

A Revision of the Old World Species
of the Genus *Eurema* HÜBNER
(Lepidoptera, Pieridae)

Part II. Description of the *smilax*, the *hapale*,
the *ada* and the *sari* (part) groups

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Abstract Redescriptions are given at species- and subspecies levels for the *smilax* (1 species), the *hapale* (1 species), the *ada* (1 species) and the *sari* groups (6 species) in the subgenus *Terias*. A new subspecies of *ada* is described from Indo-China. The following aspects of each recognized species and subspecies are presented: current combination, synonymy, diagnosis, external features, male and female genitalia, chromosome number, variation (seasonal and geographical), type material examined, material studied, taxonomic remarks, relationship, distribution, habitat, habits, early stages; adults of every recognized taxon, and male and female genitalia of every species are illustrated.

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The subgenus *Terias* SWAINSON
The *smilax* group

Eurema smilax (DONOVAN, 1805)

[Pl. 2]

- Papilio smilax* DONOVAN, 1805: 5, pl. 20, fig. 3. (Australia)
Xanthidia smilax (DONOVAN); BOISDUVAL, 1832: 59.
 ?*Terias smilax* (DONOVAN); HERRICH-SCHÄFFER, 1867: 141.
Terias ingana WALLACE, 1867: 322. (Sydney) [BMNH, Syntypes ♂ ♀, examined]
Terias parvula HERRICH-SCHÄFFER, 1869: 78. (Rockhampton)
Terias varius MISKIN, 1889: 259. (Brisbane)
Terias casta LUCAS, 1894: 68. (Queensland)
Terias gracilis KALIS, 1933: 77–78. (Soerabaja, E. Java)
Terias gracilior ROEPKE, 1935: 83–84, nom. nov., for *Terias gracilis* KALIS, 1933 (preoccupied by *Terias elathea gracilis* D'ALMEIDA, 1928)
Eurema smilax (DONOVAN); CORBET & PENDLEBURY, 1932: 192.

Diagnosis: Forewing elongate, narrowed towards apex. Black distal border on forewing upperside absent in spaces 1a and 1b+c; forewing underside without discoidal cell spot; hindwing underside with discocellular spot represented by an upper and a lower black dots; ultraviolet reflectance on upperside structurally reflective on basal portion of forewing and distal one of hindwing; phallus with carina in a line; Lateral hollow represented by almost rounded and simple depression, without any caves.

Description: *Wet-season form.*—**Male.** *Upperside:* Ground colour lemon yellow, but darkened on basal portion of forewing and distal one of hindwing. Forewing black costal border barely traceable, sometimes disappearing; black distal border broad apically, with its inner edge oblique and irregular from costa to vein 4, more or less obtuse-angled at vein 4, more deeply excavated in space 3 than in space 2; black basal border undeveloped; black discocellular bar sometimes weakly appearing; fringe usually black, mixed with yellow. Hindwing black distal border very narrow, often represented by marginal faint vein-dots; anal border undeveloped; fringe yellow. Only the extreme bases of both wings usually more or less blackish. *Underside:* Ground colour somewhat paler than on upperside. Forewing apical patch absent; discoidal cell spot absent; discocellular marking represented by a faint bar, covering about half of the discocellular vein; tornal spot absent; sex-brand light gray, sometimes with a slight purplish tinge, short and narrow, ending much before origin of vein 2; small vein-dots present, sometimes barely traceable; fringe yellow. Hindwing usually with a series of submarginal spots in spaces 1b+c to 7 usually faint, arranged in an irregular zigzag-line, and a submarginal spot in spaces 7 situated in the midway between submarginal spots and discocellular spot; subbasal dots usually present each in spaces 1b+c and 7 and in the middle of discoidal cell; a minute basal spot sometimes in space 7; discocellular spot usually represented by an upper and a lower black dots; small vein-dots almost same as on forewing; fringe yellow. Ultraviolet reflectance on upperside: Structurally reflective on basal portion of forewing and distal one of hindwing, appearing bright-white in UV-photos (Pl. 20 (1, upper)).

Forewing elongate, narrowed towards apex; distal margin almost straight or slightly convex. Hindwing strongly arched in the basal half of costal margin; distal

margin almost rounded; vein 7 free from cell; *udc* longer than *mdc*; *mdc* much shorter than *ldc*. Antenna nearly 1/3 as long as forewing, black and prominently white-checked, and white ventral dots almost connected with each other to form a white streak, club well marked, longish ovate, flattened in dried specimen. Thorax and abdomen yellow, usually slightly darkened above, clothed with black and yellow hairs on thorax and base of abdomen.

Forewing length: 13.5–18.0 mm.

Female. Similar to male, but differing as follows. Ground colour paler. Basal portion on upperside less heavily black dusted. Forewing black costal border barely traceable; black distal border broader, with its inner edge more indistinct. Hindwing black distal border much narrower, usually reduced to marginal vein-dots. Ultraviolet reflectance on upperside: Almost absorbed, appearing entirely black in UV-photos (Pl. 20 (1, lower)).

Forewing length: 15.0–17.5 mm.

Dry-season form.—Male. *Upperside:* Hindwing black distal border reduced to marginal faint vein-dots. *Underside:* Markings more strongly developed, and usually tinged with brown; forewing subapical patch well developed; vein-dots sometimes conjointed with a fine black anteciliary line. Hindwing with a submarginal spots more strongly developed, especially in spaces 4 and 5; subbasal spots larger.

Female. Not examined.

Male genitalia (Fig. 1): Tegumen somewhat broad, almost triangular in dorsal aspect, slightly concaved dorsomedially, entirely sclerotized; Valvenansatz short,

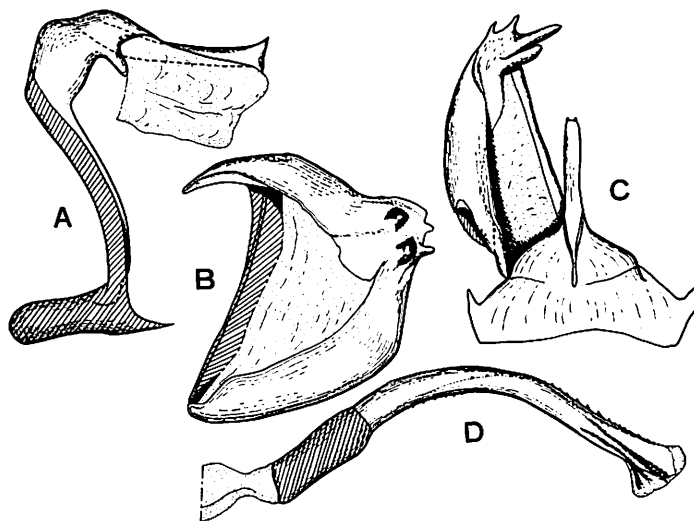


Fig. 1. Male genitalia of *Eurema smilax smilax* (DONOVAN, 1805) from Australia. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

producing downwards; vinculum not strongly arched; saccus very short (0.36–0.4 of ring height), angle between vinculum and saccus 80–90°. Uncus moderately long (dorsum proper 0.7 of ring height), extending somewhat downwards; uncal projection weakly developed (0.1 of ring height), with its apex slightly bicuspid. Valva almost as long as high; P1 absent; P2 almost as long as the proximal process of P4, shifting below close to P4; P3 very short, sometimes barely traceable; P4 represented by two short and almost straight processes, the proximal one of which is longer than the distal one. Phallus long, fairly thickened and arched dorsally, suprazonal sheath with carina in a line dorsally and ventrally, subzonal sheath about as long as 1/4 length of phallus. Juxta well sclerotized, consisting of a pair of somewhat slender pouches slightly concaved dorsally, producing a short and slender median stalk.

Female genitalia (Fig. 2): Seventh abdominal sternum with weakly concaved posterior margin. Lateral hollow represented by almost rounded and simple depression, somewhat concaved ventrally, without any eaves. Genital plate weakly invaginated ventromedially; longitudinal groove well sclerotized, broad and usually parallel sided, sometimes narrowed at the middle; banks of longitudinal groove

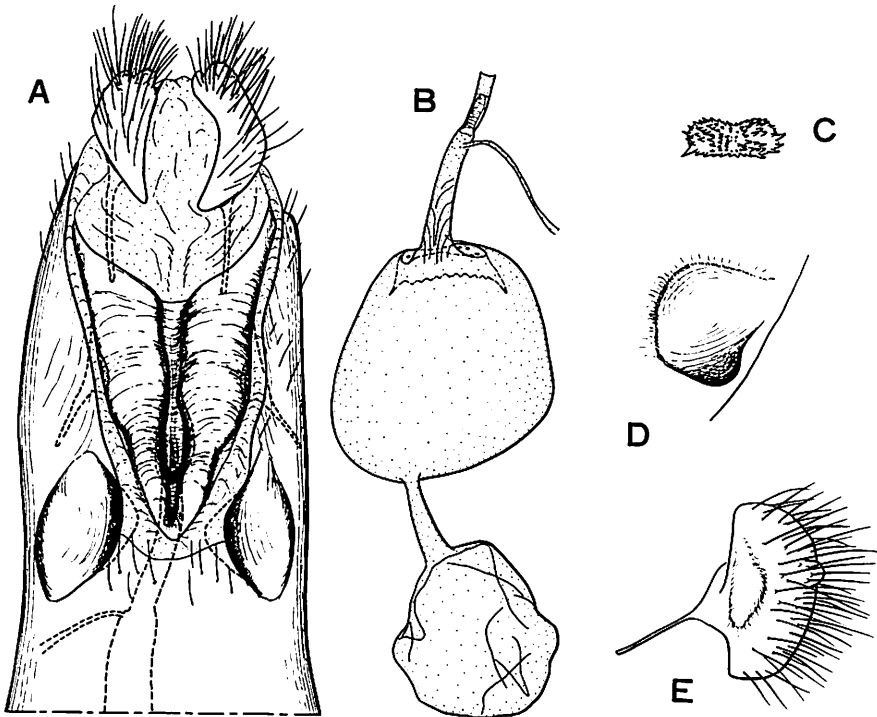


Fig. 2. Female genitalia of *Eurema smilax smilax* (DONOVAN, 1805) from Australia. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Signum (anterior). D: Lateral hollow (lateral). E: Papilla analis (lateral).

weakly developed. V-shaped wall well developed, narrowed anteriorly, forming a short and narrow sulcus anteriorly. Ostium bursae opening at the anterior portion of genital plate. Ductus bursae almost as long as cervix bursae, somewhat thick, and sclerotized on anterior 3/4. Signum broad and moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, slightly curved dorsally, as long as apophysis posterioris, with a small protuberance at the inside of just proximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region, broadened at the base of apophysis posterioris.

Variation: Although this species shows little geographical variation in wing markings, its seasonal variation is rather well marked. At higher latitudes, *e.g.* in New South Wales, two distinct seasonal forms, the summer and autumn ones are recognizable.

Relationship: This peculiar species is undoubtedly a member of the subgenus *Terias*. This species constitutes the monotypic *smilax* group, and is inferred to deviate initially from the ancestral stock of the subgenus *Terias*.

Distribution: This species occurs throughout mainland Australia and rarely in Java. It is occasionally taken in Tasmania, where there is probably no resident population (COMMON & WATERHOUSE, 1972).

Habitat and habits: This butterfly mainly inhabits open country of inland and it is usually found flying over grassy areas or in among the grass stems. Extensive migratory flights have been recorded from time to time in Queensland, New South Wales and Victoria. It migrates together with other migrants such as *Belenois java teutonia*. This species is multivoltine and it is seen flying all the year round in the subtropical and tropical regions.

Early stages: The early stages are described by McCUBBIN (1971), COMMON and WATERHOUSE (1972), etc. Egg.—Slender spindle-shaped, height about four times diameter, without prominent ribs, greenish white. The eggs are laid singly on leaves. Mature larva—Green with dark green dorsal line and yellow lateral line, head green. Pupa—Green, cephalic projection yellowish, abdomen with black spiracles and a few black dots. The larvae and pupae are similar in shape to *E. hecabe*. The larval foodplants: *Neptunia gracilis* (Mimosaceae), *Cassia fistula*, *C. coroniloides*, *C. nemophila* (COMMON & WATERHOUSE, 1973), *C. mimosoides* (JONES, *et al.*, 1987) (Fabaceae).

Eurema smilax smilax (DONOVAN, 1805)

Papilio smilax DONOVAN, 1805: 5, pl. 20, fig. 3. (Australia) [untraced]

Terias ingana WALLACE, 1867: 322. (Sydney) [BMNH, Syntypes ♂ ♀, examined]

Terias parvula HERRICH-SCHÄFFER, 1869: 78. (Rockhampton)

Terias varius MISKIN, 1889: 259. (Brisbane)

Terias casta LUCAS, 1894: 68. (Queensland)

Eurema smilax smilax (DONOVAN); YATA, 1981: 255.

The nominate subspecies is characterized by the following combination of characters.

Wet-season form.—**Male** (Pl. 2 (1–2)). *Upperside*: Ground colour lemon yellow. Forewing black costal border barely traceable, sometimes almost disappearing. Only the extreme bases of both wings more or less blackish. Forewing elongate, distinctly narrowed towards apex. **Female** (Pl. 2 (3–4)). Ground colour greenish yellow. Forewing black distal border abruptly narrowed below vein 4.

Dry-season form.—**Male** (Pl. 2(5–6)). Same as in the description of species level.

Forewing length: Male 14.0–18.0 mm (n=11, avg=16.0 mm), female 16.5–17.5 mm (n=4, avg=17.1 mm).

Material studied: AUSTRALIA: W. Australia, Koodaideri, 1 ♂, 4. iii. 1971, 2 ♂ (dry f.), 15–17. viii. 1971, 3 ♂, 16. ix. 1971 (K. TSUJI); W. Australia, Mt. Brockman, 2 ♂ 1 ♀, 23. x. 1971 (K. TSUJI); Queensland, Wallaville, 1 ♂ 2 ♀, 19. xii. 1971, Beaudesert, 2 ♂, 7–21. iii. 1972 (NAKAYAMA) [KUCGE]; New South Wales, Gunnedah, 1 ♂ 1 ♀, 28. iii. 1970, Campbell town, George's River, 1 ♂, 7. x. 1967 (SHIBATANI) (SHIBATANI coll.).

Distribution: This subspecies is distributed throughout mainland Australia and Lord Howe Isls.

Eurema smilax gracilior (ROEPKE, 1935)

Terias gracilis KALIS, 1933: 77–78. (Soerabaja, E. Java) [untraced]

Terias gracilior ROEPKE, 1935: 83–84. Nom. nov., for *Terias gracilis* KALIS, 1933 (preoccupied by *Terias elathea gracilis* D'ALMEIDA, 1928)

Eurema smilax gracilior (ROEPKE); YATA, 1981: 255.

This subspecies is distinguishable from the nominate subsp. *smilax* from Australia by the following combination of characters.

Wet-season form.—**Male**. *Upperside*: Ground colour paler. Forewing black costal border almost disappearing; sex-brand in space 8 paler and more indistinct. Only the extreme bases of both wings almost not blackish. Forewing less elongate, slightly rounder at apex. **Female** (Pl. 2(7–8)). Ground colour somewhat paler. Forewing black distal border not abruptly narrowed below vein 4.

Forewing length: Male 13.5–15.0 mm (n=2, avg=14.3 mm), female 15.0 mm.

Material studied: JAVA: E. Java, Goenoeng sahari, 1 ♂, i. 1935, 1 ♂ 1 ♀, 4. viii. 1935 [RMH].

Distribution: This subspecies is known only from Java.

The *hapale* group*Eurema hapale* (MABILLE, 1882)

[Pl. 3]

Terias hapale MABILLE, 1882: 99–100. ♂ ♀. (Madagascar) [untraced]*Terias desjardinsi* MABILLE (nec BOISDUVAL), 1887: 248, pl. 32, figs. 1a, 2. (Madagascar)*Terias hapale* f. *hibernia* NEUSTETTER, 1916: 96. (Uganda)*Terias hapale* f. *raritas* STONEHAM, 1957: 1–3. (Kenya)*Eurema* (*Maiva*) *hapale* (MABILLE); VAN SON, 1949: 78.*Eurema hapale* (MABILLE); PINHEY, 1965: 186.

Diagnosis: Forewing apex rounded and termen well convex; upperside of male wings milky white with greenish yellow tinge and that of female ones almost white; black distal border on forewing upperside much reduced to quadrate apical patch, almost disappearing below vein 3; hindwing black distal border reduced to marginal vein-dots; a spot in discoidal cell; uncus long, slightly arched dorsally, with flap-like lobe on its posterobasal end.

Description: *Wet-season form.*—**Male** (Pl. 3 (1–4)). *Upperside:* Ground colour milky-white with greenish yellow tinge. Forewing black costal border barely traceable or absent; black distal border much reduced to quadrate apical patch, disappearing below vein 2 and sometimes almost so below vein 3, with its inner edge oblique and irregular from costa to vein 4, more or less angled in the midway, almost right- to acute-angled at vein 4, more deeply excavated in space 2 than in space 3, very narrowed in space 2; black basal border undeveloped; discocellular spot absent; fringe milky-white. Hindwing black distal border reduced to marginal vein-dots which are sometimes barely traceable; fringe milky-white. Basal portions of both wings not black dusted. *Underside:* Ground colour greenish yellow, but paler in discal portion of forewing. Forewing with or without a faint discoidal cell; discocellular marking appearing by an irregular slender ring, covering more than half of the discocellular vein; tornal spot absent; sex-brand absent; a small and indistinct black dot at apex of each vein; fringe yellow greenish yellow. Hindwing with a series of submarginal spots in spaces 1 to 7, arranged in an irregular zigzag-line, and a submarginal spot in space 7 situated between submarginal spots and discocellular spot; subbasal dots usually present each in spaces 1 and 7 and in the middle of discoidal cell, but often disappearing; discocellular spot almost same as in forewing; small vein-dots as in forewing, but more distinct; fringe as in forewing. Ultraviolet reflectance on upperside: Almost absorbed, appearing entirely black in UV-photos (Pl. 20 (2, upper)).

Forewing rounded at apex; distal margin fairly convex. Hindwing almost straight in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *udc* nearly as long as *mdc* or shorter; *mdc* less than 1/5–1/3 length of *ldc*. Antenna nearly 1/3 as long as forewing, black and white-checked,

except on posterodorsal surface and a few apical segments, club more or less flattened. Thorax and abdomen milky-white somewhat darkened above, clothed with greenish yellow hairs on thorax and base of abdomen.

Forewing length: 18.5–19.5 mm ($n=4$, avg=18.9 mm).

Female (Pl. 3 (5–6)): Similar to male, but differing as follows. Ground colour generally pure-white, with greenish yellow tinge on upperside, and with pale lemon yellow at basal and apical portions on underside. *Upperside*: Forewing black distal border more weakly developed, almost disappearing below vein 3. Hindwing with marginal vein-dots much more indistinct. *Underside*: Markings fainter. Ultraviolet reflectance on upperside: Almost absorbed, appearing dark gray in UV-photos (Pl. 20 (2, lower)).

Forewing length: 18.0–19.5 mm.

Dry-season form—**Male & female** (Pl. 3 (7–8)). Ground colour somewhat paler. *Upperside*: Forewing black distal border narrower and less deeply excavated than in the wet-season form, always disappearing below vein 3. *Underside*: Most markings more strongly developed, and usually tinged with brown in varied degrees. On forewing subapical patch well developed; vein-dots slightly more distinct.

Forewing length: Male 17.5–18.0 mm ($n=2$, avg=17.8 mm), female 17.5 mm.

Male genitalia (Fig. 3): Tegumen somewhat narrow, almost triangular in dorsal aspect, slightly concaved dorsomedially, entirely sclerotized; Valvenansatz

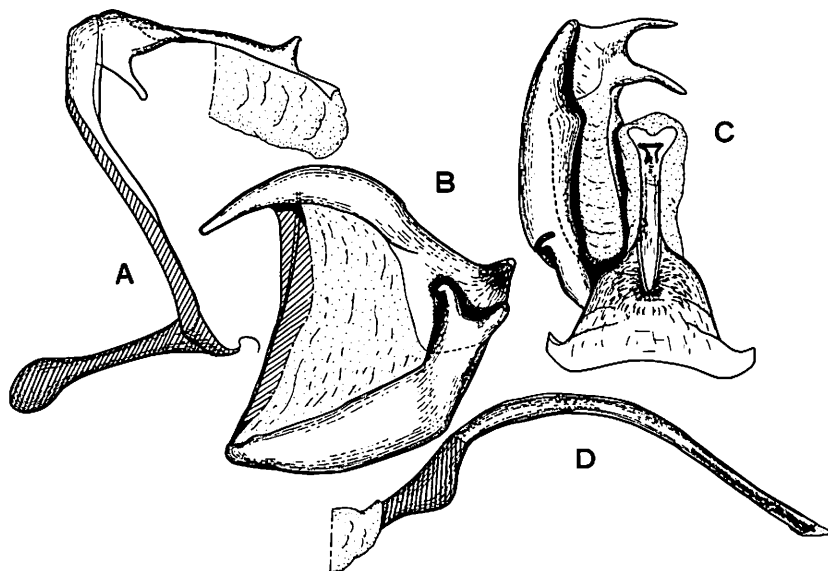


Fig. 3. Male genitalia of *Eurema hapale* (MABILLE, 1882) from Madagascar. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

short, usually producing downwards; vinculum not strongly arched; saccus short (0.58–0.6 of ring height), angle between vinculum and saccus 80–90°. Uncus long (dorsum proper 0.65 of ring height), slightly arched dorsally, extending somewhat downwards, with flap-like lobe on its posterobasal end; uncal projection short (0.1 of ring height), usually projecting posterodorsally, with its apex weakly bicuspid. Valva almost as long as high; P1 weakly produced or absent; P2 absent; P3 almost triangular, producing upwards; P4 represented by two processes which are similar to each other in length and shape. Phallus long, very slender and strongly arched dorsally, subzonal sheath about as long as 0.22 length of phallus. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

Female genitalia (Fig. 4): Seventh abdominal sternum with weakly concaved posterior margin. Lateral hollow elliptical, with dorsal eaves short and shallow, dorsal groove weakly developed, ventral eaves long and deep, median groove long, having a weak eaves and situated ventral 1/2 of lateral hollow. Genital plate weakly invaginated ventromedially; longitudinal groove weakly sclerotized, broad and deep, gradually narrowed anteriorly; banks of longitudinal groove well developed, narrowed anteriorly, excavated along each inner margin towards ostium bursae. V-

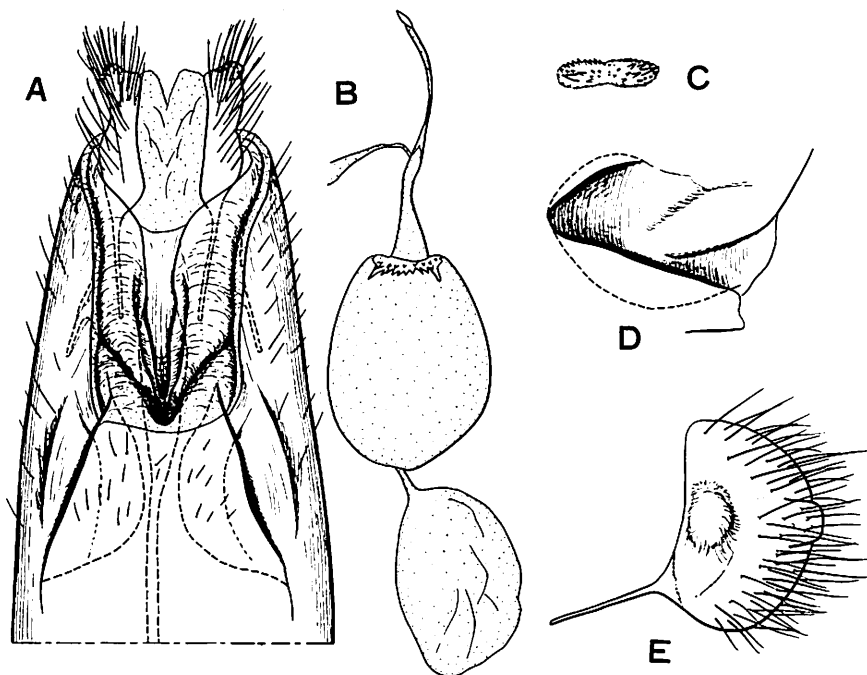


Fig. 4. Female genitalia of *Eurema hapale* (MABILLE, 1882) from Africa. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Signum (anterior). D: Lateral hollow (lateral). E: Papilla analis (lateral).

shaped wall undeveloped. Ostium bursae opening the anterior portion of genital plate. Ductus bursae about as long as 1.4 length of cervix bursae, membranous but weakly sclerotized on anterior 1/3. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris almost straight, slightly longer than apophysis posterioris, with a small protuberance at the inside of proximal portion. Papilla analis elongate, bearing a long and broad apical lobe and swollen bare-region.

Variation: Although this species shows little intra-specific variation, its seasonal polyphenism is rather strongly shown in the markings on underside.

Material studied: MADAGASCAR: 2♂1♀, 1♂1♀ (dry f.), Sakaraha, 1♂ (dry f.), iii. 1970 (NAKAYAMA) [KUCGE]. UGANDA: Kampala, 1♂, 3. xii. ? (H. INOUE) [KUCGE]. CONGO: Kinshasa, Kisantsu, 1♂, 23. i. 1972 (S. INOUE); S. Katanga, Likasi, 2♀, 17. iii. 1971 (S. INOUE) [KUCGE].

Relationship: This species is inferred to deviate in the early stage from the ancestral stock of the subgenus *Terias*. It seems to be very isolated from the *sari* and the *hecabe* groups.

Distribution: This species is distributed in East, Central and West Africa, south to Mozambique, north-east Rhodesia and Madagascar.

Habitat and habits: This butterfly mainly inhabits damper areas, especially marshy grasslands and margins of stream (WILLIAMS, 1969), and it seems to be usually rare. The females are rarer than the males.

Early stages: The early stages are unknown.

The *ada* group

Eurema ada (DISTANT & PRYER, 1887)

[Pls. 4–6]

?*Terias senna* DISTANT (nec C. & R. FELDER), 1885 :307, pl. 26, fig. 13, ♂, pl. 25, fig. 14, ♀.

Terias ada DISTANT & PRYER, 1887: 271, ♀. (Borneo) [untraced]

Terias toba DE NICÉVILLE, 1895: 496, ♀. (Sumatra)

Diagnosis: Forewing length less than 21.0 mm. Black distal border on forewing upperside almost equally excavated in spaces 2 and 3, inclined towards tornus in spaces 1a and 1b+c; two spots in discoidal cell; sex-brand very short and spindle-shaped; uncus moderately long, sickled-shaped in lateral aspect, medially broadened in depth medially.

Description: Male. Upperside: Ground colour greenish yellow. Forewing black costal border generally narrow, with its inner margin diffused; black distal border generally broad, with its inner edge oblique and irregular from costa to vein 4 and more or less angled in the midway, usually acute-angled at vein 4, equally excavated in spaces 2 and 3, but sometimes slightly more deeply excavated in space 2

than in space 3, always inclined towards tornus in spaces 1a and 1b+c; black basal border undeveloped; fringe black. Hindwing with black distal border generally narrow, with its inner edge moderately defined and almost uniform; anal border undeveloped; pale yellow and ovate sex-brand in basal portion of space 8; fringe usually black, sometimes mixed with greenish yellow, rarely entirely greenish yellow. Basal portions of both wings more or less blackish. *Underside*: Ground colour almost same as on upperside. Forewing apex usually with marginal black smudge; subapical patch usually present; two spots in discoidal cell; discocellular marking appearing as an irregular slender ring, covering more than half of the discocellular vein; tornal spot absent; sex-brand dark to reddish brown, very short, spindle-shaped, ending much before a point of origin of vein 2; small vein-dots usually conjoined with a catenate black anticiliary line; fringe black, but mixed with greenish yellow. Hindwing with a series of submarginal spots in spaces 1a to 8, arranged in an irregular zigzag-line, and a submarginal spot in spaces 7 and 8 usually bisinuate and directed towards the discocellular spot; circular subbasal spot always present each in spaces 1b+c and 7 and in the middle of discoidal cell; a minute basal spot absent; discocellular spot almost same as in forewing; small vein-dots as in forewing; fringe greenish yellow, but mixed with black. Ultraviolet reflectance on upperside: Almost absorbed, appearing entirely black in UV-photos (Pl. 20 (3, upper)).

Forewing somewhat angulate at apex; distal margin slightly convex. Hindwing slightly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black and white-checked, except on the postero-dorsal surface and a few apical segments, club more or less flattened. Thorax and abdomen greenish yellow, darkened above, clothed with black and greenish yellow hairs on thorax and base of abdomen, a black longitudinal line usually appearing along the lateral margin of abdominal terga.

Forewing length: 16.0–21.5 mm.

Female. Similar to male, but differing as follows. Ground colour paler. *Upperside*: Basal portions almost not black dusted. Forewing black costal narrower and sometimes barely traceable; black distal border broader, especially in hindwing. Forewing termen rounder.

Forewing length: 13.5–21.5 mm.

Male genitalia (Fig. 5): Tegumen broad, triangular in dorsal aspect, somewhat concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus moderately long (0.68–0.8 of ring height), angle between vinculum and saccus 80–90°. Uncus moderately long (dorsum proper 0.6–0.7 of ring height), sickled-shaped in lateral aspect, broadened in depth medially; beak-shaped uncus projection short (0.14–0.19 of ring height), with its apex very weakly bicuspid. Valva almost as long as high; P1 and P2 absent; P3 elongate and triangular, with its apex sharply pointed; P4 represented by two

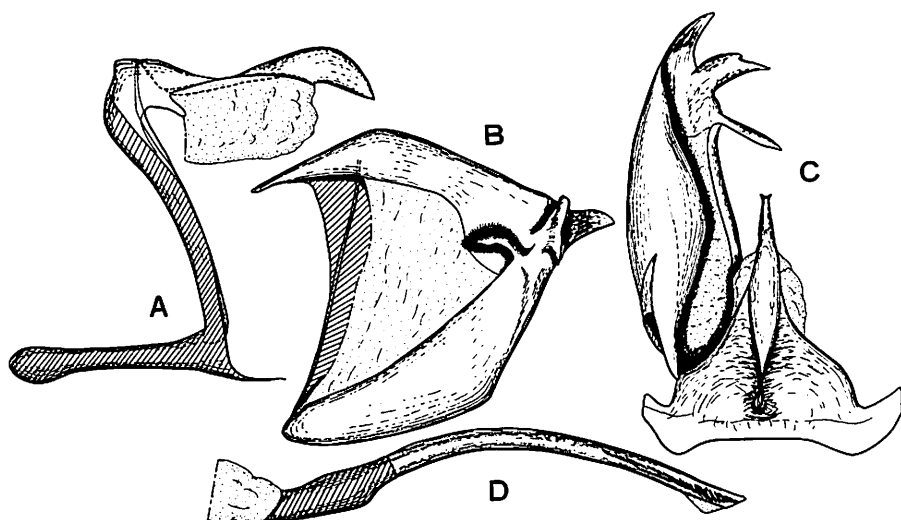


Fig. 5. Male genitalia of *Eurema ada ada* (DISTANT & PRYER, 1887) from N. Borneo. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

processes, distal one of which are broad and much flattened, with its apex somewhat incised. Phallus long, slender and arched dorsally, subzonal sheath about as long as $1/4$ length of phallus. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

Female genitalia (Fig. 6): Seventh abdominal sternum with weakly concaved posterior margin. Lateral hollow elongate, with dorsal eaves rather short and shallow, ventral eaves long and deep, median groove long, having a eaves and situated ventral $2/3$ of lateral hollow. Genital plate weakly invaginated ventro-medially; longitudinal groove weakly sclerotized, broad and deep, parallel sided, but strongly sclerotized on its anterior half; banks of longitudinal groove and V-shaped wall undeveloped. Ostium bursae opening at the anterior end of genital plate. Ductus bursae about as long as length of cervix bursae, membranous but weakly sclerotized on anterior $2/5$. Signum small in size, with a few spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, slightly longer than apophysis posterioris, with a small protuberance at the inside of proximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Variation: This species shows considerable geographical variation in wing markings and in ground colour. The seasonal polyphenism of this species is slightly marked at least in the populations from Indo-China.

Relationship: This species is inferred to deviate in the early period from the ancestral stock of the subgenus *Terias*.

