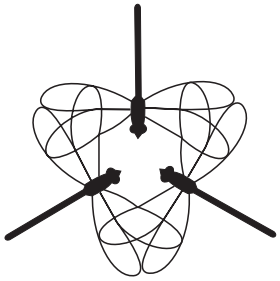

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TWO NEW ENDEMIC REPRESENTATIVES OF THE GENUS *ARCHIBASIS* FROM SRI LANKA (ZYGOPTERA: COENAGRIONIDAE)

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A. lieftincki sp. n. (holotype ♂: Gin Ganga river at Deniyaya; Matara distr.; Southern prov.; N 6.34^0, E 80.56^0; 02-V-2003; to be deposited at Sri Lanka National Museum, Colombo) and *A. oscillans hanwellanensis* subsp. n. (holotype ♂: Hanwella; Colombo distr.; Western prov.; N 6.90^0, E 80.09^0; 06-II-2011; to be deposited at Sri Lanka National Museum, Colombo) are described as new to science. Distribution, habitat requirements and threat status of these 2 endemic spp. are briefly commented.

INTRODUCTION

The genus *Archibasis* Kirby, 1890 is distributed from India in the West throughout southeastern Asia to Papua New Guinea, Solomon Islands and northern Australia in the East. In a thorough revision of the genus LIEFTINCK (1949) listed seven species: *Archibasis crucigera* Lieftinck, 1949 (New Guinea, Halmahera), *A. incisura* Lieftinck, 1949 (Malaysia, W Borneo), *A. melanocyana* (Selys, 1877) (Malay Peninsula, Myanmar, Singapore, Sumatra, Billiton, Borneo,), *A. mimetes* Tillyard, 1913 (New Guinea, northern Australia, Solomon Islands, Misool), *A. oscillans* (Selys, 1877) (western peninsular India, Assam, Myanmar, Thailand, Laos, Sumatra, Java), *A. tenella* Lieftinck, 1949 (Billiton, Borneo) and *A. viola* Lieftinck, 1948 (Malaysia, Vietnam, Cambodia, Thailand, Singapore, Sumatra, Bangka, Billiton, Engano, Java, Karimoen Djawa, Borneo, Palawan, Celebes). Some decades later *A. rebeccae* Kemp, 1989 (Malaysia, Singapore) was described by KEMP (1989), bringing the generic total to eight species.

Until recently, only *A. oscillans* has been known from the Indian subcontinent (SUBRAMANIAN, 2009), considering *A. sushmae* Singh, 1955 was synonymised by HÄMÄLÄINEN (1989) with *Indolestes cyaneus* (Selys, 1862). As far as Sri

Lanka is concerned, more than a century ago, a species from the genus *Archibasis* was described by KIRBY (1891) as *A. ceylonica*. However, it was later synonymised with *Pseudagrion rubriceps* by LAIDLAW (1924), while FRASER (1933) listed it as *Pseudagrion ceylanica*. LIEFTINCK (1940) established its current status as an endemic Sri Lankan subspecies *Pseudagrion rubriceps ceylonicum* (Kirby). Until recently, the genus *Archibasis* has not been formally reported from Sri Lanka.

In 2001 and 2003 a few male specimens of an unknown *Archibasis* species were surprisingly photographed and collected in the southwestern part of Sri Lanka. In the overview of the research state and threat status of the dragonfly fauna of the island, BEDJANIČ (2004, 2006) listed the taxon as *Archibasis* sp. n. and added a brief description of the habitat and information that it is rare and awaiting description. In 2011, another new representative of the genus was unexpectedly discovered in the western lowland part of the island (LANKIKA et al., 2012). Both new endemic representatives of the genus *Archibasis* from Sri Lanka are jointly described in the present paper.

ARCHIBASIS LIEFTINCKI SP. NOV.

Figures 1-7

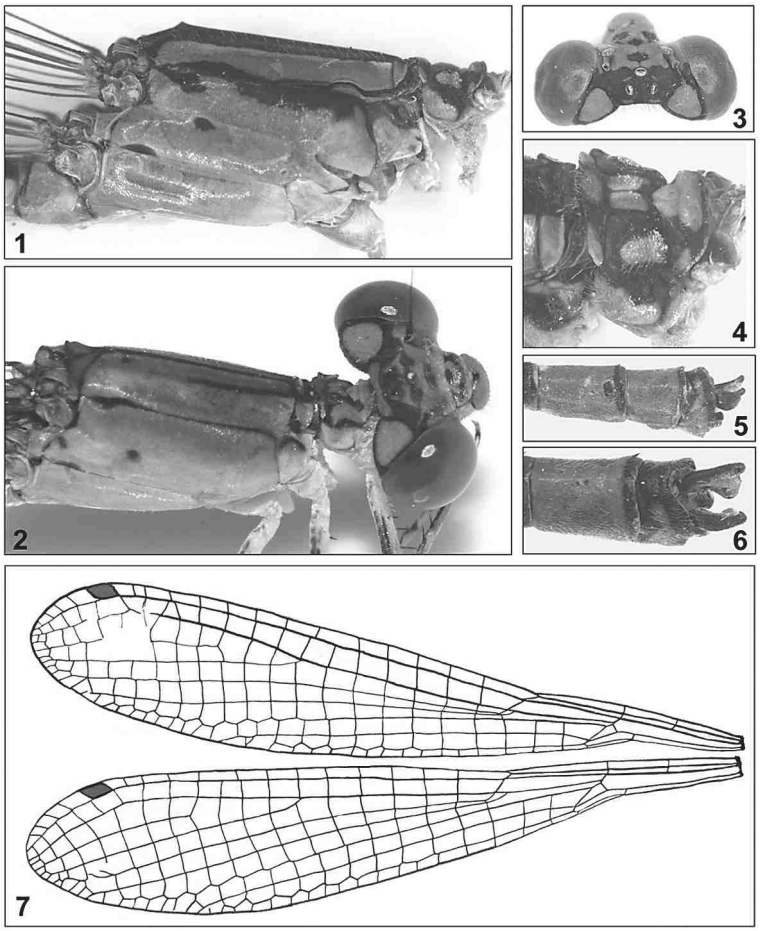
Material. – **Holotype**: 1♂ (mature male), Gin Ganga river 500m upstream of Deniyaya village; Deniyaya, Matara district; Southern province; N 6.3441^0, E 80.555^0; alt. 390m; 05-XI-2001; M. Bedjanič & A. Šalamun leg.; – **Paratypes**: 1♂, Gin Ganga river 2,5km downstream of Deniyaya village; Deniyaya, Matara district; Southern province; N 6.3531^0, E 80.579^0; alt. 380m; 30-IV-2003; M. Bedjanič leg.; 1♂, same locality, 03-XII-2004; S. Weldt leg.; 1♀, Delwala, Delwala Oya rivulet in the village, 7.5km E of Kalawana; Ratnapura district; Sabaragamuwa province; N 6.5317^0, E 80.4642^0; alt. 170m; 07-XI-2003; M. Bedjanič leg. – Holotype ♂ and paratype ♀ are to be deposited at Sri Lanka National Museum (Colombo, Sri Lanka). Other paratypes are deposited in author's comparative odonatological collection.

Etymology. – The species epithet, a noun in the genitive case, is a patronym honouring renown odonatologist Dr M.A. Lieftinck, his exceptionally extensive odonatological opus and important contributions to the knowledge of the genus *Archibasis* and dragonfly fauna of Sri Lanka.

DIAGNOSIS. – Medium-sized, black and blue coloured *Archibasis*. It is confined to Sri Lanka and differs markedly from both *A. o. oscillans* (Selys, 1877) known from western peninsular India, Malay Peninsula and Indonesia and *A. o. hanwellanensis* subsp. n. known from Sri Lanka. The shape and size of anal appendages is the main distinguishing character in males, *A. lieftincki* having very short inferior anal appendages of less than half of the superiors length and considerably expanded flap-like superiors. In both subspecies of *A. oscillans* inferiors reach almost two thirds of superiors length and the latter have more rectangular, shelf-like ventral expansion in its apical half. Different markings on abdominal segments S1, S2, S8 and S9 as well as differences in the shape and colouration of prothorax distinguish the females. All other *Archibasis* species are geographically widely separated and based on comparison of anal appendages figures from the literature, only *A. in-*

cisura Lieftinck, 1949 from Borneo possesses somewhat similar structures of the superior anal appendages. However, apart from structural differences the markings on the frons and vertex as well as on the first and last abdominal segments readily distinguish both taxa.

MALE (**holotype**, dried specimen). – H e a d . – Labium and maxillae light creamy, mandibles light blue with black tips. Labrum blue, anterior part with light setae, posterior margin with median small black spot. Genae and anteclypeus light blue.



Figs 1-7. *Archibasis lieftincki* sp. n.: (1) thorax, lateral view [male holotype]; – (2) thorax and head, lateral view [female paratype]; – (3) head, dorsal view [male holotype]; – (4) prothorax, dorsolateral view [male holotype]; – (5) abdomen (S8-S10) with anal appendages, lateral view [male holotype]; – (6) abdomen (S9-S10), with anal appendages dorsolateral view [male holotype]; – (7) wings, left pair [male holotype].

Postclypeus blue with three black markings arising from posterior margin; lateral ones larger and shoe-shaped and small central spot rhomboidal, slightly extending to frons. Frons blue with central elongated spot in the middle, bases of antennae and basal segments blue, flagellum black. Vertex and occiput black, the anterior border of black undulating; Short elongated blue stripes in front and behind of lateral occeli between postocular spots. The latter blue, triangular, slightly rounded (Fig. 3). Eyes in preserved specimen brown.

T h o r a x . – Prothorax predominantly black with blue markings as in Figure 4. Pronotum blue on dorsum; anterior lobe with cap-like marking, median lobe with two closely apposed blue longitudinal stripes and elevated rounded posterior lobe with median and two lateral blue spots. Synthorax blue, marked as in Fig. 1. Mid-dorsal band black, antehumeral stripe blue with no indentation but only very shallow convexity of black mesepimeral stripe near its upper end. The latter tapered posteriorly, with irregular ventral border and marked trapezoidal indentation in the middle of its posterior half. Rest of thorax sides blue, except of black dot in the upper middle of mesothorax and black elongated spot at the upper end of metapleural suture. – Legs: coxa, femur and tibia cream coloured marked with dark brown, the latter two armed with black spines. – Wings: hyaline; forewing 13½ Px; hindwing 12½ Px; pterostigma dark brown, covering less than one cell, small, not elongated, rhomboidal, similar in all wings. Discoidal cell in both wings acutely pointed at the distal end. Venation as in Figure 7.

