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AN IMPROVED WATERFOWL ENCLOSURE: CONSIDERING ANIMAL WELFARE AS A RESEARCH PRIORITY

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Abstract.—Large numbers of waterfowl are captured annually for research and temporarily held in a variety of enclosures that cause various degrees of stress, injury, and mortality. From concern about these consequences, we designed a portable, semi-rigid enclosure with opaque, vertical sides of vinyl coated nylon. The new design reduced stress and injury to the birds, and provided more efficient handling and data collection than wire mesh enclosures or nets. The design of any study that involves the capture of wildlife should consider the welfare of the animals.

UNA MEJORADA JAULA TEMPORERA PARA AVES ACUÁTICAS: CONSIDERANDO EL BIENESTAR DEL ANIMAL COMO UNA PRIORIDAD DE INVESTIGACIÓN

Resumen.—Un gran número de aves acuáticas son capturadas anualmente y retenidas por cortos períodos de tiempo en distintos tipos de jaulas que causan diferentes grados de tensión e inclusive mortalidad. Preocupados por estas consecuencias del cautiverio, diseñamos un jaula portátil con lados verticales de vinil, opacos y cubiertos con nilón. El nuevo diseño reduce la tensión y daño traumático a aves y provee de un manejo más efectivo y recolección de datos que aves encerradas en jaulas convencionales de alambre o de redes. El diseño de cualquier estudio que envuelva la captura de aves acuáticas debe considerar el bienestar de los animales.

In an effort to better understand their biology, large numbers of waterfowl are captured annually and held for banding and data collection before being released (MacInnes and Dunn 1988). While forethought has been given to improving and inventing more efficient capture methods, relatively little attention seems to be given the critical phase of holding waterfowl. Poor holding methods often have led to undue stress, injury, and death (Dzubin 1984). These undesirable consequences occur because waterfowl are generally held in large numbers for extended periods by devices that physically and emotionally stress the birds. Besides neglecting the birds' welfare, these devices are cumbersome for the researcher and can lead to ineffective data collection.

Typically, holding facilities are made of wood and wire mesh or netting. Alternatively, burlap bags may be used to restrain one or more birds. Known drawbacks of these devices include: tangling of bird limbs within

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netting and mesh; crowding of birds that results in excess trampling, physical exhaustion and thermal stress; abrasions to body, bill, and wings; loss of toe nails; allowing birds visual contact beyond confinement area, creating panic conditions; poor access to the birds by the researchers due to poor mobility; and bulkiness of the device, causing difficulty in handling, transport, and storage. These problems also cause avian mortality, an almost inexcusable occurrence for those involved in legitimate research.

Since 1967, the Swan Research Program (SRP) (Sladen 1973) has banded over 5000 Tundra Swans (*Cygnus columbianus columbianus*) in an effort to understand their migratory routes (Sladen 1973, Sladen and Cochran 1969) and feeding behavior (Munro 1981). Our objective was to test a prototype, used by the SRP, which reduced current problems associated with holding large numbers of waterfowl.

MATERIALS AND METHODS

The criteria for an improved enclosure were simple design, interchangeable parts, swift assembly, minimum expense, bulk, and weight, high durability; and, most importantly, safety for waterfowl. Preliminary designs were influenced by Buckminster Fuller (Marks 1960). The following descriptions of materials and assembly should be used in reference to item numbers corresponding with those in Table 1 and Figure 1.

Enclosure materials.—Tapered poles (#1) incorporate spring loaded locking buttons located 1.3 cm from the end opposite the taper. The taper is 12 cm long and contains a hole near the end for inserting a cotter pin (#5).

Non-tapered poles (#2) have two holes, one 12 cm from each end, to accept the locking buttons of the tapered poles.

PVC pipe (#3) has eight holes, four at the top and four more at the bottom. Each hole is 1.91 cm in diameter and accommodates the tapered poles. These holes are equally spaced around the corner post and are offset to allow clearance of the tapered ends from adjacent sides.

Sides of tent flooring (#4) have sleeves 6.4 cm wide sewn the entire length, at both top and bottom, to accept the side support pole assemblies (#1 and #2). Grommets are affixed at appropriate locations to accept shock cords (#7) for securing at corner posts. One of the four sides contains a zippered arch doorway, 1.07 m wide and 0.91 m high, for easy access.

