

**Ontario Species at Risk Evaluation Report for
Riverine Clubtail
Gomphe riverain
(*Stylurus amnicola*)**

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

Assessed by COSSARO as Threatened

April 2024

Final

Executive summary

The Riverine Clubtail (*Stylurus amnicola*) is a medium-sized dragonfly, measuring 47-49 mm in length. It has a slender, blackish body with yellow spots on the abdomen. In males, the abdomen terminates in a prominent club. The front of the thorax features a distinctive T-shaped thoracic collar, setting this species apart from other clubtails in the genus *Stylurus* (COSEWIC 2023, IN PRESS).

This dragonfly prefers riverine habitats, which vary in size from the large St. Lawrence River to medium-sized creeks. It typically occurs where the riparian canopy does not fully cover the channel's width. Sandy substrates and clear to slightly turbid water are essential for larval development and adult breeding. After emerging from the water, adult Riverine Clubtails disperse and feed in the forest canopy before returning to find a mate and lay eggs at the water's surface. Habitat trends/threats specific to Riverine Clubtail relate to the water quality and riparian habitat which affects larval and adult stages respectively.

There are seven extant subpopulations of Riverine Clubtail in Ontario observed since 2002. It has been documented on seven rivers: Big Otter Creek and Big Creek in Norfolk County, Thames River in Middlesex County, Big East River near Huntsville, Aux Sables and Spanish rivers west of Espanola and the Vermilion River near Sudbury (COSEWIC 2023, IN PRESS).

Riverine Clubtail was previously classified as Endangered under the *Endangered Species Act, 2007* in Ontario. The species has been reassessed and is classified as Threatened in Ontario based on meeting criteria B2ab(iii). This status differs from the COSEWIC status (Special Concern) based on the number of locations. In Canada, the number of locations is greater than 10. In Ontario, the number of locations is less than 10, but greater than 5.

1. Eligibility for Ontario status assessment

1.1. Eligibility conditions

1.1.1. Taxonomic distinctness

Riverine Clubtail (*Stylurus amnicola*) is recognized as a distinct taxon with no subspecies.

1.1.2. Designatable units

Riverine Clubtail has a single contiguous designatable unit across Canada. When Riverine Clubtail was first assessed over ten years ago (COSEWIC, 2012; COSSARO, 2013), there were extensive geographic range gaps between observations, with three designatable units defined by COSEWIC. Since these original assessments, this dragonfly has been recorded at additional sites in Ontario, Quebec and throughout the United States, revealing a range that appears to be more connected, with genetic

exchange between subpopulations likely. Given the observations of the new subpopulations, the three designatable units described across Canada in the first COSSARO report, in which Ontario was considered one, are no longer discrete (COSEWIC 2023, IN PRESS).

1.1.3. Native status

Riverine Clubtail is native to Canada and Ontario. It was first discovered in southwestern Ontario in 1999 (COSSARO, 2013). It is reasonable to believe the species was present as a native species in Ontario long before its first discovery and that it has escaped detection until 1999 as dragonflies can be very difficult to identify Riverine Clubtail in particular, since it is small and spends most of its adult time foraging in the forest canopy (COSSARO, 2013).

1.1.4. Occurrence

Riverine Clubtail is known to occur across Ontario.

1.2. Eligibility results

Riverine Clubtail (*Stylurus amnicola*) is eligible for status assessment in Ontario.

2. Background information

2.1. Current designations

- GRANK: G4 (NatureServe 2024; global status last assessed 2000)
- IUCN: Least concern (2014)
- NRANK Canada: N3 (NatureServe 2024; last assessed December 1, 2020)
- COSEWIC: Special Concern (May 2023)
- SARA: Not Listed
- ESA 2007: Endangered (March 2015)
- SRANK: S2 (ranked in 2021)

2.2. Distribution in Ontario

There are seven extant subpopulations of Riverine Clubtail in Ontario observed since 2002 (COSEWIC 2023, IN PRESS). It has been documented on seven rivers: Big Otter Creek and Big Creek in Norfolk County, Thames River in Middlesex County, Big East River near Huntsville, Aux Sables and Spanish rivers west of Espanola and the Vermilion River near Sudbury (COSEWIC 2023, IN PRESS).

