

# Species Status Assessment

**Common Name:** Marsh Imp

**Date:** 2024-10-13

**Scientific Name:** *Pyractomena lucifera*  
Henschell

**Updated By:** Katie Hietala-

**Class:** Insecta

**Family:** Lampyridae

## Species Synopsis

(a short paragraph which describes species taxonomy, distribution, recent trends, and habitat in New York):

*Pyractomena lucifera*, also known as the Marsh Imp, is a wetland habitat specialist and can be found in marshy habitat with cattails and other aquatic vegetation present. This species has a disjunct population separating northern and southern portions. Across its range, this species has been assessed by the IUCN Red List Firefly Specialist group as having a decreasing population trend and to be Data Deficient (Walker and Pfeiffer 2021). It's generally known from the eastern U.S. In New York, *P. lucifera* has been documented from Madison, Oneida, Monroe, and Westchester counties (Green 1957, Lloyd 2018). This species appears to be active in New York in late June through July and into early August (Faust 2017). This species can be extremely challenging to detect because it can have a short display period, as short as 15 minutes (Faust 2017).

In 2021, the International Union for Conservation of Nature (IUCN) Red List conducted baseline conservation assessments for nearly 80% of described firefly species in the United States and Canada. The IUCN Red List found approximately 14% of fireflies are threatened with extinction and more than half of the species (53%) could not be evaluated due to lack of data (Fallon et al. 2021). Future firefly work including monitoring and protecting populations of at-risk species, preserving, and restoring habitat, and gathering data to fill critical information gaps (e.g., population trends) for potentially rare or at-risk species, like *P. lucifera*, will help inform conservation efforts.

## I. Status

### a. Current legal protected Status

i. **Federal:** Not listed **Candidate:** No

ii. **New York:** Unprotected

### b. Natural Heritage Program

i. **Global:** GU

ii. **New York:** SNR **Tracked by NYNHP?:** No

## Other Ranks:

COSEWIC: Not listed in Canada

IUCN Red List: Data Deficient

Northeast Regional SGCN: Not listed

## Status Discussion:

*Pyractomena lucifera* has been assessed by the IUCN Red List Firefly Specialist Group as having a decreasing population trend (Walker and Pfeiffer 2021). This species is a habitat specialist of wetlands and marsh habitats with cattails (Faust 2017). In New York, this species appears to be widespread with disjunct populations and is currently documented from four counties. *Pyractomena lucifera* appears to occur in small, discrete populations and this species, along with others in the genus *Pyractomena*, typically occur in lower numbers (Faust 2017). *P. lucifera* is suspected to be of high conservation concern (Fallon et al. 2022).

## II. Abundance and Distribution Trends

Region	Present?	Abundance	Distribution	Time Frame	Listing status or S-Rank	SGCN?
North America	Yes	Unknown	Unknown	Unknown		
Northeastern US	Yes	Unknown	Unknown	Unknown		
New York	Yes	Unknown	Unknown	Unknown	SNR	No
Connecticut	No	-	-	-		
Massachusetts	Yes	Unknown	Unknown	Unknown	SNR	No
New Jersey	No	-	-	-		
Pennsylvania	Yes	Unknown	Unknown	Unknown	SNR	No
Vermont	No	-	-	-		
Ontario	Yes	Unknown	Unknown	Unknown	S4	No
Quebec	Yes	Unknown	Unknown	Unknown	SNR	No

*Column options*

**Present?:** Yes; No; Unknown; No data; (blank) or Choose an Item

**Abundance and Distribution:** Declining; Increasing; Stable; Unknown; Extirpated; N/A; (blank) or Choose an item

**SGCN?:** Yes; No; Unknown; (blank) or Choose an item

## Monitoring in New York

(specify any monitoring activities or regular surveys that are conducted in New York):

