

THE *PRINCEPS FUSCUS* COMPLEX (LEPIDOPTERA: PAPILIONIDAE)

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Abstract

The *Princeps fuscus* complex is considered to comprise 3 closely related species: *P. fuscus* (Goeze), *P. prexaspes* (C. & R. Felder) and *P. hipponous* (C. & R. Felder). Revised status is accorded to 23 species-group names: *P. fuscus lunifer* (Rothschild) (from *P. hipponous*); *P. fuscus minor* (Oberthur) and *P. f. metagenes* (Fruhstorfer) (from synonymy with *P. f. pertinax* (Wallace)); *P. fuscus canopus* (Westwood), *P. f. babberensis* (Fruhstorfer), *P. f. croton* (Fruhstorfer), *P. f. kallon* (Fruhstorfer), *P. f. hypsiclides* (Rothschild), *P. f. canopinus* (Rothschild), *P. f. vollenhovii* (C. & R. Felder), *P. f. alorensis* (Rothschild), *P. f. modestia* (Tsukada & Nishiyama), *P. f. sumbanus* (Rothschild), *P. f. umbrosus* (Rothschild) and *P. f. buisi* (Kalis) (from *P. canopus*); *P. fuscus hypsicles* (Hewitson) and *P. f. burgessi* (Samson) (from *P. hypsicles*); *P. prexaspes prexaspes* (C. & R. Felder), *P. p. andamanicus* (Rothschild), *P. p. dayacus* (Rothschild) and *P. p. bowringi* (Prout) (from *P. fuscus*); *P. prexaspes pitmani* (Elwes & de Niceville) and *P. p. duboisi* (Vitalis de Salvaza) (from *P. pitmani*). *P. fuscus oitylus* (Fruhstorfer) and *P. f. pyrgoteles* (Fruhstorfer) are placed as new synonyms of *P. f. indicatus* (Butler).

Introduction

In an earlier review of the *Princeps fuscus* group (Hancock 1983) I noted that *P. fuscus* itself was under investigation by others; consequently certain problems associated with the taxonomy of that species were left unresolved. That investigation has now been abandoned and my notes on the species are presented here.

As treated here, the *P. fuscus* complex is equivalent to the *fuscus* subgroup of Hancock (1983). Three species are included: *P. fuscus* (including *canopus* and *hypsicles*), *P. prexaspes* (including *pitmani*) and *P. hipponous*. The remaining species in the *fuscus* group, *P. albinus* (Wallace) and *P. woodfordi* (Godman & Salvin), are retained in the *albinus* subgroup. All occur primarily at low altitudes. Additional notes on the group were provided by Hancock (1985). Illustrations of most of the subspecies may be found in D'Abrera (1977, 1982), Haugum and Collins (1987) and Tsukada and Nishiyama (1982).

List of taxa

Princeps fuscus (Goeze)

This species occurs from Talaud, Sangir (Sangihe), Sulawesi and Bali to Vanuatu and Australia. Thirty-four subspecies are recognized. There are 5 basic pattern types: (i) *fuscus*-type, with dark forewings and a large, broad pale hindwing patch; (ii) *cinereomaculatus*-type, with postdiscal pale spots on the forewing and a large hindwing patch; (iii) *madanus*-type, with a pale forewing band and a large hindwing patch, (iv) *castaneus*-type, with a reduced hindwing patch, and (v) *canopus*-type, with a narrow hindwing band.

Group A: Sulawesi - Moluccas subspecies

P. f. lunifer (Rothschild), stat. rev. Talaud I. (NE of Sulawesi). Previously placed as a subspecies of *P. hipponous* and originally described from Sangir I. (N of Sulawesi) but this may have been a locality error as recent evidence (Tsukada & Nishiyama 1982) indicates that only *P. f. minor* is present there. The hindwing has a narrow, *canopus*-type hindwing band. In this and the following 9 subspecies the posterior areas of the hindwings tend to be dusted with yellow-grey scales.

P. f. minor (Oberthür), stat. rev. Sangir I. and N. Sulawesi. Usually placed as a synonym of *P. f. pertinax*. There are two distinct forms, one *fuscus*- or *cinereomaculatus*-type (form *minor*) and one *castaneus*-type. Both were illustrated by D'Abrera (1982, as *P. f. pertinax* and *P. f. ?* subsp.).

P. f. pertinax (Wallace). S. Sulawesi (Makassar). Tsukada and Nishiyama (1982) erroneously applied this name to the northern Sulawesi population but Wallace's types are from Makassar and his figure (Wallace 1865) agrees with material from southern Sulawesi. As in *P. f. minor* there are two forms, with a large or reduced (form *pertinax*) hindwing patch; both were figured by Tsukada and Nishiyama (1982, as *P. f. porrothenus*).

