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PAPILIO HOMERUS (PAPILIONIDAE) IN JAMAICA, WEST INDIES: FIELD OBSERVATIONS AND DESCRIPTION OF IMMATURE STAGES

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ABSTRACT. The life history and immature stages of *Papilio homerus* Fabricius are described from material collected in eastern Jamaica. The butterfly is now present in two small, isolated populations, each associated with the distribution of primary larval foodplants which are endemic species of *Hernandia* (Hernandiaceae) located in the last remaining areas of humid, virgin rainforest. Field observations of larval and adult behavior are also reported.

Additional key words: rainforest, Hernandiaceae, endemic species, adult behavior, taxonomy.

Papilio homerus Fabricius (Papilionidae) is the largest swallowtail species in the New World. It is endemic to Jamaica where it inhabits wet, primary forests. Only brief accounts of the immature stages have been published: Gosse (1879) described the egg and larva, Panton (1893) the mature larva, Taylor (1894) the larva and pupa, and Swainson (1901) the larva. However, as Brown and Heineman (1972) noted, none provided a complete description of the immature stages. Walker (1945) and Avinoff (in Brown & Heineman 1972) provided fragmented accounts of adult behavior. Wells et al. (1983) and Collins and Morris (1985) summarized the life history and ecology from data provided, in part, from the study reported here. Based on observations from 1962 to 1980, this paper reports the results of the first long-term study of *Papilio homerus*, describes all immature stages, and provides information on foodplants, population distribution, predation, and daily and seasonal behavior of adults in their natural environment.

MATERIALS AND METHODS

Rearing Observations

From 1968 to 1970, immature stages were collected from Corn Puss Gap in eastern Jamaica and taken to the Entomology Laboratory, University of the West Indies, Mona, for detailed study. Eggs and first and second instars were placed in small, round, plastic containers (5 × 3 cm); all other larvae were placed in larger plastic containers (25 × 10 cm). Moisture was provided by placing damp tissue paper in the container lids. Larvae were fed with leaves of *Hernandia catalpaefolia* Britton & Harris and *H. jamaicensis* Britton & Harris (Hernandiaceae)

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obtained from potted seedlings or from cuttings collected from the native habitat. Containers were cleaned daily. Before pupation, larvae were transferred to cylindrical screened cages (18 × 60 cm) with the foodplant in jars of water. Twigs were added to provide additional pupation sites. Plastic bags, placed over the cages to maintain high humidity, were left open at the bottom for ventilation. After pupation, all leaves were removed from the cages. All stages were kept in a shaded insectary at 25–30°C. Daylength varied between 12.0 and 13.25 h.

Eggs, first and second instars, and head capsules were measured with an ocular micrometer. All other measurements were made with a caliper or metric ruler. Samples of each stage were preserved in Dietrich's solution and larval head capsules were collected after each molt. Twenty-three eggs, 51 larvae, and 7 pupae were studied. Nomenclature of the immature stages largely follows Peterson (1962).

Study Area and Field Observations

Based on information from literature and museum specimen records, I visited all localities where the butterfly had been collected previously and other potentially suitable localities. I spent a total of 123 days in the field.

The main study area in the east was centered around Corn Puss Gap (elev. 600 m), where the Blue Mountains and John Crow Mountains meet, in primary tropical forest with a high canopy (30 m). The steep terrain has numerous streams and waterfalls. On the north side of the Gap, the forest is continuous; on the south side, it is fragmented due to previous logging operations, subsistence farming, and major landslides along a road from Bath to the Gap, which has become impassable. Low clouds cover this area for extended periods, particularly from September to mid-April. Over the study period, 47 days were spent observing *P. homerus* in this locality and 39 days were spent searching for the butterfly in the surrounding mountain ranges.

The western study area was between Elderslie and Quickstep (elev. 450 m) in the Cockpit Country in primary tropical forest. The terrain consists of numerous small limestone hills with steep sides, separated by narrow valleys. The forest is fragmented from logging, subsistence farming, and continuing road construction. Twenty days were spent studying this population and searching surrounding localities.