Locking cotter pins (#5) are used to secure the side support pole assemblies.

Corner post anchors (#6) provide stability during set-up if fewer than three persons assemble the unit.

Enclosure assembly.—1. Unwrap the four sides (#4), each of which contains six poles (four #1's and two #2's).

2. Construct eight side support assemblies. Join #1 pole at each end of a #2 pole by depressing the locking button so that the #1 pole can be inserted inside the #2 pole, aligning the hole with the button until the button snaps into place.

3. Insert each pole assembly into the sleeves of the sides (#4).

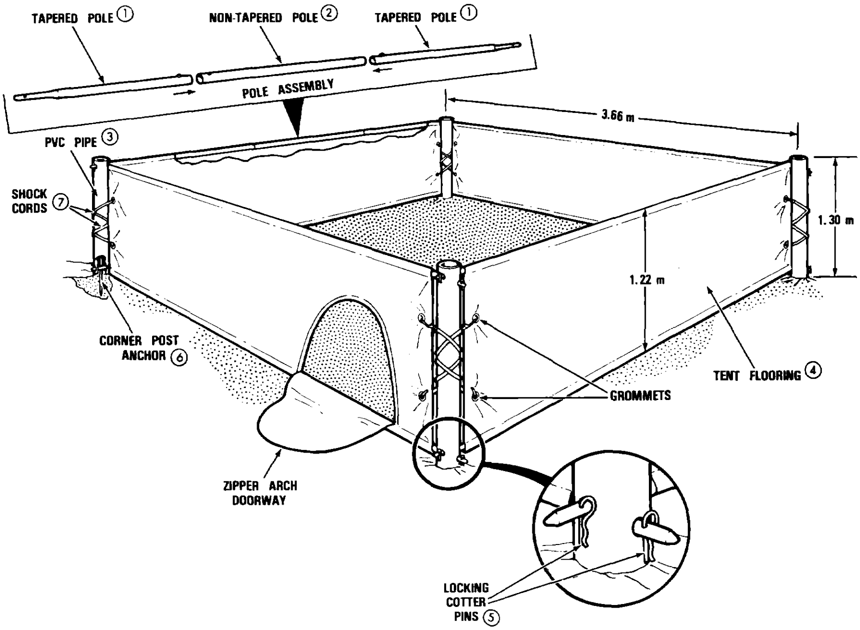

FIGURE 1. Field configuration of fully assembled enclosure with views of component materials (see Table 1 for description of numbered parts).

4. Select the best site within surrounding terrain, preferring a relatively flat (not necessarily level) uniform surface. Locate corner and place corner post vertically. (If necessary, install anchor for support.)

5. Select one side with pole assemblies and insert any tapered end through holes at bottom of corner post and insert cotter pin to secure.

6. Position the second corner post using the first corner post as a reference. The location will be in a direction and at a distance that allows insertion of the opposite end of the installed pole assembly into the bottom holes of the second corner post. Insert cotter pin to secure.

7. Lift remaining pole assembly of the side, aligning tapered ends with the corresponding holes at the top of the corner posts; insert tapered ends and secure with cotter pins. This completes assembly of one side.

Other sides are erected in this same manner, completing the enclosure and making it self-standing. For storage and transportation, all components are packed into one bundle that is roughly a cylinder, 1.3 m × 0.6 m, and has a packing volume of 0.37 m^3. The following describes other features of the enclosure: Total weight—29.5 kg, assembled dimensions—3.66 m × 3.66 m × 1.22 m, usable area—13.4 sq. m, cost—$500.00, and assembly time in minutes: 1 person 15–20, 2 persons 10–15, 3+ persons 8–12.

TABLE 1. Component materials of the enclosure.

Item	Dimension			Quantity
	Length	Width	Diameter	
*1. Tapered poles	1.39 m	—	2.22 cm o.d.	16
*2. Non-tapered poles	1.37 m	—	2.54 cm o.d.	8
3. Corner posts, PVC pipe	1.30 m	—	7.62 cm i.d.	4
4. Sides, 8 oz./sq. yd., vinyl coated nylon tent flooring	3.66 m	1.22 m	—	4
5. Locking cotter pins	5.00 cm	—	0.32 cm	16
6. Corner post anchors, metal rod	0.70 m	—	1.11 cm	4
7. Shock cords	0.80 m	—	—	8

* Hollow aluminum, 1.60 mm thickness.
o.d. = outer diameter.
i.d. = inner diameter.

