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Abstract

The Cardamom foothills were re-assessed for Odonata in the late dry season of 2015 within E Thailand and SW Cambodia. In the narrow coastal strip of Trat Province of Thailand bordering to Cambodia, 44 species (1 unidentified) were recorded, of which 15, namely *Agriocnemis nana, Archibasis viola, Ischnura senegalensis, Pseudagrion microcephalum, P. williamsoni, Acisoma panorpoides, Brachythemis contaminata, Brachydiplax farinosa, Hydrobasileus croceus, Macrodiplax cora, Rhyothemis plutonia, R. variegata, Tholymis tillarga* and *Trithemis pallidinervis* were recorded for Trat Province for the first time. That increased the number of species recorded for the province to 61. Preliminary checklists of Odonata of Ream Peninsula (that is of Ream National Park) and of Koh Rong Island were complied, mostly on the data of this trip, to count 45 species (2 unidentified) and 17 species, respectively. As many as 36 species were recorded at the village of O'Som, Pursat Province. *Copera marginipes* is added to species recorded from Bokor Hill Station. Superficially similar males of *Pseudagrion australasiae* and *P. microcephalum* were observed in the same locality in Ream National Park.

Key words: Thailand, Cambodia, new provincial records, Trat Province, Ream National Park, Koh Rong Island; O'Som village, Veal Veang District, Koh Kong Province, Bokor Plateau, deforestation, *Archibasis viola*, syntopic *Pseudagrion australasiae* and *Pseudagrion microcephalum*.

Introduction

Scientific knowledge is based upon data reproducibility. In this I found a scientific sense of my recreational family trip to the coastal areas of eastern Thailand and south-western Cambodia on March 15-April 5 in 2015. Earlier I studied Odonata of south-western Cambodia five times, in April 2010 (Kosterin 2010), November/December 2010 (Kosterin 2011), August 2011 (Kosterin 2012), May 2013 (Kosterin 2014) and June 2014 (unpublished), hence this area could be considered quite well

explored in odonatological respect. Moreover, in April 2010 it was visited at about the same late dry season (Kosterin 2010). Hence I had an opportunity to check if a new trip to the same more or less pristine tropical region in the same rather poor season would yet bring some unexpected results, or those results could be predicted without leaving an armchair. The reality turned to follow the second option. No species was added to the known fauna of not only Cambodia as a whole but even to this area. On my six earlier trips to Cambodia in 2010-2014, I respectively made a growing (rather than expectedly decreasing!) number of 13, 14, 15, 17 and 21 of the first country records of identifiable species, but zero this time. So I can conclude that before I had done my job very well. Nevertheless, I briefly report results of my 2015 trip below (before a report of the very fruitful 2014 trip which is still in preparation), for the following reasons: (i) to confirm reproducibility of faunistic data; (ii) since Cambodia is still too poorly studied in general to leave some data unpublished and (iii) since the Ream Peninsula was now much better studied than earlier and two previously not visited areas were examined, namely the environs of O'Som deep in the Cardamoms, and Koh Rong Island. The Trat Province of Thailand territory is very scarcely studied, so I orivide herewith first dataof the narrow strip of its territory along the Cardamonean coast.

Methods

Odonata were sought while walking. Well recognisable common species were recorded by sight, individuals of less obvious species were captured with a net, examined in hand and released, voucher specimens of some species were collected and preserved on cotton layers with paper covers. Odonata were photographed in purely natural conditions by the author and habitats by the author and N. Priydak using the following cameras: Canon EOS 350D, Pentax WG10, Olympus Camedia C8080. Coordinates were recorded by Garmin eTrex H personal GPS navigator but the ranges of the actually examined areas and elevations were revised using Google Earth.

Weather

The hot (but not extraordinarily) end of dry season. Short afternoon rains, often with sun, from clouds gathering along the bordering ridge, in the coastal stripe of Trat Province for the examination period on 16-18.03.2015; extremely strong downpours both nights, 28/29 and 29/30.03.2015, spent on Koh Rong Island; fogs in the first half of both days at Bokor Plateau; otherwise sunny.

Presentation

The results are presented in tables separately for specific areas examined; Tables 1-4 actually present checklists of Odonata known from the respective areas. The areas are briefly characterised and presented below in decreasing order of importance

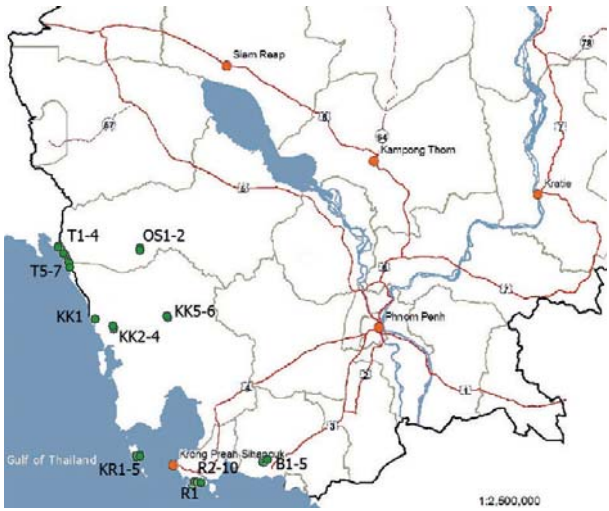

Figure 1. A schematic map of localities visited in E Thailand and SW Cambodia. For code explanation see the text.

as to investigation of the Odonata fauna of the region in general. The locality designations include prefixes referring to the areas and ordinal numbers independent for each area; their disposition is shown on the schematic map of Fig. 1.

In Tables, the following codes are used for species abundance: **1** – single individual found, **f** – few (two to five) individuals recorded (sometimes exact numbers are provided), **m** – moderate abundant (5-20 individuals recorded), **a** – abundant (the number of individuals observed approximately evaluated as more than 20 and less than 100), **v** – very abundant (obviously more than 100 individuals). These rather subjective estimates of course depend on the time spent in each locality; which however did not vary dramatically usually being 2-3 hours (each day if visited repeatedly), rarely ca 1 hour. Sexes are indicated where recognised for most specimens or especially relevant; tandems are indicated as **t**. The data confirmed by photos are boldfaced; those confirmed by voucher specimens are underlined.

Thailand

Coastal strip of Trat Province

The area

In 1904, Siam was forced to surrender Trat Province to French Indochina but three years later, in 1907, the French returned to Siam the Trat Province, populated by Thai, in exchange of larger areas in the present day Western Cambodia and at the Mekong River with predominantly Khmer population. Along with Trat, Siam received a narrow but 65 km long strip of the hitherto Cambodian land along the coast of the Siamese Bay of the Yellow Sea. This strip, presently shared by Mueang Trat and Khlong Yai Amphoes of Trat Province of Thailand, is only 1-4 km wide, so that from each point of it one can see trees growing already in Cambodia (at least in half) on the crest of the coastal hilly ridge which serves as the country border. The excellent Sukkumwit road goes along this land stripe along the towns of Laem Klat, Mai Rut and Khlong Yai towards the Hat Lek border crossing point, while the bank is a chain of resorts and 'wild' beaches. Nevertheless, this area is little known abroad and did not attract attention of researchers. From the Thai side, the short steep slopes are covered by ?primary evergreen forest, the more gentle foothills are occupied by rubber plantations but ?secondary forest and coastal shrubbery still occupy quite an area on rocky cliffs and resort territories. Water is limited to small brooks (dry at the time of visit) and small (dry) or medium (low water) rivers, soon transiting from hill gorges into brackish estuaries, as well as few hand-made ponds. I examined the area between Laem Klat and Mai Rut Towns.

Localities examined

T1. Saphonin Waterfall at Laem Klat: rapids (no actual waterfall), with large sandstone rocks and plates (Fig. 2), at quite a large (hard to cross) river with cold water in a narrow forested valley descending from a mountain higher than the border ridge south of it. A rubber plantation nearby. 12°06'08-13" N 102°42'40-47", 22-50 m a.s.l., 17.03.2015.

T2. Ponds for aquaculture near the estuary of the above mentioned river. At the time of visit empty or with very shallow pools at the bottom. 12°06'53-55" N 102°42'29-33", 6-7 m a.s.l., 17.03.2015.

