

**Ontario Species at Risk Evaluation Report for
False-Foxglove Sun Moth
Héliotin orangé
(*Pyrrhia aurantiago*)**

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

Assessed by COSSARO as Endangered

October 2020

Héliotin orangé (*Pyrrhia aurantiago*)

L'héliotin orangé, *Pyrrhia aurantiago*, est une noctuelle (famille des Noctuidés). Les adultes mesurent environ 30 mm de longueur et ont une envergure de 25 à 33 mm. Les ailes antérieures sont orange foncé à la base et violettes sur le tiers apical, les deux couleurs étant séparées par une bande sombre irrégulière. Cette noctuelle rare est extante dans trois endroits au Canada, tous situés dans des savanes et des forêts claires dominées par des chênes du sud de l'Ontario.

Selon les estimations, l'Ontario a perdu 99 % de ce type d'habitats. Ses larves dépendent de la gérardie jaune et de la gérardie fausse-pédiculaire, deux espèces en péril au Canada. Les sous-populations canadiennes de cette noctuelle se rencontrent surtout dans des zones protégées où les principales menaces sont un broutage excessif des plantes hôtes des larves par le cerf de Virginie indigène et les effets de la concurrence exercée par des plantes envahissantes sur les plantes hôtes.

L'héliotin orangé est considéré comme une espèce en voie de disparition en Ontario.

Cette publication hautement spécialisée «COSSARO Candidate Species at Risk Evaluation for False-Foxglove Sun Moth» 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 l'Environnement, de la Protection de la nature et des Parcs au cossarosecretariat@ontario.ca.

Executive summary

False-Foxglove Sun Moth, *Pyrrhia aurantiago*, is an owlet moth (family Noctuidae). Adults are approximately 30 mm long with a wingspan of 25 – 33 mm. The forewing is dark orange at the base and purple on the outer third, separated by a dark, jagged band. The hind wing is yellowish at the base, grading into dull red or pink on the outer third. The thorax and abdomen are covered with orange hairs. Younger larvae are whitish to yellowish and unmarked. Mature larvae are an overall dark brown with paler stripes on the sides and back and blackish patches on the head. This rare moth is extant at three locations in Canada, all within the oak-dominated savannas and open woodlands of southern Ontario. It is estimated that 99% of this habitat type has been lost in Ontario. The larvae depend on Smooth Yellow False Foxglove and Fern-leaved Yellow False Foxglove, both of which are species at risk in Canada. Canadian subpopulations of this moth are mostly in protected areas where the primary threats are over-browsing of the larval host plants by native White-tailed Deer and the effects of competition from invasive plants on the host plants.

1. Eligibility for Ontario status assessment

1.1. Eligibility conditions

1.1.1. Taxonomic distinctness

False-Foxglove Sun Moth, *Pyrrhia aurantiago* is recognized as a distinct taxon. There are no known subspecies or varieties (COSEWIC 2018).

1.1.2. Designatable Units

COSEWIC (2018) recognizes only one designatable unit across the Canadian range. Only one designatable unit is recognized at the provincial level.

1.1.3. Native status

False-Foxglove Sun Moth, *Pyrrhia aurantiago* is native to Canada and Ontario, and very little of its global breeding range occurs in Canada (COSEWIC 2018, NatureServe 2009).

1.1.4. Occurrence

False-Foxglove Sun Moth, *Pyrrhia aurantiago* is known to occur in Ontario.

1.2. Eligibility results

False-Foxglove Sun Moth, *Pyrrhia aurantiago* is eligible for status assessment in Ontario.

2. Background information

2.1. Current designations

- GRANK: G3 (NatureServe 2009)
- IUCN: not assessed
- NRANK Canada: N1
- COSEWIC: Endangered (May 2018)
- SARA: Not listed (under consideration)
- ESA 2007: unranked
- SRANK: S1 (ranked in 2009)

2.2. Distribution in Ontario

In Ontario, the species ranges in southwestern Ontario from eastern Lake Erie, west to Lake Huron, and south to Windsor. There are four known subpopulations of the moth.

The subpopulations in the Pinery area and the Ojibway Prairie Complex at Windsor are considered extant and the occurrences at London and Delhi are considered extirpated. The Ontario occurrences represent the total occurrences in Canada of the species.

