FIELD TESTING OF COMMERCIALLY MANUFACTURED CAPTURE COLLARS ON WHITE-TAILED DEER

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Abstract: We conducted 31 tests of commercially manufactured capture collars on female white-tailed deer (*Odocoileus virginianus*) in the Superior National Forest, Minnesota, under temperatures from −37 to 22 C. Deer were recaptured in 28 of the 31 tests; in the 3 failures, we remotely released the collars from the deer. Communication with the collars was achieved from up to 3.0 km on the ground and 26.5 km from the air.

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A radio collar was developed and tested in 1982 and 1983 that upon command of a coded radio signal would dart and drug the animal wearing it (Mech et al. 1984). Because each collar was individually handcrafted, the device was unavailable for general use. Since then, a commercial version, featuring additional functions, has been developed. We report on the field testing of the commercially produced collar.

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The commercial capture collar system, trademarked "Wildlink Data Acquisition and Recapture System," (2924 98th Avenue N., Brooklyn Park, MN 55444) includes (1) a computer-controlled radio transmitter/receiver collar with 2 1.5-cc darts, activity (mercury tilt switch) and temperature sensors, and a remote-control device for releasing the collar from the animal; and (2) a computerized, 20 W, direct current (DC) triggering transmitter and Yagi antenna used to control and interrogate the collar. (Mention of commercial suppliers does not constitute endorsement by the U.S. Government.) The activity data are stored in the collar and transmitted on command. The collar's signal can be turned on and off via the triggering transmitter or programmed remotely to turn on and off at preset times. The collar release mechanism is also programmed to activate if battery voltage drops too low for darting; the collar then continues to transmit a signal for approximately 2 weeks to allow homing and retrieval.

The 520-g collar is made of a molded polycarbonate and aluminum housing that includes the batteries, electronics, computer, and sensors. The collar was designed for capturing the same animal repeatedly, so batteries and darts could be changed, or if necessary, the entire collar could be replaced. Thus, we did not test the ultimate life of these collars. The darts are attached to a molded polyurethane belt that plugs into 1 side of the housing and is adjusted to an appropriate neck size. The biologist loads drugs into the disposable, molded acrylonitrile-butadiene-styrene darts and bolts the darts to the

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top of the belt in any of several locations. Once assembled, these collars can withstand prolonged direct contact with water without disrupting the system.

The triggering transmitter measures 34.3 × 15.3 × 7.9 cm, weighs 2 kg, and has a detachable battery pack (4 kg, 24 V rechargeable, DC). This transmitter, using an interactive menu that directs the operator to press numbered keys, sends unique coded radio signals to any number of collars.

METHODS

Thirteen adult female white-tailed deer weighing 41–78 kg were captured via rocket net or Clover trap between 1 February and 9 April 1989 in the Superior National Forest, Minnesota. Ambient temperatures ranged from −37 to 22 C. Each deer was weighed, blood-sampled, fitted with a capture collar, and released. Ten capture collars, 37 darts, and 2 triggering transmitters were tested; some collars were removed and reused on another deer. The darts each held either 150 mg of phencyclidine hydrochloride and 75 mg of xylazine hydrochloride in 50% propylene glycol as an antifreeze, or 375 mg of tiletamine and 375 mg of zolazepam in water.

In each test, we located the deer and signaled the collar to transmit the deer's accumulated activity, then repeated the procedure 5 and 10 minutes later. By comparing these cumulative counts, we determined if the deer was resting or active. Next, we signaled the collar to enable the dart mechanism, and upon receiving acknowledgment, we sent a signal to fire a dart. We then monitored the animal until it had been inactive for 5 minutes. If the deer did not become inactive within 15–30 minutes, and depending on what activity information was received, we fired the second dart. If the activity pattern did not indicate that the deer was anesthetized, we homed-in on the deer to confirm lack of anesthesia and then commanded the collar to release from the deer. Thus, at each test we homed-in on either the deer or the collar.

RESULTS

Thirty-one field tests were conducted at ambient temperatures of −25–22 C, and all collar functions worked each time. The darts were triggered from 60 to 2,000 m away (ground to ground), but 2-way communication with the collars was achieved from up to 3.0 km on the ground and up to 26.5 km in the air (1,545 m altitude). The collar's signal was detectable from 32 km (ground to air). Some deer were active during the tests, others were inactive as indicated by the activity sensors.

The longest time without human intervention between collar attachment and testing was 33 days. In this case the fired dart and electronic package were replaced, the unfired dart and the collar were placed back on the deer, and the old, unfired dart was then fired 17 days later. Thus, the dart had actually been on the deer 50 days before being tested. The longest an electronic package was tested continually in the field was 48 days.

Deer were recaptured in 28 of 31 tests even under low temperatures. In 23 tests, deer ceased activity from 4 to 30 minutes after the first dart was fired, sometimes within 3–10 m of their beds; in 5 other successful tests, we did not determine induction time. In 3 tests, both darts were needed to drug the deer. In 2 others we fired both darts but later determined that we had misread the activity data and that only 1 dart had been required for capture. In 2 unsuccessful tests, the deer were not drugged by either dart, but when we remotely released and retrieved the collars, we found that both darts had fired. In these cases the collar was attached too loosely. In the third unsuccessful test, a collar automatically dropped off 2 days after attachment because of a software problem. The program was changed, and the collar was used successfully.

Individual deer were darted via capture collars from 1 to 5 times, usually about 14–32 days apart. Those drugged with phencyclidine and xylazine were injected intravenously with 0.26 mg/kg of yohimbine to antagonize the xylazine (Mech et al. 1985). Deer drugged with tiletamine and zolazepam sometimes required an additional 50 mg of xylazine and later were injected with yohimbine, which resulted in rapid recovery. Activity data within 2 hours of release usually indicated normal patterns. In 2 cases, we flushed deer 4–13 hours after release, and they appeared to be running normally.

DISCUSSION

The electromechanical aspects of the Wildlink system operated flawlessly except for the collar that dropped off prematurely. Both drug combinations worked well. Most animals were anesthetized within a few minutes and, in our judgement, the recaptures were effected with less trauma, excitement, and stress than with conventional methods (G. D. DelGiudice et al. 1990). Even in the 2 failed attempts at recapture, both darts fired and expelled the drug. Presumably, the looseness of the collars prevented drug injection. In both those cases, the collar release mechanism worked as planned and dropped the collars from the animals.

The battery capacity of the capture collars remained sufficient throughout the tests and beyond. Preliminary indications are that the collar can function for at least 20 weeks while transmitting continually at 1 pulse per second. However, because the collar's signal can be turned off and on remotely when not in use, battery life should be considerably longer. In addition, batteries can be changed whenever the animal is drugged. The 10 collars used in these tests ran continually for up to 67 days, including the pretesting period, and then were shut down except when transmitting data or when activated for darting.

These tests indicate that the commercial version of the capture collar allows repeated capture and study of individual white-tailed deer at long distances under winter and spring conditions.

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