

A Preliminary Survey for Spiders on St. Eustatius, West Indies

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ABSTRACT

Three photographic surveys were conducted during the period; 2010 to 2011, 2013 and 2014, and supplemented by physical sampling for a one-week period in January 2015, in a wide variety of habitats on the island of St. Eustatius, West Indies, for the presence of spiders. Seventeen localities were surveyed from 15 habitats, including five man-made habitats. Twenty-four families representing 53 species were collected. Members of the family Araneidae comprised almost a quarter of the species found. More species in natural than in human-made or highly disturbed habitats.

Key words: *Anapidae, Araneidae, Barychelidae, Clubionidae, Corinnidae, Filistatidae, Gnaphosidae, Lycosidae, Mimetidae, Miturgidae, Mysmenidae, Ochyroceratidae, Oecobiidae, Oxyopidae, Pholcidae, Salticidae, Scytodidae, Sicariidae, Sparassidae, Tetragnathidae, Theridiidae, Theridiosomatidae, Thomisidae, Theraphosidae.*

INTRODUCTION

Arthropods comprise the most diverse animal group in any terrestrial environment. However, sampling arthropods is particularly challenging due to traits such as small size, short generation time, diversity, limited distribution and strict environmental requirements (microhabitats). These traits make it possible in theory to map environmental diversity and track environmental changes faster and more precisely than longer lived and more flexible organisms like vertebrates and plants.

Spiders have a worldwide distribution, occupying all land environments except at the polar extremes. Currently almost 46,058 species of spiders are described (World Spider Catalog 2016), representing what is believed to be roughly one-fifth of the total in the world. The spider fauna of the neotropics remains relatively unknown. Currently, the islands of Barbados (G. Alayón and J. Horrocks, unpubl.), St. Vincent and the Grenadines (Simon 1894; de Silva *et al.* 2006), Anguilla (Sewlal and Starr, 2010), Antigua (Sewlal 2009a), Nevis (Sewlal and Starr 2007), St. Kitts (Sewlal 2008), Grenada (Sewlal 2009b), Montserrat (Sewlal 2010a), St Lucia (Sewlal 2011) and Great Inagua, Bahamas (Sewlal and Starr 2011) are the only islands in the Caribbean whose spider fauna has been documented at the species level, although this has been done at the family level for Trinidad (Cutler 2005; Sewlal and Cutler 2003; Sewlal and Alayón 2007; Sewlal 2009c, 2010b).

The overall goal of the project was to collect and document a substantial part of the total species present in a broad range of habitats, both natural and those influenced by human activities. This paper forms an addition to the series of papers, listed above, documenting the spider fauna of islands in the Caribbean region.

METHODS

Photographic surveys of the spider fauna of St Eus-

tatius were conducted between 2010 and 2011, 2013 and 2014. This data was supplemented by a survey that took place 10-17 January 2015 utilising specialised techniques aimed at collecting spiders. The sampling methodology was unstandardised with respect to sampling techniques, collecting team and sample period, and took place over a five-year period.

St Eustatius lies at 17°30'N 62°58'W in the northern Leeward Islands of the West Indies, southeast of the Virgin Islands and immediately northwest of Saint Kitts and Nevis. The island is a saddle shape, with two elevations. "The Quill" to the southeast reaches an altitude of 602m and a collection of hills to the northeast, known as the Northern Hills, have a maximum altitude of 289.4m (Madden and Esteban 2008). St Eustatius provides a range of habitats including deciduous and semi-evergreen seasonal forest, dry evergreen forest, montane thickets, thorny woodland, and elfin forest. The selection of habitats and localities for this survey were on consultation with staff at (St. Eustatius National Parks) STENAPA and Caribbean Netherlands Science Institute (CNSI) (Fig. 1).

The photographic surveys of 2010 to 2011 were carried out by Morpeth primarily involving searching for specimens within all microhabitats of the sample site (e.g. under rocks, within soil and leaf litter, under bark, within vegetation and on/in webs). Both diurnal and nocturnal sampling was done for this survey. All specimens were collected in jars and photographed by Hannah Madden (STENAPA National Park Ranger/Education Officer), either in the field or after collection. Whenever possible a photo was taken to see the eye pattern of the spider, which is an important identification characteristic. Some individuals could not be identified due to their extremely small size, and thus difficult to photograph; these were omitted from the study. After being photographed, the spec-



Fig. 1. Localities sampled in St. Eustatius for the period 2010, 2011, 2013, 2014 and 2015. Map taken from Google Maps.

imens were released at the location at which they were found. These photographs were sent to Dr. Rolando Teruel at BIOECO (Museo ‘Tomas Romay’) for identification. Dr Teruel was able to identify 75% of the spiders photographed.