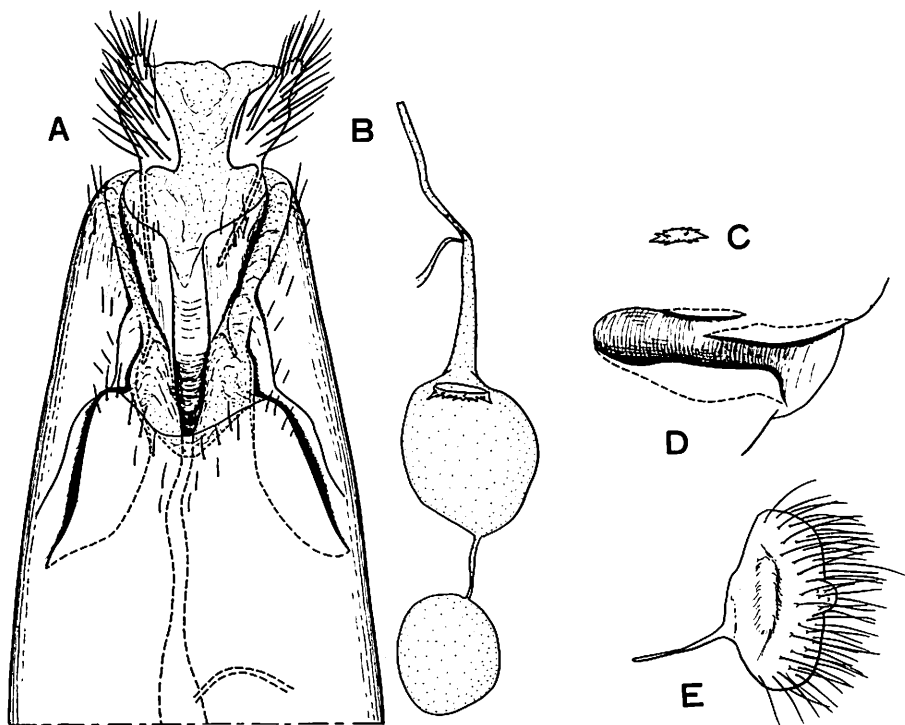


Fig. 6. Female genitalia of *Eurema ada ada* (DISTANT & PRYER, 1887) from the Malay Peninsula. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Signum (anterior). D: Lateral hollow (lateral). E: Papilla analis (lateral).

Distribution: This species is distributed from Indo-China to Sundaland (Malay Peninsula, Borneo, Sumatra and Java).

Habitat and habits: This butterfly inhabits hill forests (alt. 300–1500 m), and it is sometimes seen feebly flying along forest edges or paths through forests. HOLLOWAY (1973) reported that it was “locally common, preferring wetter areas with mixed primary and advanced secondary vegetation”. It is not so rare species as considered in former times (CORBET & PENDLEBURY, 1932, etc.), but nowhere occurs in abundance.

Early stages: The early stages are unknown.

***Eurema ada ada* (DISTANT & PRYER, 1887)**

Terias ada DISTANT & PRYER, 1887: 271, ♀. (Borneo) [untraced]

Terias lacteola ada DISTANT & PRYER; FRUHSTORFER, 1910: 167.

Eurema ada ada (DISTANT & PRYER); CORBET & PENDLEBURY, 1932: 175–176.

Terias ada ada DISTANT & PRYER; Talbot, 1939: 571.

The nominate subspecies is characterized by the following combination of characters.

Male (Pl. 4 (1–2)). *Upperside*: Ground colour pale greenish yellow. Forewing black costal border narrow; black distal border broad, with its inner edge usually slightly inclined towards tornus in spaces 1a and 1b+c. Hindwing with black distal border narrow (width at vein 4 about 1.5 mm); fringe black. Basal portions of both wings usually fairly blackish. *Underside*: Forewing apex without marginal black smudge; subapical patch usually disappearing; small vein-dots conjoined with a catenate black anticiliary line; fringe black, but mixed with greenish yellow. **Female** (Pl. 4 (3–4)). *Upperside*: Ground colour milky-white with greenish yellow tinge. Forewing black distal border broad, with its inner edge slightly inclined towards tornus in spaces 1a and 1b+c. Hindwing with black distal border narrow (width at vein 4 about 2.0 mm). *Underside*: Forewing apex with subapical patch barely traceable.

Forewing length: Male 17.0–19.5 mm (n=7, avg=18.5 mm), female 17.0–21.5 mm (n=2, avg=19.3 mm).

Material studied: BORNEO: N. Borneo, Sabah, Hot Spring, 2 ♂, 17. vii. 1973, 2 ♂, 14–15, viii. 1968 [KUCGE]; Kundasang, 1 ♂, 3. viii. 1970, 1 ♂, 15. viii. 1970 (YAMADA) [TUA]; Poring, 1 ♂, 10. viii. 1964 (F. NAGAO) [NSA], 1 ♀, 26. xii. 1974 (KÔDA); Mt. Kinabalu (550 m), 1 ♀, 31. vii. 1971 (MORISHITA) [KUCGE].

Distribution: This subspecies occurs in N. Borneo.

Eurema ada iona (TALBOT, 1839)

Terias ada iona TALBOT, 1939: 537–538. Holotype ♂ (Malay Peninsula). [BMNH, examined]

Eurema ada iona (TALBOT); CORBET & PENDLEBURY, 1932: 175–176.

This subspecies is distinguishable from the nominate subsp. *ada* from N. Borneo by the following combination of characters.

Male (Pl. 4 (5–6)). *Upperside*: Ground colour somewhat darker. Forewing black costal border slightly narrower, sometimes barely traceable; black distal border sometimes narrower, with its inner edge more strongly inclined towards tornus in spaces 1a and 1b+c. Hindwing with black distal border usually narrower; fringe black, sometimes greenish yellow mixed with black. Basal portions of both wings more weakly blackish, sometimes barely traceable. *Underside*: Most markings generally more strongly developed. Forewing apex with marginal black smudge and subapical patch; small vein-dots sometimes very faint. **Female** (Pl. 4 (7–8)). Ground colour somewhat darker. On forewing upperside inner edge of black distal border more strongly inclined towards tornus in spaces 1a and 1b+c. *Underside*: Forewing apex usually with marginal black smudge and subapical patch.

Forewing length: Male 16.0–18.5 mm (n=7, avg=17.5 mm), female 13.5–19.5

mm ($n=4$, $\text{avg}=17.3$ mm).

Type material examined: *Terias ada iona* was described from several male and female specimens from the Malay Peninsula by TALBOT. The holotype is now in the BMNH and bears the following labels; 'Type HT (red) / Malay Peninsula, Selangor, Pahang, Ginting Simpah, 2080 ft., 1.vi. 1930 / *E. ada iona* Talb., ♂ holotype / A.S. Corbet, B.M. 1937. 615'. The BMNH also possess the female 'paratype', which bears similar data labels 'Type AT (red) / Ampang, 15.iv. 1928 / Type ♀ (A.T.)', does not belong to *ada*, but to *hecabe*.

Material studied: MALAY PENINSULA: Kg. Sahom, 1 ♂, i. v. 1972, 1 ♂, xi. 1972; Gua Panzang, 1 ♀, 7. x. 1968, 1 ♂, ix. 1968 (S. TAKETANI) [OMNH]; Taiping, 2 ♂, 18. v. 1974 (NAKAYAMA); Tapah, 1 ♂, 29. x. 1975 (S. SHINONAGA); Cameron Highland, 1 ♂, i. v. 1972, 1 ♀, 28. x. 1975 (H. SHIMA); Genting Highland, 1 ♀, 30. x. 1975 (H. SHIMA) [KUCGE].

Distribution: This subspecies occurs in the Malay Peninsula.

Eurema ada indosinica YATA, **ssp. nov.**

This new subspecies is distinguishable from the nominate subsp. *ada* from N. Borneo by the following combination of characters.

Male (Pl. 5 (1–6)). *Upperside:* Ground colour somewhat darker. Forewing black costal border much narrower, usually almost disappearing; black distal border narrower, with its inner edge usually more deeply excavated in spaces 2 and 3, and usually more strongly inclined towards tornus in spaces 1a and 1b+c. Hindwing with black distal border much narrower, usually reduced to marginal black anteciliary line; fringe greenish yellow, sometimes mixed with black. Basal portions of both wings more weakly blackish, sometimes barely traceable. *Underside:* Most markings generally more strongly developed. Forewing apex with marginal black smudge and subapical patch; small vein-dots sometimes barely traceable. **Female** (Pl. 5 (7–8)). *Upperside:* Ground colour somewhat darker. Forewing black costal border almost disappearing; forewing black distal border more widely and deeply excavated in spaces 2 and 3, with its inner edge more strongly inclined towards tornus in spaces 1a and 1b+c. *Underside:* Most markings usually more distinct.

Variation: In two specimens from northern Thailand, the hindwing black distal border is reduced to marginal black anteciliary line. This variation may probably be based on seasonal polyphenism.

Forewing length: Male 17.0–19.5 mm ($n=5$, $\text{avg}=18.4$ mm), female 16.5 mm.

Type-locality: Doi Inthanon, N. Thailand.

Distribution: This subspecies occurs in Indo-China.

Holotype: ♂, Doi Inthanon, N. Thailand, 7. i. 1958, YOSHIKAWA leg. (Holotype is deposited in the Biological Laboratory, College of General Education, Kyushu University, Fukuoka)

Paratypes: BURMA: Rangoon, 1 ♀, 1887, (ex. SWINHOE 1902–308) [BMNH]. THAILAND: Kanchanaburi, 1 ♂, 9. xii. 1975 (H. SHIMA); Doi Pui (1400 m), 1 ♂, 20. xii. 1975 (H. SHIMA) [KMNH] [KUCGE]; 1 ♂, [BMNH]. VIETNAM: N. Vietnam, Bac-Kan, 1 ♂, 1. 1927 (ex. DELACOUR & LOWE) [BMNH]; S. Vietnam, Col de Blao, 1 ♂, 7. x. 1962 (S. INOUE) [KUCGE].

Remarks. This subspecies is similar to subsp. *iona* from the Malay Peninsula, but distinguishable from the latter by the narrower black distal borders of fore- and hindwings, especially in female.

***Eurema ada toba* (DE NICÉVILLE, 1895)**

Terias toba DE NICÉVILLE, 1895: 496, ♀. (Sumatra) [untraced]

Terias hecabe toba DE NICÉVILLE; FRUHSTORFER, 1910: 167.

Terias lacteola toba DE NICÉVILLE; FRUHSTORFER, 1910: 170.

Eurema ada toba (DE NICÉVILLE); CORBET & PENDLEBURY, 1932: 7: 176.

Terias ada toba DE NICÉVILLE; TALBOT, 1939: 571.

This subspecies is distinguishable from the nominate subsp. *ada* from N. Borneo by the following combination of characters.

Male (Pl. 6 (1–2)). Ground colour slightly darker. *Upperside*: Forewing black costal border slightly narrower; black distal border with its inner edge more strongly inclined towards tornus in spaces 1a and 1b+c. Hindwing with black distal border somewhat narrower; basal portions of both wings usually somewhat more weakly blackish. *Underside*: Most markings generally more strongly developed. Forewing apex with marginal black smudge and subapical patch; small vein-dots sometimes very faint. **Female** (Pl. 6 (3–4)). Ground colour slightly darker. *Upperside*: On forewing inner edge of black distal border more strongly inclined towards tornus in spaces 1a and 1b+c. *Underside*: Forewing apex usually with marginal black smudge and subapical patch.

Forewing length: Male 19.0–20.5 mm (n=2, avg=19.8 mm), female 18.0 mm.

Material studied: SUMATRA: C. Sumatra, Padang, 1 ♂; Kalo Hill, 1 ♂ 1 ♀, vi. 1979 (NISHIYAMA) [KUCGE].

Distribution: This subspecies occurs only in Sumatra.

***Eurema ada roepkei* CORBET, 1941**

Eurema ada roepkei CORBET, 1941: 503. (Sumatra) [untraced]

This subspecies is distinguishable from the nominate subsp. *ada* from N. Borneo by the following combination of characters.

Male (Pl. 6 (5–6)). *Upperside*: Forewing black costal border much narrower; black distal border narrower, with its inner edge more strongly inclined towards

tornus in spaces 1a and 1b+c. Hindwing with black distal border much narrower; fringe black, mixed with greenish yellow. Basal portions of both wings more weakly blackish, sometimes barely traceable. *Underside*: Forewing apex with indistinct marginal black smudge and faint subapical patch. **Female** (Pl. 6 (7-8)). *Upperside*: Forewing black distal border narrower, with its inner edge more strongly inclined towards tornus in spaces 1a and 1b+c. Hindwing black distal border narrower. *Underside*: Most markings larger and more strongly developed; forewing apex with subapical patch.

Forewing length: Male 18.0 mm (n=2), female 19.0 mm.

Material studied: JAVA: W. Java, 1 ♂ 1 ♀, Soekanegara, 31. vii. 1939 [RMH]; 1 ♂, Mt. Mas, ix. 1981, (NAKAYAMA) [KUCGE].

Distribution: This subspecies occurs only in Java.

The *sari* group

The *sari* subgroup

Eurema celebensis (WALLACE, 1867)

[Pls. 7-8]

Terias celebensis WALLACE, 1867: 327, pl. VI, fig. 1. (Celebes)

Eurema celebensis (WALLACE); CORBET & PENDLEBURY, 1932: 188.

Diagnosis: Upperside forewing with black distal border much broad with its inner edge regular or weakly excavated in spaces 2 and 3; forewing black basal border absent in male; hindwing black distal border much broad and continued along anal margin; upperside of female extremely blackened, as a result oblique yellow markings recognizable, sometimes barely traceable, at discal and subapical portions on fore- and hindwings, respectively; a spot in discoidal cell; forewing underside with a series of submarginal spots from tornus to costa; uncus short, with uncus projection 'temple bell'-shaped in lateral aspect; ostium bursae opening posteriorly.

Description: **Male**. *Upperside*: Ground colour lemon yellow. Forewing black costal border very broad with its inner margin somewhat diffused; black distal border much broad with its inner edge oblique and irregular from costa to vein 4, usually obtuse-angled at vein 4, sometimes regular or weakly excavated in spaces 2 and 3, in space 1 almost perpendicular to basal margin; black basal border undeveloped; discocellular spot absent; fringe black. Hindwing black distal border much broad, tapering near apex, becoming broader towards tornus then gradually narrowed and extending to base, with its inner edge moderately defined; fringe black. Basal portions of both wings broadly blackish. *Underside*: Ground colour somewhat paler than on upperside. Forewing apex with marginal black smudge; submarginal spots appearing from costa to tornus; a minute spot in discoidal cell; small discocellu-

lar marking divided into an upper and a lower spots, covering more than half the discocellular vein; tornal spot well developed; sex-brand pale brown, long and narrow, ending somewhat before a point of origin of vein 2; small vein-dots conjoined with broad and distinct black anteciliary line; fringe black. Hindwing with a series of submarginal spots in spaces $1b+c$ to 8, arranged in a somewhat irregular zigzag-line, and a submarginal spot in spaces 7 and 8 almost comma-shaped and directed to midway between submarginal spot and discocellular spot; faint subbasal spot present each in spaces $1b+c$ and 7; a minute basal spot absent; discocellular spot almost same as in forewing; small vein-dots as in forewing; fringe black. Ultraviolet reflectance on upperside: Structurally reflective on yellow area except for tornal to anal region of hindwing, but diffused distally, appearing bright-white in UV-photos (Pl. 20 (4, upper)).

Forewing rounded at apex; distal margin fairly convex. Hindwing slightly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black and white-checked, except on the posterodorsal surface and a few apical segments, club cylindrical. Thorax and abdomen almost black, beneath yellow, clothed with black hairs on thorax and base of abdomen.

Forewing length: 18.5–20.5 mm.

Female. *Upperside:* Ground colour lemon yellow to pale greenish yellow; black marginal borders much broadened; forewing black distal border with its inner edge oblique from costa to vein 4, equally excavated in spaces 2 and 3, in space 1 confluent with black basal border which occupies entirely in basal half of forewing, as a result ground colour recognizable as yellow and oblique markings which are rarely disappearing; discocellular spot sometimes recognizable; fringe black. Hindwing with black marginal borders extremely broad, as a result ground colour recognizable as a yellow subapical marking which is rarely almost disappearing; fringe black. *Underside:* Similar to male, but most markings generally larger and more distinct. Ultraviolet reflectance on upperside: Almost absorbed, appearing entirely black in UV-photos (Pl. 20 (4, lower)).

Forewing length: 17.0–21.0 mm.

Male genitalia (Fig. 7): Tegumen narrow, triangular in dorsal aspect, somewhat concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus long (0.84 of ring height), angle between vinculum and saccus $80-90^\circ$. Uncus short (dorsum proper 0.63–0.73 of ring height), very slightly arched dorsally, extending somewhat downwards; uncal projection short (0.12 of ring height), "temple bell"—shaped in lateral aspect, projecting posterodorsally, with its apex weakly bicuspid. Valva almost as long as high, narrowed posteriorly; P1 somewhat weakly sclerotized, much shorter than P4, extending anteriorly, P2 represented by a broad and weak swelling; P3 broad and triangular; P4 represented by two processes, distal one of which is much longer and

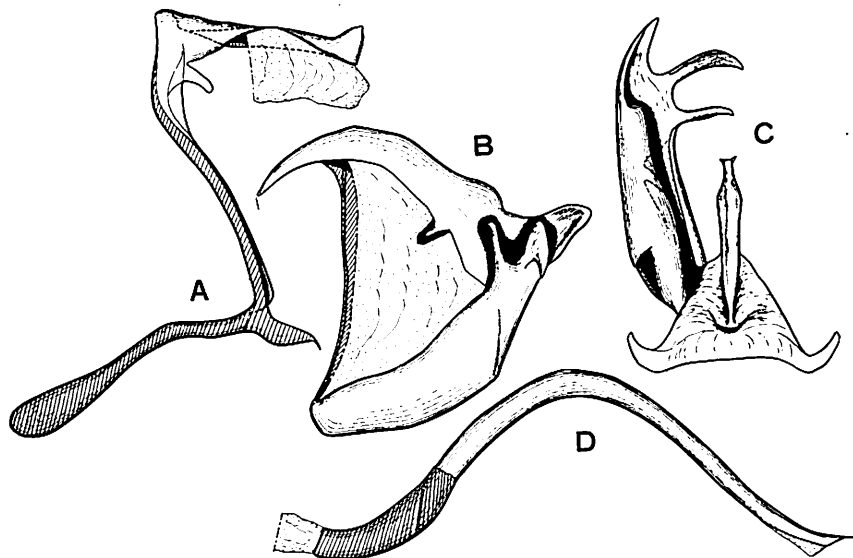


Fig. 7. Male genitalia of *Eurema celebensis celebensis* (WALLACE, 1867) from Sulawesi. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

more strongly curved ventrally than proximal one which is slightly sinuate. Phallus very long, slender and strongly arched dorsally, subzonal sheath about as long as $1/4$ length of phallus. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

Female genitalia (Fig. 8): Seventh abdominal sternum with nearly straight posterior margin. Lateral hollow elliptical, with dorsal eaves rather short and shallow, ventral eaves long and deep, median groove long, having a eaves and situated ventral $1/2$ of lateral hollow. Genital plate weakly invaginated ventromedially, obtuse-angled on its anterolateral corner in ventral aspect; longitudinal groove weakly sclerotized, broad and deep, slightly broadened posteriorly; banks of longitudinal groove well developed, somewhat narrowed anteriorly, with a small swelling at antigenital portion where regular stipples are distinctly recognizable. V-shaped wall undeveloped, but undulated swelling well developed. Ostium bursae opening near the middle of genital plate. Ductus bursae about $3\times$ as long as cervix bursae, membranous but weakly sclerotized on anterior $1/4$. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, slightly longer than apophysis posterioris, hamulated upwards in its apical $1/4$, with a prominent protuberance at the dorsal margin of proximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

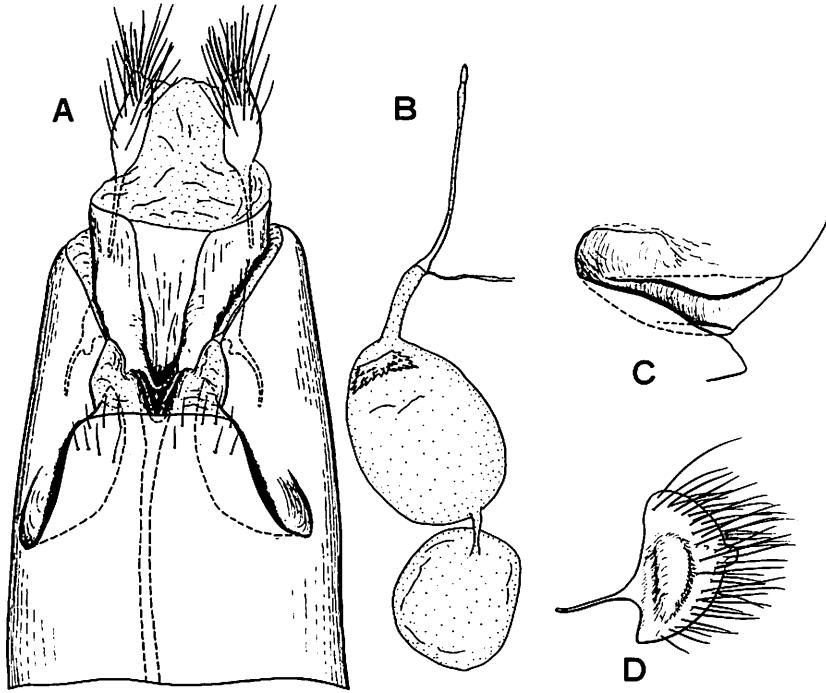


Fig. 8. Female genitalia of *Eurema celebensis celebensis* (WALLACE, 1867) from Sulawesi. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Lateral hollow (lateral). D: Papilla analis (lateral).

Variation: This species shows considerable variations in wing markings, especially in the developmental degree of black marginal borders.

Relationship: This species is closely related to *E. andersoni*, *E. beatrix*, *E. nilgiriensis* and *E. ormistoni* and these five seem to form a monophyletic group, with which the *sari* section is united.

Distribution: This species occurs in Sulawesi and Sula Isls.

Habitat: This butterfly seems to inhabit lowland forests, and it is rather rare in every places.

Early stages: The early stages are unknown.

***Eurema celebensis celebensis* (WALLACE, 1867)**

Terias celebensis WALLACE, 1867: 327, pl. VI, fig. 1, LECTOTYPE ♂ (Macassar) here designated. [BMNH, examined] (Celebes)

Terias celebensis celebensis WALLACE; FRUHSTORFER, 1910: 172.

Terias celebensis toalarum FRUHSTORFER, 1910: 172. (S. Celebes) [BMNH, Syntypes ♂ ♀, examined]

Eurema celebensis celebensis (WALLACE); CORBET & PENDLEBURY, 1932: 188.

The nominate subspecies is characterized by the following combination of characters.

Male (Pl. 7 (1–4)). *Upperside*: Forewing black distal border with its inner edge oblique and irregular from costa to vein 4, obtuse-angled at vein 4, regular or weakly excavated in spaces 2 and 3. Hindwing black distal border very broad, not extended in discoidal cell. *Underside*: Forewing with submarginal spots in spaces 2 and 3 fairly reduced, while tornal spot well developed. **Female** (Pl. 7 (5–8)). *Upperside*: Forewing black distal border with its inner edge oblique from costa to vein 4, weakly excavated in spaces 2 and 3, in space 1 confluent with black basal border which occupies entirely in basal half of forewing, as a result ground colour recognizable as yellow and oblique markings in various size; discocellular spot sometimes recognizable. Hindwing with a yellow subapical marking in various size. *Underside*: Submarginal spots usually well marked.

Forewing length: Male 18.5–20.0 mm (n=4, avg=19.5 mm), female 17.0–21.0 mm (n=5, avg=19.2 mm).

Type material examined: *Terias celebensis* was described from an unstated number of male and a female specimens from 'Celebes' by WALLACE. The BMNH now possesses a male and a female specimens. The male specimen bears the labels: 'Type (red) / Macassar, Wallace / Macassar, Hewitson Coll., 79. 69, *Terias celebensis*. 2 / Wallace, pt. 6, f. 1'. In addition the male bears the following labels; 'Lectotype (purple) / *Terias celebensis* Wallace LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. The female specimen bears similar data labels (Tondano, *Terias celebensis*, 3 / Tondano, N. Celebes, Wallace), and in addition the following labels; 'Paralectotype (blue) / *Terias celebensis* Wallace PARALECTOTYPE det. O. Yata 1990'.

Material studied: SULAWESI: S. Sulawesi, Makassar, 2♂1♀, 28–30. xi. 1973 (H. SHIMA), 1♂, 29. xi. 1973 (SHINONAGA) [KUCGE]; Bantimurung, 1♂1♀, 9. xii. 1972 (IGARASHI), 1♀, 18. viii. 1972 (IGARASHI) [IGARASHI coll.]; 'Celebes', 1♀, 19. ii. 1973 (GUNJI) [KUCGE].

Distribution: This subspecies is confined to Sulawesi in its distribution range.

Eurema celebensis exophthalma (FRUHSTORFER, 1910)

Terias celebensis exophthalma FRUHSTORFER, 1910: 172. LECTOTYPE ♂ (Sula Mangoli) here designated. [BMNH, examined]

Terias celebensis poeetia FRUHSTORFER, 1910: 172. (Sula Besi) [BMNH, Holotype ♀, examined]

Eurema celebensis exophthalma (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 188.

This subspecies is distinguishable from the nominate subsp. *celebensis* from Sulawesi by the following combination of characters.

Male (Pl. 8 (1–4)). *Upperside*: Forewing black marginal borders much broader; black distal border with its inner edge regular and not excavated in spaces 2 and 3;

basal portion more extensively black dusted. Hindwing black distal border extending in discoidal cell. *Underside*: Forewing with submarginal spots in spaces 2 and 3 not reduced, while tornal spot somewhat smaller, as a result submarginal spots almost same in size each other. **Female** (Pl. 8 (5–8)). *Upperside*: Black marginal borders on both wings extremely broader, as a result upperside almost blackened. *Underside*: Submarginal spots disappearing in spaces 2 and 3 on forewing and also in spaces 1 to 4 on hindwing.

Forewing length: Male 20.5 mm, female 19.5 mm.

Type material examined: *Terias celebensis exophthalma* was described from an unstated number of male and female specimens from 'Sula Mangoli' by FRUHSTORFER. The BMNH now possesses a male and a female specimens. The male specimen bears the labels: 'Type (red) / Sula Mongoli, Oct.–Novbr. Doherty, ex coll. H. Fruhstorfer / celebensis exophthalma, Fruhst. / Fruhstorfer Coll., B.M. 1937–285'. In addition the male bears the following labels; 'Lectotype (purple) / Terias celebensis exophthalma Fruhstorfer LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. The female specimen bears similar data labels, and in addition the following labels; 'Paralectotype (blue) / Terias celebensis exophthalma Fruhstorfer PARALECTOTYPE det. O. Yata 1990'.

Material studied: BANGGAI IS.: Noehion (450 m), 1 ♂, 20. xii. 1935 (K. BERG); Noelion, Peling, 1 ♀, 21. v. 1938 [RNH].

Distribution: This subspecies occurs in Sula Isls. (Sula Mangole, Sula Besi) and Banggai Is.

Eurema beatrix TOXOPEUS, 1939

[Pl. 9]

Eurema beatrix TOXOPEUS, 1939: 57–58. Holotype ♂ (W. Java). [Buitenzorg Mus.?, not examined]

Diagnosis: Upperside of male wings pale lemon yellow in ground colour; black distal border on forewing upperside with its inner edge slightly more deeply excavated in space 2 than in space 3; hindwing black distal border broad and strongly projected along each vein; a spot in discoidal cell; subapical patch on underside sharply defined, with its posterobasal portion clearly edged and right- or acute-angled; discocellular and basal spots on underside very large and prominent; saccus very long; ostium bursae opening at anterior end of genital plate.

Description: **Male** (Pl. 9 (1–4)). *Upperside*: Ground colour pale lemon yellow. Forewing black costal border somewhat broad but narrowed apically with its inner margin indistinct; black distal border broad, with its inner edge bluntly right-angled near base of vein 6, concaved between veins 4 and 6, almost right-angled at vein 4, slightly more deeply excavated in space 2 than in space 3, inclined slightly towards tornus in spaces 1a and 1b+c; black basal border undeveloped; discocellular

spot absent; fringe black. Hindwing black distal border broad, tapering near apex and tornus, with its inner edge sharply defined, zigzag-shaped and strongly projected along each vein; anal border undeveloped; fringe black, but mixed with yellow. Basal portions of both wings narrowly blackish. *Underside*: Ground colour somewhat paler than on upperside. Forewing apex with marginal black smudge well developed; subapical patch well developed and sharply defined, with its posterobasal portion clearly edged and right- or acute-angled; a zigzag-shaped spot in discoidal cell; discocellular marking appearing by an irregular slender ring, covering almost the whole of discocellular vein; faint tornal spot present; sex-brand salmon pink, long and broad, ending a point of origin of vein 2; small vein-dots conjoined with scattered black scales between them; fringe black, but mixed with yellow. Hindwing with a series of submarginal spots in spaces 1 to 8, arranged in an irregular zigzag-line, and a submarginal spot in spaces 7 and 8 bisinuate and directed towards the discocellular spot; circular subbasal spot large and prominent each in spaces 1 and 7 and in the middle of discoidal cell; a minute basal spot absent; discocellular spot almost same as in forewing, but larger; small vein-dots present; fringe yellow. Ultraviolet reflectance on upperside: Structurally reflective on yellow area except for tornal and anal regions of hindwing, but diffused distally, appearing bright-white in UV-photos (Pl. 20 (5, upper)).

Forewing somewhat angulate at apex; distal margin slightly convex. Hindwing slightly arched in the basal half of costal margin; distal margin slightly angulate at vein 3; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black and white-checked, except on the posterodorsal surface and a few apical segments, club cylindrical. Thorax and abdomen yellow, much darkened above, clothed with black and yellow hairs on thorax and base of abdomen, a black longitudinal line appearing along the lateral margin of abdominal terga.

Forewing length: 18.0–21.0 mm ($n=4$, $\text{avg}=18.9$ mm).

Female (Pl. 9 (5–6)). Similar to male, but differing as follows. Ground colour milky-white on upperside and greenish yellow on underside. Basal portions on upperside more extensively diffused. *Upperside*: Forewing black costal border narrower, with its inner edge more strongly diffused. *Underside*: Forewing with subapical and tornal spots more broadly developed. Ultraviolet reflectance on upperside: Moderately reflective on yellow area, appearing light gray in UV-photos (Pl. 20 (5, lower)).

Forewing length: 20.0–21.0 mm ($n=2$, $\text{avg}=20.5$ mm).

Male genitalia (Fig. 9): Tegumen narrow, triangular in dorsal aspect, somewhat concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus very long (1.0 of ring height), angle between vinculum and saccus about 90° . Uncus short (dorsum proper 0.6 of ring height), slightly arched dorsally, extending somewhat downwards,

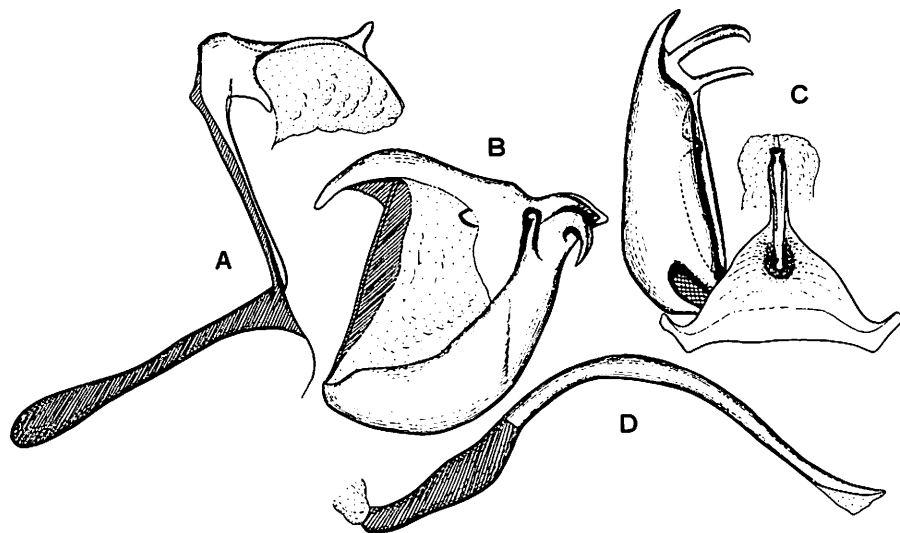


Fig. 9. Male genitalia of *Eurema beatrix* TOXOPEUS, 1939 from Java. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

with a long flap-like projection on its posterior end; uncal projection short (0.14 of ring height), usually projecting posterodorsally, with its apex weakly bicuspid. Valva almost as long as high; P1 weakly sclerotized, much shorter than P4, extending almost laterally; P2 only weakly produced; P3 broad and triangular, with a pointed apex; P4 represented by two processes, distal one of which is much longer than proximal one and much more strongly curved ventrally. Phallus very long, slender and strongly arched dorsally, subzonal sheath about as long as 1/3 length of phallus or somewhat shorter. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

Female genitalia (Fig. 10): Seventh abdominal sternum with nearly straight posterior margin. Lateral hollow elliptical, with dorsal eaves absent, ventral eaves long and deep, median groove long, having a eaves and situated ventral 1/2 of lateral hollow. Genital plate weakly invaginated ventromedially anterodorsally, obtuse-angled on its anterolateral corner in ventral aspect; longitudinal groove weakly sclerotized, deep and posteriorly broadened; banks of longitudinal groove well developed, narrowed anteriorly, with its inner margin having a narrow step. V-shaped wall undeveloped. Ostium bursae opening near the anterior end of genital plate. Ductus bursae about 2× as long as cervix bursae, membranous but weakly sclerotized on anterior 1/6. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, slightly longer than apophysis posterioris, sometimes hamulated upwards apically, with a prominent protuberance at the dorsal or inner margin of proximal portion.

