

The spiders of Prince Edward Island: experts and citizen scientists collaborate for faunistics

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Abstract

Although lists of spider species have been compiled for all of Canada's provinces and territories, the spider fauna of Prince Edward Island (PEI) is poorly known. Based on the efforts of citizen scientists, naturalists, and scientists on PEI and researchers at the Centre for Biodiversity Genomics, we present the first comprehensive list of spider species on the island, increasing the known number from 44 to 198. The Centre for Biodiversity Genomics conducted intensive collection in Prince Edward Island National Park; Nature PEI citizen scientists and naturalists contributed specimens from across the island from several different habitats. This provincial list is dominated by the araneoid families, Linyphiidae, Theridiidae, and Araneidae, with 55, 27, and 22 species, respectively. Several non-native species, such as the theridiid Eurasian False Black Widow Spider (*Steatoda bipunctata* (L.)) and the araneid Red-sided Sector Spider (*Zygiella atrica* (C.L. Koch)), have been collected in several locations on the island, suggesting that they are well established. This work highlights the effectiveness of collaboration among citizen scientists, naturalists, and professional researchers to further our knowledge of species diversity and distributions.

Key words: Maritime provinces; Araneae; Prince Edward Island; PEI; faunistics; citizen science; Arachnida

Introduction

Faunistic studies provide crucial biodiversity information and help accumulate the species distribution, habitat use, and relative abundance data necessary for conservation. Furthermore, faunistic studies record introduced species and their potential establishment as well as the movement of native species into new habitats or geographic areas over time. In several areas of the world, including Canada, the distribution of some species groups is poorly known. Obtaining a faunal baseline for a region is important because it allows tracking of future changes in species composition. Such temporal data are valuable in determining changes in, and relative abundances of, local species assemblages including decline or even extirpations of native species caused by, for example, climate change, the introduction and establishment of non-native species, or direct human alteration of landscapes and habitat (Shochat *et al.* 2004).

Spiders are a ubiquitous, diverse group, with about 47 000 species described worldwide (World Spider Cat-

alog 2018). Spider species lists and preliminary conservation status assessments have recently been compiled for all Canadian provinces and territories (CESCC 2016). Some provinces and one territory—British Columbia (Bennett *et al.* 2017), Yukon (Dondale *et al.* 1997), Manitoba (Aitchison-Benell and Dondale 1990), Quebec (Paquin and Dupérré 2003), and Newfoundland and Labrador (Pickavance and Dondale 2005; Perry *et al.* 2014)—have produced peer-reviewed or otherwise expert-created lists (e.g., online resources). Less comprehensive (but still useful) lists, resulting from habitat or area-specific ecological or faunistic studies, are available for Nova Scotia (Dondale 1956), Alberta (Buddle 2001; Holmberg and Buckle 2002), Ontario (Dondale 1971; Dondale and Redner 1994), Saskatchewan (Doane and Dondale 1979), New Brunswick (Boiteau 1983), Nunavut (Leech 1966; Pickavance 2006), and Northwest Territories (Working Group on General Status of NWT Species 2016).

Before the work reported here, no dedicated spider faunistics or ecological studies had occurred on Prince

Edward Island (PEI), and the spiders of the island appeared to be the most poorly known of the Canadian provinces and territories. To our knowledge, most of the 44 recorded species for PEI (Paquin *et al.* 2010; CESCC 2016) are a result of casual collecting by visiting entomologists/arachnologists or dedicated surveys focussed on documenting the distribution of a particular species (e.g., Knysh and Giberson 2012). In comparison, despite Nunavut's remoteness and small human population, it has at least 96 species of spiders (Pickavance 2006; CESCC 2016), and Nova Scotia and New Brunswick, the provinces bordering PEI, have 446 and 390 known species, respectively (Paquin *et al.* 2010; CESCC 2016).

Citizen science, the engagement of citizens to aid in the collection and/or processing of scientific data (Silvertown 2009), allows scientists to leverage the data acquisition power of the public (e.g., Prudic *et al.* 2017). This is particularly relevant in the context of faunistics because obtaining sufficient specimens to provide good coverage for a particular province (or over other broad spatial scales) could be a daunting task without the help of numerous volunteers (Acorn 2017).

PEI, which is approximately 5660 km² in area and lies on the east coast of Canada in the Gulf of St. Lawrence, is the smallest and most densely populated province (Statistics Canada 2016). Approximately 14 km of water separates PEI from the mainland (New Brunswick and Nova Scotia), and the adjacent ocean heavily influences the temperate climate. PEI generally has warmer winters and cooler summers than the nearby mainland, with average annual temperatures for January and July (1981–2010) of $-7 \pm 2.3^{\circ}\text{C}$ (mean \pm SD) and $19 \pm 1.2^{\circ}\text{C}$, respectively (ECCC 2017). In winter, PEI is surrounded by sea-ice that contributes to long, cool springs, while warming of the shallow Gulf of St. Lawrence in summer results in lengthy, mild autumns.

About 75% of the land is under 45 m elevation (Loo and Ives 2003). The province is over 90% privately owned (Statistics Canada 2016) and has a long history of land alteration and disturbance (Loo and Ives 2003; Sobey and Glen 2004). Most of the original Acadian Forest was cleared for agriculture by European settlers beginning in 1723, and, by 1900, an estimated 70% of the island was cleared (Loo and Ives 2003). Regenerated forest on former agricultural land and remaining fragments of original forest show a high degree of disturbance (Loo and Ives 2003; Sobey and Glen 2004). Forests currently make up 44% of the total area, active agriculture 38%, abandoned farmland 4%, while wetlands (6%) and coastal sand dunes (1%) are relatively rare habitats (Statistics Canada 2016).

Recently, a DNA barcoding project conducted by the Centre for Biodiversity Genomics (CBG) increased the number of spider species known from PEI to 82 (Blagoev *et al.* 2016). Most of the new records were produced after the data compilation that resulted in the

most recent wild species report from the Canadian Endangered Species Conservation Council (CESCC 2016). Building on that momentum, a project organized by Nature PEI involving numerous citizen scientists, in combination with experts, confirmed the presence of many of the previously documented species and further increased the list of spider species. Here we present the most comprehensive list of the 198 species now known to constitute the spider fauna of PEI.

Methods

Specimen collection and curation

In 2015, Nature PEI naturalists recruited volunteer citizen scientists to collect spiders from across PEI (Figure 1). Participants were given specific instructions via a training workshop and a field manual composed of a variety of papers and online resources (e.g., Martin 1977). The workshop described techniques for the selection of survey areas, collection and preservation of specimens, and recording and submission of field data on data cards. Specimen collection techniques consisted of pitfall trapping, sweep netting, foliage beating, aspiration, Berlese funnel extraction, and hand collecting. In total, 29 collectors (20 of whom were previously associated with Nature PEI) from across PEI contributed specimens.

Adult spiders were identified to species level by J.J.B., data-labelled, and stored in 80% ethanol in screw-cap vials with polyseal caps. A database of all specimens examined was created using Excel (Microsoft, Corp., Redmond, Washington, USA) and maintained by Nature PEI. Additional older specimens (<50) were supplied by the University of Prince Edward Island (UPEI) from beach collections and some sampling of other habitats, and are included in the Nature PEI survey. Specimens, excluding the UPEI beach specimens, have been deposited in the New Brunswick Museum in Saint John, New Brunswick (accession numbers: NBM-010790 to NBM-011349).

We compiled the list of species documented previously (i.e., Dondale and Redner 1978, 1982, 1990; Platnick and Dondale 1992; Dondale *et al.* 2003; Paquin *et al.* 2010) and, more recently by the CBG's DNA barcoding initiative (Blagoev *et al.* 2016) and CESCC (2016). We also searched (directly or via personal communication) the Canadian National Collection of Insects, Arachnids and Nematodes, New Brunswick Museum, Nova Scotia Museum of Natural History, UPEI, and Agriculture Canada collections in Charlottetown, but these yielded no additional records.

The CBG project used hand collecting, sieving, sweep netting, and trapping (Malaise, pan, pitfall, sticky) techniques at various sites along the trails of Prince Edward Island National Park, and one specimen was collected in Miscouche (Figure 1).

