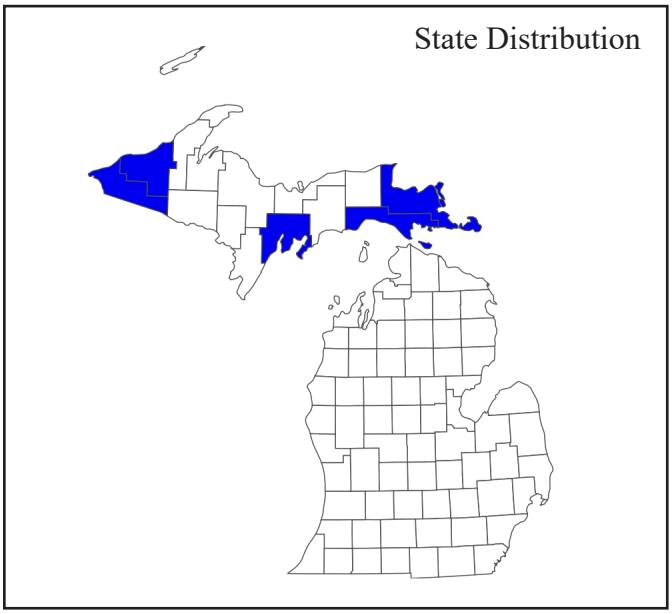
Vertigo bollesiana Morse — Delicate vertigo snail

Photo by Jeffery Nekola



Best Survey Period

Status: State Threatened

Global and State Rank: G4 (Globally Apparently Secure) / S2 (State Imperiled)

Family: Vertiginidae (formerly Pupillidae)

Synonyms: *Isthmia bollesiana*, *Vertigo bollesiana var. arthuri*

Other Common Names: Delicate vertigo

Total Range: This land snail has a scattered distribution, including Ontario to Nova Scotia, Canada, as well as Minnesota to Maine, going down the east coast to Tennessee and North Carolina. As many species in the *Vertigo* genus are morphologically similar, it is possible that some of these records misrepresent the distribution of delicate vertigo. They are the most abundant of the genus in Vermont and upstate New York and are found fairly frequently in the Great Lakes region (NatureServe 2025, Nekola 1998, Nelola 2003, Nekola 2005).

While globally this species is listed as apparently secure, the only state or province where its status is apparently secure (S4) is Ontario, Canada. The states along the southern distribution of delicate vertigo designated it as either critically imperiled (S1; North Carolina and Kentucky) or imperiled (S2; Tennessee). Many states and provinces within the range of delicate vertigo do not have status ranks available, likely due to a shortage of survey effort and its difficulty to detect.

State Distribution: Delicate vertigo have been predominantly found in Michigan's Upper Peninsula, as their habitat predominates the Keweenaw Peninsula and the northern shorelines of Lakes Huron and Michigan (Nekola 1998, Nekola 2003, MNFI 2025).

Recognition: These snails are very small, reaching 1.5 mm (3/64 in) in length. They tend to be amber to brown in color with four to five whorls in a cylindrical or beehive shape. The apex (top) is dull, and the aperture (opening) tends to be flattened on the outer edge. The main opening of the snail (aperture) has five teeth; one large and curved on the parietal margin, two smaller on the columellar margin, and two larger teeth inside the shell (Burch 1962, Morse 1865).

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In live specimens, the dorsal part of the body is light gray with a disk that is almost white. The buccal plate of the delicate vertigo is roughly the same width throughout and is slightly rounded at either end. There are fine striations on the cutting edge (Morse 1865). Due to reduced male genitalia, the most reliable taxonomy is based off shell characteristics (Nekola et al. 2009).

This species is similar to the variable vertigo (*Vertigo gouldii*), however the delicate vertigo has weaker shell striations and a duller luster. In addition, the delicate vertigo has a deeper depression over the palatal lamellae and is more conical and less cylindrical in shape (Nekola et al. 2018).

Best Survey Time: This species is active from the first week of June to the end of September. Surveys are likely to be more successful during cooler weather and higher relative humidity, typically in the spring and fall after rain or while the soil is moist. While land snails are primarily nocturnal, they can be active during the day following a rain event (Burch and Pearce 1991). Surveys can be done visually (searching for moving individuals in leaf litter or under woody debris) or in leaf litter samples (collecting soil and leaf litter and drying, sifting for shells). Past surveys found less than ten individuals at survey locations (Nekola 1998).