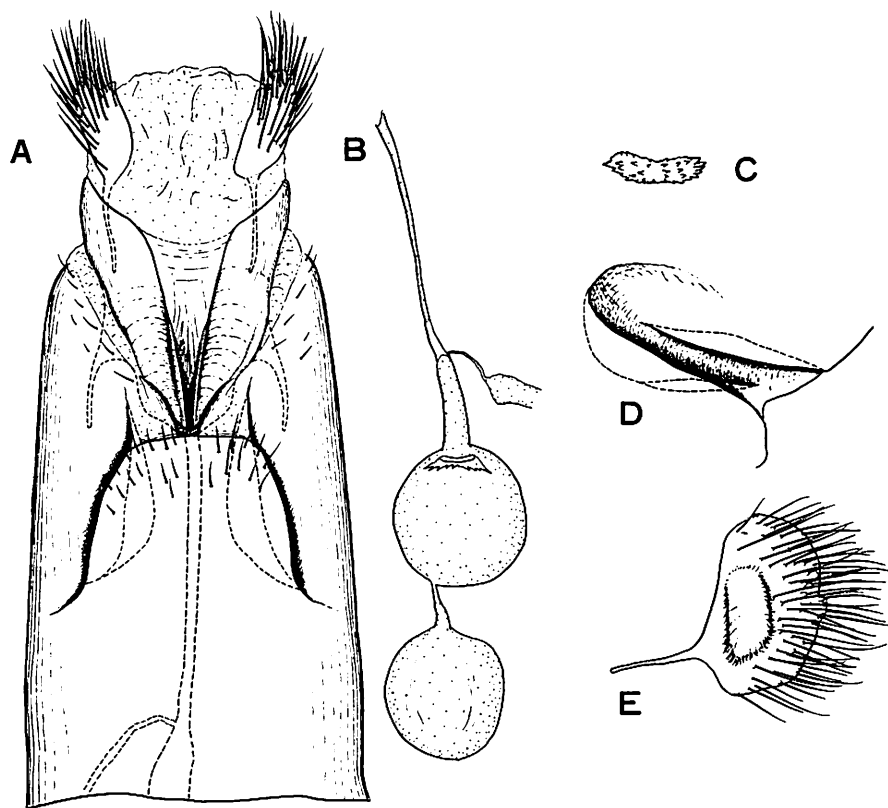


Fig. 10. Female genitalia of *Eurema beatrix* TOXOPEUS, 1939 from Java. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Signum (anterior). D: Lateral hollow (lateral). E: Papilla analis (lateral).

Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Variation: Among the specimens I examined, this species shows less prominent variation than the other species of the *sari* group.

Type material: Holotype ♂, W. Java, G. Manglajang (1500 m), 20. x. 1938, O. POCK-STEEN leg. [Buitenzorg Mus.?)

Material studied: JAVA: Java, Garoet, 1 ♂, 4. xii. 1936 [BMNH]; E. Java, Mt. Melierang? (1400 m), 2 ♂, xi. 1953 (W. A. HOMPE); Lawang (1200 m), 31. iii. 1935 (KALIS); W. Java, Soekanegara, 1 ♂, 19. iv. 1936 (TOXOPEUS), Tjisaroea (1200 m), 1 ♀, 1947 (STRAATMAN?) [RNH], 1 ♂, v. 1989 [KUCGE]. KAMODIAN IS.: 1 ♀, 10. v. 1917 [BMNH].

Relationship: This species is closely related to *E. andersoni*, *E. celebensis*, *E. nilgiriensis* and *E. ormistoni* and these five seem to form a monophyletic group, with which the *sari* section is united.

Distribution: This species is confined to Java in its distribution range.

Habitat and habits: This butterfly mainly inhabits mountain forest (alt. 600–1600 m) of Java and it seems to be very rare. According to Toxopeus (1939), "*Terias beatrix* seems to be a local mountain species. Near Soekanegara it was seen flying together with *T. ada*, on Mt. Manglajang with *T. montivaga*".

Early stages: The early stages are unknown.

***Eurema andersoni* (MOORE, 1886)**

[Pls. 9–16]

Terias andersoni MOORE, 1886: 47, pl. 4, fig. 8, ♂. (Mergui)

Terias andamana MOORE, 1907: 75, pl. 575, fig. 2a. dry f. (S. Andaman Isls.) (part)

Terias lacteola prabha FRUHSTORFER, 1910: 170. (Palawan)

Eurema andersoni (MOORE); CORBET & PENDLEBURY, 1932: 177.

Terias jordani CORBET, 1936: 168.

Diagnosis: Upperside of male wings lemon yellow in ground colour; black distal border on forewing upperside almost right-angled at vein 4, more deeply excavated in space 3 than in space 2; a spot in discoidal cell; uncus long and arched dorsally, with uncal projection fairly developed, projecting posterodorsally; ostium bursae opening posteriorly.

Description: *Wet-season form.*—**Male.** *Upperside:* Ground colour lemon yellow. Forewing black costal border usually broad with its inner margin sharply defined; black distal border generally broad, with its inner edge oblique and irregular from costa to vein 4, more or less angled in the midway, almost right-angled at vein 4, more deeply excavated in space 3 than in space 2, sometimes equally excavated in spaces 2 and 3, usually inclined slightly towards tornus in spaces 1a and 1b+c; black basal border undeveloped except in ssp. *jordani* (Sikkim, Bhutan); discocellular spot absent; fringe black. Hindwing black distal border generally broad, tapering near apex and tornus, with its inner edge moderately defined, usually zigzag-shaped, rarely projected along each vein; anal border usually undeveloped, but represented by scattered black scales continued along vein 1a in ssp. *jordani* and sometimes so in *sadanobui* (Indo-China); fringe black, sometimes mixed with yellow. Basal portions of both wings narrowly blackish, but heavily and widely black dusted in ssp. *jordani* and sometimes so in ssp. *sadanobui*. *Underside:* Ground colour somewhat paler than on upperside. Forewing apex with marginal black smudge; subapical patch absent or barely traceable; a 3-shaped spot in discoidal cell; discocellular marking appearing as an irregular slender ring, covering more than half of the discocellular vein; tornal spot usually absent, if present barely traceable; sex-brand pale salmon pink with brown tinge, long and narrow, ending slightly before a point of origin of vein 2; small vein-dots conjointed with a catenate black anticiliary line; fringe yellow, but mixed with black. Hindwing with a series of submarginal spots in spaces 1a to 8, arranged in an irregular zigzag-line, and a submarginal spot in spaces 7 and 8 usually

bisinate and directed towards the discocellular spot; circular subbasal spot usually present each in spaces 1b+c and 7 and in the middle of discoidal cell, but a spot in cell sometimes disappearing; a minute basal spot absent; discocellular spot almost same as in forewing; small vein-dots as in forewing; fringe yellow, but mixed with black. Ultraviolet reflectance on upperside: Structurally reflective on yellow area except for tornal to anal region of hindwing, but diffused distally, appearing bright-white in UV-photos (Pl. 20 (6–8, upper)).

Forewing somewhat angulate at apex; distal margin slightly convex. Hindwing slightly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black and white-checked, except on the postero-dorsal surface and a few apical segments, club cylindrical. Thorax and abdomen yellow, much darkened above, clothed with black and yellow hairs on thorax and base of abdomen, a black longitudinal line appearing along the lateral margin of abdominal terga.

Forewing length: 15.0–23.5 mm.

Female. Similar to male, but differing as follows. Ground colour milky-white to pale greenish yellow, and on underside somewhat paler. Basal portion on upperside more heavily and extensively black dusted. Forewing upperside with black costal border narrower, with its inner edge more strongly diffused in hindwing; black distal border broader. On underside tornal spot sometimes barely traceable. Ultraviolet reflectance on upperside: Almost absorbed, appearing gray to entirely black in UV-photos (Pl. 20 (6–8, lower)).

Forewing length: 15.0–22.0 mm.

Dry-season form.—Male & female. *Upperside:* Forewing black distal border narrower and less deeply excavated than in the wet-season form, sometimes its inner edge more strongly diffused; black costal border sometimes much narrower and more strongly diffused in its inner edge. Hindwing black distal border narrower than in the wet-season form and sometimes reduced to marginal vein-dots. *Underside:* Most markings more strongly developed, and usually tinged with brown in various degrees. On forewing subapical patch well developed and sometimes partially confluent with marginal black smudge; tornal spot usually present; vein-dots sometimes present. Hindwing with submarginal streak in spaces 7 and 8 more strongly zigzag-shaped and almost contiguous with discocellular marking.

Forewing length: Male 18.5–24.0 mm, female 18.5–23.5 mm.

Male genitalia (Fig. 11): Tegumen narrow, triangular in dorsal aspect, somewhat concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus moderately long (0.63–0.8 of ring height), angle between vinculum and saccus 80–90°. Uncus usually moderately long (dorsum proper 0.7–0.8 of ring height), arched dorsally, extending strongly downwards; uncal projection short (0.09–0.15 of ring height), usually

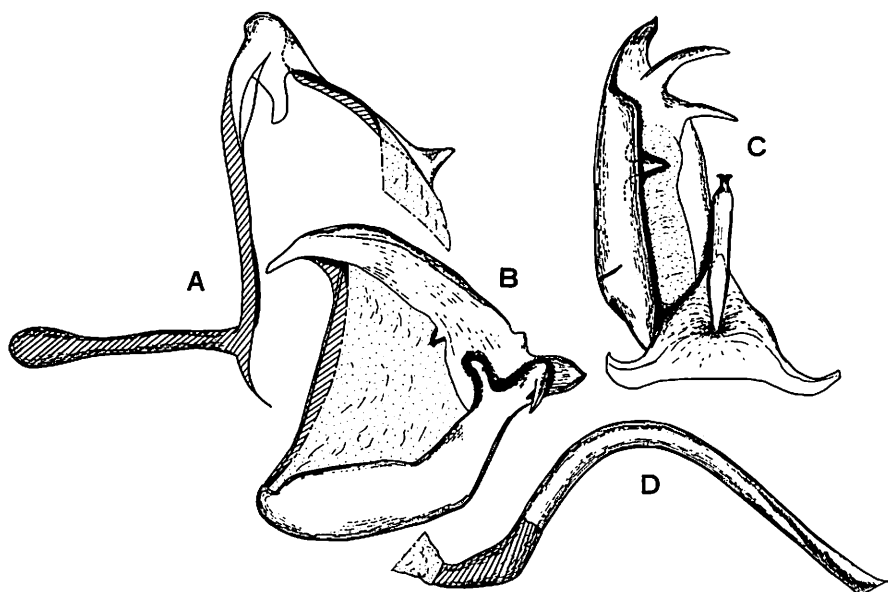


Fig. 11. Male genitalia of *Eurema andersoni andersoni* (MOORE, 1886) from the Malay Peninsula. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

projecting posterodorsally, with its apex weakly bicuspid. Valva almost as long as high; P1 somewhat weakly sclerotized, much shorter than P4, extending almost laterally, rarely disappearing; P2 absent, but a weak process usually producing dorsally just before P3; P3 broad and triangular, with a pointed apex; P4 represented by two processes, distal one of which is much longer than proximal one and more strongly curved ventrally. Phallus very long, slender and strongly arched dorsally, subzonal sheath about 1/4 as long as phallus. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

Female genitalia (Fig. 12): Seventh abdominal sternum with nearly straight posterior margin. Lateral hollow elliptical, with dorsal eaves rather short and shallow, ventral eaves long and deep, median groove long, having a weak eaves and situated ventral 1/2 of lateral hollow. Genital plate weakly invaginated ventromedially, obtuse-angled on its anterolateral corner in ventral aspect; longitudinal groove weakly sclerotized, broad and deep, parallel sided, but sometimes broadened at the middle; banks of longitudinal groove well developed, narrowed anteriorly. V-shaped wall undeveloped. Ostium bursae opening near the middle of genital plate. Ductus bursae about 1.67 length of cervix bursae, membranous but weakly sclerotized on anterior 1/4. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, slightly longer than apophysis posterioris, sometimes hamulated upwards apically or

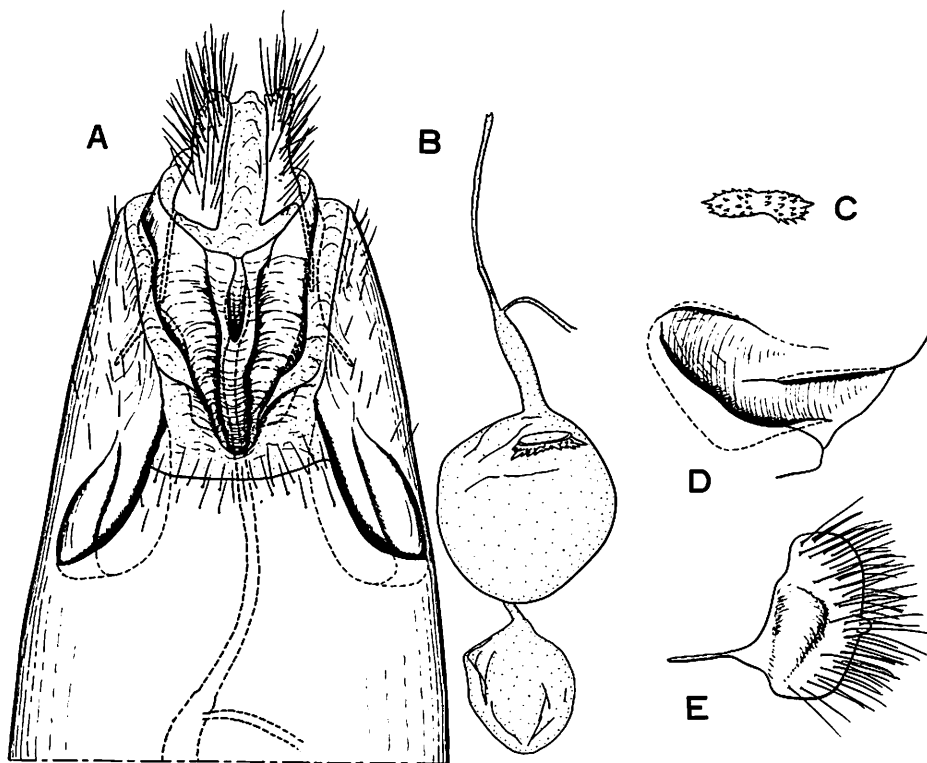


Fig. 12. Female genitalia of *Eurema andersoni andersoni* (MOORE, 1886) from the Malay Peninsula. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Signum (anterior). D: Lateral hollow (lateral). E: Papilla analis (lateral).

bended downwards medially, with a prominent protuberance at the dorsal margin of proximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Chromosome number: The haploid chromosome number is 29 in subsp. *godana* from Taiwan (MAEKI & AE, 1968).

Variation: This species is most variable geographically and seasonally in the *sari*-group. It shows considerable variations in wing markings and in female ground colour. The seasonal polyphenism of this species is rather strongly marked at least in the populations from Indo-China and Taiwan.

Relationship: This species is closely related to *E. celebensis*, *E. beatrix*, *E. nilgiriensis* and *E. ormistoni* and these five seem to form a monophyletic group, with which the *sari* section is united.

Distribution: This species has the broadest range within the *sari*-subgroup. It is distributed almost all over the Oriental Region, from India across Assam, Indo-China, Sundaland to Lesser Sundas and Taiwan.

Habitat and habits: This butterfly mainly inhabits lowland forests and is sometimes commonly found in forest edges or paths through forests. This species is generally localized and somewhat rare, especially in the tropics. The females are always rarer than the males. The abundance, however, differs considerably throughout this range. According to SHIRÔZU *et al.* (1965), for example, "Although in Formosa this species is usually rare, it is the commonest species in the genus *Eurema* in Urai and its vicinity in North Formosa". The flight is fairly swift for this genus. This species is multivoltine, and it is found flying all the year round in the subtropical and tropical regions.

Early stages: The early stages are poorly known. According to SHIRÔZU *et al.* (1965), SHIRÔZU observed that a female of this species deposited some eggs on the leaves of *Ventilago leiocarpa* (Rhamnaceae) in the course between Urai and Agyoku in N. Taiwan.

***Eurema andersoni andersoni* (MOORE, 1886)**

Terias andersoni MOORE, 1886: 47, pl. 4, fig. 8. LECTOTYPE ♂ (Mergui Isls.) here designated. [BMNH, examined]

Eurema andersoni andersoni (MOORE); CORBET & PENDLEBURY, 1932: 177–178. (Burma, E. & Peninsular Siam, Langkawi Isls., Malay Pen. Sumatra, N. Borneo)

Terias andersoni andersoni MOORE; TALBOT, 1939: 572.

The nominate subspecies is distinguishable from other subspecies by the following combination of characters.

Wet-season form.—Male (Pl. 10 (1–4)). **Upperside:** Black basal border undeveloped; hindwing black distal border moderately broad, with its inner edge sometimes projected along each vein; anal border undeveloped; basal portions of both wings narrowly blackish. **Underside:** Forewing apex with marginal black smudge barely traceable. Hindwing with a submarginal spot in spaces 7 and 8 bisinuate and directed towards the discocellular spot. **Female** (Pl. 10 (5–8)). **Upperside:** Ground colour pale greenish yellow; basal portion somewhat heavily and extensively black dusted; black distal borders broad, especially in forewing. **Underside:** Most markings generally well marked.

Forewing length: Male 17.0–21.0 mm (n=13, avg=19.4 mm), female 15.0–20.0 mm (n=9, avg=18.3 mm).

Dry-season form.—Male & female (Pl. 9 (7–8)). **Upperside:** Forewing black distal border somewhat narrow. **Underside:** Most markings well developed, but not so well developed as in males of ssp. *godana* and ssp. *inouei*.

Forewing length: Male 18.5–19.0 mm (n=2, avg=18.8 mm).

Type material examined: *Terias andersoni* was described from an unstated number of male and female specimens from 'Mergui' by MOORE. The BMNH now possesses a male and a female specimens. The male specimen bears the labels: 'Cotype

(yellow) / Mergui, Moore Coll. ♂ 1907-190. / Mergui ♂, *Terias andersoni* Moore ♂ / Specimen figd, Moore, Lep. Ind., Pl. 573, f. 2a.' In addition the male bears the following labels; 'Lectotype (purple) / *Terias andersoni* Moore LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. The female specimen bears similar data labels (Pl. 573, f. 2b), and in addition the following labels; 'Paralectotype (blue) / *Terias andersoni* Moore PARALECTOTYPE det. O. Yata 1990'.

Material studied: BURMA: Mergui Is., Maloolm, 1 ♀, 2. vi. 1961, 1 ♂, 17. vi. 1961, 1 ♂, 10. vii. 1961, 1 ♀, 5. ix. 1961, 2 ♂, 21-25. x. 1961, 1 ♀, 31. xii. 1961, 1 ♂ (dry f.), 12. iii. 1962, 1 ♂ (dry f.), 5. ix. 1962 (MORISHITA) [KUCGE]. MALAY PENINSULA: 3 ♂, 16. ix- 5. x. 1968 (TAKETANI); Langkawi Is., Padang, Lalang, 1p, 8. v. 1974 (NAKAYAMA); Taiping, 2 ♀, 3-7. iv. 1973; Cameron Highland, 1 ♀; Selangor, 1 ♂, 13. iii. 1964 (MORISHITA); Kg. Sahom, 1 ♂, xi. 1972 (NAKAYAMA); Singapore, 2 ♂ 1 ♀, 20-21. iv. 1969 (NAKAYAMA), Neesoon, 1 ♀, 19. iv. 1969 (NISHIMURA), B. Timash, Buki Panjan, 1 ♀ (H. SHIMA) [KUCGE]. SUMATRA: Kurui, 1 ♂, vii. 1979, Padang, 1 ♀ (NISHIYAMA) [KUCGE].

Distribution: This subspecies is distributed from Mergui Isls. (Burma), the Malay Peninsula and Sumatra.

Eurema andersoni godana (FRUHSTORFER, 1910)

Terias andersoni godana FRUHSTORFER, 1910: 169. LECTOTYPE ♂ (Formosa) here designated. [BMNH, examined]

Eurema andersoni godana (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 179.

This unique subspecies is distinguishable from the nominate subsp. *andersoni* from Mergui Isls. by the following combination of characters.

Wet-season form.—Male (Pl. 11 (1-2)). **Upperside:** Forewing black costal border sometimes more or less diffused; black distal border somewhat narrower, with its inner margin equally concaved in spaces 2 and 3. **Underside:** Most markings generally somewhat fainter. **Female** (Pl. 11 (3-4)). **Upperside:** Black distal borders fairly narrower, with its inner edge more indistinct, especially in hindwing. **Underside:** Markings generally fainter, especially in distal halves.

Forewing length: Male 15.0-23.5 mm (n=14, avg=21.1 mm), female 17.0-22.0 mm (n=3, avg=19.3 mm).

Dry-season form.—Male & female (Pl. 11 (5-8)). **Upperside:** Forewing black costal border almost disappearing; black distal border much narrower, with its inner edge much diffused from costa to vein 4, obtuse-angled at vein 4; hindwing black distal border reduced to vein-dots. **Underside:** Most markings larger and more sharply defined.

Forewing length: Male 19.5-24.0 mm (n=11, avg=22.6 mm), female 18.5-23.5 mm (n=5, avg=21.7 mm).

Type material examined: *Terias andersoni godana* was described from an unstated

number of male and female specimens from 'Formosa' by FRUHSTORFER. The BMNH now possesses a male and a female specimens. The male specimen bears the labels: 'Type (red) / Formosa, Fruhstorfer / Taihanroku, 1-7 VII 08 / andersoni godana Fruhst. / Fruhstorfer Coll., B. M. 1937-285.' In addition the male bears the following labels; 'Lectotype (purple) / Terias andersoni godana Fruhstorfer LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. The female specimen bears similar data labels, and in addition the following labels; 'Paralectotype (blue) / Terias andersoni godana Fruhstorfer PARALECTOTYPE det. O. Yata 1990'.

Material studied: TAIWAN: Taiwan, loc. unknown, 1 ♂, 1962; Puli(HORI), 2 ♂ 1 ♀, vi. 1958; Miaoli, Hsien, Mt. Shihtoushan, 1 ♂, 24-26. v. 1980 (MAKIHARA); Taipei, Pei-Shih-Chi, 1 ♀, 19. vi. 1965 (KUROSAWA) [NSA]; Pingtung Hsien, Kentin Park, 1 ♂ 1 ♀ (dry f.), 16-17. iii. 1968 (ARITA), 1 ♂ (dry f.), 16. iii. 1968 (OKADOME) [MUFA], 1 ♀, 19. v. 1973 (YOSHIYASU) [KUCGE].

Distribution: This race is confined to Taiwan in its distribution.

***Eurema andersoni sadanobui* SHIRÔZU & YATA, 1982**

Eurema andersoni inouei SHIRÔZU & YATA, 1981: 50. (preoccupied by *Eurema simulatrix inouei* SHIRÔZU & YATA, 1973) Holotype ♂ (Kampot, Cambodia). [KUCGE, examined]

Eurema andersoni sadanobui SHIRÔZU & YATA, 1982: 25, nom. nov.

This subspecies is distinguishable from the nominate subsp. *andersoni* from Mergui Isls. by the following combination of characters.

Wet-season form.—Male (Pl. 12 (1-2)). **Upperside:** Ground colour somewhat darker; forewing black costal border sometimes broader with its inner margin more strongly diffused; black distal border broader; hindwing black distal border broader, scattered black scales continuing along vein 1 from tornus to base. **Underside:** Marginal vein-dots conjointed with a more distinct catenate black anticiliary line. **Female** (Pl. 12 (3-4)). **Upperside:** Black distal borders much broader (about 1.5× as wide as in nominate subspecies), with its inner edge in space 1 on forewing inclined towards base.

Dry-season form.—Male (Pl. 12 (5-8)). **Upperside:** Forewing black costal border narrower; black distal border narrower, with its inner edge somewhat more deeply excavated in spaces 2 and 3. **Underside:** Most markings usually well developed and more sharply defined. **Female.** Not examined.

Forewing length: Male 18.0-22.0 mm (n=16, avg=19.7 mm), female 18.0-19.0 mm (n=16, avg=19.7 mm).

Type material examined: *Eurema andersoni inouei* was described from male and a female specimens by SHIRÔZU and YATA. The holotype male specimen is now in KUCGE and bears the following labels; 'CAMBODIA, Kampot, Tuk Chhou, 17. vi. 1962 (S. Inoue) / *Eurema andersoni inouei* Shirôzu & Yata, 1981, Holotype ♂ (red)

/ *Eurema andersoni sadanobui* Shirôzu & Yata, 1982, Holotype ♂ (red)'. KUCGE and DBA also possess the following paratypes: 1 ♂ with label 'S. VIET-NAM, Trang Bom, 7. viii. 1960, S. Inoue leg.', 1 ♀ with similar label (10. vi. 1962); 2 ♂ with similar labels (15. vii. 1962), 1 ♂ with label 'S. VIET-NAM, Dinh Quan, 6. v. 1962, S. Inoue leg.', 1 ♂ with label 'S. VIET-NAM, Banmethout, 16. viii. 1962, S. Inoue leg.' [KUCGE]; 4 ♂ with labels 'THAILAND, Khao Yoi', 1 ♀ with label 'THAILAND, Chon Buri' [DBA]; 2 ♂ with labels 'THAILAND, Nakhon Ratchasima, 14. iv. 1972, Yoshiyasu leg.' [KUCGE]. All the paratypes also have the following labels, '*Eurema andersoni inouei* Shirôzu & Yata, 1981, Paratype (orange) / *Eurema andersoni sadanobui* Shirôzu & Yata, 1982, Paratype (orange)'.

Distribution: This race is distributed from S. Vietnam across Cambodia and Thailand to Assam(?).

Eurema andersoni jordani CORBET & PENDLEBURY, 1932

Eurema andersoni jordani CORBET & PENDLEBURY, 1932: 180. LECTOTYPE ♀ (Sikkim) here designated. [BMNH, examined]

Terias jordani (CORBET & PENDLEBURY); Corbet, 1936: 168, ♂.

Terias andersoni jordani (CORBET & PENDLEBURY); TALBOT, 1939: 571.

This subspecies is distinguished from the nominate subsp. *andersoni* from Mergui Isls. by the following combination of features.

Male (Pl. 13 (1–2)). *Upperside*: Forewing with black distal border broader, narrowly extending towards base for 1/2 of basal margin; hindwing black distal border broader, especially towards tornus, with its inner edge more strongly diffused, often narrowly continued along anal margin from tornus to base. **Female** (Pl. 13 (3–4)). *Upperside*: Forewing black distal border broader, extending towards base; hindwing black distal border much broader, especially towards tornus, with its inner edge more strongly diffused, continued along anal margin from tornus to base. *Underside*: Forewing with well developed subapical patch; tornal spot small but distinct.

Forewing length: Male 23.0–24.0 mm (n=2, avg=23.5 mm), female 20.0–24.0 mm (n=3, avg=22.3 mm).

Taxonomic remarks: Although this subspecies was originally described as a subspecies of *andersoni* by CORBET and PENDLEBURY (1932), CORBET (1936) raised it to specific rank. However, I regard *jordani* as a subspecies of *andersoni*, because the male genitalia illustrated by CORBET (1941) are included in the range of variation of *andersoni*, and the wing marking of the subspecies is somewhat similar to that of *andersoni sadanobui* from Indo-China.

Type material examined: *Eurema andersoni jordani* was described from 2 females from 'Sikkim' and a female from 'Bhutan' by CORBET & PENDLEBURY. In the BMNH I found only a female specimen from Sikkim. The female specimen bears

the labels: 'Type (red) / Sikkim, 18. 10 1888, O. Moller / *Eurema andersoni jordanii*, ♀ Type Corbet'. In addition the female bears the following labels; 'Lectotype (purple) / *Terias andersoni jordanii* Corbet & Pendlebury LECTOTYPE det. O. Yata 1990' and hereby designated lectotype. According to the original description, the other female specimen from Sikkim bears similar data labels (8th September, 1888), and the other from Bhutan in the followings (Chumbi, Bhotan, taken in May, 1894, by G. C. DUDGEON).

Materials studied: SIKKIM: Sikkim, 1 ♂ (Neoallotype), vi. 1906 (Brig.-Gen. E. R. B. STOKES-ROBERTS) [BMNH]. ASSAM: Shillong, 1 ♂, 1936, Ruby Mines District, KHBH, November 1922 (ARCHBALD Coll.) [BMNH]. BURMA: N. Burma, Bhamo [BMNH].

Distribution: This subspecies is distributed from Sikkim to Bhutan.

***Eurema andersoni evansi* CORBET & PENDLEBURY, 1932**

Terias andamana MOORE, 1906: 75, pl. 575, fig. 2a (dry f.) ♂. (Andaman) (part)

Eurema andersoni evansi CORBET & PENDLEBURY, 1932: 179–180. Holotype ♂ (S. Andaman Isls.). [BMNH, examined]

Terias andersoni evansi (CORBET & PENDLEBURY); TALBOT, 1939: 572.

This subspecies is distinguished from the nominate subsp. *andersoni* from Mergui Isls. by the following combination of features.

Male (Pl. 13 (5–6)). *Upperside*: Ground colour somewhat paler; forewing black distal border narrower, with its inner edge more strongly inclined toward tornus; hindwing black distal border much narrower, represented by marginal vein-dots conjoined with a catenate black anticiliary line. *Underside*: Markings more distinct and subapical patch well developed, almost confluent with marginal smudge. **Female** (from MOORE, 1906 [Pl. 575, 2b, c]). *Upperside*: Hindwing black distal border much narrower. *Underside*: Most markings more distinct; subapical patch well developed, almost confluent with marginal smudge; tornal spot well developed and submarginal spots in spaces 2 and 3 usually present.

Forewing length: Male 21.0–21.5 mm (n=3, avg=21.3 mm).

Type material examined: *Eurema andersoni evansi* seems to be described from a male from 'S. Andamans' by CORBET and PENDLEBURY. The BMNH now possesses the holotype which bears the labels: 'Type (red) / S. Andamans. / Port Blair, 12–03 / Bingham Coll. / Type of *Terias evansii* Corbet / Coll. Moore., 94–67. / *andamana* Moore'.

Distribution: This subspecies is confined to South Andaman Isls. in its distribution range.

***Eurema andersoni anamba* CORBET & PENDLEBURY, 1932**

Eurema andersoni anamba CORBET & PENDLEBURY, 1932: 178. Holotype ♂ (Anamba Isls.). [BMNH,

examined]
Terias andersoni anamba (CORBET & PENDLEBURY); TALBOT, 1939: 572.

This subspecies is distinguished from the nominate subsp. *andersoni* from Mergui Isls. by the following combination of features.

Male (Pl. 13 (7–8)). *Upperside*: Forewing with black distal border narrower, with its inner edge slightly toothed on vein 4, more deeply concaved in spaces 2 and 3; hindwing black distal border narrower. *Underside*: Most markings redder, more well developed and more clearly defined; subapical patch barely traceable; on hindwing subbasal spot in discoidal cell punctiform, not circular. **Female**. Not examined.