T3. A small river with an open rocky bed crossing a village, upstream of which flowing through a chain of large nearly stagnant pools shaded by secondary forest with a lot of bamboo, then flowing in a narrow but sunny ditch with cleared banks, then enters a rubber plantation. 12°02'50-55" N 102°45'12-21", 9-16 m a.s.l., 17-18.03.2015.

T4. A small river at Bang Khlong Sa, dammed at the road to form a long, deep and narrow water reserve with rather steep banks. Its right side is occupied by a large durian orchard, with shallow ditches from the reserve, and a small pond with grassy banks with *Allocasia* (elephant ear). Upstream the water reserve the valley enters a rubber plantation, without water in the rocky bed. 12°02'28-33" N 102°45'33-40", 12-20 m a.s.l., 18.03.2015.

Figure 2. Saphonin 'Waterfall' at Laem Klat Town, Trat Province, Thailand (locality T1). Habitat of *Vestalis gracilis, Euphaea masoni, Copera vittata, Prodasineura autumnalis, Neurothemis fluctuans, Orthetrum glaucum, Zygonyx iris*. 17.03.2015.

Figure 3. A pond between the towns of Laem Klat and Mai Rut, Trat Province, Thailand (locality T6). Habitat of *Agriocnemis pygmaea, Ischnura senegalensis, Pseudagrion australasiae, Ictinogomphus decoratus, Brachydiplax farinosa, Hydrobasileus croceus, Neurothemis fluctuans, Orthetrum sabina, Rhyothemis phyllis/variegata, R. triangularis, Trithemis aurora*. 17.03.2015.

T5. A small rivulet entering the sea at Sentara Resort, this time without water but in the estuary, for a long time its bed is a ground dell with dark pools shaded by forest but with a large open area of a rocky bed upstream the road, further upstream crossing a cleared place with a young rubber plantation, as a chain of sunlit small but deep pools with grassy banks with *Allocasia*. 11°59'44-50" N 102°46'20-29", 16-18 m a.s.l., 16-17.03.2015.

T6. A pond on the above rivulet, with rather steep banks overgrown with grass and herbs including *Ligodium* (fern), *Allocasia* and tall sedge (*Carex* sp.) at one side and barren bank at the other side (Fig. 3); rather shallow with a muddy bottom. 11°59'34-35" N 102°46'34-35", 22 m a.s.l., 17.03.2015.

T7. A very large artificial lake surrounded with an embankment and adjacent to a woody slope with a village and orchards. Most banks shallow and mostly barren, that at the slope deep and quite steep, clad with thickets of *Gleychenia* (forked fern), tall *Cyperus* sp. and club moss (some patches of the same vegetation scattered at the shallow banks as well). 11°57'54" - 58'03" N 102°47'00-14", 13-19 m a.s.l. 18.03.2015.

Results

The results are presented in Table 1, which at the same time presents a checklist of Odonata so reported for this area (by this publication only).

A male of Macromiidae Gen. sp. at T3 was large, rusty-red with yellow markings and bluish-green eyes. It swiftly ranged along the water of the reserve and should have a very long territory since it was quite a time to see it returning. Most probably it was *Epophthalmia frontalis*.

Tholymis tillarga at T5 were observed mostly not in the main course of the brook (one female there) but flying low over its small brownish estuary at the beach on 16.04.2014.

Macrodiplax cora was, unfortunately, recorded only visually when landed on a stick, in a very relevant habitat: brackish almost dried-out pond at a river estuary; I would prefer to support this first province record at least by a photo.

At a small pond with grassy banks near the reserve at T4, curious segregation of males of *Rhyothemis* spp. was observed with respect to the height of their fluttering flight over the water: *R. triangularis* flew not higher than 0.5. m, *R. phyllis* at 1-2 m while the only male of *R. plutonia* at 2-3 m. At the deep water reserve, two females of *R. triangularis* were observed to oviposit onto the same bunch of a very fine grass emerging from water.

Numerous *Copera marginipes* was a remarkable feature of T3. Absence of chlorocyphids at Saphonin Waterfall seemed strange.

Discussion

Hämäläinen & Pinratana (1999) listed just 24 species for Trat Province. Later publications (Kosterin et al. 2011; Day et al. 2012) raised the number of species known

Table 1. Odonata species found in localities T1-T7 (see the text) of Trat Province of Thailand on 17-18.03.2015 / Checklist of Odonata so far recorded for the coastal stripe of Trat Province (asterisks indicate new records for the province).

Species	Localities						
	T1	T2	T3	T4	T5	T6	T7
Vestalis gracilis (Rambur, 1842)	f	-	f	f	f	-	-
Euphaea masoni Selys, 1879	1♂	-	-	-	-	-	-
•*Agriocnemis nana* (Laidlaw, 1914)	-	-	-	1♂	-	-	-
Agriocnemis pygmaea (Rambur, 1842)	-	-	-	1♂	-	♀	-
•*Archibasis viola* Lieftinck, 1949	-	-	-	-	1♂	-	-
Argiocnemis rubescens rubeola Selys, 1877	-	-	-	-	f ♂♂	-	-
Ischnura senegalensis (Rambur, 1842)	-	-	f	-	-	1♂, 1♀	-
Pseudagrion australasiae Selys, 1876	-	-	-	-	-	1♂	f ♂♂
Pseudagrion microcephalum (Rambur, 1842)	-	-	-	a ♂♂, m 1	-	-	-
Pseudagrion rubriceps Selys, 1876	-	-	-	a ♂♂, m 1	-	-	-
Pseudagrion williamsoni Fraser, 1922	-	-	-	-	-	-	m ♂♂
Copera marginipes (Rambur, 1842)	f	-	a ♂♂, 1♀♀	-	-	-	-
Copera vittata (Selys, 1863)	f	-	-	1♂	m ♂♂	-	-
Coeliccia kazutoae Asahina, 1964	-	-	-	-	1 f	-	-
Rhodoneura auturnalis (Fraser, 1922)	m	-	m	-	m ♂♂, ♀♀	-	1♂
Ictinogomphus decoratus melaenops (Selys, 1858)	-	-	-	1 ♂♂	-	1	-
Macromiidae Gen. sp.	-	-	-	1♂	-	-	-
•*Acisoma panorpoides* Rambur, 1842	-	-	-	f	-	-	f
Brachythemis contaminata (Fabricius, 1793)	-	m ♂♂, ♀♀	-	-	-	-	f ♂♂, ♀♀
Brachythemis chalybea Brauer, 1868	-	-	-	f ♂♂	-	-	-
•*Brachydiplax farinosa* Krüger, 1902	-	-	-	1♂	1♂	m ♂♂	-
Crocothemis servilia (Drury, 1770)	-	-	1♂	f ♂♂	-	-	-
Diplacodes nebulosa (Fabricius, 1793)	-	-	-	-	-	-	f ♂♂
Diplacodes trivialis (Rambur, 1842)	-	f	f	-	-	-	f
•*Hydrobasileus croceus* (Brauer, 1867)	-	-	-	m	-	f ♂♂	-
•*Macrodiplax cora* (Brauer, 1867)	-	1♂	-	-	-	-	-
Lathrecista asiatica (Fabricius, 1798)	-	-	-	-	m ♂♂	1♂	-
Neurothemis fluctuans (Fabricius, 1793)	f	-	m	m	m ♂♂, ♀♀	1♂	m
Neurothemis fulvia (Drury, 1773)	-	-	1♂	f	f ♂♂	-	f
Neurothemis intermedia glaucina Ris, 1919	-	-	-	-	1♂	-	-
Orthetrum chrysis (Selys, 1891)	-	-	f ♂♂	1♂	1♂	-	-
Orthetrum glaucum (Brauer, 1865)	-	-	-	-	-	-	-
Orthetrum sabina (Drury, 1770)	1♂	-	f	-	-	4	f
•*Pseudothemis jorina* Forster, 1904	-	-	f ♂♂	m ♂♂	-	-	-
Rhodothemis rufa (Rambur, 1842)	-	-	-	1♂, 1♀	1 ♂♂, 1♀	-	-
Rhyothemis phyllis (Sulzer, 1776)	-	-	-	m	-	m	-
•*Rhyothemis plutonia* Selys, 1883	-	-	-	1♂	-	-	-
Rhyothemis triangularis Kirby, 1889	-	-	-	f ♂♂, 2 ♀♀	-	f	-
•*Rhyothemis variegata* (Linnaeus, 1763)	-	-	-	-	-	1♀	-
Tholymis tillarga (Fabricius, 1798)	-	-	3 ♀♀	1♀	m ♂♂, ♀♀	-	-
Trithemis aurora (Burmeister, 1839)	-	-	f ♂♂	-	-	f ♂♂	f ♂♂
•*Trithemis pallidinervis* (Kirby, 1889)	-	-	-	-	-	-	m
Urothemis signata (Rambur, 1842)	-	-	-	m ♂♂	-	-	-
Zygonyx iris malayana (Laidlaw, 1902)	f ♂♂, 1 f	-	-	-	-	-	-

