Ontario Species at Risk Evaluation Report

for

Proud Globelet (*Patera pennsylvanica*)

Committee on the Status of Species at Risk in Ontario (COSSARO)

Assessed by COSSARO as Endangered

January, 2016

Final

Patère de Pennsylvanie (*Patera pennsylvanica*)

La patère de Pennsylvanie (*Patera pennsylvanica*) est un escargot terrestre pulmoné (capable de respirer dans l'air). Comme les autres de son genre, elle a un ombilic imperforé (orifice central sous la coquille). Contrairement aux autres espèces du genre, la patère de Pennsylvanie ne possède pas de protubérance semblable à une dent sur la paroi de son ouverture (principale ouverture de la coquille). Aucun individu vivant de cette espèce n'a jamais été documenté en Ontario. Par contre, des coquilles mortes ont été prélevées dans la ville de Windsor en 1992 et en 1996. Les recherches exhaustives et ciblées de cette espèce réalisées en 2013 ont permis de découvrir des coquilles qui étaient mortes depuis cinq ou 15 ans dans deux emplacements à Windsor. Des recherches effectuées à grande échelle dans d'autres secteurs du sud-ouest de l'Ontario n'ont pas permis de documenter d'autres données probantes sur cette espèce. Comme l'aire de répartition de cette espèce est très limitée en Ontario (moins de 4 km^2), et compte tenu des nombreuses menaces qui ont compromis ou qui peuvent compromettre la qualité de son habitat, la patère de Pennsylvanie est évaluée comme une espèce en voie de disparition en Ontario selon le critère B1ab(v)+2ab(v).

Cette publication hautement spécialisée « Ontario Species at Risk evaluation report prepared under the Endangered Species Act, 2007 by the Committee on the Status of Species at Risk in Ontario *», n'est disponible qu'en anglais conformément au Règlement 671/92, selon lequel il n'est pas obligatoire de la traduire en vertu de la Loi sur les services en français. Pour obtenir des renseignements en français, veuillez communiquer avec le ministère des Richesses naturelles par courriel à recovery.planning@ontario.ca.*

Executive summary

Proud Globelet (*Patera pennsylvanica*) is a pulmonate (air-breathing), terrestrial snail. Like others of its genus, it has an imperforate umbilicus (hole in the centre of the underside of the shell). Unique to the Proud Globelet is the lack of a parietal tooth-like protuberance on the aperture wall (main opening of the shell). No live individuals of this species have ever been documented in Ontario. However, dead shells were collected in the City of Windsor in 1992 and 1996. Extensive, targeted searches for this species in 2013 revealed shells that had been dead for 5-15 years at two sites in Windsor. Despite widespread searches in other parts of southwestern Ontario, no other evidence of this species has been documented. Because of this species' very limited range in Ontario (less than 4km^2), coupled with many threats that have, or are likely to, compromise habitat quality, this species is assessed as Endangered in Ontario based on criterion B1ab(v)+2ab(v).

