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NEW MATERIALS FROM RESEARCH

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I have been asked to comment on new developments in research. This is rather difficult because normally the end product of research is publication of results and few researchers are willing to release information prematurely. Also, those who do the research should be the ones to report their findings.

Information on new compounds and techniques is continually coming out in technical journals. To avoid duplication, and because I don't want to steal anyone's thunder, I will describe our work in a general way.

At the Denver Wildlife Research Center our people are actively searching for means of controlling damage by a whole host of animal and bird species. I say controlling damage rather than controlling species because this should be the primary objective. If we can do this without lethal control, so much the better, and it may be the more lasting solution in the long run. Often removal of some animals by lethal means either increases reproduction, survival, or invasion unless complete control is exercised over sufficiently large areas. In spite of these problems, population reduction is often relied on as a means of controlling damage. And where lethal control is required, there is a definite need for continued improvement in agents and techniques of application.

In research we must explore all approaches; one such is antifertility agents. The principle here is that reproduction is the mainspring that overcomes all mortality factors. Logically, it appears that suppressing reproduction may be a very direct approach in control. We are working on this in both coyotes and rodents, but there is much to learn. For example, we must determine the complete reproductive picture in each target species to know where to attack reproduction. Second, we must find the best agents and how to effectively apply them. Third, we must be able to determine results and how populations respond. This has been the most difficult phase to date. We have not started this work in birds, but our sister laboratory for Eastern United

States at Patuxent, Md. has.

Antifertility agents are only one promising area. Another, heavily emphasized in the past is chemical agents, particularly toxicants. There are always inherent problems associated with chemicals in control. It isn't enough to prove that a given chemical will work in control; the safety of the handler, primary and secondary hazards, residues, and degredation products if any, also have to be thoroughly investigated.

It still provides a productive area, but the time lag in putting it to application is increasing greatly. We have hopes though after finding two highly selective toxicants that more can be discovered. These studies can be approached in two ways, one is the empirical approach, used in the past, of screening numbers of chemicals known or unknown. A newer approach is to first look at the behavior and physiology of the target species to identify the most vulnerable points in their makeup and then search for an agent or technique to interfere or block this action. We are involved in both.

Studies have been initiated in the physiology of starlings and redwings to determine first the normal functions and to search for potential areas of attack. This is already opening up new leads that will soon be reported in the literature.

One area of promise is using physiological measurements to evaluate fright producing stimuli in birds. Our avian physiologist, Dr. Thompson, is well along in these studies and by telemetering heart rate is able to quantitatively measure responses. This has important implications in being able to determine the most effective sound, chemical, or technique.

Another important area to speed up our understanding of damage problems and to be able to more accurately evaluate control methods is through electronics,--principally using telemetry to determine the behavior and movement of offending species and finally to evaluate control. Several of our projects have used this effectively by instrumenting certain rodents before a control trial and determining mortality and survivors afterwards.

It shouldn't be too long until this can be achieved in birds.

Research has progressed a long way the past five years, and it takes just about that long for results to begin to show, not counting the time for new methods to become accepted and widely used. It has taken five years of intensive work on the Sand Lake corn damage problem and the cattle feedlot problem to get them to their present state.

DISCUSSION

DR. GILTZ: You seem to have identical problems at Sand Lake with what we have in Ohio, except that possibly our corn crop is worth more. Much of it is run by smaller operators. We can grow more on 40 to 50

acre fields, and spend 10 to 20 dollars per acre on scaring devices. We can move them just like this. In a way, the farmers are at the end of the line. They have to be able to afford to spend this five dollars per acre on big fields, or stop raising corn. They frown on the idea of scaring birds into their neighbors. How would you justify this in Ohio?

DR. BALSER: This is one thing that we are trying to get away from.-- By testing on a large enough scale to see if we can move the whole roosting population out. We didn't know what would happen, that's the reason that we had to have such a large trial. The cost of this, I doubt, is as great as it appears. The farmers were paying 50¢ per pound for bait, and we figured one pound per acre and an average of three treatments, and as it came out this year many did not have to treat the second and third time.