Population size and trends of False-foxglove Sun Moth are poorly understood, due mainly to the lack of specimens observed and/or collected. The species has probably declined in Canada due to the decline of both its host plants and associated habitat. About 99% of savanna habitat has been lost in southern Ontario and the species is apparently extirpated at two of the five historical sites. The number of occupied sites appears to be stable over the last 10 years (COSEWIC 2018).

2.3. Distribution, status and the broader biologically relevant geographic range outside Ontario

The range of False-foxglove Sun Moth extends from southern Maine, west through southern Ontario and southern Wisconsin; south to eastern Texas and central Florida (Schweitzer et al. 2011), overlapping the range of its three major host plant species, Fern-leaved Yellow False Foxglove (*A. pedicularia*), Smooth Yellow False Foxglove (*Aureolaria flava*), and Large-flower False Foxglove (*A. grandiflora*).

Table 1. Canadian records of False-foxglove Sun Moth.

Sub-population Number	Collection / observation date	Site Name	Collector	Specimen accession number and/or notes	Source
1	1982, August 19	Windsor	J. Pilkington	NOC14579	Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario.
2	1936, August 2	Grand Bend	Hudson- Wood	CNC LEP 00064372	Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario.
2	2015, September 12	“Port Franks” (i.e. Pinery)	K. Stead	Adult	Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario.
2	2015, August 7	Pinery	K. Stead	2 adults	Schmidt <i>et al.</i> 2016.
2	2016, August 4	Pinery	K. Stead	Adult	K. Stead pers. comm. 2016
4	c. 1900	London	H.S. Saunders	Not available.	Royal Ontario Museum, Toronto, Ontario.

5	1971, August 20	Delhi	Cheng & Hanlon	CNC LEP 00064371	Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario.
---	--------------------	-------	-------------------	---------------------	--

Table 2. Condition of the Species in Adjacent Jurisdictions and Broader Biologically Relevant Geographic Range

Adjacent Jurisdictions	Biologically Relevant to Ontario (n/a, yes, no)	Condition	Notes & Sources
Quebec	n/a	n/a	
Manitoba	n/a	n/a	
Michigan	Yes	SNR	NatureServe 2018
Minnesota	n/a	n/a	
Nunavut	n/a	n/a	
New York	No	SU	NatureServe 2018
Ohio	n/a	n/a	
Pennsylvania	No	SH	NatureServe 2018
Wisconsin	n/a	n/a	
<i>Other Relevant Jurisdiction</i>			

2.4. Ontario conservation responsibility

The Ontario population represents approximately <1% of the known occurrences globally (COSEWIC 2018).

2.5. Direct threats

Native White-tailed Deer browsing (e.g., consumption of larvae feeding on flower heads) and competition to host plants by invasive plants are probably the greatest threats to False-foxglove Sun Moth and their host plants both inside and outside protected areas. Residential and commercial developments are threats to the host plant subpopulations in the Pinery area that are outside of Pinery Provincial Park (COSEWIC 2018).

2.6 Specialized life history or habitat use characteristics

False-foxglove Sun Moth has a specialized life history. The larvae feed exclusively on two species of *Aureolaria* in Canada, which are also hemi-parasitic and restricted to oak savanna habitat. In captivity, larvae have been successfully raised on plants in the family *Scrophulariaceae* (Wyatt 1938), but are not known to do so in the wild. The species is therefore not highly adaptable (COSEWIC 2018).

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

Not applicable.

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

Meets Endangered, B1ab(iii,v)B2ab(iii,v), because the EOO is 400 km² (<5,000 km²), and the IAO is less than the threshold (12 km²) and it occurs at less than 5 locations. There is a continuing decline in (iii) area, extent and/or quality of habitat due to White-tailed Deer herbivory and competition from invasive plants on the host plants; and (v) number of mature individuals is inferred to have declined based on browsing by White-tailed Deer on the flower heads, which is where the larvae are situated.

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

Not applicable.

3.1.4. Criterion D – Very small or restricted total population

Not applicable.

3.1.5. Criterion E – Quantitative analysis

Not applicable.

3.2. Application of Special Concern in Ontario

Not applicable.

3.3. Status Category Modifiers

3.3.1. Ontario's conservation responsibility

Ontario's conservation responsibility is low, representing <1% of the species global range (COSEWIC 2018).

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

Not applicable.

