

EARLY STAGES OF *CALIGO ILLIONEUS* AND *C. IDOMENEUS*  
(NYMPHALIDAE, BRASSOLINAE) FROM PANAMA, WITH REMARKS ON LARVAL  
FOOD PLANTS FOR THE SUBFAMILY.

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**ABSTRACT.** Here we describe the complete life cycle of *Caligo illioneus oberon* Butler and the mature larva and pupa of *C. idomeneus* (L.). The mature larva and pupa of each species are illustrated. We also provide a compilation of host records for members of the Brassolinae and briefly address the interaction between these butterflies and their larval food plants.

**Additional key words:** Central America, host records, monocotyledonous plants, larval food plants.

The nymphalid subfamily Brassolinae includes Neotropical species of large body size and crepuscular habits, both as caterpillars and adults (Harrison 1963, Casagrande 1979, DeVries 1987, Srygley 1994). Larvae generally consume large quantities of plant material to reach maturity, a behavior that may be related as much to the low nutrient content of their larval food plants (Auerbach & Strong 1981) as to their large body size (e.g., 15 g for a living, mature larva of *Caligo memnon* (Felder), DeVries 1983). Several species of brassolines lay eggs in clusters, and their larval feeding activity may produce remarkable damage to their food plants. For example, two *Caligo memnon* females were reported to lay, jointly, 165 eggs on banana plants in approximately three weeks in an outdoor enclosure (Young & Muyschondt 1985). *Caligo* caterpillars were reported to cause severe damage to banana plantations (Malo & Willis 1961, Harrison 1962, 1963, 1964), and larvae of *Brassolis isthmia* Bates are known to defoliate coconut palms (Dunn 1917; R. B. Srygley, C. M. Penz pers. obs.).

Apart from studies of population control (Malo & Willis 1961, Harrison 1962, 1964), few investigations have focused on the early stage biology of *Caligo* (see Young & Muyschondt 1985, and references therein). Here we describe the complete life cycle of *C. illioneus oberon* Butler, describe a mature larva of *C. idomeneus* (L.), and review larval food plant records for 39 brassoline species.

## METHODS

Between 25 May and 31 December, 1994 we searched for ovipositing female butterflies along Pipeline Road, Soberania National Park, Panama, motivated by a study on *Caligo* mating behavior (Srygley & Penz 1999). The study area was a mosaic of old secondary and primary forests and pasture grasses with approximately 2.2 m annual precipitation (Ridgely 1976) and a wet season extending from late April to mid December. Our observations showed that *C. illioneus oberon* oviposit mostly at dusk (approx. 1700–1900 h) and only occasionally at dawn (0530–0630 h), and we therefore concentrated our observations in the twilight hours. Field collected early stages were reared in plastic containers at ambient temperature (25–29°C).

Wild female *Caligo illioneus oberon* were captured in two traps at the edge of the forest along Pipeline Road. To induce oviposition, captured females were released into an outdoor insectary (3 × 3 × 3 m) inside of which grew *Musa sapientum* L. and *Heliconia latispatha* Benth. (Musaceae), *Calathea latifolia* (Link) K. (Marantaceae), and three species of unidentified palms (Arecaceae). Females were supplied also with fresh cut leaves of *Saccharum spontaneum* L. (Poaceae) and *Cyrtostachys* sp. (Arecaceae), both exotics on which we had observed oviposition by female *Caligo illioneus* and *Opsiphanes* sp. respectively (R. B. Srygley pers. obs.).

Preserved larvae and pupal skins of *C. illioneus oberon* are in the collection of the Milwaukee Public Museum. The head capsule and pupal skin of *C. idomeneus* are currently in the Smithsonian Tropical Research Institute, to be relocated to the National Museum of Natural History in the future.

## RESULTS

### *Caligo illioneus oberon* Butler

**Oviposition behavior and food plants.** In the field, females laid clusters of 9–13 eggs ( $n = 4$  clusters) in a row along the midvein on the underside of medium-aged to old leaf blades of *Saccharum spontaneum*, an introduced Asian grass that invaded natural grasslands of Panama during the 1970's. Following its introduction, *S. spontaneum* gradually replaced the pasture grasses *Hyparrhenia rufa* (Nees) Stapf and *Panicum maximum* Jacq. (both introduced from Africa) on Pipeline Road (N. Smith pers. comm.). The native larval food plant for *C. illioneus* is not known in Panama, and our captive females did not oviposit on any of the plants available in the insectary.

**Egg** (developmental time = 6 days,  $n = 13$ ). White, spherical, approximately 1.5 mm wide, adorned with vertical ribs; description refers to a cluster of 13 eggs laid 27 August 1994.

**First instar** (duration = 8 days,  $n = 4$ ). **Head:** brown with simple black setae; two dark brown vertical stripes flank epicranial and frontal sutures from apex of head, terminating at approximately halfway the length of the front. **Body:** translucent green; broad, lemon-yellow middorsal stripe bordered by an irregular reddish-brown stripe that is prominent on the thorax and divided by a thin white discontinuous midline stripe that is more prominent on the thorax than on the abdomen; two thin, lateral, lemon-yellow longitudinal stripes; thoracic and abdominal legs grayish-white; ventral side grayish-white; caudae held separated, reddish to dark brown, each with a black sub-terminal seta arising at one-third to one-half the length of the caudae, and a terminal seta which is white at base and black at tip. The larvae molted synchronously.

**Second instar** (duration = 5 days,  $n = 4$ ). **Head:** dark brown anteriorly, lateral and post-genal regions translucent white; three pairs of scoli: dorsal scoli light brown (approximately half the height of the head), subdorsal scoli whitish (two-thirds the height of the dorsal scoli), lateral scoli whitish (approximately one-third the height of the subdorsal scoli); front dark brown; two thin whitish lines arise from base of dorsal scoli, converge toward and flank epicranial suture, ter-

minating at upper end of front; frontal suture whitish. **Body:** predominantly green; brown middorsal stripe divided by discontinuous white midline stripe; thoracic and abdominal legs grayish white; ventral side grayish white; caudae held separated, pink with black tips and numerous short white setae. The larvae molted synchronously.

**Third instar** (duration = 5–6 days,  $n = 4$ ). **Head:** as in second instar. **Body:** as in second instar, except for a broad, red lateral line divided by a thin, white spiracular stripe; single dark brown triangular middorsal projection at posterior end of abdominal segment A3. Shed caudae were not eaten after molt to fourth instar. Larvae molted asynchronously.

**Fourth instar** (duration = 6–7 days,  $n = 4$ ). **Head:** patterned in creamy-white and dark brown; dorsal scoli light brown anteriorly and reddish-brown posteriorly at the base (approximately same height as the head); subdorsal scoli creamy-white (approximately two-thirds the length of dorsal scoli); lateral scoli creamy-white (approximately one-half the length of the subdorsal scoli); one pair of creamy-white tubercles below lateral scoli; epicranial suture darkened; front creamy-white with vertical, medial brown stripe; two brown stripes arise from the base of dorsal scoli converge toward and flank epicranial and frontal sutures, terminating halfway down the length of the front; adfrontal region dark brown above stemmatal region; post-genae reddish-brown; base of head reddish-brown from occiput to mandibles; mandibles creamy-white, darkened at the cutting edge. **Body:** color varied from light mustard to greenish; thoracic segments T1 and T2 with middorsal white midline stripe, flanked by reddish stripes; remaining segments with thin grayish middorsal stripe; large reddish-brown, triangular middorsal projection located at posterior end of abdominal segment A3; very small middorsal projection at posterior end of A5; supra-spiracular white stripe along the entire length of the body; white sub-spiracular stripe on a continuous longitudinal swelling; thoracic and abdominal legs reddish; ventral side red; caudae pale pinkish-brown patterned with reddish-brown dorso-laterally, where pattern develops into thin broken lines. The larvae molted asynchronously and three out of four aggregated at rest.

