

LIFE HISTORIES OF FOUR SPECIES OF  
*PHILIRIS* RÖBER (LEPIDOPTERA: LYCAENIDAE)  
FROM PAPUA NEW GUINEA

MICHAEL PARSONS

Insect Farming and Trading Agency, Division of Wildlife,  
P.O. Box 129, Bulolo, Morobe Province, Papua New Guinea

**ABSTRACT.** The life histories of four species of *Philiris*, *P. helena* Snellen, *P. agatha* Grose-Smith, *P. intensa* Butler and *P. ziska* Grose-Smith, together with notes on their biologies, are described and illustrated.

Life histories of species of the genus *Philiris* Röber (Lycaenidae) from the Melanesian region have been little studied, but Forbes (1977) has recently detailed the life history of *P. moira* Grose-Smith from Papua New Guinea. Common and Waterhouse (1981) have briefly outlined the life history of *P. innotata* Miskin from Australia.

In the past, difficulty has been experienced with the placing of the correct females with the males of certain species of *Philiris*, but Sands (1979, 1980, 1981) has done much towards clarifying the taxonomy of the genus. The phyletic arrangement of all species, however, will remain unclear until the biologies of further species are known. It is hoped that the addition to the literature of four new *Philiris* life histories, and information about the morphology of their early stages, will assist in such a study. I am also preparing to describe the life histories of *Philiris harterti* Grose-Smith, *P. diana* Waterhouse & Lyell, *P. violetta* Röber, and *P. praeclara* Tite from Papua New Guinea, all of which feed on *Litsea* (Lauraceae).

Figs. 4 and 5 of the mature larva and pupa of *P. moira* are included here for ease of comparison. All life histories were studied from the Bulolo valley in the Morobe Province from approximately the center of the 10 km grid square reference DN50. The early stages of all species show remarkable camouflage against their foodplants. The duration of the life cycle of each species was about one month from egg to adult.

*Philiris helena* Snellen

**Egg.** Diameter 0.75 mm; white, spherical when viewed from above, oval from the side, ventrally flattened; micropylar pit surrounded by six smaller pits; egg honeycombed with larger, regular, ovoid pits, the walls of which are produced into long, outward curving spicules which shorten gradually towards median line.

**Larva. First instar.** 1.55 mm in length, 0.5 mm in width; oval and elongate in dorsal profile; head pale brown; body pale green, edged with pale yellow; hirsute, fringed with fine white setae.

**Second instar.** 3.5 mm by 1 mm; anterior end slightly wider; head pale brown; body pale green with white middorsal line, broken at each segment.

**Third instar.** 5 mm by 2 mm; similar to second but white middorsal line bordered with tan brown.

**Fourth instar.** 10 mm by 4.5 mm; similar to third but middorsal line pinkish brown pattern encircled by cream; body color pink where larva has been feeding on small, young, pink leaves of foodplant, otherwise pale green; setal fringe 1.5 mm in length.

**Fifth instar.** 16 mm by 6.5 mm; similar to fourth but middorsal line broader (3 mm), forming a diffuse pattern of four lines of white dashes; laterally this pattern is continued but is fainter (Figs. 2 and 6).

**Pupa.** 11 mm in length, 5 mm in width; oval from above, ventrally flattened; hirsute, covered by fine pubescence of soft, white setae; dimorphic depending on substrate color being either pale green or pale brown; abdomen greenish yellow dorsally with two pale green dorsolateral lines either side of wider green middorsal line which continues onto thoracic segments. Supported by cremaster and fine silk girdle (Fig. 7). Duration, 12 days.

