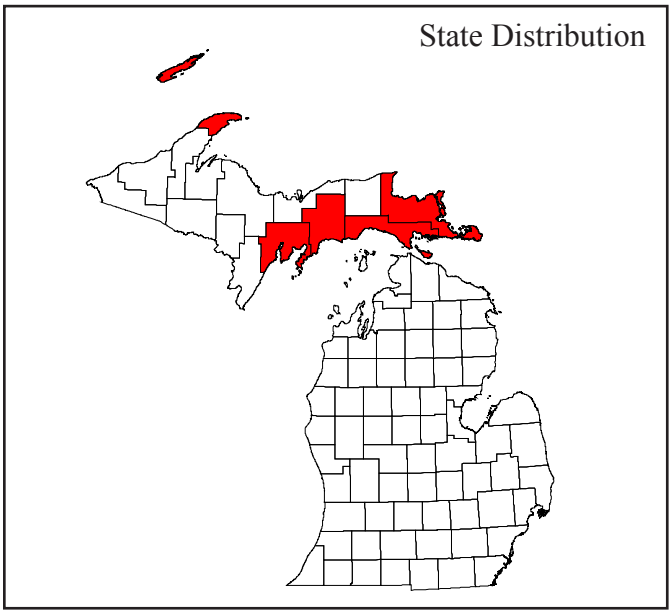
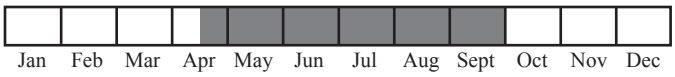
Euconulus alderi Gray — A land snail

Photo by Matthew Barthel and Jeffery C. Nekola



Best Survey Period



Status: State threatened

Global and state ranks: G3Q/S2

Family: Helicarionidae

Synonyms: None

Total range: The global range of *Euconulus alderi* includes Ireland, Sweden, the United Kingdom, and the United States. Within the U.S. it has been found in Iowa, Maine, Massachusetts, Michigan, Minnesota, and Wisconsin (Frest 1990, NatureServe 2007, Nekola 1998). This species was not known from North America until 1986 when it was discovered in Iowa and Wisconsin (Frest 1990, Nekola 1998).

State distribution: *E. alderi* has been documented at 10 sites in Michigan, all in the Upper Peninsula. These are located near the Great Lakes shoreline in Chippewa, Delta, Keweenaw, Mackinac, and Schoolcraft Counties (Nekola 1998).

Recognition: The shells of species in this genus have a dome shape, smooth surface, non-expanded apertural lip, and lack apertural armature (Burch and Jung 1988). Adult *E. alderi* are 2.3-2.8mm in diameter. They are very similar to *Euconulus fulvus* except that *E. alderi* are smaller, have a more shiny luster, and a darker shell color. Also, the microscopic spiral lines on the base of the shell are stronger than the radial striations. This is reversed in *E. fulvus* (Nekola 1998). For more information on identifying land snails, see Burch and Jung (1988) pages 155-158 or Burch and Pearce (1990) pages 211-218.

Best survey time: Surveys for *E. alderi* are best performed after rain, when the soil and vegetation are moist. During dry periods, a survey site can appear completely devoid of snails, while after a rain the same site can be found to contain numerous individuals. Temperatures should be warm enough that the ground is not frozen and there is no snow. Dry, hot periods during mid-summer should be avoided. The best time of day to survey is often in early morning when conditions are cool and moist. An indicator of suitable conditions for performing *E. alderi* surveys is the presence of other species of snails or slugs. Multiple site visits spaced days or weeks apart can help ensure that appropriate conditions are encountered during surveys. Empty shells might still be found when conditions are not suitable for live individuals.

Habitat: Most populations of *E. alderi* have been found in fens and cool, calcareous wetlands. The ten sites it has been documented at in Michigan include two fens,

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Phone: 517-373-1552

one cobble beach, three tamarack-sedge wetlands, and three white cedar wetlands. These sites are located within the Niagaran Escarpment and Keweenaw Volcanic Belt in the Upper Peninsula. Fens are peatlands that form in areas of ground water discharge. They have relatively high soil moisture and cooler soil temperatures, which are favorable for land snails. Sites at cobble beaches consisted of grasslands with exposed carbonate bedrock that are kept moist by Lake Michigan or Lake Huron. The habitat at tamarack-sedge wetlands where the species was found was described as open tamarack (*Larix laricina*) grove with speckled alder (*Alnus rugosa*) as a common shrub and a dense sedge (*Carex*) turf. Balsam popular (*Populus balsamifera*) was present, and the soil had high peat content and sat over shallow bedrock. *E. alderi* often co-occurs with (*Vertigo elatior*). The habitat at sites in white cedar wetlands consisted of forested peatlands dominated by a northern white cedar (*Thuja occidentalis*) canopy and included tamarack and speckled alder. Soil chemistry at these sites ranged from acidic, with abundant *Sphagnum* moss, to neutral, with *Sphagnum* mostly absent (Nekola 1998).