**Fifth instar** (duration = 6–7 days,  $n = 4$ , Fig. 1a). **Head:** as in fourth instar, except for a brown stripe arising from dorsal scoli that flanks the epicranial and frontal sutures, and terminates above antennal socket; head densely covered with short creamy-white setae. **Body:** predominantly beige; dark brown middorsal stripe runs along entire length of body; on segments T1, T2, and anterior end of T3, the dark brown mid-

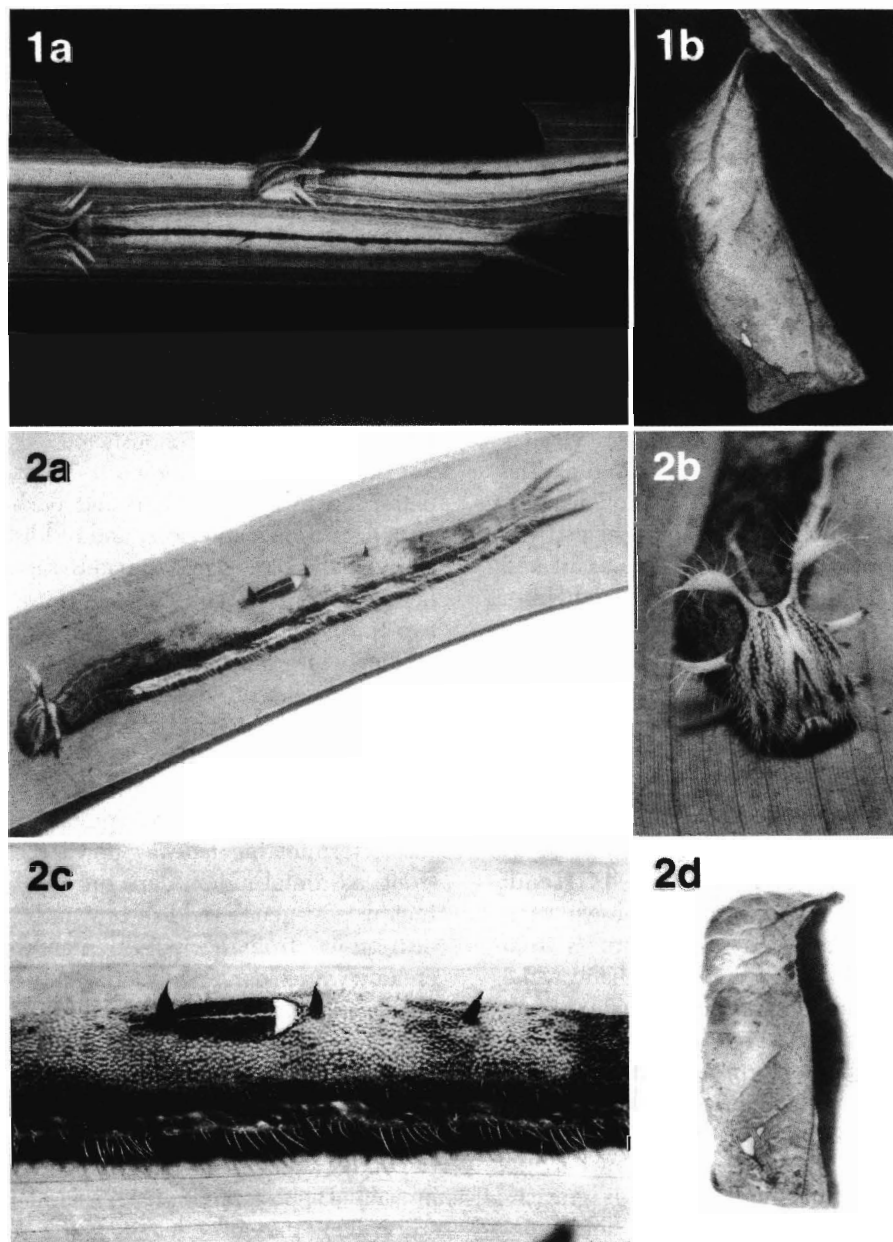


FIG. 1 *Caligo illioneus oregon*, photographs by R. Srygley; (a) fifth instar (October, 1994); (b) pupa (24 October, 1994). FIG. 2. *Caligo idomeneus* (Aiello Lot 81-77), photographs by A. Aiello; (a) final instar (2 December, 1981); (b) final instar, head (2 December, 1981); (c) final instar, body detail (2 December, 1981); (d) pupa (23 December, 1981).

dorsal stripe is divided by a thin creamy-white stripe; triangular middorsal projections same as in fourth instar; body patterned with brown from dorsal midline towards the sides, where pattern develops into thin, broken, longitudinal brown lines; dark brown supra-spiracular line bordered by creamy-white lines; creamy-white subspiracular stripe on a continuous longitudinal swelling; ventral side pink; caudae held separated, light brown at base, becoming dark brown at tip, approxi-

mately two-thirds the length of the head. Larvae molted asynchronously and did not aggregate at rest.

**Sixth instar** (duration = 14–16 days,  $n = 3$ ). **Head:** as in fifth instar, except for four pairs of scoli; additional stripe from dorsal scoli terminating above stem-matal region; dorsal scoli dark brown with white tips and basal creamy-white spots posteriorly; subdorsal and lateral scoli posteriorly brown at base; sub-lateral scoli dark brown posteriorly (one-half of the length of

the lateral scoli). **Body:** as in fifth instar, except for small dark brown triangular middorsal projection at posterior end of abdominal segment A2; large triangular middorsal projection at posterior end of A3; and small triangular middorsal projections at posterior ends of A4 and A5; ventral side brown; caudae held separated, slightly longer than head height.

**Larval development and behavior.** Egg development took 6 days ( $n = 13$ ) and larval development (from hatching to pupation) took 44–49 days ( $n = 3$ ). First through fourth instar larvae fed gregariously and generally rested together on the leaf blade. Fifth and sixth instar larvae rested away from each other on the stem of the plant. Late instar larvae found in the field were solitary (R. B. Srygley pers. obs.).

**Pupa** (duration = 13–15 days,  $n = 3$ , Fig. 1b). Beige with fine, dark brown cryptic markings, giving the general appearance of a dried, curled and sun-bleached leaf; head with transverse keel at apex; long, black setae located immediately above and on the surface of the eyes; antennae with a black longitudinal stripe, and a black transverse line marking each antennal segment; thoracic segment T2 with a prominent keel along dorsal midline, more developed in female than in male pupae; posterior edge of wing pad forming a crest; prominent hump at the base of wing pad; wing surface with two small silver spots located near base of wing; abdomen with conspicuous long black setae along dorsal midline; abdominal segments A5–10 with dark brown lateral line, A4–10 with brown ventral line; A6 humped; brown middorsal stripe arising at head and terminating at cremaster; abdominal segments with transverse oblique markings that resemble leaf venation. Pupal mass: 2.3 g ( $n = 1$ , male).

### *Caligo idomeneus* (L.)

A wandering final instar larva of *C. idomeneus* was found off the food plant by R. Kimsey at Fort Clayton (Canal Area, Panama) on 1 December, 1981 and reared to adult (Aiello Lot 81-77). The larva had about 15 white fly eggs cemented to the underside of the thorax and head. The eggs were removed with forceps and preserved in 80% ethanol. The oviposition behavior and larval food plants of *C. idomeneus* are unknown, but the captive mature larva readily accepted *Heliconia latispatha* Benth. (Musaceae) and *Calathea latifolia* (Link.) K. (Marantaceae) which it ate for 20 days prior to pupation.