NHIC element occurrence data was available to assess the population information specific to Ontario. There are seven element occurrences in Ontario comprised of eighty-eight (88) observations documented within NHIC since 1999.

2.3. Distribution, status and the broader biologically relevant

geographic range outside Ontario

The global range of Riverine Clubtail extends from Manitoba, Ontario and Quebec through to Minnesota to northern Louisiana and central Georgia. The western extent is from Nebraska south to Louisiana, the eastern extent from the Connecticut River watershed to the Carolinas and Georgia. Approximately 19.8% of the global range occurs in Canada (COSEWIC 2023, IN PRESS).

The Canadian range of Riverine Clubtail extends from the Assiniboine and Red rivers in Manitoba in the west to Québec City on the St. Lawrence River in the east. There are 17 extant subpopulations recorded over 22 waterways, the northernmost of which is found in eastern Québec near Lac Saint-Jean and the southernmost in Norfolk County on Big Otter and Big Creeks. The extent is approximately 753,150 km² (COSEWIC 2023, IN PRESS).

Considering that Riverine Clubtail occupy large rivers with sandy substrates and that this type of habitat is found throughout its range, its broader biologically relevant geographic range outside of Ontario would include its entire range. Considering that its dispersal capabilities are unknown, for the purpose of assessing the status of Riverine Clubtail within its broader biologically relevant geographic range, the immediately surrounding jurisdictions were considered.

Table 1. Condition of Riverine Clubtail in Adjacent Jurisdictions and Broader Biologically Relevant Geographic Range

Adjacent Jurisdictions	Biologically Relevant to Ontario (n/a, yes, no)	Condition	Notes & Sources
Quebec	Yes	S1	Updated March 2021 ref COSEWIC 2023, IN PRESS
Manitoba	Yes	S3	Natureserve 2024
Minnesota	Yes	SNR	Natureserve 2024
Wisconsin	Yes	S3S4	Natureserve 2024
Michigan	Yes	S2S3	Natureserve 2024
Indiana	Yes	S1S2	Natureserve 2024
Ohio	Yes	S2	Natureserve 2024
Pennsylvania	Yes	SH	Natureserve 2024
New York	Yes	SH	Natureserve 2024

2.4. Ontario conservation responsibility

Ontario represents a small portion of the species' overall range, and would be less than 25% since the Canadian population represents 19.8% of its global range. Currently there are no estimates of the total number of mature individuals across their range in Ontario.

2.5. Direct threats

Habitat trends/threats specific to Riverine Clubtail relate to the water quality and riparian habitat which affects larval and adult stages respectively. Threats which could affect water quality include pollution related to domestic and urban wastewater, application of road salt, anthropogenic hormones and prescription drugs, various effluents from agricultural, forestry, military and industrial practices entering waterways. Threats which could affect riparian habitat include loss of riparian tree cover related to residential and urban development. Other threats include direct mortality to adults from vehicle/train collisions, potential sedimentation/chloride impacts to larvae through road runoff, changes in water levels resulting from dams and aquatic invasive species such as Curly Pondweed (*Potamogeton crispus*) and Zebra Mussel (*Dreissena polymorpha*). Habitat shifting and alternation from climate change has the potential to negatively affect and influence odonate species.

2.6. Specialized life history or habitat use characteristics

The Riverine Clubtail (*Stylurus amnicola*) is a medium-sized dragonfly, measuring 47-49mm in length. It has a slender, blackish body with yellow spots on the abdomen. In males, the abdomen terminates in a prominent club. The front of the thorax features a distinctive T-shaped thoracic collar, setting this species apart from other clubtails in the genus *Stylurus* (COSEWIC 2023, IN PRESS).

Riverine Clubtail has three distinct morphological forms: egg, larvae (nymph) and adult. Female adults lay eggs over fast-flowing, open sections of the river; eggs then drift downstream to hatch in pools and slower-flow waters. Larvae remain in the water and bury under soft sediments, with only the tip of the abdomen extended into the water column for respiration. Larvae rapidly extend their mouthparts to capture small benthic invertebrates and as larvae get larger, prey items include small fish and tadpoles. Larvae spend 2-4 years in aquatic habitats and when larvae are ready to become adults, they crawl onto sandy banks or nearby vegetation, shed their skin through a process called ecdysis, and emerge as adults (COSEWIC 2023, IN PRESS).

