holstery material instead of elastic to equalize rates of deterioration of the straps.

Our data demonstrate the merit of the expandable drop-off harness as a technique to gather long-term information on juvenile bobcats. With additional testing and appropriate modifications, the expandable harness could be adapted to other carnivores.

Acknowledgments.—We thank M. W. Schlegel and V. F. Schlegel (deceased) for sewing the harnesses. C. E. Braun, H. S. Donoho, and F. B. Samson critically read the manuscript and offered advice in its preparation. M. P. Elkins, B. R. Motz, and D. C. Finch assisted in recovery of the harnesses from bobcats that had been captured by trappers. Funding for this project was provided by the Colo. Div. of Wildl. and the U.S. Fish and Wildl. Serv., Colo. Div. of Wildl., U.S. Fish and Wildl. Serv., Colorado State Univ., and the Wildl. Manage. Inst. cooperating.

LITERATURE CITED

BAILEY, T. N. 1974. Social organization in a bobcat population. J. Wildl. Manage. 38:435–446.

HALL, H. T., AND J. D. NEWSOM. 1976. Summer home ranges and movements of bobcats in bottomland hardwoods of southern Louisiana. Proc. Southeast. Assoc. Game and Fish. Comm. 30:427–436.

HAMILTON, R. 1962. An expansible collar for male white-tailed deer. J. Wildl. Manage. 26:114–115.

KARPOWITZ, J. F., AND J. T. FLINDERS. 1979. Bobcat research in Utah—a progress report. Proc. Bobcat Res. Conf., Natl. Wildl. Fed. Sci. Tech. Ser. 6:70–73.

KITCHINGS, J. T., AND J. D. STORY. 1978. Preliminary studies of bobcat activity patterns. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 32:53–59.

KOLZ, A. L., AND R. E. JOHNSON. 1980. Self-adjusting collars for wild mammals equipped with transmitters. J. Wildl. Manage. 44:273–275.

MARSHALL, A. D., AND J. H. JENKINS. 1966. Movements and home ranges of bobcats as determined by radio-tracking in the upper coastal plain of west-central South Carolina. Proc. Southeast. Assoc. Game and Fish. Comm. 20:206–214.

MECH, L. D., V. B. KUECHLE, D. W. WARNER, AND J. R. TESTER. 1965. A collar for attaching radio transmitters to rabbits, hares, and raccoons. J. Wildl. Manage. 29:898–902.

Received 6 January 1984.
Accepted 17 April 1984.

IOPHENOXIC ACID AS A SERUM MARKER IN CARNIVORES

GEORGE M. BAER, Viral and Rickettsial Zoonoses Branch, Division of Viral Diseases, Center for Infectious Diseases, Centers for Disease Control, P.O. Box 363, Lawrenceville, GA 30246

JOHN H. SHADDOCK, Viral and Rickettsial Zoonoses Branch, Division of Viral Diseases, Center for Infectious Diseases, Centers for Disease Control, P.O. Box 363, Lawrenceville, GA 30246

DAVID J. HAYES, Fish and Wildlife Service, U.S. Department of Interior, Denver Federal Center, Building 16, Denver, CO 80225

PETER SAVARIE, Fish and Wildlife Service, U.S. Department of Interior, Denver Federal Center, Building 16, Denver, CO 80225

J. WILDL. MANAGE. 49(1):49–51

Several laboratories have been involved in research on the oral immunization of foxes (*Vulpes* sp.) against rabies in attempts to control the disease in wild animals since 1962 (Baer et al. 1963, Baer et al. 1971, Debbie et al. 1972, Mayr et al. 1972, Winkler and Baer 1976). This control method was recently field-tested in foxes in a Swiss canton (Steck 1982), where tetracycline was added to the baits to identify the foxes by measuring the antibiotic in the dentine layer of the teeth (D. H. Johnston, pers. commun.).

An organic iodine-containing chemical known as iophenoxic acid (α-ethyl-3-hydroxy-2,4, 6-triiodobenzenepropanoic acid), used as a contrast agent in diagnostic X-rays, can be detected in the sera of animals ingesting iophenoxic acid-marked baits (Larson et al. 1981) by the elevated level of protein-bound iodine. We fed iophenoxic acid to red foxes (*V. vulpes*) and dogs to determine if the ingestion of this material, given via enteric-coated tablets, would result in detectable iodine levels in the blood.

MATERIALS AND METHODS

The treated animals included six red foxes, of both sexes, that weighed 4–5 kg, and six 1-year-old beagle dogs that weighed 15–18 kg.