**Final instar** ( $n = 1$ , Figs. 2a–c). **Head:** beige with brown stripes; three pairs of beige scoli: largest scoli dorsal, clothed in long setae, enlarged towards the pointed apex and abruptly curved outward toward the sides of the head; subdorsal scoli about two thirds the

length of the dorsal scoli, clothed in long setae, gently curved upwards to pointed apex; lateral scoli smallest, about one half the length of the subdorsals, conical; front with dark vertical dash; adfrontal area dark brown; upper section of epicranial suture dark brown; broad stripe lateral to adfrontal area, terminating at stemmatal level with a darker vertical dash; broad stripe from base of dorsal scoli, terminating on stemmata with a darker vertical dash; dark brown stripe from mid point of inside of each dorsal scoli, terminating at epicranial suture; dark brown stripe along curve from mid point of outside of each dorsal scoli, to sides of head just in front of subdorsal scoli; base of head dark brown from occiput to mandibles. **Body:** brown, except paler dorsally on abdominal segments A2–A6; broad subspiracular white stripe on A1–A7 with oblique brown intrusions from above, just posterior to each spiracle on A2–A7; four soft laterally flattened triangular middorsal projections, one on each of A3–A6; large oval middorsal spot, lying between the projections of A3 and A4, dark brown with a beige posterior-pointing arrow; caudae held separated, brown, broad.

**Pupa** (17 days, Fig. 2d). About 4.5 cm long, and 2 cm wide at widest point; beige with fine brown cryptic markings, giving the general appearance of a dried, curled and sun-bleached leaf; head ridged from center of eye to vertex; eye area adorned with stout dark brown upright setae; antennae with a median black stripe for their entire length, and with cross lines set approximately 0.5 mm apart; mesothorax mid-dorsally humped and keeled; a lateral keel begins near the thoracic spiracle, passes along the forewing, parallel to the inner margin, and, at a level with abdominal segment A1, smoothes to become a raised area following the forewing inner margin to the tornus; each forewing bears two white enameled triangles toward the base of the inner margin and just ventral to the wing keel; clear patches and a small dark triangle are found at the midpoint of each mesothoracic leg; on the abdomen a dark brown midventral line terminates at the tip of the cremaster, as does an oblique dark brown line that begins at the spiracle on abdominal segment A6; dorsum adorned with dark brown, upright setae from the mesothoracic hump through abdominal segment A8, on which the setae are somewhat appressed; spiracles narrowly elliptical, and that of A8 is obscure.

**Diagnostic characters of early stage morphology.** The mature larvae of Central American species of *Caligo* can be easily diagnosed by head and body color, and by the number and morphology of the head scoli. The mature larva of *Caligo eurilochus sulanus* Fruhstorfer has a dark tan head adorned with four pairs of

TABLE 1. Larval food plants of the butterfly subfamily Brassolinae (Nymphalidae). Abbreviations: ARE = Arecales, BRO = Bromeliales, CYC = Cyclanthaceae, GEN = Gentianales, gym = gymnosperm, POA = Poales, ZIN = Zingiberales, ovp = oviposition record. References: Aiello, unpubl<sup>1</sup>; Aiello & Silberglied, 1978<sup>2</sup>; Barcant, 1970<sup>3</sup>; Biezanko et al., 1974<sup>4</sup>; Burmeister, 1873<sup>5</sup>; Casagrande, 1979<sup>6</sup>; Condie, 1976<sup>7</sup>; Cubero, 1985<sup>8</sup>; d'Almeida, 1922<sup>9</sup>; d'Araújo e Silva et al., 1968<sup>10</sup>; DeVries, 1985<sup>11</sup>, 1987<sup>12</sup>; Fontaine, 1913<sup>13</sup>; Harrison, 1963<sup>14</sup>; Hayward, 1969<sup>15</sup>; Moss, unpubl (in Ackery, 1988)<sup>16</sup>; Müller, 1886<sup>17</sup>; Rothschild, 1916<sup>18</sup>; Small, unpubl<sup>19</sup>; Srygley, unpubl<sup>20</sup>; Srygley & Penz, unpubl<sup>21</sup>; Stauffer et al., 1993<sup>22</sup>; Urich & Boos, 1981<sup>23</sup>; Urich & Emmel, 1991<sup>24</sup>; Yezpez et al., 1985<sup>25</sup>; Young, 1977<sup>26</sup>, 1986<sup>27</sup>; Young & Muysshondt, 1975<sup>28</sup>, 1985<sup>29</sup>.

Butterfly species	Plant order	family	species	Reference
1. <i>Blepolenis</i> (as <i>Opsiphanes</i> ) <i>batea</i> (Hübner)	ARE	Arecaceae	"palm"	18
	POA	Poaceae	<i>Panicum lanatum</i> Sw. (as capim amargoso)	10 (no. 2388)
<i>Blepolenis batea</i> (Hübner)	ARE	Arecaceae	<i>Arecastrum</i> (as <i>Syagrus</i> ) <i>romanzoffianum</i> (Cham.) Becc.	4
	ARE	Arecaceae	<i>Butia</i> (as <i>Syagrus</i> ) <i>capitata</i> (Mart.) Becc.	4
2. <i>Brassolis astyra</i> Godart	ARE	Arecaceae	"diversas especies de Palmae"	15
	ARE	Arecaceae	"palmen"	17
<i>Brassolis astyra astyra</i> Godart	ARE	Arecaceae	<i>Arecastrum</i> (as <i>Cocos</i> ) <i>romanzoffianum</i> (Cham.) Becc. (as gerivá)	10 (no. 2362)
	ARE	Arecaceae	<i>Astrocaryum ayri</i> Mart. (as brejauva)	10 (no. 2362)
	ARE	Arecaceae	<i>Bactris</i> sp.	10 (no. 2362)
	ARE	Arecaceae	<i>Butia</i> (as <i>Cocos</i> ) <i>eriospatha</i> (C. Mart. ex Drude) Becc. (as butiázeiro)	10 (no. 2362)
	ARE	Arecaceae	<i>Cocos nucifera</i> L. (as baba de boi)	10 (no. 2362)
	ARE	Arecaceae	<i>Cocos nucifera</i> L. (as coqueiro da Bahia)	10 (no. 2362)
	ARE	Arecaceae	<i>Cocos nucifera</i> L. (as coqueiro año)	10 (no. 2362)
	ARE	Arecaceae	<i>Copernicia cerifera</i> Mart. (as carnaubeira)	10 (no. 2362)
	ARE	Arecaceae	<i>Livistona chinensis</i> (Jacq.) R. Br. (as pent-são da China)	10 (no. 2362)
	ARE	Arecaceae	<i>Livistona rotundifolia</i> (Lamarck) Mart.	10 (no. 2362)
	ARE	Arecaceae	<i>Phoenix dactylifera</i> L. (as tamareira)	10 (no. 2362)
	ARE	Arecaceae	<i>Roystonea</i> (as <i>Oreodoxa</i> ) <i>oleracea</i> (Jacq.) O.F. Cook (as palmeira imperial)	10 (no. 2362)
	ARE	Arecaceae	<i>Roystonea</i> (as <i>Oreodoxa</i> ) <i>regia</i> (Kunth) O.F. Cook (as palmeira real)	10 (no. 2362)
	POA	Poaceae	<i>Saccharum officinarum</i> L. (as cana de açúcar)	10 (no. 2362)
	ZIN	Musaceae	<i>Musa sapientum</i> L. (as bananeira)	10 (no. 2362)
3. <i>Brassolis isthmia</i> Bates	ARE	Arecaceae	<i>Chaemodora</i> sp.	27
	ARE	Arecaceae	<i>Cocos nucifera</i> L.	12
4. <i>Brassolis sophorae</i> (L.)	ARE	Arecaceae	<i>Acrocomia aculeata</i> (Jacq.) Lodd. ex Mart.	22
	ARE	Arecaceae	<i>Archontophoenix alexandrae</i> (Muell.) H. Wendl. & Drude	22
	ARE	Arecaceae	<i>Arecastrum romanzoffianum</i> (Cham.) Becc.	22
	ARE	Arecaceae	<i>Astrocaryum</i> spp.	10 (no. 2365)
	ARE	Arecaceae	<i>Attalea</i> sp.	10 (no. 2365)
	ARE	Arecaceae	<i>Bactris major</i> Jacq.	22
	ARE	Arecaceae	<i>Bactris</i> spp.	10 (no. 2365)
	ARE	Arecaceae	<i>Butia</i> (as <i>Cocos</i> ) <i>eriospatha</i> (C. Mart. ex Drude) Becc. (as butiázeiro)	10 (no. 2365)
	ARE	Arecaceae	<i>Caryota mitis</i> Lour. (as <i>C. plumosa</i> hortícola)	22
	ARE	Arecaceae	<i>Caryota urens</i> L.	22
	ARE	Arecaceae	<i>Chrysalidocarpus lutescens</i> H. Wendl.	22
	ARE	Arecaceae	<i>Chrysalidocarpus lutescens</i> H. Wendl. (as areca bambú)	10 (no. 2364)
	ARE	Arecaceae	<i>Cocos nucifera</i> L.	3, 15, 22
	ARE	Arecaceae	<i>Cocos nucifera</i> L. (as coqueiro da Bahia)	10 (nos 2363–2365)
	ARE	Arecaceae	<i>Cocos nucifera</i> L. (as coqueiro año)	10 (no. 2365)
	ARE	Arecaceae	<i>Copernicia cerifera</i> Mart. (as carnaúba)	10 (no. 2365)
	ARE	Arecaceae	<i>Desmoncus</i> spp.	10 (no. 2365)
	ARE	Arecaceae	<i>Euterpe</i> spp.	10 (no. 2365)
	ARE	Arecaceae	<i>Hyophorbe lagenicaulis</i> (L.H. Bailey) H.E. Moore	22
	ARE	Arecaceae	<i>Livistona chinensis</i> (Jacq.) R. Br. (as pent-são da China)	10 (nos 2364, 2365)
	ARE	Arecaceae	<i>Livistona</i> sp.	22
	ARE	Arecaceae	<i>Mauritia flexuosa</i> L. f.	22
	ARE	Arecaceae	<i>Neodypsis decaryi</i> Jumelle	22
	ARE	Arecaceae	<i>Orbignya</i> spp.	10 (no. 2365)
	ARE	Arecaceae	"palms"	18
	ARE	Arecaceae	<i>Phoenix canariensis</i> hort. ex Chabaud	22
	ARE	Arecaceae	<i>Phoenix dactylifera</i> L.	22
	ARE	Arecaceae	<i>Phoenix dactylifera</i> L. (as tamareira)	10 (no. 2365)