In Canada, adult emergence occurs from late June or early July and adults fly until early September. Immature adults spend at least two weeks foraging and basking in the canopy of adjacent deciduous forest habitats before entering the reproductive life stage. Males establish small territories and swiftly patrol small sections of river, often around fast, open water, waiting for females to fly into their territories (COSEWIC 2023, IN PRESS).

For most of its Canadian range, Riverine Clubtail appears to prefer medium-to-large rivers with substrates of deltaic origin dominated by deep sand deposits. In parts of their range in the United States, Riverine Clubtail also inhabit rivers with gravel substrates. In Canada, all observations of Riverine Clubtail have been found in rivers with pure sand shorelines and bottoms (COSEWIC 2023, IN PRESS).

Members of the genus *Stylurus* are referred to as “hanging clubtails” for their habit of hanging vertically when perched on streamside vegetation. Riverine Clubtail is

apparently less wary than other hanging clubtails and is easily approached. Observations of adult and larval Riverine Clubtail are widely used as indicators of water quality and habitat condition in a range of freshwater ecosystems (COSEWIC 2023, IN PRESS).

2.7. Existing Conservation and Recovery Actions

The Ontario Ministry of Natural Resources developed a recovery strategy specifically for the Riverine Clubtail. This strategy outlines essential steps to ensure the species' survival and recovery. It includes measures to: i) protect, maintain and enhance existing Riverine Clubtail habitat, ii) increase knowledge in terms of understanding its biology, distribution and abundance, life history and habitat needs, and iii) reduce threats to Riverine Clubtail and its habitat (Mlynarek, 2015).

Also, through the Species at Risk Stewardship Program, the Government of Ontario has provided funding to support three projects aimed at protecting and recovering Riverine Clubtail (Government of Ontario, 2021).

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

Does not apply. There is insufficient data from which to estimate the Ontario population. Utilizing data collected through NHIC as well as analysis of summaries in the 2023 IN PRESS COSEWIC Report indicate that there have been at least 171 observations of individual Riverine Clubtail whether they be of adults or exuviae. Most records consist of six or fewer adults and/or emerging larvae at a given date and site. Catling et al. (1999) observed up to 10 adults and separately up to 25 adults along 100m to 250m stretches of Big Creek (COSEWIC 2023, IN PRESS).

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

Meets Threatened B2ab(iii). While the extent of occurrence (EOO) of 68,434 km² is well above the threshold for Threatened, the IAO of 100 km² is below the threshold for Endangered. There are, however, greater than 5 locations but fewer than 10, which meets Threatened. In addition, there are inferred and projected declines in habitat quality.

Note that In Canada, the number of locations is greater than ten which resulted in a status of Special Concern for the species (COSEWIC 2023, IN PRESS).

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

Does not apply. There is insufficient data from which to estimate the Ontario population.

3.1.4. Criterion D – Very small or restricted total population

Does not apply. Insufficient data from which to estimate the Ontario population. Riverine Clubtail has been observed at seven locations. Index of area of occupancy is greater than $<20 \text{ km}^2$.

3.1.5. Criterion E – Quantitative analysis

Does not apply.

3.2. Application of Special Concern in Ontario

Does not apply.

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

Does not apply. The species is classified as G4 globally. Ontario's conservation responsibility is less than 25%.

3.3.2. Status modification based on level of risk in broader biologically relevant geographic range

Does not apply as populations are imperiled in adjacent jurisdictions.

3.3.3. Rescue Effect

Rescue effect is considered unlikely (COSEWIC 2023) as US populations are considered to face greater severity of threat than in Canada.

3.4. Other status categories

3.4.1. Data deficient

Does not apply.

3.4.2. Extinct or extirpated

Does not apply.

3.4.3. Not at risk

Does not apply.

4. Summary of Ontario status

Riverine Clubtail (*Stylurus amnicola*) is classified as Threatened in Ontario.

This status of this species is consistent with the definition of Threatened under the *Endangered Species Act, 2007*.

