

Review of *Delias hypomelas* group on New Guinea (Lepidoptera: Pieridae)

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Abstract: The relationship of *Delias hypomelas* Rothschild & Jordan, 1907 and *Delias argentata* Roepke, 1955 is reviewed, resulting in synonymization all *D. hypomelas* subspecies with the nominate species and reclassification of *D. argentata* and *D. destrigata* as forms of *D. hypomelas*. The distribution of all forms of *D. hypomelas*, on the mainland of New Guinea (Papua and Papua New Guinea together) is also summarised.

Rangkuman: Hubungan *Delias hypomelas* Rothschild & Jordan, 1907 dan *Delias argentata* Roepke, 1955, direvisi, dengan hasil bahwa semua subspecies *D. hypomelas* dinyatakan sinonim dengan spesies itu dan bahwa *D. argentata* dan *D. destrigata* diberikan klasifikasi baru menjadi form dari *D. hypomelas*. Sekaligus peta distribusi semua bentuk *D. hypomelas* di tanah besar New Guinea (Papua dan Papua New Guinea bersama) dirangkum.

Keywords: review, new synonyms, distribution, *D. hypomelas*, *D. argentata*, *D. destrigata*.

Introduction

Delias hypomelas has a wide distribution in the central mountain ranges of New Guinea, from the Kobowre Mts in the west to the Owen Stanley range in the east. It is also present in the geographically isolated Foja Mts and Rawlinson Mts. From the Ilaga area to the Baliem Valley *D. argentata* is a common species. However, where *hypomelas* is common, *argentata* is rare or absent and where *argentata* is common *hypomelas* is very rare or absent. This distribution and pattern of variation is very similar to *D. nais* and *D. zebra* (cfr. van Mastrigt & Davenport, 2012). Based on a series of transitional forms, Funahashi (2010) concluded that *D. zebra* should not be regarded as a separate taxon, but rather is an endemic phenotype of *D. nais*. Additionally, various authors have compared *hypomelas/argentata* with *heroni* and its white form *albo-oculatus*. This publication examines whether *argentata* should be regarded as a form of *hypomelas*, instead of a separate species.

Depositories

The abbreviations and symbols given below have been used throughout the text.

AT	- Allotype (= PT of other sex than holotype, normally ♀)
AY	- Private collection Akiro Yagishita, Japan
BT	- Private Collection Bernard Turlin, Andrésey, France
ChP	- Chimbu Province, PNG
CI	- Conservation International
EHP	- East Highland Province, PNG
EP	- Enga Province, PNG
GP	- Gulf Province, PNG
HT	- Holotype
KSP	- Koleksi Serangga Papua (Collection of Papuan Insects), Jayapura
LPI	- Lembaga Ilmu Pengetahuan Indonesia (Indonesian Institute of Sciences, Cibinong, Indonesia)
MoP	- Morobe Province, PNG
MZB	- Museum Zoologicum Bogoriense, Cibinong, Indonesia
NCB-RMNH	- Collectie Rijksmuseum van Natuurlijke Historie, Leiden, in Nederlands Centrum voor Biodiversiteit, Leiden, The Netherlands
NCB-ZMAN	- Collectie Zoologisch Museum Amsterdam, in Nederlands Centrum voor Biodiversiteit, Leiden, The Netherlands
NP	- Northern Province, PNG
PNG	- Papua New Guinea
PT	- Paratype
RL	- Private Collection Rob Lachlan, Australia
SS	- Private Collection Satoshi Sakuma, Japan
SHP	- Southern Highland Province, PNG
WHP	- Western Highland Province, PNG
WSP	- West Sepik Province, PNG

Taxonomy

*The identity of *Delias hypomelas* and its relatives*

Rothschild & Jordan (1907) initially described *hypomelas* as a subspecies of *Delias itamputi* based on a series of specimens, including two females from the Owen Stanley Mnts (Mambare R., Biagi). The location of 'Biagi', also the TL of *D. nais aegle*, is uncertain but is thought to be near the present day Kokoda Trail, north of Port Moresby.

Fruhstorfer (1910) raised the taxon to specific level and pictured *D. hypomelas* [erroneously named *hypolemas*] from the Aroa River also in the Owen Stanley Mts. At both locations *D. itamputi* is also found.

Jordan (1912) described *D. hypomelas conversa* based on a long series of both sexes from Mt Goliath at the south side of the central Mountain range on about 140° EL.

Joicey & Talbot (1922) described *D. hypomelas rubrostriata* from the Kobowre Mts (former Weyland Mts) and Talbot (1928b) added *D. hypomelas rawlinsoni* from the Rawlinson Mts on the Huon Peninsula in NE PNG.

Roepke (1955) added two further subspecies from the Baliem Valley; *D. hypomelas fulgida* (of which he comments 'is doubtful, as it cannot yet be regarded as solidly founded'), based on several males from Sigi Camp, 1,500 m, and a single male from Lower Mist Camp, 1,700 m, and *D. hypomelas lieftincki*, based on a single male, from Ibele Camp, 2,250 m. Roepke considered *D. hypomelas rawlinsoni* to be a synonym of *D. hypomelas hypomelas* and erroneously placed *heroni* Kenrick, 1909 as subspecies of *hypomelas*, (while commenting in the next sentence "It seems doubtful to me whether *heroni* Kenr. really belongs to *hypomelas*"). In the same publication, Roepke described *D. argentata*, based on a series of males and one female from Ibele Camp, 2,500 m, and *D. argentata* f. *sanguinea* based on a large series of males and four females. It is not easy to understand why Roepke decided to describe the relative small series with yellow subapical spots as *D. argentata* and the much more common ones with red subapical spots as f. *sanguinea*.

D'Abrera (1971, 1977, 1990) lists *D. hypomelas hypomelas*, *D. hypomelas robustriata* and *D. hypomelas rawlinsoni*, leaving out *D. hypomelas conversa*, and includes *D. argentata*, without further comment.

Yagishita (1993) described *D. argentata clutus*, based on two males and four females from Ilaga and one male from Ilu, all Central Mts of Papua, Indonesia. These specimens include yellow and red spotted forms which are not distinguished as separate forms as Roepke, 1955 did, however the HT male has red subapical spots.

Van Mastrigt (1996) described *D. destrigata*, based on two males from Pass Valley, 1,850 m, one from Ameagi River and the other from Bion River, localities where *argentata* is absent.

Sakuma (1999) described *D. takashii*, based on a single male from the Arfak Mts, which on underside of hindwing "resembles to *Delias argentata*".

Parsons (1999) treated *rawlinsoni* as a synonym of *D. hypomelas hypomelas* and listed localities in PNG: the type locality Owen Stanley Mts (NP), Komako (GP), Rawlinson Mts, Eddie Creek near Mt Kaindi, Cromwell Mts (MoP), Beha, Lufa (EHP), Kerowagi (ChP), Nondugl and Koinambe (WHP), Porgera (EP) and Feramin (WSP).

Lachlan (2000) recorded one specimen of *D. hypomelas hypomelas* (from Mount Akrik, Ok Tedi region, 1,625 m, 5° 10' S, 141° 09' E), matching with specimens from Wau and Kerowagi (in RL). From the same locality and from two nearby localities (Mt Binnie, 2,200 m, 5° 13' S, 141° 08' E and creek near alpine grass meadow, 2,300 m, 5° 10' S, 141° 20' E) he also collected *D. hypomelas conversa* in quite large numbers, a new record for PNG. The smaller black borders on upperside both wings and the reduced small yellow subapical spots on upperside on forewing distinguish these from *hypomelas hypomelas*.

Gotts & Pangemanan (2001, 2010) identified two different forms of *D. hypomelas rubrostriata* in the Tembagapura area, distinguished by the colour and pattern on underside of the hindwing: "one is very black with bright red marks and the other a duller brown with the red streaks barely discernible". The varieties of the pattern found in such areas raises the question of whether these constitute different subspecies.

Van Mastrigt (2006) described *D. ormoensis* from the Foja Mts, based on four males. From the second CI-LIPI expedition to the Foja Mts, van Mastrigt (2009) described *D. papuana*, both closely related to *D. hypomelas*.

Van Mastrigt (2010) presented an inventory of the *Delias* species in the Baliem Valley that included consideration of the relationship between *hypomelas* and *argentata*, and the hypothesis that the latter is only a form of the first one.

Van Mastrigt (2011) provided an inventory of the *Delias* species in Pass Valley, a total of 39 species, with *hypomelas* the most common (10.12% of all *Delias* captured). *D. argentata* is present at Suwagi (7.55%) and Watlangku (0.39%), but is absent at all localities in the environment of Abenaho, where *hypomelas* is very common.

The members of the *hypomelas* complex were all placed by Talbot within the **Group V geraldina** (including a. o. *D. heroni* Kenrick, 1909 and *D. itamputi* Ribbe, 1900).

Reissingner (1991, unpublished) defined a so called **itamputi** group, including *D. thompsoni* Talbot, 1916, *D. itamputi* Ribbe, 1900, *D. sphenodiscus* Roepke, 1955, *D. hypomelas* Joicey & Talbot, 1922, *D. argentata* Roepke, 1955 and *D. heroni* Kenrick,

1909. This **itamputi** group, together with all members of the **bornemanni** group, the **albertisi** group and the **clathrata** group was intended to become a new genus. The position of *D. nigropunctata* Joicey & Talbot, 1915 was uncertain to Reissinger who considered placing it inside the **itamputi** group or maintaining it as a member of **cuningputi** group.

This article focuses on the *hypomelas* complex, including *D. hypomelas*, *D. argentata*, *D. destrigata*, *D. ormoensis* and *D. papuana* and the closely related species *D. itamputi* and *D. heroni* and to a lesser degree on *D. sphenodiscus*.

