Revisional notes on the *Arisbe eurypylus* species group (Lepidoptera: Papilionoidea: Papilionidae)

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Abstract

The *Arisbe eurypylus* group is found to comprise eleven species, as follow: *A. eurypylus* (Linnaeus, 1758); *A. bathycles* (Zinken, 1831); *A. arycles* (Boisduval, 1836); *A. evemon* (Boisduval, 1836); *A. doson* (Felder & Felder, 1864); *A. meyeri* (Hopffer, 1874); *A. chironides* (Honrath, 1884); *A. procles* (Grose-Smith, 1887); *A. leechi* (Rothschild, 1895); *A. sallastius* (Staudinger, 1895) **stat. rev.**; *A. albociliatus* (Fruhstorfer, 1901) **stat. rev.** The following new subspecies are described: *A. eurypylus pauli* **n. subsp.** from Buton Island and Muna Island, Indonesia; *A. doson yamazakii* **n. subsp.** from Redang Island, Malaysia; *A. doson kangeanus* **n. subsp.** from Kangean Island, Indonesia; *A. arycles occidentalis* **n. subsp.** from western Thailand, Myanmar and eastern India; *A. chironides punctatus* **n. subsp.** from Laos and southern Thailand. Two new names are proposed: *A. sallastius neolepidus* **nom. nov.**, to replace *Papilio eurypylus lepidus* Fruhstorfer, 1904, which is a junior primary homonym of *Papilio lepidus* Felder & Felder, 1861, and *A. doson axionides* **nom. nov.**, to replace *Papilio axion* Felder & Felder 1864, which is a junior primary homonym of *Papilio axion* Boisduval, 1832. The following new synonyms are recognized: *Papilio sangira* Oberthür, 1879 **n. syn.**, as a junior synonym of *Arisbe eurypylus pamphylus* (Felder & Felder, 1865); *Papilio eurypylus sallastinus* Fruhstorfer, 1903 **n. syn.**, as a junior synonym of *Arisbe sallastius sallastius* (Staudinger, 1895); *Papilio eurypylus aloricus* Fruhstorfer, 1909 **n. syn.**, as a junior synonym of *Arisbe sallastius sallastius* (Staudinger, 1895); *Papilio eurypylus gabinus* Fruhstorfer, 1909 **n. syn.**, as a junior synonym of *Arisbe sallastius sallastius* (Staudinger, 1895); *Graphium doson tsushimanus* Fujioka, 1981 **n. syn.**, as a junior synonym of *Arisbe doson albidus* (Nakahara, 1930); *Papilio arycles sphinx* Fruhstorfer, 1899 **n. syn.**, as a junior synonym of *Arisbe arycles arycles* (Boisduval, 1836); *Graphium bathycles capitolinus* Gauthier, 1984 **n. syn.**, as a junior synonym of *Arisbe bathycles bathycloides* (Honrath, 1884).

Keywords: Lepidoptera, Papilionidae, *Arisbe eurypylus*, *Arisbe doson*, *Arisbe arycles*, *Arisbe bathycles*, *Arisbe chironides*, *Arisbe procles*, *Arisbe meyeri*, new subspecies.

Zusammenfassung

Die Artengruppe von *Arisbe eurypylus* umfasst elf Arten, wie folgt: *A. eurypylus* (Linnaeus, 1758); *A. bathycles* (Zinken, 1831); *A. arycles* (Boisduval, 1836); *A. evemon* (Boisduval, 1836); *A. doson* (Felder & Felder, 1864); *A. meyeri* (Hopffer, 1874); *A. chironides* (Honrath, 1884); *A. procles* (Grose-Smith, 1887); *A. leechi* (Rothschild, 1895); *A. sallastius* (Staudinger, 1895) **stat. rev.**; *A. albociliatus* (Fruhstorfer, 1901) **stat. rev.** Die folgenden neuen Unterarten werden beschrieben: *A. eurypylus pauli* **n. subsp.** von Buton und Muna, Indonesien; *A. doson yamazakii* **n. subsp.** von der Insel Redang, Malaysia; *A. doson kangeanus* **n. subsp.** von Kangean, Indonesien; *A. arycles occidentalis* **n. subsp.** aus dem westlichen Thailand, Myanmar und dem östlichen Indien; *A. chironides punctatus* **n. subsp.** von Laos und Südthailand. Zwei neue Namen werden vorgeschlagen: *A. sallastius neolepidus* **nom. nov.**, als Ersatz für *Papilio eurypylus lepidus* Fruhstorfer, 1904, der ein Homonym von *Papilio lepidus* Felder & Felder, 1861 ist, und *A. doson axionides* **nom. nov.**, als Ersatz für *Papilio axion* Felder & Felder 1864, der ein Homonym von *Papilio axion* Boisduval, 1832 ist. Die folgenden neuen Synonyme werden erkannt: *Papilio sangira* Oberthür, 1879 **n. syn.**, als jüngeres Synonym von *Arisbe eurypylus pamphylus* (Felder & Felder, 1865); *Papilio eurypylus sallastinus* Fruhstorfer, 1903 **n. syn.**, als jüngeres Synonym von *Arisbe sallastius sallastius* (Staudinger, 1895); *Papilio eurypylus aloricus* Fruhstorfer, 1909 **n. syn.**, als jüngeres Synonym von *Arisbe sallastius sallastius* (Staudinger, 1895); *Papilio eurypylus gabinus* Fruhstorfer, 1909 **n. syn.**, als jüngeres Synonym von *Arisbe sallastius sallastius* (Staudinger, 1895); *Graphium doson tsushimanus* Fujioka, 1981 **n. syn.**, als jüngeres Synonym von *Arisbe doson albidus* (Nakahara, 1930); *Papilio arycles sphinx* Fruhstorfer, 1899 **n. syn.**, als jüngeres Synonym von *Arisbe arycles arycles* (Boisduval, 1836); *Graphium bathycles capitolinus* Gauthier, 1984 **n. syn.**, als jüngeres Synonym von *Arisbe bathycles bathycloides* (Honrath, 1884).

Contents

1 Introduction

The classification of the tribe Leptocircini is still rather uncertain (Miller 1987; Smith & Vane-Wright 2001) and the arrangement of most species groups has undergone several changes since Talbot (1939) defined the tribe Graphiini. Munroe (1961) recognized seven genera (*Lamproptera* Gray, *Teinopalpus* Hope, *Eurytides* Hübner, *Protographium* Munroe, *Iphiclides* Hübner, *Graphium* Scopoli and *Meandrusa* Moore). Within *Graphium*, he recognized the subgenera *Graphium* Scopoli, *Arisbe* Hübner and *Pathysa* Reakirt). Hancock (1983) recognized eight genera distributed between two subtribes: the Teinopalpiti, comprising *Iphiclides* Hübner, *Teinopalpus* Hope, and *Meandrusa* Moore, and the Leptocirciti, comprising *Protesilaus* Swainson, *Eurytides* Hübner, *Protographium* Munroe, *Lamproptera* Gray and *Graphium* Scopoli). Within *Graphium*, he recognized the subgenera *Graphium* Scopoli, *Arisbe* Hübner, *Pathysa*, Reakirt and *Pazala* Moore. Igarashi (1979, 1984), considering only the Old World species, recognized seven genera: *Protographium* Munroe, *Teinopalpus* Hope, *Iphiclides* Hübner, *Pazala* Moore, *Pathysa*, Reakirt, *Lamproptera* Gray and *Graphium* Scopoli. He allied *Meandrusa* Moore with the tribe Papilionini. Within *Graphium*, Igarashi recognized the subgenera *Graphium* Scopoli and *Arisbe* Hübner. Miller (1987) removed *Teinopalpus* Hope and *Meandrusa* Moore, postulating that they should be placed in the tribe Papilionini, and recognized only five genera within the tribe Graphiini (= Leptocircini): *Eurytides* Hübner (with subgenera *Protesilaus* Swainson and *Eurytides* Hübner), *Protographium* Munroe, *Iphiclides* Hübner, *Lamproptera* Gray and *Graphium* Scopoli (with subgenera *Pazala* Munroe, *Pathysa* Reakirt, *Arisbe* Hübner and *Graphium* Scopoli). Simonsen et al. (2010) provided support from DNA sequence analysis for the alignment of *Teinopalpus* Hope and *Meandrusa* Moore with the tribe Papilionini.

At the species group level, Munroe (1961) placed all of the African species in *Graphium (Arisbe)*, and split the Oriental species between *Graphium (Graphium)*, which included the *sarpedon* and *eurypylus* groups, and *Graphium (Pathysa)*, which included the *eurous*, *macareus*, and *antiphates* groups. Niculescu (1977) separated the *weiskei* group from *Graphium (Graphium)* in the new genus *Klinzigia* Niculescu, which name was, however, preoccupied and was replaced with the new name *Klinzigiana* by Niculescu (1989). Saigusa et al. (1977, 1982) assumed monophyly for *Graphium (Graphium)*, including three species groups: the *sarpedon*, *agamemnon*, and *eurypylus* groups. They did not consider the African species in their analysis. In an analysis that gave considerable weight to the morphology of larvae and pupae. Igarashi (1984) recognized generic status for *Pazala* Moore (comprising the *eurous* group) and *Pathysa* Reakirt (comprising the *antiphates* group), finding that they were less closely related to *Graphium* Scopoli than *Lamproptera* Gray. Niculescu (1989) proposed, as subgenera within *Graphium*, the names *Eurypyleana*, which encompassed the *eurypylus* species group, *Macfarlaneana*, *Munroana* and *Wallaceana*. However, these names are invalid as no type species were designated. Hancock (1993) in analysing the African Leptocircini, divided *Arisbe* as constituted by Munroe (1961) and Miller (1987) and placed the tailed species in *Graphium (Graphium)*, retaining the non-tailed species in *Graphium (Arisbe)*. Smith & Vane-Wright (2001), in their review and cladistic analysis of the African Leptocircini, were not able to resolve African and Oriental species groups and concluded that the many of the previously accepted species groups and phylogenetic interpretations may be questionable. Page & Treadaway (2003, 2004), in summarizing the available data on life histories as well as analysing the anatomy of the male and female adults, with particular reference to the Oriental Leptocircini, found that the *eurypylus* group was more closely related to the African species placed in *Arisbe* Hübner by Munroe (1961) than it was to the *sarpedon*, *codrus*, *weiskei*, *wallacei* and *agamemnon* groups and restricted *Graphium* to encompass only these latter species groups. They recognized generic status for *Arisbe* Hübner and included, as subgenera, the *eurypylus* group as well as *Pazala* Moore and *Pathysa* Reakirt and *Paranticopsis* Wood-Mason & de Nicéville. They adopted Niculescu's names for subgenera within *Graphium* Scopoli and *Arisbe* Hübner and the *eurypylus* group was placed in *Arisbe (Eurypleana)* [sic]. Comparison of the nucleotide sequences of the genes encoding 28S rRNA and nicotinamide dehydrogenase subunit 5 (ND5) revealed the *eurypylus* group as a monophyletic unit, with *Graphium phidias* as sister-species within a cluster that also contained species belonging to the subgenera *Arisbe* Hübner, *Pazala* Moore and *Pathysa* Reakirt (Makita et al. 2003). The homology with

Graphium (Graphium) ND5 genes was markedly less. Monophyly of *Graphium* in their analysis was largely driven by sequences assigned to *Graphium policenes* (Cramer, 1775) from the subgenus *Arisbe* but at least one of these has subsequently been re-assigned in the *National Center for Biotechnology Information* (NCBI) depository to *Graphium cloanthus* (Westwood, 1841) from the subgenus *Graphium* Scopoli. In view of the uncertainties in the classification of the *eurypylus* group and the availability of new data on life-histories (IGARASHI & FUKUDA 1997, 2000) and DNA sequences (TSAO & YEH 2008, SIMONSEN et al. 2010, WILSON et al. 2013) we have re-assessed the affinities of the *eurypylus* group. Further, as part of an ongoing programme studying the biodiversity of Papilionidae in S. E. Asia (ABANG et al. 2004, 2006; ABANG & PAGE 2006; PAGE & TREADAWAY 2003, 2004, 2011, 2013; TREADAWAY & SCHRÖDER 2012), we have undertaken a re-examination of the geographical distribution of the species and subspecies of the *eurypylus* group that has shown that some revision of the taxonomy is needed.

A c k n o w l e d g e m e n t s

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2 Methods

The male and female genitalia were dissected by removing the terminal abdominal segments and digesting these with 10 % (w/v) aqueous NaOH for 24 hr at room temperature. The preparations were washed with several changes of water and the soft tissues removed to expose the external features. After thorough washing and clarifying by passage through 70 % ethanol, preparations were stored in 20 % (v/v) glycerol. Clarified preparations were examined unmounted using a Zeiss STEMI DV4 stereomicroscope. The nomenclature of veins and the intermediate cells follows MILLER (1970). DNA and translated protein sequences were down-loaded from the NCBI site. Redundant and highly homologous sequences of the same species were excluded from the analysis. Initial pair-wise sequence comparisons and sequence alignment were made using NCBI Blast (ZHANG et al. 2000). The sequence alignments were refined by hand. The phylogenetic analysis was carried with the PAUP* 4.0 program with all characters weighted equally, stepwise sequence addition, tree-bisection-reconnection and the MULTREES option (SWOFFORD 2000). Under "Material examined", we list only type material and those specimens that have been available for measurement and dissection. The location of the material is indicated by: BMNH (Natural History Museum, London, UK), SMF (Senckenberg Museum, Frankfurt a. M., Germany), MFNB (Museum für Naturkunde, Berlin, Germany), UZIU (Uppsala University, Zoological Museum, Uppsala, Sweden), CGT (TREADAWAY collection, part of the Senckenberg Museum), MGP (PAGE collection, Basel, Switzerland). Pictures of some of the type material are available on the Global Butterfly Information System (GloBIS) website.

