

COSSARO Candidate Species at Risk Evaluation
for
Threehorn Wartyback (*Obliquaria reflexa*)

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

Assessed by COSSARO as Threatened

June, 2013

Final

Obliquaire à trois cornes (*Obliquaria reflexa*)

L'obliquaire à trois cornes est un mollusque de taille moyenne pouvant atteindre une taille de 40 mm (maximum de 55 mm en Ontario). Il a une coquille épaisse en forme de triangle avec une rangée de trois à cinq protubérances (cornes). Cette espèce vit dans le centre de l'Amérique du Nord du golfe du Mexique aux Grands Lacs. Au Canada, on la trouve dans trois rivières dans le sud de l'Ontario, mais elle a disparu du lac Érié, du lac Ste-Claire et de la rivière Detroit. Cette moule vit généralement dans les grandes rivières au courant moyen avec des substrats stables de gravier, de sable et de vase. Elle peut vivre jusqu'à 18 ans et s'enfouit dans le lit de la rivière pour se nourrir par filtration. Tout comme les autres moules unionidées, l'obliquaire à trois cornes dépose sa progéniture dans les branchies d'une espèce hôte, généralement un poisson, et les jeunes y vivent en parasites avant de se transformer en petits mollusques autonomes. Parmi ces espèces hôtes probables, il y a le méné des ruisseaux et le naseux des rapides. Les populations d'obliquaires à trois cornes sont généralement de petite taille et ont subi un déclin, mais les tendances sur le plan de l'abondance sont mal quantifiées. Parmi les menaces majeures qui pèsent sur l'espèce, il y a la pollution de sources urbaines et agricoles, l'envasement croissant des rivières et les moules envahissantes zébrée et quagga. En raison de la perte de la majeure partie de son aire de répartition en Ontario, les menaces continuent qui pèsent sur l'espèce et le petit nombre d'occurrences restantes, l'obliquaire à trois cornes a été évaluée comme étant une espèce **menacée**.

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.

PART 1

CURRENT STATUS AND DISTRIBUTION

Current Designations:

GRANK – G5 (Assessed 12/04/2007) (NatureServe, accessed 27/05/2013)

NRANK Canada – N1 (Assessed 10/09/2011) (NatureServe, accessed 27/05/2013)

COSEWIC – Threatened (COSEWIC, 2013)

SARA – Not Listed (Environment Canada, May 26, 2013 no schedule or status)

ESA 2007 – Not Listed (Ministry of Natural Resources, not previously assessed)

SRANK – S1 (NHIC/NatureServe, accessed 27/05/2013)

Distribution in Ontario:

In Ontario, the Threehorn Wartyback is found in the lower Great Lakes region where it historically occurred in Lake St. Clair, Detroit River, and western Lake Erie as well as the Sydenham, Thames and Grand rivers. It is now believed extirpated from the offshore waters of the Great Lakes and connecting channels so that it remains only in the Sydenham, Thames and Grand rivers (COSEWIC 2013).

Distribution and Status Outside Ontario:

Globally, Threehorn Wartyback is restricted to central North America where it is broadly distributed from the Gulf of Mexico to the Great Lakes. This species occurs throughout most of the Mississippi River drainage from western Pennsylvania north into Michigan and Minnesota, southwest to eastern Kansas, Oklahoma, and Texas; and in the Coosa-Alabama River and Tombigbee River systems in the southeast. Overall, it occurs in 21 American states (Alabama, Arkansas, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Ohio, Oklahoma, Pennsylvania, South Dakota, Tennessee, Texas, West Virginia, and Wisconsin). It is considered stable over most of its range except for the lower Great Lakes, their connecting rivers and some Ontario drainages (NatureServe 2013).

PART 2

ELIGIBILITY FOR ONTARIO STATUS ASSESSMENT

2.1 APPLICATION OF ELIGIBILITY CRITERIA

Taxonomic Distinctness

Yes This is a well-recognized species (Turgeon *et al.* 1998).

Designatable Units

All Canadian populations of Threehorn Wartyback are found within the Great Lakes-Upper St Lawrence National Freshwater Biogeographic Zone. To date, there are no known distinctions among these populations that warrant consideration for designations below the species level (COSEWIC 2013).

Native Status

Yes This species has been long recognized as a valid taxon of the Ontario mussel fauna native to Ontario (Gillis and Mackie 1994).

