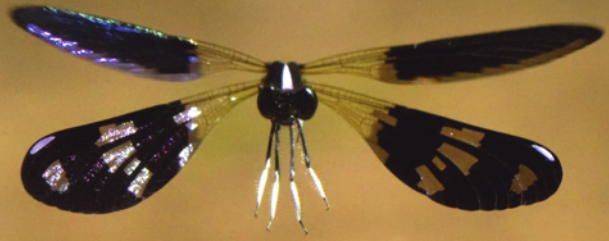


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## The Caloptera damselflies of Thailand – Distribution maps by provinces (Odonata: Calopterygoidea)

Matti Hämäläinen

Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA Leiden, The Netherlands

Email: matti.hamalainen@helsinki.fi

### Abstract

Distribution maps at province level accuracy are presented for the 44 species of the superfamily Calopterygoidea (in the old sense, excluding the 'megapodagrionid' families) recorded in Thailand. Brief species accounts are presented with information on the distribution, phenology and the first discovery of the species. For eleven species the primary type was collected in Thailand. The history of the discovery and documentation of these insects in Thailand is discussed.

**Key words:** Odonata, Zygoptera, Calopterygoidea, Devadattidae, Philogangidae, Calopterygidae, Chlorocyphidae, Euphaeidae, Thailand

### Introduction

The book "Atlas of the dragonflies of Thailand – Distribution maps by provinces" by Hämäläinen & Pinratana (1999) treated a total of 315 odonate species known to the authors from Thailand at the April 1st 1999. Of these, 38 species belong to the 'Caloptera' damselflies, members of the superfamily Calopterygoidea (in the old sense, excluding the 'megapodagrionid' families).

During the last 18 years several new additions to the Thai Caloptera fauna have been made and at present a total of 44 species of the group are known from Thailand. This paper presents new distribution maps by provinces with brief accounts of each species. The base map and attached province list are identical with those used in Hämäläinen & Pinratana (1999, pp. 16-17), although in 2011 the eastern half of Nong Khai province (nr. 19, see appendix) was split off to form a new province Bueng Kai. This division is for the present purpose irrelevant, hence these provinces are not separated in the present maps. Bangkok is treated as a 'province', although formally it is a 'Special administrative area'. It is conceded that distribution maps at the provincial level are rather unsatisfactory in terms of detail. However, since the number of records of most species still remains small, the provincial level is still the most useful standard of accuracy for this mapping. The maps are presented in appendix.

North-eastern Thailand is still very poorly known for dragonflies, and undoubtedly several of the common and widespread Caloptera species occur in most of the provinces in this region. Since the maps also include old records, such as three Caloptera species collected in Bangkok in 1923-1924 (Fraser 1927), the maps do not necessarily show the present occurrence of these species in the central plains of the country.

Caloptera disappeared from Bangkok decades ago.

All Caloptera are riparian species. With the exception of the commonest and most widespread species, a majority are confined to well forested habitats. Therefore most species can presently be found only in protected areas. Of the known 44 species, only two – *Anisopleura trulla* Hämäläinen, 2003 and *Dysphaea vanida* Hämäläinen, Dow & Stokvis, 2015 – have so far been recorded only within the borders of Thailand, although the latter species surely also occurs in Burma.

## **Annotated list of the Caloptera species recorded in Thailand**

### **Devadattidae**

#### 1. *Devadatta argyoides* (Selys, 1859) (Fig. 1)

A southern lowland species (up to 500 m asl), the range of which extends northwards at least to Kanchanaburi (Chaloem Rattanakosin). All year round in the south. In Kanchanaburi recorded in March and November (N. Makbun, in litt.).

First records: Trang, January-February 1899, W. L. Abbott (Williamson 1904); Pattani, Bukit Besar, May 1901 and Yala, Mabek, July 1901, N. Annandale & H. C. Robinson (Laidlaw (1903)).

### **Philogangidae**

#### 2. *Philoganga loringae* Fraser, 1927 (Fig. 2)

A rare species known from Chiang Mai (Doi Suthep, Doi Inthanon), Chiang Rai (Wang Pa Tak) and Chaiyaphum (Phu Khieo). Known altitude range 500-900 m. On wing from March to June.

First record: Chiang Mai, Doi Suthep, 10 June 1965, S. Asahina (Asahina 1967).

#### 3. *Philoganga montana* (Hagen in Selys, 1859)

A rare species recorded in Kanchanaburi (Kroeng Kra Via, Nang Kroan, Lam Khlong Ngu) and Chiang Mai (Doi Inthanon). Known altitude range 300-600 m. From early April to late June.

First record: Kanchanaburi, Kroeng Kra Via, 7 April 1995, Somnuk Panpichit & Amnuay Pinratana (Hämäläinen 1998).

### **Calopterygidae**

#### 4. *Caliphaea angka* Hämäläinen, 2003

A rare montane species known from Chiang Mai (Doi Inthanon, alt. 1250-1600 m) and Doi Par Hom Pok). From May to late November.

First record: Chiang Mai, Doi Inthanon, 23 June 1980, T.W. Donnelly (Asahina 1985d; as *Caliphaea confusa* Hagen in Selys, 1859). Holotype from the same location, 18 May 1999, M. Hämäläinen (Hämäläinen 2003).

