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HIGHLIGHTS OF BIRD CONTROL RESEARCH IN ENGLAND, FRANCE, HOLLAND, AND GERMANY

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The purpose of this paper is to present a brief review of the research being conducted in England, France, Germany, and The Netherlands on problems caused by nuisance and depredating birds. Much of the information presented has been obtained through correspondence with collaborators. In the fall of 1962, I discussed depredating bird and bird-airport problems with research workers in these countries, and also attended the meeting of the International Union of Applied Ornithology held in Frankfurt/Main. In November 1963, I attended an international symposium about the bird-airport problem, held in Nice, France. This paper will draw attention to the current research which I think will interest American investigators, but will not report every aspect of the foreign investigations. Details appear in the publications that are listed.

CROP DEPREDATIONS PROBLEM

England

The main research effort on bird control methods in England is carried on at the Infestation Control Laboratory of the Ministry of Agriculture, Fisheries, and Food. My information about the program in England has been obtained through discussion and correspondence with research biologists E. Wright and T. Brough, and the research station director, H. V. Thompson. Thompson estimates that $60,000 is being spent each year on bird-control research in England.

Birds considered nuisances or serious crop depredators *are,* in order of importance:

Wood Pigeon (Columba palumbus) - Damages immature and ripe cereals, especially wheat, Cruciferae, and to some extent clover.

Bullfinch (Pyrrhula pyrrhula) - Damages fruit buds, gooseberries, apples, and pears.

Starling (Sturnus vulgaris) - Damages fruit, particularly cherry orchards.

Carrion Crow (Corvus corone) - Attacks ewes in labor and newly-born lambs. This damage is not economically great but it is exceedingly irritating to farmers,

Rook (Corvus frugilegus) - Damages cereals.

A number of other species can be a problem from time to time, but the depredations are not often economically important, e.g., oyster-catchers (Haematopus ostralegus) catch cockles, mute swans (Cygnus olor) and geese (Anatidae) graze riverside meadows.

Research projects currently in progress in England include extensive work which has been underway for almost 10 years on the biology of the wood pigeon. Population ecology, breeding biology, movements and migration, food habits, and control methods are being studied. Control methods research includes investigations of the effectiveness of the destruction of nest and young during July and September, and of the use of stupefying baits. Other current research projects are studies of the bullfinch, including investigations of the biology of the species, the effectiveness of live trapping, the extent and costs of damage, the use of chemical repellents, and the relationship of bird density to food supplies. Trapping methods and the use of stupefying baits are being studied for feral pigeons (Columba livia), house sparrows (Passer domesticus) and the carrion crow. Broadcast distress calls are also being studied as a means of repelling starlings.

Several crop protection measures are now employed in England with varying efficiency. Extensive trapping is recommended for bullfinches. A great deal of shooting also is done, but Thompson considers it to have only a small effect on bird numbers. As a scaring method, however, shooting can be highly effective. Thiram-based chemical repellents are used by some fruit growers with limited success against bullfinches and sparrows. A viscous product named "Scaraweb" is placed on gooseberry bushes with some success, and strawberries and similar fruits are covered with ordinary string netting. A plastic gel called "Scarecrow Strip" is used on buildings to deter starlings and feral pigeons from roosting. Broadcast starling distress calls have been used with limited success in orchards and in woodland roosts. English research workers agreed that using distress calls at a starling roost is rather futile after the birds have arrived at the roost. Their technique was to play the distress call as starlings first began to enter a roost. The loudspeaker was directed (sometimes hand-held) at incoming flightlines of starlings. The distress call usually was used on several consecutive evenings before starlings would abandon a roost. Shell crackers and regular shotgun ammunition were tried at one roost, but the starlings did not leave until the distress call also was used. Other nearby potential roost sites were protected during roost removal operations. The English research workers agreed that the smaller a roost area, the better the chance for a successful repelling operation. Starlings usually were observed roosting in the most dense stands of trees, and birds came from as far as 30 miles.

The English also have used radar for estimating the number of birds in a starling roost. They compared the echo on a radar screen from one starling to the "angel rings" that flocks of birds made as they flew from roosts in the morning. The radar estimates were fairly close to counts made by ground observers.