Classification according to the literature up until 2012

Based on the above history five species are recognized with seven subspecies and a single variety:

1. *Delias hypomelas* Rothschild & Jordan, 1907
 - 1.1. *Delias hypomelas hypomelas* Rothschild & Jordan, 1907
Synonym: *D. hypomelas rawlinsoni* (synonymized by Roepke, 1955)
 - 1.2. *Delias hypomelas conversa* Jordan [1912]
 - 1.3. *Delias hypomelas rubrostriata* Joicey & Talbot, 1922
 - 1.4. *Delias hypomelas fulgida* Roepke, 1955 (doubtful!)
 - 1.5. *Delias hypomelas lieftincki* Roepke, 1955
2. *Delias argentata* Roepke, 1955
 - 2.1. *Delias argentata argentata* Roepke, 1955
 - 2.1.1. *Delias argentata argentata* f. *sanguinea* Roepke, 1955
 - 2.2. *Delias argentata clutus* Yagishita, 1993
3. *Delias destrigata* van Mastrigt, 1996
4. *Delias ormoensis* van Mastrigt, 2006
5. *Delias papuana* van Mastrigt, 2009
-
6. *D. itamputi* Ribbe, 1900
7. *Delias heroni* Kenrick, 1909
 - 7.1. *Delias heroni* f. *albo-oculatus* Joicey & Noakes, 1915
8. *Delias sphenodiscus* Roepke, 1955.

***D. hypomelas* and its subspecies**

Based on a large number of *D. hypomelas* ssp. from Papua in KSP (293 ♂♂, 29 ♀♀), material in BMNH, NCB-RMNH, NCB-ZMAN and MZB, and study of literature, it becomes evident that the characteristics used for descriptions of subspecies are not geographically determined. Four characteristics that have previously been

used to distinguish subspecies of *hypomelas* (size of black border, size and colour of subapical spots on forewing, ground colour and red stripes on hindwing underside) are found to be variable at many localities in Papua, except that specimens with red stripes on the underside of hindwing have not been recorded from further east than 140° EL, while specimens without red striped are found as far west as 139° EL. Individual variation in *hypomelas sensu stricto* is quite extreme in the central area of Papua, from the Ilaga area in the west to the Baliem and Pass Valley in the east where *argentata* also occurs. Besides the features mentioned above, the ground colour of the underside of forewing is also variable in these populations. The variety of phenotypes found at single locations demonstrate that the previous subspecific classification, based on minor differences in morphology, can not be maintained. The taxa *conversa*, *fulgida*, *lieftincki* and *rubrostriata* are therefore considered to be synonyms of *D. hypomelas* Rothschild & Jordan, 1907. The taxon *rubrostriata* will be used as form-name for the specimens with the red striped on the hindwing underside.

D. argentata*, a form of *D. hypomelas

The material in KSP consists of 322 *D. hypomelas* (293 ♂♂, 29 ♀♀) from Kobowre Mts, Paniai Lakes district, Tembagapura, Homeyo, Ilu, Kanggime, Tiom, Habbema, Pass Valley, Sumbale, Silakma, Ninya, Nipsan, Korupun, Langda, Sumtamon, Borme, Okbibab and Kerowagi and Wau in PNG (7 ♂♂); *D. argentata* (166 ♂♂, 17 ♀♀) from Ilaga, Ilu, Mulia, Sinak, Tiom, Kelila, Mapinduma, Habbema, Baliem Valley and Pass Valley; *D. destrigata* 1 ♂ (HT ♂ is in loan in NCB-ZMAN), *D. ormoensis* 5 ♂♂ (HT ♂ is donated to MZB), *D. papuana* HT ♂.

Other material was examined in: MZB, NCB-RMNH, NCB-ZMAN and BMNH.

The introduction mentioned an obvious parallel in distribution between *D. hypomelas* and *D. argentata* on one side and *D. nais* and *D. zebra* on the other. Further reasons to support the conclusion that *argentata* is a form of *hypomelas* are as follows.

- The parallel in distribution with *nais* and *zebra* is evident. From the Ilaga area to Nipsan to *nais* and *zebra*, *hypomelas* and *argentata* are sympatric, however they occur never together in large numbers. Where *nais* is common *zebra* is absent or very scarce; where *zebra* is common *nais* is absent or very rare. *D. argentata* is very common in the Ilaga-Mulia area where *hypomelas* is unknown. In the Baliem Valley *argentata* is the common species, while *hypomelas* is very rare. Moving to Pass Valley *argentata* becomes rarer and rarer while *hypomelas* becomes a common species, often the most common (cfr. van Mastrigt, 2011).

- The described subspecies are often weakly distinguished, and contain significant variation between sympatric specimens. Roepke (1955) described two subspecies of *hypomelas* from the environment of the Baliem Valley; Lachlan (2000) mentioned the occurrence of *hypomelas hypomelas* and *hypomelas conversa* at localities within 2 km of each other in the vicinity of Mt. Akrik in PNG. Gotts & Pangemanan (2001) recognize two forms of *hypomelas rubustriata* at Tembagapura in the Snow Mts.
- The doubtful species *D. destrigata* van Mastrigt, 1996 is closer to *argentata* than to *hypomelas*, but would not have been described as a separate species if the status of *argentata* as a white form of *hypomelas* had been known at the time. At the two type localities of *destrigata*, *argentata* is very rare and even absent.

Besides the similarity in distribution between *nais/zebra* and *hypomelas/argentata*, there are a number of morphological reasons to support *argentata* as a form of *hypomelas*.

- The uppersides of *hypomelas* and *argentata* are identical.
- In both *hypomelas* and *argentata* are found specimens with red subapical spots in upper- and underside of forewing and red terminal spots on underside of hindwing, other specimens with yellow apical spots in upper- and underside of forewing and yellow terminal spots on underside of hindwing, and also intermediates with orange spots.
- Within *argentata* a great variety of individual variations are found in the shape and size of the black spots on underside of hindwing .
- The underside of the forewing of the *hypomelas* female is largely black with a white streak near the inner margin in ssp. *hypomelas* , *conversa* and *rubrostriata*. However all females from the Pass Valley and the single known female from Nipsan are white on underside forewing, as in *argentata*. (This female form looks similar to *heroni* but was unknown by Toxopeus and Roepke.)
- A single male of *hypomelas* with white on the underside of forewing and silver grey on the underside of the hindwing is known from Habbema; other *hypomelas* males show variation in the shade of the grey suffusion on the underside of the hindwing .

Relationship between *hypomelas* and *argentata* (Roepke, 1955)

- Roepke, who revised and completed the manuscript of Toxopeus, allied *D. hypomelas fuldiga* with *rubrostriata*. Toxopeus however was convinced of a close relationship between *hypomelas lieftincki* and *argentata* (see Roepke, 1955: p. 199).

A parallel with *D. heroni*

- The relationship between *hypomelas* and *argentata* on one side and *heroni* on the other may be tentative, however the similarity between the patterns on the

underside of hindwing of *hypomelas* (without red stripes) and *heroni* is evident. The white form of *heroni* (f. *albo-oculatus*) has a similarity with *argentata*. Both in *heroni* and in *hypomelas/argentata* varieties are found which can be characterized as intermediate forms. It is therefore curious that *albo-oculatus* has always been regarded as a form of *heroni*, while *argentata* was considered to be a separate species from *hypomelas*.

The genitalia of a male paratype of *D. hypomelas fulgida* (figs 127-128), a male paratype *D. argentata* f. *sanguinea* (figs 129-130) and of a male of *D. heroni* (figs 131-132) have been dissected and examined. No significant differences are seen between the genitalia, including the aedeagus, of *hypomelas* and *argentata*. No dissection of *D. ormoensis* and *D. papuana* has been done as the morphological differences are quite obvious. The genitalia of *heroni* look quite similar though minor differences are visible.

Current taxonomy

Based on these findings, only three species are now recognized, with no subspecies but with four named forms, as follows:

1. *Delias hypomelas* Rothschild & Jordan, 1907
 (= *Delias itamputi hypomelas* Rothschild & Jordan, 1907)
 (= *Delias hypomelas conversa* Jordan, [1912] **syn. nov.**)
 (= *Delias hypomelas rubrostriata* Joicey & Talbot, 1922 **syn. nov.**)
 (= *Delias hypomelas fulgida* Roepke, 1955 **syn. nov.**)
 (= *Delias hypomelas lieftincki* Roepke, 1955 **syn. nov.**)
 - 1.1. *Delias hypomelas* f. *rubrostriata* **stat. nov.**
 (= *Delias hypomelas rubrostriata* Joicey & Talbot, 1922)
 - 1.2. *Delias hypomelas* f. *argentata* Roepke, 1955 **stat./comb. nov.**
 (= *Delias argentata argentata* Roepke, 1955)
 Including: *Delias argentata argentata* f. *sanguinea* Roepke, 1955
 - 1.3. *Delias hypomelas* f. *clutus* Yagishita, 1993 **stat./comb. nov.**
 (= *Delias argentata clutus* Yagishita, 1993, with red subapical spots)
 - 1.4. *Delias hypomelas* f. *destrigata* van Mastrigt, 1995 **stat./comb. nov.**
 (= *Delias destrigata* van Mastrigt, 1995)
2. *Delias ormoensis* van Mastrigt, 2006
3. *Delias papuana* van Mastrigt, 2009.

Relatives of *hypomelas* and *argentata*

The two species from the Foja Mts show some similarity with *D. hypomelas*. However the upperside of *D. ormoensis* (figs 102-103) shows broad black borders, not found

in *hypomelas*. The underside of forewing differs by an obvious row of four yellow subapical spots and on the underside of the hindwing a row of white spots along the outer border is lacking. The upperside of *D. papuana* (fig. 104) has more reduced black borders than *hypomelas*. The underside of the forewing is white, with two small red subapical lines on black border. The underside of the hindwing is deep black (not greyish black or brownish) with a row of terminal spots of various size and shape. These significant differences prevent the author from describing either of these species as subspecies of *hypomelas*.

