J. Field Ornithol., 70(1):101–103

WEATHERPROOF FIELD BOX FOR USE WITH A PORTABLE ELECTRONIC BALANCE

JAMES M. ZINGO
Massachusetts Cooperative Fish and Wildlife Research Unit
Department of Forestry and Wildlife Management
University of Massachusetts
Amherst, Massachusetts 01003-4220 USA

Abstract.—Use of an electronic balance instead of a hand-held spring scale can improve accuracy and precision of mass measurements in avian field studies. However, portable electronic balances are more cumbersome and require protection from the elements. I describe here an inexpensive, weatherproof field box for a portable electronic balance. A Rubbermaid® plastic file box was modified by adding a hinged plexiglass door with foam weatherstripping and a barrel bolt to one end, and a plastic dome and bullseye level on top. The resulting 1.2-kg box, weighing 3 kg including a 1.8-kg balance or 4 kg with a 1-kg ceramic floor tile added for stability in windy conditions, proved effective during three seasons of near-daily use in a tern colony.

CAJÓN INERME A CAMBIOS CLIMÁTICOS PARA USAR CON UNA BALANZA ELECTRÓNICA PORTABLE

Sinopsis.—El uso de una balanza electrónica envez de una pesola deuso manual puede mejorar la exactitud y la precisiión de las medidas de masa en estudios ornitológicos de campo. Sin embargo, las balanzas electrónicas portables son más delicadas y requieren protección de las inclemencias del tiempo. Describo aquí un cajón barato y a prueba de cambios climáticos para poder utilizar una balanza electrónica portable. Un cajón plástico Rubbermaid® se modificó al añadir una puerta de cristal plastico (plexiglass) con interiores de espuma plástica, una cerradura de barni en un extremo y un domo de plástico con nivelador de equilibrio en el lope. El cajón de 1.2 kg pesa 3 kg al incluír una balanza de 1.4 kg o 4 kg con un piso de lozeta cerámica de 1 kg añadida para dar estabilidad en condiciónes de vientos, se halló efectiva durante tres temporadas de uso casi diario en una colonia de aves del género *Sterna*.

To weigh eggs and chicks of Roseate Terns (*Sterna dougallii*) with greater accuracy and precision, especially in windy conditions, in 1995 my colleagues and I switched from hand-held spring scales to Acculab electronic balances (models V-333 and V-1200) for fieldwork on the Falkner Island Unit of the Stewart B. McKinney National Wildlife Refuge off the coast of Guilford, Connecticut. The principle challenge for using an electronic balance in the tern colony was devising a means of carrying it that would (1) protect it from light precipitation and fecal showers from the terns, which defecate in defense of the colony; (2) provide some shock-proofing if dropped on a rocky beach with often slippery or otherwise unstable footing; (3) provide stability and shelter under windy conditions; (4) allow quick and accurate levelling; and (5) allow efficient, repeated access for ease of use while moving from nest to nest and chick to chick. I describe here a weatherproof field box (Fig. 1) that addresses these needs and made a portable electronic balance practical for use in the field.

For the 1995 field season, I purchased a Rubbermaid® large plastic file box (approximately 19.75 × 30.5 cm at bottom, 23 × 33.5 cm at top, and

