

OBSERVATIONS ON INSECT VISITORS TO FLOWERING PLANTS OF ISLA SANTA CRUZ.

PART I. THE ENDEMIC CARPENTER BEE

by

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Within the Galapagos Islands there are few insect pollinators, which may be the reason that most endemic angiosperm species have small flowers (Stewart, 1911). This paucity of insects is illustrated by the fact that only one species of bee (*Xylocopa darwini*, the endemic carpenter bee) is represented on the islands (Cockerell, 1935; Hurd, 1958). Rick (1963, 1966) studied its role as a pollinator of plants on Isla Santa Cruz and reported that it made visits to *Justicia galapagana* (Acanthaceae), *Scalesia affinis* and *S. helleri* (Asteraceae), *Cordia lutea* (Boraginaceae), *Opuntia echios* (Cactaceae), *Mormordica (charantia)* (Cucurbitaceae), *Piscidia (carthagenensis)* (Fabaceae), *Nolana galapagensis* (recorded as *Periloba galapagensis*) (Nolanaceae), *Cryptocarpus (pyriformis)* (Nyctaginaceae), *Cardiospermum galapageium* (Sapindaceae), *Castela galapageia* (Simaroubaceae), and *Lycopersicon cheesmanii* (recorded as *L. pimpinellifolium*) (Solanaceae).

Linsley et al. (1966) recorded *Xylocopa darwini* as visiting the following additional plants on Santa Cruz between January 20 and February 28, 1964: *Tetramerium nervosum* (recorded as *T. hispidium*) (Acanthaceae), *Vallesia glabra* (Apocynaceae), *Scalesia pedunculata* (Asteraceae), *Bursera graveolens* (Burseraceae), *Canna* sp. (Cannaceae), *Ipomoea pes-caprae* (Convolvulaceae), *Cucurbita pepo* (Cucurbitaceae), *Acacia insulae-iacobi* (recorded as *A. tortuosa*), *A. macracantha*, *Cassia occidentalis*, *Crotalaria incana* (recorded as *C. setifera*), *Galactea striata* (recorded as *G. jussiana*), *Inga edulis*, *Parkinsonia aculeata*, *Prosopis juliflora* (recorded as *P. dulcis*), and *Rhynchosia minima* (Fabaceae), *Persea americana* (recorded as *P. gratis-sima*) (Lauraceae), *Mentzelia aspera* (Loasaceae), *Abutilon depauperatum*, *Abelmoschus manihot* (recorded as *Hibiscus manihot*), *Hibiscus tiliaceus*, *Malvastrum coromandelianum*, *Sida acuta* and *S. spinosa* (recorded as *S. angustifolia*) (Malvaceae), *Miconia robinsoniana* (Melastomaceae), *Commicarpus tuberosus* (recorded as *Boerhaavia scandens*), *Mirabilis jalapa* (Nyctaginaceae), *Passiflora foetida* (Passifloraceae), *Portulaca oleracea* (Portulacaceae), *Chiococca alab.*, *Coffea arabica*, *Psychotria rufipes* (Rubiaceae), *Physalis pubescens* (Solanaceae), *Waltheria ovata* (recorded as *W. reticulata*) (Sterculiaceae), *Clerodendrum molle*, *Lantana peduncularis*, *Stachytarpheta cayannensis* (Verbenaceae), and *Tribulus cistoides* (Zygophyllaceae).

From October 1983 through March 1984 the author performed studies to determine the presence of self-compatibility versus self-incompatibility in selected angiosperms on Santa Cruz. Plants were tested along the southern slope with quadrats established in each of the seven major vegetation zones (Wiggins and Porter, 1971; van der Werff, 1979). A secondary objective of this research was to observe natural pollination agents. The first of these observations (those pertaining to *Xylocopa darwini*) are reported in Table I, along with information on locations, amount of activity observed, and whether the plants are endemic or non-endemic.

