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FLOWER-VISITING INSECTS OF THE GALAPAGOS ISLANDS

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Abstract.—A list of known flower-visiting insects found in the Galapagos Islands is presented. This information, compiled from the literature and direct observations, represents the first step toward understanding how angiosperms interact with insects in the Galapagos archipelago.

Key Words.—Insecta, angiosperms, pollination, flower visitation, Galapagos Islands, Ecuador

The taxonomic composition of the Galapagos Islands flora and insect fauna has been the subject of numerous investigations (Linsley & Usinger 1966, Wiggins & Porter 1971, Rindge 1973, Hayes 1975, Linsley 1977, Froeschner 1985, Lawesson et al. 1987, Peck & Kukalova-Peck 1990, Peck 1991). However, relatively little is known about the relationships that exist between the insects that inhabit these islands and the reproductive processes of their flowering neighbors.

One of the first steps taken when attempting to describe an angiosperm's breeding strategy is to determine what insects regularly visit its blossoms. Direct field observations of the plant in question are normally preceded by a review of previous work on the subject. Unfortunately, the difficulty in obtaining and interpreting such literature often dissuades workers from continuing. In an effort to expedite future studies, I have assembled all available records of insect flower-visitation in the Galapagos Islands, and added to these my most recent field observations from 14 Jun–11 Aug 1990.

Scientific literature from the first part of this century reveals little of substance on the topic of insect pollination in this archipelago. Most of what can be found are casual observations of flower visitors that were made during the many collecting expeditions to the Galapagos Islands that characterized these early years (Williams 1911; Beebe 1923, 1924; Wheeler 1924). For example, Williams (1911) mentioned that *Agrius cingulatus* Fabr. (Lepidoptera, Sphingidae) (recorded as *Phlegathontius cingulata* Fabr.) was commonly seen at flowers during the day, and *Enyo lugubris delanoi* Kernbach (Lepidoptera, Sphingidae) (recorded as *Triptogon lugubris* L.) was observed visiting a "convolvalaceous" flower on Santa Cruz Island. Beebe (1923) reported seeing *Agraulis vanillae galapagensis* Holland (Lepidoptera, Nymphalidae) "flying slowly from flower to flower" on Santiago Island, and *Hyles lineata florilega* Kernbach (Lepidoptera, Sphingidae) (recorded as *Deilephila lineata* Fabr.) was observed "hovering before small blossoms" during the day on Baltra Island.

It was not until 1966 that detailed reports were presented on the possible roles insects played in the ecology and evolution of the Galapagos flora (Linsley 1966, Linsley et al. 1966). These essays summarized what was then known about the distribution of potential insect pollinators in the islands, and the plants they were known to visit. Linsley emphasized the relative dearth of insects in the archipelago, compared to mainland areas, by pointing out that only one species of bee inhabited

the islands. This was an endemic carpenter bee, *Xylocopa darwini* Cockerell (Hymenoptera, Apidae), which was known to visit 60 angiosperm species (Linsley et al. 1966).

Rick (1963, 1966), Eliasson (1974), Grant & Grant (1981), Aide (1986), and Elisens (1989) have also contributed to the growing knowledge of pollination ecology in the Galapagos Islands. In addition, McMullen (1985, 1986, 1987, 1989, 1990) has discussed the interactions between plants and insects in this archipelago.

Methods and Materials

Fieldwork was conducted on Pinta Island from 23 Jun–26 Jul 1990. During this period, breeding studies were performed on six angiosperm species. These included *Justicia galapagana* Lindau (Acanthaceae), *Darwiniothamnus tenuifolius* (Hooker f.) Harling (Asteraceae), *Scalesia baurii* Robinson & Greenman ssp. *hopkinsii* (Robinson) Eliasson (Asteraceae), *Tournefortia rufo-sericea* Hooker f. (Boraginaceae), *Plumbago scandens* L. (Plumbaginaceae), and *Lycopersicon cheesmanii* Riley var. *minor* (Hooker f.) Porter (Solanaceae). Study sites were established at a variety of locations on the southern slope of Pinta ranging from approximately 15 m to 580 m in altitude.

Observations were undertaken to determine what insects, if any, were common visitors to the flowers of these species and might act as pollinators. In addition, flower visitors of plants not involved in the breeding studies were also noted and recorded.