3 Affinities of the *eurypylus* species group

3.1 Morphology

The members of the *eurypylus* group were compared with representatives of all species groups of the Leptocircini using the character states identified by MILLER (1987) and used to produce his hypothesis for the cladistic relationships among the genera and subgenera of the Leptocircini. In some cases, as noted below, we found that the characters states provided by MILLER needed some re-interpretation in the light of the new data that is available. The characters studied were as follows. Character 15: Antennae with scales. – Character 27: Uncus trilobed. – Character 45: Tentorial crests high. – Character 46: Cross-vein between R_S and M_1 of HW sinuate. – Character 47: Aedeagus bell-shaped at base. – Character 48: Dorsolateral sclerite of valve articulated. – Character 49: Dorsal bristle-like scales present basally on ventral anal margin of ♂ HW. – Character 50: First instar larvae with bifid setae on thoracic and abdominal segments. – Character 51: Pupa with lateral ridges extending from cremaster to head. – Character 52: Papillae anales with peg-like setae. – Character 53: Pupa squat. We could not verify MILLER's interpretation of this character. We used measurements of the principal dimensions (length, depth, breadth, position of the tip of the dorsal horn with respect to cremaster) of live or undistorted dried pupae as the basis for comparison. The absolute measurements were normalized with respect to length before comparison. We found a cluster of species that had a short, deep and broad pupal profile (= squat) that comprised not only *Protographium leosthenes*, and *Eurytides marcellus* as noted by MILLER (1987) but also *Iphiclides podalirius* (as the closest correlate of *P. leosthenes*, correlation coefficient 0.99845). The pupal profiles of *Arisbe eurypylus*, *A. doson* and *A. evemon* correlated best with those of *A. (Pazala) eurous* and *A. (P.) mandarinus* (correlation coefficients > 0.9995). The pupal profile of *Graphium sarpedon* was most similar to that of *Lamproptera meges*. – Character 54: Clasper (= harpe herein) triangular with a serrate margin – we found some difficulty in the interpretation of this character and MILLER already noted that it is not well substantiated. In overlaying the profiles of the harpe from the *eurypylus* group derived from photographs (e. g. Figs. 40 and 41), we found the best match between the *eurypylus* group members (all species) with *Arisbe phidias*, which has a very similar, roughly triangular harpe with a series of teeth on its dorsal margin and distal tip, atypical for *Arisbe (Paranticopsis)* where it is usually placed (e. g. by RACHELI & COTTON 2009). The next best match was with *Protographium leosthenes*. The best match for *Protographium leosthenes* was also *Arisbe phidias* and thereafter *Eurytides dolicaon*. – Character 55: Uncus fused. *Arisbe phidias*, again unusually for *Arisbe (Paranticopsis)*,

has a long, weakly chitinized uncus with two setose, basal lateral lobes. In this it is not dissimilar in structure to *Protographium leosthenes* and one should be cautious in taking this character state as a synapomorphy for *Protographium leosthenes* and the *Eurytides*. – Character 56: Dorsolateral sclerite of valve triangular and fused to tegumen. – Character 57: Anal margin of ♂ HW with deciduous scales. – Character 58: Deciduous scales curly. – Character 59: Ostium of female a series of folds. – Character 60: Clasper (= harpe herein) with a dorsal flange and central process. – Character 61: Uncus a single projection – scored as a derived character for *Protographium leosthenes* by MILLER (1987) but, as noted above, we found this also in *Arisbe phidias*. – Character 62: Vesica with cornuti. – Character 63: Aedeagus pointed distally. The aedeagus of *Arisbe phidias* is similar to that of the *eurypylus* group members and not *Arisbe (Paranticopsis)*. – Character 64: Tegumen narrowed dorsolaterally. We found this to be quite variable and that there was a continuum in development between *Protographium*, *Arisbe phidias*, and *Graphium*. The *eurypylus* group members have a narrow tegumen, similar to *Arisbe leonidas*. – Character 65: Valve with a point on distal margin. – Character 66: First instar larva with bifid setae on head. – Character 67: Pseuduncus absent. This is true for *Iphiclides*, *Lamproptera*, *Arisbe (Arisbe)*, *Arisbe (Pathysa)* and *Arisbe (Paranticopsis)*. *Arisbe (Pazala)*, *Arisbe phidias*, and all *Graphium* have a pseuduncus (SAIGUSA et al. 1977 were not correct in stating that it is absent in *Graphium stresemanni*, which has the distal margin of the 8th tergite produced as a broad lobe under which the uncus can be withdrawn). – Character 68: Aedeagus curved. – Character 69: Pupa with a long dorsal horn. MILLER scored this only for *Lamproptera* and *Graphium*, but some *Eurytides* are now known also to have long dorsal horns (TYLER et al. 1994). – Character 70: Long setose tubercules on thoracic segments 3 and 4 and on abdominal segment 10 of the first instar larva – has been difficult to interpret as supporting this clade as several *Eurytides* are now known also to have enlarged tubercules on the thoracic segments (TYLER et al. 1994). – Character 71: FW upper discocellular vein longer than the middle discocellular vein. – Character 72: Tentorial crests sharply narrowed. – Character 73: HW discal cell small. – Character 74: Upper angle of FW cell acute. – Character 75: FW with R3 and R4 long-stalked, R5 arising from R3+4 just beyond cell. – Character 76: Ductus bursae membranous. – Character 77: Anterior apophysis absent. – Character 78: Setae absent from the papillae anales of *Lamproptera*. – Character 79: R_1 anastomosed with Sc. – Character 80: Juxta with setae. The members of the *eurypylus* group have a juxta that appears to originate as cartilaginous folds from the base of the claspers (= valves of MILLER 1987), the terminal lobes of these folds bear a dense mat of setae. A similar, although not so densely setose, arrangement is found in *Arisbe phidias*. The juxta is absent in *Arisbe (Pazala)* and *Arisbe (Paranticopsis)* but some species have setae in the same position as observed in the *eurypylus* group. *Graphium* species have a bilobed, shield-shaped juxta that has some setae around its rim. This structure does not appear to be homologous to the juxta of the *eurypylus* group, although its function is doubtless the same. – Character 81: Clasper (= harpe herein) composed of three parts – this is a feature of *Arisbe (Arisbe)*, *Arisbe (Pazala)*, *Arisbe (Paranticopsis)*. The members of the *eurypylus* group and *Arisbe phidias* have a single, triangular harpe. – Character 82: Tegumen with lateral horns. – Character 83: Distal opening of aedeagus dorsal in position. – Character 84: Female genitalia with a cup-like process. We found that the undistorted genitalia preparations of both *Lamproptera meges* and *Protographium leosthenes* present a bi-lobed chitinized structure that resembles the process MILLER described. – Character 85: Ostium with ventral central structure and paired lateral lobes. We found this feature in all *Arisbe* that have been dissected, the structure found in *eurypylus* group members (PAGE & TREADAWAY 2004) is quite similar to some of the African species of *Arisbe* (SMITH & VANE-WRIGHT 2001). – Character 86: Short tubercules present on 2nd and 3rd thoracic segments and 10th abdominal segments of final instar larvae. This emerges as a very inconstant feature (IGARASHI 1979; IGARASHI & FUKUDA 1997, 2000; SMITH & VANE-WRIGHT 2001). Many species lack tubercules on the second thoracic segment, *Lamproptera curius* has small tubercules on the 3rd thoracic segment. *Graphium macleayanus* has a single spine on the 10th abdominal segment. – Character 87: Valve (= clasper herein) with teeth on distal margin. – Character 88 Ventral lobe of ostium strongly forked. – Character 89: Vesica with a kink. – Character 90: Signum horn-like. This is a feature of the *eurypylus* group and *Arisbe (Arisbe)*, and in modified form in *Arisbe (Pathysa)* and *Arisbe (Paranticopsis)*. The signum is absent, or only represented by weak granularization, in *Graphium macleayanus*. A horn-like signum can also be found in the *Eurytides thyastes* group (TYLER et al. 1994). – Character 91: Androconia in bundles. – Character 92: Pterobilins present in wings. – Character 93: Thickened setae on inner rim of valve (= clasper herein). – Character 94: Valve (= clasper herein) with dorsal process. – Character 95: Tentorial crest with a membranous lamina along posterior margin. – Character 96: Vesica expanding dorsally. As with other characters MILLER described for the everted vesica, this is difficult to score and seems to depend on the preparation and this character was not included. – Character 97: Cornuti on vesica and base of aedeagus. – Character 98: Lateral lobes of female setose. This is common among the African species of *Arisbe* (SMITH & VANE-WRIGHT 2001) but is also found in some of the *eurypylus* group (e. g. *A. sallastius*, as described below).

In addition to the characters provided by MILLER (1987) we noted the following features: Length of the antennae. The members of the *eurypylus* group have medium length antennae, extending to between 0.28–0.36 times the forewing length. In this they resemble African species such as *Arisbe leonidas* and *A. angolanus* (range between 0.28–0.34 times the forewing length). *Graphium sarpedon*, *G. agamemnon* and *G. codrus* have longer antennae (range between 0.39 and 0.48 times the forewing length), as do *Lamproptera meges* and *L. curius* (> 0.6 times the forewing length). – Head, thorax and abdomen slender. The members of the *eurypylus* group have a relatively slender body, similar to *Arisbe leonidas* and *A. angolanus*. *Graphium sarpedon*, *G. agamemnon* and *G. codrus* have comparatively stout bodies.

3.2 DNA sequence analysis

Mitochondrial cytochrome oxidase subunit 1

The members of the *eurypylus* group differ by 33–41 nucleotide substitutions from one another. The next closest groups are the members of *Arisbe (Pathysa)* and *Arisbe (Paranticopsis)* which differ from the *eurypylus* group by 42–65 nucleotide substitutions. The *Graphium* species differ by 66–76 nucleotide substitutions, which is in about the same range as the differences the two groups show to *Lamproptera* (68–75 nucleotide substitutions) and to *Protographium leosthenes* (75 nucleotide substitutions). A phylogenetic tree based on 658 bases from the N-terminus of the cytochrome oxidase subunit 1 gene is shown in Fig. 42.

Mitochondrial nicotinamide dehydrogenase subunit 5

The members of the *eurypylus* group differ by 26–49 nucleotide substitutions from one another. The next closest groups are the members of *Pazala*, which differ from the *eurypylus* group by 59–72 nucleotide substitutions, and *Arisbe*, which differ from the *eurypylus* group by 61–69 nucleotide substitution. *Arisbe (Paranticopsis)* and *Arisbe (Pathysa)* differ from the members of the *eurypylus* group by 67–69 and 68–73 nucleotide substitutions, respectively. The *Graphium* species differ by 69–83 nucleotide substitutions from the members of the *eurypylus* group, which is in about the same range as the differences the two groups show to *Lamproptera* (67–74). A phylogenetic tree based on 780 bases from the nicotinamide dehydrogenase subunit 5 gene is shown in Fig. 43.

Nuclear 16S rRNA

Sequences are available for *doson* and *eurypylus*, which are identical and differ from the sequences available for *Arisbe (Pathysa)* species by 23–41 nucleotide substitutions. The *doson* and *eurypylus* sequences differ from most other Leptocircini, including representatives of *Graphium*, *Eurytides* and *Iphiclides*, by 40–50 nucleotide substitutions.

Nuclear 28S rRNA

The members of the *eurypylus* group differ by 1–5 nucleotide substitutions from one another. The next closest species is *Arisbe (Paranticopsis) phidias* with 5–7 nucleotide substitutions. The other members of *Paranticopsis* differ by 29–33 nucleotide substitutions from the *eurypylus* group, as do the representatives of *Arisbe (Arisbe)* (27–32 nucleotide substitutions), *Arisbe (Pazala)* (29–32 nucleotide substitutions), *Arisbe (Pathysa)* (29–32 nucleotide substitutions). The members of the *eurypylus* group differ from *Graphium* species by 23–36 nucleotide substitutions and from *Iphiclides* by 35 nucleotide substitutions.

Summary

In Fig. 44, phylogenetic trees combining the distance matrix for morphological characters, scored as binary states following SMITH & VANE-WRIGHT (2001), and the distance matrices for the sequence comparisons of (a) nicotinamide dehydrogenase subunit 5 and nuclear 28S rRNA genes and (b) the mitochondrial cytochrome oxidase subunit 1 genes, are shown. Overall, the *eurypylus* group shows affinity for the species of *Arisbe* (*Pathysa)* and *Arisbe* (*Paranticopsis).* Combining the morphological characters with the sequence comparisons of the nicotinamide dehydrogenase subunit 5 and nuclear 28S rRNA genes, reveals a close affinity of the *eurypylus* group with *Arisbe (Arisbe)*, *A. (Pazala)* and *A. (Paranticopsis).* The linkage to *Graphium* is weaker, as noted by MAKITA et al. (2003) for their sequence analysis of these genes. Combining the morphological characters with the sequence comparisons of the mitochondrial cytochrome oxidase subunit 1 genes confirms the closer affinity of the *eurypylus* group with *Arisbe (Pazala)* and *Arisbe (Paranticopsis).* It appears that *Protographium leosthenes* does not stand as close to *Eurytides* as the purely morphological analysis of MILLER (1987) suggested, and the inclusion of American species in *Protographium* (TYLER et al. 1994) is not supported. These conclusions support the removal of the *eurypylus* group from *Graphium* and its alignment with *Arisbe*. The rather weak affinity between *Arisbe* and *Graphium* (see for example Fig. 42) is consistent with separation of the groups at generic level.

4 Taxonomy

Only those species and subspecies that are relevant to the discussion of the taxonomic changes proposed herein are covered in this section. A complete list of the recognized taxa is presented in section 5. The nominate subspecies of each species are depicted in Figs. 1–11.

4.1 *Arisbe eurypylus* (Linnaeus, 1758)

Papilio eurypylus Linnaeus, 1758. Type *locality*: "Indiis" (Ambon, according to Corbet 1949).

The lectotype, designated by Honey & Scoble (2001), is held in the UZIU, Uppsala (photographs examined). *A. eurypylus* has a very wide range from central China in the North through Malaysia, Indonesia and the Philippines to Australia in the South. However, it occurs in three distinct phenotypes: (1) the *eurypylus* subspecies group, restricted to the northern Moluccas and Papuan region; (2) the *pamphylus* subspecies group, restricted to Sulawesi and neighbouring island groups; (3) the *gordion* subspecies group ranging from continental Asia through Sundaland to the Philippines.

The *eurypylus* subspecies group

This group comprises moderate to large subspecies with broad median bands on the upperside of both sets of wings. Some subspecies have a second, dark form, especially in the female, in which the median band is absent. In the male genitalia, the harpe has a bifurcate distal head, one fork produced dorsally as a dentate ridge, the other fork produced ventrally as a smooth spur (Fig. 40). In the female genitalia, the opening of the ductus bursae (operculum) is a simple groove, the ductus bursae being supported by two acuminate lateral projections.

Arisbe eurypylus eurypylus (Linnaeus, 1758)

Material examined

5 ♂♂ Buru [CGT]; 3 ♂♂ Buru [MGP]; 4 ♂♂, 1 ♀ Ceram [MGP]; 4 ♂♂ Ambon [MGP].

Diagnostic characters

Relatively large (mean ♂ FW length 44.3 ± 1.1 mm, for 16 specimens), with whitish-green spots on the upperside. The median bands of both sets of wings are well developed, but the submarginal spots are rather small (Fig. 1). The female is similar to the male, except for a green streak along the anal margin of the wing, where the androconial pouch of the males is located.

Distribution

Indonesia (Ambon, Buru, Ceram).

Arisbe eurypylus lutorius (Fruhstorfer, 1907)

Papilio eurypylus lutorius Fruhstorfer, 1907a. Type locality: "Batjan, Halmaheira".

= *Papilio eurypylus georgius* Fruhstorfer, 1907a. Type locality: "Obi" (syn.).

= *Papilio eurypylus eutorius* Bridges, 1988 [incorrect subsequent spelling].

Material examined

Type material: Syntypes of *P. e. lutorius* Fruhstorfer, 1907 (5 ♂♂) [BMNH]; syntypes of *P. e. georgius* Fruhstorfer, 1907 (30 ♂♂, 1 ♀, leg. Waterstradt [BMNH]. – Additional material: 1 ♀ Halmahera [CGT]; 4 ♂♂, 2 ♀♀ Halmahera [MGP]; 2 ♂♂, 1 ♀ Morotai [MGP]; 4 ♂♂ Batjan [MGP]; 4 ♂♂ Obi [MGP].

Diagnostic characters

Large (mean ♂ FW length 45.4 ± 1.3 mm for 14 specimens), with whitish-green spots on the upperside. The median bands of both sets of wings and the submarginal spots are well developed. The ♀ from Morotai is similar to the male, except that it is somewhat larger and has a green streak along the anal margin of the wing, where the androconial pouch of the males is located. Both ♀♀ from Halmahera have bright yellow markings instead of green but are otherwise similar to the males.

Distribution

Indonesia (Batjan, Halmahera, Morotai, Obi, Ternate).

The *pamphylus* subspecies group

These are large subspecies with narrow median bands on both sets of wings. The FW costal margins are strongly bowed and the wing tips extended. In the male genitalia, the harpe has a bifurcate distal head, one fork produced dorsally as a double serrate ridge, the other fork produced ventrally as a broad spur with small serrations. In the female genitalia, the opening of the ductus bursae (operculum) is more heavily chitinized than in the *eurypylus* subspecies group. The dorsal surface of the lip at the operculum is elaborated into a series of ridges rather than the simple groove of the *eurypylus* subspecies group. The ductus bursae is supported by two acuminate lateral projections.