5. *Caliphaea thailandica* Asahina, 1976

An uncommon montane species known from Chiang Mai (Doi Suthep, Doi Inthanon, Pu Muen, Thep Sadet), Tak (Mae La Mao) and Chiang Rai. From May to November.

First record (including holotype): Chiang Mai, Doi Suthep, 18 June 1965, S. Asahina (Asahina 1976).

6. *Echo modesta* Laidlaw, 1902

A widespread species in the southern and western part of the country. The northernmost record is from the southern part of Mae Hong Son. Mainly in lowlands, but recorded also at altitudes of 600-700 m. All the year.

First records: Trang, January-February 1899, W. L. Abbott (Williamson 1904) and Pattani, Bukit Besar, 1901, N. Annandale & H. C. Robinson (Laidlaw (1903).

7. *Matrona nigripectus* Selys, 1879

A local northern species, known from several mountains (at altitudes of 400-1300 m) in Mae Hong Son, Chiang Mai and Lampang. From April to December; most records in the late season.

First record: 'Siam' [no details given] (Fraser 1933, as *Matrona b. basilaris* Selys, 1853).

8. *Mnais andersoni* McLachlan in Selys, 1873

A northern montane species (at altitudes of 500-1600 m). It can be abundant in suitable habitats, even in rather disturbed environment. Early season species from January to July; an exceptionally early emergence is known from late November.

First record: Chiang Mai, Pang Tawn, 2 May 1931, 'Put'; A.F.G. Kerr's collector (Fraser 1932).

9. *Mnais yunosukei* (Asahina, 1990)

A rare montane species known only from Doi Inthanon and Doi Par Hom Pok, at altitudes of 1100-1600 m. Short flight season from early February to early April.

First record: Chiang Mai, Doi Inthanon, 20 March 1988, Amnuay Pinratana's collector (unpublished). Holotype: Chiang Mai, Doi Par Hom Pok, 9 February 1989, Yunosuke Kimura (Asahina 1990).

10. *Neurobasis chinensis* (Linnaeus, 1758) (Fig. 3)

Widespread and common in suitable stream habitats throughout the country. From sea level to 1250 m. All the year.

First records: Trang, January-February 1899, W. L. Abbott (Williamson 1904) and Yala, Mabek, July 1901, N. Annandale & H. C. Robinson (Laidlaw (1903).

11. *Neurobasis longipes* Hagen, 1887

Known only from Yan Ta Khao district in Trang, where the species co-occurs in the same stream with *N. chinensis*.

First record: Trang, Yan Ta Khao, 2009, Wongpakorn Kaoian (N. Makbun, in litt.).



**Fig. 1.** *Devadatta argyroides* (Devadattidae), male from its northernmost known population at Chaloem Rattanakosin (Kanchanaburi). 2 May 2015. Photo by Noppadon Makbun.



**Fig. 2.** *Philoganga loringae* (Philogangidae), female at Doi Suthep (Chiang Mai). 3 April 2000. Photo by Matti Hämäläinen.



**Fig. 3.** *Neurobasis chinensis* (Calopterygidae), perching male with wings open. Doi Saket district (Chiang Mai), 13 November 2010. Photo by Sami Karjalainen.

**Fig. 4.** *Aristocypha fenestrella* (Clorocyphidae), a flying male approaching females. Doi Suthep (Chiang Mai), 6 November 2010. Photo by Sami Karjalainen.



12. *Noguchiphaea yoshikoeae* Asahina, 1976

An uncommon and local montane species in the north. Altitude range 700-1600 m. From mid-July to early December.

First record (including holotype): Chiang Mai, Doi Inthanon, 17 September 1975, R. Kano & H. Kurahashi (Asahina 1976).

13. *Vestalaria miao* (Wilson & Reels, 2001)

Known only from Phu Luang (altitude of 700-900 m) in Loei. Recorded in October.

First record: Loei, Phu Luang, 8-14 October 1984, P. Nielsen (P. Nielsen, in litt.).

14. *Vestalaria smaragdina* (Selys, 1879)

A northern montane species, which can be locally abundant. Altitude range 700-1600 m. A late season species from September to mid-March; uncommon after December.

First record: Chiang Mai, Doi Inthanon, 7 January 1958, K. Yoshikawa & T. Umesao (Asahina 1961, misidentified as *Vestalis amoena* Hagen in Selys, 1853; reidentified in Asahina 1985d).

15. *Vestalis amethystina* Lieftinck, 1965

A southern lowland species, the range of which extends to Kanchanaburi in the north. Inhabits shadowy streamlets in deep jungle. All the year.

First record: Trang, 20 July 1935, Dajak Layang Gaddi (Lieftinck 1965).

16. *Vestalis amoena* Hagen in Selys, 1853

A southern lowland species. All the year.

First records: Trang, January-February 1899, W. L. Abbott (Williamson 1904); Pattani, Bukit Besar, May-September 1901 and Yala, Mabek, July 1901, N. Annandale & H. C. Robinson (Laidlaw (1903).