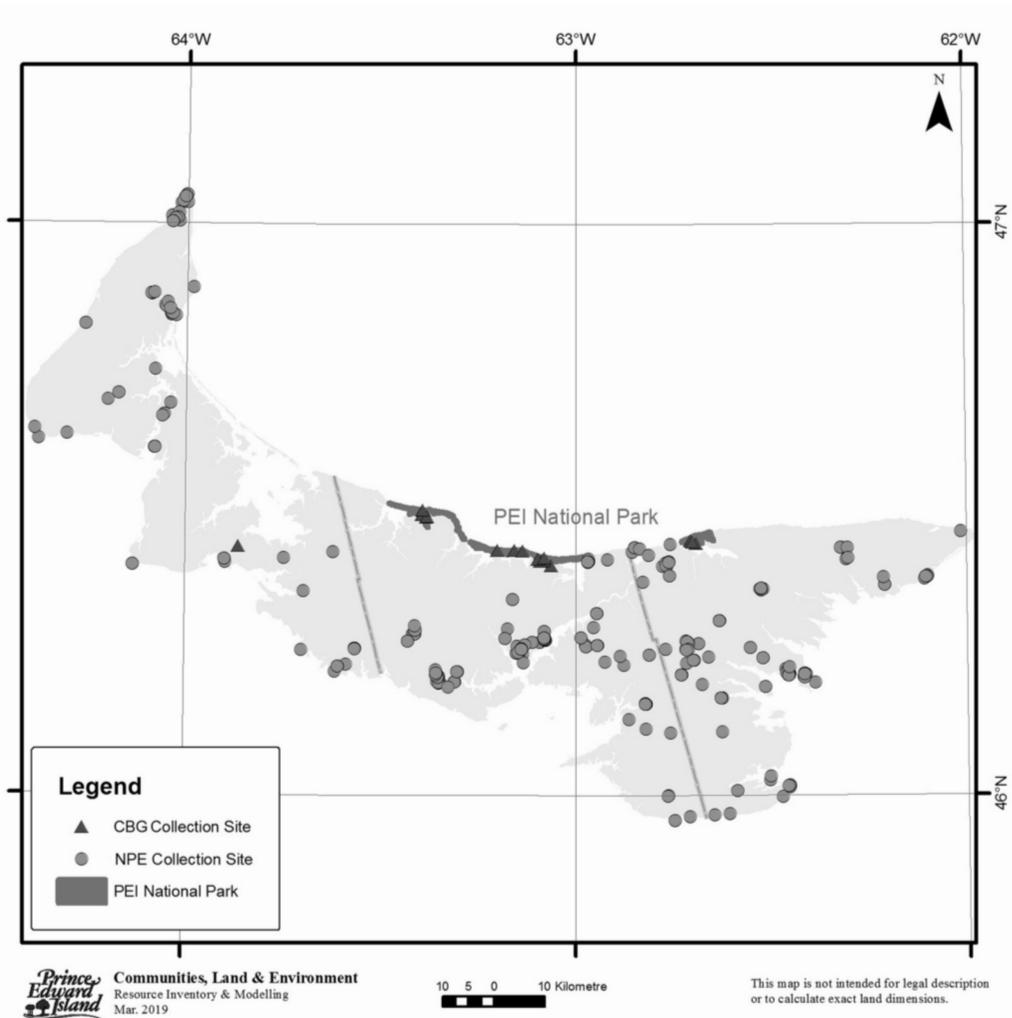


FIGURE 1. Spider collection sites on Prince Edward Island, Canada, in association with the efforts by the Centre for Biodiversity Genomics (CBG) and Nature PEI's citizen scientist campaign (NPE).

Nomenclature, specimen identification, habitat and locality data

Nomenclature follows the World Spider Catalog (2017); species are listed by family in alphabetical order. J.J.B. used various identification guides (e.g., Dondale and Redner 1978, 1990; Platnick and Dondale 1992; Dondale *et al.* 2003; Paquin and Dupérré 2003) and primary literature (e.g., Millidge 1983) to identify species and their preferred habitats. Specimens collected by the CBG were identified by G.A.B. using DNA barcoding and comparative morphology. Specimen data and photographs of barcoded specimens are available at the Barcode of Life Data System website (www.boldsystems.org; Ratnasingham and Hebert 2007).

Results

Before the CBG and Nature PEI activities, our literature, online, and museum searches yielded six other species records bringing the total to 44 species (Blagoev *et al.* 2016). More recent efforts by the CBG (G.A.B. unpubl. data) have added a further 69 new species many of which overlapped with the citizen science initiative reported here. The Nature PEI effort yielded 130 species from 737 adult specimens (over 4300 specimens collected in total). Barcode data recovered 82 species from Prince Edward Island National Park, of which 46 were new records for PEI. The complete list of spiders known to occur in PEI now comprises 198 species representing 20 families.

Some records, especially among the 44 known before Blagoev *et al.* (2016), have not been confirmed through barcoding or Nature PEI's initiative. These include Starbellied Orbweaver (*Acanthepeira stellata* (Walckenaer)), Sickie Big-headed Money Spider (*Baryphyma trifrons* (O. Pickard-Cambridge)), Autumn Money Spider (*Erigone autumnalis* Emerton), Maritime Patterned Money Spider (*Grammonota maritima* Emerton), Saxatile Thin-Legged Wolf Spider (*Pardosa saxatilis* (Hentz)), Common Pirate Wolf Spider (*Pirata piraticus* (Clerck)), and Punctate False Black Widow Spider (*Steatoda albomaculata* (De Geer)).

Nearly 10% (19 species) of the new records are non-native species. In comparison, only about 5% of all spider species recorded in Canada are introduced (Paquin *et al.* 2010; R.B. unpubl. data). Some of PEI's introduced species—e.g., Cross Orbweaver (*Araneus diadematus* Clerck), Zebra Jumping Spider (*Salticus scenicus* (Clerck)), Long-bodied Cellar Spider (*Pholcus phalangioides* (Fuesslin)), and Barn Funnelweaver (*Tegenaria domestica* (Clerck))—are cosmopolitan and synanthropic. None of the species recorded in this checklist is endemic to PEI.

Annotated list of species

Species are organized alphabetically by family, genera, and species. Data sources for physical specimens are indicated by NPE (Nature PEI), CBG (Centre for Biodiversity Genomics), or CNC (Canadian National Collection of Insects, Arachnids and Nematodes), with the NPE records solely due to NPE citizen scientist effort; otherwise literature records are indicated by reference (e.g., Dondale *et al.* 2003). Counties are indicated in bold followed by specific collection localities. Original 44 species (before NPE or CBG, i.e., 2015) are indicated as *. Probable records (R.B. pers. obs., cannot locate record) are indicated as † but not included in totals. Common names are from CESSC (2016). If the species is introduced, the origin is indicated; if native, the global range is stated (World Spider Catalog 2018).

AGELENIDAE (4 species)

Agelenopsis potteri (Blackwall, 1846) Nearctic
Common Grass Funnelweaver

Prince: Augustine Cove, Central Kildare, St. Nicholas, Norway; **Queens:** Bonshaw, Cavendish; Charlottetown, Dalvay, Marshfield St. Catherines, Orwell Cove; **Kings:** Abney, Brudenell, Cherry Island; Savage Harbour, Summerville

Habitat: Gardens, fields, and open forest, common around human dwellings

Data source: CBG, NPE

Agelenopsis utahana (Chamberlin & Ivie, 1933)
Northern Grass Funnelweaver Nearctic

Prince: Central Kildare; **Queens:** Brookvale, Charlottetown, Dalvay, Donagh, Wood Islands; **Kings:** Brudenell, Forest Hill, Launching

Habitat: Gardens, fields, and open forest, common around human dwellings

Data source: CBG, NPE

Coras montanus (Emerton, 1890) Nearctic
Northern Spurred Woodland Spider

Prince: Augustine Cove

Habitat: Litter of mixed coniferous forest; under bark; in crevices between rocks

Data source: NPE

Tegenaria domestica (Clerck, 1758) Palearctic
Barn Funnelweaver (introduced)

Prince: North Tryon; **Queens:** Charlottetown, St. Catherines; **Kings:** Summerville

Habitat: Cool, dark, humid areas such as basements and sheds

Data source: NPE

AMAUROBIIDAE (2 species)

Callobius bennetti (Blackwall, 1846) Nearctic
Eastern Laceweaver

Kings: Greenwich

Habitat: Litter of mixed coniferous forest; under (shoreside) stones

Data source: CBG

Cybaeopsis euopla (Bishop & Crosby, 1935) Nearctic
Common Spined Laceweaver

Queens: Dalvay; **Kings:** Launching

Habitat: Litter of mixed coniferous forest

Data source: CBG, NPE

ARANEIDAE (22 species)

**Acanthepeira stellata* (Walckenaer, 1805)
Starbellied Orbweaver Nearctic

Unknown collection locality

Habitat: Deciduous trees and shrubs, in forage crops, and in tall grass and weeds

Data source: Dondale *et al.* 2003

Araneus corticarius (Emerton, 1884) Nearctic
Humped Bog Orbweaver

Prince: Portage; **Queens:** Marshfield; **Kings:** Launching

Habitat: Bogs and swamps

Data source: NPE

Araneus diadematus Clerck, 1757 Palearctic
Cross Orbweaver (introduced)

Prince: North Tryon; **Queens:** Bonshaw, Cavendish, Charlottetown, St. Catherines, Donagh; **Kings:** Georgetown Royalty, Summerville, Launching, High Bank, Thomas Island, West St. Peters

Habitat: Widespread, particularly common around human-made structures and gardens

