

**Conservation Assessment for the Carinate Pillsnail,
*Euchemotrema hubrichti***



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This Conservation Assessment was prepared to compile the published and unpublished information on *Euchemotrema hubrichti*. This report provides information to serve as a Conservation Assessment for the Eastern Region of the Forest Service. It is an administrative study only and does not represent a management decision by the U.S. Forest Service. Although the best scientific information available was used and subject experts were consulted in preparation of this document and its review, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if the reader has any information that will assist in conserving this species, please contact the Eastern Region of the Forest Service - Threatened and Endangered Species Program at 310 Wisconsin Avenue, Suite 580 Milwaukee, Wisconsin 53203.

EXECUTIVE SUMMARY

Euchemotrema hubrichti (Pilsbry, 1940) was initially described as *Stenotrema hubrichti* by Pilsbry (1940). The species was known only from shell material, and it was originally thought to be extinct. Live specimens have since been found, and the species was redescribed recently by Anderson and Smith (2005). *E. hubrichti* is known from several sites in the Larue–Pine Hills Research Natural Area in Union County, Illinois, and is particularly abundant under loose slabs on the tops of relatively dry limestone outcrops at three sites. Threats to the species appear to be minimal—the known range of the species lies completely within a highly protected region of the Shawnee National Forest—but controlled burns could constitute major threats to individual populations, and the relatively small range of the species could make it susceptible to large-scale natural disasters (wildfires in particular). Management activities should include continued protection of habitat, occasional monitoring of sites with high concentrations of *E. hubrichti*, surveys in the Larue-Pine Hills RNA and nearby limestone outcrops for additional populations, and research on the life history of the species.

NOMENCLATURE AND TAXONOMY

Classification (from Emberton, 1995):

Mollusca
 Gastropoda
 Pulmonata
 Stylommatophora
 Polygyridae
 Polygyrinae
 Polygyrinai
 Stenotremeni
Euchemotrema hubrichti

Common Name	Carinate pillsnail
Synonyms	<i>Stenotrema hubrichti</i>
Type locality	“Pleistocene talus just south of McCann School, 2 miles northeast of Aldridge, Union County”
Type/paratypes	4 shells, Academy of Natural Sciences, Philadelphia (catalog number 174941); Hubricht Collection, Field Museum of Natural History (catalog numbers 118495, 257019)
Vouchers	Field Museum of Natural History (catalog number 307844)
Gene sequences	4 partial cytochrome c oxidase subunit I sequences in GenBank (www.ncbi.nlm.nih.gov ; accession numbers AY769091-AY769094)

Euchemotrema hubrichti (Pilsbry, 1940) (also known as the carinate pillsnail) was described as *Stenotrema hubrichti* by Pilsbry (1940, pg. 687-688, Figure 423) based on shells collected by Leslie Hubricht from Pleistocene talus at the base of a large limestone bluff in the Larue–Pine Hills region of Union County, southwestern Illinois. Pilsbry placed *S. hubrichti* in his

Stenotrema monodon (Rackett, 1821) species group (section *Euchemotrema* Archer) based on the morphology of the lip of the shell. He regarded the species to be a “spectacular find”, as he considered it to be the first known carinate member of the *Stenotrema monodon* group. Initially, the species was believed to be extinct, but live specimens were discovered by Hubricht (1943). The species was first listed as *Euchemotrema hubrichti* in Turgeon *et al.* (1988). Despite an extensive literature review and discussions with colleagues (B. Roth and K. Emberton, pers. comm.), neither the author responsible for the elevation of *Euchemotrema* from subgenus (or section) to genus, nor the basis for this change, could be determined. Emberton (1994; 1995) included the species in his revision of polygyrid taxonomy, with the monophyly of *Euchemotrema* supported by a reproductive behavior synapomorphy (“Penis not inserted; everted female organ receiving ejaculate from pocket at tip of penis; basal penis slightly expanded (*Euchemotrema*)”, Emberton, 1994, Appendix 2), but he wrote nothing specific about *E. hubrichti*.