3.4. Other status categories

3.4.1. Data deficient

Not applicable.

3.4.2. Extinct or extirpated

Not applicable.

3.4.3. Not at risk

Not applicable.

4. Summary of Ontario status

False-Foxglove Sun Moth, (*Pyrrhia aurantiago*) is classified as Endangered, in Ontario based on meeting criterion for Endangered under B1ab(iii,v) and B2ab(iii,v). This assessment consistent with the COSEWIC assessment of Endangered.

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

5. Information sources

COSEWIC. 2018. COSEWIC assessment and status report on the False-foxglove Sun Moth *Pyrrhia aurantiago* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 40 pp. (<http://www.registrelep-sararegistry.gc.ca/default.asp?lang=en&n=24F7211B-1>).

NatureServe 2010. *Pyrrhia aurantiago*, False-foxglove Sun Moth. https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.112746/Pyrrhia_aurantiago, accessed October 26, 2020.

Schweitzer, D.F., M.C. Minno, and D.L. Wagner. 2011. Rare, Declining, and Poorly Known Butterflies and Moths (Lepidoptera) of Forests and Woodlands in the Eastern United States. USFS Technology Transfer Bulletin, FHTET-2009-02.

Wyatt, A.K. 1938. Notes on larvae of Heliothinae. Bulletin of the Brooklyn Entomological Society 43: 90-94.

¹ A change in the classification of a species during reassessment by COSSARO may be for genuine or non-genuine reasons. Genuine reasons may include a reduction in threats to a species such that status of the species has improved, or the continuation of threats to the species such that the status of the species has further deteriorated. Non-

genuine reasons may include new information on population size or threats that was not available during a previous assessment, the use of previous COSSARO criteria that may have yielded a different result or, taxonomic revisions that result in changes in range, population sizes or designatable units.

Appendix 1: Technical summary for Ontario

Species: False-Foxglove Sun Moth (*Pyrrhia aurantiago*)

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.	1-3 years Life cycle can be completed in a single year; individuals can spend 2 -3 years as pupae.
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	Insufficient data
Estimated percent of continuing decline in total number of mature individuals within 5 years or 2 generations.	Insufficient data
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations.	Insufficient data
Projected or suspected percent reduction or increase in total number of mature individuals over the next 10 years or 3 generations.	Insufficient data
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.	Insufficient data
Are the causes of the decline (a) clearly reversible, and (b) understood, and (c) ceased?	a. No b. Yes, partially c. No
Are there extreme fluctuations in number of mature individuals?	No

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence (EOO). <i>If value in COSEWIC status report is not applicable, then use geocat.kew.org. State source of estimate.</i>	400 km ²
Index of area of occupancy (IAO). <i>If value in COSEWIC status report is not applicable, then use geocat.kew.org. State source of estimate.</i>	12 km ²
Is the total population severely fragmented? i.e., is >50% of its total area of occupancy in habitat patches that are:	a. Unknown b. Probably

Extent and occupancy attributes	Value
(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?	
Number of locations. <i>See Definitions and Abbreviations on COSEWIC and IUCN websites for more information on the term "location". Use plausible range to reflect uncertainty if appropriate.</i>	3; Windsor site may be extirpated because it was last recorded in 1982
Number of NHIC Element Occurrences <i>Request data from MNRF.</i>	4
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 sub-populations or EOs?	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. Observed decline in habitat quality due to White-tailed Deer herbivory and non-native plants outcompeting host plants.
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)

Sub-population (or total population)	Number of mature individuals
Pinery and Windsor (extant sites)	Unknown
Total	Unknown

Quantitative analysis (population viability analysis conducted)

N/A

Threats

Insert text here.

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 not ranked in Michigan; see Table 6 for status ranks elsewhere within its range
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Not likely. Dispersal capability and status of nearest subpopulations in Michigan are unknown.
Would immigrants be adapted to survive in Ontario?	Yes, likely
Is there sufficient suitable habitat for immigrants in Ontario?	Unknown
Are conditions deteriorating in Ontario?	Yes, from browsing by White-tailed Deer and competition to host plants from invasive non-native plants.
Is the species of conservation concern in bordering jurisdictions?	Unknown
Is the Ontario population considered to be a sink?	Not likely
Is rescue from outside populations likely?	Not likely

Sensitive species

No.

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