for this province to 46. Now 44 species (1 unidentified) were recorded in seven localities for two days, 15 of which, namely *Agriocnemis nana, Archibasis viola, Ischnura senegalensis, Pseudagrion microcephalum, P. williamsoni, Acisoma panorpoides, Brachythemis contaminata, Brachydiplax farinosa, Hydrobasileus croceus, Macrodiplax cora, Rhyothemis plutonia, R. variegata* (although I still believe it is the same species as *R. phyllis*, see Kosterin 2010), *Tholymis tillarga* and *Trithemis pallidinervis*, are new records for the Province. Hence 61 species of Odonata are now recorded for it. Most of species recorded were common but *A. viola* which was for the first time reported for Thailand (for the peninsular Phang Nga Province) only three years ago (Day et al. 2012). At the same time, it is common in the neighbouring Koh Kong Province of Cambodia (Kosterin 2011; 2012a).

All in all, the dry season aspect of Odonata of this coastal stripe expectedly appeared the same as in Koh Kong Province of Cambodia. However Odonata were more abundant and diverse than they usually are elsewhere in the coastal East Thailand in dry season. This is most probably because of the dislocation at the foot of the coastal ridge which captures enough moisture from the sea even in the dry season: there were short afternoon rains from the clouds gathering at the crest of the ridge all three days we were there.

Cambodia

Ream Peninsula
The area

Ream Peninsula (14x8 km) is situated 15-25 km SE of Sihanoukville, Cambodia. It has a submeridional hilly ridge (up to 277 m a.s.l.) with a steep WNW slope and gentle ESE slope, going for 8 km from the western bank to Ream settlement; otherwise the peninsula is flat. The peninsula SW tip harbours a navy base and oil terminal, the southern bank is alternation of gentle capes and bays with long and beautiful beaches with white sand. The westernmost one, with a resort being constructed by a Korean owner, is conventionally called 'Coconut Beach'; it is situated at a flat bank occupied by poor soil 'savannah' (loc. veal). The middle beach seems to be nameless, and the longer (5.5 km) eastern one is called 'Chinese Beach' because of a working resort with a Chinese owner; these beaches are bordered by thick lowland evergreen forest. At the south-east, the peninsula is bordered by a large river estuary. The steeper part of the western bank under hills is occupied by resorts and houses along the road. At the foot of the hill there is also a 'recreation centre' with a large pagoda surrounded by park. The southern bank is almost desolate, with few resorts. Most of the peninsula is occupied by Ream National Park. It is covered with dense and tall evergreen forest and crossed by a broad main road and some smaller secondary road. Quite a lot of construction of casinos etc. is hidden in the forest, with quite a number of trucks moving along the road. A large coastal hill at the eastern end of the populated area has been completely deforested for a

reason unknown. When I visited the recreation centre on 20.04.2010, there was a nice forest brook along the road ascending from the pagoda to the National Park headquarters (Kosterin 2010). Now a more robust road (said to go to a small navy office on a hill) has been constructed over the brook, with a large area along it cleared and planted with young bananas, so the nice shelter that provided many Odonata in 2010 has disappeared.

The main road across the National Park crosses quite a number of good forest rivulets: two westernmost descending from a hill foot, partly with rocky sandstone beds, others flowing through dense forest on flatland, some providing open pools at the road embankment. A characteristic feature of most of these rivulets was some tall semiaquatic Zingiberaceae (ginger) with broad leaves rising from water (Fig. 4b, 8b), which I did not see elsewhere. These rivulets offered diverse Odonata assemblages and the area in general well represents an evergreen forest at the flatland nearly at the sea level, scarcely found elsewhere.

Localities examined

R1. Ream Recreation Centre at a pagoda: a very large muddy pond dug out in clayey ground, with barren banks, with few hydrophytes at shallow bays; another large pond almost waterless, with a shallow pool. 10°30'53"-31'00" N 103°36'57-37'07", 27-54 m a.s.l., 25.03.2015 (also examined on 20.04.2010, see Kosterin 2010).

R2. A rivulet at hilly land crossing the road between Ream settlement and the Ream National Park border, with brown water: upstream the road slow, ankle to knee

Figure 4. Two rivulets at Ream Peninsula crossed by the road before entering the Ream National Park: a – locality R2, the shown reach is a habitat of *Vestalis gracilis, Diplacodes trivialis Neurothemis fluctuans, N. tullia, Orthetrum chrysis, O. neglectum, O. sabina, 26.03.2015; b – locality R3, the habitat of Agriocnemis pygmaea, N. fluctuans, Orthetrum chrysis, O. sabina, Potamarcha congener*, 27.03.2015.

deep, enclosed by dense fork fern thickets at banks; downstream the road at first as a weak brook flowing openly over broad sandstone plates (Fig. 4a), then again slow and with fork fern thickets and some deeper reaches. 10°33'26-30" N 103°39'26-33", 20-25 m a.s.l., 26.03.2015.

R3. A smaller rivulet at flatland just before the National Park border flowing over a large cleared area, dried out to just two muddy pools at the road embankment trampled by cattle, with the valley overgrown with dense tall thickets of the semi-aquatic ginger with participation of *Ligodium*. (Fig. 4b). 10°31'44-49" N 103°40'15-18", 11-12 m a.s.l., 27.03.2015.

R4. A rivulet crossing the road within National Park; downstream the road flowing in a 'tunnel' of fork fern thickets (Fig. 5a), then overflowing to a forest swamp with shallow pools and sparse semiaquatic ginger. (The sea is 1 km S) 10°31'09-11" N 103°40'58-59", 17-20 m a.s.l., 27.03.2015.

R5. A rivulet crossing the road within the National Park, with large polls at both sides of embankment (Fig. 5b); downstream impermeable because of fallen trees; upstream at first as a chain of small pools surrounded by fine Poaceae grass, then as a long, almost stagnant shady reach with black bottom, tall semiaquatic ginger at banks and some hydrophite with broad and very long linear leaves. 10°31'26-30" N 103°41'38-42", 18-20 m a.s.l., 26.03.2015.

R6. A rivulet crossing the road within National Park, very close to the previous one; upstream the road dammed to a long chest-deep shady pool; downstream the road it flows moderately fast, with some knee to chest deep pools, in an earthen ravine, shaded, with some sunny places (Fig. 6). (This rivulet was examined in 2013, see Kosterin 2014). 10°31'24-30" N 103°41'43-46", 17-20 m a.s.l., 27.03.2015.

R7. A rivulet crossing the road within National Park and forming downstream the road a very large stagnant sunny pool with warm water and banks overgrown with *Eleocharis* and other sedges and bushes (Fig. 7). 10°31'27-30" N 103°41'54", 19-21 m a.s.l., 27.03.2015.

R8. A rivulet crossing the road and dammed by it to overflow at both sides (Fig. 8a); downstream forming a waist-deep pond used to fill water-carrying heavy vehicles, upstream forming a long almost still reach of variable depth crossed by many fallen trees, with the semiaquatic ginger (Fig. 8b); water red with an oil spot on the surface. 10°31'02-04" N 103°42'54-57", 20-22 m, 27.03.2015.

R9. A rivulet forming an estuary at 'the Chinese beach', perhaps the same as R8 but downstream, with the water and bottom red because of some construction upstream; bottom partly boggy, with some chest-deep pools with black bottom and no visible current (Fig. 9). 10°30'04-20" N 103°43'11-16", 5-15 m a.s.l., 26.03.2015.

