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Comparing Live-Capture Methods for Nutria: Single-Versus Multiple-Capture Cage Traps

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Comparing live-capture methods for nutria: single- versus multiple-capture cage traps

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Abstract: Herbivory and burrowing by nutria (*Myocastor coypus*) cause substantial ecological and economic damage. Trapping is a common, effective practice for reducing nutria damage; however, trapping approaches must continually be adapted to keep pace with evolving animal welfare and ethical issues and to more effectively target pest species of interest. Our objective was to evaluate the efficacy of 2 nonlethal trap types for nutria: single-capture (SCT) and multi-capture (MCT) cage traps. We established 3 MCTs and 3 SCTs at each of 7 sites on a 10,500-ha mixed-use island located 15 km northwest of Portland, Oregon, USA. We pre-baited using carrots, apples, and sweet potatoes for ≥3 consecutive days before trapping. We checked traps daily, and an infrared motion camera was established near each MCT to document activity. We captured 26 nutria over 724 trap nights, and all captures occurred at 4 sites. Nutria captured by MCTs were larger (6.38 ± 1.68 [SD] kg, n = 10) than nutria captured by SCTs (4.21 ± 2.48 [SD] kg, n = 16; $F_{1,25}$ = 5.51, P = 0.02). Camera surveillance showed multiple nutria present in an MCT on ≥2 occasions, although individuals <3.7 kg were able to escape. The MCTs were more expensive, larger, heavier, and more difficult to transport and deploy. However, MCTs were less likely to capture nontargets. Improvements to MCT door design would likely increase multiple catch opportunities and decrease escapes.

Key words: coypu, invasive, *Myocastor*, nutria, trapping, wildlife damage

The nutria (*Myocastor coypus*) is a large, semi-aquatic, invasive rodent native to South America south of 23° latitude (Woods et al. 1992). Nutria were introduced globally over the last century for fur farming, and feral populations are now established on every continent except Australia and Antarctica (Carter and Leonard 2002). Non-native nutria populations in high densities cause substantial ecological and economic damage resulting from (1) herbivory leading to loss of wetland structure and function (Carter et al. 1999) and agricultural crop loss (Kuhn and Peloquin 1974), and (2) burrowing resulting in stream bank erosion, water control structure failure, and private property damage (LeBlanc 1994). Nutria damage has rarely been quantified on a landscape scale, but the economic impact associated with a growing nutria population in Italy is expected to increase to $11–15 million USD annually (Panzacchi et al. 2007).

Trapping is often a vital component of integrated pest management for vertebrates; however, trapping approaches must continually be adapted to keep pace with evolving animal welfare and ethical issues (Littin et al. 2004) and to more effectively target pest species of interest. Trapping is the most widely used nutria control method and has been shown to be a potentially cost-effective option (Bertolino and Viterbi 2010). Best management practices suggest 2 basic types of traps for nutria capture:

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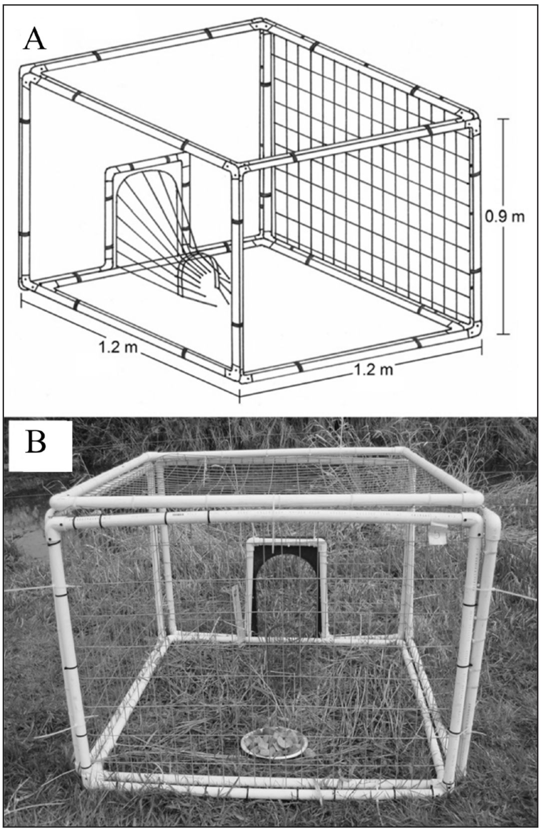

Figure 1. Nutria (*Myocastor coypus*) multiple-capture trap (MCT) depicted by (A) technical drawing with wire fencing only shown on 1 panel for illustrative purposes and (B) photo of constructed trap from rear; 21 MCTs were deployed at 7 locations on Sauvie Island, Oregon, USA, from March to April 2011.

foot-hold restraining traps and body-grip traps (Association of Fish and Wildlife Agencies 2006). Both are single-capture traps; body-grip traps are lethal and foot-hold traps are generally nonlethal. However, these methods are not ideal when nontarget issues (e.g., sensitive species) are a primary concern and are even illegal in some areas. Cage traps, another nonlethal single-capture tool, have also been used effectively in these situations for nutria control on a range of spatial scales and habitat types (Prigioni et al. 2005).