DR. CORNWELL: Don, I wonder if the Denver lab isn't putting us on a very significant track to an opportunity which you haven't quite spelled out. If we think of the ear of corn as only one of many feeding opportunities in that field, and if we recognize that every blackbird learned to feed on that ear of corn, then we can recognize that with the proper avoidance stimulus we can break this tradition of learning to feed on corn so that the bird will move to other feeding opportunities. These chemicals in addition to the other things you mentioned, if they were used over a large enough area, so that every flock of blackbirds started eating ears, they would get a shock stimulus, I think that we have a chance here to break this learning tradition or unlearn them to feed on corn. This is carried over from year to year. The broader the area in which this is applied, and the more often that the birds are exposed to this shock stimulus, the less likely they are to continue feeding on corn.

DR. BALSER: You are right; this may prove useful. In fact, our people are experimenting with behavioral drugs which may provide this stimulus, frightening birds away for long periods of time. I think that we should go on to the film "Starlings in Feedlots:"

Sound Track

"Damage to agriculture in the western states occurs at animal feedlots. Starlings are responsible for most of this damage. Information from a partial listing shows that 103 counties in 12 states had feedlot bird problems. This film deals primarily with the research chemical means for starling-damage protection at cattle feedlots.

"Studies were conducted in a section of the South Platte River Valley north of Denver Colorado. During the winter of 1963-64, huge concentrations of birds generally create the

problem. These masses are generally formed during the post-breeding season, migration periods, and during winter. This marsh is one of three major cattail roosts in the valley which contributes to the area's feedlot starling problem. From the time of the first major snowfall and zero weather through March, the roost holds approximately 400,000 birds or roughly 25,000 birds to the acre. Thirty percent of which are starlings.

"Starting approximately two hours before dark, large flocks of birds put on spectacular aerial displays as the pre-staging, pre-roosting activity. The Wilhelm-Mancini feedlot is located approximately two miles north of Brighton, Colorado. It is situated on the tree-lined South Platte River. This is a major fly way used by many of the starlings and blackbirds which comprise the valley's winter population. This lot was the primary test site for DRC-1339 baiting trials. It contains forty cattle pens covering about 47 acres. Approximately 7,000 cattle are fed a ration containing 80% cracked corn and 20% silage through the winter. At the lot, water is available throughout the winter and is highly attractive to starlings.

"Adjacent trees along the river bottom serve as excellent escape and loafing cover for the birds. The combination of food, water, and trees creates favorable conditions for large starling populations. Lots without these features generally do not attract as many birds. The problems associated with starlings in feedlots are created primarily by the consumption and contamination of food and secondarily by the filth conditions caused by starling droppings in bunkers, waterers, fences, and buildings.

"Contamination of water is an important factor associated with the problem. Having blackbirds and starlings around is in itself a nuisance to the lot owners, and many detest the birds simply because of this nuisance factor. In this area some of the starlings that used the Wilhelm-Mancini lot chose to roost in a drive-in theater screen, created an additional nuisance by making the area unsightly with their droppings. However, the most important problem is an economic one. Major damage is caused by the starling in what it eats and fouls. They take about 50% of their feed from the cattle feed bunkers while redwings get only about 10%, preferring to feed on spilled grain in alleyways.

"In the laboratory, tests were run to determine the potential consumption and the amount of filth created by single birds. Single birds were placed in separate holding cages and offered equal amounts of food. Layena poultry pellets for starlings and cracked corn for redwings. After 7 days, the test disclosed that the starlings will consume 28 grams per day and the redwing 11 grams. It also showed that starlings create about five times as much filth as redwings.

"Additional tests in which 200 starlings and 200 redwings in large cages were fed equal amounts of food were conducted. After a two-day feeding period, the differences in the amount of food consumed and the amounts of droppings by the starling and redwings were outstanding. These differences occur because the starling has a poor feed utilization rating and assimilates only about 30% of the food it consumes. Based on food consumption studies, and the amount of time the birds spent eating at the feedlots, and price of the major food items eaten, it was estimated that it cost a feedlot operator approximately $85.00 to overwinter 1,000 starlings, while it cost only $2.00 to overwinter 1,000 redwings.

"A trapping, banding, and color-banding program was initiated at the Wilhelm-Mancini lot preliminary to baiting trials in early October. Approximately 1,000 starlings were banded and color-tagged at the lot to determine the extent of their movement and to aid in locating both their roosting sites and alternate feeding sites. Roost location was necessary in order to evaluate the effects of the slow-acting toxicant, DRC-1339. Two- and one-half inch tags were used at the test lot to identify Wilhelm-Mancini birds from birds banded at other locations in the valley. Birds banded at other feedlots were identified by four-inch tags.