TABLE 1. Continued.

Butterfly species	Plant order	family	species	Reference
	ARE	Arecaceae	<i>Phoenix reclinata</i> Jacq.	22
	ARE	Arecaceae	<i>Pritchardia pacifica</i> Seemann and Wendland	22
	ARE	Arecaceae	<i>Ptychosperma macarthurii</i> (A.A. Wendl.) G. Nicholson	22
	ARE	Arecaceae	<i>Roystonea</i> (as <i>Oreodoxa</i> ) <i>oleracea</i> (Jacq.) O.F. Cook (as palmeira imperial)	10 (nos 2364, 2365)
	ARE	Arecaceae	<i>Roystonea</i> (as <i>Oreodoxa</i> ) <i>regia</i> (Kunth) O.F. Cook (as palmeira real)	10 (nos 2364, 2365)
	ARE	Arecaceae	<i>Roystonea oleracea</i> (Jacq.) O.F. Cook	25
	ARE	Arecaceae	<i>Roystonea regia</i> (Kunth) O.F. Cook	22
	ARE	Arecaceae	<i>Roystonea venezuelana</i> L.H. Bailey	22
	ARE	Arecaceae	<i>Sabal mauritiformis</i> (H. Karst.) Griseb. and H. Wendl.	22
	ARE	Arecaceae	<i>Sabal umbraculiferus</i> Mart.	22
	ARE	Arecaceae	<i>Scheelea macrocarpa</i> Karsten	22
	ARE	Arecaceae	<i>Washingtonia filifera</i> (Linden ex André) H. Wendl.	22
	POA	Poaceae	<i>Saccharum officinarum</i> L. (as cana de açúcar)	10 (no. 2365)
	ZIN	Musaceae	<i>Musa sapientum</i> L. (as bananeira)	10 (no. 2365)
	ZIN	Musaceae	<i>Ravenala madagascariensis</i> Sonn.	22
	ZIN	Musaceae	<i>Strelitzia nicolai</i> Regel & Körn.	22
5. <i>Caligo arisbe</i> Hübner	ZIN	Marantaceae	Caeté	10 (no. 2369)
6. <i>Caligo atreus</i> Kollar	ARE	Arecaceae	<i>Asterogyne martiana</i> H. Wendl. (H. Wendl.) ex Hemsl.	11
	ZIN	Marantaceae	<i>Calathea</i> sp.	7
	ZIN	Musaceae	<i>Heliconia</i> spp.	11, 29
<i>Caligo atreus dionysos</i> Fruhstorfer	CYC	Cyclanthaceae	Cyclanths	12
	ZIN	Musaceae	<i>Heliconia</i> sp.	12
	ZIN	Musaceae	<i>Musa</i> sp.	12
7. <i>Caligo beltrao</i> (Illiger)	ZIN	Cannaceae	<i>Canna indica</i> L.	6
	ZIN	Marantaceae	Caeté	10 (no. 2367)
	ZIN	Marantaceae	<i>Calathea zebrina</i> (Sims) Lindl.	6
	ZIN	Musaceae	<i>Musa sapientum</i> L. (as bananeira)	10 (no. 2367)
	ZIN	Musaceae	"plusieurs <i>Musaceae</i> "	9
	ZIN	Zingiberaceae	<i>Hedychium coronarium</i> J. König (as lírio do brejo)	10 (no. 2367)
8. <i>Caligo eurilochus</i> (Cramer)	ZIN	Marantaceae	<i>Calathea latifolia</i> (Willd. ex Link.) Klotzsch	20
	ZIN	Musaceae	<i>Hedychium</i> sp.	17
	ZIN	Musaceae	<i>Heliconia latispatha</i> Benth.	1 (lot 80-26)
	ZIN	Musaceae	<i>Heliconia latispatha</i> Benth.	20 (ovp)
	ZIN	Musaceae	<i>Musa sapientum</i> L.	20 (ovp)
	ZIN	Musaceae	"plusieurs <i>Musaceae</i> (sic)"	9
	ARE	Arecaceae	<i>Euterpe edulis</i> Mart. (as palmito)	10 (no. 2368)
<i>Caligo eurilochus brasiliensis</i> (Felder)	ZIN	Musaceae	banana	18
	ZIN	Musaceae	<i>Musa sapientum</i> L. (as bananeira)	10 (no. 2368)
	ZIN	Zingiberaceae	<i>Hedychium coronarium</i> J. König (as lírio do brejo)	10 (no. 2368)
<i>Caligo eurilochus sultanus</i> Fruhstorfer	ZIN	Marantaceae	<i>Calathea</i> sp.	12
	ZIN	Musaceae	<i>Heliconia</i> sp.	12
	ZIN	Musaceae	<i>Musa</i> sp.	12
9. <i>Caligo idomeneus</i> (L.)	ZIN	Marantaceae	unidentified	15
	ZIN	Musaceae	<i>Heliconia latispatha</i> Benth.	1 (lot 81-77)
	ZIN	Musaceae	<i>Musa</i> sp.	16
10. <i>Caligo illioneus</i> (Cramer)	ZIN	Marantaceae	<i>Hedychium coronarium</i> J. König (as lírio do brejo)	10 (no. 2371)
	ZIN	Musaceae	<i>Heliconia</i> spp.	11
	ZIN	Musaceae	<i>Musa sapientum</i> L. (as bananeira)	10 (no. 2371)
<i>Caligo illioneus oberon</i> Butler	POA	Poaceae	<i>Saccharum spontaneum</i> L.	21
	ZIN	Musaceae	<i>Heliconia</i> sp.	12
	ZIN	Musaceae	<i>Musa</i> sp.	12
<i>Caligo illioneus pampeiro</i> Fruhstorfer	ZIN	Musaceae	banana	18
11. <i>Caligo martia</i> (Godart)	POA	Poaceae	<i>Echinochloa crus-galli</i> (L.) P. Beauv. (as capim canivão)	10 (no. 2372)
	POA	Poaceae	<i>Pennisetum purpureum</i> Schumach. (as capim elefante)	10 (no. 2372)
12. <i>Caligo memnon</i> (Felder & Felder)	ZIN	Cannaceae	<i>Canna indica</i> L.	1 (lot 85-57)
	ZIN	Cannaceae	<i>Canna</i> sp.	7
	ZIN	Marantaceae	<i>Calathea latifolia</i> (Willd. ex Link.) Klotzsch	20 (ovp)
	ZIN	Musaceae	<i>Heliconia latispatha</i> Benth.	20, 29
	ZIN	Musaceae	<i>Heliconia</i> spp.	7, 11, 19
	ZIN	Musaceae	<i>Musa sapientum</i> L.	20 (ovp)
	ZIN	Musaceae	<i>Musa</i> sp.	14, 29

TABLE I. Continued.

