BIRD PROBLEMS AND THEIR SOLUTIONS IN BRITAIN

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ABSTRACT: The background and organization of research on bird pests in Britain are described and the main projects are outlined. Work is currently concentrated on bullfinches, starlings, rooks and wood-pigeons together with behavioural studies aimed at developing better bird scarers.

INTRODUCTION

Birds have always attacked our crops. Even in this technological age problems of bird damage remain largely unresolved and there is a universal demand for better methods of damage prevention and control. In developed countries bird damage affects the profitability of farming but has little impact on human nutrition. We sometimes forget that in emerging nations crops lost to birds may represent the difference between life and death to some people.

This does not mean that the indiscriminate slaughter of birds by farmers should be either justified or tolerated. Throughout the world there is an increasing awareness of the need to conserve our wildlife heritage and in most countries this finds expression in legislation for the protection of a variety of animals and plants. The European Community, of which Britain is a member, has gone a step further in its legislation on birds: member states have agreed to harmonize their national laws in accordance with guidelines laid down in a Council Directive. This recognizes that birds are not confined by territorial frontiers and effective protection will only be achieved through international collaboration. Similar arguments apply to pest control and the European Plant Protection Organization, which was founded many years ago to promote collaboration between European countries in matters of plant health and crop protection, has now extended its activities to include bird pests.

Unfortunately, the objectives of conservation and pest control often conflict and, whilst the Council Directive on bird conservation allows derogation, inter alia for the protection of crops, it nevertheless imposes more restrictions on bird control than applied hitherto. Thus in the future farmers within the EEC will find it even more difficult than at present to protect their crops against birds. Inevitably this will lead to an increased demand for new methods that do not infringe the terms of the Directive. In effect, we are being challenged to devise methods of crop protection that will prove effective, economic, and acceptable to a wide and interested public.

In the United Kingdom responsibility for research on bird damage prevention and control rests mainly with the Ministry of Agriculture, Fisheries and Food, and for the past 30 years this department has maintained a specialist unit concerned with bird pests. The initial remit was simply to investigate ways of preventing or reducing damage to agricultural crops but persistent requests for advice on urban bird problems and, at a later date, acceptance of responsibility for research on bird hazards to aircraft, widened the activities of the group considerably. Further extension of the remit occurred when it became apparent that pesticides were having adverse effects on nontarget wildlife, especially birds. Thus, despite changes in title and location, the unit has for many years provided a service in economic ornithology to a variety of "customers."

Historically, programmes for the management of bird damage have a poor record of success. Local problems can sometimes be solved by killing the birds that are responsible, but where they are very numerous, are migrants, or both, it soon becomes impossible to kill enough to reduce damage significantly. Against this background there is a growing conviction amongst biologists that an ecological approach offers the only hope of success in the long term. For this reason, we have tried to structure our research programme around in-depth studies of the biology of pest species. At the same time, we have to recognize that farmers are practical people who are in business to make a profit. Within the constraints imposed by climate and soil conditions, the habitat composition of farms, i.e., the varieties of crops grown and the amount of hedgerow, scrubland or standing timber, is determined more by market forces than any other consideration. Although opportunities to apply sound ecological principles to the amelioration of pest damage occur on many individual farms, there is a clear need for methods giving more immediate results. Therefore, we integrate work on emergency techniques, such as bird scaring and use of repellents, with more fundamental biological studies, and I should like to outline the main topics being covered at the present time.

BULLFINCHES

The Bullfinch (Pyrrhula pyrrhula) is a bud-eating finch that has been regarded as a pest, at least by fruit growers, for centuries. It is sedentary and nowhere very numerous, but a few local birds can cause extensive damage to dormant fruit buds over the winter period. Present control measures consist of shooting or cage-trapping, often employing the use of decoy birds. In other words, the basic techniques used today differ little from those employed by the bird catchers of past centuries. Commercial fruit growers expect modern science to provide rather more sophisticated methods, preferably a chemical treatment that can be applied by routine techniques. Virtually every reputed repellent has been tried without tangible success, owing perhaps to a combination of the English weather and the length of time the buds are vulnerable to attack. Some growers maintain that endrin repels bullfinches if treatments are carried out at double or even treble the insecticidal dose, but laboratory experiments simply demonstrated the toxic effects of the compound without revealing any attendant aversion.

It is characteristic of bullfinches that they show a marked preference for the buds of certain cultivars rather than others, and through the combined skills of an ethologist and biochemist we are trying to exploit this readily observed behaviour to find the key to understanding the mechanisms of food selection. We argue that since the end point of feeding is the acquisition of adequate nutrients it is probable that the basis of choice lies in the chemical constituents of the buds rather than their morphology. By analysing carefully chosen samples of buds, it should be possible to identify compounds, the presence or absence of which can be correlated with preference or avoidance. The nutritional requirements of the birds must also be considered and so must the diversity and availability of alternative foods, and an attempt is being made to bring all these factors together in a single study.

