An illustrated checklist of the papilionid butterflies (Lepidoptera: Papilionidae) of northern and central Maluku, Indonesia

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Abstract: An annotated checklist of the 5 genera, 38 species and 84 subspecies of Papilionidae (swallowtail, swordtail and birdwing butterflies) known from the northern and central islands of Maluku (Indonesia), including Kepulauan Sula, is presented. Nine of the species are endemic (2 *Graphium*, 2 *Troides*, 2 *Ornithoptera*, 3 *Papilio*), with only *Pachliopta* lacking species entirely restricted to the area. Six of the species found on the westerly archipelago of Kep. Sula do not occur elsewhere within northern and central Maluku. Within the area, the Papuan region species *Papilio aegeus* Donovan, 1805, is known only from the island of Gebe. The account gives distributions by island within northern and central Maluku, with extralimital ranges indicated for each non-endemic species and subspecies, lists of larval hostplant genera for each species where known, and coloured illustrations of adults for all 38 species.

Keywords: swallowtail butterflies, birdwings, distribution, endemism, biogeography, hostplants.

Eine illustrierte Checkliste der Papilioniden (Lepidoptera: Papilionidae) der nördlichen und zentralen Molukken, Indonesien

Zusammenfassung: Die kommentierte Liste präsentiert die 5 Gattungen, 38 Arten und 84 Unterarten der Papilionidae (Schwalbenschwänze, Ritterfalter, Vogelfalter) der nördlichen und zentralen Molukkeninseln (Indonesien) einschließlich Kepulauan Sula. Neun der Arten sind endemisch (2 *Graphium,* 2 *Troides,* 2 *Ornithoptera,* 3 *Papilio*), lediglich von *Pachliopta* sind keine Arten auf dieses Gebiet beschränkt. Sechs der Arten des westlichen Archipels von Kep. Sula kommen in den nördlichen und zentralen Molukken sonst nicht vor. Die papuanische Art *Papilio aegeus* auf den Molukken nur von der Insel Gebe bekannt. Der Bericht zeigt die Verbreitungen nach Inseln innerhalb der nördlichen und zentralen Molukken, wobei für alle nichtendemischen Arten und Unterarten auch die Verbreitung außerhalb dieser Region erwähnt wird; er gibt weiterhin Listen der Raupenwirtspflanzen auf Gattungsniveau (soweit bekannt) und Farbillustrationen der Falter aller 38 Arten.

Introduction

> "*Troides prattorum*, the Buru Opalescent Birdwing, ... occurs only at high elevation in the Indonesian island of Buru ... a reserve for the unique butterfly fauna of Buru should ... be established."
>
> Mark Collins and Michael Morris (1985):
> "Threatened Swallowtail Butterflies of the World"

This paper is the third in a series intended to cover the entire butterfly fauna of northern and central Maluku. These papers will eventually form part of more extensive accounts of the butterflies of Wallacea (the region between the Sunda and Sahul shelves), and the whole Malay Archipelago. The objective is to summarise basic data essential for biogeographic analyses and for conservation evaluation. Vane-Wright & de Jong (2003) have recently summarised similar information for the Sulawesi region. The first two papers in this series (Vane-Wright & Peggie 1994, Peggie et al. 1995) set out the objectives in more detail. Monk et al. (1997) list all but three of the species included here, but omit most information on subspecies, and many island records.

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Scope and limitations of the checklist

The present checklist covers the Papilionidae (swallowtails, swordtails and birdwings) of northern and central Maluku, all of which belong to subfamily Papilioninae.

Limits and definitions of N and C Maluku

The main islands of N Maluku ("northern Moluccas") are Morotai, Halmahera, Ternate, Bacan and Obi, together with the more easterly island of Gebe. C Maluku ("southern Moluccas" in older literature) includes Buru, Seram, Ambon, Saparua, Geser and Seram Laut. The Sula Archipelago (Taliabu, Mangole and Sanana) belongs to the Sulawesi region biogeographically (Vane-Wright & de Jong 2003), but politically forms part of the Indonesian province of Maluku. Although listed here, the fauna of Kep. Sula is treated separately, and is not considered to form part of C Maluku (if a term is needed, it could be designated W Maluku). To the south of Buru and Seram and beyond Seram Laut lie the islands of S Maluku, which include Gunungapi, Wetar, Kisar, Romang, Damar, Kep. Sermata, Babar, Moa, Leti, Kep. Tanimbar, Kep. Aru, Kep.

Kai, Kep. Banda, Kep. Watubela and Kep. Gorong. The more scattered islands of S Maluku have a generally less well-known fauna, and may be assessed in future by one of us (AR). Eventually it may prove possible to recognise a further subdivision, E Maluku, to include Kep. Aru. In our lists for N and C Maluku we also include records for a number of smaller islands.

In the first two papers in this series on N and C Maluku (Vane-Wright & Peggie 1994, Peggie et al. 1995), some confusion has arisen concerning the eastern limit of C Maluku, which we defined as Seram Laut. In certain atlases, such as the popular Times Atlas of the World (1968), Kep. Seram Laut appears to include a number of islands immediately to the east of Seram, including Geser, Pandjang, Gorong and Manawoka. In the older Atlas of the tropical Netherlands (1938), however, the island chain starting with Pandjang is named the "Gorong-Eilanden" (Kep. Gorong). We confirm here that Geser and its immediate easterly neighbour Seram Laut form our eastern limit for C Maluku, and that the Gorong group, from Pandjang eastwards, belongs to S Maluku. Reasons for accepting Seram Laut as this eastern limit include the presence, on the Gorong group, of species such as *Papilio aegeus* (not known from Seram Laut, Geser or Seram: D'Abrera 1990), and the change in colour pattern and mimicry complex centred on *Euploea leucostictos*. This crow butterfly shifts from an essentially all-dark morph on Seram, Geser and Seram Laut, to a phenotype with broadly white wing margins on the Gorong group and further east (Ackery & Vane-Wright 1984).

Taxonomic and bionomic scope

We have endeavoured to include every currently recognised species-group taxon of the Papilionidae known to occur within the area. Names are listed with author and year of publication. Full references for most can be found in Bridges (1988). Original citations for taxa published more recently can be located through Zoological Record. Data for almost all butterfly names are now also accessible via the worldwide web (Beccaloni et al. 2003).

For each taxon, we give the geographical range by island within northern and central Maluku, plus range outside this focal area for non-endemics, and (wherever possible) an indication of known larval hosts. Our main sources for foodplant data have been Igarashi (1979), Common & Waterhouse (1981), Parsons (1998), Corbet & Pendlebury (1992), Igarashi & Fukuda (1997, 2000), Matsuka (2001), and Robinson et al. (2001). In most cases we have only listed plant genera, as relatively few species of butterflies have actually been bred in the Moluccas. Thus most of the records are based on work done elsewhere, and it seems likely that the local pool of suitable plant species will often be different. Hostplant information, much of which is gathered relatively uncritically and often derived from secondary literature, should always be treated with caution.

For each species we also give one or more illustrations depicting both the upper and underside patterns of the adult butterfly (Figs. 1–63). Where the sexes are very similar and no difficulty in identification is likely to occur, we only illustrate one sex. Where marked sexual dimorphism or other polymorphism is encountered, we provide additional pictures. In a few cases, where the races that occur within N & C Maluku differ strikingly in appearance, we also give additional illustrations. With one exception (Fig. 31), all the butterflies are 'halved', the left half depicting the upperside and the right half the underside. In a few cases the images have been reversed because the wings of the best specimens available to us are significantly damaged on the left hand side. Papilionidae are large and also vary greatly in absolute size. In the interests of space economy and as an aid to comparison, we have brought all the illustrations to a common overall size. Generally this works well, although the image of *Graphium androcles* (Fig. 12) for example, is noticeably too small in comparison with its close relatives due to its very long, out-stretched tails. In the legends we give the forewing length, as measured on the right forewing from base to extreme tip, for each specimen illustrated. The sizes of the specimens shown vary from a forewing length of 39.4 mm (male *Graphium aristeus*, Fig. 10) to 109.2 mm (female *Ornithoptera goliath,* Fig. 26).

The list is not synonymic, and thus all but a few of the many synonyms (both regional and extralimital) are not included. Where species-group names are no longer in their original generic combinations, we have placed the author names and dates of original publication in parentheses, in conformity with the ICZN convention. However, we have not altered species names endings to "agree" with current generic names; like most lepidopterists, we believe that stability is better served by retaining original orthography.

The list is also non-revisional. We have not proposed any changes in taxonomy. However, it is evident that some subspecies currently recognised may yet prove to be species in their own right (*Papilio fuscus ombiranus* would appear to be one such possibility). Equally, a number of subspecies recently proposed for populations newly discovered on smaller 'satellite' islands will almost certainly prove to be unjustified. Matsuka (2001) has recently acknowledged this by synonymising two supposed 'micro'-subspecies of *Ornithoptera croesus*, and questioning a number of other such taxa (see also Ohya 2003).

Vane-Wright (2003) has discussed how, for the three swallowtail tribes found in the Indo-Australian region, no stable classification yet exists. Even subdivision of *Papilio* remains highly contentious, and the works of e.g. Zakharov et al. (2004) and Page & Treadaway (2004) demonstrate continuing uncertainty and also foreshadow further changes. Here we have adopted the system of Häuser et al. (2001), but further changes must be anticipated.

Distributional data

Distribution records and other data have been collated from a variety of literature, including unpublished manuscripts by Cottam (1940a, b). Extensive published sources used include Tsukada & Nishiyama (1980), Common & Waterhouse (1981), D'Abrera (1982, 1990), Corbet & Pendlebury (1992), Treadaway (1995), Monk et al. (1997), Parsons (1998), Matsuka (2001), and Vane-Wright & de Jong (2003).

Another major source of data has been the collections of The Natural History Museum, London (BMNH). These collections have also been fundamental for interpreting a number of problematic taxa. Most recently in the genesis of this paper, AR has brought his detailed knowledge of the Moluccan fauna to the project, including information provided *in litt.* by H. Detani.

Distribution codes and distribution patterns

In the checklist, coded distribution patterns (e.g. "W", "E", "2+5") refer to the system employed by Vane-Wright & Peggie (1994), and are comparable to those proposed by Vane-Wright (1991) for a biogeographical analysis of the Sulawesi region (see also Vane-Wright & de Jong 2003). The number and letter codes should be interpreted according to the following definitions:

E Species wholly endemic to N Maluku and/or C Maluku, excluding Kep. Sula (see next). These endemics can be subdivided into species endemic to N Maluku only, C Maluku only, and to N+C Maluku together (Table 1).