Arisbe eurypylus pamphylus (Felder & Felder, 1865)

Papilio pamphylus Felder & Felder, 1864. Type locality: Celebes [nom. nud.].

Papilio pamphylus Felder & Felder, 1865. Type locality: Celebes [homonym, nec *Papilio pamphilus* Linnaeus, 1758].

= *Papilio telephus* Wallace, 1865. Type locality: Celebes [homonym, nec *Papilio telephus* Felder & Felder, 1865].

= *Papilio sangira* Oberthür, 1879. Type locality: Sanghir, **n. syn.**

Material examined

Type material: Syntypes of *Papilio sangira* (1 ♂, 1 ♀, I.–III.1896, leg. H. C. Webster, coll. W. Rothschild) [BMNH]. – Additional material: 5 ♂♂ Sulawesi [CGT]; 5 ♂♂, 1 ♀ Sulawesi [MGP]; 2 ♂♂ Sanghir I., leg. T. Yamazaki [MGP].

Diagnostic characters

A large subspecies (mean ♂ FW length 60.9 ± 2.1 mm for 12 specimens) with strongly falcate FW and narrow median bands on both sets of wings (Fig. 13). The outer margin of the HW median band is frequently notched where it crosses the discocellar veins. The female is similar to the male except that the median bands are narrower but extend to the anal margin of the HW. The females we have seen tend to be smaller than the males. We cannot find any constant difference between specimens from Sanghir and those from Sulawesi and therefore place *Papilio sangira* Oberthür, 1879 as a junior synonym of *A. e. pamphylus*.

Distribution

Indonesia (Sulawesi, Sanghir).

Arisbe eurypylus fumikoe (Detani, 1983)

Graphium eurypylus fumikoe Detani, 1983. Type locality: Peleng.

Material examined

4 ♂♂, 2 ♀♀ Peleng [MGP].

Diagnostic characters

Very similar in size (♂ FW lengths 59.8–61.0 mm) and markings to *A. e. pamphylus*. Overall, the median bands, especially on the HW, are somewhat narrower in this subspecies than in *A. e. pamphylus*.

Distribution

Indonesia (Kep. Banggai: P. Peleng).

Arisbe eurypylus pauli **n. subsp.**

Holotype: ♂ Buton, July 2005 [SMF]. FW length 58.2 mm (Fig. 14).

Paratypes: 1 ♀ Buton, July 2005 [MGP]; 1 ♂ Buton, July 2005 [MGP]; 6 ♂♂ Buton, June 2006 [MGP]; 1 ♀ Buton, January 2007 [MGP]; 3 ♂♂, 2 ♀♀ Muna February, 2012 [MGP].

Etymology

This subspecies is named in honor of Paul Warnecke, nephew of C. G. Treadaway.

Diagnostic characters

Smaller than *A. e. pamphylus* with distinctly narrower median bands on both sets of wings. The submarginal spots are smaller than those typically observed in *A. e. pamphylus*. The male paratypes agree well with the holotypes (mean FW length 58.5 ± 1.5 mm for 10 specimens). The females have narrower median bands than the males and these are conspicuously narrower than observed in *A. e. pamphylus*. Despite being fresh, all four females have a lighter brown ground colour than the females of *A. e. pamphylus* or *A. e. fumikoe* and in the three green specimens, the green is paler and more yellowish than in the latter subspecies (Fig. 15). The fourth female has bright yellow spots in place of green (Fig. 16). This appears to be the first published record of *A. eurypylus* from these islands.

Distribution

Indonesia (Buton, Muna).

The *gordion* subspecies group

Small to medium sized subspecies with a medium to broad median band. In the male genitalia, the harpe has a bifurcate distal head, one fork produced dorsally as a dentate spur, the other fork produced ventrally as a smooth spur.

Arisbe eurypylus mecisteus (Distant, 1885)

Papilio mecisteus Distant, 1885. Type locality: Malay Peninsula.

Material examined

5 ♂♂ West Malaysia [MGP]; 1 ♀ Sumatra, Indonesia [CGT]; 2 ♂♂ Billiton (= P. Belitung), Indonesia [CGT]; 1 ♂ P. Belitung, Indonesia [MGP]; 1 ♂ Brunei, leg. C. G. Treadaway [MGP]; 6 ♂♂, 1 ♀ Kalimantan, Indonesia [MGP]; 1 ♂ Balabac, Philippines [CGT].

Diagnostic characters

This is a relatively small subspecies (mean ♂ FW length 39.2 ± 21 mm for 15 specimens) that has well-developed median bands and large submarginal spots. The submarginal spots in HW cells $Sc+R_1$-R_S and R_S-M_1 are rarely double, if so there is a small streak close to M_1. Double spots appear to be more common among specimens from the Malay Peninsula than among specimens from Borneo and Sumatra. The spots are yellowish green to bluish green.

Distribution

Malaysia (West Malaysia, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan including Karimata I.), Philippines (Palawan, Balabac, Busuanga).

Arisbe eurypylus acheron (Moore, 1885)

Zetides acheron Moore, 1885. Type locality: "N. E. Bengal".

= *Papilio eurypylus juba* Fruhstofer, 1908a. Type locality: "Hainan".

Treated as a subspecies of *Papilio jason* Esper, 1801 [= *A. doson* (Felder & Felder, 1864)] by Rothschild (1895) and as a synonym of *Graphium doson axion* (Felder &

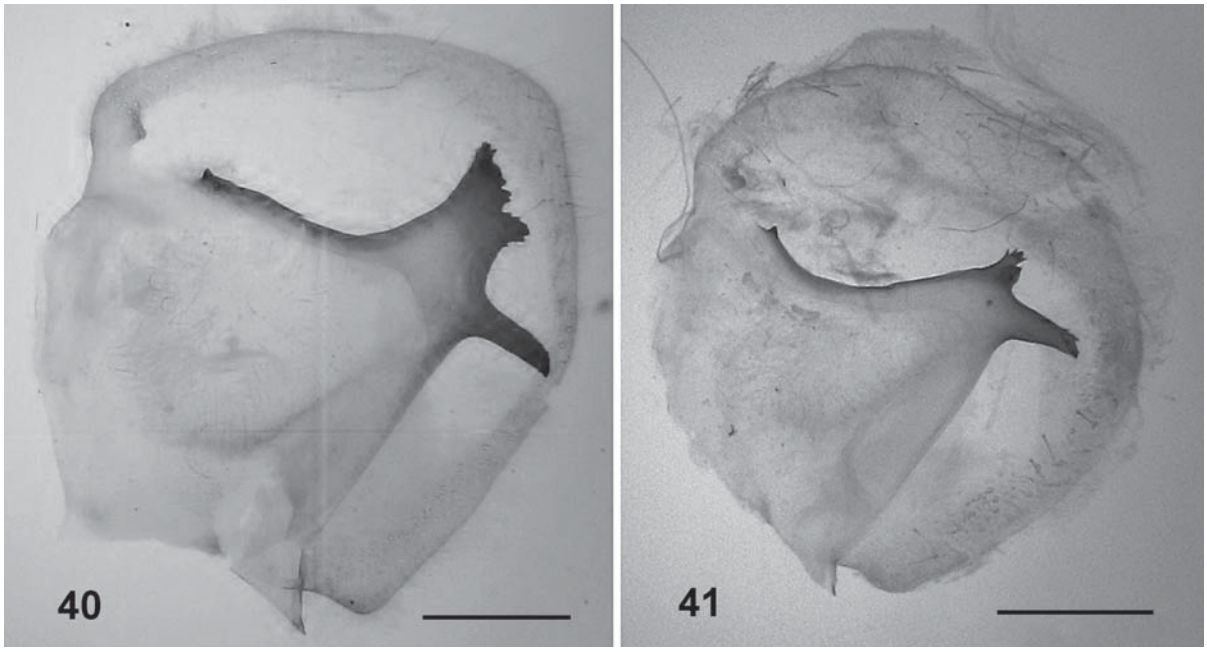
Figs. 1–8. *Arisbe* ssp. – **1**. *A. eurypylus eurypylus* (Linnaeus, 1758) ♂, Ambon, Indonesia. **2**. *A. sallastius* (Staudinger, 1895) ♂, Sumbawa, Indonesia. **3**. *A. evemon evemon* (Boisduval, 1836) ♂, Java, Indonesia. **4**. *A. albociliatus* (Fruhstorfer, 1901) ♂, north Vietnam. **5**. *A. doson doson* (Felder & Felder, 1864) ♂, Sri Lanka. **6**. *A. procles* (Grose-Smith, 1887) ♂ Sabah, Malaysia. **7**. *A. arycles arycles* (Boisduval, 1836) ♂, south Vietnam. **8**. *A. bathycles bathycles* (Zinken, 1831) ♂, Java, Indonesia. – Scales: 2 cm.

Figs. 9–16. *Arisbe* ssp. – **9**. *A. chironides chironides* (Honrath, 1884) ♂, Meghalaya, India. **10**. *A. leechi* (Rothschild, 1895) ♂, Sichuan, China. **11**. *A. meyeri meyeri* (Hopffer, 1874) ♂, Sulawesi, Indonesia. **12**. *A. eurypylus daton* (Fruhstorfer, 1908) ♂, Java, Indonesia. **13**. *A. e. pamphylus* (Felder & Felder, 1865) ♂, Sulawesi, Indonesia. **14**. *A. e. pauli* n. subsp. Holotype ♂, Buton, Indonesia. **15**. *A. e. pauli* n. subsp. Paratype ♀ green form, Muna, Indonesia. **16**. *A. e. pauli* n. subsp. Paratype ♀ yellow form, Buton, Indonesia. – Scales: 2 cm.

Figs. 17–24. *Arisbe doson*. – **17**. *A. d. axionides* nom. nov. ♂ Spring form, Yunnan, China. **18**. *A. d. axionides* nom. nov. ♂ Summer form, Yunnan, China. **19**. *A. d. actor* (Fruhstorfer, 1907) ♂ Spring form, Thailand. **20**. *A. d. actor* (Fruhstorfer, 1907) ♂ Summer form, Thailand. **21**. *A. d. evemonides* (Honrath, 1884) ♂, Kalimantan, Indonesia. **22**. *A. d. vulso* (Fruhstorfer, 1907) ♂, Java, Indonesia. **23**. *A. d. vulso* (Fruhstorfer, 1907) ♀, Java, Indonesia. **24**. *A. d. kangeanus* n. subsp. Holotype ♂, Kangean, Indonesia. – Scales: 2 cm.

Figs. 25–32. *Arisbe* ssp. – **25**. *A. doson yamazakii* n. subsp. Holotype ♂, Redang I., Malaysia. **26**. *A. d. yamazakii* n. subsp. Paratype ♀, Redang I., Malaysia. **27**. *A. arycles occidentalis* n. subsp. Holotype ♂ Recto, Chiang Mai, Thailand. **28**. *A. arycles occidentalis* n. subsp. Holotype ♂ Verso, Chiang Mai, Thailand. **29**. *A. arycles arycles* (Boisduval, 1836) ♂ Verso, south Vietnam. **30**. *A. chironides chironides* (Honrath, 1884) ♂ Spring form, Shaanxi, China. **31**. *A. chironides chironides* (Honrath, 1884) ♂ Summer form, India. **32**. *A. chironides clanis* (Jordan, 1909) ♂ Spring form, Fujian, China. – Scales: 2 cm.

Figs. 33–39. *Arisbe chironides*. – **33**. *A. c. clanis* (Jordan, 1909) ♂ Summer form, Guangxi, China. **34**. *A. c. tereus* (Fruhstorfer, 1909) ♂ Spring form, Hainan, China. **35**. *A. c. tereus* (Fruhstorfer, 1909) ♂ Summer form, Hainan, China. **36**. *A. c. punctatus* n. subsp. Holotype ♂, Danchung district, Laos. **37**. *A. c. punctatus* n. subsp. Paratype ♀, Danchung district, Laos. **38**. *A. c. punctatus* n. subsp. Paratype ♂ Spring form, Danchung district, Laos. **39**. *A. c. punctatus* n. subsp. Paratype ♂ Summer form, Chantaburi province, Thailand. – Scales: 2 cm.



Figs. 40–41. *Arisbe* ssp. – **40**. ♂ clasper of *A. eurypylus eurypylus* (Linnaeus, 1758), Ambon, Indonesia. **41**. ♂ clasper of *A. sallastius* (Staudinger, 1895), Sumbawa, Indonesia. – Scales: 1 mm.

Felder, 1864) by TALBOT (1939). It is listed as a subspecies of *G. doson* on the GloBIS website. This taxon was correctly treated as a subspecies of *Papilio eurypylus* by FRUHSTORFER (1903) and by RACHELI & COTTON (2009). The BMNH type specimen is very clearly a specimen of *A. eurypylus.*

Material examined

Type material: ♂ type specimen BMNH(E) #149386 [BMNH]; *P. e. juba* syntype ♂ [BMNH]. – Additional material: 9♂♂ Laos [MGP]; 4♂♂ Vietnam [MGP]; 6♂♂ Hainan, China [MGP]; 11♂♂ Yunnan, China [MGP]; 1♂ Bhutan [MGP].

Diagnostic characters

The largest subspecies of the group (mean ♂ FW length 41.4 ± 2.3 mm for 31 specimens), with well-developed median bands and large submarginal spots. The submarginal spots in HW extradiscal cells $Sc+R_1$-R_S and R_S-M_1 are frequently double, i. e. with a major spot and an associated streak close to R_S and M_1, respectively. The spots are pale bluish green. The distal margin of the HW median band is strongly incised where it crosses the discocellular veins and a thick black line running along R_S-M_1 is very frequent in this subspecies.

Distribution

India (Sikkim, Assam), Myanmar, Thailand, China (Guangdong, Hainan, Yunnan), Laos, Cambodia, Vietnam.

Arisbe eurypylus daton (Fruhstorfer, 1908) **stat. rev.**

Papilio eurypylus daton FRUHSTOFER, 1908a. Type locality: "West-Java".

Material examined

Type material: 2♂♂ syntypes [BMNH]. – Additional material: 2♂♂ Java, Indonesia [CGT]; 3♂♂ Mt. Gede, W. Java [MGP].

Diagnostic characters

Slightly smaller than *A. e. mecisteus* (mean ♂ FW length 38.3 ± 0.7 mm for 5 specimens) with narrower, more pointed FW. On the FW upperside, the median band of green spots is a broad as in *A. e. mecisteus* at the anal margin of the wing but the spots in extradiscal cell M_3-CuA_1 and M_2-M_3 are larger (Fig. 12). The submarginal spots are smaller, especially on the FW. The median band of the HW is narrower than in *A. e. mecisteus* and its distal margin is not so deeply notched where it crosses the discocellular veins. The green colour is typically more yellowish than observed in *A. e. mecisteus.* On the underside, the green spots are thickly overlaid by opalescent scales that give a silvery sheen. All of the spots are smaller than those of *A. e. mecisteus.*

Distribution

Indonesia (Java).

