Natural Heritage & Endangered Species Program

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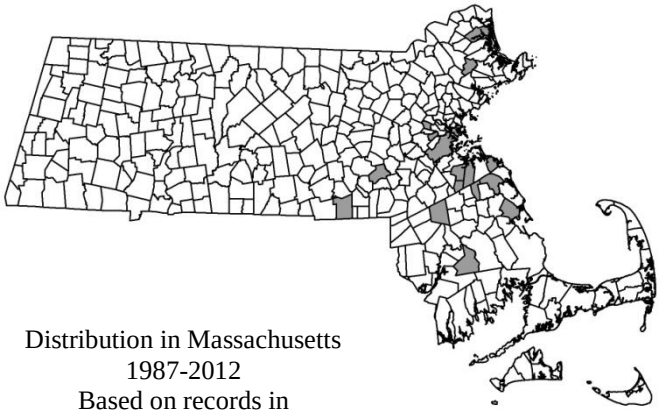
Massachusetts Division of Fisheries & Wildlife

Mocha Emerald
Somatochlora linearis

State Status: **Special Concern**
Federal Status: **None**

DESCRIPTION: The Mocha Emerald (*Somatochlora linearis*) is a large, elongate insect of the order Odonata, sub-order Anisoptera (the dragonflies), and family Corduliidae (the emeralds). Emeralds of the genus *Somatochlora* are generally large, dark dragonflies with at least some iridescent green coloration, brilliant green eyes in the mature adults (brown in young individuals), and moderate pubescence (hairiness), especially on the thorax. The Mocha Emerald is distinctive among the *Somatochlora* of Massachusetts in completely lacking markings on the thorax (section behind the head). The face is mostly yellowish brown with a brown band across the middle. The forehead is metallic green. The large eyes, which meet at a seam on the top of the head, are brilliant green in mature adults. The thorax is a chocolate color (mocha) with some metallic green highlights. The cylindrical abdomen (located behind the thorax) is most narrow at the base, widening to segment four (dragonflies and damselflies have ten abdominal segments) and then narrowing slightly toward the distal end. The abdomen is black with a brownish yellow lateral (on the side) spot at the proximal end (closest to the thorax) of segments three through ten. The first

segment has a large brownish yellow spot also positioned laterally and proximally. The wings of this species are transparent, though washed with brown or amber color, usually more extensive in females. As in all dragonflies and damselflies, the wings are supported by a dense system of dark veins. When at rest, the Mocha Emerald hangs vertically from the branches of bushes and trees, with the wings extended out horizontally, like those of an airplane.



Distribution in Massachusetts
1987-2012
Based on records in
Natural Heritage Database

Adult male Mocha Emeralds range from 2.3 to 2.4 inches (58.5 to 61 mm) in length. Females range from 2.6 to 2.7 inches (65.5 to 68.25 mm) in length. Although the females are larger, both sexes are similar in coloration and body form.

SIMILAR SPECIES: Mocha Emeralds can be easily distinguished from other species of the genus *Somatochlora* in Massachusetts by the complete lack of

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thoracic markings, elongate body form (especially in the females), and the abdominal spotting described above. Male Mocha Emeralds have distinctive bifurcate terminal abdominal appendages (as shown in Needham et al. (1999) and Nikula et al (2007)) that distinguish it from all other species in Massachusetts. Females of this species can be told by the shape of their vulvar lamina (as shown in Needham et al., 1999). Determination of these two characters is the most accurate means of identifying this species, though a hand lens or microscope is necessary for viewing their distinguishing characteristics. Williamson's Emerald (*S. williamsoni*) and Clamp-tipped Emerald (*S. tenebrosa*) are most similar to the Mocha Emerald. However, these two species may be distinguished from the Mocha Emerald by their thoracic stripes and by their distinctive terminal abdominal appendages (males) and vulvar lamina (females) (Needham et al. 1999). The nymphs can be identified by characteristics of the cerci and epiproct as per the keys in Needham et al. (1999) and Soltesz (1996).

HABITAT: In Massachusetts, the Mocha Emerald has been found most often away from breeding habitats in fields and forest clearings. However, many of these areas are adjacent to habitats that, based on observations elsewhere in this species' range, are appropriate breeding sites for the Mocha Emerald. Breeding sites for this species are small to medium-sized streams that flow through woods or swamps. At one Massachusetts site, males were found patrolling over puddles along a wooded, dirt road. A sand or gravel bottom may be an important habitat characteristic, since females prefer to oviposit in this type of substrate.