S Species found, within N & C Maluku as defined here, only in Kep. Sula. The Sula Islands are included here as they form part of the Maluku political area.

G Species found, within N & C Maluku as defined here, only on the island of Gebe.

1 Species or genus found in N and/or C Maluku (but not restricted to Kep. Sula) which also occurs in the Mindanao region (S Philippines).

2 Species or genus found in N and/or C Maluku (but not restricted to Kep. Sula) which also occurs in the New Guinea region (and/or Kep. Aru).

3 Species or genus found in N and/or C Maluku (but not restricted to Kep. Sula) which also occurs in S Maluku (as defined by Vane-Wright & Peggie 1994).

4 Species or genus found in N and/or C Maluku (but not restricted to Kep. Sula) which also occurs in the Lesser Sunda Islands.

5 Species or genus found in N and/or C Maluku (but not restricted to Kep. Sula) which also occurs in the Sulawesi region (as defined by Vane-Wright & de Jong 2003).

W Species or genus found in N and/or C Maluku (but not restricted to Kep. Sula) which also occurs in all surrounding regions (= 1+2+3+4+5).

* Indicates a species or subspecies wholly endemic to N and/or C Maluku, including those taxa restricted to Kep. Sula. There are no butterfly genera narrowly endemic to the area.

Species found in a combination of two, three or four surrounding areas are coded by the corresponding ciphers, as follows: (1+2), (2+3+4), (1+3+4+5), etc. For example, (1+2) would indicate a species found in N and/or C Maluku (other than those found in Kep. Sula only) which also occurs in the Mindanao and New Guinea regions, but not in S Maluku, Lesser Sundas or the Sulawesi region. Any records listed as doubtful (?) have been ignored in making these codes.

Based in part on this system, the distribution patterns of the Papilionidae of N & C Maluku are summarised in Tables 1 and 2. Vane-Wright & Peggie (1994) gave a general interpretation of these patterns, based on preliminary data for all butterflies of the region.

Checklist

Papilionoidea, family Papilionidae

Range: cosmopolitan; about 550 species in three subfamilies, only one of which occurs in Maluku (Häuser et al. 2001).

Foodplants: approximately 45 families of flowering plants, amongst which Annonaceae, Aristolochiaceae, Lauraceae, Magnoliaceae and Rutaceae are particularly important.

Status: the Papilionidae are the only family of insects to have been made the subject of a systematic IUCN Red Data Book; the conservation status is given for each species, following Collins & Morris (1985), updated according to Baillie & Groombridge (1996) and the IUCN Red List website (http://www.redlist.org/).

Subfamily Papilioninae

Range: cosmopolitan; about 480 species in four tribes, three of which are found in Maluku.

Foodplants: as family.

Tribe Leptocircini (= Graphiini, = Lampropterini)

Note: Smith & Vane-Wright (2001) finally resolved the issue of which of these three names should be used for the papilionine tribe that includes both *Graphium* and *Lamproptera*.

Range: pantropics, with extensions into temperate regions; about 150 species in seven genera, only one of which occurs in Maluku.

Foodplants: primarily Annonaceae; also Lauraceae, Rosaceae.

Graphium Scopoli, 1777

Range (W): palaeotropics, with weak extension into temperate areas. About 97 species in 5 subgenera, 3 of which are represented in Maluku. Recent work by Smith & Vane-Wright (2001) and Makita et al. (2003) suggests, however, that the existing subgeneric classification is unsatisfactory. Page & Treadaway (2003a, b, 2004) have now divided the species of *Graphium* among two genera, *Arisbe* Hübner, 1819, to include *Arisbe* s. str., *Pathysa* Reakirt, 1864, *Paranticopsis* Wood-Mason & de Nicéville, 1887, and *Eurypleana* Niculescu, 1989, as subgenera, and *Graphium*, to include *Graphium* s. str. and *Macfarlaneana* Niculescu, 1989, as

subgenera. We consider these changes premature and do not adopt them here, although they are noted for each species affected. Hopefully, we may soon move to a web-based, unified taxonomic system that will promote greater stability, while still permitting differing classifications to be maintained where necessary or desirable (Scoble 2004).

Foodplants: predominantly Annonaceae and Lauraceae; also ?Apocynaceae, Aquifoliaceae, Atherospermataceae, Hernandiaceae, Magnoliaceae, Rutaceae, Sapindaceae, Sapotaceae, Winteraceae.

Graphium (*Graphium* Scopoli, 1777)

Range: Indo-Australian region, extending to Japan. About 28 species.

Foodplants: as genus.

codrus (Cramer, 1777)

(Fig. 1, sexes similar)

Range (1+2+3+5): Philippines (Luzon, Mindanao), Sulawesi (including Talaud, Kep. Banggai, Kep. Sula), N & C Maluku, Kai, Aru, Gebe (H. Detani, pers. comm. to AR), Waigeo, Batanta, Salawati, New Guinea region, Solomon Islands.

Foodplants: Annonaceae (*Annona, Uvaria*), Hernandiaceae (*Hernandia*), Malvaceae (?*Thespesia*).

Status: not known to be threatened.

**c. stiris* (Jordan, 1909)

Range: Kep. Sula (Sanana).

**c. gilolensis* (Wallace, 1865) (Fig. 1)

Range: Morotai, Halmahera, Ternate, Bacan, Obi.

c. subsp. indet.

Range: Gebe (H. Detani, pers. comm.; no material in BMNH); probably same race as in New Guinea?

**c. codrus* (Cramer, 1777)

Range: Buru, Kelang, Ambon, Seram, Saparua.

anthedon (Felder & Felder, 1864)

(Fig. 2, sexes similar)

Note: we follow Murayama (1978) in separating this species from *G. sarpedon*. Until recently this butterfly was known as *G. milon* (Felder & Felder), but *milon* was only validly introduced in 1865, and is junior to *anthedon;* see Moonen (1998) and Vane-Wright & de Jong (2003).

Range (5): Sulawesi region (including Talaud, Kep. Banggai, Kep. Sula), N & C Maluku.

Foodplants: probably Lauraceae.

Status: not known to be threatened.

**a. coelius* (Fruhstorfer, [May] 1899) (Fig. 2)

= *sulaensis* (Lathy, [June] 1899)

Range: Kep. Sula (Taliabu, Mangole, Sanana).

**a. halesus* (Fruhstorfer, 1907)

Range: Buru.

**a. dodingensis* (Rothschild, 1896)

Range: Morotai, Halmahera, ?Ternate, Bacan.

**a. crudus* (Rothschild, 1898)

Range: Obi.

**a. anthedon* (Felder & Felder, 1864)

Range: Kelang, Seram, Ambon.

**stresemanni* (Rothschild, 1916)

(Fig. 3, sexes similar)

Range (E): Seram.

Foodplants: probably Lauraceae.

Status: vulnerable (Baillie & Groombridge 1996; threat category VU B1+2ad).

**batjanensis* Okano, 1984

(Fig. 4, sexes similar)

Range (E): Bacan and Morotai. Parsons (1998: 245) considered *batjanensis* to be a subspecies of *G. weiskei* (Ribbe, 1900) but we follow Hanafusa (1998) and Müller & Tennent (1999) in continuing to accord it species rank, as originally proposed by Okano (1984). Apparently overlooked by Monk et al. (1997). See also discussion in de Jong (1998: 321).

Foodplants: probably Lauraceae.

Status: not included by Baillie & Groombridge (1996) or current IUCN red list.

**b. wayabulaensis* Hanafusa, 1998

Range: Morotai (1000 m).

**b. batjanensis* Okano, 1984 (Fig. 4)

Range: Bacan (1800–2000 m).

eurypylus (Linnaeus, 1758)

(Fig. 5, sexes similar)

Range (W): Northern India, Indo-China, China, Malay Peninsula, Sumatra, Java, Lesser Sunda Islands (W & E), Borneo, Philippines (all), Sulawesi region (including Sangihe, Kep. Banggai, Kep. Sula), Wetar, Babar, Damar, Tanimbar, Kai, Aru, N & C Maluku, Waigeo, New Guinea region, northern Australia. Monk et al. (1997) indicate that this species occurs throughout the whole of Maluku. — Page & Treadaway (2003a, b, 2004) place this species in *Arisbe* subgenus *Eurypleana* Niculescu, 1989.

Foodplants: Annonaceae (*Annona, Artabotrys, Desmos, Goniothalamus, Melodorum, Miliusa, Mitrephora, Polyalthia, Pseuduvaria, Rauwenhoffia, Saccopetalum, Uvaria*), Magnoliaceae (*Michelia*), Rutaceae (*Micromelum*), Sapindaceae (*Diploglottis*).

Status: not known to be threatened.

**e. arctofasciatus* (Lathy, 1899)

Range: Kep. Sula (Taliabu, Sanana).

**e. eutorius* (Fruhstorfer, 1907) (Fig. 5)

Range: Morotai, Halmahera, Ternate, Bacan, Obi.

e. eurypylus (Linnaeus, 1758)

Range: Buru, Kelang, Seram, Ambon, Goram.

Figs. 1–2: Adult Maluku Papilionidae. **Fig. 1:** *Graphium codrus gilolensis* ♂, Jailolo, Halmahera (fore-wing length 52.5 mm). **Fig. 2:** *G. anthedon sulaensis* ♂, Jorjoga, Taliabu (fwl 45.6 mm). **Fig. 3:** *G. stresemanni* ♂, Piliana, Seram, 1500 m (fwl 39.9 mm). **Fig. 4:** *G. batjanensis batjanensis* ♂, G. Sibela, Bacan, 1800 m (fwl 41.5 mm). **Fig. 5:** *G. eurypylus eutorius* ♂, Buho-Buho, Morotai (fwl 44.2 mm). **Fig. 6:** *G. meyeri meyeri* ♂, Samanga, S Sulawesi (H. Fruhstorfer) (fwl 52.2 mm). **Fig. 7:** *G. agamemnon guttatus* ♂, Hatetabako, Halmahera (fwl 49.5 mm). **Fig. 8:** *G. macfarlanei cestius* ♂, Waisirisa, Seram (fwl 43.8 mm). **Fig. 9:** *G. wallacei rubrosignatus* ♂, Baru, Halmahera (fwl 50.9 mm). **Fig. 10:** *G. aristeus aristeus* ♂, Piliana, Seram (fwl 39.4 mm). **Fig. 11:** *G. rhesus parvimacula* ♂, Kep. Sula (W. J. C. Frost) (fwl 42.3 mm; mirror-imaged). **Fig. 12:** *G. androcles cleomenes* ♂, Jorjoga, Taliabu (fwl 55.6 mm).