17. *Vestalis anne* Hämäläinen, 1985

Inhabitant of the western and peninsular part of the country, the southernmost record made in Phuket. All the year.

First record (including holotype): Kanchanaburi, Sai Yok Yai, 18 October 1982, M. Hämäläinen (Hämäläinen 1985).

18. *Vestalis gracilis* (Rambur, 1842)

Widespread throughout the country. Common, except in the southern provinces. All the year; most abundant in dry season.

First record: Trang, January-February 1899, W. L. Abbott (Williamson 1904).

### **Cholorocyphidae**

19. *Aristocypha fenestrella* (Rambur, 1842) (Fig. 4)

Widespread throughout the country, but so far no confirmed records from the north-east. From sea level to 1200 m. All the year.



First records: Trang, January-February 1899, W. L. Abbott (Williamson 1904) and Pattani, Bukit Besar, May 1901, N. Annandale & H. C. Robinson (Laidlaw (1903).

20. *Aristocypha iridea* (Selys, 1891)

An uncommon local species in the west and northwest. Uplands and mountains at altitudes of 300-1300 m. In Chiang Mai, so far known only from Doi Inthanon. All the year.

First record: Chiang Mai, Doi Inthanon, 17 September 1975, H. Kurahashi (Asahina 1985b).

21. *Heliocypha biforata* (Selys, 1859)

Widespread and common throughout the country, especially in small lowland streams. From sea level to 1200 m. All the year.

First records: Trang, January-February 1899, W. L. Abbott (Williamson 1904) and Yala, Mabek, July 1901, N. Annandale & H. C. Robinson (Laidlaw (1903).

22. *Heliocypha perforata limbata* (Selys, 1879)

Widespread. Prefers broader streams than *H. biforata* and is much scarcer. A lowland species, from sea level to 500 m. All the year.

First record: Nakhon Si Thammarat, Khao Luang, March 1922, H. M. Pendlebury (Laidlaw 1931).

23. *Indocypha silbergliedi* Asahina, 1988

Known only from Mekong River at Chiang Khong in Chiang Rai (altitude of 350 m), where a male damselfly was photographed in 2015. The site is ca 130 km away from the type locality of this species (Muang Sing, Laos).

First record: Chiang Rai, Chiang Khong, 2015. (The name of the photographer not known). (N. Makhun, in litt.).

24. *Indocypha vittata* (Selys, 1891)

Known only from two locations: Lam Khlong Ngu in Kanchanaburi (alt. 500 m) and Huay Pha in Mae Hong Son (alt. 510 m). Recorded from early April to mid-July.

First record: Kanchanaburi, Lam Khlong Ngu, 18 June 1983, Amnuay Pinratana (Asahina 1985b; as *Indocypha leucoura* sp. nov.).

25. *Libellago aurantiaca* (Selys, 1859)

A southern lowland species reaching Kanchanaburi towards north. All the year.

First records: Trang, January-February 1899, W. L. Abbott (Williamson 1904) and Yala, Mabek, July 1901, N. Annandale & H. C. Robinson (Laidlaw (1903; as *Micromerus annandali* sp. nov.).

26. *Libellago hyalina* (Selys, 1859)

Widespread, but local and uncommon. Abundant in peat swamp streams in Narathiwat. From sea level to 500 m. In south all the year.

First record: Songkhla, 30 January 1963, Akira Nagatomi (Asahina 1966).

27. *Libellago lineata* (Burmeister, 1839)

Widespread and common throughout the country, also in rather disturbed environment, such as at Mae Ping River in the centre of Chiang Mai city. From sea level to 700 m.

First records: Trang, January-February 1899, W. L. Abbott (Williamson 1904) and Yala, Mabek, July 1901, N. Annandale & H. C. Robinson (Laidlaw (1903).

28. *Libellago stigmatizans* (Selys, 1859)

A rare southern lowland species known only from Krabi (Khao Nor Cuchi), Trang and Songkhla (Boripat). Recorded in January, February and March.

First record: Songkhla, Boribat, 27 January 1995, Amnuay Pinratana (Hämäläinen 1998).

29. *Rhinocypha arguta* Hämäläinen & Divasiri, 1997

A rare montane species known only from Phu Kradung in Loei and Thep Sadet in Chiang Mai. Altitude 1100-1200 m. Late season species, records from October to early December.

First record: Loei, Phu Kradung, October-November 1969, Aroon Samruadkit. Holotype from the same location, 29 October 1996, M. Hämäläinen (Hämäläinen & Divasiri 1997).

30. *Rhinocypha pelops* Laidlaw, 1936

A rare local species known from the peninsular part of the country. Records are from January to May.

First record: Krabi, Khao Phanom Bencha, 5-6 April 1998, M. Hämäläinen (Hämäläinen 1998).

31. *Sundacypha petiolata* (Selys, 1859)

A rare lowland species, known only from Narathiwat (Sirindhorn waterfall and Pru Toh Daeng peat swamp) and from Lad Toei waterfall area in Khlong Yai, Phatthalung. Recorded in February, March and June.

First record: Narathiwat, Sirindhorn, 25 February 2001, Kenji Ehira (K. Ehira, in litt.).