The British are limited by law in their use of poisons and drugs for bird control. Landowners cannot use these agents, and they must rely on legal means, such as shooting and certain forms of trapping. Under the Protection of Birds Act, 1954, only the Minister of Agriculture and Fisheries, or, in Scotland, the Secretary of State, may issue licenses under the Second Schedule* of the Act for killing or taking of wild birds with poison or stupefying baits. In urban

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Cormorant (Phalacrocorax carbo); carrion crow; hooded crow (Corvus cornix); domestic pigeon; goosander (Mergus merganser) - in Scotland only; great black-backed gull (Larus marinus); herring gull (Larus argentatus); jackdaw; jay (Garrulus glandarius); magpie (Pica pica); red-breasted merganser (Mergus serrator) - in Scotland only; rock dove - in Scotland only; shag (Phalacrocorax aristotelis); house sparrow; sparrow hawk (Accipiter nisus); starling; stock dove (Columba oenas); and wood pigeon.

areas, some commercial pest control firms and local authorities have been licensed to use stupefying baits against feral pigeons and house sparrows, but in rural areas licenses to use these baits against wood pigeons have been issued only to Ministry personnel (this work is still experimental).

The only drug now used against harmful birds is alpha-chloralose. This chemical is used in various baits, mainly wheat, against feral pigeons, house sparrows, and wood pigeons. Thompson reported that the drug also could be used against carrion crows and gulls, but that only a little work had been done on these species. The usual method is to prebait for some time and then use bait treated with alpha-chloralose (1.5 to 2.0 per cent by weight of bait-- 1.5 per cent by weight is about 2 ounces of chloralose per 8 pounds of bait). A mineral oil sticker is used with dry baits, but no sticker is required with bread. Captured birds are humanely killed with carbon tetrachloride. Protected species accidentally drugged are caged until they recover and then are released.

The English recognize that bird damage sometimes may be alleviated by certain cultural practices. They recommend that brush be cleared on the perimeter of orchards where bullfinches may congregate, and that growers avoid fruit varieties that are highly susceptible to bird damage. Delayed pruning of gooseberries is widely practiced.

In the opinion of the English researchers, landowners spend little on protective measures, other than the cost of the millions of cartridges that are fired at wood pigeons and other Schedule 2 birds. Intensive protective measures by some individuals growing high value crops may run about $28 per acre.

France

Bird damage control research in France is conducted by the Institut National de la Recherche Agronomique. R. G. Busnel, Director of the Laboratoire de Physiologie Acoustique, and J. Giban, Director of the Laboratoire des Pet its Vertebres, have been leaders in this research and have been the source of much of the information presented. An estimated $30,000 is being spent in France for bird damage control research this year.

Both the species causing damage and the damage are increasing. The depredating birds in France, in order of importance are:

Carrion Crow and Rook - Damage cereals, pears, and apples.

Starling - Damages grapes, cherries, some vegetables, and cereals.

English Sparrow - Damages cereals, table grapes, and sunflowers.

Bullfinch, Great Tit (*Parus major*), Blue Tit (*Parus caeruleus*), and other bud eaters - Damage fruit trees.

Wood Pigeon - Damages Brassicaceae - rape or cabbage seed.

Woodpecker (*Picidae*) - Damages fruit orchards.

The French are emphasizing research on acoustical bird-distress signals and their practical application to agriculture. They are interested in fundamental research on the semantics of a signal, its physical characteristics, species inter-specificity, and in the type of equipment required. They seek the basic factors in the efficacious signals, particularly for the Corvidae and starlings. Studies of the fundamental behavior of Corvidae and the English sparrow also are being conducted. The French have no research on new methods for lethal control.

Present crop protection in France is based almost solely on the use of bird distress calls. The French techniques are the result of 5 years of experimentation, and they claim that cropland can be efficiently protected against rooks, jackdaws (Corvus monedula), and carrion crows for periods of 2 weeks.

The French have observed an inter-specific reaction between the distress calls of the rook, jackdaw, and carrion crow. Giban believes that with the distress call of any one of the three species, he can protect crops against the other species. He has used distress calls as long as 2 months against Corvidae at a pear orchard without observing waning effects. The French technique is to broadcast for 2-minute periods every 15 or 20 minutes until the birds leave, or for 2 days, whichever is sooner. If the birds are still present after the 2 days, the calls are broadcast for 2 minutes every 30 or 40 minutes until the birds leave. The distress calls also have been used against nesting carrion crows. After the distress call was used for several days, the birds appeared to become disoriented — some left the nest, and some sat beside the nest. A collection of eggs indicated that incubation had been interrupted.

Carbide exploders are now used in France against Corvidae and other birds, but their effectiveness generally lasts only for 2 to 6 days. Firecrackers have worked temporarily against carrion crows. Viscose nets have been found to be effective and are being used more frequently for fruit trees, grapes, and strawberries.

