

## A Revision of the Indo-Australian Species of the Genus *Eurema* with Special Reference to the Malaysian Forms

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(with one plate, and seven text figures)

Several of the species comprising the genus *Eurema*<sup>1</sup> are so very variable and susceptible to seasonal and geographical influences that the determination of a species has been frequently a matter of uncertainty. For one or two species innumerable names have been published and the exact status of several forms has been very doubtful.

Our original intention in dealing with this genus was merely to try and adjust the confusion that had arisen in the nomenclature of the Malayan—and some of the Malaysian<sup>2</sup> species, and it appeared possible that an examination of the male genitalia might throw light on the subject: this anticipation has been realised fully. Over seventy such examinations have been carried out and as a result we have been enabled to identify with certainty the large number of specimens of *Eurema* in the British Museum (Natural History), and in the Federated Malay States Museum at Kuala Lumpur.

It has been found that certain characters are variable in some species and not in others, but a sufficient number of constant differences have been revealed to render identification positive. Nevertheless, in dealing with a genus where many species are very similar and also subject to considerable variation, dependence should not be placed on any one single character; and, paradoxical as it may seem, the facies of a specimen is the greatest aid to its identification. On other words, when one has become acquainted with the several species and their respective ranges of variation, it will be found that each species presents a picture of its own.

For this reason the key on page 154 is intended only as a rough guide and should be used with discretion.

Soon after our preliminary investigations on the Malayan species were completed, the former of us returned to Europe (via America) on leave, and advantage was taken of this opportunity to study the material of *Eurema* in the American Museum of Natural History, New York; the British Museum

1. *Eurema* (1820) has a few months priority over *Terias* (Jan. 1821).

2. For the definition of "Malaysia" vide C. Boden Kloss, Bulletin of the Raffles Museum, Singapore, S. S., No. 2 July, 1929, pp. 1-10 (four maps).

(Natural History), London; in Lord Rothschild's Zoological Museum, Tring; and in the Hill Museum, Witley, Surrey.

We are much indebted to the Directors of these Museums for permission and facilities to work through their material. It is a pleasure also to acknowledge the assistance given by Dr. Frank E. Watson (New York), Dr. K. Jordan, Dr. A. Seitz, Messrs. C. J. Brooks, G. Talbot, A. G. Gabriel, and Captain N. D. Riley; we are indebted particularly to Captain Riley.

As a result of these further investigations during which many thousands of specimens were examined including seventy seven types and eight co-types, it was found necessary to make a few slight modifications to our previous conclusions. At the same time it was possible to extend our inquiries to include the known species from the Indo-Australian region.

In the main this work has been confined largely to the *hecabe*-group and particular interest has been taken in the forms from Malaysia. The *libythea* and *laeta* forms in the British Museum have been examined, but no genitalia preparations have been made of the species comprising these groups, so we have done little more than to list the subspecies and make obvious nomenclatural corrections. On the other hand, the forms comprised in the *hecabe*-group have been investigated thoroughly, and it will be seen that many changes in nomenclature are necessitated. Where any doubt has existed as to the validity of a subspecies the name has been allowed to stand. In the present paper new subspecies have been described only when such a course was unavoidable, but there is every reason to believe that many more subspecies will have to be denominated when the outlying islands in the Indo-Australian region are more thoroughly explored entomologically. Many island forms from the same archipelago are often more deserving of subspecific rank than are the generally recognized races from the larger islands of Malaysia. As an instance, the *hecabe* forms from the Bismarck Archipelago, grouped under *kerawara*, differ far more among themselves than do the races from the Malay Peninsula, Sumatra, and Java.

It is difficult to draw any definite conclusions on the interesting subject of the relationship existing between form and geographical distribution, but one or two points merit discussion.

In the case of the *hecabe*-group we can recognize three more or less standard forms of variation. The characteristics of these are as follows:

- (a) Indications of a basal black border on the upperside of the forewing where none is present normally;

- (b) White or milky-white females in which the under-side is coloured a very definite greenish-white;

- (c) The females are heavily dusted with black above.

Type (a). *hecabe*-forms with a forewing basal band are found only in the Celebes and the Sula Islands. Examples of *blanda* from the Celebes, Sula Islands, Amboina and Obi all have this border or indications of it, and we have seen one specimen from Darjeeling with a distinct basal band. Curiously enough, there is a race of *andersoni* occurring in Sikkim in which the females (we have seen no males) have such a prominent forewing basal band that they might be confused with *tilaha*.

For several reasons it appears possible that *tilaha* is an older species than either *hecabe*, *simulatrix*, *blanda*, *andersoni*, *ada* or *sari*, and that these last-mentioned species have arisen directly or indirectly from *tilaha* or a *tilaha*-like form. The persistence of the forewing basal bordering on the Celebes races of *hecabe* and *blanda* suggests that these species had their origin in the Celebes, and the sporadic occurrence of the forewing basal border in specimens of *hecabe*, *blanda*, and *andersoni* on the mainland of Asia is readily explained as a reversion to an older type.

Type (b). The white or milky-white "*lacteola*" form of the female *hecabe* occurs only in the Malay Archipelago, and then only along a fairly regular line drawn from the Malay Peninsula to the Solomon Islands. The "*lacteola*" female is rare in the Malay Peninsula, common in the Natuna and Anamba Islands and in Borneo. Although unknown from the Celebes it is the usual form in the South Moluccas, common in New Guinea and the Bismarck Archipelago, and becomes the usual form in the Solomon Islands. All these localities lie within a belt bounded by the 5° N. and 10° S. lines of latitude, in fact where the dry and wet seasons are not so sharply contrasted or strongly marked as they are outside these limits. It is interesting to note further that these white "*lacteola*" females are often associated with narrow-bordered males similar to the form *asphodelus* Btlr. It is suggested that the form *lacteola* is a recessive, and although the white colour is inhibited in the male it appears possible that the zygotic factor, or factors, which give rise to white females may be outwardly manifested in the male by the smaller size and narrow black bordering. The absence of typical forms in the Anamba Is. suggests that both sexes are homozygous with respect to the factor under discussion.

Type (c). Black-dusted females of *hecabe* are confined to certain islands but, geographically, their occurrence is of a sporadic nature. The wet season form of *hecabe* from Japan is

black-dusted, but this character is most apparent in the races from Nias, the South Philippines, the South Celebes, the island of Kalidupa and New Caledonia.

Although the name *Terias* sinks to *Eurema*, as mentioned above, A. B. Klots (J. New York Ent. Soc., 1928, xxxvi, p. 61) has pointed out that the American species of the genus are distinct as a whole from the old world species and, perhaps, sufficiently so to warrant future generic distinction. Should this change be adopted, and the name *Terias* revived for the Indo-Australian species, then the Cingalese race of *blanda* must be *citrina* Mre., instead of *rotundalis* Mre.; this appears to be the only nomenclatural change which would be necessitated.

All the valid subspecies considered in the sequel have been examined by one or both of us unless the contrary is stated, and the following is a list of the types that have been inspected by the former of us: *accentifera* Mart.; *aesiopeoides* Mre., *amplexa* Mre., *andamana* Mre., *angulifera* Btlr., *apicalis* Mre., *aprica* Btlr., *arcuata* Mre., *asphodelus* Btlr., *attenuata* Mre., *australis* Wall., *bidens* Btlr., *biformis* Btlr., *blanda* Bsdv., *brevicostalis* Btlr., *cadelli* Mre., *celebensis* Hall., *cingala* Mre., *citrina* Mre., *connexiva* Btlr., *curiosa* Swinh., *diversa* Wall., *excavata* Mre., *fimbriata* Wall., *gradiens* Btlr., *grandis* Mre., *hainana* Mre., *hebridina* Btlr., *heliophila* Btlr., *hobsoni* Btlr., *hybrida* Btlr., *inanata* Btlr., *indecisa* Btlr., *invida* Btlr., *irregularis* Mre., *laratensis* Btlr., *latilimbata* Btlr., *lifuana* Btlr., *lorquini* Feld., *mariesi* Btlr., *maroensis* Btlr., *mindorana* Btlr., *moorei* Btlr., *narcissus* Btlr., *nicevillei* Btlr., *ormistoni* Watkins, *papua* Btlr., *phoebus* Btlr., *photophila* Btlr., *pseudolaeta* Mre., *pumilaris* Btlr., *purreea* Mre., *rama* Mre., *rotundalis* Mre., *rubella* Wall., *salomonis* Btlr., *sana* Btlr., *sari* Hsf., *semifusca* Btlr., *sikkima* Mre., *silhetana* Wall., *simplex* Btlr., *simulata* Mre., *sinapina* Btlr., *subdecorata* Mre., *sulphurata* Btlr., *sulaensis* Joicey and Talbot, *swinhoei* Btlr., *tilaha* Hsf., *uniformis* Mre., *vagans* Wall., *vallivolans* Btlr., *varieta* Btlr., *venata* Mre., *virgo* Wall., *woodfordi* Btlr., and *xanthomelaena* Godm.

The following co-types of forms described by Moore have been examined also: *andersoni*, *contubernalis*, *davidsoni*, *fraterna*, *kana*, *merguiana*, *patruelis*, and *sodalis*.

All the above specimens are in the collection of the British Museum (Natural History), with the exception of *sulaensis* which is in the Hill Museum, Witley, Surrey.

Where known with sufficient precision, the type localities are given below in square brackets after the author's references.

The following new subspecies and forms are described in this paper:

*Eurema hecabe novaecaledoniae* ssp. n. (New Caledonia). p. 165.

: *simulatrix tecmessa* f. *stockleyi* n. (Taok Plateau, Tenasserim). p. 167.

: *simulatrix kolleri* ssp. n. (East Java). p. 167.

: *simulatrix kolleri* f. *javanica* n. (East Java, mountains). p. 167.

: *simulatrix irena* ssp. n. (Central Celebes). p. 168.

: *blanda rileyi* ssp. n. (North Fokien, China) p. 170.

: *blanda hylama* ssp. n. (Hainan). p. 171.

: *andersoni anamba* ssp. n. (Anamba Ids). p. 178.

: *andersoni evansi* nom. n. (S. Andaman Ids.). p. 179.

: *andersoni jordani* ssp. n. (Bhotan). p. 180.

: *tominia nabalua* ssp. n. (Mt. Kinabalu, N. Borneo). p. 186.

Fruhstorfer (Seitz, Macrolepidoptera, 1910, vol. ix, p. 165), divides the Indo-Australian species of the genus into three groups:

- (1) *libythea*-group: male with no sexual spot on the forewing; two species. (= *Kibrecta*<sup>1</sup> Mre.).
- (2) *laeta*-group: male with an androconial patch of pinkish hairs below and near the base of the median on the underside of the forewing; and another patch on the upperside of the hindwing under vein 8<sup>2</sup>: two species (= *Nirmula* Mre.).
- (3) *hecabe*-group: male with two stripes of short, thick, scales at both sides of the median on the underside of the forewing; eleven species.

## FAMILY PIERIDAE

Genus *Eurema* Hbn.

Verz. bek. Schmett., 1820, p. 96<sup>3</sup>. (Type, *delia* Cram., 1780, from America.).

*Terias* Swains., Zool. Ill., Jan. 1821, i, pl. 22. (Type, *hecabe* Linn.).

1. Mis-spelt *Kibretta* in Zool. Rec. 1906, XLIII, Insecta, p. 314.

2. The androconial patch on the upperside of the hindwing is not mentioned by Fruhstorfer.

3. The exact date of publication is doubtful: some authors give 1816, but Sherborn's Index Animalium, which we follow, records 1820, with however a symbol of uncertainty.



(1) *libythea*-group. (= *Kibrecta* Mre. 1906).*Eurema libythea* (F.) 1798.

This species occurs from New Guinea and Australia across Malaysia to India and Ceylon, and to China and Formosa.

In their monograph on the 'Rhopalocera of Java', Piepers and Snellen refer to this insect as *brigitta* Cram. (Pap. Exot., 1782, iv, pl. 331 B, C.), but *brigitta* came from "La côte de Guinée" and we follow the customary plan in regarding the oriental species as *libythea* F.<sup>1</sup>

*Eurema libythea senna* (Feld.). ["Malacca Interior."]

Novara Reise, Lep., 1865, ii, p. 212.

♂. Colour above and below a bright rich yellow. Upperside: a broad, black, distal band extends from the mid costa to the tornus on the forewing. This band is broad at the apex and narrows towards the tornus, and the inner edge is excavated slightly between veins 1 and 2, 2 and 3, 3 and 4. The hindwing has a black border which is narrow at the tornus and broadens considerably towards the apex, and runs inwardly for a short distance along veins 6 and 7. The base of both wings is dusted with black; cilia of forewings pink, of hindwings pink from veins 1-5, rest yellow.

Underside: the forewing is unmarked except for a streak at the discoidal (which in some specimens may appear as a colon mark), and the dark vein endings. Markings on the hindwing are rather indistinct and consist of a circular spot in the centre of space 7, two circular spots in the cell near the discoidal, and a series of indistinct discal streaks; vein endings marked by a black dot.

The male has no sex brand.

Wing expanse, 39-40.5 mm. (One small example only expands to 29.75 mm.).

♀. Lighter in colour than the male, and with the basal area of the wings rather more heavily dusted with blackish scales; the inner margin of the black border is blurred at the edges.

Underside with markings similar to the male, and in some instances there is indication of a blackish subapical streak running from the costa to vein 4.

Wing expanse, 33-41 mm.

The F. M. S. Museum has examples of *senna* only from Penang Hill, taken at 2,000 feet.

<sup>1</sup>. Vide Butler, P. Z. S., 1871, pp. 534, 535.

