A New Wrinkle on an Old Method: Successful Use of Scarecrows as a Non-Lethal Method to Prevent Bird Damage to Field Crops in Israel

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ABSTRACT: The use of scarecrows to prevent bird damage to crops probably dates back thousands of years to the beginning of agriculture. Because many of the birds that can cause damage to field crops are protected species, farmers need effective non-lethal protection methods. Despite their perception as "low-tech" and thus ineffective, scarecrows are being used in Israel in a new way, as a cost-effective part of modern bird-damage prevention programs for field crops. Farmers in the Hula Valley in northern Israel placed seated life-size human effigies dressed in yellow hooded rain-suits, each holding a large black pipe (to simulate a shotgun) in fields of winter field crops, as part of a program to prevent damage by Eurasian cranes. Each effigy was also equipped with a life-like facial mask. Experience has shown that approximately one seated scarecrow is needed per 5 ha (about 12 acres) of field crop. To make these scarecrows more effective, and to prevent habituation, the farmers occasionally dressed in yellow rain-suits like the scarecrows, and seated themselves in the field, opening fire with pyrotechnics when birds approached. In addition, the farmers donned the yellow rain-suits whenever conducting any bird harassment activity, such as shooting pyrotechnics from vehicles while patrolling their fields. The birds apparently learned to associate the yellow-suited figures with danger and to keep away from them (and the crops). Farmers who used the new scarecrows in this way found them to be cost-effective because crop damage was almost nil, while damage prevention expenses were also kept low, since the scarecrows are cheap to build and maintain, and less pyrotechnic ammunition was needed for crop protection.

KEY WORDS: birds, crane, eco-tourism, hazing, habituation, Eurasian crane, *Grus grus*, Israel, scaring, stakeholder cooperation

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INTRODUCTION

Because many of the birds that can cause damage to field crops are protected species, and because of growing concerns about animal welfare issues (Hadidian 2000), farmers need effective non-lethal protection methods for preventing wildlife-related damage to their crops.

The use of scarecrows, mannequins, or human effigies to prevent bird damage to crops apparently dates back thousands of years to the beginning of agriculture. A wide variety of scarecrows are still in use in many cultures, but they are generally viewed in western countries as low-tech and thus non-effective.

Attempts have been made in recent years by various entrepreneurs to apply technological advances to scarecrows, presumably to make them more effective, for example, the inflatable and sound-emitting human effigy Scarey Man®. This is based on the presumption that it is necessary to add movement and/or sounds to a scarecrow to make it more effective and less likely for an animal to become habituated to it. Although such technology can reduce habituation, the present work shows that even a simple, non-moving scarecrow can be effective if used in a way that prevents habituation.

Bird-Agriculture Conflict in the Hula Valley

Israel has an especially wide variety of wildlife-human conflict (Nemtzov 2002), partly due to its position on a major migratory route for hundreds of millions of birds between Eurasia and Africa.

Eurasian cranes, *Grus grus*, began causing damage to winter wheat in the Hula Valley in northern Israel in the mid 1990s (Alon 1999*a*,*b*, 2001). Before then, few Eurasian cranes wintered in the area (Bautista *et al*. 1992). The conflict began mainly after farmers began to grow peanuts in the valley in summer. Many migrating cranes began stopping in the valley during their fall migration between Asia and Africa to feed on peanuts left in the fields after the harvest, and thousands of cranes stayed in the Hula Valley all winter, causing damage to winter crops, mainly by digging up prepared seed-beds and by trampling young shoots (Alon 1999*a*,*b*, 2001; Davidson 2005).

Over the last few years, approximately 20,000 to 30,000 cranes stay in this small (approx. 20 $km^2 \approx 8$ mi^2) valley during November and December. Most head south to Africa in late December, but approximately 15,000 remain in the valley each year until early March (Davidson 2005), when they begin their spring migration back north (Figure 1).

Due to the damage caused by the cranes, disgruntled farmers would often shoot and kill some of the cranes, even though this was illegal, until a crane-agriculture damage management program began in the year 2000. Part of the program involves offering alternative feeding sites to the cranes in the form of designated fallow fields, where approximately 2 tons of corn kernels are distributed each day from late December (when most of the cranes have left the valley to head south to Africa) until early March (when the last of the cranes have left on the spring migration back north). Part of the program provides for eco-tourism, in which thousands of tourists come to the valley to see and hear the huge flock of cranes.

Another part of the crane-agriculture damage management program involves providing farmers with effective, inexpensive non-lethal scaring methods to keep the cranes off the crops. One of these non-lethal methods is the scarecrows that are used by the farmers in a coordinated and consistent way to make them effective.

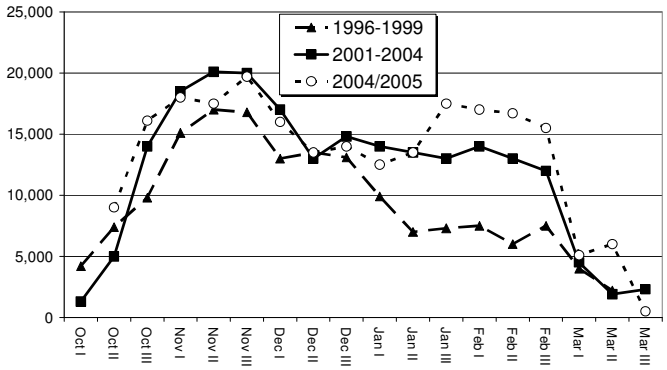

Figure 1. Number of Eurasian cranes in the Hula Valley during the winter of 2004/2005 (open circles) and multi-year averages from 1996-1999 and 2001-2004, based on counts conducted three times per month, i.e. every 10 days (based on Davidson 2005).