Type material examined: *Eurema andersoni anamba* seems to be described from a male from 'Anamba Isls.' by CORBET and PENDLEBURY. The BMNH now possesses the holotype which bears the labels: 'Type (red) / *Eurema andersoni anamba*, Corbt+Pend., H. M. Pendlebury, det TYPE 1932 / Anamba Ids, P. Jimaja, Oct 16th 1925 / Brit Mus. 1934–80'.

Forewing length: 20.5 mm (holotype).

Distribution: This subspecies occurs in Anamba Isls. (West Malaysia)

***Eurema andersoni nishiyamai* SHIRÔZU & YATA, 1981**

Eurema andersoni nishiyamai SHIRÔZU & YATA, 1981: 52–54. Holotype ♂ (Nias). [KUCGE, examined]

This subspecies is distinguishable from the nominate subsp. *andersoni* from Mergui Isls. by the following combination of characters.

Male (Pl. 14 (1–2)). *Upperside*: Forewing black distal border with its inner edge in space 1 inclined towards base. *Underside*: Most markings generally fainter, especially in hindwing a series of submarginal spots almost disappearing in space 6; subbasal dot in discoidal cell on hindwing absent; subapical patch barely traceable. **Female** (Pl. 14 (3–4)). *Upperside*: Black distal borders slightly narrower, with its inner edge in forewing more deeply excavated in spaces 2 and 3. *Underside*: Most markings fainter; subbasal spot in discoidal cell on hindwing absent; subapical patch barely traceable.

Forewing length: Male 19.5–21.0 mm (n=3, avg=20.2 mm), female 18.0–19.5 mm (n=2, avg=18.8 mm)

Type material examined: *Eurema andersoni nishiyamai* was described from 3 male and a female specimens by SHIRÔZU and YATA. The holotype male is now in KUCGE and bears the following labels; 'S. Nias, Telukdalam, vi. 1979, Y. Nishiyama leg. / *Eurema andersoni nishiyamai* Shirôzu & Yata, 1981, Holotype ♂ (red)'. The KUCGE also possesses 2 males and 1 female, bearing similar data labels '(Paratype (orange))'.

Material studied: C. NIAS: Masio, Helezelulu, 1 ♂ 1 ♀, vii–viii. 1979 [ET].

MENTAWIS: Sibert Is., 1 ♂, xii. 1983 [ET]; Sipora, 1 ♀, 26. v. 1989 [KUCGE].

Distribution: This race occurs in Nias and Mentawis (Sibert, Sipora).

***Eurema andersoni prabha* (FRUHSTORFER, 1910)**

Terias lacteola prabha FRUHSTORFER, 1910: 169. LECTOTYPE ♀ (Taot-Daram, Palawan) here designated. [BMNH, examined]

Eurema ada prabha FRUHSTORFER; CORBET & PENDLEBURY, 1932: 177.

Eurema andersoni konoyi MORISHITA, 1973: 102–103. (Palawan)

Eurema andersoni prabha (FRUHSTORFER); YATA, 1981: 239.

This subspecies is distinguishable from the nominate subsp. *andersoni* from Mergui Isls. by the following combination of characters.

Male (Pl. 14 (5–6)). *Upperside*: Ground colour somewhat paler; forewing black costal border sometimes broader with its inner margin more sharply defined; black distal border broader, with its inner edge more sharply defined and more deeply excavated in space 3. *Underside*: Most markings usually more indistinct; subapical patch absent. Forewing termen somewhat more straight. Hindwing somewhat angulate at vein 3. **Female** (Pl. 14 (7–8)). *Upperside*: Ground colour milky-white with greenish yellow tinge; black distal border slightly broader, with its inner edge more deeply excavated in space 3; basal portions of both wings more heavily and extensively black dusted. *Underside*: Ground colour milky-white with greenish yellow tinge; apical and subapical to tornal spots (submarginal series) more strongly developed.

Forewing length: Male 19.0–21.5 mm (n=3, avg=20.0 mm), female 19.0–21.5 mm (n=6, avg=20.3 mm).

Type material examined: *Terias lacteola prabha* was described from an unstated number of female specimens from 'Palawan' by FRUHSTORFER. The BMNH now possesses a female specimen, bearing the labels: 'Type (red) / Palawan, 1898. Doherty / ex coll. H. Fruhstorfer / lacteola prabha Fruhstorfer / Fruhstorfer Coll., B. M. 1937–285.' In addition the male bears the following labels; 'Lectotype (purple) / *Terias lacteola prabha* Fruhstorfer LECTOTYPE det. O. Yata 1990' and hereby designated lectotype.

Material studied: PALAWAN: Quezon, 3 ♂2 ♀, 10–13. xii. 1969 (HIURA & MIYATAKE) [OMNH]; Tagbunga, 3 ♀, 7. xii. 1970, 1 ♀, 5. i. 1971 (MIYATA) [KUCGE].

Distribution: This race is confined to Palawan in its distribution range.

***Eurema andersoni albida* SHIRÔZU & YATA, 1982**

Eurema andersoni borneensis SHIRÔZU & YATA, 1981: 52. (preoccupied by *Eurema hecabe borneensis* (FRUHSTORFER, 1910)) Holotype ♂ (N. Borneo). [KUCGE, examined]

Eurema andersoni albida SHIRÔZU & YATA, 1982: 25, nom. nov.

This subspecies is distinguishable from the nominate subsp. *andersoni* from Mergui Isls. by the following combination of characters.

Male (Pl. 15 (1–2)). *Upperside*: Ground colour somewhat paler. *Underside*: Most markings generally somewhat fainter; subapical patch barely traceable. Ultra-violet reflectance on upperside: Almost absorbed, appearing gray to entirely black in UV-photos (Pl. 49 (7, upper)). **Female** (Pl. 15 (3–4)). *Upperside*: Ground colour usually milky-white. *Underside*: Ground colour usually milky-white, diffusely margined with pale greenish yellow; markings much fainter; subapical patch usually barely traceable.

Forewing length: Male 15.8–21.5 mm (n=8, avg=19.6 mm), female 18.0–21.0 mm (n=10, avg=19.4 mm).

Type material examined: *Eurema andersoni albida* was described from male and female specimens by SHIRÔZU and YATA. The holotype male specimen is now in KUCGE and bears the following labels; 'Borneo, Sarawak, Santuboung, 19. xi. 1975, H. Shima leg. / *Eurema andersoni borneensis* Shirôzu & Yata, 1981, Holotype ♂ (red) / *Eurema andersoni albida* Shirôzu & Yata, 1982, Holotype ♂ (red)'. The KUCGE, MUFA, NSM and OMNH also possess the following paratypes: 2 ♂ 1 ♀ with labels 'Borneo, Sarawak, Santuboung, 19. xi. 1975, H. Shima leg.' [KUCGE]; 2 ♂ with similar labels (28.ii – 6.iii. 1969, T. KUNOU & ARITA leg.) [MUFA]; 1 ♂ with label 'Borneo, Sarawak, Lohang, 14. viii. 1969, F. Nagao leg.' [NSM]; 1 ♂ with label 'Borneo, Sabah, Kinabalu, 17. v. 1980, Y. Nishiyama leg.' [KUCGE]; 2 ♀ with similar labels (14–16. vii. 1973, M. NAKAYAMA leg.) [KUCGE]; 1 ♀ with similar label (11. viii. 1968) [OMNH]; 3 ♂ 1 ♀ with labels 'Borneo, Sabah, Poring, 1–7. i. 1975, N. Kôda leg.', 1 ♂ 1 ♀ with similar label (Tomani, 20. i. 1975) [KUCGE] All the paratypes also have the following labels, '*Eurema andersoni borneensis* Shirôzu & Yata, 1981, Paratype (orange) / *Eurema andersoni albida* Shirôzu & Yata, 1982, Paratype (orange)'.

Material studied: BORNEO: Amo, 1 ♀, 22. ii. 1962 [KUCGE]; N. Borneo, 1 ♀, 8. viii. 1968 (G. IMADATE) [NSM].

Distribution: This race is confined to North Borneo in its distribution range.

Eurema andersoni udana (FRUHSTORFER, 1910)

Terias andersoni udana FRUHSTORFER, 1910: 169. Holotype? ♂ (W. Java). [BMNH, examined]

Terias lacteola varga FRUHSTORFER, 1910: 169. Allotype ♀ (W. Java) [BMNH, examined] (part)

Eurema andersoni udana (FRUHSTORFER); CORBET & PENDLEBURY, 1932: 179.

This subspecies is distinguishable from the nominate subsp. *andersoni* from Mergui Isls. by the following combination of characters.

Male (Pl. 15 (5–6)). *Upperside*: Ground colour somewhat paler. *Underside*: Most markings more indistinct; subapical patch barely traceable. **Female** (Pl. 15

(7-8)). *Upperside*: Ground colour milky-white with greenish yellow tinge; black distal border sometimes slightly narrower, with its inner edge in space 1 more strongly inclined towards tornus; base of both wings less heavily black dusted. *Underside*: Ground colour milky-white with greenish yellow tinge; subapical and tornal spots well developed and more clearly defined.

Forewing length: Male 21.0 mm (n=2, avg=21.0 mm), female 18.0 mm.

Type material examined: *Terias andersoni udana* was described from an unstated number of male and female specimens by FRUHSTORFER. The one male (holotype?) is now in BMNH and bears the following labels; 'Type H T (red) / Type (red) / Java occident, Sukabumi. 2000, ex coll. H. Fruhstorfer / andersoni udana Fr. / Fruhstorfer Coll., B.M. 1937-285.'

Materials studied: JAVA: 1 ♂, (Nire?); Sockaboemi, 1 ♀, 1919 (Dr. J. A. C.) [KUFA]; W. Java, Mt. Mas, 1 ♂, ix. 1981 (NAKAYAMA) [KUCGE].

Distribution: This race is confined to Java in its distribution range.

Eurema andersoni kashiwaii SHIRÔZU & YATA, 1981

Eurema andersoni kashiwaii SHIRÔZU & YATA, 1981: 54. Holotype ♂ (E. Sumba). [KUCGE, examined]

This subspecies is distinguishable from the nominate subsp. *andersoni* from Mergui Isls. by the following combination of characters.

Male (Pl. 16 (1-2)). *Upperside*: Forewing black distal border narrow, with its inner edge in space 1 more strongly inclined towards tornus; hindwing black distal border fairly narrower; basal portion of hindwing more clearly defined. *Underside*: Most markings more clearly defined; subapical patch well developed and often almost confluent with marginal smudge; tornal spot well developed; on hindwing a subbasal ring spot in discoidal cell always present. **Female** (Pl. 16 (3-4)). *Upperside*: Ground colour usually somewhat paler; black distal borders fairly narrower, with its inner edge more strongly inclined towards tornus on forewing. *Underside*: Most markings more clearly defined; subapical patch well developed and almost confluent with marginal smudge; elongate tornal spot well developed, accompanying a submarginal spot in space 2; on hindwing subbasal ring spot in discoidal cell always present, generally fainter, especially in distal half.

Forewing length: Male 17.0-20.0 mm (n=12, avg=18.9 mm), female 19.0-19.5 mm (n=3, avg=19.3 mm).

Type material examined: *Eurema andersoni kashiwaii* was described from 11 male and 3 female specimens by SHIRÔZU and YATA. The holotype male specimen is now in KUCGE and bears the following labels; 'Sumba Is., E. Sumba, Kambata, Wandut, Lewapaku, 10. ix. 1979, N. Kashiwai leg. / *Eurema andersoni kashiwaii* Shirôzu & Yata, 1981, Holotype ♂ (red)'. The KUCGE also possesses 10 males and 2 females, bearing similar data labels '(6-10. ix. 1979 / Paratype (orange))'.

Material studied: FLORES: W. Flores, 1 ♂ (NISHIYAMA) [KUCGE].

Distribution: This race occurs in Sumba and Flores.

Habitat: This butterfly inhabits the forest and prefers the sunny places in E. Sumba (Mr. N. KASHIWAI, pers. com.).

***Eurema nilgiriensis* YATA, 1990**

[Pls. 16–17]

Eurema nilgiriensis YATA, 1990*: 161–165, Figs. 1–5, 9. Holotype ♂ (Nilgiri Hills). [KUCGE, examined]

Diagnosis: Black distal border on forewing upperside broad, with its inner edge much obtuse-angled at vein 4, more deeply excavated in space 2 than in space 3, evenly concaved in each of spaces 2 and 3; hindwing black distal border of female narrower and strongly zigzag-shaped, with its inner edge distinctly projected along each vein; forewing underside of female with apical patch large, quadrate and entirely bright chocolate brown with luster.

Description: **Male** (Pl. 16 (5–8)). *Upperside:* Ground colour yellow. Forewing black costal border broad with its inner margin sharply defined; black distal border broad, with its inner edge more or less irregularly incurved from costa to vein 4, much obtuse-angled at vein 4, more deeply excavated in space 2 than in space 3, evenly concaved in each of spaces 2 and 3, almost perpendicular to hindmargin or slightly inclined towards tornus in spaces 1a and 1b+c; black basal border undeveloped; discocellular spot absent; fringe black. Hindwing black distal border usually broad, tapering near apex and tornus, with its inner edge almost uniform and moderately defined, sometimes weakly and short projected along each vein; anal border undeveloped; fringe black, but mixed with yellow. Basal portions of both wings blackish. *Underside:* Ground colour somewhat paler than on upperside. Forewing apex with marginal black smudge usually very faint and subapical patch usually barely traceable, but these markings sometimes well developed and partially confluent with each other; a 3-shaped spot in discoidal cell; discocellular marking appearing as an irregular slender ring, covering more than half of the discocellular vein; tornal spot absent; sex-brand pale grey, short and narrow, ending before origin of vein 2; small vein-dots usually conjointed with a catenate black anticiliary line, but sometimes strongly developed and represented by a series of marginal small triangles; fringe black. Hindwing with a series of submarginal spots in spaces 1 to 8 arranged in an irregular zigzag-line, those in spaces 4 to 8 usually larger and more diffused,

* The species name, *nilgiriensis*, appeared first in the previous part (Part I) of the present paper (YATA, 1989) with its short description (key characters). The detailed description of *nilgiriensis*, however, was published later in another paper (YATA, 1990; Esakia, Special Issue (1): 161–165) which was to be published before the Part I. I propose here to select the paper of YATA (1990) as the original description of *Eurema nilgiriensis*.

and a submarginal spot in spaces 7 and 8 comma-shaped and directed to midway between submarginal spot in space 6 and discocellular spot; circular subbasal spot usually present each in spaces 1 and 7 and in the middle of discoidal cell; a minute basal spot absent; discocellular spot almost same as in forewing but larger; small vein-dots as in forewing; fringe yellow, but mixed with black.

Forewing weakly angulate at apex; distal margin slightly convex. Hindwing slightly arched in the basal half of costal margin; distal margin evenly rounded or weakly angulate at vein 3; vein 7 usually stalked with vein 6, *mdc* about $1/3$ as long as *ldc*. Antenna somewhat less than half the length of forewing, black and white-checked, except on the posterodorsal surface and a few apical segments, club cylindrical. Thorax and abdomen yellow, much darkened above, clothed with black and yellow hairs on thorax and base of abdomen, a black longitudinal weak line appearing along the lateral margin of abdominal terga. Ultraviolet reflectance on upperside: Structurally reflective on yellow area except for tornal and anal regions of hindwing, but weakly diffused distally, appearing bright-white in UV-photos (Pl. 20 (9, upper)).

Forewing length: 16.5–20.0 mm (avg=18.6 mm; n=10).

Female (Pl. 17 (1–2)). *Upperside*: Ground colour pale lemon yellow. Forewing black costal border narrow and sometimes diffused, with its inner margin rather distinct; black distal border fairly broad, with its inner edge oblique and uniform from costa to vein 4, strongly angled in the midway, almost right-angled at vein 4, more deeply excavated in space 2 than in space 3, and the excavations almost confluent with each other, almost perpendicular to hindmargin in spaces 1a and 1b+c; black basal border undeveloped; discocellular spot absent; fringe black. Hindwing black distal border narrow, tapering near apex and tornus, with its inner edge zigzag-shaped, diffused, and distinctly projected along each vein; anal border undeveloped; fringe black, but mixed with yellow. Basal portions of both wings blackish. *Underside*: Ground colour somewhat paler than on upperside. Forewing with apical patch large, quadrate and entirely bright chocolate brown with luster; a 3-shaped spot in discoidal cell; discocellular marking appearing as an irregular slender ring, covering more than half of the discocellular vein; faint tornal spot present or absent; small vein-dots conjoined with a catenate black anteciliary line; fringe black. Hindwing with a series of submarginal spots in spaces 1 to 8 arranged in an irregular zigzag-line, and a submarginal spot in spaces 7 and 8 zigzag-shaped and directed towards discocellular spot; a circular subbasal spot present each in spaces 1 and 7 and in the middle of discoidal cell; a minute basal spot absent; discocellular spot almost same as in forewing but larger; small vein-dots as in forewing; fringe black but mixed with yellow. Ultraviolet reflectance on upperside: Moderately reflective on yellow area, appearing gray in UV-photos (Pl. 20 (9, lower)).

Forewing rounded at apex; distal margin well convex. Hindwing slightly

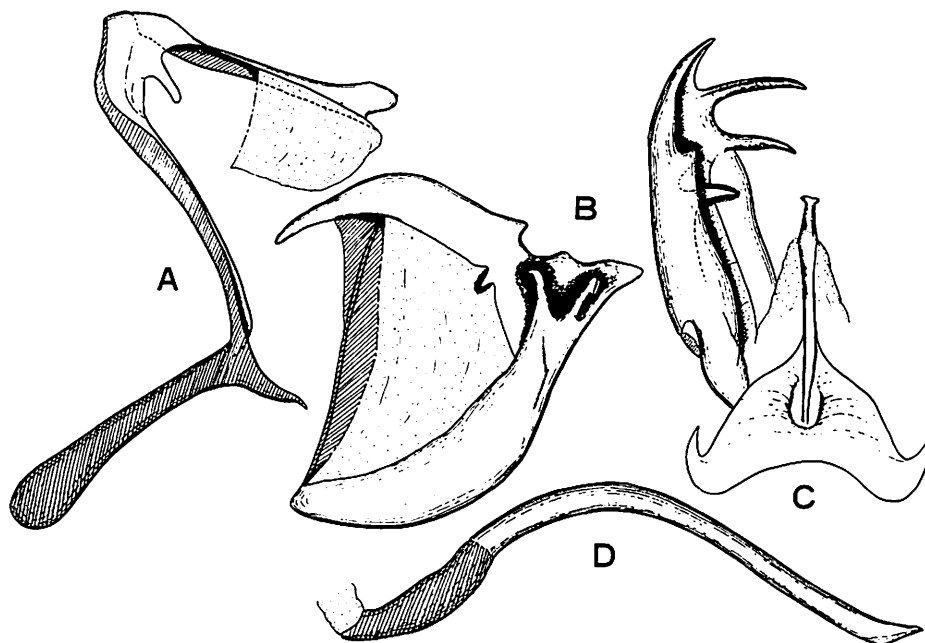


Fig. 13. Male genitalia of *Eurema nilgiriensis* YATA, 1990 from Nilgiri Hills. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

arched in the basal half of costal margin; distal margin evenly rounded; venation, antenna, thorax and abdomen almost as in male.

Forewing length: 19.0 mm (avg=19.0 mm; n=2).

Male genitalia (Fig. 13): Tegumen narrow, triangular in dorsal aspect, somewhat concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus moderately long (0.73 of ring height), angle between vinculum and saccus about 90° . Uncus long (dorsum proper 0.73 of ring height), extending strongly downwards; uncal projection short (0.1 of ring height), 'snake head'-shaped in lateral aspect, projecting posteriorly, with its apex weakly bicuspid. Valva almost as long as high; P1 somewhat weakly sclerotized, shorter than P4, extending almost laterally; P2 well developed; a weak process produced posterodorsally between P2 and P3; P3 broad and triangular, with a pointed apex; P4 represented by two processes, distal one of which is much longer than proximal one and more strongly curved ventrally. Phallus very long, slender and strongly arched dorsally, subzonal sheath about as long as $1/4$ length of phallus. Juxta weakly sclerotized, consisting of a pair of broad concaved pouches and producing a short and slender median stalk.

Female genitalia. Not examined.

Variation: Sexual dimorphism is very distinct. The female of this new species

was first figured by HAYASHI (1980) as a subspecies of *Eurema sari*. In reality the female is quite similar to that of *Eurema sari* in bearing the large, entirely bright chocolate apical patch on the forewing underside. YATA (1990) concluded, however, that the female specimen figured by HAYASHI did not belong to *sari*, but to *nilgiriensis* for the following reasons: 1) The wing markings are similar to those of males of *nilgiriensis* except in bearing the apical patch in the forewing underside, the forewing black distal border almost right-angled at vein 4 and the hindwing black distal border strongly zigzag-shaped. 2) When compared with *sari*, the hindwing black distal border is much narrower and more strongly zigzag-shaped, and its inner edge is distinctly projected along each vein. 3) The female genital structure more closely resembles that of *andersoni* than of *sari*. 4) The female in question was collected together with many males of *nilgiriensis* in the same season and same collecting site.

Type material examined: *Eurema nilgiriensis* was described from male and female specimens by YATA. The holotype male specimen is now in TSUKADA's collection and bears the following labels; 'Nilgiri Hills, South India, 19-28. ix. 1980, Tsukada coll. / *Eurema nilgiriensis* Yata, 1990, Holotype ♂ (red)'. The KUCGE, HH, BMNH possesses 8 males and 1 female, bearing similar data labels '(Hayashi coll. / Paratype (orange))'.

Taxonomic remarks: The female of this new species was first figured by HAYASHI (1980) as a subspecies of *Eurema sari* without any new subspecific name. After carefully examining the general appearance and male and female genitalia, YATA (1990) described that the "sari" from Nilgiri Hills represents a distinct new species.

Relationship: This species is closely related to *E. andersoni*, *E. ormistoni*, *E. celebensis* and *E. beatrix* and these five seem to form a monophyletic group (*andersoni* complex), with which the *sari* section is united.

Distribution. This new species is known only from Nilgiri Hills, South India.

Early stages: The early stages are unknown.

Eurema ormistoni (WATKINS, 1925)

[Pl. 17]

Terias rotundalis MOORE, 1881: 120, (wet f.) pl. 46, fig. 1b, ♀. (part) LECTOTYPE ♂ belonging to *blanda* (Ceylon) here designated; PARALECTOTYPE ♀ (=holotype of *Terias sari ormistoni* WATKINS, 1925) (Ceylon) here designated. [BMNH, examined]

Terias sari ormistoni WATKINS, 1925: 714. Holotype ♀ (=PARALECTOTYPE ♀ of *rotundalis* MOORE, 1881) (Ceylon). [BMNH, examined]

Eurema andersoni ormistoni (WATKINS); CORBET & PENDLEBURY, 1932: 179.

Terias andersoni ormistoni WATKINS; EVANS, 1932: 78.

Diagnosis: Upperside of male wings bright yellow in ground colour; black distal border on forewing upperside right-angled at vein 4, more deeply excavated in space 2 than in space 3 and each excavation having a toothed projection at bottom; hindwing black distal border represented by a catenate black anticiliary line; a spot

in discoidal cell; uncus much flattened and arched dorsally, with flattened uncal projection, projecting posteroventrally.

Description: Male (Pl. 17 (3–4)). *Upperside*: Ground colour bright yellow. Forewing black costal border very narrow or barely traceable; black distal border broad, with its inner edge oblique and irregular from costa to vein 4, more or less angled in midway, right-angled at vein 4, more deeply excavated in space 2 than in space 3, inclined towards tornus in spaces 1a and 1b+c; black basal border undeveloped; discocellular spot absent; fringe black; basal portion slightly blackish. Hindwing with black distal border very narrow and represented by a catenate black anteciliary line; anal border undeveloped; fringe yellow, but mixed with black; basal portion not black dusted. *Underside*: Ground colour slightly paler than on upperside. Most markings generally weak. Forewing apex with marginal black smudge represented by diffused vein-dots in spaces 7 to 9; subapical patch barely traceable; an irregular 3-shaped spot in discoidal cell; discocellular marking appearing as an irregular slender ring, covering more than half of the discocellular vein; tornal spot absent; sex-brand pale salmon pink with brown tinge, short and narrow, ending somewhat before a point of origin of vein 2; small vein-dots conjoined with a catenate black anteciliary line; fringe yellow, but mixed with black. Hindwing with a series of submarginal spots in spaces 1 to 8, arranged in an irregular zigzag-line, and a discoidal spot in spaces 7 and 8 usually comma-shaped and directed midway between submarginal spot and discocellular spot; circular subbasal spot usually present each in spaces 1 and 7 and in the middle of discoidal cell; a minute basal spot absent; discocellular spot almost same as in forewing but larger; small vein-dots as in forewing; fringe yellow, but mixed with black. Ultraviolet reflectance on upperside: Structurally reflective on yellow area except for tornal to anal region of hindwing, appearing bright-white in UV-photos (Pl. 21 (1, upper)).

Forewing somewhat angulate at apex; distal margin slightly convex. Hindwing slightly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black and white-checked, except on the postero-dorsal surface and a few apical segments, club cylindrical. Thorax and abdomen yellow, much darkened above, clothed with black and yellow hairs on thorax and base of abdomen.

Forewing length: 21.0 mm.

Female. (Pl. 17 (5–8)) Similar to male, but differing as follows. Ground colour paler. Basal portion on forewing not or almost not black dusted. Forewing upperside with black costal border fainter, barely traceable. On underside most markings fainter; apical black smudge disappearing. Forewing termen rounder. Ultraviolet reflectance on upperside: Moderately reflective on yellow area, appearing gray in UV-photos (Pl. 21 (1, lower)).

Forewing length: 21.0 mm.

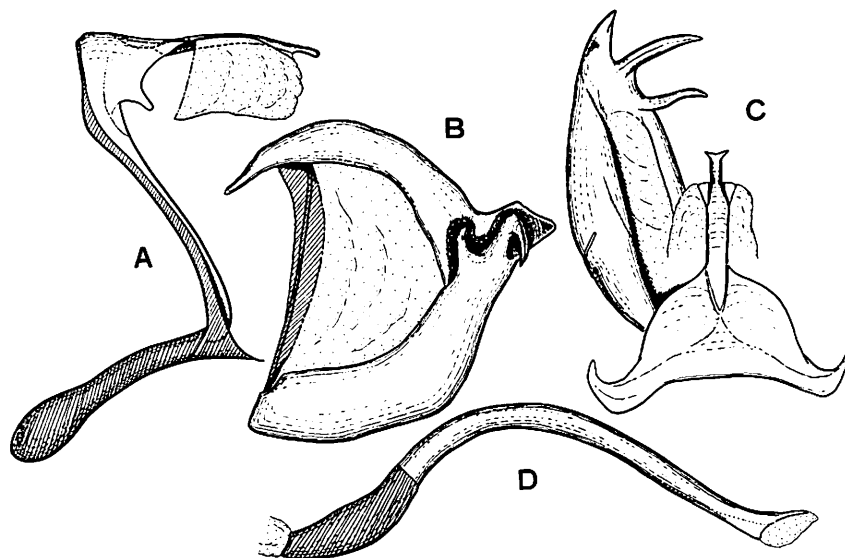


Fig. 14. Male genitalia of *Eurema ormistoni* (WATKINS, 1925) from Sri Lanka. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

Male genitalia (Fig. 14): Tegumen narrow, triangular in dorsal aspect, slightly concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus moderately long (0.7 of ring height), angle between vinculum and saccus $80-90^\circ$. Uncus usually moderately long (dorsum proper 0.64 of ring height), much flattened and arched dorsally, with short and flattened uncal projection (0.08 of ring height), projecting posteroventrally with its apex weakly bicuspid. Valva almost as long as high; P1 and P2 absent; P3 broad and triangular, with its apex bluntly pointed; P4 represented by two processes, distal one of which is much longer than proximal one and more strongly curved ventrally, and the latter distinctly sinuate. Phallus very long, slender and strongly arched dorsally, subzonal sheath about as long as $1/4$ length of phallus. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

Female genitalia: Not examined.

Variation: Among the specimens I examined this species shows less prominent individual variation than the other species of the *sari* group. As far as I know, seasonal variation is not prominent.

Type material examined: *Terias sari ormistoni* was described by WATKINS based on a female syntype of *Terias rotundalis* Moore, 1881. The holotype female is now in BMNH and bears the following labels; 'Type (red) / Ceylon, Moore Coll, 1907-190. / *Terias rotundalis* ♀, type Moore / 571.2a / *ormistoni*, Wtk.=*rotundalis*, M. ♀

(nec ♂ drawer 27)'. In addition the female bears the following labels; 'Paralectotype (blue) / *Terias rotundalis* Moore PARALECTOTYPE det. O. Yata 1990' and hereby designated a paralectotype.

Material studied: SRI LANKA: Colombo, 1 ♂, 1956 (A. A. LM.) [KUCGE]; Belihuloya, 1 ♀, 21. x. 1975 [OHTSUKA coll.].

Taxonomic remarks: The present species was originally described as the subspecies of *Terias sari* by WATKINS (1925), but later it was treated as the subspecies of *Eurema andersoni* by CORBET & PENDLEBURY (1932). CORBET and PENDLEBURY's classification had been widely accepted (TALBOT, 1939; WOODHOUSE, 1949; YATA, 1981, etc.). After careful examination of male genitalia as well as general appearance, however, I concluded that *ormistoni* represents a distinct species. Because the genitalic differences between *ormistoni* and the other species of the *andersoni*-complex are exceptionally great in degree.

Relationship: This species is closely related to *Eurema nilgiriensis*, *E. andersoni*, *E. beatrix* and *E. celebensis*, and these five seem to form a monophyletic group (*andersoni* complex), with which the *sari* section is united.

Distribution: This species is confined to Sri Lanka in its distribution range.

Habitat and habits: This butterfly mainly inhabits lowland and hill forests, and it seems to be rather rare. According to WOODHOUSE (1949), "Although *E. ormistoni* is rare in Ceylon it can be taken in numbers at the right times—April, and July to September—and localities—in or near the forests in the wettest areas in the central hill and low-country wet zones: its capture has been recorded from the Kandy and Ratnapura Districts, Deniyaya and Wellawaya".

Early stages: The early stages are unknown.

Eurema mentawiensis CORBET, 1941

[Pls. 18–19]

Eurema mentawiensis CORBET, 1941: 499–502, ♂, fig. 1. (Sipora)

Diagnosis: Upperside of female wings milky-white in ground colour; black distal border on forewing upperside obtuse-angled at vein 4, almost equally excavated in spaces 2 and 3, always inclined towards base in spaces 1a and 1b+c; subapical streak on forewing underside; a spot in discoidal cell; tornal spot absent; vein-dots on underside not conjoined with black anticiliary line; subbasal spot absent in discoidal cell; uncus short and weakly arched dorsally, with uncal projection fairly developed.

Description: Male. *Upperside:* Ground colour lemon yellow. Forewing black costal border usually fairly broad with its inner margin sharply defined; black distal border geographically variable in width, with its inner edge oblique and irregular from costa to vein 4, not angled in the midway, obtuse-angled at vein 4, equally excavated in spaces 2 and 3 or somewhat more deeply in space 2 than in

space 3, always inclined towards base in spaces 1a and 1b+c; black basal border undeveloped; discocellular spot absent; fringe black. Hindwing black distal border geographically variable in width; tapering near apex and tornus, with its inner edge usually somewhat diffused, waved or zigzag-shaped; anal border undeveloped; fringe black, sometimes mixed with yellow. Basal portions of both wings usually distinctly blackish. *Underside*: Ground colour slightly paler than on upperside. Most markings generally very faint. Forewing subapical streak usually appearing in spaces 4 to 8, sometimes represented by a series of faint spots; a small spot in discoidal cell; discocellular marking appearing by an irregular slender ring, covering more than half of the discocellular vein; tornal spot absent; sex-brand brown, long and narrow, ending slightly before a point of origin of vein 2; small vein-dots usually conjointed with a catenate black anteciliary line; fringe yellow mixed with black. Hindwing with a series of submarginal spots in spaces 1 to 8, arranged in an irregular zigzag-line, and a submarginal spot in spaces 7 and 8 small, punctiform and situated in midway between submarginal spots and discocellular spot; circular subbasal spot present each in spaces 1 and 7; a minute basal spot absent; discocellular spot almost same as in forewing but somewhat larger; small vein-dots not conjointed with a distinct black anteciliary line; fringe yellow mixed with black. Ultraviolet reflectance on upperside: Structurally reflective on yellow area except for tornal to anal region of hindwing, but diffused distally, appearing bright-white in UV-photos (Pl. 21 (2, upper)).