On the biochemical front, interest is currently focussed upon free amino acids, especially asparagine and aspartic acid. Differences have also been found in the levels of certain polyphenolic compounds which are of no nutritional significance but which may affect palatability. Food choice in relation to physical and nutritional characteristics of seeds is being studied in laboratory tests but so far these provide little evidence of selective feeding except at extremes of the range. This work is discussed more fully in a paper by Greig-Smith and Wilson currently in preparation.

Although bullfinches have featured in our research programme for many years, these studies are of relatively recent origin and it is a pleasure to note the speed with which they are gathering momentum. The implications of the work extend far beyond the immediate objectives of finding a solution to the bullfinch problem. It is becoming increasingly clear that the minor chemical constituents of plants play an important role in determining their acceptability as food by animals (Fellows 1980). If we study these systems in action, we may discover the key to an entirely new concept in the way to prevent damage by pests.

STARLINGS

In common with most other food-producing countries, Britain has a starling (Sturnus vulgaris) problem. Although this bird has long been recognised as an agricultural pest, the problem in the past appears to have been largely confined to fruit damage. Nowadays we recognise a variety of problems.

In Europe, starling numbers have undoubtedly increased enormously in the course of this century and, although a slight decline is now in evidence, they remain a major pest. Their close association with livestock is a constant source of concern on grounds of animal health, and suspicion is increased by the fact that the spring and autumn migration between Britain and the Continent of Europe involves about 35 million starlings. Although there is circumstantial evidence that they transmit a number of diseases, responsibility for infection is difficult to prove. Fortunately, histoplasmosis is not a problem in Britain.

A relatively new problem with starlings concerns damage to winter cereals in the seedling stage. This has only emerged as a problem in the last 10 years or so and may have been brought about by a tendency to reduce the depth of planting in order to promote rapid seedling establishment. Unlike larger birds, which uproot seedlings, starlings simply obtain the grain by probing. Although this can be a serious problem, the main concern at the present time is with starling depredations on animal feed concentrates. The selective removal of the more nutritious elements, together with fouling, reduce the quality and acceptability of the feed (Feare and Swannack 1978). This problem is, of course, linked to developments in animal husbandry techniques, especially intensive rearing, but the shift from a basically invertebrate diet to a cereal diet does not appear to be necessitated by food shortage. In fact the reason is obscure, since it clearly involves a penalty for the bird insofar as the gut length must be extended in order to digest this new food and the additional weight is a burden affecting the daily energy budget. Studies are aimed at the elucidation of this paradox, the penalties of switching to a new food being more obvious than the benefits.

We are also trying to explain the relationship between roost sites and the location of food supplies. One theory holds that roosts provide an opportunity for birds to "exchange information" about sources of food, thus it would appear likely that there is a correlation between its availability and choice of roosting site. On the other hand, there is evidence that within roosts a hierarchy exists in which older, experienced birds, occupy central positions by contrast with younger birds that remain on the periphery. Radio-tracking studies have just begun in an attempt to trace daily movements of individuals and relate their position in the roosting hierarchy to feeding behaviour, and hence indicate how roost dispersal might affect feeding (damage) and survival.

ROOKS

Rooks (Corvus frugeligus) have long been linked with agriculture. The old adage about sowing corn (wheat) "one for the rook and one for the crow, one to rot and one to grow" is of very ancient origin and held true for centuries, but the importance of rooks as pests in Britain declined with the rapid mechanization of agriculture during and after the Second World War. During the late 1950s and early '60s, rooks hardly featured in the list of problem species but they re-established their reputation as pests with the introduction into Britain of maize as a fodder crop. The situation is a good example of the importance of timing as a factor influencing damage. Maize is a marginal crop in England, soil temperature and light intensity being critical in the early stages of development. The optimum date for emergence is 26 May and this is about two weeks after the first juvenile rooks leave the nest and start to forage independently. By comparison with adults, juveniles are naive and inefficient in their search for food and any crop offering an "easy option" attracts them. Maize is such a crop. By tugging at the newly emerged coleoptile, birds are frequently rewarded with a large and nutritious grain, and so if maize is planted within the vicinity of a rookery, heavy damage can be expected. Changing agricultural practice has also provided the rook with another source of food in the form of animal feed concentrates. Unlike starlings, rooks will not enter enclosed premises in search of food, but the paddock system of rearing pigs provides a feeding opportunity of which they have swiftly taken advantage.

Overall, rook numbers are on the decline in Britain; but in the Thames Valley, which happens to be one of the areas with a tradition for rearing pigs by the paddock system, and in Scotland, they are holding their own. The relationship between patterns of agricultural cropping and rook density are being investigated in conjunction with the University of Aberdeen.

WOODPIGEONS

Studies of the woodpigeon (Columba palumbus) carried out by the late R.K. Murton from 1954 to 1970 clearly pointed to the availability of food in February as the key factor determining winter survival and, consequently, the size of the breeding population. Clover was identified as the critical food and since in the agriculture of the late 1960s clover was becoming increasingly uncommon, it was predicted that woodpigeon populations would decline. This happened and for a short time it seemed that the woodpigeon problem in England had been solved by changes in agricultural practice. But then another change occurred. New, cold-resistant varieties of oilseed rape were introduced and the improvement in yield of autumn-sown varieties over spring-sown rape was so rewarding that it prompted a dramatic increase in popularity of this crop. Unfortunately, winter rape proved palatable to woodpigeons and has filled the niche in their winter diet left vacant by the gradual disappearance of clover leys. Thus, at a stroke, we have a new crop problem and a resurgence of the woodpigeon population.

