

**COSSARO Candidate Species at Risk Evaluation**

**For**

**Lilliput (*Toxolasma parvum*)**

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

**Assessed by COSSARO as THREATENED**

**June, 2013**

**Final**

## **Toxolasme nain (Taxolasma parvum)**

Le toxolasme nain est un petit mollusque d'eau douce d'une longueur moyenne de 25 mm et maximale de 50 mm. Sa forme est elliptique et sa surface douce est semblable à du tissu. L'espèce est assez répandue dans l'est et le centre des États-Unis du golfe du Mexique aux Grands Lacs. Au Canada, le toxolasme nain vit dans huit rivières ou bassins dans la zone carolinienne du sud de l'Ontario, mais il a disparu de la rivière Detroit. L'espèce vit en moyenne six ans et s'enfouit dans les fonds mous pour se nourrir par filtration. Comme la plupart des moules semblables, les femelles déposent leur glochidia dans les branchies d'une espèce de poisson-hôte, où ils vivent en parasites sur ces poissons avant de former des mollusques autonomes. Parmi les espèces hôtes probables, il y a le raseux-de-terre noir, la marigane blanche, le crapet arlequin et le crapet vert. Les populations courantes sont généralement de petite taille et ont subi un déclin, mais parce que l'espèce n'a jamais été commune, les tendances relatives à son abondance n'ont jamais été quantifiées. Les menaces principales qui pèsent sur l'espèce sont la pollution de sources urbaines et agricoles, l'envasement croissant des rivières et les moules zébrée et quagga envahissantes. Compte tenu de la perte de la majorité de son aire de répartition en Ontario et du petit nombre d'endroits restants, cette espèce a été désignée comme étant **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](mailto:recovery.planning@ontario.ca).*

## **PART 1**

### **CURRENT STATUS AND DISTRIBUTION**

#### **Current Designations:**

**GRANK – G5** (Assessed May 2009, accessed 23 May 2013)

**NRANK Canada – N1** (Assessed Sept 2011, accessed 23 May 2013).

**COSEWIC – ENDANGERED** (May 2013)

**SARA – Not listed** (Environment Canada 2013)

**ESA 2007 – Not listed**

**SRANK – S1** (NHIC/NatureServe, Accessed May 2013)

#### **Distribution in Ontario:**

Lilliput is restricted to the Carolinian Zone in Ontario, where it occurs in the Lake St. Clair, Lake Erie and Lake Ontario drainages. Intensive surveys since 1997 have resulted in observations within the Sydenham River, the lower Thames River (Baptiste Creek), Ruscom River, Belle River, Grand River, Welland River, 20 Mile Creek (Jordan Harbour) and Hamilton Harbour (Sunfish Pond).

#### **Distribution and Status Outside Ontario:**

Lilliput ranges through a large portion of the central United States from Minnesota and New York south to the Gulf of Mexico from Florida to Texas. It has been documented from 24 US states as well as from Ontario, but it is considered extirpated from New York and Georgia (COSEWIC 2013). Although reportedly declining throughout the Great Lakes basin, mainly due to the invasion of dreissenid mussels (COSEWIC

2013), this species has apparently expanded its range in the southern United States (NatureServe 2013). NatureServe (2013) lists this species as SNR for Manitoba which appears to be an error.

## PART 2

### ELIGIBILITY FOR ONTARIO STATUS ASSESSMENT

#### 2.1 APPLICATION OF ELIGIBILITY CRITERIA

##### Taxonomic Distinctness

**Yes.** Lilliput (*Toxolasma parvum*, Barnes 1823) is currently accepted as a species by Turgeon *et al.* (1998), the recognized authority on aquatic molluscs.

##### Designatable Units

There is a single designatable unit in Ontario. All Canadian populations are found within the Great Lakes- Upper St. Lawrence Freshwater Biogeographic Zone (COSEWIC 2013).

##### Native Status

**Yes.** Lilliput is considered native to central North America, including the central US and Canada.

##### Presence/Absence

**Present.** The species has recently (1997-2011) been identified from 27 records within three major drainage systems in southern Ontario

#### 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.** The Lilliput is considered secure throughout much of its range, and its population is considered stable by the American Fisheries Society (as of 1993, cited in NatureServe 2013). It is widespread and common in drainages throughout the southern US states, where its range is reportedly increasing.

##### 3. Northeastern North America Ranks

**Threatened.** Lilliput has been reported from 12 northeastern North American jurisdictions and has been ranked in 10. It is considered extirpated or historical (SX or SH) from one northeastern jurisdiction (New York state), and very rare (S1-S2) in four others (50%). It is not ranked in Michigan, although it is classified as Endangered (COSEWIC 2013).

