———. 1945b. Additional notes on *Papilio aristodemus ponceana* Schaus (Lepidoptera: Papilionidae). Entomol. News 56: 187–188.
———. 1946. *Papilio aristodemus ponceana* Schaus (Lepidoptera: Papilionidae) notes. Entomol. News 57: 100–101.
HOLLAND, W. J. 1930. Notes on some American butterflies, mainly relating to their classification and nomenclature. Part 1, Papilionidae, Pieridae, Nymphalidae (Danainae). Ann. Carnegie Mus. 19: 185–204.
———. 1931. The Butterfly Book, Revised ed. Doubleday, Garden City, N.Y. 424 p.
KIMBALL, C. P. 1965. Arthropods of Florida and Neighboring Land Areas. Vol. 1. Lepidoptera of Florida. Fla. Div. Plant Industry, Gainesville. 363 p.
KLOTS, A. B. 1951. A Field Guide to the Butterflies. Houghton Mifflin, Boston. 349 p.
RAWSON, G. W. 1961. The recent rediscovery of *Eumaeus atala* (Lycaenidae) in Florida. J. Lepid. Soc. 15: 237–244.
RUTKOWSKI, F. 1971. Observations on *Papilio aristodemus ponceanus* (Papilionidae). J. Lepid. Soc. 25: 126–136.
SCHAUS, W. 1911. A new *Papilio* from Florida, and one from Mexico (Lepid.). Entomol. News 22: 438–439.
YOUNG, F. N. 1955. Notes on collecting Lepidoptera in southern Florida. Lepid. News 9: 204–212.

NOTES ON THE LIFE CYCLE AND NATURAL HISTORY OF BUTTERFLIES OF EL SALVADOR. I. *PREPONA OMPHALE OCTAVIA* (NYMPHALIDAE)

ALBERTO MUYSHONDT
101 Avenida Norte #322, San Salvador, El Salvador

For a number of years my sons and I have been collecting and breeding butterflies in the vicinity of San Salvador (600–900 m. altitude), capital city of El Salvador. Since the life cycle of many neotropical butterflies is not completely known, many species have been classified solely on the morphological characteristics of the adults. It seems desirable therefore to place on record the various facts that we have found. This we intend to do in a series of articles dealing with the life cycle, host plants, and general natural history of the species we have been able to breed.

A major difficulty has been the identification of the species described, as we are dependent on A. Seitz (ed.) (1924, Macrolepidoptera of the World, Vol. 5. The American Rhopalocera 1907–14), that is, according to many modern authors, ". . . replete with errors which cause much confusion." (Klots, 1960). To partially overcome this handicap, Drs. F. H. Rindge and A. B. Klots of the American Museum of Natural History, and L. D. Miller of the Allyn Museum of Entomolgy, have made at least

tentative determinations of the material. Specimens of adults and of their early stages have been placed in these museums, so as to be available for students of the groups.

To give a clear idea of the habitats of the species described, it seems appropriate to make a rough description of the country. El Salvador is the smallest country of Central America, and the most densely populated of continental America: 21393 km, with 3,500,000 hab. It has the shape of a rough parallelogram that lies between 87° 40′ and 90° 13′ east, and 13° 11′ and 14° 40′ north, having Guatemala to the west, Honduras to the north, and the Golfo de Fonseca to the east. It has shores only on the Pacific Ocean (south). Being separated from the Caribbean by the high mountains of Sierra Madre, its climate is not affected by the monsoon conditions. There are six months of dry season (November to April) and six of rainy season (May to October). This fact influences greatly the flora and thence, the fauna. According to Serrano & Serrano (1972), only 348 species of Rhopalocera have been reported from El Salvador.

There are four main climatic zones: hot tropical lowlands (0–800 m. altitude), warm tropical plains (800–1200 m.), cool tropical highlands (1200–1800 m.) and cold tropical highlands (1800–2700 m.). In the lowlands, cotton, rice, sugar cane, corn and cattle are grown. In the warm plains, there are sugar cane, corn, cattle, some coffee, fruits and vegetables. In the steeper cool highlands, there is mostly coffee, with some vegetables, fruits and flowers. The cold highlands are located in the NW part of the country, and there some forests are left.