The original description of *D. hypomelas* as *D. itamputi hypomelas* Rothschild & Jordan, 1907 indicates the close relationship between these species. Talbot (1929) stated that *D. itamputi* (figs 105-111) is more allied to *hypomelas* than to *heroni* (figs 112-114), however, the large white areas on underside of both wings show a possible relationship with the *heroni* form *albo-oculatus* (figs 115-117). As Talbot also remarks, *itamputi* is the only species in this group (Group V or geraldina group) where the female does not resemble the male.

D. sphenodiscus Roepke, 1955 (figs 118-120) was originally described from material of the Archbold III Expedition, based on sixteen males and three females from the Araucaria Camp, 800 m, close to the present-day village of Kobakma. Since 1990 this species has been found at Landikma and Sumbole (NE from the Baliem Valley) and also from Borme in the northern part of the Star Mts, all on an altitude of 800-1000 m. This species is classified close to *D. itamputi* from PNG, although both upperside and underside do not show much similarity.

Related hybrids

Two more species deserve discussion, *D. hikarui* Yagishita, 1993 (figs 121-122) and *D. takashii* Sukuma, 1999 (figs 123-124). Both species show some similarity with *argentata* because of the red markings on the underside of the hindwing. The upperside of *hikarui* and the underside, except for the red markings, obviously resemble *D. rileyi*. Considering that only one specimen is known (a female) and that over the years there has been intensive collecting of the Ilu area where *D. rileyi* and *D. argentata* are both quite common, the author proposes to treat *hikarui* is a hybrid of *D. rileyi* and *D. argentata*.

The upperside of *takashii* has a clear resemblance to *D. fascelis*, the underside of the forewing and the shape of the terminal spots on the underside of the hindwing also show some affinity with *argentata*. It is reported to have been collected in the Arfak Mts, which makes it impossible to regard it and a hybrid between *fascelis* and *argentata*. However, the specimen was supplied by a dealer in Nabire, who –in the experience of the author- has not been very precise in separating specimens according to locality. For these reasons the author considers

that *takashii* is a hybrid, collected in the central mountain range of Papua (Ilu-Mulia-Ilaga area).

A hybrid specimen of *D. fascelis* and *D. hypomelas* from the Star Mts is pictured (figs 125-126). The upperside resembles *fascelis* while the underside resembles *hypomelas* with a *fascelis*-like row of yellow terminal spots.

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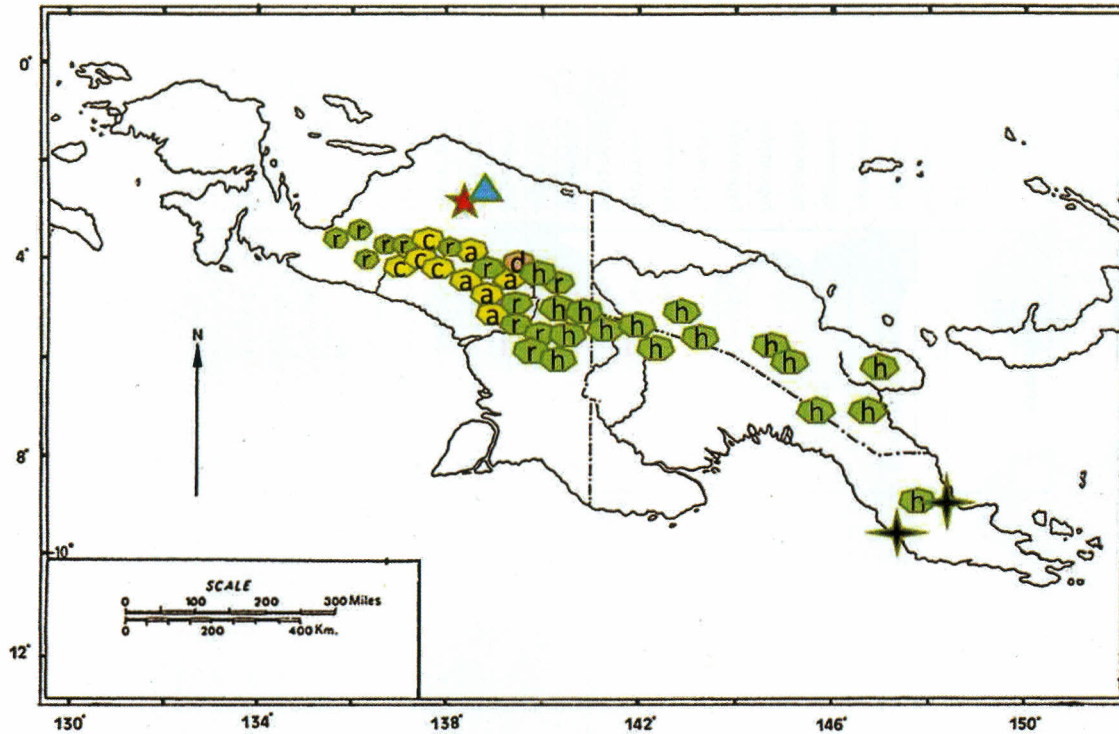
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Table 1. Localities of *D. hypomelas* and close related species

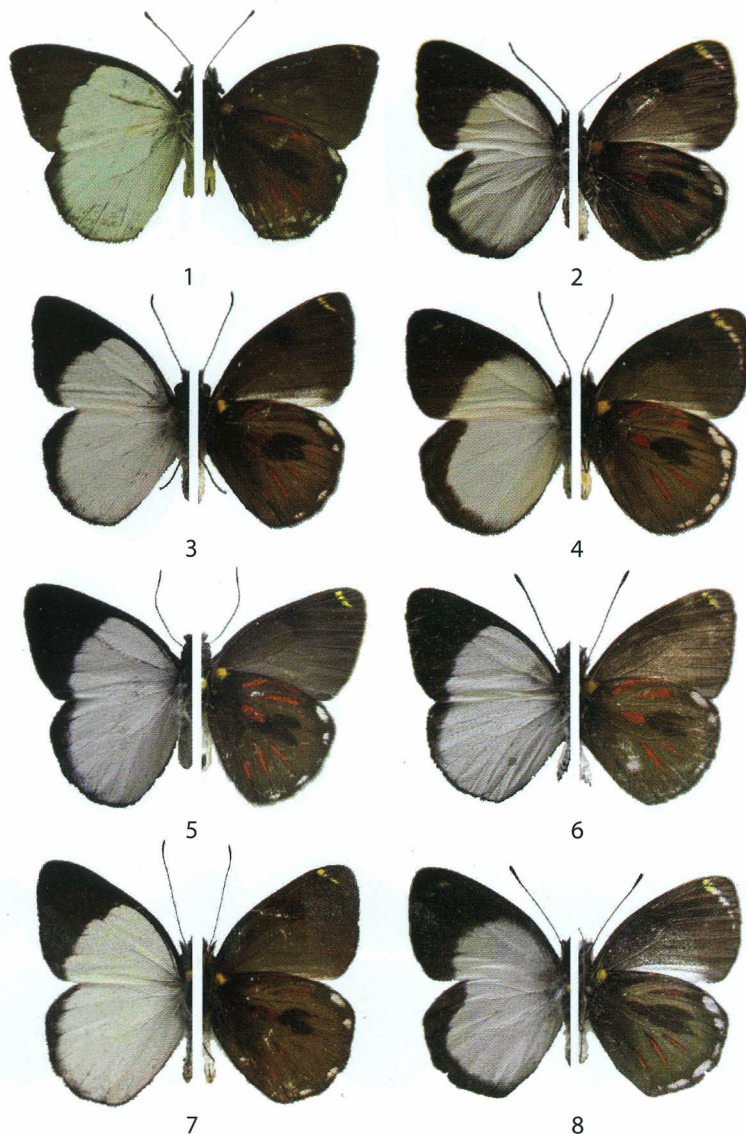
	location	former taxa	proposed taxa
1	Foja Mts	<i>ormoensis</i> TL	<i>ormoensis</i>
		<i>papuana</i> TL	<i>papuana</i>
2	Tembagapura	<i>hypomelas rubrostriata</i>	<i>hypomelas</i> f. <i>rubrostriata</i>
3	Weyland Mts	<i>hypomelas rubrostriata</i> TL	<i>hypomelas</i> f. <i>rubrostriata</i>
4	Paniai Lakes Distrct	<i>hypomelas rubrostriata</i>	<i>hypomelas</i> f. <i>rubrostriata</i>
5	Homeyo		<i>hypomelas</i> f. <i>rubrostriata</i>
6	Mulia		<i>hypomelas</i> f. <i>clutus</i>
7	Ilaga		<i>hypomelas</i> f. <i>clutus</i>
8	Sinak		<i>hypomelas</i> f. <i>clutus</i>
9	Ilul		<i>hypomelas</i> f. <i>rubrostriata</i>
	Ilul		<i>hypomelas</i> f. <i>clutus</i>
	Ilul		<i>hypomelas</i> f. <i>argentata</i>
10	Kanggime		<i>hypomelas</i> f. <i>argentata</i>
11	Tiom		<i>hypomelas</i> f. <i>rubrostriata</i>
			<i>hypomelas</i> f. <i>argentata</i>
12	Habbema		<i>hypomelas</i> f. <i>rubrostriata</i>
13	Ibele Camp Baliem Valley	<i>hypomelas liefticki</i> TL	<i>hypomelas</i> f. <i>rubrostriata</i>
	Ibele Camp Baliem Valley	<i>argentata</i> TL	<i>hypomelas</i> f. <i>argentata</i>
	Ibele Camp Baliem Valley	<i>argentata</i> f. <i>sanguinea</i> TL	<i>hypomelas</i> f. <i>sanguinea</i>
14	Lower Mist Camp	<i>hypomelas fulgida</i> TL	<i>hypomelas</i> intermediate
15	Sigi Camp	<i>hypomelas fulgida</i> TL	<i>hypomelas</i> intermediate
16	Pass Valley		<i>hypomelas</i> f. <i>rubrostriata</i>
	Pass Valley		<i>hypomelas</i>
	Pass Valley		<i>hypomelas</i> f. <i>argentata</i>
	Pass Valley		<i>hypomelas</i> f. <i>sanguinea</i>
	Pass Valley	<i>destrigata</i> TL	<i>hypomelas</i> f. <i>destrigata</i>
17	Sumbole		<i>hypomelas</i>
18	Nipsan		<i>hypomelas</i>

