AGELAIUS BLACKBIRDS AND RICE IN URUGUAY AND THE SOUTHEASTERN UNITED STATES

ETHEL N. RODRIGUEZ, Vertebrate Pest Management, Ministry of Livestock, Agriculture and Fisheries, Millán 4703, Montevideo, Uruguay.

MICHAEL L. AVERY, USDA/APHIS, Denver Wildlife Research Center, 2820 East University Avenue, Gainesville, Florida 32641.

ABSTRACT: Throughout the world, wherever rice is grown, birds that damage the crop are attracted. The situations are particularly interesting in Uruguay and the southeastern United States where different species of blackbird have adapted to rice cultivation. In the two countries, rice production practices differ in several respects such as seeding rate, seedbed preparation, and insect control practices. Furthermore, although they are congeneric, the major rice pest species differ in important ways. For example, in Uruguay, *Agelaius ruficapillus* usually nests in the rice field, whereas *A. phoeniceus*, in the U.S., does so only rarely. Agronomic and ornithological aspects of these two blackbird-rice systems are discussed and implications for development of effective damage management strategies are evaluated.

KEY WORDS: *Agelaius*, blackbird, crop damage, rice, United States, Uruguay

Proc. 17th Vertebr. Pest Conf. (R.M. Timm & A.C. Crabb, Eds.) Published at Univ. of Calif., Davis. 1996.

INTRODUCTION

Rice is a major crop in many parts of the world, and virtually wherever it is grown, rice attracts depredating birds. Parakeets, waterfowl, blackbirds, finches, and numerous other species feed on cultivated rice. In North and South America, blackbirds of the genus *Agelaius* frequent fields, wetlands, and agricultural areas. Several of the nine species in this genus are responsible for crop depredations, and this study focuses on two species that regularly damage rice. This overview is not intended as an exhaustive comparative study, but is part of on-going investigations of bird damage to rice in Uruguay and in the United States. The objectives are to compare and contrast the blackbird rice depredation problem in the two countries and to relate species' life history traits to potential damage management strategies. Much of the information presented here was obtained in interviews with rice producers and researchers in each country as well as from relevant reports and publications (T.A.E.S. 1993; De Ambrosis and Blanco 1994; L.S.U. 1995). To conserve space, these three references are not cited throughout the text.

RICE MANAGEMENT

Seeding Rate

In the southeastern U.S., the recommended rice sprout density is 20 per square foot (215/m^2). To achieve this density, rice fields are seeded at rates of 110 to 130 kg/ha. The actual seeding rate will vary with several factors, including rice variety, seeding method, and time of year. For example, drill-seeded rice fields generally require lower seeding rates (100 to 120 kg/ha) than do fields where seed is broadcast either dry or into water (120 to 165 kg/ha). Early planting requires higher seeding rates because unfavorably cool weather promotes water mold that reduces stand density. Fields that are planted earlier also are more prone to blackbird damage than are later fields (Wilson et al. 1989).

Typically, seeding rates in Uruguayan rice fields are much higher than in the U.S. Drill-seeded fields receive 150 to 200 kg/ha, whereas broadcast-seeded fields receive 200 to 250 kg/ha (Piriz 1992). All seeding is done onto dry seed beds. Recommended sprout density in Uruguay is 380 plants/m^2 which is about 80% greater than U.S. guidelines.

Rice Variety

In Uruguay, the dominant rice cultivar for the past 25 years has been Bluebelle, a long-grain variety developed in Texas in the 1960s (Bollich et al. 1968). Another long-grain variety, El Paso 144, is now being planted in increasing acreages because of greater yield potential. These cultivars apparently do not vigorously produce tillers so the rate of seeding needs to be high. Other varieties developed for conditions in the U.S. tiller profusely so that as little as 60 kg/ha will produce adequate stands in drill-planted fields.

Water Management

Rice is sown or drilled in dry seed beds in Uruguay, and the permanent flood is established six to seven weeks later. Producers rely on rain to stimulate germination, but seedling establishment is aided by periodically flushing irrigation water through the field if rain is insufficient. When a dry seedbed is used in the U.S., the field is flushed immediately after sowing and the permanent flood is usually established within three weeks. When rice is water-seeded, the field is usually drained within a day of planting so that seedlings can take root and begin to establish. The permanent flood is put on about three weeks later. To hasten seeding establishment in water-seeded fields, many U.S. producers presprout the seed by soaking it for 24 hours before planting. This technique is not practiced in Uruguay.