R10. A brackish lagune at 'Chinese beach', not examined on this trip but on 27.05.2013 (Kosterin 2014) and added here to complete the Ream checklist of Table 2. 10°30'04-20" N 103°43'11-16", 5-15 m a.s.l..

Figure 5. Two rivulets crossed by the main road in the Ream National Park, 27.03.2015: a – locality R4, a habitat of *Libellago hyalina, Archibasis viola, Copera vittata, Prodasineura verticalis sp., Neurothemis fluctuans, Orthetrum chrysis, Potamarcha congener; b – locality R5, a roadside reach being the habitat of Vestalis gracilis, L. hyalina, Aciagrion borneense, Ceriagrion olivaceum, Pseudagrion williamsoni, P. verticalis sensu Asahina, N. fluctuans, Orthetrum chrysis, O. neglectum, O. sabina, Trithemis festiva*.

Results

The results are presented in Table 2. To make it a checklist for Odonata of Ream Peninsula, I added to the table also data of 20.04.2010 (Kosterin 2010) and 27.05.2013 (Kosterin 2014).

In Table 2, I list *Orthetrum neglectum* (Rambur, 1842) as bona species rather than the subspecies of *O. pruinosum* (Burmeister, 1839) because of molecular analysis by Yong et al. (2015) revealing two species in what was hitherto considered a polytypic *O. neglectum* (although attribution of some subspecies is still to be settled).

I failed to capture two species. One was obviously a male of *Tetrathemis* sp. at R7, which I saw quite clearly. Most probably it was *T. platyptera* recorded in Cambodia in Pursat (Kosterin et al., 2012) and Mondulkiri (Kosterin in prep.) Provinces. However, in 2014 I collected in Koh Kong Province another species of *Tetrathemis* (Kosterin in

prep.) so it was most regrettable that I now missed a specimen from Preah Sihanouk Province.

A male of *Gomphidia* sp. at R6 superficially looked like *G. abbotti* I saw elsewhere. It kept to a sunlit broadening of the rivulet ravine where perched on the same small dead branch at about 2.5 m above the ground. Twice I managed to approach a net to it almost to a stroke but missed. After disturbance, the dragonfly disappeared but revisiting this place in 15-20 min I found it on the same, rarely another nearby perch. I experienced this at ca 11:30 a.m. - 1:45 p.m. and did not find this dragonfly when returned to the same place at ca 3:20 p.m. Curiously, on the same branch I

Figure 6 (left). A rivulet, locality R6, crossed by the main road in the Ream National Park, a habitat of *Vestalis gracilis, Libellago hyalina, Archibasis viola, Ceriagrion cerinorubellum, Pseudagrion rubriceps, Prodasineura verticalis* sp., *Gomphidia* sp., *Brachygonia oculata, Cratilla lineata, Nannophia pygmaea, Neurothemis fluctuans, Orthetrum chrysis*. 27.03.2015.

Figure 7 (right). A big, warm, shallow pool formed by a rivulet, locality R7, where it is crossed by the main road in the Ream National Park, a habitat of *Agriocnemis minima, Libellago hyalina, Archibasis viola, Ceriagrion olivaceum, Pseudagrion australasiae, P. microcephalum, Pseudocopera ciliata, Brachythemis contaminata, Hydrobasileus croceus, Nannophia pygmaea* (numerous), *Neurothemis fluctuans, N. tullia, Orthetrum chrysis, O. sabina, Potamarcha congener, Tetrathemis* sp., *Trithemis aurora, Urothemis signata*. 27.03.2015.

Figure 8. A contaminated rivulet, locality R8, in the Ream National Park, with roadside pools (a) and tall semiaquatic ginger in shaded reaches (b), a habitat of *P. microcephalum, Brachydiplax chalybea, Neurothemis fluctuans, Orthetrum chrysis, O. sabina, Urothemis signata*. 27.03.2015.

Figure 9. A rivulet in the Ream National Park with orange sediments, close to its mouth at 'Chinese Beach', locality R9, a habitat of *Brachydiplax chalybea, Diplacodes trivialis, Orchithemis pulcherrima, Orthetrum chrysis, O. sabina, Urothemis signata*. 26.03.2015.

found instead a female of *Cratilla lineata calverti* which was very motile: often changed its position, got into the air and returned. I wonder if it annoyed the *Gomphidia* by this making it to move.

Species	Localities										
	R1 19.04.2010	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
Vestalis gracilis	f	-	m	-	-	f	f	-	-	-	-
Hellocypha bilorata (Selys, 1859)	-	-	f ♀♀	-	-	-	-	-	-	-	-
Libellago hyalina (Selys, 1859)	-	-	f ♂♂, 1 ♀	-	f ♂♂	♂, ♂♂, ♀♀	♂ ♂♂ (Fig. 10)	-	-	-	-
Aciagrion borneense Ris, 1911	-	-	-	-	-	1 ♂	-	-	-	-	-
Agriocnemis minima Selys, 1877	-	-	-	-	-	-	-	1 ♂	-	-	-
Agriocnemis pygmaea	-	f	-	1 ♀	-	-	-	-	-	-	-
Archibasis viola	-	-	1 ♂	-	f ♂♂	f ♂♂	1 ♂	1 ♀	-	-	-
Ceriagrion cerinorubellum (Brauer, 1865)	-	-	1 ♂	-	-	-	-	-	-	-	-
Ceriagrion olivaceum Laidlaw, 1951	-	-	-	-	-	1 ♂	1 ♀	1 ♂	-	-	-
Ischnura senegalensis	-	-	-	-	-	-	-	-	-	-	1 ♂
Pseudagrion australasiae	-	-	f ♂♂	-	-	-	-	f ♂♂	-	-	-
Pseudagrion microcephalum	-	1 ♂	f ♂♂	-	-	-	-	♂, ♂♂	f ♂♂	-	f ♂♂, 1 ♀
Pseudagrion rubriceps	-	-	f ♂♂, 1	-	-	-	1 ♂	-	-	-	-
Pseudagrion williamsoni Fraser, 1922	-	-	-	-	-	1 ♂	-	-	-	-	-
Copera vittata	1 ♂	-	-	-	f ♂♂	f ♂♂	-	-	-	-	-
Coeliccia katsukoae	f ♂♂	-	-	-	-	-	-	-	-	-	-
Onychargia atracyana (Selys, 1865)	f ♀♀	-	-	-	-	-	-	-	-	-	-
Pseudocopera ciliata (Selys, 1863)	-	-	-	-	-	-	-	1 ♂	-	-	-
Prodasineura verticalis sensu Asahina, 1984 nec Selys 1860	-	-	f ♂♂, ♀♀	-	1 ♂	f ♂♂, ♀♀	2 ♂♂, 1 ♀	-	-	-	-
Gomphidia sp.	-	-	-	-	-	-	1 ♂	-	-	-	-
Ictinogomphus decoratus malaccensis	1	-	-	-	-	-	-	-	-	-	-
Brachygonia oculata (Brauer, 1878)	-	-	-	-	-	1 ♂	1 ♂	-	-	-	-