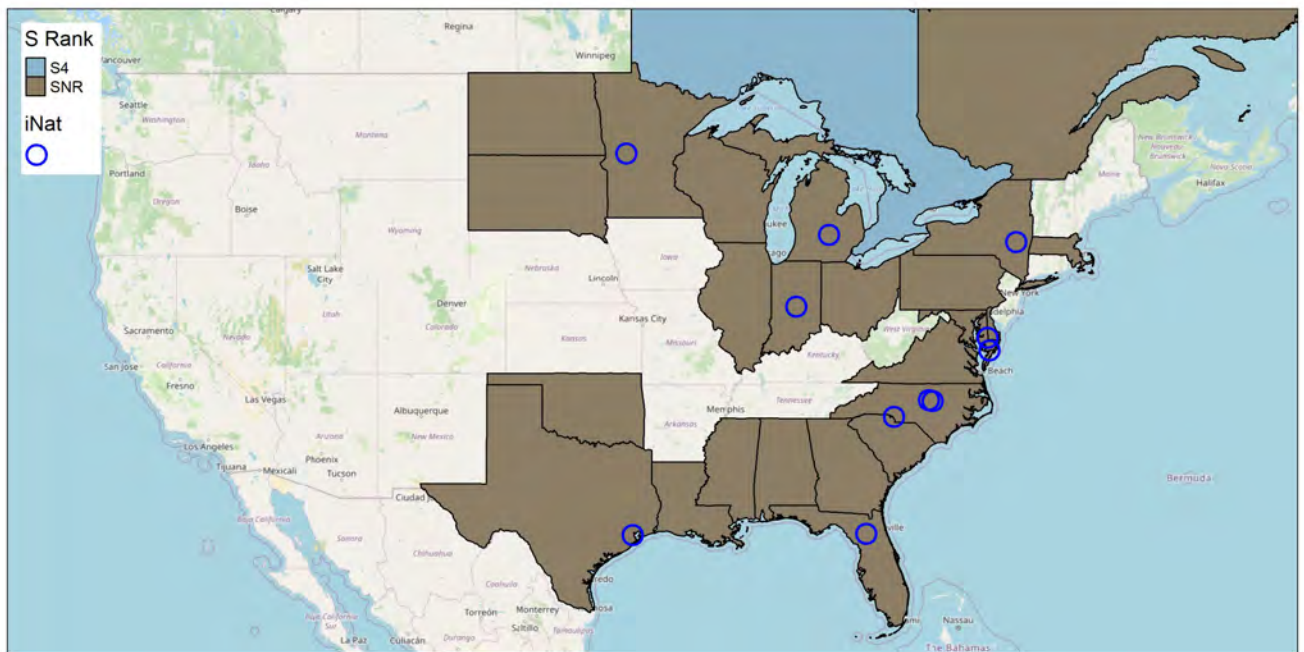
The Dark Skies for Fireflies project (2023-2025), a partnership between New York Natural Heritage Program (NYNHP) and the Office of Parks, Recreation, and Historic Preservation

(OPRHP), is an effort to survey fireflies in New York State Parks; however, there are no systematic monitoring efforts directed toward this species.