Uruguayan rice fields often contain numerous closely spaced levees for controlling water flow. The levees follow the contour lines, and depending on the degree of slope, the levees may be separated by as little as 5 m. This is in contrast to U.S. rice fields which are usually leveled very precisely so that only a minimum number of widely spaced water control levees are needed.

Weed Management

Weeds are a serious problem for rice producers in both countries. Species in the genus *Echinocloa* infest fields in Uruguay, where the common name is "capin" and in the U.S. where the same weeds are commonly called "barnyard grass." In both countries, herbicides are applied to control these and other weed species. Timing of herbicide applications is crucial. In Uruguay, if the chemical is applied before the field is fully prepared with the levees constructed, the seeds that were below the surface will be brought up during the levee-building process and *Echinocloa* will soon festoon the levees. Water management is also important because when the permanent flood is delayed, weeds are able to become established. This situation often arises in Uruguay where fields are dry-seeded and permanent flooding occurs six to seven weeks after seeding. Post-emergent herbicide application may then be needed. Although red rice is a bane to many rice producers in the U.S., it is not a for producers in Uruguay.

Insecticides

A unique aspect of rice production in Uruguay is the absence of chemical insecticides. Even though insect pests occur in Uruguayan rice fields, their impact is minor, unlike in the U.S. where rice water weevil (*Lissorhoptrus oryzophilus*), rice stink bug (*Oebalus pugnax*), and other speices seriously reduce productivity. To control damage by these pest species, U.S. rice producers apply a variety of chemicals including carbofuran and carbaryl. At least some rice growers in Uruguay believe that it is desirable to have blackbirds in their fields because of the amount of insects the birds eat. There are no data, however, that document the effects of bird predation on arthropod fauna in rice fields, either in Uruguay or in the U.S.

BIRD PEST SPECIES IN RICE

Species of Concern

Although several depredating species occur in each country, the primary pest species in rice fields in Uruguay and in the U.S. are the rufous-capped blackbird, *Agelaius ruficapillus*, and the red-winged blackbird, *A. phoeniceus*, respectively. The adult male red-winged blackbird is slightly larger (22 cm overall length) than the rufous-capped (17 cm). Except for their respective head and wing markings, adult males of both species are mostly uniform black. Females of both species are somewhat smaller and brown overall.

Diet

During the breeding season, both species are largely insectivorous. Meanley (1971) found that insects comprised 59% of the diet of redwings in Arkansas rice fields during May to July. Similarly, animal matter dominated the stomach contents of blackbirds collected at Uruguayan rice fields in December and January (Figure 1). During other months, rice was the principal food item. Meanley (1971) also found that rice represented more than half of the diet among red-winged blackbirds in Arkansas during nonbreeding months. On the other hand, Wilson (1985) found that rice exceeded 50% of the diet of Louisiana red-winged blackbirds during September to November only. The rest of the year, weed seeds dominated the diet.

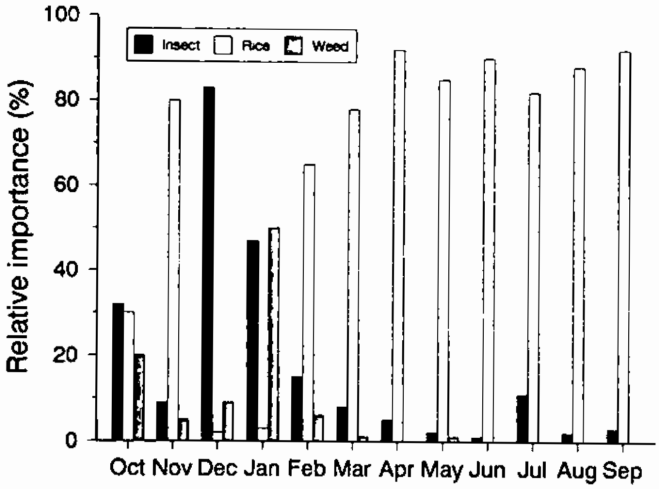

Figure 1. Relative amounts of insect matter, rice, and weed seeds in stomachs of rufous-capped blackbirds (sexes combined) collected monthly at Uruguayan rice fields during 1994 to 1995. Rice is planted during October and November, and harvest is primarily in March and April.