Presence/Absence

Present

2.2 ELIGIBILITY RESULTS

1. The putative taxon or DU is valid. **Yes**
2. The taxon or DU is native to Ontario. **Yes**
3. The taxon or DU is present in Ontario, extirpated from Ontario or extinct? **Present,**

PART 3

ONTARIO STATUS BASED ON COSSARO EVALUATION CRITERIA

3.1 APPLICATION OF PRIMARY CRITERIA (Rarity and Declines)

1. Global Rank

Not in any category G5 (NatureServe 2013).

2. Global Decline

Not in any category There is no evidence of decline over most of its range, and there may be a small increase in some parts of the range (NatureServe 2013).

3. Northeastern North America Ranks

Threatened The species ranks as S1, S2, SH or SX in 5 of 9 jurisdictions (55 %). See Appendix 1.

4. Northeastern North America Decline

Not in any category The species is not considered to be declining globally (NatureServe 2013); only 2 of 11 (18 %) Northeastern North America jurisdictions have undergone significant declines. Therefore, the species is not in any category under this criterion.

5. Ontario Occurrences

Threatened The Threehorn Wartyback has always been rare in Canada. Ontario records exist for this species in the Lower Great Lakes Unionid Database dating back to 1890 when a fresh valve was detected in Grand River (COSEWIC 2013). The historical (1890-1996) distribution of the Threehorn Wartyback included Lake Erie, Lake St. Clair, and the Thames, Grand and Detroit rivers. This distribution is based on 43 records, of which only five are known live collections representing 10 individuals (Lower Great Lakes Unionid Database 2011). The first documented live collection of the Threehorn Wartyback in Canada was made in the Detroit River in 1992.

The starting point for current records is 1997 as this year marks the beginning of a more intensive, and ongoing, survey effort covering 280 sites throughout the historical range of the Threehorn Wartyback (COSEWIC 2013, G. Mackie pers. comm. 2013). Based on 58 records (40 live individuals), this species is currently believed to survive only in the lower reaches of the Grand, Thames, and Sydenham rivers (COSEWIC 2013).

There are no NHIC EO records, so the following is from the COSEWIC (2013) report. A total of 18 live specimens of the Threehorn Wartyback were collected from five of 37 sites sampled in the lower Thames River between London and Chatham. The Threehorn Wartyback (Morris and Edwards 2007) had an average density of 0.024

animals/m² (Morris and Edwards 2007). Extrapolating this density estimate over the entire occupied range in the Thames River yields a very rough population estimate of 100,000 animals.

The Threehorn Wartyback was found at only one of 17 sites sampled in the Sydenham River between 1999 and 2003, (Metcalf-Smith *et al.* 2007) making up 0.1% of the abundance of all mussels. A further 37 live individuals were found during surveys for other species between 2002 and 2010 (McNichols pers. comm. 2010). It is not possible to estimate the population size in the Sydenham River as only a single specimen has ever been found during the quantitative sampling required to produce these estimates.

Metcalf-Smith *et al.* (2000) surveyed 24 sites in the Grand River in 1997-1998, and found one live Threehorn Wartyback each of these sites. Further surveys by Fisheries and Oceans Canada in 2011 found Threehorn Wartyback alive at three sites (two of these from (Metcalf-Smith *et al.* 2000b)), and shells at an additional three sites (Lower Great Lakes Unionid Database 2011). No historical records in the Lower Great Lakes Unionid Database are for live specimens. It is impossible to estimate population abundance or trends in the Grand River.

According to the COSEWIC (2013) report, these records represent three locations (Table 2 in COSEWIC 2013), but following NHIC criteria they would likely constitute 7-12 EOs (see Figure 7, COSEWIC 2013). Using these EO estimates, this criterion meets Threatened.

6. Ontario Decline

Threatened The species has disappeared from Lake St. Clair, Lake Erie and the Detroit River. There is no information on trends in the Thames, Sydenham or Grand rivers. It is estimated that the overall decline is about 50 % (extirpated from 3 of 6 locations), and assuming no declines on any of these rivers, and thus the species meets Threatened under this criterion. Comparison of IAO in Figures 8 and 9 in COSEWIC 2013 indicate an historical decline in IAO over 80% from 1996 to 356 km². However, the loss of the species in lower Thames River (indicated in Fig. 9) may be an artefact of sampling as this stretch of the river is under sampled, and the species is likely still present there (COSEWIC 2013). Including the lower Thames River, the IAO is 532 km², representing a decline of ~73% since 1997, and thus meeting Threatened under this criterion.