Two of the fourteen species listed by the author are new pollination records for Santa Cruz. These species are *Cordia leucophlyctis* and *Vigna luteola*. Although *Sida rhombifolia* is not mentioned specifically for Santa Cruz in previous studies, Linsley et al. (1966) do include a photograph of *Xylocopa darwini* visiting a flower of this plant near Bella Vista. Therefore, from these studies it appears that the Galapagos carpenter bee, which is polylectic and visits many different plants for pollen and nectar, continues to be a major pollinator on Isla Santa Cruz, especially for non-endemic members of the flora. Part II of this paper will outline observations on other insect visitors to plants on Santa Cruz including butterflies, moths, flies, and ants.

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LITERATURE CITED

- Cockerell, T.D.A. (1935) The Templeton Crocker Expedition of the California Academy of Sciences, 1932. The carpenter bees of the Galapagos Islands. Proc. Calif. Acad. Sci., ser. 4, 21: 379-382.
- Hurd, P.D. (1958) The carpenter bees of the eastern Pacific oceanic islands. J. Kansas Ent. Soc. 31: 249-255.
- Linsley, E.G., Rick, C.M. and Stephens, S.G. (1966) Observations on the floral relationships of the Galapagos carpenter bee. The Pan-Pacific Entomologist 42: 1-18.
- Rick, C.M. (1963) Biosystematic studies on Galapagos tomatoes. Occas. Papers Calif. Acad. Sci. 44: 59-77.
- Rick, C.M. (1966) Some plant-animal relations on the Galapagos Islands. In: R.I. Bowman (ed.), The Galapagos, pp. 215-224. Univ. Calif. Press, Berkeley and Los Angeles.
- Stewart, A. (1911) A botanical survey of the Galapagos Islands. Proc. Calif. Acad. Sci., ser. 4, 1: 7-288.
- van der Werff, H. (1979) Conservation and vegetation of the Galapagos Islands. In: D. Bramwell (ed.), Plants and Islands, pp. 391-404. Academic Press, London.
- Wiggins, I.L. and Porter, D.M. (1971) Flora of the Galapagos Islands. Stanford University Press, Stanford.

Table 1. Summary of flower records for *Xylocopa darwini* from October 1983-March 1984.

Family	Species	Location	Activity
Acanthaceae	<i>Justicia galapagana</i> (E)	Scalesia Zone, near Los Gemelos	low
Asteraceae	<i>Scalesia pedunculata</i> var. <i>parviflora</i> (E)	Scalesia Zone, near Los Gemelos	moderate
Boraginaceae	<i>Cordia leucophlyctis</i> (E)	Arid Zone, Darwin Station	high
	<i>Cordia lutea</i> (N)	Arid Zone, Darwin Station	low
Fabaceae	<i>Cassia occidentalis</i> (N)	Transition Zone 3.5km n. Puerto Ayora	low
	<i>Parkinsonia aculeata</i> (N)	Arid Zone, Darwin Station	high
	<i>Prosopis juliflora</i> (N)	Littoral Zone, Tortuga Bay	high
	<i>Vigna luteola</i> (N)	Pampa Zone, 3 km. n. Media Luna	low
Malvaceae	<i>Bastardia viscosa</i> (N)	Arid Zone, Darwin Station	low
	<i>Sida rhombifolia</i> (I)	<i>Zanthoxylum</i> Zone, near Santa Rosa	moderate
Passifloraceae	<i>Passiflora foetida</i> var. <i>galapagensis</i> (E)	Arid Zone, Darwin Station	moderate
Rubiaceae	<i>Coffea arabica</i> (C)	Scalesia Zone, near Los Gemelos	low
Verbenaceae	<i>Clerodendrum molle</i> var. <i>molle</i> (N)	Arid Zone, Darwin Station	low
Zygophyllaceae	<i>Tribulus cistoides</i> (I)	Arid Zone, Darwin Station	moderate

(E) endemic (N) native (I) introduced weed (C) cultivated escape