Reproduction

Both species are polygynous or promiscuous (Orians 1985), although mating habits of *A. ruficapillus* need to be more completely documented. In each species, average clutch size is three eggs. The female incubates and feeds the young while the male's role is primarily territorial defense.

There is a marked difference between species in nest site selection. In Uruguay, *A. ruficapillus* frequently nest in rice fields where the birds construct the nest in growing rice plants. In one 0.2 ha portion of a field, 27 nests were found, several of which had been preyed upon. Nesting also occurs in small trees and shrubs adjacent to rice fields (e.g., Bruggers et al. 1995), but the majority takes place in rice fields.

Conversely, *A. phoeniceus* seldom nests in rice fields. Rather, their nests are normally in emergent aquatic vegetation or in small trees and shrubs. In rice-growing areas, the nest site is often along a drainage canal or wood edge adjacent to a rice field (Meanley 1971).

Movements

In the U.S., many red-winged blackbirds migrate thousands of miles annually between wintering areas in the southeast and their breeding grounds in the northern Great Plains and Canada. It appears, however, that migrants are present primarily during November to February, and local, nonmigratory birds are probably responsible for most damage in rice fields (Meanley 1971; Brugger and Dolbeer 1990).

Populations of rufous-capped blackbirds in Uruguay appear to move locally in search of feeding sites in the nonbreeding season, but as yet there is no indication of consistent migratory patterns. Intensive banding and telemetry studies are needed to document more adequately the local and long-range movements of this species relative to rice-growing practices.

IMPLICATIONS FOR MANAGEMENT OF BLACKBIRD DAMAGE TO RICE

Affecting Rice Field Carrying Capacity

Rice fields possess numerous resources essential for blackbirds, and rice field habitat can support large blackbird populations. The challenge then is to lower the carrying capacity of the rice field habitat for blackbirds. It is not feasible to eliminate blackbirds or blackbird damage to rice, but it may be possible to reduce the depredating blackbird population by lowering the carrying capacity of the rice field habitat.

The carrying capacity can best be affected by altering resource availability. Of the critical resources, it is impossible to restrict the amount of nesting habitat available as there is no way to reduce availability of the rice plants used by rufous-capped blackbirds. Similarly, there is no feasible means to reduce the availability of nesting habitat for red-winged blackbirds as it is pervasive throughout rice-growing areas in the southeastern U.S. Besides, numerous other species would probably be adversely impacted by any large-scale effort to alter habitat.

Arthropod abundance is an important factor for blackbirds during the breeding season. To reduce arthropod populations, pesticides would probably be necessary. Such applications could adversely affect beneficial species, however. Also, blackbirds may simply forage in adjacent areas if prey abundance is reduced in rice fields. It is unlikely that such measures would be economical, especially in Uruguay where rice producers do not currently need to control insect pests with insecticides.

Thus, to affect carrying capacity, lower the local blackbird population, and reduce damage, it will be necessary to focus on rice and weed seed, the birds' principal food items. Food resources for blackbirds are probably lowest just before the new crop of rice is planted. By that time of year, blackbird populations have, no doubt, largely depleted the rice and other seed reserves on the ground left from the previous growing season (Labisky and Brugger 1989). Therefore, it is appropriate to maintain the food resources at the lowest level possible by denying birds access to the newly planted rice seed. Such a reduction in carrying capacity at that time of year could translate to lower populations, and less damage, during both the seeding and ripening stages.

Reducing Availability of Newly Seeded Rice

The high seeding rates (approximately 150 to 200 kg/ha) used by most Uruguayan rice producers ensure that birds will have abundant rice seed available to eat for several weeks after planting. If the seeding rate could be reduced without jeopardizing the vigor of the rice crop, then food availability for blackbirds would be lowered. In Uruguay this could be accomplished by treating the seed with methiocarb, locally known as "Draza," prior to planting. Methiocarb is an effective blackbird repellent (Holler et al. 1982), and it should be possible to devise a cost-effective means to use it so that the seeding rate is lowered, blackbird depredation of seed is diminished, and adequate rice stands are produced.