### Euphaeidae

32. *Anisopleura furcata* Selys, 1891

A montane species in the north and west. Altitude of 500-1300 m. From early May to late November.

First record: Chiang Mai, Doi Suthep, 18 June 1965, S. Asahina (Asahina 1981).

33. *Anisopleura subplatystyla* Fraser, 1927

A rare montane species known from Chiang Mai (Doi Inthanon and Thep Sadet). Altitude of 1100-1600 m. From early May to late November.

First record: Chiang Mai, Doi Inthanon, 2 July 1992, Amnuay Pinratana (Hämäläinen 1998).

34. *Anisopleura trulla* Hämäläinen, 2003

A very rare species known only from the type locality at the low elevation (ca 200 m) at Khao Poh Ta mountains in the border area of Phangnga and Ranong provinces. March and April.

First record: Phangnga, Khao Poh Ta, 3 March 1991, Somnuk Panpichit (Hämäläinen & Pinratana 1999; as *Anisopleura* sp.). Holotype from the same location and collector, 5 April 1997 (Hämäläinen 2003).

35. *Bayadera hyalina* Selys, 1879

A rare montane species known from Chiang Mai (Doi Inthanon and Doi Pu Muen) and Loei (Phu Kradung). Altitude of 1200-1700 m. From May to October.

First record: Chiang Mai, Doi Inthanon, 17 September 1975, H. Kurahashi (Asahina 1981; misidentified as *Bayadera longicauda* Fraser, 1928).

36. *Bayadera serrata* Davies & Yang, 1996 (Fig. 5)

A rare montane species known from Doi Inthanon (Chiang Mai) and Nam Nao (Phetchabun). Altitude of 750-1250 m. Recorded in April and May.

First record: Chiang Mai, Doi Inthanon, 7 May 2010, Noppadon Makbun (N. Makbun, in litt.; Hämäläinen 2013).

37. *Cryptophaea saukra* Hämäläinen, 2003

A very rare montane species known from Doi Suthep in Chiang Mai (alt. 1000-1200 m). May-June.

First record (including holotype): Chiang Mai, Doi Suthep, 23-24 May 1987, K. Kitagawa (Asahina 1987, misidentified as *Schmidtphaea schmidi* Asahina, 1978; see Hämäläinen 2003).

38. *Dysphaea dimidiata* Selys, 1853

An uncommon lowland species in the southernmost provinces. All the year.

First records: Trang, January-February 1899, W. L. Abbott (Williamson 1904; as *Dysphaea limbata* Selys, 1859) and Yala, Mabek, July 1901, N. Annandale & H. C. Robinson (Laidlaw (1903; as *Dysphaea limbata*).

39. *Dysphaea gloriosa* Fraser, 1938

Widespread, but local in central and northern parts of the country. From lowland up to 700 m. From April to August.

First record (including holotype): Prachuap Khiri Khan, Pak Tawan, 31 August 1931, A. F. G. Kerr (Fraser 1938).

40. *Dysphaea vanida* Hämäläinen, Dow & Stokvis, 2015

An uncommon species in the west and south, from Tak southwards to Nakhon Si Thammarat. From sea level to 600 m. All the year in south, from May to October in north.



Fig. 5. *Bayadera serrata*, one of the latest novelties to the Thai fauna, (Euphaeidae). Male at Doi Inthanon (Chiang Mai). 10 May 2016. Photo by Noppadon Makbun.



Fig.6. Flying males of *Euphaea ochracea* (left) and *Euphaea masoni* (right) (Euphaeidae). Doi Saket district (Chiang Mai). 13 November 2010. Photo by Sami Karjalainen.

First record: 'S' [South Thailand], Coll. Department of Agriculture, Bangkok (Asahina 1981; Asahina 1985c, as '*Dysphaea dimidiata forma?*'). Holotype: Ranong, Khlong Nakha (alt. 20-40 m), 12-13 May 1999, M. Hämäläinen (Hämäläinen et al. 2015).

41. *Euphaea impar* Selys, 1859

A rare lowland species in the southernmost provinces, known from Songkhla (Boriphat), Satun (Thale Ban) and Narathiwat (Sirindhorn). The few records have been made in January, February and July.

First record: Songkhla, Boriphat, 25 July 1993, Amnuay Pinratana & S.W. Dunkle (Dunkle 1993, Asahina 1993b).

42. *Euphaea masoni* Selys, 1879 (Fig. 6)

Widespread and common throughout the country. From sea level to 1000 m, most common at altitudes below 500 m. All the year.

First record: Yala, Mabek, July 1901, N. Annandale & H. C. Robinson (Laidlaw (1903).

43. *Euphaea ochracea* Selys, 1859 (Fig. 6)

Widespread and common throughout the country, but not yet recorded from north-east. From sea level to 1300 m, most common at altitudes below 500 m. All the year.

First records: Trang, January-February 1899, W. L. Abbott (Williamson 1904) and Patani, Bukit Besar, 1901, N. Annandale & H. C. Robinson (Laidlaw (1903).

44. *Euphaea pahyapi* Hämäläinen, 1985

A rare lowland species in south. All the year, most abundant from October to February.