7. Ontario's Conservation Responsibility

Not in any category This species has less than 5 % of its global range in Ontario (COSEWIC 2013).

3.2 APPLICATION OF SECONDARY CRITERIA (Threats and Vulnerability)

8. Population Sustainability

Insufficient information No population viability analyses exist for this mussel and there appear to be few data on abundance or short-term trends. Populations appear small or extirpated from all known habitat except the Thames and perhaps the Grand rivers where it appears that the species is still reproducing.

9. Lack of Regulatory Protection for Exploited Wild Populations

Insufficient information. Little is known of whether harvesting affects this species. However, Detweiler (1918) and Stewart (1992) reported annual collection rates early in the 20th century of between 100 and 265 tons of mussels from the Grand and Thames rivers. Using average sizes of today's individuals, these collection rates equate to 250,000 - 500,000 individuals. Although it is not known if the Threehorn Wartyback was targeted in the Thames River harvests, it was likely targeted in the Grand River (Detweiler 1918). Though the fishery no longer occurs it is likely that the current status of these populations has been affected by these historical harvests.

10. Direct Threats

Threatened This species, like all southern Ontario native clams, faces several significant threats (see Table 1). Wartybacks occur in systems with several other mussels with similar life histories and which are in steep decline and assessed as endangered or threatened. The threats listed below are significant enough to cause further declines in the remaining riverine populations.

Table 2. Description of threats and their impacts on current Threehorn Wartyback (*Obliquaria reflexa*) populations – calculated using the Threats Calculator. Threats are arranged from highest to lowest impact (from COSEWIC 2013).

Description	Impact	Scope	Severity	Timing
Household sewage & urban waste water	High	Pervasive	Serious	High
Agricultural effluents	High	Pervasive	Serious	High
Invasive non-native/alien species	Medium	Pervasive	Moderate	High
Recreational activities	Medium	Large	Moderate	High
Housing & urban areas	Low	Small	Extreme	High
Shipping lanes	Low	Small	Extreme	High
Industrial & military effluents	Low	Small	Extreme	Low
Work & other activities	Low	Small	Slight	High
Fishing & harvesting aquatic resources	Low	Small	Slight	Moderate

11. Specialized Life History or Habitat-use Characteristics

Special concern Threehorn Wartyback are moderately long-lived with the maximum lifespan of 18 years being observed (Watters *et al.* 2009). They are relatively sedentary and generally filter-feeders as adults, though evidence suggests they may engage in some pedal feeding as well (Nichols *et al.* 2005). Unionids are unique in that they have a complex reproductive cycle involving a period of obligate parasitism on a vertebrate host. The female mussel releases conglomerates (i.e., packages containing many individual glochidia) which elicit a predatory response in the host fish causing the rupture of the conglomerate and the release of the individual glochidia. However, the host species of fish for Threehorn Wartyback are not known, although two species, the Common Shiner (*Luxilus cornutus*), and Longnose Dace (*Rhinichthys cataractae*) have been identified as hosts in some US populations and occur within the range of wartybacks in Ontario (COSEWIC 2013).

3.3 COSSARO EVALUATION RESULTS

1. Criteria satisfied in each status category

ENDANGERED – [0/0]
THREATENED – [3/1]
SPECIAL CONCERN – [0/1]

List the number of Ontario-specific criteria met in each status category. These are primary criteria numbers 5, 6 and 7.

ENDANGERED – [0]
THREATENED – [2]
SPECIAL CONCERN – [0]

2. Data Deficiency

No. The number of criteria assessed as “insufficient information” is 2 secondary criteria. The impact of harvest is poorly known, but even though it was high in the past, the amount of current harvest is thought to be low and of little consequence. Population sustainability cannot be ascertained currently.

3. Status Based on COSSARO Evaluation Criteria

The application of COSSARO evaluation criteria suggests that **Threehorn Wartyback** is **Threatened** in Ontario.

PART 4

ONTARIO STATUS BASED ON COSEWIC EVALUATION CRITERIA

4.1 APPLICATION OF COSEWIC CRITERIA

Regional (Ontario) COSEWIC Criteria Assessment

Criterion A – Decline in Total Number of Mature Individuals

Not in any category Meets endangered in category A2c,e. A2: declines that may not be understood, not ceased and not reversible and inferring that declines of ~73% in IAO since 1997 reflect similar declines in abundance; (c) ongoing decline in habitat quality from invasive Zebra and Quagga mussels; and (e) the effects of introduced taxa (invasive Zebra and Quagga mussels). However, there is considerable uncertainty in the application of IAO in this way, so this criterion does not apply.