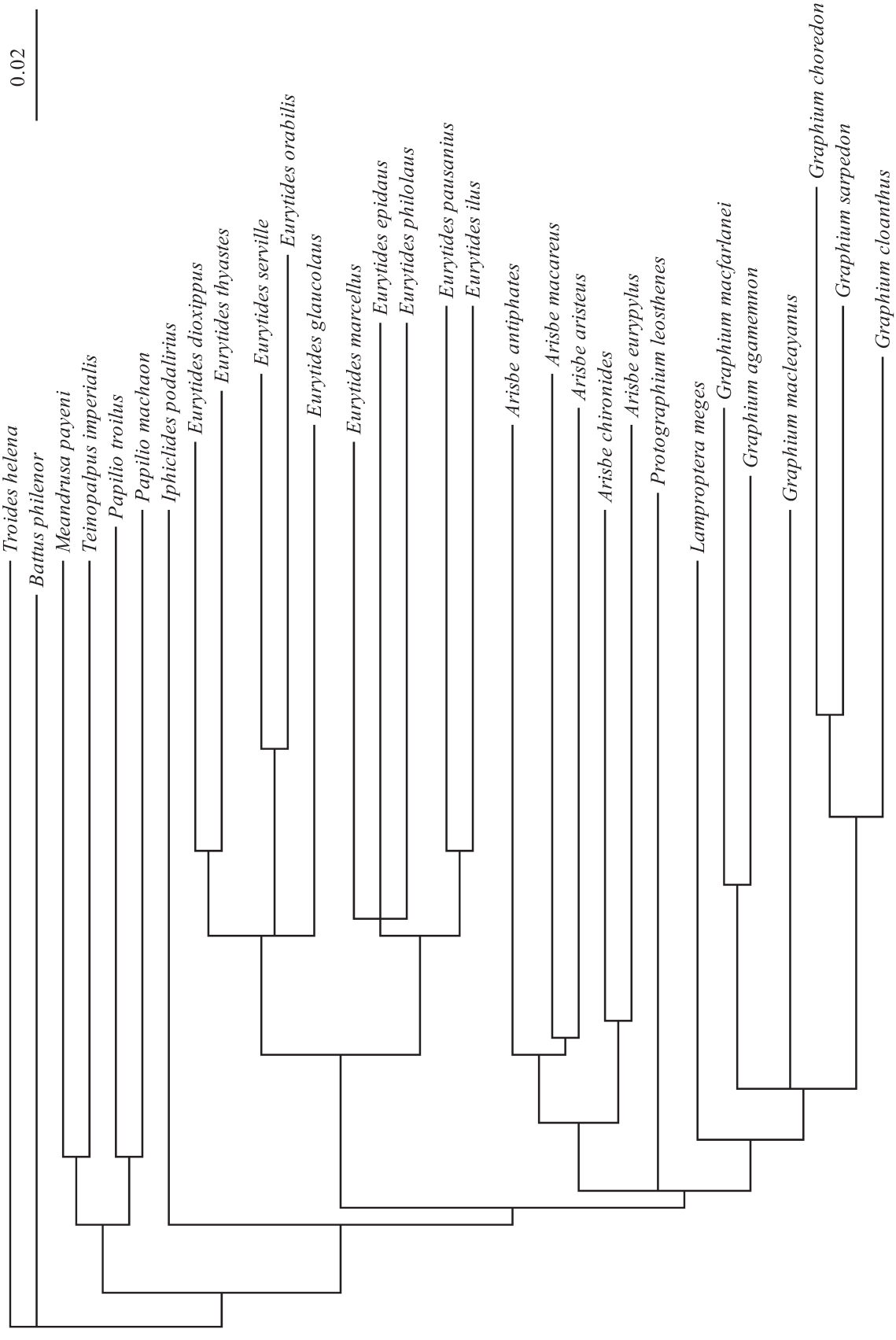


Fig. 42. Phylogenetic tree based on 658 bases from the N-terminus of the mitochondrial cytochrome oxidase subunit 1 gene. The figure shows one of the 205 most parsimonious trees: 175 steps, consistency index 0.77, rescaled consistency index 0.71.

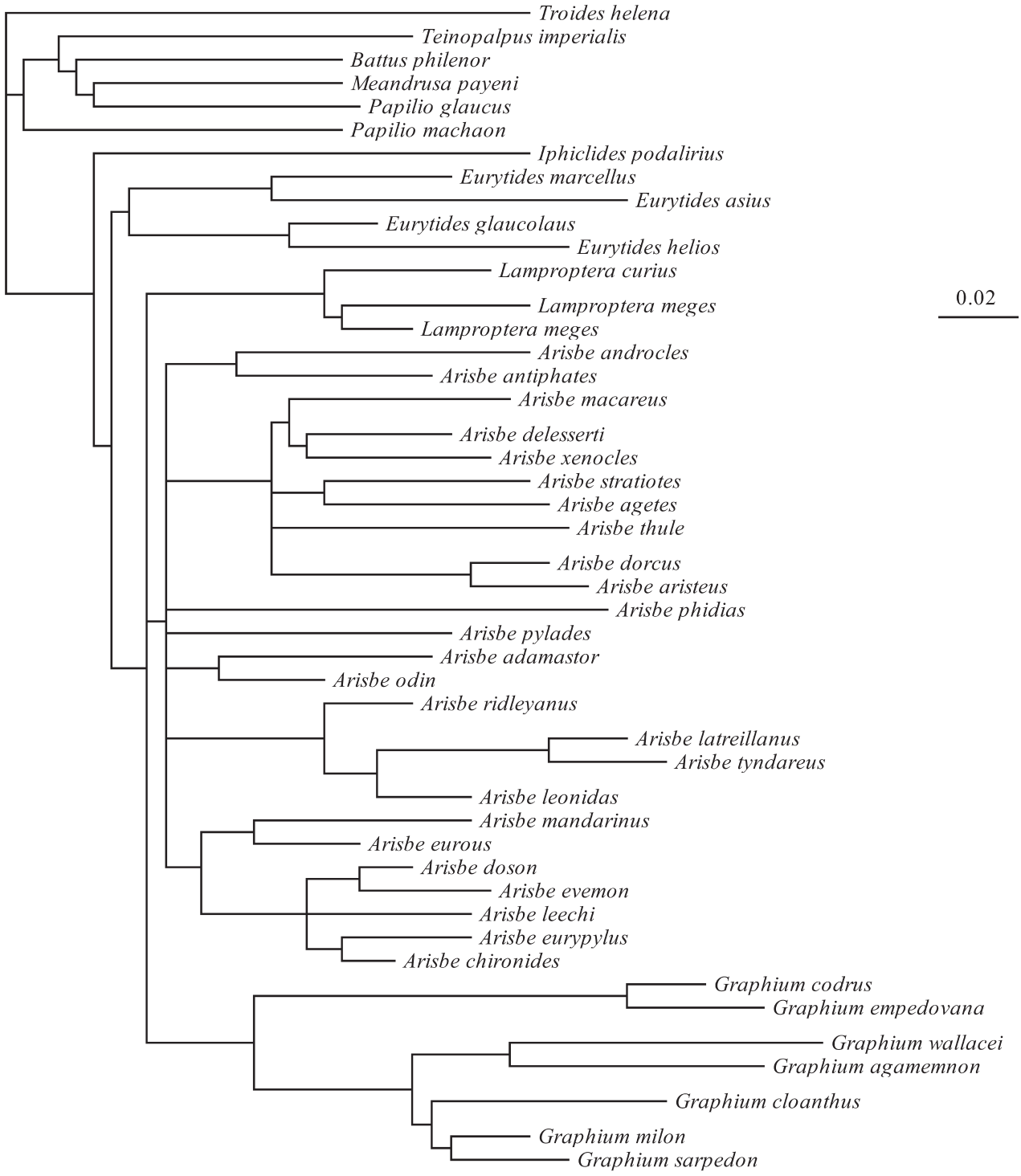


Fig. 43. Phylogenetic tree based on 780 bases from the mitochondrial nicotinamide dehydrogenase subunit 5 gene. The figure shows one of the 146 most parsimonious trees: 183 steps, consistency index 0.65, rescaled consistency index 0.61.

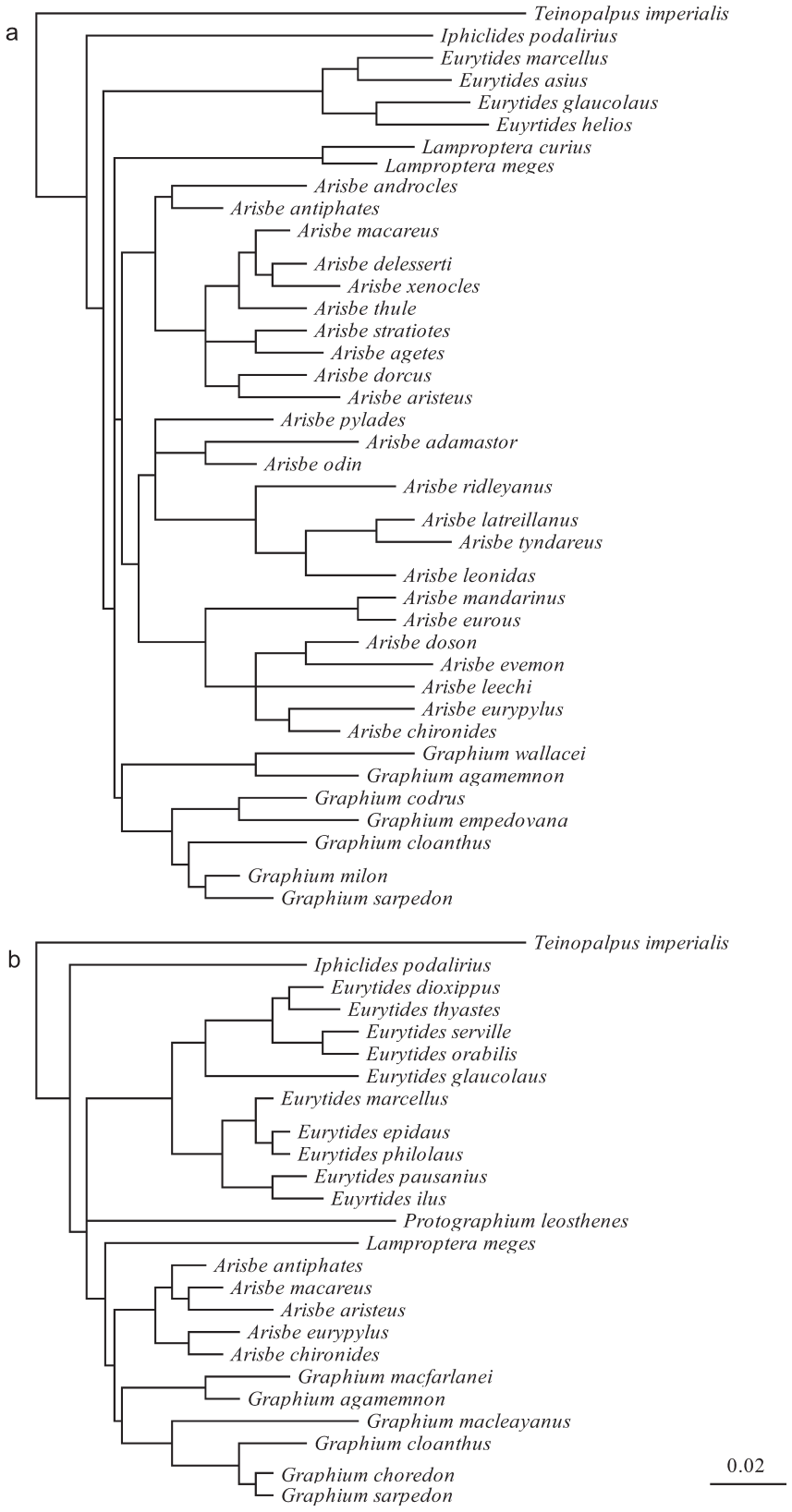


Fig. 44. Consensus phylogenetic trees combining the distance matrices for the morphological character scores with those for (a) the nicotinamide dehydrogenase subunit 5 and nuclear 28S rRNA genes and (b) the mitochondrial cytochrome oxidase subunit 1 genes.

4.2 *Arisbe sallastius* (Staudinger, 1895) **stat. rev.**

Papilio sallastius STAUDINGER, 1895. Type locality: "Insel Wetter […] auch von Sambawa".

This taxon has been treated as a subspecies of *A. eurypylus* (TSUKADA & NISHIYAMA 1980, BRIDGES 1988). It is separated here on the grounds of constant differences in pattern and in the structure of the male and female genitalia. In the male genitalia of *A. sallastius*, the clasper is round and rather lightly chitinized whereas it is oval and rather strongly chitinized in *A. eurypylus*. The dorsal rim of the harpe of *A. sallastius* is concave, curving away from the dorsal rim of the clasper and is armed with one or two small spines near its base. The dorsal rim of the harpe of *A. eurypylus* is convex, curving towards from the dorsal rim of the clasper and is armed with a dentate ridge extending to its midpoint (Fig. 41). The distal tip of the harpe of *A. sallastius* bears one small, dentate spur projecting dorsally and a larger dentate spur projecting ventrally. The smaller, dorsal spur originates from the underside of the harpe and there is a ridge along the tip of the harpe starting at the point where the small spur originates and running into the base of the larger spur. In the dissections examined from Lombok (one specimen), Sumbawa (two specimens), Flores (two specimens) and Timor (three specimens) this ridge is smooth, whereas the ridge is more prominent in the dissections examined from Kalao (three specimens in BMNH) and Tanahdjampea (four specimens in BMNH), particularly in those from Tanahdjampea. On the distal tip of the harpe of *A. eurypylus* subspecies belonging to *eurypylus* and *gordion* subspecies groups (dissections of eleven specimens from various parts of the range examined), the dorsal spur is large, the ventral spur is more weakly represented and the raised ridge is produced into an additional spur, or spurs. In the female genitalia of *A. sallastius* (dissections of two specimens, one from Lombok and one from Sermata), the opening of the ductus bursae (operculum) is heavily chitinized and is cardioid in outline with a central groove. The ductus bursae is supported by two large, multidentate lateral lobes. In the female genitalia of *A. eurypylus* (dissections of six specimens from Ceram, Halmahera, Mindanao, Mindoro and Borneo examined), the opening of the ductus bursae is less heavily chitinized and is a simple tube, open dorsally at its end. The ductus bursae is supported by two acuminate lateral lobes that lack any finer decoration.

Distribution of the species

Indonesia (P. Lombok, P. Sumbawa, P. Sumba, P. Flores, P. Alor, P. Babar, P. Leti, P. Sermata, P. Timor, P. Wetar, P. Tanimbar; P. Kalao, P. Tanhjampea and P. Selayar).

Arisbe sallastius sallastius (Staudinger, 1895)

= *Papilio eurypylus sallastinus* FRUHSTORFER, 1903. Type locality: Sumba, **n. syn.**

= *Papilio eurypylus aloricus* FRUHSTORFER, 1909. Type locality: Alor, **n. syn.**

= *Papilio eurypylus gabinus* FRUHSTORFER, 1909. Type locality: Sumbawa, **n. syn.**

Material examined

Type material: *A. e. sallastius* syntype ♂ [MFNB]; *A. e. gabinus* syntype ♂ [BMNH]. – Additional material: 3 ♂♂ Flores, Indonesia [CGT]; 1 ♂, 2 ♀♀ Lombok, Indonesia [MGP]; 3 ♂♂ Sumbawa, Indonesia [MGP]; 3 ♂♂ Flores, Indonesia [MGP]; 3 ♂♂ Alor, Indonesia [MGP]; 5 ♂♂ Timor, Indonesia [MGP]; 3 ♂♂ Wetar, Indonesia [MGP]; 1 ♀ Sermata, Indonesia [MGP].

Diagnostic characters

The median band of green spots on both wings is normally quite narrow while the submarginal spots are relatively large (Fig. 2). One specimen from Damar and and three (out of six) specimens from Wetar in the BMNH collection have broader median bands. Where collecting data is available, the specimens appear to have been caught in the dry season, whereas the narrow banded specimens we have examined were all caught in, or close to the end of, the rainy season (January–March): this needs further investigation with specimens having accurate collecting data. Irrespective of its width, the outer margin of the HW median band is deeply incised as it crosses the discal cell. The spots are pale whitish green. There is no constant feature separating the populations on the various islands of the Lesser Sunda islands, from Sumbawa to Sermata, and we consider all of these to belong to the nominotypical race (see also RAWLINS 2007).

