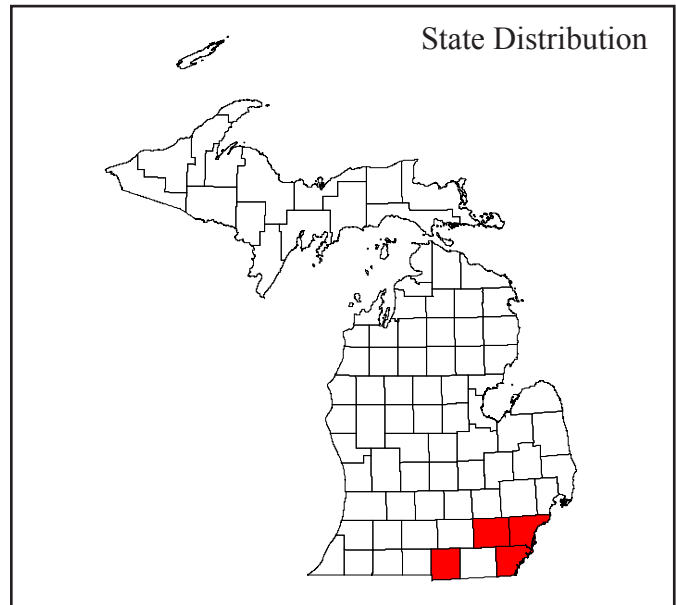
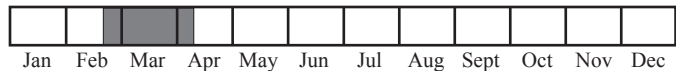




Photo by James H. Harding



Best Survey Period



Status: State endangered

Global and state rank: G5/S1

Other common names: Small-mouthed Salamander

Family: Ambystomatidae (mole salamanders)

Range: Smallmouth Salamanders primarily occur in the south-central United States (Evers 1994). This species is found from Ohio west to southern Iowa and eastern Kansas, and south to eastern Texas, Louisiana, Mississippi, and Alabama (Petranka 1998). Scattered isolated populations occur in southeastern Indiana, southern Ohio, western West Virginia, and southeast Michigan (Petranka 1998). This species also was historically reported from Pelee Island, Ontario, in Lake Erie (Uzzell 1962). This species does not occur east of the Appalachian Mountains or in the Missouri and Arkansas Central Highlands (Evers 1994).

State distribution: In Michigan, Smallmouth Salamanders occur in the southeastern portion of the state (Harding 1997). This species is known from less than 15 sites in 4 counties (i.e., Hillsdale, Monroe, Washtenaw, and Wayne) in Michigan. It is important to note that Smallmouth Salamanders occur in specific habitats, and may only occur in a small portion of each of the counties depicted. It also is important to note

that this species has not been systematically surveyed throughout its range in the state. Potential exists for this species to occur at additional sites in the state.

Recognition: The Smallmouth Salamander is a medium-sized salamander with adult total lengths ranging from 4.3 – 7.5 inches (11-18 cm) (Petranka 1998). As its name implies, it has a **very small head and snout**. The head often looks swollen behind the eyes, and the lower jaw barely protrudes beyond the upper jaw when viewed in profile. The adults are **brownish gray to grayish black with light gray speckles of lichen-like markings, particularly along the lower sides of the body**. The belly is brownish gray to black with little or no speckling.

Several *Ambystoma* salamander species in Michigan look similar and can be confused with the Smallmouth Salamander. The Blue-spotted Salamander (*Ambystoma laterale*) has a longer snout and bluish markings on the sides (Harding 1997). The Smallmouth Salamander also hybridizes with other *Ambystoma* species. Hybrids with the Blue-spotted Salamander are most common, but hybrid combinations with the Jefferson Salamander (*Ambystoma jeffersonianum*), Blue-spotted/Jefferson Salamander hybrids, Eastern Tiger Salamander (*Ambystoma tigrinum tigrinum*), Silvery Salamander (*Ambystoma platineum*), Tremblay's Salamander (*Ambystoma tremblayi*), and Streamside Salamander



(*Ambystoma barbouri*) also have been documented in Michigan (Uzzell 1964, Evers 1994, Harding 1997, Petranka 1998, Mifsud pers. comm. 2010). These hybrids may be intermediate in form and color, and may look very similar to a Smallmouth Salamander or resemble one of the other parent species. Electrophoretic identification has been successfully used to definitively identify pure Smallmouth Salamanders from hybrids (Bogart et al. 1985).