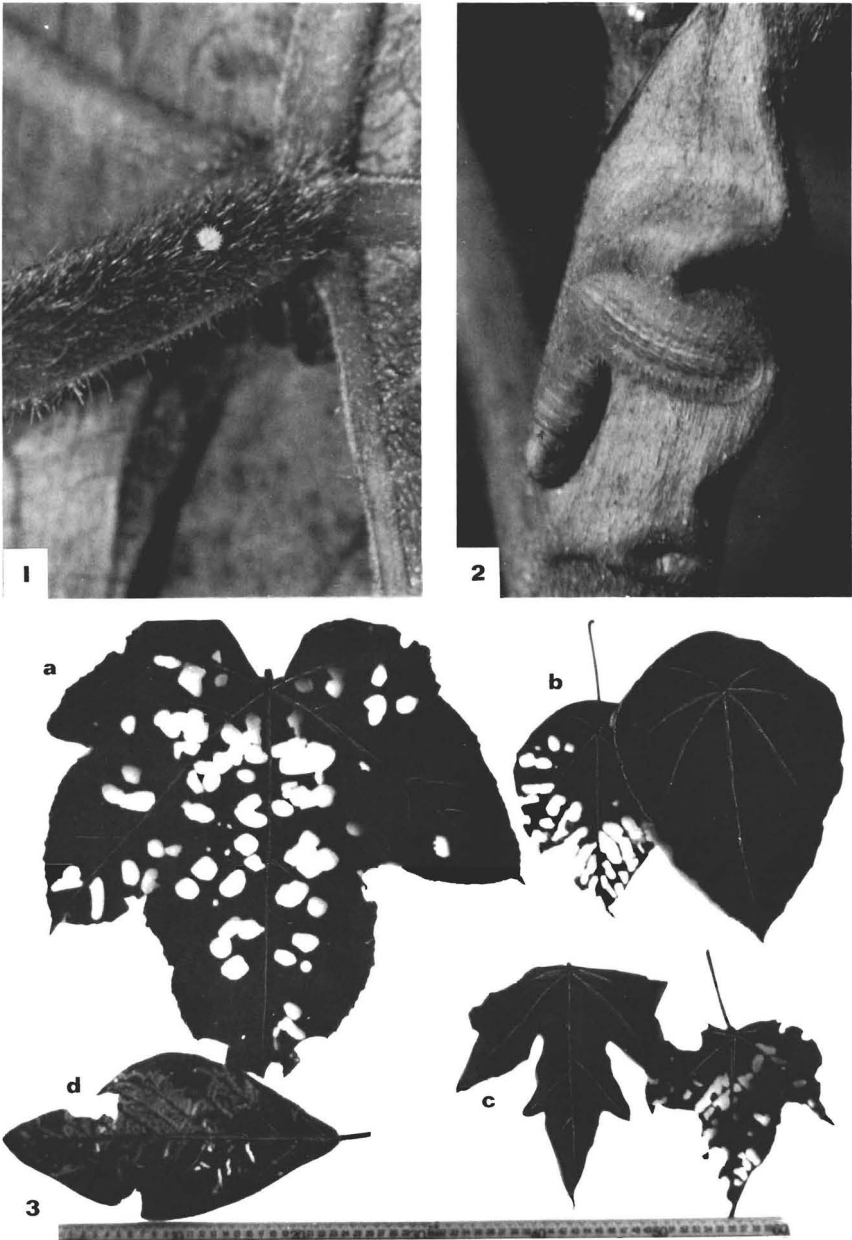
**BIOLOGY.** The foodplants are *Macaranga aleuritoides* F. Muell. and *M. quadriglandulosa* Warb. (Euphorbiaceae). Both species can grow up to 8 m in height. The leaves (Fig. 3) of both are broad and dark green. Those of *M. quadriglandulosa* are peltate, at the base (up to 35 mm in diameter) with a pointed tip and a serrated edge. Those of *M. aleuritoides* have five lobes are semipalmate and often grow to 70 mm in diameter. Both possess four to eight shiny, red, ovate glands on the upperside of the leaf bases which appear to be attractive to various species of ants. Gressitt and Nadkarni (1978, p. 114) mention that these extrafloral nectaries are also attractive to several families of flies. *M. quadriglandulosa* has a coarse felt-like covering of hairs on its leaves. The sap of both is sticky, clear and gelatinous. The foodplants are common throughout the Lae-Wau region in regrowth areas from sea level to 1200 m.

Adults of *P. helena* can often be seen in abundance where the food-plant grows. They rest on the upper surface of the leaves and may be frequently seen drinking on damp sand.

Eggs are usually laid single on the leaf petiole and adhere to the long, felty hairs (Fig. 1). The larvae when young eat only the lower epidermis, creating windows in the leaf. Later they eat many full holes (Fig. 3), skeletonizing the leaf with no more than the veins to hold its former shape. Ants are almost always present on the *Macaranga* foodplants, but their association with the *P. helena* larvae is minimal, and they seem more preoccupied with the plant glands.

Pupae are always attached to the old leaf bracts at the base of the main stem. If the bracts are dry and brown, then the pupae tend to be brown also. If the bracts are still pale green, then the pupae are of the same color.