The significance of woodpigeon damage to oilseed rape is variable, depending on when it is attacked and whether the growing point is grazed, but it is not exceptional for areas of up to about 20 ha to be rendered a total economic loss. The gross profit margin on oilseed rape is higher than on almost any other crop and this provides a strong incentive to find a solution to the pigeon problem. At present scaring devices are widely used but they cannot give protection throughout the long vulnerable period. Our research efforts are aimed at developing better scarers and identifying when they can be applied to best effect.

BIRD SCARING

The main thrust of our research on bird scarers is currently directed towards a better understanding of habituation patterns and the improvement of visual scarers by incorporating biologically meaningful stimuli.

A bird scarer may elicit fear simply by being unexpected (the startle effect) or it may mimic natural predators or alarm signals. Most commercial scarers are of the first type because it is relatively easy to build devices that produce novel auditory or visual stimuli. The disadvantage is that birds rapidly habituate to such scarers. Although it is more difficult to stimulate biological signals the advantage is that real life experience, i.e., exposure to predators, reinforces rather than detracts from efficacy. Birds that do not learn to respond quickly and persistently to a predator are unlikely to survive long enough to pass on the genes controlling such behaviour into the next generation.

Habituation studies are centered around the scaring effects of sudden loud sounds, such as those produced by propane gas guns; but in the experimental situation, for practical reasons, electronically generated bursts of white noise were used. Starlings were chosen as subjects since they adapt well to captivity and are a pest that we frequently need to scare. Considering sound intensity over the range 70-100 dBA, the higher the level the greater the startle response and the slower it declined. In other words, "bigger bangs make better scarers" but enhanced efficiency has to be weighed against greater noise pollution. In a field situation birds are exposed to a range of sound intensities depending on their proximity to the source of sound, and a further series of experiments has shown quite clearly that exposure to low-intensity sound stimuli significantly reduces the subsequent level of response to high-intensity sound. The inter-stimulus interval is also an important factor affecting habituation. In general, the rate of habituation increases as the interval decreases but randomization of the interval length slows the rate of habituation. Inexplicably, at very short intervals (<10s) there is a brief increase in responsiveness which rapidly declines with experience.

The aim of this work is to define the optimum mode of operation of bird scarers of the gas cannon type. Results indicate that a series of loud "bangs", at intervals of a few seconds, are likely to be more effective in scaring starlings than a single "bang". To minimize habituation, but at the same time to avoid allowing birds a lengthy period in which to feed undisturbed, the intervals between successive groups of stimuli should be randomized within the limits 10-20 minutes.

Research on natural alarm mechanisms is at present concentrated on species that rely upon visual rather than auditory signals. Brent geese (Branta bernicla) sometimes feed on cereals and young grass and can cause severe damage, but because they are a species in need of conservation, a solution is sought in scaring rather than killing. Brent geese appear to communicate with conspecifics through body posture, and plastic models, or even 2-dimensional cut-outs, simulating geese in alarm or feeding postures, can be used to attract or repel geese from particular fields. The technique is probably too involved ever to become popular with farmers but it is an extremely useful management tool for deflecting geese away from crops and onto refuge areas.

The woodpigeon is another bird that communicates by visual signals. The blue-grey wings are barred with white but this is revealed only in flight. Consequently, a woodpigeon taking flight produces a white "flash" which seems to act as an alarm signal to other woodpigeons. A scaring effect can be obtained by scattering woodpigeon wings, real or simulated, around a crop and the effect is enhanced if the stimulus is made larger than life (a super stimulus: see Tinbergen 1953). However effective, it would be impracticable to scatter woodpigeon "wings" over a large area so various mechanical devices have been constructed that mimic the pattern made by the wing markings as the woodpigeon takes flight. These are visible at a considerable distance and they are now on trial to assess their efficacy in scaring woodpigeons.

Eye patterns have been reported as being aversive to a wide range of vertebrate species and laboratory experiments have confirmed that starlings avoid such patterns (Inglis et al., in preparation). Various parameters of the patterns, e.g., shape, size, number, colour, were investigated and of the combinations tested, three-dimensional brown eyes of two centimetre diameter proved to be most aversive. It was further found that the degree of aversion could be enhanced by combining this stimulus with a broadcast of a starling distress call. It is envisaged that this might be used to reduce starling depredations at animal feedlots where, because of the precise location and limited extent of the site to be protected, suitable apparatus could be installed.

In conclusion, I should like to stress that this brief review of the research on bird pests undertaken by the Agricultural Science Service of the Ministry of Agriculture, Fisheries and Food has inevitably been superficial and many aspects of our work have not even received mention. Nevertheless, I hope I have been successful in giving an overall impression of both the nature of our work and the environment in which it is conducted.

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