

*Conservation Assessment
for
Warpaint Emerald Dragonfly (*Somatochlora incurvata*)*



Photo: Jackie Sones

USDA Forest Service, Eastern Region
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This Conservation Assessment was prepared to compile the published and unpublished information on the subject taxon or community; or this document was prepared by another organization and provides information to serve as a Conservation Assessment for the Eastern Region of the Forest Service. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject taxon, please contact the Eastern Region of the Forest Service - Threatened and Endangered Species Program at 310 Wisconsin Avenue, Suite 580 Milwaukee, Wisconsin 53203.

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EXECUTIVE SUMMARY

The following is a draft conservation assessment providing a summary of readily available information regarding the distribution, ecology, and population biology of the incurvate emerald dragonfly (*Somatochlora incurvata*). Where relevant information exists and was found, special attention was placed on issues pertinent to the conservation of this species in Region 9 of the USDA Forest Service.

The incurvate emerald dragonfly is listed by the USDA Forest Service as a Regional Forester Sensitive Species. It is known to occur in eight states within the Region, is listed as endangered in Wisconsin, and as a species of special concern in Michigan. Systematic surveys for this species have not been undertaken so the distribution data for the incurvate emerald is known to be incomplete.

The incurvate emerald is an above-average size *Somatochlora* whose known habitat includes bogs, fens, heath, patterned peatlands, and northern fens. No information is available about the population biology and viability of this species.

Primary threats to the incurvate emerald include: habitat degradation from peat harvesting, cranberry farming, broadcast toxic pollution, and water level alteration leading to inundation or desiccation of the habitat (Nature Serve, July 24, 2001). The ecological integrity of the wetland habitat needs to be maintained to protect this species. Water quality and quantity need to be maintained. Alterations in the humidity gradient, feeding sites and shelter prior to breeding could also impact this species (Shiffer, 1985).

There are many research needs for this species that is mainly known from anecdotal sources. Research needs include: systematic surveys, monitoring of known sites, formal description of the larva, and basic information about the biology and ecology of the species.

ACKNOWLEDGEMENTS

Information was provided by the following individuals: **Kierstin Carlson**, Conservation Data Handler, Western Pennsylvania Conservancy; **Kevin Doran**, Wildlife Biologist, Hiawatha NF, USFS; **Teresa Mackey**, Information Services, New York Natural Heritage Program; **Jamelle Schlagen**, Department of Natural Resources, State of Wisconsin; **Ed Schools**, Michigan Natural Features Inventory; **Steve Sjogren**, Wildlife Biologist, Hiawatha NF, USFS; **Wayne Steffens**, Independent Consultant, Two Harbors, Minnesota.

NOMENCLATURE AND TAXONOMY

Scientific name: *Somatochlora incurvata* (Walker 1918)

Common name: Incurvate emerald dragonfly (Dragonfly Society of the Americas).
Also referenced as warpaint emerald or Michigan bog skimmer

Family: Corduliidae (emerald dragonfly family)

Order: Odonata

Synonyms: None

DESCRIPTION OF SPECIES

The incurvate emerald is about 63 mm or 2 inches long, which is above average for the *Somatochlora* genus. The face is yellowish-brown with dark, metallic greenish markings and large, green eyes. The thorax is brown with metallic blue-green reflections and a pair of yellowish-brown elongated spots on each side. The abdomen is black with a dull greenish sheen, with pale areas on the sides of segments 2 and 3, and smaller dull yellow-brown spots on the rear portions of segments 4 to 9. The legs are black and brownish at the base (Lee 1999). Juvenile females have orange wingtips (Dunkle, 2000).

Several other species of emerald dragonflies occur in the same habitats and fly at the same time as the incurvate emerald. Adults of these different species can only be reliably distinguished by their genitalia. The best way to positively identify the incurvate emerald is to collect a specimen and have it verified by an expert.

LIFE HISTORY

Very little is currently known about the incurvate emerald. Adults have been observed flying from mid July to mid October (Walker and Corbet, 1975). Males are seen in sunny weather usually in the mid-morning to mid-afternoon. They fly in a random manner within several centimeters of the vegetation (Shiffer, 1985). Males stay on breeding territories that appear to be several square meters for several minutes (Steffens, pers. comm. 2001).