Due to the country's dense population, most of the land is under intense cultivation, so what is left of wild vegetation consists of heavily disturbed second-growth plant communities, localized mostly along rivers and ravines. An advantage for the collector of insects in general and butterflies in particular is that when being based in the capital city, San Salvador, he can find a wide range of altitudes and habitats within a range of 50 km, making it possible to find about 90% of the local species without the need of long traveling.

It is within this range that we have collected eggs and/or larvae of about 130 species of butterflies in order to study their early stages and developmental time. Among these species is *Prepona omphale octavia* Fruhstorfer, a rather scarce and elusive species of the family Nymphalidae. Some authors, e.g. Brues, Melander & Carpenter (1954), place the genus *Prepona* in the subfamily Nymphalinae, but prefer to use the more widely accepted subfamily Charaxinae. In this article we relate what we have found about the life cycle, behavior of immature stages and adults, host plant and habitat of *Prepona o. octavia* in El Salvador.

Since 1968 we have observed adults of *P. o. octavia* at different altitudes, ranging from sea level to about 2000 m., mostly in the neighborhood of coffee plantations (which can be considered man-made forests, due to the local technique of planting the coffee under shade trees, mostly *Inga* spp.), or near rivers and ravines. Yet, until December 1971, we had been unable to obtain eggs. At that time we found a female in the process of oviposition right in town, and three eggs were collected. Once the food plant was identified, a two-month search was made in an area of 20 blocks, and 21 larvae in different stadia were found. Fifteen were collected and six left on the plants.

The eggs were photographed and put in individual plastic bags, as were the 15 larvae. The larvae were supplied with fresh leaves of the host plant every two days. Attempts were made to determine the developmental time under laboratory conditions, to photograph and measure the different stadia, and to keep material of the early stages preserved in alcohol. The transparent bags were kept under ambient temperature and lighting conditions until the emergence of the adults. No moisture control was made.

