

# LIFE HISTORY OF *PEDALIODES PAREPA* FROM ECUADOR (LEPIDOPTERA: NYMPHALIDAE: SATYRINAE)

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**ABSTRACT.**— The immature stages of *Pedaliodes parepa* (Hewitson) are reported and figured in color for the first time from material collected at Cuenca in Ecuador. Larvae were reared in the laboratory to maturity on *Poa annua* (Linnaeus) (Poaceae).

**RESUMEN.**— Se describe e ilustra a colores los estadios inmaduros de *Pedaliodes parepa* (Hewitson) con material coleccionado en Cuenca, Ecuador. Las larvas fueron criadas en el laboratorio hasta madurez empleando *Poa annua* (Linnaeus) (Poaceae).

**KEY WORDS:** Andes, Azuay, biology, Bolivia, Central America, *Cissia*, Colombia, Costa Rica, Gramineae, immature stages, Neotropical, Peru, Poaceae, Pronophilini, South America, Venezuela.

The genus *Pedaliodes* Butler belongs to the tribe Pronophilini of the Satyrinae. The Pronophilini are restricted to the Neotropical Region. The genus *Pedaliodes* comprises approximately 150 species of medium sized butterflies which are distributed in montane regions of Central and South America (D'Abrera, 1988). The majority of species are to be found in the Andes of Bolivia, Peru, Ecuador and Colombia. Although there are some interesting papers about the taxonomy, ecology, geographical and vertical distribution of Pronophilini species in the Cordilleras of Colombia and Venezuela (Adams and Bernard, 1977, 1979, 1981; Adams, 1986), no modern revision of the whole tribe nor of *Pedaliodes* exist. Therefore, *Pedaliodes* is retained in a broad sense despite the partition of *Pedaliodes* into several genera by Forster (1964). Moreover, published information about the immature stages of the Pronophilini is scarce and up to now no complete life history for any *Pedaliodes* species has been described. The hostplants of *Pedaliodes* are most probable Poaceae, especially bambusoid grasses, but are certainly known only for three species of *Pedaliodes* from Costa Rica (DeVries, 1987). The hostplant of *Pedaliodes perperna* (Hewitson) is *Rhipidocladum maxonii*, while *Chusquea* is reported as hostplant for *Pedaliodes dejecta* (Bates) and *Pedaliodes ereiba* (Felder). DeVries (1987) describes the eggs of *P. perperna* and *P. ereiba* and states that the mature larva of *P. dejecta* is pale brown and similar in pattern and shape to the larva of *Cissia libye* (Linnaeus), while the pupa resembles the pupa of *Cissia gomezi* Singer, DeVries & Ehrlich.

During my stay at Cuenca, Azuay Prov., Ecuador, in January-February 1996, some individuals of *Pedaliodes parepa* (Hewitson) were observed in the parks and nearby pastures at the Río Tomebamba, in the southeast of the town at 2500m elevation (Fig. 2G). On 17 February, a female was collected and placed alive in a plastic bag for two hours. During this time, the female laid six eggs. The eggs hatched ten days later, soon after the return to Germany, and the larvae immediately accepted the grass *Poa annua* (Linnaeus) (Poaceae) as foodplant. The rearing was

conducted in the laboratory at room temperature (20-23°C) and ambient light regime in small plastic boxes with cuttings of *Poa annua*, which were replaced every two or three days. During the breeding, four of the larvae died (one in the fourth instar, two in the fifth instar and one as prepupa). The remaining two larvae molted into pupae and produced two males fifteen days later. These two hatched males are smaller than the three males and the female which were caught in Cuenca and the underside of the hindwings is also darker (Fig. 2H-I). The length of the forewing of the reared males is 19mm and 22mm. The length of the forewing of the wild caught individuals is 27mm, 26mm and 25.5mm for the males, and 26mm for the female. Most probably this is due to the circumstances of the breeding in the laboratory during winter and early spring on an European lawn grass which is not the regular hostplant. The larvae clearly suffered on this diet using very long periods to complete their development, especially in the fourth and fifth instar. This may also be the reason for the high mortality of the larvae in the last two instars. Measurements of body length were recorded for fully fed larvae in each instar. Measurements of the eggshells, head capsules, head horns and anal tails were conducted with a stereomicroscope and an ocular micrometer. The dead larvae and prepupa were preserved in alcohol. The eggshells, larval head capsules and pupal exuviae were also preserved and are together with the butterflies in my collection.