Iophenoxic acid powder was made into pills

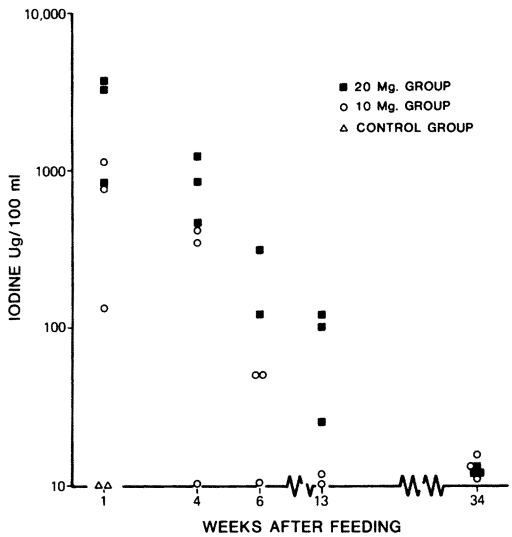

Fig. 1. Iodine levels in the sera of foxes fed one or two enteric tablets of iophenoxic acid (either 10 or 20 mg) along with levels in normal controls.

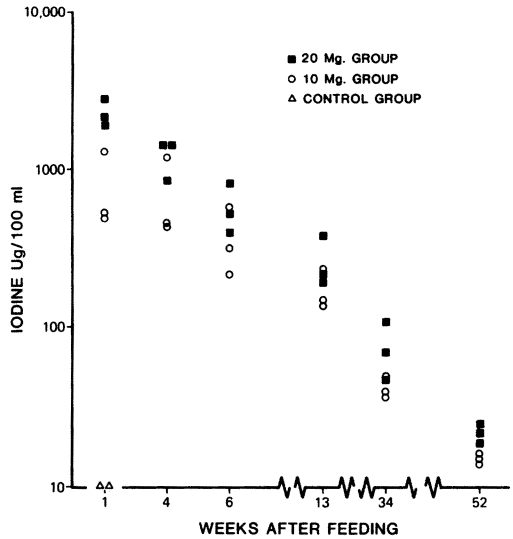

Fig. 2. Iodine levels in the sera of dogs fed one or two enteric tablets of iophenoxic acid (either 10 or 20 mg) along with levels in normal controls.

measuring 4 mm (10 mg of powder) using a pill-making machine with a suitable punch and die (Sharples-Stokes Division, Pennwalt Corporation, Warminster, PA 18974). The formed pills were enterically coated in a homemade coating apparatus, using a combined flow of compressed air (at 15 lb/in.^{3}) and hydroxypropylmethylcellulose phthalate (Shinetsu Chemical Co., Tokyo, Japan).

Either one (10 mg) or two (20 mg) of the coated pills were force-fed to the foxes and dogs. At 1, 4, 6, 13, and 34 weeks after feeding, all animals were bled from the saphenous veins into glass vials, and the serum was examined for protein-bound iodine as described previously (Larson et al. 1981).

RESULTS

The baseline iodine levels for red foxes had been determined previously as 2.0–5.0 μg/100 ml (Larson et al. 1981), and in two foxes we examined levels were 8.0 and 8.2 μg/100 ml. The levels 1 week after feeding two enteric tablets were 869–3,832 μg/100 ml, at 4 weeks 479–1,228, at 6 weeks 122–317, at 13 weeks 25–122, and 12–13 μg/100 ml at 34 weeks (Fig. 1). Those fed one pill had lower levels: 137–1,134 μg/100 ml at 1 week, 5–476 at 4 weeks, 7–53 at 6 weeks, 6–12 at 13 weeks, and 11–16 μg/100 ml at 34 weeks.

The baseline iodine levels for dogs were determined in only two control animals, and were 10.2 and 11.0 μg/100 ml, but in a later bleeding the levels in normal dogs were up to 12.2 μg/100 ml. The levels of iodine 1 week after feeding two enteric tablets were 2,080–2,929 μg/100 ml, at 4 weeks 885–1,455, at 8 weeks 402–819, at 13 weeks 207–391, at 34 weeks 47–110, and at 52 weeks 18–24 μg/100 ml (Fig. 2). In dogs given one pill, levels were 518–1,326 μg/100 ml at 1 week, 464–1,222 at 4 weeks, 223–588 at 6 weeks, 146–244 at 13 weeks, 39–50 at 34 weeks, and 13–16 μg/100 ml at 52 weeks. Fifteen normal dogs, bled after the foregoing studies were completed, had iodine levels varying from 4.6 to 12.2 μg/100 ml.