Forewing somewhat angulate at apex; distal margin slightly convex. Hindwing slightly arched in the basal half of costal margin; distal margin evenly rounded; vein 7 usually stalked with vein 6, *mdc* less than $1/3$ length of *ldc*. Antenna somewhat less than half the length of forewing, black and white-checkered, except on the postero-dorsal surface and a few apical segments, club cylindrical. Thorax and abdomen yellow, much darkened above, clothed with black and yellow hairs on thorax and base of abdomen, a black longitudinal line appearing along the lateral margin of abdominal terga.

Forewing length: 19.0–23.0 mm.

Female. Similar to male, but differing as follows. Ground colour milky-white, sometimes with greenish yellow tinge, and on underside milky-white with greenish yellow tinge. *Upperside*: Basal portions of both wings more heavily and extensively black dusted. Forewing black costal border narrower, with its inner edge more strongly diffused; black distal border somewhat broader, with its inner edge usually diffused. *Underside*: Most markings fainter; subapical streak usually somewhat more strongly developed; tornal spot sometimes barely traceable. Ultraviolet reflectance on upperside: Almost absorbed, appearing light gray in UV-photos (Pl. 21 (2, lower)).

Forewing length: 19.0–23.0 mm.

Male genitalia (Fig. 15): Tegumen narrow, triangular in dorsal aspect, slightly

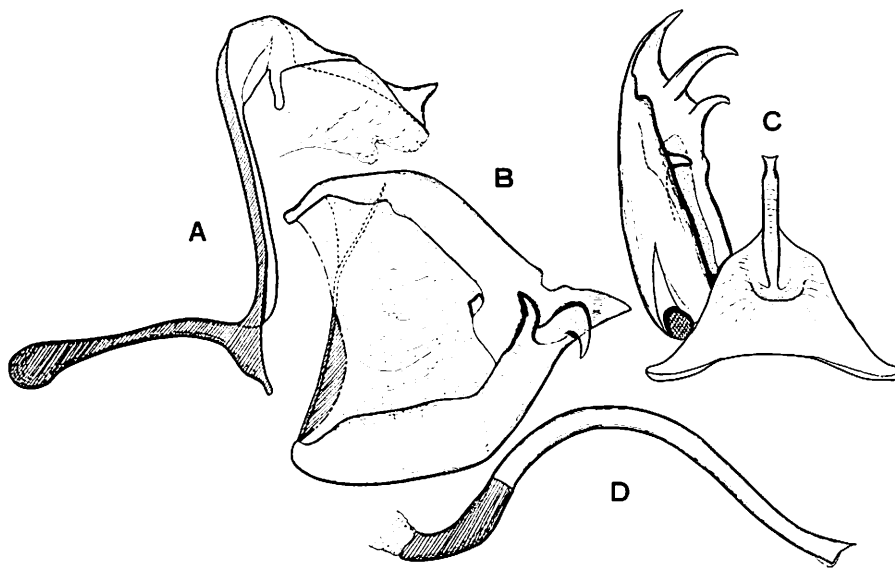


Fig. 15. Male genitalia of *Eurema mentawiensis mentawiensis* CORBET, 1941 from Siberut Is. A: Ring (lateral). B: Valva (inner aspect of right-hand). C: Dorsum and valva (dorsal). D: Phallus (lateral).

concaved dorsomedially, entirely sclerotized; Valvenansatz short, usually producing downwards; vinculum not strongly arched; saccus moderately long (0.74 of ring height), angle between vinculum and saccus 80–90°. Uncus short (dorsum proper 0.65 of ring height), slightly arched dorsally, extending strongly downwards; uncal projection fairly developed (0.11–0.19 of ring height), projecting posterodorsally, with its apex weakly bicuspid. Valva almost as long as high; P1 somewhat weakly sclerotized, much shorter than P4, extending almost laterally; P2 absent; P3 broad and triangular, with a pointed apex; P4 represented by two processes, distal one of which is much longer than proximal one and more strongly curved ventrally. Phallus very long, slender and strongly arched dorsally, subzonal sheath about as long as 1/4 length of phallus. Juxta weakly sclerotized, consisting of a pair of broad pouches producing a short and slender median stalk.

Female genitalia (Fig. 16): Seventh abdominal sternum with nearly straight posterior margin. Lateral hollow elliptical, with dorsal eaves absent, ventral eaves long and deep, median groove long, having a eaves situated ventral 1/3 of lateral hollow. Genital plate weakly invaginated ventromedially, obtuse-angled on its anterolateral corner in ventral aspect; longitudinal groove weakly sclerotized, broad and deep, somewhat narrowed medially and gradually broadened posteriorly; banks of longitudinal groove well developed, sharply excavated around ostium bursae and the excavation distinctly stippled regularly. V-shaped wall undeveloped. Ostium

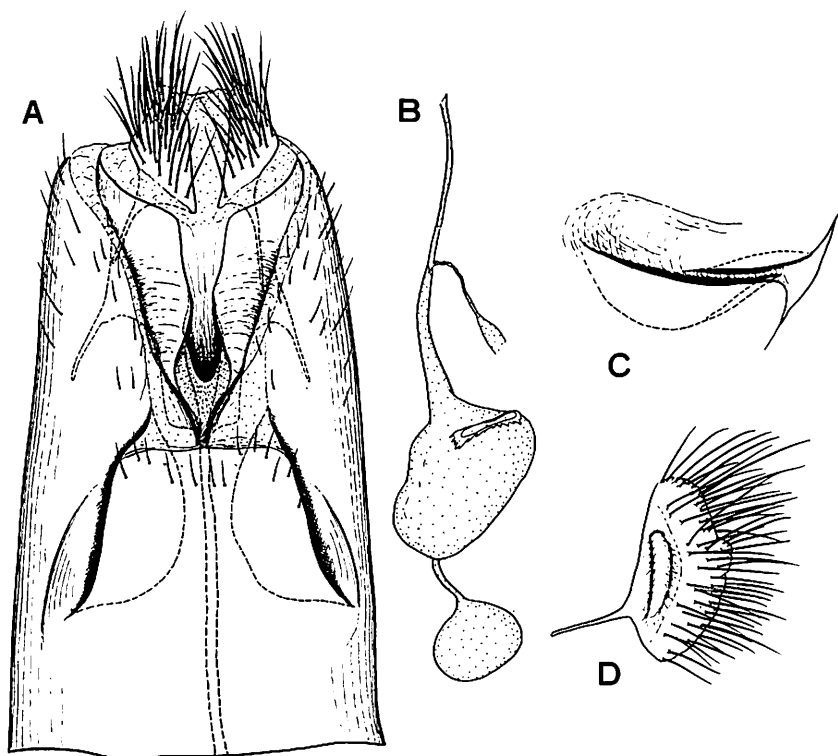


Fig. 16. Female genitalia of *Eurema mentawiensis mentawiensis* CORBET, 1941 from Nias Is. A: Female genitalia (ventral). B: Bursa copulatrix (ventral). C: Lateral hollow (lateral). D: Papilla analis (lateral).

bursae opening at the anterior 1/3 of genital plate. Ductus bursae about the length of cervix bursae or more, membranous but weakly sclerotized on anterior 1/4. Signum moderate in size, with many spines. Eighth abdominal tergum longitudinally very short; apophysis anterioris nearly straight, nearly as long as apophysis posterioris, hamulated upwards apically, with a prominent protuberance at the dorsal margin of proximal portion. Papilla analis elongate, bearing a short apical lobe and swollen bare-region.

Variation: The present species shows considerable geographical variation in size and wing markings in spite of its restricted distribution. Seasonal variation is unknown.

Relationship: This species is closely related to *sari-sarilata* and these three are inferred to form a monophyletic group.

Distribution: This species is endemic to Paramalaya (Mentawis, Nias and Simeulue).

Habitat: This butterfly is generally rare in any places. According to the

observation by Dr. Sk. YAMANE at Sipora Is., it seems inhabit lowland forests.

Early stages: The early stages are unknown.

***Eurema mentawiensis mentawiensis* CORBET, 1941**

Eurema mentawiensis mentawiensis CORBET, 1941: 499–502. Holotype ♂ (Sipora). [BMNH, examined]

The nominate subspecies is characterized by the following combination of characters.

Male (Pl. 18 (1–2)). *Upperside:* Forewing black distal border rather broad, with its inner edge somewhat diffused from costa to vein 4, slightly more deeply excavated in space 2 than in space 3; hindwing black distal border rather broad, with its inner edge strongly waved or zigzag-shaped; basal portions of both wings distinctly blackish. *Underside:* Most markings rather distinct especially in hindwing; forewing subapical streak narrow and sometimes very faint, but not disappearing; sex-brand pale brown; forewing marginal vein-dots conjoined with a catenate black anteciliary line; hindwing submarginal spots well marked and not disappearing; circular subbasal spots well developed; vein-dots usually conjoined with catenate black anteciliary line. **Female** (Pl. 18 (3–6)). *Upperside:* Black distal borders somewhat broader, with its inner edge very diffused. *Underside:* Ground colour milky-white with; forewing subapical streak narrow, but not disappearing; marginal vein-dots conjoined with a catenate black anteciliary line.

Forewing length: Male 21.0–22.0 mm (n=3, avg=21.5 mm), female 19.7 mm.

Type material examined: *Eurema mentawiensis* was described from male and female specimens from Sipora and Siberut by CORBET. The holotype male specimen is now in the BMNH and bears the following labels; 'Type H T (red) / Sipora I., W. of Sumatra, October 1924, (C. B. K. & N. S.) / Brit. Mus. 1942–21 / B. M. TYPE, No. Rh... 15050, *Eurema mentawiensis* Cbt., ♂ H.T. / B.M.(N.H.), Rhopalocera slide No. 13261'. The BMNH possesses a female paratype, which bears similar data labels '(Type AT (red) / Rh...15051, ♀ A. T.)'.

Material studied: MENTAWIS: Sipora, 2 ♂, 30. vii. 1985, (Sk. & S. YAMANE) [KUCGE]; Siberut, Muarasiberut, vi. 1980 [ET].

Distribution: This subspecies occurs in Mentawi Isls. (Sipora, Siberut).

***Eurema mentawiensis trinens* CORBET, 1941**

Eurema mentawiensis trinens CORBET, 1941: 500. Holotype ♀ (N. Pagi Is.). [BMNH, examined]

According to the original description and to the holotype female (Pl. 18 (7–8)) preserved in the British Museum (N. H.), this subspecies seems to be distinguishable from the nominate subsp. *mentawiensis* from Sipora by the narrower black distal borders on upperside and the darker ground colour of upper and undersides.

Forewing length: Female 25.5 mm (holotype).

Type material examined: *Eurema mentawiensis trinens* was described from a female specimen by CORBET. The holotype female is now in the BMNH and bears the following labels; 'Type H T (red) / North Pagi Is., W. of Sumatra, October 1924, (C. B. K. & N. S.) / Brit. Mus. 1942-21 / B. M. TYPE, No. Rh...15052, *Eurema mentawiensis trinens* Cbt., ♀ H.T.'.

Distribution: This subspecies is known only from N. Pagai Is.

Eurema mentawiensis minuta YATA, 1981

Eurema mentawiensis minuta YATA, 1981: 21, fig. 1. Holotype ♂ (Nias). [KUCGE, examined]

This subspecies is distinguishable from the nominate subsp. *mentawiensis* from Sipora by the following combination of characters.

Male (Pl. 19 (1-2)). *Upperside:* Forewing black distal border narrower, with its inner edge sharply defined, equally excavated in spaces 2 and 3; hindwing black distal border narrower, with its inner edge more weakly waved. *Underside:* Most markings fainter; forewing subapical streak represented by faint spots in spaces 4, 5, 7+8 and 9, and those in spaces 4 and 5 sometimes disappearing; sex-brand darker; marginal vein-dots not conjointed with a catenate black anticiliary line; hindwing submarginal spots disappearing in spaces 4 to 6; circular subbasal spots more poorly developed and often represented by small dots; vein-dots not conjointed with catenate black anticiliary line. **Female** (Pl. 19 (3-4)). Ground colour more or less suffused with pale greenish yellow. *Upperside:* Forewing black distal border slightly narrower, with its inner edge rather distinct. *Underside:* Forewing subapical streak represented by faint spots in spaces 4, 5, 7+8 and 9, and those in spaces 4 and 5 sometimes barely traceable; marginal vein-dots conjointed with a catenate black anticiliary line.

Forewing length: Male 19.0-23.0 mm (n=9, avg=21.3 mm), female 19.0-21.0 mm (n=2, avg=20.0 mm)

Taxonomic remarks: This subspecies is distinguished from other subspecies by its smaller size, the disappearing of the subapical streak in space 6, and the absence of hindwing submarginal spots in spaces 4 to 6. In facies, this subspecies might also be confused with *Eurema andersoni nishiyamai* SHIRÔZU & YATA from Nias, but in the former the inner margin of black distal border of forewing is not more deeply excavated in space 3 than in space 2, that of hindwing is almost uniform, and submarginal spots in hindwing underside disappear in spaces 4 to 6.

Type material examined: *Eurema mentawaiensis minuta* was described from male and female specimens by YATA. The holotype male specimen is now in KUCGE and bears the following labels; 'S. Nias, Telukdalam, 28-29. v. 1979, Y. Nishiyama leg. / *Eurema mentawiensis minuta* Yata, 1981, Holotype ♂ (red)'. The KUCGE also possesses a male and a female paratypes, bearing similar data labels '(Paratype

(orange))'.

Material studied: NIAS: Nias, 2 ♂♂, RIBBE coll. [SI]; Gunongstoli, 1 ♂, 23–25. v. 1979 [ET]; S. Nias, Telukdalam, 1 ♂, 28–29. v. 1979, 1 ♂ 1 ♀, 1979, (Y. NISHIYAMA) [KUCGE]; C. Nias, Masio Helezelulu, 2 ♂ 1 ♀, vii–viii. 1979 [ET].

Distribution: This subspecies occurs only in Nias.

***Eurema mentawiensis pseudoblанда* MORISHITA, 1981**

Eurema mentawiensis pseudoblанда MORISHITA, 1981: 4, figs. 3, 4. Holotype ♂ (Simeulue). [ET, examined]

This subspecies is distinguishable from the nominate subsp. *mentawiensis* from Sipora by the following combination of characters.

Male (Pl. 19 (5–6)). *Upperside:* Forewing black distal border narrower, with its inner edge sharply defined, equally excavated in spaces 2 and 3; hindwing black distal border much narrower, with its inner edge more weakly waved; basal portions of both wings more narrowly blackish. *Underside:* Subapical streak more strongly developed and marginal black smudge well developed; hindwing submarginal spots fainter and sometimes disappearing or barely traceable in spaces 5 and 6; submarginal spot in spaces 7 and 8 smaller; circular subbasal spots more poorly developed and often represented by small dots; vein-dots not conjoined with catenate black anticiliary line. Both wings more elongate, resembling *E. blanda* in general profile. **Female** (Pl. 19 (7–8)). Ground colour pale yellow. *Upperside:* Black distal borders of both wings narrower, with its inner edge more sharply defined. *Underside:* Most markings much more sharply defined; forewing subapical streak much broader; marginal vein-dots conjoined with a catenate black anticiliary line.

Forewing length: Male 18.0–22.5 mm (n=5, avg=20.5 mm), female 21.0 mm.

Type material examined: *Eurema mentawiensis pseudoblанда* was described from 5 male specimens by MORISHITA. The holotype male specimen is now in the ET and bears the following labels; 'Simeulue Is., Mar. 21–31. 1981 / *Eurema mentawiensis pseudoblанда* Morishita, 1981, Holotype ♂ (red)'. The ET and KUCGE also possesses 4 males, bearing similar data labels '(Paratype (orange))'.

Material studied: Simeulue Is., 1 ♀, iii. 1983 [ET]. BABI IS.: 1 ♂, 23–25. vi. 1984 [ET].

Distribution: This subspecies occurs in Simeulue and Babi Is.

(to be continued)

A Revision of the Old World Species
of the Genus *Eurema* HÜBNER
(Lepidoptera, Pieridae)

Part II. Description of the *smilax*, the *hapale*,
the *ada* and the *sari* (part) groups

Osamu YATA

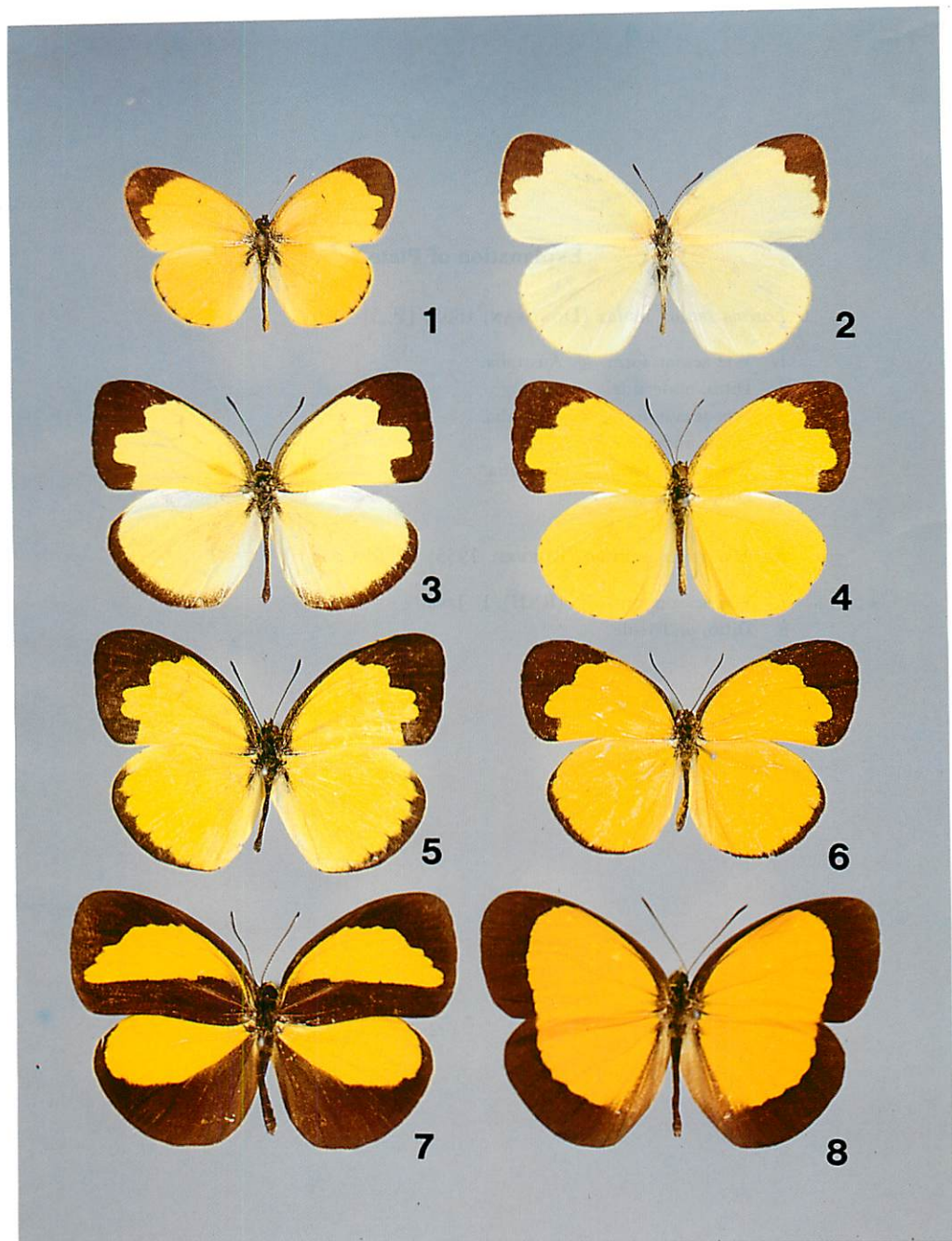
Plates 1–21.

Explanation of Plate 1.

Representatives of groups and subgroups in the subgenus *Terias*. (1: the *smilax*-group, 2: the *hapale* group, 3: the *ada* group, 4: the *lacteola* subgroup, 5 & 6: the *sari* subgroup, 7: the *tilaha* subgroup, 8: the *candida* subgroup. These 4 subgroups constitute a monophyletic group, the *sari* group.)

1. *Eurema smilax smilax* (DONOVAN, 1805) [P. 5]
♂. Australia.
2. *Eurema hapale* (MABILLE, 1882) [P. 7]
♂. Madagascar.
3. *Eurema ada ada* (DISTANT & PRYER, 1887) [P. 13]
♂. N. Borneo.
4. *Eurema novapallida* YATA, 1989
♂. N. Thailand.
5. *Eurema beatrix* TOXOPEUS, 1939 [P. 22]
♂. W. Java.
6. *Eurema nilgiriensis* YATA, 1990 [P. 39]
♂. Nilgiri Hills.
7. *Eurema tominia arsia* (FRUHSTORFER, 1910)
♂. Kalao Is.
8. *Eurema candida candida* (CRAMER, 1789)
♂. Seram.

($\times 1.3$)



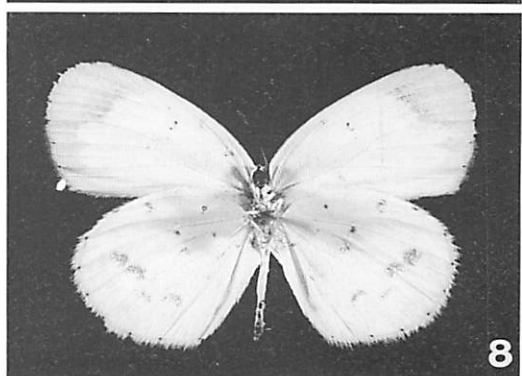
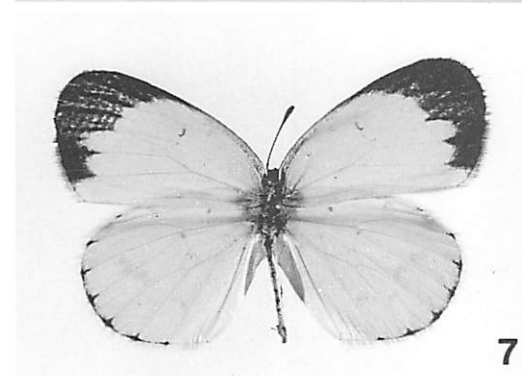
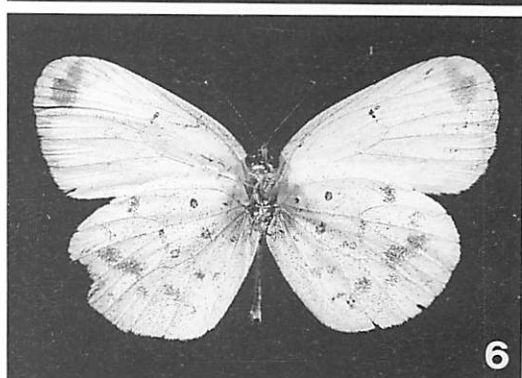
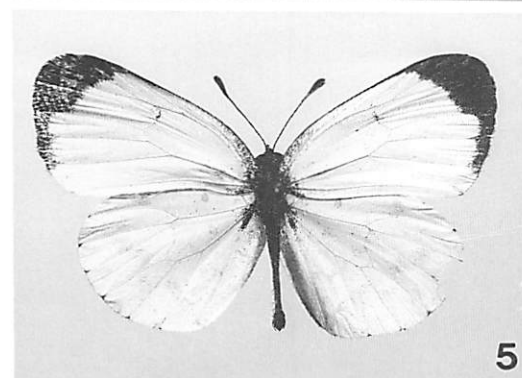
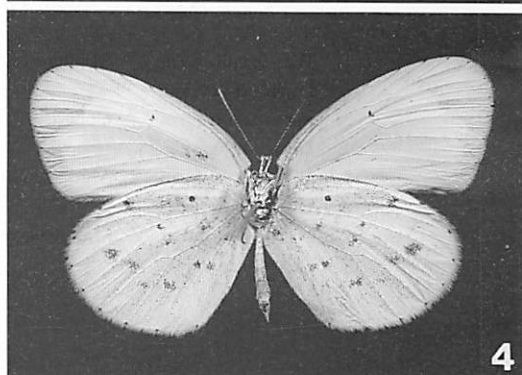
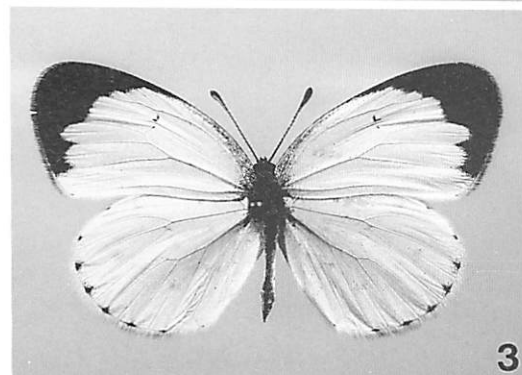
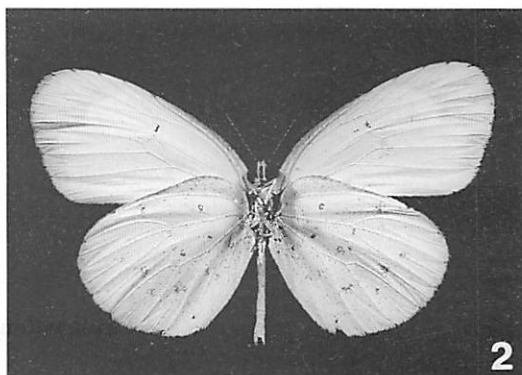
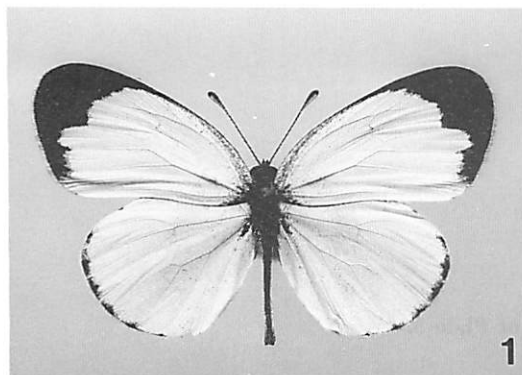
Explanation of Plate 2.

Eurema smilax smilax (DONOVAN, 1805) [P. 5]

1. Wet-season form. ♂. Australia.
2. Ditto, underside.
3. Wet-season form. ♀. Australia.
4. Ditto, underside.
5. Dry-season form. ♂. Australia.
6. Ditto, underside.

Eurema smilax gracilior (ROEPKE, 1935) [P. 6]

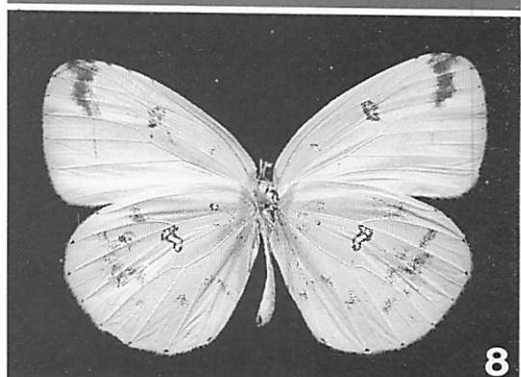
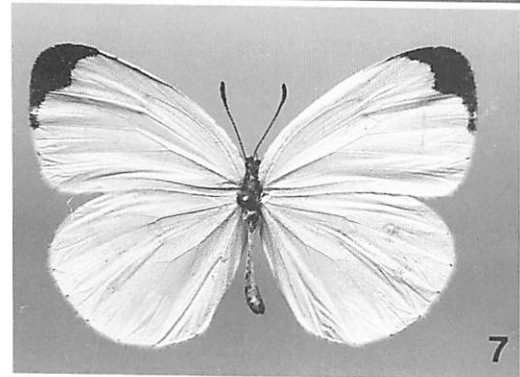
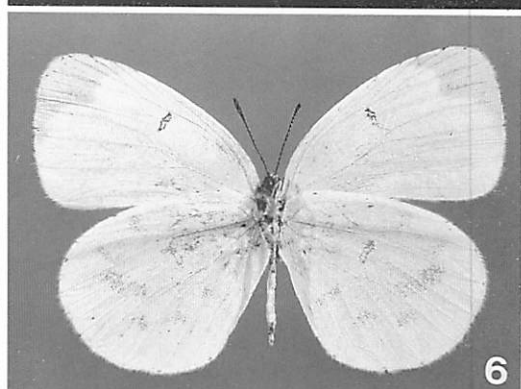
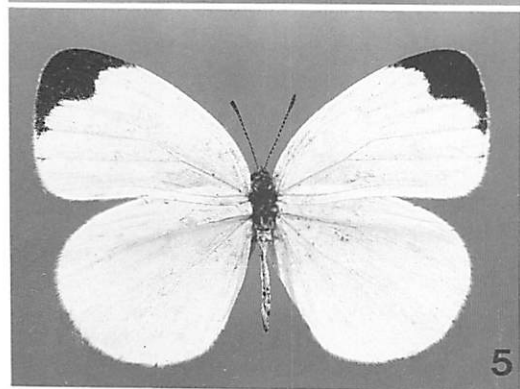
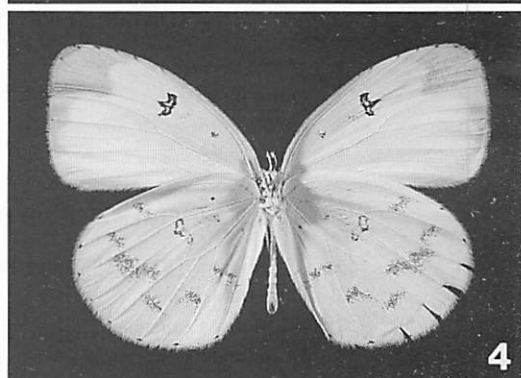
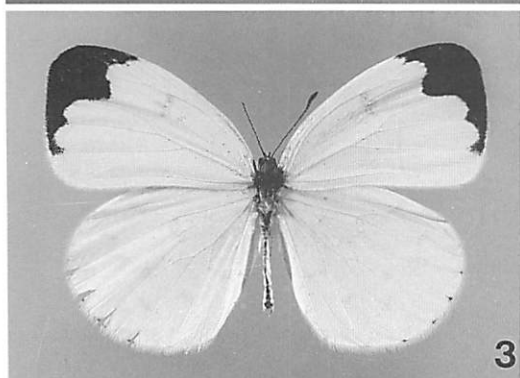
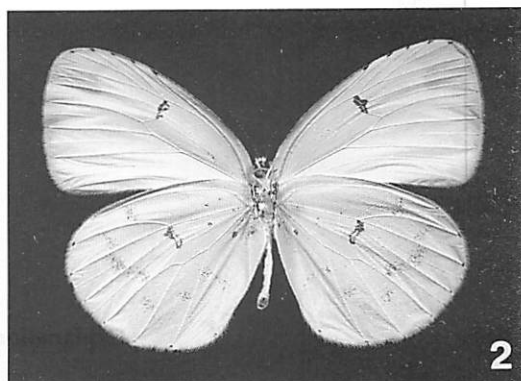
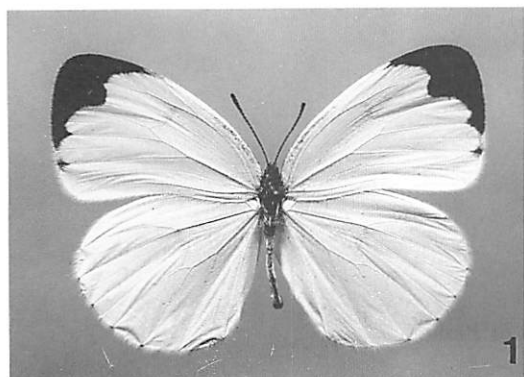
7. Wet-season form. ♀. [RNH]. E. Java.
8. Ditto, underside.



Explanation of Plate 3.

Eurema hapale (MABILLE, 1882) [P. 7]

1. Wet-season form. ♂. Madagascar.
2. Ditto, underside.
3. Wet-season form. ♂. Congo.
4. Ditto, underside.
5. Wet-season form. ♀. Madagascar.
6. Ditto, underside.
7. Dry-season form. ♂. Madagascar.
8. Ditto, underside.



