Critical species of Odonata in Thailand and Indochina

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Abstract

The report provides a summary of our present knowledge of the odonate diversity (over 500 species) in the region and some general data on the habitat conservation in different countries. Thailand has the most diverse and best known odonate fauna, but knowledge of the Laotian and Vietnamese fauna has increased rapidly over the last 10 years. The conservation status of some species listed in the 1997 Action Plan is briefly discussed. No species are red-listed due to inadequate knowledge of their conservation status.

Regional definition

The region includes four south-east Asian nations: Thailand (area 514,000 km^2, population 62.5 mill.), Laos (236,800 km^2, 5.2 mill.), Cambodia (181,035 km^2, 12.8 mill.) and Vietnam (329,566 km^2, 76 mill.). With the exception of land-locked Laos, these countries have a long coastline on the South China Sea, and, in the case of Thailand, also on the Bay of Bengal. The area lies entirely within the tropics. Annual monsoon cycles regulate the climate. In much of Thailand and Laos the south-west monsoons bring rain between June and early November. The rainy season is followed by cool and dry weather in December to mid-February. Thereafter the temperature rises very rapidly and the hottest months are from March to May. In southern Thailand the climate resembles that of Peninsular Malaysia, being hot and humid all the year round. In Vietnam the climate is regionally much more diverse than in Thailand and Laos. Violent typhoons often hit central and northern Vietnam between July and November.

Faunal lists and studies on biodiversity and taxonomy

Thailand

Thailand has the best known odonate fauna in this region. The book 'Atlas of the dragonflies of Thailand – distribution maps by provinces' by Hämäläinen & Pinratana (1999) includes an annotated checklist and distribution maps and provides a brief history of studies on the diversity of odonates in Thailand. From the 315 species listed ca 25 were identified to the genus level only. Since then several

additions have been found and a few misidentifications corrected; these were summarized in Hämäläinen (2002). In addition six species new to the Thai fauna were found in 2003 (Pinratana 2003). At present ca 340 species are known from the country. It is to be expected that at least 20-30 odonate species will still be discovered from Thailand. Recently published taxonomical papers on Thai Odonata include Yeh (2000) and Hämäläinen (2000, 2003a). Reports of field trips and faunistic records are regularly published in the yearly issues of the regional odonate newsletter 'Malangpo'. From the recent faunistic records perhaps the most surprising is the discovery of *Anaciaeschna martini* (Selys, 1897) from Doi Inthanon, a species earlier known only from Japan and Taiwan (Hämäläinen 2002). For references on Thai odonate fauna see Pinratana et al. (1988) and Hämäläinen & Pinratana (1999).

Vietnam

Martin's (1904) pioneering account of Indochinese odonates lists 139 species. Excluding synonymies and some obvious mistakes, ca 120 species were listed from the present area of Vietnam, mostly collected by H. Fruhstorfer in Tonkin and Annam. Later a few other new Indochinese species from Fruhstorfer's material were described by F. Förster, F. Ris, D.E. Kimmins and M.A. Lieftinck. The growth of knowledge of Vietnamese Odonata was very slow for decades and faunistic papers are few (Fraser 1919; Asahina 1969; Pritykina 1992). Tsuda (1991) listed 144 spp. from Vietnam. At the end of the 1980s Vietnam started to open its doors again to foreign visitors and soon an increasing number of entomologists, mainly Japanese, started to make field trips. As a result the rate of accumulation of knowledge of Vietnamese odonates has picked up substantially.

Asahina (1995, 1996, 1997) reported 78 species and described 18 new taxa collected in northern Vietnam during two Japanese expeditions in 1994 and 1995. Other recent publications on Vietnamese species include van Tol & Rozendaal (1995), Karube (1995, 1998, 1999a, 1999b, 2000a, 2000b, 2001, 2002a, 2002c, 2002d, 2003), Hämäläinen & Karube (2001a, 2001b). In Tsuda (2000) 199 species were listed, and after this at least nine new species have been described and one new record added. Much available museum material, especially in Japan and the Netherlands, waits to be worked through while field work continues, although presently in Vietnam foreign collectors are greatly encumbered by "red tape". Doubtless the total number of Vietnamese species will exceed well over 250 species.