The third area visited was on and around Mount Diablo (elev. 300–1000 m) in central Jamaica where the butterfly was last collected in 1925. This area is generally more accessible by road and consists of small fragments of primary forest on steep limestone, extensive secondary forest, pastureland, and plantations of Caribbean Pine (*Pinus caribaea* Morelot, Pinaceae) and Blue Mahoe (*Hibiscus elatus* SW.,

Malvaceae). Seventeen days were spent searching all former known localities of the butterfly and investigating other nearby areas.

The average annual rainfall at Corn Puss Gap and in the Cockpit Country is over 5000 mm, with slightly less rainfall occurring on Mt. Diablo. All areas had high humidity and frequent mists. Average daytime summer temperatures in all three areas were 25°C under the canopy to 30°C in open areas. Winter temperatures were lower, especially in the eastern study area, and ranged from 13°C to 29°C. Generally, localities had to be reached on foot. Most trips lasted one day; occasionally, 2–5 days were spent camping at one locality.

I collected foodplants and identified them at the Herbarium, Department of Botany, University of the West Indies. Observations of adults were made with wide angle binoculars (12 × 50 objectives). On each trip, I was able to recognize individual butterflies by noting unique patterns of wing damage. On one-day trips, observations were made between 0900 h and 1600 h (EST); on camping trips, between 0600 h and 1800 h. I observed a total of 103 adults and captured 23 males and 9 females. All specimens were released except eight males.

Voucher specimens of all stages have been deposited at the Allyn Museum of Entomology, Sarasota, Florida.

RESULTS AND DISCUSSION

Descriptions of Life Stages

EGG (Fig. 1A). Egg spherical 1.45–1.54 mm in height (mean 1.50); 1.73–1.77 mm wide at the widest diameter (mean 1.75) (n = 23). Base approximately 1.5 mm wide, attached to leaf by a distinct layer of basal cement. Color, pale green when first deposited. The micropyle is finely knobbed with droplets of liquid creating a white frosting. This frosting is lost after five days, after which the egg becomes pale yellow. A paler spot, the larval head, develops on top; this spot gradually darkens, and after two additional days, becomes light brown. On the eighth day, this marking becomes dark brown before the larva hatches.

The larva cuts a lateral slit below the micropyle and enlarges this to a tear-drop shape before emerging. The chorion is subsequently eaten except for the basal portion.

LARVA. Head measurements for all instars are presented in Table 1.

First instar (Fig. 1B, C): Head brown, darkening to black with 5 short, black, simple setae on each hemisphere in the ocellar region. Thorax and abdomen light brown, becoming black; last two abdominal segments predominantly white.

First thoracic segment with mid-dorsal osmeterial pit. Osmeterium brown, used with reluctance and producing little discernable scent. There is a simple seta on either side of the mid-dorsum; a single, dark brown scolus dorsolaterally bearing 2 terminal, and 14 peripheral, black setae, and a verucca at the base of the scolus bearing 5 black setae. Second and third thoracic segments and the first abdominal segment are similar to each other. Each has a single, simple, black seta on either side of the mid-dorsum, and has scoli dorsolaterally, each with one terminal and seven peripheral brown setae, tipped with black. Bases of scoli on the third thoracic segment are ringed with white. There are veruccae at the base of each dorsolateral scolus bearing simple black setae; two setae on each verucca on the first abdominal segment, and four to five setae on each verucca on the second and third abdominal segments.