From a final instar larva of *P. helena* which was collected wild, a small tachinid fly emerged. The species appears to be prone to attack by these parasitoids because numerous mummified skins of final instar



FIGS. 1-3. *Philiris* early stages and feeding damage: 1, egg of *P. helena* on petiole of *Macaranga aleuritoides*; 2, eggs (above bract) and mature larva and empty pupal case of *P. helena* on bract of *M. aleuritoides*; 3, damage to leaves of a) *M. aleuritoides*, b) *M. quadriglandulosa*, c) *M. involucrata*, d) *Ficus calopilina* (by *P. moira*).

larvae have been observed on the foodplants, each of which bore the ventral exit hole of a fly larva.

### *Philiris agatha* Grose-Smith

**Egg.** Like that of *P. helena*.

**Larva.** The first three instars of *P. agatha* closely resemble those of *P. helena* but fourth instar pattern discernibly different. Larva of *P. agatha* slightly slimmer and more elongate than *P. helena*.

**Fourth instar.** 11 mm by 4 mm; head tan brown; body pale olive green; middorsal pattern bright white commencing from behind prothorax and composed of three parallel dashes on each segment which converge to form single broad line at anal end of larva; laterally, larva patterned with narrower parallel white lines; setal fringe 1.5 mm in length.

**Fifth instar.** 18 mm by 6 mm; similar to fourth (Fig. 8).

**Pupa.** 12 mm in length, 5 mm in width; hirsute, pale olive green, boldly patterned with white; prothorax with white, triangular markings above eyes; mesothorax with two broad white lines which curve around middorsal line; middorsal abdominal pattern composed of broad white dashes either side of midline; laterally abdomen bears single, broad, white, wavy line. Supported by cremaster and fine silk girdle (Fig. 9). Duration, 12 days.

**BIOLOGY.** The foodplant is *Macaranga involucrata* (Roxb.) Bail. (Euphorbiaceae), a tree which grows to 7 m in height. The leaves (Fig. 3) are variable in shape. They are either rounded or have three or five lobes, the central lobe being the longest. The leaves are covered with a fine white pubescence which makes them extremely soft and felt-like to the touch. They bear four small, often vestigial, glands on the leaf upperside near the petiole. The sap is clear, slightly sticky, and can have a strong camphor-like smell. It is a common plant of regrowth areas around the Bulolo valley.

Adults of *P. agatha* are less frequently seen than those of *P. helena* and may be classed as occasional in their habitat. They sometimes drink on damp sand and mud at creek margins and are very fast flying.

Eggs are usually laid on the underside of a small new leaf, or its petiole, at the apex of the foodplant. The larvae commence feeding on the young leaves. Then, as they grow, they move to feed on lower, older leaves. Leaf damage is shown in Fig. 3. No actual attendance of the larvae by ants was noted, although there were often brown tree ants on the foodplant.

The monomorphic pupae are invariably attached to the underside of a very young leaf (hardly larger than the pupa) at the apex of the foodplant. They match well the felty appearance and color of these leaves.

### *Philiris intensa* Butler

**Egg.** Diameter 0.5 mm; white; hemispherical, with a regular covering of spicules.

**Larva. First instar.** 0.75 mm in length, 0.25 mm in width; oval in shape; head tan brown, lying well beneath prothorax; uniform greenish yellow; fringed with fine white setae.

**Second instar.** 3 mm by 1.5 mm; similar to first but with middorsal line patterned with reddish brown spots with dark green centers.

**Third instar.** 6 mm by 2.5 mm; similar to second but brown middorsal line broken centrally by two white spots.

**Fourth instar.** 8.5 mm by 3.5 mm; similar to third but spiracles white.

**Fifth instar.** 10 mm by 6.5 mm; similar to fourth but ground color darker green and matches that of leaf on which larva feeds; middorsal line of brown spots with white centers; setae fringe 1 mm in length, armed with prominent, outwardly directed barbs arranged in alternating rows along each hair (Fig. 10).

**Pupa.** 9 mm in length, 5 mm in width; smooth, not hirsute; apex of mesothorax with diffuse pattern of brown and white, ringed by olive green to edge of pale yellow wings; abdomen pale lime-green with brown and white middorsal pattern on segments 1-5; spiracles white, those on first abdominal segment encircled by brown spots. Supported by cremaster and fine silk girdle (Fig. 11). Duration 10 days.

**BIOLOGY.** The foodplant is *Pipturus argenteus* Willd. (Urticaceae), a common plant of creekside and regrowth areas, which grows to about 5 m tall. The leaves are pale to dark green and ovate with pointed tips and serrated edges. They average about 15-20 cm long and are felty to the touch. They are covered with minute white hairs. The small clusters of rounded, dimpled, opaque white fruit are gelatinous and are borne in alternating rows along fruit stalks.