1. Background information

1.1. Current designations

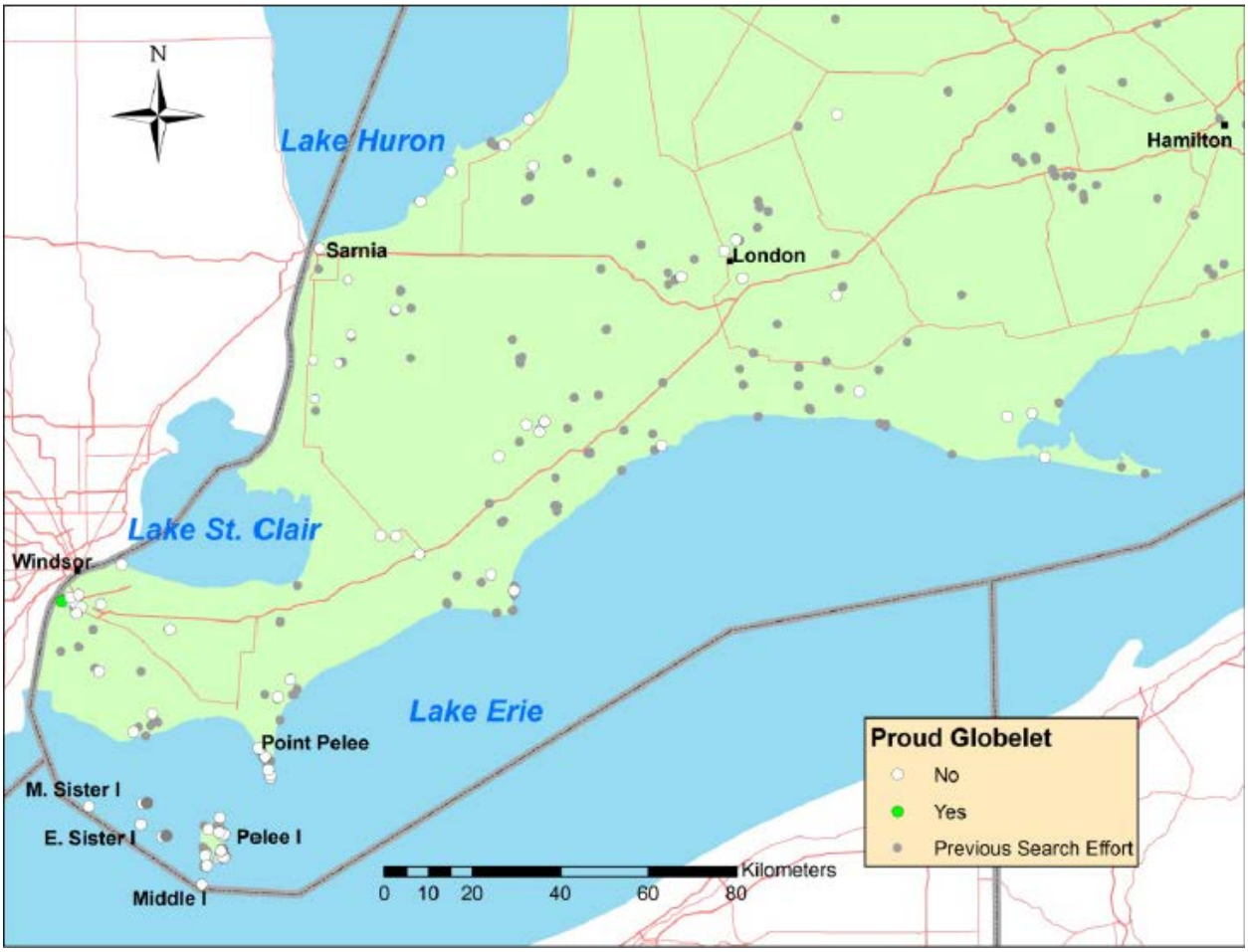
- GRANK: G4 (NatureServe 2015)
- NRANK Canada: N1
- COSEWIC: Endangered (COSEWIC 2015)
- SARA: No status
- ESA 2007: Not assessed
- SRANK: S1

1.2. Distribution in Ontario

Proud Globelet is known from only two sites in Ontario, where dead shells were found in 1992, 1996 and 2013. Live specimens have never been recorded in the province. Dead shells were found in the Black Oak Heritage Forest, which is owned by the City of Windsor, and less than 1 km away in a nearby area with building rubble that was formerly used as a light industrial site. General searches for terrestrial gastropods in other areas of the province between 1992 and 2012 did not locate any other populations. Targeted searches specifically for Proud Globelet and Broad-banded Forestsnail (*Allogona profunda*) in 2013 comprised of 233 person-hours at 74 sites in southwestern Ontario revealed only old, weathered shells found in the Black Oak Heritage Forest and nearby abandoned light industrial site (Figure 1).

Depending on the nature of threat, these two sites could be considered a single "location" if a threat would likely affect both sites at once (e.g., air- or water-borne pollution) or two "locations" if one site is more prone to a threat than the other (e.g. the former light industrial site could be subject to redevelopment in the near future whereas the Black Oak Heritage Forest has some protection as a city park, yet is subject to recreational pressures that the light industrial site is unlikely to attract). The Natural Heritage Information Centre database has not been updated to include the specimen found at the light industrial site and the 1992 and 1996 records have not been fully reviewed; therefore, there is currently only one NHIC candidate elemental occurrence in the province for this species.

Figure 1. Map of successful and unsuccessful search effort between 1992 and 2013 for Proud Globelet in Ontario (from COSEWIC 2015). Grey dots indicate sites surveyed by M.J. Oldham and A. Nicolai for land snails from 1992 to 2012. White dots represent search effort in 2013 specifically targeting Proud Globelet with none found. Green dot represents where the species was found in 1992, 1996 and 2013.