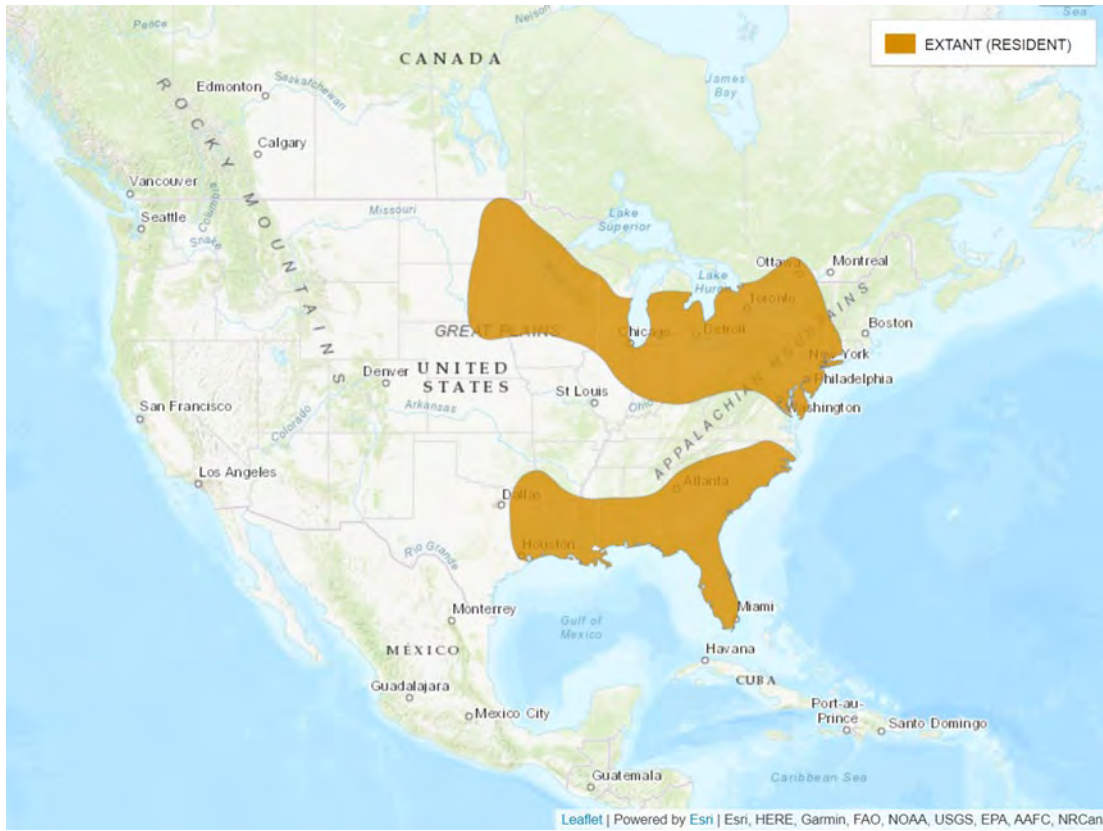
## Trends Discussion

(insert map of North American/regional distribution and status):

The IUCN Red List conservation status for *P. lucifera* is Data Deficient because local extirpations have occurred throughout its range (Walker and Pfeiffer 2021). In part because this species is wetland habitat specialist and wetlands have declined in the U.S. While large scale data sets are currently unavailable to confidently estimate trends several case studies are available. Fireflies that are restricted to specialized habitats tend to be more likely to be threatened by some level of extinction and should be included as SGCN (Fallon et al. 2021).



**Figure 1:** *Pyrrhota lucifera* North American distribution. Points show research-grade iNaturalist observations (iNaturalist community 2023, NatureServe 2023).



**Figure 2:** IUCN Red List map of *Pyractomena lucifera* North American distribution (Walker and Pfeiffer 2021).



**Figure 3:** *Pyrausta nubilalis* regional distribution as reported at <https://northeastwildlifediversity.org/rsgcn> .

### III. New York Rarity

*(provide map, numbers, and percent of state occupied)*

Within its range, *P. lucifera* prefers wetland habitat with cattails and other aquatic vegetation (Faust 2017). Currently, there are no records of *P. lucifera* in the NYNHP element occurrence database. Available records suggest that this species occurs in over 6% of New York (NYNHP 2024). *P. lucifera* has been documented in Madison, Oneida, Monroe, and Westchester counties (Green 1957, Lloyd 2018). Preliminary data from the Dark Skies for Fireflies project has not detected *P. lucifera* yet (NYNHP 2024). However, flash pattern data and voucher specimens were collected in 2023 and 2024 and species determinations and verifications are currently underway.

### New York records of *Pyraclomena lucifera*



**Figure 4:** NYS distribution of *Pyraclomena lucifera* based on historic records (pre-1999) primarily from Green 1957 and Lloyd 2018. These points represent low accuracy from georeferenced locations based on site location and county level descriptions (NYNHP 2024).