Butterfly species	Plant order	family	species	Reference
<i>Caligo memnon memnon</i> (Felder & Felder)	ZIN	Musaceae	<i>Heliconia</i> sp.	12
	ZIN	Musaceae	<i>Musa</i> sp.	12
<i>Caligo memnon telamonius</i> (Felder & Felder)	GEN	Rubiaceae	<i>Coffea</i> sp. (as cafeeiro) [dubious record]	10 (no. 2373)
13. <i>Caligo oberthurii oberthurii</i> (Deyrolle)	ARE	Arecaceae	"low, evergreen palm"	18
14. <i>Caligo oileus</i> (Felder & Felder)	ZIN	Musaceae	<i>Musa</i> sp.	16
<i>Caligo oileus scamander</i> (Boisduval)	ZIN	Musaceae	<i>Heliconia</i> sp.	12
15. <i>Caligo placidianus</i> Staudinger	ZIN	Musaceae	<i>Musa</i> sp.	16
16. <i>Caligo praxiodus</i> Fruhstorfer	POA	Poaceae	<i>Saccharum officinarum</i> L. (as cana de açúcar)	10 (no. 2374)
17. <i>Caligo prometheus epimetheus</i> (Felder & Felder)	ZIN	Musaceae	banana	18
18. <i>Caligo teucer</i> (L.)	ZIN	Musaceae	<i>Heliconia</i> sp.	16
	ZIN	Musaceae	<i>Musa</i> sp.	3
<i>Caligo</i> sp.	ARE	Arecaceae	<i>Cyrtostachys</i> sp.	20
	ZIN	Musaceae	<i>Musa sapientum</i> L. (as bananeira)	10 (no. 2366)
	ZIN	Zingiberaceae	<i>Hedychium coronarium</i> J. König (as lírio do brejo)	10 (no. 2366)
19. <i>Catoblepia amphirhoe</i> (Hübner)	ARE	Arecaceae	<i>Arecastrum</i> (as <i>Cocos</i> ) <i>romanzoffianum</i> (Cham.) Becc. (as gerivá)	10 (no. 2375)
	ARE	Arecaceae	"palmeras"	15
20. <i>Catoblepia orgetorix championi</i> Bristow	ARE	Arecaceae	palms	12
21. <i>Dasyophthalma rusina</i> (as <i>geraensis</i> ) (Godart)	ARE	Arecaceae	<i>Bactris tomentosa</i> Mart. (as uricana)	10 (no. 2376)
<i>Dasyophthalma rusina</i> (Godart)	ARE	Arecaceae	<i>Euterpe edulis</i> Mart. (as palmito)	10 (no. 2377)
	POA	Poaceae	<i>Bambusa</i> sp. (as bambú)	10 (no. 2378)
22. <i>Dynastor darius</i> (F.)	BRO	Bromeliaceae	<i>Aechmea fasciata</i> (Lindl.) Baker	10 (no. 2381)
	BRO	Bromeliaceae	<i>Aechmea nudicaulis</i> (L.) Griseb.	24
	BRO	Bromeliaceae	<i>Ananas comosus</i> (as <i>sativus</i> )(L.) Merr. (as abacaxi)	10 (nos 2379–2381)
	BRO	Bromeliaceae	<i>Ananas</i> sp. (as ananás selvagem)	10 (no. 2379)
	BRO	Bromeliaceae	<i>Ananas</i> sp. (as ananás)	10 (no. 2379)
	BRO	Bromeliaceae	<i>Billbergia nutans</i> H. Wendl. ex Regel	10 (no. 2381)
	BRO	Bromeliaceae	<i>Billbergia speciosa</i> Thunb.	10 (no. 2381)
	BRO	Bromeliaceae	<i>Billbergia</i> spp.	10 (no. 2380)
	BRO	Bromeliaceae	<i>Bromelia fastuosa</i> Lindl. (as bananilha do mato)	10 (no. 2381)
	BRO	Bromeliaceae	<i>Bromelia fastuosa</i> Lindl. (as caraguatá)	10 (nos 2379, 2380)
	BRO	Bromeliaceae	<i>Bromelia fastuosa</i> Lindl. (as banana do mato)	10 (no. 2379)
	BRO	Bromeliaceae	<i>Ortgiesia</i> (as <i>Aechmea</i> ) <i>gamosepala</i> (Wittm.) L.B. Sm. & W.J. Kress	10 (no. 2381)
	BRO	Bromeliaceae	<i>Tillandsia zebrina</i> hort. ex Baker	10 (no. 2379)
	BRO	Bromeliaceae	unidentified	17
	BRO	Bromeliaceae	unidentified	15
<i>Dynastor darius mardonius</i> Fruhstorfer	BRO	Bromeliaceae	<i>Aechmea magdalenae</i> (André) André ex Baker	11
<i>Dynastor darius stygianus</i> Butler	BRO	Bromeliaceae	<i>Aechmea</i> sp.	12
	BRO	Bromeliaceae	<i>Agallotachys pinguin</i> (L.) Beer (as <i>Bromelia pinguin</i> L.)	11
	BRO	Bromeliaceae	<i>Ananas comosus</i> (L.) Merr. [accepted by larvae in captivity]	2, 1 (lot 78-84)
	BRO	Bromeliaceae	<i>Ananas</i> sp.	12
	BRO	Bromeliaceae	<i>Bromelia plumieri</i> (E. Morren) L.B. Sm.	1
	BRO	Bromeliaceae	<i>Bromelia</i> sp.	12
	BRO	Bromeliaceae	"pineapple and other bromeliads, gravata"	18
23. <i>Dynastor macrosiris</i> (Doubleday)	BRO	Bromeliaceae	<i>Aechmea nudicaulis</i> (L.) Griseb.	23, 24
24. <i>Dynastor napoleon</i> (Doubleday)	BRO	Bromeliaceae	<i>Aechmea nudicaulis</i> (L.) Griseb.	24
	BRO	Bromeliaceae	<i>Aechmea</i> sp.	10 (no. 2382)
	BRO	Bromeliaceae	<i>Ananas comosus</i> (as <i>sativus</i> ) (L.) Merr. (as abacaxi)	10 (no. 2382)
	BRO	Bromeliaceae	gravata	18
25. <i>Eryphanis aesacus bubocula</i> (Butler)	ARE	Arecaceae	palms	12
	POA	Poaceae	<i>Bambusa vulgaris</i> Schrad. ex J.C. Wendl.	8
	POA	Poaceae	<i>Chusquea scabra</i> Soderstr. & C.E. Calderón	8
	POA	Poaceae	<i>Olyra caudata</i> Trin.	8
26. <i>Eryphanis automedon</i> (Cramer)	POA	Poaceae	<i>Bambusa</i> sp.	3
27. <i>Eryphanis polyxena lycomedon</i> (Felder & Felder)	POA	Poaceae	bamboo	12
	POA	Poaceae	<i>Bambusa arundinacea</i> (Retz.) Willd.	1 (lot 82-9)
	POA	Poaceae	<i>Saccharum spontaneum</i> L.	1, 21
28. <i>Eryphanis reevesii</i> (Doubleday)	POA	Poaceae	<i>Bambusa</i> (as <i>Guadua</i> ) sp.	10 (no. 2383)
	POA	Poaceae	<i>Bambusa vulgaris</i> Schrad. ex J.C. Wendl. (as bambú comum)	10 (no. 2383)

TABLE 1. Continued.

