VERTEBRATES

Rice fields provide excellent habitat for some bird and rodent species. The Norway rat is probably the most serious vertebrate pest of rice, feeding on newly planted seed, seedlings, or ripening grain. Muskrats burrow in rice levees, damaging drainage systems and irrigation structures. Waterfowl and blackbirds may also cause yield losses in some localized areas.

The most successful vertebrate pest management program is one that manages pest populations at levels at which significant damage never occurs. This requires knowledge of the biology and behavior of the potential pests and regular monitoring for them in and around fields. Historical records of pest population levels, control measures implemented, economics of control procedures and the success of methods used, can be used to help determine the best management approach.

Consideration also should be given to the presence of non-pest species and the potential risks of a control method. The methods and materials available for vertebrate control are constantly changing. Check with your County Agricultural Commissioner on laws and regulations concerning the status of wildlife species and the methods and materials available to control them.

Waterfowl

Annually, large numbers of waterfowl (ducks, geese, coots) migrate along the Pacific flyway to and from their northern breeding grounds and may spend from a few weeks to months in fall and winter in California's Central Valley. Flooded rice fields provide an ideal habitat for waterfowl and have an important role in the conservation of these birds (fig. 1). Because most rice in California is harvested prior to the arrival of migrating waterfowl and planted after their departure, damage to rice is usually kept to a minimum. Most problems occur where waterfowl become 'resident'. Ducks and geese cause the most serious losses in rice by feeding on maturing grain and sometimes causing lodging. Coots may sometimes damage newly planted fields.

Figure 1. Large numbers of waterfowl migrate along the Pacific flyway and spend time in California rice-growing region.

Management guidelines

All species of waterfowl are migratory game birds that are protected by federal and state laws. Waterfowl cannot be lethally controlled without a depredation permit. Damage can usually be alleviated using frightening (hazing) techniques. Propane cannons (fig. 2), electronic noise makers, pyrotechnics, Mylar tape and other sound and visual scare devices may be used to frighten waterfowl from areas where they are causing damage. Waterfowl may habituate to these techniques so they might only have short-term effectiveness. Persistence in applying the

Figure 2. Air cannon used for frightening waterfowl.

methods and alternating frightening devices are important in achieving success.

Figure 3. Electronic noise maker.

Blackbirds

Blackbirds may damage ripening rice, especially during the milk and dough stages (fig. 4, 5). Losses may be quite high in some fields that are close to important roosting areas.

Figure 4. Redwing blackbird.

Figure 5. Damage to rice panicle caused by blackbirds.

Management guidelines

Frightening techniques are most commonly used to manage blackbirds. Unfortunately, these techniques are even less effective for blackbirds than waterfowl. To be effective, you must instigate these controls as soon as birds appear in the field. A permit is not needed to lethally remove blackbirds that are causing or threatening to damage rice crops. To date, repellents have not proven to be effective in reducing blackbird damage to rice in California.

Norway rats

The Norway rat (Rattus norvegicus) is responsible for most rat damage in rice fields (fig. 6). Rat damage to growing rice is usually most serious shortly after planting when the water is temporarily lowered for seed germination and stand establishment. This can be especially severe where fields are not leveled and high spots are exposed to air. The rats pull up the sprouting plants and eat the seeds (fig. 7). Rats may also consume ripening grain as the cereal heads come into the milk stage, but losses are generally not as serious.

Norway rats have a bulky appearance and a tail that is shorter than the length of their head and body combined. Rats are mainly active at night, but if their numbers are high, activity may be observed during the day. They are omnivorous and feed on a wide variety of plant and animal materials. Norway rats dig burrows and burrow systems are frequently found along levees beside rice fields (fig. 8). These burrows can also weaken levees systems and affect irrigation.

Norway rats are prolific breeders. They are capable of breeding year-round under optimal conditions but most breeding is in spring and fall. Females produce about 4 litters per year. Average litter size is about 6, and the young are weaned at 3 weeks and become sexually ma-

Figure 6. Norway rat.

Figure 7. Germinating rice seeds damaged by Norway rats.

Figure 8. Norway rat burrow

ture at 2 to 3 months of age. These reproductive characteristics enable rat populations to rapidly increase and become widespread in response to onset of optimal environmental conditions. Populations typically undergo cycles of abundance. Problems are most likely to occur following mild winters and when food supply is abundant.

Management guidelines

Norway rats are non-native mammals and may be taken at any time and in any manner when they are causing damage to crops or other property. Where possible, non-crop habitats should be managed year round to reduce shelter and food supply for rats. Good weed control on levees is essential. Ground vegetation in areas adjacent to rice fields should be kept to a minimum by grazing or mowing.