## DESCRIPTION OF IMMATURE STAGES

**Egg** (Fig. 1A): The egg is round, the base slightly flattened. It is 1.06mm high and the greatest diameter is 1.13mm. The color is white after oviposition but turns to a greyish-white after one day. In the last two days before eclosion the black head of the larva is visible through the chorion. The surface is rather smooth but with a fine, regular reticulation. The eggs hatched on 27 February 1996, or 10 days after oviposition.

**First instar larva** (Fig. 1B-C): Head is shiny black, 0.78mm wide, 0.76mm high, with a very fine reticulate structure of chitin ridges. Api-

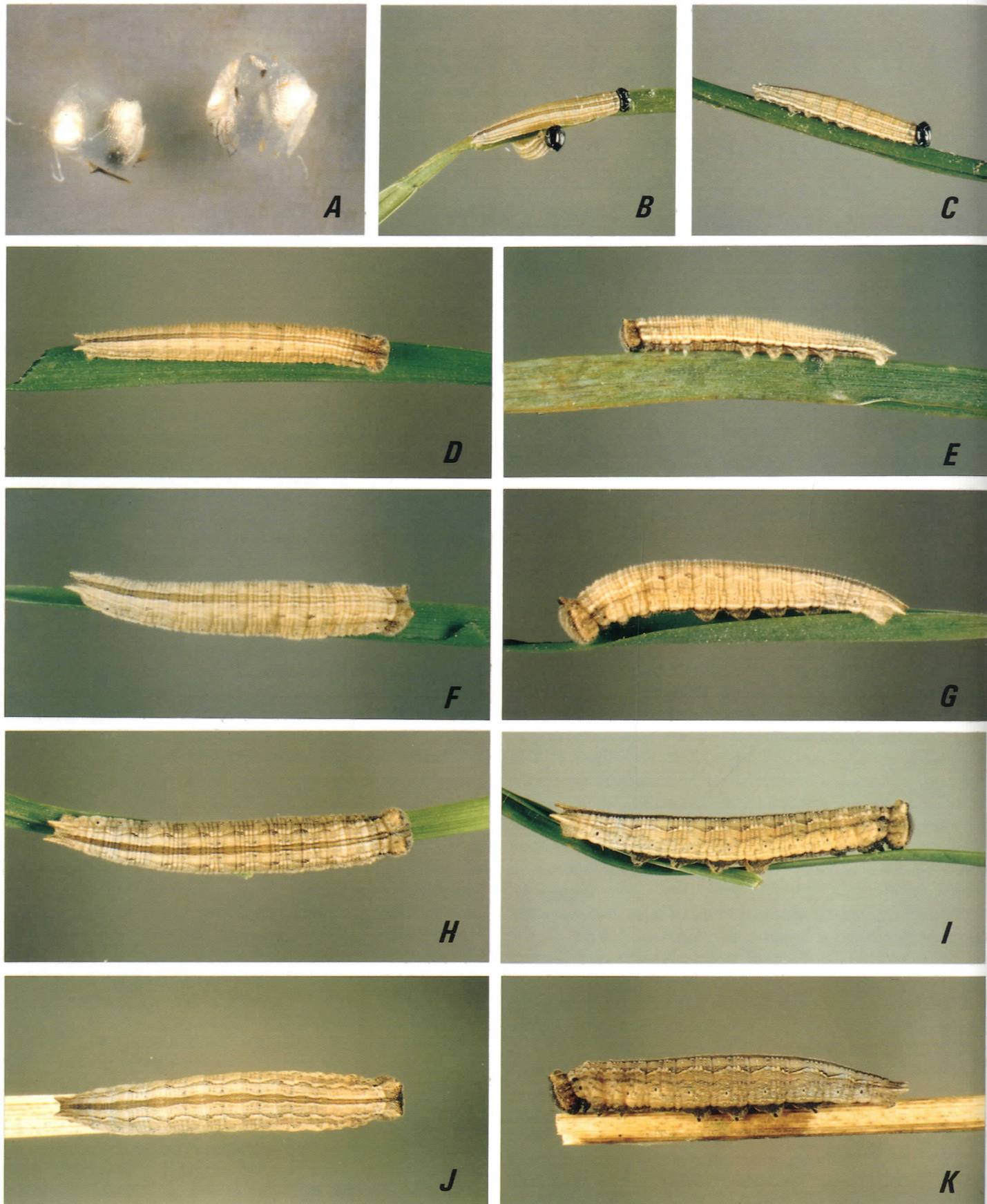


Fig. 1. Life history of *Pedaliodes parepa*: (A) Eggshells; (B) First instar larva dorsal; (C) First instar larva lateral; (D) Second instar larva dorsal; (E) Second instar larva lateral; (F) Third instar larva dorsal; (G) Third instar larva lateral; (H) Fourth instar larva dorsal; (I) Fourth instar larva lateral; (J) Fifth instar larva dorsal; (K) Fifth instar larva lateral.