A b d o m e n . – Slender, black with blue markings, creamy ventrally. S1 with basal black squarish spot on dorsum and very thinly black distal segmental margin, rest of the segment blue. Dorsum of S2 with black goblet-like marking, which is blue in the middle, rest of segment blue as well. S3-S7 bronzed brownish black on dorsum, bluish and beige laterally and ventrally, the extent of brownish black gradually widening ventrally towards end of S7. S8-S9 entirely blue, narrowly bordered with black apically; S10 with black x-shaped mark on dorsum, extending ventrolaterally; rest of the segment blue (Figs 5, 6). – Anal appendages black, interior surfaces of superiors beige. inferior anal appendages very short, less than half of the superiors length. The latter considerably expanded in apical half, flap-like, with angular convex lower margin. Its thickened dorsal edge is bent slightly upwards, prolonged in a short thumb-like process, with small apical inward directed hook (Figs 5, 6).

FEMALE (**paratype**, dried specimen). – H e a d . – Labium and mandibles pale beige. Labrum blue, anterior part with black setae, posterior margin with anteriorly elongated black spot in center and bordered narrowly black in the dorsolateral corners. Genae and anteclypeus light blue. Postclypeus blue with three black markings arising from posterior margin; lateral ones larger and shoe-shaped and small central spot oval, slightly extending to frons. Frons blue with central elongated spot in the middle, bases of antennae and basal segments blue, flagellum black. Vertex and occiput black, greenish blue line between occeli; blue postocular spots large, with blue transverse band between them (Fig. 2). Eyes in preserved specimen dark greenish brown.

Thorax. – Prothorax black with blue markings as in Figure 2. Pronotum lobes blue on dorsum, median lobe dorsally with two anteriorly divergent almost connected blue longitudinal stripes. Posterior lobe thickened, slightly raised and broadly rounded, blue on dorsum with black anterior and posterior margins. Two forwardly directed spines arise dorsolaterally from the hind margin of posterior lobe and lie closely apposed to the dorsum of the median lobe extending to its middle. – Legs: coxa, femur and tibia cream coloured marked with dark brown, the latter two armed with black spines. – Synthorax blue and greenish blue laterally, with dorsal and dorsolateral brown stripes and only few fine black lines along sutures (Fig. 2). – Wings: venation identical to male, hyaline; forewing 13½-14 Px; hindwing 12-12½ Px; pterostigma light greyish brown, covering one cell or slightly less, small, not elongated, rhomboidal, similar in all wings.

Abdomen. – Bronzed brownish black on dorsum with light greenish rings at sutures, light beige ventrally. S1 bluish with black transverse irregular line in the middle of dorsum, distal and lateral surfaces bluish with fine black line before suture. S2 greenish laterally, with narrow black longitudinal stripe centred on dorsum, which broadens into an arrow shaped marking before distal quarter of the segment, then abruptly thins to short stem and broadens again in form of narrow black ring above the suture. Dorsal black marking on S3 almost identical to S2 but longer. S4-S7 bronzed brownish black on dorsum greenish laterally. S8 blue, dorsum with broad longitudinal black stripe which broadens laterally to form a narrow black ring at the distal end of the segment. Last two segments blue, S9 with two well separated triangular black marks dorsolaterally and very narrow black line distally, S10 unmarked. – Anal appendages black, ovipositor and valves creamy, styli extending to the level of appendages' ends.

VARIATION IN PARATYPE MALES. – Colour variations in vertex markings exist, in some specimens blue is more pronounced in various patterns around occeli. Elongated blue stripes between postocular spots of various length but fused in only one specimen. Black mesepimeral stripe of various width. Dorsum of S10 in two specimens with only remnants of x-shaped mark and blue median ring all around the segment. Forewings in paratype with 12-14½ Px and hindwings with 11½-13½ Px. Life colouration of male and female as in Figures 13 and 14.

Measurements (in mm, paratype's range in brackets). ♂ – total length: 41.8 (39.2-40.2); abdomen length: 35.0 (32.7-32.9); head width: 3.6 (3.4); fore- and hindwing length: 22.7, 21.7 (22.9-22.7, 22.1-21.4); fore- and hindwing pterostigma length: 0.9, 1.0; superior appendages: 0.6; inferior appendages: 0.3 (0.25); ♀ – total length: 38.6; abdomen length: 31; head width: 3.4; fore- and hindwing length: 24.2, 22.9; fore- and hindwing pterostigma length: 0.7, 0.7.

FAUNISTIC RECORDS. – (1) Gin Ganga river 500m upstream of Deniyaya village; Deniyaya, Matara district; Southern province; N 6.3441^0, E 80.555^0; alt. 390m; 05-XI-2001; M. Bedjanič & A. Šalamun, 3♂ leg.; – (2) Gin Ganga river 1km downstream of Deniyaya village; Deniyaya, Matara district; Southern province; N 6.3525^0, E 80.5668^0; alt. 380m; 20-VII-2012; M. Bedjanič, 5♂ leg.; – (3) Gin Ganga river 2,5km downstream of Deniyaya village; Deniyaya, Matara district; South-

ern province; N 6.3531^0, E 80.579^0; alt. 380m; 30-IV-2003; M. Bedjanič, 10♂, 1♀ leg.; 03-XII-2004; S. Weldt, 1♂ leg.; – (4) Kakuna Falls on Aranuwa Dola rivulet in Sinharaja Forest Biosphere Reserve; Deniyaya; Ratnapura district; Sabaragamuwa province; N 6.3821^0, E 80.4789^0; alt. 480m; 04-XI-2001; M. Bedjanič & A. Šalamun, 1♂; – (5) stream at Weddagala village, Weddagala, Ratnapura district; Sabaragamuwa province; N 6.4628^0, E 80.423^0; alt. 270m; 14-V-2009; M. Bedjanič & K. Conniff, 1♂; – (6) Delwala, Delwala Oya rivulet in the village, 7.5km E of Kalawana; Ratnapura district; Sabaragamuwa province; N 6.5317^0, E 80.4642^0; alt. 170m; 07-XI-2003; M. Bedjanič, 10♂, 1♀ leg.

ARCHIBASIS OSCILLANS HANWELLANENSIS SUBSP. NOV.

Figures 8-12

Material. – **Holotype**: 1♂ (mature male), Drain and small stream 1.3km S of Hanwella; Colombo distr.; Western prov.; N 6.8987^0, E 80.0867^0; alt. 25 m; 06-II-2011; K. Conniff leg.; – **Paratypes**: 2♂, 2 ♀, same locality and date as the holotype. – Holotype and paratype ♀ are to be deposited at Sri Lanka National Museum (Colombo, Sri Lanka). Other paratypes are deposited in author's comparative odonatological collection.

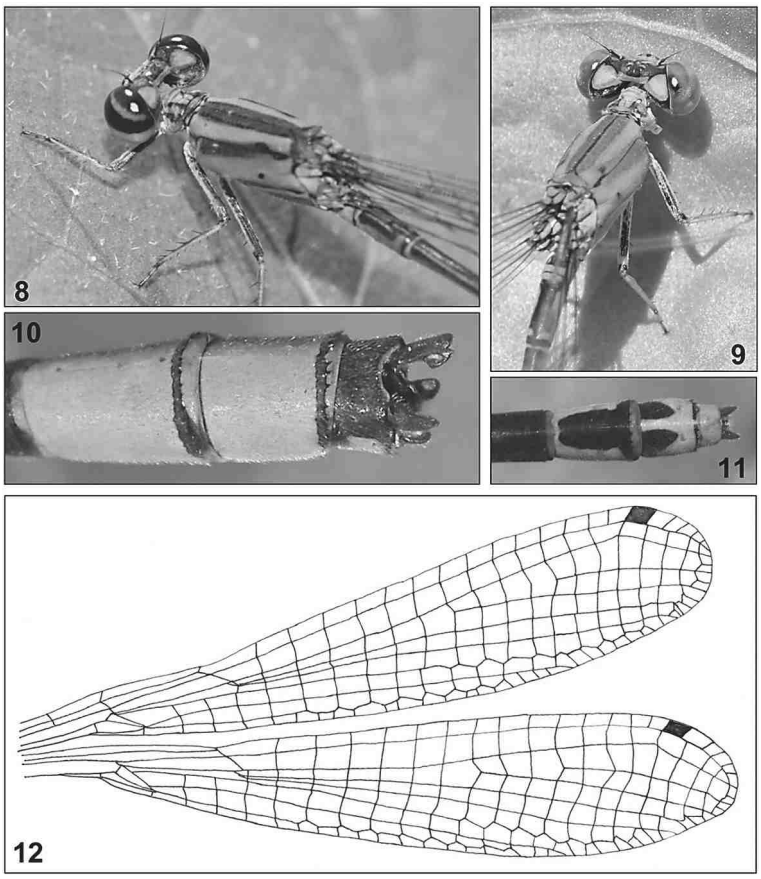
Etymology. – The species epithet, an adjective, after the type locality Hanwella.

DIAGNOSIS. – Medium-sized, black and rich dark blue *Archibasis*. *Archibasis o. hanwellanensis*, closely related to nominotypical *A. oscillans* (Selys, 1877), which occurs in western peninsular India, differs slightly with the male, lacking a spine on the inferior anal appendages and the female having a slightly different shaped prothorax and coloration of the abdomen. It differs at a glance from *A. lieftincki*, which is also confined to Sri Lanka in the male having clearly different shaped anal appendages of less than half of the superiors length and considerably expanded superiors with angular convex lower margin. Different markings on first and last abdominal segments and differences in the shape and colouration of prothorax distinguish the females.