1.3. Distribution and status outside Ontario

Outside Ontario, Proud Globelet occurs in Michigan, Pennsylvania, Ohio, Iowa, Illinois, Indiana, Kentucky, West Virginia, and Missouri.

1.4. Ontario conservation responsibility

The entire range of the Proud Globelet is estimated to be 534 453 km^2 (COSEWIC 2015). Less than 0.001% of this range occurs in Ontario. Because no live specimens have ever been recorded in Ontario, the proportion of the global population cannot be calculated for the province. Abundance data for this species are also not available for the U.S. populations.

1.5. Direct threats

Because no live specimens have ever been documented in Ontario, it is difficult to determine the causes for this species' decline. A number of factors may have played a role in its presumed decline in the province. Habitat loss from urban development is likely a factor that restricted the distribution of this species historically. The presence of a railway that crosses the Black Oak Heritage Forest may have represented a barrier for gene flow if the population had been more widespread in the forest in the past. The construction of a new bridge crossing the Detroit River is expected to increase traffic just north of the Black Oak Heritage Forest and could affect Proud Globelet habitat due to increased pollution levels associated with vehicular traffic and road maintenance (e.g. emissions, road salts, and heavy metals). Within the Black Oak Heritage Forest, recreational trail use may pose a threat to Proud Globelet through direct crushing of shells or from the trails serving as potential barriers to dispersal. Changes in soil condition by introduced earthworms and acid rain may impact the Proud Globelet. These snails may also be adversely affected by small pieces of plastic from ingesting improperly disposed litter. Although interspecific competition has not been studied for Proud Globelet, other snails have shown limited growth and reproductive success in high densities (Foster and Stiven 1996) and competition with introduced gastropods may also be a threat. Four exotic terrestrial gastropods were found to be abundant in the same areas where the Proud Globelet shells were found (COSEWIC 2015). A dump for the City of Windsor to dispose of wood from urban forestry practices at the south border of the Black Oak Heritage Forest may be a source of introduced species that could compete with or predate upon Proud Globelet. Finally, because snails are sensitive to extremes in temperature and prolonged periods of drought, climate change effects are likely to impact this species.

1.6. Specialized life history or habitat use characteristics

Very little is known about the life history and habitat use characteristics of the Proud Globelet. Based on other species of the Polygyridae, age of sexual maturity for this species is inferred to be 2-3 years with a lifespan of 3-5 years (Steensma *et al*. 2009, Foster and Stiven 1996). In Illinois, Baker (1939) reports it is found in heavily wooded ravine areas with oak, maple, hickory or sycamore trees. Hubricht (1985) indicates that in the Northeastern United States this species is "usually found on wooded hillsides or in ravines, under leaf litter or under stones. Also found on grassy roadsides" (p. 44). In Ontario, shells of this species were found in a sandy oak forest and a former light industrial site with building rubble. The dietary requirements of this species is unknown. Other Polygridae have been observed to consume fungi, lichens, tree bark, leaf litter and occasionally dead invertebrates including other snails (Foster and Stiven 1996). Snails, in general, are sensitive to prolonged periods of heat and drought as well as extreme cold (Nicolai et al. 2011). Changes in vegetation that affect levels of shade, humidity, and leaf litter can impact survival. During winter, snow cover is important for maintaining optimal temperatures in the soil or leaf litter where snails hibernate.

2. Eligibility for Ontario status assessment

2.1. Eligibility conditions

2.1.1. Taxonomic Distinctness

Yes. The species is distinct from other gastropods, forming its own subgenus *Ragdaleorbis* within the genus *Patera* (Emberton 1991, as cited in COSEWIC 2015).

2.1.2. Designatable units

No. The proximity of the two sites where this species was reported do not suggest more than one evolutionarily discrete population.

2.1.3. Native status

Yes. Shells of Proud Globelet were first found in Ontario in 1992. Although a site to dispose of wood from urban forestry practices was established at the edge of the Black Oak Heritage Forest around that time, it is unlikely that the snail migrated from the disposed woody debris (COSEWIC 2015). Lack of records prior to 1992 may be a reflection of lack of search effort and/or interest in gastropods as compared with other well studied taxa. Proud Globelet records are reported from Monroe and Wayne counties in Michigan (Michigan Natural Features Inventory, 2007) which are immediately west and southwest of Windsor, Ontario. Walker (1906) confirms the historical presence of the species in the vicinity from a specimen collected near Monroe, Michigan in the early 1900s.