Species	Localities										
	R1 19.04. 2010	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
Brachythemis contaminata (Fabricius, 1793)	-	1 ♀	-	-	-	-	-	1 ♂	-	-	-
Brachydiplax chalybea Brauer, 1868	-	-	-	-	-	-	-	-	1 ♂	1 ♂ (Fig. 11a)	-
Crocothemis erythraea calverti Förster, 1903	-	-	-	-	-	-	1 ♀	-	-	-	-
Crocothemis servilia	-	-	-	-	-	-	-	1 ♂	-	-	-
Diplacodes trivialis	-	-	1 ♂	-	-	-	-	-	-	f	-
Hydrobasileus croceus	-	-	-	-	-	-	-	f ♂♂	-	-	-
Macrodiplax cora	-	-	-	-	-	-	-	-	-	-	1 ♀
Nannophya pygmaea Rambur, 1842	-	-	-	-	-	-	1 ♂	a ♂♂, ♀♀	-	-	-
Neurothemis fluctuans	f ♂♂, ♀♀	-	a ♂♂, f ♀♀	f ♂♂, ♀♀	a ♂♂, ♀♀	a ♂♂, f ♀♀	m ♂♂, f ♀♀	1 ♂	f ♂♂, ♀♀	-	-
Neurothemis tullia (Dryry, 1773)	-	1 ♀	1 ♂, 1 ♀	-	-	-	-	1 ♂	-	-	-
Orchithemis pulcherrima Brauer, 1878	-	-	-	-	-	1 ♂	-	-	-	1 ♂	-
Orthetrum chrysis	f ♂	-	m ♂♂	f ♂♂, 1 ♀	f ♂♂	m ♂♂	f ♂♂	f ♂♂	f ♂♂	a ♂♂, 1 ♀ (Fig. 11b)	-
Orthetrum neglectum (Rambur, 1842)	-	-	f ♂♂ (Fig. 11c)	-	-	1 ♂	-	-	-	-	-
Orthetrum sabina	1	-	f	f	-	1 ♂	-	f ♂♂	f	1	-
Pantala flavescens (Fabricius, 1798)	1	-	-	-	-	-	-	-	-	-	-
Potamarcha congener (Rambur, 1842)	-	-	-	1 ♂	1 ♂	-	-	1 ♂	-	-	-
Rhodothemis rufa	1 ♀	-	-	-	-	-	-	-	-	-	-
Rhyothemis obsolescens Kirby, 1889	f	-	1 ♂, 1 ♀	-	-	-	-	-	-	-	-
Tetrathemis sp.	-	-	-	-	-	-	-	1	-	-	-
Trithemis aurora	-	-	-	-	-	-	-	f ♂♂	-	-	-
Trithemis festiva (Rambur, 1842)	-	-	-	-	-	1 ♂	-	-	-	-	-
Trithemis pallidinervis	f ♂♂	-	-	-	-	-	-	-	-	-	-
Urothemis signata	-	-	-	-	-	-	-	m ♂♂	1 ♂♂	-	-

Table 2a/b. Odonata species found in localities R1-R9 (see the text) at Ream Peninsula, Preah Sihanouk Province of Cambodia on 25-27.03.2015, with addition of data of 20.04.2010 and 27.05.2013 / Checklist of Odonata so far recorded for Ream Peninsula.

In view of a new species of *Onychargia* resently described in Cambodia with no diagnostic characters in females (Kosterin 2015), I retain some doubt about what species of *Onychargia* was collected at Ream Recreation Centre on 20.04.2010. Earlier I reported that I collected a male and female since I thought I captured a tandem (Kosterin 2010), but it later appeared that in fact there were two females in the net.

Discussion

Earlier I examined Odonata of Ream Peninsula on 20.04.2010 and 27.05.2013, that is at the hottest end of the dry season and in the beginning of the rainy season, respectively. The first of those days, entirely spent at the hilly 'recreation centre' provided 12 species (Kosterin 2010), while half of the second, spent in the lowland territory of the National Park resulted in just 5 species (Kosterin 2014). This contradicted the expectation of a poor, with respect to Odonata, dry season and rich rainy season. Now I spent two complete days in the National Park, also in dry season, and found Odonata to be even more numerous and diverse, so that I managed to find 38 species (and did not meet 7 species found before). Curiously, the rivulets in Ream National Parks seemed to have more water than in the rainy season in May 2013.

The now obtained data provide a good preliminary assessment of the Odonata fauna of the Ream Peninsula (that is of the Ream National Park) counting 45 species (but 2 unidentified). No species was found here which would not be recorded in the more north-western but also coastal Koh Kong Province. It was strange not to find such common species as *Neurobasis chinensis*, *Euphaea masoni. Neurothemis fulvia, Orthetrum glaucum, Rhyothemis* spp. but obsolescens, *Tholymis tillarga*, all of which will no doubt be found in the course of further studies. Most of the species of the list of Table 2 are new provincial records but it is too early to compile even a preliminarily checklist of Preah Sihanouk Province, which harbours a variety of habitats where some other species have been already registered (Kosterin 2010; 2014).

An interesting feature of the Odonata assemblage of the Ream Peninsula was presence of such species of the Malesian faunistic complex as *Archibasis viola, Brachygonia oculata* and *Orchithemis pulcherrima*, found mostly together at similar shaded, deep, almost still, black-bottomed reaches of different forest rivulets of the Ream National Park. Note that in the Kbal Chhay Waterfall area in the same Preah Sihanouk Province I earlier found even less expected Malesian species *Chalybaeothemis fluviatilis* (Kosterin 2014).

Other interesting features were abundance of *Nannophia pygmaea* at a pool of R7 and *Libellago hyalina* (Fig. 10) being very abundant at all lowland forest rivulets. In Cambodia, the latter species was found only in Koh Kong Province (also in lowland evergreen forest) where it was never abundant (Kosterin 2010; 2012a). No *Libellago lineata* was found in both mentioned areas, although it was found up-

Figure 10. A male of *Libellago hyalina* at locality R6, a rivulet in the Ream National Park. 26.03.2015.

Figure 11. Common libellulids at Ream Peninsula: a – *Brachydiplax chalybea*, a male, at locality R9; b – *Orthetrum chrysis*, a female, at locality R9; c, *Orthetrum neglectum*, a male, at locality R2. 26.03.2015.

stream Kbal Chhay Waterfall north of Ream (Kosterin 2014). So far I have never seen these two *Libellago* species together.

At a large sunlit roadside pool at R7, I for the first time in my experience observed males of *Pseudagrion australasiae* and *P. microcephalum* together. At that pool,

males of *P. microcephalum* were abundant and those of *P. australasiae* were few. The latter were noticeable larger so that I, could recognise them when seeing together. These species have otherwise very similar blue males with nearly identical black pattern and usually are not found together. Perhaps, they tend to exclude each othe because of problems with conspecific mating without a good visual cue to tell the males. This issue pend further studying.

It is noteworthy that at the rivulet of R9 differing from others by a red water and bottom due to fine laterite deposits, most probably because of some upstream construction, only Libellulidae and no Zygoptera was found, that seems to illustrate a negative impact of construction upon the odonate assemblage.

Koh Rong Island

The area

This is one of the remote islands 25 km W of Sihanoukvill, sized ca 15x15 km. Its nature is close to pristine, although more disturbed than at the twin island Koh Rong Sanloem. There are few roads on the island. Even the beach with a line of guesthouses and restaurants at the SE tiphas no road, so that goods are transported by trolleys over the sand. The opposite, SW bank is still almost not explored and is famous for the Long Beach (7 km long) (Fig. 12b) with a pure white sand and incredibly clean water, so that boats seem to hang in the air. However, there is already a bulldozer there. Most of the west bank, of rather an intricate shape, is rocky (Fig. 12a), with few other beaches. The island interior is hilly (up to 318 m), in its southern part the hill range has a gentle western and rather steep eastern slope. The hills and rocky banks are covered with evergreen forest which is not tall, obviously a coastal version, crossed by several pathways, on SW and NW banks

Figure 12. The western bank of Koh Rong Island as seen from the sea (a) and Long Beach at its south-western bank (b). 29.03.2015.

locally sparse and somewhere replaced by plantations. There are several rivulets with sandstone rocky beds, mostly small and larger with waterfalls, but all had no water at that season but some seepage at the lowermost reaches.

Localities examined

KR1. A brook above the western beach which supplies water for the town: several springs with small pools of clear water, with water outlet by pipes and short ditches among sparse cashew and pineapple plantations. 10°40'00-04" N 103°16'08-14", 70-90 m a.s.l., 29.03.2015.

KR2. A rivulet at SW bank (just S of the police station): sandstone plates, huge rocks and boulders; mostly shaded by forest. There is some water in the lower areas (ca 200 m) which spring from a boggy seepage, upstream the sandstone bed was currently dry. Some observations were made at a forest pathway crossing the river just above the seepage. 10°39'38-39" N 103°16'14-20", 55-20 m a.s.l., 28-30.03.2015.

KR3. Several small freshwater pools among bushes behind the Long Beach eastern end, obviously fed by ground springs. 10°40'30" N 103°15'35", 5 m a.s.l., 29.03.2015.

