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 Troiades, 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 aegerus 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


Introduction

“Troiades pratetorum, 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.”


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.

Acknowledgements

Phillip ACKERY, Kim GOODGER, Lucy HALL, Julie HARVEY, Terri HOLMES, Campbell SMITH and John TENNENT (NHM London) all helped us generously in various ways. Hiromi DETANI kindly provided much information on the distribution of Moluccan butterflies. RIVW wishes to acknowledge ongoing collaboration with Rienk DE JONG and C. G. TREADAWAY on SE Asian butterflies. The manuscript was improved following very helpful reviews by Malcolm SCOBLE and Campbell SMITH (NHM). We are especially grateful to Harry TAYLOR (NHM Photo Unit) who not only originated the excellent digital images, but also helped design the layout of the plates. Some of the costs of colour reproduction were defrayed by a grant from NHM Entomology Department Research Funds.

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, Watar, Kisas, 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), COBET & 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 aristaeus, 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 omhiranus 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 & TREADWAY (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


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 Sundas 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 Hünen, 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 taxonomy system that will promote greater stability, while still permitting differing classifications to be maintained where necessary or desirable (Scoble 2004).

**Graphium (Graphium Scopoli, 1777)**

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

**Foodplants:** as genus.

**codrus** (Cramer, 1777)

(Fig. 1, sexes similar)


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

**eurypylus** (Linnaeus, 1758)

(Fig. 5, sexes similar)


**Foodplants:** probably Lauraceae.

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

**eurypylus** (Linnaeus, 1758)

(Fig. 4, sexes similar)

**Range:** Bacan (1800–2000 m).

**eurypylus** (Linnaeus, 1758)

(Range: (E):) Seram.

Foodplants: probably Lauraceae.

Status: not known to be threatened.

**eurypylus** (Linnaeus, 1758)

(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), Wetter, Barar, 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.


**Foodplants:** Annonaceae (Annona, Aratobrys, Desmos, Goniothalamus, Melodorum, Miliusa, Mirephora, Polyalthia, Pseudouvaria, Rauehnhoaffia, Saccopetalum, Uvaria), Magnoliaceae (Michelia), Rutaceae (Micromelum), Sapindaceae (Diploptera).

Status: not known to be threatened.

**e. arctofasciatus** (Lathy, 1899)

Range: Kep. Sula (Taliabu, Sanana).

**e. eurtorius** (Fruhstorfer, 1907)

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

**e. eurtorius** (Fruhstorfer, 1907)

(Range: (E):) Seram.

Foodplants: probably Lauraceae.

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

**eurypylus** (Linnaeus, 1758)

(Range: (E):) Seram.

Foodplants: probably Lauraceae.

Status: not known to be threatened.

**eurypylus** (Linnaeus, 1758)

(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), Wetter, Barar, 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.


**Foodplants:** Annonaceae (Annona, Aratobryis, Desmos, Goniothalamus, Melodorum, Miliusa, Mirephora, Polyalthia, Pseudouvaria, Rauehnhoaffia, Saccopetalum, Uvaria), Magnoliaceae (Michelia), Rutaceae (Micromelum), Sapindaceae (Diploptera).

Status: not known to be threatened.

**e. arctofasciatus** (Lathy, 1899)

Range: Kep. Sula (Taliabu, Sanana).

**e. eurtorius** (Fruhstorfer, 1907)

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

**e. eurtorius** (Fruhstorfer, 1907)

(Range: (E):) Seram.

Foodplants: probably Lauraceae.

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

**eurypylus** (Linnaeus, 1758)

(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), Wetter, Barar, 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.


**Foodplants:** Annonaceae (Annona, Aratobryis, Desmos, Goniothalamus, Melodorum, Miliusa, Mirephora, Polyalthia, Pseudouvaria, Rauehnhoaffia, Saccopetalum, Uvaria), Magnoliaceae (Michelia), Rutaceae (Micromelum), Sapindaceae (Diploptera).

Status: not known to be threatened.
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 Evrypleana Niculescu, 1989.
Status: not known to be threatened

*m. extremum* Tsukada & Nishiyama, 1980
Range: Kep. Sula (Sanana).

agamemnon (Linnaeus, 1758)
(Fig. 7, sexes similar)
Foodplants: Annonaceae (Anaxagorea, Ancana, Annona, Artabotrys, Cyathostemma, Desmos, Fissistigma, Fitzalania, Friesodendria, Goniothalamus, Guatte­ria, Haplostichanthus, Melodorum, Miliusa, Mirephora, Oncodostigma, Polyalthia, Psueduvaria, Rauwenhoffia, Rolinia, Saccopetala, 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)
Foodplants: Annonaceae (Annona, Xylopia).
Status: not known to be threatened.

m. macfarlanei (Butler, 1877)

*m. cesus* (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)

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)

*a. bifax* (Rothschild, 1898)
Range: Obi.