MALE (**holotype**). – Head. – Labium, mandibles and labrum pale blue lined with fine hairs, labrum with fine black dart shaped points laterally and upper centre, anteclypeus blue and postclypeus blue with fine black arches on upper surface, genae blue, frons purplish blue with some black from near ocellus, ocelli reddish black, anterior base of antennae light purplish blue rest black. Eyes: greenish black on top surface, a thin blue band in line with vertex, thick black diffused streak, lower 1/2 of eye blue. Large blue teardrop shaped postocular spots meeting thin purplish blue line across occiput (Fig. 8).

Thorax. – Prothorax blue and dark blue with greenish-black markings, light blue dome shaped mark on dorsum of anterior lobe; median lobe black with deep blue ditto shaped marks on dorsum and deep blue comma-shaped marks laterally, posterior lobe rounded and uplifted, dark blue on dorsum narrowing black laterally (Fig. 8). – Synthorax dark blue with black and greenish black markings, mes-

ostigma black with two blue tear drop marks meeting above the mid-dorsal carina with dorsal stripe greenish black lined finely black, mesanepisternum deep blue, mesopleural suture striped black and of even thickness until three-quarters of the way down where it bulges upward then downward toward subalar ridge; antealar and subalar ridge black. Metanepisternum blue with a lateral black spot posteriorly, below pale blue. Black elongated spot posteriorly on metapleural suture (Fig. 8). – Legs: coxa powder blue; femur pale blue and black on surface below pale, spines black, tibia and tarsus light brown with black spines. – Wings: hyaline, pterostigma rectangular, brownish-black. Forewings with 13½ and 13 Px; hindwings with 13½ and 13 Px. Venation as in Figure 12.



Figs 8-12. *Archibasis oscillans hanwellanensis* subsp. n.: (8) head, thorax and first abdominal segments, dorsolateral view [male holotype]; – (9) head, thorax and first abdominal segments, dorsal view, [female paratype]; – (10) abdomen (S8-S10) with anal appendages, dorsolateral view [male holotype]; – (11) abdomen (S8-S10) with anal appendages, dorsal view [female paratype]; – (12) wings, right pair [male, paratype].

Abdomen. – Bronzed brownish black with beige and blue markings, ventral surface beige; S1 blue except for small apical black rectangular spot and fine black basal suture line, S2 apically ringed blue, dorsum bronzed black with large goblet shaped mark with short rectangular keyhole blue mark at upper centre, sublateral and ventral surfaces greenish blue, fine beige band before dark brown suture. S3-S7 bronzed brownish black on dorsum, beige bands at top of each segment, sutures dark brown; ventral surface light brown. S8-S9 entirely blue with irregular black band basally; S10 black on dorsum, blue ventrally extending to lateral surface (Fig. 10). – Anal appendages and secondary genitalia black, both with blue markings on interior surfaces, superior with notch and indentation on inside, inferior 2/3 size of superior, rounded cone shape with dull point in centre (Fig. 10).

FEMALE (**paratype**). – Head. – Labium, mandible and labrum pale tanish blue lined with fine hairs, labrum with downward dart shaped black point in center joining slightly with pale beige blue anteclypeus having small black marks on outer margins; postclypeus pale beige and pale blue with two upward dart shaped black marks on center of each half; frons beige with pale blue spots at base of antennae, midline black; gena pale blue adjoining eye; ocelli reddish brown surounded by black and two small points of blue midway between the upper ocelli; antennae black at base, upper sections reddish brown; deep blue tear drop shaped postocular spots almost meeting a thin blue line on occiput (Fig. 9); Eyes: top greenish brown, dark brown line below, then a narrow belt of olive green lined below with a dark brown band with a midline black spot, the lower 2/3 olive green.

Thorax. – Prothorax tan with black and blue markings as follows: pronotum lobes with midorsum blue stripe continuous to posterior lobe that is slightly raised at basal tip, laterally tanish blue on basal and median lobes outlined with black and dark brown; attached at posterior lobe lying along the dorsum to medial lobe are background coloured thin tuberous processes (Fig. 9); – Legs: coxa pale blue, femur and tibia cream coloured mottled with pale blue and brown.– Synthorax pale blue with black and light brown as follows: dorsal carina thinly black with wide pale brown stripe on mesanepisternum dorsum, antealar light brown, mesoplural suture and upper mesepimeron light blue with three small dark brown spots, one above coxa one in centre and small lateral spot near humeral area, dark brown spot at metaplural suture near wings, rest of metepimeron pale blue. – Wings: hyaline; forewing 13½-14½ Px; hindwing 12½ Px.

Abdomen. – Colours paler than in male, bronzed greenish black dorsum with sky blue rings at sutures, ventral surface tan. S1 mostly blue with black rectangular shaped spot on dorsum, distal and lateral surfaces sky blue with crescent shaped fine black line before suture. S2 with goblet shaped bronze black mark centred on dorsum, thinning to stem above suture with sky blue laterally and pale blue below (Fig. 9). S3-S6 dorsum bronzed greenish black with fine blue line before sutures. S7 dorsum bronzed black pale blue laterally and raised violet blue suture ring distally. S8 with a bronzed black mound shaped centre tapering to smaller mounds later-

ally covering most of the dorsum, the rest sky blue. S9 two large black hoof-shaped marks divided in the centre by sky blue laterally sky blue except for a fine line with black spines basally. S10 sky blue. – Anal appendages black, epiproct blue in centre, ovipositor and valves creamy blue extending to the level of the paraproct (Fig. 11).

VARIATION IN PARATYPES. – Some colour variations on S10: dorsum black but amount and shape of lateral dorsal blue mark varies. Forewings in paratype with 14½ Px (Fig. 12).

Life colouration of male and female as in Figures 15 and 16.

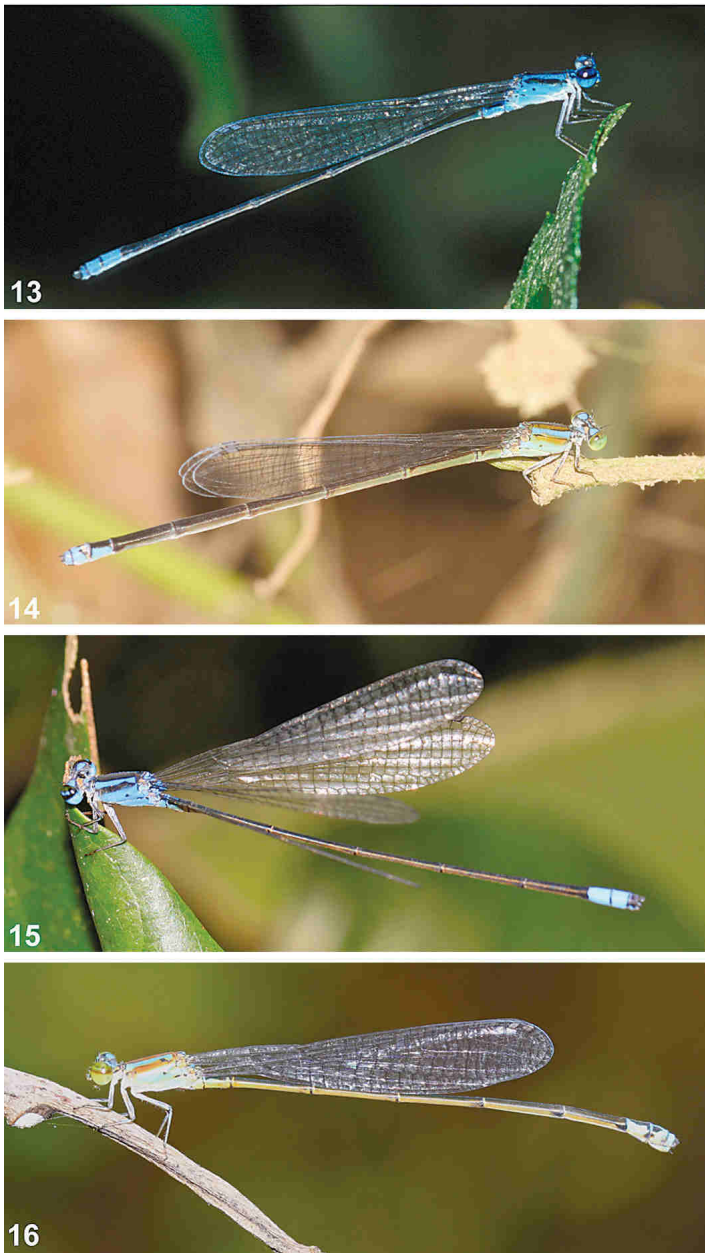
Measurements (in mm). ♂ – total length: 44; abdomen length: 34; fore- and hindwing length: 24, 25; ♀ – total length: 46; abdomen length: 37; fore- and hindwing length: 22, 24.

FAUNISTIC RECORDS. – (1) Drain and small stream at Meegahawatta wetland 1.3km S of Hanwella; Colombo distr.; Western prov.; N 6.8987^0, E 80.0867^0; alt. 10 m; 06-II-2011; K. Conniff; 3♂, 2♀; 06-III-2011; N. van der Poorten; 03-VI-2011; K. Conniff & H.M. Lankika.

TAXONOMIC NOTES AND DISCUSSION

Despite being confined to Sri Lanka it is clear that both two new representatives of the genus *Archibasis* are related to other species occurring in India, the Malay Peninsula, Indonesia, Australia, New Guinea and Solomon Islands and do not represent a distinct insular evolutionary line such as endemic representatives of family Platystictidae.

