

## THE BIOGEOGRAPHY OF THE INSECT FAUNA OF THE ULITHI ISLANDS, MICRONESIA

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### Abstract

Ulithi Atoll in Yap State is located in the western zone of the Federated States of Micronesia and comprises 49 islets. In a survey of Ulithi Atoll, we visited its four inhabited islands, Asor, Falalop, Fassarai, and Mogmog. Insects were collected both by day and night, and 262 species of insects from nine orders were recorded. In order to estimate the species richness and natural environment of each island, the number of species in each taxonomic order was considered. Fassarai had the greatest species richness of the four islands, while Mogmog had the least. This suggests that human inhabitation affects insect species richness, because most of Mogmog Island was used as living space.

Keywords: island, insect fauna, Micronesia, species richness, Ulithi

### Introduction

The Ulithi Islands consist of 49 small islets, situated in the northeast part of Yap State. Presently, Asor, Falalop, Fassarai, and Mogmog Islands are inhabited. Ulithi has a tropical climate, with relatively even, warm temperatures year-round. Rainfall is generally plentiful, but droughts occur periodically. Tropical typhoons are an annual threat to the low-lying atolls. All the islands except the low atolls are forested, and this consists of an agro-forestry complex with scattered secondary forest.

During the Yap Research Expedition in 2001, conducted by Kagoshima University Research Center for the Pacific Islands, we had the opportunity to survey the insect fauna of the Ulithi Islands. The insect fauna and the differences between islands might have played an important role in the culture and history of each island. In order to compare the insect faunae, we collected insects on four inhabited islands: Asor, Falalop, Fassarai, and Mogmog. There are few previous collecting records for the islands, although there are some records of the insect fauna of Yap proper. Insect pests were surveyed by the College of Micronesia (NELSON et al. 1990) and by a previous expedition from Kagoshima University (SAKAMAKI et al. 2001). Insect inventories can provide a tremendous amount of information about natural systems because insects respond to environmental changes quickly. Insects are often a key component of terrestrial ecosystems. The spatial distribution of an insect species is the result of both behavioral and environmental factors (TAYLOR 1984; NESTEL et al. 1995).

This study considered the social homeostasis of four islands in Ulithi Atoll from a biogeographical perspective.

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## Materials and Methods

This survey was carried out on Ulithi Atoll from 20 to 25 October 2001. Insects were collected on four islands: Falalop (20 and 21 October), Asor (21 October), Fassarai (24 October), and Mogmog (23 and 25 October). The islands cover 90, 67, 48, and 27 ha, respectively. All four islands are equally flat, and the highest point on these islands is 11.6 m on Falalop Island. Using insect nets, insects were collected during the day from grassy areas, bushes near the beach, forest gaps, around forest edges, and in forests consisting of various tree species. Insects were also collected for one night on each island by light trapping. We attempted to classify all the insects collected during the survey at the species level, although some specimens could not be identified as to species.

## Results and Discussion

One of the main difficulties with this study is how to evaluate the intensity of the surveys. Survey intensity is determined by factors such as the number of collectors, their skill and experience, the total time devoted to collection, and weather. Another difficulty is the reliance to be placed on absences. A species may be erroneously recorded as absent when collecting has been insufficient or in the wrong season, or when a species is rare. This survey was limited, in that samples were collected on only one or two days per island. This might be insufficient to estimate the ecosystems of each island. Fortunately, the conditions during the surveys were almost identical on each island. Unfortunately, optimal sampling schemes have not been developed for estimating biodiversity. LANDAU et al. (1999) compared two methods of sampling in moths and found a high similarity between intensive and long-term collections. This implies that we can estimate species richness from short-term collections.

In general, islands contain fewer species than comparable mainland areas (BEGON et al. 1990). In the survey, we collected more than 300 insect species, from nine orders. Insects were easily identified as to order, although it was very difficult to identify some as to species. In order to estimate species richness, we determined the number of species in each order for each island (Table 1). MACARTHUR and WILSON (1967) pointed out that the number of species on a given island is usually approximately related to the area of the island. In our survey, no correlation with area was observed, implying that the differences in area were too small to influence the results.

The details of the insect fauna on each island are as follows:

Table 1. The number of insect species collected in the Ulithi Islands

Order	Asor	Falalop	Fassarai	Mogmog	Total
Lepidoptera*	24	15	16	27	62
Coleoptera	12	17	34	15	47
Hymenoptera	12	14	12	8	29
Diptera	30	34	37	23	63
Hemiptera	9	21	17	6	31
Orthoptera	4	11	10	5	16
Odonata	3	5	2	4	6
Dermaptera	1	1	3	1	6
Blattaria	0	0	0	2	2
Total	95	118	131	91	262

\* Some species were not identified.

### 1) Asor Island

Only 40 people inhabit Asor Island. It is mainly forest, with a small grassy area. The number of species collected on this island was greater than predicted, most likely as a result of the species richness conserved by the forest.

### 2) Falalop Island

Falalop Island is the largest and most populated of the four islands. The airstrip, radio transmitter, administrative offices, post office, and Outer Islands High School are all on Falalop Island. It is mainly forested, but there are some grassy areas near the airstrip and high school. We caught relatively large numbers of hemipteran and orthopteran species. Most of these seemed to prefer grassy areas. In contrast, fewer lepidopterans were caught than expected, likely as a result of the location of the light trap and the rainfall at night.

### 3) Fassarai Island

Fassarai Island is approximately 20 and 24 km distant from Asor and Mogmog, respectively. It is a long, narrow island, about 3.0 km long and 100 to 200 m wide. It is mainly forested, with some grassy areas. Fassarai had the greatest species richness among the four islands. We caught more coleopterans here than on the other islands, and most were specific to this island.

### 4) Mogmog Island

Mogmog is the second most populated island of Ulithi, with 165 inhabitants, and is also the smallest of the four islands. It is also forested, but most of the island is used as living space. In the survey, Mogmog had the fewest species. This implies that the human population has had some effect on the richness of insect species.

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