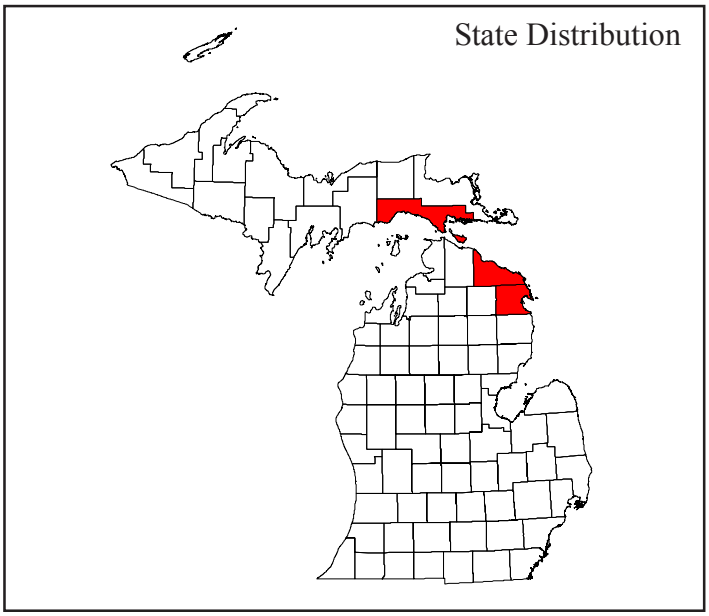
Somatochlora hineana Williamson — Hine's emerald dragonfly



Best Survey Period

Status: Federal and State endangered

Global and state rank: G1/S1

Family: Corduliidae (emerald dragonfly family)

Range: The Hine's emerald is currently known from northern Michigan, northeastern Illinois, Door County, Wisconsin, and from several sites in Missouri. Historically the species was known to occur in three areas of Ohio, and at one site in Indiana. In addition, one specimen had been collected in northern Alabama. Since 1961, Hine's emerald has not been seen in Ohio or Indiana, and it is believed to be extirpated from these states.

State distribution: The Hine's emerald is currently known from thirteen sites in Michigan. Eleven sites are in Mackinac County in the eastern upper peninsula, with one site each in Alpena and Presque Isle counties in the northern lower peninsula. Although not confirmed from Michigan until 1997 a specimen was housed in the Michigan State University insect collection and remained undiscovered until 1998. This adult male specimen had been misidentified as *Somatochlora tenebrosa* (O'Brien 1997).

Recognition: Hine's emerald adults, like other members of its family, have **brilliant green eyes**. *Somatochlora hineana* can be distinguished from all other species of *Somatochlora* by a combination of its **dark metallic green thorax with two distinct creamy-yellow lateral lines** and its **distinctively shaped terminal appendages** or genitalia (Williamson 1931). Adults have a body length of 2.3-2.5 inches (60-65 mm) and a wingspan of 3.5-3.7 inches (90-95 mm) (Zercher 1999). Other species of *Somatochlora* in Michigan which may be confused with Hine's emerald include *Somatochlora elongata*, *S. forcipata*, *S. francklini*, *S. incurvata*, *S. kennedyi*, *S. minor*, *S. walshi*, and *S. williamsoni*. Distinctively shaped male terminal appendages, and female ovipositors separate adults of *S. hineana* from all others. For positive identification adult specimens need to be netted and verified by an expert. No one character will easily or reliably differentiate larvae of Hine's emerald from the species listed above (Zercher 1999). Researchers are currently working on devising keys to differentiate *Somatochlora* larvae.

Best survey time: Adult flight records in Michigan range from late-June through mid-August and adults are best sampled during this period. Larvae can be sampled for at any time during the growing season but seem to be less active during the cooler water temperatures of late fall and early spring (Soluk et al. 1998).

