THE STARLING IN EUROPE: MULTIPLE APPROACHES TO A PROBLEM SPECIES

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ABSTRACT: In Europe, Starlings are widely distributed and comprise both resident and migrant populations. These cause various kinds of damage which varies with the crops grown in different European Economic Community (EEC) countries. Although EEC member states are governed by the same legislation on bird protection, each state interprets the Community legislation in its own national legislation. This leads to different national approaches to the prevention of Starling damage, with little information exchange between member states. The establishment of an EEC (or wider) working group on bird pests is recommended to coordinate research and development.

Proc. 15th Vertebrate Pest Conf. (J. E. Borrecco & R. E. Marsh, Editors) Published at University of Calif., Davis. 1992

INTRODUCTION

The Starling (*Sturnus vulgaris*) is an eminently successful bird, with populations established, naturally or through human introduction, on five continents. Starlings are omnivorous but exhibit seasonal changes in dietary breadth associated with seasonal changes in gut morphology (Al-Joborae 1979, Feare 1984). Consumption of foods of plant origin is greatest from late summer through late winter and it is mainly during this period that Starlings conflict with agricultural production. They can cause serious economic losses to fruit crops, eg. cherries, grapes, and to cereals (Feare 1989). Consumption of cereals is generally post-harvest, often when the cereals are presented as food for domestic stock, since although Starlings can dig up recently sown cereal plants (Dolbeer et al. 1978), they do not appear to be well adapted to taking grain from ripening ears.

Worldwide, most available damage prevention techniques have been used against Starlings, ranging from scaring devices, chemical repellents and physical protection designed to protect individual sites to mass-killing, aimed at reducing populations over wide areas in the expectation that this will reduce agricultural damage. In western Europe, the range of techniques used has also been wide but, although the actions that can be taken against birds are governed within the Commission legislation, different western European countries have adopted different strategies for combating Starling damage. The aim of this paper is to describe the Starling problems experienced by farmers in Britain, France and Spain and the techniques used to prevent damage, and to discuss whether a more unified strategy should be adopted in light of the origins and migrations of the birds involved.

DISTRIBUTION AND MIGRATION

The Starling is widely distributed in Europe, with a breeding range extending from about 67°N in Norway to about 42°N in Spain and even further south in eastern Europe (Feare 1984) and in the Canary Islands (Emmerson, Martin and Bacallado 1982). Over most of the Iberian Peninsula, the Starling is replaced as a breeding bird by the morphologically and ecologically similar Spotless Starling (*Sturnus unicolor*). In the west and south of this range breeding populations are resident but most Starlings are migrants, wintering to the west or south of their breeding areas (Fliege 1984). In the British Isles and in France, resident breeding populations are augmented in winter by large numbers of migrants from breeding populations in northern and eastern Europe, and migrants similarly reach Spain.

The movements of Starlings are complex, however, involving post breeding dispersals as well as fall and spring migrations. Post-breeding dispersals of juveniles vary in orientation and distance. In Britain, large flocks of juveniles, sometimes numbering thousands, appear on upland heather and rough grazing moors and on coastal salt marshes from late June through August-September. The geographical origins of these birds have not been investigated but they doubtless come from nearby breeding colonies since band recoveries suggest that most British juvenile Starlings remain within the country (British Trust for Ornithology unpublished data). The post-breeding dispersals of juveniles from at least some European colonies are longer and more directional, with birds from southern Scandinavia and Poland, and also from Switzerland, concentrating on the North Sea coasts of Denmark, Germany, Netherlands, Belgium and France (Feare 1984, Gromadski and Kania 1976, Studer-Thiersch 1969). Post-breeding dispersals lead to geographical and sometimes habitat separation between juveniles and adults, which Feare (1984) and Stevens (1985) considered to be a mechanism that could reduce competition between the age groups for scarce food resources in summer. Large numbers of juveniles feed in cherry orchards at this time, causing substantial damage (Feare 1980, Tahon 1980), even though cherries constitute a poor diet for Starlings (Summers 1985); it remains to be determined whether moorlands and salt-marshes also represent nutritionally poor habitats for the juveniles that forage there.

As a result of post-breeding dispersal, adult and juvenile Starlings from particular colonies may embark upon their fall migrations from distinct locations and may also have different destinations (Studer-Thiersch 1969). Adults from geographically nearby colonies may also follow separate migration routes to widely separated wintering areas, eg. birds from northern Poland winter mainly in Britain and France while those from southern Poland winter in north Africa (Rydzewski 1960, Gromadski and Kania 1976).