Similar studies took place on Santa Cruz from 27 Jul–10 Aug 1990. However, *Scalesia baurii* was not included since it does not inhabit this island, and *Lycopersicon cheesmanii* Riley var. *cheesmanii* was substituted for var. *minor*. Study sites on the southern slope ranged from approximately 90 m to 632 m in altitude but centered around the area known as Los Gemelos (632 m).

Voucher specimens of each plant species studied were collected in the conventional manner and deposited in the herbarium of the Charles Darwin Research Station on Santa Cruz Island, the Galapagos Islands. Specimens of flower visitors were also obtained and placed in the Station's research collection. Some duplicate insect specimens are housed at the Systematic Entomology Laboratory, United States Department of Agriculture in Beltsville, Maryland; and at Carleton University, Ottawa, Ontario.

Results and Discussion

Table 1 lists insect flower-visitation records for the Galapagos Islands found in the literature, as well as those obtained by direct observations during the summer of 1990. Angiosperms are listed alphabetically by family, genus, and species. Following each name, in parentheses, is a letter representing the plant's resident status.

Insect visitors to the flowers of each plant are listed alphabetically by genus and species, or by common name if the genus is not known. Authorities, orders, and families are listed the first time an insect name appears in the table, but not afterwards. Following the insect's name, in parentheses, is the island on which the visit was recorded, and the article in which the visit was published. For example, *Justicia galapagana* Lindau is reported as having been visited by *Xylocopa darwini* Cockerell on Santa Cruz Island in references 8, 9, 12, and 14. If

Table 1. Flower-visiting insects of the Galapagos Islands. Plant status, island, and references follow the taxa as abbreviations within square brackets. Plant resident status: E, endemic; N, native; C, cultivated escape; I, introduced. Island names: B, Baltra; D, Daphne Major; E, Espanola; F, Floreana; G, Genovesa; I, Isabela; P, Pinta; R, Rabida; SCRI, San Cristobal; SC, Santa Cruz; SF, Santa Fe; STG, Santiago. References: 1, Aide (1986); 2, Beebe (1923); 3, Beebe (1924); 4, Eliasson (1974); 5, Elisens (1989); 6, Grant & Grant (1981); 7, Hayes (1975); 8, Linsley et al. (1966); 9, McMullen (1985); 10, McMullen (1986); 11, McMullen (1989); 12, McMullen (1990); 13, Rick (1963); 14, Rick (1966); 15, Wheeler (1924); 16, Williams (1911). Numbers for alternative names also refer to references. Italicized years indicate my summer observations.

ACANTHACEAE

Justicia galapagana Lindau [E][a]
Damsel bug nymph (Hemiptera, Nabidae) [P—*1990*][b]
Leptotes parrhasioides Wallengren (Lepidoptera, Lycaenidae) [SC—10, 12]
Phoebis sennae L. (Lepidoptera, Pieridae) [SC—*1990*]
Short-horned grasshopper nymph (Orthoptera, Acrididae) [SC—*1990*][b]
Toxomerus crockeri Curran (Diptera, Syrphidae) [SC—*1990*]
Urbanus dorantes galapagensis Williams (Lepidoptera, Hesperiidae) [SC—*1990*][b]
Wasmannia auropunctata Roger (Hymenoptera, Formicidae) [SC—10, 12]
Xylocopa darwini Cockerell (Hymenoptera: Apidae) [SC—8, 9, 12, 14]
Tetramerium nervosum Nees (recorded as *T. hispidium* in 8) [N]
Xylocopa darwini [SC—8]

AIZOACEAE

Sesuvium portulacastrum L. (N)[c,d]
Xylocopa darwini [SC—*1990*]

APOCYNACEAE

Catharanthus roseus (L.) George Don [C][c]
Phoebis sennae [SC—*1990*]
Vallesia glabra (Cavara) Link
Xylocopa darwini [SC—8]