For example, at a cost of $16 to $17 per 50 kg bag of seed, rice seed planted at a rate of 150 kg/ha will cost $50/ha. If the seeding rate is reduced to 100 kg/ha, and if all of the seed is treated with Draza ($30/kg) at a rate of 500 g/100 kg of rice seed (0.25% active ingredient because Draza contains 50% methiocarb), the planting will cost $32 to $34/ha for the seed plus $15/ha for the Draza, giving a total cost of $47 to $49/ha. This is no more expensive than planting untreated seed at the rate of 150 kg/ha. A major advantage to the lower seeding rate, however, is that it greatly reduces the seed that is potentially available to the blackbirds at a time of the year when food availability is low. Furthermore, even the seed that is available will be unpalatable because of the Draza treatment.

This strategy can probably be refined to reduce costs further. For example, field studies in the U.S. showed that a methiocarb treatment rate of 0.125% effectively protects rice from blackbird depredation (Holler et al. 1982). This is one-half the rate proposed above, and if the Draza application rate is lowered, costs will be reduced accordingly, presumbaly without loss of effectiveness. Furthermore, pen studies with captive blackbirds have shown that treatment of half of the rice seed with 0.125% methiocarb is just as effective as treating all of the seed (Avery 1989). Thus, costs of Draza application can be reduced even further by treating only a portion of the seed and then mixing the treated seed with untreated seed prior to planting.

This strategy is currently unavailable to U.S. rice producers because methiocarb is not registered for use as a bird repellent. Other seed treatments that affect blackbird feeding behavior are available (Avery and Decker 1991) or are under development (Avery et al. 1994, 1995). It is, therefore, possible for U.S. rice producers to incorporate bird deterrent seed treatments into their blackbird management plans.

Reducing Local Blackbird Populations

An alternative approach, currently being implemented in Louisiana and Texas, is to reduce roosting populations of mostly wintering birds by application of toxic bait at pre-roosting staging areas (Glahn and Wilson 1992). Such methods can reduce local roosting populations, but there has yet to be a link established showing that there is subsequent reduction of blackbird damage in rice fields. While the toxic baiting method of bird damage management continues to be pursued in the U.S., environmental concerns associated with rice production in Uruguay (Thresher 1995) are too great for lethal blackbird control to be considered an option at this time.

Reducing Availability of Waste Rice

Rice spilled during harvesting is potentially an important food resource for the blackbird population. Actual quantification of the amount of waste rice seed during harvest and transportation from the field is underway in Uruguay. It is important to document the role that this source of food plays in the annual cycle of the blackbirds. It can then be determined how availability can be reduced through improvements in harvesting and transporting.

Reducing Availability of Weed Seeds

When rice is in short supply, there are abundant weed seeds, principally *Echinocloa*, in and nearby the rice fields as alternative sources of food. Particularly in Uruguay, *Echinocloa* grows in dense stands along the levees and the borders of most rice fields. The weed problem is exacerbated in Uruguay because of the many closely spaced levees that wind through most fields. The numerous levees create additional substrate for weed growth which, in turn, offers many attractive opportunities for blackbirds. In addition to being a source of food, such stands of tall weedy vegetation provide blackbirds with protection from predators, shelter from high daytime temperatures, and roosting cover at night. By constructing levees in the rice field first and then applying herbicides, producers should be able to reduce abundance of *Echinocloa*.

SUMMARY

There are many similarities in the blackbird-rice situations in the U.S. and Uruguay. The principal differences lie in the details of field preparation and seeding rates, and in the nest site selection of the primary depredating species, the rufous-capped and red-winged blackbirds. Uruguayan rice fields are dry-seeded and seeding rates are much higher than in the U.S. The seed is exposed to birds for about twice as long as in U.S. rice fields before the permanent flood is applied which creates a situation for higher bird populations to be supported for longer periods of time. Extensive levee systems permit growth of *Echinocloa* and other weeds that also contribute to supporting blackbird populations. Efficient use of methiocarb (Draza) will allow lower seeding rates and will protect seed from blackbird depredation thereby reducing food availability and populations at the site. Careful levee construction with appropriate timing of herbicide application can lead to more effective weed control and thus reduce food and cover resources available to blackbirds.

Prospects for effective management of blackbird damage in U.S. rice fields also depend on the ability to implement an integrated bird management strategy. Such an approach will probably include lethal control with toxic baiting, as well as repellent seed treatments and cultural practices (e.g., delayed planting).