One potential tool that has been developed and undergone initial field testing (Witmer et al. 2008) is a nutria multiple-capture cage trap (MCT). The basic MCT design (Figure 1) consists of a semi-collapsible, polyvinyl chloride frame with galvanized welded wire fencing on all sides, and both the frame pieces and fencing are attached using heavy cable ties. The trap entrance consists of a metal frame welded to heavy gauge metal wire that creates a 1-way funnel. A complete description of the nutria MCT is provided by Witmer et al. (2008), although this trap has not previously been compared to other nonlethal trap types. Our objective was to compare the efficacy of the nutria MCT to a standard 2-door cage trap (SCT). The SCT used for comparison was a standard 2-door, spring-loaded cage trap measuring 91.4 cm long × 25.4 cm wide × 30.5 cm high (Havahart®, model #1045). We hypothesized that MCTs would capture more nutria and fewer nontarget individuals per unit effort than SCTs.

Trapping was conducted daily from March to April 2011 on Sauvie Island (45° 43′ N, 122° 48′ W), a 10,500-ha mixed-use island located 15 km northwest of Portland, Oregon, USA. Seven study sites were located on both private property and public land designated as a state wildlife area. We deployed 3 MCTs and 3 SCTs at each of the 7 sites, totaling 21 MCTs and 21 SCTs. We selected sites based on prior evidence of nutria activity and pre-baited sites prior to trap placement using carrots, apples, and sweet potatoes for at least 3 consecutive days. We checked traps daily, and an infrared motion camera was established near each MCT to continuously document animal activity.

We euthanized captured nutria using a firearm in accordance with euthanasia guidelines published by the American Veterinary Medical Association (2007). All native nontarget species were immediately released at the capture site. We recorded sex and body mass (kg) for all nutria. Animal capture and handling protocols were approved by the Portland State University Institutional Animal Care and Use Committee (protocol #: psu11.03.01.1) and were in accordance with Sikes et al. (2011). Trapping was conducted under a scientific take permit from the Oregon Department of Fish and Wildlife (permit #: 012-11).

Total catch-per-unit-effort (CPUE), defined as the number of nutria captured per trap night, for the study was 0.036. We captured 26 nutria over 724 trap nights, and all captures occurred at 4 sites. The MCT only had a single nontarget catch (opossum [*Didelphis virginiana*]), wheras the SCT caught numerous nontarget individuals: ≥11 (35 captures) muskrats (*Ondatra zibethicus*),

Table 1. Analysis of variance table for general linear model of nutria body mass (dependent variable) and trap type (independent variable); $\alpha = 0.05$.

Source	df	Sum of squares	Mean square	*F*-value	*Pr* > *F*
Model (trap type)	1	29.08	29.08	5.51	0.0274
Error	24	126.57	5.27		
Corrected total	25	155.64			

Figure 2. Camera surveillance capture of a nutria (*Myocastor coypus*) social group in the vicinity of a nutria multiple-capture trap (MCT) on Sauvie Island, Oregon, USA, in March 2011; infrared motion cameras were established at each MCT to continuously monitor animal activity from March to April 2011.

2 opossums, 1 skunk (*Mephitis mephitis*), 1 feral cat (*Felis catus*), 1 brown rat (*Rattus norvegicus*), 1 brush rabbit (*Sylvilagus bachmani*), and 1 songbird (species unknown).

We used SAS 9.4 (SAS Institute, Cary, North Carolina, USA) for statistical analysis at an $\alpha = 0.05$. We used PROC CATMOD to test if number of captured nutria differed by trap type, nutria sex, or an interaction of trap type and nutria sex; we found none of the models were statistically significant. We used GLMSELECT procedure to perform effect selection and determine which variables (trap type, site, nutria sex) were good predictors of nutria body mass. We ran forward, backward, and stepwise methods, and all came to the same conclusion that trap type was a good predictor. Next, we ran a general linear model of nutria body mass on trap type using PROC GLM and PROC POWER. Although power (0.494) and R-square (0.187) were low, we still observed statistical significance based on trap type (Table 1). Homogeneity and normality held for the general linear model. A post hoc Tukey test showed that nutria captured by MCTs were significantly larger (6.38 ± 1.68 [SD] kg, $n = 10$) than nutria captured by SCTs (4.21 ± 2.48 [SD] kg, $n = 16$).

The objective of the MCT to capture all size classes is important considering that nutria form social groups consisting of both adults and juveniles (Guichón et al. 2003). These social groups were regularly documented by camera surveillance (Figure 2), but the inability of the MCT to retain any individuals <3.7 kg limited its efficacy. The MCTs did not retain multiple animals on any occasions; however, camera surveillance showed multiple nutria present in an MCT at least twice. In both cases, at least 1 individual was a small nutria that escaped. One escape was through the funnel door and the other through the welded wire fencing. Full-size nutria escaped from MCTs on at least 3 occasions. One animal escaped through the top of the trap, another escaped through a bottom corner where a piece of welded wire fencing was broken, and the nature of the third escape could not be determined.