2.1.4. Occurrence

Extant. Shells found in 2013 were all dead and estimated to be 5 to 15 years old. Although no live individuals were found, shells indicating their presence at most 15 years ago suggests there is a possibility that the species still occurs in Ontario.

2.2. Eligibility results

Proud Globelet (*Patera pennsylvanica*) is eligible for status assessment in Ontario.

3. Ontario status assessment

3.1. Application of endangered/threatened status in Ontario

3.1.1. Criterion A – Decline in total number of mature individuals

Insufficient information. No live individuals have ever been found. The fact that all 15 shells found in 2013 were at least 5 years old in contrast to the freshly dead shells found in 1992 and 1996 may suggest a decline in the population, lack of data on number of live mature individuals at any time makes it impossible to determine a rate of decline for this criterion.

3.1.2. Criterion B – Small distribution range and decline or fluctuation

Endangered B1ab(v) +2ab(v). Both the extent of occurrence and area of occupancy for the Proud Globelet in Ontario is estimated to be 4 km2, which meets the threshold for Endangered under criteria B1 and B2, respectively. Proud Globelet is known to occur at fewer than 5 locations. Fresh shells of mature adults were found in 1992 (one adult shell) and 1996 (five adult shells and two juvenile shells) at the Black Oak Heritage Forest. Despite 17 person-hours of search effort in 2013, only old, weathered shells (eleven adult and four juvenile) estimated to be 5-12 years old were found, suggesting a decline, if not total disappearance, of mature individuals from the site since 1996.

3.1.3. Criterion C – Small and declining number of mature individuals

Insufficient information. As with criterion A, lack of data on number of mature individuals from any period of time precludes the use of this criterion.

3.1.4. Criterion D – Very small or restricted total population

Threatened. Meets criteria D2 because the Proud Globelet's index of area of occupancy is less than 20 km2 and is known from fewer than 5 locations. There is clearly a restricted range that would be vulnerable to stochastic events.

3.1.5. Criterion E – Quantitative analysis

Not applicable. A quantitative analysis has not been performed for this species.

3.2. Application of Special Concern in Ontario

Does not apply. Criteria for this species meet consideration for Endangered and Threatened status.

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

Does not apply. Ontario comprises less than 0.001% of this species' range. Therefore the province does not represent a significant portion of the global range of the Proud Globelet.

3.3.2. Rescue effect

Does not apply. The Great Lakes, rivers, and highly urbanized landscape that separate Proud Globelet's range in Ontario from other jurisdictions and its limited mobility makes it highly unlikely that the rescue effect could apply for this species.

3.4. Other status categories

3.4.1. Data deficient

Does not apply. Although there is a lack of information on the past and present population size of this species in Ontario, significant search effort for this species reveals with confidence the restricted range of this species in Ontario.

3.4.2. Extinct or extirpated

Does not apply. Although no live specimens have been documented, this species was extant in Ontario at most 15 years ago. There is a possibility that the species is already extirpated but the time interval is not sufficient for this determination.

3.4.3. Not at risk

Does not apply.

4. Summary of Ontario status

Proud Globelet (*Patera pennsylvanica*) is classified as Endangered in Ontario based on meeting criterion B1ab(v)+2ab(v).

5. Information sources

Baker, F.C. 1939. Fieldbook of Illinois land snails. Illinois Natural History Survey Manual 2. Urbana Illinois. 166 pp.

COSEWIC 2015. COSEWIC Status Report on the Proud Globelet *Patera pennsylvanica* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. 41 pp.

Foster, B.A. and Stiven, A.E. 1996. Experimental effects of density and food on growth and mortality of the Southern Appalachian land gastropod, *Mesodon normalis* (Pilsbry). The American Midland Naturalist 136:300-314.

Hubricht, L. 1985. The distributions of the native land mollusks of the Eastern United States. Fieldiana Zoology 24:41-171.

Michigan Natural Features Inventory. 2007. Rare Species Explorer (Web Application). [website accessed December 10, 2015].

NatureServe. 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. [website Accessed November 24, 2015].

Nicolai, A., J. Filser, R. Lenz, C. Bertrand, and M. Charrier. 2011. Adjustment of metabolite composition in the haemolymph to seasonal variations in the land snail *Helix pomatia*. Journal of Comparative Physiology B 181:457-466.

