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Structure and Dynamics in *Nepenthes madagascariensis* Pitcher Plant Micro-Communities[1]

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ABSTRACT

The pitchers of *Nepenthes madagascariensis* are visited by a wide variety of insects attracted to the bright color of the pitcher, the nectar secreted around its opening and the odor of the fluid. The insect visitors appear to become disoriented over time and with increasing likelihood fall into the pitcher and drown.

The pitchers form a temporary habitat functional for about three months. Several specialized arthropods including mosquito larvae (*Uranotaenia bosseri, U. belkini*), mites (*Creutzeria* sp.), and frit fly larvae (*Chloropidae*) complete their life cycle in the pitcher and depend directly or indirectly on the drowned insects falling into the pitcher. Colonization by these arthropods varies spatially and temporally between the two forms of pitchers (juvenile, rosette form and adult form). Mites (*Creutzeria* sp.) show a phoretic relationship in colonizing new pitchers by clinging to adult frit flies that emerge from the pitcher's fluid. Food web interactions in the *Nepenthes madagascariensis* pitcher are more complex than those reported by Beaver (1985).

RESUMÉ

Les urnes de *Nepenthes madagascariensis* sont visitées par de différents types d'insectes attirés par la couleur de l'urne, par le nectar sécrété autour de son ouverture et par l'odeur du liquide. Les insectes visiteurs semblent être de plus en plus désorientés, et leur chance de tomber dans l'urne augmente en fonction du temps.

Les urnes forment un habitat temporaire et fonctionnel pour trois mois. Plusieurs arthropodes spécialisés, y compris des larves de moustiques (*Uranotaenia bosseri, U. belkini*), des mites (*Creutzeria* sp.), des larves de moucherons (Chloropidae) vivent à l'intérieur de l'urne et dépendent directement ou indirectement des insectes tombant dans l'urne. La colonisation de ces arthropodes varie dans le temps et l'espace entre les deux types d'urnes (forme juvenile et forme adulte). Les mites (*Creutzeria* sp.) montrent une association phorétique pour coloniser l'urne en s'accrochant sur les mouches adultes (Chloropidae) qui émergent du liquide. Les interactions entre les organismes associés au *Nepenthes madagascariensis* semblent plus complexes que celles publiées par Beaver (1985).

Key words: *colonization; community; ecology; food web; insects; Madagascar;* Nepenthes; *pitcher plant.*

INTRODUCTION

MADAGASCAR WAS THE SITE where *Nepenthes* was first discovered by Flacourt in the middle of the 17th century (Wunschmann 1872). However, virtually nothing is known of either the ecology of these plants in Madagascar, or the community structure and dynamics of the organisms associated with the pitchers. Two endemic species of *Nepenthes* occur in Madagascar: *Nepenthes masoalensis* and *N. madagascariensis*. These comprise the westernmost extension of *Nepenthes*' distribution (Beaver 1983, 1985).

Nepenthes madagascariensis is restricted to the coastal, eastern region from Tamatave to Fort Dauphin (Decary 1928, Humbert 1954, James, 1988). The species can be locally abundant but usually occurs in widely scattered populations.

The purpose of the study was to determine the structure and dynamics of the community of organisms associated with *Nepenthes madagascariensis* pitchers. Specifically, the study examined the type, behavior and abundance of arthropods living inside the pitcher as related to the pitcher's attributes, the colonization of pitchers by these arthropods, and the feeding (food web) interactions among consumers and resources associated with pitcher micro-communities.

The type, behavior and abundance of the pitcher arthropods provide information necessary to understand the dynamics and food web interactions within pitcher micro-communities (Pimm 1982,

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