

Hendersonia occulta (Say, 1831), the Cherrystone drop snail (Gastropoda: Helicinidae), extended geographic distribution, Wisconsin, USA

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ABSTRACT: This paper describes a range extension of *Hendersonia occulta*, the cherrystone drop snail. This species, occurring in heavily wooded areas with carbonate geology, is imperiled in Wisconsin. Prior to our research, *H. occulta* had been found in 13 counties within Wisconsin, mostly in the southwestern and eastern parts of the state. We have found 13 new populations, both within counties where the snail was known to occur, and within three new counties, representing a ~150 km range extension northward.

Hendersonia occulta (Figure 1) is a land snail of the family Helicinidae, a large family of tropical and subtropical land snails (Hubricht 1985). Other members of the genus *Hendersonia* occur worldwide, but *H. occulta* represents the only North American member of the genus (Baker 1925). The genus *Hendersonia* is one of the oldest extant land snail genera known world-wide with fossils from the Paleocene (55-65 mya, Branson 1963) and as old as the upper Cretaceous (76.7 mya, Two Medicine Formation, Montana, Chin *et al.* 2009). *Hendersonia occulta* once had a wider distribution in North America but is now more restricted (Baker 1925; Pilsbry 1948). *Hendersonia occulta* is a rare species considered imperiled in most of its range (Baker 1925; WDNR 2012).

Hendersonia, like other helicinids, is of interest among North American land snails in that it is a descendent of gill-breathing terrestrial snails. This family represents a separate invasion of the terrestrial environment from the more familiar pulmonate land snails (Baker 1925). *Hendersonia occulta* is a small and relatively inconspicuous, but distinctive, snail (Figure 1). The shell

has 4.5-5 whorls with a width of 6-8 mm (Burch 1962). The shell can be distinguished by the presence of an operculum, a characteristic of gill-breathing snails that allows them to completely close the shell (Burch 1962). The shell coloration of *H. occulta* is quite variable with individuals ranging in color from cinnamon red or reddish brown to pale yellow (Burch 1962; Hubricht 1985). The living animal has a dark grey skin and mantle color and is observed following a rain or heavy dew. In wet conditions, the animals are very visible crawling on vegetation. However, they are most often concealed in deep leaf litter.

The modern distribution of *Hendersonia occulta* is disjunct (Figure 2) with isolated populations clustered in three regions of the United States: the bluffs and hills of the Upper Mississippi Valley, the Niagara escarpment of Wisconsin and Michigan, and the ridge and valley of the Appalachian Mountains (Hubricht 1985). The species is found in Michigan (van der Schalie 1939), southwestern Pennsylvania (Pearce 2006), western Virginia, North Carolina, Maryland, eastern Kentucky, Tennessee, and West Virginia (Burch 1962; Hubricht 1985). The range of this species extends southward

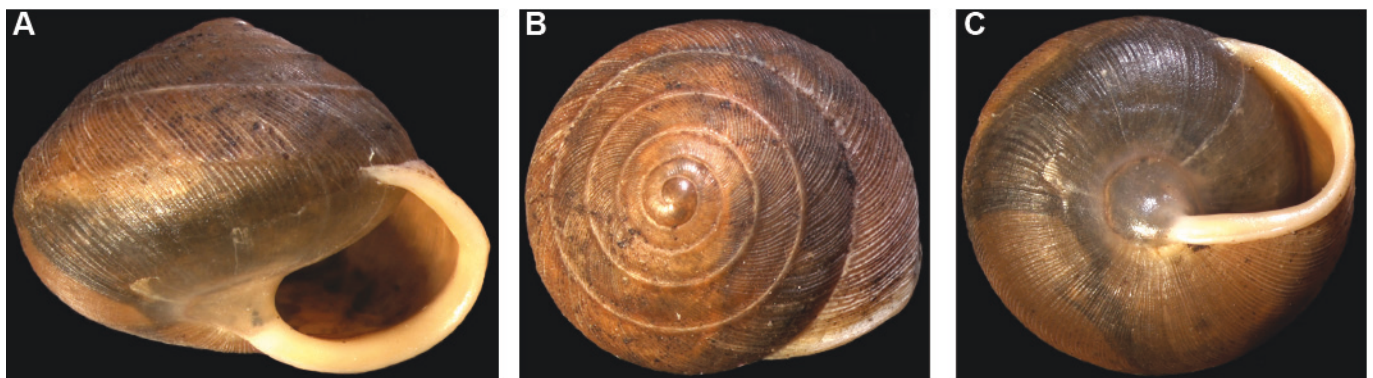


FIGURE 1. *Hendersonia occulta* shell. A: apertural view, B: top view, C: umbilical view. Images taken by Jeff Nekola, copyright University of Wisconsin – La Crosse.

to an isolated population on the stone bluffs of the Elk River in Oklahoma. Lawrence, Kansas is the site of the westernmost extant population (Branson 1963).