Landowners are able to use poisons or drugs in France, and, if needed, government employees can coordinate and organize control programs. Strychnine-impregnated or chloralose-coated grains are presently used against Corvidae. Wheat or corn baits are used; the dose of both chemicals is 0.5 per cent by weight.

The French do not know of any cultural practices being used in France to alleviate bird damage.

The Netherlands

Bird control investigations in Holland are the responsibility of the Minister of Agriculture. J.D.F. Hardenberg has been the individual principally concerned, and he has supplied me with many details about their problems. Probably not over $10,000 is being spent in 1964 for research on bird control methods.

The depredating bird species in Holland are listed below in order of importance. According to Hardenberg's personal observations, the herring gull and common gull, and the wood pigeon and jackdaw are increasing.

Starling - Damages cherries and other soft fruits, and newly sown winter grains. Also roosts in reedbeds, which have a high economic value in Holland.

House Sparrow, and to a lesser extent the Tree Sparrow (Passer montanus) - Damage ripening grains and stored, bagged grain in warehouses. Also peck buds on germinating grains and other plants.

Wood Pigeon - Damages newly sown or ripe peas, ripening and newly sown grains, soft fruits (sometimes), clover, cabbage, and flax.

Rock Pigeon - Damages newly sown peas and beans, and fouls buildings.

Mallard (Anas platyrhynchos) - Damages ripening grains.

Jackdaw, Magpie, and Jay - Damage newly sown and ripening grains, seed potatoes, beans, peas, apples, and pears.

Blackbird (Turdus merula) - Damages soft fruits, apples, and pears.

Pheasant (Phasianus colchicus) - Damages newly sown grains, low hanging fruit, and sprouting bulbs.

Dutch research projects include study of the biology of the wood pigeon, and development of trapping and poisoning methods mainly for sparrows, carrion crows, and jackdaws.

Shooting, scarecrows, pyrotechnics, poisons, distress calls, and seed dressings are the crop protective measures used today in Holland. The effectiveness of any one is difficult to rate since effectiveness depends on the surroundings and the species. Hardenberg has successfully used the starling distress call to move starling roosts. He supports the idea that the smaller the roost the easier the job of repelling, and in his opinion clear nights are the best for roost removal. He uses several loudspeakers pointing in all directions, and he usually must work 3 or 4 evenings before successfully repelling the birds. In two instances he determined the distance starlings moved -- in one case it was 20 km, in another 30 km. He has not used other scare devices along with distress calls.

Landowners cannot use poison or drugs against birds in Holland; these chemicals can be used only by government personnel. Alpha-chloralose is the principal chemical used today for bird control; strychnine and other poisons are no longer used. TEPP was tried on bread but too many wagtails (Motacilla sps.) were killed. Chloralose-treated bread is used for sparrows, and treated beans with a glucose coating are used against pigeons. Hardenberg (1963) reported on sparrow poisoning at about 100 farms in the North-East polder of 48,000 hectares. Chloralose was used on bread and prebaiting was not necessary. During a 37-day program, about 5,300 sparrows were picked up, and the author suggested that the kill could have been 50 per cent higher, since not all dead birds were found. In spite of many precautions 45 birds representing six

other species were accidentally killed along with one dog and one cat that died after eating poisoned sparrows.

No cultural practices are being used to alleviate bird damage in Holland.

Germany

Research on bird control methods is conducted throughout Germany at bird research stations which serve one or more of the German states. Facts about the German research program have been obtained through discussion and correspondence with the following research biologists: Herbert Bruns at Hamburg, Claus Koenig and Hans Loehrl at Ludswigburg, and Sebastian Pfeifer and Werner Keil at Frankfurt/Main. Keil estimated that $25,000 was spent in 1962 for bird control research methods in Germany.

In Germany the pest bird species are, in order of importance:

Starling - Damages grapes and cherries.

Blackbird - Damages grapes and fruits.

Pigeon - Is a problem in cities — in Berlin, for example.

Herring Gull - Is a problem in cities.

House and Tree Sparrows - Damage grain.

Considerable research has been done in Germany on developing acoustical methods for repelling starlings from vineyards and cherry orchards. The Germans initially used a starling distress call obtained from the French; however, habituation occurred after several weeks' use. The Germans now have two starling calls, both recorded in Germany, that they recommend for use together in vineyards: the "warning-ruf," and a new call, yet unnamed.