Butterfly species	Plant order	family	species	Reference
	POA	Poaceae	<i>Bambusa vulgaris</i> Schrad. ex J.C. Wendl. (as bambú comum)	10 (no. 2383)
	POA	Poaceae	<i>Olyra latifolia</i> L. (as taquarinha)	10 (no. 2383)
	POA	Poaceae	<i>Pennisetum purpureum</i> Schumach. (as capim elefante)	10 (no. 2383)
<i>Eryphanis reevesii</i> (Doubleday) (as <i>Caligo rivesii</i> )	POA	Poaceae	<i>Bambusa</i> sp.	17
	POA	Poaceae	<i>Olyra latifolia</i> L.	17
29. <i>Narope cyllastros</i> Doubleday	POA	Poaceae	<i>Bambusa</i> spp.	15, 17
<i>Narope cyllastros cyllastros</i> Doubleday	POA	Poaceae	<i>Bambusa</i> (as <i>Guadua</i> ) sp.	10 (no. 2384)
	POA	Poaceae	<i>Bambusa</i> sp. (as bambú)	10 (no. 2384)
<i>Narope cyllastros testacea</i> Godman & Salvin	POA	Poaceae	<i>Bambusa</i> sp.	12
30. <i>Oopoptera aorsa</i> (Godart) (as <i>Opsiphanes aorsa</i> )	POA	Poaceae	<i>Bambusa vulgaris</i> Schrad. ex J.C. Wendl. (as bambú comum)	10 (no. 2387)
31. <i>Oopoptera staudingeri</i> (Godman & Salvin)	POA	Poaceae	<i>Chusquea longifolia</i> Swallen	8
	POA	Poaceae	<i>Chusquea</i> sp.	12
<i>Oopoptera</i> (as <i>Opsiphanes</i> ) <i>staudingeri</i> (Godman & Salvin)	POA	Poaceae	<i>Chusquea</i> sp.	11
32. <i>Oopoptera</i> (as <i>Opsiphanes</i> ) <i>syme</i> (Hübner)	POA	Poaceae	<i>Bambusa</i> (as <i>Guadua</i> ) sp.	10 (no. 2395)
33. <i>Opsiphanes bogotanus</i> Distant	ARE	Arecaceae	palms	11, 12
	ZIN	Marantaceae	<i>Calathea inocephala</i> (Kuntze) H.A. Kenn. & Nicolson	1 (lot 81-41)
	ZIN	Marantaceae	<i>Calathea latifolia</i> (Willd. ex Link.) Klotzsch	20
<i>Opsiphanes bogotanus bogotanus</i> Distant	ZIN	Musaceae	banana	18
34. <i>Opsiphanes cassiae</i> (L.)	ARE	Arecaceae	unidentified	13
	ZIN	Musaceae	<i>Heliconia</i> sp.	16
	ZIN	Musaceae	<i>Heliconia</i> sp. and "différentes plantes musacées"	5
	ZIN	Musaceae	<i>Musa sapientum</i> L.	15
<i>Opsiphanes cassiae cassiculus</i> Stichel	ZIN	Musaceae	<i>Musa</i> sp.	3
<i>Opsiphanes cassiae lucullus</i> Fruhstorfer	ZIN	Musaceae	banana	18
	ZIN	Musaceae	<i>Musa sapientum</i> L. (as bananeira)	10 (no. 2389)
35. <i>Opsiphanes cassina aiellae</i> Bristow	ARE	Arecaceae	<i>Cocos nucifera</i> L.	1 (lots 77-76, 82-1, 83-17, 87-3)
	ARE	Arecaceae	<i>Livistona</i> sp.	1 (lot 91-25)
	ARE	Arecaceae	palm	1 (lot 95-8)
<i>Opsiphanes cassina fabricii</i> (Boisduval)	ARE	Arecaceae	<i>Acrocomia vinifera</i> Oerst.	11, 12
	ARE	Arecaceae	<i>Bactris guineensis</i> (L.) H.E. Moore (as <i>Bactris minor</i> )	28
	ARE	Arecaceae	<i>Bactris</i> sp.	11, 12
	ARE	Arecaceae	<i>Cocos nucifera</i> L.	11, 12, 28
	ARE	Arecaceae	<i>Erythea salvadorensis</i> (H.Wendl. ex Becc.) H.E. Moore (as <i>Brahea saldorensis</i> )	28
	ARE	Arecaceae	<i>Roystonea regia</i> (Kunth) O.F. Cook	28
36. <i>Opsiphanes invirae</i> (Hübner)	ARE	Arecaceae	<i>Arecastrum</i> (as <i>Cocos</i> ) <i>romanzoffianum</i> (Cham.) Becc. (as gerivá)	10 (nos 2390, 2392)
	ARE	Arecaceae	<i>Arecastrum</i> (as <i>Syagrus</i> ) <i>romanzoffianum</i> (Cham.) Becc.	4
	ARE	Arecaceae	<i>Butia</i> (as <i>Cocos</i> ) <i>eriospatha</i> (C. Mart. ex Drude) Becc. (as butiázeiro)	10 (nos 2390, 2392)
	ARE	Arecaceae	<i>Butia</i> (as <i>Syagrus</i> ) <i>capitata</i> (Mart.) Becc.	4
	ARE	Arecaceae	<i>Cocos nucifera</i> L. (as coqueiro da Bahia)	10 (no. 2390)
	ARE	Arecaceae	<i>Copernicia cerifera</i> Mart. (as carnaúba)	10 (no. 2390)
	ARE	Arecaceae	<i>Livistona australis</i> (R. Br.) C. Mart.	4
	ARE	Arecaceae	<i>Livistona australis</i> (R. Br.) C. Mart. (as pent-sáo austral)	10 (nos 2390, 2392)
	ARE	Arecaceae	<i>Livistona chinensis</i> (Jacq.) R. Br. (as pent-sáo chinês)	10 (no. 2392)
	ARE	Arecaceae	<i>Livistona chinensis</i> (Jacq.) R. Br.	4
	ARE	Arecaceae	<i>Livistona rotundifolia</i> (Lamarck) Mart.	10 (no. 2390)
	ARE	Arecaceae	Palmeira de leque	10 (no. 2392)
	ARE	Arecaceae	<i>Phoenix canariensis</i> hort. ex Chabaud	4
	ARE	Arecaceae	<i>Prestoea</i> sp.	8
	ARE	Arecaceae	<i>Raphia</i> sp. (as palmeira ornamental)	10 (no. 2391)
	ARE	Arecaceae	<i>Roystonea</i> (as <i>Oreodoxa</i> ) <i>oleracea</i> (Jacq.) O.F. Cook (as palmeira imperial)	10 (no. 2390)



TABLE 1. Continued.