High density populations live in humid, mixed hardwood forests with deep leaf litter and exposed dolomite bedrock outcrops, typically with permanent streams (Branson 1963). The patchy distribution of *Hendersonia occulta* and the species' reliance on the deep leaf litter of undisturbed forest habitat has resulted in its imperilment. It is listed as threatened in the state of Wisconsin and has a conservation status of S2S3, which indicates that the species is imperiled or uncommon in Wisconsin, defined as having 6-100 occurrences and/or 1000-10,000 individuals (WDNR 2012). The meanings of these abbreviations are as follows: SNR: Species Not Ranked, SX: Apparently extirpated from the state, SU: Possibly in peril in the state, S1: Critically Imperiled, S2: Imperiled, S3: Rare or uncommon. The conservation status for other states in this snails' range are as follows (NatureServe 2012): Illinois (SNR), Indiana (SX), Iowa (S3), Kansas (SX), Kentucky (S1S2), Maryland (S2), Michigan (S1), Minnesota (SNR), Mississippi (SX), Missouri (S3), Nebraska (SX), North Carolina (SU), Ohio (SX), Pennsylvania (S2), Tennessee (S3), Virginia (S3), West Virginia (S2), Ontario (SX).

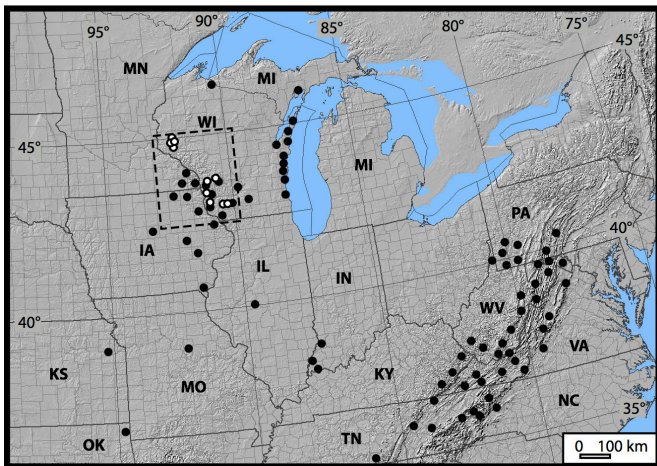


FIGURE 2. Present-day distribution of *Hendersonia occulta*. New records are indicated with white dots. Previously known population records indicated with black dots. The area indicated with a dashed square is shown in Figure 3.

Hendersonia occulta was more widely distributed in the past with fossil populations extending the Pleistocene range much farther south (Figure 2). *H. occulta* is a common Pleistocene fossil in Mississippi (Hubricht 1960) and Ohio (Leonard 1953; La Rocque and Conley 1956). Our project examined the northern extent of the range of *H. occulta* in a region known as the Driftless Area, which includes parts of Minnesota, Iowa, Illinois, and Wisconsin (Shimek 1904). Unlike surrounding regions, the Driftless Area was unglaciated at the last glacial maximum (Paull and Paull 1977; Syverson and Colgan 2004), and perhaps as a consequence it has a unique snail fauna including *H. occulta*.

Hendersonia occulta was sampled as part of a survey of the snails of the Driftless Area of Wisconsin. Specimen collection was authorized by Wisconsin Department of Natural Resources Endangered and Threatened species collection permit #670. New collections are vouchered in the Wisconsin Natural Heritage Inventory collection at the

University of Wisconsin – La Crosse Biology Department. Our sampling was concentrated in public lands, such as state parks and natural areas, and land owned or with conservation easements by land conservancies. Each locality sampled had one to nine sampling sites, depending on the number of differing habitat types, of at least 50 m², resulting in a total of 100 sampling sites. Habitat types sampled included upland hardwoods, wet grasslands, rocky hardwoods, hill prairies, and wetlands. The sampling regime for each site included a ≥ 30 minute macrosnail search and leaf litter sampling. Leaf litter samples included 0.5 – 1.0 m² leaf litter and loose organic layer of soil at each site. All sampling was conducted during the summer months (June-August) of 2010-2012.

