Entomofauna

ZEITSCHRIFT FÜR ENTOMOLOGIE

Band 38, Heft 12: 233-300 ISSN 0250-4413 Ansfelden, 2. Januar 2017

The *Cyana insularis*-group (Arctiidae, Lithosiinae, *Cyana* Walker 1854) with fifteen Insular and Mainland SE Asian taxa (seven nov.sp./two nov.ssp.) and seven habitus look-alikes (two nov.sp.) from likely parallel developing lineage(s)

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Abstract

24 species of the genus *Cyana* are classified and newly arranged following morphological criteria. 9 Taxa are described as new: *C. kasperi* nov.sp. (Java), *C. paukstadti* nov.sp. (Bali), *C. maaikeae* nov.sp. (Borneo), *C. martinii* nov.sp. (Sumatra), *C. malacca* nov.sp. (Thailand), *C. weerawoothi* nov.sp. (Thailand), *C. juliettae* nov.sp. (Thailand), *C. barlowi* nov.sp. (Genting Tea Estate), *C. johani* nov.sp. (Panay), *C. ridleyi siberuta* nov.ssp. (Sumatra) and *C. ridleyi roberti* nov.ssp. (Genting Tea Estate).

Zusammenfassung

In der vorliegenden Arbeit werden 24 Arten der Gattung *Cyana* untersucht und nach morphologischen Merkmalen neu gruppiert. 9 Taxa werden als neu beschrieben und in die Literatur eingeführt: *C. kasperi* nov.sp. (Java), *C. paukstadti* nov.sp. (Bali), *C. maaikeae* nov.sp. (Borneo), *C. martinii* nov.sp. (Sumatra), *C. malacca* nov.sp. (Thailand), *C. weerawoothi* nov.sp. (Thailand), *C. juliettae* nov.sp. (Thailand), *C. barlowi* nov.sp. (Genting Tea Estate), *C. johani* nov.sp. (Panay), *C. ridleyi siberuta* nov.ssp. (Sumatra) und *C. ridleyi roberti* nov.ssp. (Genting Tea Estate).

Introduction

In line with Roepke' s suggestion that phallus configurations, in particular spiculi (now: cornuti named) patterns on the vesica could provide valuable classification criteria, most of the twenty four SE Asean *Cyana* taxa with sometimes confusingly similar external habitus features were dissected and classified on basis of 3-dimensional vesica and/or bursal component configurations, derived from selectively dyed preparations. Fifteen taxa could structurally be clustered in a designated: *Cyana insularis* group entity, on basis of embryological positioning of cornuti configurations in the phallus hull, prior to vesica eversion, with a remarkable narrow variability range.

Analyses of the variation of several external features demonstrated narrow variability within peripheral confined Island populations, but much wider variation in the taxa distributed on the major equatorial islands Java, Borneo, Sumatra and the Malay Peninsula, as well as mainland SE Asia. On Java and Bali two new *insularis* taxa: *C. kasperi* nov.sp. and *C. paukstadti* nov.sp. were identified on these Islands respectively. Upon clarification of the degree of variability of sexual dimorphy in *C. determinata sausae* (Bucsek 2012), and clarification of the identity of the proper partner of the *C. determinata sausae* ♀ and the *C. determinata determinata* ♂ from Borneo, two new taxa, with stunning similar habitus ♂♂ of these specs., *C. maaikeae* nov.sp. on Borneo and *C. martinii* nov.sp. on Sumatra could be identified. Both these specs are similarly narrow fasciated as the *C. determinata* ♂♂, but *C. maaikeae* is (by ♀ structural analogy) closer affiliated to *C. determinata* and *C. martinii* to *C. ridleyi*. Two *C. ridleyi* related subsp. *C. ridleyi siberuta* and *C. ridleyi roberti* were identified on Sumatra and the S Malay Peninsula resp. At the Northern Malay Peninsula and mainland SE Asia three new taxa were identified: *C. malacca* nov.sp., *C. weerawoothi* nov.sp. and *C. juliettae* nov.sp. These species departed, in various degrees, away from the usual Tiger-moth habitus, by exhibiting gradual development of white front wing spots in the sub-basal white zone and the white fasciae between the medians. In ♂♂ the coloured fascia widened and became dominant orange/reddish fasciae approaching the fully orange morph of *C. coccinea*., whereas ♀♀ maintained their Tiger-moth habitus. Two likely insularis taxa *C. erythrostigma* and *C. aurantiorufa* could not be included, pending structural confirmation.

Seven species of the investigated 24 taxa significantly departed from the structural *insularis* grouping criteria definition, although two of them *C. gabika* and *C. bianca* displayed

striking similarity with narrow banded *C. determinata* ♂♂ (both genders of *C. gabika* resembling ♂♂ and both *C. bianca* genders with the broad-banded-ness as in *C. determinata* ♀♀). The two specs in this section A also lack sub-basal wedges. The *C. bianca* sexual partners were confirmed by breeding progeny from singled ♀♀. Five non-*insularis* species with distinct sub-basal wedges, and even having similar black margin fasciae as the four mainland *insularis* specs., have distinct diagnostic differential cornuti fields and arrangement thereof in the phallus hull. *C. clama* and *C. barlowi* nov.sp. fly sympatric with *C. determinata sausae* on the S Malay Peninsula. *C. clama* is also known to occur on NW Borneo and *C. barlowi* (by identical habitus identification) common in the Bornean Trus Madi Mts. ♀♀ of both of these spec and others illustrated in Section B as the *clama*-group are distinguishable from *C. determinata* taxa by their obtuse standing fasciae and inward black margin central dentation. A third C section, assembled in the *crasizona* group, comprises three specs: *C. crasizona, C. johani* nov.sp. and *C. libulae*, with an exactly similar development trend towards full orange individuals, as the four Northern *insularis* specs. These non-*insularis* look-alikes also displayed very similar wing-spot pattern development trends as noticed in the *insularis*-morphs, assumingly having arisen from similar or perhaps even identical simultaneous, regional confined selection pressure. The non-*insularis* taxa could not fully convincingly be structurally united. They were provisionally grouped into three habitus-based sub-sections, although all of them had modified cornuti aggregates and displacements thereof towards the apex of the phallus hull in common. This trend, earlier illustrated in a number of Indonesian taxa, (Roepke 1946), has now been confirmed to be an effective valuable parameter for understanding lineage events in this large genus. Extended studies on more material will likely enable broader interpretation of some of the initial structural similarities seen in sub-sections of this/these, obviously parallel to the *insularis*-group developing lineage(s).

Einleitung

Roepke's Anregung folgend, dass Phallus-Konfigurationen, namentlich Spiculi- (heute: Cornuti)-Häkchenmuster auf der Vesica wichtige Kriterien für die Klassifikation darstellen könnten, sind die meisten der vierundzwanzig südostasiatischen *Cyana*-Taxa mit manchmal verwirrend ähnlichen äußeren Erscheinungsformen untersucht worden. Dabei fand eine Klassifizierung aufgrund von dreidimensionalen Konfigurationen der Bestandteile der Vesica und / oder der Bursae statt, und zwar anhand von selektiv gefärbten Präparaten. Fünfzehn Taxa konnten nach ihrem Aufbau in einer Gruppe zusammengefasst werden, der "*Cyana insularis* Gruppe". Das allen gleiche Merkmal war mit einer bemerkenswert geringen Varianz die embryologische Positionierung der Cornuti-Konfigurationen in der Phallushülle vor der Ausstülpung der Vesica.

Einige Veränderungen wurden an mehreren äußeren Merkmalen untersucht. Dabei zeigte sich eine geringe Variabilität innerhalb von Populationen, die geschlossen auf Inseln am Rande des Archipels auftraten, hingegen eine viel größere Variantenzahl bei denjenigen Taxa, die auf den äquatorialen Hauptinseln Java, Borneo, Sumatra, auf der malaiischen Halbinsel und auf dem südostasiatischen Festland beheimatet sind. Zwei neue Insel-Taxa wurden auf Java und Bali gefunden, nämlich *C. kasperi* nov.sp. auf Java und *C. paukstadti*

nov.sp. auf Bali. Nach Abklärung des Grades der Variabilität von sexuellem Dimorphismus in *C. determinata sausae* (Bucsek 2012) und nachdem die richtigen Partner der *C. determinata sausae* ♀♀ und der *C. determinata determinata* ♂♂ aus Borneo ausfindig gemacht wurden, konnten zwei neue Taxa ermittelt werden, die ganz erstaunliche Ähnlichkeiten im Habitus bei den ♂♂ aufwiesen. Es sind dies die *C. maaikeae* nov.sp. auf Borneo und *C. martinii* nov.sp. auf Sumatra. Diese beiden Arten sind ähnlich schmal gestreift wie die *C. determinata* ♂♂, jedoch ist *C. maaikeae* (nach struktureller Analogie des ♀) enger verwandt mit *C. determinata*, und *C. martinii* mit *C. ridleyi*. Zwei der *C. ridleyi* zugehörigen Subspezies wurden gefunden, und zwar *C. ridleyi siberuta* nov.ssp. auf Sumatra und *C. ridleyi roberti* nov.ssp. auf der südmalaiischen Halbinsel. Auf der nordmalaiischen Halbinsel und auf dem südostasiatischen Festland werden drei neue Taxa beschrieben: *C. malacca* nov.sp., *C. weerawoothi* nov.sp. und *C. juliettae* nov.sp. Diese drei weichen in verschiedenen Graden vom gewöhnlichen Habitus der Tigermotte ab. Sie zeigen eine schrittweise Entwicklung weißer Flecken auf den Vorderflügeln in der subbasalen weißen Zone und in den weißen Streifen zwischen den Medianen. Bei den ♂♂ werden die farbigen Streifen breiter und schließlich zu überwiegend orange/rötlichen Streifen, ganz ähnlich dem voll orangefarbigen Habitus der *C. coccinea*, wogegen die ♀♀ ihren Tigermotten-Habitus beibehalten. Zwei mutmaßlich insulare Taxa, *C. erythrostigma* und *C. aurantiorufa* konnten in die Darstellung nicht einbezogen werden, weil es noch an der strukturellen Bestätigung fehlt.

Sieben Arten der 24 untersuchten Taxa weichen signifikant von der Definition ab, die für die strukturelle Eingruppierung als Insel-Taxa gilt. Allerdings zeigen zwei dieser Arten auffällige Ähnlichkeiten mit den schmalstreifigen *C. determinata* ♂♂ (beide Geschlechter der *C. gabika* ähneln den ♂♂ der *C. determinata* und beide Geschlechter der *C. bianca* den ♀♀ der *C. determinata* in ihrer Breitstreifigkeit). Auch fehlen den beiden Arten in dieser Sektion A die subbasalen Keile. Die Geschlechtspartner der *C. bianca* wurden bestätigt durch die Züchtung von Nachwuchs ausgesonderter ♀♀. Fünf nicht insulare Arten mit deutlichen subbasalen Keilen, und sogar mit ähnlichen schwarzrandigen Streifen wie die vier festländischen *insularis*-Arten, haben in der Phallushülle eigene diagnostisch unterscheidbare cornuti-Felder mit jeweils eigener Anordnung. *C. clama* und *C. barlowi* nov.sp. fliegen sympatrisch mit *C. determinata sausae* auf der südmalaiischen Halbinsel. Es sind auch Vorkommen von *C. clama* auf Nordwest-Borneo bekannt, und auch Nachweise von *C. barlowi* (durch identische Habitus-Beschreibung) in den borneischen Trus Madi-Bergen. ♀♀ dieser beiden Arten und auch andere, die in Sektion B als *clama*-Gruppe beschrieben werden, kann man von *C. determinata*-Taxa dadurch unterscheiden, dass sie stumpf endende Streifen und eine Zahnung innerhalb schwarzer Rahmenlinien aufweisen.

Eine dritte Sektion C, die man als *crasizona*-Gruppe zusammenfasst, enthält drei Arten: *C. crasizona*, *C. johani* nov.sp. und *C. libulae*, mit einer ganz ähnlichen Entwicklungstendenz hin zu voll orangefarbigen Individuen wie die vier nördlichen *insularis*-Arten. Diese nicht-insularen nur scheinbar gleichen Arten zeigen auch sehr ähnliche Entwicklungen in ihren Flügel-Punktmustern wie die *insularis*-Morphen, vermutlich weil sie aus ähnlichen, vielleicht sogar gleichen Bedingungen des regional begrenzten Selektionsdrucks hervorgegangen sind. Nach ihrem Körperbau konnten die nicht insularen Taxa nicht

überzeugend einheitlich klassifiziert werden. Sie sind hier in drei nach dem Habitus definierte Untergruppen eingeteilt worden, wenn sie auch alle modifizierte Cornuti-Zeichengruppen aufwiesen, die bis in die Spitze der Phallus-Hülle verlagert sind. Diese Tendenz, die schon früher anhand einer Anzahl indonesischer Taxa nachgewiesen worden war (Roepke 1946) hat sich jetzt als wichtiger Parameter herausgestellt, der das Verständnis von Abstammungslinien in dieser großen Gattung erleichtert. Wenn mehr Material genauer studiert wird, dann wird man wahrscheinlich zu einer umfassenderen Interpretation einiger der augenfälligen Ähnlichkeiten kommen, die man bei Untergruppen anderer Stämme beobachtet, welche sich offenbar parallel zu der *insularis*-Gruppe ausbilden.

Preliminary notes

The species assembled in this group of the Lithosiinae under the genus *Cyana* Walker, 1854 have very often been confused with each other. Attempts by several earlier taxonomists to cluster them failed for a number of reasons: they were based on too limited material from too restricted population samples, predominantly originating from Java (Roepke 1946) and Borneo (Holloway 2001) without sufficient knowledge of their regional variability. The species complex of this genus covers a large distribution area, ranging from Nepal and Sikkim at the Himalayan foothills, to the Wallace-line in the East, and the Great Islands within the 10º N and S parallels. Some types were poorly defined, their sexual partners sometimes wrongly chosen and structural criteria very scarcely generated. Both authors struggled with the taxonomic position of *C. bianca* and *C. determinata* and synonimized them. This study resolves the confusion by means of parameters derived from analyses of variation of external features contributing to the Tiger-moth habitus, in conjunction with structural parameters of almost all contributing taxa of both genders, selected from specimen samples covering the entire distribution area. Three-dimensional configurations of cornuti on everted vesicae of ♂ phalli, supported by ♀ structural analogue series, confirmed that the so far identified fifteen *C. determinata* related taxa form a monophyletic entity, whereas seven species, including *C. bianca*, are attributable to phenotypically look-alikes belonging to likely parallel lineage(s) still requiring further clarification.

Material/aim: On basis of habitus images, a section of 22 taxa of the (insular and mainland) SE Asian *Cyana* genus was preliminarily grouped as follows: medium sized species (wingspan, ♂♂ 17-25, ♀♀ 23-43 mm). The forewing is elongated, mostly 2.5 times as long as their breadths, and has a white background colour. ♂♂ usually have three discal cell spots in between the post- and ante-medial cross bands of the forewing: two longitudinal placed spots and a third (sometimes reduced to a small flat bar) more centrally positioned below the upper ones, forming an asymmetrical V-shaped tag. In ♀♀ there are usually only two longitudinally positioned, slightly larger cell-spots. In both sexes the cell spots are black. The hindwings of ♂♂ are more triangular in shape than those of ♀♀, which are more rounded. They sometimes display astonishing beautiful orange to carmine pigments. These colours are less pronounced in ♂♂ and can be reduced to suffused bands or fully lacking.

The wide zoogeographical distribution area of the species assembled in the above group enabled precise definition of the variability and validation of often minor diagnostic features, especially with regard to those that contributed to the stepwise formation of white wing-spots between the transverse fasciae. The taxa can regional zoogeographically be clustered but there isn' t a fully covering external parameter for the entire group, and even black cellular spot shapes are biased by spot disappearance in some species. External features enabled morphological diagnostic differentiation only by the simultaneous use of several combined features. There exists no doubt that phenotypical expression of wing features are under the control of a complex of genetical regulating factors. Although no specific crossing experiments with *Cyana* have ever been undertaken, it is noticible that the degree of phenotypical expression of the black transverse median margins are likely regulated by a complex of traits responsible for partial dominant genes or perhaps others that regulate their breadth or opther traits that can even fully mask its expression.

Understanding of genetics provides valuable additional parameters for phylogenetic interpretaton. According to Joron et al 2006, quote: "colour genes of *Heliconius* are tightly clustered and a handful of loci control phenotypical shifts across large areas of the wing surface, changing the position, size and shape of red/orange/yellow and melanic patches of both the dorsal and ventral surfaces of the fore and hind wings". The observed variations in fasciae expression indicate the possible existence of similar expression mechanisms in these Lithosiids, and the white "tiger-moth" habitus formation may presumably be under the control of pleiotropic factor(s). The expression of longitudinal features of fasciae sections can be suppressed or inhibited. Several of such potential events are highlighted and referred to in the discussion and conclusion sections.

Structural features provide a more reliable tool for classification, because of minimizing the influence of environmental factors, in particular those induced by predation. Special emphasis was laid on the generation of structural data derived from microscopic details of ♂ genitalia and their 3-D configuration of cornuti configurations on vesica and shapes of ♀ bursae and sclerotized parts therein. These features had been proven to be valuable diagnostic criteria in earlier studies (Lourens 2009, 2011)

In attempts to place species in a hypothetically assumed descendance reflecting order, based on a combination of above criteria, there still remain missing gaps or links, especially in this very large *Cyana* genus where many new species have been discovered in recent years. Traditional diagnostics of *Cyana* taxa on spec. and subsp. level has for over 150 years predominantly been based on external features. Recent novel identified species are still mostly described by external visible parameters and commonly illustrated by photographic images. They are seldom supported by genitalia preparations, which, if provided, are traditionally embedded and flattened in polymer substances seriously affecting their 3-dimensional structural shape. It will be shown hereafter that 3-D structural configurations provide additional highly valuable diagnostic information for group characterization.

Methods

The sampling techniques, storage, procedure of GP' s production and equipment used, were identical as earlier described (Lourens 2009). Slight modifications were made in

the preparation of ♀ genitalia, with respect to cleaning up specimens with "dirty" bursae, sometimes containing substantial amounts of probably embryonic material, which interfered with detailed investigation and photography of the structural components. As to remedy this, standard boiled preparations were kept submersed in Petri dishes with 4% KOH overnight after a 10% KOH solution was injected into the bursae using a 25 Gauge tuberculin syringe. As entry point a small incision was cut into the bursae, using an eye surgical scissor, at a non essential section, to avoid distortion of the 3D structure. The debris-material could thereafter usually be flushed out exerting just sufficient light pressure on a water flow. ♂ vesicas 3D structures could sometimes be visually improved using water pressure, but had always to be kept in glycerine, to maintain their dye, which vanishes in water and ethanol. The washing out of ♂ and ♀ genitalia also enables removal of disturbing small gas bubbles, sometimes arising and interfering with positioning preparations under desired angles required for macro photography of cornuti shapes and other small structures.

It is highlighted, that the selective staining of membraceous tissues and detection of various degrees of sclerotization/chitinization of structural parts thereof, is of key importance for classification and understanding of relationships between species. Such, previously called, "small differences" are practically non-detectable in squeezed preparations but of high value for precise ranking of species apparently belonging together because of external habitus similarities. When combined with identified trend lines noticed in 3D configurations or of stages of component development structures, and further confirmed by parallel trends in the opposite sex, a high degree of likeliness becomes established that the hypotheses are genuine. They provide information for ranking the species, primarily on basis of a criterion of structural simplicity. This working hypothesis describes what possibly could have occurred during their philogenetical development, in particular in perspective to climatic and consequent potential zoogeographical distribution event options known to have prevailed during the last and possible earlier ice ages.

Some, minute features, which had previously often been overlooked but considered to be of value for the formation of wing spots have been given special attention in forthcoming descriptions. They are complementary to the type descriptions of first authors. Some habitus features, of major diagnostic value, are sometimes given for the purpose of convenient separation of closely similar looking species. New species as well as some taxa necessary for comparison are described in more detail, as to provide a uniform format and accentuating relevant discriminating parameters for identifying them. Genitalia are always described in full detail.

The following abbreviations apply:

BMNH.....British Museum Natural History UK

CKB .....Collection Karol Bucsek Bratislava, Czechoslovakia

CKC .....Collection Karel Černý, Austria

CHB .....Collection Henry S. Barlow, Malaysia

Genders: .....male ♂ / males ♂♂, female ♀ / females ♀♀

GP.....genital preparation

HT .....Holotype

PT.....Paratype

MWM.....Museum Witt München, Germany

ZMAN.....Collection Zool. Museum Univ. of Amsterdam, Naturalis, Leiden, the Netherlands

General clarification of parameters: red bar – 1 cm, black bar – 1 mm.

Quoted measurements in millimeter (mm) always taken at the centre of the object. Collector references always JH Lourens, unless otherwise quoted. Plate reference numbers of the 24 species are numbered: 1 to 24 indicated by a number fb a character: a= ♂, b= ♀♀, extended by the abridged genus name plus epitheton ornans in the legends under the plates. Genitalia parts are indicated by the same rank numbers plus a further letter: c=armature, d=phallus, e=valve in proxy-lateral view, f=everted vesica, g-h=cornuti configurations or details, i-j= ♀ bursae. In most cases the features are also illustrated by photographic images taken under different angles or complemented with images from duplicates. In those cases the reference is extended by a further number. All material, including the types, will be deposited in MWM predestinated for ZSM.

Descriptive section

The taxa follow the ranking of the appendix given at the end of the conclusions section.

Cyana carmina (Černý, 1993)

Doliche carmina Černý, 1993, Nachr. Ent. Ver. Apollo, Fft Main, Suppl. 12: p. 37.
Cyana carmina Holloway, 2001, Moths of Borneo Vol 7, Arctiidae, Lithosiinae, p. 337.

Reference is made to the original imagines descriptions by Černý, 1993 of the only 2 known adult specimens available to him. Upon the availability of 4 more specimens, 2 further ♀♀ obtained at Port Barton NW Palawan 10º22.581′ N 119º11.091′ E, 13-14 xii 2007, 110 m secondary forest, close to the terra typica location of San Vincente, and 2 ♂♂ at Brgy. Culasian, Pinagar, SW Palawan, 08º48.600′ N 117º28.530′ E on 8-10 xii 2007 at a primary forest edge on an altitude of 37 m, 2 further specimens were used for the acquisition of structural information. Figs 1a and 1b as the ♂ and ♀ illustrate the imagines. A concise description of this species is given in the check list.

S t r u c t u r a l d a t a ♂ from GP JHL 82 Port Barton, Figs. 1c-1h.

The armature measures 2.3 x 2 mm and is strongly sclerotized. The straight tegumen forms a triangle at its inner borders. The uncus is 0.4 x 0.2 mm at the base and has a blunt tip. The saccus is boomerang shaped 1.5 mm wide 0.15 mm at the center. The robust valves are 2.2 x 0.8 mm. The costal edge is stronger curved than the ventral outer border, which is almost straight. The sacculus is lightly built and 1.1 mm long. The 1.2 mm long ventral lobe, has a wide, basad convex, base of 0.4 mm, but narrows, almost flask like, becomes very thin at 3/4th of its length, thereafter forms a thin but solid hook with a 90º degrees inward angle.

The costal edge of the valve is very strongly chitinized and forms a slightly undulated antesacculus, with long hairs and a light ridge to the foot of the cucullus. In the center of the valves there are 2 shadowy, slightly heavier chitinized areas with the shape of thorns.

The phallus is 2.2 mm long, with a proximal half section 0.75 and a gradually reducing distal half 0.5 mm wide. The apex is cut under an angle of 15º. The hyaline hull shows 2 cornuti fields in the center, almost on top of each other, on a warted field filling up the distal 2/3rd of the phallus. Once the vesica is ejected Fig1f, the circular chitinization around the terminal section of the hull can be seen. The vesica's central lobe is 1.5 mm long, and carries dorsally a croissant shaped lobe 0.7 x 0.3 mm with 2 humps and small warts. A sturdy and 2 mm long lobe runs 60º degrees downward and carries a terminal cornuti field with approximately 37 long and short cornutis. On the opposite side, there is a smaller 0.6 x 0.3 mm lateral lobe with about 68 small cornutis. All lobes are heavily ornamented with warts, including a distal lobe of 0.5 x 0.4 mm, carrying few very small cornuti.

Structural data ♀ from GP JHL 87 from Pinagar, Figs 1i and 1j.

Length 5.4 x 2.2 mm, valves 0.9 x 0.75 mm smooth, atrium copulatrix 1.6 x 1.3 mm dorsally with a 2 mm transverse band. The mouth of the ductus bursae is 0.5 mm wide and attaches laterally, its length 1.3 and 0.2 mm wide. At 2/3rd of it length it curves 30º degrees. In the curve, the spiralled oviduct becomes dorsally attached, Fig 1i. The bursa copulatrix is ball shaped, with a diameter of 2.2 mm. The bursal plate is 0.7 x 0.9 mm, almost triangular, and runs with the upper half in the ductus bursae. It has 3 bundles of longitudinal ribs. The plate' s distal border is undulated. On either side it connects to secondary plates, one cup-shaped 0.5 x 0.4 mm, the other curved 1.0 x 0.2 mm. At the lateral outer border of the bursa runs a U shaped 3 mm long sigma, one leg originating from the very centre, the other fusiform shaped, with a longitudinal central vein. The sigma is 0.2-0.3 mm wide and carries warts.

Cyana kasperi **nov.sp**.

HT ♂ Fig 2a , Indonesia, Bali sept, Lovina Beach, 100m, 8-10 i 1999, cultivated plantation, leg Karel Černý, GP JHL 1044. The HT will be deposited in MWM. 3 PT ♀♀ from the same location and 1 ♂ PT Indonesia, N. Bali, Singaraja, Gitgit 740m, Plantage, 6.ii.1997, leg. K. Černý in collection CKC.