*Eurema libythea drona* (Hsf.). [Java.]

Cat. Lep. E. I. Co., 1829, i, p. 137.

*herlina* (Fruh.), Seitz, Macrolepidoptera, 1910, vol. ix, p. 166<sup>1</sup>. [E. Java.]

Sumatra, Java, Bali, and Lombok. Examples from Java are larger than those from the Malay Peninsula or Sumatra, but specimens from the Sunda Islands differ from *senna* in the narrower costal margin to the forewing. As *herlina*, Fruhstorfer placed the smaller wet season form from Java and Lombok, which has a narrow, uniform, black, hind wing border.

The races of *libythea* occurring outside of Malaysia appear to be as given below. Neither *fruhstorferi* nor *dionysia* were represented in any of the collections to which we had access.

*Eurema libythea punctissima* (Mats.)<sup>2</sup>. [Formosa.]

Ent. Zs. Stuttgart, 1909, xxiii, p. 88.

*dorothea* Nakahara, Entomologist, 1922, iv, p. 123.

A male of this race in the British Museum hardly differs from Indian specimens except that it is smaller in size.

*Eurema libythea libythea* (F.). [? Canara.]

Ent. Syst. Suppl., 1798, p. 427.

*rubella* (Wall.), Trans. Ent. Soc., 1867, (3), iv, p. 323. [Calcutta.]

China, Ceylon, India, Nicobar Ids., Burma and Siam. The types of *rubella*, which Fruhstorfer placed as the dry season form, lack the usual broad, black bordering on the upperside of the hindwing.

T. R. Bell has described the life history in the Journ. Bombay N. Hist. Soc., 1913, xxii, pp. 525-527.

*Eurema libythea hainana* (Mre.). [Hainan.]

Proc. Zool. Soc., 1878, p. 700.

This form which was incorrectly placed as a *laeta* race by Fruhstorfer, has only traces of the black border on the hindwing.

*Eurema libythea fruhstorferi* (Mre.).

Lep. Ind., 1906, vii, p. 40.

Tonkin, Annam, and Siam.

<sup>1</sup>. All the "*Terias*" described during 1910 are shewn in error under the genus *Teracolus* in the Zool. Record, 1910, xlvii, Ins., p. 315.

<sup>2</sup>. Two varieties, *formosana* and *taiwana* were described by Matsumura in 1929. Mats., Thous. Ins. Japan, (Addit. 3, 1919), 1929, pp. 510, 512.

*Eurema libythea lerna* (Feld.). [Amboina.]

Sitz. Akad. d. Wiss., 1860, p. 449.

Southern Moluccas and Timor. Examples from Amboina, Buru, and Saparoea are much like Javanese specimens, but those from Timor are darker and the female has slightly more black dusting at the wing bases.

*Eurema libythea dionysia* (Hulstaert.). [Timor Laut.]

Ann. Mag. Nat. Hist., 1923, (9), xi, p. 623.

*Eurema libythea zoraide* (Feld.). [Origin unknown.]

Novara Reise, Lep., 1865, ii, p. 213.

*australis* (Wall.), Trans. Ent. Soc. 1867, (3), iv, p. 321. [Queensland.]

Queensland, New South Wales and New Guinea. The type specimen of Felder's race possibly came from Rockingham Bay, Queensland, and Wallace's type was based on a specimen from Moreton Bay near Brisbane. Examples from these localities are similar to *drona* from Java, but while the Australian specimens are more deeply coloured, those from New Guinea are lighter.

Fruhstorfer placed *sinta* (Wall.), (Trans. Ent. Soc., 1867, (3), iv, p. 322), and *immaculata* (Misk.), (Proc. Royal Soc., Queensland, 1889, p. 258), both from Australia, as the dry season form. We are unable to comment as we have not seen the types.

(2) *laeta*-group. (= *Nirmula* Mre. 1906).

*Eurema laeta* (Bsdv.) 1836.

Fruhstorfer regarded *laeta* and *venata* as separate species, but there appears to be no doubt that they are conspecific (see Mosse, Journal Bomb. Nat. Hist. Soc., xxxiv, 1931, p. 1094).

The species occurs in India, China, Japan and the Philippines, Java, Timor Laut, Key Is., and Queensland.

We are unable to state in what respects the Javanese form differs from typical *laeta*, and so tentatively place it under the name type.

*Eurema laeta laeta* (Bsdv.).

Spec. Gen. Lep., 1836, i, p. 674.

*venata* (Mre.) Cat. Lep. E.I.Co., 1857, i, p. 65. [North India.]

*santana* (Feld.) Novara Reise, Lep., 1865, ii, p. 211. [Bengal.]

*vagans* (Wall.) Proc. Zool. Soc., 1866, p. 357. [North India.]

*pallitana* (Mre.) Ann. Mag. Nat. Hist., 1877, (4), xx, p. 48. [Bombay.]

*pseudolaeta* (Mre.) Lep. Ind., 1906, vii, p. 44. [Tenas-serim.]

*annamitica* (Mre.) *ibid.* p. 46. [Annam and Siam.]

India, south to the Nilgiri Hills and east to Annam, Tonkin and Burma. Piepers and Snellen (Rhop. Java, *Pieridae*, 1909, p. 57), record *venata* as not common in Java. The F. M. S. Museum has a single specimen taken in West Java, Preanger Regency at 5,000 feet (Kawah Kamodjan, 19th April 1923, H. M. Pendlebury).

Seven subspecies of *laeta* have been described:

*Eurema laeta bethesda* (Jans.). [Yokohama.]

Cist. Entom., 1878, ii, p. 272.

*subfervens* (Btlr.) Ann. Mag. Nat. Hist., 1883, (5), xi, p. 278. [Japan.]

Japan,<sup>1</sup> Tsushima, Korea and, according to de Nicéville (J. Asiat. Soc. Bengal, 1902, lxxi, p. 26), also in Hongkong.

*Eurema laeta rama* (Mre.). [Ceylon.]

Proc. Zool. Soc., 1872, p. 566.

*cingala* (Mre.) Ann. Mag. Nat. Hist., 1877, (4), xx, p. 48. Ceylon.

*Eurema laeta sikkima*<sup>2</sup> (Mre.). [♂ Sikkim, ♀ Bhotan.]

Lep. Ind., 1906, vii, p. 43.

In the male type the distal border on the forewing does not reach the basal margin but in the female type it extends to the tornus.

*Eurema laeta semperi* (Mre.). [Luzon.]

Lep. Ind., 1906, vii, p. 47.

Philippines.

*Eurema laeta apatosa* (Hulst.). [Timor Laut.]

Ann. Mag. Nat. Hist., 1923, (9), xi, p. 180.

Olillet and Timor Laut. We have not seen the type, but from the description it is undoubtedly a race of *laeta*, and runs close to the Javanese representative.

<sup>1</sup> Two varieties of *laeta* have been denominated *nohirae* and *unicolor* by Matsumura (Thous. Ins. Japan, Addit. 3, 1919, 1929, p. 726). An aberration has been described since as *eluta* by S. Naito, (Zephyrus, 1930, ii, p. 151). We have seen neither the specimens nor the literature.

<sup>2</sup> This name is given incorrectly as *sikkimica* by Fruhstorfer (*loc. cit.*, p. 166).

*Eurema laeta josepha* (Hulst.). [Key Is.]

Ann. Soc. Ent. Belge, 1924, lxiv, p. 76.

Key Islands. This and the above-mentioned race form an interesting link between the Malay Archipelago and Queensland. Previously there was a wide gap between Java and North Australia. We have not seen the type.

*Eurema laeta herla* (McLeay). [Queensland.]

King's Survey, 1827, p. 460.

*sana* (Btlr.) Proc. Zool. Soc., 1877, p. 470. [Cape York.]

*lineata* (Misk.) Proc. Royal Soc. Queensland, 1889, vi, p. 257. [Australia.]

Queensland. We have not seen the original descriptions of *herla* and *lineata* and so have followed Fruhstorfer; *sana* is definitely a *laeta* form.

[A further species of *Eurema*, stated to belong to the *laeta* group was unknown to us until this paper was in the press; see page 192, *postea*.

*Eurema smilax* (Don.) [South and East Australia.]

Ins. New Holl., 1805, v, p. 20.

This form was unknown to Fruhstorfer. A form described from Australia by Wallace (Trans. Ent. Soc., 1867, (3), iv, p. 322) as *ingana* may belong here, as stated by Fruhstorfer, or it may be a *libythea* or *laeta* form; in Wallace's descriptions he does not make reference to the presence or absence of male sex brands.]

### (3) *hecabe*-group.

#### Genitalia Examinations (Figs. 1-7).

The genitalia investigation has been confined to an examination of the male claspers. In most cases the claspers are sufficiently distinctive in character to admit of ready separation, while the uncus does not vary much in some of the different species. The figures are based on specimens from the Malay Peninsula.

The clasper of *Eurema hecabe* (fig. 1) has five rather long, slender, slightly curved, spine-like appendages. The anterior one, situated in the centre of the clasper, is not always prominent, but can be found by careful examination. *E. hecabe* is distinguished by having five simple appendages: the only variation noticed in the series examined was that some specimens had thicker spines than others.

*E. simulatrix* (fig. 2) is the only species with four simple appendages on the clasper. The posterior three are stout and curved, whilst the interior one is smaller, more slender, and situated in the interior of the clasper.

The clasper of *E. blanda* (fig. 3) differs considerably from those of the other Malaysian species of the *hecabe*-group. Posteriorly there are four appendages, of which three are simple, rather slender, slightly curved, spine-like processes, whilst the fourth is broad, flat, and larger than the others. A fifth simple appendage is situated in the interior of the clasper as in *hecabe* and *simulatrix*. The clasper of *blanda* shews considerably more variation than any of the other species. The most distal spine may be ornamented with a series of minute spines while the flattened process exhibits differences of the same nature.

The male claspers of *E. andersoni*, (fig. 4), *E. ada* (fig. 5), and *E. sari* (fig. 6) are very similar, each possessing three distal simple appendages. In *sari* and *andersoni* these processes are stout and curved, and the distal one is somewhat flattened. The spines in *ada* are slender and fragile and have a more angulated appearance.

*E. tilaha* (fig. 7) has a clasper differing considerably from that of any other species studied here. All the appendages are very stout and thick; three are simple and spine-like in appearance whilst the fourth is very broad, flat, and bicuspid.



1. *hecabe*. 2. *simulatrix* 3. *blanda* 4. *andersoni*.



5. *ada*. 6. *sari*. 7. *tilaha*.



R. van Eecke (Treubia, 1929, vii, p. 355) has examined the male genitalia of certain species of the *hecabe*-group from Buru, and his preliminary results concerning *hecabe* and *blanda* are in accordance with those given here.

*Key to the Species of the hecabe-group from Malaya*

1. (2) Black border on upperside of forewing continued along dorsal margin .. .. *tilaha nicevillei*.
2. (5) Black spot at base of space 7 hindwing underside.
3. (4) This spot well defined; forewing underside with two cell spots and a large, cleft, reddish-brown apical spot, and on hindwing underside a figure-of-eight spot at the base of space 1 .. .. *simulatrix tecmessa*.
4. Spot at base of space 7 hindwing underside, faint; three cell spots on forewing underside .. .. *blanda snelleni*.
5. (8) Hindwing underside with a long streak in space 7 in line with the discoidal spot.
6. (7) Forewing underside with one spot in cell; male sex brand reaching origin of vein 3 .. .. *andersoni*.
7. Smaller than *andersoni*; forewing underside with two cell spots, male sex brand not reaching origin of vein 3 .. .. *ada*.
8. (9) Apical area forewing underside completely dark brown, one spot in cell, and black streak in space 1 .. .. *sari sodalis*.
9. Male sex brand broader and more prominent than in any other species; usually two cell spots on forewing underside .. .. *hecabe*.

*Eurema hecabe* (L.) 1758.

This species has the most extensive range of all the Indo-Australian members of the genus; it is, moreover, by far the most variable species and is highly susceptible to geographical influences. Innumerable varieties or forms have been recognized but, in most cases, intergrades occur between the typical form and the named form so that most of them are best neglected.

The races grouped by Fruhstorfer under *latimargo* have the underside characteristic of *hecabe* but the forewing above has a black basal border which extends for about two-thirds of the length of the basal margin. It seemed evident that *latimargo* and its allied forms were *hecabe* races and this was confirmed by an examination of the male genitalia of *pylos* which showed five hooks on the clasper arranged as in *hecabe*.

It is not always easy to separate *hecabe* from its congeners but the broad brand on the underside of the male forewing is quite distinctive: we have seen several males lacking this brand but an examination of the genitalia proved them to be *hecabe*.

Normally the species has two cell spots on the underside of the forewing but examples with no cell spots are not uncommon and, less frequently, specimens with a single cell spot are encountered. Two examples with three cell spots have been found and one of them occurred among a series bred from larvae. We have seen no specimens with the apex of the forewing beneath wholly brown as in *sari*, *simulatrix* or *blanda*.

*Eurema hecabe hecabe* (L.) (Pl. V, figs. 1-4). [Asia.]

Syst. Nat., ed. x, 1758, p. 470.

*contubernalis* (Mre.) J. Linn. Soc. Zool., 1886, xxi, p. 46. [Mergui.]

*fraterna* (Mre.) *ibid.*, p. 46. [Mergui.]

*patruelis* (Mre.) *ibid.*, p. 46. [Mergui.]

*merguiana* (Mre.) *ibid.*, p. 47. [Mergui.]

*kana* (Mre.) *ibid.*, p. 48. [Mergui.]

