

LIFE HISTORIES OF NEOTROPICAL BUTTERFLIES FROM TRINIDAD

2. *ANTIRRHAEA PHILOCTETES* (LEPIDOPTERA: NYMPHALIDAE: MORPHINAE)

F. CLIVE URICH and THOMAS C. EMMEL

Sans Souci Estate, Sangre Grande, Trinidad, and Department of Zoology,
University of Florida, Gainesville, FL 32611, USA

ABSTRACT.— The life history of *Antirrhaea philoctetes* (Linnaeus) (Lepidoptera: Nymphalidae: Morphinae) is described from material reared on palms in the family Arecaceae (=Palmae). The hemispherical egg is yellowish light green and 2.5 mm in diameter. There are five larval instars. The mature larva differs from those of other described *Antirrhaea* species in its elaborate pattern of maroon and yellow patches. Each larval instar bears a pair of long whiplike tails that compose half the length of the body. The pupa is mottled and patterned with tan, brown, and some green, resembling a crumpled leaf. The complete life cycle takes 70 days at ambient temperatures in Trinidad (7 days in the egg stage, 50 days in five larval instars, and 13 days as a pupa).

KEY WORDS: *Antirrhaea*, Arecaceae, *Caerois*, immature stages, life history, Morphinae, *Morpho*, Palmae, palms, *Pierella*.



Fig. 1. Adult *Antirrhaea philoctetes* (Linnaeus): male (Rio Ucayali, Pucallpa, Peru) and female (Explorama Lodge, 65 mi. E. Iquitos, Peru).

This paper is the second in a series of publications describing the life cycle stages and larval food plants of neotropical butterflies from the West Indies nation of Trinidad and Tobago. The initial report (Urich and Emmel, 1990) introduced the series with a discussion of the relevant geographical and ecological features of the island of Trinidad, and a description of the life history of *Pierella hyalinus fusimaculata* (Brown) (Satyridae). The reader is referred to that publication for further background details.

The rearing methods used for the life histories to be described in this series of papers were similar. All were carried out near sea level in tropical lowland conditions at Sangre Grande, Trinidad, unless otherwise stated. Gravid females were confined in screened rearing cages at ambient temperature, humidity, and natural daylight cycles. Suspected or identified host plants in freshly cut condition were placed with a female daily until the butterfly oviposited. Larvae were maintained on potted growing hosts or freshly cut branches or leaves, changed daily, in screened

cages under the same regime. Pupae were likewise maintained in screened cages under ambient environmental conditions until emergence of adults (or parasites) occurred. The senior author kept a daily log of notes and descriptions of each stage. Occasionally, colored drawings were made as part of this record. Color slides were taken in Trinidad of some of these life history stages by Hans Boos and provided to us by Julius O. Boos; photographs taken in Trinidad, in other areas of South America, or in the collections at Gainesville by Thomas C. Emmel will also be used as illustrations in this series.

The present paper treats the life history of the only species of *Antirrhoea* on the island of Trinidad: *A. philoctetes* (Linnaeus). This butterfly was formerly classified as a member of the Satyridae (e.g., Barcant, 1970) or the subfamily Satyrinae of the family Nymphalidae (Ehrlich, 1958). However, DeVries (in D'Abbrera 1984 and DeVries et al, 1985) recognized the members of this genus as actually true Morphinae, members of the same nymphalid subfamily as the brilliant blue *Morpho* species and a third genus, *Caerois*. There are approximately 21 species of *Antirrhoea* recognized (DeVries, 1987; D'Abbrera, 1984); all are restricted to the Neotropics, ranging from Guatemala to southern Brazil. Only one species lives on Trinidad. At least 5 species occur on the adjacent mainland of northeastern South America in Venezuela and the Guianas.

