they and can we trust them? We should all be concerned about the quality of the data that we are submitting. Bird masses are therefore a weighty issue.

In everyday conversation, we often talk about the weight of a bird when we are actually meaning its mass. Mass is a fundamental property of any material object. It is a measure of the inertia of it being moved or accelerated. It differs from the weight of a body in that weight, being the

result of gravitational attraction, depends on geographical position, whereas mass is a non-varying property (except at speeds approaching that of light). Thus the mass and the weight of a bird are different and are measured in different units. The unit of the mass is the gram [g] but the unit of weight, which is a force, is the newton [N]. Fortunately, at the same geographical location the mass of a body is proportional to its weight, if the weight is determined by a spring scale. So, as long as we use the correct word 'mass' when reporting the result of our weighing to Safring, we need not worry too much about the difference between the two properties.

For field work the instrument of choice is the spring balance, as it is lightweight, of a space-saving design and doesn't run out of battery power when you need it most. You should buy the best brand that you can afford; the Swiss-made Pesola are the best. Their precision is astounding. Under maximum load they are accurate within $\pm 0.3\%$. In practice, this means that we can expect to obtain a reading within the interval of 98.7 – 99.3 g when the true mass of a bird is 99.0 g if we are using a 100g scale. However, this kind of accuracy can only be obtained if the rating of the scale is matched to the job it is expected to do. For the best result one should aim to have the spring extended at least half the way down the scale under load.

Flying birds range in mass over four orders of magnitude, from the smallest humming bird of about 1.5 kg to a Kori Bustard that weighs in at around 15 kg. Here in southern Africa most netters will get by with three ratings of spring balances (50, 200 and 1 000 g) for the determination of the mass of a bird that they have caught, unless they are handling large raptors, or are encountering scores of waxbills (Estrilididae) and small sunbirds (Nectariniidae), when higher or lower rated balances, respectively, are more appropriate.

Thankfully, the quality brand balances will take life's little knocks beautifully, and will give years of reliable service if looked after well. But here's the rub. If you don't want to end up like that despairing headman on Bird Island, who had to throw out all his data after spending months weighing penguin chicks, one needs to guard against two types of errors that can be encountered.

Firstly, the scale must be calibrated against a known set of weights. I suggest you take a few pieces of non-corroding metal, stainless steel nuts of different sizes for instance, have them weighed at a certified scale in a laboratory at your nearest university and then use these to calibrate your spring balances. With a Pesola spring balance, you do this by turning the marker on its thread inside the cylinder of the scale, up or down, until the correct reading is obtained. Don't forget to fix the marker position with the small nuts, above and below, when you are done. To give you an idea of the potential magnitude of such an error: one of my 30g Pesolas inherited from my senior was out by 15 g, that's 5% and constitutes a biologically meaningful difference.

The second type of error arises from corrosion and dirt. Sea salts and sand grains are the enemies number one. Drop your lightly-oiled balance in the dust and it will give erratic readings when the same object is weighed repeatedly, because the dirt prevents the free movement of the spring mechanism. Regular cleaning will readily prevent this kind of problem. It is good practice to check each one of the balances against your calibration pieces at the start of each ringing session.

Why weigh at all? Besides being a good descriptor of the age and growth of your bird, mass is probably most useful as an indicator of condition. Body mass fluctuates quite substantially (as much as 40% in some species, e.g. penguins) depending on the bird's breeding and moulting cycle. Migrants preparing for the long flight to their winter or summer quarters, lay down fat to use as fuel prior to their departure by eating high-calorie food, while resident species that suffer a regular seasonal food shortage, increase reserves of body-fat before that famine occurs. Without weighing we would not have such interesting insights into the biology of an individual.