In particular the new subspecies *A. oscillans hanwellanensis* shows very close relation to the nominotypical *A. oscillans*, for which the nearest localities are known from the Western Ghats in India. Comparison with small series of nominotypical *A. oscillans* males and single allotype female (material labeled as *S.*[*Stenobasis*] *praeclarum* and *P.* [*Pseudagrion*] *praeclarum*, collected by F.C. Fraser on 30-IV, 23-VI and 24-VI-1928 in Tamaracherri, Malabar; and housed in Natural History Museum in London) showed that apart from variable head and thoracic markings, small differences exist in the shape of the prothorax and male appendages, as well as in the marking on the second abdominal segment in both sexes and marking on the eighth abdominal segment of females. The latter was described by (FRASER, 1933) as "large dorsal cordate spot with its point prolonged narrowly along middorsal carina as far as base of the segment, its base constricted and joining a narrow apical annule" while in the new subspecies the same marking is much bolder, not cordate, not pointed and not touching the segment base (Fig. 11). In addition the anal appendages in new Sri Lankan subspecies are clearly black (Fig. 11), while in material from India they are blue, as also described by FRASER (1933). Since *A. oscillans* is known to exhibit considerable individual variation in black markings on the head, thorax and last abdominal segment (LIEFTINCK, 1949). Since the series of both taxa available to us for comparison were small, the information



Figs 13-16. Life colouration of newly described species: (13) *Archibasis lieftincki* sp. n. [male, photo: M. Bedjanič]; – (14) the same [female, photo: M. Bedjanič]; – (15) *A. oscillans hanwellanensis* subsp. n. [male, photo: K. Conniff]; – (16) the same [female, photo: K. Conniff].

gathered on the variability of characters seems to best justify the subspecific rank of this Sri Lankan representative. Larger series of specimens from India and Sri Lanka as well as molecular data are needed to further elucidate the relation between both taxa.

The second newly described species *A. lieftincki* is clearly different from both above mentioned taxa by having very short inferior anal appendages of less than half of the superior's length and considerably expanded flap-like superior anal appendages in males. In females the differences exist in the shape of prothorax, and markings, markedly those on second, third and eighth abdominal segments. Again the individual variability in colouration will be better understood when more material becomes available.

Beautiful live colouration of *A. lieftincki* and *A. oscillans hanwellanensis* is presented in Figures 13-16.

DISTRIBUTION, PHENOLOGY AND ECOLOGICAL NOTES

Both new *Archibasis* seem to have very small ranges, each in a different part of the wet zone in southwestern Sri Lanka. Up to now, *A. lieftincki* has been found in six localities, which are all distributed in the northern and southern side of Sinharaja Forest Biosphere Reserve (Fig. 17). At the northern locality in the vicinity of Weddagala only a single male was observed in May 2009, while at Delwala Oya rivulet in Delwala the species is more common. In November 2003 a dozen of these damselflies were observed along a 100 meters stretch of the rivulet. All mentioned southern localities belong to Gin Ganga river and its tributaries around Deniyaya. The data collected in July 2012, May 2009 and April 2003 and in December 2004 and November 2001 show that the population appears to be strong in suitable river sections. It should be noted that additional *Archibasis* records were reported under "*Archibasis* sp. nov." by the members of Galle Wildlife Conservation Society in their study of faunal diversity in Galle district (WCSG, 2008). Unfortunately, without any other data only the localities Sinharaja, Kanneliya and Nakiyadeniya are listed. In the absence of voucher specimens and photographs it is impossible to ascribe these records to *A. lieftincki*. However the possibility exists that the species distribution might be broader than currently known.

Only one record of *A. lieftincki* comes from the primary rainforest rivulet inside the Sinharaja Forest Biosphere Reserve. All the others originate from slow flowing streams and rivulets in partly disturbed landscape, overgrown with belt of natural vegetation. Localities of *A. lieftincki* can be described as 2-10 meters wide streams and rivulets, with water depth between 0,2 and 1 meters, predominantly slow water flow, sandy bottom and richly vegetated banks lined with shrubs and trees. Males are usually seen near the banks, often sitting on the vertical leaves of water plants like *Lagenandra* sp. Here, in the absence of other coenagrionids, except *Pseudagrion rubriceps ceylonicum* the orange head immediately determines both sexes, they are eas-

ily recognized by their large blue postocular spots and the beautiful sky blue colour of the males. Mating or ovipositing has not been observed; only a single female has been found at the rivulet in close company of the males. As observed for its congener below, the females probably dwell away from the water in bushes and are accordingly more difficult to find.

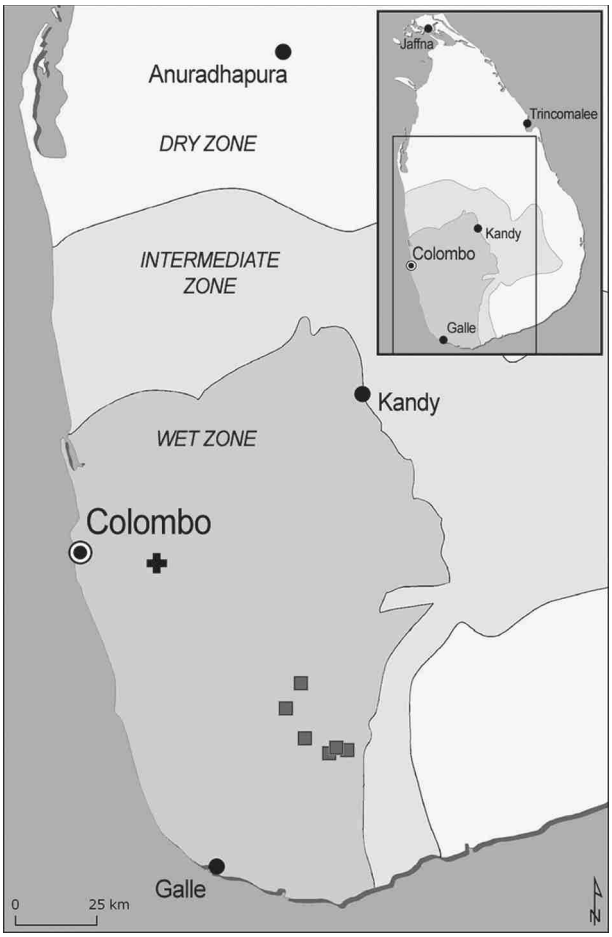


Fig. 17. Currently known distribution of *Archibasis lieftincki* sp. n. (grey squares) and *A. oscillans hanwellanensis* subsp. n. (black cross) in Sri Lanka (modified from BEDJANIČ et al., 2013).

So far, *Archibasis oscillans hanwellanensis* has been sighted at only one location in the wet zone of Sri Lanka, Meegahawatta wetland area near Hanwella, some 25 km east of Colombo (Fig. 17). The resemblance to *A. oscillans* is significant enough to designate it at a subspecific level until further research is done. The nomino-typical species occurs in the Western Ghats and South India and other locations are found in South East Asia eastwards to Sumatra and Java (LIEFTINCK, 1949). Encounters with *A. oscillans hanwellanensis* have been very rare so far. It has been observed by K. Conniff and H. Lankika Madumage in February, March and June 2011 (LANKIKA et al., 2012). Habitats in Meegahawatta wetland where this species was found were irrigation drains through a sparsely populated area near a pineapple plantation, and a small perennial, slow-moving stream through marshy land surrounded by scrub jungle of mixed species. The edges of both sides of the stream were densely covered with grasses and small scrub trees. The male lives along heav-

ily shaded swampy areas with slow moving water. Most of the time the female is away from the water in dense brush or jungle. In February 2011, males were found perched above the water and the females were inside the scrub area but in March 2011 females were found on the stream and along a drainage canal near the males. The extent of their habitat needs further study. Breeding has not been observed and no larvae have been found.

Both newly described endemic representatives of the genus *Archibasis* are quite rare and their habitats are under threats. *A. lieftincki* has been found only in streams and small rivulets near lowland rainforests in southwestern Sri Lanka, the type of habitat which has become very rare in the last decades. Ongoing expansion of tea plantations, clearing of natural forests, increasing agrochemicals use and pollution are the risk factors that affect the species' habitats both directly and indirectly. With the presently known very small extent of occurrence the species has been assessed as globally threatened and ranked into the category of endangered species according to the IUCN Red List criteria (BEDJANIČ et al., 2013). Further field research is needed in Galle and Ratnapura districts to check localities listed by WCSG (2008) and other potentially suitable environments in the vicinity of forest reserves on this part of the island.

Based on very scarce data the evaluation of threat status of *A. oscillans hanwellanensis* is only tentative and rests on speculations. However, it is definitely rare and its type locality and habitat type in general are under threat due to pressures of urbanization, agriculture and pollution. Only further targeted fieldwork in the lowlands east of Colombo can bring more solid information on the species' populations in Sri Lanka. Until then *A. oscillans hanwellanensis* is assessed as a data deficient species according to IUCN Red List criteria.

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Dr DAVID T. GOODGER and Dr BENJAMIN PRICE (London, UK) greatly facilitated the work in the odonatological collection of the Natural History Museum in London and kindly enabled a comparative loan of *A. oscillans* from the BMNH collection. For help with literature the authors are thankful to Dr BASTIAAN KIAUTA (Bergen/Lb, The Netherlands). Thanks are also due to Mr SAŠO WELDT (Ljubljana, Slovenia) for material from his collection, to Mr ALI ŠALAMUN (Ljubljana, Slovenia) and Mr SAMPATH GUNASINGHE (Galle, Sri Lanka) for rendering pleasant company in the field. Mrs HARSHANNEE LANKIKA MADUMAGE (Hanwella, Sri Lanka) was present when *A. oscillans hanwellanensis* specimens were found near her home and helped keep track of other individuals in the area. Thanks also to Mrs NANCY VAN DER POORTEN (Hammaliya, Sri Lanka) for advice, help with literature and in depth discussions. Lastly, thanks to OLIVIA MOLDEN for drawings of wings and other body parts used in the study.

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DREPANOSTICTA BURBACHI SPEC. NOV. FROM SARAWAK, BORNEO, A NEW SPECIES ALLIED TO *D. DULITENSIS* KIMMINS, WITH NOTES ON RELATED SPECIES (ZYGOPTERA: PLATYSTICTIDAE)

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The new sp. is described and compared with its closest congener, *D. dulitensis*. Holotype ♂: Malaysia Sarawak, Kuching Division, Gunung Penrissen, Borneo Highlands Resort trail system, steep boulder stream, 24-VII-2012; deposited in RMNH, Leiden. New records for *D. dulitensis* are documented and the sp. is discussed.