Laos

The first comprehensive paper on Laos odonates was presented by Fraser (1933) reporting 42 species collected by A. Kerr in April 1932. Following this, knowledge of the fauna increased slowly, the few papers adding new data including Asahina (1977, 1988). In Tsuda (1991) only 63 species were listed for Laos. After Laos again opened to foreign visitors in the early 1990s, studies on the nation's biodiversity advanced quickly. Japanese entomologists especially started to survey the rich and poorly known insect fauna. In Tsuda (2000), 125 odonate species were listed from Laos and at present we already know over 175 named species and

ca 30 still unidentified odonate species from Laos, so the known national list has tripled in 13 years. Much of the recent knowledge of the Laotian odonate fauna is credited to Naoto Yokoi, who has made several field trips to Laos from 1994 onwards. Among the nearly 100 species new to Laos reported by him in Yokoi & Mitamura (1995, 2002), Yokoi (1999, 2000, 2001, 2002), Yokoi & Kano (2002) and Kano & Yokoi (2002) are also two new species and several others are in progress to be described by him and other authors. Other recent papers with new Laotian records include Karube & Yeh (2001), Karube (2002b), Hämäläinen (2003b), Sasamoto (2003a, 2003b) and Sasamoto & Honda (2003). N. Yokoi is working on an up-dated checklist. We estimate that at least 300 odonate species occur in Laos, including many endemics.

Cambodia

Cambodia has remained the poorest known of the Indochinese countries. Martin (1904) listed 23 species with "Cambodia" specified as the range, but several other species merely defined "partout en Indo-Chine", "commune in Indo-Chine" or "commune dans tout l'Orient" surely included material also from Cambodia. Asahina (1967) provided records of 33 species. Recent contributions include Donnelly (2000) and H. Karube (unpubl.). Perhaps a total of some 70-80 species has been collected from Cambodia. Tsuda's (2000) list with 36 included species is incomplete. So far Cambodia is the type locality for only one odonate species, *Orolestes octomaculatus* Martin, 1904.

Endemic and threatened species

This region has a rich odonate fauna, probably exceeding well over 500 species. It does not form a single zoogeographical unit. Thailand's fauna is composed of Sondaic (Malaysian), Indo-Burmese, Sino-Himalayan and Indochinese elements; consequently there are only a few species endemic to the country. Based on the distribution pattern of some odonates, van Tol & Rozendaal (1995) postulated a zoogeographical subregion extending from the northernmost part of Thailand to northern and central Vietnam, and reaching northwards up to southern China, a conclusion supported by Wilson & Reels (2003). Laos and Vietnam have also a considerable number of endemic species. The areas bordering Vietnam and Laos and Vietnam and Cambodia have been ranked among the most important biodiversity centres in SE Asia. Recent odonate findings in Lak Sao area in Central Laos, in the northern edge of Nakai-Nam Theun national protected area (Yokoi & Kano 2002; Hämäläinen 2003b; N. Yokoi unpubl.) confirm this. The Cardamon mountain area in west Cambodia, which includes one of the largest remaining tracts of virgin forest in South-east Asia is very poorly known. The western lower outreaches of this mountain range reach Trat and Chanthaburi provinces in Thailand, where several new odonate species have already been found. At present we can just imagine what all the main mountain range may hide. The Cambodian and South Vietnamese fauna has also an interesting Sondaic element.

Species previosly listed

No odonates from this region are included in the present (2002) IUCN Red List of threatened species. *Macromia urania* Ris, 1916 from Vietnam was included in Moore's (1997) table of red-listed threatened species, obviously merely because the treatened Japanese *Macromia* taxon from Ishigaki and Iriomote islands has traditionally been identified as *urania*. However, recent studies by N. Yokoi (unpubl.) suggest that the Japanese taxon is not conspecific with the real *urania* from Indochina; see also Hämäläinen (1986).

At present I prefer not to include any Thai, Laotian, Cambodian or Vietnamese odonate species in the IUCN Red List of threatened species, since we do not yet have enough knowledge of the actual range, abundance and habitats of individual species to evaluate confidently which species really are threatened. It would be much easier to list those 100 + species which definitely are not threatened.

The action plan listed *Devadatta*, *Philoganga*, *Caliphaea* and *Onychothemis* species as taxonomically isolated. *Noguchiphaea yoshikoae* Asahina, 1976 from Thailand was listed both as taxonomically isolated and as a representative of monotypic genera confined to one country. The latter category includes also *Calilestes pallidistigma* Fraser, 1926 from Vietnam.

Devadatta spp. – besides the four named species also at least one undescribed species is known to occur in the region (M. Hämäläinen unpubl.).