External features HT: Head white, outer margin of patagiae with broad crimson outer seams, elythrae with long orange hairs. Wingspan 26 mm, front wings white with four well developed crimson fasciae, 0.9 mm wide slightly sinuous median fasciae. The submarginal is 0.5 mm wide and meets the costa with a short distal outflow whereas the opposite ends with a very short wedge, just not fully reaching the outer border. The crimson sections of the ante- and post medians, give way to a 3 mm diameter white circle on the costal wing half, in which three well developed cell spots, create a mask shape. The head of this mask is not full, the outflows on either side are not fully meeting. On the outer wing half, the medians are approaching each other, but widen again towards the outer margin. The ante-median stands obtuse, but the post median acute on the margin. The black margins, inner on the ante-median and outer on the post-median, follow the crimson fasciae curves. The post-median splits, just before the costa, into a larger wedge-shaped part, bridging to the outer margin, and a short and broader branch pointing basally.

This dichotomy occurs only in the ♂. The marginal band is inwardly dented, following the veins, pointing to four black dents on the center of the post median margin. Hind wings from the post-discal outwardly light carmine, near the borders lighter, at the underside creamy white. Thorax white with a 0.5 mm orange central band and a meta-thoracic diamond shaped terminal orange spot. Abdomen and legs ochre.

♂ Genitalia HT: GP JHL 1044. Figs 2c-2h. The armature of 2.4 x 1.7 mm is lightly chitinized. The valves measure 2 x 0.7 mm and have a broad almost oblong base and are at the center slightly outwardly protruding. The ventral lobe is elongated triangular 0.6 x 0.4 mm (sides/base), gradually thinning and ends with a 90' inward pointing, short thorn. The dorsal edge of the valve carries at its center a 0.1 mm protrusion, which is not fully symmetrical, since the inner slope has a light saddle. From this thorny hump the dorsal valve lobe is shaped like a regular slightly curved stick (probably rolled up) standing perpendicular on the ventral lobe, distally rounded ending. The phallus is 2 mm long, 0.8 mm wide at the basal and 0.7 mm at the outer half. The apex ends straight. The center is lightly contracted on one side, just after the 45' slanting larger triangular shaped cornuti cluster. Under this apical thickened section of this lies a 0.25 mm, smaller cornuti field fully under the projection of the larger field on the phallus hull. The vesica is 1.3 x 2 mm and carries three short lobes. Of the upper ones, the non-ornamented lobe folds backwards to the phallus base and has a insulcation at its outer border. The other upper lobe of 0.5 x 0.5 mm carrying a crest of long cornuti, points outwardly. This crown is on one side extended with a bushel of 17 larger cornuti. It connects to the terminal short cornuti field, which is not protruding, by a zone with dozens of warts in between these two fields. A short lateral lobe has a 0.5 mm cluster of 15 straight short cornuti, radiating from one point, with attaches to it a downwardly extending second bushel of cornuti, almost doubling its size. This lateral lobe is proximally densely covered with warts, which distally appear to be in organized in a tail like string of 0.5 mm.

Paratype: The ♀ originates from Bali sept. at a similar plantation cultivation as the HT ♂, 6 km S. of Singaraya, 700 m and is an ex larva specimen 1 i 1999 leg K. Černý, GP JHL 1042 .

External features: Head, patagiae, elythrae, thorax and abdomen similar as the ♂. Front wings white with almost fully straight 1 mm wide fasciae, in particular the crimson red medians, are less sinuous as in the ♂. The sub-basal and the marginal bands are orange red and narrower. The sub-basal is straighter and has less outflow extensions at both ends. The basal white wing section displays an almost trapezoid shape, because the outflows of the transverse bands on the costa and outer border are smaller than in the ♂. The white circular wing section between the medians is minimally expressed by a light contraction of the crimson band on the costal half, around the outer of the two longitudinal cell spots. The ante-median inner black margin is light inwardly curved and erratic on the outer wing halve. It carries 3 outward dents on the veins and has a substantial inward intrusion into the carmine zone on the Cu just before it obtusely meets the outer border. Here, the black margin angles under a 80' angle, pointing to the tornus. The hind wings are light pink, like the underside of both wings.

Genitalia PT: ♀: The structure is 4.9 mm long and 2.2 mm wide at the bursa. The atrium copulatrix is 1.5 mm with a dorsal semi-circular 1.5 mm wide arc. The ductus

bursae is proximally funnel shaped and runs with a hyaline 1.2 x 0.3 mm tube to the bursal plate at its base. The plate is almost triangular, 0.5 mm long and has eight light, plus one large longitudinal ridges. It connects to a structure shaped like a sickel shaped *Calendula officinalis* (Pot-Marigold) seed in the center of the half circular part of the bursa, from which the oviduct originates. The opposite half is oblong elongated to 1.5 mm from the center. It contains a U-shaped light signum, positioned at the periphery. The terminal section thereof shows a 1 mm long heavily chitinized section with a longitudinal slit (later referred to as an elongated cowry-shell. It connects with a spiral to the distal leg of the U shaped signum. There is a dark three pronged structure almost in the center of the bursa, overlaying the upper signum leg of its U shape.

D e r i v a t i o n o m i n i s : named after my first son Kasper Daan Lourens.

Taxonomic note on *Cyana ridleyi* affiliated taxa: section A 2.

The following three taxa have been associated with each other based on habitus features. They have broad median fasciae without black margins. ♂♂ have basad concave ante-medians, and broad wedge-shaped sections of the post-median outer usual dichotome split small branch towards the costa, angling 130-140º to the apex. The sub-basal wedge is always absent. The discal spots between the medians are light in ♂♂ and in two ♀♀ of the below assigned ssps. the inner spot partly missing. The features on which this affiliation is based are diagnostic but based on limited material. The ssp. status of the below described two related taxa has therefore been allocated, although this designation might require status upgrading depending on the extent of differentiating features in genitalia structures, once available.

***Cyana ridleyi siberuta* nov.ssp.**

HT illustrations Figs 3a and PT ♀ 3b. The ssp. is represented by two TL specimens from Siberut Island (130km off the coast of W Sumatra, W of Padang), Labanhan Bajan, 100m, Mentawi Group, 0°58 S 98°56' E, Jan. 2004, leg. St. Jakl, in MWM.

This taxon has 0.9 mm wide straight, perpendicular transverse post-median fasciae, similar as *C. carmina* and *C. kasperi*, but lacks the black border markings of these species. The front wing fasciae are orange and hind wings uniformly pigmented, darker in the ♀♀.

The sub-basals have on the costa a very minimal triangular shaped dot and are bluntly ending just before the outer margin. The ante-median has a short basal outflow on the costa, accentuating the slight basad concavity of the inner border, identical as the ♂ *C. ridleyi ridleyi* HT in the illustration of Hampson, 1900. In the ♂, the post-median branches split just before the costa. The inner branch is short and minimally inward turned, whereas the outer section runs thickly to the apex, in its original band width. The margin is as broad as the medians and on the veins inwardly dented. Both genders have only one outer of the usually parallel discal spots. There are no signs of a circular white spot formation between the medians. In cell 5 the post-median has a small inward dent pointing to the cell spot. The ♀ can be differentiated from *C. determinata* by the stricter maintained transverse habitus impression of the fascial bands, induced by the perpendicular position of the ante-median on the outer border, which is slightly more acute angled and light inwardly dented in field 5 than in the hereafter described and illustrated *C. determinata* taxa.

***C. ridleyi ridleyi* Hampson 1900 nov.comb.** Illustrated as (edited) Fig. 4a.

Chionaema ridleyi Hampson, 1900, - Cat. Lep. Phalaenae Br. Mus.2:300 pl.34, f.14, TL: Singapore.
Chionaema bianca form *insularis* Draudt, 1914. - Gross-Schmett. Erde, 10: 174.
Cyana biana (sic.) *insularis* Roepke, 1946. – Tijdschr. Ent. 87: 29.
Cyana determinata Walker, Holloway, 2001. - MOB part. 7, p. 337.

The ♂ HT illustrated as a right half specimen, has been PHOTOSHOP ® flipped over and merged to a complete specimen image for the purpose of comparing its habitus with the related subspecies. The following features derived here from are highlighted: Front wing fasciae dark orange. Sub-basal not reaching the outer border, meeting the costa with a thin outflow. The ante-median basad concave, widening towards the outer margin. The post-median just below the centre inwardly broken into a double concave lens shaped upper part, broadening and extending along the costa but not fully bridging to the apex. There is no inner branch or remnant thereof in this species. The outer half section is wider than the costal part. Cell spots very light but clear. The prominent marginal band is inwardly erratic dented. Hind wings sub-marginal and at the costal border orange, decreasing towards the base.

***C. ridleyi roberti* nov.ssp.**

HT Fig. 5a, the PT ♀ 5b. Both originate from the TL at the Southern Malay Peninsula, Genting Tea Estate, W. of Pahang alt. 668m, N 03°211'32.5" E 101°47'38.9", GP HSB 2, leg. H. Barlow, in collection HSB, Malaysia. Three further Paratypes, including one ♂, from the same location.

External features ♂ HT Fig. 5a: Wingspan 25 mm, fasciae dark orange, 1 mm wide. Sub-basal and ante-median with approaching outflows on the costa, whereas the inner outflow of the post-median is almost completely reduced and vague. The post-median is uniform in width and over a small section, just before the costa, bending 135° but not fully bridging to the apex. The sub-basal is almost full and is shaped like a double convex lens. The ante-median is inwards light convex. The post-median meets the outer border with a small broken-off section at Cu-level under a 20° angle. Three light cell spots between the medians forming a perfect triangle. The marginal band is as wide as the medians and has inwardly broad dents. The broken white hind wings are light red dusted and the sub-marginal field yellowish orange seamed.

Genitalia ♂: Figs 5c-5h. The armature 2.5 x 2 mm. The dorsal lobe lightly curved, spoon shaped, rounded at the apex, longer than the ventral lobe. At its centre an asymmetrical bulging saddle protruding 0.15 mm outward. The ventral lobe ends with a regular half circular rounded sharp ending hook. The phallus is 2.1 x 0.6 mm at the centre, at the base half bulgy and 0.8 mm. The larger diagonal spindle shaped cornuti field is 0.6 mm long and lies in a 45' position in the phallus hull. The lesser field fully under its lateral projection. The robust vesica has a close to 1 x 1 mm central body, the backward pointing lobe of 0.8 mm relatively narrow and connects sinuously to the 0.5 x 0.5 mm larger lateral lobe with the typical brushy insularis-shape configuration with longer cornuti. The smaller radiating cornuti configuration on the lesser lobe has a 0.8 mm long narrow tape-shaped extension on its apical side running under the small lobe. The terminal lobe carries several rows of very short cornuti, visible in the opposite phallus hull as an additional diffuse cornuti aggregate, shown as image fig 5e2.

External features: PT ♀ fig. 5b. Wingspan 30 mm, fasciae deep orange, 0.8 mm wide, with parallel banded medians, which, under magnification, are slightly sinuous. All bands meet the costa with a short triangle. No black borders. The sub-basal is shaped like a double convex lense and ends bluntly just before the outer border. The ante-median is composed of two inwardly light convex segments meeting at the centre, and stands close to perpendicular on the outer border. The post-median is at the outer border 35° outwardly curved. The marginal band is relatively broad and has seven triangle shaped inward dents. There are two longitudinal spots between the medians, the inner one small and faded, the outer black. Hind wings rose, at the inner margin stronger yellowish tinged. Abdomen greyish white.

Genitalia ♀ Figs 5i and 5j**.** The structure is 4 x 2.5 mm. The atrium copulatrix is 1 mm wide, short and with a straight transverse band. Ductus bursae funnel shaped and 1 mm long, ending with a lateral constriction narrowing to 0.2 mm connected to the bell shaped bursal plate. This carries on one side seven heavy double rimmed longitudinal ridges with a distally waved border and connects on the other side with thinner ridges to a widely grown-out thinner section connecting to the enlarged Marigold (*Calendula*) seed shaped structure (see *C. kasperi* and *C. carmina*) at the base of the oviduct. The bursa is oblong, with straight borders along two hyaline sections and rounded along a heavy U-shaped signum. This shape is diagnostically discriminative versus the dissected *C. determinata* taxa. The terminal extension thereof ends with a sturdy crab-claw like section, in some other taxa referred to as elongated cowry, protruding laterally distal from the bursa. Two 1 mm segments of the U-shaped signum form proximally a 90º angle whereas the 1.5 mm longer outer leg protrudes into a bulge of the egg-shaped bursa.

Derivatio nominis: named after my long-term friend Robert Bos in recognition of his international world health contributions.

Cyana martinii nov.sp. Fig. 6a

HT ♂ and ♀ PT 6b from Indonesia, Sumatra, Bandar Lampung, Bukit Rigis Mts., Gunung Teran, 1022m, S 5°3´43" E 104°27´6", 13-15 xi 2003, leg K.Černý.

External features ♂: Wingspan 25 mm. Front wings white, with 0.5 mm narrow crimson sub-basal and median fasciae and an orange, marginal band. The sub-basal is uninterrupted on the costal half only, with a short distal outflow on the costa. The ante-median is slightly sinuous, with a basal short outflow on the costa, standing 60´ on the outer border. The post-median is straight in the centre, and meets the costa with an interrupted short inner branch and an outer 100´ angled 2 mm long wedge, not connected to the apex. The margin is 0.5 mm wide, with irregular inward dents and is not fully reaching the tornus.

Genitalia: ♂ HT GP JHL 1038. Armature 2.6 x 1.5 mm, strongly structured. The valve 2.1 x 0.8 mm has at its centre an outward bulge with setae. The ventral lobe is heavily chitinized over its entire length and is widened at the centre. It ends with a large, regularly curved hook, 0.2 mm shorter than the dorsal valve. The phallus is 2.2 x 0.6 mm at the centre, proximal 0.8 and distally 0.7 mm. The apex is straight, on one lateral side shorter. The larger 0.6 mm cornuti field, diagonal at the centre, the short 0.2 mm field exactly at the centre below the upper one. The vesica centre base is 1 x 1.3 mm. The narrow backward pointing lobe 1 x 0.5 mm angles 50´ downwards and connects to the upper crested lobe of

1 x 0.5 mm under an angle of 120´. The terminal lobe of 1 x 0.5 mm ends in a thin plate with short cornuti, and connects with the apical leaning upper lobe by a small field of warts. The oval lateral field is 30´ rotated and carries dorsally a broad based oval crown of 30 cornuti, opposite the larger crown of wider cornuti on the crested lobe. Both these fields have lateral downward extensions.

External features of ♀ PT from Indonesia, Sumatra, Bandur Lampung env., Barisan Mts, Tikungan, S 5°27,233´ E 104°41,135´, 506m 11 xi 2003 leg. K.Černý.

Wingspan 30 mm. Front wings white, fasciae orange. The sub-based has a narrow based triangle and a short outer outflow on the costa, not fully reaching the outer border. Both median fasciae carry short outflows in both directions on the costa. The ante-median on the costal border inwardly light convex, the outer section straight angling 70´ on the outer border. The post-median is 0.8 mm wide, convex to the margin, beyond the Cu 30´ outward broken and 45´ on the outer border. The margin is as wide as the post-median with seven sharp inward dents on the veins. No clear black border along the medians, but seams of dark brown scales along the inner ante- and the outer post-medians. Hind wings at the costal and outer borders creamy yellow, from the discal field outwardly rosa flushed.

Genitalia PT ♀: The structure measures 5.2 mm, including the oval bursa, on one side rounded with a diameter of 2.5 mm. The atrium copulatrix measures 1 x 1 mm, with a 0.25 mm transverse band. The ductus bursae is 0.8 mm wide, 1.5 mm longand has a 25 mm section of the bursal plate inside the ductus. The plate carries broad crested ridges on either side and is on one side not incorporated in the bursa (see also *C. paukstadti*). The opposite side connects to the basal plate by means of a lateral protrusion. A marigold shaped structure in the proximal half of the bursa points laterally with its arc. From the bursal centre, a large undulating signum connects laterally to a 0.7 mm distal kauri-shell shaped structure. Together with the signum segments of 1 mm each, they contribute to a U-shape. In its centre lays a macula with a central slit.

Derivatio nominis: named after Mr. Karl Martini, Ingolstadt, out of appreciation for his valuable collecting contributions in the remote Trus Madi mts. in Central Borneo

Cyana determinata (Walker, 1862)

Bizone determinata Walker, 1862, J. Linn. Soc. Soc. (Zool.), 6: 120.
Chionaema ridleyi Hampson, 1900, Cat. Lepid. Phalaenae Br. Mus., 300.
Chionema biana form *insularis* Draudt, 1914, Gross-Schmett. Erde, 10: 174.
Cyana bianca insularis Roepke, 1946, Tijdschr. Ent. 87: 29.
Cyana determinata (Walker, 1862), Moths of Thailand Vol.6: 40.
Cyana determinata Holloway, 2001. The moths of Borneo: Part 7, 55(3/4) 279-486 .
Cyana determinata Černý & Pinratana, 2009. The tiger moths of Thailand, Vol. 6: 227.
Cyana determinate sausae ssp.n. Bucsek, 2012. Inst. of Zoology SAS, Bratislava : 101.

Taxonomic note: The lead species of the *Cyana insularis* group, under which most *C. determinata* looking taxa were placed, is known from a ♀ type description by Walker 1862, which was extended by Hampson, 1900. There exists however some discrepancy between these two, amongst others, in the colour of the fasciae, and the sinuous black margins along the medians. Furthermore it is noticed that the type illustrated by Hampson has a thorax and abdomen, which are definitely not like any *determinata* (or the

hereafter shown related taxa). The black borderline along the ante-median has noticeably been edited, being far too heavy, too even, unnatural, and at the ante-median, under magnification, protrudes slightly over the costa. The ♂ partners were unknown to these authors.

In the n.s. description of Walker, the fasciae colour is described as reddish-ochre, whereas Hampson in his "type"-description calls the sub-basal oblique yellow and the medians and marginal explicitly yellow. As illustrated by the Figs. on plate 1, the ♂♂ on Java, Borneo and Malaysia have yellow-ochre to light orange fasciae, without black borders on Borneo and Malaysia, but have these lightly maintained in both genders on Java, whereas these are very light, rudimentary, in a ♀ from the Malay Peninsula. Apart from the colours, and the breadth of the black margin, other features in Hampson's type description are applicable to ♀♀ from Java and the Malay Peninsula. It is therefore understandable that Holloway, 2001 choose such a *C. determinata* ♀, and illustrated it in MoB vol. 7 pl. 1 fig 36. This specimen meets most of the Hampson characteristics, in which the black margins maybe overemphasized. Its collection site is not revealed and requests for a GP investigation remain ignored. The associated ♂ partner, probably has been chosen based upon the misleading similarities of the black margin features.

This ♂ could later be separated from the *insularis* group and be assigned to a likely parallel branch with the lead species *C. clama*, which definitely doesn't belong to the *insularis* group (see section B: look-alikes species). Černý, 2009 took that ♂ as reference for *C. determinata* and illustrated his *determinata* interpretation with an arbitrarily chosen different ♀ from SE Thailand on the Malay Peninsula. His illustrated specimens distinctively differ from all other *insularis* group taxons on the Great Islands, by possessing a complete sub-basal band on the front wing, connecting the costal part to the outer border by a diagonal orange, tornal pointing wedge, of which the diagnostic value has extensively been addressed above. Černý's ♂ and ♀ specimens have to be reinvestigated and probably renamed.

The ♂ described by Bucsek, 2012 of *C. determinata sausae* nov.ssp. will in the forthcoming descriptive section be shown to closely fit features of a ♂ sexual partner of *C. determinata determinata* from Mt. Trus Madi, NE Borneo, whereas the genitalia structure of the ♀ from Borneo (Sarawak?) remains to be examined, especially with regard to ♀ bursal components configurations, by which this taxon might fully be proved to be related to a Javaan nov.sp. taxon described below.

***Cyana determinata determinata* (Walker, 1862) Fig. 7b**

External features: ♀ after Holloway, 2001 originating from Borneo (Sarawak?) illustrated with permission of the author and trustees, as per acknowledgement. Further to the concise description on p. 337, the following diagnostic details are added and highlighted: The 1 mm wide orange-red median fasciae have erratical blocked black borders, which dominate the habitus. The inner black border is sinoid; on the costal wing half inwardly convex, broad sickle shaped, straight in the center and is with a broken section, starting in cell 1b, curved to the tornus. It meets the outer margin under angle of 45´. The outer section of the post-median is comma shaped intruding into the coloured fascia section, and stands under the same angle as the ante-median. On the costa both medians have outflows on both sides, the sub-basal only outwardly and is ending just

before the outer margin. The orange marginal band is narrower than the medians, inwardly with dull broad dents. Hind wings yellowish-orange, post-discally dark pink.

External features: ♂ from Borneo, Trus Madi, Apin. Pl. 1 fig. 7a.

Wingspan 27 mm. Median fasciae orange-red , at the centre 0.6-0.8 mm wide. The marginal band orange 0.6 mm. inwardly dented. The sub-basal is reduced to an elongated triangle, distally flowing out along the costa. Its inner part reduced to merely two small dots. The medians lack black borders. The ante-median has a short basal outflow on the costa, and is slightly wider (0.8 mm) on the outer wing half standing basad 70´ acute, similar as the post-median. The latter is inwardly partly retracted and curves concavely along the discal spots, ending with a dot on the costa, shaping part of a 3mm diameter white circular mask shaped spot. Outwardly it connects with a 3 mm long bridge to the apex. This band is on the Cu inwardly expanding, contributing to shaping the neck part of a white balaclava mask. The cell spots are close to each other placed in a narrow triangle. Hind wings white, with light orange dusting. The abdomen is creamy yellow.

Genitalia ♂**:** from Borneo, Trus Madi, Apin, GP 23.118 MWM.

The armature of 3 x 2 mm. is weakly chitinized. The valves measure 2 x 0.75 mm. The dorsal lobe is light inward curved. At its base a 0.1 mm protruding pyramid shaped extension with setae. The ventral lobe is 1 mm long, symmetrical shaped and longer than the dorsal lobe. At the base 0.5 mm wide, reducing to the apex to 0.1 mm and ending with a sharp and solid inward thorn. The phallus measures 2.5 x 0.7 mm. at the center, and at its base 0.9 and proximal 0.6 mm. It ends with a diagonal apex with a ball shaped small upper section. Inside the hull, at the center a diagonal 0.6 mm. spindle shaped cornuti aggregate, with a losely packed smaller one half under the projection of the large field on the hull border. The vesica's central base is 1.5 x 1.5 mm. The backward pointing lobe almost square 1x1 mm and carries light warts, connects to the base of the upper lobe of 0.7 x 0.5 mm, with an insulcation at its base, stands almost perpendicular to the hull. The cornuti crest hereon with strong cornuti, extends to the warts field on the bowl shaped terminal lobe of 0.7 x 1 mm. The lateral lobe is oval. The narrow based cornuti field is almost similar in size as the crested configuration opposite. It has a light lateral extension at the outer border.

Cyana determinata sausae Bucsek, 2012

Erebidae, Arctiinae (Lithosiini, Arctiini) of Malay Peninsula Malaya, p. 101.

Permission was granted by the author to illustrate the HT imago Pl. 1 Fig 16 and GPs from various paratypes Pl. 2 Fig 16.

External features: ♂. The wingspan is 27 mm. The sub-basal only on the costal half, triangle shaped, flowing out along the costa, dark orange like the medians. Ante-median 0.8 mm. wide, meeting the costa with a small triangle and the outer margin basad acute at an angle of 45´ , on the Cu slightly widened. The post-median stands 60´ on the outer border and meets the costa dichotome branched by a short basad section and a 3 mm long branch to the apex. The marginal band as wide as both median fasciae, is orange and has inward dents. It does not fully extend to the tornus. On the costal half between the medians a 3 mm diameter white circular shape with three cell spots, the longitudinal ones wider separated than in *C. determinata determinata*.

The outflow of the ante-median on the costa contributes to the creation of the rounded head of a mask, and is outwardly light concave. Hind wings pure white, at the inner margin light ochre dusted.

G e n i t a l i a **:** ♂ PT from the series of the terra typica GP KB07 and GP JHL PT03 Pl.2 Fig. 9 a-e.

Armature 2.6 x 1.2 mm. thinly chitinized. The valves are 2.2 x 0.7 mm. The valve base is smooth. The dorsal lobe is light inward curved, tongue shaped and at its base a very light smooth inward protrusion. The ventral lobe is shorter than the dorsal lobe, and 0.4 mm at its base, asymmetrical reducing in width, with a sharp perpendicular inward spine. The phallus is 2.5 x 0.7 mm. at the center, apically narrowing to 0.5 mm with a small rounded protrusion at the end of a diagonal ending apex. At the center a diagonal placed spindle shaped of 0.75 mm. just not fully covering the lesser 0.25 mm cornuti configuration. The vesica base is 1.5 x 1.5 mm. on which the crowned dorsal lobe stands, leans 80´ backwards. The backwards pointing lobe 0.8 x 0.8 mm at its base, the terminal lobe 1.2 x 0.9 mm bowl shaped, laterally on the upper side a cluster of short cornuti, distally of a large field of warts. The lateral lobe with radiating cornuti extends outwards with a thin lateral string of very short cornuti.

E x t e r n a l f e a t u r e s : ♀ from Malaysia, Genting Tea Estate, Pahang, 668 m., N 3°211´ 32.5" E 101°47´38.9" ° leg H.S. Barlow. Pl. 2 fig: 7. The wingspan is 31 mm. All fasciae are orange. The sub-basal is composed of a triangle on the costa with a short distal outflow, and a broad comma section at the center, ending broadly not fully reaching the outer margin. The ante-median is 0.7 mm wide, outwardly straight, on the costa slightly widened and on the costal half basad convex, whereas the outer half is straight, 70´ acute on the outer margin. A vague inner black border. The post-median of 1 mm is not straight but irregular shaped, slightly widening on the costa and on the outer half beyond the Cu, broken under a 30´ angle directing to the tornus, standing 45´on the outer border. The outer margin light, composed of variable black segment, similar as in the Borneo specimen. The marginal band is 0.8 mm with vague inward dents. Hind wing uniform salmon, at the inner- and outer borders yellowish.