Butterfly species	Plant: order	family	species	Reference
	gym	Cycadaceae	<i>Cycas circinalis</i> L. (as palmeira de jardim) [dubious record]	10 (no. 2390)
	ZIN	Musaceae	<i>Musa sapientum</i> L. (as bananeira)	10 (nos 2390, 2392)
<i>Opsiphanes invirae amplificatus</i> Stichel (as <i>O. i. remoliatus</i> )	ARE	Arecaceae	"giriva and palms"	18
<i>Opsiphanes invirae amplificatus</i> (Stichel)	ARE	Arecaceae	<i>Phoenix</i> sp.	15
<i>Opsiphanes invirae amplificatus</i> Stichel (as <i>ampliplacita</i> )	ZIN	Musaceae	<i>Musa sapientum</i> L. (as bananeira)	10 (no. 2386)
<i>Opsiphanes invirae cuspidatus</i> Stichel	ARE	Arecaceae	<i>Bactris major</i> Jacq.	1 (lot 82-44)
	ARE	Arecaceae	palms	12
37. <i>Opsiphanes merianae</i> Stichel	ARE	Arecaceae	ornamental palm	3
38. <i>Opsiphanes quiteria</i> (Cramer)	ARE	Arecaceae	<i>Arecastrum romanzoffianum</i> (Cham.) Becc.	15
<i>Opsiphanes quiteria badius</i> Stichel	ARE	Arecaceae	<i>Bactris</i> sp.	1 (lot 81-74)
<i>Opsiphanes quiteria meridionalis</i> Staudinger	ARE	Arecaceae	<i>Chrysalidocarpus</i> (as <i>Areca</i> ) <i>lutescens</i> H. Wendl.	10 (no. 2393)
<i>Opsiphanes quiteria meridionalis</i> (as <i>philon</i> ) Staudinger	ARE	Arecaceae	<i>Astrocaryum ayri</i> Mart. (as brejauva)	10 (no. 2394)
	ARE	Arecaceae	<i>Euterpe edulis</i> Mart. (as palmito)	10 (no. 2394)
<i>Opsiphanes quiteria quirinus</i> Godman & Salvin	ARE	Arecaceae	<i>Chrysalidocarpus lutescens</i> H. Wendl.	8
	ARE	Arecaceae	<i>Cocos nucifera</i> L.	26
	ARE	Arecaceae	<i>Geonoma</i> sp.	8
	ARE	Arecaceae	palms	12
	ARE	Arecaceae	<i>Prestoea allenii</i> H.E. Moore	8
39. <i>Opsiphanes tamarindi</i> Felder & Felder	ZIN	Musaceae	<i>Musa sapientum</i> L. (as bananeira)	10 (no. 2396)
	ZIN	Musaceae	<i>Musa</i> sp.	14, 17
<i>Opsiphanes tamarindi sikyon</i> Fruhstorfer	ZIN	Musaceae	<i>Heliconia collinsiana</i> Griggs	28
	ZIN	Musaceae	<i>Heliconia latispatha</i> Benth.	28
	ZIN	Musaceae	<i>Musa</i> sp.	28
<i>Opsiphanes tamarindi tamarindi</i> Felder & Felder	ZIN	Cannaceae	<i>Canna indica</i> L.	1 (lot 84-9)
	ZIN	Musaceae	<i>Heliconia latispatha</i> Benth.	1 (lots 80-40, 80-43)
	ZIN	Musaceae	<i>Heliconia</i> sp.	12
	ZIN	Musaceae	<i>Musa</i> sp.	12
<i>Opsiphanes</i> sp.	ARE	Arecaceae	<i>Cocos nucifera</i> L. (as coqueiro anão)	10 (no. 2385)
	ARE	Arecaceae	<i>Cyrtostachys</i> sp.	20
	ZIN	Musaceae	<i>Heliconia latispatha</i> Benth.	1 (lot 82-18)
	ZIN	Musaceae	<i>Musa sapientum</i> L. (as bananeira)	10 (no. 2385)

scoli, dark brown body with six middorsal projections (see figs. 6 and 7 in Malo & Willis 1961 p. 532). That of *C. atreus dionysos* Fruhstorfer has a tan colored head with fine vertical striations and three pairs of scoli,

with the dorsal pair enlarged at tip and curved outward (see fig. 32, E1 in DeVries 1987 p. 248), a tan colored body with many fine striations on dorsum, and five middorsal projections (DeVries 1987). The head cap-

TABLE 2. Summary of larval food plant records for brassoline butterflies. Numbers represent species as listed in Table 1.

Plant order family	ARE Arecaceae	POA Poaceae	ZIN Musaceae	Marantaceae	Zingiberaceae	Canaceae	CYC Cyclanthaceae	BRO Bromeli- aceae
Butterfly genera								
<i>Blepolenis</i>	1							
<i>Brassolis</i>	2, 3, 4	2, 4	2, 4					
<i>Caligo</i>	6, 9, 14	11, 12, 17	6, 7, 8, 9, 10, 12, 14, 15, 17, 18	5, 6, 7, 8, 9, 10, 12	7, 8	7, 12	6	
<i>Catoblepia</i>	19, 20							
<i>Dasyophthalma</i>	21	21						
<i>Dynastor</i>								22, 23, 24
<i>Eryphanis</i>	25	25, 26, 27, 28, 29						
<i>Narope</i>		30, 31, 32						
<i>Opoptera</i>								
<i>Opsiphanes</i>	33, 34, 35, 36, 37, 38		33, 34, 36, 39	33		39		

sule of the mature larva of *C. memnon* is banded with tan and dark brown with four pairs of scoli (see fig. 5 in Young & Muysshondt 1985 p.162; fig. 32, E2 in DeVries 1987 p. 248), with the dorsal pair enlarged at tip. The body is light brown with a dark brown middorsal stripe, dark brown striations, and six middorsal projections (note that fig. 5 in Young & Muysshondt 1985 p.162, and fig. 31 F in DeVries 1987 p. 248, do not portray the same body color pattern). The mature larva of *C. illioneus* has a head patterned in brown and creamy white adorned with three pairs of scoli plus a lateral tubercle, and the body is beige with a dark brown middorsal stripe and four middorsal projections (Fig. 1a). That of *C. idomeneus* has a beige head patterned with brown, three pairs of scoli with the dorsal pair enlarged at tip and curved outward (Fig. 2b). The body is brown with a lighter colored area dorsally and a large oval middorsal spot between A3 and A4, a broad white subspiracular stripe, and four middorsal projections (Fig. 2a). The pupae of all species are very similar, and those of *C. illioneus* and *C. idomeneus* seem to differ only in the size of the white triangular marking at the base of the wing (more prominent in *C. idomeneus*, Fig. 2d). Early stages of *C. oileus* have never been formally described.

**Larval food plants of the Brassolinae.** It is well known that brassoline immatures are restricted to monocotyledonous plants (Ehrlich & Raven 1965, Ackery 1988, Table 1), but little correlation has been found between plant use and brassoline classification (Ackery 1988). We found that larval food plants include four of the eight monocot superorders (Table 1), a distribution suggesting that brassolines are generalist monocot feeders. However, all food plant records together indicate that the majority of species feed on plants in the families Arecaeae, Musaceae, and Poaceae (Tables 1 and 2). Therefore, the apparent lack of correspondence between plant use and brassoline classification should be reexamined.

Available records are sufficient to show that brassoline genera vary both in diet breadth and their association with monocot families (Table 2; see Stichel 1909 and Bristow 1981, 1982, 1991 for taxonomic classification of the butterflies). For instance, although individual species of *Caligo* have been reported to feed on 1–4 plant genera in 1–4 families, collectively *Caligo* has a larval food plant range that includes 11 genera in 7 families (Table 2, see also Ackery 1988) suggesting multiple events of host colonization during its evolutionary history. Similar patterns occur in *Eryphanes* and *Opsiphanes*: species of *Eryphanes* typically feed on Poaceae, except for *E. aesacus* which has also been found on Arecaeae; and *Opsiphanes* tend to associate

with Arecaeae and Musaceae, except for *O. bogotanus* and *O. tamarindi*, whose food plant range also includes Marantaceae and Canaceae respectively. Available information suggests that other brassolines are restricted to a single plant family (*Blepolepis* and *Catoblepia* on Arecaeae, *Narope* and *Opoptera* on Poaceae, *Dynastor* on Bromeliaceae). Noteworthy is that the food plant range of the putative basal genus *Brassolis* includes Arecaeae, Poaceae and Musaceae; the plant families upon which most brassolines feed as immatures. Although patterns of host association can be recognized at the generic level, their examination in an evolutionary context awaits a well supported phylogeny for this group of butterflies.

We hope that the summary presented here encourages research aimed at furthering our understanding of the patterns of food plant utilization and evolution in brassoline butterflies.

