



Status: State threatened

Global and state rank: G2G3/S2S3

Family: Acrididae (short-horned grasshopper)

Range: The Lake Huron locust is restricted to Great Lakes sand dunes in northeastern Wisconsin (Ballard 1989), the eastern Upper Peninsula and northern Lower Peninsula of Michigan, and the central Lake Huron shoreline of Ontario (Otte 1984).

State distribution: The Lake Huron locust occurs along the Lake Michigan shoreline, including the offshore islands, from Mason to Emmet and Mackinac to Schoolcraft counties; the Lake Huron shoreline from Iosco to Cheboygan and Mackinac to Chippewa counties; and the Lake Superior shoreline from Chippewa to Alger County. Altogether, it is known from 18 counties, although it has not been observed in Huron County since the 1960s.

Recognition: The Lake Huron locust is a **small** band-winged grasshopper. The length to end of its folded forewings for males is 1-1.24 inches (24-30 mm), and for females is 1.1-1.6 inches (29-40 mm). The **body** is usually **silvery to ash gray, with darker brown and white markings**. Brick red, burnt orange, and other color morphs occur occasionally, especially among females. The tegmina (toughened **forewings**) of the adults **have darker bands that may be weakly or strongly expressed**. The **hindwings are light yellow near the body with a smoky patch near the tip**. Sexes can be easily distinguished by the males' stronger mottling, their noisy (crepitating) flight, and, as in other Orthoptera, their significantly

smaller size. The Lake Huron locust is one of four species in the Great Lakes Region with the pronotum (**the saddlelike structure behind the head**) **cut across by two well-defined grooves** called sulci. The other three species occur predominately along shorelines farther south than the Lake Huron locust. The range of one of these, the similar-looking seaside locust (*Trimerotropis maritima*), overlaps with the Lake Huron locust along the Lake Michigan shoreline. It can be distinguished from the Lake Huron locust by the two narrow, blackish bands on the inner surface of the hind femora near the distal end. The Lake Huron locust has a **broad band covering half of the inner surface of the hind femora near the body and a narrow band near the distal end**. Other grasshoppers that occur with the Lake Huron locust have one or no sulcus cutting across the pronotum.

Best survey time: Nymphs can be found before mid-July. Adults are present from early to mid-July into October until the time of frequent heavy frosts and snow. Individuals become active between 9:30 and 10:00 a.m., after the sun had risen far enough to warm the foredune shoreline.

Habitat: In Michigan, the Lake Huron locust is restricted to sparsely vegetated, high-quality coastal sand dunes. A similar habitat affinity has been reported from Wisconsin (Ballard 1989). In these areas, it typically occurs in high numbers and is usually the dominant species. Where the open dunes grade into heavily vegetated or disturbed areas, their numbers quickly decline.

Biology: The seaside locust, *Trimerotropis maritima*, apparently replaces the Lake Huron locust as an ecological equivalent along the southern shores of Lake Huron and



Lake Michigan (Hubbell 1929). On the west side of the state the northward range of the seaside locust, extends at least as far as Manistee, Manistee County, while the southward range of the Lake Huron locust extends at least as far as Ludington State Park, Mason County (Scholtens 1996). Currently, it is not known whether a similar overlap occurs along the Lake Huron shoreline. Scholtens (1996) also documented a third very similar sand-colored, yellow-banded Oedipodinae grasshopper, *Spharagemon collare*, as far north as Presque Isle County along the Lake Huron shoreline. Although it occurred in habitats that are typical for *T. huroniana*, only one of the sites he surveyed contained both species. *Spharagemon collare* was not found on any shoreline sites in good to excellent condition. All localities where it occurred were heavily disturbed with high numbers of invasive weeds.

Little on the life history of the Lake Huron locust has been published. Its courtship behaviors are thought to be similar to that of the pallid-winged locust, *T. pallidipennis* (Otte 1970). Egg masses for the single generation per year are laid in the soft soil where they overwinter. Nymphs hatch in late spring and mature by mid-July. Adults may be found in large numbers through the fall, most likely succumbing to the first hard frosts.

Adults communicate through visual and auditory signals (Otte 1970). Only males crepitate in flight by flashing and snapping their wings, making a cracking noise with each snap. Crepitation occurs during a hovering courtship flight in which the males snap their wings two or three times while hovering; this display typically occurs on sunny days when temperatures reach 80°F. Crepitation also occurs during flight elicited by a disturbance. On the ground, courting males stridulate by rubbing the femora against the forewings, producing a trill in bursts of two to three pulses (Otte 1970). Females are cryptically colored against the light sand of the back dunes, whereas the males are virtually invisible on the gravel-dominated upper beaches of the foredunes.

The Lake Huron locust is strictly ground dwelling, essentially never climbing on foliage or other supports (Ballard 1989). On sunny, windless days, locusts are most common on sparsely vegetated sands, where they are evenly distributed with territories of several feet in diameter. In windy, overcast weather, individuals are densely distributed within the heavy dune grass cover, apparently seeking shelter.