INTRODUCTION

The number of Platystictidae known from Borneo has increased rapidly in recent years, with 14 species described in DOW (2010) and DOW & ORR (2012a, 2012b); 27 named species from the family are now known from the island. This increase in the number of species known parallels the situation in the Philippines (VAN TOL, 2005, VILLANUEVA et al., 2011; VILLANUEVA & SCHORR, 2011) and Sulawesi (VAN TOL, 2000, 2007). Here I describe *Drepanosticta burbachi* spec. nov. from Gunung Penrissen in western Sarawak, bringing the number of named Platystictidae known from Borneo to 28.

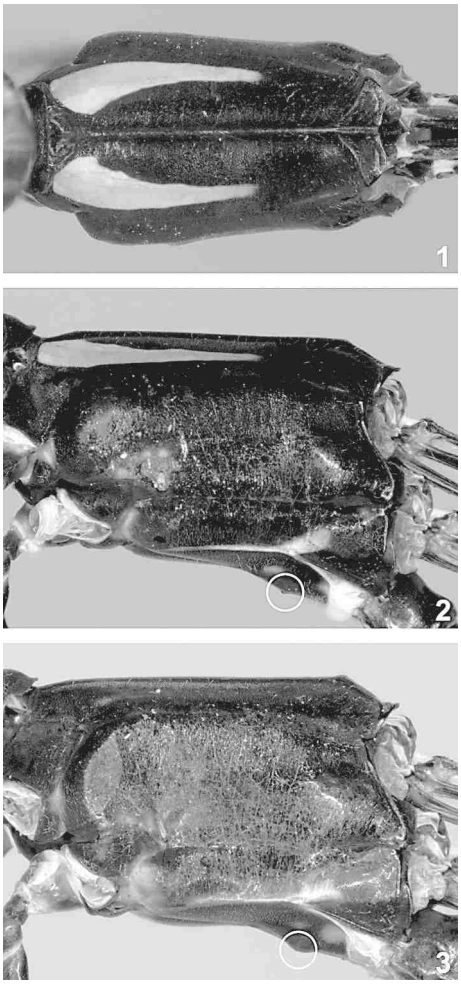
D. burbachi is closely allied to *D. dulitensis* Kimmins, 1936, a species originally described from Mount Dulit (KIMMINS, 1936) in north-eastern Sarawak. In the last few years *D. dulitensis* has been found at a number of locations in northern and central Sarawak (e.g. DOW & NGIAM, 2012), these new records are summarised here, along with notes on variation and habitat. Terminology used for the anal appendages follows that in DOW & ORR (2012a).

DREPANOSTICTA BURBACHI SP. NOV.

Figures 1, 2, 4, 6, 7, 8, 9, 10, 12

Drepanosticta new species cf. *dulitensis*: DOW, 2012: 6.

M a t e r i a l. – **Holotype** ♂**:** (SAR11_12_PST267, RMNH.INS.506890), Malaysia, Sarawak, Kuching Division, Gunung Penrissen, Borneo Highlands Resort trail system, steep boulder stream, R.A. Dow leg., 24-VII-2012, in RMNH. **Paratypes**: ♂ (SAR11_12_PST213, RMNH.INS.506818), data as holotype, in RMNH; ♂ (SAR11_12_PST350), same area, steep stream below peak of Gunung Penrissen, R.A. Dow leg., 26-VII-2012.



Figs 1-3. Synthorax: (1) *D. burbachi* holotype, dorsal view; – (2) same, lateral view; – (3) *D. dulitensis* male, Bukit Kana, lateral view.

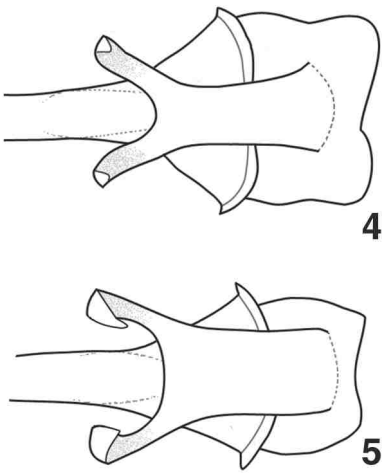
E t y m o l o g y. – *burbachi*, a noun in the genitive case. Named for Klaus B u r b a c h, in honour of his contributions to the International Dragonfly Fund, one of which supported the fieldwork during which this species was discovered.

DIAGNOSIS. – *D. burbachi* is readily distinguished from all other species except *D. dulitensis* by the combination of overall black colouration and structure of the anal appendages. It differs from *D. dulitensis* in possessing rich blue antehumeral markings that are broad near the prothorax and taper toward the wing bases; in the structure of the inferior anal appendages where the terminal, strap-like part is much longer in *D. burbachi* and not expanded at the tip, whereas in *D. dulitensis* it is always at least slightly expanded towards the tip. In *D. burbachi* the spine of the inferior appendage is more robust than in *D. dulitensis*. The two species differ further in the penis where the terminal part is narrower in *D. burbachi* than in *D. dulitensis*.

HOLOTYPE MALE. – H e a d. – Shining black except as noted: Labium mostly dark brown, prementum mostly pale. Labrum blue, except narrowly along free margin. Anteclypeus blue. Mandible bases

largely blue, black along free margin and adjacent to genae. Transverse occipital carina not prominent, with lateral extremities rounded. Ocelli whitish.

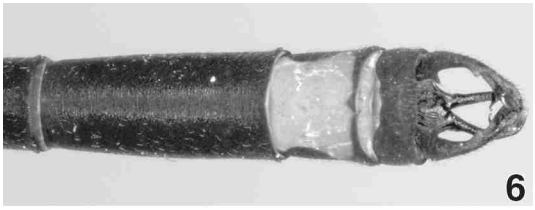
T h o r a x. – Prothorax entirely black. Posterior pronotal lobe of simple collar-like shape. – Synthorax (Figs 1-2) black except as noted: a pair of blue antehumeral stripes running from the mesostigmal plates for ca 2/3 the length of the mesepisternum, broad near prothorax, tapering towards wing bases (Fig. 2). A few small obscure pale marks above spiracle on metepisternum, an incomplete pale stripe along lower margin metepimeron, some small indistinct pale marks on venter. A pair of small rounded protuberances on the posterior part of the venter (circled in Fig. 2). Extreme posterior part of venter inflated and white. – Legs: mostly black, with white marks on coxae. – Wings: slight brown tint, 15 (left) or 14 (right) Px in Fw, 14 Px in Hw. Anal crossing branched in all wings. R_4 arising very slightly distal to subnodus in Fw, very slightly proximal to it in Hw. IR_3 arising ca half a cell after R_4, joined to it by a short stalk. Pterostigma almost rectangular, with costal side slightly shorter than anal side, black with narrow brown border, covering slightly more than one underlying cell.



Figs 4-5. Penis: (4) *D. burbachi* holotype; – (5) *D. dulitensis,* Mount Dulit.

A b d o m e n. – Almost entirely black with a few paler markings low on sides and S9 blue dorsally, this marking with a distinctive semi-circular excision laterally (Figs 6-7). Venter of S9 yellowish basally, and greenish yellow on either side of genital valves, which are small and black. – Anal appendages (Figs 8-10) long, mostly black, superior pair and inferior pair same length. Inferior appendages articulated near base. Interior projection of superior appendage basally positioned, its origin only separated from appendage base by slightly more than its own length, dorsal projection small and inwardly directed; both of these structures only visible in dorsal view. Inferior appendage with spine directed inwards and upwards, width nearly constant until near tip, where it narrows then expands slightly at the tip. Scoop strap-like, turned inwards and downwards at nearly a right angle at ca the length of the spine from the base of the spine, of constant width until its end, where rounded. – Penis (Fig. 4) of typical form for the family (see illustrations in VAN TOL, 2009), with a row of setae centrally on either side of the shaft and the arms of the terminal segment closely pressed to the shaft at their origin.

M e a s u r e m e n t s (in mm). – Abdomen without caudal appendages ca 37, superior append-



Figs 6-7. Markings of male terminal abdominal segments of *D. burbachi* holotype: (6) dorsal view; – (7) lateral view.

age just over 1, Hw 26.

FEMALE. – Unknown.

VARIATION IN PARATYPE MALES. – The extent of the white markings on the coxae is variable, as is the extent of the yellow colouration basally on the venter of S9. The wings are virtually un-tinted in one paratype. The inferior anal appendages appear much more strongly down turned in one paratype, however this is merely the result of their inwards rotation relative to their position in the holotype. In one paratype R_4 arises sligtly distal to the subnodus in all wings, and IR_3 arises more than half a cell distal to the subnodus.

Measurements (in mm). – Abdomen without caudal appendages 33-35, Hw 19.5, 13-14 Px in both wings.

REMARK. – *D. burbachi* was found in two high gradient streams on Gunung Penrissen. The holotype and one of the paratypes were perched high, hanging on plants growing from large boulders over the stream; the other paratype was perched hanging from a plant growing from a sheer rock face immediately to the side of a small waterfall.

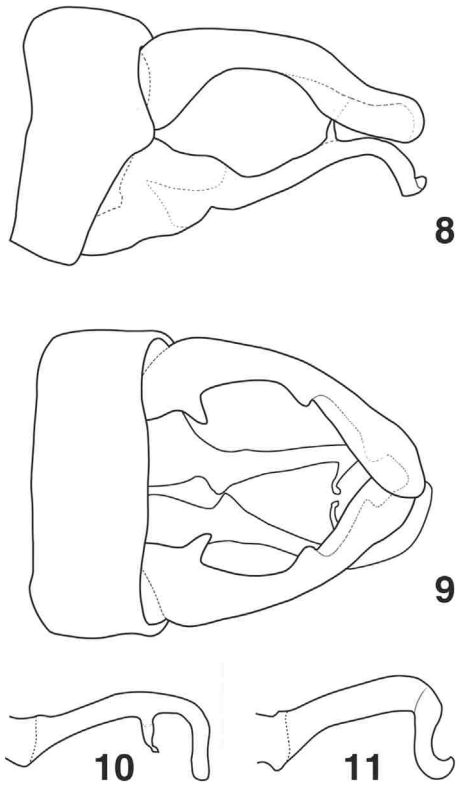
DREPANOSTICTA DULITENSIS KIMMINS, 1936

Figures 3, 5, 11, 12

Drepanosticta dulitensis: KIMMINS, 1936: 98-100, fig. 15; – LIEFTINCK, 1954: 33; – KIMMINS, 1970: 174; – VAN TOL, 1992: 88; – ORR, 2003: 38, 69; – DOW & REELS, 2009: 1, 8, 9, 13, fig. 6; – DOW & NGIAM, 2012: 10; – DOW & ORR, 2012a: 368.