Criterion B – Small Distribution Range and Decline or Fluctuation

Threatened Meets threatened under B1 with EO of 7032 km² (less than 20,000 km² threshold); meets threatened under B2 with IAO of 532 km² (less than 2000 km² threshold). Subcriteria (a) met as there are only 3 locations, and b(iii), continuing decline in extent and/or quality of habitat.

Criterion C – Small and Declining Number of Mature Individuals

Not in any category Estimated population size exceeds thresholds.

Criterion D – Very Small or Restricted Total Population

Not in any category D2 threatened may be applicable as there are fewer than 5 locations and the species is prone to the effects of human activities that can rapidly alter required habitat. However, this criterion was not used in COSEWIC's (2013) final assessment owing to uncertainty in rate of alteration of required habitat.

Criterion E – Quantitative Analysis

Not in any category Not performed

Rescue Effect

No. Status of outside population(s) of Threehorn Wartyback are generally in decline throughout the Great Lakes' drainage and are extirpated (SH) in Pennsylvania, imperilled (S2) in Ohio and vulnerable (S3) in Indiana and Wisconsin. They have not been ranked in Michigan. Only Illinois considers the Threehorn Wartyback apparently secure (S4). Populations on the Ohio shore of Lake Erie are very small and therefore unlikely to populate the Ontario shore (G. Mackie pers. comm. 2013).

Special Concern Status

No.

4.2 COSEWIC EVALUATION RESULTS

1. Criteria satisfied in each status category

Indicate whether or not a criterion is satisfied in each of the status categories.

ENDANGERED – [no]

THREATENED – [yes]

SPECIAL CONCERN – [no]

2. Data Deficiency

No

3. Status Based on COSEWIC Evaluation Criteria

The application of COSEWIC evaluation criteria suggests that **Threehorn Wartyback** is **Threatened** in Ontario.

PART 5

ONTARIO STATUS DETERMINATION

5.1 APPLICATION OF COSSARO AND COSEWIC CRITERIA

COSSARO and COSEWIC criteria give the same result. **Yes**

5.2 SUMMARY OF STATUS EVALUATION

Threehorn Wartyback is classified as **Threatened** in Ontario.

The Threehorn Wartyback is a medium-sized freshwater clam averaging 40 mm in length (maximum of 55 mm in Ontario). It has a thick, triangular shell with a row of 3-5 knobs (horns). The species occurs in central North America from the Gulf of Mexico to the Great Lakes. In Canada, it occurs in three rivers in southern Ontario, but has disappeared from Lake Erie, Lake St. Clair and the Detroit River. Typically, this mussel is found in large rivers with moderate current and stable substrates of gravel, sand and mud. This species lives up to 18 years and burrows in the riverbed to filter-feed. Like other unionid mussels, the Threehorn Wartyback females place their young in the gills of a host species, usually a fish, and the juveniles parasitize these hosts, then transform into small free-living clams. Likely host species are the Common Shiner and Longnose Dace. Current populations are generally small and have declined, but trends in abundance are poorly quantified. Major threats are pollution from urban and agricultural sources, increased sediment in their rivers and invasive Zebra and Quagga Mussels. Given the loss of much of its Ontario range, ongoing threats, and the small number of remaining locations, this species was assessed as Threatened.

Information Sources

1. Literature Cited

COSEWIC 2013. COSEWIC assessment and status report on the Threehorn Wartyback (*Obliquaria reflexa*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + xx pp. Unpublished 2-month report.

Detweiler, J.D. 1918. The pearly fresh-water mussels of Ontario. Contributions to Canadian Biology 38a:75-91.

Gillis, P.L., and G.L. Mackie. 1994. Impact of the zebra mussel, *Dreissena polymorpha*, on populations of unionidae (Bivalvia) in Lake St. Clair. Canadian Journal of Zoology 72:1260-1271.

Lower Great Lakes Unionid Database. 2011. Lower Great Lakes Unionid Database. Microsoft Access 2010. Department of Fisheries and Oceans, Great Lakes Laboratory of Fisheries and Aquatic Sciences, Burlington, Ontario.

Mackie, G. L. 2013. pers. comm. 2013. Telephone conversation with R. J. Brooks, May 31, 2013.

McNichols, K.A., pers. comm. 2010. *Preparation of summary document by K. McNichols-O'Rourke*. July 2010. Research Technician, University of Guelph, Guelph, Ontario.