An important outcome of these variable migrations is that a given wintering area may receive birds from several breeding areas. From an analysis of band recoveries,

Goodacre (1959) found that different regions of the British Isles received their winter migrants from different breeding areas although there was considerable variability, so that while most birds that wintered in eastern England, for example, came from Finland, the Commonwealth of Independent States (CIS) and Denmark, this part of Britain also received immigrants from the Netherlands, Germany, Poland, Norway and Sweden.

Similarly, western Spain receives immigrants predominantly from France, Belgium, Netherlands, Germany and Poland, but recoveries also indicate origins of wintering birds in Hungary, Italy and the CIS. Spain's eastern seaboard and the Balearic Islands receive birds mainly from Switzerland but also from Italy and Germany (Peris unpublished data). In north-west France, Clergeau (1983) recorded wintering birds mainly from Germany and Poland, but others originated in northern France, Belgium, Netherlands, Denmark, Sweden, Finland and the CIS.

Within wintering areas, behavior of Starling can vary from extreme philopatry (Caccamise and Morrison 1986, Feare 1981) to movements ranging over many kilometers within short time periods (Summers and Cross 1987). These differences appear to relate to habitat structure and food availability and also to the ages of the birds involved, but indicate considerable plasticity of behavior that presumably adapts them to local conditions

From the above, it is clear that any control techniques that aimed at a considerable reduction of numbers in a given locality would involve killing birds from breeding colonies covering a wide geographical area. Such control would therefore be unlikely to have a major impact on the breeding populations and thus to achieve a sustained reduction in numbers in future years. A similar conclusion was reached for the Starlings, involving a high proportion of juveniles, killed in attempts to alleviate damage to cherries in Belgium (Stevens 1982, Fear 1991), even though the geographical origin of these birds was probably much less extensive than that of wintering birds occupying a similar area. Furthermore, the potential mobility of birds within the wintering area (Summers and Cross 1987) could counteract the effects of such control within a winter.

POPULATION CHANGE

The high numbers of Starlings in Britain in the 1960s, 1970s and early 1980s was the culmination of a population increase that began in the first half of the 19th century (Parslow 1968, Feare 1984) and may have been part of a more general northward and westward expansion in Europe. In the south range expansion and population increase are continuing (Clergeau 1989, Emmerson, Martin and Bacallado 1982) and in northeast Spain this expansion has brought the Starling into contact with the Spotless Starling (Peris, Motis and Martinez 1987), whose population in Spain is also increasing and expanding (Ferrer, Motis and Peris, in press).

In the north, however, range contraction and extinction of some populations was first recorded in the 1960s in Finland (Ojanen, Orell and Merila 1978) and population decreases have now been recorded much further south to Germany, Denmark and Britain (Feare 1989), where the pace of decrease has recently accelerated (Anon. 1991). Since the areas of northern Europe from which decreases in breeding numbers have been recorded are the sources of birds that

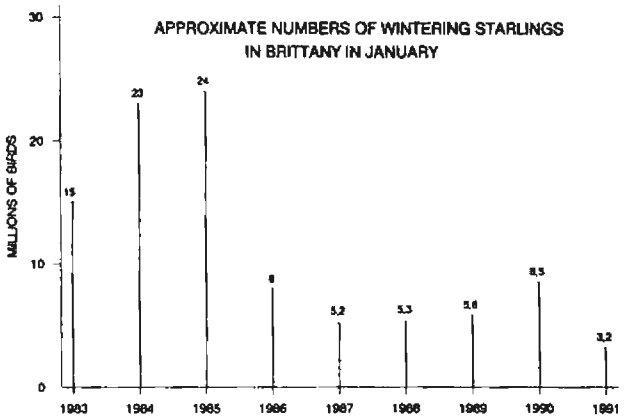

Figure 1. Estimates of the number of starlings in winter roosts in Brittany, NW France, from 1983 to 1991.

winter in Britain, France and Spain, we should expect that the numbers of wintering birds and the damage they cause will similarly have declined. Assessment of the population trends in the wintering areas is complicated by redistributions of birds in response to changing agriculture (Gramet and Dubaille 1983, Feare 1989) and in none of these countries have monitoring schemes been devised to detect change. This is consequently inferred from data collected for other purposes. There is nevertheless evidence that wintering numbers have fallen. Clergeau (1989) suggested that numbers of Starlings wintering in France increased between 1977 and 1984 and showed that the main concentration was in the northwest. Fig. 1 shows the numbers of starlings estimated to have wintered in Brittany, one of the main areas of concentration, from assessments of roost size between 1983 and 1991: these data show a marked fall after 1985. Peris (1991) and Peris et al. (in press) have recorded a considerable reduction in the winter population of southern and eastern Spain, where birds originate from northern and central Europe. In the north and northeast, however, winter numbers seemed to be stable or slightly increasing and Peris et al. (in press) attributed this to the origins of these birds in France and Belgium, where population declines have not been recorded.