ASTERACEAE

Ageratum conyzoides L. (recorded as *A. conyzoides* subsp. *conyzoides* in 12) [N]
Toxomerus crockeri [SC—10, 12]
Bidens pilosa L. [N][a]
Phoebis sennae [SC—*1990*]
Xylocopa darwini [F—8]
Darwiniothamnus tenuifolius Hooker f. Harling [E][c,d]
Atteva hysginiella Wallengren (Lepidoptera, Yponomeutidae) [P—*1990*][e]
Darwinysius marginalis Dallas (Hemiptera, Lygaeidae) [SC—*1990*][b]
Goniozus sp. (Hymenoptera, Bethylidae) [P—*1990*][b]
Lepidanthrax tinctus Thomas (Diptera, Bombyliidae) [P—*1990*][b]
Moth (Lepidoptera, Gelechioidea, probably Scythrididae) [SC—*1990*][b]
Moth (Lepidoptera, Tortricidae, Olethreutinae) [SC—*1990*][b]
Olcella sp. (Diptera, Chloropidae) [P—*1990*][b]
Orthoperus sp. (Coleoptera, Corylophidae) [P—*1990*][b]
Toxomerus crockeri [SC—*1990*]
Urbanus dorantes galapagensis [SC—*1990*][b]
Xylocopa darwini [SC—*1990*]
Encelia hispida Andersson [E]
Heliothis cystiphora Wallengren (Lepidoptera, Noctuidae) [SF—7]
Jaegeria gracilis Hooker f. [E]
Toxomerus crockeri [SC—10, 12]
Macraea laricifolia Hooker f. [E]
Xylocopa darwini [F—8]

Table 1. Continued.

Scalesia affinis Hooker f. [E]
Xylocopa darwini [F—8; SC—4, 8, 14]
Scalesia baurii Robinson & Greenman ssp. *hopkinsii* (Robinson) Eliasson [E][c]
Atteva hysginiella [P—*1990*][e]
Lepidanthrax tinctus [P—*1990*][b]
Mythenteles sp. (Diptera, Bombyliidae) [P—*1990*][b]
Pyralid moth (Lepidoptera, Pyralidae) [P—*1990*][e]
Rhinacloa sp. (Hemiptera, Miridae) [P—*1990*][b]
Scalesia helleri Robinson [E]
Xylocopa darwini [SC—8, 14; SF—8]
Scalesia pedunculata Hooker f. (recorded as *S. pedunculata* var. *parviflora* in 9) [E]
Xylocopa darwini [F—8; SC—8, 9, 12]
Scalesia sp. (probably *retroflexa* Hemsley) [E]
Xylocopa darwini [SC—8]
Sonchus oleraceus L. [I]
Xylocopa darwini [SC—11]

AVICENNIACEAE

Avicennia germinans (L.) L. [N]
Paratrechina longicornis Latreille (Hymenoptera, Formicidae) [SC—10, 12]
Tapinoma melanocephalum Fabr. (Hymenoptera, Formicidae) [SC—10, 12]

BORAGINACEAE

Cordia leucophlyctis Hooker f. [E][a]
Atteva hysginiella [SC—*1990*][f]
Disclisioprocta stellata Guenee (Lepidoptera, Geometridae) [SC—10, 12]
Xylocopa darwini [SC—9, 12]
Cordia lutea Lamarck [N][a]
Amblycerus piurae Pierce (Coleoptera, Bruchidae) [SC—*1990*][b]
Atteva hysginiella [B—3] [2]
Beetles [15]
Camponotus planus Wheeler (Hymenoptera, Formicidae) [15]
Chrysopa spp. (Neuroptera, Chrysopidae) [B—3] [15]
Enyo lugubris delanoi Kernbach (Lepidoptera, Sphingidae) (recorded as *Triptogon lugubris* L. in 16) [I—16]
Euchrombius ocellus Haworth (Lepidopetra: Pyralidae) (recorded as *Eromene ocellea* Haworth in 2) [2]
Green winged hemerobiid (probably *Megalomus darwini* Banks) (Neuroptera, Hemerobiidae) [2]
Hypasclera collenettei Blair (Coleoptera, Oedemeridae) [SC—*1990*][b]
Hypasclera sp. (recorded as *Asclera* sp. in 3) [B—3]
Manduca rustica calapagensis Holland (Lepidoptera, Sphingidae) (recorded as *Phlegathontius rustica calapagensis* Holland in 16) [I—16]
Melipotis indomita Walker (Lepidoptera, Noctuidae) [SC—*1990*][f]
Metacanthus galapagensis Barber (Hemiptera, Berytidae) [SC—10, 12]
Monomorium floricola Jerdon (Hymenoptera, Formicidae) [G—15]
Oxacis sp. (Coleoptera, Oedemeridae) [2]
Paratrechina longicornis [SC—*1990*]
Paratrechina vaga (Hymenoptera, Formicidae) [SC—10, 12]
Perepitragus fascipes Latr. (Coleoptera, Tenebrionidae) [SC—*1990*][b]
Phoebis sennae (recorded as *Callidryas eubele* L. in 2, 3, 16) [B—3; I—16; SC—*1990*; SCRI—2) [2]
Urbanus dorantes galapagensis [SC—*1990*][b]
Utetheisa galapagensis Wallengren (Lepidoptera, Arctiidae) [SC—*1990*][b]
Wasmannia auropunctata [SC—10, 12]
Xylocopa darwini [SC—1, 8, 9, 11, 12, 14, *1990*] [15]

Table 1. Continued.