Females are most active on warm but overcast days when few males are evident (Shiffer, 1985). They fly with direct and furtive flight. Females seek open pools in which to oviposit. Females oviposit alone, hovering close to the water, turning slowly in an irregular fashion and dipping the abdomen at closely spaced intervals (Shiffer, 1985). Several observers have reported seeing oviposition occurring in water-filled pools in sphagnum created by human footprints (Nature Serve, July 24, 2001). "This suggests a laying tactic which may support species abundance in habitats with little or no open water" (Nature Serve, July 24, 2001). Eggs are laid on the moss (outside plant tissues) or adjacent water surface (Nature Serve, July 24, 2001). It is believed that the eggs probably hatch the following spring or summer after being deposited (Lee, 1999).

The nymph has still not been described (Nature Serve, July 24, 2001). Similar to other species in the *Somatochlora* genus, the nymphs likely require at least two winters to reach maturity. They most likely transform into adults by crawling onto vegetation close to the water or on sphagnum moss (Shiffer, 1985).

Adults apparently remain near breeding sites (Nature Serve, July 24, 2001). Combs observed the incurvate emerald flying along the shore of Lake Superior and in a clearing about a quarter mile away from the beach. They were seen swarming on the beach during the day when the wind was offshore and in the clearing from about five o'clock until sundown or later (Walker, 1925). Steffens (pers. comm. 2001) has observed *Somatochlora incurvata* swarming in the evening along gravel logging roads. They are often seen in swarms with other dragonflies of the *Aeshna* and *Somatochlora* genera (Lee, 1999).

Both the adult and nymph stages are insectivores. The incurvate emerald probably feeds on small insects such as midges that are captured and eaten during flight (Walker, 1925).

Larger dragonflies and birds are likely predators for this species (Lee, 1999).

HABITAT

Somatochlora incurvata habitat is described as bogs, fens, and heath (Nature Serve, July 24, 2001). "Landforms in which the habitat can develop will generally be of bedrock or surficial deposits with little mineralizing potential and be of some relief as the habitat is dependent for its weak mineralization upon short or isolated catchments. However, these habitats may also form adjacent to or within peat bogs or heaths which can form in low relief areas" (Nature Serve, July 24, 2001). This species is most often associated with small pools of apparently still but not stagnant spring water in sphagnum bogs (Shiffer, 1985).

In Michigan, the incurvate emerald has also been found in patterned peatlands and northern fens. These wetland communities are often bordered by rich conifer swamps and white cedar (Lee, 1999). Wetlands with *Somatochlora incurvata* have also been found which are bordered by jack pine forest (Steffens, pers. comm. 2001). Dominant vegetation in the wetland communities includes sedges (*Carex* spp), bulrushes (*Scirpus* spp), rushes (*Eleocharis* spp), and shrubby cinquefoil (*Potentilla fruticosa*) (Lee, 1999). Northern fens contain calciphiles such as false asphodel (*Tofieldia glutinosa*) and grass-of-parnassus (*Parnassia glauca*) and bog plants such as leatherleaf (*Chamaedaphne calyculata*), Labrador tea (*Ledum groenlandicum*), and small cranberry (*Vaccinium oxycoccos*) (Lee, 1999).

S. incurvata occupied habitat surveyed by the Hiawatha in 2001 and 2002 consisted of thinly stocked bog or muskeg, many with pitcher plants (*Sarracenia purpurea*) and cotton grass (*Eriophorum* sp.). The bogs contained scattered trees, usually tamarack and spruce, five to fifteen feet in height, with occasional alder and willow (Kasik et., al 2002).

DISTRIBUTION AND ABUNDANCE

The incurvate emerald dragonfly is known from Maine, Massachusetts, New York, Pennsylvania, Ohio, Michigan, Vermont, and Wisconsin. In Canada, this species is known to occur in the provinces of New Brunswick, Nova Scotia, Ontario, and Quebec (Nature Serve, July 24, 2001). Distribution data for the incurvate emerald in the United States and Canada is known to be incomplete (Nature Serve, July 24, 2001).