	location	former taxa	proposed taxa
19	Silakma/Ninya		<i>hypomelas f. rubrostriata</i>
20	Korupun		<i>hypomelas f. rubrostriata</i>
21	Langda		<i>hypomelas</i>
22	Mt Goliath	<i>hypomelas conversa</i> TL	<i>hypomelas</i>
23	Sumtamon		<i>hypomelas</i>
24	Borme		<i>hypomelas</i>
25	Abmisibil		<i>hypomelas</i>
26	Batimban		<i>hypomelas</i>
27	Mt Binnie loc. 1	<i>hypomelas hypomelas</i>	<i>hypomelas</i>
	Mt Binnie nr alpine meadows	<i>hypomelas conversa</i>	<i>hypomelas</i>
28	Mt Akrik	<i>hypomelas hypomelas</i>	<i>hypomelas</i>
29	Feramin (WSH)	<i>hypomelas hypomelas</i>	<i>hypomelas</i>
30	Mt Tari (SHP)	<i>hypomelas hypomelas</i>	<i>hypomelas</i>
31	Porgera (EP)	<i>hypomelas hypomelas</i>	<i>hypomelas</i>
32	Koinambe, W. Bismark Mts (WHP)	<i>hypomelas hypomelas</i>	<i>hypomelas</i>
33	Nondugl (WHP)	<i>hypomelas hypomelas</i>	<i>hypomelas</i>
34	Kerowagi, Mt Wilhelm (ChP)	<i>hypomelas hypomelas</i>	<i>hypomelas</i>
35	Lufa (EHP)	<i>hypomelas hypomelas</i>	<i>hypomelas</i>
36	Okapa (EHP)	<i>hypomelas hypomelas</i>	<i>hypomelas</i>
37	Beha (EHP)	<i>hypomelas hypomelas</i>	<i>hypomelas</i>
38	Eddie Cr. Mt Kaindi, Herzog Mts (MoP)	<i>hypomelas hypomelas</i>	<i>hypomelas</i>
39	Garaina (MoP)	<i>hypomelas hypomelas</i>	<i>hypomelas</i>
40	Komako (GP)	<i>hypomelas hypomelas</i>	<i>hypomelas</i>
41	Cromwell Mts (MoP)	<i>hypomelas rawlinsoni</i>	<i>hypomelas</i>
42	Rawlinson Mts Huon Pen.	<i>hypomelas rawlinsoni</i> TL	<i>hypomelas</i>
43	Aroa R. Owen Stanley Mts	<i>itamputi</i> TL	<i>itamputi</i>
44	Biagi, Mambare R.	<i>itamputi</i>	<i>itamputi</i>
	Biagi, Mambare R.	<i>hypomelas hypomelas</i> TL	<i>hypomelas</i>

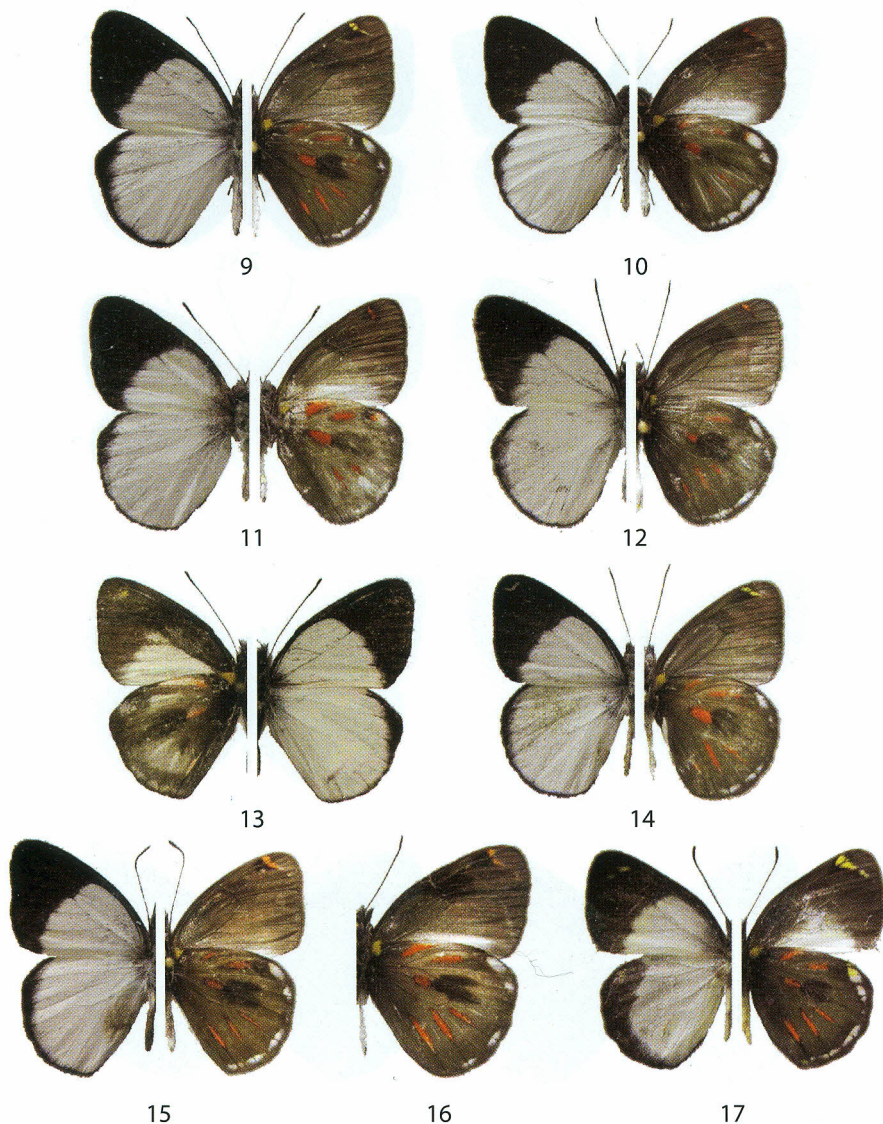


Map 1. Distribution of *D. hypomelas* and close related species in New Guinea

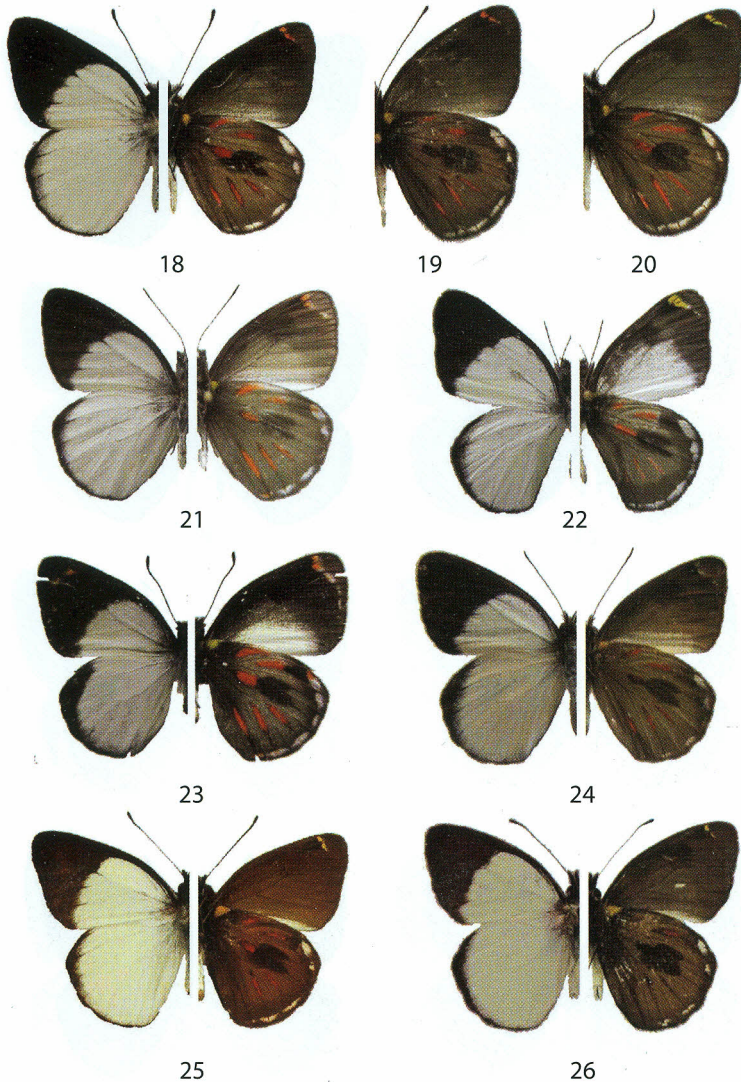
● *D. hypomelas* f. *rubrostriata*; ● *D. hypomelas* f. *clutus*; ● *D. hypomelas* f. *argentata*;
 ● *D. hypomelas* f. *destrigata*; ● *D. hypomelas*; ▲ *D. papuana*; ★ *D. ormoensis*; ★ *D. itamputi*



Figs 1-8. *Delias hypomelas* f. *rubrostriata* upp./und.: 1. ♂ (= *D. hypomelas rubrostriata* PT) from Menoo Valley (NCB-RMNH); 2. ♀ (= *D. hypomelas rubrostriata* PT) from Menoo Valley (BMNH); 3. ♂ from Kobowre Mts (KSP 25826); 4. ♀ from Timeepa (KSP 25829); 5. ♂ from Kamu Valley (KSP 25836); 6. ♂ from Tuguwai (KSP 25843); 7. ♂ from Tembagapura (KSP 25862); 8. ♀ from Tembagapura (KSP 25863).