Table 1. Number of observations of *Pyraclomena lucifera* grouped by the dates known to be extant (repeat observations (element occurrences) include the years spanning first observation to last observation) and the number and percent of total of counties these observations fall within for New York State.

Years	# of records	# of Counties	% of counties in State
Pre-1999	5	4	6.5
2000-present	NA	NA	NA

**Details of historic and current occurrence:**

Percent of North American Range in NY	Classification of NY Range	Distance to core population, if not in NY
1-25%	Disjunct	

Column options

Percent of North American Range in NY: 100% (endemic); 76-99%; 51-75%; 26-50% 1-25%; 0%; Choose an item

Classification of NY Range: Core; Peripheral; Disjunct; (blank) or Choose an item

**IV. Primary Habitat or Community Type**

(from NY crosswalk of NE Aquatic, Marine, or Terrestrial Habitat Classification Systems):

NatureServe (2023) broad habitat types: Bog/fen, Herbaceous wetland, Temporary pool

**Habitat or Community Type Trend in New York**

Habitat Specialist?	Indicator Species?	Habitat/ Community Trend	Time frame of Decline/ Increase
Yes	Unknown	Unknown	Unknown

Column options

Habitat Specialist and Indicator Species: Yes; No; Unknown; (blank) or Choose an item

Habitat/Community Trend: Declining; Stable; Increasing; Unknown; (blank) or Choose an item

**Habitat Discussion:**

IUCN Red List (Walker and Pfeiffer 2021):

*Pyraetomena lucifera* is a wetland habitat specialist found in freshwater marshy areas with aquatic vegetation and cattails (Buschman 1984, Faust 2017).

**V. Species Demographics and Life History**

Breeder in NY?	Non-breeder in NY?	Migratory Only?	Summer Resident?	Winter Resident?	Anadromous/ Catadromous?
Yes	Yes	No	Yes	Yes	No

Column options

First 5 fields: Yes; No; Unknown; (blank) or Choose an item

Anadromous/Catadromous: Anadromous; Catadromous; (blank) or Choose an item

**Species Demographics and Life History Discussion**

(include information about species life span, reproductive longevity, reproductive capacity, age to maturity, and ability to disperse and colonize):

IUCN Red List (Walker and Pfeiffer 2021):

Based on studies by Buschman (1984), better life history information exists for *P. lucifera* than for most North American species. Larvae of this species are semi-aquatic and, although they

lack specialized tracheal gills for oxygen intake, they have been shown to survive a 31-day period under aerated water (Buschman 1984). They feed on gastropods (freshwater snails and limpets) and other invertebrates, which they hunt both above and below the water surface (Buschman 1984). Once they catch their prey under the water, they pull it out as they climb up emergent vegetation (Buschman 1984). When mature, larvae attach themselves to emergent vegetation and pupate 2 to 45 cm above water (Buschman 1984).

In the northern reaches of its range, *P. lucifera* adults are active from late June, through July and into August. In Florida, they can be found year-round (Faust 2017). Courtship displays begin about thirty minutes after sunset, peak within five minutes and remains intense for only 10- 15 minutes, after which activity decreases rapidly (Buschman 1984). During displays, males emit a quick, pale orange flash every three to five seconds, while flying low over marshy vegetation (Buschman 1984, Faust 2017). Females perched on nearby vegetation respond with a one second prolonged flash, sometimes with an afterglow (Faust 2017). Both sexes mate multiple times, and copulations averaged 33 hours (Buschman 1984). In captivity, females lived an average of about 30 days and about 100 eggs, which were deposited in groups on vegetation (Buschman 1984).