Data source: CBG, NPE

- Araneus groenlandicola* (Strand, 1906) Nearctic
Northern Bog Orbweaver
Queens: Blooming Point
Habitat: Bogs, low shrubs, stunted trees
Data source: NPE
- **Araneus marmoreus* Clerck, 1758 Holarctic
Marbled Orbweaver
Prince: Central Kildare, Freeland, North Tryon;
Queens: Donagh, Glenfinnan, Marshfield;
Kings: Launching
Habitat: Tall grasses/shrubs in marshes, sometimes moist open forest areas
Data source: Dondale *et al.* 2003, NPE
- Araneus nordmanni* (Thorell, 1870) Holarctic
Normann's Orbweaver
Queens: Bonshaw, Cavendish, Dalvay;
Kings: Brudenell, Summerville
Habitat: Mixed coniferous forest; trees and tall shrubs near forest
Data source: CBG, NPE
- **Araneus saevus* (L. Koch, 1872) Holarctic
Common Orbweaver
Queens: Bonshaw
Habitat: Trunks and lower branches of trees, mixed coniferous forest
Data source: Dondale *et al.* 2003, NPE
- Araneus trifolium* (Hentz, 1847) Nearctic
Shamrock Orbweaver
Queens: Blooming Point, Dalvay, Donagh;
Kings: Greenwich, High Bank, Launching, Summerville, West St. Peters
Habitat: Tall shrubs and herbs
Data source: CBG, NPE
- **Araniella displicata* (Hentz, 1847) Holarctic
Six-spotted Yellow Orbweaver
Queens: Cavendish, Dalvay; **Kings:** Greenwich, New Perth, Summerville
Habitat: Shrubs and herbs, deciduous trees, sometimes in conifers
Data source: Dondale *et al.* 2003, CBG, NPE
- **Argiope aurantia* Lucas, 1833 Nearctic
Yellow Garden Orbweaver
Queens: Cavendish, Charlottetown, Donagh, Orwell Cove; **Kings:** St. Catherines, Summerville
Habitat: Open areas e.g., gardens, meadows, old fields, shrubs, tall grasses
Data source: CBG, NPE
- **Argiope trifasciata* (Forsskål, 1775) Nearctic
Banded Garden Orbweaver
Prince: Central Kildare, North Cape, Norway, St. Nicholas; **Queens:** Blooming Point, Cavendish, Charlottetown, Donagh, Grandview; **Kings:** Summerville, West St. Peters
Habitat: Open areas e.g., gardens, meadows, old fields, shrubs, tall grasses
Data source: CBG, NPE
- Cyclosa conica* (Pallas, 1772) Holarctic
Common Trashline Orbweaver
Prince: Augustine Cove; **Queens:** Cavendish, Dalvay
Habitat: Shrubs and trees, mixed coniferous forest
Data source: CBG, NPE
- Eustala cepina* (Walckenaer, 1841) Nearctic
Riparian Duncecap Orbweaver
Kings: Greenwich
Habitat: Grassland, marshes, dune plants, roadside weeds, and garden crops
Data source: CBG
- Eustala emertoni* (Banks, 1904) Nearctic
no common name
Queens: Dalvay
Habitat: Fields, open forests, and marshes
Data source: CBG
- Eustala rosae* Chamberlin & Ivie, 1935 Nearctic
no common name
Queens: Dalvay
Habitat: Fields, open forests, and marshes
Data source: CBG
- **Hypsosinga pygmaea* (Sundevall, 1831) Holarctic
Common Dark-eyed Orbweaver
Queens: Blooming Point, Covehead; **Kings:** Greenwich
Habitat: Wet meadows, shrubs and herbs of forest edges and roadsides
Data source: Dondale *et al.* 2003, CBG, NPE
- Hypsosinga rubens* (Hentz, 1847) Nearctic
Forest Dark-eyed Orbweaver
Kings: Head of Cardigan
Habitat: Shrubs and herbs in forests, leaf litter and loose bark
Data source: NPE
- **Larinioides cornutus* (Clerck, 1758) Holarctic
Furrow Orbweaver
Prince: North Tryon, Coleman, Norway; **Queens:** Bonshaw, Brookvale, Cavendish, Covehead, Dalvay, Donagh, Kellys Cross; **Kings:** Forest Hill, Head of Cardigan, Milltown Cross, Savage Harbour, Summerville

Habitat: Common on human-made structures (e.g., fences, buildings), hedges, and shrubs
Data source: CBG, NPE

Larinioides patagiatus (Clerck, 1758) Holarctic
 Ornamental Orbweaver

Queens: Dalvay

Habitat: Common on human-made structures (e.g., fences, buildings), hedges, and shrubs, particularly near coniferous forest

Data source: CBG

Mangora placida (Hentz, 1847) Nearctic
 Tuft-legged Orbweaver

Queens: Brackley Beach, Cavendish, **Kings:** Head of Cardigan

Habitat: Undergrowth of deciduous forests, but may also be found in tall grass

Data source: CBG, NPE

**Neoscona arabesca* (Walckenaer, 1841) Nearctic
 Arabesque Orbweaver

Prince: Augustine Cove, Central Kildare; **Queens:** Blooming Point, Bonshaw, Covehead, Dalvay, Glenfinnan, Lake Verde, Marshfield, Mount Albion, South Melville, Wood Islands; **Kings:** Abney, Corraville, Forest Hill, Greenwich, High Bank, Launching, Little Sands, New Perth, Savage Harbour, St. Peters Harbour, Summerville

Habitat: Tall weeds and grasses

Data source: Dondale et al. 2003, CBG, NPE

**Zygiella atrica* (C.L. Koch, 1845) Palearctic
 Red-sided Sector Spider (introduced)

Prince: Norway, North Tryon; **Queens:** Cavendish, Charlottetown, Covehead, Bonshaw, Donagh; **Kings:** Brudenell, Greenwich, Head of Cardigan, Launching, Savage Harbour, St. Catherines, Summerville

Habitat: Heath plants and boulders along coastlines, also on human-made structures (e.g., fences, barns, windows)

Data source: Dondale et al. 2003, CBG, NPE

CLUBIONIDAE (13 species)

Clubiona abboti Koch, 1866 Nearctic
 Abbot's Sac Spider

Queens: Brackley Beach, Covehead, Dalvay; **Kings:** Summerville

Habitat: Litter of forests and meadows, under stones, in bogs/wetlands

Data source: CBG, NPE

Clubiona bryantae Gertsch, 1941 Nearctic
 Bryant's Sac Spider

Queens: Covehead; **Kings:** Corraville

Habitat: Litter from meadows, forest edges, litter from spruce-fir forests, herbaceous vegetation in bogs/swamps

Data source: CBG, NPE

**Clubiona canadensis* Emerton, 1890 Nearctic
 Canada Harpoon Sac Spider

Prince: Norway; **Queens:** Bonshaw, Brackley Beach, Cavendish, Dalvay; **Kings:** Greenwich, Savage Harbour, Woodville Mills

Habitat: Trees and shrubs, under loose bark, under stones, in leaf litter and moss

Data source: Dondale and Redner 1982, CBG, NPE

Clubiona johnsoni Gertsch, 1941 Nearctic
 Johnson's Sac Spider

Queens: Brackley Beach, Covehead

Habitat: On the ground of meadows, bogs, and forests, and from shrubs and beach litter

Data source: CBG

Clubiona kastoni Gertsch, 1941 Nearctic
 Kaston's Sac Spider

Queens: Covehead

Habitat: Forest litter, on beaches and sand dunes, or on bogs

Data source: CBG

Clubiona kiowa Gertsch, 1941 Nearctic
 Kiowa Sac Spider

Queens: Covehead

Habitat: Plant litter in marshes

Data source: CBG

Clubiona moesta Banks, 1896 Holarctic
 Mournful Sac Spider

Queens: Dalvay

Habitat: Branches of trees, under loose bark, in hayfields

Data source: CBG

Clubiona norvegica Strand, 1900 Holarctic
 Norway Harpoon Sac Spider

Prince: Norway; **Queens:** Covehead

Habitat: In sphagnum bogs, beach grasses, and salt marshes, on buildings, rocky lake shores, at the margins of prairie sloughs, occasionally in foliage

