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Geographical variation in food web structure in *Nepenthes* pitcher plants

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ABSTRACT. 1. Relative to *Nepenthes* species in West Malaysia near the evolutionary centre of the genus, outlying species of *Nepenthes* in the Seychelles, Sri Lanka and Madagascar have fewer species of both prey and predator living in them, fewer and smaller guilds of species, much apparently empty niche space, less complex food webs, and a greater connectance. The ratios of prey to predators, and of connectance (C_1) to the total number of trophic types present remain approximately constant.

2. Differences between the food webs appear to be related in a complex way to the size of the country and its degree of spatial and temporal isolation, the size of the local species pool capable of colonizing the pitchers, and the number of *Nepenthes* species present. However, the maximal length of food chains in the richest and most complex food webs is probably limited by energetic constraints or environmental predictability.

3. The data may illustrate how food webs change to become more complex, both by the addition of new guilds of species and the addition of species to existing guilds, while at the same time certain properties of the food web are kept approximately constant.

Key words. Food webs, geographical variation, species guilds, food chain lengths, predator–prey ratios, connectance, *Nepenthes*.

Introduction

Although food web ecology is a rapidly expanding area of research (Cohen, 1978; Pimm, 1982), there have been few attempts to compare community food webs in the same habitat in different geographical areas (Briand, 1983; Kitching, 1983). Briand (1983) suggested that, regardless of geographical location and taxonomic composition, food webs from similar habitats tended to be more similar to each other than to food webs from contrasting habitats. Using data on the communities living in five species of *Nepenthes* pitcher plants in four widely separated tropical countries, I show here that there are considerable differences between geographical areas in certain food web parameters within the same habitat type.

The pitchers of *Nepenthes* are well known to attract insects which fall into the pitchers and drown. Their remains are partly absorbed by

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