P. f. porrothenus (Jordan). Kalao and Tanadjampea Is (S of Sulawesi).

P. f. metagenes (Fruhstorfer), stat. rev. Binongka and Tukangbesi Is (SE of Sulawesi). Usually placed, without explanation, as a synonym of *P. f. pertinax*, the status of this population is uncertain.

P. f. talyabona (Talbot). Sula Is (E of Sulawesi).

P. f. fuscus (Goeze). Southern Moluccas (Ambon, Buru, Seram). This is a variable subspecies, with forms *castaneus* Goeze, *cinereomaculatus* Goeze, *madanus* Fruhstorfer and *fuscus* (= *severus* Cramer) all occurring together.

P. f. ombiranus (Rothschild). Obi, Central Moluccas.

P. f. lapathus (Fruhstorfer). Northern Moluccas (Halmahera, Bachan, Ternate, Morotai). *Papilio heringi* Niepelt appears to be a hybrid between this subspecies and *P. tydeus* (C. & R. Felder).

P. f. offakus (Fruhstorfer). Waigeo I. (NW of Irian Jaya).

Group B: Lesser Sunda Islands - NW Australia subspecies

P. f. thomsoni (Butler). Kai Is (S of Irian Jaya). In this and the following 12 subspecies the tails are narrower and the hindwings broader and more rounded in appearance than in the remaining subspecies.

P. f. canopus (Westwood), stat. rev. NW Australia and Northern Territory. Regarded as a distinct species since Rothschild (1895).

P. f. babberensis (Fruhstorfer), stat. rev. (= *tenimberensis* Rothschild, a homonym). Tanimbar and Babar Is (E of Timor). This and the following 10

subspecies have previously been placed as subspecies of *P. canopus*. This subspecies resembles *P. f. xenophilus*, having the hindwing band broader than the normal *canopus*-type, approaching that of the *fuscus*-type.

P. f. croton (Fruhstorfer), stat. rev. Damar I. (NE of Timor). This subspecies varies considerably, with forms approaching both the previous and next subspecies in pattern.

P. f. kallon (Fruhstorfer), stat. rev. Romang I. (N of Timor). The status of this population is uncertain. Usually placed as a synonym of *P. f. canopus*, it may be more closely related to *P. f. hypsiclides*. This and the next 3 subspecies are closely allied and variable in pattern.

P. f. hypsiclides (Rothschild), stat. rev. Wetar I. (N of Timor). The hindwing tails may be present or absent. Forms occur with the broader tails and more elongate hindwings typical of *P. f. fuscus*, suggesting that this population may have resulted from a dual invasion from the Sulawesi/Moluccan and Lesser Sunda lineages.

P. f. canopus (Rothschild), stat. rev. Moa and Leti Is (E of Timor). The hindwing tails may be present or absent and the bands yellow or white.

P. f. vollenhovii (C. & R. Felder), stat. rev. Timor. The hindwing tails may be rudimentary or absent and the bands yellow or white. The white form apparently mimics *Euploea* sp. (Tsukada & Nishiyama 1982).

P. f. alorensis (Rothschild), stat. rev. Alor I. (N of Timor). This and the next 4 subspecies are tailless and have greatly reduced pale markings. Some of the forms may be mimics of *Euploea* spp. (Tsukada & Nishiyama 1982).

P. f. modestia (Tsukada & Nishiyama), stat. rev. Flores I.

P. f. sumbanus (Rothschild), stat. rev. Sumba I.

P. f. umbrosus (Rothschild), stat. rev. Sumbawa and (provisionally) Lombok.

P. f. buisi (Kalis), stat. rev. Bali. Records from Lombok may belong to this subspecies.

Group C: New Guinea - Pacific subspecies

P. f. beccarii (Oberthür). Northern Irian Jaya and NW Papua New Guinea.

P. f. rotalita (Swinhoe). Aru Is. The original description from the Kai Is is generally accepted as a locality error.

P. f. indicatus (Butler) (= *oitylus* Fruhstorfer, syn. nov.; = *pyrgoteles* Fruhstorfer, syn. nov.). Southern Papua New Guinea (including Louisiades, D'Entrecasteaux and Woodlark Is) and Torres Strait Is. Intergrading with *P. f. capaneus* at Cape York. The names *oitylus* from Yule I. (Gulf of Papua)

and *pyrgoteles* from St Aignan (Misima) (Fruhstorfer 1916) appear to represent no more than individual forms and not valid subspecies.

P. f. capaneus (Westwood). Eastern Australia (Cape York to northern NSW).

P. f. lamponius (Fruhstorfer). New Britain.

P. f. cilix (Godman & Salvin). New Ireland and New Hanover.

P. f. hasterti (Ribbe). Bougainville and Solomon Is except Ugi and San Cristobal. *Papilio ponceleti* Le Moulton appears to be a hybrid between this subspecies and *P. woodfordi* (Godman & Salvin).