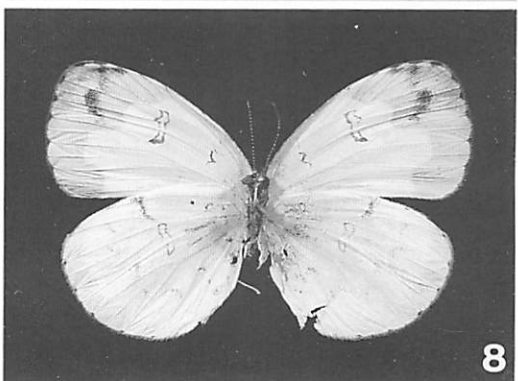
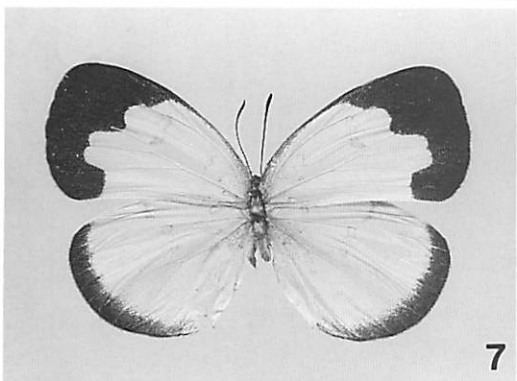
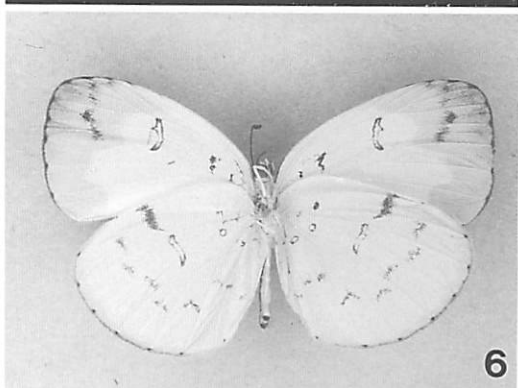
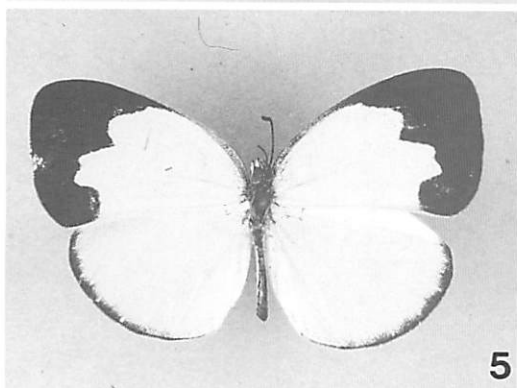
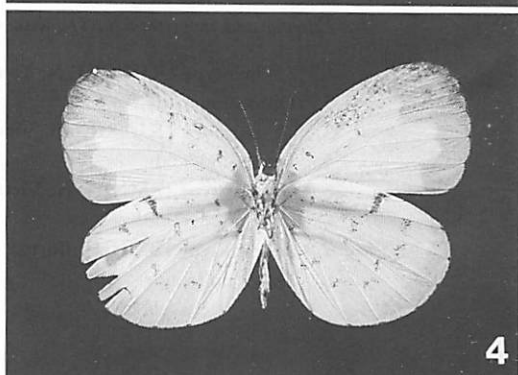
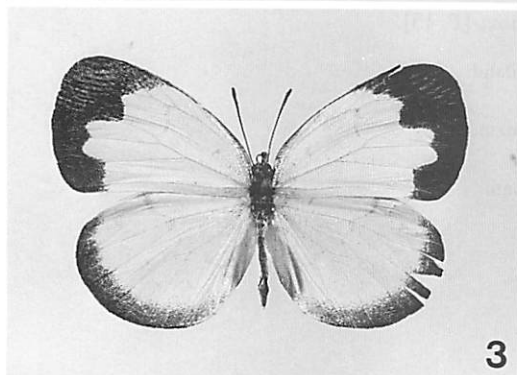
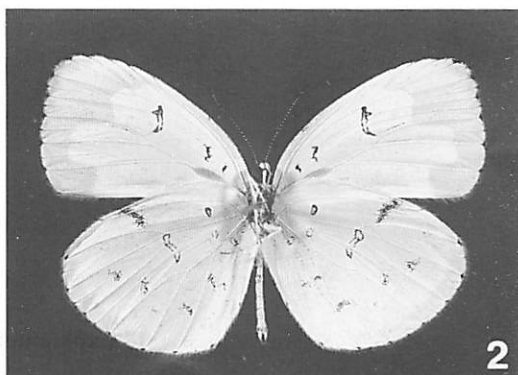
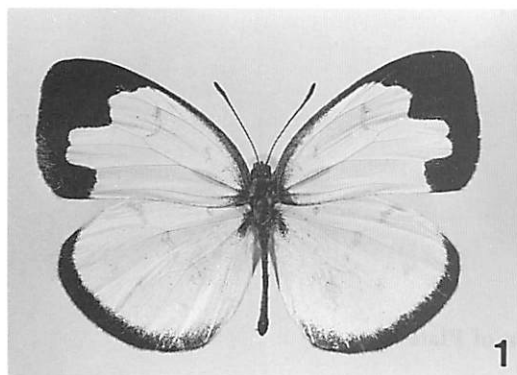
Explanation of Plate 4.

Eurema ada ada (DISTANT & PRYER, 1887) [P. 13]

1. ♂. N. Borneo.
2. Ditto, underside.
3. ♀. N. Borneo.
4. Ditto, underside.

Eurema ada iona (TALBOT, 1939) [P. 14]

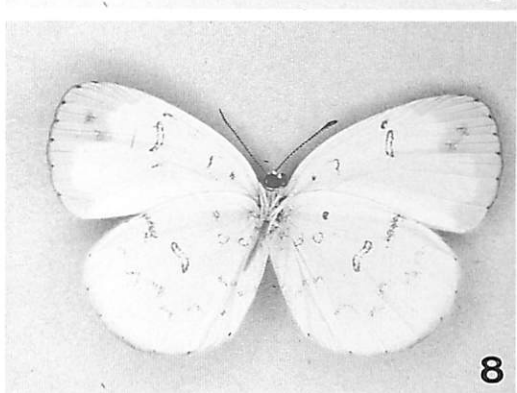
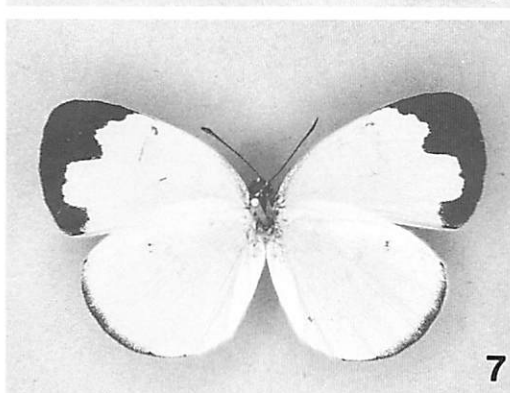
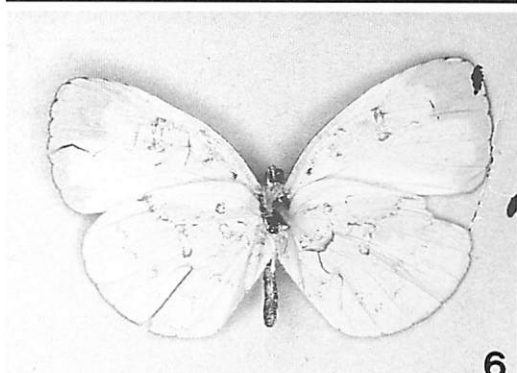
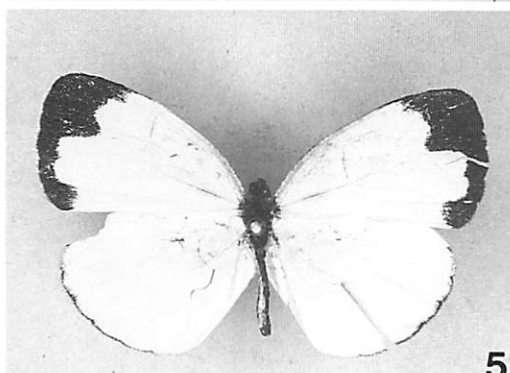
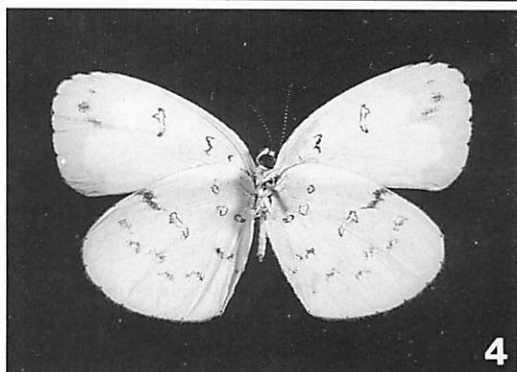
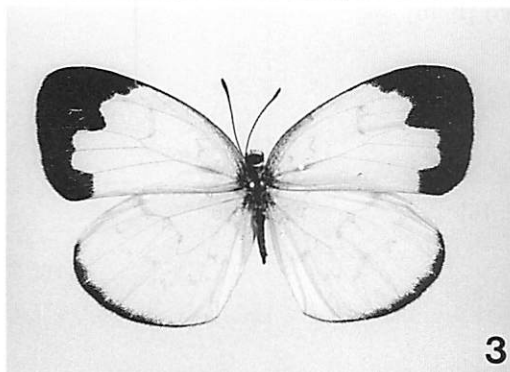
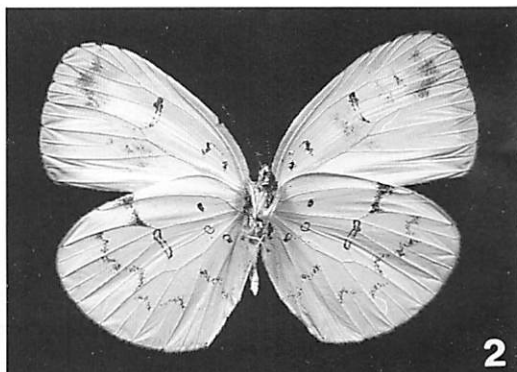
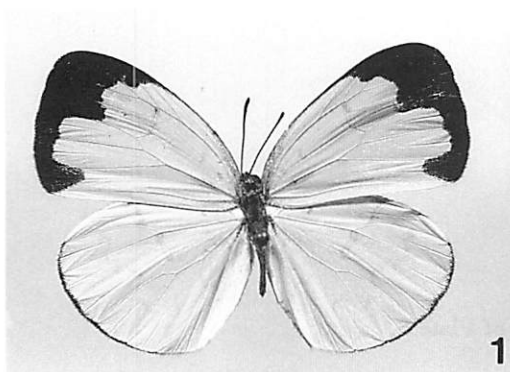
5. ♂, lectotype [BMNH]. Malay Peninsula.
6. Ditto, underside.
7. ♀. Malay Peninsula.
8. Ditto, underside.



Explanation of Plate 5.

Eurema ada indosinica YATA, ssp. nov. [P. 15]

1. ♂, holotype [KUCGE]. N. Thailand.
2. Ditto, underside.
3. ♂, paratype [KUCGE]. S. Vietnam.
4. Ditto, underside.
5. ♂, paratype [BMNH]. N. Vietnam.
6. Ditto, underside.
7. ♀, paratype [BMNH]. Burma.
8. Ditto, underside.



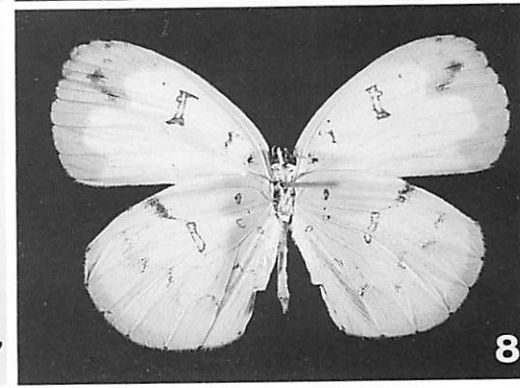
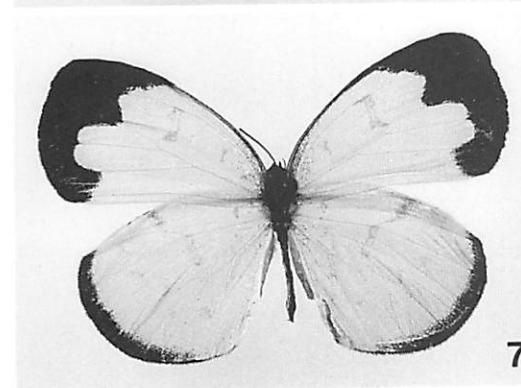
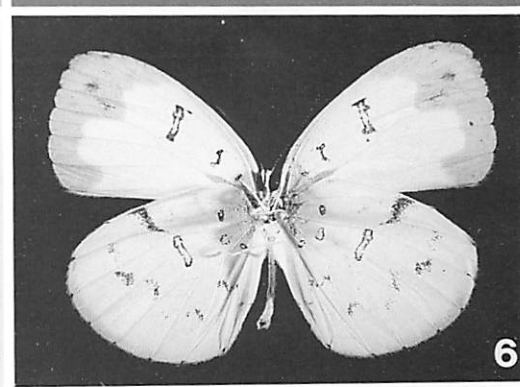
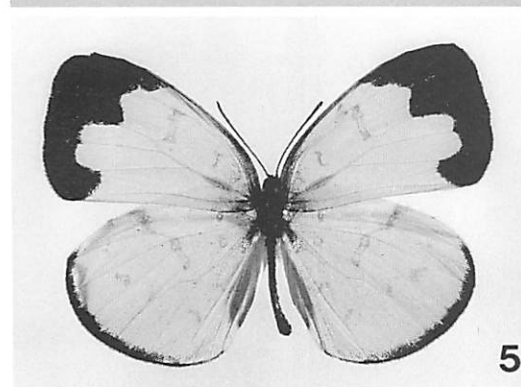
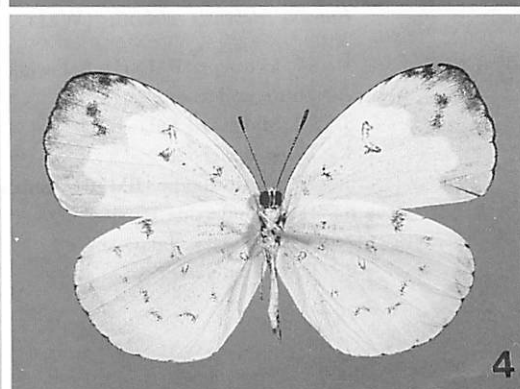
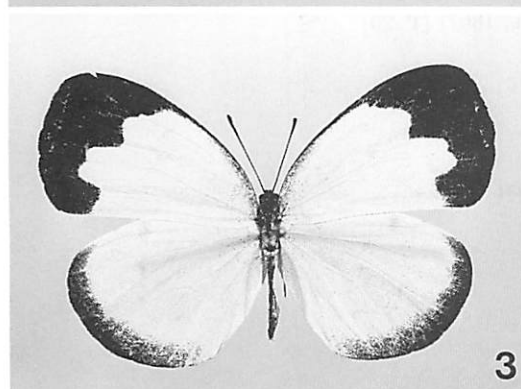
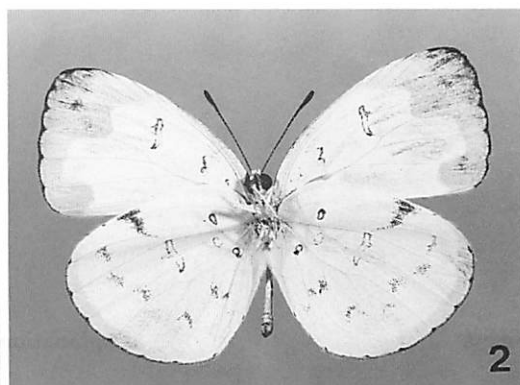
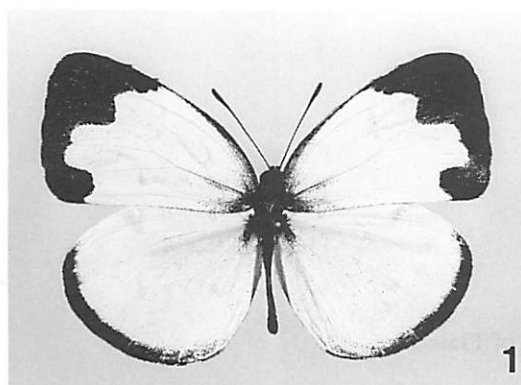
Explanation of Plate 6.

Eurema ada toba (DE NICÉVILLE, 1895) [P. 16]

1. ♂. Sumatra.
2. Ditto, underside.
3. ♀. Sumatra.
4. Ditto, underside.

Eurema ada roepkei CORBET, 1941 [P. 16]

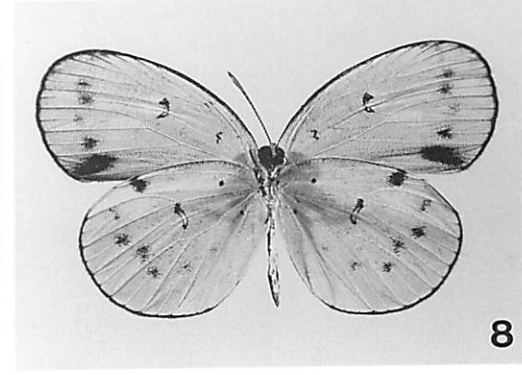
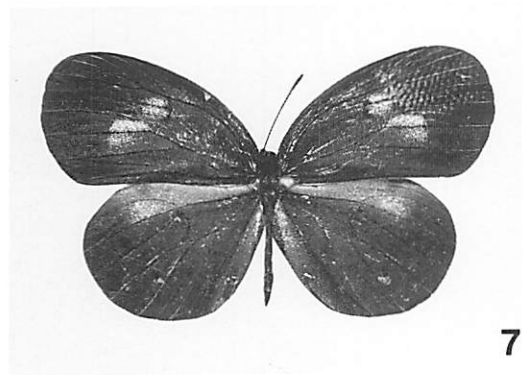
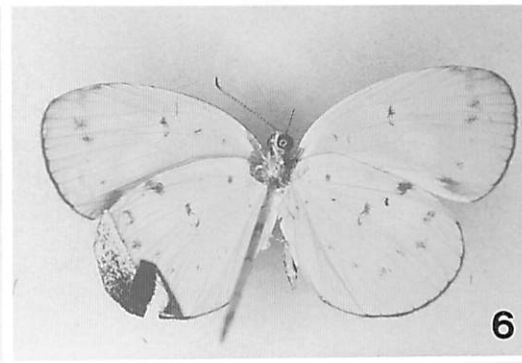
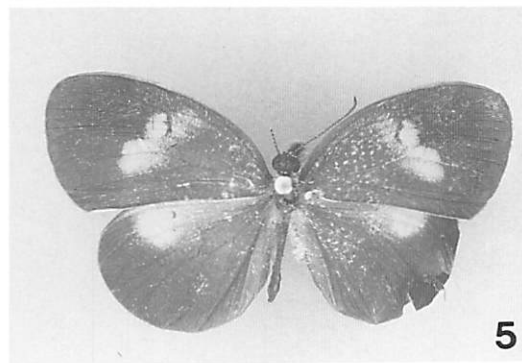
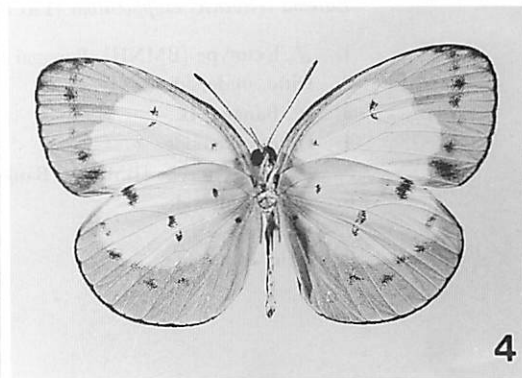
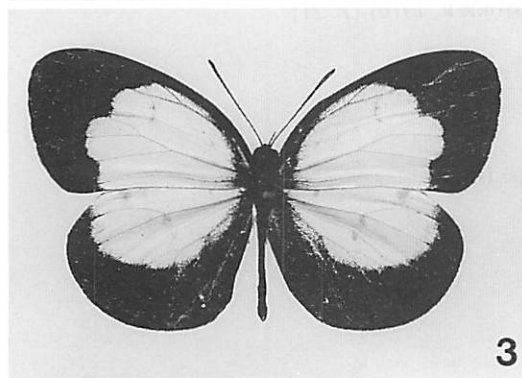
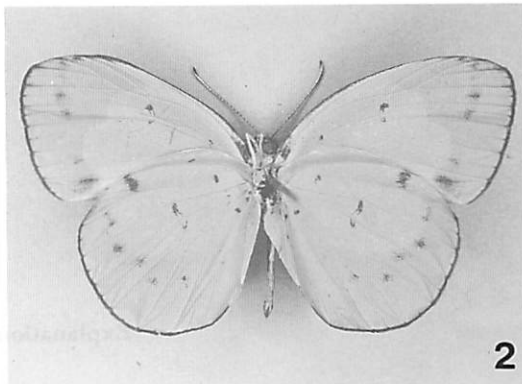
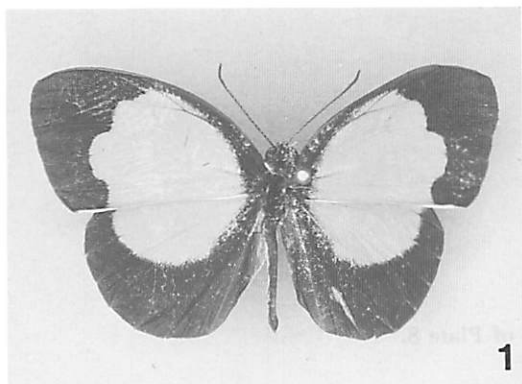
5. ♂. W. Java.
6. Ditto, underside.
7. ♀. W. Java.
8. Ditto, underside.



Explanation of Plate 7.

Eurema celebensis celebensis (WALLACE, 1867) [P. 20]

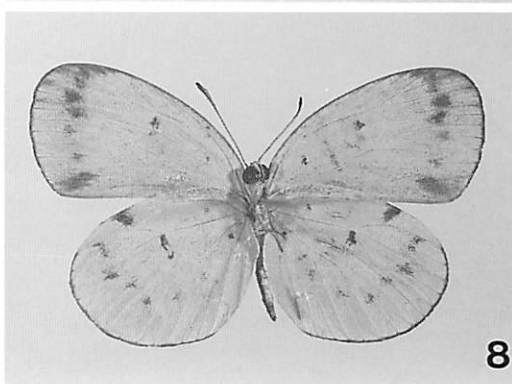
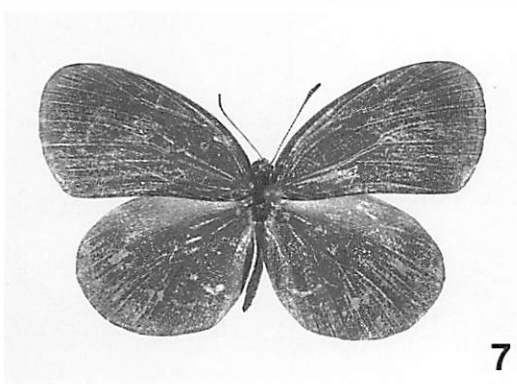
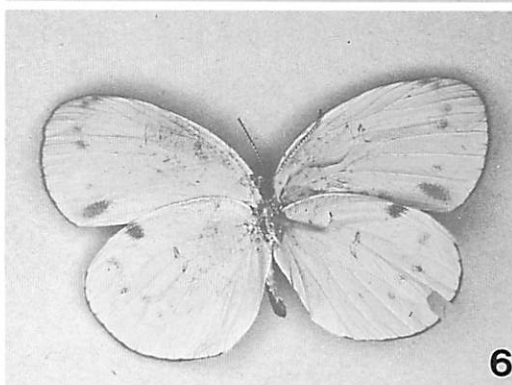
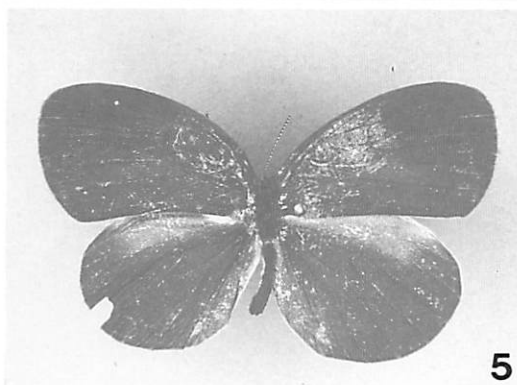
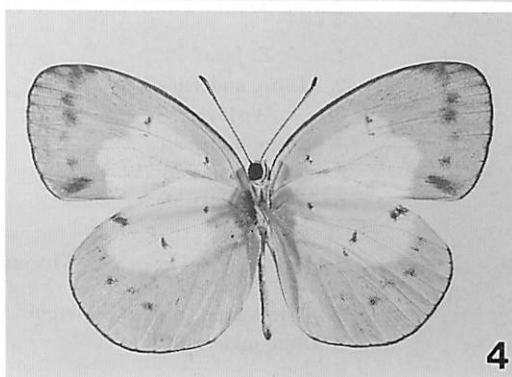
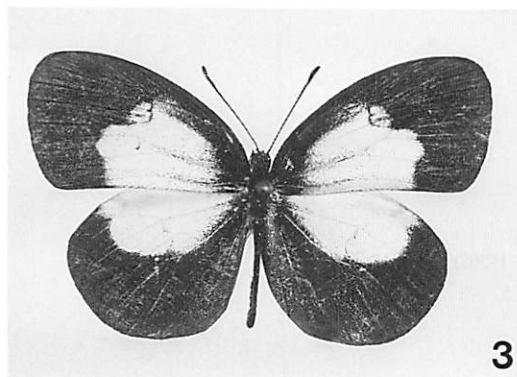
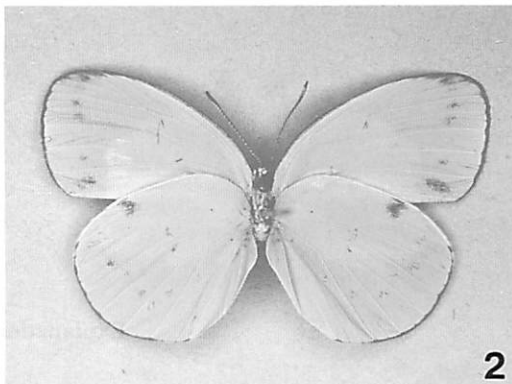
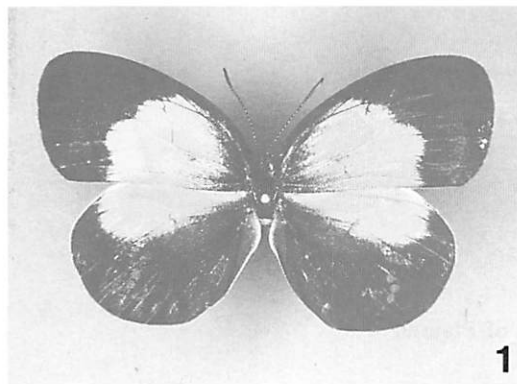
1. ♂, lectotype [BMNH]. Sulawesi.
2. Ditto, underside.
3. ♂. Makassar, Sulawesi.
4. Ditto, underside.
5. ♀, paralectotype [BMNH]. Sulawesi.
6. Ditto, underside.
7. ♀. Makassar, Sulawesi.
8. Ditto, underside.



Explanation of Plate 8.

Eurema celebensis exophthalma (FRUHSTORFER, 1910) [P. 21]

1. ♂, lectotype [BMNH]. Banggai Is.
2. Ditto, underside.
3. ♂. Banggai Is.
4. Ditto, underside.
5. ♀, paralectotype [BMNH]. Banggai Is.
6. Ditto, underside.
7. ♀. Banggai Is.
8. Ditto, underside.



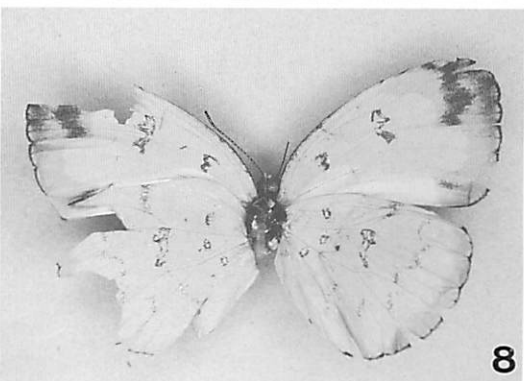
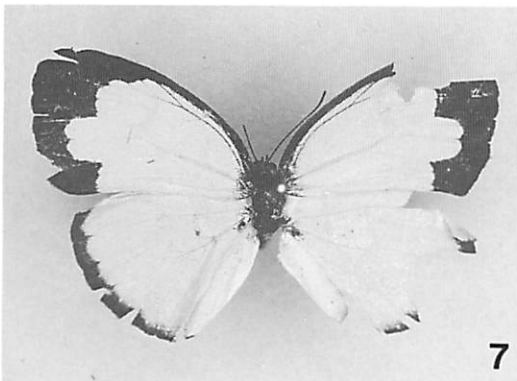
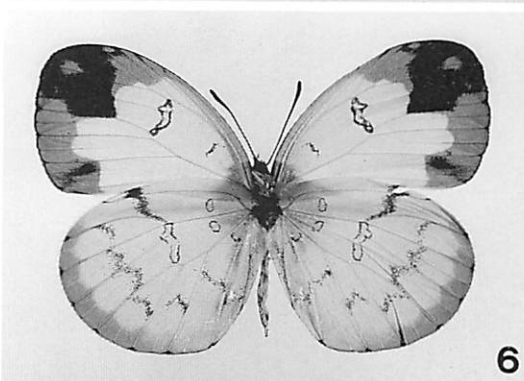
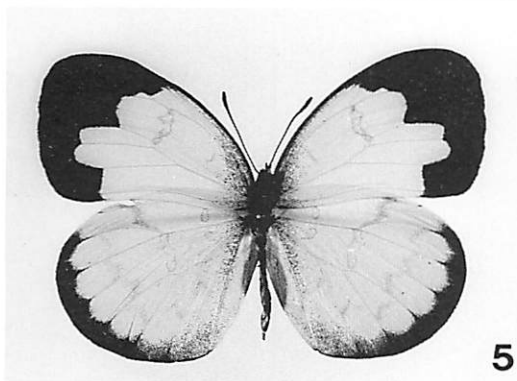
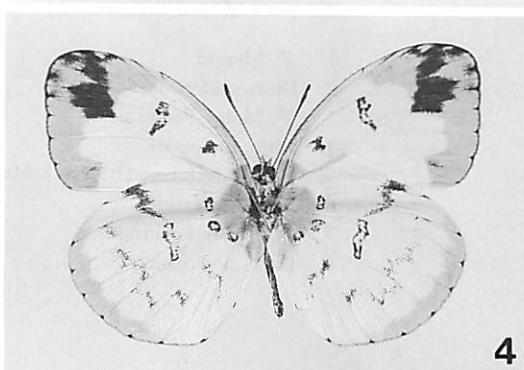
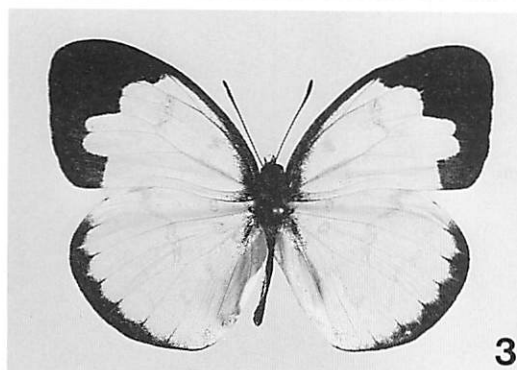
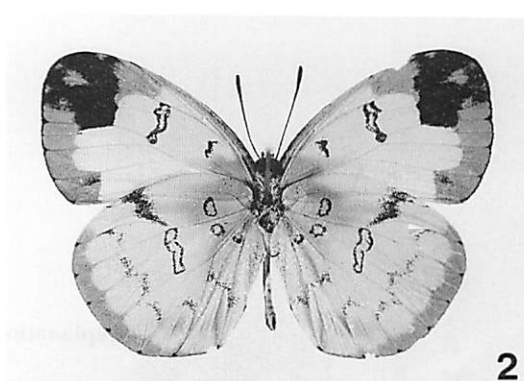
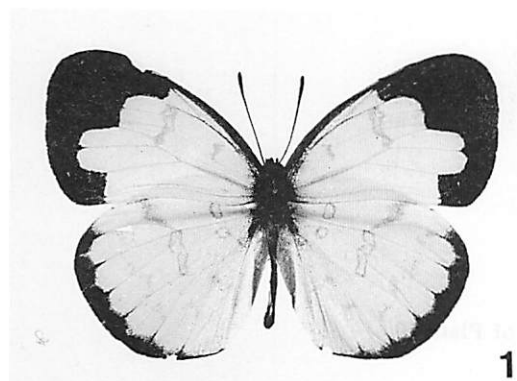
Explanation of Plate 9.

