Composition, Food Webs and Population Limitation in Dung Arthropod Communities During Invasion and Succession

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Composition, Food Webs and Population Limitation in Dung Arthropod Communities During Invasion and Succession

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ABSTRACT: Arthropod species invade fresh dung in an orderly pattern and the number of taxa and the complexity of the food web increase as succession takes place. Short-term, local changes in the environment during early succession seem to have a more pervasive effect on species abundance than seasonal changes.

The interactions between burrowing and predatory beetles, and large and small diptera larvae are the core of the food webs in dung succession. Burrowing beetles arrive early and remain throughout succession. Their tunnels riddle the dung and are used by the air-breathing fly larvae to reach the interior of the dropping. Predatory beetles lack adaptations for burrowing but may use burrows already excavated to reach the otherwise unavailable fly larvae. The presence of burrowers, therefore, facilitates predation. The predators involved can feed only on small prey 0.5-6.0 mm long. The larvae of larger flies found early in dung succession are able quickly to outgrow this size range, and escape predation. There is a second group of small fly larvae that then enters this size range and remains exposed to predation for the duration of succession.

Competition for dung is not likely to be a major limitation for dung feeder populations since excess dung seems available. Similarly, estimates of prey needed by predators are smaller than the standing crops of prey available. Predation does not appear to be limiting to prey populations. Similarly, predators themselves are unlikely to be prey-limited. Local, short-term changes in dung and in the immediate environment may be too fast and too erratic to permit fuller use of dung as a resource.

The frequent occurrence of introduced species in dung composition may be related to the lack of competition and predation pressure in dung-inhabiting arthropods. The initial stages of dung succession, as in most other new environments, are largely determined by factors other than competition and predation.

INTRODUCTION

Successional changes in animal communities have been studied for a relatively long time (Odum, 1971). However, there are few studies in which the changes in species composition, as well as the changes in structure of food webs, were followed. Prominent among these are studies on the fauna of ruminant feces.

There has been sustained interest in the invertebrate faunas associated with bovine manure, and several substantial studies have dealt with successional changes in invertebrate communities of dung (Hafez, 1939; Mohr, 1943; Snowball, 1944; Laurence, 1956). The discrete nature of dung droppings, as well as the relative simplicity of the fauna, makes this system amenable to replication and relatively easy to study. The purpose of this paper is to document quantitative and qualitative