Cordia spp.
Pseudoplusia includens Walker (Lepidoptera, Noctuidae) [7]
Tournefortia psilostachya Humboldt, Bonpland, Kunth [N]
Leptotes parrhasioides [SC—10, 12]
Pyralid moth (Lepidoptera, Pyralidae) [SC—10, 12]
Tournefortia rufo-sericea Hooker f. [E][c]
Disclisioprocta stellata [SC—*1990*]
Frankliniella sp. (Thysanoptera, Thripidae) [P—*1990*; SC—*1990*][b]
Leafhopper (Homoptera, Cicadellidae) [P—*1990*; SC—*1990*][b]
Mordellistena galapagoensis Van Dyke (Coleoptera, Mordellidae) [SC—*1990*][b]
Phoebis sennae [SC—*1990*]
Utetheisa galapagensis [SC—*1990*][b]
Wasmannia auropunctata [SC—*1990*]

BRASSICACEAE
Brassica campestris L. [C]
Xylocopa darwini [F—8]

BURSERACEAE
Bursera graveolens Triana & Planchon [N]
Xylocopa darwini [F—8; SC—8]

CACTACEAE
Opuntia echios Howell var. *echios* [E]
Ammophorus sp. (Coleoptera, Tenebrionidae) [D—6]
Xylocopa darwini [D—6]
Opuntia echios Howell (probably var. *gigantea* (Howell) Porter) [E]
Xylocopa darwini [S—8, 14]
Opuntia helleri K. Schumann [E]
Caterpillar [G—6]
Cricket [G—6]
Diptera [G—6]
Manduca rustica calapagensis (recorded as *Protoparce rustica galapagoensis* Holland in 6) [G—6]
Monomorium floricola [G—15]
Tetramorium guineense (Fabr.) Wheeler (Hymenoptera, Formicidae) [G—6]
Opuntia megasperma Howell [E]
Xylocopa darwini [SCRI—8]
Opuntia sp. (probably *insularis* Stewart) [E]
Phoebis sennae (recorded as *Callidryas eubele* in 16) [I—16]
Opuntia sp. [E]
Agrius cingulatus Fabr. (Lepidoptera, Sphingidae) [7]

CAESALPINIACEAE
Caesalpinia pulcherrima (L.) Swartz [C][c,d]
Xylocopa darwini [SC—*1990*]
Cassia occidentalis L. [N]
Xylocopa darwini [SC—8, 9, 12]
Cassia picta George Don [N][a]
Phoebis sennae [SC—*1990*]
Xylocopa darwini [SC—11]
Cassia sp.
Atteva hysginiella [2]
Euchrombius ocellus (recorded as *Eromene ocellea* in 2) [2]
Green winged hemerobiid (probably *Megalomus darwini*) [2]

Table 1. Continued.

Oxacis sp. [2]
Phoebis sennae (recorded as *Callidryas eubele* in 2) [2]
Parkinsonia aculeata L. [N]
Xylocopa darwini [E—8; F—8; SC—8, 9, 11, 12, *1990*]

CANNACEAE
Canna sp. [Not Endemic]
Xylocopa darwini [SC—8]

CARICACEAE
Carica papaya L. [C]
Agrius cingulatus [SC—10]

CONVOLVULACEAE
Ipomoea linearifolia Hooker f. [E]
Xylocopa darwini [SC—11]
Ipomoea pes-caprae (L.) R. Brown [N]
Xylocopa darwini [SC—8]
Ipomoea sp.
Agrius cingulatus [7]

CUCURBITACEAE
Cucurbita pepo [C]
Xylocopa darwini [SC—8]
Mormordica charantia L. (recorded as *M. indica* in 8) [C]
Leptotes parrhasioides [SC—10]
Wasmannia auropunctata [SC—10]
Xylocopa darwini [SC—8, 13]