Host plant use in the Lake Huron locust is not restricted to grasses, although these probably make up a large portion of the diet. Scholtens (1996) reports that abundant dune grasses are among the most preferred species, but several dune forbs apparently are included in the diet. Three plant species were common to all sites with Lake Huron locusts, dune grass (*Calamovilfa longifolia*), beach grass (*Ammophila breviligulata*) and wild wormwood (*Artemisia campestris*). Other plant species may be important to the locust if it employs diet mixing as a nutritional strategy as

do many other locusts (Mulkern et al. 1969). Scholtens (1997) analyzed frass (fecal) pellets to confirm that Lake Huron locust nymphs were feeding on four vascular plant species, including beach grass, wild wormwood, dune grass, and wheatgrass (*Agropyron dasystachyum*). Significant among the acceptable forbs is Pitcher's thistle (*Cirsium pitcheri*), a federally protected species restricted to the dunes. Unacceptable species were generally woody species, but also included the state-threatened Lake Huron tansy (*Tanacetum huronense*). Limited observations in the field indicate that locusts feed by clipping off vegetation near the base of plants. Parts of insect exoskeletons were found in 28% and 44% of pellet samples from two sites (Scholtens 1997). It is thought that locust nymphs scavenge dead insects to supplement the nitrogen intake in their diet. Nitrogen is widely recognized as the most common limiting nutrient for herbivorous insects (Mattson 1980). Scholtens (1997) concluded that the locust appear to be fairly randomly distributed in dune habitat with respect to plant species and seemed to eat most acceptable host plants, virtually at random, although some preference was shown for beach grass. Host plant specialization is not thought to be a factor limiting this species to shoreline dune habitats at this time.

Lake Huron locusts do show significant preference for dry, loose sand substrates characteristic of shoreline dune habitats and not stabilized, wooded dunes or most inland habitats (Scholtens 1997). The biological reason for this preference is not known. The largest, apparently most stable populations of the locust are associated with areas of extensive, wide dunes. Shorelines that are one mile or more in length with at least two sets of dunes containing blowout areas are ideal.

Explaining the presence or absence of the locust from particular dune systems requires evaluation of a variety of factors including geological processes, biological interactions, and human influence. Interactions between changes in lake levels, availability of suitable habitat, and the locust's ability to colonize and recolonize could have significant influence on the species' distribution patterns at any one point in time.

Conservation/management: Unfortunately, significant parts of the locust's high-quality dune habitat have been degraded or destroyed by shoreline home and recreational development throughout the Great Lakes Region. Protection of the remaining habitat is the most significant action that could be taken for the conservation of this species in Michigan. Although a dune-obligate species, the Lake Huron locust apparently can persist with low to medium levels of human-related disturbance. The extent of the dunes protected at a site should be large enough to allow natural processes to locally change the character of the dunes through blowouts, which create more habitat, or stabilization by plants, which reduces habitat. When disturbance changes the character of the habitat away from a typical dune system to one with a large number of invasive weeds, or lack of sand movement, the Lake Huron



locust seems to drop significantly in numbers. Healthy locust populations have been maintained on private lands in several places on Lake Michigan and Lake Huron, as long as the basic dune system is kept intact. The housing developments most destructive to the locust seem to be those older developments along Lake Huron, where the dune system was quite narrow and construction of houses and swimming beaches has essentially removed the dune and its vegetation. Severe destruction of dunes on public lands has had the same effect where the dunes have been essentially denuded of native vegetation and mechanically flattened to create swimming and volleyball areas.

Scholtens (1996, 1997) identified several major shoreline areas with significant populations of the locust:

1. the northwestern segment of Emmet County along Lake Michigan at Sturgeon Bay, an area of at least 10 miles;
2. the Sleeping Bear Dunes National Lakeshore in Benzie and Leelanau counties;
3. the Ludington State Park area in Mason County which includes at least six miles of good beach front;
4. the Pt. Aux Chenes dunes in Mackinac County with at least two to three miles of dunes;
5. much of the Lake Superior shoreline, where long stretches of high dunes exist from Whitefish Point to the Grand Marais area in Chippewa County; and
6. the Lake Michigan islands.

Research needs: Additional surveys should be conducted to verify the current ranges of the Lake Huron locust, the seaside locust and *S. collare*. Examination of the ecological relationships between these species would be helpful. Additional information on the ecology and life history of the Lake Huron locust also is needed to provide a stronger basis for management planning and conservation activities. The exact microhabitat requirements of the locust over the course of its lifespan should be determined. Long-term monitoring of populations spanning a geographic range of disturbance types and levels would provide crucial information necessary to make recommendations about best management practices for this species. Information about normal movement and dispersal patterns, as well as about the locusts' recolonization capabilities, also would be useful.

Related abstracts: open dunes, Pitcher's thistle, Houghton's goldenrod, Lake Huron tansy, piping plover, prairie warbler, dune cutworm

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