Fig. 2. Life history of *Pedaliodes parepa*: (A) Head of the fourth instar larva frontal; (B) Head of the fifth instar larva frontal; (C) Caudal part of body with anal tails of the fifth instar larva lateral; (D) Pupae dorsal; (E) Pupae lateral; (F) Pupa ventral; (G) Habitat at Río Tomebamba in the southeast of Cuenca, Azuay-Prov., Ecuador, 2500m, 26 Jan 1996; (H) Imagines dorsal surface: above, left: wild caught male Ecuador, Azuay Prov., Cuenca, 2500m, 26 Jan 1996 (Forewing length 25.5mm), above, right: parent female Ecuador, Azuay Prov., Cuenca, 2500m, 17 Feb 1996 (Forewing length 26mm); below: reared males emerged 24/25 May 1996 in Germany (Forewing length 19mm and 22mm); (I) Imagines ventral surface: same individuals and sequence as in (H).

cally on the epicranium are two short, rounded processes or horns which are 0.08mm long. Setae long and pointed. Body beige with a pattern of longitudinal stripes: dorsal line brown, divided by a narrower beige median stripe into two parts and bordered laterally by white lines. In the caudal third of the body the dorsal line becomes darker brown and the beige median stripe is less prominent. Subdorsal line orange-brown, ventrally also bordered by a white stripe. The fine supraspiracular line is brown and continues on the anal tails. A broad white subspiracular line is bordered dorsally by a narrower orange-brown and ventrally by a dark brown line. Spiracles black surrounded by cream-white patches. Thoracic legs and abdominal prolegs beige. The body bears only a few pointed setae, which are longer in the caudal part of the body. Anal tails distinct, 0.12mm long. The greatest body length is 5.5mm. The first instar molted on 7 March 1996, or 9 days after eclosion.

**Second instar larva** (Fig. 1D-E): Head laterally and dorsally beige with brown stripes and patches of variable extension, frontally dark brown with more or less prominent beige markings: a reverse V in the middle of the epicranium and a beige patch on frons. Head horns rounded, more prominent, beige laterally and caudally, dark brown frontally. The dorsal line continues on the head as a dark brown stripe. The entire surface of the head capsule is punctuated with numerous deep regularly spaced pits and bears numerous short setae. The head is 1.08mm wide, 1.03mm high and the horns are 0.14mm long. Body beige, similar to the first instar. The median stripe which divides the dorsal line is wider than in the first instar and the white bordering lines are laterally accompanied by fine brown stripes. The orange-brown subdorsal line is very fine and distinct only on the thorax and on the last four abdominal segments. On abdominal segments 1-5 instead of the subdorsal line brown patches (relatively large and dark brown on segments 1 and 2, smaller and light brown on segments 3-5) are visible in the posterior part of each segment. The white bordering stripe ventrally is narrower than in the first instar. The supraspiracular line disappears on abdominal segments 2-6. Subspiracular pattern as in first instar, but the dark brown line is broadened ventrally on abdominal segments 3-6 and continues there on basal part of the prolegs. Spiracles black ringed with white patches. Thoracic legs and abdominal prolegs beige. Whole body with numerous fine, short, pointed setae. The greatest body length is 9.5mm and the anal tails are 0.29mm long. The second instar molted on 16 March 1996, or 9 days following the first molt.