First record: Trang, Khao Chong 24-26 June 1965, S. Asahina (Asahina 1985c, as *Euphaea khaochongensis* sp. nov.). Holotype: Krabi, Khao Phanom Bencha, 27 October 1982, M. Hämäläinen (Hämäläinen 1985).

### Note on the holotypes

The following 11 species have their primary type (holotype) collected in Thailand: *Caliphaea angka*, *Caliphaea thailandica*, *Mnais yunosukei*, *Noguchiphaea yoshikoeae*, *Vestalis anne*, *Rhinocypha arguta*, *Anisopleura trulla*, *Cryptophaea saukra*, *Dysphaea gloriosa*, *Dysphaea vanida* and *Euphaea pahyapi*. Moreover, three synonymous species have been described with holotype being collected in Thailand: *Indocypha leucoura* Asahina, 1985 (= *Indocypha vittata*), *Micromerus annandali* Laidlaw, 1903 (= *Libellago aurantiaca*) and *Euphaea khaochongensis* Asahina, 1985 (= *Euphaea pahyapi*). For details, see the relevant species accounts.

### Diversity and distribution of Thai Caloptera species – a brief history and analysis of their discovery

The first scientific collection of Caloptera species in Thailand (then Siam) was made by William Louis Abbott (1860-1936) in Trang (mostly in Khao Soi Dao) in January-February 1899. Williamson (1904) listed 11 Caloptera species from Abbott's dragonfly collections.

These are (using their present names): *Devadatta argyroides*, *Echo modesta*, *Neurobasis chinensis*, *Vestalis amoena* [it should be determined if any of the 6 male and 4 female specimens collected in fact represent *V. amethystina*], *Vestalis gracilis*, *Aristocypha fenestrella*, *Heliocypha biforata*, *Libellago aurantiaca*, *Libellago lineata*, *Dysphaea dimidiata* and *Euphaea ochracea*. Before Williamson's (1904) paper, Laidlaw (1903) had already reported the odonate species collected by Thomas Nelson Annandale (1876-1924) and Herbert Christopher Robinson (1874-1929) in two locations in the Siamese Malay States in 1901-1902. Their collecting sites are in the present Pattani and Yala provinces. They too found 11 Caloptera species, 10 of them also recorded by Abbott; they omitted *Vestalis gracilis*, but in its place was *Euphaea masoni*. Before these two expeditions only one species of Odonata was known from Siam – the holotype of *Archibasis oscillans* (Selys, 1877).

The next person to collect Caloptera in southern Thailand was Henry Maurice Pendlebury (1893-1945) who collected four species, *Aristocypha fenestrella*, *Heliocypha perforata limbata*, *Libellago lineata* and *Euphaea ochracea* in Nakhon Si Thammarat in February-March 1922 (Laidlaw 1931). The second of these species was a new addition to the fauna.

The first records from northern Thailand were provided by Fraser (1921), who listed *Neurobasis chinensis*, *Libellago lineata* and *Euphaea masoni* from Na Kram and/or Pak Tah among other odonates collected by local collectors. These sites are in Uttaradit (or in the northern part of Phitsanulok). Later Fraser (1927) listed five species (*Neurobasis chinensis*, *Vestalis gracilis*, *Heliocypha biforata*, *Libellago lineata* and *Euphaea masoni*) included in Sir Walter Williamson's (1867-1954) collection from several locations in central and southeastern Siam in 1923-1924; three of these species were found also in Bangkok. Fraser (1932) recorded three species from Prachuap Khiri Khan (*Libellago lineata*, *Euphaea masoni* and '*E. ochracea*') collected by Arthur Francis George Kerr (1877-1942) in July-August 1931 and *Mnais andersoni* McLachlan, 1873 from Pang Tawn, Chiang Mai, obtained by Kerr's local collector in May 1931. The '*Euphaea ochracea*' specimen from Prachuap Khiri Khan was a misidentification. Later Fraser (1938) described it as a new species *Dysphaea gloriosa*. *Matrona nigrippectus* (misidentified as *M. b. basilaris*) was another new record to Thailand reported by Fraser (1933) without further details of the locality. Thus, by the end of the 1930's, 16 species of Caloptera had been reported from Thailand (called Siam until 1939). Moreover, at least one additional calopterygid species was collected in Trang in July 1935, but it was not until 30 years later that this specimen was identified as *Vestalis amethystina* (Lieftinck 1965).

Knowledge of Thai dragonflies began to increase when Syoziro Asahina (1913-2010) started publishing on Thai dragonflies in 1961. His first papers (Asahina 1961, 1964a, b, 1966) treated the material collected by the participants of the Osaka City University Biological Expedition to Southeast Asia in 1957-1958 and 1961-1962 and by other Japanese entomologists, including Asahina himself, in 1957-1963. These collections included two new Caloptera, *Vestalaria smaragdina* from Doi Inthanon, collected in January 1958 and *Libellago hyalina* from Songkhla, collected in January 1961. In June 1965 Asahina visited Thailand sponsored by a US-Japan Co-operative

Science Program and he collected dragonflies in several locations in northern, central and southern parts of the country. His collection results in 1965 included four Caloptera new to Thailand: *Philoganga loringae* (Asahina 1967), *Caliphaea thailandica* (Asahina 1976) and *Anisopleura furcata* (Asahina 1981) from Doi Suthep (Chiang Mai) and *Euphaea khaochongensis* (Asahina 1985c) from Khao Chong (Trang); the latter species is a synonym of *Euphaea pahyapi*.