EUPHORBIACEAE
Croton scouleri Hooker f. var. *scouleri* [E][a]
Atteva hysginiella [P—*1990*][c] (male flowers)
Caterpillar [G—6]
Moth [SC—14]
Euphorbia cyathophora J. A. Murray [C][c,d]
Xylocopa darwini [SC—*1990*]

FABACEAE
Crotalaria incana L. (recorded as *Crotolaria setifera* in 8) [N]
Xylocopa darwini [SC—8]
Galactea striata (Jacquin) Urban (recorded as *G. jussiana* var. *volubilis* in 8) [N]
Xylocopa darwini [SC—8]
Geoffroea spinosa Jacquin (recorded as *G. striata* in 8) [N]
Xylocopa darwini [F—8]
Piscidia carthagenesis Jacquin (recorded as *P. erythrina* in 13) [N]
Xylocopa darwini [SC—13]
Rhynchosia minima (L.) de Candolle [N]
Xylocopa darwini [SC—8]
Vigna luteola (Jacquin) Bentham [N][a]
Leptotes parrhasioides [SC—10, 12]
Utetheisa ornatrix L. (Lepidoptera, Arctiidae) [SC—*1990*][b]
Xylocopa darwini [SC—9, 12, *1990*]

GOODENIACEAE
Scaveola plumieri (L.) M. Vahl [N]
Xylocopa darwini [F—8]

Table 1. Continued.

Inga edulis Martius [C]
Xylocopa darwini [F—8; SC—8]
Prosopis juliflora (Swartz) de Candolle (recorded as *P. dulcis* in 8) [N]
Tapinoma melanocephalum [SC—10, 12]
Xylocopa darwini [F—8; SC—8, 9, 12]

MYRTACEAE

Psidium guajava L. (recorded as *P. guayava* in 8) [C]
Xylocopa darwini [F—8; SCRI—8]

NOLANACEAE

Nolana galapagensis Johnston (recorded as *Periloba galapagensis* in 8, 14) [E]
Xylocopa darwini [SC—8, 14]

NYCTAGINACEAE

Bougainvillea spectabilis Willdenow [C][c]
Phoebis sennae [SC—*1990*]
Commicarpus tuberosus (Lamarck) Standley (recorded as *Boerhaavia scandens* in 8) [N]
Leptotes parrhasioides [SC—10, 12]
Xylocopa darwini [SC—8, 11]
Cryptocarpus pyriformis Humboldt, Bonpland, Kunth [N][a]
Camponotus sp. (Hymenoptera, Formicidae) [SC—*1990*]
Xylocopa darwini [SC—13]
Mirabilis jalapa L. [C]
Xylocopa darwini [SC—8]

PASSIFLORACEAE

Passiflora foetida L. var. *galapagensis* Killip (recorded as *P. foetida* in 1, 8) [E]
Xylocopa darwini [SC—1, 8, 9, 11, 12, *1990*]

PLUMBAGINACEAE

Plumbago scandens L. [N][a,d]
Cardiocondyla nuda Mayr (Hymenoptera, Formicidae) [P—*1990*][b]
Naucles sp. (Coleoptera, Scraptiidae) [P—*1990*][b]
Lepidanthrax tinctus [P—*1990*][b]
Leptotes parrhasioides [P—*1990*; SC—10, 12, *1990*][e]
Ornebius erraticus Schudder (Orthoptera, Gryllidae) [P—*1990*][b]
Paratrechina sp. [P—*1990*][e]
Phoebis sennae [SC—10, 12, *1990*]
Urbanus dorantes galapagensis [SC—*1990*][b]
Wasmannia auropunctata [SC—*1990*]
Xylocopa darwini [SC—*1990*]

POACEAE

Setaria geniculta (Lamarck) Beauvois [N]
Wasmannia auropunctata [SC—10, 12]

POLYGONACEAE

Polygonum opelousanum Small [N]
Toxomerus crockeri [SC—10, 12]

PORTULACACEAE

Portulaca oleracea L. [N]
Xylocopa darwini [SC—8]

RUBIACEAE

Borreria sp.
Diptera [SC—14]

Table 1. Continued.