Top view of Smallmouth Salamander head/snout.
Photo taken by Yu Man Lee.

Best survey time: The best time to survey for this species is during the spring breeding season when adult Smallmouth Salamanders are migrating to and congregating in breeding ponds. Migrations to breeding sites usually occur at night during rainy weather with the first warm rains in late winter or early spring. Initiation and timing of the spring breeding season will vary from year to year and site to site depending on local weather and site conditions. In general, salamander activity is highest during or immediately following rainfall and daytime temperatures that exceed 55°F (13°C) (Ohio Division of Wildlife 2010). Significant snowmelt or high humidity also will occasionally stimulate salamander migrations to breeding sites (Ohio Division of Wildlife 2010). In southern Michigan, salamander migrations and spring breeding season can start as early as late February and last through March to early April. Surveys for adults in breeding ponds can be conducted by setting aquatic minnow or funnel traps in the ponds. Drift fences with or without pitfall traps also can be placed around breeding ponds to intercept individuals entering or exiting the ponds. Surveys for aquatic larvae or newly transformed juveniles dispersing from breeding ponds also can be conducted in late spring and/or summer (i.e., late April/May to late June/early July) using aquatic minnow traps in the ponds

or drift fences with or without pitfall traps around the ponds, respectively. Trapping should occur on multiple nights during the breeding season, and aquatic minnow traps, drift fences, and pitfall traps should be checked on a daily basis (i.e., traps should not go unchecked for over 24 hours). Aquatic minnow traps should be set so that the funnel openings are completely submerged, but a small section of the trap should penetrate the water surface to allow captured animals to access the air. Dip net, egg mass, and visual encounter surveys also can be used to survey for this species.

Habitat: The Smallmouth Salamander primarily inhabits forested floodplains, swamp forests, deciduous forests and associated wetlands (Minton 1972, Petranka 1982a, Evers 1994, Harding 1997, Petranka 1998). This species also can utilize more open habitats such as prairies and farm fields (Harding 1997). Smallmouth Salamanders require temporary, shallow bodies of water, which are usually fish-free, for breeding (MNFI 2007). Adults have been found breeding in forested vernal ponds, oxbow ponds in floodplains, roadside ditches, borrow pits, flooded fields, prairie ponds, swamps, and, on rare occasions, slow headwater streams or pools (Bailey 1943, Ramsey and Forsyth 1950, Petranka 1982a and 1998). Open wetlands with clay soils seem to be preferred breeding habitats (Evers 1994). Smallmouth Salamanders often select shallower breeding sites than other *Ambystoma* species and can breed in pools that are only a few inches deep (Minton 1972, Petranka 1982a and 1998). Outside the spring breeding season, Smallmouth Salamanders generally remain hidden beneath rotting logs, rocks, or leaf litter or underground in crayfish or small mammal burrows. Natural community types with which Smallmouth Salamanders may be associated include floodplain forest, southern hardwood swamp, mesic southern forest, inundated shrub swamp, wet prairie, and southern wet meadow (MNFI 2007).

Biology: In Michigan, adult Smallmouth Salamanders generally emerge from hibernation and migrate to their breeding ponds very early in the year often with the first warm rains in late winter or early spring, and breeding typically occurs from late February through March or early to mid-April (Evers 1994, Harding 1997, Petranka 1998). Adults tend to be explosive breeders, and migrate at night to shallow, breeding ponds during rainy weather (Harding 1997, Petranka 1998). Adults congregate in the breeding ponds and engage in courting groups where the



males and females bump and nudge each other (Wyman 1971, Petranka 1982b, Evers 1994). Each female can lay 300 to 700 eggs annually (Harding 1997). Eggs are laid either singly or in loose clusters or small masses on twigs, leaves, plant stems, grasses, and other vegetation and detritus in the breeding ponds (Minton 1972, Petranka 1982a, Harding 1997). The eggs hatch within two or three weeks to six or eight weeks depending on the water temperature (Minton 1972). Newly hatched larvae are about 0.4 in (1 cm), and quickly transform into terrestrial adult salamanders in two to three or four months (Harding 1997, Petranka 1998). Juveniles reach sexual maturity when they reach 2.4-2.8 inches (6-7 cm) snout-vent length, probably within two years after metamorphosis but this is still unclear (Petranka 1998).