In September 1975 Japanese collectors made three new Caloptera records at Doi Inthanon: *Aristocypha iridea* (Asahina 1985b), *Bayadera hyalina* (Asahina 1981; misidentified as *Bayadera longicauda*) and *Noguchiphaea yoshikoeae* (Asahina 1976).

In 1980's new players entered the field. In late 1981 Amnuay Pinratana, from Saint Gabriel's College in Bangkok, expanded his interests in butterflies and moths to include dragonflies. By 2003, when his dragonfly collecting activity ended, his collection of Thai dragonflies had grown to by far the largest and most diverse in the country. Pinratana and his team of collectors facilitated the field work of several foreign odonatologists, including Matti Hämäläinen (since 1986) and Thomas W. Donnelly (since 1993). Donnelly had visited Thailand as early as June 1980; on that trip he collected a *Caliphaea* species, first identified as *C. confusa* (Asahina 1985d), but later described as a new species *Caliphaea angka* (Hämäläinen 2003). Hämäläinen visited Thailand for the first time in October 1982. The results of his first collecting trip with Pah-yap Kamnerdarata (Kasetsart University, Bangkok) included the collection of two new Caloptera species: *Vestalis anne* and *Euphaea pahyapi* in Kanchanaburi and Krabi, respectively (Hämäläinen 1985a, b). Pinratana's first new Caloptera discovery was an *Indocypha* species found in Kanchanaburi in June 1983. It was described as a new species *Indocypha leucoura* by Asahina (1985b), but later it was synonymized with *Indocypha vittata* (Hämäläinen & Pinratana 1999). Two other Caloptera novelties were found in late 1980's. The first of them was an euphaeid species discovered at Doi Suthep in Chiang Mai by Kazuo Kitagawa in May 1987. Asahina (1987) incorrectly identified and redescribed it as *Schmidtphaea schmidi* Asahina, 1978, a species described from Manipur, India (Asahina 1978). Later this specimen was re-identified as a new genus and species *Cryptophaea saukra* (Hämäläinen 2003). The other novelty, *Mnais yunosukei*, was first collected by Pinratana's team at Doi Inthanon in March 1988, but it was described from specimens collected by Yunosuke Kimura at Doi Par Hom Pok in February 1989 (Asahina 1990).

The four 'Caloptera parts' of Asahina's illustrated series 'A list of the Odonata recorded from Thailand' (Asahina 1985a, b, c, d) and its additions (Asahina 1990) included a total of 30 species. '*Schmidtphaea schmidi*' was not listed in the additions. Asahina's series of 21 parts, covering all Odonata, added with some other of his articles, was later republished in Thailand as a book (Asahina 1993a).

In 1990's several Caloptera novelties were discovered by Amnuay Pinratana's team: *Philoganga montana*, *Libellago stigmatizans*, *Anisopleura subplatystyla*, *Anisopleura trulla* and *Euphaea impar*. Other novelties found by other workers were: *Rhinocypha arguta* and *Rhinocypha pelops*. For details, see the relevant species accounts. By 1999 the Caloptera list had grown to 38 species (Hämäläinen & Pinratana 1999).

In this century there have been four new records: *Sundacypha petiolata* (2001), *Neurobasis longipes* (2009), *Bayadera serrata* (2010) and *Indocypha silbergliedi* (2015); for the recorders and other details, see the relevant species accounts. Moreover, in 2015 it was discovered that *Vestalaria miao* was collected in Thailand by Peter Nielsen in 1984, 15 years before the type series was collected in Hainan. Furthermore, in 2015, '*Dysphaea dimidiata* Selys forma (?)' (sensu Asahina 1985c) was described as a separate species *Dysphaea vanida* (Hämäläinen & al. 2015). So, at present, 44 species of Caloptera are known from Thailand.

It is fair to claim that among Odonata, the Caloptera damselflies are the best known group in Thailand as far as their diversity is concerned. No doubt a few new additions to the fauna will be discovered and that the distribution patterns of individual species will be refined. Many other odonate families are still inadequately known. At present over 350 odonate species are known from Thailand. Unfortunately, most of the ca 25 species listed at genus level only in Hämäläinen & Pinratana (1999) still remain to be properly named and described, and a revised and updated checklist of Thai dragonflies still awaits publication. Many potential new species in collections are in genera which would require detailed revisions covering all species known from a large area within the Oriental region. Moreover a number of published species identifications would require confirmation.

In Thailand insect collecting (with the exception of a small number of protected species – none of them dragonflies) is allowed outside the protected areas. Collecting within protected areas (national parks, wildlife sanctuaries and non-hunting areas) requires a written permit from the Royal Forest Department. Permits can be difficult and time-consuming to obtain and in practice, they are virtually unavailable to visiting foreign entomologist arriving as a tourist. Given this and the fact that most of the remaining forests are within the protected areas, legal collection of the most dragonfly species (as well as other insects) is difficult or impossible. This greatly hampers biodiversity research in Thailand.

