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CONSTRUCTION AND ANALYSIS OF A LARGE CARIBBEAN FOOD WEB[1]

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Abstract. We document the construction of a relatively large food web (44 species) from the island of St. Martin in the northern Lesser Antilles, and compare it with patterns observed in other, generally smaller food webs. In constructing this web, we integrate data from a variety of studies, many of which focussed on *Anolis* lizards and their vertebrate predators. In addition to determining the links between predators and prey, we estimate the frequencies of predation (the link strengths), and find an approximately bell-shaped distribution with a majority of links of intermediate frequencies. Some of the properties of this web contrast strongly with those of webs in the ECOWeB compilation. In particular, our analysis shows this web to possess an unusual richness of intermediate species (relative to top predators or basal species) and of links between those intermediate species. The number and lengths of chains are also unusually high, as is the degree of omnivory. Nor does this web match the predictions of the cascade model, which predicts even higher proportions of intermediate species and links between them, and even more numerous chains. It appears that these and other differences are not due simply to the large number of species involved here, but it is not yet clear whether they should be ascribed to the completeness with which some of the diets are known, to differences between the ways this and other webs were constructed, or to unique ecological conditions on the island of St. Martin.

Key words: Anolis; *Caribbean; cascade model; ECOWeB; food web; Lesser Antilles; link strength; predation frequency; St. Martin; trophic relations.*

INTRODUCTION

A food web summarizes the trophic relations among species by identifying the links between predators and their prey. Quantitative information about the frequency of predation or magnitude of energy flow provides a more complete picture of a community, but such information is usually not available, and many studies of food webs (e.g., Cohen 1978, Sugihara 1984, Sugihara et al. 1989, Cohen et al. 1990) focus on patterns that depend on the presence rather than the strength of links. Casting data in the form of a food web compensates somewhat for the absence of quantitative information by aiding comparisons between communities and by permitting analyses that can reveal community-level patterns. Nonetheless the relative strengths of the links are important ecologically and information about them can be useful (Paine 1980).

As we will show, many properties of food webs vary with the number of species in the web (Martinez 1991*a*), although the invariance of some properties remains an open issue (Briand and Cohen 1984, Sugihara et al. 1989, Schoenly et al. 1991). Because the food webs that have been collected or studied have been relatively small, many of the patterns considered to be typical food webs may be misleading descriptions of full-scale communities (Polis 1991). In the ECOWeB data bank (Cohen 1989), a compilation of 213 food webs, the mean web size is <19 species, and >95% of the webs contain <40 species. Yet North America contains, for instance, ≈3500 species of vertebrates (Wernert 1982), 90 000 species of insects (Arnett 1985), and >16 000 species of flowering plants (Williams 1964); when groups such as fungi, nematodes, and mites are included, simple arithmetic shows that, unless there are thousands of entirely disjoint food webs in North America, most webs must contain dozens to hundreds of species. The numbers are presumably even more extreme for tropical regions. We suspect that the lack of time and resources, rather than sparseness of actual communities, has limited the compilation and study of large food webs (Polis 1991).

The data that are assembled into food webs may be heterogeneous, combining species and relations that are well known with others that are known only sketchily, taxonomically resolving some groups to species while identifying others by orders, classes, or other broad categories. When the data are collected by different workers, the different levels of resolution employed may not easily correspond to one another. The resulting web is biased by the centering of detail about certain species, the foci of the data gathered. The distinction among "community," source," and "sink" webs (Cohen 1978) reflects basic differences in the collection

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