Distribution

Indonesia (P. Lombok, P. Sumbawa, P. Flores, P. Sumba, P. Alor, P. Timor, P. Wetar, P. Leti, P. Sermata).

Arisbe sallastius insularius (Rothschild, 1896) **n. comb.**

Papilio eurypilus insularius ROTHSCHILD, 1896. Type locality: "Kalao I., between Celebes and Flores".

= *Papilio eurypylus insularis* JORDAN, 1909 [incorrect subsequent spelling].

The incorrect spelling *insularis* was introduced by JORDAN (1909) (see BRIDGES 1988). This subspecies was treated as *G. (G.) eurypylus insularis* Rothschild, 1896 by VANE-WRIGHT & DE JONG (2003). It is listed on the GloBIS website as *Papilio eurypilus* subsp. *insularis* Rothschild, 1896 and considered to be a junior primary homonym of *Papilio agetes insularis* Staudinger, 1895 (GloBIS website). It was treated by TSUKADA & NISHIYAMA (1982) as *G. (G.) eurypylus insularius* Rothschild, 1896.

Material examined

Type material: Syntypes 6 ♂♂, 3 ♀♀ [Collection W. ROTHSCHILD, BMNH]

Diagnostic characters

Similar in size to *A. s. sallastius*, but with a broader median band and smaller submarginal spots. The spots of the FW median band in extradiscal cells CuA_2-1A and CuA_1-CuA_2 are not separated by black scaling along the discocellular vein. The spots are pale whitish-green as in *A. s. sallastius*. This subspecies has somewhat different male genitalia to *A. s. sallastius*, as described above. The females have broad median bands and well marked submarginal spots. The spots are bright yellow in two of the females, which is a form more typical of the *pamphylus* and *eurypylus* subspecies groups. We have not seen a yellow form of *A. s. sallastius*.

Distribution

Indonesia (P. Kalao).

Arisbe sallastius crispus (Fruhstorfer, 1903)

Papilio eurypylus crispus Fruhstorfer, 1903. Type locality: Babar.

Diagnostic characters

Smaller than *A. s. sallastius* from further west in the Lesser Sunda islands but with a much broader median band and smaller submarginal spots. We have not seen recent specimens of this subspecies: the old material in the BMNH (dating from 1895) collected on "Damar" and "Babar" have pale, almost white spots, but this may be due to the age of the specimens. It is retained here as a subspecies until more recent material becomes available.

Distribution

Indonesia (P. Babar, P. Damar).

Arisbe sallastius lucius (Fruhstorfer, 1909) **stat. rev.**

Papilio jason lucius Fruhstorfer, 1909. Type locality: "Tanah Djampea".

Originally described as a subspecies of *A. doson* then treated as a junior synonym of *A. e. insularis* by Tsukada & Nishiyama (1982) and Bridges (1988). Vane-Wright & de Jong (2003) included the Tanahdjampea and Selayar populations in "*G. e. insularis*".

Material examined

Type material: Holotype ♂ [BMNH]. – Additional material: 4 ♂♂, 1 ♀ "Djampea" [BMNH]

Diagnostic characters

Similar in size to *A. s. insularius* but the holotype and three of the other ♂♂ have even broader median bands than in the BMNH series of *A. s. insularius*. One ♂ has a median band that is as narrow as in some specimens of *A. s. insularius*, but the outer margin of the HW band is not deeply incised as it is in *A. s. insularius*. The male genitalia of *A. s. insularius* and *A. s. lucius* show consistent slight difference in the form of the harpe, as described above. The ♀ also has a broader median band than the females of *A. s. insularius*. It has bright yellow spots like two of the BMNH ♀♀. Tsukada & Nishiyama (1982) figure a specimen of *A. eurypylus* from Selayar, suggesting that it might represent *A. s. insularius*. However, this specimen does not conform very well to the syntype series from Kalao but it is very similar to the holotype of *A. s. lucius*, suggesting that this subspecies is also found on Selayar.

Distribution

Indonesia (P. Tanahdjampea, P. Selayar).

Arisbe sallastius neolepidus **nom. nov.**

Papilio eurypylus lepidus Fruhstorfer, 1904. Type locality: Tanimbar island [homonym, nec *Papilio lepidus* Felder & Felder, 1861].

Papilio eurypylus lepidus Fruhstorfer, 1904 is a junior homonym of *Papilio lepidus* Felder & Felder, 1861 (now *Battus crassus lepidus* Felder & Felder, 1861). Bridges (1988) listed *Papilio eurypylus lepidus* Fruhstorfer, 1904 as a homonym in need of replacement. We therefore propose the new name *neolepidus* for this taxon.

Diagnostic characters

This appears to be a very small subspecies with broad median bands. We have not seen recent specimens of this subspecies: the old material (10 ♂♂, 1 ♀, leg. H. Kuhn) in the BMNH collected on Larat island have pale, almost white spots, but this may be due to the age of the specimens. It is retained here as a subspecies until more recent material becomes available.

4.3 *Arisbe evemon* (Boisduval, 1836)

Papilio evemon Boisduval, 1836. Type locality: "Java et Sumatra".

A specimen designated as "Type" in the BMNH (#149402) bears the labels "Evemon, Boisduval (Species général, p. 234). Java; 1 ♀. Specimen typicum.", "Typicum Specimen" and "Ex Museo Dr Boisduval". It is very clearly a male specimen, despite the label, and it cannot represent the holotype, since Boisduval (1836) described *A. evemon* from Java and Sumatra, without indicating what specimens (if any) he had examined and simply remarked that specimens of this species are to be found in many collections identified as *A. eurypylus*. We designate the BMNH specimen #149402 as the lectotype for *Papilio evemon* Boisduval, 1836, with the type locality Java.

Distribution of the species

China, India, Myanmar, Cambodia, Thailand, Laos, Vietnam, Malaysia, Brunei, Indonesia, Philippines.

Arisbe evemon evemon

Material examined

Type material: Lectotype ♂ BMNH (#149402) [BMNH], see above. – Additional material: 1 ♂ Koops Bay, Java, Indonesia [CGT]; 2 ♂♂ Mt. Halimun, Java, Indonesia, June, 2009 [MGP].

Diagnostic characters

This is the smallest race of *A. e. evemon* (mean ♂ FW length 37.5 ± 0.2 mm for 4 specimens) and has sharply pointed FW apices, with a distinctly concave FW distal margin. The green-blue spots in the FW median band are relatively large, except for the spot in extradiscal cell M_2-M_3, which is minute (Fig. 3). Boisduval (1836) included specimens from Java and Sumatra in the original description but specimens from Sumatra are larger, with less well-developed green markings (including lacking the spot in cell M_2-M_3 altogether), than those from Java and they are dealt with below under *A. e. eventus* (Fruhstorfer, 1901).

Distribution

Indonesia (Java).

Arisbe evemon eventus (Fruhstorfer, 1908)

Papilio evemon eventus Fruhstorfer, 1908a. Type locality: "Borneo […], Natuna […] Sumatra […], Malay. Halbinsel".

Fruhstorfer (1908a) included specimens from a number of locations in his description of this subspecies. The syntype preserved in the BMNH is from Pontianak, Borneo and we propose that the type locality should be restricted to this location. Specimens from Natuna are very similar to those from Borneo. The specimens we have seen from Sumatra and its off-shore islands, are slightly larger than those from Borneo but the markings are very similar and these can readily be accepted as *G. e. eventus*. Specimens from the Malay Peninsula, originally including in this subspecies by Fruhstorfer (1908a) but separated by Jordan (1909) as subspecies *orthia*, are smaller and have less bluish-green shade of markings, see below.

Material examined

Type material: Syntype ♂ Pontianak, Borneo [BMNH]. – Additional material: 2 ♂♂ Singkep, Riaow Is. Indonesia [CGT]; 2 ♂♂ Sumatra, Indonesia [CGT]; 1 ♂ Kalimantan, Indonesia [CGT]; 1 ♂ Mapun Is., Philippines [CGT]; 7 ♂♂ Sabah, Malaysia, leg. M. Page [MGP]; 7 ♂♂ Sumatra, Indonesia [MGP]; 4 ♂♂ Belitung, Indonesia [MGP]; 1 ♂ Brunei, leg. C. G. Treadaway [MGP]; 4 ♂♂ Kalimantan, Indonesia [MGP]; 2 ♂♂ Tanahmasa [MGP].

Diagnostic characters

A relatively large subspecies (mean ♂ FW length 39.9 ± 0.6 mm for 31 specimens) with more rounded FW apex and less concave distal margin. The green-blue spots in the FW median band are not as broad as those of the nominotypical race and the spot in extradiscal cell M_2-M_3 is absent. The spots of fresh specimens are intense bluish green but they fade to greenish-grey in old specimens.

Distribution

Brunei, Indonesia (Kalimantan, Natuna I., Singkep, Sumatra, Tanahmasa, Bangka, Belitung), Malaysia (Sarawak, Sabah), Philippines (Mapun).

Arisbe evemon orthia (Jordan, 1909)

Papilio orthia Jordan, 1909. Type locality: Malay Peninsula.
= *Arisbe (Eurypleana) evemon orithia*; Page & Treadaway, 2003 [incorrect subsequent spelling].

Material examined

2 ♂♂ Pahang, Malaysia [CGT]; 1 ♂ Perak, Malaysia [CGT]; 1 ♂ Selangor, Malaysia [CGT]; 13 ♂♂ Perak, Malaysia [MGP]; 4 ♂♂ Langkawi I, Malaysia, leg. T. Yamazaki [MGP]; 2 ♂♂ S. Thailand [MGP]; 2 ♂♂ Singapore, leg. M. Page [MGP].

Diagnostic characters

Most specimens are intermediate in size between *G. e. evemon* and *G. e. eventus* (mean ♂ FW length 38.9 ± 0.5 mm for 25 specimens) and with sharply pointed FW apices and strongly concave distal margin. The green-blue spots in the FW median band are not as broad as those of the nominotypical race but are broader than those of *G. e. eventus*. The spots are duck-egg green to bluish green in fresh specimens, thus generally less bluish than seen with fresh specimens of *G. e. eventus*.

Distribution

S. Thailand, West Malaysia (Perak, Pahang, Selangor), Singapore.

Arisbe evemon heurni (van Eecke, 1913)

Papilio eurypylus heurni van Eecke, 1913. Type locality: "Sinabang (Simalur)" [Pulau Simeulue].

The taxon *heurni* was first described as a subspecies of *P. eurypylus* (Van Eecke 1913), but then assigned to *Papilio evemon* shortly afterwards (Jacobson & Van Eecke 1914, Van Eecke 1914). It was treated as a subspecies of *G. evemon* by Tsukada & Nishiyama (1982), but

considered to be a junior subjective synonym of *G. doson evemonides* by BRIDGES (1988). It is indeed a subspecies of *A. evemon*.

Material examined

Type material: Type ♂ in the Leiden Natural History Museum (Photograph examined).

Diagnostic characters

The size is similar to that of *A. evemon igneolus* Fruhstorfer, 1901 from Nias (FRUHSTORFER 1901a, VAN EECKE 1913) and the Menatawei Islands. The pattern shows the same modifications as *A. evemon igneolus* (Fruhstorfer 1901) from Nias and *A. evemon hetaerias* (Jordan, 1937) from Siberut, in that the red spots on the HW underside are enlarged (more than *A. e. hetaerias* but less than *A. e. igneolus*) and there is a strong incursion of black along the discocellular vein R_S+M_1. The type specimen is the only example we have seen.

Distribution

Indonesia (Pulau Simeulue).

4.4 *Arisbe albociliatus* (Fruhstorfer, 1901) **stat. rev.**

Papilio evemon albociliatus FRUHSTORFER, 1901b. Type locality: "Chiem-Hoa, Tonkin".

This taxon has recently been included in *A. evemon* (e. g. TSUKADA & NISHIYAMA, 1982, COTTON & RACHELI 2007, MONASTYRSKII 2007) although FRUHSTORFER (1908a) remarked that it is a valid species. It is separated here on the grounds of constant differences in markings and the structure of the male genitalia.

In the male genitalia (7 dissections: 3 from Vietnam, 2 from Laos, 2 from Yunnan) the harpe has three raised projections, as is characteristic of the group. The dorsal projection, very near the base of the harpe, is a relatively large toothed ridge that projects into the cavity of the clasper. The distal projection is multi-furcate while the ventral projection is a smooth spur with a dentate tip. The same features are apparent in *A. evemon* subspecies (10 dissections). The dorsal projection of the latter is smaller and is located about mid-way between the base of the harpe and the dorsal projection. It projects towards the rim of the clasper rather than into the cavity. The major, distal projection of *A. albociliatus* is shorter than in *A. evemon* subspecies and more highly dentate. In *A. evemon* subspecies the distal projection is a long bifurcated spur with small teeth on both forks, that projects as far as the rim of the clasper. The ventral spur is differently orientated. The "ventral" spur of *A. albociliatus* is directed distally rather than ventrally, such that the angle subtended by the long axes of the major distal projection and the "ventral" spur is only 30–40°, compared to 55–65° for *A. evemon* subspecies.

Material examined

Type material: Syntypes (1 ♂, 1 ♀) [both figured on the GloBIS website] [BMNH]. – Additional material: 1 ♂, 1 ♀ Yunnan, China [CGT]; 6 ♂♂ Vietnam [MGP]; 7 ♂♂ Laos [MGP]; 11 ♂♂ Yunnan [MGP].

Diagnostic characters

A. albociliatus is typically larger than *A. evemon* (mean ♂ FW lengths 42.5 ± 1.6 mm for 24 specimens and 38.8 mm for 77 specimens, respectively). The upperside pattern of the wings is superficially similar to that of *A. evemon* but the median greenish band is broader on both sets of wings while the spots in the submarginal bands are smaller (Fig. 4). There is a relatively large spot in space M_2-M_3, which is minute (*A. e. evemon*) or absent in *A. evemon* subspecies. The same differences are apparent on the underside and there is a red spot on the costal margin, as in *A. doson* or *A. eurypylus*, but not in any of the subspecies of *A. evemon*, sensu stricto.

Distribution

India (Assam), Myanmar, N. Laos, N. Vietnam, China (Yunnan).

4.5 *Arisbe doson* (Felder & Felder, 1864)

Papilio jason ESPER, 1801. Type locality: Ceylon [homonym, nec *Papilio jason* Linnaeus, 1758].

Papilio doson FELDER & FELDER, 1864. Replacement name for *Papilio jason* ESPER, 1801.

= *Papilio telephus* FELDER & FELDER, 1864 (nom. nud.).

= *Papilio telephus* FELDER & FELDER, 1865. Type locality: Ceylon.

Distribution of the species

Japan, China, Taiwan, Pakistan, Nepal, India, Sri Lanka, Bangladesh, Myanmar, Thailand, Laos, Vietnam, Cambodia, Malaysia, Singapore, Brunei, Indonesia, Philippines.

Arisbe doson axionides **nom. nov.**

Papilio axion FELDER & FELDER, 1864. Type locality: "India sept. (Silhet) (haec?)" [Silhet is currently in Bangladesh on the border with India] [homonym, nec *Papilio axion* Boiduval, 1832].