Data source: CBG, NPE

Clubiona obesa Hentz, 1847 Nearctic
 Trilobed Sac Spider

Queens: Cavendish

Habitat: Low-growing shrubs in deciduous forests, on trunks, and in tall grasses

Data source: CBG

- Clubiona pallidula* (Clerck, 1757) Palearctic
European Sac Spider (introduced)
Queens: Cavendish
Habitat: On shrubs, herbs, under bark
Data source: CBG
- Clubiona quebecana* Dondale & Redner, 1976
Quebec Sac Spider Nearctic
Queens: Dalvay
Habitat: Trunks and larger branches of deciduous trees such as oaks
Data source: CBG
- **Clubiona riparia* L. Koch, 1866 Holarctic
Riparian Sac Spider
Prince: Coleman; **Queens:** Blooming Point, Charlottetown; **Kings:** St. Catherines, Summersville
Habitat: In tall grass in marshes and near sloughs and lakes, mixed forest on the ground
Data source: Dondale and Redner 1982, NPE
- Clubiona trivialis* C.L. Koch, 1843 Holarctic
Conifer Sac Spider
Queens: Marshfield; **Kings:** Launching, Savage Harbour, St. Catherines, Thomas Island
Habitat: Spruce, fir, and pine foliage, sphagnum bogs, low deciduous shrubs, and loose bark, stones, and leaf litter in mixed forests
Data source: NPE
- DICTYNIDAE (9 species)
- **Argenna obesa* Emerton, 1911 Nearctic
Short-eared Meshweaver
Queens: Covehead, Cavendish
Habitat: Wetland, river banks, moist forest clearings
Data source: CBG
- Cicurina brevis* (Emerton, 1890) Nearctic
Small-eared Meshweaver
Queens: Brackley Beach; **Kings:** Launching, Greenwich
Habitat: Mostly in forest, but also fields under rocks and in rotten logs, in litter
Data source: CBG, NPE
- Dictyna bostoniensis* Emerton, 1888 Nearctic
Boston Thread Meshweaver
Queens: Covehead
Habitat: Mixed forest; shrubs and herbs
Data source: CBG
- Dictyna brevitarsa* Emerton, 1915 Nearctic
Short-heeled Thread Meshweaver
Queens: Dalvay; **Kings:** Greenwich
Habitat: Mixed coniferous forest; shrubs and herbs
Data source: CBG
- Dictyna volucripes* Keyserling, 1881 Nearctic
Truncated Thread Meshweaver
Prince: North Cape, Norway; **Queens:** Brackley Beach
Habitat: Shrubs and vegetation in open fields, potentially forest clearings
Data source: CBG, NPE
- Emblyna annulipes* (Blackwall, 1846) Holarctic
Common Ribbon Meshweaver
Prince: West Point; **Queens:** Dalvay
Habitat: Mixed forest litter, on low vegetation and trees
Data source: CBG, NPE
- Emblyna manitoba* (Ivie, 1947) Nearctic
Manitoba Ribbon Meshweaver
Queens: Covehead
Habitat: Mixed forest, low vegetation
Data source: CBG
- Emblyna phylax* (Gertsch & Ivie, 1936) Nearctic
Grooved Ribbon Meshweaver
Queens: Bonshaw; **Kings:** Greenwich
Habitat: Mixed forest, litter, and low vegetation
Data source: CBG, NPE
- Emblyna sublata* (Hentz, 1850) Nearctic
Wide Ribbon Meshweaver
Kings: Summersville, Head of Cardigan
Habitat: Vegetation in fields, shrubs, apple orchards on trees
Data source: NPE
- GNAPHOSIDAE (4 species)
- **Gnaphosa parvula* Banks, 1896 Nearctic
Slender Ground Spider
Kings: Corraville
Habitat: Under stones, boards, and beach debris, in meadows and bogs
Data source: Platnick and Dondale 1992, NPE
- **Herpyllus ecclesiasticus* Hentz, 1832 Nearctic
Parson Ground Spider
Queens: Dalvay; **Kings:** Summersville
Habitat: In buildings and under logs and stones, but also associated with deciduous trees, pine, and pitcher plants
Data source: CBG, NPE
- Micaria pulicaria* (Sundevall, 1831) Holarctic
Iridescent Antmimic Ground Spider
Queens: Donagh
Habitat: Fields, meadows, deciduous and mixed forests, bogs, and fens; on beaches and salt marshes; and in buildings
Data source: NPE

- **Zelotes fratris* Chamberlin, 1920 Holarctic
Common Preening Ground Spider
Queens: Covehead, Dalvay, Marshfield, Savage Harbour
Habitat: In litter of deciduous and coniferous forest, orchards, meadows, and in salt- and freshwater marshes
Data source: Platnick and Dondale 1992, CBG, NPE
- HAHNIIDAE (4 species)
- Antistea brunnea* (Emerton, 1909) Nearctic
Brown Comb-tailed Spider
Kings: Launching, New Zealand
Habitat: Wet areas in mixed forest
Data source: NPE
- Cryphoeca montana* Emerton, 1909 Nearctic
Mountain Comb-tailed Spider
Queens: Dalvay
Habitat: Mixed coniferous forest; under bark; shrubs
Data source: CBG
- Neoantistea gosiuta* Gertsch, 1934 Nearctic
Goshute Comb-tailed Spider
Queens: Dalvay
Habitat: Mixed coniferous forest
Data source: CBG
- Neoantistea magna* (Keyserling, 1887) Nearctic
Thick-hooked Comb-tailed Spider
Queens: Bonshaw, Dalvay; **Kings:** New Zealand
Habitat: Mixed coniferous woods; back of beaches; bogs.
Data source: CBG, NPE
- LINYPHIIDAE (55 species)
- Agyneta fabra* (Keyserling, 1886) Nearctic
Double-knobbed Short-legged Sheetweaver
Queens: Cavendish, Dalvay
Habitat: Mixed forest litter
Data source: CBG
- Agyneta unimaculata* (Banks, 1892) Nearctic
One-spotted Short-legged Sheetweaver
Queens: Brackley Beach
Habitat: Mixed forest litter
Data source: CBG
- Allomengea dentisetis* (Grube, 1861) Holarctic
Toothed Tuft-horned Sheetweaver
Prince/Queens: Malpeque Bay
Habitat: Coastal barrens and near ponds on ground/low vegetation
Data source: CNC
- **Baryphyma trifrons* (O. Pickard-Cambridge, 1863) Holarctic
Sickle Big-headed Money Spider
Locality unavailable
Habitat: Low shrubs and litter, damp habitats
Data source: Unavailable
- Bathyphantes canadensis* (Emerton, 1882) Holarctic
Canada Shield Sheetweaver
Prince: Central Kildare
Habitat: Mixed forest litter
Data source: NPE
- Centromerus denticulatus* (Emerton, 1909) Nearctic
Toothy Spurred Sheetweaver
Queens: Dalvay
Habitat: Mixed forest litter
Data source: CBG
- Centromerus persolutus* (O. Pickard-Cambridge, 1875) Nearctic
Thin-faced Spurred Sheetweaver
Queens: Dalvay
Habitat: Mixed forest litter
Data source: CBG
- Centromerus sylvaticus* (Blackwall, 1841) Holarctic
Common Spurred Sheetweaver
Kings: Greenwich
Habitat: Mixed forest litter
Data source: CBG
- Ceraticelus bulbosus* (Emerton, 1882) Holarctic
Hump-eyed Armoured Money Spider
Queens: Bonshaw
Habitat: Mixed forest, grass, and litter
Data source: NPE
- Ceraticelus emertoni* (O. Pickard-Cambridge, 1874) Nearctic
Emerton's Armoured Money Spider
Kings: St. Catherines
Habitat: Crop fields, coastal grasslands
Data source: NPE
- Ceraticelus fissiceps* (O. Pickard-Cambridge, 1874) Nearctic
Bicolored Armoured Money Spider
Prince: Augustine Cove, Central Kildare; **Queens:** Bonshaw, Charlottetown; **Kings:** Forest Hill, Kingsboro, Launching, Lorne Valley
Habitat: Mixed forest litter and low shrubs
Data source: NPE
- Ceraticelus similis* (Banks, 1892) Nearctic
Broad Armoured Money Spider
Queens: Cavendish, Dalvay
Habitat: Mixed forest litter and low shrubs
Data source: CBG