## VI. Threats

Threat Level 1	Threat Level 2	Threat Level 3	Spatial Extent	Severity	Immediacy	Trend	Certainty
6. Human Intrusions & Disturbance	6.1 Recreational Activities	6.1.8 Wildlife observation/photography	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
7. Natural System Modifications	7.3 Other Ecosystem Modifications	(habitat loss/degradation)	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
9. Pollution	9.3 Agricultural & Forestry Effluents	9.3.1 Nutrient loads	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
9. Pollution	9.3 Agricultural & Forestry Effluents	9.3.3 Herbicides & pesticides (runoff)	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
9. Pollution	9.6 Excess Energy	9.6.1 Light pollution	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
11. Climate Change	11.1 Habitat Shifting & Alteration	-	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
11. Climate Change	11.4 Changes in Precipitation & Hydrological Regimes	11.4.2 Droughts	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.

**Table 2.** Threats to *Pyraclomena lucifera*.

## Are there regulatory mechanisms that protect the species or its habitat in New York?

Yes:

No:



Unknown:

If yes, describe mechanism and whether adequate to protect species/habitat:

### Describe knowledge of management/conservation actions that are needed for recovery/conservation, or to eliminate, minimize, or compensate for the identified threats:

Threats to *P. lucifera* include light pollution, soil and air pollution, pesticides, habitat fragmentation and destruction, and climate change (Lewis et al. 2024). Minimizing these key threats are needed to conserve at-risk firefly species. In addition, Reed et al. (2020) found that fireflies have numerous risk factors that can contribute and make them more susceptible to various threats, including specialized diets, poor dispersal abilities, and unique mating signals and behaviors.

Artificial lights can impair firefly communication resulting in reduced courtship and mating (Faust et al. 2012). *P. lucifera* becomes active at late dusk and continues into complete darkness (Faust 2017). Being active at this time may potentially make it more sensitive to light pollution. Even low levels of light pollution can reduce reproductive success (Owens et al. 2022). Light pollution can be managed by turning off unnecessary lights and planting hedgerows or trees around occupied sites to block trespassing light. Pesticide exposure can reduce fitness and cause mortality, especially in the long-lived, ground-dwelling larval life stage. Runoff or direct exposure of insecticides, herbicides, and fertilizers may degrade firefly habitat and can have lethal and sublethal effects on fireflies (Lewis et al. 2024). Sublethal effects can include changes in the midgut, body convulsions, persistent glow, and other physiological changes (Wang et al. 2022). Indirect effects include contaminating and reducing available prey.

Habitat loss and degradation is another leading threat to firefly populations. While some fireflies are generalists, like the common *Photinus pyralis* (Big Dipper Firefly), others are habitat specialists and are restricted to specific conditions. Once unique habitats – such as wetlands and mature forests – are lost, fireflies may experience direct mortality or be unable to recolonize an area that has been converted or developed. Climate Change can result in more droughts, wildfires, floods, sea-level rise, etc. all of which can potentially negatively impact fireflies in all life stages. Maintaining the natural hydrology of a site will benefit firefly populations.

Overtourism can lead to development and trampling. Impressive firefly light shows can draw large crowds that may increase onsite light pollution or trample individuals and habitat (Lewis et al. 2024). While programming and education/outreach surrounding these species can increase insect conservation and awareness, care should be taken at known sites to limit access areas and light use during breeding.

Additional conservation actions to support at-risk firefly populations include reducing light pollution that spills into parks or other sensitive areas, eliminate the use of broad-spectrum insecticides, modify mosquito control programs to minimize risk to fireflies, and protect wetland and riparian habitat from recreational activities (Lewis et al. 2024).