Papilio axion Felder & Felder, 1864 is a junior homonym of *Papilio axion* Boisduval, 1832 (= *Papilio euchenor* Guérin-Méneville, 1829). MOONEN (1984) proposed that *Papilio axion* Boisduval, 1832 should be treated as a nomen oblitum, leaving *Papilio axion* Felder & Felder, 1864 available for this subspecies of *G. doson*. RACHELI & COTTON (2009) treated it as a valid subspecies, *Graphium doson axion* (Felder & Felder, 1864). However, BRIDGES (1988) regarded *Papilio axion* Felder & Felder, 1864 as in need of replacement and it is listed as being permanently

invalid as a junior primary homonym of *Papilio axion* Boisduval, 1832 on the GloBIS website. We therefore propose the new name *axionides* for this taxon.

Material examined

2 ♂♂ Nepal [MGP]; 4 ♂♂ Khasi Hills, India [CGT]; 63 ♂♂, 2 ♀♀ Khasi Hills, India [MGP]; 45 ♂♂ Yunnan, China [MGP]; 1 ♂, 3 ♀♀ Hong Kong [CGT]; 21 ♂♂, 3 ♀♀ Chiang Mai province, Thailand [MGP]; 4 ♂♂ Myanmar [MGP]; 2 ♂♂ Ha-Giang province, Vietnam [MGP].

Diagnostic characters

Relatively large in the Summer (wet season) form (mean ♂ FW length of 41.3 ± 1.8 mm for 72 specimens) and somewhat smaller in the Spring (dry season) form (mean ♂ FW length of 37.6 ± 1.2 mm for 21 specimens). In the Summer form, the green spots in the FW median band are broad and vary in shade between duck-egg green and bluish-green. In old specimens, the colour has usually faded to greyish-green. The spots of FW median band are narrower in the Spring forms, and the colour more intense. Representative specimens of the Spring and Summer forms are shown in Figs. 17 and 18, respectively. The females have green spots in the FW median band that are similar in shade to those of the males, sometimes rather more yellow-green than blue-green.

Distribution

Pakistan, Nepal, India (Sikkim, Assam), China (Yunnan), Hong Kong, Bangladesh, Myanmar, Thailand (N. W. Prov.), N. W. Vietnam (Ha Giang Province).

Arisbe doson evemonides (Honrath, 1884)

Papilio jason var. *evemonides* Honrath, 1884. Type locality: "Malacca, S. O. Borneo".
= *Papilio jason appulejus* Fruhstorfer, 1909. Type locality: Sumatra, Borneo.
= *Papilio jason autronicus* Fruhstorfer, 1909. Type locality: Natuna.

Material examined

Type material: 2 ♂♂ syntypes [BMNH] from Malacca (leg. H. K. Künstler) and Banjermasin, SE-Borneo (leg. F. Grabowsky) ex. coll. E. G. Honrath. – Additional material: 3 ♂♂ S. Thailand [CGT]; 5 ♂♂ Langkawi I., Malaysia leg. T. Yamazaki [MGP]; 1 ♂ Langkawi I., Malaysia, leg. A. Owston [MGP]; 1 ♂ Selangor, Malaysia [CGT]; 2 ♂♂ Selangor, Malaysia leg. A. Owston [MGP]; 1 ♂ Sahem, Malaysia [CGT]; 2 ♂♂ Sumatra, Indonesia [CGT]; 2 ♂♂ Sumatra, Indonesia, leg. M. Page [MGP]; 3 ♂♂ Belitung, Indonesia [CGT]; 11 ♂♂, 1 ♀ Belitung, Indonesia [MGP]; 6 ♂♂ Tanahmasa, Indonesia [MGP]; 4 ♂♂ Kalimantan, Indonesia [MGP]; 5 ♂♂ Natuna I., Indonesia [MGP]; 2 ♂♂ Brunei, leg. C. G. Treadaway [MGP]; 3 ♂♂ Sabah, Malaysia, leg. M Page [MGP]; 5 ♂♂ Mapun I., Philippines [CGT]; 1 ♂, 3 ♀♀ Balabac, Philippines [CGT]; 3 ♂♂, 2 ♀♀ Sanga Sanga, Philippines [CGT]; 3 ♂♂, 1 ♀ Sinutu, Philippines [CGT]; 8 ♂♂, 8 ♀♀ Tawi Tawi, Philippines, leg. N. Mohagan [MGP].

Diagnostic characters

This is a relatively small subspecies (mean ♂ FW length 38.8 ± 1.6 mm for 71 specimens) (Fig. 21). The FWs are sharply pointed, with a strongly concave distal margin. The median band is duck-egg green to bluish-green and is relatively broad. The spots of the FW median band are separated from one another by black scaling running along the veins, except CuA_2. The HW median band is incised as it crosses the discocellular veins, but the black scaling rarely runs deep into the median band. Some specimens have a narrow streak of black traversing the median band along discocellular vein CuA_1-CuA_2. The ♀♀ are slightly larger than the ♂♂, with somewhat more extensive green markings. We have seen yellow forms of the ♀ from the Tawi Tawi island group but they seem to be rare from elsewhere in museum collections.

Distribution

S. Thailand, Malaysia, Brunei, Indonesia (Sumatra, Tanahmasa, Simeleue, Belitung, Kalimantan, Natuna), Philippines (Balabac, Bongao, Mapun, Sanga Sanga, Sibutu and Tawi Tawi islands).

Arisbe doson postianus (Fruhstorfer, 1902)

Papilio doson postianus Fruhstorfer, 1902a. Type locality: Formosa.
= *Papilio doson jostianus* Fruhstorfer, 1903 and subsequently elsewhere [incorrect subsequent spelling].

Material examined

1 ♂ Taiwan [CGT]; 1 ♂, 1 ♀ Batanes, Philippines [CGT]; 9 ♂♂, 2 ♀♀ Taiwan [MGP]

Diagnostic characters

Overall, a medium-sized subspecies, although specimens from earlier in the year (♂ FW length range 36–41 mm in specimens from March–April) tend to be smaller than those occurring later (♂ FW length range 43–47 mm in specimens from June–September). The males vary in colour between pale yellowish-green (prevalent in early season specimens) to bluish green (prevalent in the later specimens). The pale specimens have the same colour as *A. d. albidus* and *A. d. perillus*.

Distribution

Taiwan, Philippines (Batanes).

Arisbe doson actor (Fruhstorfer, 1907) **stat. rev.**

Papilio jason actor Fruhstorfer, 1907b. Type locality: Hainan.
= *Papilio jason nanus* Fruhstorfer, 1909. Type locality: Süd-Annam, Xom-Gom.
= *Papilio jason praestabilis* Fruhstorfer, 1909. Type locality: Tonkin.

Material examined

Type material: *Papilio jason actor* syntype ♂ "Hainan" [BMNH]; *Papilio jason nanus* syntype ♂ "Süd-Annam, Xom-Gom, Februar" [BMNH]. – Additional material: 12 ♂♂ Hainan, China [MGP]; 22 ♂♂ Phrae province, Thailand [MGP]; 28 ♂♂ Laos [MGP]; 8 ♂♂ Dak Lak province, Vietnam [MGP]; 2 ♂♂ Cambodia [MGP].

Diagnostic characters

Smaller than *A. d. axion* in both seasonal forms: the Summer (wet season) forms (mean ♂ FW length of 39.7 ± 0.8 mm for 42 specimens) are somewhat larger than the Spring (dry season) forms (mean ♂ FW length of 36.1 ± 1.3 mm for 30 specimens). In the Summer form, the green spots in the FW median band are narrow and separated by black scaling along the veins. Fresh specimens are usually bluish-green, which fades to dull greyish-green in old specimens. The spots of FW median band are even narrower in the Spring forms, and the colour is more intense. The submarginal spots, particularly on the HW, are rather larger in many Spring forms than they are in the majority of Summer forms, but this is not a constant difference. The black scaling along vein CuA_2 often does not completely separate the green spots in the neighbouring cells in the Spring forms. The BMNH syntype of *Papilio jason actor* Fruhstorfer, 1907 is typical of the Summer forms found from eastern Thailand through Laos, Vietnam and southern China. The BMNH syntype of *Papilio jason nanus* Fruhstorfer, 1909 is typical of the Spring forms. Representative specimens of the Spring and Summer forms are shown in Figs. 19 and 20, respectively.

Distribution

S. China (Guangdong, including Hainan), Laos, E. Thailand (Phrae), Cambodia, Vietnam.

Arisbe doson vulso (Fruhstorfer, 1907) **stat. rev.**

Papilio jason vulso Fruhstorfer, 1907b. Type locality: "Ost und West-Java".

Material examined

7 ♂♂ Java, Indonesia [CGT]; 8 ♂♂, 1 ♀ Java, Indonesia [MGP].

Diagnostic characters

Typically larger than *A. d. evemonides* (mean ♂ FW length 39.5 ± 1.1 mm for 15 specimens). The FWs are not so sharply pointed and the distal margin is not so strongly concave. The median band is broader and the submarginal spots larger than in *A. d. evemonides* (Fig. 22). The HW median band is not strongly incised as it crosses the discocellular veins. Most specimens have a narrow streak of black traversing the median band along discocellular vein CuA_1-CuA_2. The females (Fig. 23) are larger than the males, with more extensive green markings, especially in the submarginal band. We have not seen a yellow form of the female of this subspecies.

Distribution

Indonesia (Java).

Arisbe doson perillus (Fruhstorfer, 1908)

Papilio jason perillus Fruhstorfer, 1908b. Type locality: "Ishigaki-shima" [Yaeyama I., Japan].

Material examined

Type material: Syntype ♂ [BMNH]. – Additional material: 1 ♂ Yaeyama I., Okinawa Prefecture, Japan [MGP].

Diagnostic characters

With *A. d. albidus* (below), this is one of the largest subspecies of *A. doson* (FW length 50.4 mm for the one specimen we have measured), having well-developed median band and submarginal spots. There are usually two spots in the FW extradiscal cell CuA_2-1A. The green markings are very pale yellowish-green. On the HW underside, the red spots are brick-red, almost orange in some specimens. This subspecies was ignored by Racheli & Cotton (2009), who included specimens from the Yaeyama Islands under *A. d. albidus* (Nakahara, 1930).

Distribution

Japan (Okinawa Pref.).

Arisbe doson albidus (Nakahara, 1930)

= *Papilio mikado* Leech, 1887. Type locality: Satsuma, Japan [homonym, nec *Papilio micado* Pagenstecher, 1875].

Papilio doson albidus Nakahara, 1930. Replacement name for *Papilio mikado* Leech, 1887.

= *Graphium doson tsushimanus* Fujioka, 1981 **n. syn.**

= *Graphium doson aykut* Koçak & Kemal, 2000a. Unnecessary replacement name for *Papilio mikado* Leech, 1887.

Material examined

1 ♂ Shikoku I., Japan [CGT]; 1 ♂, 2 ♀♀ Honshu I., Japan [CGT]; 3 ♂♂ Honshu I., Japan [MGP]; 1 ♂ Shikoku I., Japan [MGP]; 2 ♂♂ Kyushu I. Japan, [MGP].

The name *albidus* was given by Wileman (1903) to an aberration of *Papilio mikado* Leech, 1887 in which the black areas are not properly developed, giving a pale overall appearance. Nakahara (1930) made this infrasubspecific name available by using it as a replacement name for *Papilio mikado* Leech, 1887.

Diagnostic characters

Together with *A. d. perillus*, one of the largest subspecies of *G. doson* (range of ♂ FW lengths 41.3 mm to 52.5 mm) with broad FWs having rounded apices. The median band and submarginal spots are well developed. The lower of the pair of submarginal spots in extradiscal cell CuA_2-1A is always small and is absent in about half of the specimens we have seen. The green markings are very pale, ranging from nearly white to pale bluish-green. On the HW underside, the red spots range from scarlet through to almost yellow. The latter is common on Shikoku and Honshu. There is some variation in the width of the black costal bar on the HW underside and specimens from Tsushima Island fall within this range. They otherwise conform to the phenotype of specimens from other parts of Japan and we therefore place *Graphium doson tsushimanus* Fujioka 1981 as a junior synonym of *A. d. albidus.*

Distribution

Japan (Honshu, Shikoku, Kyushu, Tsushima).

Arisbe doson kajanga (Corbet, 1937)

Papilio kajanga CORBET, 1937. Type locality: Pulau Tioman.

Material examined

2 ♂♂ Tioman I., Malaysia [CGT]; 4 ♂♂ Tioman I., Malaysia, leg. T. YAMAZAKI [MGP]; 1 ♂ Tioman I., Malaysia, leg. A. OWSTON [MGP].

Diagnostic characters

Larger than *A. d. evemonides* (mean ♂ FW length 42.3 ± 1.1 mm for 7 specimens) with narrower median bands on both sets of wings, but larger submarginal spots, especially on the hindwing. The green spots are similar in colour to those of *A. d. evemonides*, being duck-egg green, sometimes bluish green in fresh specimens, and fading to duck-egg green in older specimens.

Distribution

Malaysia (Pulau Tioman).

Arisbe doson yamazakii **n. subsp.**

Holotype: ♂ Redang Island, Malaysia, 30 April 2006, leg. T. YAMAZAKI [SMF].

Paratypes: 3 ♂♂ Same data as holotype [MGP].

Etymology

This subspecies is named in honor of T. YAMAZAKI, who collected the type specimens.

Diagnostic characters

Relatively large (FW length 42.0 mm), with narrow median bands on both sets of wings. The distal margin of the HW median band is deeply incised where it crosses the discocellular veins and the spot in extradiscal cell CuA_1-CuA_2 is separated by a thick black line running along the discocellular vein. The submarginal spots of the FW are smaller than in *A. d. evemonides*, but those on the HW are larger. The secondary spots in HW extradiscal cells $Sc+R_1$-R_S and R_S-M_1 are small and round, in contrast to *A. d. evemonides* where they are typically strongly represented by narrow streaks. The green spots are more bluish even than fresh specimens of *A. d. evemonides.*

The paratype males are similar to the holotype (FW lengths 40.7, 42.1, 44.4 mm) (Fig. 25). The paratype females are larger (FW lengths 43.9 and 45.6 mm) (Fig. 26) and both have bright yellow markings instead of green, which is prevalent in females of *A. d. evemonides.* Like the males, the median bands are narrow but the HW submarginal spots are at least as large as found in *A. d. evemonides.*

This subspecies resembles *A. d. kajanga* most closely but is readily separable by the consistent bluish colour, and the small spots in the FW submarginal band.

Distribution

Malaysia (Pulau Redang).

Arisbe doson kangeanus **n. subsp.**

Holotype: ♂ Kangean Island, Indonesia. August 2006 [SMF].

Paratypes: 2 ♂♂ Kangean Island, Indonesia, August 2006 [MGP]; 3 ♂♂ Kangean Island, Indonesia, June 2006 [MGP].

Etymology

This subspecies is named after its type locality, Kangean island.

Diagnostic characters

This is a relatively small subspecies (FW length 37.8 mm) with very narrow median bands on both sets of wings (Fig. 24). The distal margin of the HW median band is incised where it crosses the discocellular veins and the spot in extradiscal cell CuA_1-CuA_2 is separated by a thin black line running along the discocellular vein. The submarginal spots are relatively large, as in *A. d. vulso.* The secondary spots in HW extradiscal cells $Sc+R_1$-R_S and R_S-M_1 are represented by narrow streaks. The green spots are more bluish even than fresh specimens of *A. d. evemonides.*

The paratype males are similar to the holotype (FW lengths 36.4 – 39.6 mm, average 38.1 mm).

Distribution

Indonesia (Pulau Kangean).

4.6 *Arisbe arycles* (Boisduval, 1836)

Papilio arycles BOISDUVAL, 1836. Type locality: "de Java ou de Sumatra".