G e n i t a l i a : ♀ from the same location as above GP HSB 2.

The structure is 4.8 mm. long. The atrium copulatrix is 1 mm. wide with a 0.25 mm transverse ventral arcted band. The bursa is rounded to oval in lateral view. Ductus bursae funnel shaped, at the base 1.2 mm wide and 1.4 mm long. It connects to the bursal plate of 1 x 1 mm. with a small sinusoid curved section and is there narrowed to 0.2 mm. The plate is bell shaped, spreading 1 mm out into the bursa, with o one side a semi-circular contraction. On either side of the plate about 7 double crested longitudinal, sclerotized ribs. A marigold seed shaped structure in the upper bursa lays with its curve distally, connects with two filaments to the plate ridges. The signum is V-shaped. The upper branch 1.5 mm. horizontal over the center of the bursa, the other 1.5 mm branch lateral to the apex, conically widening to 0.4 mm structure with a zigzagged slit, shaped like a crab-claw. A second similar but shorter structure almost cauri-shell shaped, runs from the upper signum leg to the bursal plate.

***Cyana paukstadti* nov.sp.**

HT ♂ from Indonesia West Java, S. of Jakarta leg. Paukstadt, in MWM. Material investigated: 1 PT ♀ and 2 PT ♂♂ in from W. Java, Preanger, in ZMAN. Leiden, in the Netherlands and 3 PT ♀♀ in MWM Germany.

External features: ♂. Its wingspan is 29 mm, orange fasciae, the outer margin lighter and 1 mm wide, inwardly with robust dents along the veins, not reaching the tornus. The dull ending sub-basal does just not fully reach the outer border, on the costa with a sharp distal triangular outflow. The ante-median meets the costa with a small triangle and is constricted around the discal cells, but gradually widening gradually towards the outer border, on which it stands perpendicular. The black border follows the double concave lens shaped costal section of the ante-median. Both medians contribute to formation of a white balaclava mask. The cell spots are prominent and closely grouped in a triangle. The outer black border on the post-median makes, just before the costa an obtuse outwards bend along the orange outer branch of the split section. The inner branch is reduced to a small dot on the costa, similar as in *C.determinata determinata.*

Genitalia**:** ♂ HT Indonesia, W. Java as above GP 23.116 MWM Pl. 2 fig 11 a-f.

Armature lightly chitinized 2.4 x 1.6 mm. Valves 2 x 0.8 mm, with a short diagonal ridge at the center. The dorsal lobe tongue shaped and terminally rounded standing almost perpendicular, with heavier chitinized ventral lobe of 1 x 0.5 mm which is more abrubt contracting on both sides (than in *C. determinata determinata*) ending with a strong inward thorn. The phallus is 2.4 x 0.7 mm at the center, basally 0.8 and apically 0.5 mm, ending with a diagonal cut and an upper narrow rounded extension. At the centre a 0.5 x 0.1 diagonal positioned spindle shaped cornuti aggregate with a small 0.15 mm second one, fully under the projection hereof on the hull. The vesica has a central base of 1 x 1 mm. The 1 mm long backward pointing lobe angles laterally downwards from the hull, ends 0.4 mm wide and is covered with light warts. The upper lobe is short and covered with a full crest of long cornuti, leaning 30´ apically outwards. The terminal lobe forms outwardly half a 0.5 mm circle, its upper side carries a field of heavy warts, connecting to the upper lobe base. The lateral lobe is small and has 17 long cornuti radiating from a narrow base and a downward ridge of warts.

External features: ♀ Paratype from Indonesia, W. Java Pl 1 Fig. 15.

Wingspan 33 mm. Orange median fasciae, lighter than the ♂**.** The inwardly dented marginal band ochre, with yellow cilia. The sub-basal like the ♂. The medians more parallel, without mask formation or contractions on the costal half. The inner black border line is narrower than the outer, and on light sinusoid shaped. The costal half basad convex, the center ziczacced and stands under a 45´ angle on the outer border. The post-median is just over 1 mm wide, with the outward heavy black border outwardly concave to the marginal band. Hind wings uniform yellowish ochre, discally with orange dusting.

Genitalia**:** ♀ Paratype Indonesia, W. Java GP JHL 1078 Figs 9i and 9j.

The structure is 5.5 mm long. The atrium copulatrix is 1 mm wide, with a 0.3 mm broad ventral transverse band. The ductus bursae mouth 0.7 mm funneling to 0.4 mm with a sinuous contraction to the bursal plate. The bursa is ball shaped with a radius of 1.7 mm. The plate 0.6 x 0.4 mm with light longitudinal ribs, is almost triangular and lays with one side outside the bursa and is on the other side connected by an elevated ridge to a similar

structure at the end of the V-shaped signum. This is composed of a 2 mm long component in the upper half of the bursa and a lateral positioned 0.8 mm oblong crab-claw shaped structure which extend laterally into the outer half of the bursa. A marigold seed shaped structure lays with its arc directing to the plate, in between the long arm, where a 0.8 mm isolated segment of signum structured material is seen.

D e r i v a t i o n o m i n i s : named after Dr. Paukstadt for his esteemed collection contribution of this species in West Java.

***Cyana maaikeae* nov.sp.**

PT ♀ illustration Fig 10b.

HT ♂ Fig 10a Indonesia, Borneo, prov. Sabah, Mt. Trus Madi, near Apin Apin 1080m 21 iii-12 iv 2006 leg. K. Martini. Paratype material investigated: 20 ♂♂, 7 ♀♀ from Borneo, Trus Madi 800-1200m, iii/iv 2003-2006 all leg. Martini in MWM.

E x t e r n a l f e a t u r e s : Wingspan 27 mm. Front wings white, all fasciae crimson. The sub-based composed of a wide based triangle, flowing outwardly along the costa, and a zigzagged central section, ending pointed and not fully reaching the outer border. The ante-median of 0.8 mm, is lightly sinuous and has on the costa outflows in both directions, its width on the costal half is reduced. The post-median is split just before the costa into a 0.5 mm section 130´ to the apex, and an inner branch reduced to a small bar on the costa, not connected to the post-median. Both medians stand basad 45´ on the outer border. They have light black margins, on the post-median three small grey outward dents. The marginal band is not fully reaching the tornus, and has sharp inward dents. Hind wings white, post discal rosa flushed.

G e n i t a l i a ♂**:** GP JHL 1038 Figs 10c-10h.

Armature 2.2 x 1 mm, heavily chitinized. The valve 2.1 x 0.8 mm at its dorsal center a heavier chitinized 0.2 mm outward protrusion with setae. The dorsal lobe is light inwardly curved, its dorsal costa straight, and gradually reduced at its ventral edge. It ends blunt. The ventral lobe is straight, from its base already reduced in width and ends with a 0.3 mm wide 90´ inward spine. The phallus is 2.8 mm, sack shaped, at its base 1 mm wide, and disitally contracted to 0.6 mm. The central cornuti configuration is 0.7 mm long with a 0.25 mm broader apical end, partly overlaying a smaller cornuti aggregate of 0.4 mm, not fully covering it with it with its projection on the phallus hull.

E x t e r n a l f e a t u r e s PT ♀. Fig. 10b. Wingspan 27 mm. Front wings yellowish white. Sub-basal and median fasciae red, the margin orange, with golden cilia. Sub-basal composed of a small triangle on the costa and shattered, thinner sections at the center, not fully to the outer border. The ante-median straight, perpendicular, without outflows, on the costal half with minute concave sections. The post-median outwardly light concave, thickened on the costa, with one inner outflow. Towards the outer border thinner, standing 60´ on the border, and in that section a vague irregular outer black margin. On the inner ante-median shattered grey scales. Hind wings pink, at the outer and inner borders yellow.

G e n i t a l i a ♀ PT GP JHL 1077, Figs 10i and 10j. The structure is 6 mm long and 2.6 mm diameter almost fully circular bursa. The atrium copulatrix is 1.1 mm wide and has a 0.1 mm thin arc. The ductus bursae funnel shaped, at the base 1.2 mm, meeting the bursal

plate of 1 mm. situated by half of its length into the ductus. The plate has about seven longitudinal filamentous ribs and ends on one side undulated. The marigold seed shaped structure lays with its back pointing to the center of the bursa. In the proximal half of the bursa a 1.7 mm. segment of a v-shaped signum and with a proximal pointing lateral spiraling part connecting to a wide kauri-shaped structure.

D e r i v a t i o n o m i n i s : this species is named after my second daughter Janine Amelie Zwart-Lourens.

Cyana aurora Roepke, 1935

Roepke W., 1935. Misc. zool. Sumatr. 99. Über eine kleine Sammlung Lepidoptera Heterocera aus Ost-Sumatra, p.3.

M a t e r i a l e x a m i n e d : The HT ♀ in ZMAN in Leiden Fig 11a, the Netherlands, a further ♀ and four ♂♂ from Borneo in MWM Germany, under an identification label: *Cyana aurora*, Roepke, 1935 det. de Vos, 2005. The following complementary illustrations for group analysis: illustration of ♂ Fig. 11a from Sumatra Dolok Merangir, 28 iv 1981 leg. Dr. Diehl and a further ♂ Fig. 11a2 from Sumatra.

The Fig. 12 illustration of the HT ♀ of *Cyana erythrostigma* Roepke, 1946 in ZMA Leiden is added to demonstrate the close resemblance with the *C. aurora* ♀ HT, but the single distinctly red discoidal spot is clearly discriminative. Only two ♀ specimens of this taxon are known to exist from C. and E Java respectively and are likely affiliated to *C. aurora*.

E x t e r n a l f e a t u r e s : Fig 11a. Wingspan 24 mm. The three front wing fasciae orange, the medians narrow, 0.25 mm. The marginal band 0.6 mm, is inwardly dull dented and reaches the tornus thinly The sub-basal with a triangular distal outflow, inwardly pointed, not full. The medians not fully straight. Ante-median lightly widened on the costa, and 60´ on the outer border. The post-median with a short and thin outer arc to the apex and an inner, not connected dot on the costa, straight to the outer border with a broken end off the Cu, standing 45´ on the outer border. Hind wings light pink flushed.

G e n i t a l i a ♂ GP 23.119 MWM. Armature 2.1 x 1.5 mm lightly structured. Valves 2.x 0.7 mm., at the dorsal center 0.2 mm bulged. The base of the dorsal lobe is thinner than in *C. maaikeae*, apically with a narrower tongue. The ventral lobe is very similar to *C. maaikeae*, but the terminal thorn studier and more abrupt 90´ inward curved. The phallus is 0.8 mm long at the center, proximally bulged to 1 mm, distally narrowed to 0.6 mm. The large cornuti configuration of 0.7 mm. is oval, and fully covers the 0.3 mm smaller one under its projection on the phallus hull. The vesica base is 1 x 0.8 mm, the backward lobe 1 x 0.7 mm and connects with a straight border to the upper part of the crested lobe, which lays almost horizontally. The terminal lobe carries a shield of short cornuti, close to the pecten shaped crest of the upper lobe. The cornuti field on the lateral lobe is smaller but similar in shape as on the opposite crested lobe.

E x t e r n a l f e a t u r e s ♀ Fig. 11b2 GP 23.120 MWM from Borneo, Sabah, Mt. Trus Madi near Apin Apin, 1080m 21 iii-12 iv 2006 leg K. Martini, labelled as *Cyana aurora* Roepke, 1935, det. de Vos 2005.

Complementary features further to the type description in Misc. Zool. Sumatrana XCLX p.3 no. 7. Fasciae red. The sub-basal on the costal half only, composed of a small triangular section on the costa, without outflows, and a not connected comma at the wing center. The

ante-median is straight, lightly widened on the costa and standing at 60´ on the outer border. The post-median outwardly concave, on the costa widened to the apex and 45´ on the outer border. No traces of black margins whatsoever. The marginal band is similar to the ♂. Hind wings pinkish flushed, darker than in ♂♂.

G e n i t a l i a ♀. GP 23.120 MWM. Figs 11i and 11j. The structure is 4.9 mm long with a 2 mm wide pear shaped bursa. The atrium copulatrix measures 1.2 x 0.8 mm and has a vague transverse taped band. The ductus bursae is 1 mm long and attaches laterally to the upper part of the bursa copulatrix. The 1 mm plate has seven irregular longitudinal ribs on each side, widening out distally. From its center the plate connects to an apparent tubular system descending distally in the bursa, and connecting to a transverse 1.1 x 0.4 mm crab claw shaped, not chitinized structure. In the distal part of the bursa lays a broad kauri-shaped structure of 0.6 x 0.4 mm. The proximal side of the bursa is bulging out, connects with a fold laterally to the bursal plate, and is filled with longitudinal filaments.

Cyana erythrostigma Roepke, 1946

Tijdschrift voor Entomologie, 87: 30.

N o t e : This taxon is known by 2 ♀ specimens from Java only. The HT ♀, illustrated as Fig. 12 from Mariotambangan, Muriah District, C. Java in ZMAN Leiden, strongly resembles the HT ♀ of *C. aurora*, Fig. 11b2. The *C. erythrostigma* ♀ has one (outer) of the usual two longitudinal insularis cell-spots, which is distinctly red, whereas in *C. aurora* both of the usually black *insularis* cell-spots have obviously disappeared. The sub-basal of erythrostigma is slightly longer than in *C. aurora*, and ends dull. Both the sub-basal and ante-median fasciae meet the costa with a triangle widened section, making the outflows on the costa meet each other. The ante-median is composed of a concave lense-shaped section on the costal wing half, and is straight on the outer half, meeting the outer border basad convex. The post-median is almost fully straight except for a small section from the Cu bending inwards to stand obtuse, unlike as in *C. aurora*.

These fasciae features distinguish these two taxa from each other, which are otherwise almost identical in general habitus, including hind-wing colours. There exists a good deal of support to consider these species closely related, although structural affiliation to the *insularis* group is still outstanding.

Cyana aurantiorufa (Rotschild, 1912) nov.comb.

Chionaema aurantiorufa aurantiorufa Rotschild, 1912, ssp. *Chionaema a. niasana* Rotschild, 1912. – Novit. Zool. 19(2): 246**.**

N o t e : The HT ♂ of this distinctive taxon originates from mainland Sumatra, Padang Highlands and a ssp. designated on basis of 2 specimens from Nias Island of the Mentawi Island chain, 130 km S. of Sumatra. The taxon raised considerable interest by Hampson, 1914. - Cat. Lep. Phal. Supplem. I: p. 632; pi. 33, f. 26, and Seitz, 1914 - Grossschm. d. Erde X: p. 174, but further specimens were never reported. The limited specimens were not accessible for dissection and without structural support it remains premature to enclose this taxon into the *insularis* group, despite its triple tag-shaped habitus cellular spot arrangement in ♂♂. A potentially further ♀ double cell-spotted specimen, originating from W Java, in

MWM, illustrated as Fig. 13, carries on the ante-median the diagnostic external *aurantiorufa* features of strongly reduced narrow fasciae, with outer black margins as in the *niasana* ssp. in conjunction with strongly reduced orange fasciae, but differs from here by having the black margin inwardly, like in all other *insularis* taxa, where these are phenotypically expressed.

Cyana malacca nov.sp. Fig 14a

HT ♂ from SW Thailand Surat Thani prov. Khao Sok NP, 199m., 8°53'23"N 98°30'25"E, 6 xii 2005, leg. K. Černý. GP JHL 1056.

External features: Wingspan 25 mm. Front wings narrower than the *C.* "*determinata*" sensu Černý, 2009, as measured on the ante- and post medians, resp. 4 and 4.7 mm versus 4.5 and 5.5 mm. The sub-basal is complete and arches on the costa to the ante-median, fully closing the upper part of the white basal spot. The wedge on the outer margin is pointed, not fully closing the spot. The crimson fasciae are 0.5 mm. wider than in *C. determinata sausae*, including the light inwardly dented margin. The outer white section is significant narrower. The longitudinal placed cell spots are closer together than in *C. determinata* sensu Černý. The black margins on the medians are light, fading out near the costa. Hind wings light pink.

Structures: HT ♂ GP JHL 1056. The robust armature carries sturdy valves, of which both the tongue shaped and the ventral lobe carry prominent, broad based triangular protrusions in the center. The ventral lobe lobe is shorter than the tongue shaped lobe, and the hooks are gradually thinning and curve 90' inward. The tongue shaped lobe has a light diagonal ridge running from the central hump to the base of the ventral lobe.

The phallus hull carries the characteristical *insularis* cornuti configurations, with a narrow and short small cornuti field, which on the everted vesica shows to carry approx 20 short cornuti, and measures <1/4th of the field of the thumb shaped lobe. The smooth backward pointing lobe looks inflated, and is together with the terminal lobe almost egg shaped. The thumb shaped lobe is short and leans distally. The terminal lobe carries a cluster of short sharp cornuti which are proximally positioned in the phallus hull.

♀**:** PT GP JHL 1055 Fig 14b. SW Thailand, Chumphon prov. Pa Toh distr. Ban Lang Tang, 162 m., 9°46'5"N 98°46'59"E, 7 xii 2005, leg K. Cerny. Wingspan 31 mm. Fasciae brick red. The sub basal 1 mm. wide, on the costa lightly (0.5 mm) flowing out, similar as the wedge, which doesn't fully reach the outer border, unlike as in the ♂. On the borderline scattered orange scales. The ante median is straight, its inner black margin slight inwardly curved from the Cu-vein. The post median breadth is almost 2 mm. and has a slightly sinuous, broad black margin. The outer margin is relatively narrow, inwardly dented and orange like the hind wings

The ♀structures**:** PT GP JHL 1055 bursa is oval and on one side flattened. The (1.5 mm) short and narrow ductus bursae attaches to the (0.6 x 0.4 mm.) small bursal plate, which lies directly under/partly inside de db. It connects laterally to a marigold-seed structure in the opposite proximal section of the bursa. A well developed U-shaped signum runs from the center to the bursal apex. The proximal section is on one side heavily serrated, and

connects via an interrupted broken part to the lateral thinner structure leading to a cowry-shaped terminal part of the signum, encircling a macula.

D e r i v a t i o n o m i n i s : named after the Malay Sultanate province Malacca with this name, bordering the Thailand region, where the new species was collected.

Cyana juliettae **nov.sp.**

HT ♂ Fig15a from N Thailand, Nan Prov., Doi Phuka, 1350 m, between Pua and Bo Lang, 19º12' N 101º 05' E, 3 xi 2002, leg. B. Herczig & G. Ronkay, GP JHL 92. ♀ PT Fig.15b from N. Thailand, Chiang-Mai Prov., Chiang Mai 400m, Doi Khan, 2006 leg. Thomas Ihle.

E x t e r n a l f e a t u r e s : ♂ HT. Wingspan 26 mm Thorax with a 2 mm wide crimson transverse central band. The wing coloration predominant crimson-red, the white transverse bands markedly reduced. The basal white field triangular, and a clear white balaclava mask between the medians with prominent eye-spots. The sub-basal fascia is 90º broken, intruded by the triangular shaped basal white band. The fasciae bridge on the costa g to the ante-median. Both medians are 1.5 mm wide, with approaching outflows, but not fully closing. The inner black marginis irregular shaped and stands basad obtuse on the outer border. The outer black margin is single curved sinoid, both not reaching the costa. A 1 mm wide arc runs from the post-median to the apex. The marginal band is 2 mm wide. The hindwings are uniform carmine-red.

S t r u c t u r e ♂**:** GP JHL 92. Armature solid and heavily structured, 2.8 x 3 mm. Valve 2.5 x 1.3 mm, uniformly chitinized. The well developed dorsal lobe ends asymmetrically tongue shaped. The ventral lobe is regularly ridged and lightly curved, 0.4 mm shorter than the dorsal lobe, abruptly 90' inward curved and ending with a sharp and solid thorn. The phallus is 2.3 x 0.8 mm, at the basis wider and bulgy. The larger cornuti field at the center almost touches the lesser field. The vesica is longer than its width. Its central part almost 1mm long and 1.5 mm wide. The short crested lateral lobe is only 0.5 mm long, has a narrowed basis and stands perpendicular to the phallus hull. Its crest spreads broadly over the periphery. The sturdy backward pointing lobe is 1.5 mm long and is inwardly heavily spotted with warts. It connects with a significant hump to the crested lobe. The terminal lobe is conical and densely covered with lines of very small cornuti. The lateral lesser lobe is small and carries a meager cornuti configuration with 10-12 cornuti from a narrow base.

E x t e r n a l f e a t u r e s PT ♀: Fig. 15b. Its wingspan is 34 mm. The white background wingcolour is dominant, unlike as in ♂♂. Transverse fasciae deep-orange, the medians with very irregular multiple sinoid undulating black margins, composed of sections with variable widths. The 1 mm wide sub-basal is L-shaped with a very short outflow on the costa, not connected to the ante-median. The ante-median is 1 mm wide at the center, but 2.5 mm at the outer border and contributes thereby strongly to the neck shape of the white balaclava mask. The post-median is 1.5 mm wide at the center, widening to 2 mm on the outer wing half. The marginal band is 1 mm wide. Hind wings uniform carmine-red.

S t r u c t u r e : PT ♀ GP JHL 724. The structure is close to 7 mm long. The atrium 2 mm wide with a 0.3 mm broad transverse band.The ductus bursae mouth is 0.5 mm and hyaline only over a 0.5 mm section. Because it is filled up with a gigantic 4.5 mm long bursal plate,

protruding 1.5 mm inside the bursa copulatrix. The plate has 9 longitudinal strongly chitinized ridges, some of them double edged. They end as a thick undulating, signum-like, chitinized structure. The bursa is on one side rounded, and at the other JHL 724. Side almost square. The oblong section carries a 1 x 0.5 mm kauri-shell shaped structure as well as several smaller lightly chitinized maculae.

D e r i v a t i o n o m i n i s : This species is named after Juliette Aimée Kwee in recognition of her NGO activities for the smoky-mountain people in Manila.

***Cyana weerawoothi* nov.sp. Fig. 16a**

HT ♂, ab ovo progeny from a ♀ from SE Thailand, Prov. Surin, 225m Ban Cham-baemg, 14°28,53' N 103°49,16' E, ex larva 1 xi 2010 leg. (cultured) by K. Černý.

A further pair of PT's cultured from another ♀ originates from SE Thailand, Ubon Ratchatani, 220 m, border of Nam Yuem NP 14°25.37' N 104°52.16' E ex larva 3 xi 2010 leg. et cult. K. Černý.

E x t e r n a l f e a t u r e s : ♂ wingspan 28 mm. Front wing narrow as in *C. malacca* nov.sp. Background white, but the crimson colour dominates. The fasciae are >2 mm wide. Along the costa all white wing sections are closed by arches. The sub-basal is L-shaped, the wedge forming the foot is 2 x 1 mm. The medians are, on the outer wing half, fully merged. The discal spots are white encircled, the longitudinal ones round and the central one flattened, shifted under the outer spot. The black margins on the medians are heavy and straight, the outer not fully reaching the costa, the inner inwardly arching to the very broad >2 mm wide outer margin.

S t r u c t u r a l f e a t u r e s : ♂ HT: GP JHL 1073 The armature is slightly wider than in *C. malacca*, as well as the flask shape hooked lobe. The curved terminal e section of the cucullus is close to 90° and gradually thinning. The tongue shaped lobe has a diagonal ridge as in *C. coccinea* and the broad based pyramid protrusion at the dorsal center of the valve identical to *C. malacca*. The cornuti fields in the phallus hull show diagnostic differences with *C. malacca*. The large field is reduced to 0.65 mm and the small field increased to 0.42 mm versus 0.9 x 0.3 mm in *C. malacca*. On the everted vesica (Fig..) these structures are almost symmetrical. The cornuti of the lesser field are of the same length as those on the "thumb" shaped lobe. The backward pointing lobe is anvil-shaped, narrow and has longitudinal, non-sclerotisized folds. The terminal lobe, with small warts and short spiny cornuti, is laterally shifted, and is of the same size as an opposite lobe from which the ductus seminalis originates.

♀: the PT is an ab ovo cultured specimen from the same ♀ as the above HT. Wingspan 31 mm. Front wings with a "tiger" pattern, crimson fasciae alternated with white wing sections, which are partially open at the costal border. The sub-basal is identical as in the ♂ HT. Between the medians there is a balaclava mask of which the head is shaped by the semicircular inner borders of the medians on the costal half, and the "neck" is formed by inward widening median fasciae on the outer wing half. The cell spots are round and heavy. The outer margin is heavy and straight, the inner light and slightly sinuous, at the costa inwardly curved, shaping the white basal spot oval. The inner margin of this spot is lightly dusted with black scales.

♀ PT: GP JHL 1074. The valves and atrium are similar in dimensions as in *C. malacca*, as well as the positioning of upper part of the plate which is partly protruding into the ductus copulatrix. The plate is light, with thin, erratic longitudinal ribs. The marigold-seed shaped organ overlaps with the basis of the plate. The bursa copulatrix is very small, almost triangular and only 1/4th of the size of *C. malacca* and C. *coccinea*. The signum is U-shaped, with the sides squeezed together. The proximal section is serrated and the terminally section is shaped like an oblong cowry.

D e r i v a t i o n o m i n i s : named after my long-time Thai friend Dr. Kantanyukul Weerawooth.

Cyana coccinea (Moore, 1878)

Bizone coccinea Moore, 1878; Proc. zool. Soc. Lond. 1878; 28, pl. 3, f. 14.
*Cyana cocci*nea Holloway, 2001, Moths of Borneo, Part 7, p. 338.

Five ♂♂ and six ♀♀ investigated specimens from Sikkim, North India, Legship, 800 m, 24-28 vii 1990 leg. W. Thomas, are the base of this description enabling comparison with other *insularis*-group members, illustrated as imago, Figs 17a ♂ and 17b ♀ and genitalia structures below.

