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Tools and Technology

A Modified Night-Netting Technique for Recapturing Quail

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ABSTRACT Difficulties in recapturing radiomarked birds often prevent wildlife researchers from replacing transmitters and continuing to collect data over long time periods. We developed an effective, inexpensive capture technique for radiomarked mountain quail (*Oreortyx pictus*). Twenty-three of 25 mountain quail in south-central Idaho, USA, in 2006 and 2007 were recaptured for transmitter replacement. This technique will provide researchers with an opportunity to recapture relatively small birds, particularly those in dense vegetation, to help conduct long-term studies. © 2012 The Wildlife Society.

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Long-term monitoring using telemetry often is desirable to gain biological information (Seddon et al. 2007) or to evaluate conservation efforts for bird species (Armstrong and Ewen 2001), but restrictions in radiotransmitter mass (e.g., $\leq$4% of a bird's mass; Carrol 1990) limit transmitter longevity. Thus, long-term monitoring of individual birds entails recapture and replacement of transmitters. Targeting specific individuals for recapture can be difficult when using common capture methods, such as funnel traps (Hamerstrom and Truax 1938) and treadle traps (Winchell 1999). Some authors have described capture techniques that are capable of targeting individuals, in particular night-netting, a technique widely used on greater sage-grouse (*Centrocercus urophasianus*) and other species (Labisky 1968, Giesen et al. 1982, Wakkinen et al. 1992). Applying night-netting techniques to some avian species may require modifications to those already published techniques to accommodate distinct habitat and behavioral attributes.

Mountain quail (*Oreortyx pictus*) is a species of conservation interest because populations have declined throughout the Intermountain West (Gutiérrez and Delehanty 1999), particularly in Idaho, USA (Brennan 1990), and one for which long-term monitoring is important for restoration efforts (Howard 2003). We describe a modified night-netting technique used to recapture radiomarked mountain quail that allows for replacement of transmitters and long-term radiomonitoring of quail during a population restoration effort in south-central Idaho.

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STUDY AREA

We captured mountain quail in the Bennett Hills, Elmore County, Idaho (43°8′56.57″, −115°9′9.48″), an area encompassing 2,330 km^2. Elevation ranged from 900 m to 2,300 m. Vegetation at elevation >1,600 m included patches of quaking aspen (*Populus tremuloides*) and conifer forests intermixed with deciduous shrubs ranging from 0.5 m to 4.0 m in height. Conifer forests were dominated by Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*). Lower elevations (900–1,599 m) were characterized by shrub-steppe, which was comprised largely of sagebrush (*Artemisia* spp.) with an understory of primarily nonnative grasses. Vegetation communities across aspect and elevation in the Bennett Hills were diverse. Other prevalent shrub species included currant (*Ribes* spp.), chokecherry (*Prunus* spp.), serviceberry (*Amelanchier* spp.), and buckbrush (*Ceanothus* spp.). Steep canyons with riparian corridors consisted of a variety of deciduous trees and shrubs. Mean annual precipitation in the area was 37 cm and mean temperature was 8° C during this study (Western Regional Climate Center, Reno, NV; http://www.wrcc.dri.edu).

METHODS

All procedures of this study that involved capturing and handling mountain quail were approved by the Idaho State University Institutional Animal Care and Use Committee (Protocol no. 530-06-03). We equipped quail with necklace-style radiotransmitters (Model PD-2C, Holohil Systems Ltd., Carp, ON, Canada), which weighed 4.3–4.6 g. To avoid battery failure of transmitters on radiomarked mountain quail, we targeted quail that had carried active transmitters for 150–180 days. The average expected transmitter battery life was 180 days. We conducted

recaptures during the autumn months (01 Sep–15 Nov) of 2006 and 2007 and spring months (01 Mar–30 Apr) of 2007. Two-person crews located quail at night using Yagi antennas and receivers (Advanced Telemetry Systems, Isanti, MN). Crews traveled on foot and used small headlamps to navigate during the night. We generally located quail within small groups (range = 2–5 quail) and rarely located singles. To avoid flushing quail, we approached radiomarked quail while triangulating their location. When estimated distance to targeted quail was approximately 10 m, headlamps were turned off and one person searched for the quail using a 1,000,000-candlepower handheld spotlight (model S700, Garrity Industries, Inc., Madison, CT). Often, it was beneficial to use binoculars (8 × 32 configuration) and adjust the focus to distinguish quail in dense vegetation and detect a shine from one or both eyes. Mountain quail appear to remain roosting and motionless when targeted by the spotlight.