There is a male specimen in the BMNH (BMNH(E) #149417 in the Levick Bequest), which bears the label "*Arycles*, Boisduval (Species général, I, p. 231. Singapore; 1 ♂. Specimen typicum" and "ex Museo Dr. BOISDUVAL". There are additional labels "Typicum Specimen", and "Type". These latter two labels are clearly erroneous, as BOISDUVAL (1836) states that the abdomen and antennae are missing from his holotype (see below), but the BMNH specimen is intact. Further, the location Singapore for the BMNH specimen does not correspond to the speculative location of "Java or Sumatra" given by BOISDUVAL. The BMNH specimen is evidently a mislabelled non-type specimen.

The original description is reproduced here in full: *«Un tiers plus petit qu'Agamemnon, et ayant à peu près le port d'Evemon. Dessus des ailes noires, avec un grand nombre de taches vertes du même tou et à peu près de la même furvure que celle de l'Agamemnon des Philippines. Les ailes inférieures sans queue, dentées obtusément, avec les échauertures blanches. Dessous un peu plus pâle, semblable au dessus pour le dessin; celui des secondes ailes offrant en outre deux taches d'un rouge carmin, dont une sur le bord d'en haut, près de la base, placée sur une raie plus noire que le fond de l'aile, l'autre transversale située à l'anle anal; une ligne rouge le long du bord abdominal. Le corps et les antennes manquent. M. N. – Decrit sur un individu unique envoyé de Java ou de Sumatra par M. Diard.*» [A third smaller than *agamemnon*, and having almost the size of *evemon*. Above wings black, with many green spots almost the same hue as those of *agamemnon* from the Philippines. The hindwing tailless, obtusely toothed, with white fringes. A little paler below, similar to the design above, the hindwing has two patches of crimson, one on the costal margin, near the base of the wing, placed on a stripe that is more black than the ground colour of the wing, the other transverse, located at the anal angle; a red line along the abdominal board. The body and antennae are missing. M. N. – Described from a single individual sent from Java or Sumatra by Mr. DIARD.].

The BMNH specimen has a pattern of red markings on the HW underside that matches that described by BOISDUVAL, namely one spot at the costal margin near the base of the wing, one transverse spot in extradiscal cell CuA_1-CuA_2 and a stripe along vein 1A. It could be taken as a typical specimen, but not the type. The colour of the green markings is not as bright green as those of *Graphium agamemnon* but is not as blue-green as *A. doson* or *A. eurypylus*. Unfortunately, it is not representative of specimens coming from the Malay Peninsula, which have at least one more red spot on the underside, and have bright, apple-green markings on the upperside. It is close to specimens coming from Cambodia, Laos, eastern Thailand and Vietnam and is extremely similar to the syntype specimen of *Papilio arycles sphinx* Fruhstorfer, 1899, also held in the BMNH. It is only specimens from Indochina that have just three red markings on the HW underside and it would appear that this the real origin of BOISDUVAL's type. The collector, PIERRE-MÉDARD DIARD, travelled widely in south-east Asia, including a brief trip through Indochina in 1821–1824 (PEYSSONNAUX 1935).

Distribution of the species

India, Myanmar, Thailand, Laos, Cambodia, Malaysia, Indonesia, Philippines.

Arisbe arycles arycles

= *Papilio arycles sphinx* FRUHSTORFER, 1899. Type locality: Tonkin, **n. syn.**

= *Graphium (Graphium) arycles masal* KOÇAK & KEMAL, 2000b. Unneccessary replacement name for *Papilio arycles sphinx* Fruhstorfer, 1899.

Material examined

Type material: Holotype (♂, BMNH(E) #149418) and Paratype ♂ of *Papilio arycles sphinx* FRUHSTORFER, 1899 [BMNH]. – Additional material: 2♂♂ S. Vietnam [CGT]; 1 ♀ Cambodia [CGT]; 5♂♂, 2♀♀ Laos [MGP].

Diagnostic characters

Relatively large (♂ FW length 38.0 – 41.0 mm, mean 39.8 mm), with bluish-green spots, those on the underside overlain with opalescent scales giving a yellowish sheen. The black areas separating the spots are quite extensive. The holotype and the majority of specimens we have seen have a small spot in HW extradiscal cell M_2-M_3. In some specimens this is absent from the upperside but it is usually still represented on the underside. If there is any red pigmentation on the underside in HW extradiscal cell M_3-CuA_1, then it is restricted to narrow longitudinal stripes running parallel to the veins either side of the green spot. The colour of the red spots is orange through brick-red to crimson.

The close similarity between BOISDUVAL's description, especially the pattern of red markings on the HW underside, taken together with the "Specimen Typicum" discussed above, and modern specimens from Indochina leave little doubt that this is the real type locality for *arycles*. The name *sphinx* Fruhstorfer, 1899 thus becomes a junior synonym of *arycles* Boisduval. The transfer of the type locality of *arycles* Boisduval to Indochina leaves the name *rama* Felder & Felder available for the populations ranging from southern Thailand south into Malaysia.

Distribution

E. Cambodia, E. Thailand, C. S. Laos, C. & S. Vietnam.

Arisbe arycles rama (Felder & Felder, 1860) **stat. rev.**

Papilio rama Felder & Felder, 1860. Type locality: "Malacca".

Material examined

1 ♂ Selangor, Malaysia [CGT]; 1 ♀ Malacca, Malaysia [CGT]; 1 ♂ Sabah, Malaysia [CGT]; 1 ♀ Java, Indonesia [CGT]; 2 ♂♂ Perak, Malaysia [MGP].

Diagnostic characters

Small (♂ FW length 32.0 – 38.0 mm, mean 36.2 mm), with bright yellow-green spots, those on the underside overlain with opalescent scales giving a golden sheen. The black areas separating the spots are considerably more restricted than in the nominotypical subspecies. None of the specimens we have seen have a spot in HW extradiscal cell M_2-M_3. There is a large transverse red spot on the underside in HW extradiscal cell M_3-CuA_1. The red spots on the underside have a bright red to scarlet hue.

The original description and illustration of *rama* clearly indicate the bright green markings of the upperside and red markings of the underside, that match specimens from the Malay Peninsula, including southern Thailand, and Borneo.

Although Java and Sumatra are frequently included in the range of *A. arycles*, specimens from these islands are very rare in collections and further work is needed to substantiate the range of this subspecies.

Distribution

Malaysia (Sabah, Selangor, Perak), Indonesia (Java, Kalimantan), S. Thailand.

Arisbe arycles arycleoides (Fruhstorfer, 1902) **stat. rev.**

Papilio arycles arycleoides Fruhstorfer, 1902b. Type locality: Muok-Lek, Siam.

Material examined

Type material: Syntype ♂ [BMNH]. – Additional material: 5 ♂♂ Chanthaburi district, Thailand [MGP].

Diagnostic characters

Smaller than *A. a. arycles*, but larger than *A. a. rama* (♂ FW length 33.0 – 39.0 mm, mean 38.4 mm), with bluish-green spots, those on the underside overlain with opalescent scales giving a yellowish sheen as in *A. a. arycles*. The black areas separating the spots are quite extensive as in *A. a. arycles*. The BMNH syntype and the majority of specimens we have seen lack the small spot in HW extradiscal cell M_2-M_3 even on the underside. There is usually red pigmentation on the underside in HW extradiscal cell M_3-CuA_1 in two narrow, longitudinal stripes running parallel to the veins either side of the green spot. The red spots typically have a deeper shade than in *A. a. arycles*, being brick-red to crimson.

Cotton & Racheli (2007) placed *A. a. arycleoides* as a junior synonym of *A. a. sphinx*, however we find consistent differences between the material from south-eastern Thailand (type locality of *A. a. arycleoides*) and Vietnam (type locality of *A. a. sphinx* and presumed also of *A. a. arycles*) or Laos and therefore retain *A. a. arycleoides* as a valid subspecies.

Distribution

South eastern Thailand (Muak Lek, Pak Phili, Chonburi, Chanthaburi, Saraburi, Wan Nam Khiewo, Khao Khiewo, Khlong Tariew districts).

Arisbe arycles occidentalis **n. subsp.**

Holotype: ♂ Chiang Mai, Thailand, May 1966, leg. C. G. Treadaway [SMF]

Paratypes: 2 ♂♂ Chiang Mai, Thailand, May 1966, leg. C. G. Treadaway [CGT]; 1 ♂ South Myanmar [MGP]; 1 ♂ Manipur, N. E. India [MGP].

Etymology

This subspecies is named for its occurrence to the west of previously named populations (occidentalis from Latin 'occidens', 'occident-', from present participle of 'occidere', to set, used of the sun).

Diagnostic characters

Smaller than *A. a. arycles*, but larger than *A. a. rama* (♂ FW 36.9 mm) (Fig. 27), with pale green spots, those on the underside (Fig. 28) overlain with opalescent scales giving a yellowish sheen as in *A. a. arycles* (Fig. 29). The black areas separating the spots are less extensive than in *A. a. arycles*, the green spots thus being larger and less separated. The small spot in HW extradiscal cell M_2-M_3 even on the underside There is a slight trace of red pigmentation on the underside in HW extradiscal cell M_3-CuA_1 in the form of two narrow, longitudinal stripes running parallel to the veins either side of the green spot. The red spots typically have a deeper shade of brick-red than those of *A. a. arycles*.

The paratypes from Chiang Mai agree well with the holotype. The specimens from Manipur and Myanmar have a darker ground colour and bluish-green spots rather than the pale green of the Chiang Mai specimens. The green bilin pigment of Leptocircini can be quite variable in colour, and its preservation in older specimens depends on the conditions of storage. We separate the little known western populations because they combine the smaller size and lighter markings, which align them with the southern subspecies, with the blue-green colour that is typical of the northern subspecies. Cotton et al. (2013) have published a list of the Indian Papilionidae that specifically excludes *A. arycles* as not found in India. However, it is protected by Indian law and listed as coming from India by Collins & Morris (1985).

Distribution

North western Thailand, northern Myanmar, north-east India (Manipur).

4.7 *Arisbe bathycles* (Zinken, 1831)

Papilio bathycles Zinken, 1831. Type locality: Java.

Distribution of the species

Brunei, Indonesia (Java, Kalimantan, Sumatra), Malaysia (Perak, Selangor, Sabah, Sarawak), Thailand, Philippines.

Arisbe bathycles bathycles

Material examined

6 ♂♂ Java, Indonesia [MGP]

Diagnostic characters

This is a relatively small subspecies (mean ♂ FW length 34.6 mm), with sharply pointed FWs and markedly concave FW distal margins (Fig. 8). The median band and submarginal spots are duck-egg green, more bluish in fresh specimens. The median band is broad in the FW anal cell and extradiscal cells CuA_2-1A and CuA_1-CuA_2, thereafter narrowing sharply towards the apex of the cell. There is a single submarginal spot in extradiscal cell CuA_2-1A, rarely a faint trace of a second. The HW median band is broad and its distal margin is deeply incised where it crosses the discocellular veins, with black scaling running along the full length of the veins. There is a large spot in extradiscal cell M_3-CuA_1. On the HW underside, the post-discal spots are brick-red to brownish orange.

Distribution

Indonesia (Java).

Arisbe bathycles bathycloides (Honrath, 1884)

Papilio bathycles var. *bathycloides* Honrath, 1884. Type locality: Malacca, Borneo.

= *P. bathycles manlius* Fruhstorfer, 1908a. Type locality: Palawan [Homonym, *nec Papilio manlius* Fabricius, 1834].

= *Graphium bathycles capitolinus* Gauthier, 1984. Replacement name for *P. bathycles manlius* Fruhstorfer, 1908, **n. syn.**

Material examined

Type material: syntype ♂ [BMNH]. – Additional material: 1 ♂ Sahom, Malaysia [CGT]; 1 ♂ Perak, Malaysia [CGT]; 1 ♂ Selangor, Malaysia [CGT]; 1 ♂ Sumatra, Indonesia [CGT]; 1 ♂ Balabac, Philippines [CGT]; 11 ♂♂, 2 ♀♀ Palawan, Philippines [CGT]; 1 ♂ Brunei [MGP]; 2 ♂♂ Kalimantan, 5 ♂♂ Sumatra, Indonesia [MGP]; 1 ♂ Perak, 1 ♂ Sabah, Malaysia [MGP]; 26 ♂♂, 2 ♀♀ Palawan, Philippines [MGP]; 5 ♂♂ S. Thailand [MGP].

Diagnostic characters

Larger than *A. b. bathycles* (mean ♂ FW length 38.5 mm). The median band is narrower than in *A. b. bathycles* but the submarginal spots are smaller. Nevertheless, there are usually two submarginal spots in extradiscal cell CuA_2-1A, rarely there is one large spot with a faint trace of the second. The HW median band is not as broad as in *A. b. bathycles* and the spot in extradiscal cell M_3-CuA_1 is always absent. Specimens from Palawan are among the largest and tend to have broader FWs with more rounded apices, but this is not a constant characteristic and we retain these specimens within *A. b. bathycloides*.

Distribution

S. Thailand, Malaysia (Peninsular Malaya, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan), Philippines (Palawan, Balabac, Busuanga).

4.8 *Arisbe chironides* (Honrath, 1884)

= *Papilio chiron* Wallace, 1865. Type locality: "Assam; Sylhet…?". [Homonym, nec *Papilio chiron* Fabricius, 1775].

Papilio chiron var. *chironides* Honrath, 1884. Type locality: "bei Darjeeling, Sikkim etc.".

= *Graphium clanis chironicum* Eliot, 1982. Proposed as a replacement name for *Papilio chiron* Wallace, 1865.

Distribution of the species

Bhutan, Brunei, Cambodia, China, India, Indonesia, Laos, Malaysia, Thailand, Vietnam.

Arisbe chironides chironides

Material examined

8 ♂♂, 1 ♀ Meghalaya, India [CGT]; 1 ♂ Sikkim, India [CGT]; 1 ♀ Nepal [CGT]; 1 ♂, 1 ♀ Yunnan, China [CGT]; 15 ♂♂ Meghalaya, India [MGP]; 11 ♂♂ Yunnan, China [MGP]; 7 ♂♂ Sichuan, China [MGP]; 2 ♂♂ Shanxi, China [MGP].

Diagnostic characters

A large subspecies, particularly in its type locality, N. E. India (mean ♂ FW length 44.5 ± 1.2 mm) (Figs. 9, 30, 31). The size diminishes somewhat through Yunnan, northwards into Sichuan (mean ♂ FW length 43.3 ± 0.8 mm) and Shanxi. On the FW the spot of the median band in the anal cell is separated by a narrow black line from that in extradiscal cells CuA_2-1A by a thin black line. On the HW, the spot in extradiscal cell M_3-CuA_1 is usually (> 90 %) absent in ♂♂. There is seasonal dependence in size and markings, the early season forms (Fig. 31) being smaller, with more extensive green markings and occasionally, when the median band is very broad, an additional spot in HW extradiscal cell M_3-CuA_1.

Distribution

China (Shanxi, Shaanxi, Sichuan, Yunnan), India (Sikkim, Meghalaya, Assam, Manipur, Nagaland).

Arisbe chironides tereus (Fruhstorfer, 1908) **n. comb.**

Papilio bathycles tereus Fruhstorfer, 1908a. Type locality: Hainan.

This subspecies has been treated as a subspecies of *A. bathycles* by Koçak & Kemal (2009) and is listed as such on the GloBIS website.

Material examined

Type material: syntype ♂ [BMNH]. – Additional material: 25 ♂♂, 1 ♀ Hainan [MGP].

