MORMON CRICKET

Anabrus simplex Haldeman, 1852 (Tettigoniidae)

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Anabrus simplex male

(photo by R. Srygley)

Anabrus simplex male

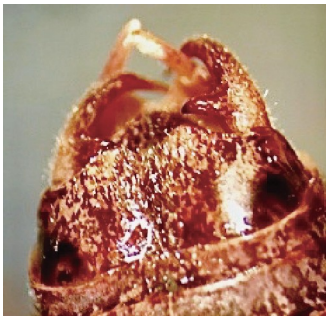
(photo by R. Srygley)

Anabrus simplex female

(photo by R. Srygley)

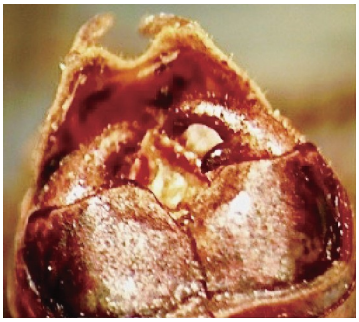
IDENTIFICATION AND DIAGNOSIS

Anabrus simplex like all *Anabrus* lack functional wings, and can be separated from other *Anabrus* species by the morphology of male cerci and ratio of femur length to pronotum length (F/P). Male cercus with inner tooth greatly enlarged and at right angle to main body of cercus: *Anabrus cerciata* Caudell, 1907. Male cercus different, clubbed, with apex of inner tooth half, or more than half, the length of cercus from base to main body of cercus; F/P of 2.0 or less: *Anabrus simplex*. Male cercus with inner tooth less stout and apex of inner tooth varying in position from very near base of main body to about midway the length of cercus ; F/P ⩾ 2.0: *Anabrus longipes* Caudelle, 1907 and *Anabrus spokan* Rehn & Hebard, 1920 (*A. spokan* may not be a valid species but only a subspecies of *A. longipes*; *A. spoken* cerci appear more similar to *A. longipes*, but F/P is near 2.0 and more like that of *A. simplex*).



A.longipes

A.cerciata



A.spokan?

A.simplex

Male cerci of *Anabrus simplex* and three other species of *Anabrus*

(photo by Laura Senior, USDA-ARS)

DISTRIBUTION

Western United States (Arizona, California, Colorado, Idaho, Kansas, Minnesota, Montana, Nevada, Nebraska, New Mexico, North and South Dakota, Oregon, Utah, Washington, Wyoming) and Southern Canada (Alberta, British Columbia, Manitoba, Saskatchewan).

HOSTS

Natural Hosts

Over 400 (mainly rangeland) plant species have been recorded as hosts of Mormon crickets.

Major Crop Hosts

Major crop species include wheat and alfalfa. However barley, beans, cantaloupe, carrots, clover, corn, flax, grape, hay, lettuce, millet, oats, onion, peaches, potatoes, rye, sorghum, strawberries, sugar beets, tomatoes, and watermelon can also sustain damage when encountered by migratory bands.

PLANT DAMAGE/ ECONOMIC IMPACT

Mormon crickets prefer leaves of broad-leaved plants and tend not to feed on leaves of grasses except when occurring in extremely high densities. However this species will feed on the protein-rich parts of many plants (including grasses) such as wheat kernel, seeds and ovaries of other broad-leaved plants and grasses.

REPRODUCTIVE BIOLOGY

Eggs: Laid individually 2-4 cm beneath the soil surface. A female may lay up to 350 eggs during her lifetime. Mormon crickets overwinter in the egg stage. Eggs typically hatch during the following spring. However, in at least one high-elevation population, eclosion occured after two winters. *Nymphs* feed for 45-60 days, depending on temperature. *Adults* are found from mid-June to September, begin mating after about 6-10 days, and may live 1-3 months depending on availability of food and other factors.

During outbreaks, *A. simplex* has the distinctive behaviour of forming large aggregations (called “bands”) with densities of 10-100 Mormon crickets per square meter. Aggregations can be up to 2 km across and 10’s of km long with

individuals walking in the same direction for weeks. Aggregation into migratory bands can begin in the third nymphal instar or later. Bands exceeding 1 km in width and densities of 14per square meter were common in the summer months during the recent outbreak in the USA. Great Basin. Visual estimates of (1-100) per square meter have also been reported. From their average daily movement of 0.33 linear km (range 1-1,959 m) and the band would often be observed at the same location for over 10 days, we estimate that some bands exceeded 3 km in length.

MANAGEMENT

Biological Control

Several pathogens of Mormon crickets are known. *Heterovesicula (Vairimorpha) cowani* and *Paranosema (Nosema) locustae* are two microsporidia found in Mormon crickets. The former on bran bait showed some potential in field enclosure tests, producing significant reductions in survival of the first to the third instars (>60%). More recently, the Ascomycete fungi *Beauveria bassiana* and *Metarhizium anisopliae* sensu *lato* have shown some promise as biocontrol agents used in an inundative manner. *Metarhizium acridum*, a specialist pathogen of Acrididae, is very pathogenic but has not been tested in the field. The active thermoregulatory behaviour of Mormon crickets, whereby body temperatures can be as high as 40-41℃, limits the efficacy of most pathogens. The entomopathogenic nematode *Steinernema carpocapsae* is infectious in the laboratory but failed in the field. A nematomorphid nematode, *Gordius robustus*, can occasionally achieve high prevalence in Mormon cricket populations but seems to have little practical significance. The sphecid wasp, *Palmodes laeviventris*, is one of the most important natural predators of *Anabrus*. Some birds and mammals can be effective predators. Turkeys and geese have been used to reduce Mormon cricket populations in some localized areas.

Cultural Control

In the early 20th century, mechanical flails and “hopper-dozer” collection devices were used to kill Mormon crickets, but their use was discontinued because of laboriousness, and, more recently, concern about preservation of plant life. While grazing management has been shown to reduce grasshopper impact in short grass prairie, this approach may not be applicable to Mormon crickets. Burning or flooding rangelands to manage Mormon crickets have been proposed

but are not used in practice.

Chemical Control

Typically to protect rangeland and adjacent resources such as private cropland, an insecticide is applied within an outbreak area to rapidly suppress or reduce (but not eradicate) *A. simplex* populations. The mainstay compounds used are carbaryl (as a bait using wheat bran or apple pumice carrier) or spray; diflubenzuron as a spray; and to a much lesser extent, malathion spray. Applications are made by ground or aircraft.

Regulatory Control

Permits are required for transport across U.S. state boundaries.

Field Monitoring

Monitoring is conducted by U.S. Department of Agriculture, Animal and Plant Health Inspection Service (USDA, APHIS) and state departments of agriculture with recording of presence/absence at annually-visited sentinel sites and other survey sites scattered throughout the western states of the USA. Both nymphal and adult surveys are conducted. The need for suppression programs are considered on a case-by-case basis, but generally at minimum population densities of 3.6 per square meter. However, in many cases, populations of much greater than 3.6 per square meter do not justify suppression.

MAIN INFORMATION SOURCES

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