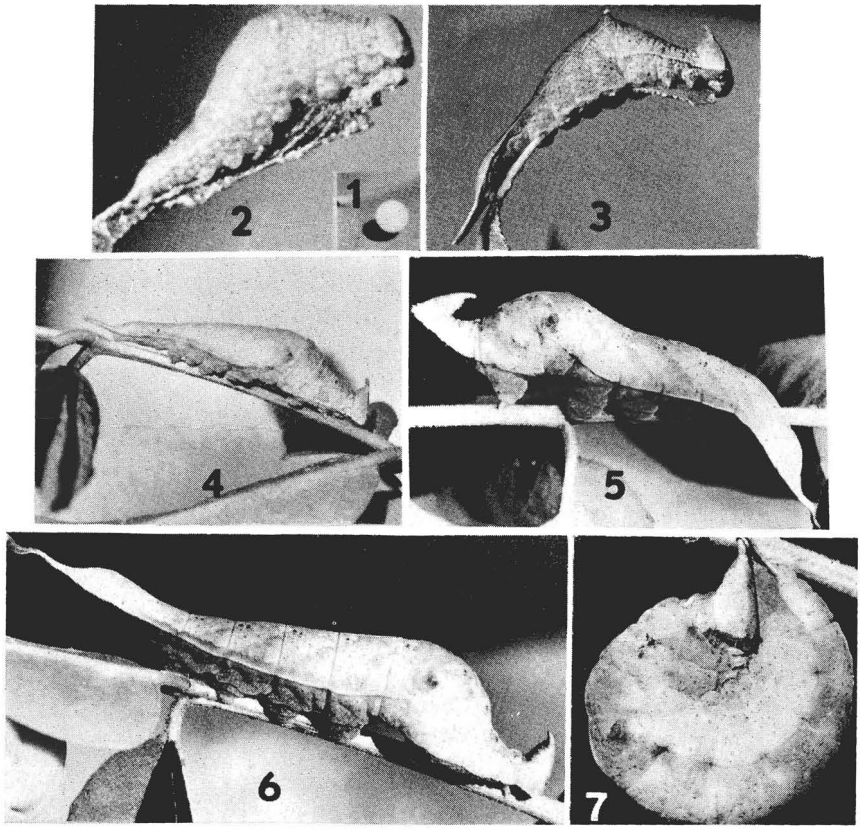
Life Cycle Stages

Egg. Pure white, spherical with slightly flattened base and depression at mycropyle, which is surrounded by a tiny ridge. No visible sculptures at 10× magnification. Diameter, 2.5 mm. All hatched in 7 days.

First instar larva. Light brown all over. Head naked and roundish, slightly thicker than thoracic segments. Body naked, thickening gradually to 2nd abdominal segment, which is made prominent by two warts located one at each side, at subdorsal area, lighter brown than the general color. Body tapering to 6th abdominal segment then keeping about the same thickness to the 10th, which ends in two short and stubby "tails." Anal prolegs slightly smaller than the other prolegs. Lateral ridge starting at thoracic segments subspiracularly, ending low at side of first abdominal segment. Another lateral ridge originates at 2nd abdominal segment between the wart and spiraculum, which is placed much higher than the rest, and terminates at the "tails" of the 10th. Spiracula of subsequent abdominal segments are placed under this ridge, except on the 8th abdominal segment where it is above, and so out of line with the others. Larvae at emergence 3.5 to 4 mm, growing to 1.3 cm before moulting. Time, 12–13 days.

Second instar larva. Darker brown on upper surface of body, where the two warts on 2nd abdominal segment are conspicuous due to lighter shade. Head, undersurface of body, and caudal zone all around, light brown. Head pyramid-shaped, with two fused epicranial horns, projecting higher than humped abdominal segments (1st and 2nd). Distinct "neck" formed by narrow 1st and 2nd thoracic segments. True legs tiny on 1st, slightly bigger on 2nd, and still bigger on 3rd thoracic segments. Anal prolegs much reduced as compared to the other prolegs. Tails on tenth abdominal segment elongated. Head and body always naked, but tiny grainings most apparent around upper thoracic segments. Ridges lighter colored than rest of body. Reaching about 2.5 cm in 8–10 days.

Third instar larva. Lighter brown than 2nd instar. Thin black lines dorsally at thoracic segments. Grains on head more noticeable and fused horns with tip slightly



