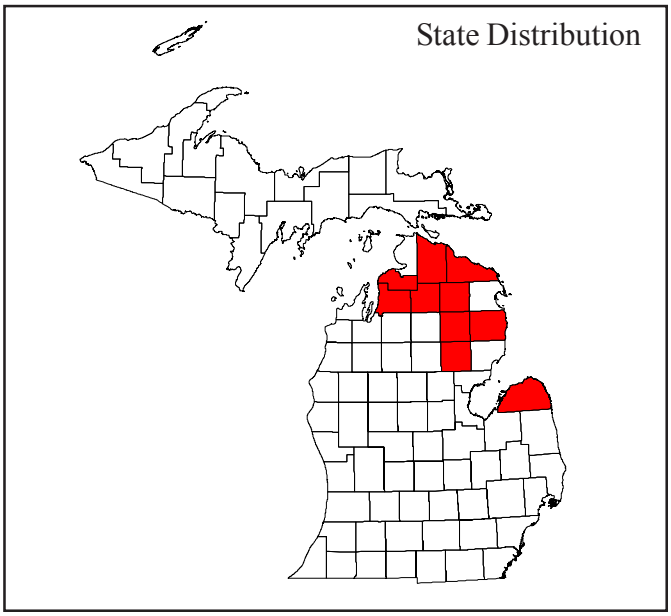
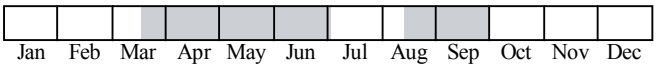
Appalachina sayanus Pilsbry — spike-lipped crater



Best Survey Period



Status: State special concern

Global and state rank: G4G5/SU

Family: Polygyridae

Range: The spike-lip crater is known mostly from the Appalachians ranging from Maine south through New York, Pennsylvania and Virginia to North Carolina, and west to Michigan, Kentucky and Tennessee (Burch 1962, Hubricht 1985, Burch and Jung 1988, Grimm 1996). This species also occurs in Ontario, Canada, primarily north and east of Toronto and Hamilton (Grimm 1996).

State distribution: In Michigan, the spike-lip crater is known only from the northern part of the state. This species has been documented from only 13 sites in 9 counties in northern Michigan (i.e., Charlevoix, Antrim, Otsego, Montmorency, Cheboygan, Presque Isle, Oscoda, Ogemaw and Huron) (Michigan Natural Features Inventory (MNFI) 2002). Most of these records are based on museum specimens that were collected in the late 1930's and 1940's. Recent surveys conducted by the Michigan Natural Features Inventory reconfirmed this species at one known site and documented a new site in Montmorency County (MNFI 2002).

Recognition: The shell of an adult spike-lip crater ranges from about **20 to 27 mm (0.8 to 1.1 in) in diameter**, and has about **5 1/2 whorls** or complete turns or coils (Burch and Jung 1988). The shape of the shell is **depressed helicoid**, which means the spire or whorls of the shell are flattened dorso-ventrally. The shell is usually **pale yellow to pale olive-tan**, and can range from dull to somewhat glossy (Burch and Jung 1988). The shell also is thin, and the outer surface is sculptured with fine, transverse or diagonal growth lines or striae, as well as microscopic incised spiral lines (Burch 1962, Burch and Jung 1988). The sutures, or external lines on the shell where adjacent whorls meet, are strongly impressed (Burch and Jung 1988). The shell has a **wide and deep umbilicus**, or opening in the center of the base of the shell (i.e., umbilicate shell), which is about 1/7 the shell diameter (Baker 1939, Burch 1962). The aperture, or opening of the shell through which the head-foot of the snail emerges, is nearly round, with a **narrow, strongly reflected** (i.e., turned outward) **lip** around the outer edge of the aperture, which barely covers the umbilicus. The aperture also has a **small, narrow, white tooth or projection on the parietal or inside wall of the aperture** (i.e., parietal tooth), as well as a **tooth or distinct projection on the basal** (or baso-columellar) **end of the lip** toward the umbilicus (i.e., basal tooth) (Goodrich 1932, Burch 1962, Burch and Jung 1988). The basal tooth is especially useful in identifying this species (Burch and Jung 1988). Immature individuals of this snail are difficult to identify since

Michigan Natural Features Inventory
P.O. Box 30444 - Lansing, MI 48909-7944
Phone: 517-373-1552

the apertural teeth have not yet developed, and the lip of their shells is not reflected (Burch 1962).