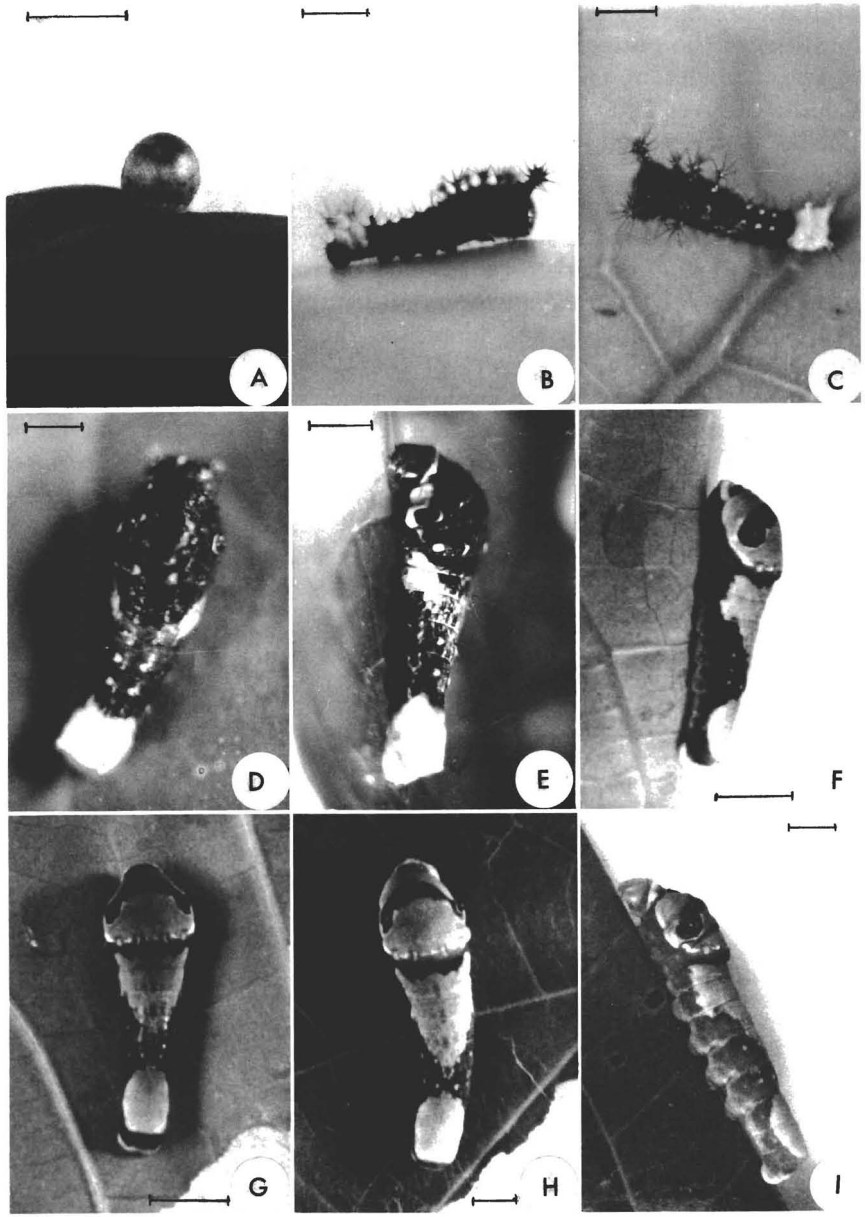

FIG. 1. *Papilio homerus*. A, Egg; B–I, Larva: B, First instar, lateral aspect; C, First instar, dorsal aspect; D, Second instar; E, Third instar; F, Fourth instar, lateral aspect; G, Fourth instar, dorsal aspect; H, Fifth instar, dorsal aspect; I, Fifth instar, lateral aspect. Scale bars: A–C = 0.25 cm; D–E = 0.50 cm; F–I = 1.0 cm.

TABLE 1. Measurements in mm of larval head widths of *Papilio homerus*.

Instar no.	n	Range	Mean	SD
1	13	0.8–1.2	1.00	0.04
2	11	1.7–2.2	1.95	0.01
3	10	2.8–3.0	2.90	0.03
4	9	3.9–4.4	4.10	0.08
5	8	5.7–6.4	6.05	0.09

Abdominal segments 2 to 7 each with a pair of short dorsolateral scoli bearing five setae; a part of base of each scolus is white. Laterodorsally on each of these segments is a single black seta with a brown base. Abdominal segments 2 to 4 pigmented laterally with a white diagonal saddle-like marking with a brownish center. Mid-dorsum becomes light brown posteriorly. Last two segments white and slightly larger than preceding abdominal segments. Each of these two segments with a simple black seta near the mid-dorsum, and white scoli dorsolaterally and laterally, each scolus with one central and seven peripheral white setae with black tips. At base of each lateral scolus, an additional simple seta. Ventral regions, prolegs, and claspers brown; anal region gray. This first stadium lasts 5 days, and the larva grows from 4.0 mm to ca. 9.0 mm in length.