Eurema beatrix TOXOPEUS, 1939 [P. 22]

1. ♂. E. Java.
2. Ditto, underside.
3. ♂. W. Java.
4. Ditto, underside.
5. ♀. Sockanegara, W. Java.
6. Ditto, underside.

Eurema andersoni andersoni (MOORE, 1886) [P. 30]

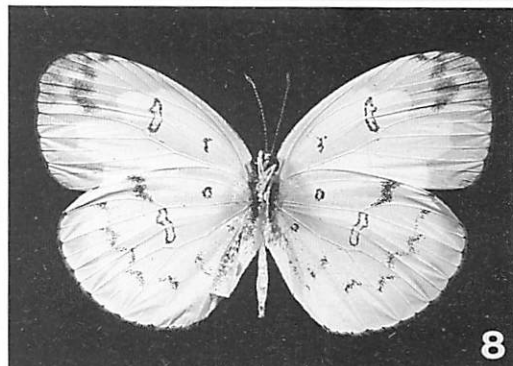
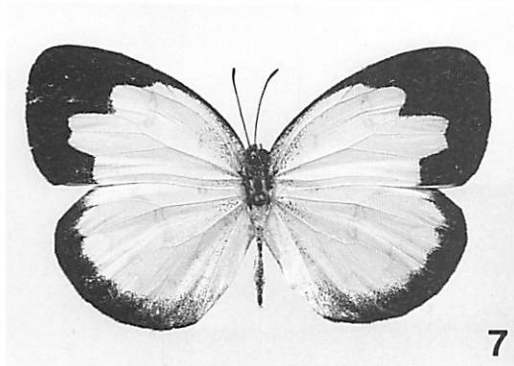
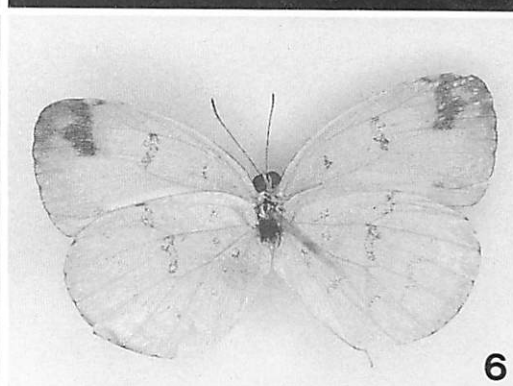
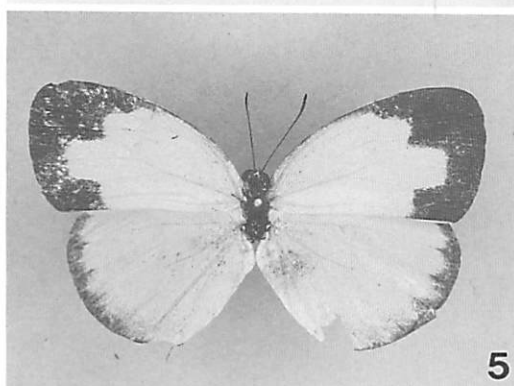
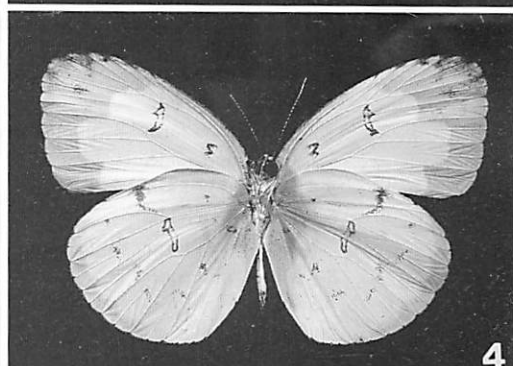
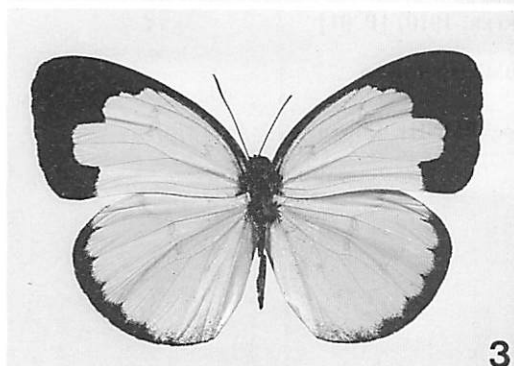
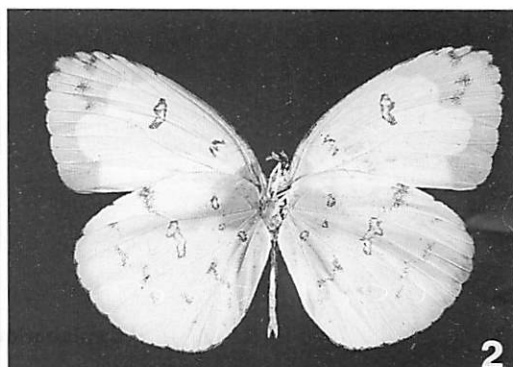
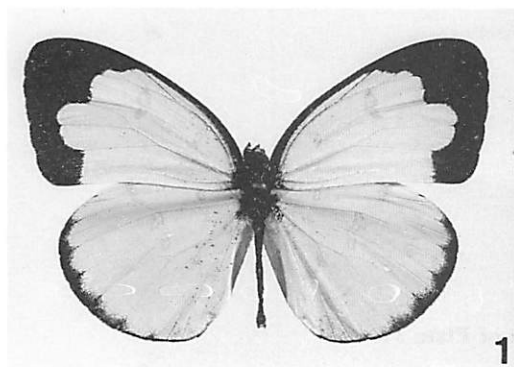
7. ♂, lectotype [BMNH]. Mergui.
8. Ditto, underside.



Explanation of Plate 10.

Eurema andersoni andersoni (MOORE, 1886) [P. 30]

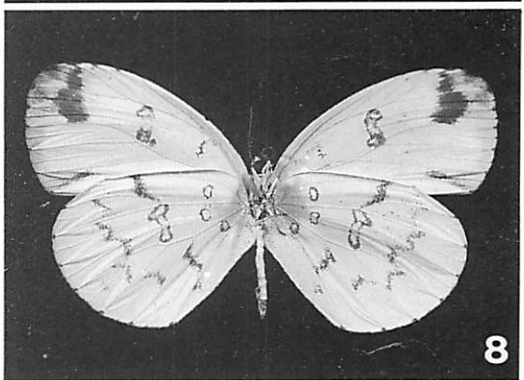
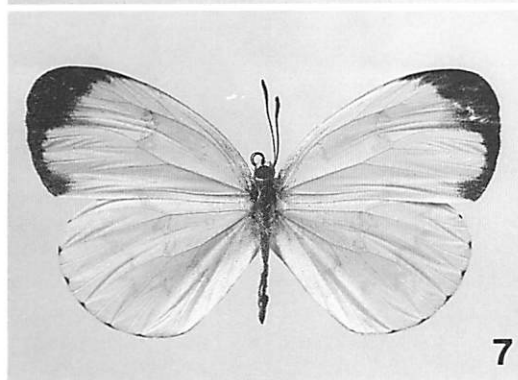
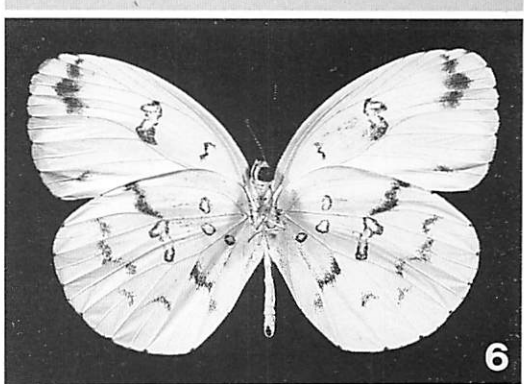
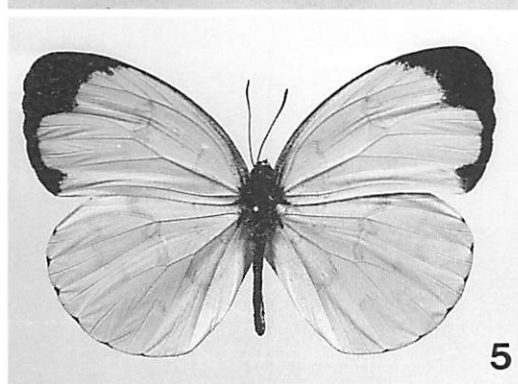
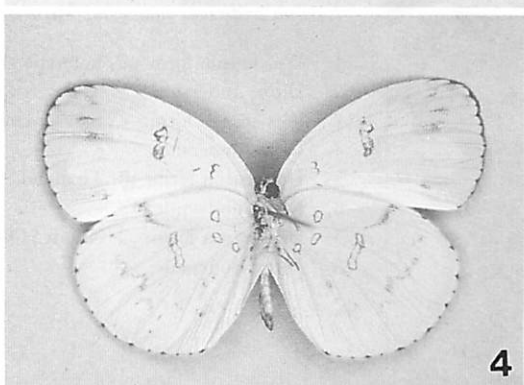
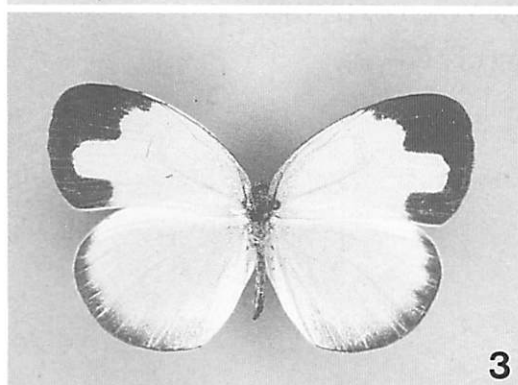
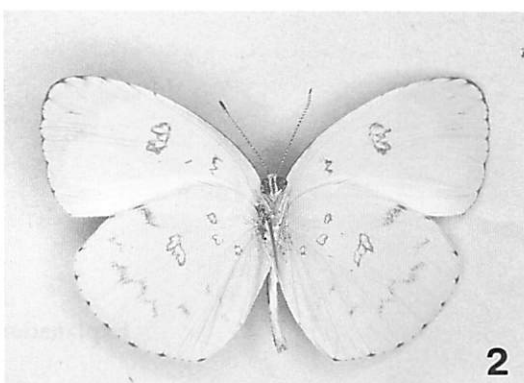
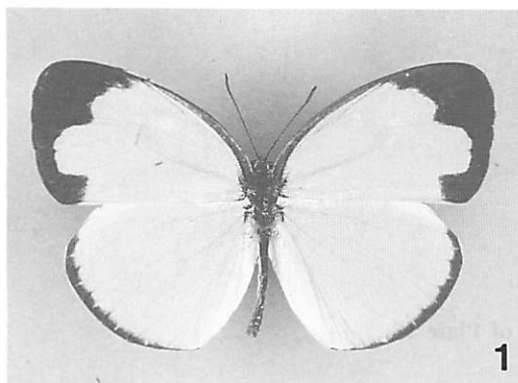
1. ♂, Mergui.
2. Ditto, underside.
3. ♂. Malay Peninsula.
4. Ditto, underside.
5. ♀, paralectotype [BMNH]. Mergui.
6. Ditto, underside.
7. ♀. Malay Peninsula.
8. Ditto, underside.



Explanation of Plate 11.

Eurema andersoni godana (FRUHSTORFER, 1910) [P. 31]

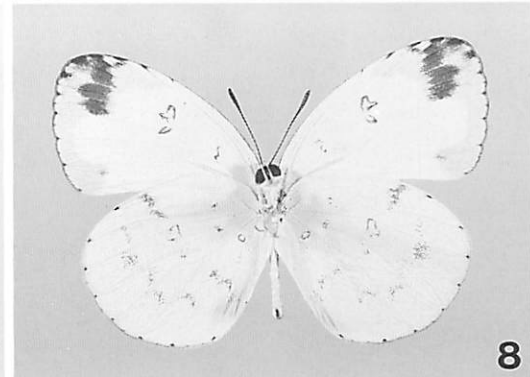
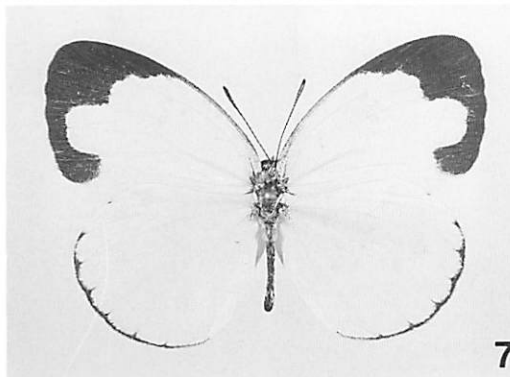
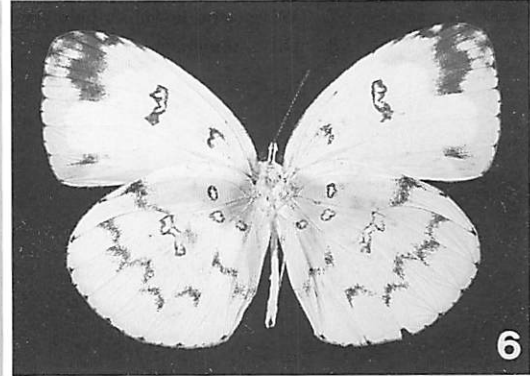
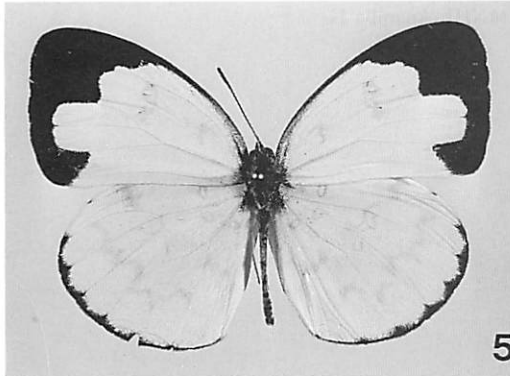
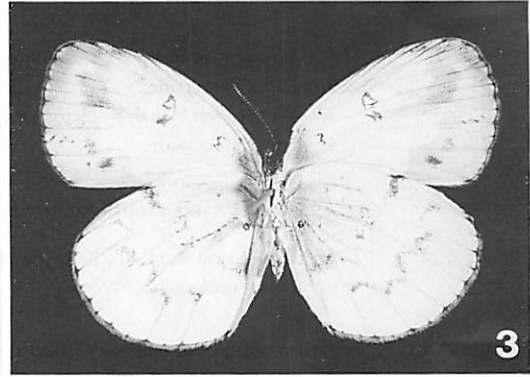
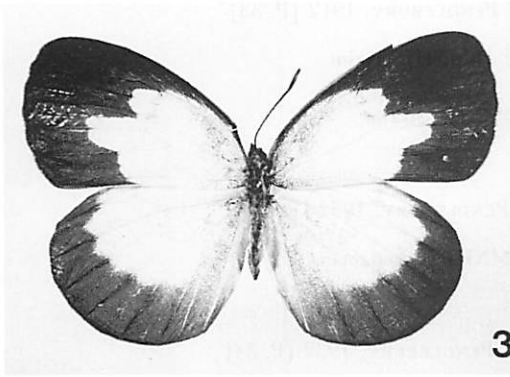
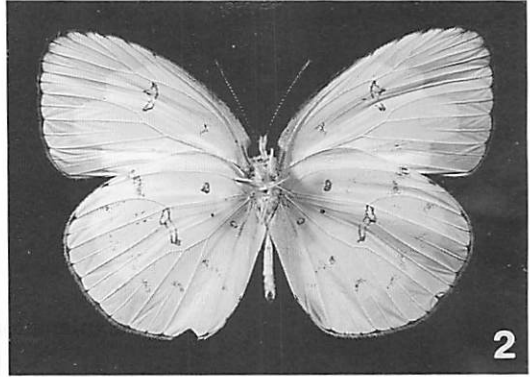
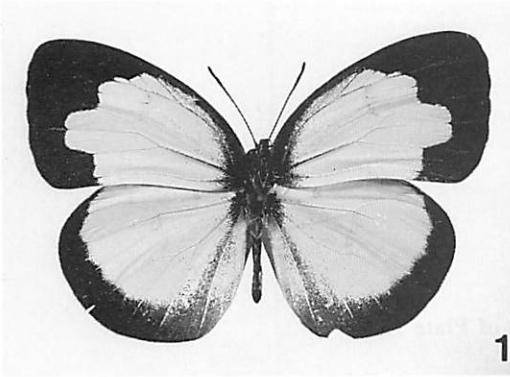
1. Wet-season form. ♂, lectotype [BMNH]. Taiwan.
2. Ditto, underside.
3. Wet-season form. ♀, paralectotype [BMNH]. Taiwan.
4. Ditto, underside.
5. Dry-season form. ♂. Taiwan.
6. Ditto, underside.
7. Dry-season form. ♀. Taiwan.
8. Ditto, underside.



Explanation of Plate 12.

Eurema andersoni sadanobui SHIRÔZU & YATA, 1982 [P. 32]

1. Wet-season form. ♂, holotype [KUCGE]. Cambodia.
2. Ditto, underside.
3. Wet-season form. ♀. S. Vietnam.
4. Ditto, underside.
5. Dry-season form. ♂. Thailand.
6. Ditto, underside.
7. Dry-season form. ♂. Nilgiri Hills.
8. Ditto, underside.



Explanation of Plate 13.

Eurema andersoni jordani CORBET & PENDLEBURY, 1912 [P. 33]

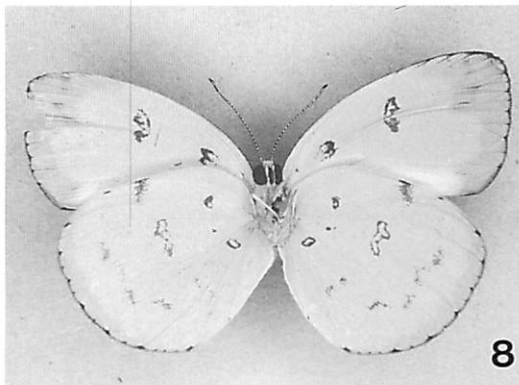
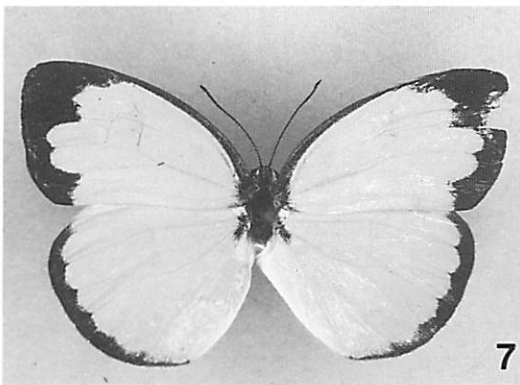
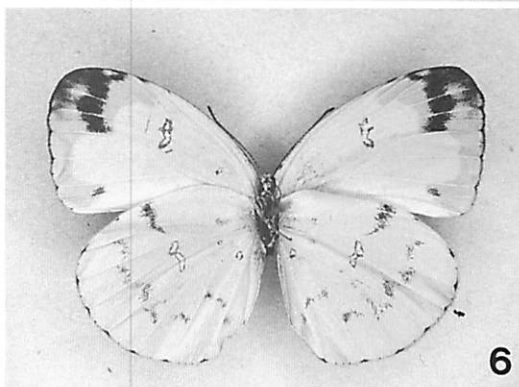
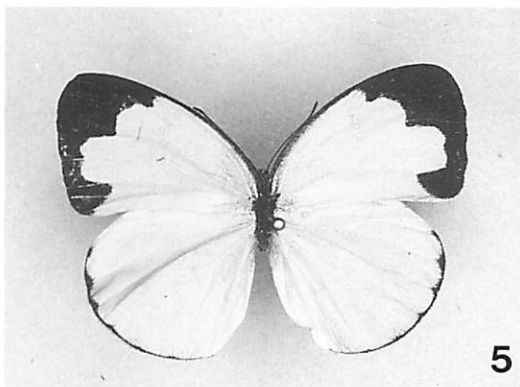
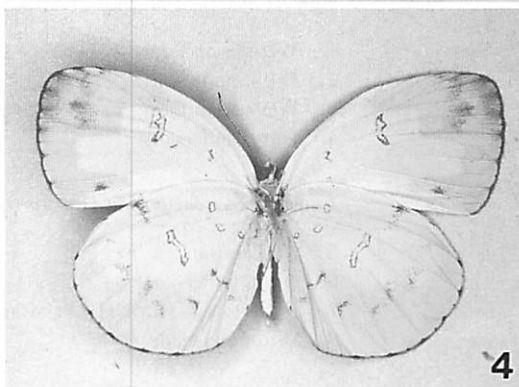
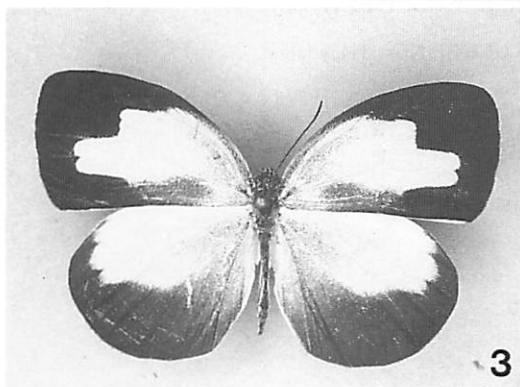
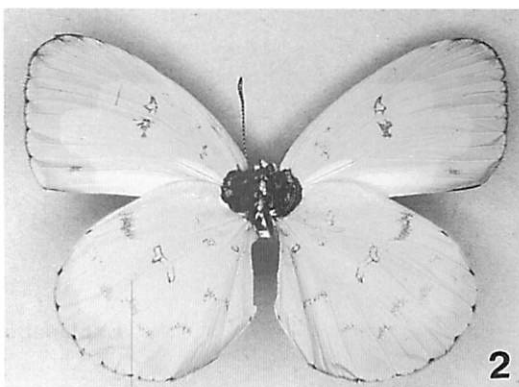
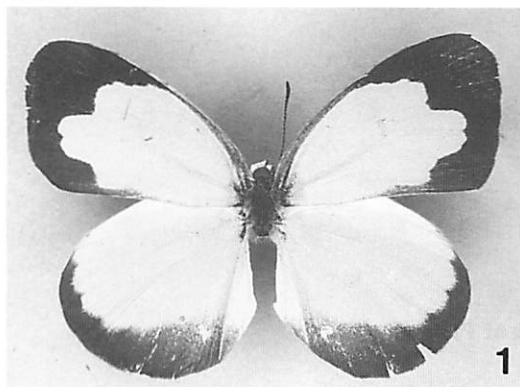
1. Wet-season form. ♂, 'neoallotype' [BMNH]. Sikkim.
2. Ditto, underside.
3. Wet-season form. ♀, lectotype [BMNH]. Sikkim.
4. Ditto, underside.

Eurema andersoni evansi CORBET & PENDLEBURY, 1932 [P. 34]

5. Dry-season form. ♂, holotype [BMNH]. S. Andamans.
6. Ditto, underside.

Eurema andersoni anamba CORBET & PENDLEBURY, 1932 [P. 34]

7. Wet-season form. ♂, holotype [BMNH]. Anamba Is.
8. Ditto, underside.



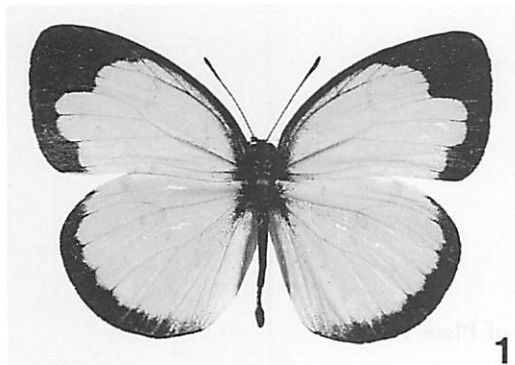
Explanation of Plate 14.

Eurema andersoni nishiyamai SHIRÔZU & YATA, 1981 [P. 35]

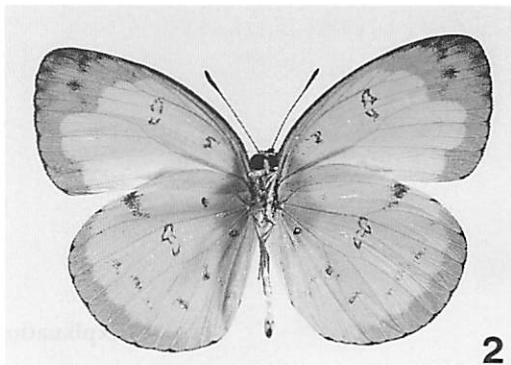
1. Wet-season form. ♂, holotype [KUCGE]. Nias, Telukdalam.
2. Ditto, underside.
3. Wet-season form. ♀. Nias, Telukdalam.
4. Ditto, underside.

Eurema andersoni prabha (FRUHSTORFER, 1910) [P. 36]

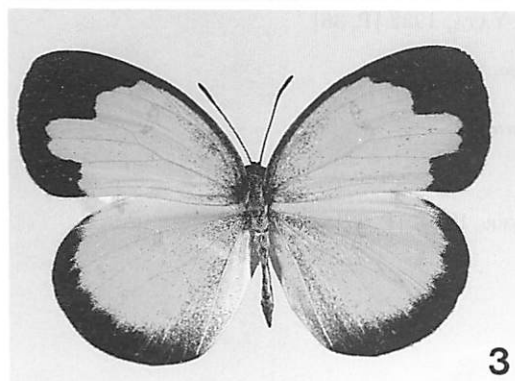
5. ♂. Palawan.
6. Ditto, underside.
7. ♀, lectotype [BMNH]. Palawan.
8. Ditto, underside.



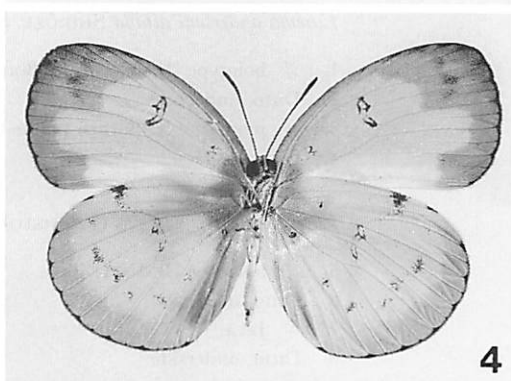
1



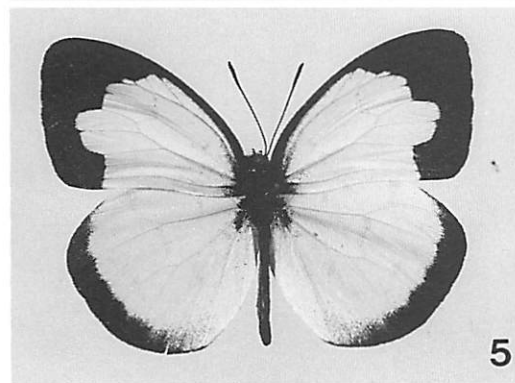
2



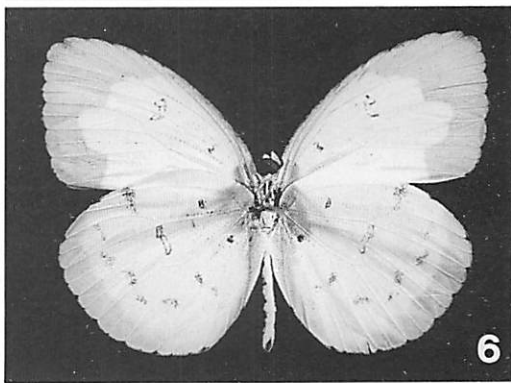
3



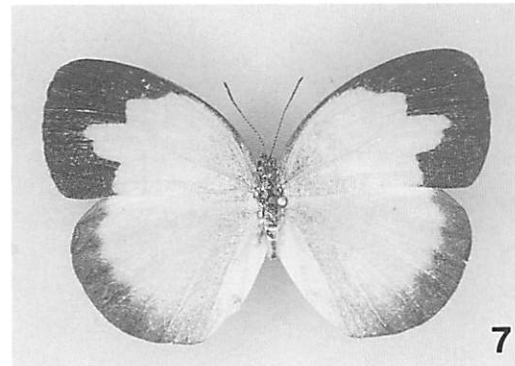
4



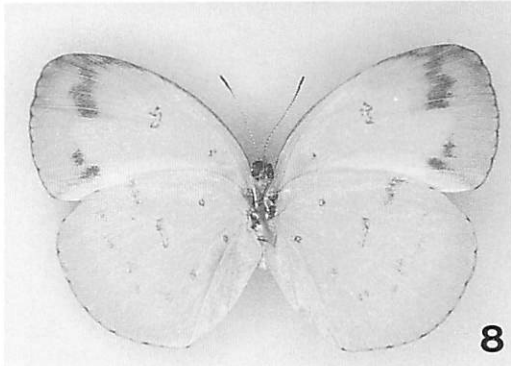
5



6



7



8

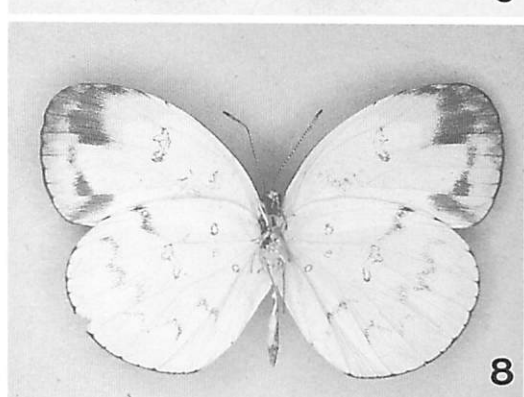
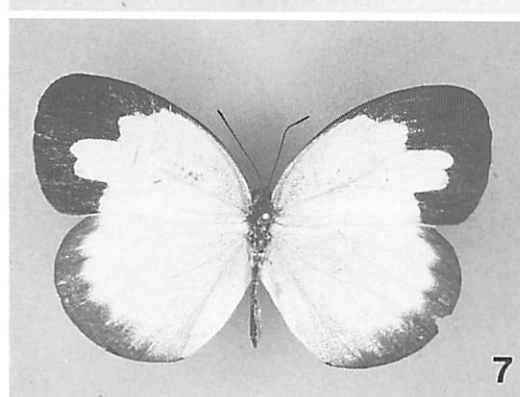
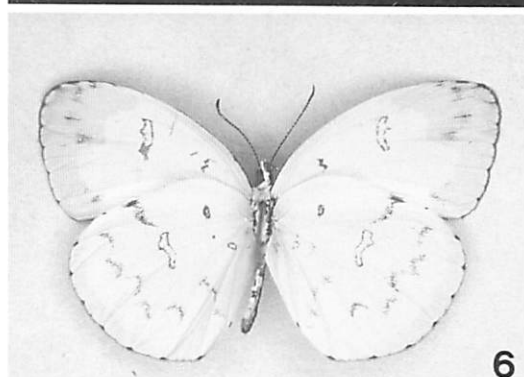
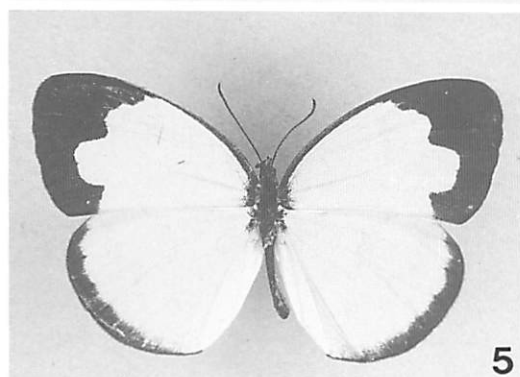
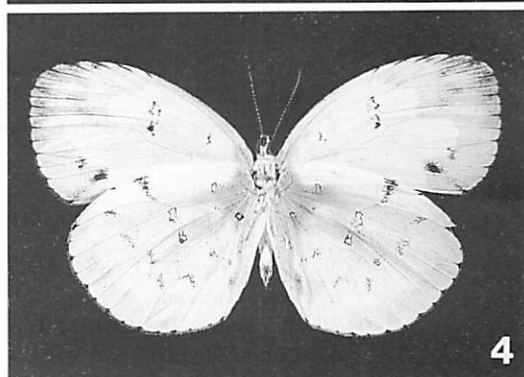
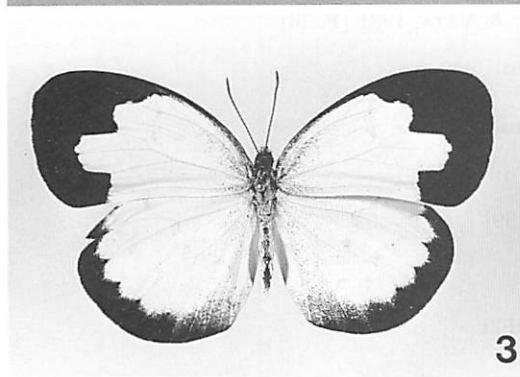
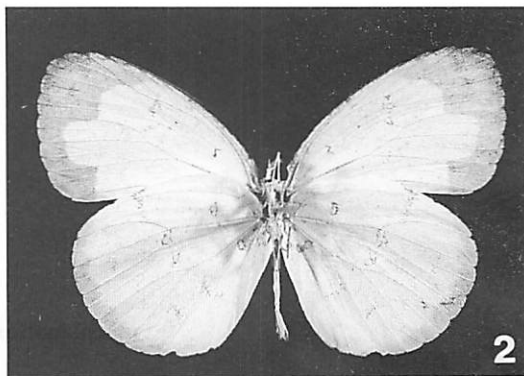
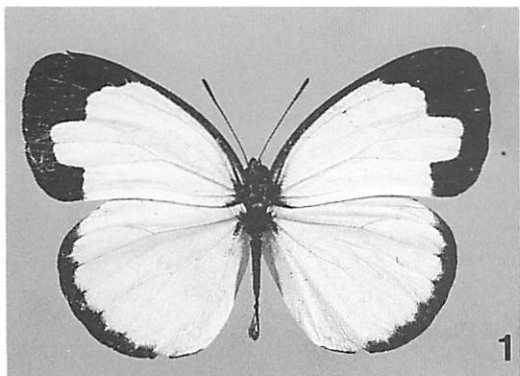
Explanation of Plate 15.