During the last dozen, or so, years documenting of dragonflies with digital cameras has become a common practice. However, in many dragonfly genera many species cannot be reliably identified from photos. This applies especially to female specimens. The risk of incorrect distribution records and other assessments based on misidentifications has increased. In the tropics, for most insect orders, even such well-known and conspicuous groups as the butterflies, it is impossible to identify species solely from field photos, and for taxonomic study, collecting remains essential.

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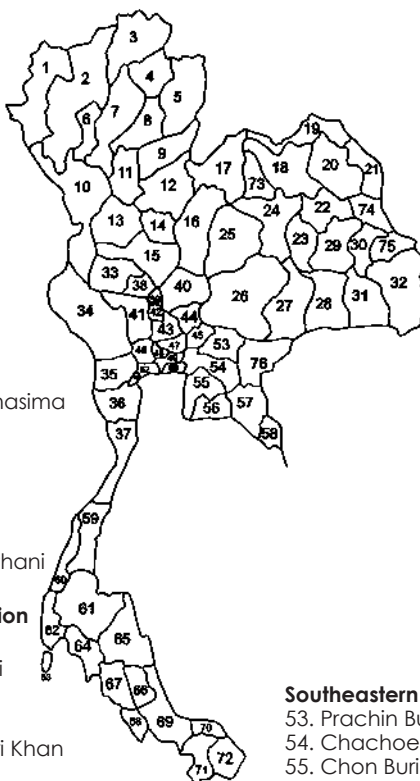
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## Appendix

The distribution of Thailand's provinces with the corresponding names of the provinces is shown in the map on p. 17. [Both the map and province list are scanned from Hämäläinen & Pinratana (1999)]. The numbering of the individual distribution maps follows the same species order as in the species accounts on p. 2-11.



**Northern region**

1. Mae Hong Son
2. Chiang Mai
3. Chiang Rai
4. Phayao
5. Nan
6. Lamphun
7. Lampang
8. Phrae
9. Uttaradit
10. Tak
11. Sukhothai
12. Phitsanulok
13. Kamphaerlg Phet
14. Phichit
15. Nakhon Sawan

**Northeastern region**

16. Phetchabun
17. Loei
18. Udon Thani
19. Nong Khai
20. Sakon Nakhon
21. Nakhon Phanom
22. Kalasin
23. Maha Sarakham
24. Khon Kaen

**Southeastern region**

53. Prachin Buri
54. Chachoengsao
55. Chon Buri
56. Rayong
57. Chanthaburi
58. Trat

**Peninsular region**

59. Chumphon
60. Ranong
61. Surat Thani
62. Phangnga
63. Phuket
64. Krabi
65. Nakhon Si Thammarat
66. Phatthalung
67. Trang
68. Satun
69. Songkhla
70. Pattani
71. Yala
72. Narathiwat
73. Nong Bua Lamphu [Northeast]
74. Mukdahan [Northeast]
75. Amnat Charoen [East]
76. Sra Kaeo [Southeast]

**Eastern region**

25. Chaiyaphum
26. Nakhon Ratchasima
27. Buri Ram
28. Surin
29. Roi Et
30. Yasothon
31. Si Sa Ket
32. Ubon Ratchathani

**Southwestern region**

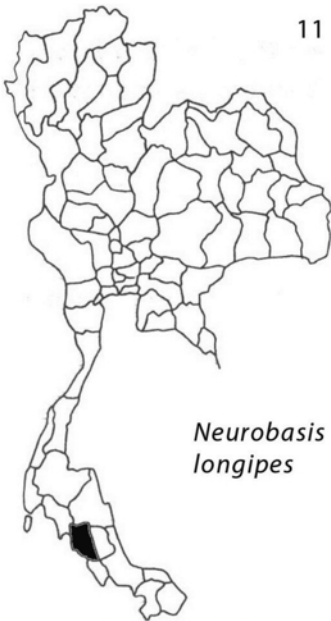
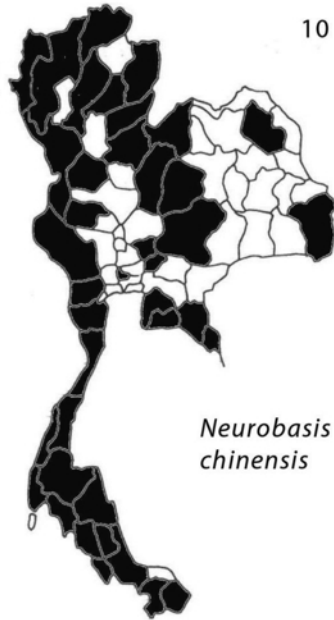
33. Uthai Thani
34. Kanchanaburi
35. Ratchaburi
36. Phetchaburi
37. Prachuap Khiri Khan