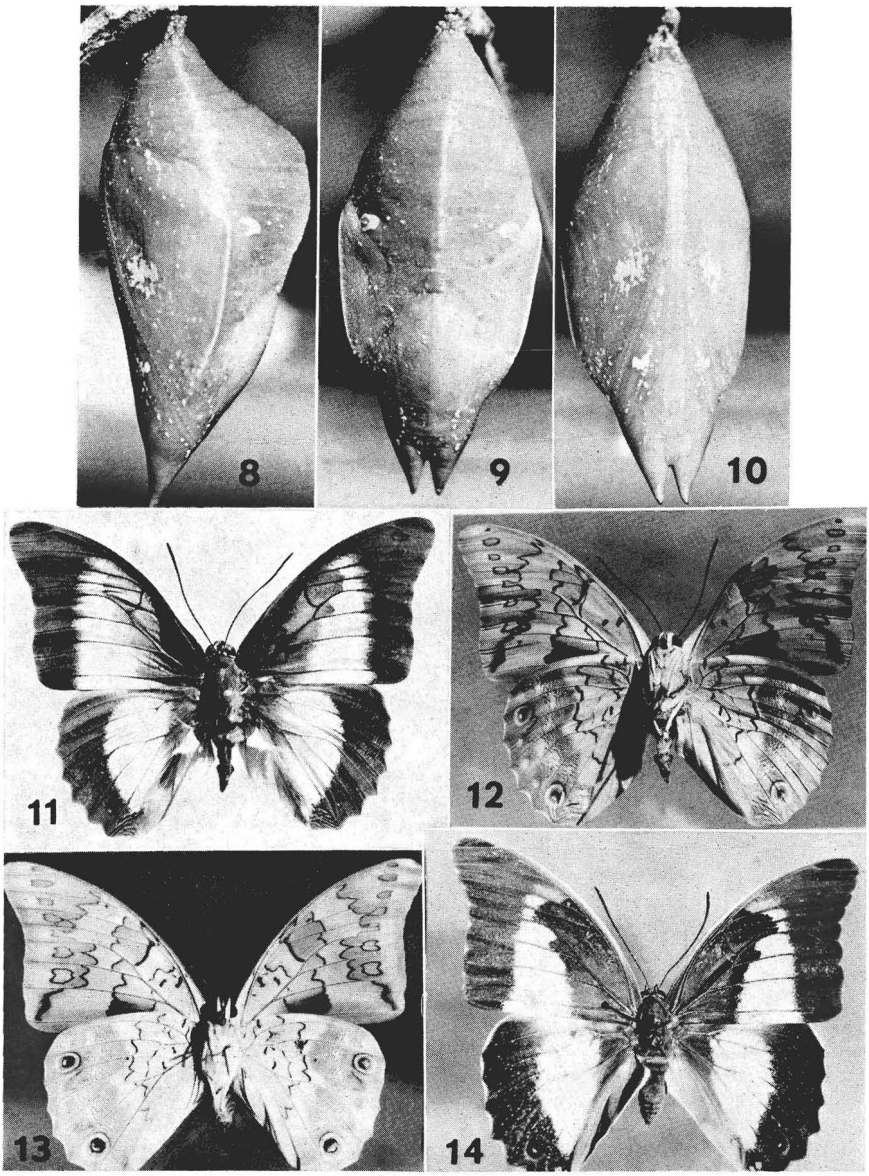
Figs. 1–7. *Propona omphale octavia* Fruhstorfer: 1, egg (2.5 mm); 2, first instar larva 10 days after hatching (1 cm); 3, second instar larva 2 days after moulting (1.7 cm); 4, third instar larva 10 days after moulting (3.8 cm); 5, fourth instar larva 10 days after moulting (5.2 cm); 6, fifth instar larva 12 days after moulting (7.2 cm); 7, prepupa.

curved back. Anal prolegs still more reduced, and tails more elongated and slightly crooked. Reaching about 3.8 cm in 9–12 days.

Fourth instar larva. Base of true legs on 3rd thoracic segment and prolegs on 3rd, 4th, 5th and 6th abdominal segments much thickened, seeming to start just below spiracula. Body develops an indefinite and faint pattern of darker brown shade dorsally. Anal prolegs still more reduced. Tails longer and quite crooked. Reaching about 5.2 cm in 11–14 days.

Fifth instar larva. Same aspect as 4th instar, but much longer and thicker, so that head appears disproportionately small. Very much reduced anal prolegs. The day before entering pre-pupal stage, color becomes "transluscent" light brown. Reaching 7 or 7.5 cm in 19–26 days.

Pre-pupa. Thick and incurvated, so touching with the horns the twig from which it hangs. General color transluscent brown, the warts now being darker than the body. Anal tails positioned at either side of twig. Time, one day.



Figs. 8–14. *Prepona omphale octavia* Fruhstorfer: 8–10, pupa—lateral, dorsal and ventral views (3.2 cm long); 11–12, adult male—dorsal and ventral view (7 cm); 13–14, adult female—dorsal and ventral view (8 cm).

Pupa. Leaf green. Very humped dorsally across the first abdominal segments, tapering to cremaster and to head. Spiracula brown, with prominent orange stain around first abdominal one. Occasional orange stains in wing cases near antennae. Cremaster light brown and bifid head points light orange. Becoming dark gray shortly before adult emergence. Measures 3 to 3.3 cm long, 1.3 to 1.7 cm dorso-ventrally at widest point and 1.2 to 1.6 cm laterally at widest point. Time, 12–14 days.