*a. aristeus* (Stoll, 1880) (Fig. 10)
Range: Seram, Ambon [probably extinct: AR].

a. parmaus (Gray, 1852)
Range: Gebe, Aru, Waigeo, Misool, New Guinea, Australia.

rhesus (Boisduval, 1836)
(Fig. 11, sexes similar)
Status: not known to be threatened.

*r. parvimacula* (Joyce & Talbot, 1922) (Fig. 11)
Range: Kep. Sula (Mangole, Sanana).

androcles (Boisduval, 1836)
(Fig. 12, sexes similar)
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 *Arise* Hüneber, 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).  
**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, 1863), 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).  
**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.

**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 tagala).  

**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)  
**Foodplants:** Aristolochiaceae (Aristolochia tagala).

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**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. polydorus sejanus ♂, Hatetabako, Halmahera (fwl 56.8 mm).  
**Fig. 17:** Troides hypolitus hypolitus ♂, Hila, Ambon (fwl 77.0 mm).  
**Fig. 18:** T. h. abyssinus ♀, Hila, Ambon (fwl 66.6 mm).  
**Fig. 19:** T. oblongomaculatus oblongomaculatus ♀, Hila, Ambon (fwl 96.4 mm).  
**Fig. 20:** T. c. criton ♀, Daeo, Morotai (fwl 73.8 mm; mirror-imaged).  
**Fig. 21:** T. c. criton ♀, Daeo, Morotai (fwl 75.8 mm; mirror-imaged).  
**Fig. 22:** T. pratton ♀, Daeo, Morotai (fwl 82.4 mm; mirror-imaged).  
**Fig. 23:** T. pratton ♀, Liang Neat, Buru (fwl 97.8 mm).

**Fig. 24:** Adult Maluku Mimicry.  
**Fig. 25:** Ornithoptera goliath procus ♂, [Seram] (ex H. M. Peebles coll.) (fwl 49.8 mm).  
**Fig. 26:** O. a. scripta ♀, Central Seram (C. F. & J. Pratt) (fwl 109.2 mm).  
**Fig. 27:** O. a. eacus ♂, Obi major (Waterstradt) (fwl 79.1 mm).  
**Fig. 28:** O. a. eacus ♀, Obi (fwl 94.5 mm).  
**Fig. 29:** O. c. toetanei ♀, Daeo, Morotai (fwl 75.0 mm).  
**Fig. 30:** O. c. toetanei ♀, Daeo, Morotai (fwl 88.1 mm).  
**Fig. 31:** O. c. cahili ♀, Mandoli (fwl 100.4 mm; upperside only).  
**Fig. 32:** O. p. croesus ♀, Ambon (J. L. Rey) (fwl 53.5 mm).  
**Fig. 33:** O. p. croesus ♀, Ambon (J. L. Rey) (fwl 62.5 mm).  
**Fig. 34:** Papilio gigon ♀, Mandioli (fwl 100.4 mm; upperside only).  
**Fig. 35:** P. p. ascalaphus ♀, Mangole, Kep. Sula (Flesken) (fwl 73.7 mm).  
**Fig. 36:** P. a. ascalaphus ♀, Kep. Sula (Kühn) (fwl 75.2 mm).
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 Monkkonen et al. 1997, but unlikely), Kasiruta (H. Detani, pers. comm.), Bacan, 303hi (listed by both Monkkonen et al. 1997 and Haugum & Low 1985: 94, but unlikely to be correct).

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

**Troides** (Troides) Hübner, 1819
Range: as genus.
Foodplants: as genus.

**oblongomaculatus** (Goeze, 1779)
(Figs. 19, 20; sexes dissimilar)

Note: according to H. Detani (pers. comm.), *T. o. mangolen sis* Tsukada & Nishiyama, 1980, supposedly from Kep. Sula, was almost certainly based on mislabelled material. The supposed “mountain form” from Buru, *T. o. ohzui* Kobayashi & Kowaya, 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)

**criteron** (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. halipbron*. However, as noted by van-E-Wright & de Jong (2003), the taxonomic status of the two nominal subspecies involved *T. criteron celebensis* (Wallace, 1865), and *T. c. selayarensis* Kobayashi & Kowaya, 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. criteron** (Felder & Felder, 1860) (Figs. 21, 22)

**c. criteronides** (Frühstorfer, 1903)
Range: Obi, Obilatu (Matsuka 2001).

**prattorum** (Joyce & 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 (Baille & Groombridge 1996; threat category VU D2, being vulnerable due to very restricted area of occupancy).