Second instar (Fig. 1D): Head dark brown to black with 5 simple black seta in the ocellar region. Osmeterium and anterior portion of first thoracic segment brown. Anterior segments enlarged to form a mostly black anterior hump which narrows to a brown mid-abdominal region. There is a small scolus with short black setae laterally on the first, and dorsolaterally on the last two abdominal segments. All other major scoli reduced to tubercles that become light brown and ringed with blue as larva grows. Lateral tubercles on the third thoracic segment are the most prominent. Posterior abdominal segments black, except for the last two, which are slightly larger than those preceding and are white dorsally. All darker areas of the larva dotted with fine, circular to ovate, dark spots with lighter peripheral rings. There are white patches laterally between the second and fourth abdominal segments, and a pair of white dorsolateral spots on the last thoracic segment as well as on the first, fourth, fifth and sixth abdominal segments. There are simple black setae laterally on all legs, prolegs, and claspers. The larva is ca. 15.0 mm in length at end of second instar, which lasts 5 days.

Third instar (Fig. 1E): Head light brown. Anterior region of first thoracic segment white and forms ridge above head. Area around osmeterial pits light brown. Osmeterium brown, with a turpenoid scent when extruded.

Anterior segments enlarged to form broad hump ca. 10.0 mm wide, narrowing to an abdomen only half as wide and with only slightly enlarged terminal segments. Basic larval coloration remains dark gray to black, with a darker diamond pattern along mid-dorsum. A broad, white, lateral stripe on thorax tapers to an end on third segment. Immediately above this stripe on third segment, tubercle is black basally and light brown terminally, ringed with a blue crescent dorsally, and subtended ventrally by a separate brown crescent, producing a prominent eye-spot.

Abdominal markings similar to those of previous instar, but segments six and seven have some white coloration dorsally, which merges into the last two segments, which are entirely white. Terminal segment bears two white dorsolateral prominences. Sublateral region brown. I observed larvae drinking water from leaf surfaces. Larva is ca. 26.0 mm long at the end of third instar, which lasts an average of 9 days.

Fourth instar (Fig. 1F, G): When first molted, larva retains coloration and markings of third instar. After ca. 18 hours most areas that were previously white become light green; after approximately 84 hours they become darker green edged with greenish yellow. Head pale brown and withdrawn into thoracic segments. Region around osmeterial pit green; osmeterium brick red. Remaining dorsal, lateral, and ventral regions gray to black. Anterior thoracic and abdominal segments greatly enlarged compared with the

relatively narrow posterior region which ends bluntly. Tubercles on third thoracic segment now form very conspicuous eye-spots with a brown dorsal band between. Along the posterior edge of the anterior hump is a white band broken by two blue spots on each side of the dorsum. Anterior portion of abdomen marked with a gray-and-white-flecked saddle across dorsum, with some green coloration mid-dorsally. There are blue spots laterodorsally and laterally on the fifth segment and laterally on the sixth. There are three conspicuous green patches laterally on the seventh segment. Terminal segments white dorsally, with some green mid-dorsally. Spiracles edged with light brown. Claspers gray. Fourth instar lasts an average of 10 days and the larva grows to ca. 40.0 mm in length.

Fifth instar (Fig. 1H, I): Markings and color same as at end of fourth instar. After feeding for 16–24 days, larvae reach 64.0 to 70.0 mm in length. Head gray-brown with major epicranial sutures lighter. Prothorax with first annulation dark brown. Osmeterium brick red when extended. Remainder of thorax green dorsally, except for conspicuous lateral eye-spots at end of a thick, brown band that crosses the dorsum. Other than the green dorsal and lateral markings, larva brown. Crotchets of prolegs arranged in uniserial, triordinal, transverse bands.

Pre-pupa: Larva ceases feeding and all green pigmented areas turn dull green and then yellowish; brown areas become black and all blue spots become pale blue. Just before pupation, larva turns dark gray. Approximately 48 hours after spinning the cremastal pad and thoracic girdle, the larva pupates.

PUPA (Fig. 2A, B). Pupa dull gray immediately after shedding larval skin, then develops into one of three color forms: gray, brown, or brown mixed with green. Each pupal form bears a series of white spots that become prominent a few hours later. Of 7 pupae reared, 5 were brown and 2 were gray. Three pupae were observed in the field: two were suspended on branches of *Hernandia* overhanging streams and were gray; the third pupated on a brown stem of a green fern and was brown mixed with green.