Nature Serve estimates that there could be as many as 268 occurrences based on available inventory data. Since many areas have not been inventoried, that number is likely an underestimation (Nature Serve, July 24, 2001). The Michigan Odonata Survey database (2002) lists 19 element occurrences in Michigan, primarily in Mackinac and Chippewa counties. The following map shows the county distribution in Michigan (Michigan Odonata Survey 2002).



Status in the Great Lakes Region

Table 1. State Rankings of the Incurvate Emerald Dragonfly

State	Ranking	Comments
Maine	Not listed as T, E, or SC	S3 (vulnerable)
Massachusetts	Not listed as T, E, or SC	S?
New York	Unprotected	S1 (critically imperiled)
Pennsylvania	Not listed as T, E, or SC	S1 (critically imperiled)
Ohio	Not listed as T, E, or SC	S?
Michigan	Special concern	S1S2 (critically imperiled/imperiled)
Vermont	Not listed as T, E, or SC	S?
Wisconsin	Endangered	S2 (imperiled)

POPULATION BIOLOGY AND VIABILITY

No information is available about the population biology and viability of *Somatochlora incurvata*.

POTENTIAL THREATS AND MONITORING

Present or Threatened Risks to Habitat or Range

Primary threats include: habitat degradation from peat harvesting, cranberry farming, broadcast toxic pollution, and water level alteration leading to inundation or desiccation of the habitat (Nature Serve, July 24, 2001).

The ecological integrity of the wetland habitat needs to be maintained to protect this species. Water quality and quantity need to be maintained. Alterations in the humidity gradient, feeding sites, and shelter prior to breeding could also impact this species (Shiffer, 1985).

The Hine's Emerald Dragonfly Draft Recovery Plan (USFWS, 1999) lists the following potential threats in Michigan: off-road vehicle traffic, creation of water impoundments, real estate development, road development and maintenance, pipeline construction, and changes in hydrology. Other concerns include invasion of woody or exotic species, logging, and possibly roadkill. At least two Hine's emerald sites in Mackinac County, MI have incurvate emerald present as well.

Commercial Recreational, Scientific Or Educational Over Utilization

There are currently no concerns identified with excessive commercial, recreational, scientific, or educational use of the incurvate emerald.

Disease or Predation

Unknown. Larger dragonflies and birds are likely predators for this species (Lee, 1999).

Inadequacy of Existing Regulatory Mechanisms

N/A.

Other Natural or Human Factors Affecting Continued Existence of Species

Off-road vehicle use can alter the surface hydrology of the habitat.

SUMMARY OF LAND OWNERSHIP & EXISTING HABITAT PROTECTION

The incurvate emerald is only known to occur on the Hiawatha National Forest within Region 9.

In 2002 a total of 39 wetland locations were surveyed on the Hiawatha, 25 on the east unit and 14 on the west. Some of the wetland habitats are quite extensive and surveyors only visited a portion of the area. Some of the areas were visited more than once, depending on weather and capture success. A total of 15 voucher specimens were collected (Figure 1) from 4 counties (Kasik et., al 2002).



Figure 1. *S. Incurvate* vouchers collected on Hiawatha N.F.

Table 2. Number of Occurrences and Land Ownership by National Forest

Forest	Number of Occurrences	County	Land Ownership	Comments
Hiawatha NF	14	Chippewa	100% Federal	Incomplete inventories
	3	Mackinac	100% Federal	
	4	Schoolcraft	100% Federal	
	2	Alger	100% Federal	
	3	Delta	100% Federal	

Table 3. Incurvate Emerald Occurrences by County, State, and Year

State	County of Occurrence (Number of Occurrences)	Year*
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Maine	Hancock (3)	1997-1999
	Penobscot (9)	1997-1999
	Somerset (6)	1997-1999
	Washington (5)	1999-2000
	York (2)	1997-2000
Massachusetts	Worcester (2)	1995-1998
New York	Information not found	
Pennsylvania	Clinton (1)	Last observed 1987
Ohio	Athens (1)	1996
Michigan	Chippewa (15)	1916-1995
	Keweenaw(2)	1900's
	Mackinac(4)	1993
	Schoolcraft(1)	1997
Vermont	Information not found	
Wisconsin	Adams (3)	1998
	Jackson (12)	1989-1999
	Juneau (1)	1998
	Langlade (1)	2000

***County occurrence information from:**

Maine Damselfly and Dragonfly Survey, 1997-2000 Records.