5. Information sources

COSEWIC. 2023. IN PRESS. COSEWIC assessment and status report on the Riverine Clubtail *Stylurus amnicola* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. Xii + 77pp.

COSSARO. 2013. COSSARO Candidate Species at Risk Evaluation for Riverine Clubtail (*Stylurus amnicola*). https://cossaroagency.ca/wp-content/uploads/2017/06/Final-COSSARO-Evaluation-Riverine-Clubtail-March-20-2013_GFM-FINAL-s.pdf

Mlynarek, Julia J. 2015. Recovery Strategy for the Riverine Clubtail (*Stylurus Amnicola*) in Ontario Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. V +22 pp. [Recovery Strategy for the Riverine Clubtail \(*Stylurus amnicola*\) in Ontario.](#)

NatureServe. 2024. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Website: <http://explorer.natureserve.org> [accessed March 2024].

Government of Ontario. 2021. Review of Progress towards the protection and recovery of Ontario's species at risk. [Recovery Strategy for the Riverine Clubtail \(*Stylurus amnicola*\) in Ontario.](#)

Appendix 1: Technical summary for Ontario

Species: Riverine Clubtail (*Stylurus amnicola*)

Demographic information

Demographic attribute	Value
Generation time based on the IUCN Generation Calculator and also uses Pacifici et al. (2013) for the upper value of 6 years.	Estimated at 2-4 years
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
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
Are the causes of the decline (a) clearly reversible, and (b) understood, and (c) ceased?	a. Unknown b. Unknown c. Unknown
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 (EOO).	68,434 km ²
Index of area of occupancy (IAO).	100 km ²
Is the total population severely fragmented? i.e., is >50% of its total area of occupancy 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. Unknown
Number of locations.	Seven locations in Ontario
Number of NHIC Element Occurrences	Seven

Extent and occupancy attributes	Value
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	No
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	No
Is there an observed, inferred, or projected continuing decline in number of sub-populations or EOs?	No
Is there an observed, inferred, or projected continuing decline in number of locations?	No
Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat?	Yes. Inferred decline at some sites
Are there extreme fluctuations in number of populations?	No
Are there extreme fluctuations in number of locations?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

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

The number of mature individuals in Ontario is unknown.

Quantitative analysis (population viability analysis conducted)

Not available.

Threats

Key threats (based on COSEWIC 2023, IN PRESS) were identified as:

- I. Agricultural & forestry effluents (Medium-Low impact)
- II. Residential & Commercial Development (Low impact)
- III. Roads and Railroads (low impact)
- IV. Logging & wood harvesting (low impact)
- V. Domestic & Urban Wastewater (Unknown impact)
- VI. Industrial & military effluents (Unknown impact)
- VII. Dams & water management (unknown impact)
- VIII. Other ecosystem modifications (unknown impact)
- IX. Invasive non-native/alien species/diseases (unknown impact)
- X. Habitat shifting & alteration (unknown impact)
- XI. Droughts (unknown impact)
- XII. Storms & Flooding (unknown impact)

Rescue effect

Rescue effect attribute	Value
Does the broader biologically relevant geographic range for this species extend beyond Ontario?	Yes
Status of outside population(s) most likely to provide immigrants to Ontario	Status of populations outside of Ontario range between SH to S2.
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Likely possible
Would immigrants be adapted to survive in Ontario?	Yes
Is there sufficient suitable habitat for immigrants in Ontario?	Yes
Are conditions deteriorating in Ontario?	Yes, based on decline in water quality at some sites.
Is the species of conservation concern in bordering jurisdictions?	Yes
Is the Ontario population considered to be a sink?	No
Is rescue from outside populations likely?	Unknown

Sensitive species

Not a sensitive species.

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
EO: Element occurrence (as defined by NHIC)
EOO: extent of occurrence
GRANK: global conservation status assessments
IAO: index of area of occupancy
IUCN: International Union for Conservation of Nature and Natural Resources
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
S3: Vulnerable
S4: Apparently Secure
S5: Secure
IUCN: International Union for Conservation of Nature and Natural Resources
CDSEPO: Le Comité de détermination du statut des espèces en péril en Ontario