Habitat: Important habitat characteristics of Hine's emerald sites include graminoid dominated wetlands which contain seeps, or slow moving rivulets; cool, shallow water slowly flowing through vegetation; and open areas in close proximity to forest edge (Zercher 1999). The shallow, flowing, cool water provides important larval habitat and the open areas with adjacent woodland edge provide adult hunting and roosting habitat. Michigan Hine's emerald dragonfly sites could be classified as calcareous wetlands or northern fens with an underlining layer of shallow dolomite. One site in Mackinac County has been described as thinly treed, alkaline peatlands (Penskar and Albert 1988). Dominant vegetation in northern fens include sedges (*Carex aquatilis*, *C. lasiocarpa*, *C. limosa*, etc.),

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shrubby cinquefoil (*Potentilla fruticosa*), bulrushes (*Scirpus* spp.), rushes (*Eleocharis* spp.), and twig-rush (*Cladium mariscoide*). White cedar (*Thuja occidentalis*) commonly surrounds and invades northern fens. Other communities in and around Hine's emerald observation locations include: rich conifer swamps, marl fens, coastal fens with seeps, marl pools, hummocks, shallow pools, and small creeks.

Biology: The Hine's emerald exhibits a typical dragonfly life cycle with an aquatic egg, aquatic larva, and a terrestrial/aerial adult (Zercher 1999). The larval stage may last from between 2 to 4 years as they continue to forage and grow within small streamlets (Soluk et al 1998). Hine's emerald larvae are assumed to be a sit-and-wait predator. Analysis of larval behavior in the lab indicates that the larvae are more active at night than during the day (Pintor and Soluk, INHS, unpublished data). Other workers (Mierzwa et al. 1998) have also reported larval movement during the night in the field. It is very likely that the larvae are opportunistic predators feeding on a wide range of invertebrates including but not limited to mayfly, caddisfly, oligochaete larvae, isopods, smaller larvae of other dragonflies, mosquito larvae, worms, and snails (Zercher 1999). An interesting and possible important aspect of larval ecology is the ability to withstand low water or even drought conditions. Hine's emerald larvae have been found beneath discarded railroad timbers in a dried stream channel in Illinois and from crayfish burrows in Illinois and Wisconsin (Soluk 1998). The presumed larval habitat at sites in Michigan has been completely dried up during certain times of the year. Little is currently know on how the larvae survive these conditions in Michigan.

When the larva matures it climbs upon a cattail, rush, or other vertical structure and sheds its exoskeleton (skin) and transforms into a winged adult. This emergence takes place in Michigan from late June through July with adults on the wing until mid-August in most years. As an adult it feeds, establishes a territory, mates, and females lay eggs. Most adult dragonflies are general predators feeding primarily on insects in which they snare while flying (Corbet 1962).

Conservation/management: The most significant threats to the existence of this species have been identified as habitat destruction or alteration, and contamination. Types of direct habitat loss include commercial and residential development, quarrying, creating landfills, constructing pipelines, and filling of wetlands (Zercher 1999). Alteration of habitats include changing the hydrology of sites. This may include building roads, railways, pipelines, and ditches; flooding areas; pulling surface water from nearby areas for irrigation purposes; or pumping groundwater, which could lower groundwater levels (Zercher 1999). Roads and railroads which bisect suitable habitat are especially problematic. Wetland hydrology and quality should also be mantained by preventing improper off-road vehicle use and controlling invasive weeds in these areas. Contamination is a concern due to chemicals and their slow movement through these habitats and the long aquatic stage of this dragonfly (2-4 years). Chemicals in muck sediments can persist and remain toxic for long periods of time and may be difficult if not impossible to treat. Other concerns identified by researchers include environmental extremes, road kills, disease or predation, and fragmentation of habitat leading to genetic stochasticity (Zercher 1999). Further research is needed before more specific management guidelines can be developed. Education and outreach, as well as landowner contact, are important tools for Hine's emerald recovery in Michigan.

Research needs: Additional surveys are needed throughout its range to locate new Hine's emerald populations. In Michigan, larval habitats within occupied wetland complexes need to be identified and protected. Surveys to determine population sizes need to be undertaken at all Michigan sites. Research should focus on the ecological requirements of both adults and larvae.

Related abstracts: incurvate emerald dragonfly

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