Toward a More Effective Coyote Lure

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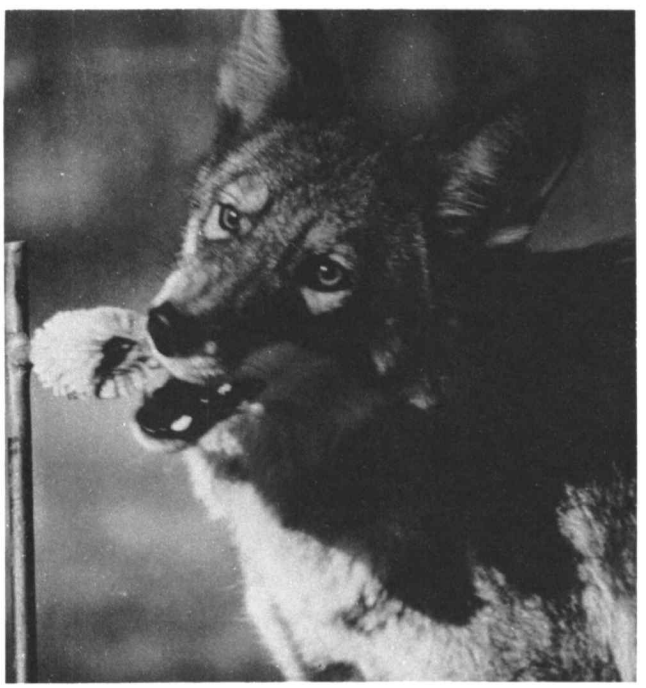
Olfaction (the sense of smell), is known to influence animal food-gathering ability, social interaction, and population regulation. However, relatively little is known about the influence of specific odors on animal behavior. There are questions concerning which odors induce specific behaviors as well as the amount and concentration of odors necessary to stimulate behavioral responses. More knowledge is also needed about how odors influence animals of different sex and age or how environmental conditions affect responses to odors. Such knowledge will improve our management of wildlife, particularly the manner in which we deal with wildlife-damage problems.

Odor attractants are used by fur trappers and damage-control specialists to attract animals to traps or other similar devices. In predator control, lures are used to attract carnivores to traps and M-44s[1] and potentially can be used for attraction to baits or devices containing toxicants or antifertility agents. In predator control, the lures must elicit specific behavioral responses such as chewing, licking, biting, or pulling. By assessing the behavioral responses elicited by various chemical compounds, lures can be developed which are both selective and effective.

Most odor attractants for carnivores are composed of a mixture of blood, animal organs, urine, and other similar constituents. Such mixtures are allowed to ferment before use. Numerous "recipes" for effective attractants have been circulated among trappers; however, the preparation of lures is more of an art than a science and often there is little consistency in their formulation. The variability in performance has caused a desire for synthetically derived lures. Synthetic lures would not require as much time and expertise to prepare.

In 1972, a joint-effort multidisciplinary team from USDA and University of California initiated chemical and behavioral studies to discover chemicals which evoke specific reactions from coyotes. Coyotes were selected because most predator-control efforts are directed toward them. Most of the investigations were centered on attempts to find which chemicals are associated with sex and food and how coyotes respond to chemicals isolated from such sources.

The testing procedure involved applying the test attractant to the exterior of a wool carpet piece wrapped around a steel post. The post was secured in a vertically buried pipe. Individual coyotes were released into a .25-acre test area through a remote control door and observed for 10 minutes from a blind. Between tests, the odor posts were cleaned and deodorized. New carpet pieces were used in each test.



Some odor attractants elicit biting behavior.

Coyote Urine as an Attractant

Although trappers have successfully used coyote urine as an ordor attractant for years, the chemical basis of its attractiveness was unknown. One of the first undertakings of the project was to identify the chemical components of coyote urine and to determine the behavioral responses of coyotes exposed to urine. It was found that coyotes spent as much as 2.5 times longer at some fractions of coyote urine than at whole urine. As the concentration of these fractions increased