Brief photographic surveys were carried out in 2013 and 2014 each lasting for five days. Photos during these surveys were taken by Mark Yokoyama (Les Fruits de Mer, St Maarten).

Supplementary sampling of the main vegetation types was carried out by Sewlal and Starr during the period 10-17 January 2015. The main collecting methods employed were sweep-netting and visual searches, both at ground level and above ground, including shrubs and low trees. Both collecting methods were employed at each site visited. The former concentrated on dislodging any individuals resting or hiding in the vegetation, whilst

the latter relied on visual cues in addition to the orb-webs to find old webbing or retreats or silk threads that could lead to the retreats of nocturnal species. Cryptic microhabitats, such as under rocks, rotting logs and bark were also searched. No nocturnal surveys were conducted as these were deemed too dangerous. All specimens were stored in glass vials in 95% alcohol.

Nests of the mud-dauber wasp *Sceliphron cf. assimile* (Sphecidae) were found in abundance under a rocky outcrop at the base of the Boven National Park. This genus is known to exclusively use spiders to provision their nests (Iwata 1976). Therefore active and recently sealed nests were collected as a potential additional source of spiders.

Specimens from the 2015 survey are deposited in the Land Arthropod Collection of the Zoology Museum at the University of the West Indies, St Augustine, Trinidad and Tobago.

RESULTS

During this study, 17 localities (Fig. 1) covering 15 habitat types were sampled, including six that were man-made or heavily influenced by human activities. The sampling effort produced a total of 53 species from 24 families. Since sampling effort was not standardised comparisons of species richness between habitats/locations must be made with caution. The results showed that overall the natural habitats (31 species) and habitats occupied by humans or influenced by human activities (38 species) contained similar numbers of species (Table 1). The dry scrubland habitat yielded 24 species; whilst the garden habitat produced 19 species (Fig. 2). However, of the habitats sampled, the two altered habitats (abandoned storage shed and ruins) yielded only one and two species respectively (Table 1). Araneidae was the dominant family, yielding 13 species. Araneidae and Tetragnathidae were the two most ecologically diverse families containing species collected from nine and seven habitats respectively. Species from 12 families were found in only one habitat, five of which were collected from dry scrubland (Fig. 3), indicating that this habitat had a unique species composition. However, this is a preliminary survey and with further sampling more species from those families could be found in other habitats on the island.

DISCUSSION

Based on sampling efforts conducted on other islands in the region, it was not surprising that the thorny scrubland on Gilboa Hill proved particularly speciose in terms of web-building spider species. The thorny vegetation provides increased points of attachment which are more stable for web construction. However, the grass and understory vegetation in some places provides pockets of microhabitat suitable for non-web-building species for example, those of the family Salticidae and Miturgidae. In this locality, we found two aggregations of the leaf litter dwelling species *Aleimosphenus licinus* (Tetragnathidae). It was observed that this species shared its microhabitat with many lizards of the species *Anolis* sp. a known predator of spiders. This observation led to the hypothesis that this species' bright red colour is aposematic, the testing of which requires further research.

In terms of habitats modified by human activities, garden yielded the most species. This may be as they have similar conditions as thorny scrubland that favour web-building spider species which comprised a majority of the species recorded in this habitat. The pathways and gaps in gardens allow prey in particular, flying insects which can be blown into webs. Another feature of most altered habitats is the presence of artificial lighting during the night which attracts flying insects, so that nocturnal species have

a relatively steady food supply.