DESCRIPTION OF SPECIES

The following description is summarized from Anderson and Smith (2005) and Pilsbry (1940). The shell (Figure 1) was the only aspect of this species available to Pilsbry, and Pilsbry’s description of the shell needs little modification:

“The imperforate shell is depressed, lens-shaped, **acutely carinate** [emphasis added], the height not much exceeding half of the diameter. Spire low conic, or slowly increasing whorls, the first two convex, the rest nearly flat, impressed above the keel; last whorl shortly descending in front. The base is flattened below the keel, then convex, and slightly impressed around the central axis. The embryonic whorls are most minutely granulose. Later whorls are lightly striate, the striae low, very unequal. Base with fainter striae and densely, minutely granulose. The aperture resembles that of *S. fraternum* but is narrower, the parietal tooth nearer to the basal lip, approaching it slightly towards the outer end; nearly straight, rather low, connecting with the end of the collumellar lip by a low, curved ridge. The basal lip is reflected, rather strongly thickened within, the thickening narrowing at the passage of basal into columellar margin, forming a rounded sinus there; in the outer half of the basal margin it is wider, but narrows gradually at the position of the keel, not abruptly as in *S. barbigerum*.” (Pilsbry, 1940, p. 687).

In addition, there is sometimes a small fulcrum (using Pilsbry’s terminology; see his description of *S. hirsutum barbatum*, Pilsbry, 1940, p. 665) positioned well within the ultimate whorl. This fulcrum can be seen in Figure 1 (bottom left photo). Pilsbry (1940) reported a range of 4.5-5.0 for whorl count. Hubricht (1943) described the periostracum as reddish brown and covered with short hairs on both surfaces. Many specimens are reddish brown, but shell coloration in this species ranges from reddish brown to light brown or amber (Figure 1). Burch (1962) listed a shell diameter range of 8.9-9.7 mm, but Anderson and Smith (2005) found individuals ranging from 5 mm to 10.3 mm in shell diameter.

No other land snail in the Larue-Pine Hills region has a shell quite like that of *E. hubrichti*, so in this case shell morphology should be sufficient for identification. *Anguispira alternata* (Say, 1816) in this region has a slightly angular shell, but there are a number of features that distinguish the shell of this species from that of *E. hubrichti*, even to the casual observer. The shell of *A. alternata* 1) lacks apertural dentition, 2) lacks a sharp keel on the periphery of the shell, 3) is heavily striated, and 4) is usually clearly marked with reddish-brown blotches or stripes (hence one common name for this species—the flamed tigersnail). For additional

information on *E. hubrichti* anatomy, particularly details of the reproductive tract, radula and jaws, please see Anderson and Smith (2005).