Steemsma, K.M.M., P.L. Lilley and H.M. Zandberg. 2009. Life history and habitat

requirements of the Oregon forestsnail, *Allogona townsendiana* (Mollusca, Gastropoda, Pulmonata, Polygyridae), in a British Columbia population. Invertebrate Biology 128: 232-242.

Walker, B. 1906. An illustrated catalogue of the Mollusca of Michigan. Report of the State Board of Geological Survey of Michigan for the Year 1905. Wynkoop Hallenbeck Crawford Company, Lansing, Michigan. 531 pp.

Appendix 1: Technical summary for Ontario

Species: Proud Globelet (*Patera pennsylvanica*)

Demographic information

Demographic attribute	Value
Generation time. Based on average age of breeding adult: age at first breeding = X year; average life span = Y years.	3-5 years (based on taxonomic family)
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	Unknown
Estimated percent of continuing decline in total number of mature individuals within 5 years or 2 generations.	Unknown
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations.	Unknown, possibly 100%: Fresh shells found in 1992 & 1996 but only old (5-15 year old) shells found in 2013.
Projected or suspected percent reduction or increase in total number of mature individuals over the next 10 years or 3 generations.	Unknown
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over any 10 years, or 3 generations, over a time period including both the past and the future.	Unknown, possibly 100%: Fresh shells found in 1992 & 1996 but only old (5-15 year old) shells found in 2013.
Are the causes of the decline a. clearly reversible and b. understood and c. ceased?	a. No b. No c. No
Are there extreme fluctuations in number of mature individuals?	Unknown

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence. (Request value from MNRF or use http://geocat.kew.org/)	4 km^2
Index of area of occupancy (IAO). *(Request value from MNRF or use http://geocat.kew.org/)*	4 km^2

Is the total population severely fragmented? (i.e. is >50% of its total area of occupancy is in habitat patches that are (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse?)	a. No b. No
Number of locations (*as defined by COSEWIC*).	1-2
Number of NHIC Element Occurrences (*Request data from MNRF)*	1
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	Unknown
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	Unknown
Is there an observed, inferred, or projected continuing decline in number of populations?	Unknown
Is there an observed, inferred, or projected continuing decline in number of locations?	Unknown
Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat?	Yes. Decline in quality of habitat is inferred.
Are there extreme fluctuations in number of populations?	Unknown
Are there extreme fluctuations in number of locations?	Unknown
Are there extreme fluctuations in extent of occurrence?	Unknown
Are there extreme fluctuations in index of area of occupancy?	Unknown

Number of mature individuals in each sub-population or total population (if known)

Black oak heritage forest in the City of Windsor: 0 alive (15 dead adult and juvenile shells found in 2013).

Quantitative analysis (population viability analysis conducted)

Not conducted.

Rescue effect.

Rescue effect attribute	Likelihood
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Yes, but unlikely
Would immigrants be adapted to survive in Ontario?	Unknown
Is there sufficient suitable habitat for immigrants in Ontario?	Unknown

Is the species of conservation concern in bordering jurisdictions?	Yes. Unranked in Michigan and Ohio, but S1S2 in Pennsylvania
Is rescue from outside populations reliant upon continued intensive recovery efforts?	Unknown

Appendix 2: Adjoining jurisdiction status rank and decline

Information regarding rank and decline for Proud Globelet

Jurisdiction	Subnational rank	Population trend	Sources
Ontario	S1	unknown	NatureServe (2015)
Quebec	Not present	n/a	n/a
Manitoba	Not present	n/a	n/a
Michigan	SNR	unknown	NatureServe (2015)
Minnesota	Not present	n/a	n/a
Nunavut	Not present	n/a	n/a
New York	Not present	n/a	n/a
Ohio	SNR	unknown	NatureServe (2015)
Pennsylvania	S1S2	unknown	NatureServe (2015)
Wisconsin	Not present	n/a	n/a

Acronyms:

COSEWIC: Committee on the Status of Endangered Wildlife in Canada
COSSARO: Committee on the Status of Species at Risk in Ontario
ESA: Endangered Species Act
GRANK: global conservation status assessments
IAO: index of area of occupancy
MNRF: Ministry of Natural Resources and Forestry
NHIC: Natural Heritage Information Centre
NNR: Unranked
NRANK: National conservation status assessment
SARA: Species at Risk Act
SNR: unranked
SRANK: subnational conservation status assessment
S1: critically imperiled
S2: imperiled