Pupae are 31 to 40 mm in length. Head 6.0–9.5 mm in width; width at wing base 9.0–12.0 mm; maximum width 12.0–18.5 mm across pupal wings. There are small projections on the frontal prominence and at base of the wing-cases. There is a median, blunt, thoracic projection anterior of the wings. Thoracic region dorsoventrally flattened, but not markedly. Abdomen roughly circular in cross section. Between thorax and abdomen, pupa is bent at an angle of approximately 120°. Dorsally, head region marked with a pinkish brown spot anterior of the frontal prominence and with a pair of white dorsolateral spots just behind this prominence. Mid-thoracic region pinkish brown with a faint V-shaped marking. Wing-cases usually have a dark, gray-brown median marking. Abdomen has two pairs of raised, white spots dorsolaterally on the second segment and an additional pair laterodorsally on the third segment behind the wing-cases. Ground color varies and is usually tan brown or dark gray. A third color form is tan brown with extensive areas of lime green on the thorax, abdomen and wing-cases. Pupal stage lasts 10–14 days. Diapause has not been recorded. Adults emerge between 0300 h and 0900 h (n = 6, of which 5 were males).

The life cycle takes 64–74 days from egg to adult (n = 6).

ADULT (Fig. 2C, D). Both males (FWL = 72.0–76.0; $\bar{x}$ = 74.5; n = 15) and females (FWL = 74.0–80.0; $\bar{x}$ = 77.3; n = 15) black with large yellow bands on each wing dorsally. A less conspicuous row of light blue spots occurs distal of the yellow band on the hindwings, which also possess prominent, spatulate, black tails. Females similar to males, but with ground color less intense and yellow and blue markings more intensely colored. Peripheral red markings on hindwings more prominent in the female. Undersides of both sexes similar to uppersides but with ground color predominantly reddish brown rather than black. The Homerus Swallowtail is unmistakable in flight and can be easily identified at a distance. Adult lifespan is unknown.

Field Observations

Papilio homerus was located only in the eastern and western study areas and was not seen on Mount Diablo, although previously it had

FIG. 2. *Papilio homerus*. A, Pupa, dorsal aspect; B, Pupa, lateral aspect; C, Adult male, dorsal aspect; D, Adult male, ventral aspect. Scale bars = 1.0 cm.

been collected from all three areas (Fig. 3). What once was probably a single population, occupying the central forests of Jamaica, now appears to be divided into two small isolated populations referred to as the eastern and western populations. The central population apparently

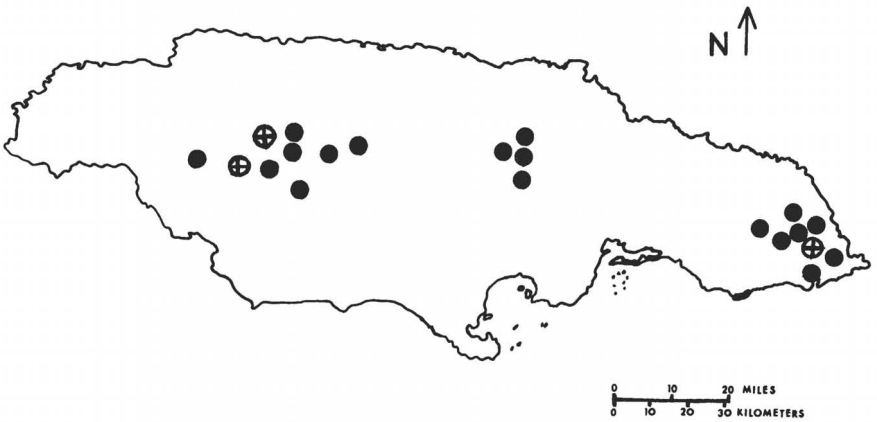

FIG. 3. Past and present distribution of *Papilio homerus* in Jamaica showing the decline of the eastern and western populations. The last recorded capture from the central population was ca. 1925. ⊕ Breeding populations located 1962–1980. ● Collecting localities recorded before 1962; no adults located 1962–1980.

no longer exists. The last capture of this butterfly from the Mount Diablo area was about 1925 (Kaye 1926).