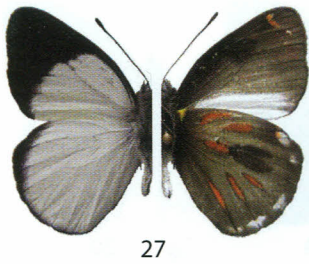


Figs 9-17. *Delias hypomelas* f. *rubrostriata*: 9-13. ♂ upp./und. from Ilu: 9. With yellow subapical tips (KSP 25898); 10. With red subapical tips (KSP 25890); 11. Idem (KSP 25913); 12. Idem (KSP 25911); 13. With poor reddish spots (KSP 26271); 14-17. From Kayuwagi: 14. ♂ upp./und. (KSP 25930); 15. ♂ upp./und. (KSP 25932); 16. ♂ und. (KSP 25934); 17. ♀ upp./und. (KSP 25928).

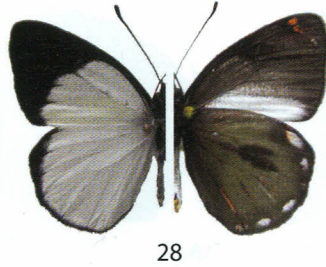


Figs 18-23. *Delias hypomelas* f. *rubustriata* (upp.)/und.: 18. ♂ from R. Wesi, Baliem Valley (KSP 25973); 19. ♂ from R. Habbema, Mt Trikora (KSP 25966); 20. idem (KSP 25950); 21. idem (KSP 25967); 22. from R. Opir, Mt Trikora (KSP 25975); 23. ♀ from Yekmi, Kurima, S. Baliem Valley (BT).

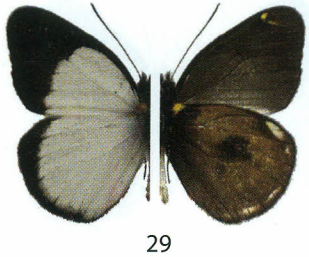
Figs 24-26. *Delias hypomelas* ♂ from Neth. Ind.-American New Guinea Exped. upp./und.: 24. (= *Delias hypomelas lieftincki* HT) from Ibele Camp (NCB-RMNH); 25. (= *Delias hypomelas fulgida* HT) from Sigi Camp (NCB-RMNH); 26. (= *Delias hypomelas fulgida* PT) from Lower Mist Camp (NCB-RMNH).



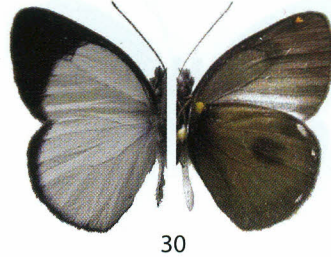
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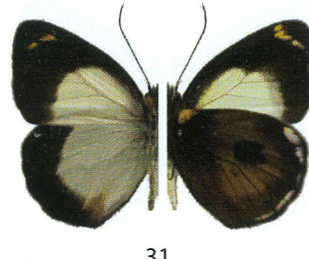
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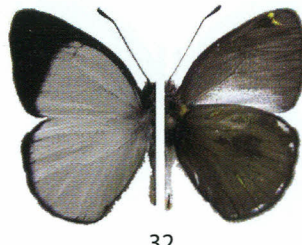
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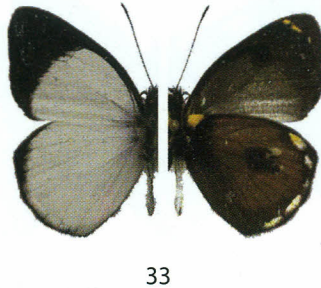
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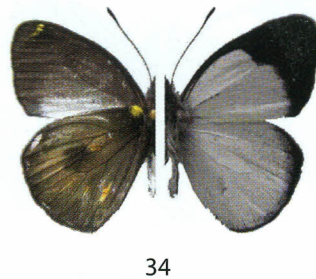
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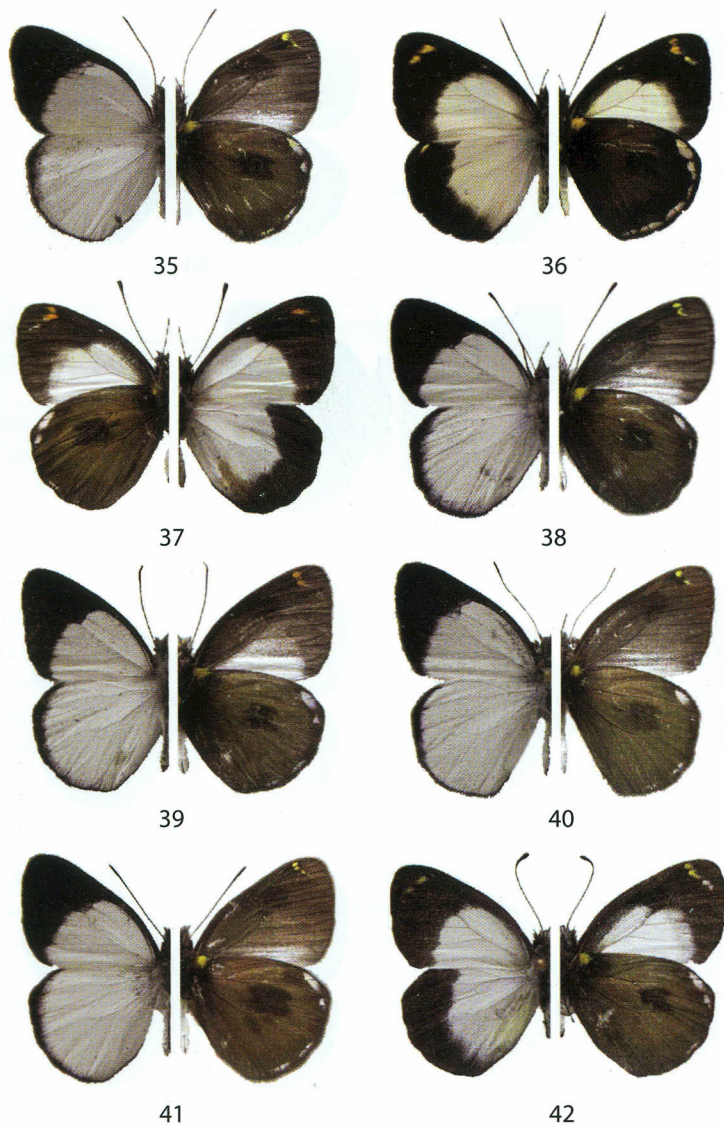


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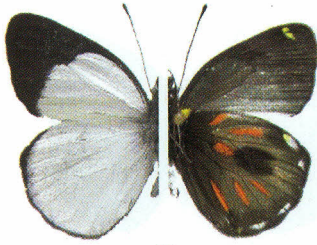


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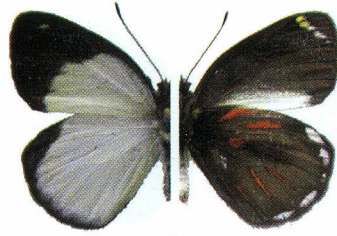
Figs 27-28. *Delias hypomelas* f. *rubrostriata* ♂ upp./und. from R. Suwagi, Pass Valley: 27. (KSP 26033); 28. (KSP 26035). **Figs 29-34.** *Delias hypomelas* upp./und. from Pass Valley: 29. ♂ from R. Suwagi (KSP 25983); 30-31. from R. Watlangku: 30. ♂ (KSP 26036); 31. ♀ (KSP 26024); 32-33. ♂ from R. Ibem: 32. (KSP 25994); 33. (KSP 25991); 34. ♂ from R. Bion (KSP 26006).



Figs 35-42. *Delias hypomelas* upp./und.: 35-39. from Pass Valley: 35-37. from R. Bion: 35. ♂ (KSP 26007); 36. ♀ (KSP 26012); 37. ♀ (KSP 26042); 38-39. ♂ from R. Ameagi: 38. (KSP 26045); 39. (KSP 26031); 40. ♂ from R. Wolon, Sumbale (KSP 26068); 41. ♂ from R. Waluk, Nipsan (KSP 26078); 42. ♀ from Nipsan (KSP 26082).