Adult. Dorsally, basic color is dark gray to dark grayish brown. Forewing with iridescent light blue band that starts near costa subapically, with outer border parallel to wing's outer margin, inner border of band sinuose and diverging from outer border, so as to make band at inner margin of wing much wider than at costal margin. Hindwing with similarly colored band not reaching the costal margin, nor the outer angle, extending itself down parallel to the outer margin, but not reaching the anal angle, covering discal area without touching the inner margin or the basal area. Males, in addition to the light blue band in the forewing, have a dark blue area that covers the space between the band and the base of the wing. In the hindwing males have basally, under the cubital vein, a tuft of honey-colored "hairs." The females lack the dark blue area in the forewing, and have an "eye" near the anal angle in the hindwing.

Ventrally, wings are pearly gray basally, darker gray distally; the forewing with thin black lines forming an elaborate pattern, that in the hindwing is less elaborate. The hindwing has two medium-sized "eyes," dark colored and surrounded by a clear gray ring; one near the outer angle, the second corresponding to the eye seen dorsally in the female, near the anal angle. Basic color and markings are darker in males than in females.

Both sexes have the proboscis pink, the antennae black. Females have a wing span of 8 cm, while males are only 7 cm. Total developmental time: from 79 to 97 days, females being slower than males.

Natural History

The foodplant, *Andira inermis* (Wright) Urban, is a robust leguminous tree that has very thick, dark green, imparipinate foliage, with leaves ranging from 6 to 10 cm. long, and a profuse lilac inflorescence from early March to mid-April. It has a rounded tree-top, and has been favored as an ornamental tree alongside sidewalks and parks in towns. In natural conditions it usually grows near rivers, thence its local name: Almendro de Río (River Almond). These trees shed all their leaves from late December to late January, stay bare for about two weeks before growing new leaves that take another two weeks to reach maturity. After that, the trees flower.

Soon after the first instar larvae come out of the egg, they eat the egg shell completely, and stay under the leaf without further eating for one day. They move then to the tip of the leaf and eat around the central vein, leaving it bare. With frass stuck with silk they build a continuation to the bare vein, that then appears to project beyond the leaf limits, and the larvae keep perched on it while not feeding, usually head pointing outwards. This behavior is kept all through the first, second and third instars. Commonly during the third instar a larva

moves to another leaf because it has eaten the first one, and builds another "perch" on it with the now heavier frass. During the fourth stadium the larvae start wandering about the tree for feeding purposes, and keep motionless for long periods of time when not feeding, striking two characteristic poses: (1) head and thorax hanging at side of the twig where larvae hold with just the central prolegs, with the rear section of the abdomen either hanging also, or slightly raised from the seventh abdominal segment caudad; (2) head and thorax raised from second thoracic segment anteriad and last abdominal segments from seventh also raised. During the fifth stadium the larvae behave similarly. When newly hatched, and more markedly during subsequent stadia, the larvae walk with a balancing movement from side to side, due possibly to the very humped back and the fact that the reduced anal prolegs are not used for holding to the twigs while walking, having thence little leverage. During the prepupal stage, larvae weave a narrow girdle around a twig and then hang from it with the much reduced anal prolegs, positioning the crooked anal tails one at either side of the twig. Before hanging, the larvae clean the digestive tract by expelling a considerable amount of liquid with excrement. When becoming a pupa the larval skin splits from the head, breaking the head capsule in half and separating the fused horns. The larval attitude is all along very passive, being slow moving. No defense movements have been noticed during the pupal stage either, even when handled. Adults emerge very rapidly from the pupa shell, eject an amount of brown meconium, and are ready to fly in about 20 minutes.