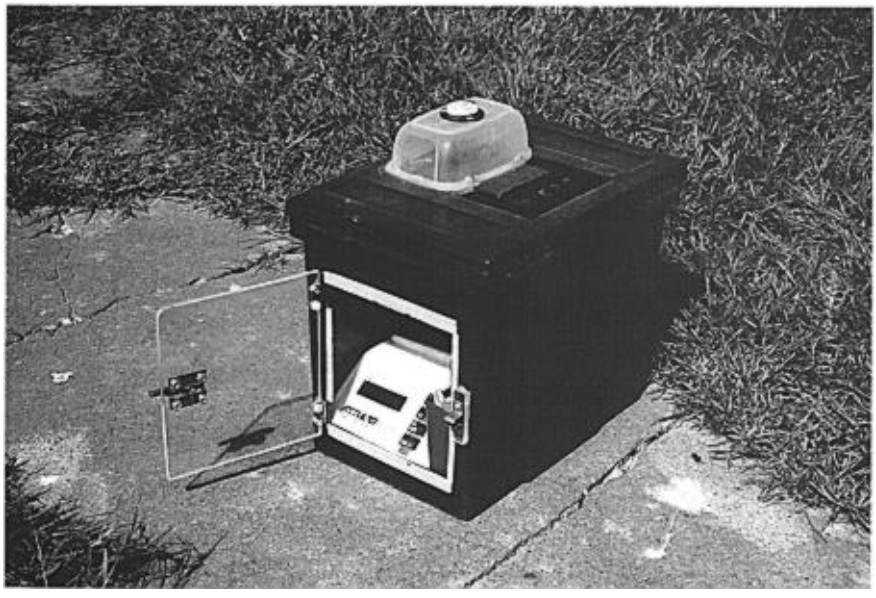

FIGURE 1. Weatherproof field box with electronic balance.

27.5-cm tall), which was lightweight but sturdy with a hinged top and carry handle. Because opening the top for each use of the balance was not efficient and also allowed wind, rain, and tern droppings to reach the balance, I cut a 14.5 × 15.25 cm rectangular opening in one end for easier access. The opposite end was faced into the wind or rain and thus the balance and weighing subject were mostly sheltered, although windy conditions usually necessitated placing rocks on top of the box to steady it. The box was levelled by eye and the mass of the holding cup was used as a check for accuracy each time the box was moved to a new location. Most of the time, chicks were weighed by placing them head-down in a tall narrow cup, which proved more effective than a short, broad container because the former restricted chick movement and better accommodated large chicks. However, when using a tall cup the wingtips and tails of older chicks pressed against the top of the box and affected measurements. We alleviated this problem by partially opening the top when weighing these chicks.

Although the box was adequate when used in the above manner, I made additional modifications for 1996–1997 (Fig. 1). To cover the access hole, I added a hinged plexiglass door (16 × 17.5 × 0.6 cm) with foam weatherstripping and a 5-cm barrel bolt for additional protection from the elements. With the door closed, the box could be oriented in any direction in any conditions and the LCD display read through the plexiglass. I also cut a small (6.25 × 11.5 cm) opening in the top and attached a transparent "dome" (0.3–l plastic food container) with screws and sili-

cone caulk to accommodate the wingtips and tails of large chicks. To minimize the need to place and remove rocks repeatedly to steady the box under windy conditions (a solution that might be rather difficult to achieve at non-rocky sites), I cut a 1 kg, 19.25 × 30 cm piece from a standard 30 × 30 × 0.6 cm ceramic floor tile and placed it on the bottom of the box beneath the balance. This sufficed on all but the windiest of days (for which a second piece of tile was sometimes added), and the entire setup was still light enough to carry during fieldwork (total mass of 4 kg including the 1.8-kg balance). Finally, although repeated trials at different tilt angles and directions (front, back, side) simulating potential human error indicated that accuracy was virtually unaffected by non-level placement after re-taring the balance (mean error = −0.2%, $n = 49$), I added a bullseye bubble level on top to make sure the balance could be quickly and properly levelled during use.

This weatherproof field box cost less than US $20, required only 2–3 h of labor, allowed efficient use of the balance, and proved durable over three summers of near-daily use. There was enough room inside the box to accommodate not only the balance and weighing containers but also additional equipment such as calipers, extra batteries, markers, and specimen bags. While this worked well for weighing tern eggs and chicks on a sparsely-vegetated beach, the basic design presented here can be customized for different species; balances, or habitats (for example, a smaller or narrower box might be more easily carried through densely vegetated areas).

ACKNOWLEDGMENTS

I thank the Stewart B. McKinney National Wildlife Refuge staff and the U.S. Fish and Wildlife Service for their support and permission to work on the refuge; numerous supporters of the Falkner Island Tern Project, including Patuxent Wildlife Research Center (formerly NBS, currently USGS/BRD), Little Harbor Laboratory, Fulton Foundation, Connecticut Audubon Society, Connecticut Chapter of The Nature Conservancy, and Connecticut Department of Environmental Protection; Jeffrey Spendelow, David Shealer, and numerous field assistants for providing feedback on use of the field box and balance; and Peter Capainolo, C. Ray Chandler, Douglas Faulkner, David Rosgen, Jeffrey Spendelow, and an anonymous reviewer for their helpful comments on this paper.