"Roosting sites of the test-lot birds were determined by observations of the color-tagged birds and also by following the flightlines of birds from the lot in the evening. Color-marking proved valuable in pin pointing other lots and feeding areas that were used by the test-lot birds. A total of 14 known roosting areas were used by the birds before December 11th, when snow and zero weather forced the birds to shift from all satellite roosts into three major all-winter roosts. These had one thing in common: a deep bisecting water channel affording protection and warmth to the birds in winter. The roosts ranged in distance from the lot from one to 27 miles and radiated in all directions.

"In the lab, chemicals are administered orally to fasted starlings by intubation in water to determine toxicity levels, dosages, and concentrations. Acute oral toxicities are also determined for other species to assess the specificity of the chemicals. Once dosage levels are determined, DRC-1339 is prepared for treating poultry pellets. A solution of DRC-1339, water, and acetone was prepared by dissolving 45.4 grams in 500 ml acetone and 90 ml of water. This was then poured over 10 pounds of poultry pellets. At this 1% concentration, a starling would obtain a dose of approximately 8.8 mg/kg by consuming a single pellet.

"Before treating the pellets are shaken through a 6-mesh per square inch screen to obtain uniform size. A solution is poured over the screened pellets. They are then shaken thoroughly

to gain complete coverage then spread to dry.

"Treated baits were then mixed at various ratios with cracked corn and Layena crumbles. The untreated baits act both as a diluent to prevent nontarget species from obtaining a lethal amount of bait in the field, and as an additional attractant at the bait site.

"Dawn proved to be the most effective baiting time for killing starlings. The bait was spread and ready before the first starling arrived at the lot. This is most frequently the period of the day with least disturbance caused by normal feedlot operations. Bait was hand broadcasted in alleyways, pens, and on the manure mounds for most trials. Later morning baiting trials proved less successful.

"Birds on the bait site after baiting. Starlings prefer to feed in pen areas when they are firm and dry, they do not use them as heavily when they are muddy or filled with snow. Because DRC-1339 is a slow-acting starling toxicant, most birds are able to return to their respective roosts before they die. A minimum of 5,262 were killed in nine baiting trials at the Wilhelm-Mancini feedlot using 140 pounds of treated bait from November 4, 1963 through February 17, 1964. This kill represented 2,062 more starlings than the highest daily count of birds in the lot.

"A comparison of 1962-63 and 1963-64 peak starling population estimates at the lot showed 60% fewer starlings in the latter year. There was also reduction in the pretreatment population estimate of 3,200 by December 14th. This was attributed to major kill of starlings which used the lot in early morning. As this nucleus flock was reduced there was much attraction for wandering, late morning and afternoon flocks.

"One or any combination of three methods were used to calculate kills after each baiting trial depending upon the stability of the starling population and the accessibility of marsh roosts. In the first, collections of kills were made on line transects established in three major roosts. Kills at the drive-in were used only as an index. The peak number of starlings using the screen were only 1,400 in 1963-64 compared to 2,500 in 1962-63. The birds deserted this roost approximately one month earlier than in the previous year. This abandonment was probably caused by the numerous affected birds in the screen. Starlings found dead under trees along the flyways also served as an index to the kill. DRC-1339-killed starlings were identified by their dead posture in which breast and throat feathers are puffed out and the legs are pulled in toward the body.

"The second method used to determine kills was to incorporate a small percentage of a fast-acting toxicant, TEPP, in all

bait trials. TEPP kills starlings in 1 to 3 minutes, while it takes 12 to 48 hours for a starling to die from effects of DRC-1339. TEPP-treated pellets were mixed with DRC-1339 pellets in a 1 to 40 ratio and both baits were exposed in the same site at the same time. Thus for each TEPP-killed starling found on the bait site, 40 starlings were expected to be killed by DRC-1339. Starlings killed by TEPP cannot be confused by DRC-1339-killed birds because of their death posture: legs extended straight out in natural plumage conditions.

"The third method was to determine a reduction in the starling population in the lot by making counts once before, during and after baiting trials.

"Field observations coupled with laboratory data indicate strongly that little, if any, secondary hazard exists to avian or mammalian predators that feed on DRC-1339 killed starlings.