E x t e r n a l f e a t u r e s ♂: Wingspan 29 mm.: both wings dark burnt orange. The usually white inter-fascial zones on the front wings show up as orange tinged bands. The sub-basal is fully closing the outer margin of the basal white spot and is on the costa connected to the ante-median by an arch. The black margins on the medians are very dominant, the inner one lining half of the inside off the orange spot with dusted black scales. The outer one bends to the apex, and is not fully reaching the costa. Two round and one oval discal spots are fully encircled by orange on the costal half wing section between the medians. On the outer wing half, the medians are fully merged.

♂ s t r u c t u r e s : GP JHL 77 and GP JHL 78 Figs 17 c-17h from the above location. The armature (2.6 x 1.6 mm) is robust and carries strongly chitinized valve lobes. The tongue shape lobe showa a diagonal ridge, running from the dorsal center to the inner meeting point with the cucullus. The center of the tongue shaped lobe is dorsally expanded instead of forming a pyramid shaped hump (like in *C. ridleyi* and *C. weerawoothi)*. The cucullus is shorter than the tongue shaped lobe, and the terminal hook gradually thinning and 90° inwardly curved. The 2.2 mm long phallus is on 3/4th of its length slightly contracted, and the diagonal apex lightly sclerotized. The smaller cornuti field inside the phallus hull is slightly larger (n=3) than in other *insularis*-group taxa. The vesica has an anvil shaped basal pointing lobe, densely covered with small warts. The thumb shaped lobe is short and points 60° backward. On the everted vesica, the cornuti fields lay symmetrical opposite to each other ; the spines of the smaller field are larger than in *C. determinata sausae*. The terminal lobe has shifted laterally and carries 2 rows of.

The ♀♀ from the same loc. and coll. date, have wingspans of 38 mm. and have the usual "tiger" pattern of white wing sections alternated with 2 mm broad crimson fasciae. The full sub-basal with a breadth of 1 mm, distinctly separated from the wing-base, forms the inner half of an oval basal white spot, aided by a wedge on the outer margin. The other half is formed by the heavy half-moon shaped black margin. The white spot is fully closed on the

costa, and on the sub-basal part inwardly light black dusted. ♀♀ display a distinct balaclava mask, predominantly formed by the shape contribution of the post-median.

♀ structures: GP JHL 723 and GP JHL 90 Figs 17 i-17k.The ductus bursae is funnel shaped and in the middle contracted to 0.35 mm. The upper part is hyaline, the lower part filled with the proximal narrowing bursal plate. This plate carries six ribs on each side, the nov.sp. ends out into the bursa by another 1 mm. The bursa is circular with a diameter of 1.5 mm and has a U-shaped signum in one half. The upper signum part is serrated with four dents, and connects thinly to an elongated cowry-shell shaped structure, which is terminal positioned at 3/4th of the bursal apex. There is a marigold-shaped organ, from which the oviduct originates, just below the bursal plate.

Cyana gabika Bucsek, 2012

Erebidae, *Arctiinae* (Lithosiini, Arctiini) of Malay Peninsula Malaya, p. 101.

The HT ♂ Fig 18a and ♀ PT Fig. 18b from Malaysia, Pahang distr, Endau Rompin State Park, illustrated with permission of the author. Further to the detailed description by Bucsek, the following additional observations.

External features: Front wing background colour of both genders creamy white. Hind wings uniform light ochre. Both genders have three cell spots, in ♀♀ triangular placed, in ♂♂ the centre spot closer to the post-median. Lesser clustered, and the outer longitudinal spot smaller than the others. The median fasciae are slightly narrower than *C. determinata sausae,* lesser parallel and lesser uniform in width. The ante-median lacks the inward basal outflow on the costa. In ♀♀ at the center a small inward bulge. In both genders the ante-medians are slight acute angling on the outer border. In the post-medians of ♂♂, the outer wedge to the apex is thinner. The discal spots: the margins are narrow, have the same colour as the other fasciae and lack inward dentations.

Genitalia ♂: GP JHL KB9 from same location as the HT. Armature 2 x 1.2 mm, valve 2.15 x 0.8 mm at the center a dorsal bulge. The dorsal lobe perpendicular with the valve base, slightly inward curved, with a tongue shaped apex. The ventral lobe with a narrow 0.25 mm base and a strongly chitinized short, lightly inward curved thorn. The phallus is 2 x 0.6 mm with a narrower section at 1/3rd of its base. Two lesser cornuti aggregates at the center and a third 0.6 x 0.2 in the outer half of the phallus hull. The vesica base approximately 1 x 1 mm with four lobes and and large diagonal placed field of short cornuti. A terminal rounded field with radiating rows. Two upper lateral lobes, one crested with long cornuti on one side and a smaller, also crested lobe leaning backwards to the phallus base. A lower broad lobe ornamented with cornuti, radiating from a narrow base, protruding on one side (a shape commonly seen in *insularis*-taxa) at the lower end of the vesica.

Genitalia ♀ from GP JHL KB10 Figs 18i and 18j from Malaysia, The structure is 4.2 x 1.9 mm. The atrium copulatrix is lightly chitinized, 1 mm long and 0.8 mm wide. A very light hyaline transverse band runs over its base. The mouth of the ductus bursae with filaments is 0.5 x 0.5 mm, connects to a small 0.6 mm plate with approx. 10 thin ridges, spreading out on the connection to the pear shaped bursa. The proximal section of the bursa is filled with filaments, similar as in *C. aurora,* from which the oviduct arises. The dorsal

half of the bursa contains a strongly coated distal tube-like structure, with two side branches, running to the apex. They encircle a broad kaurishaped structure located almost at the apex of the bursa.

Cyana bianca (Walker, 1856)

Bizone bianca Walker,,1856, vii: p. 1684.
Chionaema bianca Hampson, 1900. - Cat. Lep. Phal. Br. Mus. 2: 323, pl. 27 f.8.
Chionaema bianca form insularis Draudt, 1914. - Gross-Schmett. Erde, 10: 174.
Cyana biana (sic.) insularis Roepke, 1946. – Tijdschr. Ent. 87: 29.
Cyana bianca bianca Černý & Pinratana, 2009. MoT, Vol. 6 p. 41 figs. pl.6 f.81.
Cyana bianca ssp malayana Bucsek, 2012 - Moths of Malaysia p. 100.

N o t e : Thanks to progeny from a singled ♀ from Thailand cultured by Dr. K. Černý, the genuine partners could with certainty be confirmed. ♂ and ♀ from SW Thailand, Chumphon-Prov, Pa Toh Distr., Ban Lang Tang 162 m N 9°46´5" E 98°30´25" ex ovo 2006, leg. KČ. Further to the concise description of Černý, Moths of Thailand, Vol. 6, p. 41, the following details.

E x t e r n a l f e a t u r e s : ♂ Fig. 19a. White front wings with 1.3 mm wide crimson medians with heavy black borders, a crimson full sub-basal, and orange 1.1 mm marginal band reaching the tornus. The sub-basal on the costal half well developed with an inward outflow on the costa. The central part with a small white intrusion reaches the outer border a very thin and short wedge, not interfering with the more or less trapezoid shape of the basal white band. The ante-median at the center zigzagged: the black margin with two inward dents at the center, the crimson inner border waved, meeting the costa widened and the outer margin contracted. The post-median splits just before the costa into two similar narrowing triangular dots. These are on the costa, connected by a longitudinal 90´ broken off section originating from the post-median. The black inner cell spots not fully longitudinal, and the central spot under the outer spot, parallel with the post median.

G e n i t a l i a ♂: GP JHL 1070. Figs 19c-19h. Armature 2.9 x 2 mm with a wide sacculus. Valve mussle shaped 2.7 x 1.2 mm, distally bulged, the dorsal rim at 2/3rd of its length with a heavy 0.5 mm inward thorn, the dorsal lobe perpendicular versus the ventral lobe, 0.9 mm, tongue shaped, short and distally rounded. The ventral lobe larger, 0.3-0.2 mm wide till the apex, slightly inward curved, with a short, heavily chitinized thorn. The phallus measures 2.6 x 1 mm at the base, 0.8 mm beyond the center. A very large and complex cornuti aggregate of 1.2 x 0.4 mm runs from the center to the apex of the phallus hull. Vesica base 1 x 1 mm. A croissant shaped lobe 2 x 1 mm laterally partly over the apical section of the phallus hull. A terminal conical lobe, carrying longitudinal rows of short cornuti, and a diagonal positioned plate with warts and short cornuti, connecting to the dominant lobe in front. A 1.5 mm hyaline erratic shaped downward lobe, without ornamentation, perpendicular to the phallus hull.

E x t e r n a l f e a t u r e s : ♀ Fig. 19b. Wingspan 31 mm. front wings white, with 1.5 mm wide scarlet medians, with heavy black borders. The marginal band is Bordeaux red. A heavy scarlet sub-basal, inwardly concave, on the costa with an inward outflow, at the center white indented, and an outward blunt wedge. The sub-basal is straight, at the center a heavy inward black dent. The black margin on the costal section inwardly concave, following the widened outflow to the apex, and stands on the outer margin with a contracted base. The margin of the ante-median is thinner than the 0.5 mm black margin on the post-

median. The post-median contracts around the outer discal spot and is convex on the outer wing half. The margin is 1.2 mm without inward dentation. Hind wing dark salmon, the frontal border and cilia golden yellow.

G e n i t a l i a ♀: GP JHL 1069. Figs 19i-19j. Structure 4.9 mm long with an oval bursa copulatrix of 2.8 wide and 2 mm long. The atrium copulatrix of 1 mm has a transparant 0.3 mm transverse band. The ductus bursa funnel shaped, 1.5 mm at the base, 1 mm long and 0.4 mm at the bursa. The bursal plate is semi-circular and resembles a dried oak leaf, with undulating inward curled borders, approximately 2 x 1 mm in size. Proximally the plate is overlaid by a filamentous hood, from which the oviduct arises. Opposite the plate, the bursa contains several thickly bordered, probably tubular structures. There is no signum. A denser 0.3 x 0.3 mm section could be designated macula.

Cyana clama Bucsek, 2012

Erebidae, *Arctiinae* (Lithosiini, Arctiini) of Malay Peninsula Malaya, p.101.

HT Fig 20a. This taxon has been established on basis of a single ♂ from Malaysia, Pahang distr., Endau Rompin State Park, Kincin River, 50 m 2º27' 10.4" N 103º20' 10.9" E. The ♂ imago, its armature Fig 20c and the phallus Fig 20d are illustrated with the permission of the author. Further to the parameters of the detailed original external description, these parameters also apply to a specimen from N Borneo, from which additional genitalia structures Fig 20c2-20d2 and 20e-20h were obtained. This specimen closely resembles *C. clama* an/or might be allocated inspecies or subspecies status pending investigation of more material.

1) The sub-basal fasciae extend fully over the wing breadth and are meeting the costa with a small triangular section and the outer margin by a wedge shaped section pointing outwards. This renders this band shape into a symmetrical cup standing with its bottom on the wing base. It forms almost a third section of a circle.

2) the investigated specimen have black margins along the medians, inner on the ante- and outer along the post-median fasciae. In the HT from Malaysia, the black margin on the ante-median is straight and ends before the main branch of the dichotome split outward pointing part, whereas in the Bornean specimen the black margin follows along the broken off section. In the HT the black margin on the ante-median meets the outer border slightly obtuse, whereas this is more advanced in the studied Bornean specimen.

3) in all ♂♂, the upper cell spots are wider separated from each other than in *C. determinata* and related taxa. The flattened central spot does not fully cover the space between them.

4) hind wings of the HT are light pink suffused at the outer margin, whereas those from Borneo are uniformly white, except for the outer margin which is yellowish.

A further specimen of this apparent group might be the *C. determinata* sensu Holloway 2001 specimen illustrated as Fig 20a3.

The ♂ genitalia of the Malaysian HT ♂ armature and the lateral view of the phallus illustrated by Bucsek 2012 are matching in two specimen of this apparent group.

The diagnostic spine at the center of the dorsal valve lobe, as well as the identical positioning of the cornuti fields inside the phallus hull of ♂ GP 1043 from NW Borneo. Based hereon,

specimen 1043 is considered to be closely related to the HT but differs here from in the following details.

The relatively wide armature of GP 1043 measures 3 x 2 mm (length/width at the center) and carries 2.5 mm long lobes. The dorsal lobe displays a stronger chitinized section at the center, which is smooth in the HT. The ventral lobes have identical 3 mm sharp ending lateral spines. The apex of these is slightly shorter than the main lobe. The phallus is 2.7 x 0.7 mm in the center contracted, where a bungy oval cornuti field of 0.7 x 0.4 mm is located. A smaller diffuse field with small cornuti lies at the apical section. The everted vesica shows a third small triangular field with 11 cornuti. The main oval vesica lobe of 1.6 x 0.8 mm folds backwards, closely over the phallus hull. The small conical terminal lobe carries numerous very short thorny cornuti similar in shape as in *C. crasizona*. A 4 mm long ductus seminalis connects with a widened basis just below the terminal lobe. The cornuti configurations inside the phallus hull are in the same position, however slightly smaller than in the HT and the lesser field more dispersed.

Taxonomic note: in particular the ♂ phallus configuration, vesica structures with their ornamentation layout and bursal component arrangements are considered key diagnostic criteria. They were obtained from a closely related taxon with some major common, but not fully similar details as the HT, of which the proper taxonomic status still needs further confirmation. They provide the closest possible reference for being able to differentiate other taxa of this obvious *C. clama* "group".

Cyana barlowi nov.sp.

♂ HT Fig 21a from Southern Malay Peninsula, Genting Tea Estate, W. of Pahang alt. 668m, N 03°211'32.5" E 101°47'38.9", leg. H. Barlow, in collection HSB. Three Paratypes, including one ♀, collected at the same location, in collection HSB. Thirteen further PT' s from Mt. Trus Madi C. Borneo in coll. MWM with striking similarity. One pair of these is illustrated Fig 21a2 ♂ and 21b2 ♀. The characteristical black margins on the outer border stand under an angle of 124.45' +/- 1.15 for n=12 ♂♂. In one ♀ of the series, has the identical black dent in the centre and is outwardly acute angled versus the outer border. These specimens were not dissected.

External features: Wingspan ♂ 32-34 mm Front wings white with three orange-red transverse fasciae and a terminal orange band with inward dentations. The sub-basal meeting the costa with two small outflows and the outer margin with a comma shaped wedge. The band is asymmetrical.

The ante-median is > 0.15 mm wide with a small apical outflow on the costa and meets the outer border widening to double the breadth at the center. The prominent inner black margin is patchy, still straight but with various intensity and breadth fluctuations. The post-median has a distinctive inward dent in the Cu-field and is also widening towards the outer margin. The heavy black outer margin follows the inward contracted section. The inner part of the usually dichotome split sections by which the ante-median of the ♂ is meeting the costa is minimally developed, whereas the outer part arcs over the costa to the margin. The outer black border ends before the prong. The dark upper cell spots are widely separated from each other, the centre spot reduced to a short longitudinally placed flat bar, shorter than the distance between upper spots. Hind wings homogeneous light pink.

The thorax white, in the centre and on the metathorax orange transverse bands. A narrow transverse band is formed by the orange outwards fringes of the patagiae. Abdomen creamy white, legs ochre.

G e n i t a l i a HT**:** GP JHL HSB2. The armature measures 3 x 2.5 mm and has 3 mm long lobes. The main lobe is isocelic with two 1.5 mm legs and a 0.7 mm base with a minimal small inside pointing tip. Its center carries a heavy broad based thorn. The ventral lobe is slightly shorter, 0.2 mm wide and has in its center a short sharp thin thorn. The phallus is 3.5 x 0.5 mm, at its base onion shaped 0.7 mm in diameter and is at the apex widened, where it holds a 0.7 x 0.3 mm curved and bunched cornuti field and a smaller one just under its projection at the apical edge. Two vesica ball shaped balloons with a diameter of 0.3 mm protrude partly out of the phallus apex. The everted vesica has a dorsal lobe of 2 mm which is, at its center, 90' folded and pointing backwards to the phallus base. The two balloon shaped structures seemingly holding it in place. There is a small lateral cornuti field with six short cornuti. The terminal lobe with numerous short cornuti lays at the base of a > 3 mm long ductus seminalis.

E x t e r n a l f e a t u r e s ♀ P a r a t y p e : Wingspan 36 mm. Deep orange fasciae on white front wings. The costal half of the sub-basal is straight and without outflows on the costa. The outer half formed by a wedge under an angle of 30' versus the outer border. Both median fasciae are >1.5 mm. The ante-median is almost fully straight, without widening at the edges. The inner black border undulated, with an inward bulge at the center. The post-median is almost uniform in width except for the inward dent on the Cu, as in the ♂. The outer black margin has a 90' broken section following the inward dent and meets the costa with a small deviation to the apex. The margin is lighter orange than the medians and has minimal inward dentation. Hind wings pink. Cilia of the outer borders ochre yellow. The thorax is greyish white with relatively narrow transverse bands. The abdomen is grey, hind legs ochre.

G e n i t a l i a ♀ P T : GP JHL HSB5. The entire structure is 7 mm large. The atrium copulatrix carries a broad 0.2 mm half circular ring. Ductus bursae 2.5 mm long with an upper 1 mm hyaline section, is proximally funnel shaped widened and a 1.5 mm heavily chitinized section with 11 longitudinal ridges. It is shaped as a bulb widened at the base to 1 mm and connects to a solid bursal plate of 0.6 x 0.5 mm from which the oviduct arises. The bursa copulatrix is rounded, almost heart shaped, with a diameter of 2.5 mm. It appears to be composed of two sections, one with a large bubbly 3 mm signum, of which the upper part is 90' inwardly curved. At the apex of the bursa lies a stone like 0.7 x 0.3 mm structure, that connects to a tubular channel (filled with debris, noticeable only when touched with a needle). It runs lateral inwards of the longitudinal signum. Halfway, there is another structure, possibly a macula, looking similar to the discussed apical "stone" structure.

Cyana crasizona Wileman & West, 1928 rev.comb.

Cyana crasizona Wileman & West, 1928, Ann. Mag. Nat. Hist. (10) 2: 219.
Cyana crasizona Kishida, 1991, Tinea 13 (8): 65.
Doliche crasizona Černý, 1993, Nachr. Ent. Ver. Apollo Suppl. 12 p. 40.

Material of this species had so far been restricted to a single ♀ HT originating from Mindanao, subprov. Lanao, Kolambugan, of which the extrapolated coordinates are: 07°21′

N, 124° 45′ E. The taxonomic status has been subject to numerous speculations. Over the last 5 years 18 more specimens, 8 ♂♂ and 10 ♀♀, have been acquired from North and Eastern Mindanao and Leyte. The ♀ figured by Černý, 1993 has the shape of the fasciae fully in agreement with the recent collected material, however the colour is overdosed with yellow. In the original description Wileman & West, 1928 describe the margins fasciae as English-red, in accordance with the material from recent collections, given as in Figs. 22a ♂ 22b and 22b2 ♀♀ from Leyte and Mindanao respectively.

M i n d a n a o : 1 ♂, Agusan Sur, Mt. Hilong-Hilong 470 m, 34 km W of Ampayan, Kulambugan 08º58′ N, 123º49′ E, 30 vi 2005 JHL leg.; 2 ♀♀ East Surigao, Lianga, 8 km W of Diatagon 275, 08°42′ N, 126°05′ E, 3-7 vii 2005 JHL leg.; 1 ♂ at the same location, 29xi – 1xii leg. JHL & A. Schintlmeister; 3 ♂♂ 1 ♀ at a nearby location, 13 km from Diatagon, 430 m, 08°44.475′ N, 126°05.632′ E, 22-23 v 2007 JHL leg.; Misamis Oriental, 22 km NE Claveria, Brgy Mat-I 1050 m., 08°39.988′ N, 124°59.686′ E, 2 iii 2009 K. Knoblich & JHL leg.; 1 ♂ 1 ♀ same location 20-21 iii 2009 K. Cerny & JHL leg.

L e y t e **:** 1 ♀ Hilusig, Mt. Balocawe 700 m, 10º40.742′ N, 124º55.270′ E, 19-20 v 2005; 2 ♂♂ 4 ♀♀ same location 15-19 v 2007; 1 ♂ 1 ♀ SW Leyte, 20 km N of Maasin, Hinapu Dacu, 600 m 10°16′ N, 124°55′ E, 6-7 x 2005, all JHL leg.

First description of C. crasizona ♂ Fig 22a.

Head: Vertex white, frons white, the border with the patagiae with a thin line of crimson scales. Patagia white, the outer borders crimson over 1/3rd of the width. There is a narrow carmine band just under the eyes. The antennae are orange, the 1st segment white. Tegulae white frontal half, distally with long orange hair tufts. The thorax is white, at the center a light, hairy transverse band, pointing towards the center of the mesothoracal hump. This hump has terminally a deep crimson crescent and has at the center a proximal dent touching the light transverse hairy crimson band.

Frontwings 14-15 mm, ground colour white. Wingbase white 1 mm. The sub-basal deep crimson, split into 2 sections, on the costa forming a bridge to the ante-median; at the outer wing border a diagonal wedge slanting to the ante-median. The two sections of the subbasal are at the center separated by a black dot. The inner black margin on the ante-median is basad concave. The black margin on the post-median is almost straight, at the costa and the outer border light outwardly curved. The basal white spot is widely open at the wing' s outer border. The white band between the medians runs almost straight over the wings, slightly contracted around the cell spots. Its width is variable: 6 mm in 2 specimens from Mindanao, but narrower on Leyte, only 2 mm wide. The margin is ochre, with the inner half sprinkled with orange. Hind wings dorsal and ventral ochre Abdomen dorsally orange, ventrally creamy white: the last 3 segments form a terminal, ochre tuft. Thorax white, lateral sclerites with white hairs, under the frontwing base crimson, and orange under the hindwings. Legs: inner flanks creamy white, laterally orange. Front leg ♀urs laterally carmine. The ♀urs have a white ring at the center.

♂ G e n i t a l i a **:** Fig. GP JHL 75.

Armature (length x width) 2.4 x 2.5 mm. Harpe solid, at the center 0.5 mm, 1 mm legs. The uncus is sturdy, blunt ending. The saccus is solid, at the valve base 1.2 mm 2 mm wide, rim-like. Sacculus well developed 0.25 mm wide, the process thereof (cucullus) strongly chitinized and at a 50º angle inward curved. The ventral valve is 2.3 x 1 mm, has a flat

dorsum and is lightly lobed, with a 0.2 mm ridge to a proxilateral ventral heavy and short thorn. The dorsal ridge foot extends along the costa in both directions. The valve lobe is almost triangular 1 x 1 mm with a base of 0.8 mm against the ridge. The distal section of the lobe is double layered, with an inner lining with irregular hairs**.** Phallus 2.2 x 1 mm, at 2/3 of the apex constricted to 0.75 mm, ending with a slightly slanting edge. A distinct cornuti field at the terminal 3rd section, with 2 wide bladed short spines, arising from underlying plates.

Vesica**:** Central lobe 1.25 x 1 mm. Terminally 2 lobes of 1 mm, 1 hyaline, ending in a short 0.3 mm wide short tubular section, the other with a cornuti field composed of scale like platelets, with 2 short and wide cornutis (2.5 x 0.09 mm). At the phallus apex a thumb shaped lobe 1.2 x 0.8 mm at the base, ornamented with 100s of very short thorns, almost wart like. This lobe has a hyaline posterior extension, to which the ductus seminalis directs.

D i a g n o s t i c f e a t u r e s o f t h e ♀ Fig. 22b.

Habitus similar as the ♂♂, however larger (19 mm), the black fascies straighter and more prominent and only 2 radial placed cell spots. The basal white spot is open on both sides: at the costa at least 1 mm, and at the outer wing border 2 mm. The white band between the median fasciae is 2-6 mm wide, in which the inner black spots lies at 2/3rd of the cell, the outer one just touching the post marginal or slightly incorporated into this crimson transverse line.

♀ G e n i t a l i a **:** Figs 22i and 22j GP JHL 89.

Length 7.2 x 3.1 mm wide, with a clearly separated bursa copulatrix of 2.7 x 1.8 mm,. carrying a well developed plate and pseudo-bursa of 3 x 2.5 mm.

The valves measure 0.7 x 0.5 mm, and the atrium copulatrix 1.3 x 1.3 mm with a 0.6 mm tranverse band. The ductus copulatrix is 1.1 mm wide, carries a thickened rim at the base, and has a bell shape. It connects with one side to the plate's proximal border, off the center. The base of the the plate is 2.2 mm wide with on either side 3 branching short ribs, and is on the wider side, bowl shaped. The distal section of the plate is heavily structured, with rounded sections, and strongly ribbed. In dorsal view, the plate's center carries > 10 longitudinal ribs. A deep incision on the separation line with the pseudobursa and bursa copulatrix. A large macula in the center, with a border of warts, and a semi-circular signum along the outer border of the psb, at one end with a 0.6 x 0.3 fusiform, the other, meeting with a cup shaped 0.5 x 0.3 mm structure.

Cyana johani nov.sp.

HT ♂ from Panay Island, Iloilo, Brgy Supanga, E. of Mt. Baloy, 570m 11º09.460' N 122º21.279' E, 30/31 viii 2008 JHL leg. One PT ♂ in MWM. Two PT ♀♀ from Panay, Aklan 1 km N of Logtugan, 12 km W of Libacao, 105m. sec. forest. 11º24.691' N 122º 18.526' E, 2 ix 2008. Two ♂♂ and 5 ♀♀ PTs from Negros Or., NE of Don Salv. Benedicto, Brgy Bagong Silang, Mt. Mandalugan 770m., 10º36.017' N 123º16.127' E prim. Forest, 19/20 vi 2009 JHL leg. Of this series one ♀ in MWM.