Prior to this research the known populations of *Hendersonia occulta* extended over 13 counties in Wisconsin, mostly found in southern and eastern parts of the state (Figure 2). We found 13 new populations of *H. occulta* in Wisconsin (Table 1), all in relatively pristine deeply wooded areas, with underlying dolomite geology (Figure 3). This species' preference for deep woods has been well documented, but its preferred geology has not been strongly demonstrated. In addition to 13 new populations, this sampling documents a range extension northward of ~150 km and adds three new counties in Wisconsin (Pierce, St. Croix, and Dunn) to the species' known range along with several new populations within already documented counties. The discovery of these new populations extends the known modern range of *H. occulta*. In addition, this supporting evidence that *H. occulta* is restricted to dolomite underlying geology (as seen in Figure 3) can be used to discover new populations and further extend our knowledge of the range of this species.

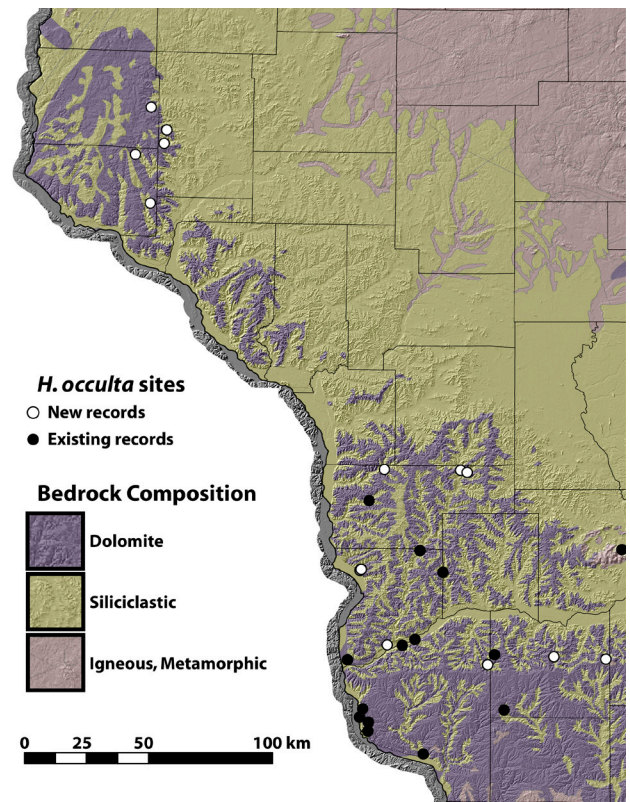


FIGURE 3. Map of southeastern Wisconsin with new *H. occulta* records indicated by white dots, underlying geology is visible by different colored regions.

TABLE 1. Localities and collection numbers for new records of *H. occulta*. Vouchers reside in the Wisconsin Natural Heritage Inventory collection at the University of Wisconsin – La Crosse. Collection number represents the “voucher number” in this collection.

COLLECTION NUMBER	COORDINATES	LOCALITY	COLLECTOR	DATE
958	43.347700° N 91.073610° W	~1 km N of Ferryville, Crawford Co., WI, ~400 m W of N. Buck Creek Road, Sugar Creek Bluff SNA	K. Perez, C. Lynum, R. Amundson, R. Werren	6-02-2010
961	43.713803° N 90.990019° W	~2 km NE of Coon Valley, Vernon Co., WI, Intersection of Co. P and Spring Coulee Ridge Rd and SE side of bluffs	K. Perez, C. Lynum, R. Amundson	6-23-2010
969	43.683032° N 90.583° W	~5 km S of Ontario, Vernon Co., WI, ~500 m E of intersection of Hwy 131 and Co. Rd. F in Wildcat Mountain State Park ~50 m NW of Co. Rd. F at base of Mt. Pisgah	K. Perez, C. Lynum, R. Amundson, L. Hartman	7-15-2010
972	43.702210° N 90.549160° W	~4 km S of Ontario, Vernon Co., WI, ~1.5 km W of intersection of Hwy 33 and Co. Rd. F in Wildcat Mountain State Park, forested area ~75 m NW of Co. Rd. F	K. Perez, C. Lynum, R. Amundson, L. Hartman	7-15-2010
976	43.035000° N 90.114300° W	~4 km N of Dodgeville, Iowa Co., WI, ~3.75 km N of entrance to Governor Dodge State Park following road, Unmanaged grassland	C. Lynum, R. Amundson	7-20-2010
982	43.005070° N 90.441330° W	~3.5 km N of Montfort, Grant Co., WI, ~1 km along Bluff Rd off of Co. Rd. I, Fern forest on northern side of hill ~100 m N of Bluff Rd.	K. Perez, C. Lynum, R. Amundson	7-27-2010
987	43.026530° N 89.857260° W	~1 km NW of Blue Mounds, Iowa Co., WI. Rocky slope just W of Blue Mound State Park's West Observation Tower	K. Perez, C. Lynum, R. Amundson	7-28-2010
1022	43.074084° N 90.93824° W	~4 km W of Wauzeka, Grant Co., WI, ~40 m N of Hwy 60.	K. Perez	6-16-2010
1023	44.65867° N 92.16648° W	~3 km N of Plum City, Pierce Co., WI, ~350 m N of end of 70 th Street in Plum Creek Woods SNA	M. Kuchta	2010
1024	44.92615° N 92.09375° W	~13 km W of North Menomonie, Dunn Co., WI, ~2 km NE of intersection between Co. Rd. Q and Interstate 94.	M. Kuchta	2010
1025	44.92547° N 92.092867° W	~13 km W of North Menomonie, Dunn Co., WI, ~2 km NE of intersection between Co. Rd. Q and Interstate 94.	M. Kuchta, A. Cameron, S. Wahl, B. Nadziejka	2012
1026	44.83388° N 92.24908° W	~10 km SW of Spring Valley, Pierce Co., WI NE corner of Crystal Cave along Hwy 20	M. Kuchta, A. Cameron, S. Wahl, B. Nadziejka	2012
1027	45.00638° N 92.17528° W	~6.5 km S of Glenwood City, St. Croix Co., WI, ~75 m off Rustic Rd 3 along creek extending from Glen Lake in Glen Hills Park	M. Kuchta, A. Cameron, S. Wahl, B. Nadziejka	2012