*lacteola* (Dist.) Rhop. Malay., 1886, p. 466. [Singapore.]

*acandra* (Fruh.) Seitz, Macrolepidoptera, 1910, vol. ix, p. 169. [Hong-Kong.]

♂. Upper surface bright yellow. *Forewing*: costal margin narrowly and apex and distal margin broadly bordered with black: this black margin sinuate between the costa and vein 4 and excavated between veins 2 and 4: vein 3 black just before

entering the distal border. The black border is not continued along the basal margin and, at the tornal angle, its inner edge is generally at right angles to the basal margin and usually slightly concave. *Hindwing*: a black, sinuate border from the apex to the tornus, the width of which is somewhat variable.

The underside is paler and of a more lemon-yellow colour with reddish-brown markings. *Forewing*: a sex brand on both sides of the median vein extending from the base of the wing to the origin of vein 2; this brand is broader than in any other Malaysian species of the *hecabe*-group. Normally, there are two small streaks in the cell which is closed by an annular marking: vein endings brownish. Usually no apical markings are present but often there is a prominent, subapical, transverse, elongate spot of irregular shape and variable width. This spot never reaches the distal margin as in *blanda*, *sari* and *simulatrix*. *Hindwing*: three sub-basal spots and an elongate, annular spot covering rather more than half of the discoidal. A discal series of very irregular, curved streaks form an irregular band but some or all of these streaks may be obsolete. The streak in space 7 is out of line with the other discal streaks and directed to midway between the discoidal spot and the discal streaks.

Wing expanse 29-49 mm.

♀. Similar to the male but usually both surfaces are of a paler colour, the black distal border on the forewing slightly broader and the black bordering on the hindwing usually narrower than is the case with the male.

Wing expanse 33-50 mm.

Typical *hecabe* are figured by Fruhstorfer (*loc. cit.*, plate 73, F 2 and F 3).

South China, Bengal, Sikkim, Burma, Siam, Langkawi Islands and Malay Peninsula. Although considerable variation is exhibited throughout this range it does not appear to be of a geographical nature although, generally, females from the Langkawi Islands are more densely dusted with black. We have seen a female specimen in perfect condition from Kuala Selangor, F. M. S., in which the usual black markings are russet (E. M. Hayward, August, 1929).

The milky-white female form, *lacteola*, was described by Distant as a separate species and, although the type is no longer in existence, there can be no doubt that Distant's butterfly was a *hecabe* form. White females are rare in India but the Tring Museum has one from Sikkim: they occur occasionally in the Malay Peninsula when they are associated with narrow bordered males which closely resemble *asphodelus* Btlr., described from

Central India. In some examples of the female form *lacteola* from Bukit Kutu, Selangor, in the F. M. S. Museum the colouring above is milky-white and a pale greenish-yellow below. On the upperside both wings are black-dusted at the bases; the markings are as in *hecabe* but the hindwing border is broader and more diffuse than usual. The underside markings are as in *hecabe* but indistinct and the apex of the forewing bears a single indistinct, transverse streak. The wing expanse is from 40 to 41.5 mm.

Fruhstorfer described *acandra* from Hong-Kong as a *blanda* but Talbot (Bull. Hill Mus., 1924, i, p. 533) has examined the female type and found it to be a *hecabe* form. We have seen no examples of *blanda* from Hong-Kong and doubt if it occurs there: it is not mentioned in de Nicéville's list of Hong-Kong butterflies (J. As. Soc. Bengal., 1902, lxxi, p. 26).

*Eurema hecabe latilimbata* (Btlr.). [Sumatra.]

Ann. Mag. Nat. Hist., 1886, (5), xvii, p. 221.

*bidens* (Btlr.) *ibid.*, p. 222. [Sumatra.]

*semifusca* (Btlr.) *ibid.*, p. 222. [Sumatra.]

The Sumatran race is larger and usually more heavily marked on the underside than is the case with *hecabe* from the Malay Peninsula. The streak in space 7 on the underside of the hindwing, although shorter than in *andersoni*, is often directed towards the discoidal spot as is invariably the case with that species.

*Eurema hecabe satellitica* (Fruh.). [Nias Island.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 167.

This form is of slightly smaller size than examples from the Malay Peninsula and the pale females are dusted with black. A female in the Tring Museum has a cell end spot on the forewing above.

*Eurema hecabe enganica* (Fruh.). [Engano Island.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 167.

We have seen no examples of this race but it is said to have very deeply incised black borders on both wings.

*Eurema hecabe sankapura* (Fruh.). [Bawean.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 167.

Bawean, Java, Bali and Lombok. The author described this subspecies as being recognizable by its narrow black distal border which, on the forewing, is fairly evenly edged. In the



Javanese specimens we have examined this border is only slightly less broad than in typical *hecabe* but such specimens are often heavily marked on the underside.

*Eurema hecabe amplexa* (Btlr.). [Christmas Island, south of Java.]

Proc. Zool. Soc., 1887, p. 123.

This very distinctive form has a narrow, uniform, black margin on the forewing above but the underside is characteristically that of *hecabe* and examination of the male genitalia showed conclusively that it is nothing more than a well developed race of that species.

*Eurema hecabe locana* (Fruh.). [Natuna Islands.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 167.

*yaksha* (Fruh.) Seitz, Macrolepidoptera, 1910, vol. ix, p. 170. [Natuna Islands.]

Natuna and Anamba Islands. Examples from these islands are smaller and paler than typical *hecabe*. The F. M. S. Museum has a series of *hecabe* from the Anamba Islands in which the male has a very narrow forewing border, which is only slightly excavated between veins 2 and 4, whilst the females are small, pale greenish-white in colour and recall *lacteola* from Malaya: this variety is referable to *yaksha* of Fruhstorfer who, however, confused it with another species. We have seen no yellow females from the Anamba Islands.

Examples from Tioman Island are nearer to *locana* than to *hecabe*, the male having a narrow black border only slightly excavated whilst the female occurs in both the typical and *yaksha* forms.

*Eurema hecabe borneensis* (Fruh.). [Borneo.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 167.

North and South Borneo. Fruhstorfer's figures (*tom. cit.*, plate 73, E 1 and E 2) show a much broader black border to the hindwing than is found in any specimens in the F. M. S. Museum from the lowlands of North Borneo and from Mt. Kinabalu up to 4,700 feet. Examples from Mt. Kinabalu are larger and more brightly coloured than the lowland forms. A large proportion of the females from North Borneo are white or milky white.

*Eurema hecabe jalendra* (Fruh.). [Palawan.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 167.

Palawan and Balabac. This distinct subspecies is larger than *tamiathis* but in both sexes the distal border on the forewing is somewhat narrower and the female is not black-dusted.

The *hecabe* races occurring outside of Malaysia are given below.

*Eurema hecabe mandarina* (l'Orza.). [Japan.]

Lep. Japan, 1869, p. 18.

*mariesi* (Btlr.) Trans. Ent. Soc., 1880, p. 198. [Nikko.]

*connexiva* (Btlr.) *ibid.*, p. 199. [Nikko.]

*hybrida* (Btlr.) *ibid.*, p. 199. [Nikko.]

Japan. The dry season form, *mandarina*, resembles *anemone* in that it has only a narrow black apical border on the forewing above. The wet season form, *mariesi*, resembles typical *hecabe* but is larger and the female is a paler yellow and black dusted on the upperside: *connexiva* and *hybrida* are intermediates between the two seasonal forms.

*Eurema hecabe anemone* (Feld.). [Ningpo, East coast of China.]

Wien. Ent. Mon., 1862, vi, p. 23.

Korea, North and Central China and Yunnan. In this region two forms can be distinguished: the "*anemone*" form, with a narrow black apical forewing border, is probably a product of the dry season and is fairly constant and the "*hecabe*" form which has the facies of typical *hecabe* and may be associated with the wet season.

In Korea the "*hecabe*" form is of small size and has a narrow and almost uniform distal border on the forewing, and examples taken in Central China are almost intermediate between this and *anemone*. In Shanghai and Kiukiang, females of the "*hecabe*" form show a tendency to approach the "*anemone*" form and examples from Yunnan are more like typical *hecabe*.

Examination of the male genitalia of a specimen of the "*anemone*" form showed it to be a *hecabe* race.

*Eurema hecabe hobsoni* (Btlr.). [Formosa.]

Proc. Zool. Soc., 1880, p. 668.

*unduligera* (Btlr.) *ibidem.* [Formosa.]

*paroena* (Strand) Ent. Zs., 1922, xxxvi, p. 19. [Parce, Formosa.]

*Formosa*. This race resembles typical *hecabe* but has rather narrow black bordering on the upperside. The form *paroena* is stated to have broad borders to both wings, that on the hindwing being 4 mm. wide.

*Eurema hecabe subdecorata* (Mre.). [Hainan.]

Proc. Zool. Soc., 1878, p. 699.

*arcuata* (Mre.) *ibid.*, p. 700. [Hainan.]

*attenuata* (Mre.) *ibid.*, p. 700. [Hainan.]

Hainan and the Southern Loo Choo Islands. In this subspecies the black bordering on the forewing is distinctly narrow.

*Eurema hecabe simulata* (Mre.). [Ceylon.]

Lep. Ceyl., 1881, i, 119.

*aesiopeoides* (Mre.) Lep. Ind., 1906, vii, 60. [Karachi.]

*asphodelus* (Btlr.) Proc. Zool. Soc., 1883, p. 151. [♂, Mhow; ♀, Depalpur.]

*narcissus* (Btlr.) *ibid.*, p. 151. [Mhow.]

*curiosa* (Swinh.) Proc. Zool. Soc., 1884, p. 508. [Karachi.]

*swinhoei* (Btlr.) Ann. Mag. Nat. Hist., 1886, (5), xvii, p. 216. [Bombay.]

Ceylon, South and Central India. Examples from these localities are smaller and, perhaps, slightly darker than typical *hecabe*. In *asphodelus* and *narcissus* the black distal border on the forewing is very narrow in both sexes.

Fruhstorfer incorrectly placed *curiosa* as a *sari* form.

*Eurema hecabe fimbriata* (Wall.). [Masuri.]

Trans. Ent. Soc., 1867, (3), iv, p. 323.

*excavata* (Mre.) Proc. Zool. Soc., 1882, p. 252. [Kangra.]

*purpurea* (Mre.) *ibid.* [Kangra.]

*apicalis* (Mre.) *ibid.*, p. 253. [Kangra.]

*irregularis* (Mre.) *ibid.* [Kangra.]

*simplex* (Btlr.) Ann. Mag. Nat. Hist., 1886, (5), xvii, p. 217. [Kangra.]

North India. Evans (Iden. Ind. Butterflies, 1927, p. 49), gives the range of *fimbriata* as "Punjab—Chitral—Kumaon". The male type of Wallace's butterfly from the Himalayas has a very narrow black border on the forewing above and lacks the usual black square spot at the tornus: the forms described from Kangra are some like typical *hecabe*. Females from this

region are often black-dusted and have a somewhat broad, diffuse border on the hindwing. The life history has been described by T. R. Bell in the Journ. Bombay Nat. Hist. Soc., 1913, xxii, pp. 527–530.

*Eurema hecabe nicobariensis* (Feld.). [Nicobar Islands.]

Verh. Zool.-bot. Ges. Wien., 1862, xii, p. 480.

This form differs but little from typical *hecabe* and examples from the Andaman Islands are very similar.

*Eurema hecabe blairiana*<sup>1</sup> (Mre.). [Andaman Islands.]

Lep. Ind., 1906, vii, 75.

*andamana* (Mre.) *ibid.* [Andaman Islands.]

Andaman Islands.

*Eurema hecabe luzoniensis* (L.). [Luzon.]

Mus. Utr., 1764, p. 249.

This form is smaller and darker than typical *hecabe* and the pale yellow female is not black-dusted.

*Eurema hecabe sintica* (Fruh.). [Mindora.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 167.

This form differs from *luzoniensis* only in that the female usually has a black spot faintly visible at the cell end on the upperside of the forewing and is lightly black-dusted.

*Eurema hecabe tamiathis* (Fruh.). [Bazilan.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 167.

Mindanao, Bazilan and Jolo. Some females agree with the author's description of *tamiathis* in having a broad distal border, a spot at the cell end on the forewing and the wings densely scaled with black but others hardly differ from typical *hecabe* except in that they are darker.

*Eurema hecabe latimargo* (Hopffr.).

Stett. Ent. Ztg., 1874, p. 25.

*anguligera* (Btlr.) Ann. Mag. Nat. Hist., 1886, (5), xvii, p. 224. [Tondano.]

*accentifera* (Martin) Iris, 1920, xxxiv, p. 199. [Pekawa Mountains, South-west of Palu Bay, West Celebes.]

<sup>1</sup> *Blairiana* is mis-spelt *blairana* in the Zool. Record 1907, xlv, Insecta, p. 294.

North Celebes. Fruhstorfer placed *latimargo* as a separate species but the underside is of the usual *hecabe* character. On the upperside of the forewing are indications of a black basal border; in the male this basal marking comprises a narrow black streak but in the female it is hardly noticeable. In the montane form *accentifera*, which is darker than *latimargo* or *sinda*, the forewing basal border is prominent; the male has a black streak in the cell on the forewing above and the female is very dark and heavily black-dusted.

The black basal border which is present in certain species of *Eurema* from the Celebes and Moluccas is a very inconstant character and it is impractical to found geographical races on its appearance.

*Eurema hecabe sinda* (Fruh.). [Peak of Bonthian, South Celebes.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 168.

*nesos* (Fruh.) Seitz, Macrolepidoptera, 1910, vol. ix, p. 168. [Peak of Bonthian, South Celebes.]