Material. – **Holotype** ♂: Malaysia, Sarawak, Miri Division, Mount Dulit, 3700 ft, B.M. Hobby & A.W. Moore leg., 20-X-1932. – **Other material** (all Malaysia, Sarawak): ♂, Miri Division, mid Baram area, Gunung Kalulong, forest streams at ca 800-950 m, G.T. Reels leg., 19-XII-2007; 2 ♂, same location, R.A. Dow leg., 8-X-2009; 2 ♂, same mountain, stream at 700-800 m, R.A. Dow leg., 17-VII-2010; ♀, same location and date, M. Kibi leg.; 6 ♂, ♀, vicinity of Gunung Kalulong, Batu Uro', R.A. Dow leg., 16-VII-2010; 2 ♂, Miri Division, Mount Dulit, steep forest stream, ca 850-880 m, R.A. Dow leg., 30-VII-2008; 3 ♂, same location and date, G.T. Reels leg.; ♀, same location, G.T. Reels leg., 31-VII-2008; ♂, Kapit Division, same mountain, stream at ca 1100 m, R.A. Dow leg., 30-IX-2009; 2 ♂, Kapit Division, Hose Mountains, stream at 920-1020 m, R.A. Dow leg., 17-V-2010; ♂, same mountains, stream at 1070-1170 m, R.A. Dow leg., 19-V-2010; 7 ♂, same mountains, steep

stream at foot, R.A. Dow & M. Budi leg., 21-V-2010; 2 ♂, same mountains, Gunung Kajang area, stream, ca 600 m, R.A. Dow leg., 5-IV-2011; ♂, same location, R.A. Dow leg., 15-IV-2011; ♂, same area, stream at ca 740 m, M. Kibi leg., 6-VI-2011; ♂, same location, R.W.J. Ngiam leg., 13-IV-2012; 5 ♂, ♀, same area, streams ca 660-840 m, R.A. Dow leg.; 9-IV-2011; 3 ♂, same location and date, R.W.J. Ngiam leg.; 2 ♂, same location, R.W.J. Ngiam leg., 10-IV-2011; 2 ♂, ♀, same location, R.A. Dow leg., 12-IV-2012; ♂, same location and date, M. Kibi leg.; ♂, same area, stream 900-1000 m, 13-IV-2011; 2 ♂, Bintulu Division, Sarawak Planted Forest Project, Tubau area, block E2N, steep stream, ca 65 m, R.A. Dow leg., 17-VIII-2009; 2 ♂, ♀, western Bintulu Division, Bukit Kana/Naong complex, steep stream on Bukit Naong, ca 350 m, R.A. Dow leg., 22-III-2012; ♂, same location and date, O. Tateh leg.; ♂, same area, stream on lower slopes Bukit Kana, ca 260 m, R.A. Dow leg., 26-III-2012.



Figs 8-11. Anal appendages of *D. burbachi* holotype and *D. dulitensis*: (8) *D. burbachi* right lateral view; – (9) *D. burbachi* dorsal view; – (10) *D. burbachi* post articulation part of left inferior anal appendage in ventral view; – (11) *D. dulitensis*, Hose Mountains, post articulation part of left inferior anal appendage in ventral view.

REMARKS. – *D. dulitensis* occurs in steep, forested, terrain, from near sea-level to over 1100m. It is typically found hanging high over high gradient torrential streams with a closed canopy, and sometimes perched on vegetation by waterfalls on such streams. The distribution of *D. dulitensis* is illustrated in Figure 12 and discussed further below.

KIMMINS (1936) notes that there is variation in the markings of the type series of *D. dulitensis*, but gives no details. With more material now available, it is clear that *D. dulitensis* is a very variable species. The blue colouration of the anteclypeus often extends onto the adjacent part of the postclypeus. KIMMINS (1936) describes the antehumeral stripes of the holotype male as yellowish red, but this appears to be an artefact of preservation; in life the antehumeral stripes are yellowish green, when present. However, in the majority of male specimens the antehumeral stripes are either entirely absent or represented merely by small marks near the mesostigmal plates. Yellow markings on the metepisternum and metepimeron are very variable in size and distinctness. The venter of the synthorax is dark in some populations but pale in others. In some individuals S9, blue

dorsally in the holotype, is entirely black. There is considerable variation in size; this seems to be correlated with altitude. Kimmins' states that the "Eyes said to be blue in life"; this is correct. The venter of S9 is often extensively pale, in some populations typically bright yellow, and in two males from the Hose Mountains, even the genital valves are yellow.

Understandably, the original description does not mention that the posterior part of the venter of the synthorax bears a pair of gentle swellings (circled in Fig. 3); these are inconspicuous, and become interesting only in a wider context (see below). KIMMINS (1936) did not illustrate the penis of *D. dulitensis*; this is illustrated here for the first time (Fig. 5). Kimmins did give a ventral view of the terminal part of the inferior appendage, as there is some variation in how the end of this appendage appears; another individual is illustrated in Figure 11.

M e a s u r e m e n t s (in mm). – Males: abdomen without anal appendages 33.5-41, Hw 19.5-25; – Females: abdomen without anal appendages or ovipositor 29-34, Hw 20-24.

DISCUSSION

D. burbachi is clearly the sister species of *D. dulitensis*: the two are very similar in general colouration, and in the structure of the anal appendages and penis, moreover they occupy very similar habitats and display the same perching habits. As noted in the diagnosis of *D. burbachi*, the two can be easily separated by their synthoracic markings and details of the inferior anal appendages. With regards to the inferior anal appendages, in both of these species the terminal part, referred to as the 'scoop' in DOW & ORR (2012), is strap-like, but in *D. burbachi* it is of approximately constant width over its entire length, whereas in *D. dulitensis* it is always at least slightly expanded towards the tip. The expansion near the tip of the inferior appendage in *D. dulitensis*, is not always visible in all views, for instance it is more apparent in KIMMINS' illustration (1936: 99, fig. 15C) than in Figure 11 in this publication; this is due to the degree of rotation of the appendage and in the individual illustrated in Figure 11 the expansion is readily apparent in a lateral view. The spine of the inferior appendage is more robust in *D. burbachi* than in *D. dulitensis*. Depending on the position in which the appendages are lying, the spine may or may not be visible in a particular view, for instance it is not visible in the *D. dulitensis* male illustrated in Figure 11.

They also share the peculiar swellings on the posterior part of the venter of the synthorax, which do not appear to have been mentioned before as a character in the Platystictidae. Such swellings are far from unique in the Platystictidae, they are inconspicuously present, for instance, on species of *Telosticta*, although not mentioned in DOW & ORR (2012a); *D. dulitenisis* was considered as closely related to *Telosticta* by DOW & ORR (2012a). However similar swellings are present on species such as *D. crenitis* Lieftinck, 1933 and *D. dentifera* Kimmins, 1936; two species that, on the basis of all other morphological characters, cannot be con-

sidered to be closely related to *D. burbachi* and *D. dulitensis*, as well as many other species. Modifications to this part of the synthorax are quite common in Odonata, especially in males, although not often remarked on.

Fig. 12. Map of Borneo showing the distributions of *D. burbachi* (white circle) and *D. dulitensis* (white square).

Both of the species discussed here are likely to be under-recorded since they occur at low densities in high gradient forest streams that are difficult (sometimes hazardous) to work in. Although *D. burbachi* is currently only known from Gunung Penrissen in Kuching Division in western Sarawak (Fig. 12), it is likely to also occur at least in the nearby Bungo Range, and in the mountains immediately over the border in Indonesia. The habitats on Gunung Penrissen have no formal protected status, but are not likely to be disturbed further in the foreseeable future both because they are in unsuitable terrain for development and because the surrounding forest forms a significant part of the appeal of the Borneo Highlands Resort, which is visited by many birdwatchers. The known distribution of *D. dulitensis* lies within a relatively small area in central and north eastern Sarawak (Fig.12), with known sites forming a rough arc from the mid Baram (Gunung Kalulong and Batu Uro') in Miri Division and Mount Dulit on the Miri-Kapit border, through the Tubau area (which could be described as a low arm of the Dulit Range) in the east of Bintulu Division and round to the Hose Mountains in Kapit Division, with an outlying population on the somewhat isolated Bukit Kana complex in the west of Bintulu division. It is highly likely to be common in the mountainous areas partly framed by the main arc of known sites, but much further work in this inaccessible area, and over the border into Kalimantan, is needed to determine the true limits of its range.

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Dulit and the Hose Mountains has been partly supported by grants from the International Dragonfly Fund, the Worldwide Dragonfly Association and Uyttenboogaart-Eliasen Stiching. Many thanks are due to LUKE SOUTHWELL for facilitating fieldwork in Miri and Kapit Divisions, and to JOANES UNGGANG and the entire Conservation Department of Grand Perfect Sendirian Berhad for the same in Bintulu Division. Last but not least thanks are due to ALBERT ORR for his continued support of the author's work.

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Odonatologica 42(3): 211-228 *September 1, 2013*

DESCRIPTION DATE OF *SOMATOCHLORA EXUBERATA* BARTENEV, *LEUCORRHINIA INTERMEDIA* BARTENEV AND *SYMPETRUM VULGATUM GRANDIS* BARTENEV, THE FATE OF A.N. BARTENEV'S TYPE SPECIMENS AND DESIGNATION OF THE LECTOTYPE OF *L. INTERMEDIA* (ANISOPTERA: CORDULIIDAE, LIBELLULIDAE)

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Descriptions of *Somatochlora exuberata* Bartenev, *Leucorrhinia intermedia* Bartenev and *Sympetrum vulgatum grandis* Bartenev were published simultaneously but 4 times in 2 languages and in 3 years, 1910, 1911 and 1912. One of the 1910 publications was fragmented and published in 4 subsequent journal issues, involving confusion with the order of parts and the paper title, but it is this publication which has priority. The date of publication of the above mentioned names is Oct. 1, 1910. Hence *Somatochlora exuberata* Bartenev, 1910 has priority over *Somatochlora japonica* Matsumura, 1911. Syntypes in Bartenev's own collections were most probably lost, as were most of his types, but some may remain in European collections as received by foreign odonatologists from Bartenev in exchange. A ♂ syntype of *L. intermedia* from Ris' collection, kept in Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt/Main, Germany (FMS), is designated as the lectotype of this taxon.