- Ceratinella brunnea* Emerton, 1882 Nearctic
Brown Waxed Money Spider
Queens: Bonshaw, Cavendish, Dalvay, Kellys Cross; **Kings:** Greenwich, New Zealand
Habitat: Mixed forest and adjacent grasslands, low shrubs
Data source: CBG, NPE
- Ceratinopsis nigriceps* Emerton, 1882 Nearctic
Stump-armed Arboreal Money Spider
Queens: Kellys Cross; **Kings:** Cardigan, Kingsboro, Launching, Summerville
Habitat: Mixed forest
Data source: NPE
- Collinsia plumosa* (Emerton, 1882) Nearctic
Feathered Money Spider
Queens: Dalvay; **Kings:** East Lake, Greenwich
Habitat: Mixed forest, low bushes and ground
Data source: CBG, NPE
- Diplocephalus subrostratus* (O. Pickard-Cambridge, 1873)
Common Muppet Money Spider Holarctic
Queens: Brackley Beach, Cavendish
Habitat: Mixed forest, meadows
Data source: CBG
- **Diplostyla concolor* (Wider, 1834) Holarctic
Long-spined Sheetweaver
Queens: Brackley Beach, Cavendish, Orwell; **Kings:** Greenwich, Launching, Savage Harbour
Habitat: Mixed forest, low shrubs and bushes, beaches, gardens, cultivated lands
Data source: CBG, NPE
- Drapetisca alteranda* Chamberlin, 1909 Nearctic
Northern Long-toothed Sheetweaver
Queens: Bonshaw, Dalvay
Habitat: Mixed forest
Data source: CBG, NPE
- Erigone aletris* Crosby & Bishop, 1928 Holarctic
Common Money Spider
Prince: North Tryon; **Queens:** Cavendish, Charlottetown; **Kings:** Greenwich, Kingsboro
Habitat: Mixed forest, bogs, litter, stones and low herbs near beaches
Data source: CBG, NPE
- Erigone arctica* (White, 1852) Holarctic
Circumpolar Money Spider
Prince: Miscouche
Habitat: Moist open habitats e.g., heathlands
Data source: CBG
- **Erigone autumnalis* Emerton, 1882 Holarctic
Autumn Money Spider
Locality unavailable
Habitat: Fields
Data source: Unavailable
- Erigone blaesa* Crosby & Bishop, 1928 Nearctic
Faltering Money Spider
Queens: Cavendish; **Kings:** Cherry Island
Habitat: Litter near fresh and saltwater beaches/shores, sand dunes
Data source: NPE
- **Erigone dentipalpis* (Wider, 1834) Palearctic (introduced)
Toothed-palped Money Spider
Kings: Head of Cardigan, Summerville
Habitat: Coastal barrens, mixed forest, gardens
Data source: NPE
- **Grammonota angusta* Dondale, 1959 Nearctic
Slender Patterned Money Spider
Prince: Augustine Cove, Miscouche, Norway; **Queens:** Bonshaw, Cavendish, Charlottetown, Dalvay, Kellys Cross; **Kings:** Kingsboro, Launching, New Perth, Summerville, Thomas Island
Habitat: Mixed forest, low vegetation, gardens
Data source: CBG, NPE
- Grammonota gentilis* Banks, 1898 Nearctic
Kinsman Patterned Money Spider
Prince: Miscouche; **Queens:** Cavendish, Dalvay; **Kings:** Summerville
Habitat: Mixed forest
Data source: CBG, NPE
- **Grammonota maritima* Emerton, 1925 Nearctic
Maritime Patterned Money Spider
Locality unavailable
Habitat: Coastal barrens
Data source: Unavailable/specimen record unverifiable
- Grammonota pictilis* (O. Pickard-Cambridge, 1875)
Painted Patterned Money Spider Nearctic
Queens: Brackley Beach, Cavendish, Dalvay
Habitat: Coniferous foliage
Data source: CBG
- Grammonota vittata* Barrows, 1919 Nearctic
Banded Patterned Money Spider
Queens: Glenfinnan
Habitat: Low vegetation, especially near bogs
Data source: NPE
- Hypomma marxi* (Keyserling, 1886) Nearctic
Marx's Under-eyed Money Spider

Prince: Augustine Cove; **Queens:** Bonshaw, Dalvay; **Kings:** Launching
Habitat: Mixed coniferous forest litter, beach and shrub litter
Data source: CBG, NPE

Porrhomma terrestre (Emerton, 1882) Nearctic
 Terrestrial Wide-eyed Sheetweaver
Queens: Covehead
Habitat: Mixed coniferous forest
Data source: CBG

Sciastes truncatus (Emerton, 1882) Nearctic
 Short-armed Money Spider
Queens: Dalvay
Habitat: Mixed coniferous forest, understorey, and litter
Data source: CBG

Scylaceus pallidus (Emerton, 1882) Nearctic
 Blemish Money Spider
Queens: Dalvay
Habitat: Mixed coniferous forest, especially on ground in mosses
Data source: CBG

Soulgas corticarius (Emerton, 1909) Nearctic
 Coathook Money Spider
Prince: Central Kildare; **Queens:** Covehead, Dalvay
Habitat: Mixed coniferous forest litter and coastal areas
Data source: CBG, NPE

Wabasso quaestio (Chamberlin, 1949) Nearctic
 Short-tongued Money Spider
Kings: Kingsboro
Habitat: Mixed coniferous forest, moist open areas, coastal barrens
Data source: NPE

Walckenaeria communis (Emerton, 1882) Nearctic
 Common Erudite Money Spider
Queens: Dalvay; **Kings:** Corrville, Launching
Habitat: In moss and moist litter in mixed coniferous forest, bogs, pond and lake shores
Data source: CBG, NPE

Walckenaeria exigua Millidge, 1983 Nearctic
 Small Horned Erudite Money Spider
Queens: Dalvay
Habitat: In moss and moist litter in mixed coniferous forest, bogs, shrub areas
Data source: CBG

Walckenaeria lepida (Kulczyński, 1885) Holarctic
 Pleasant Erudite Money Spider

Queens: Charlottetown, Dalvay, Kellys Cross;
Kings: Launching
Habitat: Mixed forest or shrub litter
Data source: CBG, NPE

Walckenaeria pinocchio (Kaston, 1945) Nearctic
 Pinocchio Erudite Money Spider
Queens: Dalvay
Habitat: Mixed coniferous forest
Data source: CBG

LIOCRANIDAE (1 species)
Agroeca ornata Banks, 1892 Nearctic
 Ornated Spiny-legged Spider
Prince: Central Kildare; **Queens:** Dalvay;
Kings: Greenwich, Launching
Habitat: Ground litter or decaying logs in mixed forests, and on the ground in pastures, meadows, marshes, sphagnum bogs, mosses, and lichens
Data source: CBG, NPE

LYCOSIDAE (12 species)
Alopecosa aculeata Charitonov 1931 Holarctic
 Pointed Wolf Spider
Prince: North Tryon; **Queens:** Marshfield
Habitat: Sunlit forest glades and shrubby meadows
Data source: NPE

**Arctosa littoralis* (Hentz, 1844) Nearctic
 Shoreline Wolf Spider
Kings: Greenwich, Launching
Habitat: Sandy beaches of both fresh- and salt-water
Data source: Dondale and Redner 1990, NPE

Gladicosa gulosa (Walckenaer, 1837) Nearctic
 Drumming Sword Wolf Spider
Kings: Summerville
Habitat: Open deciduous forest
Data source: NPE

Pardosa fuscata (Thorell, 1875) Nearctic
 Brown Thin-legged Wolf Spider
Kings: Abney, Corrville
Habitat: Moist habitats, mainly fresh and salt marshes, bogs, and meadows, occasionally coniferous forest
Data source: NPE

**Pardosa moesta* Banks, 1892 Nearctic
 Shiny Thin-legged Wolf Spider
Queens: Covehead, Brackley Beach; **Kings:** Abney, Corrville, Launching, Greenwich
Habitat: Meadows, hayfields, marshes, bogs, open forest, and urban lawns
Data source: Dondale and Redner 1990, CBG, NPE