Once quail were visually detected, we extinguished the high-powered light and approached the quail with a capture apparatus that consisted of multiple components (Fig. 1). We illuminated the quail with a single 1,000-candlepower light (model QH-82YF, halogen [55 W], Optronics, Inc., Muskogee, OK), which was mounted to the base of a net rim attached to an extendable handle. The circumference of the rim of the net was 122 cm and constructed of 6-gauge galvanized wire. This malleable wire allowed the operator to bend the net perpendicular to the extension handle to capture birds that are roosting high or, if necessary, to modify the hoop by making it more ellipsoid so as to effectively penetrate thick vegetation. We secured the rim to the handle using a wrap of monofilament (pounds per square inch = 20 lb, Mega Pascals = 0.138) encased in 2-part epoxy glue. The net was 60 cm deep with a light mesh (3.8 × 7.0 cm; model R-24P, Ranger Products, Detroit, MI). The handle consisted of a modified 60-cm paint-roller handle (model Rollerlite, Quali-Tech Mfg. Co, Rancho Dominguez, CA) with an adjustable 2- to 4-m telescopic extension (model Standard Duty Extension Handle, Ace Hardware Corporation®, Oakbrook, IL). We modified the roller handle by bending the roller mounting apparatus to an angle of approximately 75° relative to the handle. We bolted the spotlight to the bent portion of the apparatus and powered the light via a 3.7-m extension cord. A sealed 12-V, DC battery (Power-Sonic Corporation, San Diego, CA) powered the spotlight and was carried in a backpack worn by the net operator. We extended the net slowly and quietly over the roosting mountain quail illuminated by the spotlight.

We trapped mountain quail during the new moon phase to minimize natural light during capture hours. We did not trap quail during nights of precipitation to avoid the risk of displacing quail in adverse weather. To prevent escape and injury after capture, we held birds in opaque, breathable cotton bags (26.8 × 27.3 cm) that were closed with a drawstring. Captured quail were fitted with new radiocollars and released at the location of their original roost site by placing the quail under thick vegetation in an effort to prevent flushing the bird, which could lead to unnecessary disturbance and influence movement patterns.

