A survey of the family *Sphingidae* in Springfield, Dominica

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Abstract

The purpose of this study was (1) to perform a survey of the biodiversity of the family Sphingidae of Dominica, West Indies (2) to compare the moon phases and the effect of Lepidopteran activity.

Introduction

Dominica is an unique island in the Caribbean, lying in the center of the Lesser Antilles. Most islands that have separated over time have a reduced diversity of fauna; however, Dominica has one of the richest. (Lack,et al., 1997)The vegetation of Springfield, Dominica, located in the Parish of St. Paul, consists of cultivated and disturbed land, which consists of mostly fruit, tree crops, and ornamental plants.

(Lack, et al., 1995) The flora present at Springfield allows the larvae of Sphingidae to flourish.

Description

Sphinx, or Hawk, moths belong to the family Sphingidae. Approximately 1,200 species are present in the world. (Grimaldi & Engel, 2005) They are medium to large size and closely resemble bumblebees and hummingbirds. The body is round and robust with the abdomen tapering down to a sharp point. The proboscis is prominent and long enabling the adult to feed and hover over flowering plants like hummingbirds. The wingspread is 160mm or more and a frenulum and a retinaculum joins the forewing and the hindwing.(Scoble,1995) Sphingids are known to be one of the fastest fliers of the Lepidopteran order. The wings are narrow allowing the organism to have a strong rapid wing beat. (Triplehorn & Johnson, 2005)

The female will first lay, one at a time, translucent flat green eggs on the host plant and will hatch from 3 to 21 days depending on temperature and altitude. (Scoble, 1995 & Pittway, 1993) The larvae have a dorsal horn at the tip of the abdomen, known as the "hornworm" and also have just few hairs on the body. When disturbed the larvae will resume a sphinx-like position by tucking its head and holding the legs off the surface; this is most likely why the family is known as the common name of 'Sphinx moth.' (Triplehorn, Charles A., Johnson, Norman F.) The larvae will consume herbaceous and woody plants during the day and at night and pupate in soil and form cocoons in the leaf litter. The larvae of *Eumorpha vitis*, may feed on *Cissus verticillata* and *Ludwigia erecta*. (http://www.silkmoths.bizland.com/evitivit.htm), both flora have been recorded on the island. The pupae have a cremaster at the tip of the abdomen. As an adult, it will feed on nectar and is able to live up to 10 to 30 days. (Pittaway, 1993) The adults are active at night, twilight, and at dawn. (Covell, 1984) Below are pictures of specimens collected from the study.