Philoganga spp. – two species are known from Thailand, *P. loringae* Fraser, 1927 and *P. montana* (Selys, 1859), and one, *P. vetusta* Ris, 1912, from Vietnam and Laos. All the known habitats are inside protected areas.

Caliphaea spp. – molecular studies by Dumont et al. (2004) indicate that there is no special reason to include them as taxonomically isolated species. On the contrary *Noguchiphaea yoshikoae*, which Dumont et al. (2004) characterize as "a living fossil", has taxonomically and biogeographically a very isolated status among the oriental odonates. So far it has been recorded only from North Thailand, but in all likelihood it occurs also in adjoining areas in Burma and Laos. In North Thailand we now know it from at least five stream sites in montane forests, four of them in protected areas. Thus, as a species it should not be threatened at the moment. Since its flight season from mid-July to early October coincides with the wettest monsoon period, records have remained few.

Onychothemis spp. – two species, *O. culminicola* Förster, 1904 and *O. testacea* Laidlaw, 1902, occur in the area. They are uncommon, but not threatened.

Calilestes pallidistigma – it is a very poorly known montane species; possibly the holotype from "Tonkin, Ngai Tio" – an incomplete male – still remains the only known specimen.

Habitat conservation

It is obvious that the conservation of the majority of odonate species in this region depends on the preservation of the remaining forests and wetlands. Hence establishing and maintaining a comprehensive network of protected areas is the main strategy for conserving odonates. My capacity to provide anything concrete on this

topic is very limited. However, some general information on the state of nature conservation can be given, mainly based on data received from the Royal Forestry Department, Bangkok and the detailed reports by the International Centre of Environmental Management (e.g. ICEM 2003) available at <www.mekong-protected-areas.org>.

In all the countries covered by this report quite a proportion of the land area is already formally protected.

Thailand
has gazetted some 17% of its total land area as national parks, wildlife sanctuaries and other protected areas, totalling 88,000 km^2. These incorporate most of the remaining forests in the country. The total number of protected areas is over 260. The best coverage of protected land is in the western part of the country, near the Burmese border areas. Moreover, since 1989 there has been a logging ban throughout the whole country.

Vietnam
has 25 national parks, 60 nature conservation areas and 37 cultural-historic-environmental sites, which totals 23,901 km^2, i.e. 7.4% of the country. Most of the protected areas are rather small, the largest unit, the nature reserve Muong in the north-west, is 1,820 km^2. The fragmented nature of protected areas probably limits their effectiveness in conserving biodiversity overall although it is unclear specifically how this affects odonate communities. Fortunately in the west many parks are linked to larger protected areas in neighbouring Laos and Cambodia. According to data given by the ICEM, in Vietnam the loss of forest was arrested in the mid 1990's, when remaining cover was ca 28% of total land area, and currently the amount of forest land is increasing. However, Collins et al. (1991) table the maximum forest extent as about 17% – they also state that only about 10-12% of closed forests remain, less than 1% in a pristine state. Wetlands are still poorly protected in Vietnam, only one Ramsar site (120 km^2) has been established. However, 68 wetlands of national importance have been identified and plans for their protection are under way. But wetlands may not be so important for tropical odonate conservation, since maximal biodiversity seems to be on the forest streams.

Laos
has a total of 20 national protected areas, covering 14% of nation's land area, which have been established since 1993. Moreover there are additional protected areas established at the provincial and local level (6% of national area). Unfortunately, at present these areas enjoy only nominal protection and in reality are still multiple use areas. Domestic resources for conservation management are very low. However, the rapid development of various conservation concerns in Laos during the last 12 years is a good sign. According to reports by ICEM, presently there is still 80% forest cover in Laos, although half of the forests are badly degraded. Collins et al. (1991) give the lower figure of 54% with half degraded. The protected areas cover several good montane and hill forest habitats, but wetlands and lowland forests are underrepresented.

In Cambodia,
where the first national park in South-east Asia was gazetted in 1925, presently 21% of the area is protected; the highest national figure in the region. The ultimate goal is to reach 25% within a few years. Most of the national parks, wildlife sanctuaries and protected forests are in isolated areas of low population density. Unfortunately, the protected areas still suffer from illegal logging and encroachment, since the government's capacity to monitor them is very limited. In 1999 the forest coverage in Cambodia was estimated at 58% in ICAM reports (37% in Collins et al. 1991). The Cardamon mountain area in West Cambodia is now nearly completely within the national protected area system. Cambodia has also considerable wetlands areas, some of them protected.