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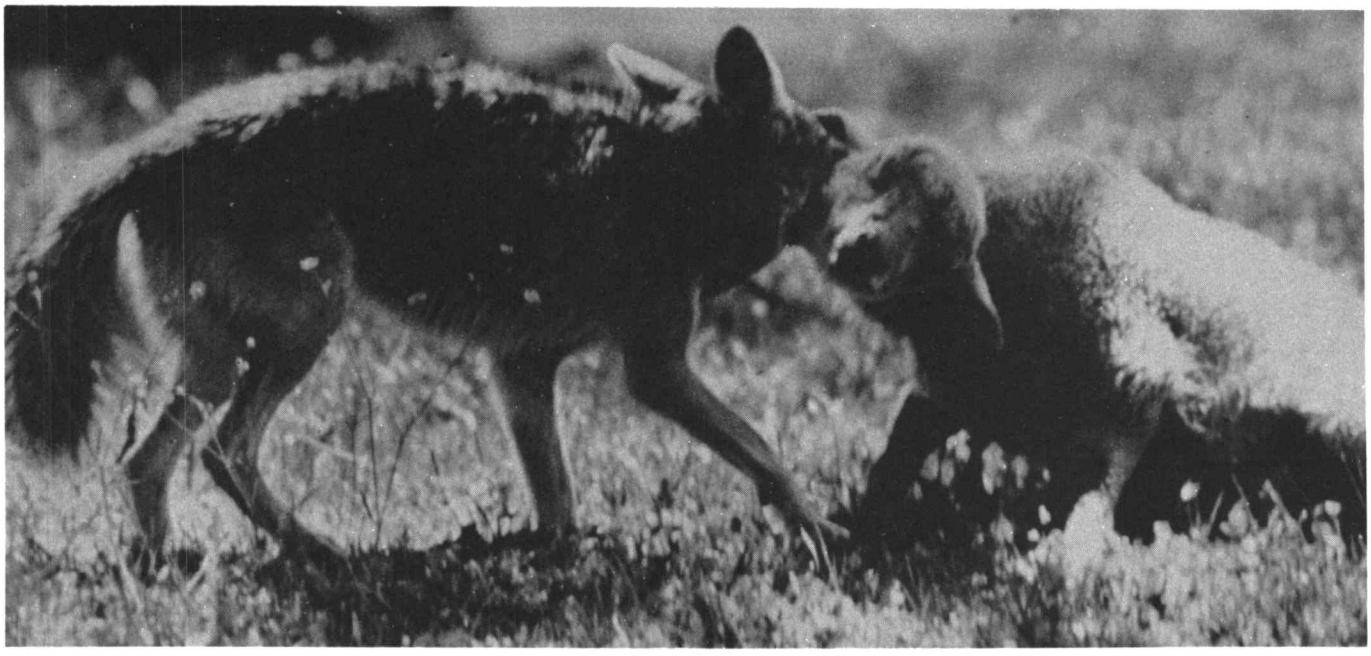
[1]When the baited capsule holder of an M-44 placed at ground level is pulled by a coyote, the spring ejector propels sodium cyanide into the coyote's mouth.



Sheep-killing coyotes must be controlled or livestock losses can be high. Photo courtesy of G.E. Connolly and R.M. Timm.

beyond their natural occurrence in whole urine, coyote interest in the odors also increased.

In another test, male coyotes were exposed during the breeding and nonbreeding season to odors derived from estrous and nonestrous-coyote urine. When coyote responses to both types of urine in the breeding season were compared to the nonbreeding season, coyotes spent less time at the nonestrous odors and more time at the estrous odors.

A Chemical Lure

One compound, trimethylamine (TMA), has been identified in the anal sacs of coyotes, dogs, and red fox, and in domestic dog urine. When this compound is combined with valeric acid, a constituent of coyote urine, the product is trimethylammonium valerate (TMAV). This compound proved to be highly attractive to captive coyotes. Because other compounds could also be combined with TMA, a series of tests was run to identify additional attractive compounds. One compound, trimethylammonium decanoate (TMAD), proved to be 4.2 times more attractive than TMAV.

Because of its superiority, TMAD was established as a standard against which other odor attractants were compared. The attractiveness of TMAD exceeded all other single-compound lures and most commercial lures. With TMAD, the coyotes spent a greater proportion of their time at odor posts licking and biting the odor samples, which are two important behavior factors for attractants for use with the M-44 and other techniques being developed for predator control. In addition, since TMA was not identified in domestic cat urine, there is reason to hope that animals in the cat family may not be attracted to TMAD to the same degree as coyotes. This, however, still needs to be determined.

Although TMAD has most of the characteristics Fagre et al. (1983) suggested ideal coyote lures should have, analysis of long-term data on captive-coyote responses to TMAD reveal a deficiency: the attractiveness of TMAD to coyotes appears to vary seasonally. Trimethylammonium decanoate was found to be most effective during the winter. Coyote responses to TMAD as influenced by environmental or breeding condition or some other factor is presently being investigated. Other lures may also vary seasonally in attractiveness to coyotes. Seasonal responses to odor attractants may explain in part the fact that trapping success varies seasonally.