"Tests with another chemical, included the use of an experimental soporific, DRC-736, to discourage redwinged blackbirds from using a feedlot. In these trials, screened cracked corn was treated to contain 1.25% DRC-736. At this concentration, a redwing taking a single particle of treated corn would get a dosage of approximately 5.2 mg/kg. Fifty pounds of treated bait was mixed with 500 pounds of untreated, unscreened cracked corn in a cement mixer to insure a uniform mixture. This bait was used in two trials. A 25-pound capacity Cyclone lawn seed spreader was used to scatter the bait to get a more uniform distribution of the bait at varying densities. The bait was broadcast at dawn at approximately 0.5 pound per acre.

"Redwings that accepted treated bait became affected in 16 to 31 minutes. Most birds would remain immobilized for from 1-1/2 to 8 hours. Redwings collected after baiting were banded and released. Surviving birds apparently do not suffer any ill effects from DRC-736. This was indicated in 18 birds retrapped from 5 to 18 days and in one bird taken 14 months after capture by DRC-736 and subsequent banding.

"Seventy-four percent of the pretreatment population of 7,500 birds were directly affected during the two trials. Six days after the first trial, only 6.7% of the peak population present at the initiation of the trial remained in the lot. After the second trial, there was an immediate reduction in the redwing population, and only 300 birds remained in the lot. There were 90% fewer birds in the lot for a one-month period after baiting.

"The redwing mortality rate was 15% for the trials. Mortality was heavier on females than males because of the differential weight between the sexes. This mortality is probably increased by predation on affected birds. DRC-736 shows high potential as an area repellent for redwings, however with

inclement weather and periodic snowfall, repeated baitings may be necessary to keep birds away from an area.

"Tests conducted with DRC-1327, a chemical frightening agent [Avitrol, Ed.], also shows high potential for discouraging starlings from utilizing feedlots. This lot was baited with 2% DRC-1327 treated poultry pellets. Starlings taking these baits would fly in towering erratic circles while emitting distress calls. Approximately 10% of the starling population is killed and the rest of the birds are frightened away by the rest of towering birds which are constantly emitting distress calls.

"Amplified distress calls used at feedlots to frighten birds require use of special equipment. A weather-proof equipment box set up at the lot contains an amplifier, tape deck, continuous playing tape cartridge which is turned off and on by a timing device, and a thermostat which controls two light bulbs to provide heat within the box. Temperatures are recorded from a thermometer. Each unit supplies sound to two sets of speakers per cluster. Speakers face in three directions for maximum coverage and are on posts approximately 600 feet apart.

"In trials at one lot, the hunting call of a marsh haw, distress calls from a starling, redwing, and brewer's blackbird were played intermittently to frighten the starlings from the lot. These calls reduced a starling population of 5,000 by 80% during the trials.

"The winter trials end as spring rapidly approaches and the starlings prepare to migrate to their summer homes from Colorado to Canada."

End of Film: "Starlings in Feedlots."

DISCUSSION CONTINUED

DR. JACKSON: Anything else to say, Don?

DR. BALSER: No, only that this film also needs updating because the past years control was aimed at population reduction. The population was reduced from 300,000 from down to 40,000 as baiting techniques were improved.

DELEGATE: What is your finished percentage for DRC-1339 bait?

DR. BALSER: One per cent. The dilution of the treated grain is varied depending upon the situation.

DR. GILTZ: Why have you not continued your reduction of this population?

DR. BALSER: Baiting was continued as long as was practical. The remaining 40,000 proved to be extremely difficult to bait, and may be feeding directly out of bunkers or away from the feedlot. This is also the only close field test area to Denver and we wished to see if the population recovered to use as a test area this coming winter and save certain roosts to use as a source for laboratory birds.

J. STECKEL: What's the explanation of using dilution baiting to protect nontarget species?

DR. BALSER: Dilution baiting offers a number of advantages. First, it saves on toxicant since one kernel is lethal, there is no point in overdosing many birds with 10-15 lethal doses; it also aids in uniform and thin spreading of lethal bait; prevents undue concentration of toxic bait; the untreated portion serves as an additional attractant and most important it reduces the chance of mortality among larger birds. By adjusting the dilution rate, it is possible to satiate the appetite of a pheasant, for example, before a lethal dose is obtained. In penned tests, our biologists have killed starlings without killing pheasants while both were feeding on the same bait due to differential toxicity and body weight.

J. STECKEL: How about a smaller bird?

DR. BALSER: A smaller bird such as a mourning dove has little differential in body weight so all you can rely on is differential toxicity. Areas where mourning doves frequent should be avoided as bait sites, however we haven't worked out suitable baits or techniques to use where mourning doves are present.