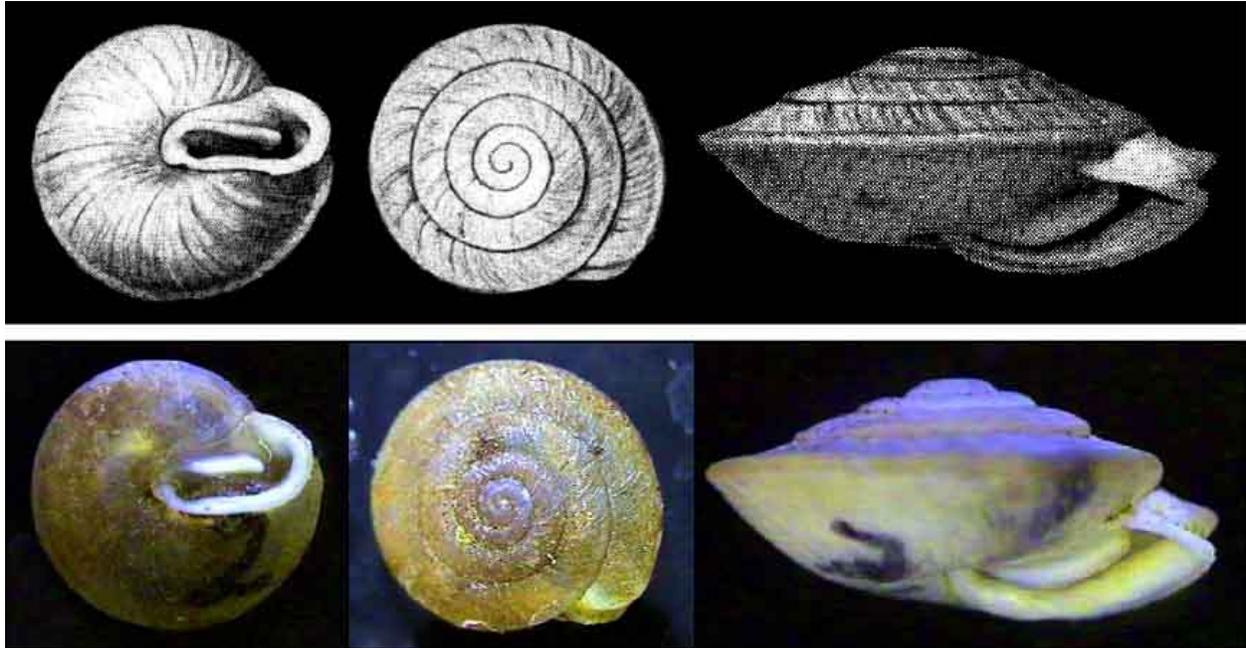


Figure 1. The shell of *E. hubrichti*. Top row: Shell figures from Pilsbry, 1940 (fig. 423, p. 687). Bottom row: Shell figures from present study for comparison (shell measurements: 4.3 mm X 9.4 mm X 4.75 whorls).

NON-TAXONOMIC LITERATURE REVIEW

As noted above, Pilsbry (1940) described *Euchemotrema hubrichti* (as *Stenotrema hubrichti*) based on shell material collected by Leslie Hubricht. Hubricht (1943) described his first encounter with live *S. hubrichti* specimens, and provided brief descriptions of one collection locality and of the periostracum of the shell, but he did not describe the soft-part anatomy of the species. Webb (1947) detailed the mating anatomies (“... anatomies of snails exhibiting the sex-organs in the extruded, functional condition.”) of *S. hubrichti*, but this work provided no figures that are appropriate for specific identification. Burch (1962) included a brief description of the shell of *S. hubrichti* in his handbook of eastern North American land snails. Hubricht (1985) noted the distribution of the species in his monograph on eastern U.S. land snail distributions, and described the habitat of *S. hubrichti* as “crevices of shaded cliffs, often more than 20 ft above the ground” (Hubricht 1985, pg. 41; Figure 2).

HABITAT

Euchemotrema hubrichti is known only from limestone bluffs in the Larue–Pine Hills region of Union County in southwestern Illinois. Hubricht (1943) found live *E. hubrichti* on the walls of a moist ravine, and noted that searches of the (dry) talus slopes at the base of the bluffs failed to

produce a single recent shell. He also noted that the species shows “a decided preference for such situations as would require the collector to risk his neck to collect them” (Hubricht, 1943, pg. 74). These observations tell only part of the story. *Euchemotrema hubrichti* is fairly common on moist ravine walls, as Hubricht noted, but he does not seem to have found the areas where *E. hubrichti* is truly abundant—the shaded tops of certain outcroppings.

The outcrops where *E. hubrichti* is found in high abundance share a few characteristics, which provide some insight into the apparent habitat preference of this species. First, these outcrops have one or more relatively flat shelves, often covered with thin, loose limestone slabs of various sizes; *E. hubrichti* can sometimes be found in abundance attached to the underside of such slabs. Second, all of the high abundance sites are shaded to some extent by surrounding trees, but none are especially damp (rainwater seems to drain from the tops of the outcroppings quite quickly). Third, two of the three sites (and others where smaller numbers of *E. hubrichti* have been found) are topped with one or more Eastern red cedars (*Juniperus virginiana* Linnaeus), emphasizing the comparative aridity of these sites. Finally, *E. hubrichti* is far more numerous at these sites than any other species of land snail.

STATUS

E. hubrichti has a NatureServe (<http://www.natureserve.org>) Global Status of G1 (“critically imperiled across its entire range”) and state status of S2 (“imperiled”) (Figure 2), as well as an IUCN Red List of Threatened Species (<http://www.redlist.org>) designation of DD (“data deficient”) (Mollusc Specialist Group, 1996). An IUCN status of “DD” indicates that there is insufficient information—particularly regarding distribution or abundance—to assess the extinction risk of a taxon.

DISTRIBUTION AND ABUNDANCE

The species is found at several sites throughout the Pine Hills region in southern Illinois, and has been found on limestone outcrops in Jackson County, immediately to the north of the main Larue–Pine Hills bluff line (J. Slapcinsky, pers. comm.) (Figure 2). However, during a recent (summer 2003) exploration of two of these outcrops, no live *E. hubrichti* specimens or shells were found. No other traces of *E. hubrichti* have been found outside of this region, suggesting that the species is restricted to the Larue–Pine Hills bluff system.