Since the development of TMAD, many other odors have been evaluated. It was found that when sulfide compounds, such as methylbutyl sulfide and methylpropyl sulfide, were added to TMAD, the attractiveness of TMAD increased.

Some of the most promising odors presently being evaluated are found in liver extract. In one experiment, the attractiveness of liver extracts from sheep, pork, and beef was compared. Coyotes responded more to pork-liver extract than to either sheep or beef-liver extract; but since more is known about the compounds present in sheep-liver extract, a decision was made to further investigate its attractiveness.

Diluted sheep-liver extract was found to be more attractive than diluted TMAD but less attractive than undiluted TMAD. Undiluted liver extract is difficult to prepare so it is hoped that with continued testing the identity of key odors in liver extract will be determined so that extract lures could be chemically synthesized.

Summary and Conclusions

At present, TMAD and compounds related to TMAD continue to be the best synthetic attractants evaluated at the Hopland Field Station. Liver extracts are probably more attractive than TMAD and as attractive as the best commercially available lure but synthetic versions must be developed before they can be of practical use.

Field testing of TMAD-based lures is in progress. While it is

too early to make any definite conclusions about the effectivness of TMAD, the results appear promising. With continued research, it should be possible to develop odor attractants which are both safe and selective and which can be effectively used to resolve animal damage problems.

References

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Cost and Other Effects of Predation on an Angora Goat Ranch

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The Angora goat industry is an important part of the agricultural economy of Texas. In 1983, Texas had more than 90% of the Angora goats in the United States, with an estimated population of 1.1 million. In 1965, at the peak of the Texas goat industry, there were 4.6 million goats. Since that time goat numbers have steadily declined. A significant factor contributing to the decline of goat numbers has been predation, primarily by coyotes. Predation caused an estimated 73% of all goat and kid deaths during 1982 as compared to only 45% in 1967 (Texas Crop and Livestock Reporting Service 1983, 1979).

Little is known regarding the total economic impact of goat losses to predators. Most dollar estimates of predation impacts have considered only the cash value of livestock killed by predators. The purpose of this analysis was to identify and quantify costs and other effects of predation that generally have been overlooked.

Study Area

The study was performed on a ranch operated by Mr. and Mrs. L. Charles Howard, Jr., near Meridian, Texas. The Howards operate a small, diversified farm and ranch enterprise in Bosque County in the Grand Prairie ecological area. They produce small grains, hay, and pecans and raise cattle, Angora goats, and a small flock of sheep. During the study, the Howards managed goats on 12 separate pastures, most of which were leased lands. The vegetation is dominantly mid and tall grasses as well as scattered ashe juniper and mottes of live oak trees. About 80% of the soils are very shallow to deep, well drained and are underlain by limestone. The terrain is gently sloping to steep with a gravely or cobbly clayey and loamy surface layer. Principal land uses in the area include livestock grazing of tame pasture, rangeland, and cropland.

The cost of predation on the Howard Ranch was determined for a 3-year period beginning October 1978. Pastures containing Angora goats were usually visited on alternate days unless coyotes were known to be killing livestock, in which case pastures were visited daily. Goats were examined for injuries caused by predators. Vulture activity often was used to identify location of dead goats, including predator kills. Periodically the goats were gathered and counted and the pastures systematically searched on foot and from horseback for suspected dead and/or missing animals.

Predation by coyotes and other species as a cause of death was established from tooth puncture wounds in skin and bones, hemorrahage around tooth marks, and tracks at kill sites. Costs of predation were calculated from livestock loss data and other ranch records. For cost factors identified but not specifically measured at the Howard Ranch, evaluation is based on the literature.

Discussion

In comparison to 1979, predation losses on properties operated by the Howards were greatly reduced in 1980 and 1981 (Table 1). Confirmed livestock losses to predators reached a peak in 1979, when 106 animals valued at $10,690 were killed. Predators also killed or otherwise caused the death of an estimated 213 kids valued at $15,980. Thus, in 1979 total costs of predation exceeded total income from goats (Wade and Connolly 1980). By late 1979, intensive predator control by several methods, which included experimental use of 1080 toxic collars, reduced coyote numbers in the ranch vicinity and costs due to predation declined accordingly. In 1980, predation losses declined to 62 animals valued at $4,000, and in 1981, 92 animals valued at $5,280 were killed. In 1980 and 1981, total income from the goat operation exceeded costs of production and predation losses.

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