Larval Foodplants

Hernandia catalpaefolia, H. jamaicensis, and *Ocotea* sp. (Lauraceae) were recorded as larval foodplants. *Hernandia catalpaefolia,* an endemic species of Hernandiaceae with affinities to Lauraceae, is locally common where the eastern population of *P. homerus* occurs. The local names for this plant are "water mahoe" and "water wood" and should not be confused with the unrelated "blue mahoe" (*Hibiscus elatus*) or "seaside mahoe" (*Thespesia populnea* (L.) Solander ex. Correa), which belong to the Malvaceae and are not larval foodplants. A number of early records of larval foodplants are incorrect, largely due to confusion over colloquial plant names. Kaye (1926) correctly identified *H. catalpaefolia* as a larval foodplant.

I observed one *P. homerus* ovipositing on *H. jamaicensis* in the southwestern region of the Cockpit Country in October 1971. Six eggs were deposited, at intervals of about one every 30 seconds, on the upper surfaces of older leaves at approximately 1400 h. *Hernandia jamaicensis* is an endemic species known locally as "popnut," "pumpkin wood," or "suck axe," and is locally common where the western population of *P. homerus* occurs. This is the first record of *H. jamaicensis* as a foodplant for *P. homerus.* In August 1969, I observed a female lay 14 eggs between 1500 and 1600 h on one tree of *Ocotea* sp. (tentatively identified as *O. leucoxylon* (SW.) Gómez maza) (Lauraceae) at Corn

Puss Gap. Lewis (1949) also observed oviposition on *Ocotea* in the Cockpit Country. Another potential larval foodplant is *Hernandia sonora* L., which was introduced into early forestry cultivations in Jamaica and is recorded at Moneague in the northern foothills on Mt. Diablo (C. D. Adams pers. comm.). The present status of this introduction is not known. *Ocotea* sp. also occurs on Mt. Diablo and either plant could have been the host plant for the central population.

Larval Behavior

All eggs collected in the field (n = 23) were found on *H. catalpaefolia* and were oviposited 1–3 m above the ground on the top of older leaves rather than on terminal shoots. Eggs were laid singly, but up to 5 eggs of different ages were often found on the same leaf. Two collected eggs failed to hatch due to unknown causes, but no parasitism was observed. On three occasions, between 1000 and 1400 h, I observed a large ant remove a total of seven eggs from a foodplant leaf.

Larvae were usually solitary, but occasionally four to five larvae (fourth and fifth instars) were collected resting on a silken mat spun on top of a single leaf often positioned beneath other overhanging leaves. Larvae in the first three instars fed on mature leaves; in the final two instars, larvae fed on younger leaves. Larvae were reluctant to extrude osmeteria even when disturbed, although when extruded, osmeteria emitted a mildly pungent, turpenoid scent. Although larval coloration appears to mimic bird or lizard excrement in the first three and early fourth instar, larvae of all ages were subject to predation from birds. On three occasions, between 1000 and 1400 h, I observed a species of *Elaena* (Tyrannidae) take first, second, or third instars (a total of four) from small marked plants on which the black and white larvae were resting, exposed on tops of leaves. On one occasion, at 1300 h, I watched an oriole, *Icterus* sp. (Icteridae) take green fourth (n = 2) and fifth (n = 3) instars from the tops of leaves of a sapling.

Adult Behavior

Papilio homerus was observed flying as early as 0900 h in sunny weather. Density of vegetation, steep terrain, and narrow trails often made capture or prolonged observation of adults difficult. Usually no more than three different individuals were observed on days with favorable weather conditions, but each individual was often sighted several times. Most observations were less than a minute in duration, but observations for longer periods were often possible while adults were sunning, circling, feeding, or ovipositing.

Single adults made short flights from the forest to a sunlit area and selected a large leaf, often that of *Cecropia peltata* L. (Moraceae), on

which they settled and remained, for as long as 35 min, with wings outspread. This behavior was also noted by Walker (1945) and Avinoff (in Brown & Heineman 1972). After sunning, the butterfly ascended to the forest canopy or flew to clearings in search of nectar sources. Species of *Cissus* (Vitaceae), *Mecranium* (Melastomaceae), *Lantana* (Verbenaceae), *Asclepias* (Asclepiadaceae), *Bidens* (Asteraceae), and a malvaceous shrub were recorded as nectar sources. *Cissus* provided the main nectar resource at Corn Puss Gap where there are few plants flowering at any one time. Walker (1945) also reported adults feeding on *Cissus*. In addition, Lewis (1947) recorded *Spathodia* (Bignoniaceae) as a nectar source. Adults spent less than a minute visiting each flowering plant near the ground, but *Cissus* vines hanging from other trees presented a long array of small flowers that were visited briefly or occasionally for up to 10 min. All specimens caught while nectaring were males (n = 4).

