

# VERTICAL DISTRIBUTION OF NOCTURNAL ARTHROPODS AT THE FOREST EDGE AT LA SELVA, COSTA RICA

Julie L. Bykowski and Dorothee K. Schreiber

## ABSTRACT (JLB & DKS)

We examined the insect orders and Lepidoptera families attracted to blacklights at two different heights above the ground at the edge of secondary growth forest. The differences in taxa captured at the two sampling heights suggest differences in habitat usage and/or behavioral responses to light.

Key Words: nocturnal arthropods, night-flying Lepidoptera, moths, blacklight capture, vertical distribution

## INTRODUCTION (JLB & DKS)

This year's insect comparative study (Zug et al 1994) reported wide variation of insect orders among various microhabitats. We were curious about the differential representation of nocturnal arthropod taxa in different vertical microhabitats. Various theories have been proposed to explain why certain insects are attracted to blacklights, including physiological short-circuiting (Janzen, 620). Regardless of the underlying mechanism of attraction, it is a useful technique for sampling the nocturnal arthropod composition. We hypothesized that arthropod composition would vary with distance above the ground. Therefore we predicted a greater total abundance of insects at the low site. As flying insects, such as nocturnal Lepidoptera, should be able to use the full vertical expanse of the secondary forest, we expected some families to be differentially represented at the higher and lower sites.

## METHODS (JLB & DKS)

We erected two blacklight stations behind

the main laboratory at La Selva Biological Station, Costa Rica on 13-15 January, 1994. Trap 1 was on the balcony of the laboratory, 4.5m above ground. A white sheet 0.5m<sup>2</sup> was surrounded by 0.5m high black plastic sheets on two sides and on the bottom with a sheet angled 45° upwards, to prevent scattering of light. Trap 2 was 0.75m above the ground at its highest point. We again covered the top and three sides of the frame from which the 0.5m<sup>2</sup> sheet hung with opaque black plastic. Both traps were illuminated with a standard blacklight bulb and were 10m from the edge of secondary growth forest.

On both nights, surrounding white lights were extinguished at 22:00 and the first blacklight was illuminated at 22:30. We surveyed the contents of our trap at 45-minute intervals until dawn, alternating between the two locations. On the second night the schedule was reversed. Contents were counted and identified to order (all) or family (Lepidoptera).

## RESULTS (JLB & DKS)

We found eight orders of insects at both

Table 1: Number of insects representing eight orders captured at the forest edge, La Selva, Costa Rica. Chi-square statistics test for unequal capture rates at the two levels.

Order	Number of Individuals			
	Lower	Upper	X <sup>2</sup>	P
Diptera	38	44	0.44	>0.05
Hemiptera	3	1	----	----
Homoptera	480	35	384.52	<0.05
Lepidoptera	58	56	0.04	>0.05
Megaloptera	2	0	----	----
Orthoptera	73	36	4.47	<0.05
Tricoptera	4	1	----	----
Total	658	140		

of our blacklight stations (Table 1). At the lower blacklight, we found a significantly greater abundance of Orthoptera ( $X^2 = 64.47$ ,  $p < 0.05$ ) and Homoptera ( $X^2 = 384.52$ ,  $p < 0.05$ ). Diptera and Lepidoptera were equally abundant at both trapping sites ( $X^2 = 0.44$ ). Hemiptera, Tricoptera, and Megaloptera were also present in low numbers (Table 1).

Within the order Lepidoptera, six families were found at both blacklights; Saturnidae responded only to the lower light. The abundance of Liparidae was significantly greater at the lower blacklight station ( $X^2 = 4.46$ ,  $p < 0.05$ ). This trend was also evidence in the Arctiidae, while Geometridae appeared in greater abundance at the upper blacklight (Table 2). The families Pyralidae, Noctuidae, Saturnidae, Sphingidae, and the sub-order Microlepidoptera were also present but in low abundance.

## DISCUSSION (JLB & DKS)

Differences in the insect taxa captured at different heights were consistent with known

Table 2: Abundance of Lepidoptera families at two heights at the forest edge, La Selva, Costa Rica. Chi-square statistics test for unequal capture rates at the two levels.

Order	Number of Individuals			
	Lower	Upper	X <sup>2</sup>	P
Actiidae	8	1	-	-
Geometridae	2	7	-	-
Liparidae	9	2	4.46	>0.05
Noctuidae	3	2	-	-
Pyralidae	3	6	-	-
Saturnidae	3	0	-	-
Sphingidae	1	2	-	-
Other Macro-				
Lepidoptera	0	3	-	-
Microlepidoptera	21	33	2.66	>0.05
Total	58	56		

habitat use. Orthopterans (grasshoppers) and Homopterans (leafhoppers) are herbivorous and forage largely near the ground whereas Diptera and Lepidoptera, dependent on flight to reach flowers, fruit, and follow pheromone trails, are able to move vertically. This also suggests that nocturnal insects attracted to blacklights will not be attracted to a light outside of their normal range.

Within the Lepidoptera, the different abundances at the two trapping levels suggests that families use different night-flying or orientation strategies.

Further investigations in the physiological basis of attraction to light and use of light as a directional reference may help clarify our findings. Our method of collection provided only a partial view of nocturnal insects because not all taxa respond to blacklights. To get a better picture of diversity and abundances, large sample sizes and additional collection methods such as white light and passive ("sticky") traps would

be helpful. Further comparative studies between forest edge, secondary growth, and primary forest would be of interest, including various height ranges.

#### LITERATURE CITED

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