Metcalfe-Smith, J.L., G.L. Mackie, J. Di Maio, and S.K. Staton. 2000. Changes over time in the diversity and distribution of freshwater mussels (Unionidae) in the Grand River, southwestern Ontario. Journal of Great Lakes Research 26:445-459.

Metcalfe-Smith, J.L., D.J. McGoldrick, D.T. Zanatta, and L.C. Grapentine. 2007. Development of a monitoring program for tracking the recovery of endangered freshwater mussels in the Sydenham River, Ontario. Science and Technology Branch, Environment Canada, Burlington, Ontario. 61 pp.

Morris, T.J., and A. Edwards. 2007. Freshwater mussel communities of the 1420 Thames River, Ontario: 2004-2005. Fisheries and Oceans Canada. 1421 Canadian Manuscript Report of Fisheries and Aquatic Sciences 2810. 1422 Threehorn Wartyback, Burlington, ON. 30 pp.

NatureServe. 2013. NatureServe Explorer: An online encyclopedia of life. Web site: http://www.natureserve.org/explorer/servlet/NatureServe?post_processes=PostReset&loadTemplate=nameSearchSpecies.wmt&Type=Reset [accessed May 2013].

Nichols, S.J., H. Silverman, T.H. Dietz, J.W. Lynn, and D.L. Garling. 2005. Pathways of food uptake in native (Unionidae) and introduced (Corbiculidae and Dreissenidae) freshwater bivalves. *Journal of Great Lakes Research* 31:87-96.

Stewart, W.G. 1992. Freshwater molluscs of Elgin County, Ontario. W. G. Stewart, St. Thomas, Ontario. 8 pp.

Turgeon, D.D., J. Quinn, J.F., A.E. Bogan, E.V. Coan, F.G. Hochberg, W.G. Lyons, P.M. Mikkelsen, R.J. Neves, C.F.E. Roper, G. Rosenberg, B. Roth, A. Scheltema, F.G. Thompson, M. Vecchione, and J.D. Williams. 1998. Common and scientific names of aquatic invertebrates from the United States and Canada: Mollusks. 2nd edition. American Fisheries Society Special Publication 26: ix-526.

Watters, G.T., M.A. Hoggarth, and D.H. Stansbery. 2009. The freshwater 1617 mussels of Ohio. Ohio State University Press, Columbus, Ohio. xiii + 421 1618 pp. Watters et al 2009

2. Community and Aboriginal Traditional Knowledge Sources

No Community or Aboriginal Traditional Knowledge sources were available.

3. Acknowledgements:

Gerry Mackie provided insight on the distribution and abundance of the wartyback.

APPENDIX 1

NORTHEASTERN NORTH AMERICA STATUS RANK AND DECLINE

	Subnational Rank	Sources	Decline	Sources NatureServe 2013; COSEWIC 2013
CT	NA	NatureServe 2013		
DE	NA	NatureServe 2013		
IL	S4	NatureServe 2013	No decline	
IN	S3	NatureServe 2013	No information	
IA	S1	NatureServe 2013	No information	
LB	NA	NatureServe 2013		
KY	S4S5	NatureServe 2013	No decline	
MA	NA	NatureServe 2013		
MB	NA	NatureServe 2013		
MD	NA	NatureServe 2013		
ME	NA	NatureServe 2013		
MI	SNR	NatureServe 2013		
MN	SNR	NatureServe 2013	Some increase	NatureServe 2013
NB	NA	NatureServe 2013		
NF	NA	NatureServe 2013		
NH	NA	NatureServe 2013		
NJ	NA	NatureServe 2013		
NS	NA	NatureServe 2013		
NY	NA	NatureServe 2013		
OH	S2	NatureServe 2013	No information	
ON	S1	NatureServe 2013	Decline 50-70%	COSEWIC 2013
PA	SH	NatureServe 2013	Decline 100%	COSEWIC 2013
PE	NA	NatureServe 2013		
QC	NA	NatureServe 2013		
RI	NA	NatureServe 2013		
VA	NA	NatureServe 2013		
VT	NA	NatureServe 2013		
WI	S3	NatureServe 2013	No information	
WV	S2	NatureServe 2013		

Occurs as a native species in 11 of 29 northeastern jurisdictions
 Srank or equivalent information available for 9 of 11 jurisdictions = (82 %)
 S1, S2, SH, or SX in 5 of 9 = (55 %)