P. f. xenophilus (Mathew). Ugi and San Cristobal, southern Solomon Is. In this and the following 3 subspecies the pattern approaches that of the *canopus*-type.

P. f. nomus (Gabriel). Torres I. (N of Vanuatu). This subspecies appears to be intermediate between *P. f. xenophilus* and *P. f. hypsicles*.

P. f. hypsicles (Hewitson), stat. rev. Northern and Central Vanuatu (Esperito Santo to Efate). Previously regarded as a distinct species or subspecies of *P. canopus*.

P. f. burgessi (Samson), stat. rev. Southern Vanuatu (Erromango southwards). Previously placed as a subspecies of *P. canopus* or *P. hypsicles*. *Princeps prexaspes* (C. & R. Felder), stat. rev.

This species occurs from Hainan and Thailand to Burma and Malaysia. Six subspecies are recognized. As noted previously (Hancock 1985), *P. pitmani leptosephus* (Fruhstorfer) appears to be a synonym of *P. hipponous*, the original locality of Assam being undoubtedly erroneous.

P. p. prexaspes (C. & R. Felder), stat. rev. Peninsular Malaysia. Placed as a subspecies of *P. fuscus* since Rothschild (1895).

P. p. andamanicus (Rothschild), stat. rev. Andaman Is. Previously placed as a subspecies of *P. fuscus*.

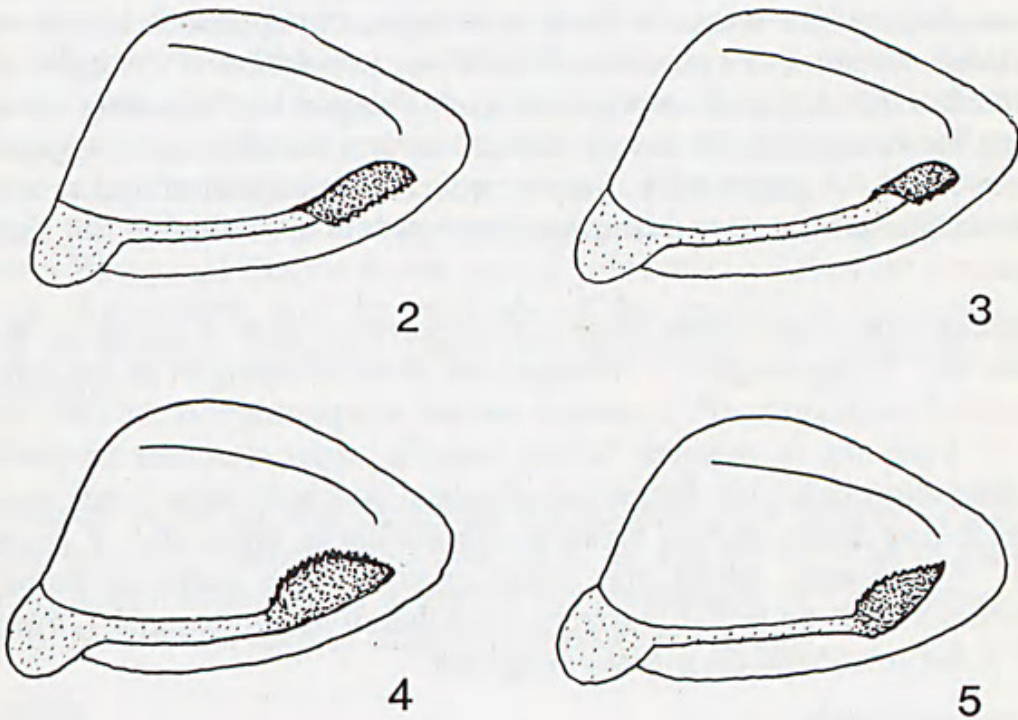
P. p. dayacus (Rothschild), stat. rev. Borneo (Sarawak, Sabah). Previously placed as a subspecies of *P. fuscus*.

P. p. duboisi (Vitalis de Salvaza), stat. rev. (Fig. 1). Vietnam. Previously placed as a subspecies of *P. hipponous* or *P. pitmani*, this subspecies has not hitherto been illustrated.

P. p. bowringi (Prout), stat. rev. Hainan I. (S. China). Previously placed as a subspecies of *P. fuscus* or *P. hipponous*. As in *P. p. duboisi*, this subspecies has the broad hindwing band continued narrowly to the anal margin of the wing, with the last two spots suffused with grey scales. The band is narrower in this subspecies than in *P. p. duboisi*.



Fig. 1. *Princeps prexaspes duboisi*, male ex Trang Bom Forest, S. Vietnam; upper and undersides.



Figs 2-5. Valve and harpe of *Princeps* species: (2) *P. fuscus capaneus*; (3) *P. fuscus hypsicles*; (4) *P. prexaspes prexaspes*; (5) *P. hipponous*.