This study highlights current advantages and disadvantages (Table 2) of single and multiple-capture nutria live-trapping methods, and our results suggest that design modifications may improve the performance of the MCT. Large nutria were captured in MCTs with a funnel door diameter of 10 cm, so we suggest that the deployment protocol for the nutria MCT should include funnel diameter ≤10 cm. Other entrance designs (e.g., rotating paddle door, 1-way hinge door) also should be explored. Our observations support the conclusion of Witmer et al. (2008) that small animal escape is a primary concern for the MCT; however, design modifications to retain small nutria (e.g., smaller wire mesh size) may result in a corresponding increase in the capture rate of small nontarget species (e.g., muskrats).

Our MCT performance results differed somewhat in comparison to initial field testing in Louisiana, USA (Witmer et al. 2008). Our

Table 2. Comparison of observed performance and deployment advantages (+) and disadvantages (−) between the standard cage trap (SCT) and the multiple-capture cage trap (MCT); 0 indicates no demonstrated advantage or disadvantage.

	Trap type	
Performance	SCT	MCT
Multiple catches	Not possible (−)	Theoretical, but not demonstrated (0)[a]
Nontarget catches	Many (−)	None/few (+)[a]
Active period	Inactive after tripped (−)	Always active (+)
Animal escape	Low (+)	High for small animals (−)[b]
Size selectivity	None (+)	Nutria ≥3.7 kg (−)[b]
Deployment		
Cost	Moderate: $80 (+)	Expensive: $130 (−)[c]
Size/weight	Small: 3.5 kg (+)	Large: 20 kg (−)
Placement options	Most locations (+)	Relatively flat 2-m^2 area (−)
Initial placement	Low effort (+)	Moderate effort: 7–13 minutes (−)

[a]Increase may be observed if design modifications increased capture efficiency of small animals
[b]Decrease may be observed if design modifications increased capture efficiency of small animals
[c]$90 for materials + $40 for labor

study experienced a lower nutria CPUE (0.036 captures per trap night) than the CPUE reported in Louisiana (0.122), but it was within the reported range of other nutria studies (Bounds et al. 2003). The timing for our study may have contributed to the low trapping success. We conducted trapping in the early spring when vegetation was emerging, possibly making trap bait less attractive because of abundant natural food sources. Another difference was nutria size, as nutria captured in the MCT were larger on Sauvie Island (6.38 ± 1.68 [SD] kg) than in Louisiana (3.77 ± 1.34 [SD] kg). This is likely a result of smaller nutria in the Louisiana population due to high trapping pressure in Terrebonne Parish where Witmer et al. (2008) conducted their study (G. Witmer, USDA National Wildlife Research Center, personal communication). Finally, Witmer et al. (2008) captured multiple nutria on 3 of 18 trap occasions, whereas no successful multiple-capture events occurred in our study.

Our study compared the efficacy of the MCT to a standard cage trap for 1 species, but results have broad applications for vertebrate pest capture. While direct comparisons of trap performance at the intraspecific level for mammals are not common (Blundell et al. 1999), assessing potential trap biases in relation to the range of size classes for target vertebrate pest species is an important consideration. This is particularly true for eradication campaigns where the ability to put all reproductive animals at risk is needed for success (Bomford and O'Brien 1995). The ability of live traps to limit nontarget captures is also important because some mammals, such as beaver (*Castor* sp.; Arjo et al. 2008), can experience capture myopathy leading to acute or delayed mortality. Finally, continued development of new control methods, such as the evolution of the MCT, is crucial for effective control and management of vertebrate pests around the globe.

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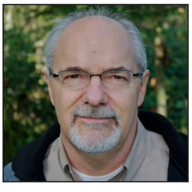

Jacoby Carter has been a research ecologist at the U.S. Geological Survey's National Wetlands Research Center since 1995. His research has focused in the areas of invasive species, population dynamics modeling, fire ecology, and submerged aquatic vegetation community ecology. He has a doctoral degree in wildlife management from the University of Massachusetts, Amherst; an M.S. degree in ecology and evolutionary biology from Cornell University in Ithaca, New York, and a B.S. degree in zoology and botany from the University of Washington, in Seattle, Washington. His current research focus in the ecology, impact, and management of giant apple snails (*Pomacea maculata*) in freshwater wetlands along the Gulf of Mexico Coast.

Jimmy D. Taylor is a supervisory research wildlife biologist and field station leader with the USDA National Wildlife Research Center. His research project is housed within the College of Forestry at Oregon State University in Corvallis, Oregon, where he is a courtesy faculty member. He has an undergraduate degree in forestry and wildlife management, a master's degree in wildlife science, and a Ph.D. degree in forest resources from Mississippi State University, where he also holds an adjunct faculty appointment. His research is conducted at the human–wildlife interface and focuses primarily on defining impacts and developing strategies to reduce wildlife damage in forest and rangeland systems. His research often includes overabundant species and species of concern.