**Ornithoptera** Boisduval, 1832

**goliath** Oberthür, 1888
(Figs. 25, 26; sexes dissimilar)
Foodplants: Aristolochiaceae (Aristolochia).
Status: Not considered to be threatened (not included by Baille & Groombridge 1996), but protected in Indonesia and listed under CITES Appendix II.

**g. proculus** (Rothschild, 1914) (Figs. 25, 26)
Range: Seram.

**aescacus** (Ney, 1903)
(Figs. 27, 28; sexes dissimilar)
Range (E): Obi.
Foodplants: unknown, but almost certain to be Aristolochiaceae.
Status: Vulnerable (Baille & 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 (Ballie & Groombridge 1996; threat category EN B4+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. toantei* 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 *spp. 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)


*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* (Linneaus, 1758) (Figs. 32, 33; sexes dissimilar)


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* (Linneaus, 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.

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**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 Hübnner, 1819)**


Foodplants: Lauraceae, Magnoliaceae, Rubiaceae, Rutaceae.

**gigon Felder & Felder, 1864**

(Fig. 34, sexes similar)


Foodplants: Rutaceae (Citrus, Eudia, Glycosmis).

Status: not known to be threatened.

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

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

**ascalaphus Boisduval, 1836**

(Figs. 35, 36 – sexes dissimilar)


Foodplants: Rutaceae (Citrus).

Status: not known to be threatened.

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Figs. 37–48: Adult Maluku Papilionidae. **Fig. 37**: *Papilio mneson 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. mneson* ♀ of introduced hybrid, Salemion, Seram (fwl 67.5 mm; mirror-imaged). **Fig. 40**: *P. mneson* tailless ♀ of introduced hybrid, Salemion, Seram (fwl 66.3 mm). **Fig. 41**: *P. mneson* tailless ♀ of introduced hybrid, Salemion, 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. t. 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* alphonef ♀, Waisirisa, Seram (fwl 55.2 mm).

Figs. 49–60: Adult Maluku Papilionidae. **Fig. 49**: *Papilio polytes* alphonef ♀, Waisirisa, Seram (fwl 52.6 mm). **Fig. 50**: *P. aeger* 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. obirianus* ♀, Laiwui, Obi (fwl 54.5 mm). **Fig. 55**: *P. heningi* ♀, Halmahera (fwl 65.9 mm). **Fig. 56**: *P. gambrius gambrius* ♀, Waisirisa, Seram (fwl 81.1 mm). **Fig. 57**: *P. g. gambrius* ♀, Saparua (ex Rothschild Bequest) (fwl 83.2 mm). **Fig. 58**: *P. tydeus* halatus ♀, Buho-Buho, Morotai (fwl 66.4 mm). **Fig. 59**: *P. t. halatus* ♀, Buho-Buho, Morotai (fwl 64.6 mm). **Fig. 60**: *P. demoleus* libanios ♀, Piru, Seram (fwl 44.5 mm).
a. ascalon
Staudinger, 1895 (Figs. 35, 36)
Range: Kep. Sula (Sanana).

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 m. nestor 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.

P. deiphobus Linnaeus, 1758
(Figs. 42–45; sexes dissimilar)
Range: Buru, Boano, Seram, Ambon, Saparua.

m. acalson Staudinger, 1895 (Figs. 35, 36)
Range: Kep. Sula (Sanana).

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 m. nestor 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.

P. deiphobus Linnaeus, 1758
(Figs. 42–45; sexes dissimilar)
Range: Buru, Boano, Seram, Ambon, Saparua.

sataspes FELDER & FELDER, 1864
(Figs. 46, 47; sexes slightly dissimilar)
Status: not known to be threatened.

p. polycritos FRUHSTORFER, 1901

*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 polycites is noted by Parsons 1998 as a New Guinea species; there is a possibility of confusion with Q P. ambrax which could also explain such records).

*P. alphenor CRAMER, 1776 (Figs. 48, 49)
Range: Buru, Manipa, Kelang, Boano, Seram, Ambon, Saparua, Geser.

*P. deiphobus FELDER & FELDER, 1864 (Figs. 42, 43)
Range: Morotai, Halmahera, Ternate, Kasiruta, Bacan.

*P. obideiphobus HACHITANI, 1989
Range: Obi.

m. deiphobus Linnaeus, 1758 (Figs. 44, 45)
Range: Buru, Boano, Seram,Ambon, Saparua.

p. polycritos FRUHSTORFER, 1901

*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 polycites is noted by Parsons 1998 as a New Guinea species; there is a possibility of confusion with Q P. ambrax which could also explain such records).