♂ HT Figs 23a: Frons white, at the clypeus a crimson border with a small central backward protrusion in the center. Vertex white, antennae orange, first segment white. Palps bright crimson, and similar rings below the eyes, connected to the patagiae. These are crimson with 2 isolated half circle white spots, with their basis placed on the

borderline with the vertex. Thorax white, and with a transverse crimson band (1.2 mm wide) with a small protrusion in the center and a crimson band towards the metathorical hump, which has its terminal half crimson, leaving distally 2 small white spots visible. Elytrae white with long crimson hairs towards the abdomen, and a upper crimson border. The usual half crescent white band from wingbase over the thorax, is interrupted by the crimson upper margin of the elytrae. The abdomen is laterally and dorsally orange coloured, ventrally white. Thorax white, legs laterally orange, insides creamy white and such on rings at the joints. The ♀urs of the front legs have two bright crimson bands on the side and two bands on the thorax halfway towards the eyes. The wingspan is 30 mm. Front wings dominated by crimson, with incomplete transverse white fascies. The wing base is white. The sub-basal line is deep crimson and composed of two oblique long based triangles meeting in the center to a black central dot, and their long bases on the costa and the outer wing margin. Their outsides flank the sides of the white basal white spot, which is almost V-shaped, with the keel on the black central dot. The costal part lacks the inner black lining, or is very thin. The wing base section protrudes 3 mm towards the tornus, and has a clear inner black lining, sometimes intermingled with the crimson, and giving the impression of a second dot, but does not meet with the outer black transverse margin of the submarginal fascies. This one is 3 mm broad, crimson and spreading slightly along the costa and on the outer margin, considerably widening to 3 mm. Its inner black border is straight. The white zone between the ante- and postmedians varies in Negros and Pany specimens. In Panay there is an oval white spot only (holding the black discal spots) on the discocellular area, whereas in Negros specimens the white reaches the outer wing base via a narrow slab. Two of the cell spots position radially, the 3rd tangentially above the outer one. Of the available four ♂♂, two have separated spots, in one, the outer spots have merged to a 90º L whereas another has the lower outer spot strongly reduced to a narrow stripe. The outer spots touch the crimson inner line of the marginal, are not surrounded by any white, and incorporated into that fascies. The post-median outer black margin is black, but not reaching the costa, bending off and fading out towards the apical wing area. Below it lays a wedge shaped white downward pointing field pointing at the Cu. The 3mm wide crimson marginal line has progressed towards the wingbase, stronger in Negros, but lesser in Panay specimens. At the front wing underside the glandular mark above the disc cell is round in Negros and laterally somewhat expanded in Panay specimens. Hindwings are pink, cilia golden ochre.

♂ Genitalia structures: HT GP JHL 86.

The armature measures 3.4 x 3.2 mm and is heavily chitinized. The short uncus has a blunt tip. The valve, 2.8 x 1 mm (in the center) carries a heavy dorsal lobe, spreading out along the costa in both directions. The tip of the lobe is similarly structured, and widely rounded. Ventrally, the sacculus and the cucullus, do not lie in the same line, are arched with a 30´ angle, and the terminal thorn of the cucullus slightly inward curved. In the center of the lobe runs a low ridge to the joining point of ventral lobe, ending in a small, but blunt, rose-thorn, pointing at the valve base.The phallus of 2.3 x 1 mm, is constricted in the center to 0.72 mm. In the predominantly hyaline hull, one central cornuti field is visible, and 3/4th terminally a similar, vaguer one. The phallus hull is lightly sclerotized at the rim, spreading diagonally over the distal section. The vesica is complex. Dorsal to the central lobe, there are 2 small lobes, each with a backward branch. A 3rd dorsal lobe lies distally, and carries

a single large curved cornutus, sprouting from a section with about 8 chitinized scale like small plates. Below the caudal lobe, 2 prominent downward pointing lobes are seen, 1 with 2 dichotome small protrusions, the other with a field of 7 short, broad, flat cornuti terminally and with a distal warts field. A bell shaped, 1 x 1 m lobe arises from the ventral lobe, close to the phallus mouth, pointing backward.

External description ♀ PT GP JHL 76 from Panay.

Head: Frons, vertex, antennae, patagia and elytrae as in the ♂. The abdomen is dorsally pink, vertrally white, with a ring of crimson scales around the genital aperture. The legs are orange outside and creamy white inside. Front legs ♀ur white, with narrow crimson bands. From the eye towards the hindwing base runs a crimson band of short hairs in Negros specimens, which is more prominent in those from Panay, and extended to other thoracal hairs.

Its wingspan is 40 mm, predominantly white with clear transverse dark crimson fascies and black margins. The wing base is clear white. Basal fascies as in ♂♂, with dark crimson triangular sections, centrally merged with a prominent black dot. The upper section of the basal band lies on the crimson costa, the opposite one extends towards the tornus, but does not connect to the inner black margin of the antemedian. There is a > 1 mm gap between, leaving the spot open at the margin. The black borderline of the antemedian slightly curves inward on the R, and ends just before the costa. In 2 specimens from Negros the inner margin of the upper triangle is thinly black marked, but does not form a full arc to the approaching black border.

The ante- and post median crimson fascies are fully separated in Panay, but, below the discal cell, merged in Negros specimens, leaving a somewhat rounded white spot on the discal area, carrying the 2 black cellspots. This white spot forms in Panay specimens, the "balaclava" mask spot which has a narrow white band connecting to the outer wing border. The outer discal spot is oval and placed tangentially: appearing as if it is composed of 2 incompletely merged circles. The inner black spot lies inside the white section, whereas the outer one is half embedded in the crimson median fascia.

♀ Genitalia: GP JHL 76 from Panay Island. The structure is 7 mm long and 3.5 mm wide. The valves measure 0.8 x 0.5 mm, and are bluntly pointed. A 0.2 mm semi-circular band runs over the atrium copulatrix. The rim of the ductus bursae 1.7 mm wide, heavily structured, is double layered. Its length is 1.2 mm, and it is gradually contracting to 0.3 mm, thereafter widening to 1.2 mm on the connection point with the bursal plate). The ductus seminalis attaches laterally to the db, and enters the bell shaped bursa section with a 1 mm membrane with warts, spreading over the base of the bursal plate. Just before the merging place of the ds with the db there is a 1 mm wide section of the db, split in 2 compartments, one 2mm and one 3 mm long. The bursal plate is bell shaped, 2 mm long and 1.6 mm wide at the foot (at the center 1.3 mm wide with a link to a bowl shaped structure with an insulcation) The plate carries seven longitudinal double ribs.

The bursa is composed of two sections: one 2.2 mm long, bell shaped, the other 4 x 2 mm potato tuber shaped, carrying eleven fine diagonal ribs. The foot of the bell shaped section attaches to the upper half of the bursa, under an almost 90´angle. The positioning of the proximal section of the bursa, seemingly exerts pressure to the opposite bursal side, and thereby forms a characteristic shape, supported by the chitinized bowl. (seen in all specs of

this group.) The larger bursal section carries two maculae and a 5 mm long thin, undulated, U-shaped sigma, of which one proximal end carries a 0.4 x 0.15 mm spindle shaped section.

D e r i v a t i o n o m i n i s : the species is named after my youngest son Johan Derick Lourens.

Cyana libulae Černý, 1993,

Černý K., 1993 – Nachr. Entomol. Ver. Apollo, Fft Main, Suppl. 12: 38.

The ♂ Fig 24a and ♀♀ Fig 24b, S Luzon, Fig 24b2 N Luzon, The HT ♂ from the Philippines, Luzon, Quezon Nat. Park, 250m. 14°01´N 122°11´E, 250m in coll. BMNH. A recent abundant collection of 6 ♂♂ 10 ♀♀, at a nearby location in SE. Luzon, Quezon Prov. Lucban, Brgy Samil, at the Ft. of Mt Banahaw, 741m, S. slope prim. forest 14°6.030' N 121°31.478' E 2-3 v 2013 JHL, further confirmed that the species is common. Complementary to the original description some further details and additional genitalia for group affiliation and classification.

E x t e r n a l f e a t u r e s : In both genders, the front wing colour is > 50% dominated by orange. The species can be differentiated from *C. johani* nov.sp. by having the basal white field fully closed. The sub-basal is crimson red and on the costa fully connected to the ante-median. The wedge on the outer border, with a solid black margin and at the outer border merged with the ante-median. The center of the sub-basal formed by a black spot. In ♂♂ the circular white spot between the medians is on the costa closed by dispersed scales, but in ♀♀ widely open. ♀♀ display a balaclava mask with an inner small and an outer, partially merged, second eye. In ♂♂ there is no (more) mask because the inner cell spot is enlarged and dominates the eye-spot. There are two ♀ forms, similar as in *C. johani* nov. sp., depending on the degree of inward merging of the medians on the outer wing-half. All ♂♂ are fully merged (n=8) 2 ♀♀ resembling fully merged ♂♂, 2 partially and 6 fully white banded specimens. The white zone between the post median and the marginal band has almost vanished in ♂♂, but is in ♀♀ > 1 mm wide. The outer black margin on the post-median has a 90´ broken section on the Cu in ♀♀ only. Hind wings carmine.

G e n i t a l i a ♂: Fig. 24c-Fig 24h GP JHL 79 Philippines, Philippines, S. Luzon, Quezon Nat. Park 29 iv 2004 JHL leg.

Armature 2.4 x 1.7 mm, harp short legged. The saccus is 1.7 mm wide with a 0.15 mm semi circular rim. The valve long and narrow 2.65 x 0.8 mm. Its dorsal side almost straight, a light thickened transverse strip to an inside thorn, just before the ventral rim of the valve, similar like *C. crasizona*, but lighter structured. A short thorn at the end of the ventral lobe. The phallus 2.4 x 0.9 mm, at its center contracted to 0.7 mm. At the apex half of its width bulged out with a field of 4 protruding cornuti. Laterally adjacent a line of 5 chitinized structures. Vesica: central body 1.5 x 1 mm, with a semi circular upper lobe with small warts, a terminal 0.7 x 0.5 mm ornamented lobe, a heart shaped hyaline lower - and a short 0.6 mm lateral lobe holding 5 platelets. The terminal lobe carries a plate with at least 2 large and 2 short but sturdy cornuti, encircled by rows of platelets.

G e n i t a l i a ♀: Fig. 24i and 24 j. GP JHL 88 Philippines, N. Luzon, Mtn. Prov. Banaue City, 25 viii 1992 JHL & KDL leg. The structure is 6.2 x 2.9 mm, valve 0.6 x 03 mm lightly sclerotized. The atrium copulatrix carries a semi-circular 0.2 mm broad transverse band. The ductus copulatrix mushroom shaped, at the base with an elongated extension. The

bursa copulatrix is divided into two sections, the outer, cake shaped with a diameter of 3 mm and a proximal 1.5 x 2.8 mm part, folding half of its width over the terminal section. The proximal section contains diagonal ribs bundled in aggregates: two proximal and one on the fissure line with the distal part. The bursal plate is a hyaline cup without a chitinized base, except for some of the ribs. The bursal part contains a long worm-like vague signum in its periphery with a broader section at the center.

Discussion

Earlier studies on the species of the *insularis* group had been restricted to specimens from island or country restricted populations. Roepke focussed on Java, Holloway on Borneo, Černý on the Philippines and on Thailand, Bucsek on Peninsular Malaysia and all authors were predominantly using external morphological differential features. These are however directly subjected to regional restricted environmental factors, and predation, which simultaneously also affect the habitus of non-related sympatric taxa, and thereby renders these potentially confusing, especially if they are used without full knowledge of their variability. Overemphasis of external features, as well as material limitation, lack of or confusion about sexual partners has led to far reaching confusion, in particular over the taxonomic status of *C. determinata*. See the taxonomic note in the descriptive section.

In practically all *Cyana* collections, ♂♂ are always more abundantly represented than ♀♀, especially when taxa are stronger sexual dimorph. However, if one collects in moist swampy low montane forest dominated by *Cyathea* tree ferns, ♀ frequencies are usually much higher. This implies that such biotopes are presumably more likely the reproduction biotopes, which are in most cases more difficult accessable. This could explain why they are far more frequently caught on light than ♀♀. ♂♂ assumably also disperse further away from their breeding grounds. On Borneo *C. determinata* ♂♂ fly sympatric with two confusingly similar species, also belonging to the *insularis* group.: *C. aurora,* a species with minimal transverse fasciae, lacking black discal spots and without black margins, the other: *C. maaikeae* n.sp.*,* a species with very light discal spots, a remnant very thin black margin and pigment depleted hind wings in ♂♂*,* from which *C. determinata* ♂♂ are almost indistinguishable. The three above taxa underlay a reduction trend in phenotypical expression of fasciae and pigments especially in ♂♂. The above named ♂♂ have a very similar habitus, are always smaller than ♀♀, and might well be exposed to different selection pressure. Their species status could securely be confirmed by structural differences in vesicae of ♂♂ as well as V-shaped signa and other structures in ♀ bursae. *C. martinii* n.sp.from Sumatra represents an intermediate stage in demonstrating narrow wing fasciae, but still having the U-shaped signum in the ♀.

Although external features have so far been the cornerstones for diagnostic differentiation in practically all collections in taxonomic institutes since the early days of taxonomy, awareness is rising that structural criteria are gradually beginning to play a more dominant role. Ideally a classification system should be a complementary synthesis of both and overreliance on structural criteria should be avoided, for which there is a tendency in the sometimes exclusive use of DNA barcodes in taxonomic publications. Image illu-strations remain valuable tools for swift identification although during the course of this study, it

became gradually clear that none of the external criteria on its own provided sufficient convincing leverage for the design of a fully covering classification system for arranging the species in this group. As to meet the need for supportive structural grouping parameters, genitalia micro-structures were very intensively screened for diagnostic properties. Discriminating structural grouping criteria were eventually discovered in 3-D configuration of vesica lobe ornamentations and their embryological positioning in the phallus hull prior to eversion of the vesica, as outlined in the structure variability section and conclusions.

Variability of external features in general: The complexity of the variability of a significant external feature: the black margin on the median fasciae, is responsible for much of the confusion within the taxa dealt with in this study. The phenotypical expression of this feature apparently seems to be under the control of a switch-on or switch-off mechanism, theoretically regulating this trait, either on species or even gender level, in different geographically separated populations of this group.

In the *C. determinata*-related section the gradual fading out of black margins in ♀♀, which are already fully absent in the strong sexual dimorph ♂♂, raises the suggestion that the expression of this trait is under the control of a partial dominant gene. On Sumatra, the southern Malay Peninsula and adjacent lesser islands, the margins are absent in both genders of the *C. ridleyi*-related taxa, as well as the in the sympatric non-*insularis* but related *C. gabika* and *C. bianca malayana* Bucsek, 2012. The fact that the latter taxon lacks black margins in the South, whereas these are fully expressed on the Northern Peninsula and in Thailand, where four genuine *insularis* taxa occur with distinctly clear black margins, indicates that there has to be an underlying mechanism in place responsible for the phenotypical expression of this trait in these widely separated populations.

Further there exist clear but minute variations in the shape of the margin. In the *C. determinata*-related *insularis* taxa, the margin follows the inward outflow of the ante-median on the costa, which is straight in ♂♂, but lightly diagonal and sinusoid in ♀♀. In *C. bianca bianca*, *C. clama* and *C. barlowi* nov.sp. (see hereafter) the ante-median inner border is straight and perpendicular in ♀♀, and at the center inwardly dented. This dent could be considered to be the hinging point of a broken-up former circular shape, straightened into a (recurrent) transverse position. ♂♂ of these three taxa very much resemble the predominantly straight *insularis* ♂ shape and always angle basad obtusely on the outer margin. The black margin of three species of another (structural) distinct non-*insularis* section designated *crasizona*-group (discussed later) are usually inwardly concave and part of a distinctive oval shaped white wing section with extended black lining arising from the sub-basal. This section between the sub-basal and the ante-median fasciae is referred to as the basal white spot. The three species of the *crasizona*-group have that feature in common with four specs of the *insularis*-group distributed in the northern Malay Peninsula and on mainland SE Asia.

Basal white spot formation goes hand in hand with the disappearance of the white band between the medians. This is also seen in species of the *C. lunulata* and *C. vespertata* sections with intermediates on the Visayan Islands, and geographically associated with the appearance of fully orange front winged species on northern Luzon Island. (Lourens 2009, 2010) The incidence of morphs departing from the usual Tiger-moth habitus is in the

Philippines noticeably correlated with a north/south latitude gradient. There exists similarity with fully orange morphs of the northern *insularis* taxa on the northern Malay Peninsula and on mainland SE Asia with approximately the same 15° N latitude as northern Luzon. The strict Tiger-moth habitus of the *insularis*-group taxa of the Great Sundanean Islands lies within the latitudes 10°N and 10°S and has never given rise to fully orange/red phenotypes as seen in the north. A probable explanation could exist in the assumption that such morphs have evolved under presently similar selection pressure regimes on C. Thailand and C. Luzon as remnants from formerly widely dispersed predators during the last of even earlier glacial interglacial periods and an activation of a dormant genome for the trait originating from ancient kinship.

For the design of rounded spots, longitudinal elements are required to configure them, to complement the usual transverse wing features in the *Cyana* genus. For shaping an oval or rounded spot, the sub-basal band has two (obviously genetic independent operating) longitudinal components on the costal- and outer half sections of the wing. The costal section is an (inverted) "comma" shaped band section, with a short outward tail along the costal border. Together with a similar opposite outflow, by which the ante-median meets the costa, the white basal spot tends to form an arch. The closure of the outer section of the spot is aided by a diagonal orange wedge. This feature operates stepwise and similar in the *insularis*-, *lunulata*-, *vespertata*-, *crasizona*-groups, as well in look-alikes of the *clama*-group, and is therefore without diagnostic significance for the four "odd fasciated" species forming the northern branch of the *insularis* group.

The white band between the medians tends to form a circular spot on the costal half, whereas on the outer half, the medians gradually merge. This is seen in both genders, but most spectacular in ♀♀. On the outer wing half, the fusion of the medians is mostly incomplete and leaves a narrow white half band section, which combined with the upper part, forms a white "balaclava"-mask shape, complemented by two discal spots, simulating eyes. The upper part of the mask is composed of a small dichotome split component from the post-median and a small outward flowing section of the ante-median. These minute features are highly diagnostic in this group. The wedge enables to identify the specs of the northern *insularis* (branch) by habitus, in combination with a slightly acute angle of the ante-median on the outer border.

The angling position of fasciae on the outer border varies from perpendicular, to basad acute or obtuse. It provides a supplementary diagnostic criterion, which is very useful for visual identification of *insularis* taxa.

Almost perfect perpendicular median fasciae are seen in both genders of *C. carmina, C. kasperi, C. ridleyi siberuta*. They are geographically confined to the outer small islands at the periphery of the insular distribution area. This feature also covers the ♀♀ of *C. determinata determinata* and *C. determinata sausae*, and both genders of *C. paukstadti* nov.sp. at the center of the greater Islands of Borneo, the S. Malay Peninsula and Java respectively. The ♀♀ also have dull ending sub-basals, which are just not fully meeting the outer border.

C. ridleyi ridleyi and *C. ridleyi roberti* nov.ssp. from the S. Malay Peninsula have basad obtuse ante-medians and strongly reduced sub-basals. Four northern peninsular and SE Asian mainland *insularis* species also have obtuse ante-medians, but full sub-basals

reaching the outer border by means of the earlier discussed orange wedge. The band breadth (width). All the species quoted in the above sections have broad (ie > 0.7 mm) fasciae. The strictly insular species affiliated to *C. determinata determinat*a have acute ante- and post-median fasciae incomplete, sometimes very strongly reduced, sub-basals and are narrow (ie < 0.4 mm) banded.

The main group of the *insularis* species, restricted to the Great Islands, has a lower frequency of the small longitudinal wing features, and always lacks the sub-basal wedge, thereby stricter maintaining the common "tiger-moth" habitus with the display of a more or less trapezoid shaped white basal field. This feature prevailing in 8 out of 11 *insularis* taxa is in the *C. determinata*-related *C. maaikeae* and *C. aurora* almost iso-scelic. The lack of expression of the sub-basal on the outer wing half is in *C. determinata* taxa directly correlated with a reduced size of the outer marginal band, which does not always fully extend to the tornus. This band-wise suppression zone on the outer wing half is a phenomenon indicative for the operation of zonal regulating probably pleiotrophic genetic factor, absent in four specs of the northern *insularis* branch, which have full sub-basal phaenotypical fasciae expression and display full basal wedges, by which these taxa can always be identified in the simultaneous expression of these features together with their distinct marginal black borders.

Differential diagnosis of ♀♀: The *C. determinata* HT has been described on basis of external parameters of a single specimen. Upon clarification of its correct sexual partner of the affiliated ssp. *C. determinata sausae*, and the taxon on species level: *C. paukstadti* nov.sp. in comparison to *C. carmina* and *C. johani* n.sp., the combination of several external features fully enabled to differentiate them from each other. The possession of the more or less trapezoid basal white field on the front wing, the dull ending incomplete sub-basal, the angling positions of the ante-median, as well as the fasciae breadths eventually enabled a full habitus based identification, once the variability of the black margin criterion had been understood. *C. determinata* related ♀♀ have variable degrees of blackening along the median fasciae, strongest in the HT, and rudimentary in *C. determinata sausae*. They occur lighter in *paukstadti* nov.sp., but are strongly present in *C. carmina* and *C. kasperi* nov.sp. Black borders are fully absent in the illustrated C. *ridleyi* and both genders of *C. ridleyi roberti*, and *C. ridleyi siberuta* nov.sp. from Siberut island off the Sumatran coast, also having reduced discal spots in both genders. The *C. ridleyi roberti* ♀ has lost the outer border half section of the sub-basal which is only expressed as an inverted comma along the costa.

Differential diagnosis of ♂♂ by external features is always possible, except for *C. maaikeae* and the *C. determinata sausae*. The suppression of the sub-basal is usually more prominent, especially in the *C. determinata*-affiliated taxa, as well as *C. ridleyi*. The relevance of this parameter had already been noticed by Roepke 1946, who used it as diagnostic criterion for the separation of *C. piepersi* and *C. pudens* (*pectinata*).

The outer border section of the sub-basal fascia forming the "wedge", present in all northern taxa of the *insularis* group., is absent in the *C. ridleyi* related taxa. They reappear in *C. malacca* nov.sp. from SW Thailand up to the north. Apparent hybrids with external *C. determinata sausae* features, but distinct *C. ridleyi roberti* genitalia have been identified. A hypothetical explanation has been considered that this trait might have been acquired

through hybridization with *C. determinata sausae*. This assumption however requires breeding experiments for verification.

The constriction and fading-out of the transverse fasciae in ♂♂ starts to suggest that a regional confined selection pressure might be in place acting specificly on ♂♂. It has earlier been assumed that ♂ specimens usually roam around, and are seemingly far more common, whereas ♀♀ are much stricter biotope bound. It may therefore be likely that ♂♂ could be exposed to a different selection pressure regime than ♀♀, and might have become narrow banded if such a trait would present a higher chance for survival. With such a hypothetical mechanism in place the always observed broad banded-ness of ♀♀ could theoretically be possible.

A selection pressure regime, leading to narrow straight transverse orange banded species initially in ♂♂, is also apparent on the Sumatra on the southern Mentawi Islands string, where another similar species *C. aurantiorufa* occurs with reduced fasciae, reduced cell spots and reduced black margins. This phenomenon, first noticed on Borneo and Sumatra, also prevails on the Southern Malay Peninsula, where the Singapore HT of *C. ridleyi* lacks black median margins and ♀♀ occur with a rudimentary inner discal spot. All "tiger" patterned taxa in this territory have a minimal size pointed (incomplete) sub-basal, which renders this minute feature to a major diagnostic criterion.

The "wedged" *insularis* species of mainland SE Asia, including those of the northern Malay Peninsula, have often been misidentified because of the almost identical external features of look-alikes, not belonging the *insularis* group, in particular ♂♂. The mainland SE Asian species, *C. malacca*, *C. juliettae*, *C. weerawoothi* and *C. coccinea* do all meet the structural criteria of the *insularis* group in both genders.

They can visually be separated from the *insularis* group members by the possession of an oval, rounded or V-shaped basal white spot on the front wings. On the costal border, the white spot can partially or fully be closed by an arch, similarly at the outer wing border by means of a diagonal placed wedge. In addition to this, the white band between the medians forms on the costal half, the head of a balaclava mask (see above). This shaping trend proceeds toward a full mask-shape over a south/north gradient , whereby the mask shape gradually becomes more complete and the crimson coloration of the medians on the outer border half, tends to merge. This trend directs toward the rise of fully orange specimens with a small remnant white (faded) spot around the black disco cellular black spots. The northern species always have prominent black borders along the medians.

The past taxonomical confusion within the *insularis* group of species has mainly arisen from absence of interpretable genitalia illustrations and a wrongly chosen ♂ partner. This has further been aggravated by the incidence of a substantial number of similar phenotypes, which (as later will be shown) do not meet the requirements for classifying them in the *insularis* group. Seven species have so far been identified, but there will likely be more. Substantial confusion had also arisen from erroneous labeled specimens, interchanging ie Sikkim with Philippine Mt. Apo material.

Note re rectification of a collecting location. There are 79 specimens of *Cyana coccinea* in circulation with Philippine Mt Apo labels, all with the same collecting dates. On contact with the quoted collectors, it was explicitly confirmed that none of them had never seen nor collected any of the "*coccinea*" specimens, during their two days collecting time at

Kidapawan on the given Mt. Apo Mindanao location on those labels. Details of the GP of this species figured by Černý, 1993 Fig 37 phallus/vesica and Fig 66 of the armature, quote the correct origin. It was researched that during those days large series of this attractive, locally sometimes common species had been collected in Sikkim (Kanchejunga and Legship) by various collectors, and dispersed by exchange. At one point such material must have been interchanged.

♀♀: have their "tiger" pattern stricter maintained. This is most convincingly demonstrated by the cultured progeny of isolated ♀♀ of *C. weerawo*othi nov.sp. in captivity by Černý.