##### 4. Northeastern North America Decline

**Not in any category.** Although the Lilliput has conservation rankings in several northeastern jurisdictions, there is no evidence of a serious regional population decline or range contraction. A lack of standardized, repeated population sampling across this area precludes such evidence to some extent. COSEWIC (2013) suggests that the species is “in decline throughout the Great Lakes basin,” although this appears to be based on the conservation rankings in the northeast (also the northern range limit), rather than on a generally recognized pattern of range contraction or widespread population decline. NatureServe (2013) does not identify a clear regional decline for the northeast, with a range expansion in the Mississippi River of Minnesota, but Lilliput is probably declining in the Great Lakes region of the US as a result of the same impacts from invasive species as in Ontario.

## **5. Ontario Occurrences**

**Threatened.** Currently there are no Element Occurrences for this species in the NHIC Biotics database; Lilliput is ranked S1 in Ontario (NHIC 2013). However, there are 27 recent (1997-2011) records (live and shells) in the Lower Great Lakes Unionid Database (COSEWIC 2013). The year 1997 is considered a starting point for recent records due intensive surveys initiated in that year. Of the 27 records, 12 records represent live individuals, totalling 39 live animals.

COSEWIC (2013) interprets these 27 records as representing four “locations” (i.e. category of Endangered). Consistent with IUCN guidelines, a “location” defines a geographically or ecologically distinct area in which a single threatening event could affect all individuals of that taxon. However, using EO criteria outlined by NatureServe (2013), occurrences for mussels in flowing water are separated by a distance of more than two stream kilometres of unsuitable habitat (the most conservative approach). Recent records show the species to be present in eight distinct subwatersheds. If we apply EO criteria using mapped data (Figure 3 in COSEWIC 2013), the number of extant Element Occurrences would number at least nine (with more than one in the Grand River), but fewer than 20 (i.e. a category of Threatened).

## **6. Ontario Decline**

**Threatened.** COSEWIC (2013) reports declines in the both the extent of occurrence and the index of area of occupancy (IAO) of the Lilliput in Canada (i.e. Ontario). The extent of occurrence, based on the difference between the historical maximum and current estimated values, shows a decline of 22%. The IAO has reportedly declined by 44% over the last 18 years (three generations), based on a maximal historical IAO of 100 km<sup>2</sup> and a current estimated IAO of 56 km<sup>2</sup>. Populations are not known to be cyclical and the category of Threatened applies based on the IAO decline of 44%. The Lilliput is believed to have been extirpated from the Detroit River (Schloesser et al. 2006).

## **7. Ontario’s Conservation Responsibility**

**Not in any category.** The Ontario range of Lilliput represents less than 5% of the global range (COSEWIC 2013). There is no information on global

population abundance, or the percentage of the global population that exists in Ontario.

### **3.2 APPLICATION OF SECONDARY CRITERIA (Threats and Vulnerability)**

#### **8. Population Sustainability**

**Insufficient information.** No population viability analysis has been conducted for the Lilliput in Ontario.

#### **9. Lack of Regulatory Protection for Exploited Wild Populations**

**Not in any category.** Lilliput is not commercially exploited in Ontario. Freshwater mussels have previously been protected under the federal Fisheries Act.

#### **10. Direct Threats**

**Threatened.** As is the case with all native freshwater mussels, the Lilliput faces a high number of threats within its Ontario range. The invasion of dreissenid mussels (Zebra and Quagga Mussels) have significantly altered the freshwater ecosystem of the Great Lakes, and are present in several areas where Lilliput has been observed, mainly within the Lake Erie drainage. The Round Goby affects juvenile mussels directly through predation and is also implicated in the decline of the Johnny Darter, one of the suspected host species. It is present in at least some areas of the Lilliput range, especially the Ruscom River (COSEWIC 2013).

Sediment loading and increased turbidity are believed to pose a threat to the species, although perhaps not to the extent that these threaten other at-risk Ontario mussels, since the Lilliput prefers muddy and silty substrates. Similarly, nutrient (particularly phosphorus) loading has been identified as a primary threat to freshwater mussels in general, by impacting respiratory processes and affecting host fish communities. Poor water quality has been well documented in the Sydenham River, Thames River basin (Baptiste Creek), Ruscom River, Grand River, and Welland River, and the range of the Lilliput generally coincides with intense agricultural pressure. Mussels are also susceptible to high contaminant loads, and these are known to exceed federal guidelines in areas such as Hamilton Harbour (COSEWIC 2013). Residential and commercial



development such shoreline development or hardening occurs throughout the range of the species, and is of particular concern in the Belle and Ruscom Rivers (COSEWIC 2013).

Other suspected or potential threats include climate change, oil spills, and the effects of water transportation (dredging and shipping). Multiple threats that act either directly on the species, or indirectly on their hosts, have the potential to severely impact Ontario's small population. Although specific documentation on effects of each of these threats on the Lilliput is lacking, together they appear to present a significant risk to this species throughout its Ontario range.