DESCRIPTIVE NOTES

ADULT: This large satyrid-like morphinae butterfly rather resembles *Pierella hyalinus fusimaculata* (Brown) (Satyridae) as it flies sympatrically in rain forest, close to the forest floor. The male has an array of four or five small to medium-sized patches or spots of mildly iridescent blue coloration, loosely gathered into a postmedian band, across the dorsal surface of the lower half of the dark-brown hindwing. The forewing is dark brown, crossed by an almost obsolete, vertical, off-white postmedial stripe, in the Trinidad subspecies. The forewing has an extensive overlapping protrusion downward across the top of the hindwing, where specialized androconial tufts (primarily in three clusters) occur on both the hindwing and forewing. Abdominal scent tufts are used to gather specialized scales from the bottom surface of the forewing and then transfer these scales to the antennae of the female (Vane-Wright, 1972), probably to calm her prior to copulation. The female is larger than the male, but has a similar brown and blue dorsal pattern (Fig. 1). However, the lower margin of the forewing is straight (rather than dipping downward across the hindwing as in the male), and the blue areas on the hindwing are slightly paler and more diffuse. The underside of both sexes is patterned in dark and lighter browns, with a prominent medial band of burnt umber on the hindwings and a straight submarginal stripe of light tan or cream across the tip of the forewing. Both sexes have a short tail on each hindwing. The male measures about 60mm in wingspread, the female up to 85mm.

On the mainland of South America, *Antirrhoea* species are found from the lowland rain forests at sea level up to almost 3000m elevation in some areas (DeVries, in D'Abbrera 1984). They are always rare. Our Trinidad species, *A. philoctetes* (which

also occurs from the Guianas south into the Amazon Basin), is found only in the dark forest undergrowth where it flies low to the ground and seeks rotting fruits or fungi, to feed on juices. Palm fruits are a favorite source of nutrition. Length of life is unknown, but if similar to *Morpho* species that have been studied in Costa Rica, *Antirrhoea* adults may live for several months.

HOSTS: Palms of several unidentified species (Arecaceae, formerly Palmae).

EGG: A single egg was laid on 25 April 1983. The egg is hemispherical in shape and is 1.25mm in diameter. The flattened lower portion is attached to the ventral surface of a palm leaf by the female. The color of the egg is yellowish light-green. The general shape and appearance are that of a *Morpho* egg. The eggs hatched on 2 May 1983, or seven days after being laid.

LARVA:

First Instar: At full growth, the first instar was 7mm in length.

Head: Light brown in ground color, with a darker brown to blackish band running across the width of the head at a point about 2/3 from the bottom edge. A darker brown color covers the top of the oval head. A row of dark, blackish flattened hairs, slightly curved, are arranged on the head, starting from each side and continuing over the top of the head. These somewhat flattened hairs point slightly forward.

Body: Pale green in ground color, with a brownish-red stripe running the length of each side of the body. At a point just before the tails begin, a bar of the same reddish-brown color connects the two lines. A pair of prominent tails about 2mm in length are present, the color being reddish-brown. From the tip of each tail extends a single, slightly curved hair about 3mm in length. The curve of each hair is upwards, and the curve is very slight. Also present are short hairs sticking up along the length of the body in two well-spaced rows. These hairs are brownish-red. The first ecdysis took place on 10 May 1983, eight days after hatching.

Second Instar:

Head: In this instar, the ground color of the head is light brown. The head is oval in shape, and covered with short, black, curved hairs facing forward. On each side of the head are two thicker black hairs facing straight forward. These appear more thickened toward their terminal points, and are longer than the curved hairs rising from the surface of the head.

Body: The overall length of the larva at the end of this instar is about 18mm, including two relatively long, thin, dark maroon-colored tails which are 9.0mm in length. These tails are curved outward slightly, and towards the end, they curve back inwards, almost touching at the extremities in such a way as to give the area beyond the anus and between the tails a thin, narrow, oval shape.