Conflicting interests in national parks

In Thailand generally and also in some national parks in Vietnam, the authorities have the capacity to manage protected areas and maintain efficient law enforcement. Thus, in theory much of the presently known dragonfly diversity should be reasonably safe. However, experience from Thailand shows that in heavily visited national parks, the construction of visitor facilities is often highly detrimental to insect populations, especially odonates, since streams and waterfalls attract humans as well as odonates. The present park management practice seems to favour clearing undergrowth from stream banks and along trails leading to major waterfalls, in order to provide visitors with a better view of the stream as they walk to the falls. Unfortunately removal of the brush and rheophytes considerably damages odonate habitats. In Khao Phanom Bencha National Park in Krabi, this practice has clearly decreased the number of *Euphaea pahyapi* Hämäläinen, 1985 downstream of the Huay To waterfall. This euphaeid species is an endemic species in southern Thailand and has only a few known habitats; the stream below Huay To used earlier to have a thriving population. At Doi Suthep-Pui in Chiang Mai, downstream of the Monthatarn waterfall considerable areas have been cleared of bushes and undergrowth to increase space for car parks and picnic tables for visitors. At present the former, very rich butterfly fauna has largely disappeared, and odonate diversity has also suffered. Higher up at Doi Suthep National Park, a small forested montane stream – the habitat of many rare odonates – was heavily cleared and partly dammed in sections in 1997; then waterpipes were installed near the stream bed. With the flow of the stream regulated, a section of the stream is now nearly dry.

A famous terrain for rare Thai odonates, the area below Siribhum waterfalls (altitude 1,250 m) at Doi Inthanon mountain in Chiang Mai – the holotype site of many insect species, has lost much of its diversity during the last 20 years due to human activities. However, this was to be expected, since the area is an enclave inside the national park boundaries and has been designated for the development of agriculture, including terraced vegetable plantations, fruit trees and flower crops grown by hill-tribe people. During the last few years the base of the falls has been turned into a flower garden with paved walkways, picnic shelters and completely cleared streambeds to attract visiting tourists. Presently very little of the once rich odonate diversity is left.

Research priorities

The composition of the national odonate fauna remains inadequately known in Vietnam and Laos. In Cambodia very little is known at all. Thus, extensive field work aimed at collecting new material to form the basis of all faunistic and taxonomic work must still receive top priority in these countries. In Thailand detailed surveys of the diversity of odonate fauna and the ecology of species in some protected areas in different parts of the country should be attempted. In particular detailed studies on habitat associations and community structures would help to identify those species most vulnerable to future disturbance. Very preliminary species lists have already been published for Khao Yai, Doi Suthep-Pui, Doi Inthanon and Phu Kradung national parks and for Khao Soi Dao wildlife sanctuaries (for details see Hämäläinen & Pinratana 2000).

Taxonomy of the oriental odonates is still often in the alpha phase, dozens of undescribed species in different collections awaits description and surely an even larger number await discovery in the wild. Very little is known concerning the early stages of regional odonates; Kazuo Matsuki has provided most of the recent larval descriptions of the Thai species.

Of the many genera in need of complete revision within the whole Oriental region one in particular, *Macromia*, stands out. The genus is very speciose in Thailand and Indochina and in Laos 15 *Macromia* species, including four undescribed, are known to occur (N. Yokoi unpubl.).

Current activities

Several workers are actively studying different aspects of the regional odonates, of which a few examples may be mentioned. Taxonomic work under way covering the entire region or significant sub-regions includes:

revision of Chlorogomphinae and treatment of several gomphid and aeshnid genera by Haruki Karube. From Vietnam he has at present material of ca 15 undescribed species, mainly chlorogomphids and gomphids;

descriptions of various new species from Laos and completing an catalogue of Laotian odonates by Naoto Yokoi;

revision of oriental Platystictidae by Jan van Tol;

revisiory work of taxonomically poorly known taxa in the oriental Calopterygoidea by Matti Hämäläinen;

revising the *Idionyx optata* group by Akihiko Sasamoto and Matti Hämäläinen.

The growing interest in odonates by some local biologists and naturalists in Thailand is badly hampered by the lack of up-dated identification guides. Asahina's (1993) reprinted papers and the recent well illustrated guide books for Hong Kong, Taiwan and Borneo odonates and to some extend also the colour plates in the Thai dragonfly atlas help to identify many of the species. Unfortunately, as far as I know, no field guide covering all the known odonates of Thailand is presently planned.

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