LAURACEAE

Persea americana Miller (recorded as *P. gratissima* in 8) [C]
Xylocopa darwini [SC—8]

LOASACEAE

Mentzelia aspera L. [N]
Xylocopa darwini [SC—1, 8]

LYTHRACEAE

Cuphea racemosa (L. f.) Sprengel [I][a,d]
Leptotes parrhasioides [SC—10, 12]
Toxomerus crockeri [SC—10, 12]
Xylocopa darwini [SC—*1990*]

MALVACEAE

Abelmoschus manihot (L.) Medicus (recorded as *Hibiscus manihot* in 8) [I]
Xylocopa darwini [SC—8]
Abutilon depauperatum (Hooker f.) Robinson [E]
Xylocopa darwini [SC—1, 8]
Bastardia viscosa (L.) Humboldt, Bonpland, Kunth [N]
Xylocopa darwini [SC—8, 9, 11, 12]
Gossypium barbadense L. var. *darwinii* (Watt) J. B. Hutchinson [E]
Phoebis sennae (recorded as *Callidryas eubele* in 2) [SC—10, 12; SCRI—2]
Xylocopa darwini [I—8]
Gossypium sp. [E]
Atteva hysginiella [2]
Euchrombius ocellus (recorded as *Eromene ocellea* in 2) [2]
Green winged hemerobiid (probably *Megalomus darwini*) [2]
Oxacis sp. [2]
Phoebis sennae (recorded as *Callidryas eubele* in 2, 16) [I—16] [2]
Hibiscus tiliaceus L. [N]
Xylocopa darwini [SC—8, 11, *1990*]
Malvastrum coromandelianum (L.) Garcke [I]
Xylocopa darwini [SC—8]
Sida acuta Burman f. [I]
Xylocopa darwini [SC—8]
Sida paniculata L. [I]
Xylocopa darwini [F—8]
Sida rhombifolia L. [I][a]
Leptotes parrhasioides [SC—10, 12]
Phoebis sennae [SC—*1990*]
Utetheisa ornatrix [SC—*1990*][b]
Xylocopa darwini [F—8; SC—8, 9, 12, *1990*]
Sida spinosa L. (recorded as *S. angustifolia* in 8) [N]
Xylocopa darwini [F—8; SC—8]

MELASTOMATACEAE

Miconia robinsoniana Cogniau [E]
Xylocopa darwini [SC—8]

MIMOSACEAE

Acacia insulae-iacobi Riley (recorded as *A. tortuosa* in 8) [N][a]
Urbanus dorantes galapagensis [SC—*1990*][b]
Xylocopa darwini [SC—8, 11]
Acacia macracantha Willdenow [N]
Xylocopa darwini [F—8; SC—8]

Table 1. Continued.

Chiococca alba (L.) A. S. Hitchcock [N]
Xylocopa darwini [SC—8]
Coffea arabica L. [C]
Xylocopa darwini [SC—8, 9]
Diodia radula Chamisso & Schlechter [I][a]
Phoebis sennae [SC—*1990*]
Toxomerus crockeri [SC—10, 12, *1990*]
Urbanus dorantes galapagensis [SC—*1990*][b]
Psychotria rufipes Hooker f. [E]
Xylocopa darwini [SC—8]

SAPINDACEAE

Cardiospermum galapageium Robinson & Greenman (recorded as *C. galapageum* in 8) [E]
Xylocopa darwini [SC—8, 18]

SCROPHULARIACEAE

Bacopa monniera [Not Endemic]
Xylocopa darwini [SC—8]
Galvezia leucantha Wiggins var. *leucantha* [E]
Xylocopa darwini [I—5]
Galvezia leucantha Wiggins var. *pubescens* Wiggins [E]
Xylocopa darwini [R—5]

SIMAROUBACEAE

Castela galapageia Hooker f. [E]
Xylocopa darwini [SC—8, 14, *1990*]

SOLANACEAE

Cacabus miersii (Wellstein f.) D'Arcy [E]
Agrius cingulatus [7]
Capsicum frutescens L. [C]
Wasmannia auropunctata [SC—10, 12]
Lycopersicon cheesmanii Riley var. *cheesmanii* (recorded as *L. pimpinellifolium* in 13, 14) [E][a]
Leptotes parrhasioides [SC—*1990*]
Urbanus dorantes galapagensis [SC—*1990*][b]
Xylocopa darwini [SC—11, 13, 14, *1990*]
Lycopersicon cheesmanii Riley var. *minor* (Hooker f.) Porter [E][c]
Leaf bug (Hemiptera, Miridae) [P—*1990*][b]
Physalis pubescens L. [N]
Xylocopa darwini [SC—8]
Solanum americanum Miller [N][a]
Toxomerus crockeri [SC—*1990*]
Xylocopa darwini [SC—11]