Variability of structural features

♂♂: The armatures, harps and juxtae of *insularis* taxa are homogeneous in general outline and dimension, irrespective of whether they vary in the degree of maintaining the trapezoid white field or possess black margins, as in the northern distributed species. The valve shapes vary moderately, especially the curvature of the spine-bearing ventral lobe, which is sometimes species specific inwardly curved. The dorsal lobes never carry an apical thorn, but they are variable in structural density (by reduced chitinization) and are sometimes transparent. This is most noticeably reduced in *C. paukstadti* and the *C. determinata*-taxa. The center of the dorsal lobe is variably equipped with a small broad based saddle-like protrusion. This hump feature is present in broad banded straight fasciated taxa, notably distributed at the periphery of the *insular* species, as well as in *C. ridleyi roberti* and *C. malacca*. All *insularis* taxa possess phalli with two centrally positioned cornuti configurations: a larger one literally overshadowing a smaller one partly or complete, if laterally projected on the phallus hull. The lesser cornuti aggregate varies in the position under the upper structure, and can even be only partially overshadowed as in *C. coccinea*, which is just still within the variation range of this criterion.

The everted vesicae of all *insularis* taxa are uniform in shape, by having a backward pointing lobe, two ornamented lateral lobes and a terminal lobe from which the ductus ejaculatorius originates. The backward pointing lobe can be light to densely covered with small warts. The lateral lobes are more or less opposite to each other, tend to have some degree of symmetry with lateral cornuti coverage, but these fields are uneven in size, the larger one with longer parallel arranged cornuti, the smaller lobe with lesser and shorter cornuti originating from a narrow base in a radial arrangement. The lesser aggregate often has enlarged side- or downward extensions. The larger, thumb shaped lobe is species specifically angled. Terminal lobes are usually round and upwards bulging with variable diameters, sometimes ending conical or apically circular flattened. They are always heavily warted, of which sections have modified into very short spiny aggregates. The vesica is a flexible but rigid structure, comparable to a thin layered PVC plastic bottle. It can be lightly deformed by mechanical pressure, but retakes its 3-D shape on release. This also applies for the lobes. Their positions are stable and slanting angles are not the effect of handling deformation. During eversion by means of water pressure, the vesica shape pops-up instantly, whereby the final 3-D configuration is predetermined by variable internal structural support elements. Its lateral position is predetermined by the diagonal shape of

the phallus hull apex. Genitalia preparations stored in glycerin/ethanol maintain their 3-D shape for later re-examination.

♂♂ of three nov.specs. *C. malacca*, *C. juliettae* and *C. weerawoothi* from SW and SE Thailand respectively and *C. coccinea* from Sikkim, are illustrated and their structures featured in the descriptive section. They possess the characteristic armature- and valve layout, the embryological cornuti field configuration in the phallus hull, and the backwards pointing vesica lobe, by which they are united in the *insularis*-group. Noticeable developments in cornuti size, the realization of almost symmetrical fields on the thumb shape and opposite lobes, as well as 3D shaping and ornamentations of vesica lobes, suggests that these three species are closely related. The trend of these structures runs parallel with the described external feature for a gradual change towards fully orange/red species in the North.

Although there exists a high degree of similarity between the lobes of *C. malacca* and *C. determinata sausae* Bucsek, 2012, the enlarged opposite vesica lobe is indicative for a potential relationship tendency with *C. ridleyi*. (see analysis of *C. determinata sausae* PT's in the descriptive part).

♀♀: The above described structural rigidity of vesica also applies to ♀ bursae. They are on one side mostly circular, sometimes oval or pear shaped or can be laterally extended on one side. Twelve investigated ♀ congeners of structurally united ♂ partners showed a great deal of similarity in the shape of the atrium copulatrix, funnel shaped durctus bursae and bursal plates which were all partly protruding into the ductus. In all species the bursal plate lies proximal in the bursa copulatrix, but the topical arrangement of the half-moon shaped Marigold seed shaped structure, close to the bursal plate can shift position. In most taxa the signa are U-shaped, with the outer section always in the terminal part of the bursa attached to an elongated crab-claw shaped ending, also referred to as elongated cowry when it shortens. When widened, this structure looks markedly similar to a cowry shell.

The central distributed species, including *C. determinata sausae*, have V-shaped signa. In the Bali taxon *C. kasperi* n.sp., the central part of the U-shaped signum is detached, showing some departure from the U-shape, demonstrating that the V-shape likely has arisen from a reduction event of a former U-shape. In species with V-shaped signa, the distal component is fading out and the terminal widened section is contracted to a clear cowry shape. These species, such as *C. aurora* are still included in the *insularis* group because of the phallus configuration criterion of ♂♂.

Variability of non-*insularis* species (look-alikes, perhaps mimics)

They are so far seven taxa seen with sometimes very similar phenotypes as in the *insularis* group members, flying sympatric or disjunct on regional islands at approximate similar latitudes. They structurally do not meet the defined *insularis* group parameters, despite displaying similar patterns and even development trends.

The cornuti configurations in the phallus hull are significantly different from the *insularis* design especially by the larger size of the cornuti aggregates, which have a tendency of shifting to the apex and the presence of tubular structures in the bursae of ♀♀. Two of them

possess the trapezoid basal white band, differing from each other by width of fasciae bands, and black margins. The narrower banded *C. gabika*, without black margins but exhibiting otherwise almost all *C. determinata* external features, can structurally not be assigned to the *insularis* group. The terminal vesica lobe however is strikingly similar to *C. bianca bianca*. These two species lack the sub-basal wedge, which prevails in the other five look-alikes that hereafter will be placed in two structural different sections.

All five of them are broad-banded and have black margins. They all have the orange sub-basal wedge, by which the basal white field becomes V-shaped. Two S. Malayan species could potentially originate from Borneo. Three Philippine species with virtually identical almost fully orange front wings and circular sub-basal white spots as in the northern *insularis* branch species, lack any trace for structural affiliation or zoogeographical affinity.

The *clama*-group

External features of ♂♂: So far two confirmed species with a similar habitus as the northern *insularis* branch specs. *C. clama* and *C. barlowi* nov.sp. were joined in a newly designated *C. clama* group. They can visually be separated by a V-shaped basal white wing section, contrasted with a black inner margin on the ante-median, meeting the outer border at an obtuse angle. (mean for *C. barlowi*: 124.45' +/- 1.15' for a n=12 series in MWM from Borneo). In ♂♂ the black line is uninterrupted slightly curved or straight over most of its length. The *determinata* designations by Holloway 2001, and Černý, 2009 probably fall into this category. Hind wings: white to light pink, abdomen: greyish white. On Borneo *C. clama* flies in lower montane biotopes.

♀♀: Front wings: as the above defined *determinata* taxa, but with a complete sub-basal band, whereby the outer border section carries a prominent crimson wedge, pointing to the tornus, partially closing the outer margin of the basal white transverse band. The breadth of the median bands are > 1.5 mm. The crimson part of the ante-median meets the costa obtusely under an >95' angle. The black line carries an inward dent at its center, by which these can be distinguished from the *insularis* taxa. Hind wings: light pink, abdomen: greyish white.

♂ structures: The armature has slightly inward curved pointed ventral lobes, which are shorter than the tongue shaped lobe sections. The latter have one sharp thorn at the center of the dorsal rim. Specimens from both Borneo and the *C. clama* HT from the Malay Peninsula, have this diagnostic feature in common. The phallus is > 2.5 mm long and the layout of the cornuti configurations in the hull differs significantly from the *insularis* members by that they have merged to one large field, which has shifted to the apex. The vesica displays a backward pointing lobe with a single proximal cornuti field of large cornuti. This lobe is homologue with the thumb shaped lobe of the *insularis* taxa. The anvil shaped *insularis* lobe is present as a small protrusion under the basal slanting thumb lobe. It is not developed. The small lateral lobe (referred to as the opposite lobe) has the small *insularis'* like field, but this is strongly reduced, and carries <12 small short cornuti. The terminal lobe is well developed and densely covered with a large number of short, sharp, rose-plant like thorns. It shows up in the phallus hull as an apical positioned diffuse spot.

The ♀ bursa (*C. barlowi*) possesses an elongated 2 mm heavily chitinized plate, inwardly positioned over 2/3rd of the ductus bursae with 12 longitudinal ribs. The oval bursa has a wide U shaped signum and a slightly widened cowry shaped terminal end. The oviduct emerges from a Marigold-seed shaped, one mm structure, adjacent to the bursal plate.

The *crasizona* group

External features: The three species in this group display very similar wing fasciae and colours as the northern *insularis* species. They can be separated from each other by the degree of encircling (closing) of the white basal spot on the front wing, similar as in the *C. lunulata* group, (Lourens 2009). They occur in the Philippines in distinct geographical regions: *C. crasizona* on Mindanao/Leyte, *C. johani* on Negros/Panay and *C. libulae* on Luzon/Mindoro.

All of them have straight transverse bands, with thick black margins on the median bands, outer- on the post and inner- on the ante-median, as well as the outer basal and the tornal pointing wedge on the outer wing border. The ♂♂ have three black discal spots, the more central one shifted outwardly. The two median bands have a tendency to merge, narrowing the white zone that separates them, to form a uniform fully orange or crimson zone, with a small white spot, centered by one proximal black discal spot in *C. libulae*. In this species the discal white spot of ♂♂ is fully encircled and forms in ♀♀ a balaclava-mask with two black "eye" dots.

In *C. johani* nov.sp., the degree of closing of the basal white spot, as well as the merging of the medians is incomplete, leaving either a small white zone from the cell spot to the costa border in half closed specimens, or still having a full white transverse band in others. In one ♂ specimen of *C. johani* nov.sp. from Panay Island, the outer marginal half is closed, similar as in some ♀♀. The incidences of these variations on Negros and Panay Islands did not allow to designate subspecies status for any of these populations, because of insufficient numbers of specimens by which the frequency of this apparent modifier allele in these two island populations, could not be quantified.

In *C. crasizona* the colour of the outer marginal band and hind wings is ochre, the white zone between the median crimson bands mostly broader and only slightly narrowing down in one ♀ from Leyte. The hind wings are brilliant pink, in *C. crasizona* superimposed on the ochre fond. It was observed that species were generally more reddish, the farther North they occur, which also applies to other Philippine species within this Genus: *C. janinae, C. vespertata,* and in the species of the *C. rosabra* section of the *Cyana gonypetes* group (in prep.).

♂ genitalia structures: The cornuti configurations in the phallus hull show in lateral position, prior to ejection of the vesica, two patches of flat small sclerotized structures (in *crasizona* overlapping) from which a limited number of cornuti sprout. These diffuse fields of small plated cornuti show a tendency towards apical positioning. Their position in the phallus hull is characteristic for each species. In *C. johani* there is one field in the center and one at 3/4th to the apex, in *crasizona* one distally, and in *libulae* a vague field at 3/4th and a second at the apex from which the cornuti protrude outwards. The lesser

spot consists of five chitinized platelets. The vesica lobes are variable with only one identifiable "terminal" lobe (in *libulae*) from which a small number of short broad bladed cornuti sprout. The bladed spines, arising from an underlying scale-covered plate on the terminal sections of the vesica lobes is diagnostic for these species: *C. crasizona* has 2, *C. libulae* 4 and *C. johani* 7 of these.

The well developed vesicas display a variety of lobes, of which the one carrying the cornuti is blunt ending, positioned terminally in *C. libulae,* and laterally in *C. crasizona* and *C. johani*.

♀♀ have the tiger-moth pattern stricter maintained. In *C. crasizona* from Mindanao the median white band is twice the width as in the ♀ from the Leyte-Island population. The white zone is narrow and the head of the balaclava mask hardly developed. The margins are wider than in the Visayan *C. johani* and have a clear ocher tinge. In this species the balaclava mask is more pronounced. The basal white spot is oval rounded in *C. crasizona* and *C. johani,* but on the outer border never fully closed like in *C. libulae* from the northern Philippine Island of Luzon.

♀♀ G e n i t a l i a have almost identical shaped bursae, with a central constriction, separating the upper part containing the plates from the lower half carrying the peripheral signa. These are thin and light. In *C. crasizona* there is a small Marigold seed shaped structure at the separation line, from which the oviduct originates. The thin and wide U-shaped signa at the periphery of the distal half of the bursa possess vague cowri-shell shaped structures and 1 or 2 maculae.

The bursal characteristics of these three species are clearly different and support the species status allocations of their sexual partners. The extend of the diagnostic differences in bursae excludes a possible assumption for the incidence of a clinal variation gradient behind the mask formation trend in these species.

Considerations about relationship of the non-*insularis* groups

Although the phenotypes of the *crasizona* group are markedly similar to the northern representatives of the *insularis* group, they cannot be assigned to this group, because of their very different genitalia structures.

The ♂ *C. libulae* closely resembles the ♂ *C. coccinea* and the ♀ *C. johani* is almost identical to the ♀ of this species. The *crasizona* ♂ structures, in particular the embryological positioning of the cornuti-configurations in the phallus hull, shifting to the apex, is also seen in two representatives of the *clama* group. The *crasizona* vesicas are only ornamented with diffuse cornuti clusters and scaly base remnants of probably reduced cornuti on the smaller lateral lobe. In the *clama* group the *insularis*-type ornamentations are present and clearly identifiable as one (merged) field composed of the usual ornamentations of the "thumb" shaped and opposite lesser lobe, as well as the diffuse type, first seen in *crasizona*. This could possibly indicate that the *clama* group might be intermediate. The *crasizona* ♀♀ have a uniform bursal layout with a central fissure, and carry very light U-shaped signa. They vastly differ from any *insularis* shape but resemble the *C. barlowi* shape which also

has an initial bursal division at the meeting point of the bursal plate with the bursa. These features could indicate some degree of relationship between the *clama* and *crasizona* groups, but it would not be justified to consider that hereby sufficiently substantiated.

It appears likely that the *clama* group is remotely related to the *insularis* group and because of that, forms an independent parallel development with convergent developed or developing phenotypes.

The three Philippine species of the *crasizona* group display a similar form of defensive mimicry as individuals exhibiting the generally successful *insularis* morphs on the Great Islands, assumedly acquired during past cyclic glacial interglacial periods.

There exists no justification for lineage affiliation based on external features.

Despite the above discussed trends in structural criteria, the Philippine *crasizona* group evolved too far away for being allowed to be considered an extended development of the clama gp. They represent an endemic monophyletic branch, parallel to the *insularis* group likely originating from a remote common ancestor.

The balaclava mask development trend and the almost full orange habitus development trends in the *insularis*, *clama* and the *crasizona* groups are parallel developments (see conclusions) and the extend of differences in structural features in each of these groups is indicative for remote rather than close relationship. The incidence of the rise of species with almost fully orange morphs with apparent predator deterrent white spots might in the *crasizona* and at least three other non-related groups within the *Cyana* genus, suggests that these features are probably under the control of predation complex(es) and the incidences of appearance in various *Cyana* sections merely a recurring expression of earlier adaptations.

Final conclusions: interpretation of trends

The earlier defined section of 22 sometimes confusingly similar SE Asian taxa of the Genus *Cyana*, has been classified on basis of structural criteria of genitalia of both genders. ♂ differential criteria were derived from configurations of cornuti aggregates on the everted vesica, which are species specific, as illustrated and described. The vesica lobes are 3-dimensionally almost similar, with two ornamented lateral lobes, from which a backward pointing lobe arises with variable densities of minute warts, and a terminal lobe with small short spiny cornuti. Prior to eversion of the vesica, the two lateral cornuti fields are visible at the center of the hyaline phallus. The position of the lesser cornuti aggregate under the projection of the larger field on the lateral side of the phallus hull, represents a diagnostic group criterion for this *insularis* designated group. Its lay-out is embryological determined and reflects, in a more condensed form, a narrow range of variation noticable in 15 taxa, considered to be a monophyletic entity. Seven taxa, with sometimes very similar habitus, departed from the group-criterion, inclusive of *C. bianca*, which species had erroneously been synonymized with *C. determinata* of the *insularis* group. ♀ genitalia of the *insularis*-taxa further support the group designation by similarities of signa and plate features in the bursae copulatrix, although these exhibit a lesser degree of homogeneity. *Insularis*-signa are commonly U-shaped in most of the species, except for a section of taxa closely affiliated

to *C. determinata*, unified by having V-shaped signa. This structural deviating feature coincides with several significant departures from the usual broad (ie > 0.7 mm) fasciated transverse Tiger-moth front wing pattern, initially in ♂♂ only (*C. determinata determinata* and *C. determinata sausae* as well as in the intermediate *C. paukstadti* n.sp.), but eventually progresses to both genders (*C. maaikeae* n.sp., and *C. aurora,*) in which the fasciae have narrowed down to (< 0.4 mm) and always meet the outer border basad acutely. This trend represents a cladistic development, away from, but still within the variability of the *insularis* group's criterion, in the *C. determinata* section, which culminates in the rise of the closely related *C. gabika*, which species has departing phallus hull cornuti aggregate configurations, as well as novel vesica-features, but some of the usual *insularis* cornuti field characteristics still contained, as well as tubular structures instead of signa in the bursa, already seen in *C. aurora*. It shares this feature with a strikingly similar terminal vesica lobe with *C. bianca*. Both these species possess trapezoid shaped basal white wing sections and have basad acute angling fasciae. They notably differ thereby including the position of the black margin, when present.

♀♀ of two *C. determinata* populations on Borneo and the S. Malay Peninsula, still have black margins, whereas these are maintained in both genders of *C. paukstadi* nov.sp. from Java and the peripheric distributed species *C. carmina* on Palawan and *C. kasperi* nov.sp. of Bali. The intensity of blackening of the margins gradually fades out over a gradient from Borneo, Java, S. Malay Peninsula and has completely vanished in *C. martinii* nov.sp. from Sumatra. There are also no black margins in *C. ridleyi* and the illustrated affiliated *C. ridleyi siberuta* n.ssp. (in MWM) population on Siberut Island, Mentawi Group of Island, 130 kms S. of Sumatra. The *ridleyi*-related section of the *insularis* group, possesses obtuse angled ante-median fasciae, including *C. ridleyi roberti* nov.sp. of the Malaysian Genting Highlands. Four Northern *insularis* species: *C. malacca* nov.sp., South Thailand (NE of the Malayan Sultanate), *C. julietta* nov.sp. from the Chang-Mai area, *C. weerawoothi* nov.sp. from Central Thailand and *C. coccinea* from Sikkim, have solid black margins along the medians together with basad obtuse ante-median fasciae. This Northern *insularis*-branch distinguishes itself also from all other *insular*-bound *insularis* taxa by possessing complete sub-basal fasciae, connected to the outer margin by a torsal pointing wedge. This wedge interferes with the more or less trapezoid shape of the basal white band, rendering it V-shaped or modifying it into an oval or rounded white spot. In these four species the white spot formation is also gradually progressing in between the median white bands, in which the orange/red fasciae approach each other, creating the shape of a white balaclava mask as an intermediate. This spot formation trend series is stunningly similar in three Philippine species of an earlier described *crasizona*-group, structurally held together by vastly distinctive but similarly shaped genitalia. This group represents a parallel development line without a sufficiently confirmative zoogeographical background history, very widely disjunct from the four Mainland SE Asian *insularis* taxa.

The exactly similar intermediate balaclava-mask sequence feature suggests that the genetic Back-ground for this trait must have been encrypted and could represent an ancient morph that recurrently became phenotypical activated upon the prevalence of the right triggering environmental or predatorial stimuli.

Two *C. malacca* look-alikes from the Southern Malay Peninsula could not be assigned to the *insularis* group because of their enlarged (in *insularis*: lesser) lateral lobe configurations,

and a shift of these fields to the phallus apex. *C. clama* and *C. barlowi* nov.sp. constitute the *clama*-group, of which there are various other look-alikes still to be investigated such as the illustrated couple found in MWM from Borneo. (see descriptive section) This group is likely to also include the *C. determinata* taxon sensu Holloway, 2001.

They can instantly be differentiated by an inward pointing dent at the center of the black ante-median in ♀♀ only. In *C. bianca* the black dentation shows up in both genders.

C. gabika, C. bianca and the *clama*-group taxa are structurally closely united by the possession of ornamented partly backward pointing vesica lobes. Based upon the fact that the cornuti aggregates on these lobes are identical to those of the larger lateral lobe of the *insularis* taxa, it is concluded that they represent a 3-dimensional reshuffle of the *insularis* lobe lay-out. Also the presence of the lesser lobe ornamentations with radiant cornuti sprouting from a narrow base, and terminal lobe similarities further support the likeliness of this event. The maintenance of the backward pointing vesica lobe is interpreted as a structural homologue for an assumed functional coupling mechanism.

Based upon the presently available structural data from only a limited number of taxa, it is not possible to conclude whether the *clama*-group is a branching off from the *insularis* lineage, or represents a parallel developing lineage on its own.

The first option is most likely, also because they are flying sympatric with *insularis* taxa, but there are a considerable number of other species with apical shifted cornuti aggregates on Java (illustrated by Roepke, 1946) which need to be investigated prior to reaching a final conclusion on this matter.

The 22 taxa listed below are ranked according to supposed grouped lineage relationships. They are summarized in the appendix hereafter by brief descriptions of (sometimes very minute) external diagnostic feature combinations by which these taxa can also be differentiated.

Appendix

Enumeration of confirmed and likely "*insularis*" group taxa as well as look-alikes, for swift field identification by highlighting of some diagnostic differential external features. In addition to the general habitus grouping criteria in the material section, the strictly *insular* taxa of the Sundanean Islands can be diagnosed by the possession of a more or less trapezoid basal white field on the front wing, and the absence of a sub-basal wedge on the outer border.

Section A 1: involves the taxa of the surrounding Islands: Palawan, Bali, Siberut (SW off the Sumatran coast). These species display a strict Tiger-moth habitus with straight; broad perpendicular fasciae and almost complete, dull ending sub-basals in ♀♀. The ante-medians are fully straight in both genders, whereas these are straight in ♂♂ only but sickle shaped sinusoid on the costal half in the *C. determinata determinata* affiliated ♀♀.

C. carmina Černý, 1993. Figs 1a and 1b. Palawan, the Philippines: Broad straight sub-basals in both genders. In ♂♂ early signs of mask formation by the partial merging of the

inner orange borders of both medians on the outer wing half. The ante-median with very light and post medians with heavier outer black margins. Hind wings carmine-red.

***C. kasperi* nov.sp.** Figs 2a HT ♂ and Fig 2b PT ♀ Bali, with broad straight red fasciae and light black margins as *C. carmina*. In ♂♂ early signs of mask formation restricted to the post-median. Sub-basals prominent but incomplete, heavier and dull ending in ♀♀. Hind wings flushed reddish, in ♂♂ only on the outer half. The marginal band with light inward dentations. Hind wings pink, those of ♂♂ only on the outer half.

Section A 2: The strict Tiger-moth habitus prevailing but fasciae slightly narrower than in the A1 section. The ante-median of ♂♂ inwardly light convex. No black margins.

***C. ridleyi siberuta* nov.ssp.** Figs 3a and 3b. One pair from Siberut Island, off the SW coast of Sumatra in MWM, with broad straight red fasciae. Both genders without a sub-basal wedge. Cell spots reduced, in the ♀ similar as the *C. ridleyi roberti* n.ssp.. Illustrated/not dissected.

C. ridleyi ridleyi Hampson, 1900. Fig. 4a. The HT ♂ from Singapore figured, not dissected. Identifiable by broad brick-red fasciae, the sub-basal is short and pointed and does not extend over the costal wing half, the ante-median light concave versus the base, the post-median at the center 120' inwardly broken, the broad apical wedge meets the costa widened, but is not fully bridging to the margin. No black margins along the medians. Hind wings orange suffused at the outer border, gradually lighter towards the inner and frontal borders.

***C. ridleyi roberti* nov.ssp.** Fig 5a ♂ HT, Fig 5b PT ♀ Genting Highlands in CHSB. Differs from the Singaporean *C. ridleyi ridleyi* ♂ HT by having the broad outward section of the dichotome split post-median on the meeting point with the costa closer to the costal border, just not arching to the apex. The inner branch (absent in *C. ridleyi ridleyi*) is small and interrupted. Both genders with long, just incomplete, sub-basals, ending broadly in the ♀ and pointed in the ♂, fasciae colour orange, no black margins. In ♂♂ the ante-median is light convex, in ♀♀ only on the costal half, and their post-medians with a small outer section bending to the tornus. The outer margins with short inward dentations. In ♀♀ the inner discal spot is faded. Hind wings of ♀♀ orange, in ♂♂ restricted to the outer border.

Section A 3:. Habitus features*:* narrow fasciae and long pointed sub-basals in both genders**.** No black margins. This taxon is hereby intermediate to the following section.

***C. martinii* nov.sp.** The ♂ HT Fig. 6a ♀ PT Fig 6b. TL Sumatra. This species resembles *C. determinata determinata* (below) but can be distinguished by a shorter apical wedge of the dichotome branching post-media, not fully arching to the marginal band. This is similar as in *C. maaikeae*, (shown hereafter) but *C. martinii* has the outer half of both medians outwardly curved towards the tornus (in *C. maaikeae* only the post-median). The ♀ ante-median stands more acute on the outer margin, creating an almost isoscelic trapezoid. Both genders with short and pointed sub-basals. ♂ hind-wings white, in the ♀ pink on the outer half.

Section A 4: The centrally distributed taxa of Borneo, West Java, Sumatra and the S. Malay Peninsula. Habitus features: ♂♂ with narrow fasciae and broad banded ♀♀.

C. determinata determinata (Walker, 1862 & Hampson, 1900). Figs 7a ♂ and 7b ♀ Borneo. Five ♂♂ from Mt. Trus Madi on Central Borneo in MWM with short pointed sub-basals, and narrow fasciae without median black borders. The straight ante-median meets the costa with a small club shaped section bending to the sub-basal, and stands acute on the outer border. Initial formation of a mask head between the medians. Hind wings white, with diffuse orange scales along the inner border. The ♀ in BMNH, illustrated by Holloway 2001, likely representing a genuine specimen of this rare gender, has broad banded red fasciae with sharp black margins along the medians. The ante-median is on the costal wing half inwardly convex. The marginal band is very narrow, ocher, inwardly thinly serrated. The ♀ hind wings dark rose, those of ♂♂ white.

