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A PROGRAM FOR DEVELOPING MALE CHEMOSTERILANTS FOR RED-WINGED BLACKBIRDS

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Red-winged Blackbirds (*Agelaius phoeniceus*) are one of the primary species of birds contributing to agricultural damage throughout the United States. Methods have been developed for reducing the damage they cause to ripening corn (De Grazio *et al.* 1971; 1972), sprouting corn (Stickley and Guarino, 1972), ripening rice (DeHaven *et al.* 1971), and windrowed peanuts (Mott *et al.* 1972). These methods frighten or repel Redwings from crops; however, in some situations, techniques are also needed to manage specific problem-bird populations by reducing their numbers.

At present, the primary methods for reducing large numbers of problem birds involve the use of chemical toxicants and wetting agents. These methods are often only temporary and, in this age of environmental awareness, generally are not accepted by the public. The proper use of avian chemosterilants for population reduction should be safer, more specific, and more acceptable; it could, in fact, be more effective. For example, Knipling (1959) showed mathematically that it was more efficient to control insect populations by sterilizing males than by killing them. Further, in territorial birds, if a sterilized individual continues to occupy and defend its territory, the breeding habitat is made less productive. With these advantages in mind, personnel of the Section of Bird Damage Control at the Denver Wildlife Research Center began to investigate the possibilities of reducing Red-winged Blackbird populations by chemosterilants in 1969.

When chemosterilants are considered for population reduction, one of the first choices to make is which sex to treat. The selection will depend not only on response to individual chemosterilants but also on species' habits. For example, many avian chemosterilants are effective only when given at a specific time in the reproductive cycle (usually during or just before the breeding season); and with migratory species such as the Redwing, this requires treatment of large numbers of birds over vast breeding ranges. For the Redwing, we concluded that the sex to concentrate on was the male. Territorial male Redwings are polygynous and sterilizing one male should influence the production of two or more females, and adult males are the easiest population segment to bait, particularly during fall and winter when they gather in large flocks and roosts. We have therefore concentrated our efforts on finding a chemosterilant that will sterilize male Redwings for at least 8 months in a single dose, that will not affect libido, that can be formulated in a well-accepted grain bait, and that is environmentally safe and potentially registerable. First, we have had to demonstrate that sterilizing male Redwings will actually result in population reduction.

These studies are being conducted in a four-stage program begun in 1970: Stage 1 in developmental work on candidate sterilants in the laboratory;

Stage 2, a test of the concept of using male sterility to control populations of Redwings; Stage 3, small-scale field tests of potential sterilants; and Stage 4, gathering ecological information on a large regional problem population of Redwings on which promising compounds could eventually be tested.

Stage 1 - Laboratory Studies

The first step in the laboratory was to determine if the Coturnix Quail (*coturnix coturnix*) would be acceptable for screening potential chemosterilants. Coturnix were chosen primarily because they have a rapid breeding cycle (6-8 weeks), their reproductive cycle can be easily manipulated by photoperiod regulation, and they are easy and inexpensive to maintain.

Tests were conducted to determine the effects of six chemosterilants on testicular growth and function in Coturnix males in different stages of reproductive development. Results showed that breeding adult males could be used to eliminate most ineffective compounds (Schafer *et al.* 1972) and that effective compounds could then be tested on males with regressed testes (to approximate the response during fall or winter).

The second step was to determine if the compounds that were the most effective on Coturnix would also be effective on Redwings held under laboratory conditions. Male Redwings with regressed testes were treated with one of the effective compounds, triethylene melamine (TEM), then artificially stimulated by photoperiod manipulation, and the growth and development of their testes were compared with those of the Coturnix males. Results showed that appropriate doses prevented sperm development and production in male Redwings through a 6- to 8-week stimulated breeding period (Mott and Schafer, 1973). Thus, it appeared that Coturnix males could be used to selectively screen chemosterilants that could eventually be used on Redwings.

The third step, now in progress, is to selectively screen candidate chemosterilants until a practical compound is found. To date, the Section has tested about 35 compounds with known chemosterilant activity for insects, birds, or mammals. Five of these have caused sterility in Coturnix males and will be tested in Redwings.