By 1000 h, some adults started circling slowly, high above the canopy, in the natural horseshoe-shaped amphitheaters delineated by the forest where mountain streams flow over cliffs. The same individuals, identified by distinct wing damage, occupied this territory for as long as four hours at a time without nectaring and returned to the same location on consecutive days. When captured, these individuals were found to be males (n = 6). Females were collected flying along stream beds (n = 5) and along intersecting clearings in the forest, under the canopy, where larval foodplants grew (n = 5). Males were also captured under the canopy (n = 7) or descending or ascending streams (n = 10).

Predation of adults by birds was also observed. Loggerhead flycatchers (*Tolmarchus* sp., Tyrannidae) attacked adults either when the butterflies were resting on top of foliage with wings outstretched (n = 7) or in flight (n = 13). Adults that escaped from such attacks usually sustained noticeable wing damage. Beak damage from unidentified birds is also evident on some museum specimens (n = 24). Adults of both sexes emitted a strongly perfumed, turpenoid scent when handled. This scent was similar, but not identical, to that emitted from larval osmeteria and appears to emanate from the thoracic segments. Courtship and mating were not observed. Oviposition occurred between 1000 and 1600 h (n = 12).

Three overlapping broods were identified at Corn Puss Gap between April and October: mid-April to June, June to mid-August, and August to October. Immature stages have been collected between August and December at lower elevations, representing two broods: August to mid-October and October to December.

At ca. 1300 h, adults started flying down the mountain slopes, usually following streams and flying in groups about 4 m above the stream

bed. This daily flight was spectacular when the species was abundant. In 1962, as many as 18 individuals were counted in 1.5 h descending a stream just south of the Gap. Six of these were captured and all were males. By 1500 h this flight was largely over and adults were rarely seen after this time. Avinoff (in Brown & Heineman 1972) noted seeing adults flying as late as 1800 h but did not specify where these observations were made. When populations were small, this daily movement was less noticeable. No large-scale daily movement was seen between 1969 and 1980.

In addition to the local daily migrations observed in summer near Corn Puss Gap (elev. 600 m), the eastern population also exhibits seasonal vertical movement.

Corn Puss Gap was visited in all months of the year, but *P. homerus* was not seen at this locality from January through March. Adults were first seen in April when ovipositing on *Hernandia* was also observed. Their numbers increased in May and June but most (73%) of the adults were seen during July and August. Only six individuals were seen from September through December during the entire study.

In September, minimum temperatures in the Corn Puss Gap area fall below 20°C, there are heavy daily rains, and the forest is shrouded in low cloud. The reduction in numbers of adults coincides with these weather changes. In April, after the minimum temperature has risen above 20°C and the cloud cover lifts, adults again can be found in this area.

Papilio homerus was found along tributaries of the Plantain Garden River, southeast of the Gap, and along tributaries of the Rio Grande, northeast of the Gap at elevations as low as 220 m. Adults have been collected in these lower localities in most months of the year. My records of 37 individuals observed in the Rio Grande Valley show that 73% were collected from September through March. Immature stages were seen from August through December.

Comparison with Related Species

Papilio homerus belongs to the tribe Papilioninii, the fluted swallowtails. Collins and Morris (1985), summarizing earlier authorities, list Central American species that are morphologically similar to *P. homerus*. These include *P. birchalli* Hewitson in the *scamander* species-group and *P. victorinus* Doubleday, *P. garamas* Geyer, and *P. abderus* Hopffer in the *homerus* species-group.

Like *P. homerus*, the adults of these species usually can be seen flying over the canopy in humid cloud forests and females oviposit on species of Hernandiaceae and Lauraceae. Eggs are laid singly, often on saplings,

are similar in size, though not in color to *P. homerus*, and larvae emerge after a development of time of about eight days.