C. determinata sausae **subsp.** Bucsek, 2012 ♂ HT Fig. 8a TL Lata Lembik, Malay Peninsula in MWM. Seven ♂ PTs investigated, and two ♀♀, one illustrated as Fig. 8b from Genting Highlands in CHSB. Of the descriptive parameters, the dichotome split section of the post-median bridging to the apex, the inward dentation and short marginal band also apply to other taxa in this segment. For differentiation the very low degree of mask formation is helpful. The ante-median meets the costa with a minute triangle on the costa. Together with the inward branched section of the post-median it creates a rounded impression on the costa. The parallel positioning of both medians, with in ♂♂ acute angles on the outer border, and the almost crimson fasciae colour jointly contribute to identification. The ♂ hind wings are variable, ranging from white to considerably carmine suffused, more densely along the borders, in ♀♀ from the Genting Highlands CHSB uniformly dark salmon coloured. The incomplete, dull ending sub-basals, acute angles of the medians, with rudimentary black borders along the outer margin characterize this congener.

C. paukstadti **nov.sp.** HT ♂ Fig 9a and PT ♀ Fig 9b from W Java. in MWM and ZMAN. respectively. The ♂ sub-basal is short and pointed, narrower than in the heavier and broader ending ♀. Fasciae colour of the medians tends to orange in the ♂. The ♀ medians are dark ochre with a light ocher inwardly serrated margin. The medians have light black margins in both genders. Distinguishable from *C. d. determinata* by a minute symmetrical triangle at the meeting point of the ante-median on the costa. This contributes to a very slight partial rounded shape on the costal border of the trapezoid white field. On the outer wing half, the medians show a tendency to meet, forming the neck of the mask. ♂ hind wings white with light ochre suffusion. Those of ♀♀ dark ochre with a rose flush.

Section A 5: Habitus features: fasciae straight (< 0.5 mm**)** narrow fasciae and very short sub-basals in both genders, without any tendency towards white spot formation in between the median fasciae. Two species with a short marginal band (as ♂♂ in A 4, not reaching the tornus)

C. maaikeae **nov.sp.** HT ♂ Fig 10a and PT ♀ 10b from Mt. Trus Madi N Borneo. Both genders with very short sub-basals. The narrow median fascia parallel and straight, standing almost perpendicular on the outer border. The outer dichotome branching section of the post-median is as heavy as the transverse section. Cell spots very small. In ♀♀ the basal

white band forms an almost scalene trapezoid. The post-median is slightly concave versus the narrow ochre margin. Hind wings salmon coloured, fading towards the base.

C. aurora Roepke, 1935. The HT Fig 11b TL Sumatra Medan-Deli, in the collection ZMAN at Leiden, the Netherlands. Three ♂♂ Fig. 11a and two ♀ specimens from Sumatra and Borneo in MWM with very narrow parallel fasciae, similar in both genders, no black margins and no cell spots. Hind wings light pink suffused.

Section A6: still unconfirmed but potential *insularis* group candidates.

C. erythrostigma Roepke, 1946. The HT ♀ Fig.12 from W. Java in ZMAN, strongly resembles *C. aurora* Fig 11b2 in MWM. This taxon is illustrated only. Not dissected. Only 2 ♀ specimens are known to exist.

C. aurantiorufa (Rotschild, 1912). One ♀ specimen illustrated as Fig 13 from W Java in MWM with almost fully reduced ante-median fasciae, but still showing the black margins, almost meets the description of sp. *C. a. niasana* (Rotschild, 1912) of this taxon from Nias Island, Sumatra. It is illustrated/not dissected. Only three traceable specimens are known to exist.

Section B : The *insularis* species of the northern Malay Peninsula and Mainland SE Asia referred to as the Northern Branch of the *insularis* group, can all be diagnosed by the possession of a prominent tornal pointing sub-basal wedge. Habitus feature: taxa which a V-shaped or oval rounded basal white field on the front wings, broad fasciae with complete sub-basals. In both genders a tendency to form encircled basal spots and a balaclava mask between the medians. There is a trend towards reduction of the mask neck by merging of the medians on the outer half of the front wings.

C. malacca **nov.sp.** HT ♂ Fig 14a and PT ♀ Fig 14b both from SW Thailand at the Central Malay Peninsula. The HT ♂ with an almost V-shaped white basal spot. The sub-basal on the costa fully bridged to the ante-median. The sub-basal wedge interferes with the trapezoid shape as in the species above. Early signs of mask formation on the post-median band in the ♂ only. In the ♀ the wedge is short. Fine black margins along the medians. Broad and smooth marginal bands. ♀ hind-wings rose, in the ♂ light and dispersed.

C. juliettae **nov.sp.** HT ♂ Fig15a and PT ♀ Fig 15b from NW Thailand close to Chiang-Mai. The complete sub-basal is outwardly V-shaped and broad, rendering the white basal spot diamond shaped, narrower than in *C. malacca*. On the costa closed, and almost closed on the outer border. The ante-median is widened on the border, closing in towards meeting the post-median, narrowing the neck of the balaclava mask. The ♀ like *C. weerawoothi*, (below) except for the black margin on the post-median which is sinuous. ♂ discal spots heavier than *C. malacca*, and the head of the mask is open on the costa, wider in the ♀. ♀ hind wings carmine red.

C. weerawoothi **nov.sp.** The HT ♂ Fig 16a and PT ♀ 16b from SE Thailand are very similar to *C. malacca*, but the arching along the costa has progressed over the entire stretch from the ante-median to the apex. In ♀ PTs the costal arch is just not full, but the wedge is as prominent as in the ♂. The inner black margin is sinuous in the ♀, the other straight as

in ♂♂. The medians of ♂♂ are merged on the outer wing half; the white field reduced to a circular spot surrounding the discal spots. ♀♀ have maintained the transverse white bands, although both medians have narrowed and form part of the neck of a balaclava mask shape. Hind wings pink.

C. coccinea (Moore, 1878) Sikkim. Figs 17a ♂ and 17b ♀. An unmistakable, brilliant orange habitus in ♂♂ on a background of light orange, in what in *C. weerawoothi* appears as white wing sections. Sub-basals, including the wedge are broad. The black margins, convex on the ante- and concave on the post-median band position versus the wing base. In ♀♀ the latter is straight. ♀♀ have the white wing sections maintained, with almost fully encircled white basal spot and a full balaclava mask between the medians. Hindwings in ♂♂ deep orange, in ♀♀ carmine.

Look-alike species: not complying with the structural *insularis* group-criteria. Full structural data in the descriptive section, see also discussion about the assumed parallel development of the following taxa.

Section C 1: Habitus: Two species with a trapezoid white basal front wing field, without sub-basal wedges.

C. gabika Bucsek, 2010, Figs 18a ♂, 18b ♀. Malay Peninsula. Although this species displays a somewhat similar habitus as the ♂ taxa of section 4, the broken white background colour combined with the narrower, lesser straightened transverse fascia and the different discal spot arrangement, this species is instantly differentiable by this complex of features. See also further external details in the descriptive section. This common species exhibits the same habitus as the *C. determinata sausae* ♂ in both genders and is the only taxon with 3 discal cellspots in the ♀.

C. bianca (Walker, 1856) Figs 19a ♂ and 19b ♀ from SW Thailand. A very broad banded crimson species with incomplete and pointed sub-basal in the ♂ and almost full dull-ending in the ♀. Medians with prominent black margins. In ♀♀, the one on the ante-median with an inward dent at the center, in ♂♂ lesser or with a light undulation. The basal white field protrudes with a small white bulge into the sub-basal opposite the inward dent on the ante-median. The two outer cell spots of ♂♂ parallel with the post-median. The ochre margin reaches the tornus and is lightly serrated. Hind wings deep pink.

Section C 2: Habitus features: Two species with straight and (> 1.5 mm) broad crimson median fasciae, with heavy black margins**,** straight in ♂♂ and in ♀♀ at the center inwardly single dented. No clear trapezoid basal white wing field because of a thin sub-basal wedge. The ante-median stands obtuse on the outer margin, meets the costa at an 90' angle because of a curved section at the very end. The costal wedge of the post-median distally blackened. The longitudinal cell spots of ♂♂ are wider separated from each other than in *C. determinata* taxa, and closer to the medians.

C. clama Bucsek, 2010. A singleton ♂ HT Fig 20a from the Malay Peninsula and a ♂ singleton Fig 20a2 from NW Borneo. Fig 20a3 is the ♂ *C. determinata determinate* sensu Holloway, 2001 illustrated in Moths of Borneo. This specimen possesses a straight black

margin inwardly along the ante-median. It meets the costa with a pinhead sized basal curved knob and stands basad acute on the outer wing border. The three illustrated specimens have this in common. In *C. determinata* taxa the ante-median angles always basad acute.

***C. barlowi* nov.sp.** HT ♂ Fig 21a and PT ♀ 21b from Genting Highlands in CHSB. Very similar to *C. clama,* with similar black margins but more advanced mask development between the medians in ♂♂. Hind-wings of ♂ shiny white and in the ♀ uniformly light pin. A series of twelve (very likely) *C. barlowi* specimens from Mt. Trus Madi NW Borneo in MWM with heavier sub-basal wedges requiring GP confirmation One pair from NW Borneo, Trus Madi is illustrated Figs 21a2 ♂ and 21b2 . The ♀♀ have sharp black margins with a central inward dent on the ante-median.

Section C 3: Habitus features: Three species with very broad (2-3 mm) median fasciae and extremely wide marginal bands fasciae**.** Front wings with >50% orange/crimson red coloration and an enlarged sub-basal wedge, encircling or almost closing the basal white spot on the outer margin and the costa. Heavy black margins along the medians. The semi-circular sub-basal and the convex ante-median have black borders, accentuating the spot shape. The cell spots touch or are partly incorporated in the very broad crimson medians. The broad marginal bands inwardly smooth.

C. crasizona (Wieleman & West, 1928) Figs 22b2 HT Philippines, Mindanao, Kolambugan. An uncommon species known to occur also on Leyte Figs 22a ♂ and 22b ♀. The sub-basal and median fasciae crimson. The marginal band is orangy pink in both genders. The sub-basal white spot is on the outer border almost closed in ♂♂, in ♀♀ wide open. ♂♂ with a balaclava mask, ♀♀ with a full white band between the medians, broad in Mindanao, narrow in Leyte. The hind-wings ochre-yellow.

***C. johani* nov.sp.** HT ♂ Fig. 23a and PT. Fig. 23b from Panay Island, the Philippines, Visayas. An abundant species, also flying on Negros Island. Figs 23a2 ♂ and 23b2 ♀. All fasicae deep crimson. The basal white spot is not fully closed on the outer border. In both genders the white band between the medians can either be full or can be merged on the outer wing half. The discal spots are almost fully encircled by (remnant) white from the transverse band, however always open along the costa. The hind wings are carmine-red.

C. libulae Černý, 1993 HT Figs 24a ♂ and 24b ♀ Philippines, Quezon Province, a common species on Luzon, even at 1400 m altitude in Mountain Province. Fig 24b2 from Banaue. The species also flies on Mindoro. The imagines have an encircled basal white spot in both genders. In ♂♂ the inner discal spots fully surrounded by white, closed along the costa. ♀♀ can either have a full balaclava mask between the medians or have the neck thereof almost fully carmine dusted. Hind wings deep carmine-red.

Acknowledgements

Most of the material elaborated in this study came from Dr. Karel Černý, who stimulated me to extend this taxonomic research beyond the geographical territory of the Philippines. Most of his Indonesian and all Thailand material has been sent to me for dissection. I express my sincere thanks to Dr. h.c.Thomas Witt and Dr. W. Speidel of MWM and Drs. R. de Vos, of the ZMAN in the Netherlands for their full support by which the required material could be processed, pictured and some old type descriptions be traced. Karol Bucsek is gratefully acknowledged for his esteemed work on some Malaysian taxa, which casted new visions on the traditional eng-passed status of some taxa. Thanks to Henry Barlow' s contribution, most of the Peninsular Malaysian taxa could finally be better understood based upon material from his private collection made available for dissection. I am grateful to the Board of Trustees of the Malaysian Entomological Society for permission to publish copies of two adult images illustrated in Moths of Borneo vol. 7. I thank Dr. Alexander Schintlmeister for helping me with sorting out label queries and those who contributed with advice, Dr. R. de Jong,. Erik Nieukerken, Naturalis Netherlands, Jeremy Holloway and Dr. A. Zilli of the BMNH for the realization of this voluminous publication.

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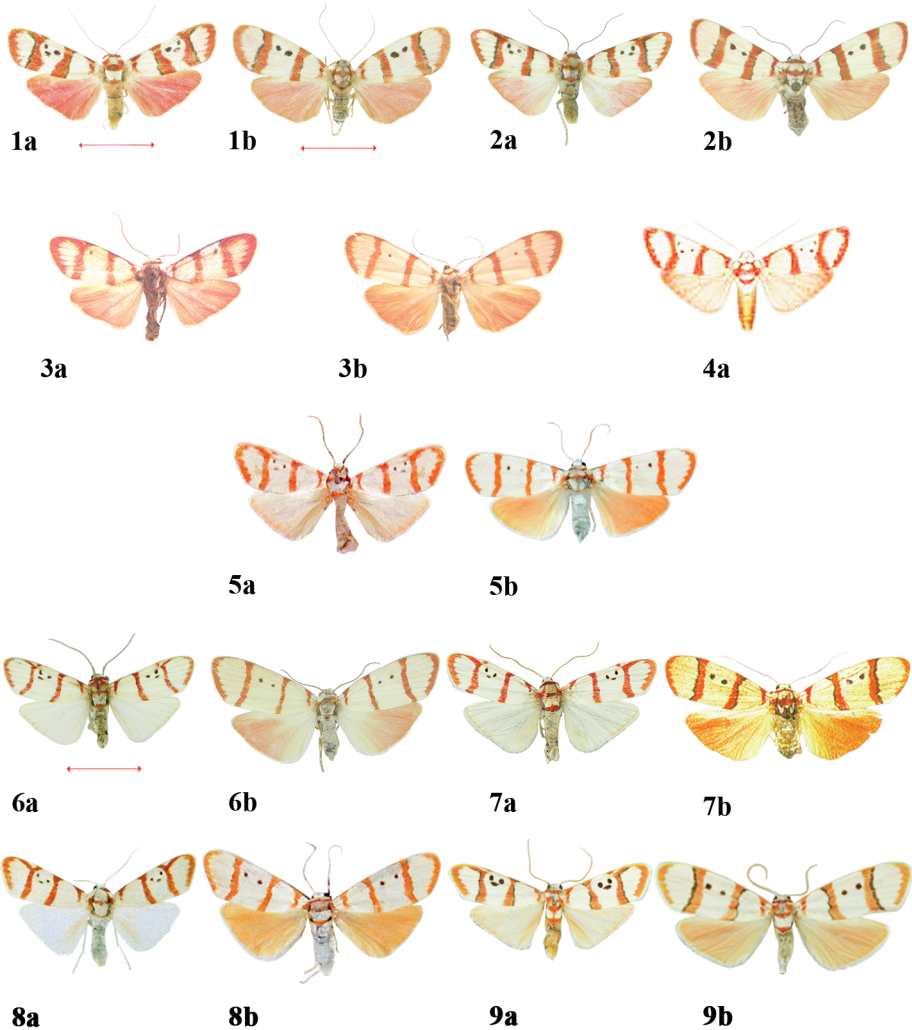
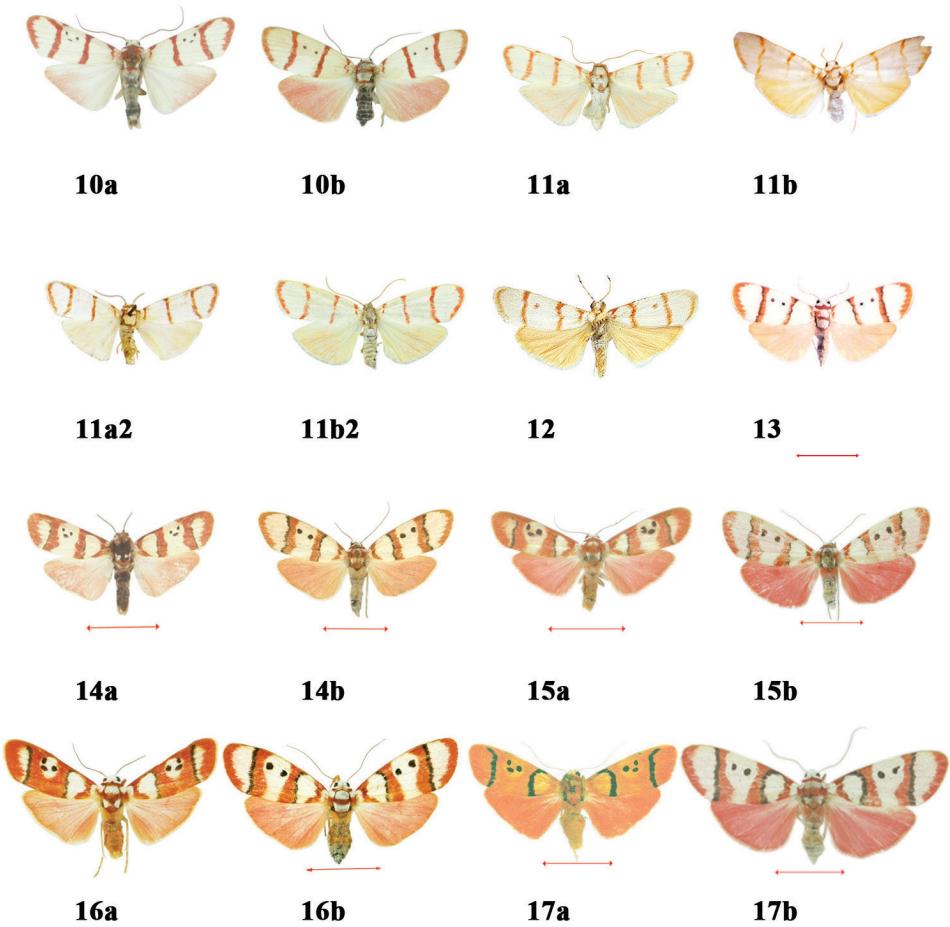
Plate 1: imagines of the insularis-group (part 1)



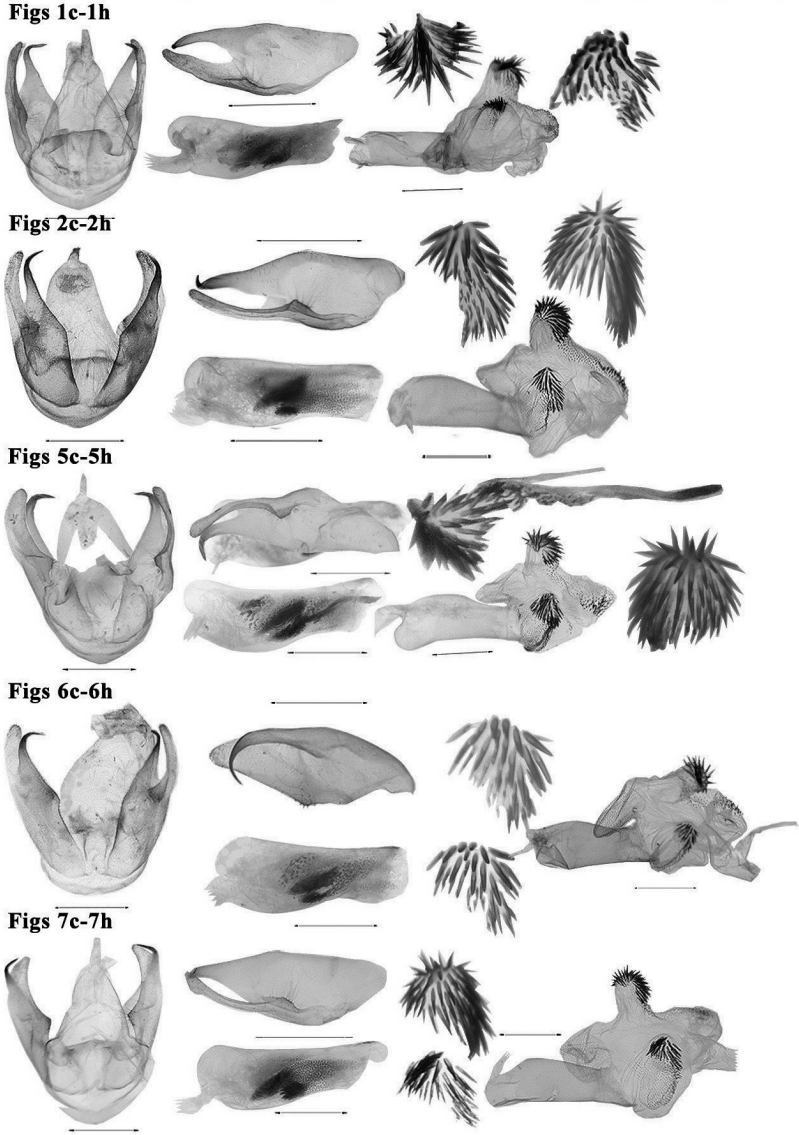
Figs 1a-1b: ***C. carmina*** ♂♀ Palawan, **Figs 2a:** HT ♂ ***C. kasperi*** n.sp. **, Fig 2b:** ♀ PT Bali, **Figs 3a:** HT ♂ ***C. ridleyi siberuta*** ssp.n.**., Fig.3b**: ♀ PT **,** S..W Sumatra, **Fig 4a**: ***C. ridleyi*** ♂ HT Singapore, after illustration Hampson, **Figs 5a**: HT ♂ ***C. r. ridleyi roberti*** ssp. n. **, Fig 5b:** ♀ PT Malaysia Genting, **Fig 6a**: HT ♂ ***C. martinii*** n.sp. **, Fig 6b**: ♀ PT Sumatra, **Fig.7b:** ***C determinata determinata*** ♀ Holloway 2001, Borneo Sarawak? wings digitally adjusted, Fig 7a: ***C. d. determinata*** ♂ Trus Madi Borneo Apin GP 23.118 MWM, **Fig 8a:** ***C. det. sausae*** HT ♂ Bucsek 2012 Malaysia Raub, **Fig. 8b:** ***C. det. sausae*** Malay Peninsula Genting, wings digitally adjusted, **Fig 9a:** ***C. paukstadti* n.sp.** HT ♂ Java GP 23116 MWM, **Fig 9b:** ***C. paukstadti*** n.sp. PT ♀ Java GP 23.117 MWM,

Plate 2: imagines of the insularis-group (part 2)



Figs 10a-10b: ***C. maaikeae*** n. sp. HT ♂ and PT ♀ Borneo Trus Madi, Fig. **11a:** ***C. aurora*** ♂ Sumatra Dolok GP 23119 MWM, ***Fig.* 11b:** ***C. aurora*** HT Sumatra ZMAN Leiden, Fig. **11a2** ***aurora*** ♂ Borneo Trus Madi in MWM, Fig. 11b2***: C. aurora*** ♀ Borneo Trus Madi GP 23.120 MWM, **Fig, 12***: C. erythrostigma* HT ♀ Central Java ZMAN Leiden, **Fig 13:** ***C. aurantiorufa related*** ♀ ssp? from W Java MWM, **Fig. 14a:** ***C. malacca*** n.sp. HT ♂ SWThailand, Surat Thani, GP JHL1056, **Fig.14b***: C. malacca* ♀ PT SW Thailand Chumphon, GP JHL 1055, **Fig. 15a***: C. juliettae* n.sp. HT ♂ N Thailand Nan Province GP JHL 92, **Fig. 15b:** ***C. juliettae*** ♀ PT NW Thailand Chiangmai GP JHL 725, **Fig 16a***: C. weerawoothi* **n.sp. HT** ♂ SE Thailand GP JHL 1073, **Fig. 16b***: C. weerawoothi* **n.sp.** ♀ PT SE Thailand GP JHL 1074, **Fig. 17a***: C. coccinea* ♂ Sikkim courtesy Dr. K. Černý, **Fig. 17b** ***C. coccinea*** ♀ Legship. Sikkim

Plate 3: male genitalia components of the insularis group taxa (part1)

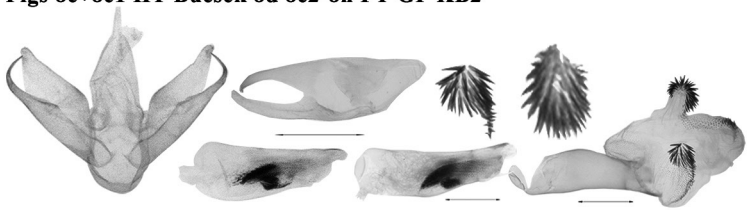


Legend: Fig nrs similar as the adult images: 1a ♂1b female. Male genitalia components: c-armature, d-male valve proxilateral view, e-phallus, f-large cornuti aggregate, g-lesser cornuti field, h-everted vesica.