### **11. Specialized Life History or Habitat-use Characteristics**

**Special Concern.** Like other mussels, the Lilliput is dependent upon host fishes to complete its lifecycle. Host species have not yet been confirmed for Canadian populations, although six fish species have been identified as hosts for US populations (Fuller 1978; Hove 1995; Watters et al. 2005). The most likely functional hosts of Lilliput glochidia in Ontario, based upon range overlap, are Green Sunfish, Bluegill, White Crappie, and Johnny Darter (COSEWIC 2013). A high degree of host specialization appears unlikely, and several of the possible host fish species are relatively widespread in Ontario. However, it is notable that natural glochidial mortality is extremely high: an estimated 0.001% of mussel glochidia successfully attach to a host (Bauer 2001).

Unlike many at-risk mussels, Lilliput are considered habitat generalists, being found in a variety of soft substrates such as mud, sand, and silt (NatureServe 2013; COSEWIC 2013). They are, however, highly sensitive to changes in water quality and have limited movement and dispersal ability, except during the glochidial stage on the host fish.

## **3.3 COSSARO EVALUATION RESULTS**

### **1. Criteria satisfied in each status category**

*List the number of primary and secondary criteria met 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.** Only one criterion was assessed as “insufficient information.”

## **3. Status Based on COSSARO Evaluation Criteria**

The application of COSSARO evaluation criteria suggests that **Lilliput** 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**

**Threatened.** A2, subcriterion (c) is applicable as there has been a 44% decline in the Area of Occupancy since 1997. The causes of the decline are not reversible, understood, but not ceased.

###### **Criterion B – Small Distribution Range and Decline or Fluctuation**

**Threatened.** B1 is applicable for threatened as Extent of Occurrence (10,220 km<sup>2</sup>) is below the threshold of 20,000 km<sup>2</sup>. Meets criteria for endangered under B2ab(iii) because IAO (56 km<sup>2</sup>) is below the threshold of 500 km<sup>2</sup>, however there are more than 5 locations, but fewer than 10 and there is an inferred continuing decline in the quality of habitat based on continuing threats.

Lilliput have been recently recorded in eight distinct subwatersheds, therefore the number of extant Element Occurrences are considered to be at least eight, but fewer than 20 (i.e. a category of Threatened).

###### **Criterion C – Small and Declining Number of Mature Individuals**

**Insufficient information.** Population size is unknown.

###### **Criterion D – Very Small or Restricted Total Population**

**Not in any category.** COSEWIC (2013) states that Threatened is applicable as there are fewer than five locations according to COSEWIC criteria. However they are still present in eight separate watersheds which would qualify as EOs and therefore it is over the threshold of five.

**Criterion E – Quantitative Analysis**

**Not in any category.** A quantitative analysis of the Lilliput population has not been completed.

**Rescue Effect**

**No.** Although other populations of Lilliput may occur relatively nearby in adjacent states, the mussel has limited dispersal ability and is dependent on the mobility of its host fish, therefore rescue effect may be possible but is highly unlikely.

**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 **Lilliput** 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

**Lilliput** is classified as **Threatened** in Ontario.

The Lilliput is a small freshwater clam reaching an average length of 25 mm and a maximum of 50 mm. It is elliptical to ovate in shape with a smooth cloth-like surface. The species is quite widespread in the east-central US from the Gulf of Mexico to the Great Lakes. In Canada, it occurs in eight rivers or basins in the Carolinian Zone of southern Ontario, but has disappeared from the Detroit River. Lilliput lives an average of six years and burrow in soft bottoms to filter-feed. Like most similar mussels, Lilliput females place their glochidia in the gills of a host species of fish, and they live as parasites on these fish before forming into free-living clams. Likely host species are Johnny Darter, White Crappie, Bluegill and Green Sunfish. Current populations are generally small and have declined, but because the species has never been common 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 and the small number of remaining locations, this species was assessed as Threatened.

## Information Sources

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

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## APPENDIX 1

### NORTHEASTERN NORTH AMERICA STATUS RANK AND DECLINE

	Subnational Rank	Sources	Decline	Comments
CT	NA	NatureServe 2013		
DE	NA	NatureServe 2013		
IL	S4	NatureServe 2013		
IN	S3	NatureServe 2013		
IA	S1	NatureServe 2013		
LB	NA	NatureServe 2013		
KY	S4	NatureServe 2013		
MA	NA	NatureServe 2013		
MB	SNR	NatureServe 2013		Apparent error
MD	NA	NatureServe 2013		
ME	NA	NatureServe 2013		
MI	SNR	NatureServe 2013		Endangered
MN	SNR	NatureServe 2013		
NB	NA	NatureServe 2013		
NF	NA	NatureServe 2013		
NH	NA	NatureServe 2013		
NJ	NA	NatureServe 2013		
NS	NA	NatureServe 2013		
NY	SH	NatureServe 2013		
OH	S5	NatureServe 2013		
ON	S1	NatureServe 2013		
PA	S1S2	NatureServe 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		
WV	S2	NatureServe 2013		

Occurs as a native species in 12 of 29 northeastern jurisdictions  
 Srank or equivalent information available for 10 of 12 jurisdictions = (82 %)  
 S1, S2, SH, or SX in 5 of 10 = (50 %)