*sophrana* (Fruh.) Seitz, Macrolepidoptera, 1910, vol. ix, p. 168. [South Celebes: plains.]

Fruhstorfer states that *sinda* differs from *nesos* in the absence of black dusting on the upperside of the female: both forms closely resemble *latimargo* and it is doubtful if there is more than one subspecies of *hecabe* in the Celebes.

*Eurema hecabe pylos* (Fruh.). [Sula Mangoli.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 168.

*sulaensis* (Joicey and Talbot) Bull. Hill Mus., 1922, i, p. 347. [Sula Islands.]

Sula Islands. In this race the black basal border on the forewing is prominent and extends for two-thirds of the basal margin. Examination of the male genitalia confirmed the view that *pylos* is a subspecies of *hecabe*.

The male holotype of *sulaensis*, which was described as a *norbana* race, does not differ from *pylos* but the female allotype is a *blanda* form.

*Eurema hecabe dentyris* (Fruh.). [Tanah Jampea.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 168.

The male is dark yellow and the female is rather like *maroensis* from Timor Laut, having a narrow distal border on the forewing and no black dusting.

*Eurema hecabe kalidupa* (Fruh.). [Kalidupa.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 168.

Kalidupa is in the Tukang Besi Islands, off the South Celebes. In this very distinct subspecies the male forewing is more rounded apically and more elongated than usual; in the black dusted female the veins are broadly covered with black and there is a prominent spot at the end of the cell on the forewing above.

*Eurema hecabe asanga* (Fruh.). [North Moluccas.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 168.

Halmaheira and Batchan. The male of this form resembles that sex from Timor but the broad bordering on the upperside of the hindwing is not incised.

*Eurema hecabe diversa* (Wall.). [Buru.]

Trans. Ent. Soc., 1867, (3), iv, p. 324.

Buru, Obi, Amboina and Ceram. Fruhstorfer referred the *hecabe* race from Amboina and Ceram to *biformis* but of Butler's types, both from Amboina, the male holotype is a *blanda* and the female allotype is a *hecabe* form.

In *diversa* the male is bright yellow with a rather narrow and regular forewing distal border which is not noticeably indented between veins 2 and 4; the hindwing distal border is narrow and almost uniform. The female is milky white and the narrow distal border on the forewing is slightly excavated between veins 2 and 4. As is usual with this "*lacteola*" form there is a pale reddish apical stripe on the underside of the forewing. Occasionally females from Amboina and Ceram have a yellowish tinge on the wing bases above and we have seen one female from Amboina, taken by C. B. Kloss in March 1911, which is as yellow as the males.

*Eurema hecabe bandana* (Fruh.). [Banda Island.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 168.

In this race both sexes have narrower bordering than in *diversa* and in the pale yellow female the hindwing border is almost obsolete.

*Eurema hecabe chemys* (Fruh.). [Alor.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 168.

Alor, Sumbawa and Flores: not Sumba as stated by Fruhstorfer. The male is a deep yellow with a broad black distal border on the hindwing and the female is basally grey-dusted.



*Eurema hecabe maroensis* (Btlr.). [Maroe Island, Timor Laut.]

Proc. Zool. Soc., 1883, p. 368.

*brevicostalis* (Btlr.) Ann. Mag. Nat. Hist., 1898, (7), i, p. 76. [Sema Island, near Timor.]

*dendera* (Fruh.) Seitz, Macrolepidoptera, 1910, vol. ix, p. 168. [Sumba.]

Sumba, Timor, Wetter, Babber, Dammer, Kisser and Timor Laut. Examples of *hecabe* from these islands are inseparable; they resemble *chemys* but the broad hindwing border is deeply incised.

The female allotype of *brevicostalis* came from Ternate and so is referable to *asanga*.

*Eurema hecabe photophila* (Btlr.). [Key Islands.]

Ann. Mag. Nat. Hist., 1884, (5), xiii, p. 196.

Key and Aru Islands. Examples of this race are nearer to *oeta* than to *maroensis*: the hindwing black border is uniform in the male and diffuse in the female and is not deeply incised.

*Eurema hecabe oeta* (Fruh.). [New Guinea.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 168.

This race is larger and more broadly bordered than is the case with *photophila* but in the deep yellow male the bordering is narrower than in typical *hecabe*. The hindwing border is almost invariably uniform in the male and rather broad and diffuse in the pale yellow or white females.

*Eurema hecabe kerawara* (Ribbe). [New Britain.]

Iris, 1898, xi, p. 85.

Bismarck Archipelago. Males in the British Museum from St. Mathias Island, French Island, New Hanover and New Ireland are all small in size, deep yellow in colour and with narrow black bordering. The females are variable: usually the colouring is pale yellow or milky white, black dusting may be present and the diffuse hindwing border varies in width according to locality. There is little doubt that a number of new subspecies will have to be denominated when the Bismarck Archipelago is better known to the entomologist.

*Eurema hecabe magna* (Ribbe). [Mioko, Bismarck Archipelago.]

Iris, 1898, xi, p. 85.

This form is not represented in any of the collections to which we have had access but is said to be similar to *kerawara* but of larger size.

*Eurema hecabe nivaria* (Fruh.). [Solomon Islands.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 168.

In both sexes the hindwing border is very narrow and the female is almost white.

*Eurema hecabe sulphurata* (Btlr.). [Mare, Loyalty Islands.]

Proc. Zool. Soc., 1875, p. 607.

*hebridina* (Btlr.) Proc. Zool. Soc., 1875, p. 617. [Tanna, New Hebrides.]

*pumiliaris* (Btlr.) *ibidem*. [Tanna, New Hebrides.]

*varieta* (Btlr.) *ibidem*. [Erromango, New Hebrides.]

*sinapina* (Btlr.) Ann. Mag. Nat. Hist., 1877, (4), xx, p. 355. [Lifu, Loyalty Islands.]

*lifuana* (Btlr.) *ibidem*. [Lifu, Loyalty Islands.]

*inanata* (Btlr.) Trans. Linn. Soc. Zool., 1877, (2), i, p. 550. [♂, Mata Island; ♀, Erromango, New Hebrides.]

*aprica* (Btlr.) Ann. Mag. Nat. Hist., 1883, (5), xi, p. 420. [Tongatabu.]

*phoebus* (Btlr.) Ann. Mag. Nat. Hist., 1886, (5), xvii, p. 221. [Richmond River, New South Wales.]

New Hebrides, Loyalty Islands, Fiji Islands, Tonga Islands and Australia. The Australian examples resemble typical *hecabe*, the females being yellow but of a paler hue than the more narrowly bordered males. The island specimens differ only in their smaller size.

*Eurema hecabe novaecaledoniae* ssp. n.

♂. Deep yellow. The apex of the forewing is less rounded than usual and the black distal border is clearly defined. The hindwing black border is about 2 mm. wide and of uniform width throughout its length. The underside markings are small but distinct.

Wing expanse 38 mm.

♀. The upperside is paler than in the male and the forewing is less rounded than usual in this sex. The black bordering is clearly defined on the forewing but very diffuse on the hindwing. The whole of the upperside is very heavily dusted with black, particularly in the basal area of the forewing, and there is a black ring-spot at the cell-end on the forewing. The underside markings are small and less distinct than in the male and the basal part of the forewing is of a much brighter yellow than the rest of the wing.

Wing expanse 34 mm.

Both types from Mt. Mou, New Caledonia, 16th March, 1914, P. D. Montague, and are in the British Museum (Natural History).

Very little variation is shown in the long series in the British Museum.

*Eurema simulatrix* (Stgr.) 1891.

The species ranges from Burma, across Malaysia, to the Philippines and Celebes. The large rusty-brown, cleft, apical spot on the underside of the forewing, the distinct spot at the base of space 7 and the figure-of-eight spot at the base of space 1 on the hindwing beneath are constant characters which differentiate *simulatrix* from all other species.

*Eurema simulatrix tecmessa* (de Nic.) (Pl. V, figs. 8, 10).

[Penang and North-east Sumatra.]

J. As. Soc. Bengal, 1895, p. 498.

♂. Upperside: deep citron yellow. Markings similar to those of *hecabe* but blacker and, on the forewing, the distal band is narrower at the tornus. The rather broad black border on the hindwing is catenated.

Underside: bright yellow. In general character the markings resemble those of *hecabe* but are more prominent. The forewing has two cell spots of which the outer one is long and shaped somewhat like a double S; the discoidal spot is longer and broader than in *hecabe* and usually closes the cell completely. The apex is covered by a large red-brown quadrate spot which bears traces of a yellow transverse streak. In addition to the markings found on *hecabe*, the hindwing has a small spot at the base of space 7 whilst the spot at the base of space 1 is shaped like a figure of 8; the discoidal marking is large and prominent and completely closes the cell. The discal streaks form a catenated band.

The male sex brand as in *hecabe* but narrower.

Wing expanse 38-50 mm.

♀. Resembles the male but the hindwing has a broader and more diffuse black border.

Wing expanse 49 mm.

Occurs in Burma, Peninsular Siam, Malay Peninsula, Sumatra and Borneo. It is found in the Malay Peninsula on the plains and up to 3,500 feet. Specimens from Peninsular Siam differ slightly in that the distal border on the upperside

of the hindwing is much narrower whilst specimen from Pulau Tioman has a paler under surface.

A single male example (exp. 38.5 mm.) from the Langkawi Ids., off the West Coast, Malay Peninsula (April 28th 1928, H. M. P.), differs from *tecmessa* in being smaller than the average, and in having a narrower black distal border to the forewing (Pl. V, fig. 10).

A specimen taken in British North Borneo, Mt. Kinabalu, Marei Parei Spur, 5,000 feet (H. M. Pendlebury) hardly differs from Malayan examples.

f. *stockleyi* nov.

Above paler yellow and of a more greenish hue than *tecmessa* and the distal margins of both wings are distinctly serrate. The forewing black distal border is broad towards the apex and tapers until it is almost obsolete at the tornus and the hindwing border is barely traceable. The markings on the underside are larger and more distinct than in *tecmessa* and in the prominent forewing apical spot the yellow zone is almost obsolete; the angle formed by the two inner edges of this spot is very acute and not approximately a right angle as in *tecmessa*. Wing expanse 40 mm.

♂, Taok Plateau, Upper Tenasserim, Burma, 5,000 feet, 6th January, 1924, Major Stockley.

Type in the British Museum (Natural History).

An examination of the male genitalia showed the four hooks on the clasper arranged as in *tecmessa*.

*Eurema simulatrix kollerii* ssp. n.

Above it differs from *tecmessa* in that the black distal border on the forewing is not continued along the basal margin, so that the usual square spot at the tornus is hardly traceable, and the hindwing border is slightly narrower. On the underside the spots at the cell-ends are larger but all other markings are smaller than in *tecmessa*; the forewing apical spot is indistinct, and the yellow cleft is very prominent. Wing expanse 42 mm.

♂, Senggora, Zuider Geb, Res. Pasærean, Java, 1899, A. Koller.

Type in the British Museum (Natural History).

f. *javanica* nov. (Pl. V, fig. 9.).

A series of males in the F. M. S. Museum from the mountains of East Java differ very distinctly from *kollerii* in the larger

size (wing expanse 47-51 mm.) and in the broader and more prominent apical patch on the underside of the forewing.

♂, Ongop-Ongop, East Java, 5,000 feet, march, 1916, H. C. Robinson.

Type in the F. M. S. Museum.

Two subspecies of *simulatrix* occur outside of Malaysia:—

*Eurema simulatrix simulatrix* (Stgr.). [Philippines.]

Semper, Lep. Philipp., 1891, p. 253.

Philippines. Staudinger's description and figures leave much to be desired but some notes and photographs of the types in the Senckenberg Museum at Frankfurt-on-Main, forwarded by Dr. A. Seitz, show conclusively that *simulatrix* is conspecific with *tecnessa* and not a form of *E. blanda vallivolans* as stated by Fruhstorfer.

In a series of males in the British Museum from Davao, South-east Mindanao, the underside markings are large and very distinct with the exception of the apical spot on the forewing which is less prominent than in other races and comprises only a short reddish-brown band followed by the usual yellow cleft which extends to the wing margin where the vein endings are marked by small diffuse spots.

*Eurema simulatrix irena* ssp. n.

Above the wings are yellow with a definite suggestion of brown and the black-brown bordering is narrower than in *tecnessa*. The pale reddish-brown markings on the underside are very large and prominent; the forewing apical spot is large and the yellow cleft is almost obsolete. The submarginal streaks on the hindwing are very broad and not conjoined, being much more irregular than in the other races. Wing expanse 51 mm.

♀, Bøekøra, Central Celebes.

Type in the British Museum (Natural History).

*Eurema blanda* (Bsdv.) 1836.

The collective species ranges from the Bismarck Archipelago across Malaysia to India and Ceylon and to China and Formosa.

In agreement with Bingham, we have found that the three cell spots on the underside of the forewing constitute a constant character which affords a ready means of recognizing the species: the female of *blanda* is often surprisingly like the *hecabe* female in having a broad, deeply excavated margin on the forewing.

The races collected by Fruhstorfer under *norbana* have the characteristic underside of *blanda* and are clearly the representatives of this species from the Celebes and Moluccas. An examination of the male genitalia of *moorei* proved that this butterfly is also a *blanda* form.

*Eurema blanda snelleni* (Mre.) (Pl. V, figs. 5, 6). [Sumatra.]

Lep. Ind., 1906, vii, p. 78.

♂. Upperside: yellow but usually paler than *hecabe*. The markings are as in *hecabe* but the black, distal border on the forewing is narrower and its inner edge is less regular and not so sharply angled at vein 4. The hindwing black border is narrower than in *hecabe*.