Figure 13. A natural channel between the Long Beach and a woody ridge at the SW bank of Koh Rong Island, locality KR4, a habitat of *Ischnura senegalensis, Pseudagrion microcephalum, Diplacodes nebulosa, Neurothemis fluctuans*. 29.03.2015.

KR4. A long and narrow freshwater natural channel some 150 m long between Long Beach and a low woody ridge parallel to it, close to the village at the Long Beach western end, about knee-deep, warm, with a muddy bottom full of gastropods, the surface is covered with very abundant *Nymphoides* with flower buds (Fig. 13). 10°42'12-14" N 103°14'45-48", 9 m a.s.l., 29.03.2015.

Figure 14. The brackish lagoon at the mouth (top) and a dry waterfall of a river (bottom) at the NE end of the Long Beach at Koh Rong Island, locality KR5, the habitats of *Ceriagrion cerinorubellum, Copera vittata, Prodasineura verticalis* sensu Asahina, *Neurothemis fluctuans, Orthetrum chrysis*. 29.03.2015.

KR5. The river at the village at the Long Beach western end: a large and rather deep brackish lagoon (Fig. 14), broad rocky bed formed with huge sandstone rocks, temporarily dry with some pools and springs, moist cliffs of a seasonal waterfall. 10°42'27-37" N 103°13'41-45", 5-40 m a.s.l., 29.03.2015.

Species	Localities					
	KR1	KR2	KR3	KR4	KR5	J.H.
Vestalis gracilis	f	m				
Agriocnemis pygmaea	1♂		f ♂♂			
Ceriagrion cerinorubellum			m ♂♂, ♀♀		1♂	
Ischnura senegalensis			m ♂♂, ♀♀	v ♂♂, ♀♀		
Pseudagrion microcephalum			f ♂♂, 1♀	f ♂♂		
Copera vittata	f ♂♂	m ♂♂			f ♂♂	
Coeliccia kazukoae		**2 ♂♂ (Fig. 15)**, 1♀				
Prodasineura verticalis sensu Asahina, 1984 nec Selys 1860		m ♂♂, ♀♀			m ♂♂, ♀♀	
Diplacodes nebulosa				f ♂♂		
Diplacodes trivialis	f	f				
Lathrecista asiatica			1♂			
Neurothemis fluctuans			m ♂♂, ♀♀	m ♂♂, ♀♀	m ♂♂, ♀♀	
Orthetrum chrysis	f ♂♂	f ♂♂	f ♂♂		m ♂♂	
Orthetrum glaucum	**1 ♂ (Fig. 16b)**					
Potamarcha congener	1♂					
Rhyothemis obsolescens						J.♂
Tholymis tillarga		**1 ♂ (Fig. 16a)**, 1♀				

Table 3. Odonata species found in localities KR1-KR5 (see the text) at Koh Rong Island, Preah Sihanouk Province of Cambodia on 28-30.03.2015, with addition of the datum by J. Holden (J.H.) of August 2008 / Preliminary check-list of Odonata so far recorded in Koh Rong Island.

Figure 15. A male of *Coeliccia kazukoae*, at the premature colourational stage, at a shady and rocky rivulet temporarily with scanty water, locality KR2, at Koh Rong Island. 28.03.2015.

Figure 16. Males of common libellulids at Koh Rong Island: a – *Tholymis tillarga* at locality KR2; b – *Orthetrum glaucum* at locality KR1.

Results

The results are presented in Table 3, which may serve as a preliminary checklist of Odonata of Koh Rong Island. For this purpose I included into it the only published datum of Odonata of Koh Rong Island: a male of *Rhyothemis obsolescens* photographed by Jeremy Holden in August 2010 (Kosterin & Holden 2011).

Discussion

Sixteen species were found for three days of field survey presented here and one was previously photographed by J. Holden (Kosterin & Holden 2011). An expectedly poor fauna of a relatively small island in the dry season. The aspect of Odonata resembles e.g. that of the surroundings of Koh Kong, also expectedly.

Absence of *Vestalis gracilis* at the dry sandstone bed of KR5 was strange, since the habitat was very suitable and they were present in an analogous (although smaller) one at KR2.

O'Som environs

The area

O'Som (Veal Veng District, Pursat Province) used to be a desolate forest village in the depth of the Cardamoms. Until the end of 1990s it was the last stronghold of Khmer Rouge, since that for long it was hardly accessible by a muddy road crossing the Cardamom Mts. Everything has changed recently. We arrived to O'Som by car on a good, partly concrete road and passed by not less than four hydropower stations constructed by Chinese firms, with accompanying small towns, tall dams (Fig. 17b) and revolting water reservoirs with partly cleared, partly dead forest at lifeless banks (Fig. 17a). Later in Google Earth I found out that we did not see perhaps the largest one N of O'Som, some 6x7 km, on a larger river. We saw good evergreen forest only within some 46 km from Koh Kong, that is before the border of Koh Kong and Pursat Provinces. Close to O'Som there were only three kinds of landscape: thick forest-like plantations of some unrecognised tree, old banana/ginger plantations under tall forest canopy and, mostly, young banana plantations among burned stumps and trunks of what recently was a vibrant forest (Fig. 18). The air was misty, obviously because of the slash-and-burn agriculture still going on.

Localities examined

OS1. A medium-sized river just before the O'Som village centre (Fig. 19), in some 300 m of its estuary to a new water reserve, examined near the iron bridge. It flows in a shallow valley among flatland covered by banana plantations (no forest), the banks with bamboo thickets and bushes with the *Ligodium* fern, the bed broad, formed by flat sandstone plates; water shallow but with a large lake-like waist-deep

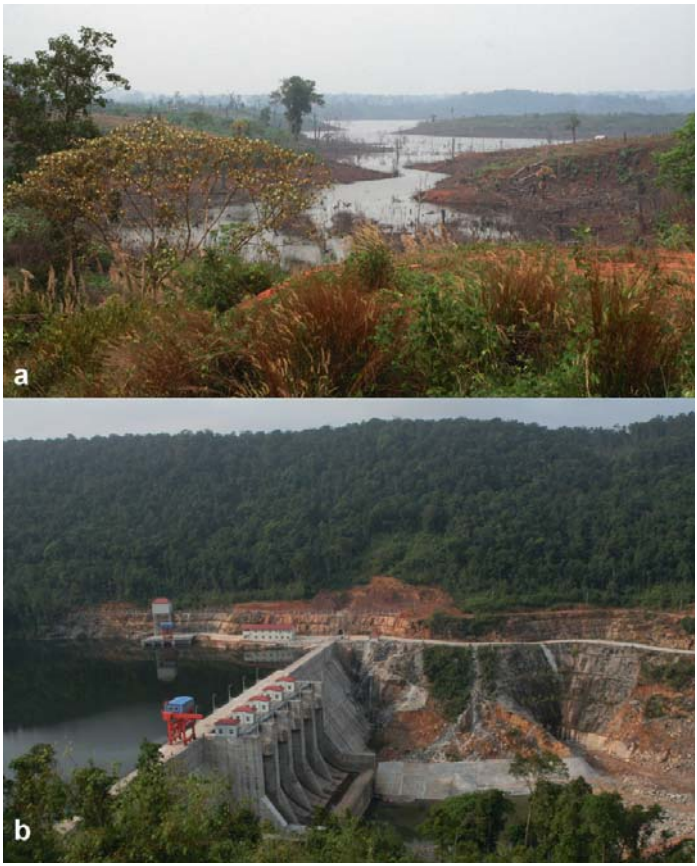

Figure 17. Newly made water reserves at O'Som village (a) and along the road from Koh Kong to there (b). 24.03.2015.

extension and some smaller deeper pools upstream the bridge; some ground springs at banks. 12°04'40-45" N 103°12'21-35", 524-531 m a.s.l., 24.03.2015: 9:00-12:50.

OS2. An about 1 m wide brook at the border of the cleared area around O'Som and the forest; flows among plantations with some trees left, the bed is hidden

Figure 18. Landscapes in the vicinity of O'Som village: young banana plantations among stumps of burnt forest. 24.03.2015.