The basic ground color of the body is opaque light greenish-green. The overall pattern is extremely colorful. Dorsally, the pattern can be described as follows: Starting from the base of the head, there is a marking that is generally club-shaped, almost like a lathed table-lamp base, with cuts around the edges creating the appearance of globe-shaped sections. The diameters of these



Fig. 2. Fifth-instar larva of *Antirrhoea philoctetes*, dorsal view. (Photo by H. Boos).

globes increase gradually from the base, reaching a maximum diameter and then decreasing suddenly just under the "shade" of the lamp-like marking. The color of this marking is light lime-green. The mid-section of the lamp shade is a bright red, club-shaped mark; and the conical-shaped balance of the shade is the same light lime-green color.

From the top of this lamp-shade figure arises a pair of thin lime-green strokes like a "V". If the conical lamp-shade marking was described as the head of an arrow, then a bird-like red figure occupies the inside of the arrow point, which is also lime-green in color. Directly following this arrow point posteriorly are two markings which appear to be the shape of a wheat grain. These are the same light green color. Another lime-green, arrow-shaped marking follows, with red color inside the arrow-shaped point. Directly following this marking is another lime-green mark which is the shape of a wheat grain again. Closer to the tail end is yet another wheat grain mark, but about half the size of the former ones and bearing a thin red cross in the midsection. Joined to this mark is another lime-green, oval-shaped mark which gets progressively smaller as it draws nearer to the rear end of the body. Just between the bases of the pair of long tails occurs the last and smallest lime-green oval marking, with an extremely light, black mark separating it from touching the one before it. This mark appeared to be a segment line. Short black markings parallel to each other (but not to the length of the body) are present along the edges of the lamp shade (or arrowhead-shaped) markings. The second molt occurred on 18 May 1983, or eight days after the first molt.

Third Instar:

Head: At this stage, the head has the general shape of an isosceles triangle with blunt points, with the bottom side somewhat shorter than the two rising sides. Two small black blobs are present near the curves of the triangle and slightly above the baseline. Two rows of fine, short, black hairs curve around the outer edges of the head, curving slightly forward from both sides. As one progresses further up the head, these hairs stick straight outwards at the side, whereas those at the top of the head stick out slightly upwards and backwards. At the bases of all these hairs are small black dots, from each hair arises. The three lowest hairs on each side at the base of the head are much

more thickened than the others. The basic ground color of the head is a very light brown or beige. A small inverted "V," maroon in color, is present in the center of the head. The top half of the head has a pinkish tinge, which is separated from the bottom half of the head by a straight line of pink color running across the width of the head.

Body: The incredibly colorful pattern of the larvae of this species continues in this instar. A description of the dorsal pattern follows. Starting at the back of the head is a head club-like marking, greenish-yellow in color, with the small end situated at the margin of the head. At the tip of this club-like figure is a slightly more yellow blob. Touching this is a four-sided figure, red in color, superimposed on which is a marking similar to an arrowhead, the point of which points away from the head. There is a slight tinge of reddish color right at the tip of this arrowhead. The color of the arrowhead is light yellowish-green.

From the tip of this arrow-like figure extends an oval-shaped marking, about half the length of the club that was situated right behind the head. It is orange in color where it touches the arrow's tip, with the posterior portion in dark red. Around this mark, another arrow-shaped mark occurs with the same light yellowish-green color as the first one described above. This arrow mark is followed by two yellowish, slightly green arrow-shaped tips, with the shafts thicker than the first two described.

Continuing posteriorly on the body, there is a narrow oval marking in red, surrounded by a thin black line. This black line runs across the width of the body at the point where the arrowhead point stops. Starting from both sides of this red oval marking is a new marking which may be described as the tail fin of a fish, a marking which continues towards the posterior end in the shape of a fish body, with "pectoral fins" as seen from the dorsal angle, and ending in a pointed mouth. At this point, a thin dark line separates this light lime-green/yellowish fish-like figure from the short shaft of yet another arrowhead marking of the same color as the fish-like figure. This shaft is quite thick at the point where it merges with the inside of the arrowhead. Inside that thickening is a thin cross, red in color, with the long end facing the tail of the larva. The arrow point of this marking is extremely blunt, with a darkish line separating it from an uneven oval-shaped mark. All these arrow-like markings and shafts are

of the same yellowish or slightly greenish color as in the oval mark just described.