Eurema andersoni albida SHIRÔZU & YATA, 1982 [P. 36]

1. ♂, holotype [KUCGE]. N. Borneo.
2. Ditto, underside.
3. ♀, paratype. N. Borneo (white form).
4. Ditto, underside.

Eurema andersoni udana (FRUHSTORFER, 1910) [P. 37]

5. ♂, holotype [BMNH]. Java.
6. Ditto, underside.
7. ♀. Java.
8. Ditto, underside.



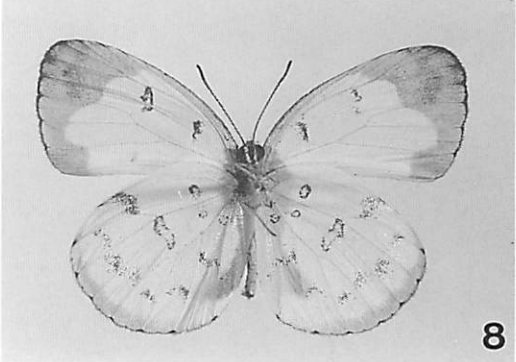
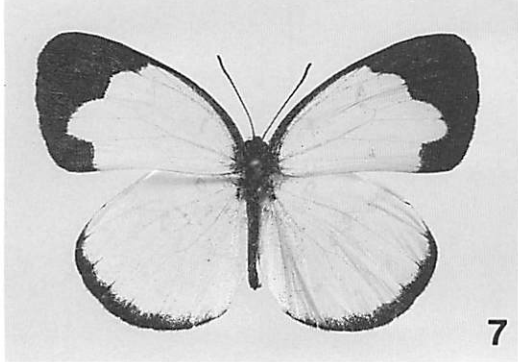
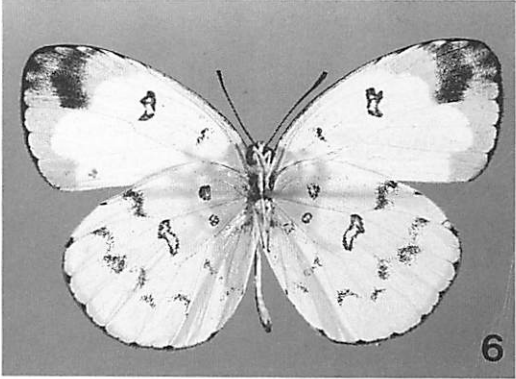
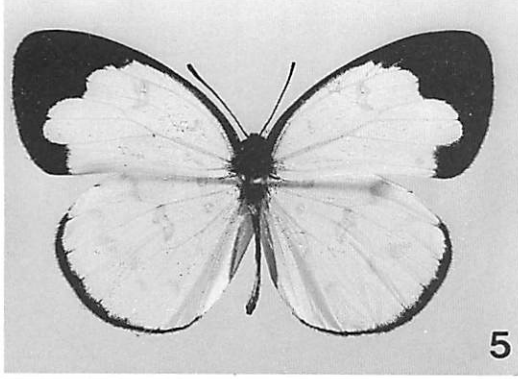
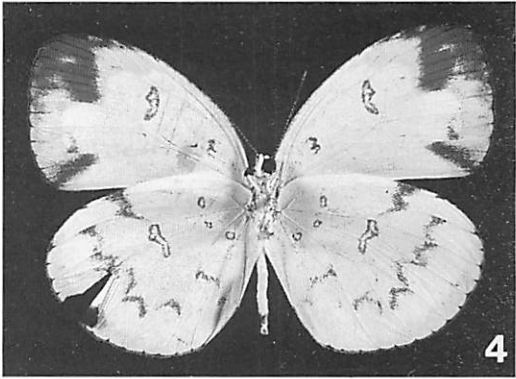
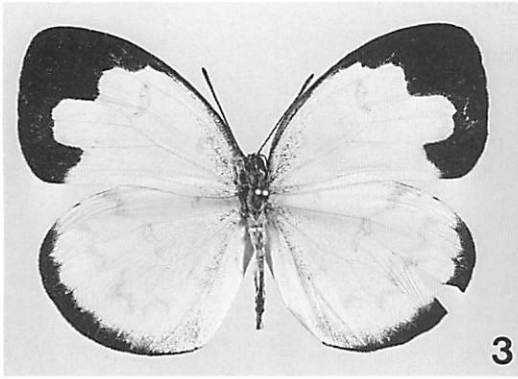
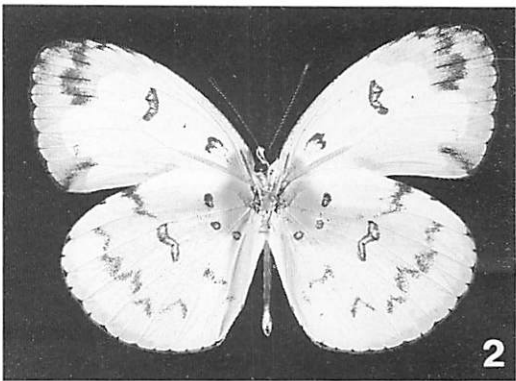
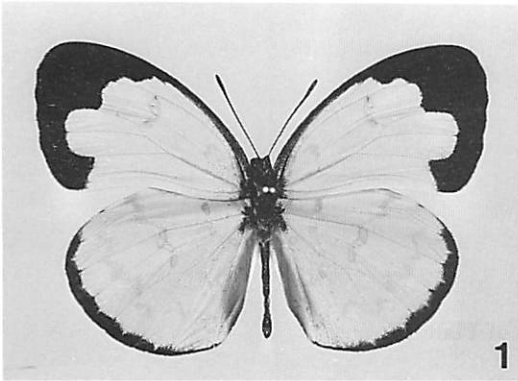
Explanation of Plate 16.

Eurema andersoni kashiwarii SHIRÔZU & YATA, 1981 [P. 38]

1. ♂, holotype [KUCGE]. E. Sumba.
2. Ditto, underside.
3. ♀, paratype [KUCGE]. E. Sumba
4. Ditto, underside.

Eurema nilgiriensis YATA, 1990 [P. 39]

5. ♂, holotype [ET]. Nilgiri Hills.
6. Ditto, underside.
7. ♂, paratype [KUCGE]. Nilgiri Hills.
8. Ditto, underside.



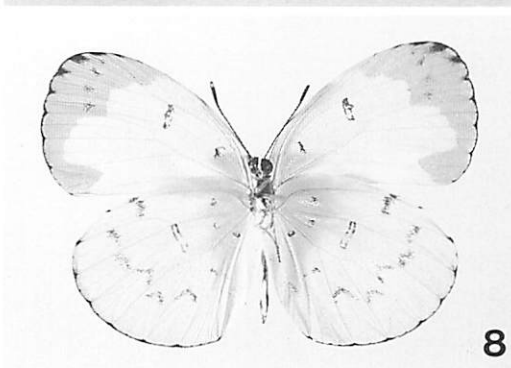
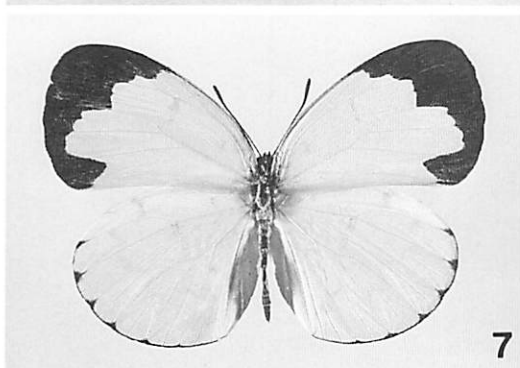
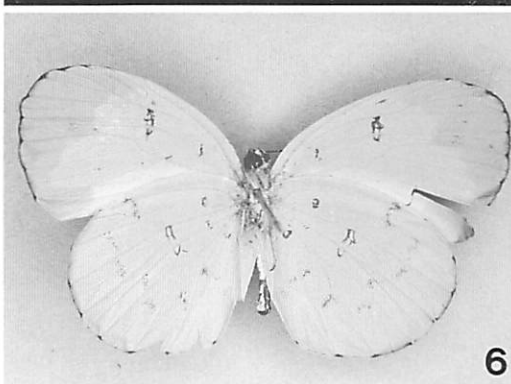
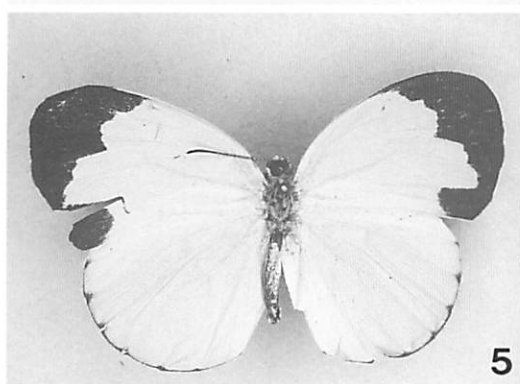
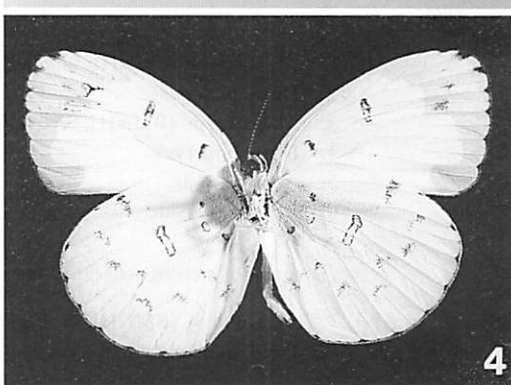
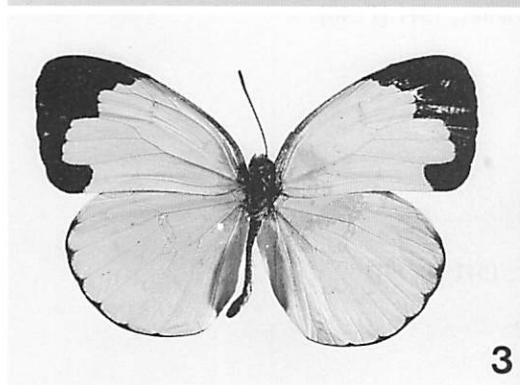
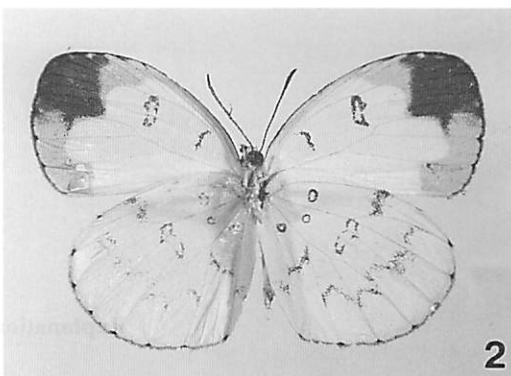
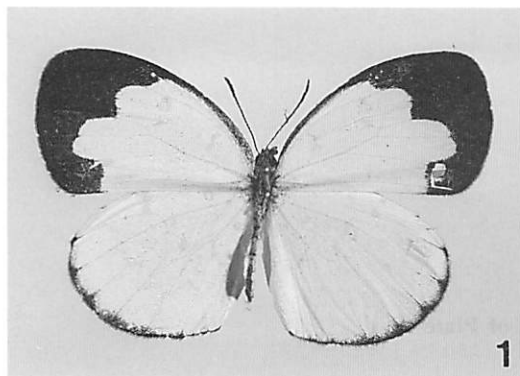
Explanation of Plate 17.

Eurema nilgiriensis YATA, 1990 [P. 39]

1. ♀, paratype [OHTSUKA coll.], Nilgiri Hills.
2. Ditto, underside.

Eurema ormistoni (WATKINS, 1925) [P. 42]

3. ♂, Sri Lanka.
4. Ditto, underside.
5. ♀, lectotype [BMNH], Sri Lanka.
6. Ditto, underside.
7. ♀, Sri Lanka.
8. Ditto, underside.



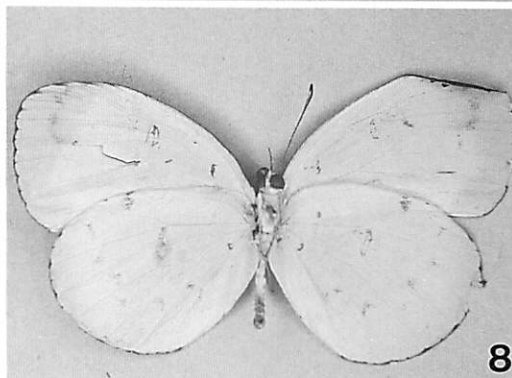
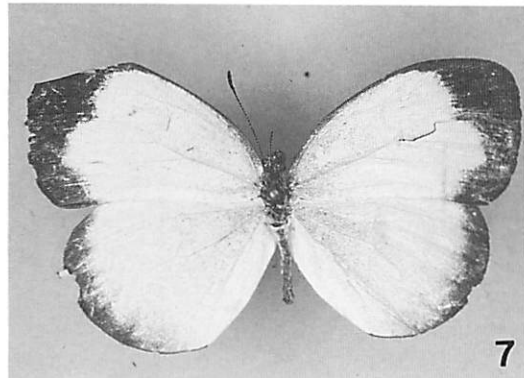
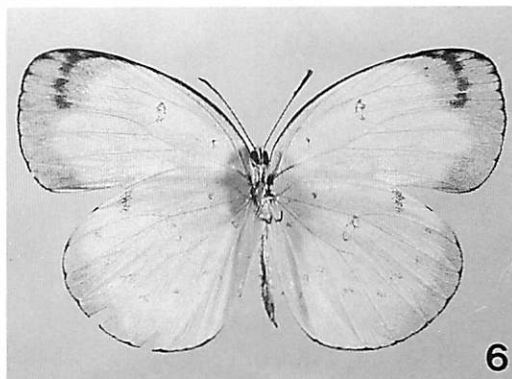
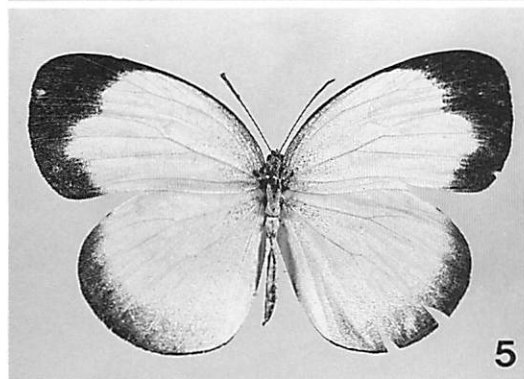
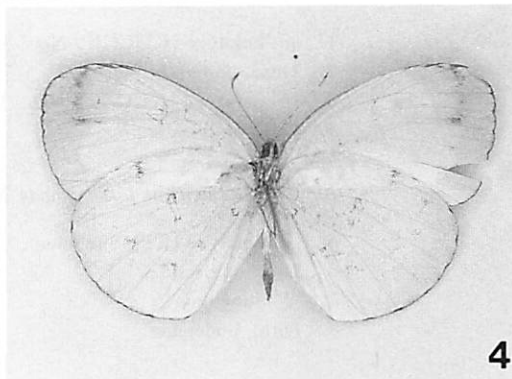
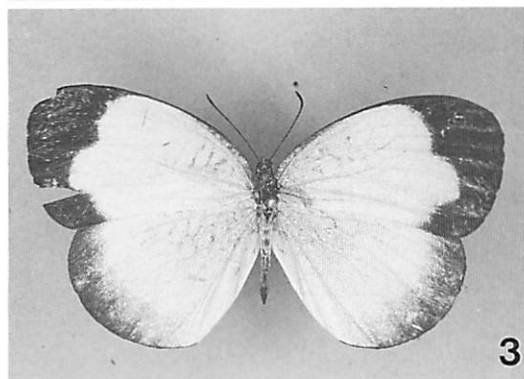
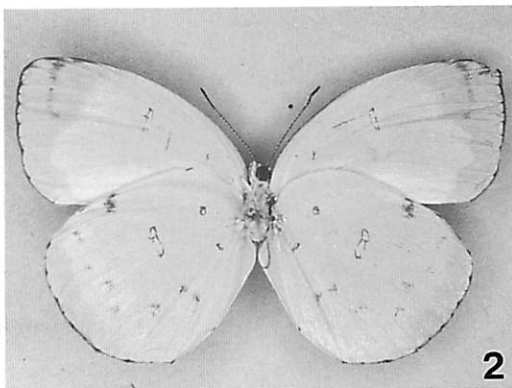
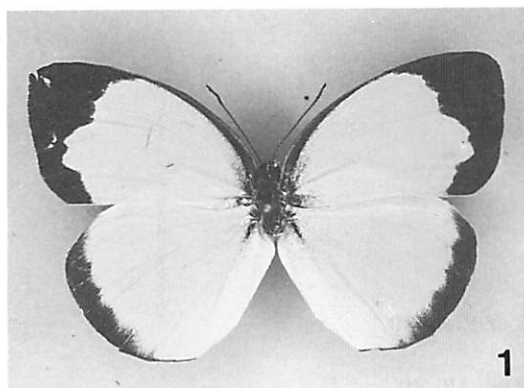
Explanation of Plate 18.

Eurema mentawiensis mentawiensis CORBET, 1941 [P. 48]

1. ♂, holotype [BMNH]. Sipora Is.
2. Ditto, underside.
3. ♀, paratype [BMNH]. Sipora Is.
4. Ditto, underside.
5. ♀. Siberut Is.
6. Ditto, underside.

Eurema mentawiensis trinens CORBET, 1941 [P. 49]

7. ♀, holotype [BMNH]. N. Pagi Is.
8. Ditto, underside.



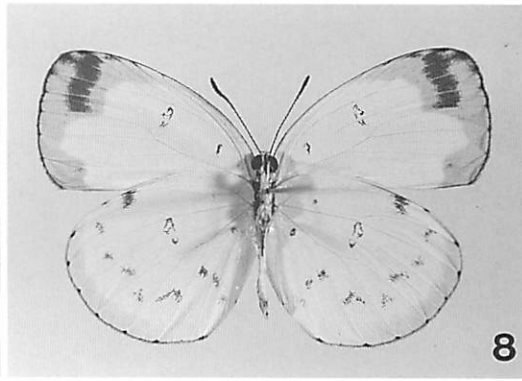
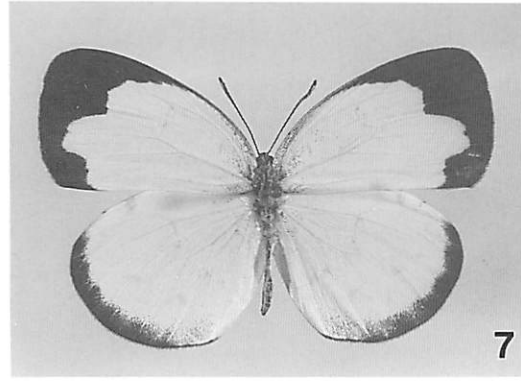
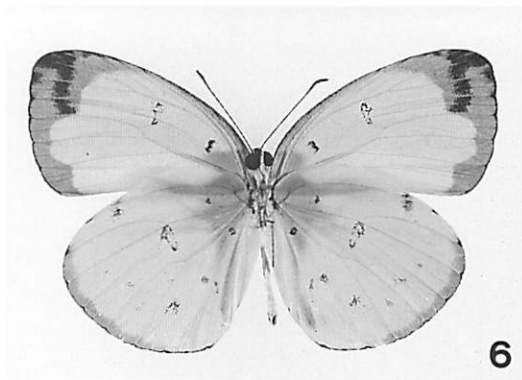
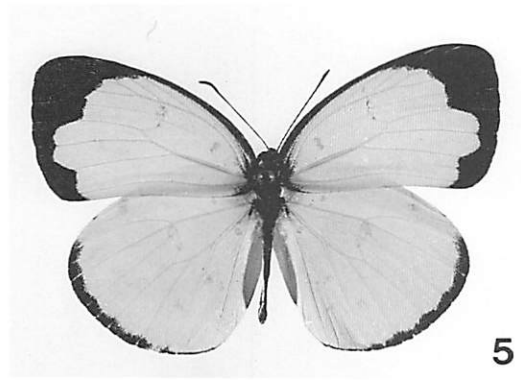
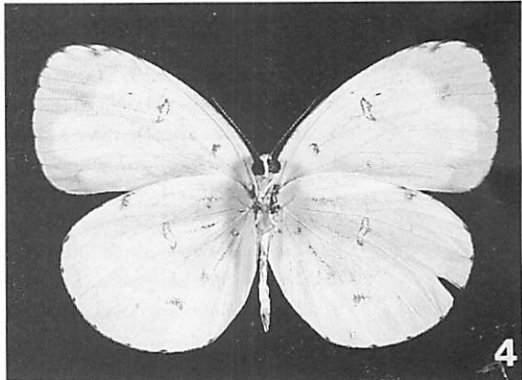
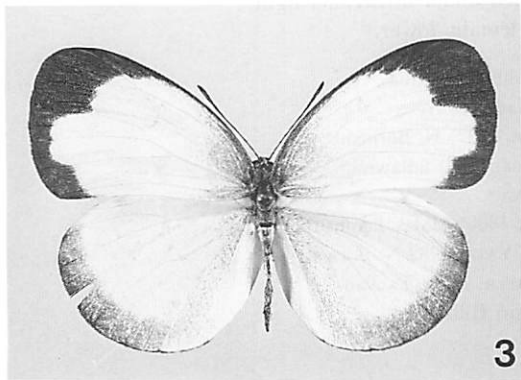
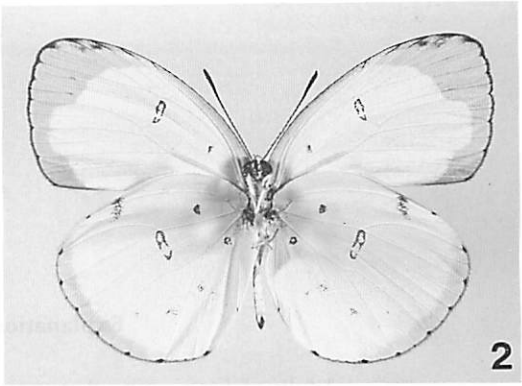
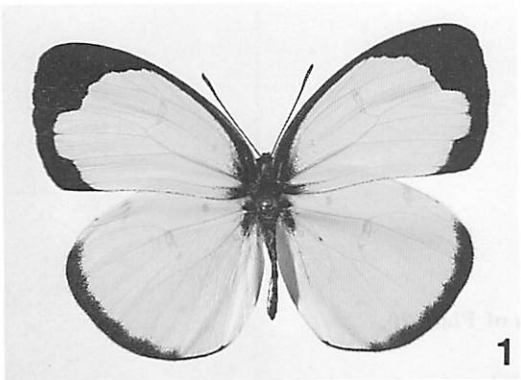
Explanation of Plate 19.

Eurema mentawiensis minuta YATA, 1981 [P. 50]

1. ♂, holotype [KUCGE]. Nias, Telukdalam.
2. Ditto, underside.
3. ♀, paratype [KUCGE]. Nias, Telukdalam.
4. Ditto, underside.

Eurema mentawiensis pseudoblanda MORISHITA, 1981 [P. 51]

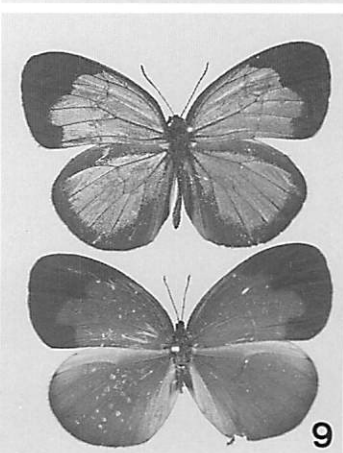
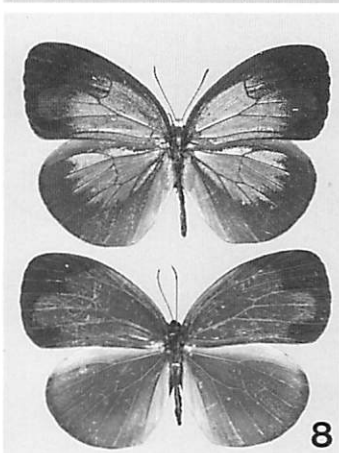
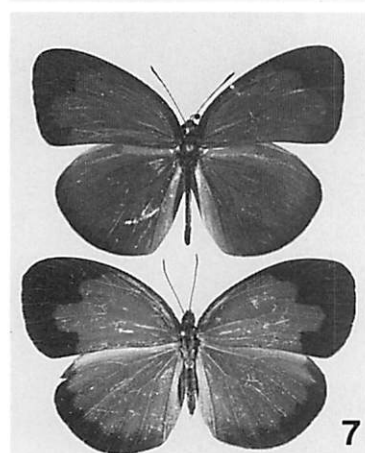
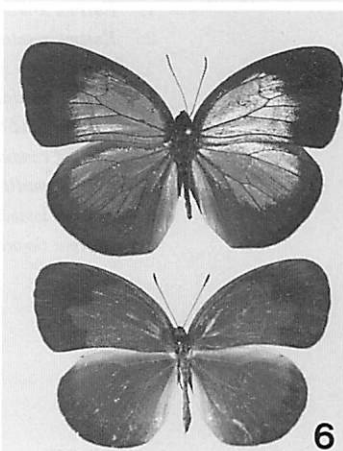
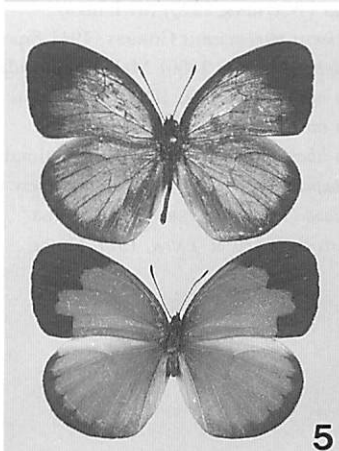
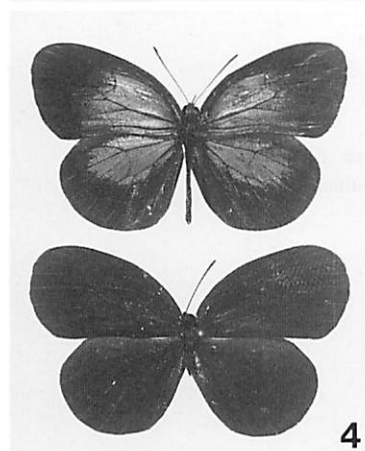
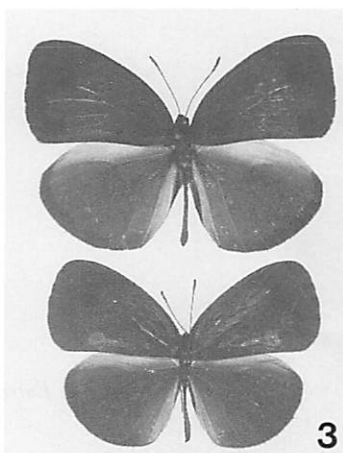
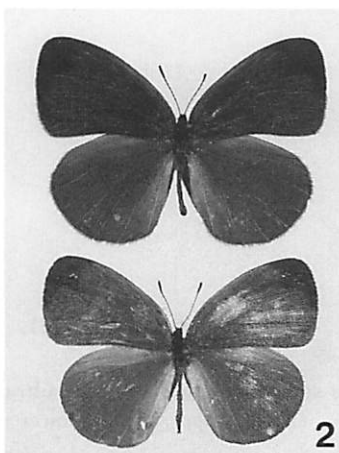
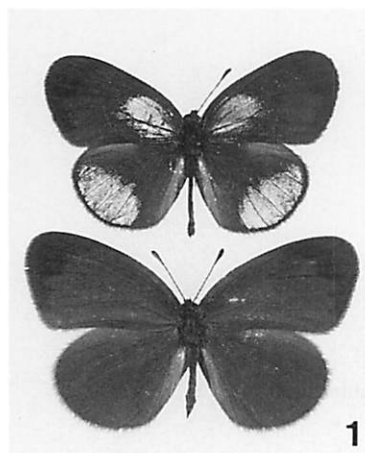
5. ♂, holotype [ET]. Simeulue.
6. Ditto, underside.
7. ♀. Simeulue.
8. Ditto, underside.



Explanation of Plate 20.

Adults of *Eurema* spp. photographed under ultraviolet light.
(Male: upper, female: lower.)

1. *Eurema smilax smilax* (DONOVAN, 1805) Australia.
2. *Eurema hapale* (MABILLE, 1882) Madagascar.
3. *Eurema ada ada* (DISTANT & PRYER, 1887) N. Borneo.
4. *Eurema celebensis celebensis* (WALLACE, 1867) Sulawesi.
5. *Eurema beatrix* TOXOPEUS, 1939 Java.
6. *Eurema andersoni andersoni* (MOORE, 1886) Malay Peninsula.
7. *Eurema andersoni albida* SHIRÔZU & YATA, 1982 N. Borneo.
8. *Eurema andersoni godana* (FRUHSTORFER, 1910) Taiwan.
9. *Eurema nilgiriensis* YATA, 1990 Nilgiri Hills.



Explanation of Plate 21.

Adults of *Eurema* spp. photographed under ultraviolet light.
(Male: upper, female: lower.)

1. *Eurema ormistoni* (WATKINS, 1925) Sri Lanka.
2. *Eurema mentawiensis mentawiensis* CORBET, 1941 Sipora.
3. *Eurema sari sodalis* (MOORE, 1886) Malay Peninsula ♂, Palawan ♀.
4. *Eurema sarilata sarilata* (SEMPER, 1891) Mindanao.
5. *Eurema candida candida* (CRAMER, 1789) Ambon.
6. *Eurema candida libera* (FRUHSTORFER, 1910) Halmahera ♂, Ternate ♀.
7. *Eurema puella papuana* (BUTLER, 1898) Papua New Guinea.
8. *Eurema lombokiana* (FRUHSTORFER, 1897) Sumba.
9. *Eurema timorensis* SHIRÔZU & YATA, 1977 Timor.