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LITERATURE CITED

- Baker, H.B. 1925. Anatomy of *Hendersonia*: a primitive Helicimid mollusk. *Proceedings of the Academy of Natural Sciences of Philadelphia* 77: 273-303.
- Branson, B.A. 1963. New Mollusk Records from Oklahoma and their zoogeographical significance. *Transactions of the Kansas Academy of Science* 66: 501-512.
- Burch, J.B. 1962. *How to Know the Eastern Land Snails*. Dubuque, Iowa: Wm. C. Brown Company. 214 p.
- Chin, K., J.H. Hartman, and B. Roth. 2009. Opportunistic exploitation of dinosaur dung: fossil snails in coprolites from the Upper Cretaceous Two Medicine Formation of Montana. *Lethaia* 42: 185-198.
- Hubricht, L. 1960. *Hendersonia occulta* fossil in Mississippi. *The Nautilus* 74: 83.
- Hubricht, L. 1985. The distributions of the native land mollusks of the eastern United States. *Feldiana: Zoology, New Series* 24: i-viii, 1-191.
- La Rocque, A., and J.F. Conley. 1956. Two Pleistocene Molluscan faunules from Hunter's Run, Fairfield County, Ohio. *The Ohio Journal of Science* 56: 325-328.
- Leonard, A.B. 1953. Molluscan faunules in Wisconsinian loess at Cleveland, Ohio. *American Journal of Science* 251: 369-376.
- NatureServe. 2012. *NatureServe Explorer: An Online Encyclopedia of Life, NatureServe, Arlington, Virginia. Version 7.1*. Electronic Database accessible at <http://www.natureserve.org/explorer/>. Captured on 21 August 2012.
- Paull, R.K., and R.A. Paull. 1977. *Geology of Wisconsin and Upper Michigan, Including Parts of Adjacent States*. Dubuque, Iowa: Kendall/Hunt Publishing Co. 260 p.
- Pearce, T.A. 2006. New records of *Hendersonia occulta* (Gastropoda: Helicinidae) in limestone areas of Pennsylvania, USA. *Tentacle* 14: 2.
- Pilsbry, H.A. 1948. Land Mollusca of North America (north of Mexico). *Academy of Natural Sciences of Philadelphia, Monograph* 3(2): xlvii, 521-1113.
- Shimek, B. 1904. *Helicina occulta* Say. *Proceedings of the Davenport Academy of Science* 9: 173-180.
- Syverson, K.M., and P.M. Colgan. 2004. The Quaternary of Wisconsin: a review of stratigraphy and glaciation history. *Developments in Quaternary Sciences* 2: 295-311.
- van der Schalie, H. 1939. *Hendersonia occulta* (Say) in Michigan; its distribution, ecology, and geological significance. *Occasional Papers of the Museum of Zoology, University of Michigan* 399: 1-8.
- WDNR. 2012. Wisconsin Natural Heritage Working List. Electronic Database accessible at <http://dnr.wi.gov/>. Captured on 4 September 2012.

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