Touching the bottom of this last oval figure is a rectangular marking of the same color as the arrows and other markings, with both ends somewhat rounded off. From the bottom of and from the sides of this rectangle jut out the extremely long tails, maroon in color, and curved slightly outwards on the horizontal plane, finally gradually bending inwards. The last few millimeters are white in color.

The entire length of the larva at this stage from head to end of tails is 40mm at maturity. The tails account for 15 mm of this length. The larva is only 2 mm in width. Along the length of the body are several rows of short, fine, white hairs, along with dark maroon markings on the lateral surfaces that resemble rough parallelograms, with gray color in between. These are arranged parallel to each other but not with the length of the body. In other words, these markings start at the sides of the body and slope upwards in a posterior direction at a very slight angle. The third molt took place on 24 May 1983, or seven days after the second molt.

Fourth Instar:

Head: The head of this instar retains the same basic shape, except that the ground color is somewhat lighter beige, with the same inverted "V" mark in the center. Three rows of black hairs are present around the sides and continue over the top of the head. A triangular area bare of hairs exists in the middle section of the head.

Body: The elaborate larval color pattern continues in this instar with some modifications. Looking at the larva from the anterior end towards the posterior, a white club-like mark surrounded with a black line is present right behind the head. The top of this club-like figure touches a very thick, short arrow shaft, bright red in color, with a thin arrowhead pointing towards the tail end. Touching this arrowhead is another arrow-like, thicker shaft crowned by another more prominent arrowhead in light yellow. Touching this arrowhead is a mark resembling half of an oval, which is yellow and has red lines on each side. The top half of the oval thus appears as if a hollow, circular arrowhead were sitting over it. Another similar figure follows on the body, with the same description as the last except that the head of this arrow is somewhat thinner than the first or the one before this. Both of these heads end bluntly and do not come to a point. The next posterior marking is a fish-like figure in red, surrounded by black lines. Posterior to this, a figure in yellow, similar to that of a fish with the front half cut off, is present, with the two tail fins coming forward and overlapping at the sides of about two-thirds of the length of the reddish fish figure.

Behind this figure is what could be described as a hollow-shaped arrowhead, in yellow, and the front portion of the preceding yellow fish figure seems to have entered the hollow portion of the arrowhead. The tip of this hollow arrowhead figure is marked with a red cross-like figure, with the two outward short lines of the cross in black. Directly following this is another figure like the rear three-quarters of a fish. However, the shape of this fish marking is not as streamlined as the first fish-like figure described. Yet the body near the tail of the fish is almost the same width as the portion of the midsection of the

lime-colored fish figure.

To the outside of all these described figures are black outlines. As described for the last instar, gray lines roughly parallel these figures but are set at an angle. Some of these gray lines are curved to follow roughly the contours of the shape they outline. At the bottom of these gray markings are black lines that follow the same contours as the gray lines they enclose.

The entire length of the larva at this stage is 46 mm; however, the width is only 2.5mm and this ratio gives a very slim appearance for the entire caterpillar. It is interesting to note that out of this total length, the distance from the head to the base of the long slim tails alone is 26mm, and the length of the tails alone is 20mm. Running along both sides of body just above the legs is a thick gray line, with irregular markings of black, from which rise numerous rows of fine long white hairs. These run the entire length of the body on both sides. The tails are black, with the color near the tips a pinkish-red, finally terminating in white tips.

The fourth molt took place on 3 June 1983, or ten days after the third molt.