1
codrus ♂

2
anthedon ♂

3
stresemanni ♂

4
batjanensis ♂

5
eurypylus ♂

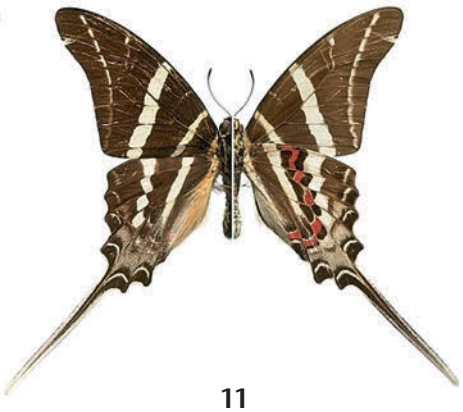
6
meyeri ♂

7
agamemnon ♂

8
macfarlanei ♂

9
wallacei ♂

10
aristeus ♂



11
rhesus ♂

12
androcles ♂

***meyeri* (Hopffer, 1874)**

(Fig. 6, sexes similar)

Range (S): Sulawesi region, including Kep. Banggai and Kep. Sula. We have not examined *G. m. extremum* from Kep. Sula; it appears to be very similar to the nominate race from Sulawesi, but with slightly narrower discal bands. – Page & Treadaway (2003b, 2004) place this species in *Arisbe* subgenus *Eurypleana* Niculescu, 1989.

Status: not known to be threatened

****m. extremum*** Tsukada & Nishiyama, 1980

Range: Kep. Sula (Sanana).

***agamemnon* (Linnaeus, 1758)**

(Fig. 7, sexes similar)

Range (W): Sri Lanka, India, southern China, Indo-China, Malay Peninsula, Sumatra, Java, Lesser Sunda Islands (W & E), Borneo, Philippines (all), Palau Islands, Caroline Islands (material in Bishop Museum, Honolulu), Sulawesi region (including Sangihe, Talaud, Kep. Sula), Wetar, Leti, Moa, Babar, Roma, Damar, Tanimbar, Banda, Kai, Aru, Misool, Salawati, Waigeo, N & C Maluku, New Guinea region, Solomon Islands, northern Australia. Monk et al. (1997) indicate that this species occurs throughout the whole of Maluku. – Page & Treadaway (2003a, b, 2004) place this species in *Graphium* subgenus *Macfarlaneana* Niculescu, 1989.

Foodplants: Annonaceae (*Anaxagorea, Ancana, Annona, Artabotrys, Cyathostemma, Desmos, Fissistigma, Fitzalania, Friesodielsia, Goniothalamus, Guatteria, Haplostichanthus, Melodorum, Miliusa, Mitrephora, Oncodostigma, Polyalthia, Pseuduvaria, Rauwenhoffia, Rollinia, Saccopetalum, Uvaria, Xylopia*), Bombacaceae (*Durio*), Dioscoreaceae (*Dioscorea*), Fabaceae (*Cassia*), Lauraceae (*Cinnamomum, Cryptocarya*), Magnoliaceae (*Elmerillia, Magnolia, Michelia*), Piperaceae (*Piper* – listed by Robinson et al. 2001), Rutaceae (*Citrus* – listed by Robinson et al. 2001).

Status: common.

a. comodus (Fruhstorfer, 1903)

Range: Kep. Sula (Taliabu, Sanana), Sulawesi, Sangihe, Salayar, Kalao, Tanahjampea.

****a. guttatus*** (Rothschild, 1895) (Fig. 7)

Range: Morotai, Halmahera, Ternate, Bacan, Obi.

a. plisthenes (Felder & Felder, 1864)

Range: Buru, Ambelau, Manipa, Kelang, Seram, Ambon, Saparua, Goram.

***macfarlanei* (Butler, 1877)**

(Fig. 8, sexes similar)

Range (2): N & C Maluku, Waigeo, Misool, Batanta, Salawati, Aru, New Guinea, Bismarck Archipelago, Admiralty Islands, Australia. – Page & Treadaway (2003b, 2004) place this species in *Graphium* subgenus *Macfarlaneana* Niculescu, 1989.

Foodplants: Annonaceae (*Annona, Xylopia*).

Status: not known to be threatened.

m. macfarlanei (Butler, 1877)

Range: Morotai, Halmahera, Ternate, Bacan, Gebe, Obi, Waigeo, Misool, Batanta, Salawati, Aru, New Guinea, Australia.

****m. cestius*** (Fruhstorfer, 1903) (Fig. 8)

Range: Buru, Ambelau, Seram, Ambon, Saparua.

***wallacei* (Hewitson, 1858)**

(Fig. 9, sexes similar)

Range (2): N Maluku (including Obi), Aru, New Guinea. Monk et al. (1997: 415) additionally list this species from Kep. Sula and Ambon, but we consider these records to be erroneous. – Page & Treadaway (2003) do not comment on this species; possibly they would include it in *Graphium* subgenus *Macfarlaneana* Niculescu, 1989.

Foodplants: Annonaceae (*Annona*).

Status: not known to be threatened.

****w. rubrosignatus*** (Rothschild, 1895) (Fig. 9)

Range: Morotai, Halmahera, Bacan, Obi (W. Doherty, ex Rothschild collection).

w. wallacei (Hewitson, 1858)

Range: Gebe, Aru, New Guinea.

***Graphium* (*Pathysa* Reakirt, 1865)**

Range: Oriental and Australian regions. Includes about a dozen species.

Foodplants: Annonaceae, Lauraceae, Magnoliaceae.

***aristeus* (Stoll, 1780)**

(Fig. 10, sexes similar)

Range (W): north-eastern India, Indo-China, Malay Peninsula, Sumatra, Java, Lesser Sunda Islands (W & E), Borneo, Philippines (all), Kalao, Tanahjampea, Timor, Wetar, Aru, Romang, Waigeo, N & C Maluku, New Guinea region, northern Australia. Monk et al. (1997: 415), while including this species in their list, do not give any distribution data, other than to indicate that it does not occur on Kep. Sula. – Page & Treadaway (2003a, b, 2004) place this species in *Arisbe* Hübner, 1819, subgenus *Pathysa.*

Foodplants: Annonaceae (*Miliusa, Pseuduvaria*).

Status: not known to be threatened.

****a. timocrates*** (Felder & Felder, 1865)

Range: Morotai, Halmahera, Bacan, Buru (Tsukada & Nishiyama 1980).

****a. bifax*** (Rothschild, 1898)

Range: Obi.

****a. aristeus*** (Stoll, 1880) (Fig. 10)

Range: Seram, Ambon [probably extinct: AR].

a. parmatus (Gray, 1852)

Range: Gebe, Aru, Waigeo, Misool, New Guinea, Australia.

***rhesus* (Boisduval, 1836)**

(Fig. 11, sexes similar)

Range (S): Sulawesi region (including Kep. Banggai, Kep. Sula). – Page & Treadaway (2003b, 2004) place this species in *Arisbe* Hübner, 1819, subgenus *Pathysa.*

Status: not known to be threatened.

****r. parvimacula*** (Joicey & Talbot, 1922) (Fig. 11)

Range: Kep. Sula (Mangole, Sanana).

***androcles* (Boisduval, 1836)**

(Fig. 12, sexes similar)

Range (S): Sulawesi region (including Kep. Banggai, Kep. Sula). – Page & Treadaway (2003b, 2004) place this species in *Arisbe* Hübner, 1819, subgenus *Pathysa.*

Status: not known to be threatened.

****a. cleomenes*** (Fruhstorfer, 1911) (Fig. 12)

Range: Kep. Sula (Taliabu, Sanana).

euphrates (Felder & Felder, 1862)

(Fig. 13, sexes similar)

Range (1+5): Philippines (Balabac, Palawan, Luzon, Mindanao), Banggi (Sabah), Sulawesi, N Maluku. — Page & Treadaway (2003a, b, 2004) place this species in *Arisbe* Hübner, 1819, subgenus *Pathysa.*

Foodplants: Annonaceae (*Uvaria*), Lauraceae.

Status: not known to be threatened.

**e. ornatus* (Rothschild, 1895) (Fig. 13)

Range: Halmahera, ?Ternate, Bacan (AR), Obi (doubtful according to H. Detani, pers. comm. to AR, but listed by Tsukada & Nishiyama 1980, and by Monk et al. 1997).

Graphium (*Paranticopsis* Wood-Mason & de Nicéville, 1887)

Range: Oriental and Australian regions. This subgenus includes about 12 species.

Foodplants: Aquifoliaceae (Hancock 1983a).

deucalion (Boisduval, 1836)

(Fig. 14, sexes similar)

Note: *Graphium felixi* (Joicey & Noakes, 1915), from Biak, is included as a subspecies of *G. deucalion*, and not the New Guinea species *G. thule* (Wallace, 1865), on the authority of Hancock (1979). Further research is needed to confirm or refute this suggestion because, if Hancock is correct, this collective species offers evidence for an intriguing biogeographical pattern (Vane-Wright 1991: 193).

Range (2+5): Sulawesi, Kep. Banggai, N Maluku, Biak (Irian Jaya). — Page & Treadaway (2003b, 2004) place this species in *Arisbe* Hübner, 1819, subgenus *Paranticopsis.*

Foodplants: probably Aquifoliaceae.

Status: not known to be threatened.

**d. leucadion* (Staudinger, 1884) (Fig. 14)

Range: Morotai, Halmahera, Ternate (Monk et al. 1997), Bacan, Obi.

Tribe Troidini

Range: pantropical (except for African mainland), with weak extension into temperate regions; about 130 species in 12 genera. Two widespread genera occur in Maluku (*Troides* and *Pachliopta*), together with one Papuan genus (*Ornithoptera*).

Foodplants: Aristolochiaceae, Piperaceae (Igarashi & Fukuda 1997).

Pachliopta Reakirt, 1865

Range (W): Oriental and Australian regions. Two of the 16 species occur in Maluku.