Biology: Terrestrial snails and slugs, along with aquatic snails (Gastropoda) belong to the Phylum Mollusca. They are related to clams and mussels (Bivalivia); squids, octopuses, and nautiluses (Cephalopoda); and five Classes of lesser known mollusks found in marine environments: chitons (Polyplacophora), tusk shells (Scaphopoda), solenogasters (Aplacophora), Monoplacophorans, and Caudofoveatans. As the first molluscan group to expand out of aquatic environments (~150 million years ago, Clarkson 1979), land snails have adapted to a wide variety of terrestrial habitats. There are close to one thousand species in the U.S. and Canada alone.

Although there is very limited information on the specific biology of *E. alderi*, the general biology of land snails applies to this species. One of the most important physiological characteristics of land snails is the need for moisture. Water is expended for locomotion and reproduction, and is lost by evaporation from external tissues (Riddle 1983). Land snail eggs have little resistance to desiccation, and so must be deposited in areas that remain moist. Snail shells are made of calcium carbonate, which is secreted from glands in the mantle along the edge of the shell. The oldest part of the shell is at the apex. The shells coil in one of two directions dextral or sinistral. With the aperture of the shell facing you and the pointed end of the spire pointed up, a dextral shell will have the aperture on the right side while a sinistral shell will have the aperture on the left. Most species of land snails, including *E. alderi*, have dextral shells. Since land snails require a source of calcium for shell production, many species are most abundant on limestone and soils high in calcium carbonate (Burch 1955).

The diet of snails includes a wide range of organic materials including plants, fungi, animal tissue, and soil. Senescent plant material (e.g. aging leaves of deciduous trees, fruit, flowers, shoots) usually comprises the largest component of their diet, being preferred over green or dead plant tissue. Snails have been reported to eat algae, mosses, and lichens, but only rarely grasses. Senescent plant tissue is likely preferred because of its low toxin content. Many types of fungi are eaten by land snails, including some that are highly toxic to mammals. Soil particles are known to be a regular component of their diet, humic acid in particular is important for the nutrition of snails in laboratory culture. Animal remains probably comprise only a small portion of food items. Earthworms, chaetae, mites, remains of insects and other small animals, and mammalian feces have been reported in their diet. Land snail species can occur in a wide range of habitats, and utilize different food types based on what is available. Most snails begin foraging for food around sunset. The sense of smell, which is perceived by their tentacles, directs them toward some types of food items (Speiser 2001).

Reproduction in land snails is characterized by internal fertilization, and often includes elaborate courtship behavior. Land snail reproductive systems are complex and varied. *E. alderi*, along with many other species (pulmonates), are simultaneous hermaphrodites, meaning they have both male and female gonads. Other land snails (prosobranchs) are dioecious, that is, individuals are either male or female. Cross-fertilization combined with oviparity (individuals lay eggs) is most common, but self-fertilization with ovoviviparity (eggs develop within the female's body until they hatch) has been documented in many taxa (Gomez 2001).

Conservation/Management: Land snails are particularly vulnerable to habitat degradation due to

their localized nature and inability to migrate long distances. They are strongly tied to habitats such as carbonate cliffs, fens, wooded wetlands, and rocky upland woods. Irrevocable losses to land snail diversity may occur unless action is taken to protect these habitats in north-eastern Wisconsin and southern Upper Peninsula of Michigan (Nekola 2003). Roughly 97% of the regions land snail diversity could be conserved by protecting representative examples of these habitats within each of the geographic subregions (Nekola 2003). Landuse activities that could trample or otherwise alter cool, moist microhabitats should be avoided (e.g. ORV use and timber harvest). Prescribed fire has been shown to substantially reduce the abundance of land snails, including *E. alderi*, and cause the local extirpation of land snail species in upland and lowland grassland habitats (Nekola 2002). Nekola (2002) recommends that burn intervals be at least 15 years and that other methods of removing woody and invasive plants be used that preserve organic litter layers at sites with land snails. Hydrologic changes to ecosystems supporting land snail habitats should be avoided.

Research needs: Studies on the life history of *E. alderi* are needed. Further morphometric and genetic research is needed to confirm that *Euconulus alderi* and *Euconulus fulvus* in North America are distinct taxa. As evidenced by the recent (1986) discovery of this species in North America, relatively little is known about the status and distribution of *E. alderi*. Surveys are needed to help determine the true range and status of *E. alderi* populations in Michigan, and to gain information on its habitat requirements.

Related abstracts: Pleistocene Catinella (*Catinella exile*), Eastern Flat-whorl (*Planogyra asteriscus*), Cherrystone Drop (*Hendersonia occulta*), Spike-lipped Crater (*Appalachina sayanus*), Limestone Cobble Shore, Limestone Bedrock Glade, Limestone Bedrock Lakeshore, Alvar, Rich Conifer Swamp, Boreal Forest, Northern Fen

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