Diagnostic characters

A medium sized subspecies that shows pronounced dimorphism that may represent seasonal variation but is probably influenced by local microclimates. The first form (Fig. 34), which is associated mostly with specimens from the early part of the season (April–June) is small (mean ♂ FW length 40.2 ± 1.6 mm for 8 specimens) and has broad median bands on both sets of wings and well developed submarginal spots. The majority (7 out of 8 specimens) have a spot on the HW in extradiscal cell M_3-CuA_1. The green markings are pale, whitish green. The second form (Fig. 35), which is associated mostly with specimens from later in the season (July–August) is large (mean ♂ FW length 44.4 ± 2.2 mm for 17 specimens) and has narrow median bands, with thicker black lines separating the spots. None of the specimens we have seen have a spot on the HW in extradiscal cell M_3-CuA_1. Specimens corresponding to the early season form can be found as late as July in the Wuzi Shan mountain area, and specimens corresponding to the late season form can be found as early as May in the lowland area outside of Haikou.

The early season form resembles *A. c. punctatus* n. subsp. (see below) from Laos & southern Thailand, except that it is rather paler and the black lines separating the spots of the median bands are broader. The late season form resembles the Summer form of *A. c. clanis*, except that it is smaller and the black lines separating the spots of the median band are not so pronounced.

Distribution

China (Hainan).

Arisbe chironides clanis (Jordan, 1909) **stat. rev.**

Papilio clanis Jordan, 1909. Type locality: "Fo-kien" [Fukien, in Fujian, China].

Material examined

Type material: syntype ♂ [BMNH]. – Additional material: 2 ♂♂, 1 ♀ Fujian, China [MGP]; 12 ♂♂, 1 ♀ Guangxi, China [MGP]

Diagnostic characters

The largest subspecies of *A. chironides* (mean ♂ FW length 47.3 ± 2.1 mm for 13 Summer brood specimens) (Figs. 32, 33). In the northern part of the range (Fujian) there is seasonal dependence in size and markings, the early season forms being smaller, with more extensive green markings. On the FW, the spots of the median band are all separated by broad black lines running along the discocellular veins. On the HW, the spot in extradiscal cell M_3-CuA_1 is always absent. The diagnosis of this subspecies given by Racheli & Cotton (2009), in particular that this eastern Chinese specimens correspond to the Spring form from Laos and Vietnam, is inconsistent with the material we have seen and we recognize *A. c. clanis* as a distinct subspecies.

Distribution

China (Fujian, Guangxi).

Arisbe chironides punctatus **n. subsp.**

Holotype: ♂ Mt. Phupien Kaxieng, Danchung district, Xekong Prefecture, Laos, 1–10 June 2007, leg. R. Westphal [SMF]

Paratypes: 5 ♂♂, 2 ♀♀ Mt. Phupien Kaxieng, Danchung district, Xekong Prefecture, Laos, 1–10 June 2007, leg. R. Westphal [MGP]; 2 ♂♂ Phrae, Thailand, March 2007 [MGP]; 5 ♂♂ Ya Mo Kwi, Umphang, Tak Province, Thailand, April 2009 [MGP]; 2 ♂♂ Chiang Mai, Thailand, March 2006 [MGP]; 1 ♂, 1 ♀ Chiang Mai, Thailand, April 2009 [MGP]; 1 ♂ Khao Soi Dao, Chantaburi Province, Thailand, June 2005 [MGP]; 2 ♂♂ Dak Lak province, Vietnam, May 2010 [MGP]

Etymology

This subspecies is named for the high frequency of additional spots in the upperside median and submarginal bands.

Diagnostic characters

Relatively small (holotype FW length 40.0 mm) with broad median bands and large submarginal spots on the upperside. On the FW the spot of the median band in the anal cell is separated from that in extradiscal cell CuA_2-1A by a thin black line; the other spots of the median band are well separated. There are two submarginal spots in extradiscal cell CuA_2-1A. On the HW, the median band is divided by broad black lines running along the discocellular veins. There is a prominent spot in extradiscal cell M_3-CuA_1. On the underside, all the green spots are overlaid with translucent opalescent scales. The post-discal band is formed of bright orange spots.

The paratype males (Figs. 38, 39) agree well with the holotype (Fig. 36) (mean FW length 39.8 mm, range 36.4–41.5 mm). Two specimens (one from Umphang, Thailand and one from Phrae, Thailand) lack the second submarginal spot in extradiscal cell CuA_2-1A and one specimen (from Mt. Phupien Kaxieng, Danchung district, Xekong Prefecture, Laos) lacks the median band spot in extradiscal cell M_3-CuA_1. The latter spot varies in size from a small point to a significant spot approximately 1.5 mm in diameter (the specimen from Chantaburi Province, Thailand). There may be some seasonal variation: the specimens from early season (March–April) are among the smallest specimens but have relatively broad median bands. RACHELI & COTTON (2009) mention a Spring form from Laos and Vietnam without giving any details of its characteristics. The Spring form of *A. c. chironides* from Yunnan and northern parts of Thailand and Laos has larger submarginal spots and a broader median band than *A. c. punctatus* with narrower black lines traversing the discal portion of the HW median band.

The two paratype females are similar to the males, but are slightly larger (FW lengths 42.0 mm and 42.3 mm) and have even broader median bands (Fig. 37). The brown groundcolour and green markings are paler than in the males.

Distribution

Laos, Thailand, Vietnam. Probably also in Cambodia.

5 Check list of the *eurypylus* species group

Arisbe eurypylus (Linnaeus, 1758)

eurypylus subspecies group

- *A. eurypylus eurypylus* (Fig. 1). – Range: Indonesia (Ambon, Buru, Ceram).
- *A. eurypylus lycaon* (C. & R. Felder, 1865) = *Graphium (Graphium) eurypylus subhi* Koçak & Kemal, 2000. – Range: Australia (Queensland to New South Wales).
- *A. eurypylus lycaonides* (Rothschild, 1895) = *Papilio eurypylus priscus* Fruhstorfer, 1907. – Range: Indonesia (Biak, Waigeo, West Papua, Yapen), Papua New Guinea including D'Entrecasteaux islands.
- *A. eurypylus extensus* (Rothschild, 1895). – Range: Papua New Guinea (New Britain, New Ireland, Duke of York Group; New Hannover).
- *A. eurypylus lutorius* (Fruhstorfer, 1907). – Range: Indonesia (Batjan, Halmahera, Morotai, Obi).
- *A. eurypylus nyctimus* (Waterhouse & Lyell, 1914). – Range: Australia (Northern Territory, Groote Eylandt I.).
- *A. eurypylus kaicola* (Koçak, 1983). – Range: Indonesia (Key Is.).

pamphylus subspecies group

- *A. eurypylus pamphylus* (Felder & Felder, 1865) = *G. eurypylus telephus* Wallace, 1865 = *Papilio sangira* Oberthur, 1879 n. syn. – Range: Indonesia (Sanghir, Sulawesi).
- *A. eurypylus arctofasciatus* (Lathy, 1899). – Range: Indonesia (Sula Is.).
- *A. eurypylus fumikoe* (Detani, 1983). – Range: Indonesia (Peleng I.).
- *A. eurypylus pauli* n. subsp. – Range: Indonesia (Buton, Muna).

gordion subspecies group

- *A. eurypylus gordion* (Felder & Felder, 1865). – Range: Philippines (Bohol, Catanduanes, Cebu, Homonhon, Lubang, Luzon, Masbate, Mindoro, Mindanao, Panay, Polillo, Sibuyan, Siquijor).
- *A. eurypylus mecisteus* (Distant, 1885). – Range: Brunei, Indonesia (Belitung, Kalimantan, Karimata, Sumatra), Malaysia, Philippines (Balabac, Busuanga, Palawan).
- *A. eurypylus acheron* (Moore, 1885) = *Papilio eurypylus juba* Fruhstofer, 1908. – Range: China (Guangdong, Hainan, Yunnan), India (Assam, Sikkim, Meghalaya), Myanmar, Thailand, Laos, Cambodia, Vietnam.
- *A. eurypylus daton* (Fruhstorfer, 1908). – Range: Indonesia (Java).
- *A. eurypylus macronius* Jordan, 1909. – Range: India (Andaman Is.).
- *A. eurypylus isaribi* (Tsukada & Nishiyama, 1981). – Range: Indonesia (Siberut).
- *A. eurypylus madrmii* (Hanafusa, 1993). – Range: Indonesia (Kangean).

Arisbe sallastius (Staudinger, 1895) = *Papilio eurypylus sallastinus* n. syn. Fruhstorfer, 1902 = *Papilio eurypylus aloricus* Fruhstorfer, 1909 n. syn. = *Papilio eurypylus gabinus* Fruhstorfer, 1909 n. syn.

- *A. sallastius sallastius*. – Range: Indonesia (P. Alor, P. Flores, P. Leti, P. Lombok, P. Timor, P. Sermata, P. Sumba, P. Sumbawa, P. Wetar).
- *A. sallastius insularius* (Rothschild, 1896). – Range: Indonesia (Kalao I.).
- *A. sallastius lucius* (Fruhstorfer, 1903). – Range: Indonesia (P. Selayar, P. Tanahjampea).
- *A. sallastius crispus* (Fruhstorfer, 1903). – Range: Indonesia (P. Babar, P. Damar).
- *A. sallastius neolepidus* nom. nov. pro *Papilio eurypylus lepidus* (Fruhstorfer, 1904). – Range: Indonesia (P. Tanimbar, P. Larat).

Arisbe evemon (Boisduval, 1836)

- *A. evemon evemon*. – Range: Indonesia (Java).
- *A. evemon igneolus* (Fruhstorfer 1901). – Range: Indonesia (Nias).
- *A. evemon eventus* (Fruhstorfer, 1908). – Range: Brunei, Indonesia (Bangka, Belitung, Kalimantan, Natuna, Singkep, Sumatra, Tanahmasa), Malaysia (Sabah, Sarawak), Philippines (Mapun).
- *A. evemon orthia* (Jordan, 1909). – Range: Malaysia (Langkawi I., Perak, Selangor), Singapore, S. Thailand.
- *A. evemon heurni* (Van Eecke, 1913). – Range: Indonesia (Simeulue).
- *A. evemon hetaerias* (Jordan, 1937). – Range: Indonesia (Siberut).
- *A. evemon lebar* Page & Treadaway, 2011. – Range: Indonesia (Karimata I.).

Arisbe albociliatus (Fruhstorfer, 1901). – Range: China (Yunnan), India (Assam, Meghalaya), Laos, Myanmar, Vietnam.

Arisbe doson (Felder & Felder, 1864)

- *A. doson doson* (Fig. 5). – Range: Sri Lanka.

- *A. doson axionides* nom. nov. pro *Papilio axion* (Felder & Felder, 1864). – Range: China (Yunnan), Hong Kong, India (Assam, Arunchal Pradesh, Meghalaya, Sikkim), Myanmar, Nepal, Pakistan, Thailand, Vietnam.
- *A. doson evemonides* (Honrath, 1884) = *Papilio jason appulejus* (Fruhstorfer, 1909) = *Papilio jason autronicus* Fruhstorfer, 1909. – Range: Brunei, Indonesia (Belitung, Kalimantan, Natuna, Sumatra), Malaysia, Philippines (Balabac, Bongao, Mapun, Sanga Sanga, Sibutu, Tawi Tawi), Thailand.
- *A. doson rubroplaga* (Rothschild, 1895). – Range: Indonesia (Nias).
- *A. doson eurypylides* (Staudinger, 1895). – Range: Indonesia (Lombok, Sumbawa).
- *A. doson postianus* (Fruhstorfer, 1902). – Range: Philippines (Batanes), Taiwan.
- *A. doson sankapura* (Fruhstorfer, 1904). – Range: Indonesia (Bawean).
- *A. doson eleius* (Fruhstorfer, 1907). – Range: India (Kerala, Tamil Nadu).
- *A. doson actor* (Fruhstorfer, 1907) = *Papilio jason nanus* Fruhstorfer, 1909 = *Papilio jason praestabilis* Fruhstorfer, 1909. – Range: Cambodia, China (Guangdong, Hianan), Laos, Thailand (Phrae), Vietnam.
- *A. doson gyndes* (Fruhstorfer, 1907). – Range: Philippines (Busuanga, Dumaran, Palawan).
- *A. doson vulso* (Fruhstorfer, 1907). – Range: Indonesia (Java).
- *A. doson perillus* (Fruhstorfer, 1908). – Range: Japan (Yaeyama Is.).
- *A. doson albidus* (Nakahara, 1930) = *Graphium doson tsushimanus* Fujioka, 1981 n. syn. = *Graphium doson aykut* Koçak & Kemal, 2000. – Range: Japan (Honshu, Kyushu, Shikoku, Tsushima I.).
- *A. doson kajanga* (Corbet, 1937). – Range: Malaysia (Tioman I.).
- *A. doson sangeanus* (Kalis, 1941). – Range: Indonesia (Bali, Nus Barong).
- *A. doson nauta* (Tsukada & Nishiyama, 1980). – Range: Philippines (Basilan, Jolo, Luzon, Mindanao, Mindoro, Negros, Panay, Polillo).
- *A. doson okibi* (Tsukada & Nishiyama, 1981). – Range: Indonesia (Siberut, Sipora).
- *A. doson sarpedonoides* Abang & Page, 2006. – Range: Malaysia (Sabah: Balambangan I., Banggi I.).
- *A. doson gelap* Page & Treadaway, 2011. – Range: Indonesia (Karimata I.).
- *A. doson yamazakii* n. subsp. – Range: Malaysia (Redang I.).
- *A. doson kangeanus* n. subsp. – Range: Indonesia (Kangean).

Arisbe meyeri (Hopffer, 1874)

- *A. meyeri meyeri* (Fig 11). – Range: Indonesia (Sulawesi, Buton).
- *A. meyeri extremum* (Tsukada & Nishiyama, 1980). – Range: Indonesia (Sula Is.).

Arisbe procles (Grose-Smith, 1887) (Fig. 6). – Range: Malaysia (Sabah)

Arisbe arycles (Boisduval, 1836)

- *A. arycles arycles* (Fig. 7) = *Papilio arycles sphinx* Fruhstorfer, 1899 n. syn. = *Graphium (Graphium) arycles masal* Koçak & Kemal, 2000. – Range: Cambodia, Laos, Vietnam.
- *A. arycles rama* (Felder & Felder, 1860). – Range: Malaysia, S. W. Thailand. Possibly Indonesia (Java, Kalimantan).
- *A. arycles arycleoides* (Fruhstorfer, 1902). – Range: S. E. Thailand.
- *A. arycles perinthus* (Fruhstorfer, 1915). – Range: Philippines (Balabac, Busuanga, Palawan).
- *A. arycles occidentalis* n. subsp. – Range: India (Midizoram), Myanmar, N. W. Thailand.

Arisbe bathycles (Zinken, 1831)

- *A. bathycles bathycles*. – Range: Indonesia (Java).
- *A. bathycles bathycloides* (Honrath, 1884) = *Graphium bathycles capitolinus* Gauthier, 1984 n. syn. – Range: S. Thailand, Malaysia (Peninsular Malaya, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan), Philippines (Palawan, Balabac, Busuanga).

Arisbe chironides (Honrath, 1884)

- *A. chironides chironides*. – Range: China (Shanxi, Shaanxi, Sichuan, Yunnan), India (Sikkim, Meghalaya, Assam, Manipur, Nagaland).
- *A. chironides tereus* (Fruhstorfer, 1908). – Range: China (Hainan).
- *A. chironides clanis* (Jordan, 1909). – Range: China (Fujian, Guangxi).
- *A. chironides malayanum* Eliot, 1982. – Range: S. Thailand, West Malaysia.
- *A. chironides punctatus* n. subsp. – Range: Laos, Thailand, Vietnam. Probably also in Cambodia.

Arisbe leechi (Rothschild, 1895) (Fig. 10) = *Graphium leechi yunnana* Lee, 1985. – Range: China (Sichuan, Yunnan, Fujian, Guangxi, Hainan), Vietnam.

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