Fifth Instar:

Head: The head shape is similar to that of the fourth instar, generally triangular in shape and smoothly textured, with an inverted, extremely thin line in the shape of a "Y". All ends of the triangular head are rounded off, and also those of the areas that gradually turn back anteriorly towards the front end of the larva. The thickness of the head is about 2.5mm in depth, and the head remains (in the resting position) at an angle of about 45° to the body, the top of the triangle facing backwards. A corona of black and slightly curved stiff hairs is present right around the clear midsection of the head area, as viewed from the front.

Body: Along both sides of the body, and running their entire length, is a beige line from which emanates thin black and beige lines, similar to waves, on the top side of the beige line. Those on the ventral side of the line are more vaguely marked, with blackish spots mingling all over the area similar to a speckled ceramic tile. Very fine white hairs jut out in tufts horizontally from each side, just above the legs, and run the length of the body. As mentioned above, the areas on both lateral surfaces above the beige line are occupied by alternating black and beige lines, sometimes irregular in shape, that give the effect of waves breaking forward. The dorsal and lateral surfaces along the entire length of the body are extremely colorful and intricately patterned, and a description of the various colors and shapes is attempted as follows.

Starting from the base of the head and proceeding posteriorly is initially a short baton-like shape, of a light yellow color, with the bottom (or smaller end) a light beige. This whole baton-shaped marking is surrounded by a fairly thick, jet black line, except where it touches the end of another baton-shaped marking which is red in color. Another way to describe this marking would be as a kind of fish-like figure, with two black notches at the head which might represent the markings of nostrils, and two very small yellow dots on each which could be imagined to be eyes. About two-thirds along the length of this red marking are situated two short, fin-like marks, facing the head end of the larva. All of this design is surrounded by a thick black line.

Moving towards the posterior end of the larva, the end of this previous figure touches another fish-like figure directly in the "V" of the large tail fin, split in two: this figure is colored bright yellow and surrounded by a black line. The body of the fish-like shape is contoured by yellow, with two red lines opening slightly outwards, leaving another yellow line in the center. The two red marks, or streaks, taper off and end about halfway into what may be described as the tail fins of a stout dart-like fish. These start again at the base of the stout dart-like shaft, and curve open slightly, then back again more closely at a point about midway into the dart or arrowhead-shaped mark. All of these markings just described are surrounded by a thick black line.

From the point of this arrowhead mark, which is quite blunt, continues a parallel red mark, surrounded by black. This is followed towards the posterior end by another similar fish-like figure in yellow, almost exactly the same in shape and coloring as the first one described. From the blunt point of this mark is yet another red mark similar to the last red mark described, only thinner than the first and surrounded at the sides with six extremely small yellow dots. This marking ends in the middle of the tail fins of a bomb-like figure in yellow, which is of the same length as the fish-like figures described above. A blunt end of this bomb-like mark ends directly between the base of the tails, which are spread very widely apart. These tails start with a color of beige on the outer sides and merge to black colors that go towards the tips, which have a tinge of light beige at the extremities.

The entire length of the larva at this stage is 57mm, and the greatest width is 5mm. It is interesting to note that the length of the tails within this whole body length is 20mm, and that they flare out about 3mm from their bases as they proceed posteriorly.

This larval stage pupated on 20 June 1983, seventeen days after the fourth instar molted to fifth instar.

PUPA: The length of the pupa is 29mm. The larva pupated on the underside of a leaf, hanging at a steep angle. Viewing the pupa from the side, the pupa has an extremely stout point where it is attached to the bottom of the leaf. Two thin black lines run to the end of this point, which has a general beige ground color. These two thin black lines open out slightly as they come anteriorly towards the center of dorsal side, and the base of this triangle continues in a dirty yellowish "V", the outline of which is black at both tips of the "V" and gradually becomes a dirty tan in color. From the side, the tips of the "V" end in pointed projections, which are short. From the tips of this "V", the angle of the dorsal side of the pupa turns downward in relation to the end of the pupa at about 53°. As seen from the dorsal side, a "X" is present, with the four ends of the "X" filled in with this dark tan color and an overall appearance of being varnished. The area between the two bottom points of the "X" figure is filled in with a light, dirty yellowish figure that when examined with a lens, resembles a man's head with small reddish eyes and mouth. At the top of this head-like figure, a reddish line separates the figure, suggesting a skullcap of the same color as the head.