DAMAGE

The territories of Britain, France and Spain transcend about twenty-two degrees of latitude and their climates vary from cool, moist temperate to Mediterranean. Agriculture varies considerably over this geographic area, with variations in both crop type and in the timing of farm activities. The Starling's dietary adaptability enables it to exploit a variety of commodities, thereby causing economic loss, but the kind of damage inflicted clearly depends upon the agricultural activities practiced in different areas. Thus losses caused by food consumption at cattle feedlots occurs mainly in southern and eastern England and in northwest France, areas where cattle and other stock are reared intensively and where food is presented in a form that is accessible to Starlings (Feare and Wadsworth 1981, Douville de Franssu, Gramet and Such 1991a). Losses to germinating winter cereals are more localised, usually occurring near winter roosts as the birds return in the evening. Although Feare (1980) recorded losses in England of up to 37% of plants, this had no significant effect on yield. In France, however, Douville de Franssu,

Gramet and Such (1991a) recorded plant losses between 26% and 73% which did presumably reduce yields and certainly forced some farmers to redrill their fields.

The growth of cherries in western Europe is widespread but highly localised. Damage is caused primarily by juveniles and can be extensive, and has been an important factor driving some farmers out of cherry cultivation (Feare 1980, Douville de Franssu, Gramet and Such 1991a). In Britain, viticulture constitutes only a very small part of the agricultural economy and, although Starlings are known to cause losses, these have not been quantified. In France, viticulture is widespread but damage appears to be concentrated in the northern and eastern vineyards of the Rhine and Loire Valleys, Champagne and Bourgogne/Beaujolais. The birds responsible are largely migrants on passage and damage is concentrated on red grape cultivars. However, the damage caused by Starlings in vineyards has not been adequately assessed. Damage to grapes in Spain is also localized, as is damage in winter to olives but the reasons for this localization are not known.

Agricultural damage thus varies geographically according to the availability of resources susceptible to damage. Most damage is localized to a greater or lesser degree but none is restricted to only one EC country. In the three countries considered here, different attitudes have been taken to damage assessment and, where assessments have been made, different techniques have been used. In addition to agricultural damage, communal roosts in woodlands, in towns and on industrial structures cause economic and human health and safety problems in all three countries. Urban roosting began in Britain in the middle of the nineteenth century, but roosts have been established in French and Spanish towns only in the last decade, during the period of decrease of migrant populations (Peris et al. in press). Whether the two trends are related is not known.

LEGISLATION

Within the European Economic Community (EEC), bird protection legislation falls under the European Commission (EC) Council Directive of 2 April 1979 on the conservation of wild birds, commonly called the "Birds Directive." This directive sets out the bird protection measures to be adopted within the EEC but each member state interprets these measures within its own national legislation. Member states are also able to derogate from some of the conditions of the directive to meet local needs.

The general tenet of the Birds Directive is that all birds are protected but lists of birds on annexes to the Directive receive different degrees of protection. With respect to birds that cause agricultural damage, many are on the "Hunting Annex" and may be killed at prescribed times of year by prescribed means. If member states wish to allow the killing of species which are not on the Hunting Annex, the killing of Hunting Annex species during the close season, or the killing of these species using techniques prohibited by the Directive, these member states can apply for derogations from the Directive.

In Spain, the Starling is on the list of birds which may be hunted and is thus subject to a close season. In France, the Starling is one of six species classified as pests and can be shot or trapped (using cage traps) for a longer period of the year than is permitted for birds that may be hunted. In the United Kingdom, the Starling is one of 13 species of pests which national legislation permits to be taken or killed throughout the year. Recently, the European Commission has proposed an amendment which, if adopted, would enable five species of corvid which are currently protected by the Directive to be hunted in an open season. The United Kingdom Government is not satisfied that this proposal addresses the fundamental problem of year-round pest control and is negotiating with the Commission to secure a compromise that would enable control of all 13 species to continue.