Underside: only slightly paler than the upperside; the markings are similar to but less prominent than those of *hecabe* with the difference that the cell of the forewing has three streaks of which the largest and most distal one is W-shaped, while on the hindwing a faint, punctiform spot is visible at the base of space 7 and the discal streaks are more nearly united to form an irregular band. The apex of the forewing is usually unmarked but occasionally bears a reddish-brown transverse streak.

The sex brand on the forewing is paler and narrower than that of *hecabe*.

Wing expanse 33-50 mm.

♀. Paler than the male both above and below. The markings are similar but the forewing above has a broader and more deeply excavated distal border. Below, the apex of the forewing often bears markings which range from a transverse, irregular streak to a large, cleft, quadrate spot covering the whole of the apical area as in *simulatrix tecnessa*.

Wing expanse 40-49 mm.

*E. b. snelleni* has a straighter costal margin to the longer and narrower forewing than is found in *hecabe*.

Peninsular Siam, Langkawi Islands, Malay Peninsula, Pulau Jarak, Sumatra and Borneo. Examples from these localities are hardly separable but Sumatran specimens sometimes have a very pale under surface with very indistinct spotting. Females from Peninsular Siam and the Langkawi Islands often have the whole of the apical area of the forewing beneath covered by a quadrate spot as in the example of *silhetana* figured by Fruhstorfer (*tom. cit.*, plate 73, C 3).

This subspecies appears to be least common in Borneo. In the Malay Peninsula it occurs on the lowlands and has been taken on the hills up to 6,000 feet.



*Eurema blanda natuna* (Fruh.). [Natuna Islands.]

Seitz, *Macrolepidoptera*, 1910, vol. ix, p. 169.

Natuna and Anamba Islands. This race is distinguished by the almost uniform and only moderately broad distal border to the forewing and a quite light female recalling that of *Gandaca harina* Hsf.; the markings on the under surface are very faint. Males from Tioman Island are pale and intermediate between *natuna* and *snelleni*; some examples, however, resemble the mainland form more closely.

*Eurema blanda blanda* (Bsdv.). [Java.]

Spec. Gen. Lep., 1836, i, p. 672.

Java, Bali, Billiton and, according to Fruhstorfer, Engano. The male type in the British Museum has a narrow apical portion to the black distal border on the forewing.

The subspecies of *blanda* occurring outside of Malaysia are given below.

*Eurema blanda arsakia* (Fruh.). [Formosa.]

Seitz, *Macrolepidoptera*, 1910, vol. ix, p. 169.

*aphaia* (Fruh.) *ibidem*. [Formosa.]

The one example of the wet-season form *arsakia* in the British Museum is larger and more broadly bordered on the forewing than is the case with specimens of the dry-season form *aphaia*. Fruhstorfer's types of *aphaia* have been examined by Mr. G. Talbot who found that the male is a narrow margined *hecabe* but the female is a *blanda* and as the latter sex is described it may be taken as the holotype.

*Eurema blanda rileyi* ssp. n.

The upperside is pale yellow and the narrow, uniform, black distal border on the forewing, which extends from the apex to the tornus, is broader at the apex and only slightly incised between veins 2 and 4. The hindwing distal border is very narrow. The underside is paler and the markings are very faint indeed. This subspecies is unlike any of the neighbouring races and it differs from *arsakia* in that the forewing distal border is regular and not square at the apex.

Wing expanse 46 mm.

North Fokien, China, 1904, C. D. Rickett.

Type in the British Museum (Natural History). Another male in the British Museum from the same locality is identical.

Named after Captain N. D. Riley.

*Eurema blanda hylama* ssp. n.

♂. The upperside is coloured as in *snelleni* but the wings are narrower. The forewing distal border is broad at the apex and narrow at the tornus and thus giving the appearance of a prominent quadrate black spot at the apex. The hindwing bears only traces of a black distal border. The underside is coloured as above and the apex of the forewing bears prominent reddish-brown markings somewhat as in *simulatrix tecmessa*; The other markings are similar to but rather darker and larger than in *snelleni* from the Malay Peninsula.

Wing expanse 47 mm.

♀. Lemon yellow in colour and the upperside has a broad, black border on the forewing and a broad diffuse border on the hindwing which is 3.5 mm. wide at the broadest part. The markings on the under surface are large but not very prominent: the forewing bears a reddish-brown subapical patch.

Wing expanse 53 mm. The largest of the Oriental *Eurema*.

The male holotype labelled "Hainan, Whitehead", The female allotype from Hainan Interior, April, 1920, C. T. Bowring. Both in the British Museum. (Natural History).

Examples from Tonkin differ in that the male is paler and has a more pronounced black quadrate spot at the apex of the forewing above but females are indistinguishable from those from Hainan.

Talbot (Bull. Hill Mus., 1924, i, p. 533) places the Hainan race of *blanda* as *hobsoni* Btlr., which, however, is a *hecabe* form.

*Eurema blanda rotundalis* (Mre.). [Ceylon.]

Lep. Ceyl., 1881, i, p. 119.

*citrina*<sup>1</sup> (Mre.) *ibid.* preoccupied by *citrina* Poey (Mem. Cuba, 1851, p. 247.). [Ceylon.]

*uniformis* (Mre.) Lep. Ceyl., 1881, i, p. 120. [Ceylon.]

*templetoni* (Btlr.) Ann. Mag. Nat. Hist., 1886, (5), xvii, p. 218. [Ceylon.]

This race recalls *snelleni* but the males are smaller and, in some specimens, the forewing black border is broad at the apex and narrow at the tornus.

Some confusion has arisen with regard to *rotundalis*. The male holotype in the British Museum is a *blanda* but the female is a form of *andersoni*. Fruhstorfer placed *rotundalis* as a *blanda* race but, later, Ormiston ("Butterflies of Ceylon, 1924,

1. This name is incorrectly given as *citrinaria* by Fruhstorfer (*loc. cit.*, p. 169).

Cave & Co., Colombo.), reserved the name for the Ceylon race of *andersoni*. As the male is the holotype, Ormiston's action cannot be supported and, recently, Watkins has taken this female as the holotype of his *ormistoni* for the Ceylon race of *andersoni*.

*Eurema blanda davidsoni* (Mre.). [Nilgiri Hills, South India.]

Lep. Ind., 1906, vii, p. 63.

South India. Both sexes have broad black margins on the upperside and the pale female has a spot at the cell end on the forewing above. This race differs quite distinctly from *silhetana* from North India.

*Eurema blanda silhetana* (Wall.). [Silhet, Assam.]

Trans. Ent. Soc., 1867, (3), iv, p. 324.

*heliophila* (Btlr.) Ann. Mag. Nat. Hist., 1883, (5), xi, p. 420. [Assam.]

*grandis* (Mre.) Lep. Ind., 1906, vii, p. 67. [Khasia Hills, Assam.]

North-east India, Sikkim, Bhotan, Assam and Burma. This race is larger than *davidsoni* but very like *snelleni* into which it gradually passes in South Burma and Peninsular Siam. Unlike *snelleni*, however, a large proportion of the females of *silhetana* bear a large reddish-brown spot on the apex of the forewing beneath.

A Darjeeling female from Felder's collection in the Tring Museum is pale yellow and the rather elongated wings are lightly black dusted at the bases on the upperside. On the forewing above is a black basal border such as occurs in the races from the Celebes and Moluccas. Near the distal margin this basal border is regular, then it becomes diffuse and terminates about 1 cm. from the base of the wing. On the underside the markings are faint but the three cell spots on the forewing and the small spot at the base of space 7 on the hindwing are prominent. The life history is described by T. R. Bell in the Journ. Bombay Nat. Hist. Soc., 1913, xxii, pp. 530, 531.

*Eurema blanda roepstorffi* (Mre.).

Lep. Ind., 1906, vii, p. 76.

*cadelli* (Mre.) *ibid.* p. 77.

Andaman Islands. The male types of both *roepstorffi* and *cadelli* are from the Andaman Islands but the females are from the Nicobars and hence must be ranged under *moorei*. In the Andaman race the male has a very narrow hindwing border whilst the female has broad margins to both wings.

*Eurema blanda moorei* (Btlr.). [Nicobar Islands.]

Ann. Mag. Nat. Hist., 1886, (5), xvii, p. 216.

Car and the Central Nicobars according to W. H. Evans who has separated the form from the South Nicobars. This very distinct subspecies has a narrow uniform border on the forewing.

*Eurema blanda grisea* (Evans). [South Nicobars.]

Iden. Ind. Butterflies, second ed., 1932, p. 78.

We have not seen this form but it is stated that the forewing border is narrower than in *moorei* and is very scaled between the veins.

*Eurema blanda visellia* (Fruh.). [Luzon.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 169.

We have not seen this subspecies but the author states that it is pale yellow and the hindwing is somewhat more broadly margined than in *acandra*.

*Eurema blanda mensia* (Fruh.). [Central Philippines.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 169.

Samar, Leyte and Bohol. This form also is unrepresented in any of the collections to which we have had access but it is said to be darker in colour than *visellia* and with broader bordering.

*Eurema blanda vallivolans* (Btlr.). [Mindanao.]

Ann. Mag. Nat. Hist., 1882, (5), xi, p. 420.

Mindanao and Palawan. The black bordering on the upperside of the female is broader than usual. Fruhstorfer incorrectly placed *simulatrix* as the wet season form of *vallivolans*.

*Eurema blanda norbana* (Fruh.). [North Celebes.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 171.

The forewing has a broad basal border which is uniform throughout its length and extends to the base of the wing. In the female the hindwing border is very broad and increases markedly at the tornus.

*Eurema blanda odinia* (Fruh.). [South Celebes.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 171.

South Celebes and Sula Islands. This race usually differs from *norbana* in the paler colouring and the rather browner bordering on the upperside. In examples from the South Celebes the forewing basal border is diffuse near the base of the

wing and the hindwing border is narrower than in *norbana*. Examples from the Sula Islands are very variable but are referable to *odinia*. The female allotype of *sulaensis* J. & T. in the Hill Museum is very like *norbana* in the heavy bordering on the upperside but, usually, females from this locality are not separable from those from the South Celebes.

*Eurema blanda indecisa* (Btlr.). [Batchan.]

Ann. Mag. Nat. Hist., 1898, (7), i, p. 78.

*salegos* (Fruh.) Seitz, Macrolepidoptera, 1910, vol. ix, p. 171. [Halmaheira.]

Halmaheira and Batchan. Judging by the limited material under examination it appears that the black basal border on the forewing is usually obsolete in the male but prominent in the female.

*Eurema blanda biformis* (Btlr.). [Amboina.]

Ann. Mag. Nat. Hist., 1884, (5), xiii, p. 196.

*cungata* (Fruh.) Seitz, Macrolepidoptera, 1910, vol. ix, p. 169. [Amboina.]

*depicta* (Fruh.) Seitz, Macrolepidoptera, 1910, vol. ix, p. 171. [Amboina.]

Amboina, Ceram and Buru. The male type of *biformis* is a *blanda* whilst the female is a *hecabe* form and thus Butler's name is singularly appropriate. Examples from the Southern Moluccas exhibit considerable variation, some males having a narrow, rectilinear distal border on the forewing whilst in others the distal border is continued along the basal margin for a distance of about half an inch. Some females resemble the male but others have a narrow diffuse basal border and traces of a cell end spot on the forewing. A male in the British Museum, taken at Amboina by C. B. Kloss in April, 1911, is almost white. Females from Ceram are black dusted. Judging from van Eecke's figures (Treubia, 1929, vii, p. 356) specimens from Buru are referable to *biformis* although the British Museum has a male in which the distal border on the forewing is broad at the apex and narrow at the tornus and the basal area of the wing is black dusted.

*Eurema blanda anios* (Fruh.). [Obi.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 171.

Examples of this race are pale in colour with narrow bordering and usually no basal border or basal dusting is present but in a male in the Tring Museum the distal border is continued along the basal margin for about half its length.

*Eurema blanda sanapati* (Fruh.). [Lombok.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 169.

Lombok, Sumbawa, Flores, Alor and probably Sumba. This form is of small size and the black bordering on the forewing is almost confined to the apical portion of the wing.

*Eurema blanda cantideva* (Fruh.). [Wetter.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 169.

This form, which we have not examined, was described as a very small race with a much broadened and very deeply incised distal border to the forewing.

*Eurema blanda laratensis* (Btlr.). [Larat, Timor Laut.]

Proc. Zool. Soc., 1883, p. 369.

*dosithea* (Hulstaert) Ann. Mag. Nat. Hist., 1923, (9), 12, 228. [Tamderna Island.]

Timor Laut. This form resembles examples from the North Moluccas but the narrow black border on the hindwing is dentate. Fruhstorfer incorrectly placed *laratensis* as a *hecabe* form.

*Eurema blanda saraha* (Fruh.). [Dutch New Guinea.]

Ent. Rundschau., 1912, xxix, p. 35.

Waigui and New Guinea. In the male the forewing distal border is apically rather quadrate and narrow at the tornus.

*Eurema blanda wuwulana* (Fruh.). [Matty Island, north of Admiralty Island.]

Ent. Rundschau., 1912, xxix, p. 35.

Bismarck Archipelago. A male in the British Museum from Aola, Guadalcanar, in the Solomon Islands resembles examples from New Guinea but the apical portion of the forewing distal border is not so quadrate and the hindwing margin is very narrow.

*Eurema ada* (Dist. & Pryer) 1887.