Foodplants: Aristolochiaceae (*Aristolochia, Thottea*), Piperaceae (*Piper*).

polydorus (Linnaeus, 1763)

(Fig. 15, sexes similar)

Range (2+3): N & C Maluku, S Maluku (Tanimbar, Kai, Aru), Waigeo, Misool, New Guinea, Solomon Islands, Australia.

Foodplants: Aristolochiaceae (*Aristolochia*).

Status: generally common, but some subspecies may be threatened.

**p. septentrionalis* (Rothschild, 1895) (Fig. 15)

Range: Morotai, Halmahera, Bacan.

**p. kajelanus* (Fruhstorfer, 1899)

Range: Buru, Ambelau.

p. polydorus (Linnaeus, 1763)

Range: Obi (Tsukada & Nishiyama 1980), Manipa, Kelang, Seram, Ambon, Saparua, Geser, Goram.

polyphontes (Boisduval, 1836)

(Fig. 16, sexes similar)

Range (5): Sulawesi region (including Sangihe, Talaud, Kep. Banggai, Kep. Sula), N and ?C Maluku (?Seram: J. Weintraub, pers. comm.; very unlikely according to AR). No record for C Maluku is confirmed by Page & Treadaway (1995), who suggest that *P. polyphontes* is most closely related to a Philippine species, *P. kotzebuea* (Eschscholtz, 1821).

Foodplants: Aristolochiaceae (*Aristolochia tagala*), Piperaceae (*Piper:* Igarashi & Fukuda 1997).

Status: not known to be threatened.

**p. aipytos* (Fruhstorfer, 1908)

Range: Kep. Sula (Taliabu, Mangole, Sanana).

**p. sejanus* (Fruhstorfer, 1908) (Fig. 16)

Range: Morotai, Halmahera, Ternate, Bacan.

Troides Hübner, 1819

Range (W): Oriental and Australian regions. About 20 species, in 2 subgenera (one monobasic), both of which are represented in Maluku.

Foodplants: Aristolochiaceae (*Aristolochia, Thottea*).

Troides (*Ripponia* Haugum & Low, 1975)

Range: A single species restricted to the Sulawesi region and Maluku.

Foodplants: Aristolochiaceae (*Aristolochia*).

hypolitus (Cramer, 1775)

(Figs. 17, 18; sexes dissimilar)

Range (5): Sulawesi region (including Kep. Sangihe, Kep. Banggai, Salayar, Muna, Kep. Tukangbesi), N & C Maluku.

Foodplants: Aristolochiaceae (*Aristolochia tagala*).

Figs. 13–24: Adult Maluku Papilionidae. **Fig. 13:** *Graphium euphrates ornatus* ♂, Halmahera (ex Staudinger) (fwl 43.5 mm). **Fig. 14:** *G. deucalion leucadion* ♂, Halmahera (Kibler) (fwl 48.0 mm). **Fig. 15:** *Pachliopta polydorus septentrionalis* ♂, Buho-Buho, Morotai (fwl 53.5 mm). **Fig. 16:** *P. polyphontes sejanus* ♂, Hatetabako, Halmahera (fwl 56.8 mm). **Fig. 17:** *Troides hypolitus hypolitus* ♂, Hila, Ambon (fwl 77.0 mm). **Fig. 18:** *T. h. hypolitus* ♀, Laha, Ambon (fwl 100.0 mm). **Fig. 19:** *T. oblongomaculatus oblongomaculatus* ♂, Hila, Ambon (fwl 86.6 mm). **Fig. 20:** *T. o. oblongomaculatus* ♀, Hila, Ambon (fwl 96.4 mm). **Fig. 21:** *T. criton criton* ♂, Daeo, Morotai (fwl 73.8 mm; mirror-imaged). **Fig. 22:** T. *c. criton* ♀, Daeo, Morotai (fwl 75.8 mm; mirror-imaged). **Fig. 23:** *T. prattorum* ♂, Buru (ex A. Low) (fwl 82.4 mm; mirror-imaged). **Fig. 24:** *T. prattorum* ♀, Liang Neat, Buru (fwl 97.8 mm).

Figs. 25–36: Adult Maluku Papilionidae. **Fig. 25:** *Ornithoptera goliath procus* ♂, [Seram] (ex H. M. Peebles coll.) (fwl 95.0 mm). **Fig. 26:** *O. g. procus* ♀, Central Seram (C. F. & J. Pratt) (fwl 109.2 mm). **Fig. 27:** *O. aesacus* ♂, Obi major (Waterstradt) (fwl 79.1 mm). **Fig. 28:** *O. aesacus* ♀, Obi (fwl 94.5 mm). **Fig. 29:** *O. croesus toeantei* ♂, Daeo, Morotai (fwl 75.0 mm). **Fig. 30:** *O. c. toeantei* ♀, Daeo, Morotai (fwl 88.1 mm). **Fig. 31:** *O. c. croesus* ♀, Mandioli (fwl 100.4 mm; upperside only). **Fig. 32:** *O. priamus priamus* ♂, Ambon (J. L. Rey) (fwl 89.3 mm). **Fig. 33:** *O. p. priamus* ♀, Piliana, Seram (fwl 105.4 mm). **Fig. 34:** *Papilio gigon mangolinus* ♂, Mangole, Kep. Sula (W. Doherty) (fwl 62.5 mm). **Fig. 35:** *P. ascalaphus ascalon* ♂, Mangole, Kep. Sula (Platen) (fwl 73.7 mm). **Fig. 36:** *P. a. ascalon* ♀, Kep. Sula (Kühn) (fwl 75.2 mm).

13
euphrates ♂

14
deucalion ♂

15
polydorus ♂

16
polyphontes ♂

17
hypolitus ♂

18
hypolitus ♀

19
oblongomaculatus ♂

20
oblongomaculatus ♀

21
criton ♂

22
criton ♀

23
prattorum ♂

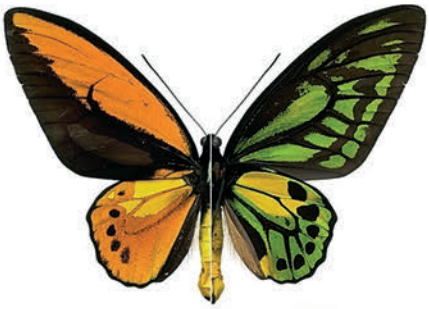
24
prattorum ♀

25
goliath ♂

26
goliath ♀

27
aesacus ♂

28
aesacus ♀

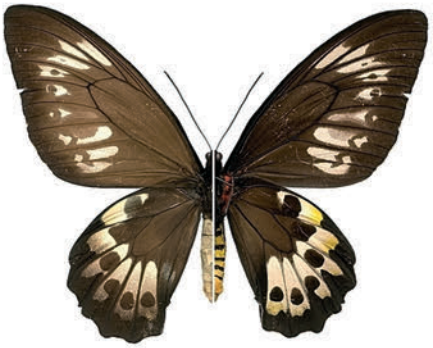


29
croesus toeantei ♂

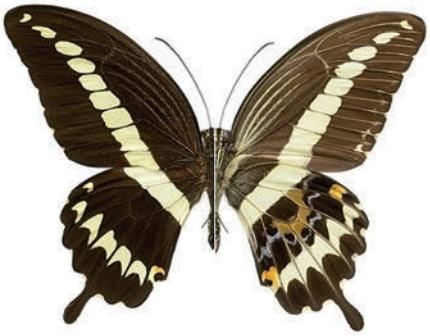
30
croesus toeantei ♀

31
croesus croesus ♀

32
priamus ♂



33
priamus ♀



34
gigon ♂

35
ascalaphus ♂

36
ascalaphus ♀

Status: not known to be threatened but protected under Indonesian law.

****h. sulaensis*** Staudinger, 1895

Range: Kep. Sula (Taliabu, Mangole, Sanana).

****h. antiopa*** Rothschild, 1908

Range: Morotai, Halmahera (north-eastern arm only?), ?Ternate (listed by Monk et al. 1997, but unlikely), Kasiruta (H. Detani, pers. comm.), Bacan, ?Obi (listed by both Monk et al. 1997 and Haugum & Low 1985: 94, but unlikely to be correct).

****h. hypolitus*** (Cramer, 1775) (Figs. 17, 18)

Range: Buru, Seram, Saparua, Ambon, Haruku (Matsuka 2001).

Troides (*Troides* Hübner, 1819)

Range: as genus.

Foodplants: as genus.

oblongomaculatus (Goeze, 1779)

(Figs. 19, 20; sexes dissimilar)

Range (2+3+5): Salayar, Tanahjampea, Buton, Kep. Tukangbesi, C Maluku, Kep. Gorong, Kep. Watubela, Kep. Banda, Salawati, Schouten Island (Yapen), New Guinea.

Note: according to H. Detani (pers. comm.), *T. o. mangolensis* Tsukada & Nishiyama, 1980, supposedly from Kep. Sula, was almost certainly based on mislabelled material. The supposed "mountain form" from Buru, *T. o. ohzui* Kobayashi & Koiwaya, 1979, probably just represents normal variation within subspecies *bouruensis*.

Foodplants: Aristolochiaceae (*Aristolochia*).

Status: not known to be threatened but protected (in Indonesia).

****o. bouruensis*** (Wallace, 1865)

Range: Buru, Ambelau.

o. oblongomaculatus (Goeze, 1779) (Figs. 19, 20)

Range: Manipa, Kelang, Boano, Seram, Ambon, Haruku, Saparua, Nusa Laut, Geser (Haugum & Low 1985: 297), Seram Laut (Tsukada & Nishiyama 1980, Monk et al. 1997, Haugum & Low 1985: 297), Misool (Matsuka 2001).

****criton*** (Felder & Felder, 1860)

(Figs. 21, 22; sexes dissimilar)

Range (E): ?Sulawesi, N Maluku (including Obi).

Note: records for Sulawesi are thought to represent hybrids (Matsuka 2001), *T. helena* × *T. haliphron*. However, as noted by Vane-Wright & de Jong (2003), the taxonomic status of the two nominal subspecies involved [*T. criton celebensis* (Wallace, 1865), and *T. c. selayarensis* Kobayashi & Koiwaya, 1981] evidently deserves further investigation. See also discussion in de Jong (1998: 321).

Foodplants: Aristolochiaceae (*Aristolochia*).

Status: not known to be threatened but protected under Indonesian law.

****c. criton*** (Felder & Felder, 1860) (Figs. 21, 22)

Range: Morotai, Halmahera, Ternate, Tidore, Kasiruta, Bacan (Matsuka 2001).