STERCULIACEAE

Waltheria ovata Cavanilles (recorded as *W. reticulata* in 8) [N][a]
Atteva hysginiella [P—*1990*][c]
Xylocopa darwini [SC—8, 11, *1990*]

VERBENACEAE

Clerodendrum molle Humboldt, Bonpland, Kunth var. *glabrescens* Svenson [E]
Xylocopa darwini [SC—11]
Clerodendrum molle Humboldt, Bonpland, Kunth var. *molle* [N]
Ant (Hymenoptera, Formicidae) [SC—10, 12]
Hawk moth (Lepidoptera, Sphingidae) [SC—10, 12]
Xylocopa darwini [SC—9, 11, 12, *1990*]

Table 1. Continued.

Clerodendrum molle Humboldt, Bonpland, Kunth (variety not known)
Manduca rustica calapagensis (recorded as *Phlegathontius rustica calapagensis* in 16) [I—16]
Pseudoplusia includens [7]
Xylocopa darwini [SC—8]
Lantana peduncularis Andersson [E]
Xylocopa darwini [SC—8, 11]
Phyla sp. [Not Endemic][c]
Leptotes parrhasioides [SC—*1990*]
Stachytarpheta cayennensis (Richard) M. Vahl (recorded as *S. cayannensis* in 8) [I]
Xylocopa darwini [F—8]
ZYGOPHYLLACEAE
Tribulus cistoides L. [N]
Leptotes parrhasioides [SC—10, 12]
Xylocopa darwini [SC—8, 9, 12]

[a] Flowers reported as visited by new insects.
[b] Insect reported for the first time as a flower visitor in the Galapagos Islands.
[c] Flowers reported for the first time as visited by insects in the Galapagos Islands.
[d] Flowers reported for the first time as visited by *Xylocopa darwini.*
[e] Insect reported for the first time as a flower visitor on Pinta Island.
[f] Insect reported for the first time as a flower visitor on Santa Cruz Island.

the island is not known, the reference number appears alone in square brackets. The designation "*1990*" represents an observation by me during the summer of that year.

The observations from 1990 provide several new records. Ten angiosperms, representing nine families, are reported for the first time as having their flowers visited by insects in the Galapagos Islands. In addition, new insect visitors are reported for 16 angiosperms from 14 families. Six flowering plants are reported for the first time as having their blossoms visited by *Xylocopa darwini.*

Twenty-four insects, representing eight orders, are reported for the first time as flower visitors in the Galapagos; four insects are reported as flower visitors for the first time on Pinta Island, and two are reported for the first time on Santa Cruz Island. Although no other references than mine are listed in the table for *Melipotis indomita* Walker (Lepidoptera, Noctuidae), it is not listed as a first time flower visitor in the Galapagos because Hayes (1975) mentions that "adults come to flowers at dusk in the rainy season."

Table 1 indicates that *Xylocopa darwini* is the primary flower visitor on the islands that it inhabits. The vast majority of these visits have been made by female bees. In fact, all but two of the carpenter bee records from 1990 refer exclusively to female visitors. Only *Cordia lutea* Lamarck (Boraginaceae) and *Waltheria ovata* Cavanilles (Sterculiaceae) were observed being visited by both male and female bees.

A total of 79 plant taxa, from 35 families, are listed that have been visited by this polytropic bee, with 25 of these being endemics. Apparently, the more recent arrivals to the Galapagos Islands are favored as sources of pollen and nectar. Although members of several different families are visited, the legumes, mallows, and composites are especially well represented.

Among the other flower visitors observed in 1990, an *Olcella* sp. (Diptera: Chloropidae), a *Goniozus* sp. (Hymenoptera: Bethylidae), and a *Leptotes parrhasioides* Wallengren (Lepidoptera: Lycaenidae) appeared to be most common on Pinta Island. On Santa Cruz, *Toxomerus crockeri* Curran (Diptera: Syrphidae) and *Phoebis sennae* L. (Lepidoptera: Pieridae) were extremely active.

In summary, this paper represents the first phase of a study designed to understand the reproductive relationships that exist between the plant and insect coinhabitants of the Galapagos Islands. It should be noted that this listing does not assign any particular value to each flower visitor. Undoubtedly, some of these insects are more important pollen vectors than others. Details can be found in the literature cited, or in the case of the 1990 observations, in future publications.

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