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INTRODUCTION

In odonatological literature, both Bartenev's names, *Somatochlora exuberata* and *Leucorrhinia intermedia*, have been dated variously to 1910, 1911 or 1912. (We should note here that this author transliterated his Russian surname to the Latin alphabet as either "Bartenef" or "Bartenev" or both, e. g. in BARTENEF (1915; 1919); in this text we adopt "Bartenev" as consistent with the standard British spelling but retain the other spelling in references when so printed). For instance, BELYSHEV et al. (1989) dated both names to 1911, HARITONOV et al. (2007) dated both names to 1910, BRIDGES (1993) and STEINMANN (1997) dated both names to 1912, DAVIES & TOBIN (1985: 66, 92) dated *exuberata* to 1910 and *intermedia* to 1912 while TSUDA (2000: 144 and 160), on the contrary, dates *exuberata* to 1912 and *intermedia* to 1910. These example references are important to worldwide and regional checklists and so are alone enough to inspire a special investigation of the correct date(s) of the descriptions of these taxa, as this is important with respect to priority. So far, there have been two publications concerning this problem. In a short abstract, MALIKOVA (2006: 33) communicated the following: "The date of Bartenev's work in *Raboty Laboratorii Zoologicheskogo Kabineta Warshavskogo Universiteta*, 1910 (6/7) was somewhat enigmatic, because Bartenev himself referred to this work as published in 1910, while most modern catalogues give the date of publication as 1912. I found the journal in the Library of the Zoological Institute, and there is no day or month of the issue indicated, but the year is 1911. Under the text of Bartenev's work there is a note: "*accepted February 27, 1910*", but the other included in the issue are marked with April, 1911." Later KOSTERIN & ZAIKA (2010: 309) repeated and extended this information as follows: "Both names are commonly referred to Bartenev (1912a) – a German translation of a paper previously published in Russian. As MALIKOVA (2006) pointed out, Bartenev himself used to assign his original descriptions to 1910, which was partly adopted by other authors. The Russian journal with the original descriptions is very rare but MALIKOVA (2006) reported on her discovery of a copy held in the library of the Zoological Institute in St Petersburg. She found out that 1911 is indicated on the cover of the relevant issue. Bartenev's paper was accepted on 27 February 1910 but some other papers were accepted only in April 1911. This fact confirms that the issue was not published before 1911. Hence, the correct names are *Somatochlora exuberata* Bartenev, 1911 and *Leucorrhinia intermedia* Bartenev, 1911."

However, a special search for all relevant Bartenev's publications showed that the above information was incorrect in three respects: (i) the mentioned 'Russian journal' was not the edition where the descriptions were published for the first time, (ii) the indication "1910 (6/7)" in MALIKOVA (2006) was in error and (iii) the dates indicated under the papers in the mentioned journal were not specified as dates of acceptance but lacked a printed explanation.

Our detailed investigation of the problem revealed that the correct description year of both taxa (as well as of a neglected invalid but available name *Sympetrum vulgatum* var. *grandis* Bartenev) is 1910 (October 1) as is substantiated below. In view of a permanent international demand for information concerning Bartenev's type specimens, we made further efforts to locate the type specimens of these taxa, resulting in just one pair of syntypes of *Leucorrhinia intermedia*, from which the male has been designated as the lectotype. The fate of other Bartenev's type specimens is briefly considered as well.

METHODS

Old literature was examined by A.M. at the Fundamental Scientific Library of the Moscow State University (further in the text F.S.L.M.S.U.), in the Library Department at the Faculty of Biology of the same University (L.D.F.B.M.S.U.) and by E.M. in the Library of Zoological Institute of Russian Academy of Science, St. Petersburg (further L.Z.I.). The relevant pages were photographed. Also very helpful was the resource "Internet Archive" (http://www.archive.org). The Odonata collection of Zoological Institute of Russian Academy of Science, St. Petersburg (ZIN) was investigated by E.M. in 2005 and A.M. in 2011; that of the Zoological Museum of Moscow State University (ZMUM) and the Entomology Department of the same University by A.M. in 2010.

RESULTS AND DISCUSSION

PUBLICATIONS CONTAINING DESCRIPTIONS OF *SOMATOCHLORA EXUBERATA* BARTENEV, *LEUCORRHINIA INTERMEDIA* BARTENEV AND *SYMPETRUM VULGATUM* VAR. *GRANDIS* BARTENEV

As was correctly pointed out earlier (MALIKOVA, 2006; KOSTERIN & ZAIKA, 2010), dating of the names in question to 1912 resulted from the publication (BARTENEF, 1912a) in the German language, published on April 4, 1912, in which the descriptions were presented as original, including "*n. sp*" for the two species and "*n. var.*" for the new variation (BARTENEF, 1912a: 230, 234, 236). Nothing in it hinted to a Western reader that they had been already published in Russian before. However, this German paper was just a direct German translation of the corresponding Russian paper, which had neither title nor abstract or resumé in any language other than Russian. The fact that it was a translation was first acknowledged in a bibliopgraphy by SCHMIDT (1933: 24): "Deutsche Übersetzung von 1910e", although the original Russian paper was cited under "1910e" not so completely and correctly (see below).

Russian authors knew of the existence of the Russian paper and used to date both taxa to 1910 or 1911. Since no current Russian odonatologists seem to have this paper in hand, the reference to it was mostly copied from one source to another without reading the original. It varied as to the title of the edition and otherwise. For instance, the reference to "(Bartenev, 1911)" in KOSTERIN & ZAI-

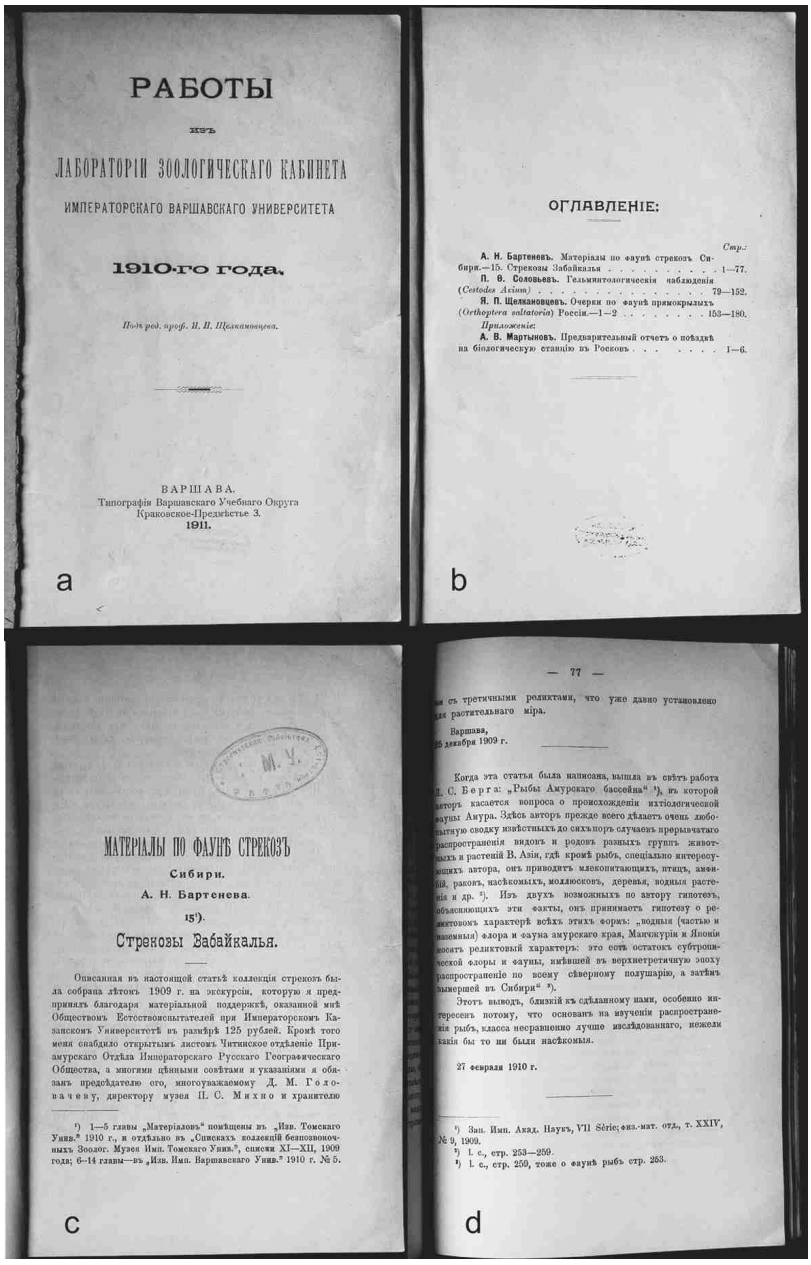

Fig. 1. Pages from a copy of *Raboty iz laboratorii zoologicheskogo Kabineta imperatorskago varshavskago Universiteta 1910 goda* from the Library Department at the Faculty of Biology, Moscow State University: (a) cover; – (b) contents; – (c) the first page; – (d) the last page of BARTENEV, 1911.

KA (2010) omitted "1910 goda" from the edition title but erroneously included the issue number "6/7", and the range of pages was indicated as "1-78" instead of "1-77"; this incorrect form of the reference was adopted from recent Russian literature (where the corrigenda page seems to have been counted, see below). The same concerns the reference to "(Bartenev, 1911)" in KOSTERIN et al. (2004) where, in addition, the communication number "15" turned into "1-5".

However, we found out that variation as to the edition title did not result from accumulating errors, since the same Russian paper was published thrice in three different editions, although with identical printed pages. They are enumerated below, under independent references in this paper.