LIFE HISTORY/BEHAVIOR: The Mocha Emerald has been recorded in Massachusetts from early July through mid-August. Information from nearby areas for this species extends the flight season from late June through early September. Although little has been published about the life cycle of the Mocha Emerald in particular, information documented for other dragonfly species is most likely applicable. During their complete life cycle, dragonflies go through two distinct stages, a nymph stage where they are wholly aquatic, and an aerial adult stage.

The nymph of the Mocha Emerald may be found clinging to the roots of sedges or other plants growing in the water where it waits until a potential meal comes within reach. Dragonfly nymphs are obligate carnivores, feeding on just about any animal of appropriate size, including a wide variety of aquatic insects, small fish, and tadpoles.

Full development of the nymph generally takes about a year, but may take longer in some species (5 or more years). When fully developed (with the adult still inside of the last nymphal skin), the Mocha Emerald crawls up onto grasses or other emergent vegetation, usually no more than a foot above the water, to emerge. When the dragonfly has found a sturdy substrate to cling to, the adult begins to push itself out of the nymphal exoskeleton, head and thorax first and then the abdomen. Immediately following emergence, the adult is very compacted, especially the wings and abdomen. As soon as the abdomen and wings are fully expanded, the adult takes its first flight. This maiden flight usually carries the individuals up into surrounding forests or other areas away from water, where it spends time maturing and feeding and is protected from predators and inclement weather.

Adult Mocha Emeralds can be found in fields and forest clearings which they patrol in search of small aerial insects, such as flies and mosquitoes, on which they feed. The adult coloration is acquired and the dragonfly becomes sexually mature, usually in about a week, before returning to the breeding habitat to initiate mating.

Breeding in Massachusetts probably occurs from early July through August, as in other regions where this species occurs. At the breeding habitat, male dragonflies spend most of their time patrolling up and down the stream in search of females and driving off competing males. Upon locating a female, a male will grasp her thorax with his legs and secure her by the back of the eyes with his terminal abdominal appendages. A receptive female swings the tip of her abdomen, where her reproductive organs are located, towards the male's hamules (secondary sexual organs), located on the underside of the second abdominal segment. The familiar heart-shaped "wheel position" is thus formed with the male on top and the female below. The joined pair quickly flies off into the surrounding upland habitat to mate. Following mating, oviposition (egg-laying) occurs. Females of the genus *Somatochlora* oviposit alone and deposit their eggs directly into the substrate by tapping the tip of the abdomen on its surface.

Mocha Emeralds are known to prefer to oviposit in shallow portions of the stream where the substrate is fine gravel or sand. Females fly back and forth over such an area tapping the substrate or water with the tip of her abdomen, depositing the eggs. Due to the shallowness of these areas, they may dry up soon after oviposition occurs. For this reason, eggs must be able to survive periods of drought.

RANGE: The Mocha Emerald is distributed throughout the eastern United States from Massachusetts south to Florida and west to Michigan, Iowa and Texas. In New England, the Mocha Emerald is recorded from Connecticut and Rhode Island, north only to Massachusetts.

POPULATION STATUS IN MASSACHUSETTS: The Mocha Emerald is listed as a Species of Special Concern in Massachusetts. As with all species listed in Massachusetts, individuals of the species are protected from take (picking, collecting, killing, etc…) and sale under the Massachusetts Endangered Species Act. The species is known from about nine locations, all confined to eastern Massachusetts. The limited distribution of the Mocha Emerald here may be due to the fact that Massachusetts represents the northern limit of its range.

MANAGEMENT RECOMMENDATIONS: As for many rare species, exact needs for management of the Mocha Emerald are not known. As an inhabitant of streams, the Mocha Emerald may be vulnerable to impacts such as damming and flow alteration. Other impacts on aquatic systems such as chemical pollution pose a threat to the Mocha Emerald and all dragonflies and damselflies. The adults may also be particularly vulnerable in upland areas away from the breeding site, where they spend up to a week feeding and maturing. Maintaining natural uplands for feeding and roosting is a key part of protection of this species.

Mocha Emerald Flight Period

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

REFERENCES:

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