**Third instar larva** (Fig. 1F-G): Head as in second instar, 1.54mm wide, 1.46mm high and head horns 0.21mm long. Body similar to the second instar. Dorsal line is swollen somewhat on abdominal segments 1-5. The beige median stripe is very wide on thorax and on the first two abdominal segments, leaving only narrow remnants of the brown parts. The white bordering lines and fine brown stripes laterally are distinct only in the anterior part of the body. These brown stripes are enlarged to a small dark brown patch in the middle of abdominal segments 1-4. The subdorsal line is as in the second instar, but an additional brown patch appears on abdominal segment 6 and the white bordering stripe below is wider and distinctly curved upward on each segment, especially on abdominal segments 1-7. These white stripes are now bordered by fine orange-brown lines ventrally (not very prominent in the middle of the body). The brown supraspiracular line is as in the second instar. The white subspiracular line is narrower than in the second instar, not very distinct and the orange-brown line above disappears. The dark brown line below is as in the second instar. Thoracic legs dark brown, abdominal prolegs beige with a dark brown lateral patch, anal prolegs beige. The greatest body length is 13mm and the anal tails are 0.65mm long. The third instar molted on 25 March 1996, or 9 days following the second molt.

**Fourth instar larva** (Fig. 1H-I): Head as in third instar, 2.20mm wide, 2.11mm high, head horns 0.38mm long and 0.30mm wide (Fig. 2A). The ground color of the body is beige with numerous very fine white or

bluish-grey dots, especially dorsally. The abdominal segments 6-8 are in general lighter, more bluish-grey colored. The pattern is comparable to the third instar. The median stripe of the dorsal line is narrower and distinct only on thorax and on abdominal segment 1-2. The white bordering lines are clearly visible only in the anterior part of the body, but the brown lateral stripes are in contrast more prominent, especially the pattern of two small dark brown patches in the middle of each of the abdominal segments 1-5. The brown subdorsal line is distinct on the whole body, curved upward on each segment and enlarged dorsally to a dark grey-brown patch on the posterior part of the abdominal segments 1-6. The white stripe below is as in the third instar, but the orange-brown bordering line ventrally is more prominent. The dark brown supraspiracular line is clearly visible, only interrupted by patches of the ground color in the anterior part of the abdominal segments 2-7. On abdominal segment 8 it curves upward and joins with the orange-brown part of the subdorsal line, which continues on the anal tails. On the prothoracic segment a conspicuous black round patch appears in the supraspiracular line. The white subspiracular line disappears totally. The dark brown line below, the spiracles, the thoracic legs and abdominal prolegs are as in third instar. Ventrally the body is beige with a fine brown median line. The greatest body length is 16.5mm and the anal tails are 0.82mm long. The fourth instar molted on 9 April 1996, or 15 days following the third molt.

**Fifth instar larva** (Fig. 1J-K): The fifth instar resembles the fourth instar very closely. Head is 2.97mm wide, 2.89mm high, with horns 0.54mm long and 0.54mm wide (Fig. 2B). The ground color of the body is beige and the white or bluish-grey dots are more frequent than in the fourth instar. The pattern is as in the fourth instar. Only the white part of the subdorsal line is narrower and more cream-white, which turns to a bluish-grey in the middle of each segment and the orange-brown bordering line below disappears. The greatest body length is 26mm and the anal tails are 1.4mm long (Fig. 2C). The fifth instar changed to prepupa on 8 May 1996, or 29 days following the fourth molt.

**Prepupa:** For pupation the larva went to a strong dry stem of grass at the bottom of the rearing box and there suspended with the anterior part of the body turned up. The prepupa is beige and the pattern of the larva disappears almost completely. The length of the prepupa is 20.5mm. The prepupa molted to a pupa on 9 May 1996, or one day following the change to prepupa.

**Pupa** (Fig. 2D-F): Head of the pupa with two broad points. The dorsal part of the wing case edges from a right angle with the lateral part. These sharp edges are colored light-beige and end cranially in a sharp point. Abdominal segments with a total of five (one dorsal and on each side two lateral) rows of small pointed protuberances. Mesonotum dorsally turned upward with a sharp, arched keel. This keel dorsally is colored dark brown with a fine beige midline. End of cremaster with numerous fine black colored hooks. The ground color of the pupa is beige mottled with olive-grey striae and patches. This grey suffusion is strongest on the dorsal part of head, thorax and wing cases, also distinct on the lateral parts of the wing cases and on the lateral parts of the abdomen. In the outer third of the wing cases are small white dots. The spiracles are black. There are two conspicuous small black patches in the middle of the mesothoracic leg cases. The end of the antennal cases also is black. The total pupal length is 12.5mm and the dorsal width of the pupa across the wing cases is 5mm. The imago emerged on 24 May 1996, or 15 days after pupation.

**Development Time:** Total time of development from egg to imago at 20-23°C in the laboratory was 97 days.

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