The adults of *P. o. octavia*, like most Charaxinae, have a swift and powerful flight that produces a rustling noise, somewhat like Hesperidae. This flight has been described by Lichy (1962) ". . . algo ruidoso y con movimientos de alas perceptibles, aunque rapidísimos," (somewhat noisy and with perceptible wing movements, even though extremely swift). Males are very belligerent and chase any flying animal or object near their perching site. Females are larger than males and when ovipositing, circle the host tree several times at different levels before alighting in a cluster of mature leaves. There, sitting on the lower surface of the leaf, she deposits one egg. The female repeats the process several times before moving to another tree. The eggs we saw being laid were between 2.5 and 3.5 m. above the ground, the tree being about 6 m. tall. The hour, 13:15.

Both sexes are assiduous visitors of fermenting fruits, and some individuals have been observed feeding in specific spots on trees, halfway up the trunks. Both sexes favor shaded coffee plantations, ravines, and

rivers with thick second growth forests and patches of thick vegetation along shorelines.

It was noticed that when newly emerged males and females were pressed on the thorax, they emitted a light green liquid from the base of the wings, and that they produced a mouldy odor when handled.

We did not find a single case of parasitism in the 24 individuals observed. We found one instance of predation, a *Chrysopa* larva attacking a 2nd instar larva of *Prepona o. octavia*, which was killed without making any defense effort. The remains of a pupa were found still attached to a twig, only the abdominal segments affixed to the cremaster, with some body tissues left inside. One larva died while moulting to 2nd instar and one 4th instar larva died of a disease that softened the body.

Three adult females were dissected, one each on days one, two and three after emergence. No eggs were found in any of them. A bright green fluid was found inside the abdomen.

DISCUSSION

As this is the first time the life cycle of *P. o. octavia* is fully described, some interesting facts have been found. The egg shape is very similar to the egg shape of the various species of *Anaea* found in El Salvador, even though its size is much bigger. The shape of the larvae from the 2nd stadium on resembles the shape of the larvae of *Anaea* (*Zaretis*) *itys* Cramer (ms in prep.). The behavior of the three initial instars of *P. o. octavia* is very much like the behavior of those instars in various *Anaea* spp. except for the balancing gait of *Prepona* while walking. The spiracula of the 2nd abdominal segment in *P. o. octavia* is located very high, and this would explain why in the drawing of another *Prepona* (*P. amphimacus* Fabricius) that appears in Comstock (1961, p. 174, fig. 234), this spiraculum is lacking. This same characteristic, not so drastic, is found in the various *Anaea* spp. larvae we have observed, as is the slightly out-of-line spiraculum on the 8th abdominal segment. All of these factors seem to confirm the grouping of the two genera under one subfamily: the Charaxinae.

The absense of parasitism found while breeding this species is striking considering the long developmental cycle (two and a half to three months), and the apparent lack of chemical and mechanical defenses. The larvae are very slow moving and passive, and the plant family Papilionaceae in general is not reputed for having poisonous components. Thus it appears that the immature stages of this species rely solely upon mimicry for protection: the larvae look like fragments of dry leaves, and the pupae are very inconspicuous in green foliage. It should be empha-

sized that while we studied the life cycle of *P. o. octavia*, the life cycles of two other species which were feeding on the same trees were being observed: *Panthiades bitias bitias* (Cramer) and *Theritas lisus* (Stoll) (both Lycaenidae). These two species produced braconid wasps most of the time. This fact excludes the explanation that the lack of parasitism in *P. o. octavia* was due to the absense of parasites at the time the life cycle was being studied.

A possible cause of massive mortality of young larvae during the dry season could be the characteristic of the host plant, *Andira inermis*, of shedding all of its leaves rather abruptly during the period between late December and late January (not all the trees shed their leaves at the same time). The trees remain bare of leaves for a couple of weeks before growing new ones, and it is another two weeks before the new leaves reach the maturity the larvae require for feeding. In natural conditions *A. inermis* trees grow too far away from one other to allow larvae to move from one tree to another. Even when planted as ornamentals along sidewalks and parks in towns, they are placed from 6 to 10 m. apart.

It is possible that *P. o. octavia* uses other plants of the same group as a food plant, although we have not observed this. We can say in any case, it is one of the few species of Rhopalocera that have profited by man-made changes in natural ecology.

