Carrion Reduction by Animals in Contrasting Tropical Habitats

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ABSTRACT

Decomposition of lizard (*Iguana iguana, Ctenosaura similis*) and toad (*Bufo marinus*) carrion open to arthropods was studied in a tropical dry and a tropical wet forest in Costa Rica. Carcass fates, feeding interactions of necrophagous animals and their predators, temporal succession patterns, and species compositions differed between sites. More than 170 species representing 49 families were associated with the carrion baits; calliphorid and sarcophagid larvae and adults and adult Formicidae and Scarabaeidae were most important in reducing carcasses to the dry skin stage. The significance of these results is discussed in relation to nutrient cycles and the decomposition submodel of a tropical forest ecosystem.

SYNTHESES OF ENERGY and elemental transfers in tropical forest ecosystems are now available (Golley *et al.* 1969, McGinnis *et al.* 1969, Odum and Pigeon 1970, Malaisse *et al.* 1972, Fittkau and Klinge 1973). The grazing and detritus food chains are the two major pathways for the movement of nutrients in such ecosystems (Odum and de la Cruz 1963, Wiegert and Owen 1971). Nutrients enter the decomposer subsystem via such detritus pathways as annual leaf fall (de la Cruz 1964); total plant death (Richards 1952); seed and fruit drop (Smythe 1970); animal defecation (Watling 1963, Nicholson, Bocock, and Heal 1966); and animal death (Heatwole 1971).

Nutrients tied up in dead animals of various sizes are released in large part by activities of necrophagous bacteria, fungi, and animals. Research on carrion bacteria and fungi is scant (Okafor 1966), but this is not true for investigations of the role of scavenger birds (Chapman 1938, Stager 1964), omnivorous mammals (Koepcke and Koepcke 1952), and arthropods (Chapman and Sankey 1955, Reed 1958). In addition, Fuller (1934), Bornemissza (1957), Payne (1965), and Payne and Crossley (1966) report results of studies on faunas associated with carrion. More specialized research discusses carrion-associated Coleoptera (Pessôa and Lane 1941, Howden 1950, Halffter and Matthews 1966, Shubeck 1969, Payne and King 1969a); Diptera (Hepburn 1943); and Lepidoptera (Payne and King 1969b). These investigations have increased our understanding of the intricate food webs, temporal patterns, and identity of arthropods associated with the carrion microcosm in temperate regions of the world. Virtually nothing is known about similar phenomena in tropical environments.

The purpose of this research is (1) to document relative durations of the various stages of lizard and toad decomposition in two different tropical forests; (2) to structure preliminary trophic interactions and discuss them in terms of resource partitioning; (3) to detail temporal succession patterns; and (4) to establish an inventory of species attending these carrion. Information about the carrion microcosm will be useful in elucidating detritus compartments of the above-mentioned models of ecosystems.

SITES, MATERIALS AND METHODS

This research was conducted at a tropical dry lowland forest at Finca La Pacifica, 5 km N of Las Cañas, Guanacaste Prov., Costa Rica, and a tropical wet lowland forest 5 km W of Rincón de Osa, Puntarenas Prov., Costa Rica, in the dry season during parts of February and March 1968. From February 8 to February 17 temperatures measured at ground level at the Guanacaste site ranged from 21.8 to 38.5° C with a typical daily fluctuation from 24° C (0400 hr) to 34° C (1300 hr). Ten-year averages of rainfall at Las Cañas (Scott 1966) ranged from a low of 5 mm in January and March, through an average of 17 mm during February to a high of 375 mm in October. In February, the soil was rather dry and loose, and the depth of the dry leaf litter, where existent, averaged 5 cm. The Osa site exhibited temperature extremes of 22.0 and 28.5° C at ground level for the period February 29 to March 9; typical daily fluctuations ranged from 23 to 27° C. Rainfall profile by ten-year averages for nearby Coto, Puntarenas Prov., ranged from 39 mm (February) to 579 mm (October) with 60 mm as the average for March (Scott 1966). The soil was moist, somewhat compact and rocky. Litter depth averaged

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