RESULTS

Our enclosure has provided safe, temporary confinement for ducks, geese and swans. It has been tested in ten bandings of wild Tundra Swans at Mattamuskeet National Wildlife Refuge, North Carolina and on the South River, near Annapolis, Maryland and one catch of a variety of captive and pinioned waterfowl at the Wildfowl Trust of North America, a private wildlife sanctuary in Maryland.

A total of 214 swans were captured in seven attempts (average, 31/catch) in February of 1985, 1986 and 1987 at Mattamuskeet NWR. Swans were trapped using a rocket net on corn baited gravel and sand peninsulas. Following deployment of the net, the enclosure was transported to the site as four pre-assembled sides and remaining parts. Once on the banding site three sides of our enclosure were erected and slid under the net within five minutes. The birds were then herded into the area and confined by the three sides and the fourth side was added completing confinement.

Three swan captures totaling 119 birds (average, 40/catch; maximum 52) occurred on the South River in December 1985, 1986 and March 1987. Swans were caught using a corn baited water funnel trap, then herded into three sides of the enclosure set up on shore. The fourth side was added completing confinement. If smaller waterfowl are confined this way, a net may be needed to cover the top to prevent escape through flight.

Swans were removed from our enclosure one at a time. A swan "catcher" entered the enclosure through the zippered arch doorway, caught a swan, and handed it out the door to a swan "holder." The banding process was conducted as an assembly line operation: banding, sexing, aging, weighing, measuring, and photographing. Individual swans were then released to the wild. Our enclosure was disassembled and rebundled within 15 min following the removal of the last swan.

A total of 39 captive, pinioned birds were herded into the enclosure to examine and replace bands. This sample included the following species of ducks and geese: Greater Snow Goose (*Anser caerulescens atlantica*), Canada Goose (*Branta canadensis*), Atlantic Brant (*B. bernicla hrota*), Emperor Goose (*A. canagicus*), White-fronted Goose (*A. albifrons frontalis*), Black Duck (*Anas rubripes*), Gadwall (*Anas strepera*), and Redhead Duck (*Aythya americana*).

In 11 total uses of the enclosure, 368 birds were held (average, 33/catch). The specified objectives were realized: limb entanglement was eliminated; crowding and trampling were greatly reduced, facilitating thermoregulation; abrasions to body and wings were reduced and no toe nails were lost; lateral vision was confined to the area within the enclosure, greatly reducing panic; the zippered arch doorway provided easy access to the birds and internal mobility was ample for both birds and researchers. Finally, low bulk has enhanced the handling, transport and storage. All birds retained in our enclosure have been released to the wild, satisfying our most important goal: zero percent mortality.

The performance of the enclosure was excellent under varying conditions of terrain and weather, ranging from sunny conditions, 10 C with little wind, to below 0 C with 48 km/h winds. One test included successful operation in winds of up to 83 km/h. Careful examination of our enclosure after each use revealed no damage to it by the birds or from any other source.

DISCUSSION

Modifications to allow expanded applications have already been suggested and considered. Partitions could segregate birds within a single enclosure or multiple units could provide a series of enclosures forming a modular complex for very large catches.

The semi-rigid, vertical, smooth sides of the enclosure reduced injury to the birds by avoiding the tangling and cutting that occurs with enclosures made of net and/or wire mesh. Our system also permits the birds to stand upright which decreases soiling. In addition to minimizing physical stress, we observed less emotional stress.

Holding devices with net or mesh barriers do not confine the bird's lateral view, causing added confusion at what would appear to be escape routes. The birds frequently make a panicked rush in these directions when startled by the movements of banders, resulting in trampling and self-inflicted injuries. We feel the reduction in signs of stress with our enclosure can be largely attributed to the opaque sides that limit the birds' lateral vision. This reduced field of view appears to calm the captive birds. Such an effect is well known for other animals (e.g., horses, falcons) and we encourage further application of this concept to promote animal welfare.

We recommend use of this waterfowl enclosure because it minimizes stress and injury to captured wild birds.

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