



Best Survey Period



Status: State threatened

Global and state rank: G3/S1

Family: Gomphidae (clubtail dragonflies)

Range: The pygmy snaketail is known only from northeastern North America (NatureServe 2006). The known range of this species can be separated into a western and an eastern portion (Mead 2003). The western portion of its range encompasses the western half of the Upper Peninsula of Michigan, northern Wisconsin, and eastern Minnesota (Mead 2003). The eastern portion of its range occurs along the Eastern Seaboard and extends from Maine south to Kentucky, Tennessee, Virginia, and North Carolina (Needham et al. 2000, NatureServe 2006). This species also is known from a single location in New Brunswick, Canada (NatureServe 2006).

State distribution: To date, the pygmy snaketail has been documented from only two sites in Michigan (Michigan Natural Features Inventory (MNFI) 2007). Both sites are located in the Paint River in Iron County in the Upper Peninsula. However, systematic surveys for this species have not been conducted throughout the state. Thus, potential exists for this species to occur in additional counties in which suitable habitat is available.

Recognition: The pygmy snaketail is the smallest species within its family in North America (Shiffer 1985). **Adults are about 1.2-1.3 in (31-34 mm) long**, with the abdomen about 0.8-0.9 in (22-24 mm) long and the hind wing about 0.7-0.8 in (19-21 mm) long (Smith 1999, Mead 2003). No other snaketail dragonflies are this small (Mead 2003). The **thorax** (upper body) is **bright green or olive green** on top and on the sides (Mead 2003). The **inner or basal portions of the hindwings are yellow** (basal half of the hindwings in males, basal two-thirds of the hindwings in females). The **abdomen** (segmented, lower body) is **slightly widened at the end** (“clubtail”) and is **black with small, yellow spots on top that are triangular in shape** and of various sizes (Mead 2003). All abdominal segments have a yellow, triangular spot on top except for the last segment at the posterior end of the abdomen (segment 10). The eyes are green and do not meet at the top of the head. The legs are black. Females can be distinguished from males because they have a short, sharp horn on each side of the rear of the head (Smith 1999).

Larvae of the pygmy snaketail are flat, brown, and have divergent wing cases (NatureServe 2006). The larvae can be distinguished from other larvae in its genus by their small size (0.7-0.8 in/19- 22 mm in length), absence of dorsal hooks (i.e., small projections in the center on the top of the abdominal segments),



vestigial nature or absence of lateral hooks (i.e., small projections on the sides of the abdominal segments) on abdominal segment 7, and long cerci (Kennedy and White 1979, Smith 1999). Cerci (“*sir-see*”) are the pair of upper appendages at the tip of segment 10 at the end of the abdomen.

Best survey time: The best time to survey for pygmy snaketails in Michigan is from mid-June to mid-July when the larvae leave the water to undergo their final molt and emerge as flying adults (Mead 2003, Gibbs et al. 2004). Adult emergence also can occur earlier (e.g., late April, May, and early June), particularly in other parts of the species’ range (Shiffer 1985, Needham et al. 2000) and dependent upon seasonal variations from year to year (Mead 2003). Emergence typically occurs between 0600 and 1400 hours (Gibbs et al. 2004). The easiest way to survey for this species is to look for exuviae (shed, cast skin of dragonfly larvae) on rocks, vegetation, woody debris, or other structures along the shore within a few feet of the water’s edge or floating on the water’s surface. Surveys for aquatic larvae also can be conducted by disturbing the substrate (e.g., kicking the substrate) and dislodging organisms into an aquatic sampling net.

Surveys for adults of this species also can be conducted during and after the emergence period although they may be difficult to observe because they tend to spend a great deal of time in vegetation high above the water (Shiffer 1985, Smith 1999, Dunkle 2000). Adults of this species tend to be most active during late morning and early to mid-afternoon (Dunkle 2000, Mead 2003). Also, because dragonflies require warm conditions for activity and efficient metabolism, they generally are active on warm, sunny days (i.e., air temperature of 65°F or higher) but become less active and seek cover on cool, cloudy days (Dunkle 2000, Mead 2003). They also are less active and seek cover on hot, sunny days to avoid overheating (Mead 2003).

Habitat: The pygmy snaketail inhabits high quality, clear, fast-flowing, large or medium-sized streams and rivers with gravel or sand substrates in largely forested watersheds (Shiffer 1985, Tennessen 1993, Smith 1995, Smith 1999, Dunkle 2000, Mead 2003, NatureServe 2006). *Ophiomphus* or snaketail larvae, in general, require clean, well-oxygenated water and gravel or sand substrates with little sedimentation (Smith 1995, Smith 1999, Mead 2003). Snaketail larvae generally are not

found in streams or rivers with reduced currents, high levels of sedimentation, or in watersheds that are less than one-half to two-thirds forested (Smith 1999). In Michigan, pygmy snaketail larvae have been found in large to medium-sized sections of a river (estimated 125-200 ft/38-61 m wide and 2-4 ft/0.6-1.2 m deep) with substrates consisting of boulders, cobbles, sand, and some silt (MNFI 2007). In other parts of the species’ range, larvae have been found in undisturbed streams and rivers that are 33-656 feet (10-200 m) wide and have sand and gravel substrates (Tennessen 1993).