DISCUSSION

Iophenoxic acid previously fed to five species of wild carnivores was shown to induce high levels of serum iodine at least 6–8 weeks after feeding (Larson et al. 1981). Marked differences were found among the various species, with raccoons (*Procyon lotor*) having high levels of serum iodine whereas foxes often had amounts at the "predosage level" 8 weeks after feeding.

The present study confirmed the earlier work in showing rises in iodine levels in foxes with normal levels 6–13 weeks later; those animals

fed 20 mg rather than 10 mg, however, continued to have levels of iodine significantly higher than baseline levels 13 weeks later, whereas some animals given the 10-mg dose showed low levels even after 4–6 weeks.

The iodine levels in dogs rose to higher levels than those in foxes and remained high for longer periods. All the dogs fed the 20-mg dose and even those given the lower dose had levels far above base levels at 34 weeks, whereas at 52 weeks the levels in the three dogs fed the higher dose were approximately double the "normal" levels. These findings indicate that iophenoxic acid may serve as a serum marker for dogs or foxes fed rabies vaccine (or other vaccines) in the wild to determine how many pick up and consume baits.

LITERATURE CITED

BAER, G. M., M. K. ABELSETH, AND J. G. DEBBIE. 1971. Oral vaccination of foxes against rabies. Am. J. Epidemiol. 93:487–490.

———, S. B. LINHART, AND D. J. DEAN. 1963. Rabies vaccination of foxes. Annu. Rep. of the Div. of Lab. and Res., N.Y. State Dep. of Health, Albany. 145pp.

DEBBIE, J. G., M. K. ABELSETH, AND G. M. BAER. 1972. The use of commercially available vaccines for the oral vaccination of foxes against rabies. Am. J. Epidemiol. 96:231–235.

LARSON, G. E., P. J. SAVARIE, AND I. OKUNO. 1981. Iophenoxic acid and mirex for marking wild, bait-consuming animals. J. Wildl. Manage. 45: 1073–1077.

MAYR, A., H. KRAFT, O. JAEGER, AND H. HAACKE. 1972. Orale Immunisierung von Fuchsen gegen Tollwut. Zentralbl. Vet. Med. 19:615–625.

STECK, F. 1982. Rabies virology and control. Experientia 38:1361–1362.

WINKLER, W. G., AND G. M. BAER. 1976. Rabies immunization of red foxes (*Vulpes fulva*) with vaccine in sausage baits. Am. J. Epidemiol. 103: 408–415.

Received 11 April 1983.
Accepted 21 January 1984.

SERUM PROGESTERONE LEVELS AND REPRODUCTIVE STATUS OF INCIDENTALLY KILLED FEMALE DALL PORPOISES

JONATHAN L. TEMTE,[1] School of Oceanography, Oregon State University, Corvallis, OR 97330
SANDRA SPIELVOGEL, Department of Zoology, Oregon State University, Corvallis, OR 97330

J. WILDL. MANAGE. 49(1):51–54

The reproductive endocrinology of odontocetes requires much elucidation. Investigations of female reproductive cycles have typically relied upon the observation of the morphology and histology of the ovaries and uterus and the changes associated with ovulation, pregnancy, parturition, and lactation. The ovarian cycle has been described for *Lagenorhynchus obliquidens, Stenella graffmani, Delphinus delphis* (Harrison et al. 1969), *Tursiops truncatus* (Harrison and Ridgway 1971), *S. attenuata, S. longirostris* (Benirschke 1980), *Phocoena phocoena* (Fisher and Harrison 1970), *Phocoenoides dalli* (Newby 1982), and for two species of the river dolphins, *Inia geoffrensis* and *Pontoporia blainvillei* (Harrison and Brownell 1971). A review of the ovarian cycles of several species is provided by Harrison et al. (1972).

Due to the difficulty, expense, and public opposition to the collection of marine mammal samples in the field, most studies of steroid hormones in these animals have been conducted on captive or zoo/aquarium animals. Exceptions include study of the seasonal flux of testosterone in the Atlantic bottlenose dolphin by Harrison and Ridgway (1971) and the use of samples from *S. attenuata* and *S. longirostris* collected in the tuna purse seine fishery in the eastern tropical Pacific (Sawyer-Steffan and Kirby 1980).

The Dall porpoise (*Phocoenoides dalli dalli*) is distributed along the eastern, northern, and western rims of the north Pacific Ocean and south of the ice front in the Bering Sea. This

[1] Present address: Medical School, University of Wisconsin, 1300 University Avenue, Madison, WI 53706.