P. p. pitmani (Elwes & de Niceville), stat. rev. Southern Burma and Thailand. Previously regarded as a distinct species or subspecies of *P. hipponous*.

Princeps hipponous (C. & R. Felder)

This species is restricted to the Philippines and Banggi I. (Sabah). No subspecies are recognized here (see discussion).

Discussion

Princeps fuscus

Based on the characteristic reflexed shape of the male harpe and the orientation of the hindwing band, *P. hipponous lunifer* is transferred to *P. fuscus*. *P. canopus* and its subspecies are also included; they have identical male genitalia and larvae, and hybridization experiments between typical *P. canopus* from Northern Territory and *P. fuscus capaneus* from Queensland (R. Straatman, personal communication) resulted in fertile offspring to at least F3 generation. Association of *P. canopus* with *P. fuscus* has prompted a reassessment of the status of *P. hypsicles* and it is now considered that the genitalic differences are not significant enough to warrant specific separation from *P. fuscus*. Pattern variation within other populations of *P. fuscus* provides further evidence of conspecificity in these cases.

The *canopus*-like and *hypsicles*-like subspecies are linked to *P. fuscus* via intermediate populations such as *P. f. babberensis* and *P. f. xenophilus/P. f. nomus*. They are not directly related to each other, as is evidenced by the different shape of the wings in the two lineages, but appear to have evolved their reduced patterns in parallel. The Wetar population (*P. f. hypsiclides*) has a form very similar in appearance to *P. f. hypsicles*, including the more elongate hindwing, but the former population is a variable one, suggesting a separate origin. A gradation in pattern reduction occurs from east to west in the Lesser Sunda lineage and from north to south in the Solomon Is - Vanuatu lineage.

The apical plate of the harpe (Figs 2-3) is narrower in *P. f. hypsicles* than is the case in *P. f. capaneus/P. f. canopus*, but more information on the status of the Torres I. population (*P. f. nomus*) and the morphology of the early stages of *P. f. hypsicles* is required before specific separation can be justified. Available information (R. Straatman, personal communication) indicates that the larvae and pupae of *P. f. hypsicles* are similar to those of *P. f. capaneus* and *P. f. canopus*, whilst the apical plate of the harpe is somewhat intermediate in shape in *P. f. hasterti*. I am therefore removing *P. f. hypsicles* and *P. f. burgessi* from the *albinus* subgroup.

Princeps prexaspes

In the case of *P. prexaspes*, southern populations have generally been included within *P. fuscus* but the male genitalia (Fig. 4) do not have the reflexed harpe characteristic of that species and the apical portion is more

evenly rounded; they are very close to those of *P. hipponous* (Fig. 5) in appearance. *P. pitmani* is also included within this species; it is linked to typical *P. prexaspes* by subspecies *P. p. duboisi* and *P. p. bowringi* in much the same manner as the *canopus*-like subspecies of *P. fuscus* are linked to more typical subspecies by *P. f. babberensis* and *P. f. xenophilus*. The relationship between *P. p. bowringi* and typical *P. prexaspes* was also noted by Prout (1919). All subspecies of *P. prexaspes* appear to have the white submarginal spots on the underside of the forewing confined to space 1b. Variation within *P. p. pitmani* was noted by Haugum and Collins (1987).

Princeps hipponous

As in *P. prexaspes*, *P. hipponous* lacks the reflexed harpe seen in *P. fuscus* (Fig. 5). It differs from both these species in the orientation of the pale band on the hindwing. In both *P. fuscus* and *P. prexaspes* this band is relatively curved, the outer edges of the upper three spots all being about the same distance from the wing margin. In *P. hipponous* this band is straighter, with the outer edges of the upper three spots lying progressively further from the wing margin. From *P. prexaspes* it also differs in the better developed submarginal white spots on the underside of the forewing, which in *P. hipponous* extend at least into spaces 1a and 2.

There is still considerable controversy concerning the recognition and distribution of subspecies in *P. hipponous*. Jumalon (1969) recorded the species from all the major islands except Samar and Leyte, whilst Treadaway (1989) recorded typical *P. hipponous* from Luzon and Marinduque and subspecies *bazilanus* (Fruhstorfer) from islands southwards of Palawan and Panay. Tsukada and Nishiyama (1982) also recognized these two subspecies (based on material from Marinduque and Palawan) but noted the difficulty in separating them, as similar variation occurs in both populations. Variation was also noted by Haugum and Collins (1987). D'Abrera (1982) additionally recorded the species from Samar and Leyte, and included this material and that from Panay and Negros in the typical subspecies. Given the absence of clear-cut distinctions, and the presence of the species in the intervening locality of Mindoro (Jumalon 1969), the recognition of subspecies is not accepted here.

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