Figure 19. The river in front of the village of O'Som, locality OS1, a rich habitat of *Neurobasis chinensis, Vestalis gracilis, Dysphaea gloriosa, Heliocypha biforata, Aciagrion borneense, Agriocnemis pygmaea, Pseudagrion australasiae, P. pruinosum, P. rubriceps, P. williamsoni, Copera marginipes, Pseudocopera ciliata, Prodasineura autumnalis, Ictinogomphus decoratus, Merogomphus parvus, Brachythemis contaminata, Crocothemis servilia, Diplacodes trivialis, Hydrobasileus croceus, Neurothemis tullia, Onychothemis testacea, Orthetrum chrysis, O. neglectum, O. sabina, Rhyothemis phyllis, R. plutonia, Tholymis tillarga, Trithemis aurora, T. festiva, T. pallidinervis, Urothemis signata*. 24.03.2015.

under the leaves of *Allocasia*, shady and fast downstream the road, upstream of the road dammed to a large pond with remnants of burnt out forest at banks (Fig. 20), ~12º01'15" N 103º11'39" (GPS data, recent Google Earth photo and hence intervals not available), ~508 m a.s.l., 24.03.2015: 13:00-14:30.

Results

The results are presented in Table 4. Macromiidae Gen. sp. were very large black insects with some small lighter markings which were seldom seen swiftly flying by above the river, with a long time between sightings. One of them was a female ovipositing to a slower shallow reach.

Figure 20. A brook S of O'Som at the border of the cleared area and forest. OS2, a habitat of *Vestalis gracilis, Libellago hyalina, Pseudagrion australasiae, P. pruinosum, P. rubriceps, P. williamsoni, Prodasineura autumnalis, P. verticalis sensu Asahina, Ictinogomphus decoratus, Orthetrum chrysis, O. luzonicum, Rhyothemis phyllis, R. plutonia, Trithemis aurora, T. festiva, Urothemis signata, Zygonyx iris*. 24.03.2015.

Discussion

This extremely interesting and promising area is dying and appeals for an urgent study of what is still left. Quite a number of species from the broad area around O'Som has been identified by photos by Jeremy Holden taken before logging and inundation (Kosterin et al. 2012) but they are only a minor part of the diversity this area can (or could) offer.

It should be noted that the examined river within the village, of a promising medium size, missing any forest or any natural habitats around the examined site and soon entering a lifeless new reservoir, still showed a very diverse Odonata assemblage. It did not offer new country records, however it offered perhaps the maximum diversity and abundance of odonates which can be found at the dry season (plus *M. parvus* already emerging in advance of the rainy season), much more than at Koh Kong or the almost virgin area of Thma Bang (see below). Its examination for just four hours offered as many as 32 species.

Observation of *Orthetrum luzonicum* at OS2 confirmed an impression that this species prefers open slow brooks overgrown with *Allocasia*.

Table 4. Odonata species found in localities OS1 and OS2 (see the text) in O'Som village environs, Veal Veang District, Pursat Province, Cambodia on 24.03.2015.

Species	Localities	
	OS1	OS2
Neurobasis chinensis (Linnaeus, 1758)	f ♂♂, ♀♀	-
Vestalis gracilis	f	f
Dysphaea gloriosa Fraser, 1938	**1 teneral** ♂	-
Heliocypha biforata	1 ♂	f ♂♂, ♀♀
Libellago hyalina	-	1 ♂
Aciagrion borneense	1 ♂	-
Agriocnemis pygmaea	m	-
Pseudagrion australasiae	f ♂♂	f ♂♂
Pseudagrion pruinosum (Burmeister, 1839)	f ♂♂	f ♂♂
Pseudagrion rubriceps	m ♂♂, f ♀♀	m ♂♂, f ♀♀
Pseudagrion williamsoni	f ♂♂	f ♂♂
Copera marginipes	m ♂♂, f ♀♀	-
Pseudocopera ciliata	f ♂♂, ♀♀	-
Prodasineura autumnalis	m ♂♂, ♀♀	m ♂♂, ♀♀
Prodasineura verticalis sensu Asahina, 1984 nec Selys 1860	-	m ♂♂, ♀♀
Ictinogomphus decoratus melaenops	f ♂♂	f ♂♂
Merogomphus parvus (Krüger, 1899)	**f teneral** ♂♂	-
Macromiidae Gen sp.	f ♂♂, 1 ♀	-
Brachythemis contaminata	1 ♂	-
Crocothemis servilia	f ♂♂	-
Diplacodes trivialis	m	-
Hydrobasileus croceus	f ♂♂	-
Neurothemis tullia	m ♂♂, ♀♀	-
Onychothemis testacea Laidlaw, 1902	f ♂♂, 1 ♀	-
Orthetrum chrysis	f ♂♂	f ♂♂
Orthetrum luzonicum	-	f ♂♂
Orthetrum neglectum	2 ♂♂	-
Orthetrum sabina	v ♂♂, ♀♀	-
Rhyothemis phyllis	1	1
Rhyothemis plutonia	1 ♂, 1 ♀	f ♂♂
Tholymis tillarga	1 ♀	-
Trithemis aurora	m ♂♂, 1 ♀	m ♂♂
Trithemis festiva	f ♂♂	1 ♂
Trithemis pallidinervis	1 ♂	-
Urothemis signata	f ♂♂	f ♂♂
Zygonyx iris malayana (Laidlaw, 1902)	-	1 ♂

Bokor Hill Station

The area

The natural conditions of Bokor Plateau and the environs of Bokor Hill Station was described by me earlier (Kosterin 2010; 2011; 2012a, b), so I may focus only to the sad changes. The Thansur Bokor Highland Resort/Casino is working and is the only, and an expensive, accommodation there. The Ranger Station no more works. Swamps are drained out and are committed to construction of villa estates. Unbelievably, the forest is cut at both sides of the Popokvil River, with only some several trees wide

Figure 21. Teneral males of rheophylous Odonata species at the river at O'Som village, locality OS1: a – *Dysphaea gloriosa*; b – *Merogomphus parvus*.

strips left at the very banks (Fig. 22), now accompanied with asphalted roads. Downstream the hotel, a large (1x0.3 km) lifeless water reserve is made, with ugly swan-shaped boats for rent and dead forest at sides. The sites are advertised 7 km apart which is called Veal Srae Moy Roy "one hundred paddy fields" and the one 17 km apart called 'Five Hundred Paddy Fields', with intricate and picturesque sandstone rocks, a lot of *Nepenthes bokorensis* etc.; there is an asphalted road there. We did not figure out to visit them but from the advertisement they look like Bokor Hill Station as it was still five years ago.

Localities examined

B1. The Popokvil River with a broad and flat, temporarily dry sandstone bed, some pools of nearly stagnant water from ankle to waist deep and a current reduced to a tiny brook (Fig. 22, left). Partly the same as 'Idionyx reach' in Kosterin (2012a, b). 10°39'16-20" N 104°01'45"-02'10", 929-933 m a.s.l., 31.03.2015.

B2. A large water reserve on the right Popokvil River tributary, with banks partly barren and partly with dead forest. 10°38'51" N 104°01'26", 952 m a.s.l., 31.03.2015.

B3. A small swamp in front of the hotel, fed by a ditch, with inundated fine fresh Poaceae grass, tall *Cyperus* thickets, some *Allocasia*; numerous *Sepedon* flies, parasitic on Gastropoda. Large water reserve on the right Popokvil River tributary, with banks partly barren and partly with dead forest. 10°38'15" N 104°01'10", 1012 m a.s.l., 31.03.2015.

B4. Popokvil Waterfall (see Kosterin 2011; 2012a, b), temporarily waterless (Fig. 22, right) (the tiny brook disappears several dozens of metres before the upper tile). 10°39'30-33" N 104°03'03-10", 915-917 m a.s.l., 1.04.2015.

Figure 22. The Popokvil River at Bokor Hill Station, almost devoid of water because of the dry season and of forest because of the development: left – flat section, locality B1, 31.03.2015; right – the (dry) waterfall, locality B4. 1.04.2015.

B5. Bush thickets at the top of the plateau crossed by roads, sometimes with road-side ditches with current water, at Black Palace, Catholic Church and Wat. ~10°37-38-' N 104°01-05', 965-1035 m a.s.l., 31.03-1.04.2015

Results and Discussion

The results are presented in Table 5.