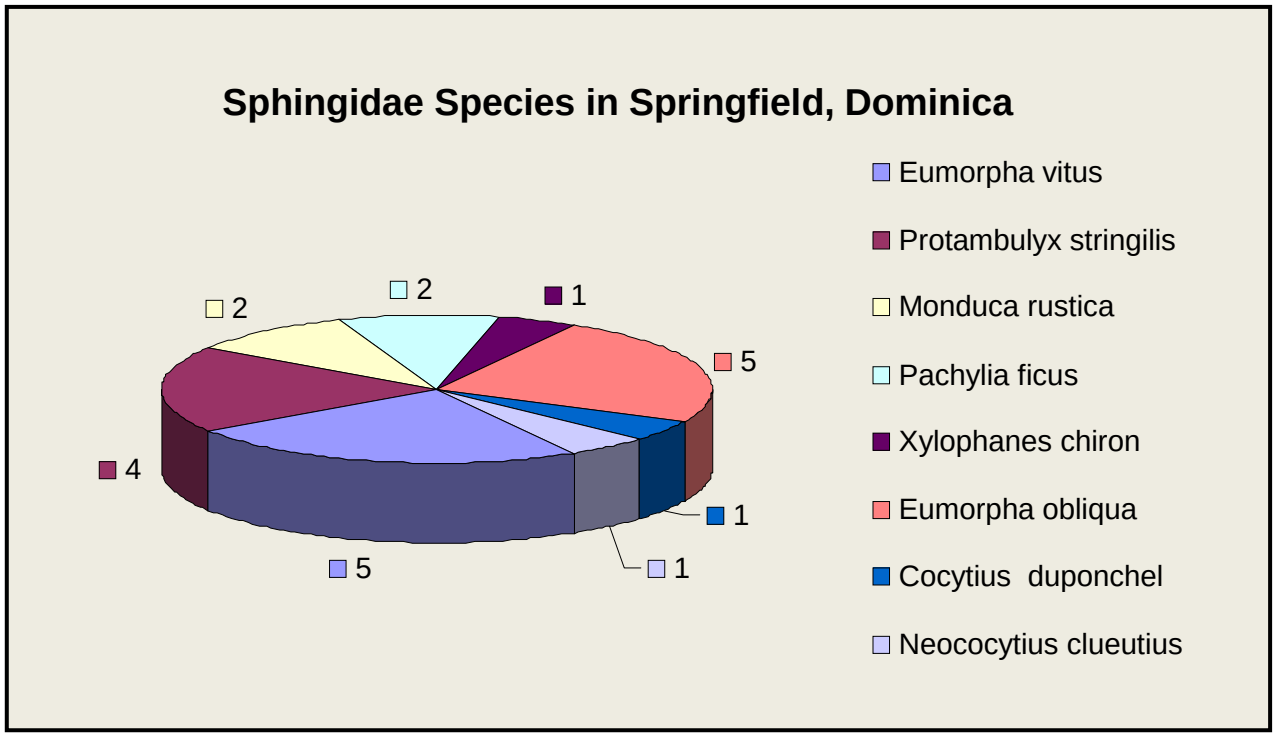
Materials and Methods

The primary means of collecting Sphingidae was by a light trap. A light trap consists of a light, 'Eye Self-Ballasted Mercury Lamp,' at 220 watts, rope, queen white sheet, extension cord, and a power source. In order to properly preserve the scales of the wings, as they are fast fliers with a strong wing beat, a syringe filled with ethyl alcohol was inserted into the thorax to quickly and humanely kill the specimen. The specimen was maintained in a jar until pinned, identified, and labeled. Voucher specimens of all species collected in this study have been deposited in the insect collection, Archbold Tropical Research and Education Centre, Springfield, Dominica.

A Field Guide to the Moths of Eastern North America ,by Charles V. Covell, Jr., Borror and DeLong's Introduction to the Study of Insects, by Charles A. Triplehorn, Norman F. Johnson, as well as a previous study, in 2002, by Jennifer Morrison, at Springfield, Dominica were used to aid in pinning and identification. Depending on the size of the specimen a size 2 or 3 pin was used. The specimen is first removed from the jar and a pin is inserted through the high point of the thorax, making a right angle to the long axis of the body. The specimen must remain level. Next, the insect is placed on the spreading board so that the wings lie flat and right angles are made to the body. Thin strips of paper are held over the wings with a size 3 pin. The paper strips aid in moving the wings. A small triangular space is left between the forewing and the hind wing. Each portion of the wing is moved gently in order to hold the Lepidoptera in place. A label describing the species with the date is place on the board next to the specimen. The specimen must remain on the board until dried.

Results

The pie chart below demonstrates the distribution of species collected at Archbold, Springfield.



A table below lists the species that were collected daily. The highest point of collecting, from May 22 to June 2, 2009, was on May 24 with a total of eight specimens collected. The lowest points of collecting include May 27, 28, 30 and June 2. The most prevalent species collected was *Eumorpha vitus.* Linnaeus

Specimens Recorded and Collected Daily

	22-May	23-May	24-May	25-May	26-May	27-May	28-May	29-May	30-May	31-May	1-Jun	2-Jun
Species												
Cocytius duponchel											1	
Eumorpha obliqua		2	1	1								
Eumorpha vitus Linnaeus	3		2		1							
Monduca rustica			1									
Neococytius cluentius										1		
Pachylia ficus		1	1									
Protambulyx strigilis	1		3					1				
Xylophanes chiron	1											
Total	5	3	8	1	1	0	0	1	0	1	1	0

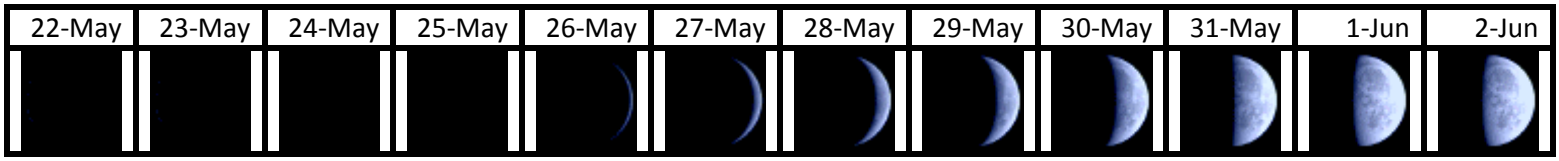
Discussion

The light trap was set up at dawn until approximately midnight. During the first two evenings, May 22- 23, of the survey, the trap was set out facing the Caribbean Sea. In order to prevent the light trap from becoming soaked with rain the light trap was moved facing the mountains to the west. In addition, a black light was set up at a lower elevation at Archbold, and as a result not a single sphingid appeared. The light trap facing the west was the primary source for collecting sphingids.