The immature stages of *P. victorinus* are described in part by Muyshondt et al. (1976), Young (1984), DeVries (1987), and Comstock and Vasquez (1961). The sites of oviposition both dorsally and ventrally on young and mature *Hernandia* leaves, the relatively equal size of dorsal setae, color pattern, ready use of osmeteria in the first instar, and erect pupae with dorsal and lateral longitudinal markings all differ significantly from *P. homerus*. However, the third instar of both species appear similar in shape, color, and behavior. The fifth instar of *P. homerus*, *P. victorinus*, and *P. birchalli* also show similarities. They are mostly green dorsally with an enlarged thoracic region bearing spectacled eyespots, and a darker "crossed" mark mid-abdominally. The pupa of *P. birchalli* (DeVries 1987) is also said to be "similar to *thoas* only much rounder, with larger abdomen and rounded head area". This description also could be applied to the pupa of *P. homerus* but there is no mention of the very distinctive white dorsal spots as found on *P. homerus*. Beutelspacher (1980) states that the mature larva of *P. garamus* is similar to that of *P. homerus*, but sufficient details have not yet been published for a detailed comparison. K. S. Brown Jr. (pers. comm.) regards *P. garamas* and *P. abderus* as conspecific. He has made comparisons of all the adults and immature stages discussed here, and is of the opinion that *P. garamas* is probably a near relative of *P. homerus* but that *P. homerus* should be considered distinct.

Determining the degree of affinity of *P. homerus*, which has been isolated on Jamaica, to related species in Central and South America may prove difficult because of hybridization between several of those species and subspecies. Additional life history information is needed to help clarify these affinities.

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LITERATURE CITED

BEUTELSPACHER, C. R. 1980. Mariposas diurnas del Valle de Mexico. Edificiones cientificas L.P.M.M. Mexico Registro de Cámara Nacional de la Industria Editorial No. 00106. p. 31.

BROWN, F. M. & B. HEINEMAN. 1972. Jamaica and its butterflies. E. W. Classey Ltd., London. 478 pp.

COLLINS, N. M. & M. G. MORRIS. 1985. Threatened swallowtail butterflies of the world. The IUCN Red Data Book. IUCN, Gland and Cambridge. 401 pp.

COMSTOCK, J. A. & L. VASQUEZ. 1961. Estadios de los ciclos biologicos en lepidopteros Mexicanos. Ann. Inst. Biol., U.N.A. Mexico 31:349–448.
DEVRIES, P. J. 1987. The butterflies of Costa Rica and their natural history. Princeton Univ. Press, Princeton. 327 pp.
GOSSE, P. H. 1879. On *Papilio homerus*, its ovum and larva. Proc. Entomol. Soc. Lond. 1879:lv–lviii.
KAYE, W. J. 1926. The butterflies of Jamaica. Trans Entomol. Soc. Lond. 73:455–504.
LEWIS, C. B. 1947. Butterfly notes and records. Natural History Notes, Institute of Jamaica 3(29–30):91.
——— 1949. Butterfly notes. Natural History Notes, Institute of Jamaica 4(39):48.
MUYSHONDT, A., A. MUYSHONDT JR. & P. MUYSHONDT. 1976. Notas sobre la biologica de lepidopteros de El Salvador. I. Rev. Soc. Mex. Lepid. 2:77–90.
PANTON, E. S. 1893. A description of the larva of *Papilio homerus*. J. Inst. Jamaica 1: 375–376.
PETERSON, A. 1962. Larvae of Insects. Lepidoptera and Hymenoptera. Part 1. 4th edition. Edwards Brothers Inc., Ann Arbor, Michigan. 315 pp.
SWAINSON, E. M. 1901. Notes on lepidopterous larvae from Jamaica. J. New York Entomol. Soc. 9:77–82.
TAYLOR, C. B. 1894. The description of the larva and pupa of *Papilio homerus* Fabricius. Trans. Entomol. Soc. Lond. 42:409–410.
WALKER, D. J. 1945. *Papilio homerus*. Natural History Notes, Institute of Jamaica 2(22–24):161–163.
WELLS, S. M., R. M. PYLE & N. M. COLLINS. 1983. The IUCN Invertebrate Red Data Book. IUCN, Cambridge and Gland. 632 pp.
YOUNG, A. M. 1984. Notes on the natural history of *Papilio victorinus* Doubl. (Papilionidae) in northeastern Costa Rica. J. Lepid. Soc. 38:237–242.

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