ACKNOWLEDGMENTS

Primary support for this project was provided by an agreement between the Instituto Nacional de Investigaciones Agropecuarias (INIA), the Ministerio de Ganaderia Agricultura y Pesca (MGAP), and Asociacion de Cultivadores de Arroz (ACA). Additional support was provided by the Denver Wildlife Research Center (DWRC) of the U.S. Department of Agriculture. Special thanks go to P. Blanco, E. De Ambrosis, C. Mas, R. Mendez, and G. Zorrilla of INIA for insights and information on rice field management and production practices in Uruguay. The efforts of J. Alleman and R. Bruggers of the DWRC in facilitating this research are greatly appreciated.

LITERATURE CITED

AVERY, M. L. 1989. Experimental evaluation of partial repellent treatment for reducing bird damage to crops. J. Appl. Ecol. 26:433-439.

AVERY, M. L., and D. G. DECKER. 1991. Repellency of fungicidal rice seed treatments to red-winged blackbirds. J. Wildl. Manage. 55:327-334.

AVERY, M. L., D. G. DECKER, and D. L. FISCHER. 1994. Cage and flight pen evaluation of avian repellency and hazard associated with imidacloprid-treated rice seed. Crop Prot. 13:535-540.

AVERY, M. L., D. G. DECKER, J. S. HUMPHREY, E. AAONOV, S. D. LINSCOMBE, and M. O. WAY. 1995. Methyl anthranilate as a rice seed treatment to deter birds. J. Wildl. Manage. 59:50-56.

BOLLICH, C. N., J. E. SCOTT, B. D. WEBB, and J. G. ATKINS. 1968. Registration of Bluebelle rice. Crop Sci. 8:399-401.

BRUGGER, K. E., and R. A. DOLBEER. 1990. Geographic origin of red-winged blackbirds relative to rice culture in southwestern and southcentral Louisiana. J. Field Ornithol. 61:90-97.

BRUGGERS, R. L., C. J. FEARE, E. L. GILL, M. B. SERRA, S. B. CANAVELLI, and M. E. ZACCAGNINI. 1995. Leg streamers for marking chesnut-capped blackbirds *Agelaius ruficapillus* in Argentina. Hornero 14:46-48.

DE AMBROSIS, E., and P. BLANCO. 1994. Rice production in Uruguay. Unpubl. rep. INIA, Treinta y Tres, Uruguay.

GLAHN, J. F., and E. A. WILSON. 1992. Effectiveness of DRC-1339 baiting for reducing blackbird damage to sprouting rice. Proc. East. Wildl. Damage Control Conf. 5:117-123.

HOLLER, N. R., H. P. NAQUIN, P. W. LEFEBVRE, D. L. OTIS, and D. J. CUNNINGHAM. 1982. Mesurol for protecting sprouting rice from blackbird damage in Louisiana. Wildl. Soc. Bull. 10:165-170.

LABISKY, R. F., and K. E. BRUGGER. 1989. Population analysis and roosting- and feeding-flock behavior of blackbirds damaging sprouting rice in southwestern Louisiana. Florida Coop. Fish and Wildl. Res. Unit, Tech. Rep. 36. 77 pp.

LOUISIANA STATE UNIVERSITY. 1995. Rice varieties and management tips. Louisiana State Univ. Agric. Cen. 19 pp.

MEANLEY, B. 1971. Blackbirds and the southern rice crop. U.S. Fish and Wildl. Serv. Res. Publ. 100. 64 pp.

ORIANS, G. H. 1985. Blackbirds of the Americas. Univ. of Washington Press, Seattle. 163 pp.

PIRIZ, M. 1992. Costos del cultivo de arroz. INIA Resultados Experimentales Arroz, Uruguay.

TEXAS AGRICULTURAL EXTENSION SERVICE. 1993. Rice production guidelines. Texas A & M Univ., College Station. 83 pp.

THRESHER, P. B. 1995. Wetlands of Uruguay threatened again by inappropriate development. Environ. Conserv. 22:81.

WILSON, E. A. 1985. Blackbird depredation on rice in southwestern Louisiana. M.S. Thesis, Louisiana State Univ., Baton Rouge. 91 pp.

WILSON, E. A., E. A. LEBOUEF, K. M. WEAVER, and D. J. LEBLANC. 1989. Delayed seeding for reducing blackbird damage to sprouting rice in southwestern Louisiana. Wildl. Soc. Bull. 17:165-171.