There are several factors that may potentially influence the activity of Sphingidae. These include rainfall, temperature, and the phase of the moon. Biological rhythms often are influenced by external cues that synchronize various behavioral and physiological systems. Illumination is

especially important from a behavioral perspective in organisms ranging from invertebrates to mammal. (Pittendrigh, 1993)

Moon phases from May 22 to June 2, 2009



The most insect activity for Sphingidae was on May 24, 2009, when the moon was at the 'new moon' phase. From May 24, the amount of Sphingids steadily decreased as the phases of the moon increased. Unfortunately moonlight creates an additional variable in light-trap sampling, apparently by affecting the congregation of moths at light in ways not well understood, hence there is usually a pronounced lunar periodicity in numbers caught. It seems certain that this periodicity is in part an artifact of trapping, the possibility remains that moonlight may affect, not only efficency of sampling, but also the proportion of the flight-worthy individuals of a population that fly. (Brown, E.S., and Taylor, L.R.) Based on the data collected from this study, Sphingidae are most active during a new moon instead of a full moon.

There have been several studies pertaining to animal behavior and lunar effects. C.B. Williams performed a study concerning the 'Influence of Moonlight on Activing of Certain Noctornal Insects, Particularly the Family Noctuidae as Indicated by a Light Trap.' In this study, seventeen out of the eighteen lunar months the captures of the Noctuidae in the "no moon" week were above those of the "full moon" week. It has been found in other investigations, that the

most important non-periodic single factor in determining the catch is the minimum temperature of the night.

A study of Sphingidae at localities with different light sources for light traps would aid in furthering the investingation. In addition, comparing nocturnal and diurnal Sphingidae and noting the rainfall, temperature, and moon phases, would help further understand more about the characterization of these organisms.

Acknowledgement

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References

1. A field Guide to the Moths of Eastern North America. Covell, Charles V. Jr, Houghton Mifflin Company Boston 1984.
2. Dominica Nature Island of the Caribbean. Illustrated Flora. Lack, Andrew J., Whiteford, Caroline, Evans, Peter G.H., James, Arlington. 1997)
3. The Lepidoptera: Form, Function and Diversity. Scoble, Malcolm J.Oxford University Press & Natural History Museum London.1995.(2nd edition)
4. Borror and DeLong's Introduction to the Study of Insects Triplehorn, Charles A., Johnson, Norman F. (7^{th} edition)2005 ISBN 0-03-096835-6
5. Cycles in the Distribution and Abundance of Airborne Insects in the Equatorial Highlands of East Africa E. S. Brown and L. R. Taylor *Journal of Animal Ecology*, Vol. 40, No. 3 (Oct., 1971), pp. 767-779 (article consists of 13 pages) Published by: British Ecological Society Stable URL: http://www.jstor.org/stable/3449

6. The Influence of Moonlight on the Activity of Certain Nocturnal Insects, Particularly of the Family Noctuidae, as Indicated by a Light Trap C. B. Williams Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences, Vol. 226, No. 537 (Oct. 19, 1936), pp. 357-389 (article consists of 33 pages) Published by: The Royal Society Stable URL: http://www.jstor.org/stable/92272

7. Online at http://www.silkmoths.bizland.com/evitivit.htm (as of 6 June 2009)

8. Online at http://www.meteo.dm/pages/dt2.htm (as of 6 June 2009)

9. Online at http://www3.interscience.wiley.com.ezproxy.tamu.edu:2048/cgi-bin/fulltext/121541111/HTMLSTART?CRETRY=1&SRETRY=0 (as of 6 June 2009)

10. Online at http://www.reliefweb.int/rw/fullMapsAm.nsf/0/5C4A2A941802C1D28525

6EF30075731F/$File/cia_dominica.gif?OpenElement (as of 6 June 2009)

11. Online at http://skepdic.com/fullmoon.html (as of 6 2009)