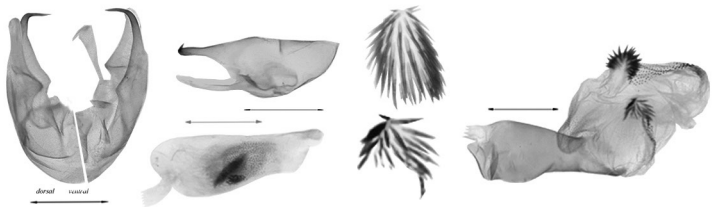
Figs 1c-1h*:* ***C. carmina*** ♂ Palawan GP JHL 82 **Figs 2c-2h:** ***C. kasperi* n.sp.** HT ♂ Bali GP JHL1044, **Figs 5c-5h:** ***C. ridleyi roberti*** ssp.n. ♂ Genting Highlands GP HSB1, **Figs 6c-6h:** ***C. martinii*** n.sp. HT ♂ Sumatra GP JHL 1038, **Figs 7c-7h:** ***C. det. determinata*** ♂ Borneo Apin GP 23.118 MWM

Plate 4: male genitalia components of the insularis group taxa (part 2)

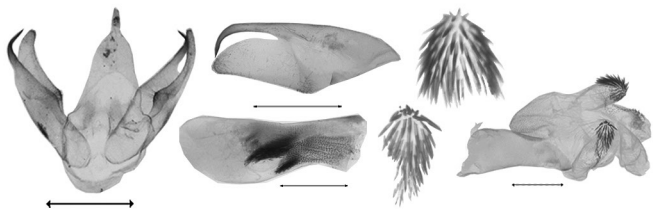
Figs 8c+8e1 HT Bucsek 8d 8e2-8h PT GP KB2



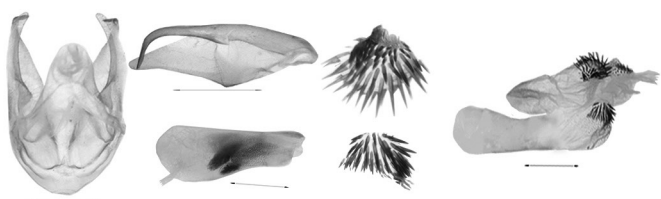
Figs 9c-9h



Figs 10c-10h



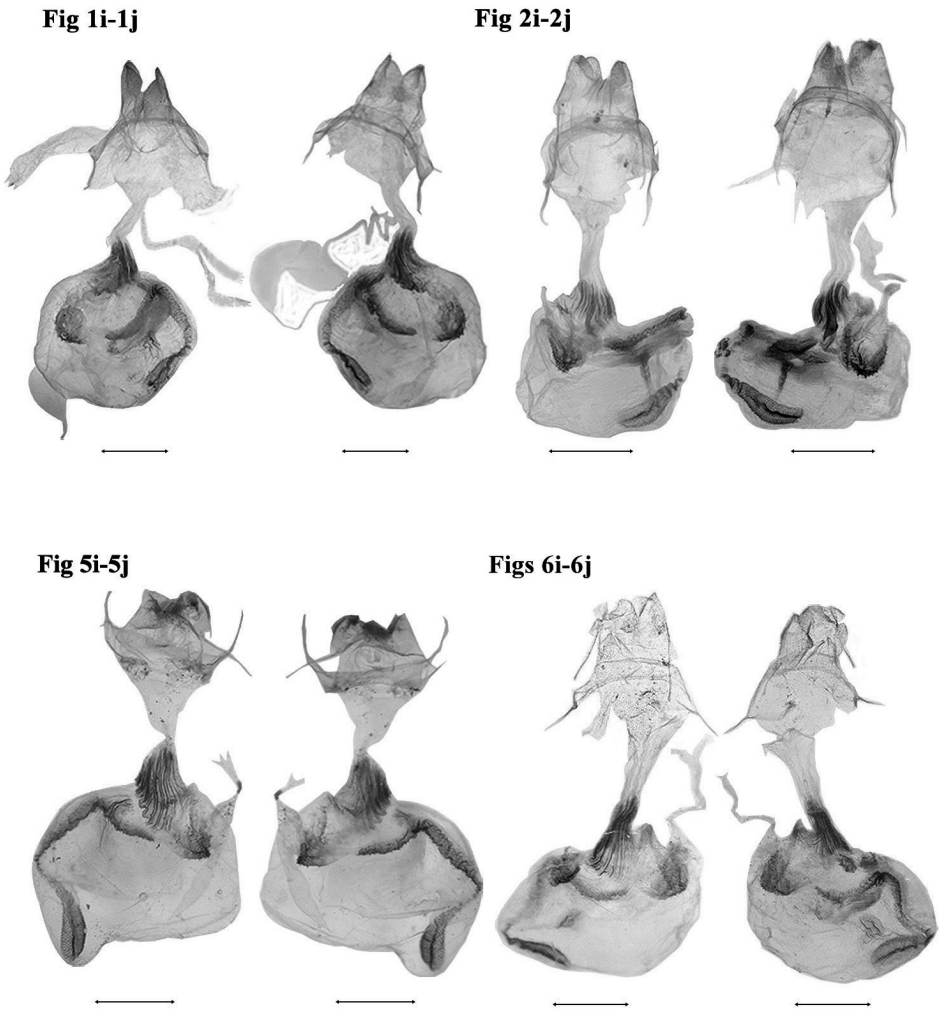
Figs 11c-11h



Legend: Figure numbers similar as the adult images: a-♂ b-female. Male genitalia components: c-armature, d- male valve proxilateral view, e-phallus, f-large cornuti aggregate, g-lesser cornuti field, h-everted vesica.

Figs 8c+8e1: HT illustrations ***C. det. sausae*** ♂ Bucsek 2012, **Figs 8d, 8e2-8h** GP KB2 ♂ PT Malaysia Raub, **Figs 9c-9h:** HT ♂ ***C. paukstadti*** n.sp. Java GP 23116 MWM, **Figs 10c-10h:** HT ♂ ***C. maaikeae*** n. sp. Borneo Trus Madi GP JHL1057, **Figs 11c-11h:** ***C. aurora*** ♂ Sumatra Dolok GP 23119 MWM,

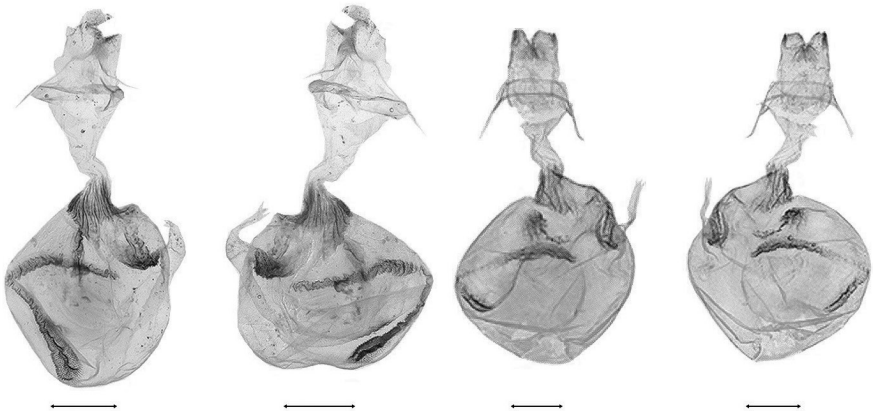
Plate 6: female bursae of the insularis group taxa (part 1)



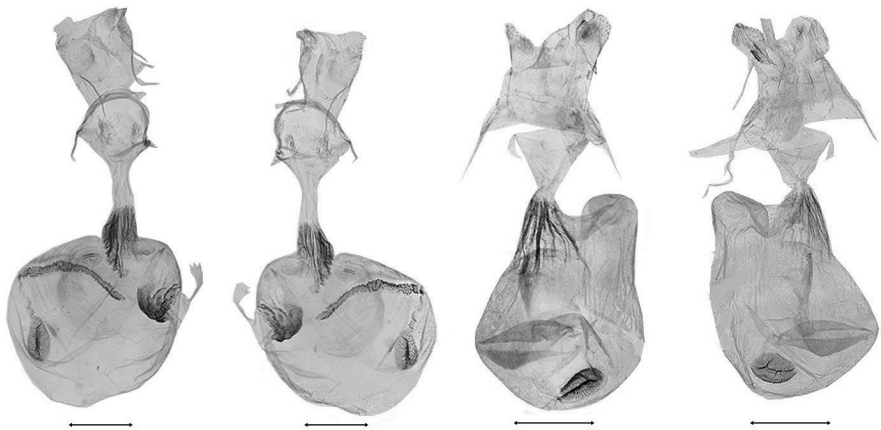
Figs 1i-1j*: C. carmina* ♀ Palawan GP JHL 87 Palawan, **Figs 2i-2j*: C. kasperi*** n.sp.♀ PT Indonesia Bali GP JHL 1042, **Figs 5i-5j*: C. ridleyi roberti*** ssp.n. PT ♀ Malaysia Genteng GP HSB 3, **Figs 6i-6j: *C. martinii*** n.sp. PT ♀ Sumatra GP JHL 1039

Plate 7: female bursae of the insularis group taxa (part 2)

Figs 8i-8j **Figs 9i-9j**



Figs 10i-10j **Figs 11i-11j**

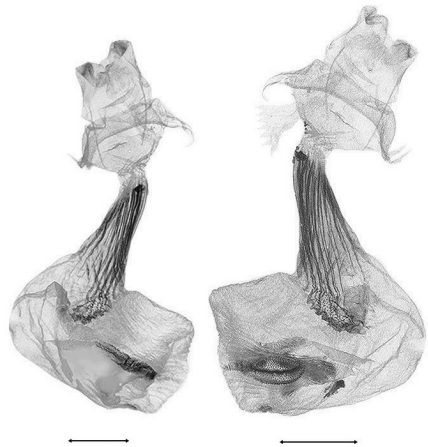


Figs 8i-8j: ***C. d. sausae*** ♀ PT Bucsek 2012 Malaysia Genting GP HSB 2, **Figs 9i-9j:** ***C. pauk-stadti*** n.sp PT ♀ Java GP JHL1078, **Figs 10i-10j:** ***C. maaikeae*** n sp. ♀ PT Borneo Trus Madi GP JHL 1077, **Figs 11i-11j:** ***C. aurora*** ♀ Borneo Apin GP 23.120 MWM

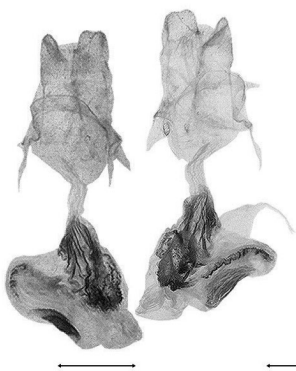
Plate 8: female bursae of the insularis group taxa (part 3)

Figs 14i-14j

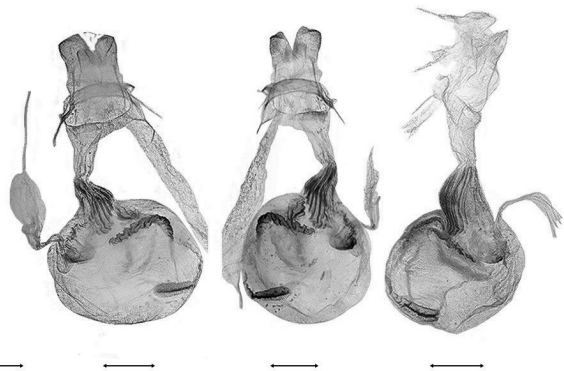
Figs 15i-15-j



Figs 16i-16j



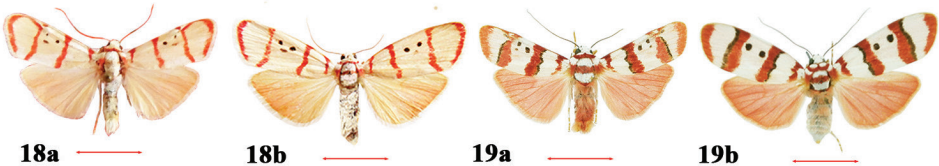
Figs 17i-17j



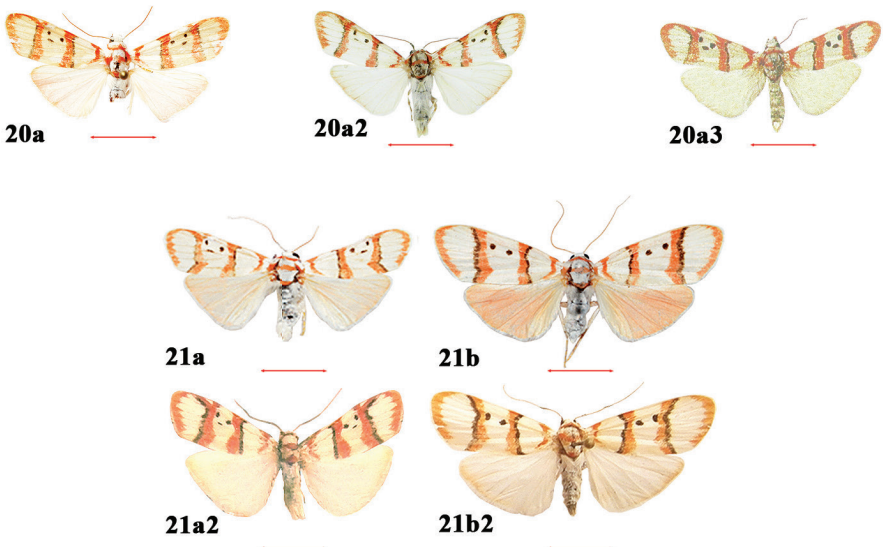
Figs 14i-14j: ***C. malacca*** n.sp. ♀ PT SW Thailand Chumphon GP JHL 1055, **Figs 15i-15-j:** ***C. juliettae*** n.sp. ♀ PT N Thailand Chiang-Mai prov Doi Khan GP JHL 93, **Figs 16i-16j:** ***C. weera-woothi*** n.sp. ♀ PT SE Thailand Ubon Ratchatani GP JHL 1073

Plate 9: imagines of the non-insularis species (sections a and b)

Section A: species with a trapezoid white basal wing section



Section B: the clama gp with V-shaped or oval white basal wing sections and a subbasal wedge



Figs 18a-18b: ***C. gabika*** Bucsek 2012 ♂ HT and ♀ PT, **Figs 19a-19b:** ***C. bianca*** SW Thailand ♂ 1070 ♀ 1069 ab ovo bred specimens, **Fig 20a:** ***C. clama*** ♂ Bucsek 2012 HT Malaysia, **Fig 20a2:** ♂ ***C. clama*** NW Borneo 1043, **Fig 20a3:** ***C. determinata*** ♂sensu Holloway 2001, **Fig 21a:** ***C. barlowi*** **n.sp.** HT ♂ Genting GP HSB4, **Fig 21b:** ***C. barlowi*** **n.sp.** ♀ PT GP HSB5, **Fig 21b:** ***C. barlowi*** **n.sp.** PT ♀ GP HSB5, **Figs 21a2 -21b2:** ♂ / ♀ Borneo Trus Madi in MWM (genitalia not confirmed)

Plate 10: imagines of non-insularis species Section c: the crasizona group)

Section C: the crasizona group: basal white wing section oval and inwardly black bordered

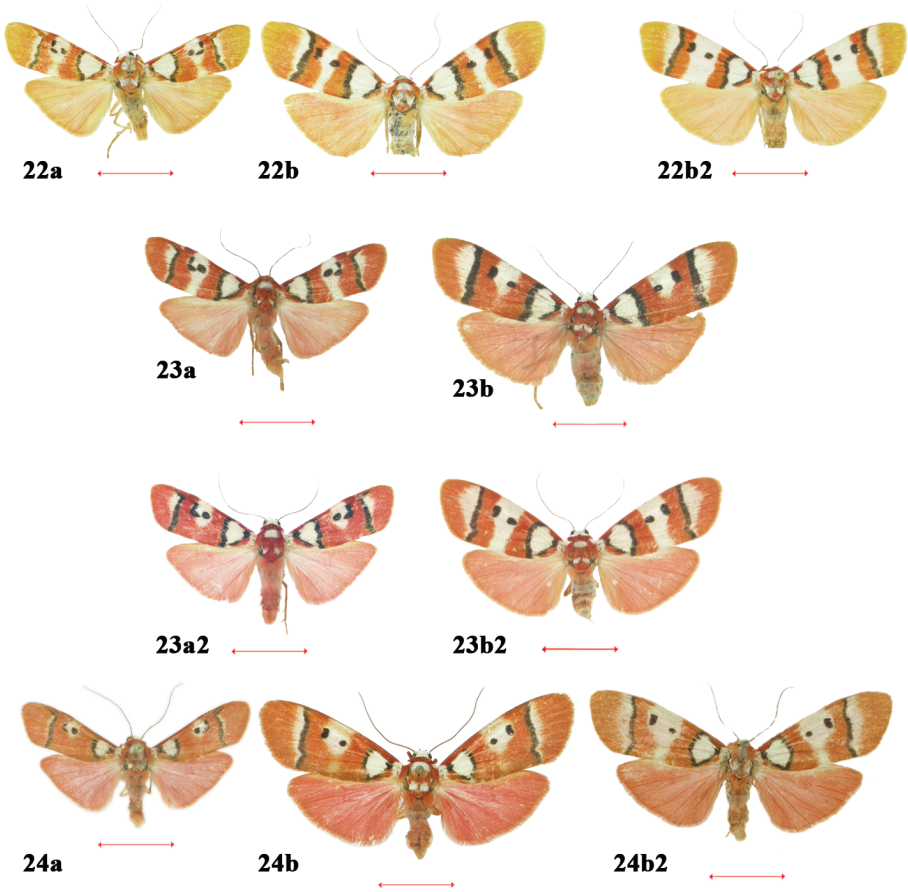
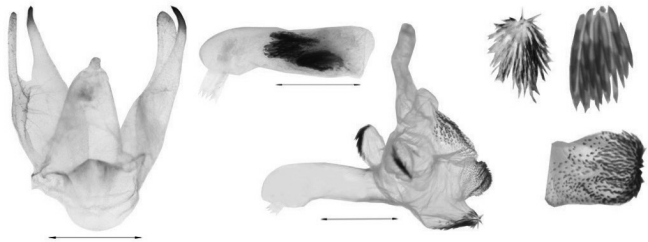


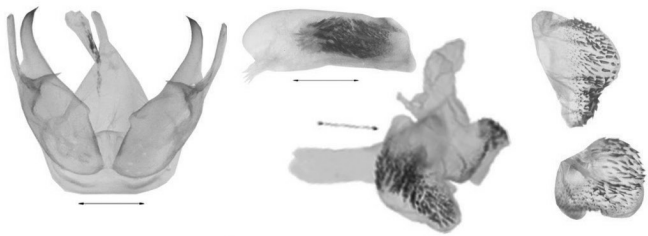
Fig 22a: ***C. crasizona*** ♂ Leyte Hilusig GP JHL 207, **Fig 22b:** ***C. crasizona*** ♀ Leyte Maasin GP JHL208, **Fig 22b2:** ***C. crasizona*** ♀ Mindanao Surigao, **Fig 23a:** ***C. johani*** n.sp ♂ HT Panay Island., **Fig 23b:** ***C. johani*** n.sp PT ♀ Panay Island, **Fig23a2:** ***C. johani*** n.sp. PT ♂ Negros Island, **Fig 23b2:** ***C. johani*** n.sp. PT ♀ Negros Island, Visayas, **Figs 24a-24b:** ♂ and ♀ ***C. libulae*** Luzon Mt. Banahaw, **Fig 24b2:** ***C. libulae*** ♀ Luzon Banawe

Plate 11: male genitalia components of non-insularis taxa

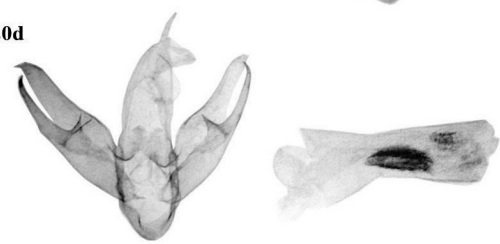
Figs: 18c, e-i and 18k terminal lobe



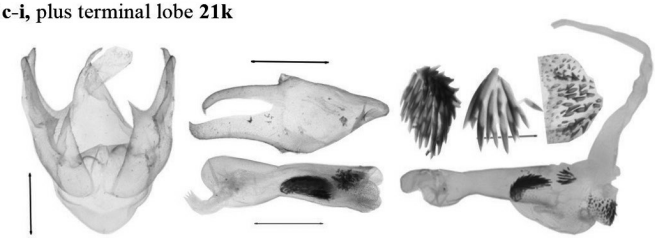
Figs 19c, 19e-f and i; and 19k terminal lobe positions



Figs: 20c-20d



Figs: 21c-i, plus terminal lobe **21k**

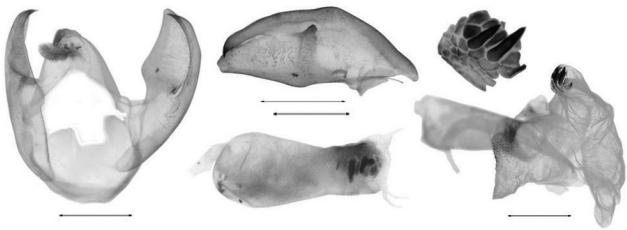


Figs: 18c, e, f-h *C. gabika* PT GP JHL KB9, **Figs: 19c-19h *C. bianca*** ♂ Thailand GP JHL 1070 , **Figs: 20c-20h *C. clama* HT** GP ♂ 215 Bucsek 2012, **Figs: 20c2-20d2 and 20e-20h**, 20k terminal lobe **C. clama** NW Borneo GP JHL 1043

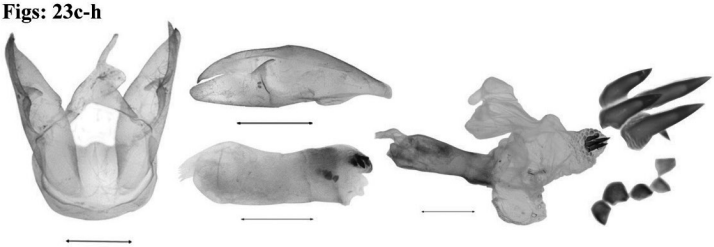
Plate 12: male genitalia non-insularis taxa (part 2)

Figs: 21c-f and 21f2

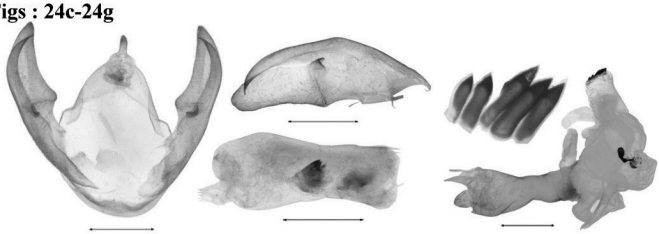
Fig: 22c-g



Figs: 23c-h

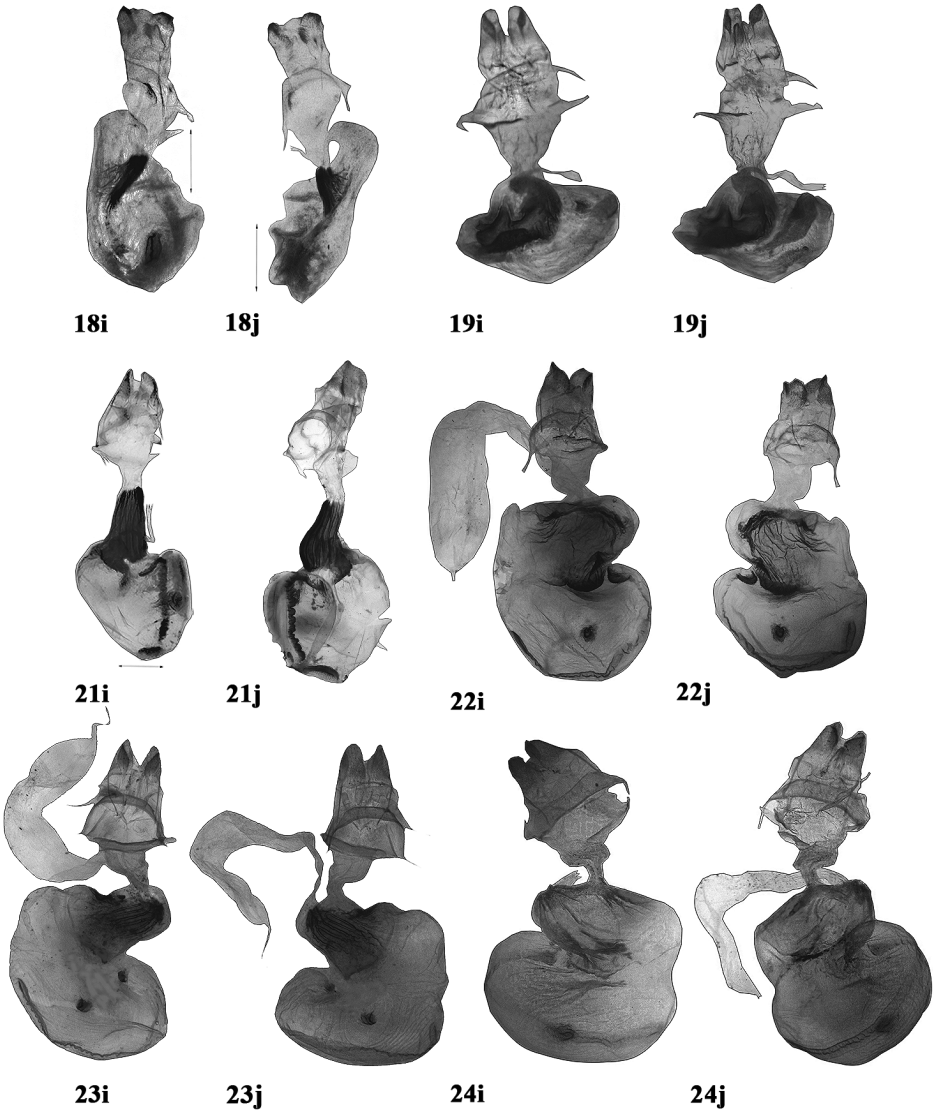


Figs : 24c-24g



Figs: 21c-f plus **21f2** in rotated position ***C. barlowi*** n.sp. HT Malaysia Genting GP HSB4, **Figs: 22c-22g** ***C. crasizona*** Mindanao GP JHL 75, **Figs: 23c-23g** ***C. johani*** n.sp ♂ HT Panay GP JHL 76 , **Figs:: 24c-24h** ***C. libulae*** ♂ Luzon GP JHL 79

Plate 13: female genitalia of non-insularis taxa



Figs 18i-18: ***C. gabika*** ♀ PT GP KB10, **Figs 19i-19j:** ***C. bianca*** ♀ GP JHL 1069, **Figs 21i-21j:** ***C. barlowi n.sp.*** ♀ PT GP HSB5, **Figs 22i-22j:** ***C. crasizona*** ♀ GP JHL 89 Leyte Hilusig, **Figs 23i-23: j** ***C. johani*** n.sp. ♀ PT GP JHL 86 Panay Island, **Figs 24i-24j:** ***C. libulae*** GP JHL 88 Luzon Mt Banahaw

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