Keil reported that they are now able to protect 20 per cent of the vineyards in his area of responsibility (Hessen, Rheinland-Pfalz, and Saarland). They use the alarm call system only at vineyards that do not have trees or hedges, since these plants interfere with sound propagation. Vineyard operators are told to remove the trees and hedges. The research station sells the alarm call tape to the vineyard operators for about $6, and the Telefunken Electronics Corporation sells them the loudspeaker system.

Schmitt (1962) reported that in 1961 starlings were kept away from 50 acres of ripe grapes at a vineyard near Oppenheim (Rhein) for 7 weeks by broadcasting two different starling alarm calls with a tape recorder linked to six loudspeakers. The cost of protection was $25 per acre.

Keil stated that during the grape damage period, birds are migrating from eastern Europe and probably remain in one area for only about a fortnight. Thus, different groups of starlings are present throughout the damage season. For scaring starlings, the Germans have 300- and 600-meter exploding rockets that may be used alone, or in conjunction with the alarm calls, if winds prevent the proper propagation of the sound. Short-range shell crackers and other pyrotechnic devices also are used with limited success.

In cherry orchards, loudspeakers are mounted on towers located between the trees, with all the speakers facing the same direction. A typical orchard setup might consist of 10 or 12 speaker towers and one watchtower where the whole system is controlled by an operator who is on duty all day.

Bruns reported that 90 per cent of the starlings near Hamburg feed in meadows and that the damage in orchards is caused by a small percentage of the starling population. He used one loudspeaker and prevented starlings from entering an isolated 2-acre orchard surrounded by meadows. He admitted that the problem is considerably more difficult where orchard tracts are continuous and birds can move from orchard to orchard.

The German research workers also have experimented in starling roost removal. They have moved as many as one million birds by an interesting technique employing distress calls, rockets, shotguns, shell crackers, and lights. About 50 people were involved in the operation, since the roost was relatively large (15 acres). On a dark night when the birds were asleep, the operators made a disturbance in the roost to awaken and alert the birds. Then, in sequence, they used 300-meter rockets, the distress call, lights, shotguns, and shell crackers. The various devices were added one at a time a few seconds apart so at the peak of activity all frightening devices were being used. This 2- to 3-minute crescendo was repeated several times about every 15 minutes. The searchlights were used to determine when the birds were in the air over the roost, and when this occurred the 600-meter rockets were fired so that they exploded beneath the birds. The searchlights were turned off once the birds were well above the roost. For this technique to work, much careful preparation must be made, and all potential secondary roosting sites must be protected on the same night.

Roost removal techniques were discussed with Kei1, who said that the method described above is expensive, and that one night's cost for pyrotechnics might be $500 or $600. However, since the birds in the German roosts are on migration, they can be moved considerable distances.

In one German experiment, a helicopter was used successfully to move 30 or 40 thousand starlings roosting in a marsh. However, the cost of helicopters is almost prohibitive. Smoke pots made from discarded DOT also were used at one roost. The birds did not leave the roost on the night of treatment, but they did not return on subsequent nights.

The Germans have experimented with viscose fiber netting, pyrotechnics, and the silhouette of a hawk painted with black and white stripes and suspended from a balloon over a vineyard. Fibers and netting can be used with success, but they are not practical for large areas. Experiments with the hawk silhouette were not conclusive.

In Germany only government personnel can poison or drug birds. Strychnine-treated grain is used on English sparrows, cyanide on pigeons; and, in the spring, phosphorus-treated eggs are used on carrion crows. Except for experiments in lethal control, lethal chemicals cannot be used on any of the other species found in Germany (not even on the starling).

Bird control research in Germany not only includes research on methods for alleviating bird depredations, but also includes research on methods for propagating certain birds that feed on forest insects. This endeavor is only one aspect of a research program directed at the biological control of injurious forest insect populations; use of birds, ants, bats, and parasites and diseases of insects all are being studied. Many experiments are underway in which vast numbers of bird nesting boxes are being placed in forests to encourage certain insect-eating species, i.e., redstart (Phoenicurus phoenicurus), great tit, blue tit, tree sparrow, tree creeper (Certhia familiaris), and flycatchers (Muscicapidae).

German research workers have increased population densities of forest breeding birds by 5 to 20 times through careful site selection for nest boxes and through use of better boxes. As many as 20 nest boxes per acre have been used in experiments, and breeding birds have occupied as many as 60 per cent of these boxes. During a 3-year period in one area, the range of flycatchers was increased from an altitude of 300 meters to 500-750 meters by use of nest boxes.