This small and rather uncommon species is confined to Burma, Indo-China, Siam and Malaysia. It prefers the hills to the plains and is confined to the jungle: the female is much rarer than the male.

The collective species has been confused with others by previous authors. In his "Rhopalocera Malayana" (1886) Distant figured, as *senna*, what is probably this species as de Niceville and Martin have pointed out: *senna*, however, is the Malayan representative of *libythea* and the description given by Distant



is of no assistance. When dealing with the *Rhopalocera* of North Borneo, Distant and Pryer (1887) described *ada* as a new species allied to but distinct from *lacteola*. The description of *ada* is not detailed but sufficient to leave no doubt that it refers to the species figured on plate V, fig. 11, and is quite distinct from *lacteola* which Distant and Pryer also recorded from Borneo. Distant's type of *ada* appears to have been lost but the Tring Museum has a specimen labelled *ada* from Distant's collection.

Fruhstorfer (1910) confused *ada* and *lacteola* and placed the former as the Bornean representative of the latter.

**Eurema ada ada** (Dist. & Pryer.) (Pl. V, fig. 11.). [British North Borneo.]

Ann. Mag. Nat. Hist., 1887, (5), xix, p. 271.

♂. Colour above and below a pale primrose yellow.

Upperside: The usual markings of the *hecabe*-group are present but the forewing black distal border is broader than usual; the inner edge of the excavated portion between veins 2 and 4 is rounded and no blackening of vein 3 occurs where it enters the border. At the tornus the inner edge of the black border is rounded. The hindwing bears a narrow, diffuse, black border.

Underside: the markings are similar to those of *hecabe* but smaller and less distinct. The cell of the forewing has two streaks placed near together; the apical area is usually unmarked but sometimes has a reddish-brown transverse streak. The streak in space 7 on the hindwing is comma-shaped and directed towards and almost contiguous with the discoidal mark.

The sex brand is broad and shorter than that of any other Malaysian species, not reaching the origin of vein 3.

Wing expanse 27-37 mm.

♀. Very similar to the male but rather larger; the forewing is more pointed and the hindwing border is usually broader.

Wing expanse 36 mm.

Burma, Tonkin, Siam, the Malay Peninsula and North Borneo. Malayan examples differ from those from North Borneo only in the narrower black bordering to the hindwing. It has been taken on Mt. Kinabalu, Marei Parei Spur at 5,000 feet (H. M. Pendlebury). We have seen no specimens from the Langkawi, Tioman or Anamba Islands.

**Eurema ada toba** (de Nic.). [North-east Sumatra.]

J. As. Soc. Bengal, 1895, lxiv, p. 496.

The male hardly differs from typical *ada* but a female taken in jungle at Brastagi at 4,000 feet (A. S. Corbet) is larger

(length of forewing 20 mm.), has more rounded forewings and is heavily marked above and below.

**Eurema ada varga** (Fruh.). [West and South Java.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 170.

Javanese examples are usually larger than typical *ada* and some females are almost white.

**Eurema ada prabha** (Fruh.). [Palawan.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 170.

In this very distinct subspecies the black bordering on the upperside is very broad and the hindwing has a richer yellow tinge.

**Eurema andersoni** (Mre.) 1886.

Several authors have regarded *andersoni* as a form of *sari* but we have little doubt that the two are distinct species. It is true that both have the same number of pointed appendages on the male claspers but the species have differently shaped wings and frequently *andersoni* may be abundant where no *sari* occur and *vice versa*: the argument that both are seasonal forms has little to support it. *E. andersoni* occurs in Formosa, Ceylon, India, Burma, Siam and Malaysia.

This species has two dark transverse streaks in the apex, a single cell spot and traces of a dark streak in space 1 on the forewing beneath; the long streak in space 7 on the underside of the hindwing is directed towards and almost contiguous with the discoidal spot. The last-named character is found only in *ada* which is readily separated from *andersoni* by its smaller size, general appearance and colouring. *E. andersoni* is more likely to be confused with *hecabe* than with any other member of the genus, but in the former species the forewings are always more acute.

**Eurema andersoni andersoni** (Mre.) (Pl. V, fig. 12). [Mergui Archipelago.]

J. Linn. Soc., Zool., 1886, xxi, p. 47.

♂. Upperside: rather a rich greenish-yellow colour. The markings are as usual but blacker and more regular than in *hecabe*. On the forewing the inner edge of the black distal border is sharply angled at both veins 2 and 4 and the hindwing distal border is more catenated than in *hecabe*.

Underside: paler than above but with a distinct greenish hue. The forewing has a single cell spot and some examples

bear traces of a dark streak in space 1 as is found in *sari*. At the apex two transverse, sinuous streaks are present, one situated in the centre of the apical area and the other against the outer margin. The hindwing has the same markings as *hecabe* but the long streak in space 7 is directed towards and almost contiguous with the discoidal mark and the discal streaks are conjoined to form a catenated band.

The sex brand resembles that of *blanda*.

Wing expanse 30–42 mm.

♀. Paler than the male on both surfaces and with more rounded forewings. The black distal borders on both wings are much broader than in the male. The markings on the underside as in the male.

Wing expanse 32–42 mm.

Burma, East and Peninsular Siam, Langkawi Islands, Malay Peninsula, Sumatra and North Borneo. Generally, specimens from the Langkawi Islands have a broader marginal border on the hindwing than is found in mainland examples. L. de Nicéville and Martin state that *andersoni* from Sumatra differs from the typical form only in the larger size and somewhat paler colouring on both surfaces. A specimen from British North Borneo differs slightly from the Malayan form in its paler and more greenish colouring.

In the Malay Peninsula *andersoni* occurs on the lowlands and on the hills up to 3,500 feet.

*Eurema andersoni anamba* ssp. n. (Pl. V, fig. 13).

On the forewing the black distal border is narrower and the edging much less sharply defined than in typical *andersoni*; the black toothed projection on vein 4, which is so prominent in *andersoni*, is so blurred that it appears as two teeth rather than one.

The underside is a bright yellow and the markings are redder, broader and more clearly defined than in *andersoni*. The apical markings on the forewing are barely traceable. The streak in space 7 on the underside of the hindwing is short and directed towards the distal side of the discoidal spot whilst the spot near the base of the cell is punctiform and not circular.

Wing expanse 36 mm.

♂, Anamba Islands, 16th. October, 1925, F. N. Chasen.

Type in the F. M. S. Museum.

*Eurema andersoni udana* (Fruh.). [West Java.]

Seitz, *Macrolepidoptera*, 1910, vol. ix, p. 169.

Fruhstorfer states that *udana* has the under surface more distinctly spotted with black than is the case with the more northerly races, and this is generally true. A male from Banjæwange, East Java, (5,000 feet) in the F. M. S. Museum hardly differs from typical *andersoni* except that the apical markings on the forewing beneath are fainter but the rest of the spotting is more distinct. A series of females from the same locality in East Java closely resemble *hecabe*, ♀-f. *lacteola* in colouring above and have a very narrow black border to the hindwing. The under surface is pale yellow, all the markings are rather faint and the usual apical markings on the forewing are hardly visible.

A few subspecies occur outside of Malaysia.

*Eurema andersoni godana* (Fruh.). [Formosa.]

Seitz, *Macrolepidoptera*, 1910, vol. ix, p. 169.

This form is not represented in any collections to which we have had access but it is stated to be larger, paler and more narrowly margined with black than in typical *andersoni*.

*Eurema andersoni ormistoni* (Watkins). [Ceylon.]

J. Bombay Nat. Hist. Soc., 1925, xxx, p. 714.

Ceylon and South India. The female type in the British Museum, which was formerly Moore's type of *rotundalis*, has not a continuous black border on the hindwing above. Both sexes are smaller than typical *andersoni* and the usual apical markings on the underside of the forewing are barely visible in Ceylonese specimens but more distinct in examples from South India.

*Eurema andersoni evansi* nom. n.

Above paler than typical *andersoni* but similarly marked. The markings on the underside are visible from above and the hindwing border comprises a series of small spots at the vein endings conjoined to form a narrow line.

The underside has the usual markings but the apical bars on the forewing and the streak in space 7 on the hindwing are remarkably distinct. The apical markings on the forewing comprise an anterior, rather broad and very distinct, dark-brown, transverse stripe, on which the veins show yellow, united by a stripe on the costal margin with a short stripe on the distal margin. All the hindwing markings are very distinct; the streak in space 7 is continuous with the spot at the end of the cell. Wing expanse 36 mm.

♂. Port Blair, South Andaman Islands.

Type in the British Museum (Natural History). Named after Brigadier W. H. Evans, C.S.I., C.I.E., D.S.O.

This butterfly was described and figured by Moore (Lep. Ind., 1906, vii, p. 75 and plate 575, fig. 2a) as the type of *andamana*, dry-season form. The wet season form of *andamana*, which is a *hecabe* form, and a synonym of *blairiana* (Mre., *ibid.* p. 75) was described first.

***Eurema andersoni jordani* ssp. n.**

Above yellow but not of the deep hue usual in *andersoni*. On the upperside the forewing black distal border is broad and deeply excavated and vein 3 is tinged with black immediately before entering the border. This border is broadly continued along the basal margin; the distal third is clearly defined, then it becomes broader and very diffuse and terminates about  $\frac{1}{2}$  cm. before reaching the wing base. The hindwing border increases in width from the apex to the tornus and is continued for some distance along the basal margin; at the widest part this border is about 7 mm. broad. Both wings are rather heavily dusted with black at the bases.

The under surface is a rather brighter yellow than above; the markings are rather lighter than in typical *andersoni* but of the usual character and the tornal spot on the forewing is small but distinct. Wing expanse 42 mm.

♀. Sikkim, 18th October, 1888, O. Moller. Another female taken in the same locality on 8th September, 1888, by the same collector is identical.

Type in the Tring Museum. Named after Dr. K. Jordan.

A female from Chumbi, Bhotan, (taken in May, 1894, by G. C. Dudgeon) in the British Museum is similar but has more elongated forewings (wing expanse 44 mm.).

This very distinct subspecies is of considerable interest in possessing a basal border on the forewing such as is found in no other form of *andersoni* but which might be expected to occur in a Celebesian race if such existed.

***Eurema sari* (Hsf.) 1829.**

This species has a different geographical range to that of *andersoni*, which lends support to the view that we are dealing with two distinct species. This butterfly occurs from Burma to Peninsular Siam, Malaysia and the Philippines. The large, black, quadrate spot covering the whole of the apical area, the single cell spot and the black streak in space 1 on the underside of the forewing render this species unmistakable.

***Eurema sari sodalis* (Mre.) (Pl. V, fig. 7). [Mergui.]**

J. Linn. Soc., Zool., 1886, xxi, p. 45.

♂. A deep, bright yellow colour above and rather paler below.

Upperside: markings as in *hecabe* but the distal border on forewing is blacker and, in the apical portion, broader; the excavated portion differs from all other Malayan species in that its inner edge is directed towards the distal margin at a point just above the tornus.

Underside: the forewing has a single cell spot, the usual discoidal mark, a broad, dark brown streak at the tornus and a large quadrate spot covering the whole of the apical area. The hindwing is marked as in *hecabe* but the circular cell spot is obsolete: the markings are faint and ill-defined.

The sex brand is pale, long and narrow as in *blanda*.

Wing expanse 31.5-42 mm.

♀. Resembles the male but the black border on the hindwing is broader and more diffuse.

Wing expanse 36-43 mm.

South Burma, South-west Siam, Perhentian Islands, Malay Peninsula, Anamba Islands, Sumatra and North Borneo. In the Anamba specimens the markings on the upperside are lighter but the width of the hindwing border is as in *sodalis*. The British Museum has males from the Nilgiri Hills and Travancore (2,700 feet) which have no hindwing border and are rather smaller than typical *sodalis*.

***Eurema sari thyreus* (Fruh.). [Engano Island.]**

Seitz, Macrolepidoptera, 1910, vol. ix, p. 170.

The reddish-brown markings on the under surface are prominent and the tornal spot on the underside of the forewing is greatly enlarged.

***Eurema sari obucula* (Fruh.). [South Borneo.]**

Seitz, Macrolepidoptera, 1910, vol. ix, p. 170.

South Borneo, Natuna Islands and Palawan. A Palawan example in the British Museum has a broad border on the hindwing.

***Eurema sari sari* (Hsf.). [Java.]**

Cat. Lep. E. I. Co., 1829, i, p. 136.

Typical *sari* differs but little from *sodalis*; the upperside bordering is somewhat broader and the markings on the underside are larger and more distinct. Specimens from Banka are intermediate between *sari* and *sodalis*.

Two subspecies occur in the Philippines.



*Eurema sari mindorana* (Btlr.). [Mindora.]

Ann. Mag. Nat. Hist., 1898, (7), i, p. 73.

The females are broadly margined and there are traces of a black spot at the cell end on the upperside of the forewing. Fruhstorfer incorrectly placed *sarilata* as the *sari* race from the Central Philippines.

*Eurema sari sarilata* (Semp.). [Mindanao.]

Reise Philip. Lep., 1891, p. 254.

*crinatha* (Fruh.). Seitz, Macrolepidoptera, 1910, vol. ix, p. 170. [Mindanao.]

Resembles *mindorana* but is more heavily marked beneath and the female lacks the cell end spot on the upperside of the forewing.

*Eurema tilaha* (Hsf.) 1829.

This species ranges from South Burma, across Malaysia, to the Philippines and Celebes. It is easily recognised by the black basal border on the upperside of the forewing whilst the under surface also is distinctive. The races ranged by Fruhstorfer under *invida* and *alitha* are clearly subspecies of *tilaha*.