****c. critonides*** (Fruhstorfer, 1903)

Range: Obi, Obilatu (Matsuka 2001).

****prattorum*** (Joicey & Talbot, 1922)

(Figs. 23, 24, 64–68; sexes dissimilar)

Note: Matsuka (2001: 100) refers to this species, otherwise known as the Buru Opalescent Birdwing, as Pratt's Birdwing, but this is correctly Pratts' Birdwing, reflecting that *prattorum* (genitive plural) refers to the brothers C. F. & J. Pratt, the original collectors of this species. Matsuka provides wonderful pictures of live *T. prattorum* taken on Buru, showing the changing iridescent colours of the male hindwing of this magnificent insect; we have tried to give some impression of this with five photographs taken from a museum specimen (Figs. 64–68). In the past this species has been thought to be closely related to the Philippine opalescent birdwing, *T. magellanus* (Felder & Felder, 1862), but this idea is rejected by Page & Treadaway (2004).

Range (E): Buru (mid-montane).

Foodplants: unknown, but almost certain to be Aristolochiaceae.

Status: Vulnerable (Baillie & Groombridge 1996; threat category VU D2, being vulnerable due to very restricted area of occupancy).

Ornithoptera Boisduval, 1832

Range: Maluku, New Guinea, Bismarcks, Solomon Islands, Australia. All 12 of these spectacular species, 4 of which occur in Maluku, are protected under the Convention on International Trade in Endangered Species (CITES) (New & Collins 1991).

Foodplants: Aristolochiaceae (*Aristolochia*, *Pararistolochia*).

goliath Oberthür, 1888

(Figs. 25, 26; sexes dissimilar)

Range (2): Seram, Waigeo, New Guinea, Yapen, Goodenough Island.

Foodplants: Aristolochiaceae (*Aristolochia*).

Status: Not considered to be threatened (not included by Baillie & Groombridge 1996), but protected in Indonesia and listed under CITES Appendix II.

****g. procus*** (Rothschild, 1914) (Figs. 25, 26)

Range: Seram.

****aesacus*** (Ney, 1903)

(Figs. 27, 28, sexes dissimilar)

Range (E): Obi.

Foodplants: unknown, but almost certain to be Aristolochiaceae.

Status: Vulnerable (Baillie & Groombridge 1996; threat category VU D2, being vulnerable due to very restricted area of occupancy).

****croesus*** Wallace, 1859

(Figs. 29, 30, 31, sexes dissimilar)

Note: Matsuka (2001) has recently clarified the synonymy of various minor island races proposed for *croesus*, and we have followed his system. Matsuka lists *croesus sananaensis* Tsukada & Nishiyama, 1980, purportedly from Sanana (Kep. Sula), as a doubtful subspecies, but according to H. Detani (pers. comm.) Sanana was probably an erroneous locality inadvertently provided by a dealer; thus this taxon was apparently described in error, and possibly represents a minor variation of *croesus croesus*. See also discussion of this species in de Jong (1998: 320).

Range (E): N Maluku.

Foodplants: Aristolochiaceae (*Aristolochia*).

Status: Endangered (Baillie & Groombridge 1996; threat category EN B1+2c, being endangered due to extent of occurrence estimated at less than 5000 km², with indications of extreme fluctuations in population size); protected under Indonesian law.

Note: this conservation status evaluation is difficult to understand, as the so-called Halmahera rain forest biome (covering Morotai, Halmahera, Bacan and nearby islands, together with Obi) is currently listed as being in excess of 25 000 km², with 80% of the original forest reported as still intact, and seven protected areas amounting to 4880 km² in extent (www.worldwildlife.org/wildworld/profiles; see also Monk et al. 1997).

****c. toeantei*** Parrott & Schmid, 1984 (Figs. 29, 30)

= *morotaiensis* Sumiyoshi, 1989

Note: Ohya (2003) regards this as only a "local form" of *croesus lydius*. However, as he notes that "The female ... differs from ssp. *lydius* in the very dark brown, almost black ground colour and in the heavily dusted pale pattern with brownish-black scaling except at the base of the wing", we follow Matsuka (2001) in retaining this taxon as a formal subspecies.

Range: Morotai.

****c. lydius*** (Felder & Felder, 1865)

Range: Halmahera, Doi (Matsuka 2001), Ternate (apparently not seen since volcanic eruption of 1983), Tidore (Monk et al. 1997, Ohya 2003).

****c. croesus*** Wallace, 1859 (Fig. 31)

= *helios* Kobayashi & Hayami, 1992

= *wallacei* Delisle, 1991

Note: Both *helios* and *wallacei* were formally synonymised by Matsuka (2001), but Ohya (2003) refers to them as "local forms" of *croesus croesus*.

Range: Kasiruta, Mandioli, Bacan.

priamus (Linnaeus, 1758)

(Figs. 32, 33; sexes dissimilar)

Range (2+3): Maluku, Kep. Kai, Kep. Aru, Kofiau, New Guinea, Bismarck Archipelago, Solomon Islands, eastern Australia.

Foodplants: Aristolochiaceae (*Aristolochia, Pararistolochia*).

Status: common, but protected in Indonesia and listed under CITES Appendix II.

****p. gebeensis*** Parrott, 1985

Range: Gebe.

****p. impensus*** Parrott, 1990

= *priamus*? – listed as doubtful subspecies by Matsuka (2001)

Range: Manipa.

****p. priamus*** (Linnaeus, 1758) (Figs. 32, 33)

Range: Kelang, Seram, Ambon, Haruku, Saparua.

Tribe Papilionini

Range: cosmopolitan; about 210 species in three genera, one of which occurs in Maluku.

Foodplants: approximately 30 families of flowering plants, the most important being Apiaceae, Lauraceae, Magnoliaceae, and Rutaceae.

Papilio Linnaeus, 1758

Range (W): almost cosmopolitan, but not in New Zealand. About 200 species, currently divided into 9 subgenera by Häuser et al. (2001), of which 3 occur in N & C Maluku. However, the work of Zakharov et al. (2004) suggests that various changes must be anticipated, including the possible inclusion of both *Menelaides* and *Achillides* within a revised concept of subgenus *Princeps*. This would be a very different arrangement to that now proposed by Page & Treadaway (2003a, b, 2004). For the present we continue to urge a conservative approach to subdivision of *Papilio*.

Foodplants: as tribe.

Papilio (*Menelaides* Hübner, 1819)

Range: Oriental and Australian regions, extending into temperate Asia. Nearly 60 species, divided amongst 10 species-groups. – Page & Treadaway (2003a, b, 2004) give *Menelaides* generic status.

Foodplants: Lauraceae, Magnoliaceae, Rubiaceae, Rutaceae.

gigon Felder & Felder, 1864

(Fig. 34, sexes similar)

Range (S): Sulawesi region (including Sangihe, Talaud, Buton, Kep. Banggai, Kep. Sula). – Page & Treadaway (2004) would exclude this species from *Menelaides*, placing it instead in *Papilio* s.str.

Foodplants: Rutaceae (*Citrus, Euodia, Glycosmis*).

Status: not known to be threatened.

****g. mangolinus*** Fruhstorfer, 1899 (Fig. 34)

Range: Kep. Sula (Taliabu, Mangole, Sanana).

ascalaphus Boisduval, 1836

(Figs. 35, 36 – sexes dissimilar)

Range (S): Sulawesi region (including Kep. Banggai, Kep. Sula).

Foodplants: Rutaceae (*Citrus*).

Status: not known to be threatened.

Figs. 37–48: Adult Maluku Papilionidae. **Fig. 37:** *Papilio memnon nestor* ♂, "Obi", syntype (ex R. Krüger, Leipzig) (fwl 61.3 mm). **Fig. 38:** *P. m. nestor* ♀, "Obi" syntype (ex R. Krüger, Leipzig) (fwl 65.5 mm). **Fig. 39:** *P. memnon* ♂ of introduced hybrid, Salemon, Seram (fwl 67.5 mm; mirror-imaged). **Fig. 40:** *P. memnon* tailed ♀ of introduced hybrid, Salemon, Seram (fwl 66.3 mm). **Fig. 41:** *P. memnon* tailless ♀ of introduced hybrid, Salemon, Seram (fwl 67.3 mm). **Fig. 42:** *P. deiphobus deiphontes* ♂, Babang, Bacan (fwl 68.9 mm). **Fig. 43:** *P. d. deiphontes* ♀, Babang, Bacan (fwl 71.0 mm). **Fig. 44:** *P. d. deiphobus* ♂, Waisirisa, Seram (fwl 77.0 mm). **Fig. 45:** *P. d. deiphobus* ♀, Kayeli, Buru (Doherty) (fwl 76.1 mm). **Fig. 46:** *P. sataspes ahasverus* ♂, Mangole, Kep. Sula (Platen) (fwl 69.5 mm). **Fig. 47:** *P. s. ahasverus* ♀, Mangole, Kep. Sula (Platen) (fwl 68.2 mm; mirror-imaged). **Fig. 48:** *P. polytes alphenor* ♂, Waisirisa, Seram (fwl 55.2 mm).

Figs. 49–60: Adult Maluku Papilionidae. **Fig. 49:** *Papilio polytes alphenor* ♀, Waisirisa, Seram (fwl 52.6 mm). **Fig. 50:** *P. aegeus ormenus* ♂, Gebe (Waterstradt) (fwl 62.5 mm). **Fig. 51:** *P. a. ormenus* ♀ f. *"selucis"* Jordan, Gebe (Waterstradt) (fwl 67.8 mm). **Fig. 52:** *P. a. ormenus* ♀ f. *"leporina"* Jordan, Gebe (Waterstradt) (fwl 71.9 mm). **Fig. 53:** *P. fuscus lapathus* ♂, Daeo, Morotai (fwl 52.8 mm). **Fig. 54:** *P. f. ombiranus* ♂, Laiwui, Obi (fwl 54.5 mm). **Fig. 55:** *P. heringi* ♂, Baru, Halmahera (fwl 65.9 mm). **Fig. 56:** *P. gambrisius gambrisius* ♂, Waisirisa, Seram (fwl 81.1 mm). **Fig. 57:** *P. g. gambrisius* ♀, Saparua (ex Rothschild Bequest) (fwl 83.2 mm). **Fig. 58:** *P. tydeus hanafusai* ♂, Buho-Buho, Morotai (fwl 66.4 mm). **Fig. 59:** *P. t. hanafusai* ♀, Buho-Buho, Morotai (fwl 64.6 mm). **Fig. 60:** *P. demoleus libanius* ♂, Piru, Seram (fwl 44.5 mm).