The spike-lip crater can be distinguished from similar looking snails in Michigan such as the white-lip globe (*Mesodon thyroidus*), which is in the same family, and formerly the same genus, as the spike-lip crater, in that its umbilicus is wider and barely covered by the reflected basal lip, and its apertural lip is narrower (Burch 1962, Burch and Jung 1988). The spike-lip crater's shell also is more depressed, and the spiral lines are less prominent and the sutures are more impressed on the spike-lip crater's shell than that of the white-lip globe (Burch and Jung 1988). The white-tip globe also usually lacks a basal tooth on the aperture lip. The proud globe (*Mesodon elevatus*) is another state-listed special concern snail species in Michigan that is in the same family, and formerly the same genus, as the spike-lip crater. However, this species is currently known only from extreme southern Michigan, and its shell has 6-7 whorls, no umbilicus, a more raised shell, a large parietal tooth, no basal tooth, and a basal lip with a long lamina (thin layer or plate) along the inner edge (Burch 1962).

Best survey time: Based on other land snails, the best times to survey for the spike-lip crater are from late March until June, after snowmelt when conditions have warmed up and ground vegetation is minimal, and again during the latter part of August until late September (Taft 1961, Burch pers. comm.). Generally, land snails can be found following rain showers or when the soil is moist (Taft 1961). Snails also tend to be more active during higher relative humidity conditions and cooler temperatures (Burch and Pearce 1990). The best way to survey for this species is to look for individuals crawling on the ground, in moist leaf litter, or near or under woody debris. Empty snail shells also should be noted and/or collected.

Habitat: The spike-lip crater appears to use a variety of habitats. Hubricht (1985) indicated that the spike-lip crater is usually found in moist leaf litter or near logs on wooded hillsides. Pilsbry (1940) and Archer (1936) also reported the spike-lip crater from stone fences and among leaves and under rotten logs in pastures and open fields. In Ontario, this species prefers shaded, rocky, mesic forested habitats (Oughton 1948, Grimm 1996). In Michigan, this species appears to be associated with moist, mesic or wet-mesic deciduous forests, sloped areas and areas with calcareous soils, limestone and/or exposed rock (e.g., morainal areas) (Atkinson pers. comm.). Analysis of known spike-lip crater locations in the state also indicate an apparent association with northern cedar swamps. Several of the known sites for this species, including the two recent sightings, occur on forested slopes where the upland, mature deciduous forest transitions into cedar swamp, floodplain or other lowland forest types. Also, most of the known occurrences in the state occur along or near streams, rivers and lakes. Forested river valleys often provide suitable habitats for terrestrial snails, and those with limestone outcrops usually contain particularly rich mollusk faunas (Burch and Pearce 1990).

Biology: Little information is available on the specific biology, life history and ecology of the spike-lip crater. However, understanding the basic biology and life history requirements of terrestrial gastropods (i.e., snails and slugs), in general, and similar land snails such as the white-tip globe can provide some insight into the biology of this species. Land snails, in general, require habitats that provide adequate moisture, abundant food supply, shelter and an available source of lime or calcium (Burch and Pearce 1990). Land snails require moisture or water for basic physiological processes and for locomotion and reproduction (Burch and Pearce 1990). Land snails travel by producing mucous trails, and mucus is comprised mostly of water. Also, while adult snails can survive dry periods or conditions by closing their shell aperture, crawling into crevices or cracks, or burrowing into leaf litter, soil humus or other moist refuge, their eggs have little resistance to desiccation and must remain in moist conditions (Burch and Pearce 1990). Terrestrial snails also respond to certain microhabitats and microclimatic conditions given their need for moisture. Snails tend to be most abundant in soil humus and leaf litter, under and in decomposed logs, and under and around the base of stones (Burch and Pearce 1990). Also, some leaf litter holds more moisture and provides more spaces for land snails than others (e.g., leaves that fold up rather than lie flat) (Burch and Pearce 1990). Refuge from cold, heat, desiccation and predators often is a limiting factor for terrestrial snail abundance (Burch and Pearce 1990). Additionally, most species of gastropods seem to prefer deciduous forests (Burch and Pearce 1990).

Most land snails are generalist herbivores (Burch and Pearce 1990). Many snail species feed on fungi (Burch and Pearce 1990). The white-tip globe has been

found to consume a variety of fungi, slime molds, lichen, woods nettle (*Laportea canadensis*) and lilac (*Syringa vulgaris*) (T. D. Foster in Pilsbry 1940, F. T. and F. A. Wolf in Burch and Jung 1988). Snails, in turn, provide food for a number of organisms including carnivorous gastropods, ducks and other birds, rodents and other small mammals, and lampyrid beetle larvae and other insects. Snails also require calcium for shell production, and often are associated with limestone, soils derived from limestone or otherwise high in calcium carbonate, or areas with calcium-rich vegetation (Burch and Pearce 1990).

Most gastropods are unisexual or dioecious (i.e., male and female reproductive organs are on different individuals), and fertilization is external, although some gastropods are hermaphroditic (i.e., male and female reproductive organs in the same individual). The white-tip globe has been found mating in the field in the fall in September and November (T. D. Foster in Pilsbry 1940). Eggs were found from May through mid-August in shallow holes excavated by the snail in the soil in clutches of 20 to 70 eggs each. All the snails that survived the first winter attained full growth and were recognizable as adults with a reflected lip by the following fall. Individuals became reproductively mature in their third year. Individual snails usually lived three or four years (T. D. Foster in Pilsbry 1940).