As few as 19, mostly common, species were observed. It was strange not to meet *V. gracilis* which used to be abundant at Popokvil River (Kosterin 2011; 2012a). Data of my three previous visits to Bokor Hill Station are summarised in Kosterin (2012b). It was not very specific and interesting, as could be expected from so unusually looking a habitat, and many of those species were still found this time again. The only species now added to the Bokor fauna is *C. marginipes*.

I was pleased to see that the blue *Aciagrion*, once common on the *Sphagnum* swamps, is still present and quite abundant at the Popokvil River banks. I see no morphological and pattern difference between *A. migratum* (Selys, 1876) from Japan, Korea and

Table 5. Odonata species found in localities B1-B5 (see the text) at Bokor Hill Station, Kampot Province, Cambodia on 31.03-01.04.2015.

Species	Localities				
	B1	B2	B3	B4	B5
Agriocnemis pygmaea	f ♂♂	-	-	-	-
Aciagrion ?migratum (Selys, 1876)	m (mostly teneral)	-	-	-	-
Archibasis viola	1 ♂	-	-	-	-
Ceriagrion olivaceum	1 ♂	-	-	-	-
Ischnura senegalensis	-	-	v ♂♂, ♀♀	-	-
Pseudagrion rubriceps	f ♂♂, 1 ♀	-	-	-	-
Pseudagrion sp. (blue)	-	1 ♂	-	-	-
Copera marginipes	a ♂♂, ♀♀	-	-	-	-
Copera vittata	f ♂♂	-	-	-	-
Prodasineura autumnalis	m ♂♂, t, tenerals	-	-	-	-
Diplacodes trivialis	m	-	-	f	f
Neurothemis fulvia	f ♂♂, ♀♀	-	-	-	-
Neurothemis tullia	-	-	-	-	1 ♀
Orthetrum chrysis	f ♂♂	-	-	1 ♂	-
Orthetrum glaucum	-	-	-	-	1 ♂
Orthetrum sabina	-	-	-	-	1 ♂
Pantala flavescens	f	m	-	-	f
Trithemis aurora	f ♂♂	-	-	-	1 ♀
Trithemis pallidinervis	-	f ♂♂	-	-	-

China, and *A. approximans* (Selys, 1876) from Khasi Hills, as defined by the neotype designation by Kosterin et al. (2014). The only difference is the blue ground colour in males of the former and violet in the latter. Maybe these two species will later be proved synonyms. The Bokorense males are blue so I cannot help but identify them as *A. migratum* for the time being. It should be noted that this time on Bokor Plateau I collected an obviously teneral male which has a violet ground colour, that weakens the distinction. However, all mature males were blue. The specimens were collected into alcohol and will hopefully be helpful in untangling this taxonomical puzzle.

Koh Kong Province

The area

The area was described in detail by Kosterin (2010; 2011; 2012a; 2014). The differences concerned the lowest amount of water observed (Fig. 23): the usually mighty river above Tatai Waterfall could be crossed without wetting feet. Butterflies were very scarce. Permanently some smoke could be observed because of small forest fires near households. No noticeable changes at the Thma Bang area.

Localities examined

KK1. The larger of 'Calamorum ponds' in the SE suburbs of Koh Kong, described by Kosterin (2012a; 2014), 11°35'03-05" N 102°59'08-10", 4 m a.s.l. This time very shallow, strongly trampled by cows but still with some green *Eleocharis*. 23.03.2015

KK2. Tatai Waterfall area, described in (Kosterin 2010; 2011). This time the river was represented by three subtle brooks at the waterfall (Fig. 23) and broad knee-deep pools over broad sandstone plates above it; there are several pools of different size and darkness of bottom at the forest margin at the left side of the sandstone bed. 11°35'10-15" N 103°05'48-52", 19-27 m a.s.l., 20.03.2015.

KK3. A forest rivulet near Tatai village, in thick evergreen forest, with sandstone bed, this time dry with some pools of different sizes, with black bottom, and dry waterfall several dozens of metres high, above which some current is seen in a small pool. 11°33'57"-34'15" N 103°06'32-43", 45-90 m a.s.l., 19-20.03.2015.

KK4. Tatai village: muddy buffalo pools (Fig. 24), bank of a large brackish estuary upstream and downstream Phum Doung Bridge, with some cashew and coconut plantations and bush thickets. 11°33'40"-34'02" N 103°07'39"-08'11", 8-22 m a.s.l., 20-21.03.2015.

KK5. Thma Bang area, 'Microgomphus River' (see Kosterin 2010; 2011; 2012a; 2014). 11°38'39-57" N 103°23'40-51", 338-341 m a.s.l.. 20.03.2015.

Figure 23. The Tatai Waterfall, Koh Kong Province, locality KK2, very low of water at the dry season end. 20.03.2015.

KK6. Thma Bang Waterfall (see Kosterin 2014). 11°39'38-40'' N 103°24'00'', 351-353 m a.s.l.. 20.03.2015.

Results and discussion

The results are presented in Table 6. Quite a representative set of species expectable at the dry season but not more, no gomphids and aeshnids. The only finding of a species unexpected that season was *Idionyx thailandica*. In twilight (ca 5:20 p.m.) a female made rounds very closely above a tiny pool, the only one with noticeable current, at generally dry sandstone rivulet bed just above a waterfall; when it was caught, another one immediately appeared (I missed, since that no more individuals were seen).

'Microgomphus River'' at Thma Bang as usual (Kosterin 2010; 2011; 2012a; 2014) offered very abundant and quite diverse Odonata but this time neither gomphids nor macromiids. *Agriocnemis pygmea*, although a common species, was an addition to that place.

Figure 24. A buffalo pond at the temple at Phum Doung village, Tatai commune, Koh Kong Province (part of locality KK4), a habitat of *Diplacodes trivialis, Orthetrum sabina, Pantala flavescens, Potamarcha congener*. 21.03.2015.

Table 6. Odonata species found in localities KK1-KK6 (see the text) in Koh Kong Province of Cambodia on 19-23.03.2015.

Species	Localities					
	KK1	KK2	KK3	KK4	KK5	KK6
Neurobasis chinensis					m ♂♂, ♀♀	f ♂♂, ♀♀
Vestalis gracilis		f	f ♂♂			f
Dysphaea gloriosa		1 t			m ♂♂	1 ♂
Euphaea masoni			1 ♂		f ♂♂	
Heliocypha biforata					1 ♂	
Heliocypha perforata limbata (Selys, 1879)		1 ♂			m ♂♂, ♀♀	f ♂♂
Rhinagrion viridatum Fraser, 1938					1 ♀	
Agriocnemis pygmaea	m				1 ♂	
Ischnura senegalensis	m					
Pseudagrion australasiae					f ♂♂	
Pseudagrion pruinosum					f ♂♂	
Pseudagrion rubriceps		f ♂♂, 1 ♀			a ♂♂, m t	
Pseudagrion williamsoni					a ♂♂, m t	
Copera vittata			1 ♂, 1 juv.			
Prodasineura autumnalis		1 ♀			a, incl. tenerals	
Prodasineura verticalis sensu Asahina, 1984 nec Selys 1860		1 ♂	f ♂♂			
Idionyx thailandica Hämäläinen, 1985			f ♀♀			
Diplacodes trivialis	f		1 ♂	f		
Lathrecista asiatica		1 ♂, 1 ♀				
Neurothemis fluctuans	m	m	1 ♂	m ♂♂, 1 ♀		
Neurothemis fulvia		f ♂♂		f ♂♂		
Neurothemis intermedia atalanta				1 ♂		
Neurothemis tullia				1 ♂		
Onychothemis testacea					1 ♂	
Orthetrum chrysis		f ♂♂	1 ♂	1 ♂	1 ♂, 1 ♀ ovip.	
Orthetrum sabina	f	1 ♂		f		
Pantala flavescens		f		f		
Potamarcha congener	f ♂♂			f		
Rhyothemis phyllis	f					
Trithemis aurora		f ♂♂			a ♂♂	
Trithemis festiva					m ♂♂	
Zygonyx iris malayana		1 ♂			f ♂♂, 1 ♀ ovip.	

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