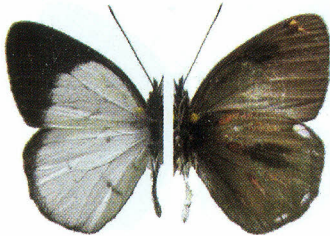
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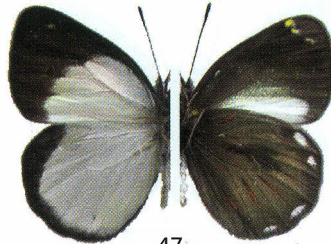
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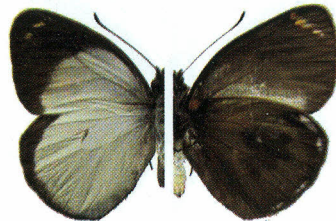
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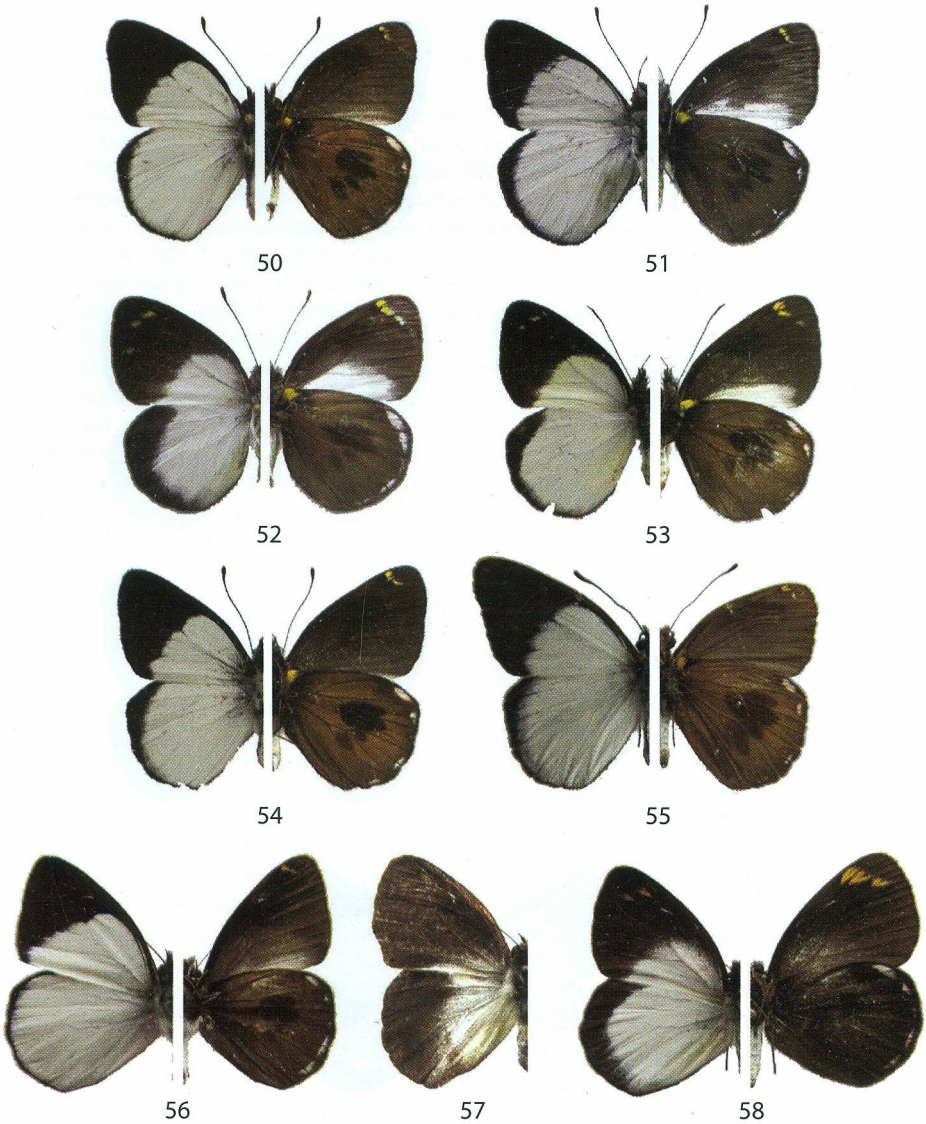
48



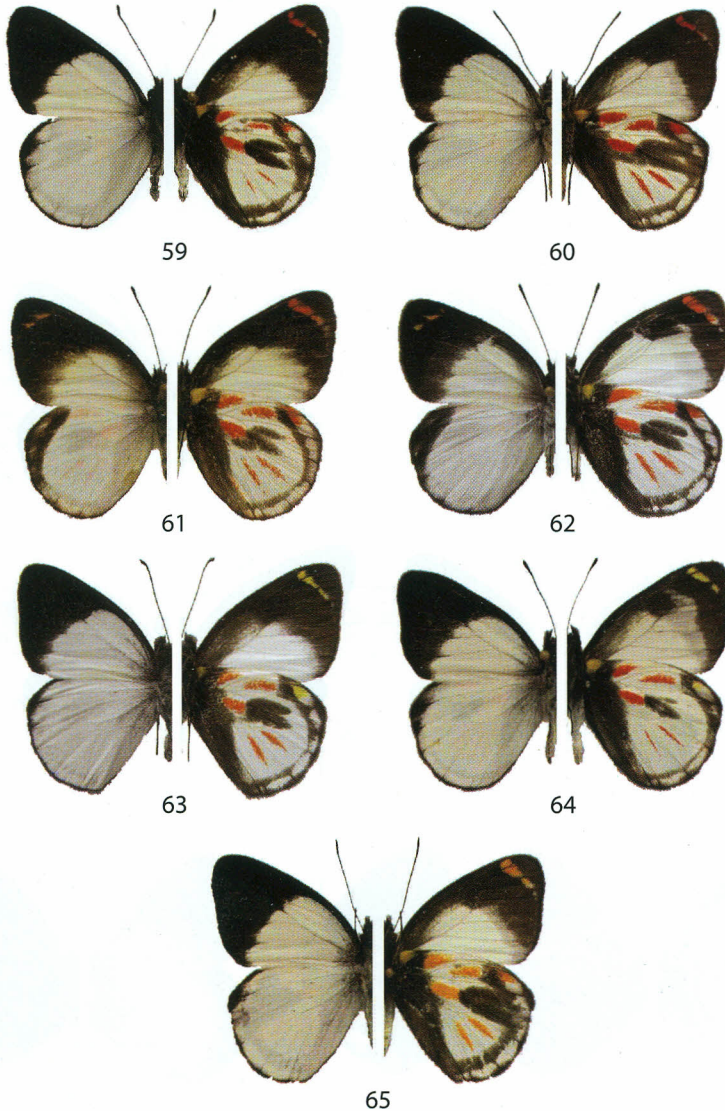
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Figs 43-47. *Delias hypomelas* f. *rubrostriata* upp./und.: 43-45. from R. Koluk, Silakma: 43. ♂ (KSP 26059); 44. ♀ (KSP 26064); 45. ♂ (KSP 26072); 46-47. from R. Wantek, Korupun: 46. ♂ (KSP 26074); 47. ♀ (KSP 26070).

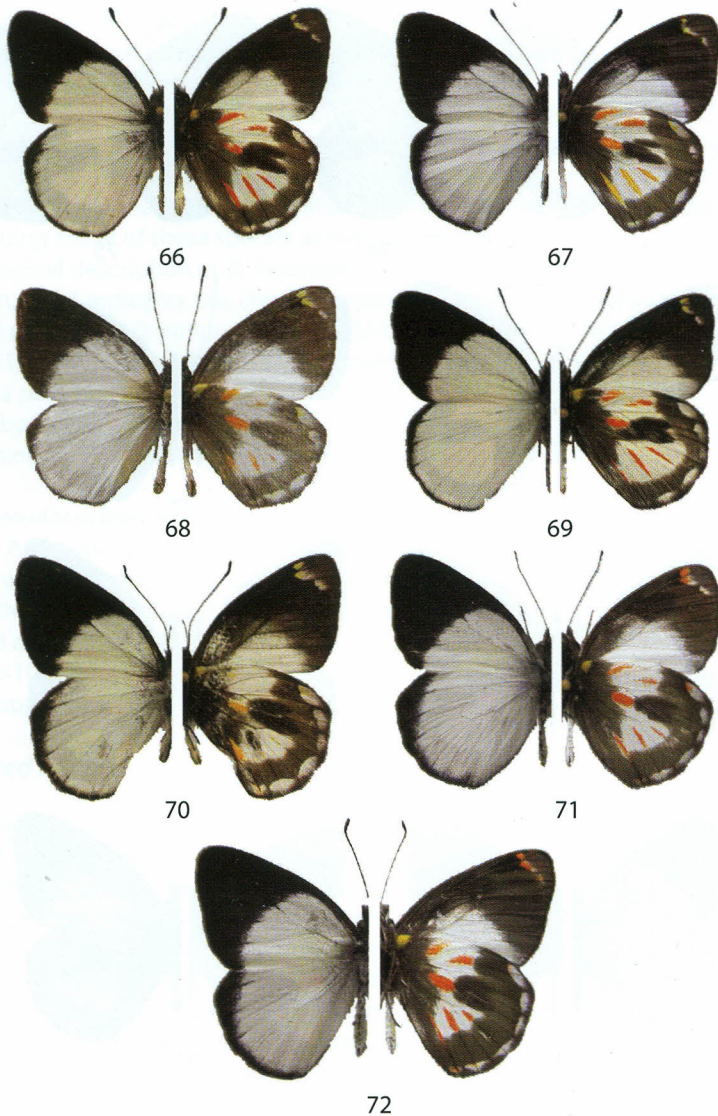
Figs 48-49. *Delias hypomelas* (= *Delias hypomelas conversa*) from Mt Goliath: 48. ♂ HT (BMNH); 49. ♀ PT (BMNH).



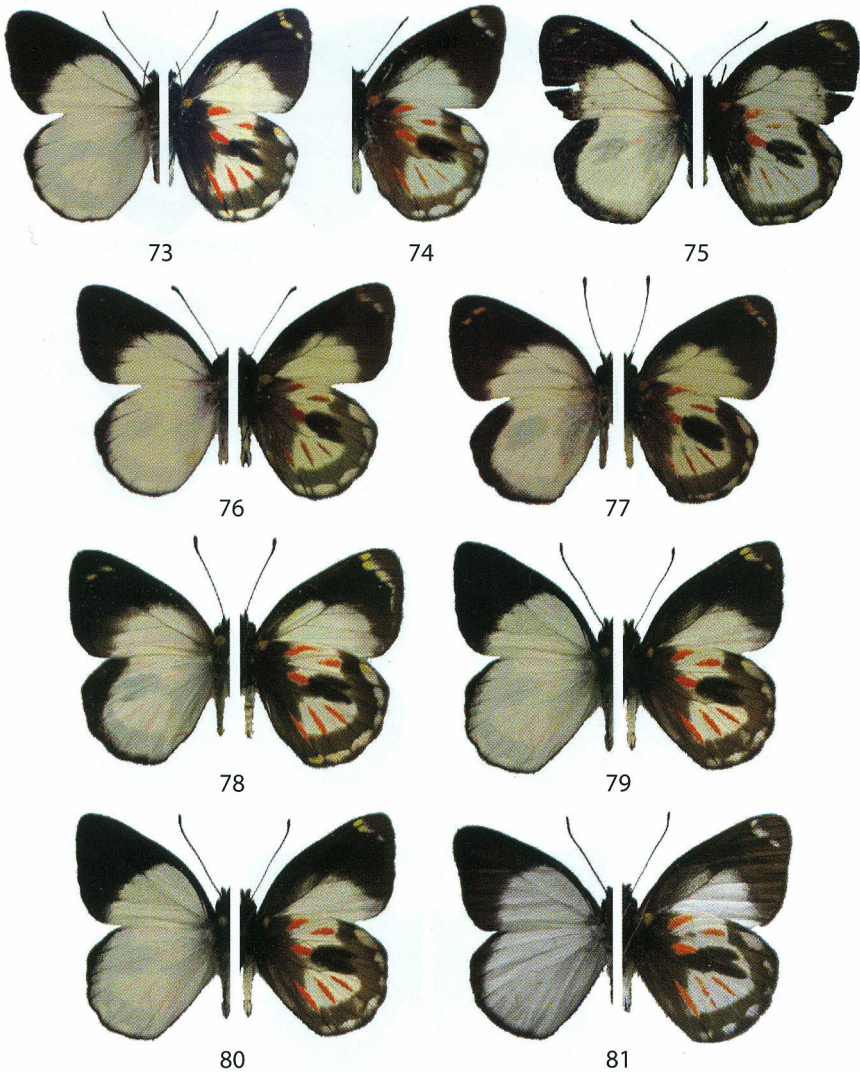
Figs 50-58. *Delias hypomelas* upp./und.: 50-53. from Okbibab, Star Mts: 50. ♂ from R. Oktanglap (KSP 26134); 51. ♂ from R. Dao (KSP 26138); 52. ♀ from R. Ngupel (KSP 26144); 53. ♀ from R. Okse (KSP 26147); 54. ♂ from Kerowagi, PNG (KSP 26156); 55. ♂ (= *D. hypomelas rawlinsoni* PT) from Huon Golf (BMNH); 56-58. (= *D. itamputi hypomelas*) from Biagi, Mambare (BMNH): 56. ♂ HT; 57. ♀ PT; 58. ♀ PT.