*Eurema tilaha nicévillei* (Btlr.) (Pl. V, fig. 14). [North-east Sumatra.]

Ann. Mag. Nat. Hist., 1898, (7), i, p. 79.

♂. Bright yellow above, rather pale below.

Upperside: on the forewing the black distal border extends from just beyond the middle of the costa to the tornus and is then continued along the basal margin to the base of the wing: the inner edging of the bordering is fairly regular and the veins which traverse the basal portion are coloured yellow. The narrow, black distal border on the hindwing becomes broader and more diffuse towards the tornus.

Underside: markings much sparser than in *hecabe*. The forewing has a single mark in the cell, the usual discoidal spot and faint apical markings recalling *andersoni*. The hindwing is marked as in *hecabe* but the spot in the cell is either missing or very faint and the discal markings are little more than spots.

The sex brand is long, rather narrow and prominent.

Wing expanse 41-48 mm.

♀. Resembles the male but has broader bordering on the upperside of the hindwing.

Wing expanse 39.5-49 mm.

South Burma, Peninsular Siam, Langkawi Islands, Malay Peninsula, Tioman Island, North-east Sumatra and Pulau Weh. The species is generally distributed throughout Malaysia but is nowhere common and usually occurs at elevations of from 500 to 2,500 feet.

*Eurema tilaha lamperti* (Fruh.). [Pulau Tello.]

Ent. Rundschan., 1912, xxix, p. 95.

Batu Islands, south of Nias. This form is not before us but it is said to be separable from *tilaha* from Java by the broader bordering on both wings whilst the intense yellow colouring of the underside places it near to *nicévillei*.

*Eurema tilaha gradiens* (Btlr.). [Borneo.]

Ann. Mag. Nat. Hist., 1886, (5), xvii, p. 223.

The type has a very narrow black basal border on the forewing but many Bornean examples closely approach *nicévillei*; usually, however, the inner edge of the basal border is more irregular.

*Eurema tilaha tilaha* (Hsf.). [Java.]

Cat. Lep. E. I. Co., 1829, i, p. 136.

*eumide* (Feld.) Novara Reise, Lep., 1865, ii, p. 214.

Typical *tilaha* from Java differ from *nicévillei* in that the black basal border on the forewing is narrower and more broken. The F. M. S. Museum has specimens from East Java taken at 5,000 feet.

*E. t. eumide* was described from the Celebes but Fruhstorfer found the type to be indistinguishable from Javanese *tilaha*. Some of Felder's specimens of *eumide* in the Tring Museum are without locality labels but are clearly of Javanese origin.

*Eurema tilaha myria* (Fruh.). [Bali.]

Ent. Rundschan., 1913, xxx, p. 92.

The black basal border on the forewing is stated to be scarcely half as wide as in *tilaha* from Java. We have seen no examples of this form.

Quite a number of other subspecies have been described by Felder and Fruhstorfer. Of these we have examined all but *bazilana*, *djampeana*, *leytensis*, *samarana* and *sanama*.

*Eurema tilaha garama* (Fruh.). [Sulu Archipelago.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 170.

*bozonina* (Fruh.) Ent. Rundschan., 1913, xxx, p. 92. [Sulu Archipelago.]

The ground colour is light yellow and the black bordering is narrow. The female is heavily black dusted as in *bazilana* but has more rounded forewings.

*Eurema tilaha bazilana* (Fruh.). [Bazilan.]

Seitz, *Macrolepidoptera*, 1910, vol. ix, p. 171.

*aebutia* (Fruh.) *loc. cit.*, p. 171. [Bazilan.]

This subspecies is stated to have very broad borders to both wings, the anal border on the hindwing nearly reaching to the cell. In the male form *aebutia* the hindwing border is much narrowed anally.

*Eurema tilaha alitha* (Feld.). [Mindanao.]

Wien. Ent. Mon., 1862, vi, p. 289.

*invida* (Btlr.) *Ann. Mag. Nat. Hist.*, 1883, (5), xi, p. 418. [Mindanao.]

It approximates to *lorquini* in having a deep yellow male and a pale lemon coloured female; in both sexes the black bordering is broad.

*Eurema tilaha leytenensis* (Fruh.). [Leyte Island, Central Philippines.]

Seitz, *Macrolepidoptera*, 1910, vol. ix, p. 170.

The author states that this form approaches closely to typical *tilaha*.

*Eurema tilaha samarana* (Fruh.). [Samar Island, Central Philippines.]

Seitz, *Macrolepidoptera*, 1910, vol. ix, p. 170.

This *Eurema* is said to differ from all others by the roundish, isolated patch at the hind margin of the forewing.

*Eurema tilaha sangira* (Fruh.). [Sangir Island, North Celebes.]

Seitz, *Macrolepidoptera*, 1910, vol. ix, p. 171.

Rather similar to examples from North Celebes but the black bordering on both wings is broader than is the case with representatives from the South Celebes.

*Eurema tilaha zita* (Feld.). ["Celebes".]

Novara Reise, Lep., 1865, ii, p. 210.

Felder gives the type locality of *zita* as "Celebes" but states that it differs from *lorquini* from South Celebes in the broader, shorter and more rounded wings, the broader basal border on the forewing and the broader bordering on the hindwing. This

description agrees with examples of *tilaha* in the British Museum from Menado, Kalawara and Jaloe which conform to Fruhstorfer's figures (*tom cit.*, plate 73, H5 and H6).

In the Tring Museum is a female *tominia* from the Felder Collection labelled "*zita*" and bearing a locality label from Sangir. In the original description of *zita* nothing is said which suggests a *tominia* form and W. H. Evans has shown that several of Felder's specimens at Tring are wrongly labelled.

Although some doubt is attached to the identity of *zita*, it appears advisable to follow Fruhstorfer and regard it as the *tilaha* representative from North Celebes. Females from this locality are more heavily black dusted on the wing bases above than is the case with examples from South Celebes.

*Eurema tilaha lorquini* (Feld.). [Macassar.]

Novara Reise, Lep., 1865, ii, 209.

*marosiana* (Fruh.) Seitz, *Macrolepidoptera*, 1910, vol. ix, p. 171. [Maros.]

South Celebes. The wings of the female are lightly dusted with grey brown and, in some specimens, the broad, black hindwing border ends abruptly before reaching the tornus.

*Eurema tilaha djampeana* (Fruh.). [Tanah Jampea.]

Ent. Zeit., Stuttgart, 1908, p. 63.

In this race it is stated that the forewing black distal border enters the cell and the hindwing is broadly bordered with black.

*Eurema tilaha sanama* (Fruh.). [Sanama, Sula Islands.]

Ent. Rundschau., 1913, xxx, p. 92.

This subspecies was founded on a female described as being intermediate between *zita* and *bazilana*, having less black dusting than *zita* and a narrow yellow area as in *bazilana* whilst the hindwing bordering is not as expansive as in *zita*.

*Eurema tominia* (Vollenh.) 1865.

This species, which is confined to Borneo and the Celebes, differs from *tilaha* in having the hindwing black border continued along the basal margin; Fruhstorfer states that the male genitalia differ.

Both *tominia* and *tondana* from the North Celebes were first described in 1865 but Wallace has shown (*Trans. Ent. Soc.*, 1867, (3), iv, p. 327) that the first name has priority.

*Eurema tominia nabalua* ssp. n.

♂. The black bordering on the upperside is distinctly narrower than in *horatia* and the basal border on the hindwing is well-developed, extends into the wing rather beyond vein 1, is widest at the tornus, then tapers gradually and disappears just beyond vein 7. The underside markings are a spot at the cell end on each wing, a small black tornal smudge on the forewing, and on the hindwing a brownish-black mark near the apex of vein 9 extending from the costa to interspace 7, a smaller sub-marginal mark near vein 7 and a few brownish scales in interspaces 5, 4, 3 and 1 (a hand lens is required to see those in 3 and 1).

♀. The forewing above is similar to that of the female *tilaha nicévillei* but the border on the dorsum is wider at the base thus resembling more a female *battana* Fruh. (*tom. cit.*, p. 171 and plate 73, G3) than *horatia* and the hindwing border is narrower than either. The underside markings resemble those of the male but are less distinct.

Length of forewing ♂, 24 mm.; ♀, 24.5 mm.

British North Borneo: Mt. Kinabalu; ♂, Kenokok river, 3,300 feet, 24th April, 1929; ♀, Marei Parei Spur, 5,000 feet, 30th April, 1929, H. M. Pendlebury. Types in the F. M. S. Museum.

Two examples in the British Museum from Mount Kinabalu are similar.

*Eurema tominia horatia* (Fruh.). [Pontianak.]

Seitz, *Macrolepidoptera*, 1910, vol. ix, p. 171.

South Borneo. It is represented in the British Museum by two males from "Borneo" which resemble closely the specimens figured by Fruhstorfer (*tom. cit.*, plate 73, G6 and G7).

Of the subspecies found outside of the Malaysian region only *mangolina* and *tominia* are known to us.

*Eurema tominia mangolina* (Fruh.). [Sula Mangoli.]

Seitz, *Macrolepidoptera*, 1910, vol. ix, p. 171.

*besina* (Fruh.) *ibid.*, p. 171. [Sula Besi.]

Sula Islands. Examples in the British Museum from Sula Mangoli and Sula Besi are not separable. The males differ but slightly from *tominia* but the females are much blacker.

*Eurema tominia talissa* (Westw.). [Talissee Island, off North Celebes.]

Trans. Ent. Soc., 1888, p. 469.

It is stated that the males have a broader and more obliquely placed band than *tominia* whilst the females differ only slightly.

*Eurema tominia tominia* (Vollenh.). [Tomini.]

Monogr. Pierid., 1865, p. 66.

*tondana* (Feld.) Novara Reise, Lep., 1865, ii, p. 214. [Tondano.]

*zamida* (Fruh.) Ent. Zeitschr., Stuttg., 1908, p. 63. [Lutangan, near Toli-Toli.]

*battana* (Fruh.) Seitz, *Macrolepidoptera*, 1910, vol. ix, p. 171. [South Celebes.]

*toradja* (Fruh.) *ibid.*, p. 171. [East Celebes.]

Celebes. Felder's figure of *tondana* is clearly referable to typical *tominia*. As a general rule examples from North and South Celebes do not differ sufficiently to justify separation into distinct subspecies. Some specimens in the British Museum from Tawaya, North Palos Bay, and from Dongalo, South Palos Bay, agree closely with Fruhstorfer's figure of *mangolina*. The form *zamida* refers to a dwarf female with yellow transverse bands but almost entirely covered with black dusting on both wings.

*Eurema tominia halesa* (Fruh.). [Saleyer Island, off South Celebes.]

Seitz, *Macrolepidoptera*, 1910, vol. ix, p. 171.

It is stated that in this race the forewing black basal border extends to beyond the middle of the cell.

*Eurema tominia faunia* (Fruh.). [Binungka, Tukang Besi Islands.]

Seitz, *Macrolepidoptera*, 1910, vol. ix, p. 171.

The author states that this form approaches *besina* in the small size and the narrow distal bordering on both wings whilst the ground colour is paler than in any other named subspecies of *tominia*.

*Eurema tominia arsia* (Fruh.). [Tanah Jampea.]

Seitz, *Macrolepidoptera*, 1910, vol. ix, p. 171.

It is said to differ from *battana* in that the black basal border encroaches more deeply into the cell.

*Eurema lombokiana* (Fruh.) 1897.

This species is of considerable interest for whilst the upper surface recalls a somewhat narrow bordered *hecabe* or *blanda* the underside is most like *tilaha*. An examination of the male genitalia showed that the clasper had four anal hooks of which three were of the usual size and the fourth was from two to



three times as broad. In the anterior of the clasper was a small, soft, hook-like process which was directed anteriorly. This butterfly is confined to Lombok, Sumbawa and Flores.

*Eurema lumbokiana* (Fruh.). [Lombok.]

Berl. Ent. Zeitschr., 1897, p. 8.

The female is larger than the male and has a broader and diffuse border on the hindwing above; on the underside is a submarginal band composed of reddish, diffuse, irregular spots.

*Eurema celebensis* (Wall.) 1867.

This species is confined to the Celebes and examination of the British Museum material shows that only two races can be separated.

*Eurema celebensis exophthalma* (Fruh.). [Sula Mangoli.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 172.

*poetelia* (Fruh.) *ibid.*, p. 172. [Sula Besi.]

Sula Islands.

*Eurema celebensis celebensis* (Wall.). [♂, Tondano; ♀, Macassar.] Trans. Ent. Soc., 1867, (3), iv, p. 327.

*toalarum* (Fruh.) Seitz, Macrolepidoptera, 1910, vol. ix, p. 172. [South Celebes.]

Celebes. As a rule specimens from South Celebes are slightly larger and more yellow than those from North Celebes and the yellow areas on the upperside of the female are not black-dusted. These differences, however, are too slight to justify separation into two subspecies.

*Eurema candida* (Cram.) 1780.

This insect has a curious distribution, occurring in the Moluccas, Lesser Sunda Islands, New Guinea, the Bismarck Archipelago, the Solomon Islands and Australia.

*Eurema candida libera* (Fruh.). [Halmaheira.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 172.

Examples in the British Museum from Ternate and Batchan agree with Fruhstorfer's figures (*tom. cit.*, plate 73, D1 and H7).

*Eurema candida dindymene* (Fruh.). [Obi.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 172.

The hindwing distal border is proximally widened and in the female the forewing is black dusted basally.

*Eurema candida candida* (Cram.). [? Ceram.]

Pap. Exot., 1780, iv, p. 82.

*exalbescent* (Jurriaanse) Ent. Ber. Amsterdam, 1926, vii, p. 67. [Buru.]