- **Pardosa saxatilis* (Hentz, 1844) Nearctic
Saxatile Thin-legged Wolf Spider
Collection locality not listed in source
Habitat: Grassy fields and meadows, but also found in marshes, bogs, deciduous woods, and sandy beaches
Data source: Dondale and Redner 1990
- Pardosa xerampelina* (Keyserling, 1877) Nearctic
Ubiquitous Thin-legged Wolf Spider
Prince: Central Kildare
Habitat: Short grass, among herbs along streams, in dry stony river beds and lakeshores, in cultivated fields, along roadsides, in open forests
Data source: NPE
- **Pirata piraticus* (Clerck, 1757) Holarctic
Common Pirate Wolf Spider
Collection locality not listed in source
Habitat: Marshes (fresh and salt), swamps, bogs, and shores of lakes and streams
Data source: Dondale and Redner 1990
- Piratula cantralli* (Wallace & Exline, 1978) Nearctic
Cantrall's Pirate Wolf Spider
Queens: Glenfinnan, Dalvay; **Kings**: Corraville
Habitat: Marshes
Data source: CBG, NPE
- Piratula minuta* (Emerton, 1885) Nearctic
Small Pirate Wolf Spider
Queens: Dalvay
Habitat: Meadows, hayfields, marshes, swamps, and bogs
Data source: CBG
- Trochosa ruricola* (De Geer, 1778) Holarctic
Eurasian Litter Wolf Spider (introduced)
Queens: Cavendish, Covehead, Dalvay, Harrington; **Kings**: Savage Harbour, Summerville
Habitat: Forest, scrub, grasslands, lawns
Data source: CBG, NPE
- **Trochosa terricola* Thorell, 1856 Holarctic
Common Litter Wolf Spider
Prince: Cap Egmont; **Queens**: Harrington, Dalvay, Charlottetown
Habitat: Forest, grasslands, heathlands, under stones and logs
Data source: Dondale and Redner 1990, CBG, NPE
- PHILODROMIDAE (11 species)
- **Philodromus cespitum* (Walckenaer, 1802) Holarctic
Common Running Crab Spider
Queens: Covehead, Dalvay, Donagh
Habitat: On grasses, shrubs, and trees
Data source: Dondale and Redner 1978, CBG, NPE
- Philodromus histrio* (Latreille, 1819) Holarctic
Attractive Running Crab Spider
Kings: Greenwich
Habitat: On sagebrush in the west and on heath plants, weeds, and tall grasses
Data source: CBG
- Philodromus oneida* Levi, 1951 Nearctic
Oneida Running Crab Spider
Queens: Dalvay
Habitat: Foliage of various trees
Data source: CBG
- Philodromus peninsulanus* Gertsch, 1934 Nearctic
Peninsular Running Crab Spider
Queens: Dalvay
Habitat: Openings in mixed coniferous forest
Data source: CBG
- **Philodromus placidus* Banks, 1892 Nearctic
Conifer Running Crab Spider
Kings: Launching
Habitat: Foliage of conifers
Data source: Dondale and Redner 1978, NPE
- Philodromus praelustris* Keyserling, 1880 Nearctic
Resplendant Running Crab Spider
Queens: Brackley Beach, Dalvay; **Kings**: Head of Cardigan
Habitat: Tree trunks and branches, and on wooden fences and buildings
Data source: CBG, NPE
- Philodromus rufus* Dondale, 1964 Nearctic
White-striped Running Crab Spider
Prince: Augustine Cove, Central Kildare, Norway; **Queens**: Brackley Beach, Cavendish, Covehead, Dalvay, Marshfield; **Kings**: Cardigan, Launching, New Perth, Summerville
Habitat: Foliage of coniferous and deciduous trees and shrubs
Data source: CBG, NPE
- Thanatus formicinus* (Clerck, 1757) Holarctic
Ant Running Crab Spider
Kings: West St. Peters
Habitat: Mixed coniferous forest, under stones, and in grasses and low shrubs in meadows or orchards
Data source: NPE
- Thanatus striatus* C.L. Koch, 1845 Holarctic
Hairy Running Crab Spider
Queens: Brackley Beach
Habitat: Grassland litter and low vegetation
Data source: CBG

Tibellus maritimus (Menge, 1875) Holarctic
Grooved Running Crab Spider

Queens: Brackley Point; **Kings:** Greenwich

Habitat: Tall grass

Data source: CBG

Tibellus oblongus (Walckenaer, 1802) Holarctic
Slender Running Crab Spider

Prince: North Cape; **Queens:** Blooming Point, Grandview, South Melville; **Kings:** Head of Cardigan, Summerville

Habitat: Tall grass

Data source: NPE

PHOLCIDAE (1 species)

Pholcus phalangioides (Fuesslin, 1775) Palearctic
Long-bodied Cellar Spider (introduced)

Prince: North Tryon; **Queens:** Donagh; **Kings:** Brudenell, Head of Cardigan, Summerville

Habitat: In houses and other buildings

Data source: NPE

PHRUROLITHIDAE (2 species)

Phrurotimpus borealis (Emerton, 1911) Nearctic
Greater Antmimic Corinne Spider

Queens: Brackley Beach, Cavendish; **Kings:** Greenwich

Habitat: Leaf litter of coniferous or deciduous forest, prairies, bogs, swamps, and meadows, on rocky hill-sides, and under stones and beach debris

Data source: CBG

Scotinella minnetonka (Chamberlin & Gertsch, 1930) Nearctic
Midwestern Antmimic Corinne Spider

Kings: Greenwich

Habitat: On ground in pastures, meadows, swamps, deciduous forests, under stones

Data source: CBG

PISAUROIDAE (1 species)

Dolomedes triton (Walckenaer, 1837) Nearctic
Six-spotted Fishing Spider

Queens: Dalvay; **Prince:** Huntley, Gordon's Pond, MacNeill's Mills; **Queens:** Brackley Beach, Cavendish; **Kings:** Head of Cardigan, Forest Hill

Habitat: At the margins of ponds, lakes, and the quiet parts of rivers and streams

Data source: Knysh and Giberson 2012, CBG, NPE

SALTICIDAE (10 species)

Eris militaris (Hentz, 1845) Nearctic
Bronze Jumping Spider

Prince: Central Kildare, Portage, St. Nicholas, Norway, Coleman; **Queens:** Avondale, Cavendish, Bon-

shaw, Blooming Point, Dalvay, Charlottetown, Covehead, Marshfield; **Kings:** Abney, Brudenell, Greenwich, Head of Cardigan, Forest Hill, Launching, Milltown Cross, Savage Harbour, Summerville, West St. Peters

Habitat: On foliage of grasses, herbs, orchards, deciduous trees, shrubs

Data source: CBG, NPE

Evarcha hoyi (Peckham & Peckham, 1883) Nearctic
Hoy's Knobbed Jumping Spider

Kings: Launching, Forest Hill

Habitat: Shrubs, herbs, grasses, and other low vegetation

Data source: NPE

Neon nelli Peckham & Peckham, 1888 Nearctic
Nell's Tiny Jumping Spider

Queens: Cavendish, Brackley Beach, Dalvay

Habitat: Mixed hardwood leaf litter

Data source: CBG

Pelegrina flavipes (Peckham & Peckham, 1888) Nearctic
Big-headed White-cheeked Jumping Spider

Prince: Norway; **Queens:** Bonshaw, Charlottetown, Donagh; **Kings:** Forest Hill, Kingsboro, Launching, Savage Harbour, Summerville, Thomas Island, Woodville Mills

Habitat: Mixed coniferous foliage and bark, tall grasses in marshlands and fields

Data source: NPE

Pelegrina proterva (Walckenaer, 1837) Nearctic
Common White-cheeked Jumping Spider

Prince: Central Kildare, Norway; **Queens:** Cavendish, Bonshaw, Brackley Beach, Dalvay, Donagh, Kelly's Cross, Marshfield; **Kings:** Cape Bear, Forest Hill, Lorne Valley, Launching, Savage Harbour, Summerville

Habitat: Woodland understorey

Data source: CBG, NPE

Phidippus princeps (Peckham & Peckham, 1883) Nearctic
Sinuous Tufted Jumping Spider

Kings: Summerville

Habitat: Old fields, goldenrod

Data source: NPE, previous record unverifiable (immature *Phidippus* specimen)

Salticus scenicus (Clerck, 1757) Palearctic
Zebra Jumping Spider (introduced)

Prince: North Tryon; **Queens:** Brackley Beach, Donagh, Winsloe; **Kings:** Summerville

Habitat: On and in houses and other buildings, on fences, meadows, and fields

Data source: CBG, NPE

- *Sittiflor floricola palustris* (Peckham & Peckham, 1883)
Flower Patterned Jumping Spider Nearctic
Prince: West Point, Central Kildare; **Queens:** Covehead, Mount Albion, Wheatley River
Habitat: Bogs, marshes, fens, and meadows
Data source: CBG, NPE
- Synageles venator* (Lucas, 1836) Palaearctic
Palaearctic Antmimic Jumping Spider (introduced)
Queens: Charlottetown
Habitat: Sand dunes on the coast, tussocky or scrub vegetation close to wet areas
Data source: NPE
- *Tutelina similis* (Banks, 1895) Nearctic
Thick-spined Jumping Spider
Kings: Launching
Habitat: Grasslands, meadows, and other areas of low vegetation
Data source: NPE
- TETRAGNATHIDAE (10 species)
- *Pachygnatha brevis* Keyserling, 1884 Nearctic
Northeastern Thick Long-jawed Spider
Queens: Bonshaw, Marshfield; **Kings:** Forest Hill, Lorne Valley
Habitat: Swamps and salt marshes or plant debris near water
Data source: Dondale et al. 2003, NPE
- *Tetragnatha caudata* Emerton, 1884 Nearctic
Tailed Long-jawed Spider
Prince: Portage
Habitat: Bogs, marshes, and swamps among reeds and tall grasses
Data source: Dondale et al. 2003, NPE
- *Tetragnatha dearmata* Thorell, 1873 Holarctic
Uncommon Long-jawed Spider
Queens: Dalvay
Habitat: On trees and understorey shrubs in mixed coniferous forests, and swamp grasses
Data source: Dondale et al. 2003, CBG
- Tetragnatha elongata* Walckenaer, 1841 Nearctic
Elongated Long-jawed Spider
Queens: Blooming Point, Culloden, Dalvay, Glenfinnan Avondale, South Melville; **Kings:** Launching
Habitat: On branches that overhang streams, especially near forest
Data source: CBG, NPE
- *Tetragnatha extensa* (L., 1758) Holarctic
Northern Long-jawed Spider
- Queens:** Covehead; **Kings:** Head of Cardigan, Milltown Cross, St. Peters Harbour, Summerville
Habitat: Widespread on shrubs and trees in meadows
Data source: Dondale et al. 2003, CBG, NPE
- Tetragnatha guatemalensis* O. Pickard-Cambridge, 1889
Guatemala Long-jawed Spider Nearctic
Queens: Covehead, Dalvay
Habitat: Streamside or lakeside shrubs and tall herbs
Data source: CBG
- *Tetragnatha laboriosa* Hentz, 1850 Nearctic
Silver Long-jawed Spider
Prince: Kelvin, Miscouche, North Tryon; **Queens:** Blooming Point, Cavendish, Covehead, Glenfinnan; **Kings:** Corraville, Greenwich, St. Peters Harbour, Summerville
Habitat: Fields, roadsides, and crops, near or away from water, but also bogs, meadows, and marshes
Data source: Dondale et al. 2003, CBG, NPE
- Tetragnatha shoshone* Levi, 1981 Holarctic
Shoshone Long-jawed Spider
Queens: Cavendish, Dalvay; **Kings:** Greenwich
Habitat: Tall plants near lakes
Data source: CBG
- Tetragnatha versicolor* Walckenaer, 1841 Nearctic
Common Long-jawed Spider
Queens: Cavendish, Dalvay
Habitat: Trees and shrubs near water, but also mixed conifer forest
Data source: CBG
- Tetragnatha viridis* Walckenaer, 1841 Nearctic
Green Long-jawed Spider
Queens: Dalvay; **Kings:** Greenwich, St. Peters Harbour
Habitat: On coniferous trees, namely pine and balsam fir
Data source: CBG, NPE
- THERIDIIDAE (27 species)
- *Canalidion montanum* (Emerton, 1882) Holarctic
Montane Cobweaver
Queens: Dalvay
Habitat: Shrubs and trees in mixed coniferous forest
Data source: CBG
- Crustulina sticta* (O. Pickard-Cambridge, 1861)
Common Dimpled Widow Spider Holarctic
Queens: Covehead
Habitat: Among stones and among herbs and litter near beaches
Data source: CBG