Adults of *P. intensa* are commonly seen near the foodplant, and males are especially fond of drinking on damp sand.

Eggs are laid singly on the leaf underside, usually near the base. At all stages larvae eat the upper epidermis of the leaf and leave a characteristic long, narrow feeding trail of a meshwork of small veins. On occasion they were attended by small brown ants.

Pupation is always on the upperside of a large or small leaf of the foodplant and along the main vein just before it joins the petiole.

A small (8 mm long) orange ichneumonid wasp parasitoid was reared from a wild collected pupa.

### *Philiris ziska* Grose-Smith

**Egg.** Diameter 0.55 mm; pale bluish-white, hemispherical with regular covering of spicules.

**Larva. First instar.** 0.75 mm in length, 0.25 mm in width; oval in shape; head tan brown, lying well beneath prothorax; uniform pale yellow; fringed with fine white setae.

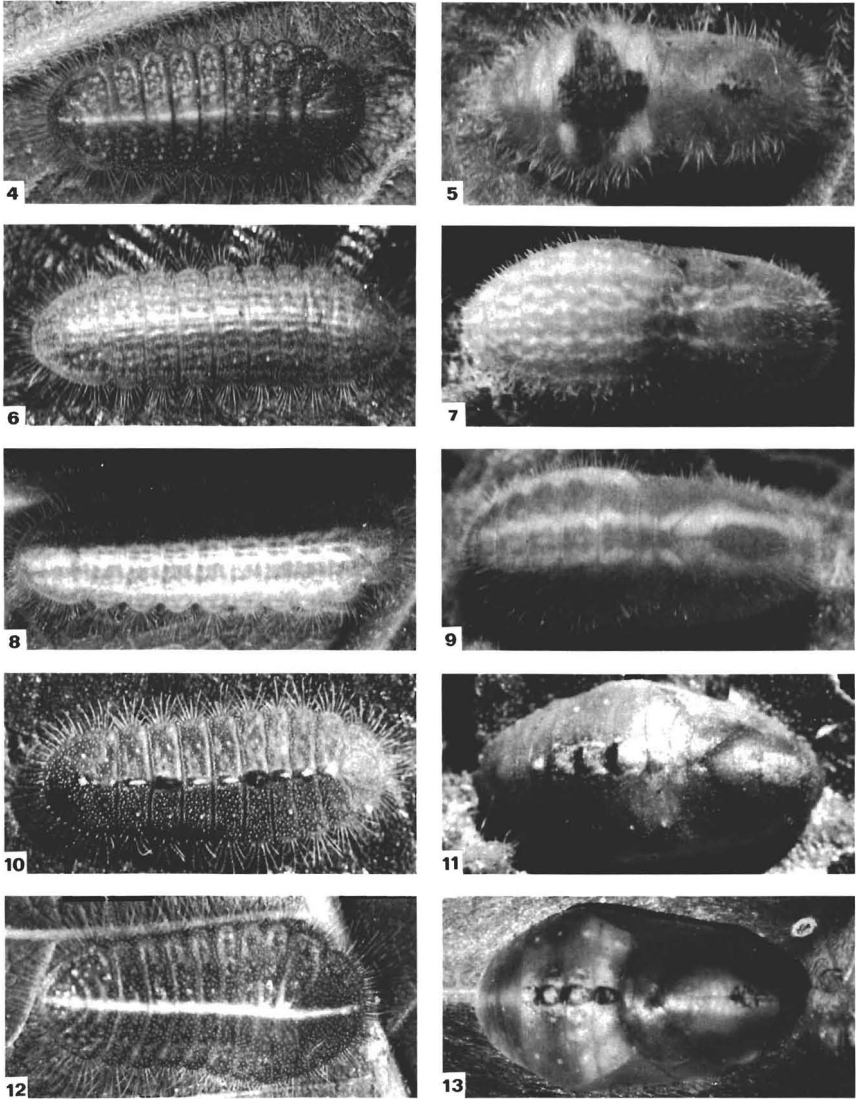
**Second instar.** 3 mm by 1.5 mm; similar to first but color straw-yellow; dorsal vessel shows as dark green middorsal line; middorsal line white, not extending onto thoracic or anal segments; four orange-red spots laterally, two at center of body and two on penultimate abdominal segment.