**Central region**

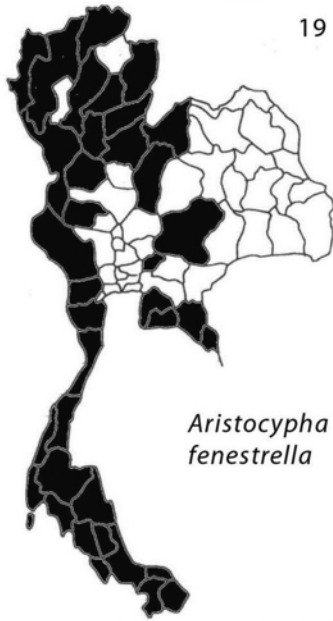
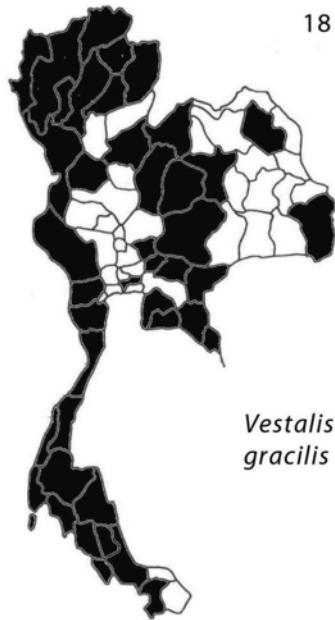
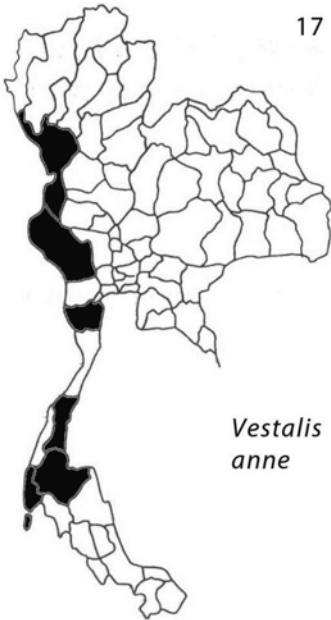
38. Chai Nat
39. Sing Buri
40. Lop Buri
41. Suphan Buri
42. Ang Thong
43. Phra Nakhon Si Ayutthaya
44. Saraburi
45. Nakhon Nay ok
46. Nakhon Pathom
47. Pathum Thani
48. Nonthaburi
49. Bangkok
50. Samut Prakan
51. Samut Songkhram
52. Samut Sakhon



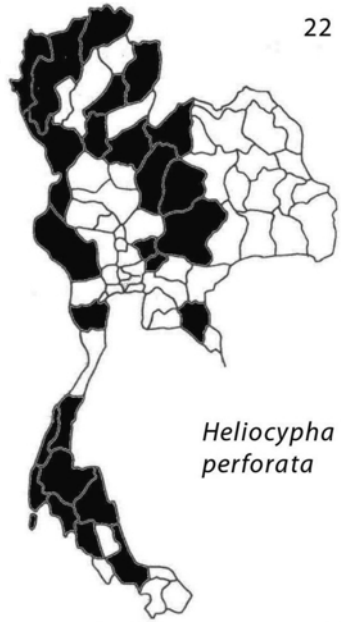
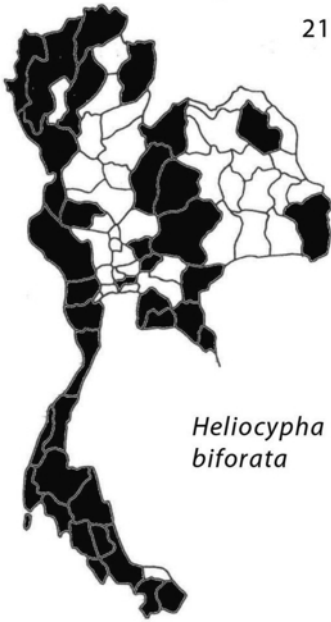










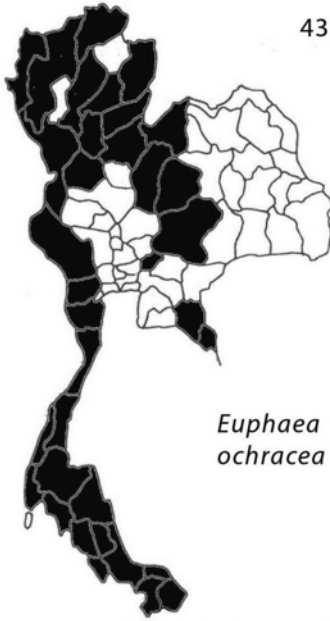
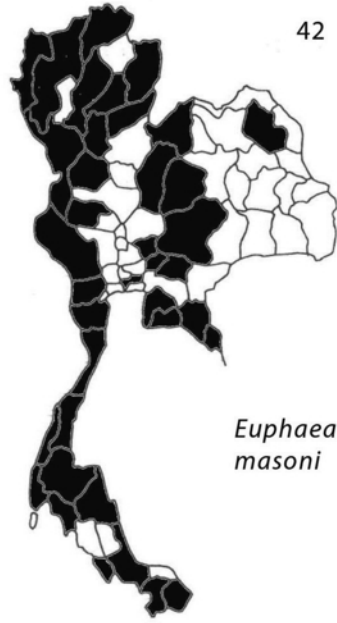












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