Ed Schools, Michigan Natural Features Inventory, pers. com. 2001 and Michigan Odonata Survey(2002)

OdeNews Newsletter, 1995-1998. From Cape Cod, Massachusetts.

Ohio Odonata Society, Survey data <http://mcnet.marietta.edu/~odonata/>.

Pennsylvania Natural Diversity Inventory. Letter dated May 31, 2001.

Jamelle Schlangen, Department of Natural Resources, State of Wisconsin. Letter dated October 1, 2001.

SUMMARY OF EXISTING MANAGEMENT ACTIVITIES

There are currently no management activities being undertaken for the benefit of the incurvate emerald dragonfly.

PAST AND CURRENT CONSERVATION ACTIVITIES

Limited, project specific surveys for the incurvate emerald have been done on the Eastside of the Hiawatha National Forest.

RESEARCH AND MONITORING

Existing Surveys, Monitoring, and Research

No systematic monitoring of this species has been reported. No research is currently being conducted on this species.

Survey Protocol

No specific survey protocols are known to exist.

Surveys should be conducted from mid-July through August. Males are usually seen during sunny weather from mid-morning to mid-afternoon (Shiffer, 1985). Females are most active on warm but overcast days when few males are present. Adults are best sampled by capturing them with a mesh net. There are also reports of *Somatochlora incurvata* participating in evening feeding swarms along Lake Superior beaches (Walker, 1925) and along two-track roads (Steffens, pers. comm. 2001) in Michigan.

In 2001 and 2001 *S. incurvata* surveys were conducted on the Hiawatha National Forest in Michigan using the following methodology (Steffens 2001); Potential wetland habitats were evaluated in 2 stages: 1) by reviewing aerial photographs and soil maps for appropriate physical characteristics, and 2) by visiting sites with potential habitat in person. Field surveys were conducted in August by walking through areas of suitable habitat with insect net, and collecting medium-large *Somatochlora*. Some surveys were conducted by driving secondary roads slowly, and searching for feeding swarms. This was especially effective in the late afternoon and evening hours. Surveys were conducted under clear or partly cloudy skies, between 0830 and 2000 hours. Temperatures were in the mid-upper 80's and 90's for all surveys. Voucher specimens were collected and preserved using standard preservation techniques (acetone drying). No attempt was made to identify all dragonflies at survey sites, although on several occasions non-target dragonflies were netted and released.

Research Priorities

A systematic survey has not been undertaken for this species. Recent surveys in Maine, Michigan and Nova Scotia have encountered this species with a higher frequency than might have been expected previously. Additional surveys in states with known occurrences would likely find new locations.

Monitoring of known sites should be undertaken.

A formal description of the incurvate emerald larva is needed. (Currently being prepared by T. Cashatt according to Nature Serve, July 24, 2001).

Basic information on the life history and ecology of the larval and adult stages of the incurvate emerald are still lacking and are necessary to predict population viability and potential impact of human activities on this species (Lee, 1999).

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APPENDIX

List of Contacts

Information Requests

Kierstin Carlson, Conservation Data Handler, Western Pennsylvania Conservancy

Kevin Doran, Wildlife Biologist, Hiawatha NF, USFS

Teresa Mackey, Information Services, New York Natural Heritage Program

Jamelle Schlangen, Department of Natural Resources, State of Wisconsin

Ed Schools, Michigan Natural Features Inventory

Steve Sjogren, Wildlife Biologist, Hiawatha NF, USFS

Wayne Steffens, Independent Consultant, Two Harbors, Minnesota

Review Requests

N/A