Each country thus applies the EC Birds Directive in different ways, based on locally perceived needs and on national legislation/traditions that pertained before the EC Birds Directive came into force. In France and the United Kingdom respectively the Ministry of Environment and Department of the Environment are responsible for bird protection and hunting. In France the Ministry of Agriculture is responsible for plant and farming protection and this sometimes leads to conflict with the Ministry of Environment. In the United Kingdom, Agriculture Departments advise the Department of the Environment on agricultural damage by birds and are also empowered to grant licenses to permit deviations from the Wildlife and Countryside Act, 1981, the UK legislation that embodies the spirit of the Birds Directive. In addition, the Secretary of State for the Environment may grant licenses for controlling pest species causing other problems, e.g., public health and air safety risks or predation of game bird populations, etc. In Spain a Royal Decree (1497/1986) defined the country's interpretation of the Birds Directive but each of 17 "Communidad Autonoma" produced its own legislation within the general framework: consequently different regions of Spain have different laws pertaining to bird control.

In France, damage caused by starlings, especially where ensiled maize was fed intensively to cattle, was perceived to be so severe that a working group was set up to investigate the problem and possible solutions. The working group comprised staff from three organizations: Association de Coordination Technique Agricole (ACTA), Institut National de la Recherche Agronomique (INRA) and Societe de la Protection des Vegetaux (SPV). The working group coordinated experimentation on lethal control and its effectiveness (see below) and relevant data collection on damage and produced several reports (ACTA/INRA/SPV 1983-84, 1984-85, 1985-86, 1987) (see Douville de Franssu, Gramet and Such 1991b).

In the United Kingdom two organizations within the Agricultural Development and Advisory Service (ADAS) of the Ministry of Agriculture, Fisheries and Food were responsible for research and promotion, the Mammals and Birds Department of Worplesdon Laboratory (now the Central Science Laboratory) and the Wildlife and Storage Biology Discipline (a regionally based service) respectively. Close liaison between these two organizations was effective in identifying and undertaking the necessary research and in promoting the findings to the farming community, but no formal working group was formed.

In Spain, all of the research on Starling biology, damage and control has been undertaken by academic institutions, with no direction or funding from the Ministry of Agriculture.

CONTROL

The approaches to Starling damage alleviation in the three countries highlight different control strategies, for in the

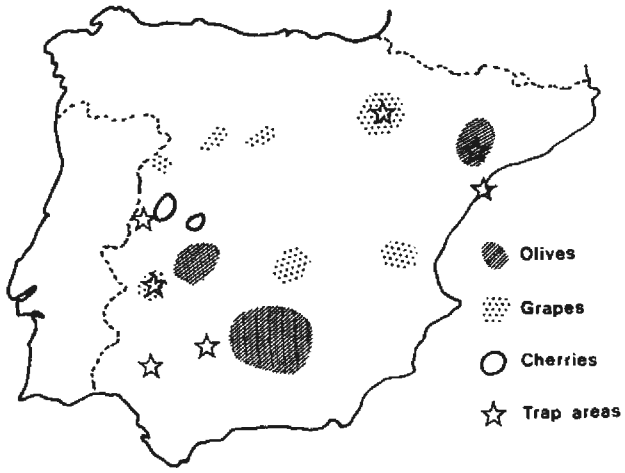

Figure 2. The distribution of damage by starlings to olives, grapes and cherries in Spain in relation to the sites where starlings are trapped.

United Kingdom the killing of large numbers of Starlings was discounted as an effective means of reducing damage (Feare 1984, Feare et al. 1981) and an "immediate crop protection strategy," *sensu* Ward (1979), was adopted. This involved physical protection of vulnerable commodities and changes in agricultural practice that would render foods less accessible to the birds (Boyce 1979, Feare 1984 and Swannack 1978, Feare et al. 1981).

In France, on the other hand, the ACTA/INRA/SPV working group had a dual strategy which involved, in addition to immediate crop protection including physical barriers, scaring and alteration of cultural practices, a population limitation strategy (Douville de Franssu, Gramet and Such 1991b). This involved the aerial spraying of winter roosts with a toxicant, CPT, in experiments undertaken with specific government licensing under a derogation from the EC Birds Directive. In some winters large numbers of Starlings were killed but the proportion of the estimated local population never exceeded 15% and, during the years of high winter populations, was considerably less than this (Fig. 1). The imposed mortality thus did not approach the natural annual mortality (estimated at 33-49% between 1960 and 1978 — Feare 1984) and would not have produced a sustained population reduction. As stated above, unless there was a highly unusual concentration of birds from one breeding area in the treated roosts, it is unlikely that these operations would have had a serious impact on breeding populations. The failure to attain higher levels of mortality was due to the difficulties of spraying roosts at night, to environmental and meteorological constraints and to the high cost of the operations (Douville de Franssu, Gramet and Such 1991b).

