Vertigo modesta parietalis Ancey — land snail

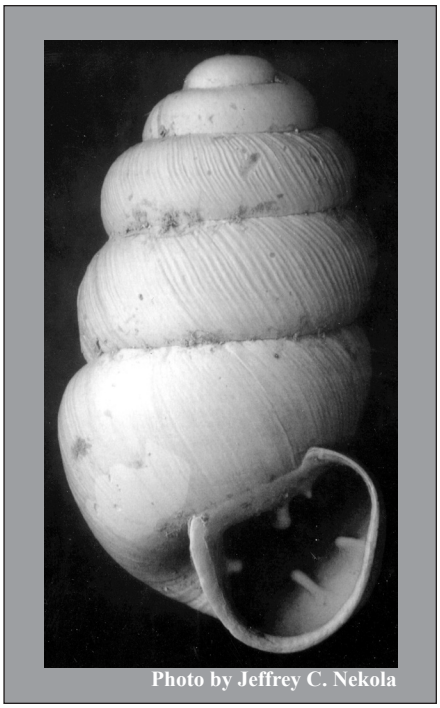
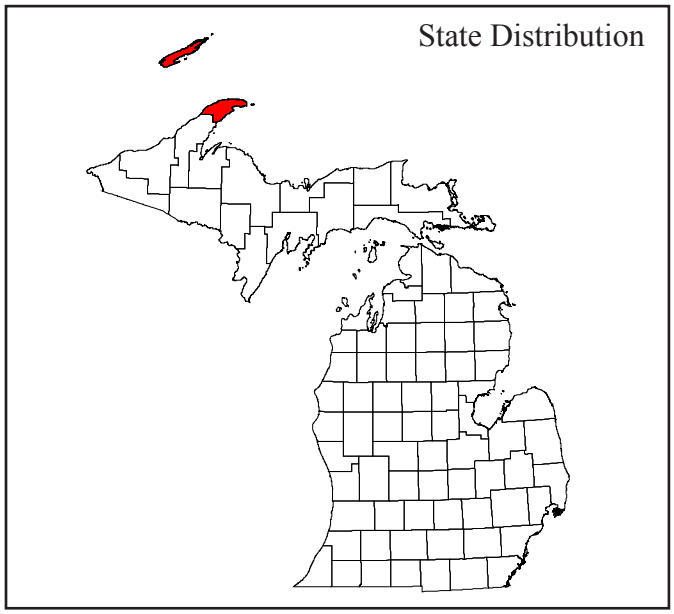
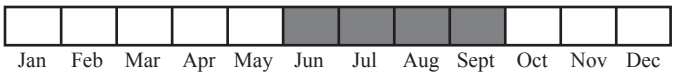


Photo by Jeffrey C. Nekola



Best Survey Period



Status: State endangered

Global and state rank: G5T1/S1

Family: Pupillidae

Range: *Vertigo modesta parietalis* and a number of other subspecies of *Vertigo modesta* (cross vertigo) have been identified based on slightly different shell morphologies (Nekola 1998). This appears to have resulted in inconsistencies in identification of this subspecies, and the range of this subspecies is unclear. The range of *Vertigo modesta* has been reported from Maine to California and south to New Mexico, Arizona, and Texas in the U. S. and across Canada from Ontario to British Columbia (Burch 1962, NatureServe 2007). *Vertigo modesta parietalis* is known primarily from the western U. S., particularly the Rocky Mountain region (Nekola 1998). This subspecies has been reported, at least historically, from Montana, Utah, and Arizona (Pilsbry and Vanatta 1900, Vanatta 1914, Pilsbry and Ferriss 1911, Berry 1919, Oliver and Bosworth 1999 in Utah Division of Wildlife Resources 2007). This subspecies also has been reported from Canada in British Columbia (Vanatta 1906 in Forsyth 2007), Newfoundland, and Labrador (Brooks 1936 in Forsyth 2007). *Vertigo modesta parietalis* has been documented recently in the eastern U. S. in Michigan (Nekola 1998) and Minnesota (Nekola et al. 1999), and is also known from central and eastern Canada (e.g., southern Ontario) (Nekola 1998, Nekola et al. 1999). Distribution data for this subspecies in the U. S. and Canada are known to be incomplete.

State distribution: In Michigan, *Vertigo modesta parietalis* has been documented from only one site in Keweenaw County in the western Upper Peninsula (Nekola 1998, Michigan Natural Features Inventory (MNFI) 2007a). Systematic surveys for this land snail have not been conducted throughout the state. Thus, potential exists for this species to occur at additional sites in which suitable habitat is available.