Stage 2 - Redwing Vasectomy Studies

These studies were undertaken to verify that it was feasible to use male chemosterilants for reducing production in breeding populations of Redwings. It was not known whether sterilizing a portion of the territorial males in a breeding congregation would lower production, because the females associated with a sterilized male could still be fertilized by other males. Therefore, different proportions of territorial male Redwings in Colorado marshes were surgically vasectomized in 1971 and 1972 and production measured in their territories (Bray *et al.* 1972).

The number of fertile clutches in territories of vasectomized males decreased, but not as much as expected. When 100% and 50% of the males in two marshes were vasectomized, 88% and 67% of the clutches of eggs laid

within the territories of the sterile males were infertile. In a third marsh where three males were vasectomized and seven normal males were breeding nearby, only 56% of the clutches in the sterile males' territories were infertile. In territories of control males all clutches were fertile. Thus, it appears that chemosterilants could be used to reduce problem populations of Redwings, but that a high percentage of males must be treated.

Stage 3 - Small-scale Field Studies

In this stage, candidate chemosterilants are tested on breeding Redwings in small marshes to determine their effects on production. Because dose level is one of the factors being evaluated (one criterion for a chemosterilant is one-dose effectiveness), the dose given must be known and the same for all birds in any group. This means that specific territorial males must be captured and orally dosed. This was a difficult and time-consuming task until a trap was developed for capturing territorial males with ease (Bray *et al.* 1973a).

Section personnel tested TEM on territorial male Redwings on a small breeding population in Colorado in the spring of 1973 (Bray *et al.* 1973b). They found that the chemical was ineffective in reducing production at the level tested (1.78 mg/kg), even though the same level had been effective in the laboratory. The exact reasons for the failure of TEM in the field are not known, but we suspect that either the dosage was too low to prevent or reduce sperm production or that the birds were dosed too late in their reproductive cycle. In similar studies conducted with C.P. Stone on a local population of Starlings (*sturnus vulgaris*) breeding in nest boxes, a slightly higher level of TEM (2.42 mg/kg) was effective in lowering production. All eggs were sterile in clutches from three nest boxes that were isolated from the main study area, and some eggs were sterile in some clutches from boxes in the main study area. These data are still being analyzed.

Stage 4 - Regional Redwing Population Studies

The final test of a chemosterilant is to determine if it is effective in reducing a large population of troublesome birds by reducing their productivity during the breeding season. This necessitates treating large numbers of birds. At present, the only practical way of doing this is to apply the compound to grain baits. Birds can then be baited either in feeding and staging areas adjacent to winter roosts or in areas where large numbers of birds are causing damage during late summer or fall. Because male Redwings are especially vulnerable to baiting, we feel that this method will be feasible.

Anticipating that a chemosterilant will be found that meets our criteria, the Section accelerated banding and marking studies in 1972 to gather movement data on a population of Redwings wintering in north-central Colorado. The objective was to pinpoint local breeding marshes in Wyoming so that the reproductive effects could be determined when the population was eventually treated. Although the Section had already gathered much information on this population through banding and marking over 45,000 birds in Colorado in the past 10-12 years, there have been only three recoveries in Wyoming during

the breeding season. In addition, only one Redwing has been recovered in Colorado from banding nearly 1,500 nestlings in Wyoming. It was obvious that answers were not being provided from continued winter banding, so it was decided to band and tag male Redwings on their breeding territories in Wyoming and search for them on their wintering areas in Colorado.

With the new trapping technique, 260 male Redwings were captured on their breeding territories in north-central Wyoming in 1972 and marked with coded, 3-inch-long yellow plastic leg streamers. In January 1973, 4 were sighted among 500,000 Redwings wintering in the Arkansas Valley near Las Animas, Colorado (about 450 miles southeast), and 4 more were seen among 200,000 wintering in the South Platte Valley near Milliken, Colorado (about 300 miles southeast). These sightings provided the first information to link specific local breeding populations in Wyoming with Colorado wintering populations.

In May 1973, 344 more territorial males were banded and tagged in Wyoming. We hope that a search for tagged birds this winter will provide additional information to tie the Wyoming breeding marshes to the Colorado wintering areas. During the trapping in Wyoming in 1973, 48 birds were recovered that had been marked in the same marshes in 1972, and 2 additional males were recovered that had been banded in the South Platte Valley of Colorado in January 1971 and January 1973. The large number of recaptures illustrates the tendency of adult male Redwings to return to the same marsh to breed. This information, coupled with the eight Colorado winter sightings, indicates that we will be able to define the Colorado-Wyoming population well enough for field testing a chemosterilant in the future.

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