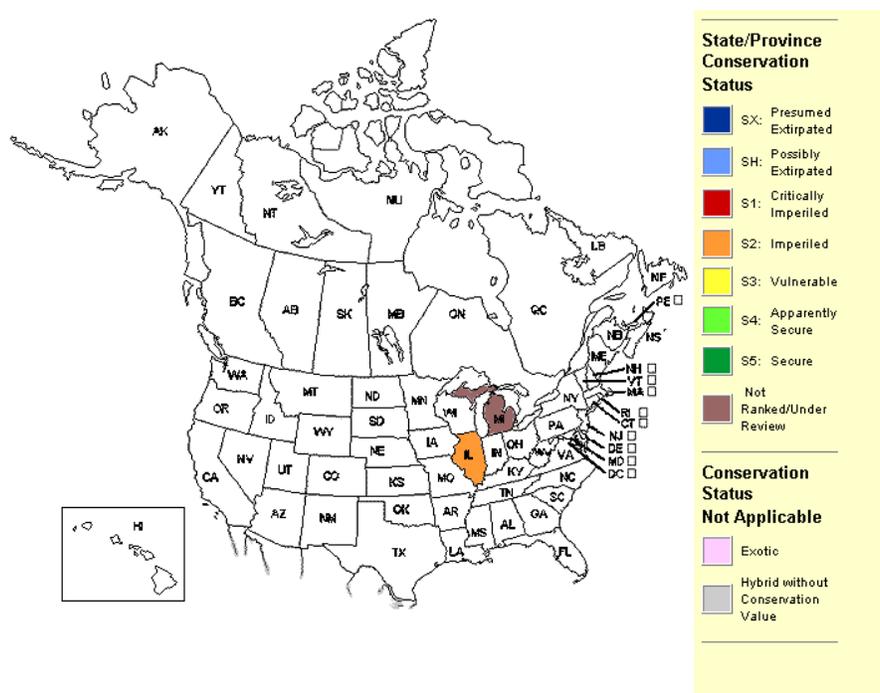


Figure 2. Distribution and conservation status of *E. hubrichti* from the NatureServe website (<http://www.natureserve.org>; accessed January 3, 2005). The “not ranked/under revision” status for Michigan is unjustified, the species has never been found in that state.

Euchemotrema hubrichti is found in low numbers at several localities (Table 1), but the tops of three outcrops appear to harbor hundreds of *E. hubrichti* individuals. Abundance estimates for two of these outcrops were estimated via mark-recapture experiments conducted over three years (2001-2003). Two estimates are presented for each population—one is based on population size estimates combined across years using the Schnabel method; the other is based on samples taken during the summer of 2003 only, analyzed with the Jolly-Seber method. The shells of individual snails were marked with different colors of nail polish to denote where and in what year the snail was collected. This method allowed migration between the populations (if any) to be detected, and also allowed an assessment of overwinter survivorship (see below).

No migrants were detected between the two populations at which mark-recapture experiments were performed during the three years of the study. However, preliminary DNA data suggests that there is migration (gene flow) among these populations and several others. Despite some gene flow, there is one population that appears to be genetically distinct from the other populations (Table 1; Anderson, in prep).

GPS Coordinates	Estimated <i>E. hubrichti</i> Abundance
37°35.421' N, 89°26.367' W	low
37°35.376' N, 89°26.348' W	low
37°33.456' N, 89°26.482' W*	201 snails (178, 230); 86
37°33.683' N, 89°26.429' W*	723 snails (594,923); 206
37°33.456' N, 89°26.482' W	very low
37°33.256' N, 89°26.439' W	medium
37°33.149' N, 89°26.382' W**	very high
37°32.522' N, 89°26.314' W	very low

Table 1. GPS coordinates and estimated *E. hubrichti* abundance for several sites in the Larue-Pine Hills Research Natural Area where *E. hubrichti* was found. Qualitative measures of abundance: “very low” = 1-5 individuals found; “low” = more than 5, less than 10 individuals found; “medium” = more than 10, fewer than 50 individuals found; “high” = more than 50, less than 100 individuals found; “very high” =100+ individuals found. * - population size estimates based on mark-recapture studies described in the text (multi-year estimates, Schnabel method, and 95% confidence intervals, in plain text; *single-year estimate - Jolly-Seber method - in italics*); ** - genetically distinct population.