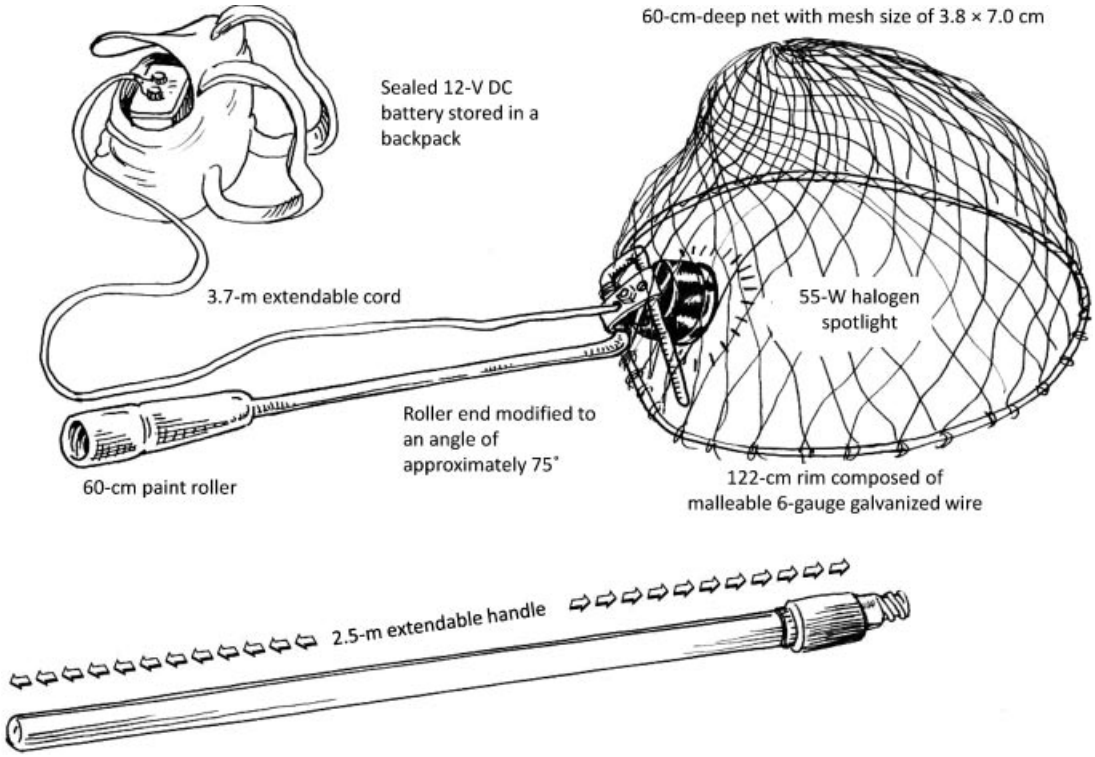

Figure 1. We recaptured mountain quail in south-central Idaho, USA, in 2006 and 2007 for transmitter replacement. The capture net consisted of sealed 12-V battery, 55-W spotlight, 4-m extendable handle, 60-cm modified paint-roller handle, and malleable 6-gauge wire net rim.

RESULTS

When first located at night, we observed 19 of 25 (76%) quail roosting on the ground and 6 of 25 (24%) quail roosting in above-ground vegetation. Four of six quail roosting above ground were in shrubs at a height of $\leq$2 m. The remaining 2 quail were found at heights of 2.3 m and 2.6 m in Douglas-fir trees. After detecting a radio signal from a target mountain quail, the amount of time to capture using this technique varied (range = 0.3–4.0 hr).

During 2006–2007, we successfully recaptured 23 of 25 (92%) mountain quail targeted for transmitter replacement. When the first netting attempt failed, we often were able to capture targeted birds on a second or third attempt within the same night because flushed quail frequently landed <30 m away, and in an area with less vegetation cover than its original roosting area. We captured 7 of 23 (30%) quail on the first attempt, 8 (35%) on the second attempt, and 8 (35%) on the third attempt. No more than one quail were captured per netting event. In addition to capturing radio-marked mountain quail, we incidentally captured 4 non-radiomarked yearlings and one adult that we observed roosting near targeted quail. No mortalities resulted from this modified capture method.

DISCUSSION

With increasing studies and conservation concern for threatened ground birds in both New World and Palearctic montane environments (IUCN 2009), this recapture technique may be useful when the study objectives require long-term data collection. Mountain quail are unusual among New World quail in that they frequently demonstrate a pronounced seasonal altitudinal migration (Gutiérrez and Delehanty 1999). The ability to track mountain quail as they make seasonal movements in response to environmental cues is just one example of valuable information that may become readily available by employing this recapture technique. Although night-lighting methods have been described previously (Labisky 1968, Giesen et al. 1982, Hernandez et al. 2006), past techniques focused on species such as greater sage-grouse and Montezuma quail (*Cyrtonyx montezumae*) that typically roost in relatively open, flat areas (Schroeder et al. 1999, Stromberg 2000). This technique provides a method to recapture individuals of species that occupy dense vegetation in steep terrain.

Our netting technique has several advantages. The spotlight mounted directly to the net minimizes illumination of the netter by positioning the light source away from the netter's body and allows a single individual to make the final approach to the bird. Traditional methods typically employ spotlights held by a second person near the netter (Connelly et al. 2003), which increases disturbance and the probability of flushing the bird. Second, the malleable rim allows adjustment of the shape of the net in a manner conducive to capturing quail in relatively thick vegetation or at high roost locations. Essentially, the targeted bird can be spotted and the net quickly shaped to suit the roosting location of the bird. Third, the extendable handle allows the netter to carry a short-handled net while moving across the landscape but then extend the handle length to accommodate situations where a longer reach is necessary. The equipment necessary for our method is inexpensive and the technique could be applied in areas with little technological and logistical support available. Although our method was developed specifically for mountain quail, it likely can be adapted for use on other species.

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