Outside the breeding season, adults and juveniles spend most of their time hidden on the forest floor under downed logs, woody debris, rocks, leaf litter, and other debris or underground in crayfish, small mammal, and other burrows (Minton 1972, Parmelee 1993, Harding 1997). They are sometimes active and can be found foraging or moving above ground on rainy nights (Minton 1972, Harding 1997, Petranka 1998). Juveniles and adults appear to remain close to their breeding ponds, with many remaining within 200 ft (i.e., 50-60 m) of the ponds (Parmelee 1993, Petranka 1998). Adult Smallmouth Salamanders eat small invertebrates such as earthworms, slugs, and insects (Harding 1997). The larvae feed on zooplankton and other small aquatic invertebrates including *Daphnia*, ostracods, isopods, chironomids, amphipods, copepods, gastropods, odonates, and coleopterans (Whitaker et al. 1982, McWilliams and Bachmann 1989, Petranka 1998). Smallmouth Salamander larvae also occasionally feed on other salamander larvae (Harding 1997). Adult salamanders are preyed upon by garter snakes, water snakes, and other vertebrate predators such as owls, raccoons, and skunks (Harding 1997, Petranka 1998), while the larvae are consumed by crayfish, fish, aquatic insects, tiger salamander larvae, birds, and snakes (Wilbur 1972, Harding 1997, Petranka 1998).

Conservation/management: The primary threats to Smallmouth Salamander populations are habitat loss and degradation due to the loss of floodplain forests, bottomland forests, and associated vernal pools (Petranka 1998). These wetland habitats have been cleared, drained, filled, and/or impacted due to agricultural use and residential, and commercial

development (Evers 1994, Petranka 1998). Destruction and degradation of breeding sites through draining and filling have resulted in habitat fragmentation and population isolation at many of the known sites which could lead to increased inbreeding and risk of local extirpations. Exposure to chemical pollutants due to runoff of fertilizers, insecticides, and herbicides also may pose a threat to this species. Hybridization with Blue-Spotted Salamanders and other Ambystomatids may pose a threat to Smallmouth Salamander populations by genetically diluting the populations, and competition with hybrids may reduce the viability of populations (Evers 1994). Recent salamander surveys and electrophoretic analyses have confirmed the presence of several different hybrids at a number of sites in Michigan but few or no pure Smallmouth Salamanders to date (Mifsud pers. comm. 2010).

Protecting known Smallmouth Salamander sites and maintaining suitable habitat at these sites are essential for conservation of this species. Maintaining and/or constructing a complex of natural and/or artificial vernal ponds at these sites and nearby suitable forested habitats would provide breeding, foraging, and dispersal habitat for this species. Ponds should not freeze completely during the winter and hold water until at least July. Breeding ponds should remain free of fish. Although Smallmouth Salamanders can occur in drier, open habitats, maintaining cool, moist, microenvironments, canopy cover, and sufficient leaf litter and woody debris on the forest floor is important for providing cover and foraging habitat for juveniles and adults. Exposure to highly acidic conditions and/or chemical pollutants should be minimized to reduce the potential for adverse impacts to this species until more is known about their potential impacts (MNFI 2007).

Research needs: An assessment of the species' current distribution and status in the state is urgently needed, particularly efforts to determine the presence of pure Smallmouth Salamanders and their status and locations. Research examining the displacement of Smallmouth Salamander populations by hybrids should continue. Long-term population studies including viability analyses are needed to better understand Smallmouth Salamander population dynamics. This information would be useful for developing effective monitoring protocols and assessing this species' status in the state. Impacts of management and land use practices on this species should be further investigated.



Related abstracts: Blanding's Turtle, Marbled Salamander, Eastern Box Turtle, Gray Ratsnake, Spotted Turtle, Dry-mesic Southern Forest, Floodplain Forest, Inundated Shrub Swamp, Mesic Southern Forest, Southern Hardwood Swamp, Southern Wet Meadow, Vernal Pools, and Wet Prairie.

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