According to the time it took to develop under laboratory conditions, we can assume that there are four generations a year of *P. o. octavia* in El Salvador. We can expect also that the females are slow in reaching sexual maturity, and that even if they produce eggs for a considerably long period of time (as do some other Lepidoptera with slow developmental time), they would not produce a very large number of them, because individuals of this species are rather scarce in spite of the little, if any, parasitism and predation the species is subject to, on one hand, and the abundance of the foodplant on the other. These factors would tend to make the species very abundant if the females were highly fertile.

Besides three other species of *Prepona* found in El Salvador, that resemble very much *P. o. octavia*, there is an Apaturinae, *Doxocopa cherubina* Felder, that is superficially very similar to it. Whether or not these two species form a mimetic complex, we do not know. If they do, which is the model and which the mimic? The fact is that both species are very scarce locally and that circumstance would go against the tenet of accepted Batesian mimicry theory that requires the protected model to be more abundant than its unprotected mimic. The fact that *P. o. octavia* feeds on a tree that is not reputed to have poisonous properties would tend to eliminate the possibility of this resemblance being a Muellerian mimicry case.

ACKNOWLEDGMENTS

We are grateful for the kind assistance of Dr. Lee D. Miller (Allyn Museum of Entomology) who identified the species mentioned, and made constructive criticism on the manuscript. We also thank Dr. Alexander B. Klots, for his encouragement to present the results of our work, and Drs. Theodore D. Sargent and Allen M. Young, who gave many valuable suggestions. My younger son, Pierre, first observed oviposition in *P. o. octavia.* Specimens of early stages and adults are deposited with the Allyn Museum of Entomology.

LITERATURE CITED

BRUES, C. T., A. L. MELANDER & F. M. CARPENTER. 1954. Classification of Insects. Bulletin of the Museum of Comparative Zoology, at Harvard College. Vol. 108. Cambridge, Mass.

COMSTOCK, W. P. 1961. Butterflies of the American Tropics, The Genus *Anaea,* (Lepidoptera, Nymphalidae).

KLOTS, A. B. 1960. A Field Guide to the Butterflies. Houghton Mifflin, Boston.

LICHY, R. 1962. Apuntes sobre los *Agrias* Doubleday. (Nymphalidae, Charaxidinae). Revista de la Facultad de Agronomía. Vol. II, No. 4. Maracay. Venezuela.

SERRANO, FRANCISCO Y SERRANO, MIGUEL E. 1972. Las Mariposas de El Salvador. Primera parte: Papilionidae. Comunicaciones, 2a. Epoca. Vol. 1 #1. Universidad de El Salvador.

TWO NEW SPECIES OF PHYCITINAE FROM TEXAS, WITH DESCRIPTION OF TWO NEW GENERA (PYRALIDAE)

ANDRÉ BLANCHARD
P. O. Box 20304, Houston, Texas 77025

Triozosneura A. Blanchard, **new genus**

Tongue well developed. Antenna (Fig. 12) simple; finely pubescent in male. Labial palpus (Fig. 4) upcurved, rough scaled, reaching level of vertex, third segment very short (on denuded palpus (Fig. 13) it appears less than ⅓ the length of second segment). Maxillary palpus squamous. Vestiture entirely of scales.

Forewing (Fig. 11): Smooth, eleven veins, R_4 absent, cell longer than half the length of the wing; discocellular vein weak curved; vein Cu_2 from near lower angle of cell; Cu_1 from the angle, slightly separated at base from stalk of M_{2-3}; M_2 and M_3 stalked for about ⅓ their lengths; R_2 contiguous or partly fused, for about ⅓ its length, with the stalk of R_{3-5}; R_3 and R_5 stalked for about ¾ their lengths; vein R_1 from cell.

Hindwing (Fig. 11): With veins Cu_1 and M_3 both present; cell at lower angle about half as long as wing; discocellular vein deeply concave; vein Cu_2 from near lower angle of cell; vein Cu_1 shortly united with the stalk of M_{2-3}; M_2 and M_3 stalked