37
memnon "nestor" ♂

38
memnon "nestor" ♀

39
memnon ♂

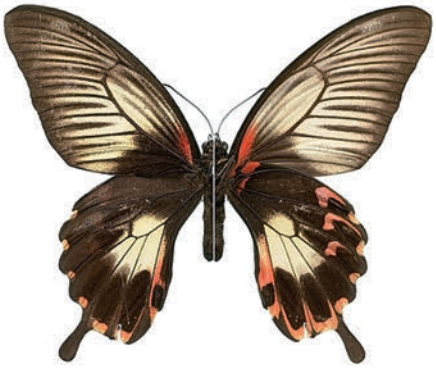
40
memnon ♀

41
memnon ♀

42
deiphobus deiphontes ♂

43
deiphobus deiphontes ♀

44
deiphobus deiphobus ♂



45
deiphobus deiphobus ♀

46
sataspes ♂

47
sataspes ♀

48
polytes ♂

49
polytes ♀

50
aegeus ♂

51
aegeus ♀

52
aegeus ♀

53
fuscus lapathus ♂

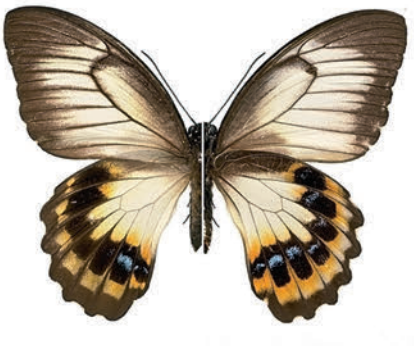
54
fuscus ombiranus ♂

55
heringi ♂

56
gambrisius ♂

57
gambrisius ♀

58
tydeus ♂



59
tydeus ♀

60
demoleus ♂

**a. ascalon* Staudinger, 1895 (Figs. 35, 36)

Range: Kep. Sula (Sanana).

memnon Linnaeus, 1758

(Figs. 37–41, sexes dissimilar, ♀ polymorphic)

Range: north-eastern India, Indo-China, China, Taiwan, southern Japan, Malay Peninsula, Sumatra, Java, Lesser Sunda Islands (W & E), Borneo, Palawan, Balabac and Mapun (Page & Treadaway 2004), Kalao, ?Obi. Not listed by Monk et al. (1997) as occurring anywhere within Maluku. – Page & Treadaway (2003a, b, 2004) include *P. lowii* Druce, 1873, within *P. memnon*, thus extending the range of the collective species to Palawan.

Foodplants: Magnoliaceae (*Magnolia*, *Michelia*), Rutaceae (*Atalantia, Citrus*, *Clausena, Fortunella, Paramignya, Poncirus, Severinia, Toddalia, Zanthoxylum*).

Status: not threatened.

m. ‡nestor Talbot, 1929 (Fig. 37, 38)

Note: this distinctive-looking taxon was described by Talbot from a pair of specimens supplied to the former Hill Museum (Witley) by the Leipzig dealer R. Krüger, and said to be from Obi. While the taxon may be valid, its disjunct distribution coupled with lack of further material from Maluku casts doubt on its provenance. The hybrid *memnon* population introduced to C Maluku (see below) has recently spread to Obi. If *P. m. nestor* is genuinely from Obi and still survives there, its future prospects may now be very poor. – The name *nestor* Talbot is nomenclaturally invalid, being a primary homonym of *Papilio nestor* Linnaeus, 1758.

Range: ?Obi.

memnon introduced hybrid population (Figs. 39–41)

Range: Kep. Sula (Sanana), Obi, Buru, Ambelau, Seram, Ambon, Saparua. Founded by escaped or released specimens of "farmed" Bali × Belitung hybrid *memnon* stock, and spreading rapidly. The ♀♀ of this hybrid may be tailed or tailless.

deiphobus Linnaeus, 1758

(Figs. 42–45; sexes dissimilar)

Range (2): Maluku, Waigeo, Batanta, Misool, Antalisa. Monk et al. (1997) indicate that this species occurs throughout the whole of Maluku. However, the races of N Maluku are very different to the race from C Maluku, and it is conceivable that two species are involved. We have no record for Gebe, but it may well occur there. It does not occur on Kep. Sula. Hachitani (1989) indicates that the ♂♂ of the Obi race are polymorphic for tail-length. Page & Treadaway (2003a, b, 2004) include *Papilio rumanzovia* Eschscholtz, 1821, within *P. deiphobus*, which would extend the range of the collective species to the whole of the Philippines, Kep. Talaud and Kep. Sangihe (Treadaway 1995, Vane-Wright & de Jong 2003). If this is accepted, then the distribution coding for *deiphobus* would have to be re-assessed as (1+2), a biogeographic pattern otherwise unknown amongst the Maluku Papilionidae. Given this, and our doubts over the conspecificity of even the taxa found in N & C Maluku, we do not follow Page & Treadaway here.

Foodplants: probably *Citrus*.

Status: not known to be threatened.

**d. deiphontes* Felder & Felder, 1864 (Figs. 42, 43)

Range: Morotai, Halmahera, Ternate, Kasiruta, Bacan.

**d. obideiphobus* Hachitani, 1989

Range: Obi.

**d. deiphobus* Linnaeus, 1758 (Figs. 44, 45)

Range: Buru, Boano, Seram, Ambon, Saparua.

sataspes Felder & Felder, 1864

(Figs. 46, 47; sexes slightly dissimilar)

Range (S): Sulawesi region (including Kep. Banggai, Kep. Sula).

Status: not known to be threatened.

**s. ahasverus* Staudinger, 1895 (Figs. 46, 47)

Range: Kep. Sula (Sanana).

polytes Linnaeus, 1758

(Figs. 48, 49; sexes dissimilar)

Note: Jordan (1908–10) divided *Papilio polytes* into two supra-subspecific groups: one distributed throughout continental Asia, Taiwan, Ryukyu islands and Malaysia, the second occurring in the Philippines and Maluku. Hiura & Alagar (1971) considered Jordan's second group (*alphenor*) to be a distinct species, and this was followed by Tsukada & Nishiyama (1980). Most recently, however, Page & Treadaway (2004) summarise various lines of evidence suggestive that the two divisions should not be separated as distinct species, and we follow their conclusion here. Apparently this taxon was overlooked by Monk et al. (1997).

Range (W): India, China, Taiwan, Ryukyu islands, Malaysia, Greater Sunda Islands, Lesser Sunda Islands, Sulawesi, Philippines, Palau Islands, Kep. Talaud, Kep. Sangihe, Kep. Banggai, Kep. Sula, Maluku, Misool, ?New Guinea.

Note: although coded as "W", *P. polytes* only just penetrates, at most, the western margin of the New Guinea region (see comments under *p. nicanor*, below).

Foodplants: Rutaceae (including *Citrus*).

Status: not known to be threatened.

p. polycritos Fruhstorfer, 1901

Range: Kep. Banggai, Kep. Sula (Taliabu, Sanana).

**p. nicanor* Felder & Felder, 1864

Range: Morotai, Halmahera, Ternate, ?Kayoa, Bacan, Obi, ?Misool, ?New Guinea (New Guinea tentatively listed on basis of old and poorly labelled material in BMNH, but neither *alphenor* nor *polytes* is noted by Parsons 1998 as a New Guinea species; there is a possibility of confusion with ♀ *P. ambrax* which could also explain such records).

**p. alphenor* Cramer, 1776 (Figs. 48, 49)

Range: Buru, Manipa, Kelang, Boano, Seram, Ambon, Saparua, Geser.

aegeus Donovan, 1805

(Figs. 50–52; sexes dissimilar, females polymorphic)

Range (G): Gebe, Gorong, Watubela, Banda, Aru, Kai, Waigeo, Misool, Salawati, New Guinea region, Solomons (Santa Cruz: Ndeni), Norfolk Island, Australia. This is essentially the distribution given by Parsons (1998), although he also included Seram and Goram, which we consider to be in error, and overlooked Gebe, well documented by material in various collections. Also overlooked by Monk et al. (1997).

Foodplants: Lauraceae (*Cinnamomum, Cryptocarya, Petroselinum*), Rubiaceae (*Morinda*), Rutaceae (*Acronychia, Choisya, Citrus, Clymenia, Eriostemon, Euodia, Flindersia, Geijera, Glycosmis, Halfordia, Microcitrus, Micromelum, Murraya, Phebalium, Zanthoxylum, Zieria*).

a. ormenus Guérin-Méneville, 1831 (Figs. 50–52)

Range: Gebe, Waigeo, Misool, Salawati, Aru, New Guinea, Fergusson.

Status: common, not considered to be threatened.

fuscus Goeze, 1779

(Fig. 53, 54; sexes similar)

Range (2+3+5): Malay Peninsula, Borneo, Sulawesi region (including Sangihe, Talaud, Kep. Sula), N & C Maluku, Kai, Aru, Waigeo, New Guinea, Australia, Solomon Islands, Vanuatu. Monk et al. (1997) indicate that this species occurs throughout the whole of Maluku. The race from Obi appears very distinct, and conceivably represents a separate species.

Foodplants: Rubiaceae (*Morinda*), Rutaceae (*Bosistoa, Citrus, Euodia, Fagara, Glycosmis, Halfordia, Microcitrus, Micromelum, Murraya, Zanthoxylum*).

Status: not known to be threatened.

**f. talyabona* Joicey & Talbot, 1932

Range: Kep. Sula (Mangole, Sanana, Taliabu).

**f. lapathus* Fruhstorfer, 1904 (Fig. 53)

Range: Morotai, Halmahera, Ternate, Bacan, Gebe.

**f. ombiranus* Rothschild, 1898 (Fig. 54)

Range: Obi.

f. fuscus Goeze, 1779

Range: Buru, Ambelau, Kelang, Boano, Seram, Ambon, Geser, Goram.

**heringi* Niepelt, 1924

(Fig. 55, sexes similar)

Note: this little-known taxon was accepted as a full species by Munroe (1961), but considered to be a natural hybrid of *P. fuscus* × *P. tydeus* by Hancock (1983b). However, Racheli & Haugum (1993) regarded it as a full species, near the *fuscus*-group. ♀♀ are rarely encountered, although several have recently been obtained by collectors (AR). See also discussion in de Jong (1998: 321).