METHODS

Scarecrows Design and Distribution

Scarecrows were built by filling bright yellow, 2-piece rain-suits with straw and other materials in a way that prevented them from sagging even after rain. Details of the actual construction and the filling of the scarecrows are trade secrets developed by the second author. All scarecrows were fitted with a face mask or other bright material in the facial area. Each scarecrow was "armed" with an imitation rifle in the form of a piece of metal pipe painted black, with or without an added wooden stock (Figure 2).

Scarecrows were placed in the fields in a seated position upon old or broken chairs, at a density of approximately one scarecrow per 5 ha (≈12 acres).

Farmer Activity

There was an organized bird-scaring program in the valley that helped keep cranes off the fields and sent them to the alternative feeding sites (see below). In addition, all the farmers in the Hula Valley were taught how to contribute to the success of the scarecrows by following a simple rule: all farmers (as well as all workers involved in the bird-scaring) were to wear rain-suits similar to those used on the scarecrows, whenever they were engaged in bird-scaring activities such as chasing or shooting pyrotechnics. This was required so that the cranes would associate the yellow-suited figures in the field with a genuine threat.

Preventing Habituation

A farmer who saw that some birds were becoming habituated to the scarecrows in his field would have to dress like a scarecrow and place himself before dawn in a chair in the field among the seated scarecrows and wait for the birds to approach at first light (Figure 3). Once the cranes came near him, he would then stand up and walk towards the cranes, scaring them by firing pyrotechnic ammunition directly at them. This activity would reinforce the message to the cranes that the yellow-suited figures in the fields represent a real, unpredictable threat.

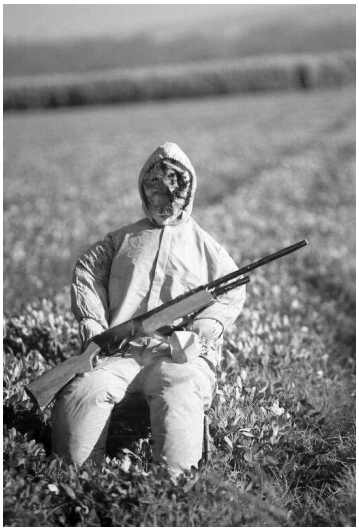

Figure 2. A "new" scarecrow in the field. Note that the scarecrow is wearing a bright yellow rain suit, has a light colored face mask, is seated rather than standing, and carries an imitation rifle.

Figure 3. A farmer, dressed the same as the scarecrows, sits among the scarecrows in the field ready to shoot pyrotechnic ammunition to scare the cranes, as a way to avoid habituation.

COST-BENEFIT ANALYSIS

The annual cost of the organized crane-agriculture damage management program was approximately 350,000 NIS (≈US$75,000) (Davidson 2005). This was mainly to pay for the corn that was distributed, for the cost of leasing the fields for this alternative feeding, and for the organized scaring.

About half of the organized program was paid for by the farmers in the Hula Valley by assessment at a rate of 60 NIS per ha farmed (≈US$5 per acre). The rest of the organized program was financed with funds from the local government, the Ministry of the Environment, the Ministry of Agriculture, and the Society for the Protection of Nature in Israel (a pro-wildlife non-government organization). It is important to note that farmers had

additional costs related to preventing crane damage, which included the scarecrows, that were estimated to be about equal to the assessment (Davidson 2005).

A detailed cost-benefit analysis of the entire crane-management program was conducted by Lindman (2004). Overall losses to the farmers due to crop damage and attempted prevention were not quantified before the program began, but they were estimated to be several million NIS (Ofer Sivan, pers. commun.). Lindman's (2004) analysis showed that the entire crane-agriculture management program was cost-effective for the farmers, since losses due to crane damage were reduced to almost nothing, although they still have to pay for the prevention. The farmers also feel that the program is a financial success and continue to support it each year; however, it is necessary to find ways to reduce the cost of the program borne by the farmers by, for example, having ecotourism income cover part of the costs (Davidson 2005).

It is difficult to isolate the actual cost vs. benefit of the scarecrows, since Lindman's (2004) analysis did not look at the scarecrows as an individual component of the overall crane-management and damage-prevention program. Each scarecrow costs about 50 NIS (≈$10) to make, but the cost of operating the scarecrows in the field was not quantified.

An added benefit to the program, however, was the spirit of stakeholder cooperation that led to a win-win situation in which damage was prevented, profits increased, costs were reduced, ecotourism increased, and cranes were not harmed. This spirit of cooperation has carried over into designing additional cooperative projects in the region for dealing effectively with other wildlife-damage issues, i.e., damage to freshwater fisheries by great cormorants (*Phalacrocorax carbo*) and white pelicans (*Pelecanus onocrotalus*), damage to crops and orchards by wild boar (*Sus scrofa*), and depredation of livestock by wolves (*Canis lupus*) and golden jackals (*C. aureus*).

CONCLUSION AND DISCUSSION

We have found that it is not the technology built into the actual scarecrow that makes it effective, but rather it is the way the scarecrow is used in training wild birds to avoid coming near crops, that determines its utility.

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