Below the figure of the head are two brownish, curved lines which are very thin. These could be described as the outline of a stiff broad collar, having the same color as that of the head.



Fig. 3. Lateral view of pupa of *A. philoctetes*. Fig. 4. Dorsal view of pupa of *A. philoctetes*. (Photos by H. Boos)

These collar flaps curve slightly upwards and form the pointed projection on each side. This figure resembles a bird with its wings wide open, and which has a small pointed red tail, at both sides of which are a pair of "legs" that appear to rise above the surface of the pupal case and stretch straight backward. Directly below this marking are two circular small dots which rise above the surface of the pupal case like the "bird legs" described above. These are a dirty brass color.

In the center of the dorsal side, and approaching the head section, is an inverted "U"-shaped mark similar in color to that of the face described above. The curve of the dorsal surface is more gentle towards the head end. However, viewing it from the side, the shape starts to turn slightly outwards and away from the leaf. The dorsal side of the pupa ends in a point and turns sharply at almost a right angle back towards the leaf at about 8 mm. The curved sides of the dorsal side of the pupa are outlined with a thick blackish mark and separate the ventral side of the pupa from the turtle-like appearance already described.

From the ventral side, starting once again from the abdomen area, the section in the tail region bulges gradually towards the leaf surface and curves back in a gradual line to meet the point at which the dorsal point started to turn back towards the leaf

surface. In a frontal view, two short points may be seen rising from each side of this ventral section. It should be noted that this whole area is marked with venation similar to that of a leaf, and is of a light greenish color and slightly mottled in appearance.

The pupal stage lasted 13 days, and the adult male hatched on 3 July 1983.

GENERATION TIME (egg to imago): 70 days.

ACKNOWLEDGMENTS

The publication of this series of life history papers is supported in part by the Lepidoptera Research Fund at the University of Florida Foundation, and the Division of Lepidoptera Research, University of Florida, Gainesville, Florida.

REFERENCES CITED

- Barcant, M.
1970. Butterflies of Trinidad and Tobago. London: Collins. 314 pp.
- D'Abrera, B.
1984. Butterflies of the Neotropical Region. Part II. Danaidae, Ithomiidae, Heliconidae & Morphidae. Victoria, Aust.: Hill House. 384 pp.
- DeVries, P. J.
1984. The genera *Antirrhea* Hubner and *Caerois* Hubner. Pp. 361-371. In D'Abrera, B. 1984. Butterflies of the Neotropical Region. Part II. Danaidae, Ithomiidae, Heliconidae & Morphidae. Victoria, Aust.: Hill House. 384 pp.
- DeVries, P. J., I. J. Kitching, and R. I. Vane-Wright
1985. The systematic position of *Antirrhea* and *Caerois*, with comments on the higher classification of the Nymphalidae (Lepidoptera). *Syst. Ent.* (London), 10: 11-32.
- DeVries, P. J.
1987. The butterflies of Costa Rica and their natural history. Princeton: Princeton Univ. Press. 327 pp.
- Ehrlich, P. R.
1958. The comparative morphology, phylogeny, and higher classification of butterflies (Lepidoptera: Papilionoidea). *Kansas Univ. Sci. Bull.* (Lawrence), 39: 305-370.
- Urich, F. C., and T. C. Emmel
1990. Life histories of Neotropical butterflies from Trinidad. 1. *Pierella hyalinus fusimaculata* (Lepidoptera: Satyridae). *Tropical Lepid.* (Gainesville), 1:25-26.