Biology: The pygmy snaketail exhibits a typical dragonfly life cycle with an aquatic egg, aquatic larva, and a terrestrial/aerial adult. Female snaketails lay their eggs in riffles or rapids in streams and rivers by dipping their abdomen in the moving water (Mead 2003, NatureServe 2006). The eggs are carried by the water and are deposited in interstitial spaces in the rock, gravel, and/or sand substrate of the stream or river. The time required for the eggs to develop and hatch is not known for the pygmy snaketail (Shiffer 1985), but dragonfly eggs generally hatch in about 10 days to as long as several months (Dunkle 2000).

As with most dragonflies, the pygmy snaketail likely spends most of its life as an aquatic larva (Mead 2003). After the eggs hatch, the larvae burrow into gravel or sand substrates where they grow and develop (Smith 1999, Mead 2003). As the larvae grow, they shed or molt their skin numerous times. The shed skin is referred to as exuviae. The larvae are opportunistic, ambush predators. They burrow and hide in the substrate and pounce on prey that comes within striking distance (Mead 2003). Pygmy snaketail larvae have been reported to feed on water mites, mayfly nymphs, and chironomids or midges (Kennedy and White 1979). In turn, dragonfly larvae, in general, are preyed upon by fish, birds, aquatic insects, and other dragonfly larvae (Mead 2003).

The time required for pygmy snaketail larvae to develop into adults is currently not known. Most dragonfly species transform into adults in one to three years (Mead 2003), although larval development times can range from one month to eight years depending on the species and temperature (Dunkle 2000). Collection of several distinct sizes of larvae during a study in Virginia indicate the pygmy snaketail may have a two-year life cycle (Shiffer 1985). Gibbs et al. (2004) also found a



variety of larval stages or instars from May to October during a study in Maine including final instar larvae in July after emergence of adults in June. These results indicate pygmy snaketails likely require two or more years to complete a generation (Gibbs et al. 2004). These results also suggest that the pygmy snaketail has overlapping generations and produces more than one brood or generation per year (Gibbs et al. 2004). These results also indicate that pygmy snaketails overwinter as larvae.

When the larvae are ready to transform into adults, they climb out of the water and attach themselves to vegetation, rocks, tree roots, woody debris, bare ground, or other structures or surfaces located along the stream banks or floating in the water (Shiffer 1985, Mead 2003). The larvae undergo a final molt and emerge as winged adults. Emergence typically occurs in Michigan from mid-June through mid-July, although emergence could occur earlier dependent upon local weather conditions (Mead 2003). Newly emerged adults, or teneral, typically remain perched for one or two hours to dry their wings before they can fly (Mead 2003). During this time, they are extremely vulnerable to predation and mortality due to human disturbance or environmental factors such as wind or rain (Dunkle 2000, Mead 2003).

Adult pygmy snaketails are observed occasionally at breeding sites, but generally are not seen as frequently or in large numbers after the adult emergence period compared to other dragonfly species (Shiffer 1985, Smith 1999). Adults of this species may be difficult to observe because they tend to forage and spend a great deal of time in vegetation high above the water (e.g., in the tree canopy along river valleys) (Shiffer 1985, Smith 1999, Dunkle 2000). Adult snaketails perched on vegetation or flying over moving water also may be difficult to see because of their green color and their wings tend to reflect sunlight over the water (Dunkle 2000, Mead 2003).

Although the lifespan of adult pygmy snaketails is not specifically known, adult dragonflies typically live for approximately one month, and up to nine months to a year in a few species (Dunkle 2000). Adult dragonflies become sexually mature within a week or up to a month after emergence (Smith 1999, Dunkle 2000). Males usually initiate mating by grasping females with their legs and terminal appendages (Mead 2003). The

connected pair then flies to nearby vegetation or tree canopies to mate (Smith 1999, Mead 2003). Adult snaketails forage for flying insects, such as butterflies, moths, damselflies, mosquitoes, and flies, in sunny areas including open grassy fields, forest openings, and over streams and rivers (Smith 1999, Mead 2003). Predators of adult dragonflies include birds, frogs, lizards, fish, and other large dragonflies (Mead 2003).

Conservation/management: Given that the pygmy snaketail has been documented from only a few sites in Michigan, all known populations of this species should be protected and monitored. Maintaining good water quality and gravelly or sandy substrates with little sedimentation is essential for conservation of the pygmy snaketail. Snaketail dragonflies, in general, require clean, well-oxygenated water, and are highly sensitive to changes in water quality (Smith 1999). They also appear to be limited in distribution by the types of substrates in which the larvae can survive (Smith 1999). Also, the larvae burrow in sand but are vulnerable to being buried in silt or washed away during spring snowmelt or other significant increases in water flow (Mead 2003). Dams, stream channel modifications, shoreline modifications, pollution, and sedimentation can cause habitat loss and degradation and can adversely impact the species (Smith 1999). These activities or threats should be avoided or minimized at sites at which this species occurs. Maintaining largely forested watersheds and forested streamside buffers also would benefit this species.

Research needs: A systematic survey for pygmy snaketails in all suitable habitat in the state is needed to identify additional occupied sites and determine this species' status and distribution in Michigan. Additional surveys and monitoring of known sites are warranted to determine their population status, extent, and viability. More information on the pygmy snaketail's life history, including its phenology, larval development, and specific larval and adult habitat use and requirements in Michigan, should be obtained. An assessment of threats to the species at extant sites also should be conducted. Additional information on the species' status, distribution, life history, and threats will facilitate development of appropriate conservation and management strategies for this species in Michigan.

Related abstracts: rapids clubtail (dragonfly), splendid clubtail (dragonfly), extra-striped snaketail (dragonfly),



incurvate emerald (dragonfly), Hine's emerald (dragonfly)

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