Habitat: Delicate vertigo are typically found in leaf litter, on cliff-face ledges (calcareous or igneous outcrops, limestone/dolomite lakeshore ledges), boulder tops in mesic upland forest hillsides, and damp microsites in northern white cedar wetlands or marshes (Neokla and Coles 2010). In a large regional ordination, the delicate vertigo was found to favor duff soils, typically found on mountain side slopes that are well drained (Nekola 2003). This species is noted as being intolerant of disturbance, so surveys should focus on areas that have been stable for around 100 years or longer (Nekola 1998). Undisturbed old growth forests tend to have a diversity of microhabitats and microclimates that can support a diversity of land snails (Jordan and Black 2012).

Biology: Little is known about the specific life history of delicate vertigo and other species in the genus. Land snails are typically considered generalist herbivores, fungivores, and detritivores, although some are predators. Snails are often prey for birds, small mammals, amphibians, reptiles, other snails or slugs, and insects (Burch and Pearce 1991).

To maintain their shells, snails require calcium. For this reason, snails are often found in regions rich in calcium, such as limestone, or in areas with soils derived from limestone or that are high in calcium carbonate. Snails can also obtain calcium from local vegetation (Burch and Pearce 1991) or from absorbing or drinking water high in dissolved calcium (Heller and Mararitz 1983, Martin 2000).

Land snails can actively disperse slowly over short distances when conditions are favorable (i.e., cool temperatures and high relative humidity). Sufficient moisture is required to produce mucous trails during movement, which is predominantly composed of water (Burch and Pearce 1991). Movement is typically restricted to seeking food, primarily via olfaction, or for reproducing. It is suspected that long distance dispersal is more passive, via hitchhiking on mammals, birds, or insects, by wind, or by rafting on objects (Baker 1958, Vagvolgyi 1975). Moisture is also necessary for snail eggs, which are particularly susceptible to desiccation (Burch and Pearce 1991, Martin 2000). Most land snail species can seal their shell openings with an epiphragm, a mucus film that minimizes water loss, during dry periods (Burch and Pearce 1991).

Most snails are thought to be hermaphroditic (Martin 2000), although land snails show many different reproductive strategies (Leonard 1991). When hermaphroditic, snails have both male and female sex organs and can self-fertilize. Even so, many snails exhibit reciprocal mating, where both partners exchange sperm during copulation (Martin 2000). Land snails can lay eggs (oviparous), have eggs develop in the mother and juveniles are born live (ovoviviparous), or retain eggs in the mother until they are more advanced and then laid (egg

retention; Tompa 1979).

Conservation/Management: These species are thought to be intolerant of disturbance, making them particularly vulnerable to extirpation. Land snails tend to avoid dry areas or areas without any vegetation, even seemingly small, unpaved paths. Thus, even low traffic hiking trails can impact movement and conservation of land snails (Jordan and Black 2012). Prescribed fire can also destroy refuges used by land snails and should be done infrequently leaving some areas unburned (Jordan and Black 2012, Nekola 1998).

Land snail abundances may be most limited by refuge availability, as opposed to food resources or predation. Snails use refuges from extreme hot or cold temperatures or predators (Burch and Pearce 1991). Common refuges include soil humus, leaf litter, woody debris (such as rotting logs), crevices in bark, rocks, and soils, and under rocks, logs, or boards (Burch 1962). Many habitats that support these snails, notably Wisconsin carbonate cliffs, are threatened by development, which would dramatically alter the distribution of delicate vertigo (Nekola 2003).

Research Needs: Dedicated surveys using multiple methods (visual, leaf litter collection) to understand delicate vertigo distribution and habitat use would help better identify areas of conservation need. In addition, genetic studies on distinct populations of land snails could help better understand the diversity of these organisms. Land snails are generally understudied, and more specific information is needed to better describe their life history for more effective conservation and management.

Related Abstracts: Vertigo cristata, Vertigo elatior, Vertigo modesta parietalis, Vertigo morsei, Vertigo nylanderi, Vertigo paradoxa**,** limestone bedrock glade, limestone bedrock lakeshore, limestone cliff, limestone lakeshore cliff, volcanic cliff, rich conifer swamp

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