LIFE HISTORY

Very little is known of the life history of *E. hubrichti*. Webb (1947) described the mating behavior and anatomy of the species, but collected no data on the life history of individuals in the wild. He noted that *E. hubrichti* thrives and breeds readily in laboratory settings (suggesting that some life history parameters could be obtained by studying laboratory-reared populations). Anderson and Smith (2005) noted that *E. hubrichti* appears to reach sexual maturity (as inferred based on the presence of a reflected shell apertural lip) at about 9 mm shell diameter. Mark-recapture experiments revealed that *E. hubrichti* can survive over at least two winters; some individuals that were marked in the summer of 2001 were recovered alive in the summer of 2003.

POTENTIAL THREATS AND MONITORING

Based on mark-recapture experiments ending in August 2003, the populations of *E. hubrichti* on two adjacent outcroppings appear to be fairly stable. Visits to a third outcrop in the early spring of 2004 suggest that the population there is stable as well.

Potential threats to the species seem to be limited, as it seems to only inhabit the USDA Forest Service LaRue–Pine Hills/Otter Pond Research Natural Area, a highly protected area where collections are prohibited. No *E. hubrichti* were found during a single search of two bluffs north of the Larue-Pine Hills RNA, and cursory attempts to find *E. hubrichti* in other areas were also unsuccessful. This suggests that the species may not be found on nearby private property in the area.

There seem to be relatively few threats to the species. *E. hubrichti* is found in low abundances at sites throughout the Larue-Pine Hills bluff system (a minimum north-south range of 5 km), and in high abundance at sites that are up to 1 km apart. The relatively limited geographic range of the species does make it vulnerable to local catastrophes. In particular, the low vagility of the snails would make them more vulnerable to fire than many other animals. Floods seem unlikely to be a major threat; the “high-abundance” sites are at least ten meters above the road that runs along the base of the main bluff line. Anything short of a truly gargantuan flood would be unlikely to impact the species adversely.

Apart from wildfire, human-induced threats are the major concern. Controlled burns (Kiss and Magnin, 2003) (or—much less likely—pesticide or molluscicide use) near the high-abundance sites could have a major impact on the species. Unless carefully performed, even the techniques that have been used to survey outcrops for *E. hubrichti* (e.g., lifting limestone slabs) can crush individuals.

There is no ongoing monitoring program for this species. Adequate monitoring of the species requires some habitat disturbance, so it is conceivable that regular monitoring—unless carefully planned and performed—could adversely impact the species.

PRESENT OR THREATENED RISK TO HABITAT OR RANGE

None other than the potential threats described above.

SUMMARY OF LAND OWNERSHIP AND EXISTING HABITAT PROTECTION

The known range of *E. hubrichti* lies within the LaRue–Pine Hills/Otter Pond Research Natural Area, and the region is also a National Natural Landmark. This area is a part of the Shawnee National Forest where collections are prohibited.

PAST AND CURRENT CONSERVATION ACTIVITIES

Euchemotrema hubrichti is considered a Regional Forester Sensitive species by the United States Department of Agriculture Forest Service, and was listed as a Category 2 species by the U.S. Fish and Wildlife Service (USFWS) prior to abolition of that category. Category 2 status was used for taxa that the USFWS believes might be endangered or threatened, but for which persuasive data on biological vulnerability and threat were not available. The USFWS used the Category 2 listing to encourage necessary research on vulnerability, taxonomy, and/or threats for the listed taxa.

RESEARCH AND MONITORING

Ongoing research on the population genetics of *E. hubrichti* suggest that there is limited gene flow among certain populations (Anderson, in prep). Additional surveys of limestone bluffs near the Larue-Pine Hills system in both Illinois and Missouri may bring to light additional populations of the species.

MANAGEMENT PRIORITIES

Continued protection of the habitat of *E. hubrichti* is clearly the key to maintaining viable populations of the species. Beyond habitat protection, forest management efforts should be carefully evaluated, particularly in close proximity to the high-abundance populations of *E. hubrichti* that have been found.

Of particular concern are controlled burns and human incursions. In a recent study, Kiss and Magnin (2003) noted that land snail abundance and diversity is diminished after fire perturbation, suggesting that controlled burns could have an adverse impact on *E. hubrichti* populations. Regular monitoring of high-abundance populations—if performed at all—should be undertaken with care. Large numbers of snails can be found estivating on the undersides of large limestone slabs. If slabs are moved in an effort to find *E. hubrichti*, snails could be dislodged or crushed. In addition, simply walking on loose slabs may crush snails underneath.

ACKNOWLEDGEMENTS

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