Recognition: *Vertigo modesta parietalis* is a minute land snail with a **dark-olive brown to chestnut brown, cylindrical (beehive-shaped) shell** that is about **2.2 to 2.7 mm (0.09 to 0.11 in) in height** and about 1.2 mm (0.05 in) in width (Burch 1962, Nekola 1998). The shell of *Vertigo modesta parietalis* is somewhat wider than that of *Vertigo modesta*, and usually has about **five whorls** (Pilsbry and Vanatta 1900). The **aperture**, or main opening of the shell, usually **has five short lamellae or "teeth"** (calcareous plates, ridges, or folds on the inside of the shell opening) (Pilsbry and Vanatta 1900). **Four of the teeth** in the aperture **are arranged in the form of a cross** (i.e., opposite one another) (Burch 1962). **The fifth lamella or tooth is a distinct angular lamella adjacent to the parietal**

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lamella along the top of the aperture. *Vertigo modesta parietalis* differs from *Vertigo modesta modesta* in that it has this fifth, distinct angular lamella, although it is less developed in some individuals (Pilsbry and Vanatta 1900, Nekola 1998).

Best survey time: Surveys for the *Vertigo modesta parietalis* can be conducted anytime during the growing season, but the best time to survey for this species is from June through September (MNFI 2007b). Because land snails require moisture, surveys are generally most successful in the spring (after snowmelt) and fall, particularly after rain events, when the soil is moist, and during higher relative humidity conditions and cooler temperatures (Taft 1961, Burch and Pearce 1990, MNFI 2007b). The best way to survey for this species is by soil litter sampling. This consists of collecting soil and leaf litter samples in the field and drying, sifting, and looking for snail shells in the samples in the laboratory (Nekola 1998, Nekola 1999).

Habitat: In Michigan, *Vertigo modesta parietalis* has been found on an open talus slope at the base of a basalt cliff, often located in organic-rich soil accumulations between talus fragments (Nekola 1998, MNFI 2007b). Cool air seepages keep the lower portion of the basalt talus slope moist and cool (Nekola 1998). These areas are dominated by polypody ferns (i.e., *Polypodium vulgare*) with scattered clumps of *Ribes* in moist pockets (Nekola 1998). In Minnesota, *Vertigo modesta parietalis* has been found on talus slopes and igneous outcrops or basalt cliffs that are covered with lichens and moss and have tree canopies dominated by mature to old growth eastern white pine (*Pinus strobus*), white spruce (*Picea glauca*), and northern white-cedar (*Thuja occidentalis*) (Nekola et al. 1999).

Biology: Little information is available about the specific biology and life history of *Vertigo modesta parietalis*. In general, land snails require adequate moisture, shelter, abundant food supply, and an available source of calcium (Burch 1962, Burch and Pearce 1990). Land snails require moisture or water for basic physiological processes as well as locomotion and reproduction (Burch and Pearce 1990). For example, land snails generate mucous trails as they crawl, and mucous is largely comprised of water (Burch and Pearce 1990). Also, most snail eggs are highly susceptible to dessication, and must be deposited in moist sites to survive (e.g., moist soil, under stones, logs, or leaf litter) (Burch and Pearce 1990, Martin 2000). Most land snails can minimize water loss and survive dry conditions by aestivating and closing their shell opening with an operculum (i.e., a calcareous "lid" that seals the opening) or a mucous film that hardens over the opening (Burch 1962, Burch and Pearce 1990).

Snails require calcium to maintain their shells. As a result, snails are often associated with habitats that are rich in calcium such as areas that are abundant in limestone (e.g., limestone outcrops), or have soils derived from limestone or are otherwise high in calcium carbonate (Burch and Pearce 1990). Snails also can occur in areas in which the soils are poor in calcium if the local vegetation can provide sufficient calcium (Burch and Pearce 1990). Snails ingest soil particles and scrape rocks or snail shells in order to obtain calcium (Fournie and Chétail 1984). Snails also can obtain calcium that is dissolved in water by absorbing the water through their skin or drinking it (Heller and Magaritz 1983 in Martin 2000).

Availability of adequate shelter or refuges also is extremely important to land snails in general. Burch and Pearce (1990) have suggested that refuges may be the most important factor limiting the abundance of land snails. Refuges provide shelter from cold and hot weather conditions and desiccation as well as protection from predators (Burch and Pearce 1990). Refuges include soil humus, leaf litter, rotting logs and other woody debris, crevices and cavities in tree bark, rocks, soil crevices, and under the soil surface. Most land snails also overwinter underground or under rocks, logs, and boards (Burch 1962).