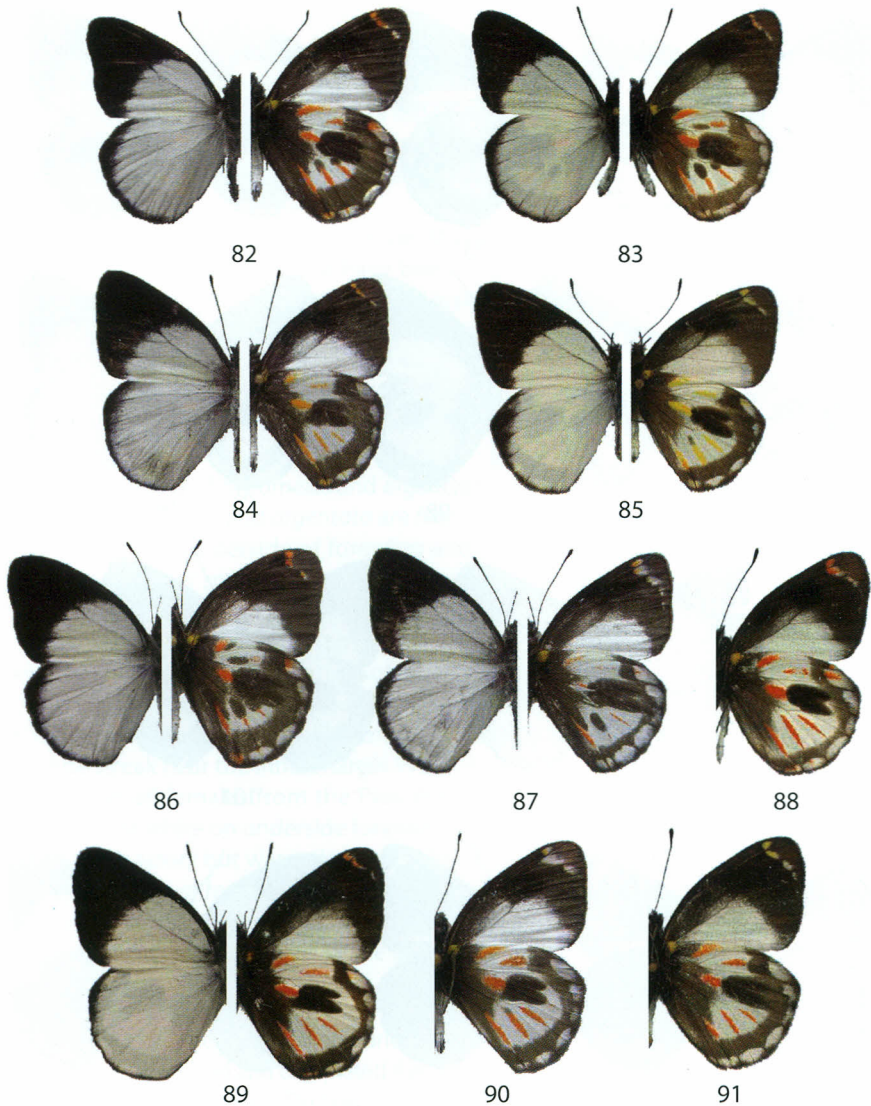
Figs 59-65. *Delias hypomelas* f. *clutus*: 59. ♂ from Puncak Jaya (KSP 26165); 60. ♂ from Ilaga (KSP 26171); 61-63. from Ilu: 61. ♀ (KSP 26188); 62. ♀ (KSP 26193); 63. ♂ (KSP 26203); 64. ♂ from Sinak (KSP 26200); 65. ♂ from Ilaga (KSP 26211).



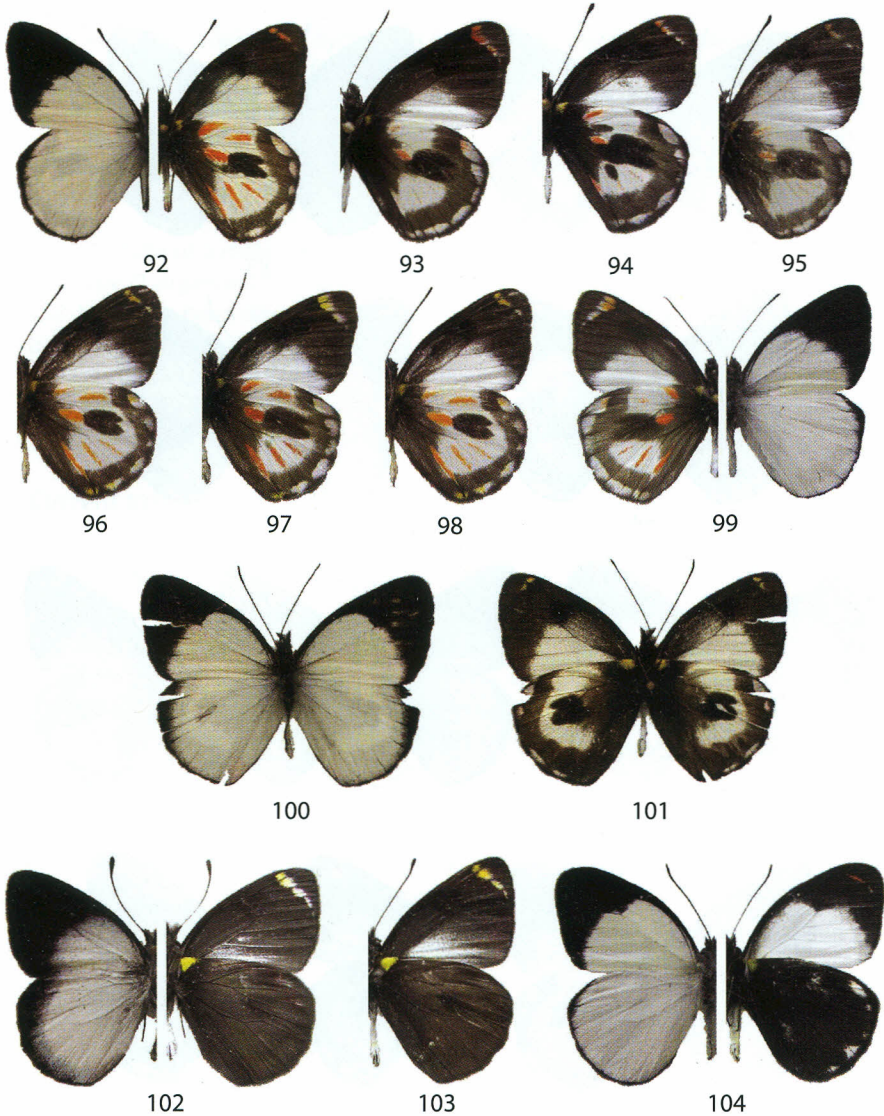
Figs 66-72. *Delias hypomelas* upp./und.: 66-68. ♂ f. *argentata* from Kanggime: 66. (KSP 26232); 67. (KSP 26244); 68. (KSP 26237); 69. ♂ f. *argentata* from Mapinduma (KSP 26248); 70. ♂ f. *argentata* from Kelila (KSP 26272); 71-72. ♂ f. *sanguinea*: 71. from Kelila (KSP 26226); 72. from Kuyawagi (KSP 26227).