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#### LITERATURE CITED

- ACKERY, P. R. 1988. Hostplants and classification: a review of nymphalid butterflies. *Biol. J. Linn. Soc.* 33:95–203.
- AIELLO, A. & R. E. SILBERGLIED. 1978. Life history of *Dynastor darius* (Lepidoptera: Nymphalidae: Brassolinae) in Panama. *Psyche* 85:331–345.
- AUERBACH, M. J. & D. R. STRONG. 1981. Nutritional ecology of *Heliconia* herbivores: plant fertilization and alternate hosts. *Ecol. Monogr.* 51:63–83.
- BARCANT, M. 1970. The butterflies of Trinidad and Tobago. London, Collins.
- BIEZANKO, C. M., A. RUFFINELLI & D. LINK. 1974. Plantas y otras sustancias alimenticias de las orugas de los lepidopteros uruguayos. *Rev. Centro de Ciências Rurais* 4:107–147.
- BRISTOW, C. R. 1981. A revision of the brassoline genus *Catoblepia* (Lepidoptera: Rhopalocera). *Zool. J. Linn. Soc.* 72:117–163.
- BRISTOW, C. R. 1982. A revision of the brassoline genus *Selenophanes* (Lepidoptera: Rhopalocera). *Zool. J. Linn. Soc.* 76:273–291.
- BRISTOW, C. R. 1991. A revision of the brassoline genus *Opsiphanes* (Lepidoptera: Rhopalocera). *Zool. J. Linn. Soc.* 101:203–293.
- BURMEISTER, H. 1873. Description de Morphonides Brésiliens. *Rev. et Mag. Zool.* 3:17–47.
- CASACRANDE, M. M. 1979. Sobre *Caligo beltrao* (Illiger). I. Taxonomia, biologia, morfologia das fases imaturas e distribuições espacial e temporal (Lepidoptera, Satyridae, Brassolinae). *Rev. Brasil. Biol.* 39:173–193.
- CONDIE, S. 1976. Some notes on the biology and behavior of three species of Lepidoptera (Satyridae: Brassolinae) on non-economic plants in Costa Rica. *Tebiwa* 3:1–28.

- CUBERO, R. 1985. Notes on the life cycle and natural history of *Opsiphanes quiteria quirinus* Godman and *Eryphanis aescacus buboculus* Butler (Brassolidae). *J. Lep. Soc.* 39:33–43.
- D'ALMEIDA, R. F. 1922. *Mélanges Lépidoptérologiques. Etudes sur les Lépidoptères du Brésil.* Berlin.
- D'ARAÚJO E SILVA, A. G., C. R. GONÇALVES, D. M. GALVÃO, A. J. L. GONÇALVES, J. GOMES, M. DO NASCIMENTO E SILVA & L. DE SIMONI. 1968. Quarto Catálogo dos insetos que vivem nas plantas do Brasil. Rio de Janeiro: Ministerio de Agricultura.
- DEVRIES, P. J. 1983. Checklist of butterflies, pp. 654–678, 703–704, 722–723, 729–732, 741–742, 751–752, 754–755. *In*, D.H. Janzen (ed.) *Costa Rican natural history.* University of Chicago Press, Chicago.
- DEVRIES, P. J. 1985. Hostplant records and natural history notes on Costa Rican butterflies (Papilionidae, Pieridae & Nymphalidae). *J. Res. Lep.* 24:290–333.
- DEVRIES, P. J. 1987. *The Butterflies of Costa Rica and their natural history.* Princeton University Press, Princeton, New Jersey.
- DUNN, L. H. 1917. The coconut-tree caterpillar (*Brassolis isthmia*) of Panama. *J. Econ. Entomol.* 10:473–488.
- EHRlich, P. R. & P. H. RAVEN. 1965. Butterflies and plants: a study in coevolution. *Evolution* 18:586–608.
- FOUNTAIN, M. E. 1913. Five months butterfly collecting in Costa Rica in the Summer of 1911. *Entomologist* 46:189–194, 214–219.
- HARRISON, J. O. 1962. The natural enemies of some banana pests in Costa Rica. *J. Econ. Entomol.* 56:282–285.
- HARRISON, J. O. 1963. On the biology of three banana pests in Costa Rica (Lepidoptera: Limacodidae, Nymphalidae). *Ann. Entomol. Soc. Amer.* 56:87–94.
- HARRISON, J. O. 1964. Factors affecting the abundance of Lepidoptera in banana plantations. *Ecology* 45:508–519.
- HAYWARD, K. F. 1969. Datos para el estudio de la ontogenia de Lepidopteros Argentinos. Instituto Miguel Lillo, Tucuman.
- MALO, F. & E. R. WILLIS. 1961. Life history and biological control of *Caligo eurilochus*, a pest of bananas. *J. Econ. Entomol.* 54:530–536.
- MÜLLER, W. 1886. Südamerikanische Nymphalidenraupen: versuch eines natürlichen systems der nymphaliden. *Zoologische Jahrbücher* 1:417–678.
- RIDGELEY, R. S. 1976. *Birds of Panama.* Princeton University Press, Princeton, New Jersey.
- ROTHSCHILD, W. 1916. Notes on Amathusiidae, Brassolidae, Morphidae, etc, with descriptions of new forms. *Novitates Zoologicae* 23:299–318.
- SRYGLEY, R. B. 1994. Shivering and its cost during reproductive behaviour in Neotropical owl butterflies *Caligo* and *Opsiphanes* (Nymphalidae: Brassolinae). *Anim. Behav.* 47:23–32.
- SRYGLEY, R. B. & C. M. PENZ. 1999. Lekking in Neotropical owl butterflies, *Caligo illioneus* and *C. oileus* (Lepidoptera: Brassolinae). *J. Insect Behav.* 12:81–103.
- STAUFFER, F., A. J. CLAVIJO & M. BEVILACQUA. 1994. Ataque de *Brassolis sophorae* (L., 1758) (Lepidoptera: Nymphalidae: Brassolinae) a las palmas (Palmae) del parque del este "Romulo Betancourt", Caracas, Venezuela. *Bol. Ent. Venez. N. S.* 8(1):95–103.
- STICHEL, H. 1909. Brassolidae. *Das Tierreich* 25:1–244.
- URICH, F. C. & J. O. BOOS. 1981. Metamorphosis of *Dynastor macrosiris* Westw. (Lepidoptera Brassolidae). *Living World*, 1981:34.
- URICH, F. C. & T. C. EMMEL. 1991. Life histories of Neotropical butterflies from Trinidad: 5. *Dynastor darius darius* (Lepidoptera: Nymphalidae: Brassolinae). *Trop. Lepidoptera* 2(2):145–149.
- YEPEZ, G., F. FERNANDEZ Y. & J. CLAVIJO. 1985. Presencia de *Brassolis sophorae* (L.) (Lepidoptera: Brassolidae) causando danos en palmas de chaguaramos, *Roysotea oleraceae* (Jacq.), en el estado Carabobo, Venezuela. *Bol. Entomol. Venez. N. S.* 4(3):23–24.
- YOUNG, A. M. 1977. Notes on the defoliation of coconut palm (*Cocos nucifera*) by the butterfly *Opsiphanes quiteria quirinus* in north-eastern Costa Rica. *Deutsche Entomologische Zeitschrift*, 24:353–365.
- YOUNG, A. M. 1986. Natural history notes on *Brassolis isthmia* Bates (Lepidoptera: Nymphalidae: Brassolinae) in northeastern Costa Rica. *J. Res. Lep.* 24:385–392.
- YOUNG, A. M. & A. MUYSHONDT. 1975. Studies on the natural history of Central America butterflies in the family cluster Satyridae-Brassolidae-Morphidae (Lepidoptera: Nymphaloidea). III. *Opsiphanes tamarindi* and *Opsiphanes cassina* in Costa Rica and El Salvador. *Studies on the Neotropical Fauna* 10:19–56.
- YOUNG, A. M. & A. MUYSHONDT. 1985. Notes on *Caligo memnon* Felder and *Caligo atreus* Kollar (Lepidoptera: Nymphalidae: Brassolinae) in Costa Rica and El Salvador. *J. Res. Lepid.* 24:154–175.

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