Diploena nigra (Emerton, 1882)
Common Highbrowed Cobweaver

Kings: Corraville

Habitat: Mixed forest and shrubs

Data source: NPE

Enoplognatha latimana Hippa & Oksala, 1982
Cavernous Long-jawed Cobweaver

Palaearctic
(introduced)

Prince: West Point; **Queens:** Donagh, Grandview;

Kings: St. Peters Harbour, Summerville

Habitat: Fields and field margins; open, dry habitats, low vegetation, and shrubs

Data source: NPE

**Enoplognatha ovata* (Clerck, 1757)
Polymorphic Long-jawed Cobweaver

Palaearctic
(introduced)

Prince: Central Kildare; **Queens:** Blooming Point, Cavendish, Charlottetown, Dalvay, Donagh, South Melville; **Kings:** Little Sands, Summerville

Habitat: Fields and field margins, open habitats, low vegetation and shrubs, gardens

Data source: CBG, NPE

Euryopsis argentea Emerton, 1882
Black-headed Triangular Cobweaver

Holarctic

Queens: Covehead

Habitat: Mixed forest litter

Data source: CBG

Euryopsis funebris (Hentz, 1850)
Eastern Triangular Cobweaver

Nearctic

Queens: Covehead

Habitat: Mixed forest litter

Data source: CBG

Neospintharus trigonum (Hentz, 1850)
Horned Parasitic Cobweaver

Nearctic

Queens: Cavendish, Dalvay

Habitat: Mixed forest

Data source: CBG

Neottiura bimaculata (L., 1767)
Bimaculated Cobweaver

Palaearctic
(introduced)

Queens: Covehead; **Kings:** Greenwich

Habitat: Low vegetation and bushes, sometimes low branches of trees, broad habitats

Data source: CBG

Parasteatoda tabulata (Levi, 1980)
Wandering House Cobweaver

Palaearctic
(introduced)

Prince: Central Kildare, North Tryon; **Queens:** Charlottetown, Donagh; **Kings:** Brudenell, Elliot-vale, Savage Harbour, Summerville, West St. Peters

Habitat: In houses, sheds, other buildings, sometimes gardens

Data source: NPE

Parasteatoda tepidariorum (C. L. Koch, 1841)
Common House Cobweaver

South America
(introduced)

Queens: Charlottetown

Habitat: In houses, sheds, other buildings, sometimes gardens

Data source: NPE

Phoroncidia americana (Emerton, 1882)
Hump-backed Cobweaver

Nearctic

Kings: Launching

Habitat: Coniferous tree foliage (e.g., cedar, pine) near farms and adjacent fields, sometimes litter

Data source: NPE

Platnickina tincta (Walckenaer, 1802)
Conifer Cobweaver

Palaearctic
(introduced)

Queens: Cavendish, Marshfield; **Kings:** Savage Harbour

Habitat: Shrubs and tree foliage, gardens, parks, roadsides

Data source: CBG, NPE

Robertus riparius (Keyserling, 1886)
Bent Immaculate Cobweaver

Nearctic

Kings: Launching, New Zealand

Habitat: Mixed coniferous forest litter

Data source: NPE

Rugathodes sexpunctatus (Emerton, 1882)
Six-spotted Cobweaver

Holarctic

Queens: Cavendish

Habitat: Mixed coniferous forest, shrubs, gardens, parks

Data source: CBG

**Steatoda albomaculata* (De Geer, 1778)
Punctate False Black Widow Spider

Holarctic

Locality unavailable

Habitat: Sandy areas, sparsely vegetated areas, rocky ground

Data source: Unavailable/specimen record unverifiable

Steatoda bipunctata (L., 1758)
Eurasian False Black Widow Spider

Palaearctic
(introduced)

Prince: Traveller's Rest, North Tryon, Central Kildare; **Queens:** Charlottetown, Marshfield;

Kings: Head of Cardigan, Summerville

Habitat: Near human-made structures, e.g., fences, buildings, houses, sheds

Data source: NPE

- Theridion differens* Emerton, 1882 Nearctic
Common Long-legged Cobweaver
Prince: Central Kildare; **Queens:** Brackley Beach, Covehead, Marshfield
Habitat: Low vegetation in mixed coniferous forest, wetland areas
Data source: CBG, NPE
- Theridion frondeum* Hentz, 1850 Nearctic
Eastern Long-legged Cobweaver
Prince: Portage; **Queens:** Blooming Point, Dalvay, South Melville, Wood Islands; **Kings:** Summerville
Habitat: Deciduous forest, shrubs and herbs
Data source: CBG, NPE
- **Theridion glaucescens* Becker, 1879 Nearctic
Large-spined Long-legged Cobweaver
Queens: Dalvay
Habitat: Mixed coniferous forest, low foliage
Data source: CBG
- Theridion murarium* Emerton, 1882 Nearctic
Fence Long-legged Cobweaver
Prince: Central Kildare; **Queens:** Dalvay; **Kings:** New Perth
Habitat: Mixed coniferous forest
Data source: CBG, NPE
- Theridion pictum* (Walckenaer, 1802) Holarctic
Wetland Long-legged Cobweaver
Queens: Charlottetown, Dalvay
Habitat: Mixed coniferous forest
Data source: CBG, NPE
- Theridion varians* Hahn, 1833 Palearctic (introduced)
Eurasian Long-legged Cobweaver
Prince: North Tryon; **Queens:** Cavendish; **Kings:** Summerville
Habitat: Tree and shrub foliage, fences, grasslands
Data source: CBG, NPE
- Theridula emertoni* Levi, 1954 Nearctic
Emerton's Bitubercled Cobweaver
Queens: Blooming Point
Habitat: Mixed coniferous forest
Data source: NPE
- Thymoites unimaculatus* (Emerton, 1882) Nearctic
Spotted Cobweaver
Queens: Covehead; **Kings:** Canavoy
Habitat: Fields, mixed coniferous forest, marshes
Data source: CBG, NPE
- Wamba crispulus* (Simon, 1895) Nearctic
Bayonet Cobweaver
Prince: Central Kildare; **Queens:** Dalvay
Habitat: Mixed coniferous forest, grasslands
Data source: CBG, NPE
- Yunohamella lyrica* (Walckenaer, 1841) Holarctic
Lyric Cobweaver
Queens: Dalvay; **Kings:** Launching
Habitat: Most common in dry, pine-dominated areas, but also in other coniferous trees and grasslands
Data source: CBG, NPE
- THERIDIOSOMATIDAE (1 species)
Theridiosoma gemmosum (L. Koch, 1877) Holarctic
Common Eastern Ray Spider
Queens: Dalvay; **Kings:** Greenwich
Habitat: Damp areas (e.g., swamps), or wet cliff faces and overhanging stream banks, grassy fields with rose bushes, mossy ground in white spruce stand
Data source: CBG
- THOMISIDAE (8 species)
Bassaniana utahensis (Gertsch, 1932) Nearctic
Utah Bark Crab Spider
Prince: Central Kildare; **Queens:** Brackley Beach
Habitat: Under tree bark and in litter of mixed forest
Data source: CBG, NPE
- **Misumena vatia* (Clerck, 1757) Holarctic
Goldenrod Crab Spider
Prince: North Cape, St. Nicholas; **Queens:** Cavendish, Covehead, Dalvay, Donagh; **Kings:** Greenwich, Head of Cardigan, Launching, Summerville, West St. Peters
Habitat: On flowers and foliage of many herbs, shrubs, and deciduous trees in pastures, meadows, and orchards
Data source: CBG, NPE
- **Ozyptila distans* Dondale & Redner, 1975 Nearctic
Distant Leafhopper Crab Spider
Queens: Brackley Beach, Dalvay, Kellys Cross; **Kings:** Greenwich, Head of Cardigan
Habitat: Swamps, sphagnum bogs, abandoned fields, and pine litter
Data source: Dondale and Redner 1978, CBG, NPE
- Tmarus angulatus* (Walckenaer, 1837) Nearctic
Tuberculated Crab Spider
Kings: Head of Cardigan, Summerville
Habitat: Mixed forest and nearby grasslands and shrub vegetation
Data source: NPE
- Xysticus canadensis* Gertsch, 1934 Holarctic
Boreal Ground Crab Spider
Queens: Dalvay
Habitat: Mixed coniferous forest
Data source: CBG