The two habitats yielding the least number of species were ruins (two species) and abandoned buildings (a single species). *Oecobus* sp. (Oecobiidae) which is commonly found on ruins in other islands were found on the ruins of a sugar plantation building on the eastern side of the island, but not the western coast along Gallows and Oranje Bays. Their absence could be due to the fact that most of the ruins were located at the waters' edge and thus subjected to constant wave action. The presence of the second species found in this habitat - *Kukulcania hibernalis* (Filistatidae)

Sampling efforts yielded three species of the family Pholcidae commonly called Cellar Spiders or Daddy Long-legs. In forested habitats the space between buttress roots, (referred to as "buttress notches") a common spider microhabitat, was consistently empty throughout the island, probably because they were not deep enough to provide shelter and protection from the elements or predators. Semi-evergreen forest habitat yielded three species. However, the conditions inside the crater were closest to a rainforest and individuals of the genus *Modisimus* were observed. It is expected that this habitat contains a fairly rich spider fauna however, the trail proved too challenging to proceed very far inside as it has become degraded over the years especially during a period of very heavy rain in 2010 (Jessica Berkel, pers. comm.).

Along the trails on Gilboa Hill in the northern part of the island, which is considerably drier, pholcid spiders were found between the stem and the base of the leaves of the terrestrial bromeliad *Bromelia humilis*. This sturdy and thorny vegetation would prevent easy access by predators like birds and lizards. The single species detected from an abandoned storage facility approximately 100m from the airport was *Smeringopus pallidus* (Pholcidae). This species is documented from caves and abandoned houses in Anguilla (Sewlal and Starr 2010).

Despite the known association between the wasp *Sceliphron* cf. *assimile* and spiders, their nests yielded no spiders or their exoskeletons. Further sampling of nests during nesting season, suspected to be during the late northern summer, might be more fruitful.

With respect to human health, the species *Latrodectus geometricus* (Theridiidae), commonly called the Brown Widow, and those belonging to the infraorder Mygalomorphae, commonly referred to as "tarantulas" should be approached with caution but are not regarded as fatal. Although no specimens of this infraorder were collected from this survey, their presence was confirmed by the presence of the tarantula-hunting wasp *Pepsis ruficornis* (Pompilidae).

Table 1. Continued. Araneomorphae and Mygalomorphae spiders for each habitat sampled in St. Eustatius for the period 10-17 January 2015. *NOTE:* Sampling effort was not standardised so any comparisons of species richness between habitats/locations must be made with caution.

Families and Species	Garden	Roadside	In and on Buildings	Pasture land	Ruins	Abandoned storage facility	Sceliphron sp nests	Coastal Vegetation	Thorny woodland	Dry evergreen forest	Semi-evergreen forest	Montane thickets	Elfin woodland	Deciduous forest	Dry scrubland
Salticidae															
Sp A				✓											✓
Sp B	✓														✓
<i>Hentzia</i> sp.															✓
<i>Menemerus bivittatus</i>			✓												
<i>Lyssomanes</i> sp				✓								✓			
Scytodidae															
<i>Scytodes fusca</i>												✓			
<i>Scytodes longipes</i>			✓												
Sicariidae															
<i>Loxosceles caribbaea</i>															✓
Sparassidae															
<i>Olios</i> sp.									✓						
Theridiidae															
Sp. A										✓					
<i>Anelosimus studiosus</i>	✓														
<i>Latrodectus geometricus</i>	✓														
<i>Argyrodes elevatus</i>	✓														✓
<i>Faiditus</i> sp.	✓														
Theridiosomatidae															
Sp A				✓									✓		
Tetragnathidae	✓										✓		✓		
<i>Leucauge argyra</i>															
<i>Leucauge regyni</i>	✓								✓	✓		✓	✓		✓
<i>Aleimosphenus licinus</i>													✓		✓
<i>Tetragnatha</i> sp.															✓
Theraphosidae															
<i>Cyrtopholis</i> sp.											✓				
Thomisidae															
<i>Misumenops bellulus</i>	✓														
TOTAL (number of species)	19	6	4	6	2	1	0	6	9	7	3	7	4	5	24

CONCLUSION

This study documents a substantial part of the spider diversity of St Eustatius from a range of natural habitats and habitats influenced by human activities. This study therefore serves as a baseline study for the spider fauna of the island and forms part of a series of papers documenting the spider fauna of islands in the Caribbean region. Together they help to build a picture of the biodiversity and biogeography of the Caribbean region. In addition to standardising sampling effort in future surveys, nocturnal sampling should be included to detect species which escape detection during the day.

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