Digital kitchen-spoon scales: another instrument in the field herpetologist's tool-box?

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Getting an accurate and reliable weight of amphibians (and other vertebrate classes) when in the field is an important consideration for a number of reasons, including measuring the health and overall well-being of individuals (Orton et al., 2014). Weight can also be used as an indication of the age-class an individual belongs to (Brown, 1990), for individual recognition or species determination. A number of different methods have been used previously to weigh amphibians such as spring balances (Jennings & Hayes, 1985), sensitive dynamometers (Pereira & Maneyro, 2016) and digital scales (Orizaola & Laurila, 2009). However, there has been a shift towards the use of digital techniques due to their more accurate mass measurements (Deichmann et al., 2008). In this paper we present data that indicates that with the right application digital kitchen-spoon scales (often used in household applications) can be used in the weighing of amphibians. Previous to testing scales were compared to check their performance using a number of British sterling coins, each with its own known weight and a 10 g calibration weight. The scales did not differ when tested in ideal conditions (on a level kitchen worktop) and so the experimental trial proceeded.

In mid-May 2017, twenty-five smooth newts (*Lissotriton vulgaris*), 16 males and 9 females, were captured using dip-netting techniques from a site in Cambridgeshire, UK (TL399625), and placed in a temporary aquarium. For the first treatment, each newt was individually sexed before being weighed on both a set of digital scales (Metro Electronic MH-Series, 0.1 g accuracy up to 200 g) and then using a digital spoon (Technoline KW-120, 0.1 g accuracy up to 300 g). Both pieces of measuring equipment were bought from a local Maplin store and tared off periodically (when required) between the weighing of each newt. For the second treatment, the same procedure was followed but both the scales and the spoon were tared off and wiped dry of any water droplets before weighing each newt again (Fig. 1). After weighing twice all newts were released at the point of capture.

In the first treatment, there was no significant difference between the weights of the newts weighed (paired t-test, $t = 0.231$, $df = 24$, $p = 0.41$). The mean weight of each newt when weighed with the scales was 2.57 g (SD = 0.489) and 2.43 g (SD = 0.489) with the spoon. Likewise in the second treatment, the results were also not significant (paired t-test, $t = 0.39$, $df = 24$, $p = 0.35$). Again there was a small difference, the mean weight of each newt weighed with the

Figure 1. A male smooth newt being weighed with a digital kitchen-spoon

scales was 2.17 g (SD = 0.469) and 2.12 g (SD = 0.469) with the spoon. As expected for a sample using the same individuals with each replicate, standard deviations were similar. Comparing both methods to weigh newts in the field showed very little difference despite the precautions taken, this can easily be attributed to the degrees of error that each of the two pieces of digital equipment operates to, although this wasn't observed when we tested the calibration of both scales. There are clear differences in the mean weights between the two methods, showing the effects of excess water droplet building in potentially aiding to misrepresent weights. The small differences between the digital scales and the measuring spoon (which ranged from +0.1 g to -0.2 g) may also be explained by the movement of the newts when being sampled or the effects of outside disturbance such as the wind, as sampling was carried out in the field. The error of up to 0.3 g ranges between 8.75-20% of the overall weight of the newts sampled and may be due to the technique rather than the equipment.

Using the methods described above we have shown experimentally that digital spoons can be used to reliably weigh amphibians when in the field. Digital spoons have some additional advantages over scales but also limitations. Digital spoons are perfect for weighing smaller amphibians such as newts (e.g. *L. vulgaris* or *L. helveticus*) and smaller anuran species (e.g. *Alytes obstetricans*) and similar spoons have been used previously (e.g. Spitzen-van der Sluijs et al., 2017). Like digital scales, the best results are achieved when the spoons are placed on a level plane. Potentially small plastic containers placed on the digital scales may be as effective and may be more adaptable but spoons are a slim-lined self-contained unit that were originally designed to make measuring ingredients in the kitchen easier.

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Accepted: 14 April 2018