From the Field

Tooth extraction from live-captured mule deer in the absence of chemical immobilization

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Age-specific rates of natality and mortality are important demographic parameters (Caughley 1977). Accurate age data are essential for determining and modeling age of first reproduction, reproductive declines due to senescence, and population age structure and its effect on rate of increase (Nelson and Peek 1982, Van Ballenberghe 1983). Basic techniques to determine the ages of large, grazing mammals have included those based on tooth eruption (Deming 1952), tooth wear (Severinghaus 1949), or analysis of tooth cementum annuli (Laws 1952). Recently, Nelson (2001) concluded there are many advantages to the latter technique. A disadvantage of using cementum annuli to determine absolute age, however, is that an appropriate tooth must be safely removed from the study animal.

Extraction of teeth for age determination has been an ongoing practice among biologists working with caribou (*Rangifer tarandus*) (Bergerud and Russell 1966) and moose (*Alces alces*) (Ballard et al. 1991, Gasaway et al. 1992, Keech et al. 2000). Nonetheless, few references that provide technical details of the extraction procedure are available (Nelson 2001). Recently, Nelson (2001) described a method for extracting incisiform teeth from white-tailed deer (*Odocoileus virginianus*) that had been captured alive and then immobilized with a combination of xylazine hydrochloride and ketamine hydrochloride. We developed a similar technique and used it to extract canine teeth from mule deer (*O. hemionus*) that were not chemically immobilized before the procedure.

During March and April 2001, we captured 93 female mule deer in the eastern Sierra Nevada and 4 in the Sonoran Desert of California using a hand-held net gun fired from a helicopter (Krausman et al. 1985). In the Sierra Nevada, animals were manually restrained and transported to a central processing area; in the Sonoran Desert, individuals were manually restrained and processed in the field. Each animal was examined, blood samples were collected, and, in the eastern Sierra Nevada, we used ultrasonography to assess body condition (Stephenson et al. 2002) and fetal rates. Each animal was fitted with a telemetry collar.

About 5 minutes prior to tooth extraction, we injected 0.5 cc of 2% lidocaine hydrochloride (Phoenix Pharmaceuticals, Inc., St. Joseph, Mo., USA) in the gingiva surrounding a canine tooth to alleviate pain. Similar to Nelson (2001), we used a winged dental elevator to loosen tissue surrounding the root of the tooth, and dental forceps to remove the tooth from its socket. To hasten clotting, we

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Careful use of a tooth elevator likely minimized the possibility of breakage and contributed to the successful removal of incisiform teeth.

Dental forceps were used to extract the incisiform tooth following use of the tooth elevator.

placed a cotton swab in the socket for approximately 5 minutes. Deer did not exhibit overt evidence of pain and remained calm during the procedure. We administered Penicillin G Benzathine/Procaine (DuraPen; Vedco, Inc., St. Joseph, Mo., USA) prophylactically. No teeth were broken during the procedure, no deer exhibited pronounced bleeding, and all were released ≤10 min after the procedure. We believe thorough use of the elevator prior to extraction prevented breakage.

We have observed 85 of the 97 deer in the field and noted no debilities among them. Further, mandibles from 15 of 17 deer killed by predators or in accidents showed no evidence of infection. Moreover, during March 2002 we recaptured and examined 75 of the 80 surviving animals; all had healed appropriately. Chemical immobilization can place ungulates at greater risk than some other methods of capture (Kock et al. 1987). Thus, investigators planning to use cementum annuli for age determination of live animals may wish to use local anesthesia, rather than chemical restraint, prior to tooth extraction.

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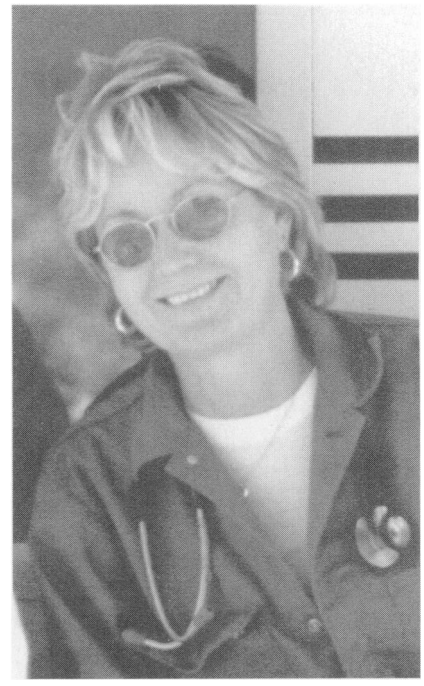

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