I observed several experimental areas. One was an old stand of Scotch pine (Pinus sylvestris), where the sawfly (Acantholyda nemoralis) had been a problem from 1925 until 1945. In 1955, 410 nest boxes were erected on 95 acres *(4 per* acre); the density of breeding birds, mainly flycatchers, as measured by the number of successful broods per acre, increased from 0.2 to about 1.6 broods. There were 150 successful pairs on the 95 acres. Food studies showed that some of the young were being fed sawflies.

At another site, a young stand of Scotch pine 7 to 8 years old, nest boxes had been erected on 6-foot posts when the trees were 2 years old. There were four test plots and four control plots, varying from 3.75 to 10 acres. There were 25 nest boxes in each of the two 3.75-acre plots and 30 in each of the two 10-acre plots. In 1962, 75-90 per cent of the boxes were occupied in spite of the heavy growth of pines which concealed them. Two pairs of birds nested in the control plots. The boxes were about 10-15 meters apart. The principal species using the boxes were the great and blue tit, the tree sparrow, and the redstart. The diet of 300 young birds produced in 1962 consisted of 50 to 60 per cent insects considered harmful.

Wellenstein (1962) reported on the effects of ant, bird, and bat colonies on the insect fauna in a forest near Heidelberg. He studied the effects of nesting birds through random sample diggings, a series of "glue-boards," and through infection experiments. The different methods of censusing insect populations demonstrated the effect of birds upon the density of forest insects. The density of Lepidoptera and Tenthredinidae was reduced about 50 per cent during the larval stage; the effect was most noticeable among the larger insect-species.

Bruns (1960) reviewed the work on the importance of birds in forests, and reported that birds can remove substantial proportions of pest insect popu lations when the insect populations are low, and that the most important effect of birds may be in preventing an insect plague from developing rather than in reducing one that already has occurred.

England and Holland

The bird-plane strike problem became a matter of serious concern in England and The Netherlands by the mid fifties -- particularly because of strikes involving military aircraft. Although aircraft-bird collisions were not rare prior to this time, they most often involved piston aircraft, which usually were not seriously affected. With more jet aircraft, however, the problem rapidly increased, basically because of the vulnerability of jet engines to bird ingestion and susceptibility of airframes to structural damage. Bird-plane strikes have caused crashes of military aircraft and extensive damage to both military and commercial aircraft. The majority of civil strikes occur at airports, whereas most military strikes occur on cruise. The numbers of frying birds are considerably greater at altitudes of 5,000 feet or less (Lack, 1959; 1960), and high speed, low level flights by jet aircraft greatly increases the probability of bird strikes.

Many methods have been used to repel birds from airports, such as naphthalene balls, falcons, radar, ultrasonics, smoke, Klaxon horns, Very flares, smoke puffs (similar to short-range shell crackers), carbide exploders, stuffed gulls, the broadcasting of bird distress calls, and habitat modification. Thus far, bird distress calls and pyrotechnic devices (flares, shell crackers) have been the best scaring devices used in England, and bird distress calls have given the best results in The Netherlands.

The species of most concern in England and Holland include:

England - Herring Gull, Black-headed Gull (*Larus ridibundus*), Common Gull, (*Larus canus*), Lapwing (*Vanellus vanellus*), Wood Pigeon, Rook, Oyster-catcher, Starling, and Golden Plover (*Charadrius apricarius*).

Holland - Herring Gull, Black-headed Gull, Common Gull, Lapwing, Wood Pigeon, and Swift (*Apus apus*).

France

The French have bird-plane problems in certain areas, and have experimented with many of the same bird scaring techniques used in other countries. They believe that bird distress calls offer the most promise. A very active bio-acoustic research program is underway at the Laboratory of Physiological Acoustics at Jouy-en-Josas, where bird distress call systems have been developed for use against the main problem species – starlings, corvids, and black-headed and herring gulls. French biologists effectively repelled black-headed and herring gulls at the Nice Airport during March through October 1963, but they recognize that the gull problem at Nice can never be completely solved until sewage outlets have been removed from the airport vicinity. The French concur with workers in other countries that bird scaring methods are only partial solutions to the problem at airports, and that every effort should be put forth to make airports less attractive to birds through the manipulation of habitat, e.g., removal of garbage dumps, and sewage outlets.

With shooting, the French have successfully controlled diurnal birds of prey at the Toulouse-Blagnac Airport. The birds were shot from a "hide" and an owl on a 16-foot pole was used to attract them. More than 700 birds were shot (1956 through 1960), and the bird population decreased an estimated 50 per cent (Mathieu, 1963).

Germany

Birds are a hazard in Germany, particularly for military jet aircraft, but very little research was done prior to 1963, when German research workers began to study the problem.

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