Xysticus emertoni Keyserling, 1880 Holarctic
Emerton's Ground Crab Spider

Kings: Corraville, Summerville

Habitat: Fields, meadows, bogs, and herbaceous vegetation

Data source: NPE

Xysticus punctatus Keyserling, 1880 Nearctic
Punctated Ground Crab Spider

Queens: Dalvay; **Kings:** Savage Harbour

Habitat: On trees and litter of mixed coniferous forest

Data source: CBG, NPE

Xysticus triguttatus Keyserling, 1880 Nearctic
Three-banded Ground Crab Spider

Prince: Central Kildare

Habitat: On ground in grasslands, on shrubs and herbs

Data source: NPE

ULOBORIDAE (1 species)

Hyptiotes gertschi Chamberlin & Ivie, 1935 Nearctic
Gertsch's Triangle Weaver

Kings: Launching

Habitat: Mixed coniferous forest, pine stands on trees

Data source: NPE

Discussion

We have shown that collaboration among experts and volunteer citizen scientists can contribute effectively to our understanding of the diversity and distribution of species. Broad-scale contributions from the public overcame the logistic difficulties associated with collecting specimens from a diverse range of habitats and geographic locations across PEI. The naturalists engaged, organized, and trained citizens in collection and preservation techniques and the experts identified, recorded, and prepared voucher specimens. This approach is particularly important in efforts to document the current state of biodiversity, including the conservation status of species across the globe.

We have increased the number of spider species known to occur on PEI to 198 through the combined efforts of professional researchers using DNA barcoding technology and comparative morphology and through the help of citizen scientists using traditional collecting and identification methods. Concerted volunteer effort in combination with novel technology, such as DNA barcoding, have produced a baseline record of spider diversity for the province.

The CBG and Nature PEI studies complemented each other in unforeseen ways. Although the CBG surveyed one protected area intensively, citizen scientists surveyed a range of habitat types over a wide geographic area, demonstrating that many of the species collected within the 27-km² national park are distributed across the entire province. The increased number of specimens collected via a citizen science approach can

result in an increased opportunity for studies of species occurrence, relative abundance, and relationships (Acorn 2017). In addition, an especially noteworthy positive outcome is that more active community engagement in conservation was encouraged and the project was widely reported through various media (e.g., CBC News 2016), providing positive feedback for involvement in community collection efforts.

Collaboration among experts and citizen scientists in this time of rapid species loss is imperative to help document the diversity and distribution of species on earth (Ceballos *et al.* 2015). It does take effort by professionals and naturalists to engage and train the public in such ventures, but fortunately, there are ever-growing opportunities for academics and governmental and non-governmental agencies to engage the public and inform them about how they can contribute to these efforts (Bonney *et al.* 2009, 2014; Prudic *et al.* 2017).

The citizen science approach also presents some challenges; for example, participants tend to sample sites familiar to them and the quality of specimens and associated data submitted can be highly variable. Thus, less than 20% of the over 4300 specimens collected by the Nature PEI citizen scientists were adults that could be positively identified by morphological characteristics. Nonetheless, their efforts yielded about a quarter of the total number of species, with many others overlapping the parallel DNA barcoding. Efforts to conduct faunistic surveys such as these even in a province of this size would be more challenging without contributions from the public.

PEI lies in the Gulf of Saint Lawrence with New Brunswick to its west and south, and Nova Scotia to its east and south. Thus, unsurprisingly and similar to other species groups, the PEI spider fauna largely represents a subset of species found in those adjacent provinces (e.g., Adler *et al.* 2005; Majka *et al.* 2008). Many were likely able to colonize PEI when it was connected to the mainland some 10 000 years ago (Shaw *et al.* 2002). However, the proximity of the adjacent mainland means that many spider species are capable of colonizing the island via aerial ballooning (Greenstone 1990) or even via natural rafts, such as floating algae (Coffin *et al.* 2017). Humans have likely introduced others accidentally. Despite PEI's relatively small human population, it is densely populated and is a popular tourist destination during summer months.

Some species previously reported from PEI were not collected during the Nature PEI or CBG studies. This absence could indicate that these species are rare on PEI, are present in habitats that were not well surveyed in the two studies (e.g., *Pirata piraticus* in wetlands), were originally misidentified, or simply no longer exist on the island. Although PEI is the smallest province in Canada, it possesses a diversity of habitat types. As with other animal groups, some spider species are habitat generalists, while others are specialists depending on their physiological requirements. In some

cases, narrow physiological requirements dictate that species distributions may change dramatically across very small spatial scales (e.g., microhabitats; DeVito *et al.* 2004). For example, DeVito *et al.* (2004) found that three species of wolf spider distributed themselves in proximity to a river corresponding to their desiccation thresholds. A high turnover in species across the landscape may mean that some are missed in faunistic studies. Despite intensive sampling by the CBG, it was spatially restricted and focussed on the national park, whereas the efforts by Nature PEI were broad in geographic scope, but much less intensive and often consisted of a single collection at a given site.

As is typical for many groups in eastern North America, several introduced species are now well established on PEI. The degree to which introduced species may affect native species is not well known, but some evidence supports the idea that such introductions could lead to competitive exclusion (Houser *et al.* 2014).

Some species collected in this project (e.g., *Gladicosa gulosa*) are otherwise known only from more southern localities (e.g., southern Nova Scotia, Quebec, or Ontario) in Canada or in the continental United States (Dondale and Redner 1990). PEI lies near the boreal-temperate transition zone and the discovery of such species could indicate a northward shift in their range. Because we do not have reliable information about the past presence of species on the island, it is impossible to know for certain how long this species or others have existed there. This is in contrast to species such as *Misumena vatia* or *Pardosa xerampelina*, which have been collected in all other provinces in Canada and some territories, as well as the Magdalen Islands, in the case of the latter, but never before documented from PEI (Dondale and Redner 1978, 1990).

The finding that the Linyphiidae was the most speciose group in this collection is typical of other spider lists in Canada (e.g., Dondale *et al.* 1997; Pickavance and Dondale 2005), including those from community ecology studies (e.g., Buddle 2001). Indeed, the Linyphiidae is the second most speciose family globally (second to the Salticidae), boasting over 4500 species (World Spider Catalog 2017), but their diversity is especially high in northern environments (e.g., Bowden and Buddle 2010).

Although we have made substantial progress in documenting the spiders of PEI, we expect that many additions remain to be made. Moreover, additional species could be found through further collection in areas that were not well sampled during this effort, such as sand dunes, hardwood stands, and various agricultural fields, marshes, and upper tree canopies, which could yield some unique species (Larivière and Buddle 2009). Collection in these areas could also benefit from more intensive pitfall trapping.

We achieved strategic collaboration among professional, naturalists, and citizen scientists, and emphasize that these relationships are mutually beneficial where

professionals are aided by the collection of data and citizens can learn more about local species and their natural history. We hope that our efforts inspire others to participate in such collaborative projects and to continue to contribute to social networks and online repositories dedicated to documenting species (e.g., iNaturalist). Still, professionally led research projects on biodiversity in PEI would likely yield further records and provide a better portrait of species community structure.

Author Contributions

R.C. indicated the need for a study and initiated discussion. J.J.B., K.M.K., G.A.B., R.B., and R.C. conceptualized the study and methods, J.J.B., G.A.B., and R.B. produced or compiled data. R.C. procured funding for the NPE portion of the project. K.M.K., R.C., C.F.H., and R.W.H. contributed to project administration by supervising and leading the NPE citizen science specimen collection initiative. M.A.A. created the map figure. J.J.B. and R.B. wrote the original draft of the article and undertook revisions. All authors contributed to revisions and approved the final manuscript.

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