Range (E): Halmahera.

Status: insufficiently known; may be threatened (Collins & Morris 1985).

**gambrisius* Cramer, 1779

(Figs. 56, 57; sexes dissimilar)

Range (E): C Maluku.

Status: insufficiently known.

**g. buruanus* Rothschild, 1897

Range: Buru, Ambelau.

**g. gambrisius* Cramer, 1779 (Figs. 56, 57)

Range: Kelang, Seram, Ambon, Saparua.

**tydeus* Felder & Felder, 1860

(Figs. 58, 59; sexes dissimilar)

Range (E): N Maluku. Burk's (1991) relatively recent discovery of this species from Morotai has shown *P. tydeus* to be an endemic species characteristic of all the main islands of the N Maluku group. See also discussion in de Jong (1998).

Status: apparently common, not thought to be threatened.

**t. hanafusai* Burk, 1991 (Figs. 58, 59)

Range: Morotai.

**t. tydeus* Felder & Felder, 1860

Range: Halmahera, Ternate, Kasiruta, Bacan.

**t. obiensis* Rothschild, 1898

Range: Obi.

Papilio (*Princeps* Hübner, 1807)

Range: Currently includes 19 species divided amongst 6 species groups. Afrotropical except one invasive species occurring from the Arabian Peninsula eastward through the Oriental and Australian regions, and into the Pacific (Hawaii and possibly other Pacific islands). However, as noted above, the work of Zakharov et al. (2004) suggests that quite radical changes affecting this subgenus must be anticipated. Page & Treadaway (2003b, 2004) regard *Princeps* as a synonym of *Papilio*, and do not accord it even subgeneric rank, but we do not follow their arrangement here.

Foodplants: as genus.

demoleus Linnaeus, 1758

(Fig. 60, sexes similar)

Range (W): Arabia, Iraq, Iran, Afghanistan, and Oriental and Australian regions including Taiwan, Malay Peninsula, Sumatra, Java (Kato 1989, Moonen 1991), Lesser Sunda Islands, Borneo, Philippines (Luzon, Palawan, Mindanao), Sangihe, Talaud, Sulawesi, Kep. Sula, Maluku, New Guinea (Moonen 1999, Parsons 1998, Gotts & Pangemanan 2001) and Australia.

Foodplants: Fabaceae (*Cullen, Psoralea*), Loganiaceae (*Fagraea*), Magnoliaceae (*Michelia*), Rhamnaceae (*Ziziphus*), Rutaceae (*Acronychia, Aegle, Atalantia, Chloroxylon, Citrus, Clausena, Flindersia, Fortunella, Glycosmis, Limonia, Microcitrus, Micromelum, Murraya, Ruta, Toddalia, Triphasia, Zanthoxylum*), Tiliaceae (*Tilia*).

Status: common.

d. libanius Fruhstorfer, 1908 (Fig. 60)

Note: Smith & Vane-Wright (in prep.) think it unlikely that separation of *d. libanius* from *d. demoleus* can be justified, at least on the basis of colour pattern. If *libanius* were to be included within *P. demoleus demoleus*, then the range for the subspecies now found in C Maluku extends further than that given below, from the Arabian Gulf through Sri Lanka to India and mainland China.

Range: Taiwan, Borneo (Matsumoto 2002, C. G. Treadaway pers. comm.), Philippines (including Luzon, Mindanao, Palawan), N Sulawesi (Vane-Wright & de Jong 2003), Sangihe, Talaud, Kep. Sula (Sanana), C & S Maluku (Buru, Ambelau, Manipa, Seram, Ambon, Saparua, Kai, Tanimbar, Kisar, Wetar, Moa, Leti, Roma, Babar). Has spread in C Maluku since 1990 (AR).

Papilio (*Achillides* Hübner, 1819)

Range: About 25 species, mainly Oriental, but extending into E Palaearctic, and eastward to Solomon Islands, Australia and New Caledonia; two occur in N & C Maluku. Page & Treadaway (2003a, b, 2004) give *Achillides* generic status.

Foodplants: mainly Rutaceae.

lorquinianus Felder & Felder, 1865

(Fig. 61, sexes similar)

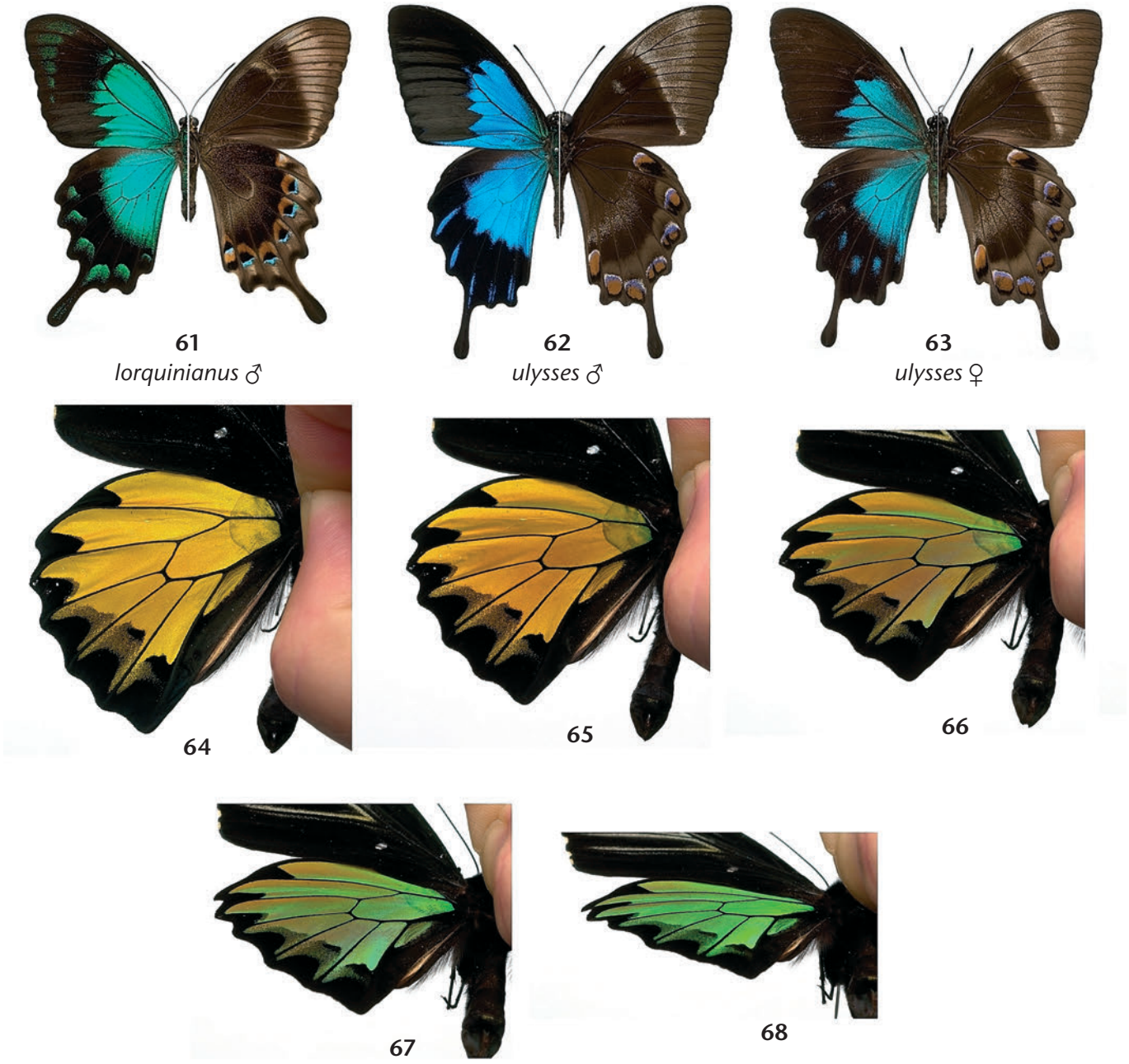
Range (2): N & C Maluku, Irian Jaya.

Foodplants: Rutaceae (*Zanthoxylum avicennae*).

Status: not known to be threatened.

**l. esmeae* Parrott, 1985 (Fig. 61)

Range: Morotai.



Figs. 61–68: Adult Maluku Papilionidae. **Fig. 61:** *Papilio lorquinianus esmeae* ♂, Buho-Buho, Morotai (fwl 57.8 mm). **Fig. 62:** *P. ulysses telegonus* ♂, Makian, Bacan (fwl 58.2 mm). **Fig. 63:** *P. u. telegonus* ♀, Makian, Bacan (fwl 59.4 mm). — **Figs. 64–68:** Hindwing of *Troides prattorum* from five different angles, showing iridescence.

**l. lorquinianus* Felder & Felder, 1865
Range: Halmahera, Ternate.

**l. gelia* Jordan, 1909
Range: Bacan.

**l. mizukoshii* Okano, [15. viii.] 1992
= *boanoensis* Kariya, [30. ix.] 1992
= ‡*ryuheii* Okano, [21. xii.] 1992 (lapsus for *mizukoshii* Okano; see Okano 1992)
Range: Boano.

**l. philippus* Wallace, 1865
Range: Seram.

ulysses Linnaeus, 1758
(Figs. 62, 63; sexes slightly dissimilar)
Range (2): Maluku, New Guinea, Bismarck Archipelago, Solomon Islands. Monk et al. (1997) indicate that this species occurs throughout the whole of Maluku.
Foodplants: Rutaceae (*Acradenia, Citrus, Euodia, Evodiella, Geijera, Halfordia*), Verbenaceae (*Vitex*).
Status: not threatened.

**u. morotaicus* Rothschild, 1908
Range: Morotai.

**u. telegonus* Felder & Felder, 1860 (Figs. 62, 63)
Range: Halmahera, Ternate, Bacan.

**u. dohertius* Rothschild, 1898
Range: Obi.

**u. ampelius* Rothschild, 1908
Range: Buru, Ambelau.

**u. reikoae* Kariya, 1988
Range: Manipa.

**u. ulysses* Linnaeus, 1758
Range: Kelang, Boano, Seram, Ambon, Haruku, Saparua.
Note: some more of the recently discovered populations of *P. ulysses* on smaller islands, such as that found on Kelang, may constitute microgeographic races, but we are not convinced that any of these are worthy of naming.

