

CHAFERS, RHINOCEROS AND FRUIT BEETLES OF THE CANOPY IN TROPICAL FORESTS

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Summary

An overview on the species of Coleoptera Scarabaeidae Pleurosticti or Melolonthidae associated with the canopy in tropical forests is presented. At least 7,000 species of the subfamilies Melolonthinae, Dynastinae, Rutelinae and Cetoniinae may be related with the distinct microhabitats that the upper parts of the tropical trees and their epiphytes offer to many animal species. A large number of species of shiny chafers and rhinoceros beetles may complete their life cycle in the canopy, because their larvae and pupae take advantage of hollow trees and dead wood located up to 10 m from the soil surface. Other large groups of chafers and fruit beetles only visit the canopy during their adult life time, because their larvae and pupae live in the soil or in rotten wood near the soil surface. The feeding sites frequented by the adult beetles in the canopy comprise leaves, phloem, sap flows, flowers, pollen and fruits, meanwhile the white grubs are located in dead trunks, old termite nests, and inside or under epiphytes. The ecological importance of these species as decomposers, herbivorous, pollinators and also as preys for a large number of other arthropods and vertebrates are emphasized. So that any precise or integrate study on the chafers, rhinoceros and fruit beetles in the canopy of tropical forests have been made, the author suggests some important lines for work on the taxonomy, biology and ecology of these thousands of interesting insect species.

1. Introduction

Tropical forests are the home of thousands of insect species. Most of these species have a long time of co-evolution with tropical plants, and a few species are recent intruders searching for an opportunity of survival. Some authors, as Erwin and Scott (1980) observed that one species of tropical tree is closely associated with at least 163 species of beetles, plus another 1,038 species of transient beetle species. This apparently astonishing number of beetles are well distributed in the canopy: on all over the old or young leaves, on the twigs and branches, inside the flowers, fruits and seeds, in the hollows and cracks of the higher part of the trunk, as well as in relation with the epiphytic plants supported by the tree, as bromeliads, orchids, araceae, ferns, mosses, and lichens. With these data Erwin (1982) proposed an estimate of 12,448 species of beetles per hectare of tropical forest canopy, because one hectare has nearly 70 tree species.

Usually, the soil and undergrowth of tropical rain forests do not offer much food, but provide excess of humidity and scarce sunlight. These conditions are good to the mushrooms and relatives but not much for the beetles and other insects. Thus, much of the energy flow is moved to the canopy, specially in tropical forests which are periodically flooded, creating new ecological niches directly related with the so called "suspended soils" or organic matter formed or collected inside the holes, and cracks of tree trunks, under the roots of epiphytes and loose barks, as well as on the base of the wide leaves of bromeliads or in the bifurcations of tree branches (Fig. 1). As a result, a great number of specialized beetle species occupying each small space containing some kind of compost, many species acting as saprophagous, others as predators, and many living with unknown feeding preferences.

2. Diversity of Forms, Habits and Life Cycles

The body form and size of the beetles living in the canopy is widely variable, as well as their color, and the length of legs and antennae. Species with very small size, 1-3 mm in length, are found under barks, on fungi, inside seeds or flowers, meanwhile, giant species, 50-160 mm in length, are located on twigs, inside galleries in the wood, or in hollows of tree trunks. The most striking species of beetles or Coleoptera in the canopy are classified into the families: Buprestidae, Carabidae, Chrysomelidae, Cerambycidae, Curculionidae, Elateridae, and Scarabaeidae. The latter family contains some of the largest, heaviest, colorful and strongest beetles of the world, as will be detailed in this chapter, and is one of the better known groups of Coleoptera.

The larvae of big species of Buprestidae and Cerambycidae frequently live inside galleries formed under the bark of large trees. Adults of many species of Carabidae and Chrysomelidae are commonly seen on the leaves of different trees, but the first group searching for prey and the last group feeding on the leaf tissues. The habits of the adults of Elateridae are less known, and apparently many do not feed, but are searching for members of the opposite sex on the leaves and twigs of the trees. The larvae and adults of Curculionidae have different styles for exploring the tissues of fruits, seeds, leaves and twigs, and some species also feed under barks or inside fresh or rotten wood.

Members of the Scarabaeidae family are usually divided into two large subgroups, Laparosticti and Pleurosticti (Table 1), most of the species in the first subgroup are related with feces of diverse animals, carcass and organic matter. But the species included in the second subgroup (Scarabaeidae-Pleurosticti or Melolonthidae) are mainly phytophagous, feeding on many vegetal sources, such as live roots, stems, leaves, flowers, pollen or fruits. Other important species of Melolonthidae are saprophagous, well known as rotten wood, organic soil or leaf litter consumers (Morón 2004), and a few species feed on the larvae or adults of other beetles, larvae of ants and nymphs of some treehoppers.

Superfamily	Families	Series	Subfamilies
Scarabaeoidea or Lamellicornia	Lucanidae	---	9
	Passalidae	---	2
	Trogidae	---	---
	Scarabaeidae (<i>sensu lato</i>)	“Laparosticti” (<i>in partim</i>)	Scarabaeinae
			Aphodiinae
		“Pleurosticti” or family Melolonthidae	Melolonthinae
			Dynastinae
Rutelinae			
Cetoniinae			

Table 1. General classification of the Coleoptera Scarabaeoidea (Morón 2004)

Not much is known about the life cycles of the beetle species of the canopy, because if it is not easy to study the biology of the species near the soil surface in tropical forests, it is much difficult to obtain data from the upper parts of the tropical trees. Some of the adults observed on the leaves of the trees probably complete their development in the soil of the forest, feeding on roots or soil organic matter, but the larvae of the most part of species surely feed on suspended soils, as well as other species feed on the fresh or rotten wood in the trunk and branches. Species that complete their life cycle in a few weeks probably are related with different types of seeds and woody fruits, or with fresh leaves, but the larvae of species that require a long time for feeding need to construct long galleries into the wood or under heavy barks, or live inside the hollows of the tree trunks filled with large quantities of organic debris. Some of the long life cycle species are members of the genera included in the subfamily Prioninae of Cerambycidae, as *Callipogon*, or in the subfamily Dynastinae of Melolonthidae, as *Megasoma*.

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