Amboina, Ceram, Buru and Saparoea. The dense brown dusting in the basal area of both wings, which is mentioned by Fruhstorfer, is not always very evident in a long series from the first three named localities in the British Museum. Examples from Buru are not separable from those from Amboina.

*Eurema candida goramensis* (Fruh.). [Goram, South-east of Ceram.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 172.

We have seen no specimens of this form but it is said that the distal bordering is much narrower than in *candida* and that it forms a transition to *virgo*.

*Eurema candida micromalayana* (Fruh.). [Timor and Flores.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 172.

We have seen no examples of this very broadly black margined race from the Lesser Sunda Islands.

*Eurema candida virgo* (Wall.). [Aru Islands.]

Trans. Ent. Soc., 1867, (3), iv, p. 328.

In the male and female types in the British Museum the distal bordering is approximately equal to that in *libera*. The female is white.

*Eurema candida talboti* (Hulstaert). [Watuvar.]

Ann. Mag. Nat. Hist., 1923, (9), xii, p. 228.

Key Islands. This quite distinct race resembles *candida* but the distal margin on the forewing is sinuate in both sexes. The hindwing is black dusted at the basal margin and broadly so in the female.

*Eurema candida octagesa* (Fruh.) [Waigui.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 172.

*biakensis* (Joicey & Talbot) Ann. Mag. Nat. Hist., 1917, (8), xx, p. 218. [Biak Island, North of Dutch New Guinea.]

In *octagesa* the distal margining is somewhat narrower than in *libera*; the male of *biakensis* hardly differs from *octagesa* but the female is darker yellow.

*Eurema candida puella* (Bsdv.). [Dutch New Guinea.]

Voy. Astrolabe, Lep., 1832, p. 60.

Humboldt Bay and Dorey to Etna Bay and Merauke. In this race the distal band is widened anteriorly as stated by Fruhstorfer.

*Eurema candida diotima* (Fruh.). [Mandated Territory of New Guinea.]

Seitz, Macrolepidoptera, 1910, vol. ix, p. 172.

Described from "German New Guinea and Vulcan Island". In specimens from the first named locality the male is paler in colouring than *puella* whilst the female is pure white with narrower bordering to both wings.

*Eurema candida papuana* (Btlr.). [Port Moresby.]

Ann. Mag. Nat. Hist., 1898, (7), i, p. 60.

British New Guinea and Queensland. The distal bordering is somewhat narrower than in *virgo*.

*Eurema candida xanthomelaena* (Godm.). [New Ireland.]

Proc. Zool. Soc., 1879, p. 159.

Bismarck Archipelago. This distinct subspecies is represented in the British Museum by specimens from New Ireland, Duke of York Island, New Britain, Witu (French Island) and St. Mathias Island. In the male the hindwing anal margin extends to the cell and the female is densely dusted with black-brown on both wings. Fruhstorfer has described *digentia* (*loc. cit.*, p. 172) as forming a transition between examples from New Ireland and New Britain and those from the Fauro and Alu Islands but no locality is mentioned. Unless *digentia* is a form from Bouganville it is difficult to place it.

*Eurema candida woodfordi* (Btlr.). [Aola, Guadalcanar.]

Ann. Mag. Nat. Hist., 1898, (7), i, p. 61.

*salomonis* (Btlr.) *ibidem*. [Fauro Islands.]

Solomon Islands. In the British and Tring Museums are numerous examples from the Fauro and Alu Islands, Woodford Island and the Solomon Islands. Both sexes have relatively

narrow distal borders to both wings and the female is pale yellow: examples from all localities are very similar.

We have been unable to place satisfactorily the following four forms, but believe that they are all referable to *hecabe*.

*suava* (Bsdv.) Spec. Gen. Lep., 1836, p. 670, from "Ban". This is a small form with a narrow forewing border such as occasionally appears in many of the *hecabe* races.

*sinensis* (Lucas) Rev. et Mag. Zool., 1852, p. 429, from "China".

*sarinoides* (Fruh.) Seitz, Macrolepidoptera, 1910, vol. ix, p. 167.

This was described as a *hecabe* form with a large red apical spot on the forewing beneath, but no locality was given.

*ochrys* (Fruh.) *ibid.*, p. 168, from the Philippines.

Other *Eurema* which are unknown to us are:

*rahel* (F.) Mant. Ins., 1787, ii, p. 22, believed to be a synonym of *tilaha* Hsf., although Moore gives the habitat as Borneo.

*phanospila* (Feld.) Novara Reise, Lep., 1865, ii, p. 209, from Java, is probably a synonym of *blanda* Bsdv.

*angulata* (Wallengren) Wien. Ent. Mon., 1863, iv, p. 34. Wallace (Trans. Ent. Soc., 1867, (3), iv, p. 301) gives the habitat as Sandwich Islands, but this certainly must be a mistake as the only Pierine known from the Hawaiian Islands is *Pieris rapae* L., which was introduced from North America.

The correct names for the *Eurema* forms figured in Seitz Macrolepidoptera, vol. ix, plate 73, are given below:—

C. 1, *silhetana*; 2, *davidsoni*; 3, *silhetana*; 4, *didymene*.

D. 1, *libera*; 2 and 3, *ada*; 4 and 5, *fruhstorferi*; 6 and 7, *laeta*; 8, *lombokiana*.

E. 1 and 2, *borneensis*; 3 and 4, *blanda*; 5 and 6, *diversa*; 7, *sinda*.

F. 1, *sinda*; 2 and 3, *hecabe*; 4, 5 and 6, *sari*; 7 and 8, *exophthalma*.

G. 1, *tilaha*; 2 and 3, *tominia*; 4 and 5, *lorquini*; 6 and 7, *horatia*.

H. 1, *odinia*; 2 and 3, *mangolina*; 4, *norbana*; 5 and 6, *zita*; 7, *libera*.

*Eurema smilax* (Don.) 1805.

This species which is confined to the Australian continent can hardly be confused with any other old world species of the genus.

The male has a brand situated near the base of the median vein on the underside of the forewing, as in *hecabe*, as well as a patch of modified scales at the base of space 7 on the hindwing above as in *laeta*. The apex of the forewing is very rounded, the forewing distal border terminates abruptly before reaching the basal margin, and on this wing the only marking usually found on the underside is a small dark spot at the cell end. The species is migratory and no geographical races can be separated, although quite marked variation is shewn in size and in the intensity of the markings on the under surface.

*Eurema smilax* (Don.). [Australia.]

Insects of New Holland, 1805, v, p. 20.

*ingana* (Wall.) Trans. Ent. Soc., 1867, (3), iv, p. 322.  
[Sydney, N. S. Wales.]

*parvula* (Herr.-Sch.) Stettin. ent. Zeit., 1869, xxx, (1), p. 78.  
[Rockhampton, Queensland.]

*varius* (Miskin) Proc. Royal Soc. Queensland, 1889, iv, (5), p. 259. [Brisbane.]

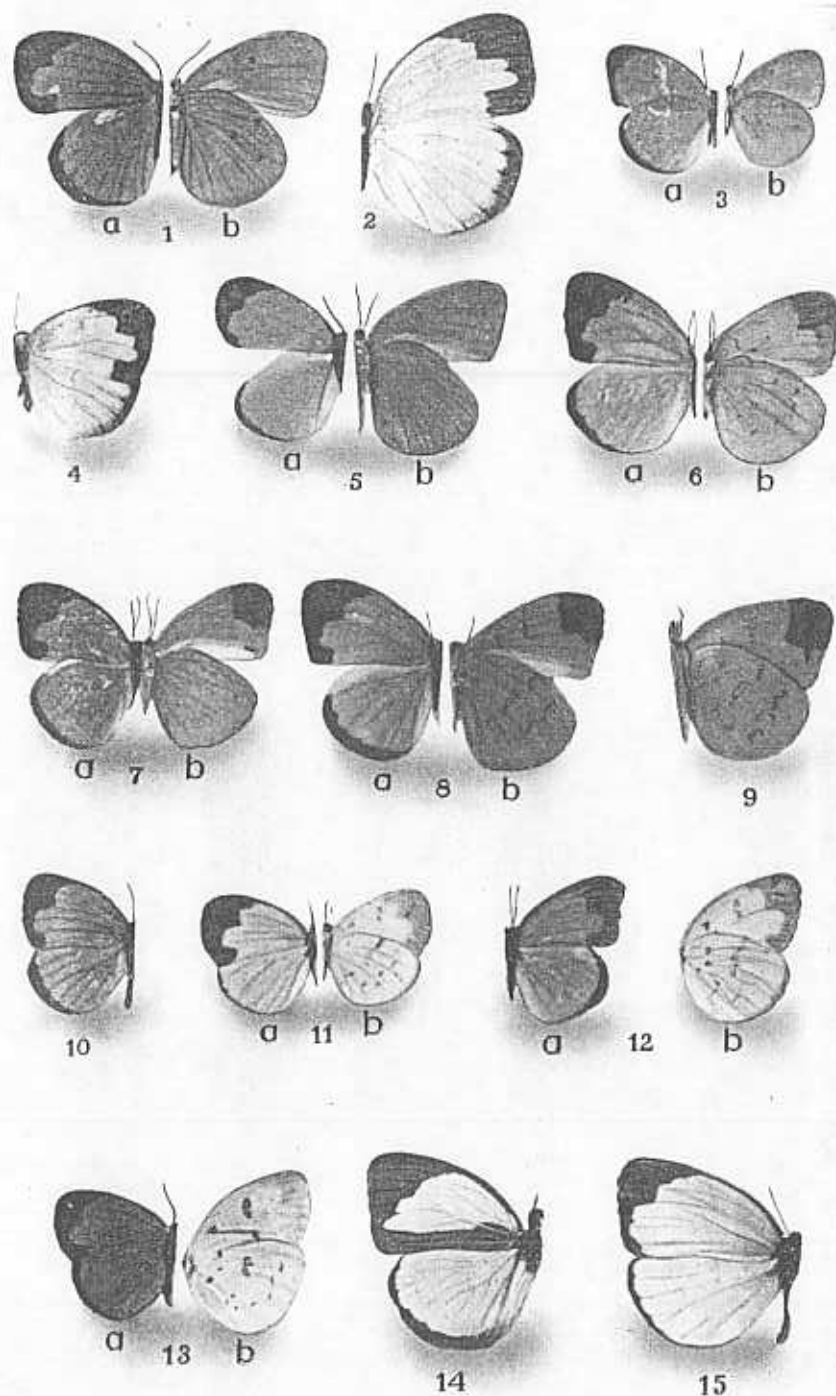
*casta* (Lucas) *id.*, 1892, viii, (3), p. 68. [Duaringa, Queensland.]

As this species is not described in Seitz' *Macrolepidoptera of the World*, volume ix, a short description is appended. The male sexual characters are mentioned above. In both sexes the colour is yellow, but the female is slightly paler.

**Upperside.** The apex of the forewing is very rounded and the markings on this wing consist of a broad black brown distal border placed as in *hecabe*, but differing in that the inner margin is irregular and diffuse, and that the border terminates abruptly at vein 1; there is a minute dark dot at the cell end. The hindwing is usually unmarked, although occasionally there are traces of a dark distal border.

**Underside:** paler than above. Usually the forewing is unmarked except for a brown spot at the cell end, but rarely there are traces of brown apical markings as in *andersoni*. The markings on the hindwing consist of three basal dots, a series of faint discal streaks or splashes and a series of streaks conjoined to form a very irregular submarginal band.





A REVISION OF THE INDO-AUSTRALIAN SPECIES OF EUREMA

The type of *ingana* Wall., is in the Natural History Museum, South Kensington, and has been examined.

According to Waterhouse and Lyell ("Butterflies of Australia", Sydney, 1914, Angus & Robertson), the species ranges from Victoria to Cape York and Darwin.

PLATE V

(For the photographs of the figures on the accompanying plate we are indebted to Mr. H. Guntery.)

EXPLANATION OF FIGURES

- Fig. 1. *Eurema hecabe hecabe* ♂, (a) upperside, (b) underside.  
 Fig. 2. *Eurema hecabe hecabe* ♀, upperside.<sup>1</sup>  
 Fig. 3. *Eurema hecabe* ♂—f. *asphodelus*, (a) upperside (b) underside.  
 Fig. 4. *Eurema hecabe* ♀—f. *lacteola*, upperside.  
 Fig. 5. *Eurema blanda snelleni* ♂, (a) upperside (b) underside.  
 Fig. 6. *Eurema blanda snelleni* ♀, (a) upperside (b) underside.  
 Fig. 7. *Eurema sari sodalis* ♂, (a) upperside (b) underside.  
 Fig. 8. *Eurema simulatrix tecmessa* ♂, (a) upperside (b) underside.  
 Fig. 9. *Eurema simulatrix* f.—*javanica* f. n., underside.  
 Fig. 10. *Eurema simulatrix tecmessa* upperside (Langkawi Islands).  
 Fig. 11. *Eurema ada ada* ♂, (a) upperside (b) underside.  
 Fig. 12. *Eurema andersoni* ♂, (a) upperside (b) underside.  
 Fig. 13. *Eurema andersoni anamba* ssp. n., (a) upperside (b) underside.  
 Fig. 14. *Eurema tilaha nicevillei* ♂, upperside.  
 Fig. 15. *Eurema blanda snelleni* ♂, upperside (Pulau Jarak).

<sup>1</sup> Although not apparent from the photograph, the specimen representing fig. 2 is actually much darker than fig. 4. Figs. 2, 14 and 15 were taken by a slightly different process to the others and appear comparatively lighter on reproduction.