When rat populations continue to be high despite habitat modification, rodenticides may be used. Currently (2023), registered rodenticides for Norway rat control on levees and adjacent non-cropped areas include the acute toxicant zinc phosphide and the anticoagulants diphacinone and chlorophacinone. The rodenticide and application method should be chosen with regard for potential non-target hazards. Consult your Agricultural Commissioner for specific information.

Zinc phosphide is an acute toxicant that is metabolized quickly within the target animal, and has minimal (if any) secondary poisoning risks. However, because of its fast action, rodents might only ingest a sublethal dose of bait before becoming sick. This may result in rodents becoming ‘bait shy’. Consequently, it is best to wait at least 3 months, and preferably 6 months between applications. Zinc phosphide bait is placed according to label instructions in active burrows or in places frequented by rats but inaccessible to livestock, poultry, non-target wild-

Figure 9. Tube used to decrease non-target exposure of rodenticides.

life, pets and children (fig. 9). When possible, prebait with clean grain several days before bait application to determine if rats are taking the bait and to overcome any bait shyness. Prebaiting is especially important where other foods are abundant.

Anticoagulant baits act by reducing the clotting ability of the blood. The target animal must consume a number of doses of bait over a period of several days to obtain a lethal dose. Because a residue of the anticoagulant bait may remain in the target animal (primarily in the liver), predators or scavengers may also be at risk of consuming a lethal dose of bait. Risk increases where treated rat populations levels are extremely high (i.e., high availability of carcasses containing anticoagulant) and in areas where and at times when predator and scavenger populations are especially abundant. Risk also increases when too much bait is applied. As with all rodenticides, follow the label carefully and use as little bait as possible to bring the population under control.

Anticoagulants may be applied in bait stations, by spot application, or in paraffinized bait blocks. Bait stations protect bait from rain and prevent non-target species feeding on the bait. To achieve control, keep the stations well-supplied until feeding ceases. Bait blocks made from paraffin may be placed in areas of rat activity. These blocks aren't as readily accepted as loose baits but are relatively waterproof and eliminate the need for bait boxes. Replace blocks as necessary and discard of uneaten bait when the control program is completed.

Muskrats

Muskrats (Ondatra zibethicus) are semi-aquatic rodents named for their conspicuous odor resulting from secretions from musk glands at the ventral base of the tail (fig. 10). They sometimes inhabit water supply canals and drainage ditches near rice fields. Their burrowing, especially around headgates can cause breaks in levees and dikes. Significant yield loss may occur before repairs can be completed. Muskrats also occasionally cut and eat rice plants.

Muskrats have dense fur, a long, laterally flattened tail and partially webbed feet. Adults are about 18 inches long and weigh from 1.5 to 2.5 pounds. Their native range in California was along the Colorado River by the Arizona border and in scattered locations on the eastern side of the Sierra Nevada from Mono to Lassen County. Construction of irrigation canals in the early 1900's enabled them to expand their range into southern California. A high demand for muskrat fur during the 1920's resulted in the release of muskrats elsewhere. Muskrats now occupy canals, ponds, and irrigation ditches throughout most of California.

Muskrats are very prolific. Most females have two or three litters per year, with an average of about 6 or 7 kits per litter. Most births occur in spring. The gestation period is between 25 and 30 days. The young become active and able to swim within 14 days, and are weaned at 28

days. Most become sexually active the spring after their birth.

Depending on the environment and season, muskrats construct either houses or dig burrows into banks. Unless the population is very dense, muskrats prefer to burrow into banks rather than build houses. Soil type and slope of the bank determine the permanence and complexity of a burrow system. Burrows often begin in the water, from 6- to 8-inches below the surface, and penetrate the embankment on an upward slant. Burrows are not typically found when banks are less than 0.2 meters high, slope is less than 10 degrees, or when combined sand/gravel content is less than 90 percent. Burrows may extend 20 feet or more into banks. Houses are usually constructed from the dominant emergent plants in the area. They are built at water level with several underwater tunnels or "leads" for entrances.

Muskrats are primarily herbivorous although animal matter like crayfish may occasionally be consumed. Muskrats feed on aquatic vegetation growing in the vicinity of their dwellings. Characteristic signs of muskrat feeding activity include food platforms and feeding houses. Most activity occurs at night, with peaks at dusk and dawn.

Management guidelines

Muskrats are classified as furbearers but can be taken at any time when they are causing damage to crops or other property. Management of vegetation to reduce muskrat food sources on levees and on ditch banks can help minimize muskrat problems. In some situations however, lethal control of muskrats is necessary. Trapping can be very effective in reducing muskrat populations and damage. Conibear traps are probably the most effective but it is important to note that while they can be

used to remove muskrats causing damage, they cannot be used to trap muskrats for fur (see Fish and Game Code).

Anticoagulant baits (diphacinone and chlorophacinone) may also be used. Bait can be placed in floating bait boxes or bait blocks (also used for Norway rat control) may be placed in muskrat feeding areas on levees and banks.

Figure 10. Muskrat.