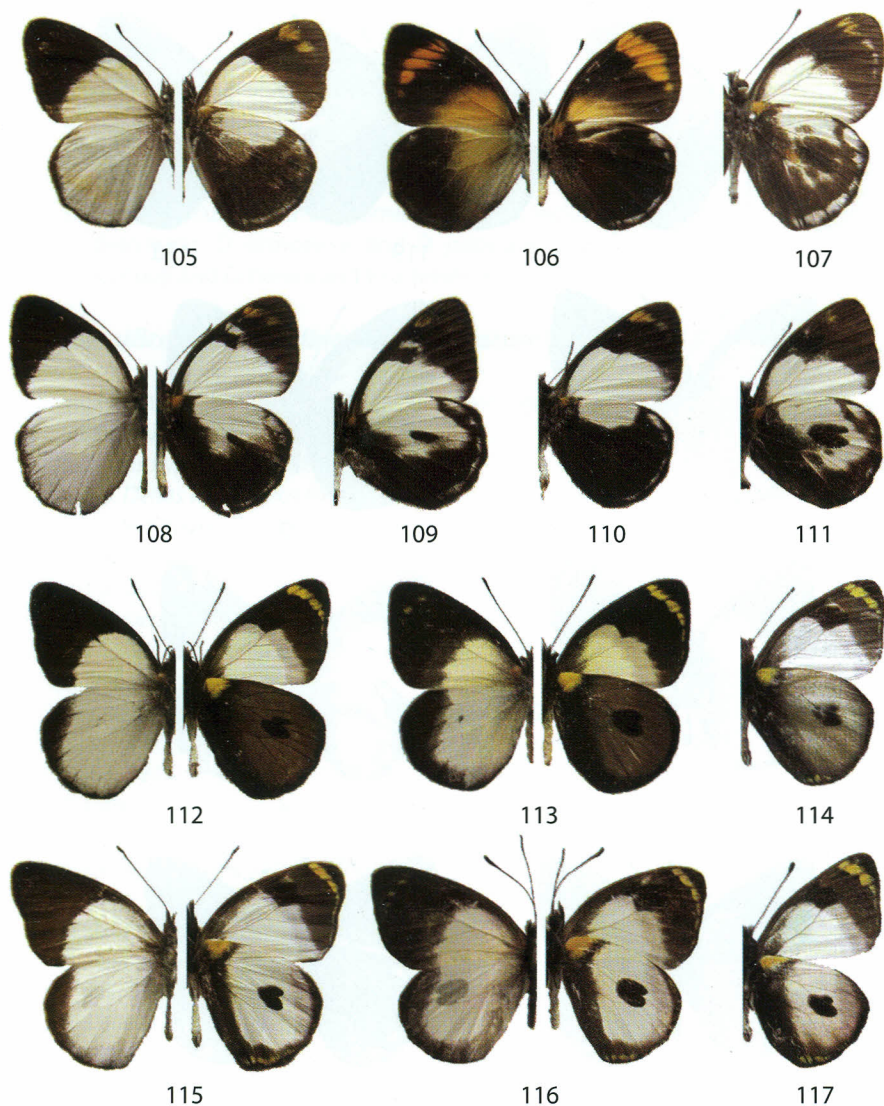
Figs 73-81. *Delias hypomelas* f. *argentata* (upp.)/und.: 72-76. from Neth. Ind.-American New Guinea Exped. (NCB-RMNH): 73. (= *D. argentata* ♂ HT); 74. (= *D. argentata* ♂ PT); 75. (= *D. argentata* ♀ PT); 76. (= *D. argentata* f. *sanguinea* ♂ HT); 77. (= *D. argentata* f. *sanguinea* ♀ PT); 78. ♀ f. *argentata* from Daela (KSP 26270). 79. ♀ f. *argentata* from Makki (KSP 26333); 80-81. ♂ f. *argentata* from Welesi: 80. (KSP 26251); 81. (KSP 26339).



Figs 82-91. *Delias hypemelas* ♂ f. *argentata* (upp.)/und.: 82-85. from Welesi: 82. (KSP 26335); 83. (KSP 26334); 84. (KSP 26340); 85. (KSP 26342); 86. from Daela (KSP 26337); 87-90. from Habbema: 87. (KSP 26338); 88. (KSP 26183); 89. (KSP 26326); 90. (KSP 26263). 91. from Habbema (KSP 26267).

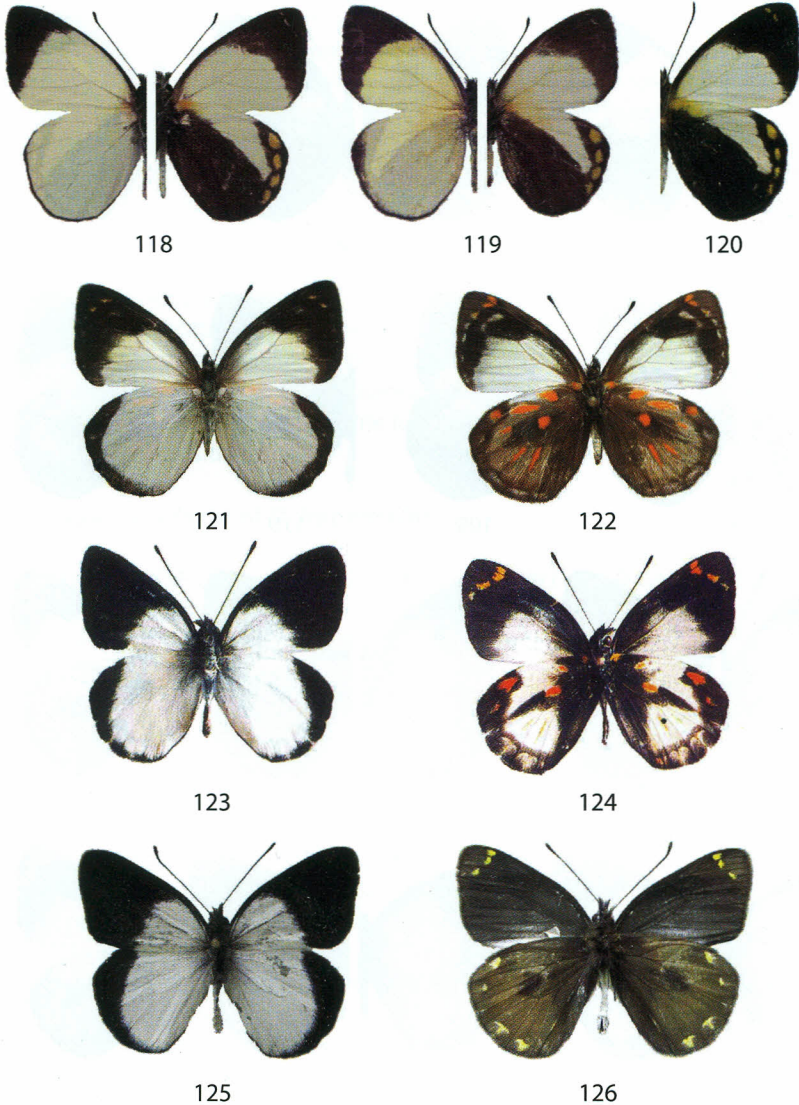


Figs 92-101. *Delias hypomelas* ♂ (upp./und.: 92-99. f. *argentata* from R. Suwagi, Pass Valley: 92. (KSP 26306); 93. (KSP 26228); 94. (KSP 26292); 95. (KSP 26274); 96. (KSP 26296); 97. (KSP 26305); 98. (KSP 26228); 99. from R. Bion (KSP 26289); 100/101. f. *destrigata* (= *D. destrigata* PT) from R. Bion (KSP 26343). **Figs 102-103.** *Delias ormoensis* ♂ from Foja Mts: 102. upp./und. HT (KSP 44738); 103. und. PT (KSP 44740). **Fig. 104.** *Delias papuana* ♂ HT upp./und. from Foja Mts (KSP 58288).

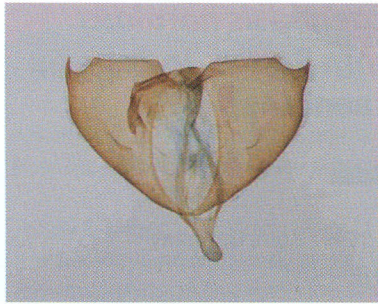


Figs 105-111. *Delias itamputi* from Biagi, Mambare (upp.)/und. (BMNH): 105. ♂ HT; 106. ♀ PT; 107-111. ♂♂ varieties.

Figs 112-117. *Delias heroni* from Arfak Mts (BMNH): 112. ♂ HT; 113. ♀ PT; 114. ♀ (KSP 26354); 115-117. f. *albo-oculatus* from Angi Lakes: 115. ♂ HT; 116. ♀ PT; 117. ♂ (AY).



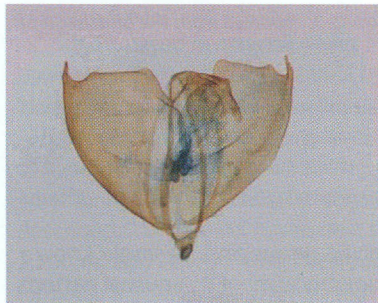
Figs 118-120. *Delias sphenodiscus* (upp.)/und.: 118-119. from Neth. Ind.-American New Guinea Exped. Araucaria Camp (NCB-RMNH): 118. ♂ HT; 119. ♀ PT; 120. ♂ from Borme (KSP 26388); **Figs 121-126.** Possible hybrids: 121-122. Hybrid upp/und. of *D. hypomelas* and *D. rileyi* from Ilu (= *D. hikarui* HT) (AY); 123-124. Hybrid upp/und. of *D. fascelis* and *D. hypomelas* from central mountain range Papua (= *D. takashii* HT) (SS); 125-126. Hybrid upp/und. of *D. fascelis* and *D. hypomelas* from Okbibab (KSP 26141).



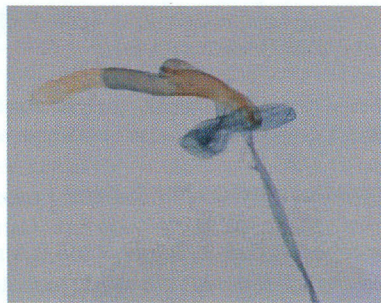
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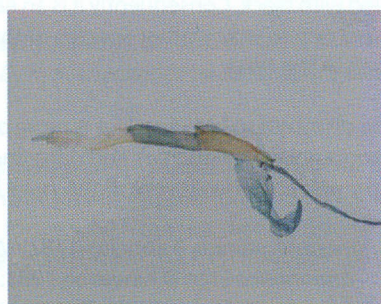
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Figs 127-132. Male genitalia (NCB-RMNH): 127-128. *Delias hypomelas* (= *D. hypomelas fulgida* PT) (prep. RV 1401): 127. habitus; 128. aedeagus; 129-130. *D. hypomelas f. argentata* (= *D. argentata f. sanguinea* PT) (prep. RV 1402): 129. habitus; 130. aedeagus; 131-132. *D. heroni* (prep. RV 1403): 131. habitus; 132. aedeagus.