*P. alphenor CRAMER, 1776 (Figs. 48, 49)
Range: Buru, Manipa, Kelang, Boano, Seram, Ambon, Saparua, Geser.

aegyes 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, Petroelium), Rutaceae (Morinda), Rutaceae (Acronychia, Choisya, Citrus, Clymenia, Eriostemon, Euodia, Flindersia, Geijera, Glycosmis, Halodia, Microcitrus, Micromelum, Murraya, Phe­balium, Zanthoxylum, Ziera).
**a. ormenus** Guérin-Méneville, 1831 (Figs. 50–52)
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, Cirtus, Euodia, Fagara, Glycosmis, Halfordia, Microcitrus, Micromelum, Murraya, Zanthoxylum).
Status: not known to be threatened.

*f. talyabona* Jokcy & Talbot, 1932
Range: Kep. Sula (Mangole, Sanana, Taliabu).

*f. lapathus* Fruhstorfer, 1904 (Fig. 53)
Range: Morotai, Halmahera, Ternate, Baca. Gebe.

*f. ombirarus* 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, Rachi & 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. Burke’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.

*tydeus* Felder & Felder, 1860
Range: Halmahera, Ternate, Kasiruta, Baca.

*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)
Foodplants: Fabaceae (Calhun, Psoralea), Loganiaceae (Fagraea), Magnoliaceae (Michelia), Rhamnaecae (Ziziphus), Rutaceae (Acronychia, Aegle, Atalantia, Chloroxylon, Cirus, Clausena, Flindersia, Foutnea, Glycosmis, Limonia, Microcitrus, Micromelum, Murraya, Ruta, Todalia, Triphasia, Zanthoxylum), Tiliaceae (Tilia).
Status: common.

**d. libanius** Fruhstorfer, 1908 (Fig. 60)
Note: Smith & Vané-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.

**Papilio (Achillides) Hübner, 1819**
Range: About 25 species, mainly Oriental, but extending into E Palaeartic, 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)
Foodplants: Rutaceae (Zanthoxylum avicennae).
Status: not known to be threatened.

*l. esmeae* Parrott, 1985 (Fig. 61)
Range: Morotai.
*P. lorquinianus* Felder & Felder, 1865  
Range: Halmahera, Ternate.

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

*P. mizukoshii* Okano, [15. viii.] 1992  
= *boanoe­nsis* Kariya, [30. ix.] 1992  
= *‡ryuhe­ii* Okano, [2. xii.] 1992 (lapsus for *mizukoshii* Okano; see Okano 1992)  
Range: Boano.

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

*P. 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.

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

*P. telegonus* Felder & Felder, 1860 (Figs. 62, 63)  

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

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

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.
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 Guinea”, but we have 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 Malahera 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 + Malahera + Bacan gives 23.

Endemism at the level of individual islands is quite low: Buru (*Troides prattorum*), Seram (*Graphium stresse-mannii*), Obi (*Ornithoptera aescus*) and Malahera (*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, Malahera, 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 westery (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 aescus*, *O. croesus* and *Graphium stresse-mannii*) 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).

<table>
<thead>
<tr>
<th>Island</th>
<th>Sula</th>
<th>Bur</th>
<th>Amb</th>
<th>Ser</th>
<th>SLa</th>
<th>Obi</th>
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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
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 sydneus and Troides crion), 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 Malahera or Bacan) could begin to remedy many of the deficiencies in our knowledge of Moluccan butterfly biology.

References


——— (1940b, unpubl.): Rhopalocera of the Dutch East Indies and West Indies. — Manuscript Faunistic Lists. 2. (Rhopalocera from the island of Celebes and from the islands adjacent to Celebes). — Hand-written script held in The Natural History Museum, London.


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 endemism 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 Kei. 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); S = 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.

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<td>Gebe only (G)</td>
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<td>(2) [N/C Maluku + New Guinea]</td>
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<td>(5) [N/C Maluku + Sulawesi]</td>
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<td>(2+3)</td>
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<td>(2+5)</td>
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<td>(2+3+5)</td>
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<td>(1+2+3+5)</td>
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<td>Total: 37 (P. memnon not incl.)</td>
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Parsons, M. (1998): Butterflies of Papua New Guinea. Their systematics and biology. — San Diego, London (Academic Press); xi + 737 + [1], 26 + 139 pls. — [Note: although this book indicates “1999” as its publication date, there is no doubt that it was published and available in 1998; J. Tennent, pers. comm.]


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Received: 7. ix. 2004, 1. xii. 2004