Some land snails appear to respond strongly to soil surface architecture (Nekola 2003). Some snails prefer soils with a thin (< 4 cm/1.6 in) organic horizon (soil layer) underlain by an upper soil horizon firmly bound by plant roots (i.e., "turf specialists"), while others prefer deeper (> 4 cm), loose soils comprised primarily of humus and mineral soil (i.e., "duff specialists") (Nekola 2003). *Vertigo modesta parietalis* did not demonstrate a significant difference between or preference for duff or turf soils, but this may have been due to small sample size (Nekola 2003). Soil surface architecture may be important to land snails in general since almost 90% of land snails live within 5 cm (2 in) of the soil surface (Hawkins et al. 1998). The architecture of the organic litter layer and the

underlying soil also may impact land snails (Cameron 1986, Nekola 2003).

Temperature, moisture, and light intensity are the primary factors regulating or influencing land snail activity (Burch 1962, Burch and Pearce 1990). Land snails are primarily nocturnal, but may be active during the day following a rain event (Burch 1962, Burch and Pearce 1990). High relative humidity and cooler temperatures also can cause increased land snail activity (Burch and Pearce 1990). Land snails generally do not move much except to find food or reproduce (NatureServe 2007). They actively migrate fairly slowly and over relatively short distances (i.e., usually only centimeters or meters) under favorable environmental conditions (Burch and Pearce 1990, NatureServe 2007). Long-distance dispersal is thought to occur passively through transport by animals (i.e, mammals, birds, or insects) or by humans such as on food, plants, or machinery (Burch and Pearce 1990, NatureServe 2007).

Land snails exhibit a number of different sexual systems and reproductive strategies, behaviors, and anatomy (Leonard 1991 in Martin 2000). Many land snails are hermaphroditic (i.e., possesses both male and female sex organs) (Martin 2000). Although such land snails can self-fertilize, they commonly exhibit reciprocal mating or outcrossing in which each hermaphroditic partner acts as both male and female and exchange sperm during copulation (Martin 2000). Land snails can be oviparous (i.e., lay eggs), ovoviviparous (i.e., eggs develop inside the mother and the young are "born live"), or undergo egg retention in which the eggs are retained inside the mother for some period of time such that the embryo are more advanced when they are laid (Tompa 1979 in Martin 2000).

Most land snails are generalist herbivores (Burch and Pearce 1990). Many also feed on fungus or detritus. A few snail species are carnivorous, consuming other snails, slugs, and invertebrates in the soil (Burch and Pearce 1990). Land snails are preyed upon by various organisms including birds, small mammals, amphibians, reptiles, other snails or slugs, beetle and fly larvae, and other insects (Burch and Pearce 1990).

Conservation/management: Nekola (1998) states that *Vertigo modesta parietalis* is undoubtedly one of the rarest land snails in Michigan, with only one known extant site. This site should be protected, and this species should be considered for listing as State endangered (Nekola 1998). Land-use activities that impact or alter critical habitat requirements including suitable microclimate and soil surface architecture as well as adequate moisture, calcium, food, and refuge should be avoided at the known occupied site (MNFI 2007b). These include, but are not limited to, activities such as timber harvesting, recreational or urban development, and road construction (Nekola 1998). This species also is vulnerable to excessive trampling (e.g., from recreational hiking or other uses) and off-road vehicle use (MNFI 2007b). Rock climbing also may impact this species as it has been found to negatively impact snail density, richness, and diversity (McMillan et al. 2003). Talus slopes which provide habitat for *Vertigo modesta parietalis* and other boreal land snails should be prioritized for surveys and potential management or protection.

Research needs: A systematic survey for *Vertigo modesta parietalis* is needed to identify additional occupied sites and determine this species' status and distribution in Michigan. Additional surveys and monitoring of the known extant site are warranted to determine population status, extent, and viability. Research is needed to obtain information about the species' specific habitat requirements, life history, and ecology in Michigan. An assessment of threats to the species also should be conducted. Studies to monitor and investigate the effects of various land-use and recreational activities such as off-road vehicle use, rock climbing, and other activities on *Vertigo modesta parietalis* are vital to ensure adequate management and protection of this species (Nekola 1998). It also is important to know how much buffer from management and recreational activities is needed to provide adequate protection for land snails (Nekola 1998).

Related abstracts: Vertigo cristata, Vertigo morsei, Vertigo elatior, Vertigo nylanderi, Vertigo paradoxa

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