**Third instar.** 5 mm by 2.5 mm; similar to second but color greenish yellow with lateral spots brown; middorsal line extends along entire abdomen; setal fringe 0.55 mm in length.

**Fourth instar.** 8 mm by 4 mm, greatest width being at metathorax; dark green, paling to edges; middorsal line wholly white, or with pattern of brownish purple spots, three centrally and one on penultimate abdominal segment.

**Fifth instar.** 12 mm by 6 mm; dark green; middorsal line creamy white, along entire body length; setal fringe 2 mm in length (Fig. 12).

**Pupa.** 9 mm in length, 5 mm in width; similar to *P. intensa*; smooth, not hirsute; dark



FIGS. 4-13. *Philiris* spp., larvae and pupae: 4 & 5, *P. moira*; 6 & 7, *P. helena*; 8 & 9, *P. agatha*; 10 & 11, *P. intensa*; 12 & 13, *P. ziska*.

green with middorsal pattern of chocolate-brown flecks on white on abdominal segments 1-4; same pattern repeated at apex of mesothorax and both areas surrounded by pale yellow; spiracles white. Supported by cremaster and fine silk girdle (Fig. 13). Duration, 12 days.

**BIOLOGY.** The foodplant is *Malaisia scandens* (Lour.) Bl. (Moraceae)

which grows to about 5 m tall and is common along creeksides or road verges around Bulolo (altitude 700 m). Young leaves are soft and pale green. Old leaves are dark green and extremely brittle to the touch. They are ovate and may reach a length of 150 mm. The tree is a sprawling species which sends out long adventitious shoots. The small fruits are soft and red and are borne in many clusters along the branches.

Adults of *P. ziska* are often fairly common where the foodplant grows, especially alongside creeks.

Eggs are laid anywhere on the underside of new or old leaves, sometimes five on a leaf. The newly emerged larva eats the top of the egg and leaves a white ring of shell which remains attached to the leaf. At all stages the larvae feed on the lower epidermis of the leaf and leave the upper epidermis as windows of tissue. They will not accept any other related plant species. The larval ground color is a perfect mimic of a vein. They were seen to be attended by small brown ants.

Pupation is always on the upperside of the leaf along the mid-vein just before it joins the petiole. Up to 12 pupae have been found dispersed throughout one branch. The ground color is a perfect match of that of the leaf, and the brown markings edged with yellow resemble blemishes that are typically found on the leaves of various moraceous tree species.

*P. ziska* appears to be prone to attack by small, black chalcid wasp parasitoids. For example, one larva collected in its fourth instar ceased feeding and two 2 mm-long wasp larvae emerged to spin their cocoons beneath it before the larva died. Some pupae found had also died from what appeared to be a fungal disease.

#### DISCUSSION

A number of adults of each species have been reared and compared with material in the British Museum (Natural History) collection. In all cases males and females compared favorably with the pairings presented in the collection (as figured by D'Abrera, 1977). Representatives of each species have been placed in the collection of the Insect Farming and Trading Agency in Bulolo.

Comparison of the early stages, especially the morphology of the pupae, shows that *P. helena* and *P. agatha* are closely related as are *P. ziska* and *P. intensa*. The pupa of *P. moira* resembles more the latter pair than those of *P. helena* or *P. agatha* but is very distinct in that it is prominently hirsute, not smooth as in *P. ziska* and *P. intensa*, and its maculation is different. It is very similar to that of *P. innotata* and also that of *P. kapaura* Tite. Pupae of the latter species I have

found attached to saplings of a species of fig with large (500 mm diameter), hirsute leaves. Therefore, *P. moira*, *P. innotata* and *P. kapaura* form a closely related group of species. The similarities between the larval morphologies and foodplant relations of *P. ziska*, *P. intensa* and *P. moira* (together with *P. innotata* and *P. kapaura*), however, suggest that these butterflies may also belong to the same species group. Females of *P. moira* are virtually indistinguishable from those of *P. ziska*.

It is noteworthy that I have found *P. moira* larvae feeding on *Ficus semivestita* Corner (Moraceae), near Bulolo, as well as *Ficus calopilina* Diels. The latter is the foodplant recorded for the species by Forbes (1977).

#### ACKNOWLEDGMENTS

My thanks to to Kenneth Airy Shaw of Kew Herbarium, England for his assistance in the identification of the foodplants and to Don Sands of C.S.I.R.O., Queensland, Australia for kindly sending me separates of his papers.

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