Species excluded from the checklist

Troides (Troides) helena (Linnaeus, 1758)

Matsuka (2001) records the Sulawesi race of this Oriental species, *T. h. hephaestus* (Felder & Felder, 1864), from Kep. Sula, and this was tentatively accepted by Vane-Wright & de Jong (2003). However, Matsuka (2001: 214–217) appears to map the species uncertainly from Kep. Sula. According to Monk et al. (1997), *T. helena* does not occur anywhere in Maluku, and this is confirmed by H. Detani (pers. comm.) with special reference to Kep. Sula; we suggest that Matsuka's tentative record is erroneous.

Papilio (Menelaides) albinus Wallace, 1865

Monk et al. (1997), based on Collins & Morris (1985), record *Papilio albinus* apparently from the whole of Maluku. Collins & Morris state that the species occurs in Papua New Guinea, Irian Jaya and the Moluccas, and is "not rare, except in the Moluccas". Parsons (1998), who described the species as "rare generally, but may be common locally", considered it "endemic to mainland N[ew] G[uinea]". We know of no reliable record of this species from anywhere else, and suggest that it is removed from the Maluku checklist.

Discussion

Species richness, endemism and biogeography

In contrast to the Pieridae (as documented by Peggie et al. 1995), in which the main islands of Central Maluku are distinctly more species-rich than those of N Maluku, the opposite is the case for the Papilionidae. Both Halmahera and Bacan have 21 species of swallowtails, whereas the equally well-known Seram, the richest island of C Maluku, has just 19 (Table 1). Moreover, all of the swallowtails summed for Buru + Ambon + Seram total only 20 species, whereas Obi + Halmahera + Bacan gives 23.

Endemism at the level of individual islands is quite low: Buru (*Troides prattorum*), Seram (*Graphium stresemanni*), Obi (*Ornithoptera aesacus*) and Halmahera (*Papilio heringi*) are the only islands with unique species (Table 1). For the biogeographical units of N and C Maluku (*sensu* Vane-Wright & Peggie 1994), endemism is notably higher: of the 23 species of Papilionidae found in N Maluku (Morotai, Ternate, Bacan, Halmahera, Obi and satellites), 6 are not found elsewhere (26%). For C Maluku (Buru, Ambon, Seram and satellites) the figure is lower: 3 out of 20 (15%). There is no species of swallowtail solely restricted to the two regions combined, although this is the main range of *Papilio deiphobus*, discussed by de Jong (1998) as a "widespread Moluccan endemic". However, it does occur on a few islands to the east (see above), and Page & Treadaway (2003a, b, 2004) have even suggested that the largely Philippine species *P. rumanzovia* belongs to it. Two species appear to be unique to, and found throughout the main islands of the northern group: *Troides criton* and *Papilio tydeus*. *Papilio gambrisius* is characteristic for the main islands of the central group (Table 1).

These observations are consistent with the conclusions of Vane-Wright & Peggie (1994) for all N & C Maluku butterflies. Although the combination of the two regions can be interpreted as an area of endemism in its own right, the evidence, unlike that for N and C Maluku taken separately, is not compelling. This is underlined by the relatively high complementarity of the two areas (Table 1): the 20 species of C Maluku, when added to the 23 species of N Maluku, combine to give a total of 30 species (*P. memnon* not included, as its natural occurrence in the islands has never been confirmed, and even though an artificially introduced hybrid population is now established; nor the six species only found on western Sula archipelago; nor *P. aegeus*, the single regional species found only on the eastern island of Gebe). As pointed out by de Jong (1998), Tsukada & Nishiyama considered *P. gambrisius* (S Maluku) and *P. tydeus* (N Maluku) to form a sister species pair; if so, this would provide some evidence in favour of N + C Maluku as an area of endemism, but their remarkably different geological history would make this difficult to accept (de Jong 1998).

Turning to the distribution of the non-endemic species, their biogeographical patterns provide evidence of both easterly (pattern 2) and westerly (pattern 5) links (Table 2). The six species restricted within Maluku to Kep. Sula are all represented on Sulawesi. The single regional species found only on Gebe is also found in S Maluku as well as New Guinea. Only five of the species are widespread throughout the whole region, and no other strong pattern is evident. We conclude that the swallowtail faunas of northern and central Maluku are derived from a mixture of western (primarily Sulawesi) and eastern (primarily New Guinea) sources, and that they have evolved largely independently of each other, with notable endemism developing in N Maluku. These limited conclusions are consistent with the more detailed but rather similar analysis of de Jong (1998).

Conservation

So far as we are aware, few if any field studies have been carried out on the needs and conservation status of Moluccan butterflies, Hill et al. (1995) being an exception. Even the spectacular swallowtails have received little serious attention, although Matsuka (2001) provides extremely valuable information for the birdwings.

New & Collins (1991) nominated four endemic Maluku species (*Troides prattorum*, *Ornithoptera aesacus*, *O. croesus* and *Graphium stresemanni*) out of a total of 10 Indonesian papilionids in need of urgent assessment, suggest-

Table 1: Distribution of the 38 species of Kep. Sula, N & C Maluku and Gebe Papilionidae, by major island or island group: Kep. Sula (including Mangole, Sanana and Taliabu), Buru, Ambon, Seram, Seram Laut, Obi, Halmahera, Bacan, Ternate, Morotai and Gebe. Black diamonds (◆) denote records for species non-endemic to N and C Maluku. Open squares (□) indicate species narrowly endemic to single islands. Open diamonds (◇) are species endemic to the biogeographical region of N Maluku found on more than one island. Open triangles (△) indicate species endemic to the biogeographical region of C Maluku that occur on more than one island. Question marks indicate uncertain records. A dash (—) indicates that, in the estimation of the authors, it seems likely that the species will eventually be found on the particular island. Symbol × indicates the recently introduced hybrid population of *Papilio memnon* (which on Obi possibly occurs together with the unconfirmed *P. m. nestor*). Totals are given for species richness (definite records only; *P. memnon* not included), and for the number of narrow endemics per island. Data for Gebe and Seram Laut are evidently deficient (figures in parentheses in the totals for species richness give our estimate of the more likely true values for these two islands).

	Island										
	Sula	**Bur**	**Amb**	**Ser**	**SLa**	**Obi**	**Hal**	**Bac**	**Ter**	**Mor**	**Gebe**
G. codrus	◆	◆	◆	◆	—	◆	◆	◆	◆	◆	◆
G. anthedon	◆	◆	◆	◆		◆	◆	◆	?	◆	
G. stresemanni				□							
G. batjanensis								◇		◇	
G. eurypylus	◆	◆	◆	◆	—	◆	◆	◆	◆	◆	—
G. meyeri	◆										
G. agamemnon	◆	◆	◆	◆	—	◆	◆	◆	◆	◆	—
G. macfarlanei		◆	◆	◆		◆	◆	◆	◆	◆	◆
G. wallacei						◆	◆	◆		◆	◆
G. aristeus		◆	?	◆		◆	◆	◆		◆	◆
G. rhesus	◆										
G. androcles	◆										
G. euphrates						?	◆	◆	?		
G. deucalion						◆	◆	◆	◆	◆	
Pac. polydorus		◆	◆	◆	—	◆	◆	◆		◆	—
Pac. polyphontes	◆						◆	◆	◆	◆	
T. hypolitus	◆	◆	◆	◆		?	◆	◆	?	◆	
T. oblongomaculatus		◆	◆	◆	◆						
T. criton						◇	◇	◇	◇	◇	
T. prattorum		□									
O. goliath				◆							
O. aesacus						□					
O. croesus							◇	◇	?	◇	
O. priamus			◆	◆							◆
P. gigon	◆										
P. ascalaphus	◆										
P. memnon	×	×	×	×		×+?					
P. deiphobus		◆	◆	◆		◆	◆	◆	◆	◆	
P. sataspes	◆										
P. polytes	◆	◆	◆	◆	—	◆	◆	◆	◆	◆	—
P. aegeus											◆
P. fuscus	◆	◆	◆	◆	—	◆	◆	◆	◆	◆	◆
P. heringi							□				
P. gambrisius		△	△	△							
P. tydeus						◇	◇	◇	◇	◇	
P. demoleus	◆	◆	◆	◆	—						
P. lorquinianus				◆			◆	◆	◆	◆	
P. ulysses		◆	◆	◆		◆	◆	◆	◆	◆	
spp. richness	**15**	**16**	**15**	**19**	**1(8)**	**16**	**21**	**21**	**13**	**20**	**8(12)**
narrow endemics	**0**	**1**	**0**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**

Table 2: Frequency of 11 distribution patterns represented by the 38 N & C Maluku Papilionidae, other than *Papilio memnon*. Note high but separate species endemism in N and C Maluku, but absence of species endemic to the two areas combined. The patterns for non-endemic species provide evidence of both easterly (pattern 2) and westerly (pattern 5) links. The six species restricted within Maluku to Kep. Sula are all represented on Sulawesi. The species only found on Gebe is also found in S Maluku as well as New Guinea. Area 1 = Mindanao region; area 2 = New Guinea region; area 3 = S Maluku; area 4 = Lesser Sunda Islands (no links evident); 5 = Sulawesi region. See also text. VANE-WRIGHT & PEGGIE (1994) give a general analysis of the distributions of all N & C Maluku butterflies, based on an earlier data set.

Specific components	Frequency
Endemic (E) (6 N, 3 C)	9
Sula only (S)	6
Gebe only (G)	1
Widespread (W)	5
(2) [N/C Maluku + New Guinea]	6
(5) [N/C Maluku + Sulawesi]	3
(1+5)	1
(2+3)	2
(2+5)	1
(2+3+5)	2
(1+2+3+5)	1
Total:	**37 (*P. memnon* not incl.)**

ing that up to six months fieldwork be devoted to each. In addition, they mentioned two more endemics (*Papilio heringi* and *P. gambrisius*) in need of further investigation to determine their conservation status. Of these two, some researchers have considered *P. heringi* to be a hybrid (e.g. HANCOCK 1983b), but the males are now very commonly found, and seem far too numerous to be of hybrid origin. Although there is no current suggestion of immediate threat, three more endemic swallowtails should be added to this list (*Graphium batjanensis, Papilio tydeus* and *Troides criton*), to make a total of nine swallowtail species apparently found nowhere else on Earth. Based on the suggestions of VANE-WRIGHT & PEGGIE (1994), an autecological research programme centred on four islands (Buru, Seram and Obi, together with Halmahera or Bacan) could begin to remedy many of the deficiencies in our knowledge of Moluccan butterfly biology.

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