Around sprayed roosts temporary population reductions were recorded, suggesting that the technique had some value in terms of "immediate crop protection." However, Douville de Franssu, Gramet and Such (1991b) concluded that the constraints and costs of the operation would limit the use of the technique to exceptional circumstances.

In Spain, large number of Starlings have been killed annually. Fields are planted with cane (*Arundo donax*) in order to encourage birds to roost there and these birds are then trapped at night (Parsons 1960). This activity, however, falls within the realm of hunting rather than pest control (the birds are trapped by professional hunters and are used for food, either locally or exported), and areas where Starlings are trapped in this way do not always coincide with areas where serious crop damage occurs (Fig. 2).

CONCLUSION

The Starling is a highly adaptable migratory species with the capacity both to alter its wintering areas and to modify its ranging behaviour within the wintering area. Both of these changes occur presumably in response to changes in food supply. Birds from a given breeding area do not winter exclusively in a well-defined locality and any wintering area can contain Starlings from many breeding sites.

Starlings that cause damage on migration or in winter may have bred in countries, some of them outside the EEC, where the birds cause no damage and are held in esteem on account of their valued role as insect predators, their educational and their aesthetic values (Feare 1984). Claims from countries where Starlings winter that breeding populations should, by some means, be limited (Bernis 1960) are unlikely to be received sympathetically by those to the northeast who eagerly await the Starlings' return in spring.

The damage caused by Starlings is not uniform in type or severity across the EEC and each damage situation may require a different approach. On grounds of effectiveness, feasibility, cost, humaneness and environmental safety a population limitation strategy is unlikely to be an appropriate solution (although it could contribute to damage alleviation in long-lived bird species with low reproductive and mortality rates). The potential for Starlings to reestablish large flocks at good feeding sites after heavy mortality has been inflicted locally (Feare 1991, Stevens 1982) indicates that even local population reduction is only temporarily effective in reducing damage. Consequently, an immediate crop protection strategy, whereby crops or commodities suffering losses are individually protected, is most likely to achieve the objective of achieving lasting damage reduction. This strategy has a further advantage over a population limitation strategy in that while the latter requires substantial inputs and agreements from a wide range of interest groups and thus becomes political, the former strategy remains the responsibility of the individual farmer, acting on advice from specialists.

Immediate crop protection may involve a wide variety of defensive measures: killing, behaviour modification, habitat modification, provision of alternative food, and physical protection. For maximum protection a combination of these is often advantageous but the most appropriate form of integration must be determined locally. Nevertheless, a wide variety of protection techniques must be available to provide farmers with the best package for his purposes. At present, each EEC country acts independently on its bird pest control problems, with little contact or discussion of the relative merits of each technique in different situations. This situation must change, since cooperation and coordination between countries could reduce research and development costs and ensure that data collection is standardised between countries so that data are comparable. The situation existing at present is well illustrated by the fact that the United Kingdom, through the British Trust for Ornithology's Common Birds Census, has good data on trends in Starling breeding numbers (Marchant et al. 1990) while France has good data on winter roost distribution,

size and number, about which nothing is known in Britain. As a result, we have information from diverse sources that indicate that Starling numbers in winter have fallen but these data are difficult to interpret in terms of population decline or redistribution; we have no information on the impact the decline in numbers has had on agricultural damage.

This highlights the need for an EEC (or larger, to encompass northern European countries in which the EEC's wintering Starlings breed) working group on bird pests to assess problems, standardise approaches and undertake collaborative research and development with appropriate funding from the EC. Changes in farming practices will ensure that the pest problems continue to change and therefore that there will be a continuing demand for new approaches. Inclusion of information from the breeding grounds of migrants, concerning population change and breeding success or failure, is fundamental to the design of damage prevention strategies, since different approaches may be required according to whether populations are declining or increasing.

The second priority duty of a working group on bird pests should be to convene conferences along the lines of the Vertebrate Pest Conference, with the initial objective of drawing together existing data on vertebrate pests of agriculture, their impact and the measures taken to alleviate damage in the EEC member states. This would form the background to subsequent efforts to ensure that complementary research is undertaken in each country to quantify damage and seek effective solutions that are widely applicable within the EEC.

ACKNOWLEDGMENTS

Research by CJF was funded by the Ministry of Agriculture, Fisheries and Food (London). We are grateful to Mrs. V. Silvester, Mr. R. Groombridge and Dr. P.W. Greig-Smith for critically reading the manuscript.

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