**Table 3.** Recommended conservation actions for *Pyractomena lucifera*.

Action Category	Action	Description
A.1 Direct Habitat Management	A.1.0.0.0 Direct Habitat Management	Site/Area management
A.2 Direct Species Management	A.2.0.0.0 Direct Species Management	Invasive/problematic species control
B.3 Outreach	B.3.1.0.0 Outreach, communication, and distribution	Awareness & Communications
C.6 Design and Plan Conservation	C.6.0.0.0 Design and plan conservation.	Site/Area protection
C.6 Design and Plan Conservation	C.6.0.0.0 Design and plan conservation.	Resource/Habitat protection
C.6 Design and Plan Conservation	C.6.5.1.3 Develop a conservation, management, or restoration plan for protected private lands	Habitat and natural process restoration
C.7 Legislative and Regulatory Framework or Tools	C.7.1.3.0 Create, amend, or influence regulation	Regulations
C.7 Legislative and Regulatory Framework or Tools	C.7.2.1.0 Create or amend policies	Policies
C.9 Education and Training	C.9.2.0.0 Training and individual skill development	Training

## VII. References

### This SSA drew heavily from these resources:

New York Natural Heritage Program, State University of New York College of Environmental Science and Forestry. 2023. Element Occurrence and Element Dataset. Albany, New York. [Exported 12/14/2023].

NatureServe. 2023. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. <http://www.natureserve.org/explorer>. [Accessed 12/14/2023].

Walker, A. and B. Pfeiffer. 2021. *Pyractomena lucifera*. *The IUCN Red List of Threatened Species* 2021: e.T164044928A166771388. <https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T164044928A166771388.en>. Accessed on 14 October 2024.

**Additional references:**

Buschman, L.L. 1984. Biology of the firefly *Pyractomena lucifera* (Coleoptera: Lampyridae). *The Florida Entomologist* 67(4): 529-542.

Fallon C.E., Walker A.C., Lewis S., Cicero J., Faust L., Heckscher C.M., et al. 2021. Evaluating firefly extinction risk: Initial red list assessments for North America. *PLoS ONE* 16(11): e0259379. <https://doi.org/10.1371/journal.pone.0259379>

Fallon, C., A. Walker, S. Lewis, and S. Jepsen. 2022. State of the Fireflies of the United States and Canada: Distributions, Threats, and Conservation Recommendations. 64 pp. Portland, OR: The Xerces Society for Invertebrate Conservation. (Available online at <https://xerces.org/publications/scientific-reports/state-of-the-fireflies>)

Faust, L.F. 2017. Fireflies, Glow-worms, and Lightning Bugs: Identification and natural history of the fireflies of the eastern and central United States and Canada. The University of Georgia Press. Athens, Georgia. 356 pp.

Green, J.W. 1957. Revision of the Nearctic species of *Pyractomena* (Coleoptera: Lampyridae). *The Wasmann Journal of Biology* 15(2): 237-284.

iNaturalist community. 2023. Observations of *Pyractomena lucifera* from North America. Exported from <https://www.inaturalist.org> [Exported 12/14/2023].

Lewis, S.M., W.F.A. Jusoh, A.C. Walker, C.E. Fallon, R. Joyce, and V. You. 2024. Illuminating firefly Diversity: Trends, Threats, and Conservation Strategies. *Insects* 2024, 15, 71. <https://doi.org/10.3390/insects15010071>

Lloyd, J.E. 2018. *A naturalist's long walk among shadows: of North American Photuris - patterns, outlines, silhouettes... echoes*. Self-published, Gainesville, FL.

NYNHP. 2024. Unpublished firefly database. Compiled by New York Natural Heritage Program, State University of New York College of Environmental Science and Forestry. Albany, New York. [Exported 10/13/2024]

Owens, A.C.S., M. Van Den Broeck, R. De Cock, and S.M. Lewis. 2022. Behavioral Responses of Bioluminescent Fireflies to Artificial Light at Night. *Front. Ecol. Evol.* 10, 946640.

Reed, J.M., A. Nguyen, A.C.S. Owens, and S.M. Lewis. 2020. Linking the seven forms of rarity to extinction threats and risk factors: an assessment of North American fireflies. *Biodiversity and Conservation*. Volume 29: 57-75.

Wang, Y., C. Cao, and D. Wang. 2022. Physiological Responses of the firefly *Pyrocoelia analis* (Coleoptera: Lampyridae) to an Environmental Residue from Chemical Pesticide Imidacloprid. *Front. Physiol.* 13, 879216.

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