Conservation/management: The status and viability of the spike-lip crater snail in Michigan is currently very precarious. The species has been documented from only a small number of disjunct sites in the state, and most of these are historical records. Additionally, recent surveys of several known sites as well as areas with potential habitat have documented this species at only two sites within three miles of each other in one county. However, a live snail was found at one of these sites, indicating an extant population, and the other site represented a new location, suggesting the potential for documenting additional populations in the state.

Threats to this species include habitat loss and degradation due to management and land use activities such as timber harvesting, residential development and road construction. Land use activities that significantly alter the microclimate and/or availability of moisture, food or refuge at a site can adversely impact the spike-lip crater. Land use activities, such as timber harvesting and residential development, also have the potential to cause direct take or mortality of individual snails at a project site, particularly if heavy equipment is employed.

Identification, protection and management of the remaining spike-lip crater populations in the state are crucial for conservation of this species in Michigan. Systematic surveys of previously documented sites as well as new areas with suitable habitat are needed to identify extant spike-lip crater populations in the state. At a minimum, surveys for the spike-lip crater should be conducted at known sites and surrounding areas with suitable habitat prior to development and implementation of management or land use activities in these areas. Maintaining intact tree canopy above snail sites seems crucial for some land snails (Nekola et al. 1996). Leaving sufficient habitat at and around snail sites to maintain suitable microclimate and other habitat requirements such as adequate moisture, food and refuge (e.g., woody debris) also is essential.

Research needs: Systematic and comprehensive surveys to document this species' current distribution and status in the state are urgently needed. Studies to elucidate this species' biology, life history and ecology, particularly its habitat requirements, also are imperative. Impacts of forest management and other land use activities on this species also should be investigated to ensure development and implementation of appropriate management and conservation practices.

Related abstracts: Cherrystone drop, eastern massasauga, red-shouldered hawk, mesic northern forest, rich conifer swamp

Selected references

Archer, A.F. 1936. The land Mollusca of Cheboygan County, Michigan. Occasional Papers of the Museum of Zoology, Univ. of Mich. (340): 1-15.

Atkinson, J. Personal communication. Mich. State Univ. Dept. of Zoology, East Lansing, MI.

Baker, F.C. 1939. Fieldbook of Illinois Land Snails. Illinois Natural History Survey Manual 2, Urbana, IL. 166 pp.

Burch, J.B. 1962. How to Know the Eastern Land Snails. Wm. C. Brown Company Publishers, Dubuque, IA. 214 pp.

Burch, J.B. Personal communication. Univ. of Mich. Museum of Zoology, Ann Arbor, MI.

Burch, J.B. and Y. Jung. 1988. Land snails of The Univ. of Mich. Biological Station area. Walkerana

3(9): 1-177.

Burch, J.B. and T.A. Pearce. 1990. Terrestrial gastropoda. Pages 201-299 in D.L. Dindal, ed. Soil Biology Guide. John Wiley & Sons, Inc., New York, NY. 1349 pp. + i-xviii.

Goodrich, C. 1932. The Mollusca of Michigan. Michigan Handbook Series No.5. The University of Michigan Press, Ann Arbor, MI. 120 pp. + plates i-vii.

Grimm, F.W. 1996. Terrestrial molluscs *in* Smith, I. M. Assessment of species diversity in the Mixedwood Plains Ecozone. Burlington: Ecological Monitoring and Assessment Network.

Hubricht, L. 1985. The distributions of the native land mollusks of the eastern United States. Fieldiana Zoology New Series (24): i-viii, 1-191.

Michigan Natural Features Inventory (MNFI). 2002. Biological and Conservation Data System. Lansing, MI.

Nekola, J.C., T.A. Smith and T.J. Frest. 1996. Land snails of Door Peninsula natural habitats. Final report to the Wisconsin Chapter of The Nature Conservancy. 55 pp. + apps.

Oughton, J. 1948. A Zoogeographical Study of the Land Snails of Ontario. University of Toronto Press, Toronto, Ontario. 128 pp. + maps, charts,diagrams.

Pilsbry, H.A. 1940. The land Mollusca of North America (North of Mexico). Academy of Natural Sciences, Monograph 3, vol.1, pt.2, pp.i-viii, 575-994, i-ix.

Taft, C. 1961. The shell-bearing land snails of Ohio. Bulletin of the Ohio Biological Survey New Series 1(3): i-xii, 1-108.

Abstract citation:

Lee, Yu Man. 2002. Special animal abstract for *Appalachina sayanus* (spike-lip crater). Michigan Natural Features Inventory. Lansing, MI. 4 pp.

Funding for abstract provided by Michigan Department of Natural Resources – Forest, Mineral and Fire Management Division.