When offered citrus leaves of three different age classes, ants strongly preferred young leaves over mature leaves, and mature leaves over old leaves (56% vs. 31% vs 13%, X^2 = 48.5, df = 2, $p < 0.001$; Figure 2).

DISCUSSION (DBZ)

Although we hypothesized that ants would be less likely to select for non-target leaf species at a greater distance from their nest, the ants selected citrus, Inga, and cyclanth in proportions that did not differ between proximal and distal sites. Contrary to optimal foraging models, the ants did not appear to make selection decisions based on the amount of time invested to travel to the encounter sites. Ants were just as likely to pick up a disk of target leaves (in this case, citrus) near or far from their nest.

Ants accepted a greater total number of disks at the proximal site than the distal site. Although this difference was statistically significant, the effect was mostly due to a single trial in which the number of disks accepted at the proximal site (34) was much greater than at the distal site (6). This trial occurred at 10:50 when we observed a decrease at the distal site in the number of ants not carrying leaf fragments. The lower number of ants that could pick up disks at the distal site may explain the apparent difference in acceptance.

Ants selected among leaf species. These preferences may be determined by differential nutritional or chemical defense content in the leaves. In addition, high acceptance of citrus suggests that ants may prefer disks of what is currently their target tree.

Ants selected among leaves of different age classes of the target tree species. The ants may prefer young leaves due to lower chemical defense and filter content, which makes a better growth substrate for the ants' fungus colony. The high acceptances of both young and mature leaves as opposed to old is consistent with our observations of the target tree, on which old leaves appeared to be avoided. This avoidance may also be due to the presence of epiphylls.

Future studies should include the entire foraging sequence to assess ant preferences. Although our preference selection tests did not include the costs of leaf cutting, our results show that individual ants have an ability to make foraging decisions. Ants did not appear to alter foraging preferences with distance, as predicted by optimal foraging models, however they did differentiate among tree species and among different age classes of leaves within a single species.

LITERATURE CITED

Hölldobbler, B. and E. O. Wilson. 1990. The Ants Belknap Press of Harvard University Press, Cambridge, MA.

Kunz, P. L. , D.M. Larsen, D.B. Zug, Jr.. 1994. "The effects of distance on foraging selectivity of leaf-cutter ants (Atta cephalotes)"pages 74-75, in J.L. Bykowski, editor. Dartmouth Studies in Tropical Ecology 1994. Dartmouth College, Hanover, NH.

PALPI FUNCTION IN ANARTIA FATIMA (LEPIDOPTERA: NYMPHALIDAE)

Eden H. Abram, Hannah M. Fouts, D. Meegan Larsen and Jonathan J. Ruel

ABSTRACT (JJR)

Some investigators have proposed that butterfly palpi clean debris from the surface of the eyes. We tested this hypothesis in Anartia fatima by surgical reduction of the palpi and subsequent recapture. We examined the presence of debris on the eye surface in unmanipulated individuals and recaptured experimental individuals. As predicted, butterflies with reduced palpi had a significantly greater proportion of eyes with debris present.

Key Words: Anartia fatima, palpi, nectarivore

INTRODUCTION (EHA)

Butterflies have highly scaled modified appendages known as palpi attached below the eyes, generally spanning the diameter of the eye. DeVries (1987) has observed palpi passing over the eye like windshield-wipers during feeding or rest periods and suggested they may be used as grooming devices for the eyes. We hypothesized, based on these observations, that pulpi function to clear the eyes of mites and/or debris picked up during foraging. Palpi may function to extract mites in frugivorous and or dung-feeding butterflies, and to clear debris and possibly pollen from the eyes of nectarivores. We predict that nectar-feeding Anartia fatima butterflies (Figure 1) with experimentally shortened palpi will have more debris, including pollen, in their eyes upon recapture after 24 hours than control individuals with palpi left intact.

METHODS (JJR)

On 31 January, 1994, between 08:00 and 10:30, we captured 55 A. fatima individuals within 30 meters of the intersection of Sendero Rio Sirena and the air strip in Corcovado National Park, Costa Rica. For each butterfly, palpi were cut to about one-third original length, reaching just past the proboscis, the top of the body cavity was tagged with a drop of Liquid Paper ® and the individual was released.

The following morning, between 08:00 and 10:30, we recaptured 13 of our marked individuals and 30 others for use as palpi intact controls. With examination under 20X magnification, we classified all individuals into one of two categories: those with debris visible on the surface of either eye and those with no such debris. Proportions of those with and without debris for manipulated and control individuals were compared with Chi-square analysis.

RESULTS (DML)

We found a significant difference between control and manipulated groups in the proportion of A. fatima with debris in their eyes ($X^2 = 19.8$; $p < 0.001$). All butterflies whose palpi were removed had debris in their eyes. However, we found debris in the eyes of only 36% of the control butterflies with palpi still intact (Figure 1).

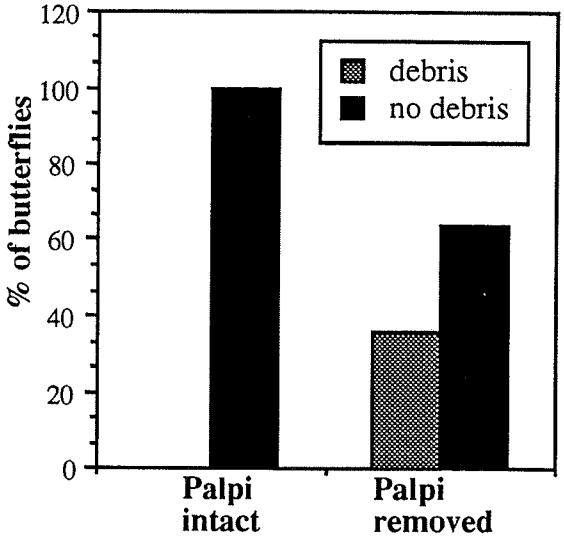

Figure 1. Percentage of butterflies with and without eye debris for both control (palpi intact) and manipulated (palpi removed) groups.

DISCUSSION (HMF)

Our results support the hypothesis that palpi affect the surface condition of the eye in A. fatima. As predicted, when palpi were removed more debris occurred on the eye. Increased debris load in the eye may potentially impair vision. Thus, if palpi serve the function of grooming and cleaning, they may be pivotal in the overall fitness of an individual, in which case natural selection would favor developed and efficient palpi.

The question remains whether palpi play the same role in other Lepidoptera foraging niches (i.e.. frugivores and/or dung feeders) which encounter potentially different types of debris (e.g. mites). Perhaps further examination of palpi structure in additional foraging guilds would reveal possible divergence of function among these guilds.

LITERATURE CITED

DeVries, P.J. The Butterflies of Costa Rica. Princeton University Press, New Jersey, 1987.