(1) BARTENEV, 1911. The edition entitled (transliteration) "*Raboty iz Laboratorii zoologicheskago Kabineta imperatorskago varshavskago Universiteta* 1910 goda, pod redaktsiey Prof. Ya.P. Shchelkanovtseva" ["Works from Laboratory of Zoological Cabinet of Emperor Warsaw University of 1910, under editorship by Prof. Ya.P. Shchelkanovtsev"] (Fig. 1). In the tradition of those times, no publisher, but rather a printing house, was indicated on the cover (Fig. 1a). This edition was part of a periodical, since there are "*Raboty*..." of other years, e.g. 1909 and 1911, but the issues had no numbers. The relevant issue was composed of four papers, at the end of which a place and date were indicated without explanation. Most probably this was the date and place where and when an author finished his manuscript, a tradition that remains today. e.g., in poetry. Bartenev's paper (BARTENEV, 1911) (Fig. 1d) ended with "Varshava, 25 dekabrya 1909 g." [Warsaw, 25 December 1909] which was followed, on the same page, by a short additional text starting with "[When this paper was already written, there appeared a work by L. S. Berg ...].", which ended with "27 fevralya 1910 r." ["27 February 1910"] (Fig. 1c). Among the other three papers in the edition, the oldest date of April 1911 was indicated in the paper by SHCHELKANOVTSEV (1911). The stamp of the Library of the Zoological Museum of imperial Academy of Sciences on this edition contains the date of acceptance as June 3, 1911.

We must note here that, until 1918, Russia used the Julian calendar (the so-called 'old-style'), the dates in which were 13 days earlier than in the Gregorian calendar used in most other countries at that time and throughout the world nowadays. However, the "Kingdom of Poland" and "Grand Principality of Finland", although being constituents of the Russian Empire in those days, used the Gregorian calendar (VITKOVSKIY & LOVYAGIN, 1895). For this reason, the dates printed and stamped in Warsaw were consistent with the current Gregorian calendar, while those printed and stamped in Saint-Petersburg or Moscow, were 13 days earlier than in the Gregorian calendar.

(2) BARTENEV, 1910c. A separate reprint with its own cover showing the printed date of publication as 1910 (Fig. 2). According to the definition in the Glossary of the International Code of Zoological Nomenclature (1999; hereafter, ICZN), this edition, being a separate reprint supplied with its own date

of publication, should be interpreted as a *preprint*. The preprint contained the original descriptions of the three taxa in question, and if no earlier publications were found, according to Art. 21.8 of the ICZN, they would be considered as validly published in that preprint. Taking into account Art. 21.3.2 of the ICZN, mandating acceptance as the publication date the last day of a printed year or month unless there is evidence for an earlier specific date, and the fact that Poland used the Gregorian calendar, for taxonomic purposes the date of its publication should be accepted as December 31, 1910. It is noteworthy that the cover (Fig. 2) indicated that it was a preprint or a paper from two editions simultaneously: the above considered edition *Raboty iz Laboratorii zoologicheskogo Kabineta imperatorskago varshavskago Universiteta 1910 goda* (BARTENEV, 1911) and the journal *Varshavskiya universitetskiya Izvestiya* [Warsaw University Communications], which contained the next publication of the same paper.

(3) BARTENEV, 1910b. The journal *Varshavskiya universitetskiya Izvestiya* (Fig. 3): Bartenev's paper in question was published in parts in four sequential issues, 6-9, with the part published in issue 6 under a wrong title.

In all examined issues of this journal, most papers had their own pagination starting with page 1 but some were published in parts: in Contents the range of pages were separately indicated for each paper, e.g. "str. 1-8", or "str. 95-110",

Fig. 2. Cover (left) and title page (right) of a copy of the preprint of Bartenev's 'Transbaikalian' paper in Russian (BARTENEV, 1910c). – [Copy from L.D.F.B.M.S.U.]

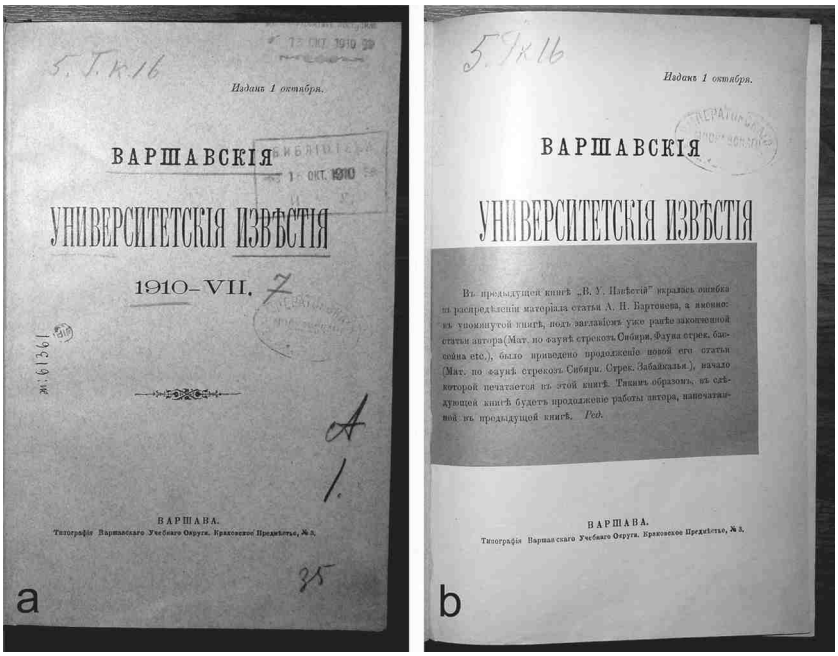

Fig. 3. Issue No. 7 (2010) of the *Varshavskiya univertitetskiya Izvestiya*: (a) cover; – (b) corrigendum to issue No. 6 glued under it. – [Copy from F.S.L.M.S.U.]

"str." being an abbreviation of the Russian word "stranitsy" meaning "pages". The relevant paper by Bartenev was mentioned in Contents for issue 7: "str. 1-24", for issue 8: "str. 41 56" (without a dash), and issue 9: "str. 57 77" (without a dash). Indeed, these issues contain the pages of this paper indicated in their Contents but pages 25-40 were missing.

Issue 7 had a sheet of red paper glued under the cover, over the title page (Fig. 3b), a corrigendum, with the following printed text: "In the previous book of "V[arshavskiya]. U[niversitetskiya]. Izvestiya" an error occurred in the redistribution of the material of the paper by A.N. Bartenev, namely, in the mentioned book, under the title of the already earlier finished paper ([Materials on the fauna of dragonflies of Siberia. Fauna of dragonflies of the basin...]), a continuation of his new paper was given (Materials on the fauna of dragonflies of Siberia. Dragonflies of Transbaikalia), the beginning of which is printed in this book. That is, in the following book there will be a continuation of the author's work printed in the previous one. *Edit[orial]*" (Russian citations are translated by O.K.). Indeed, the Contents of issues 5 and 6 mention the following paper (BARTENEV, 1910a): A.N. BARTENEV. [Materials on the fauna of dragonflies of Siberia. Fauna of dragonflies of the basin of the Tuba river, Minusinsk u[ezd] of Eniseiskaya

gub[ernia] on the data of excursion of 1908 year]; the contents for issue 5 indicate pages "str. 1 24" (without a dash), that for issue 6 indicate "str. 25 40" (without a dash). Issue 5 contained the above-mentioned Tuba river paper (BARTENEV, 1910a), while issue 6 contained pages 25-40 of the Transbaikalian paper (BARTENEV, 1910b).

It was quite a puzzle to learn which of the versions of the Russian paper was referenced by SCHMIDT (1933: 23) in his bibliography, as follows:
"[1910]e Матеріалы по фауне стрекозъ Сибири. (15) [1]) [Beiträge zur Libellenfauna Sibiriens.] (15) Работы Лабораторіи Зоолог. Кабинета Императорск. Варшавскаго Университ. (Варшавскія Университетскія Известія. 1910) [Laboratoriums-Arbeiten des Zoologischen Kabinets der Universität Warschau] p. 1-77 + 1 p. Errata [2]) – Cf. 1912e".

Besides, SCHMIDT (1933: 23) supplied this reference with the following footnote: "[2]) Die Arbeiten in Раб. Лаб. Зоол. Каб. Варшавск. Унив. erschienen (sec. FUDAKOWSKI i. l.) mit gleicher Band- und Jahrzahl (und offenbar auch Pagination) auch in Варшавск. Унив. Известия, die mir als solche nicht vorgelegen haben". However, it seems that SCHMIDT did not have both mentioned editions (cited here as BARTENEV, 1911 and BARTENEV, 1910b, respectively), otherwise he would not have made the statement that both papers had the same year of publication and the same volume, which was erroneous since the first mentioned edition was in fact published in 1911 (see above and Fig. 1), while both editions had no special volume numbers other than the publication year. At the same time, the doubted identity of pagination appeared true. We have to conclude that SCHMIDT (1933) referenced the preprint ("BARTENEV, 1911c"), on the cover of which both editions mentioned by Schmidt are indicated, although separated by a comma and without parentheses (Fig. 2).

DATE OF DESCRIPTION OF THE TAXA IN QUESTION

In BARTENEV, 1910b the description of *Leucorrhinia intermedia* is given on pages 13-17, that of *Sympetrum vulgatum* var. *grandis* on pages 19-20. These pages were included in issue 7 of "*Varshavskiya universitetskiya Izvestiya*", 1910. The description of *Somatochlora exuberata* is given in pages 22-29. The description of *S. exuberata* appeared to be fragmented in two pieces in "*Varshavskiya universitetskiya Izvestiya*": its end, pages 25-29, was published in the issue 6, ahead and under an incorrect paper title, while its beginning, pages 22-24, was published in issue 7.

Since, according to Art. 21.3.2 of the ICZN, we have to accept the publication date of the preprint (BARTENEV, 1910c) as December 31, 1910, the journal publication (BARTENEV, 1910b) has priority. Covers of the journal issues have a printed year below the journal title and a printed date of the relevant issue in the upper right corner, e.g. "Izdan 1 oktyabrya" [issued on October 1] (Fig. 3a). For

the relevant issues they are as follows: September 1 for issue 6, October 1 for issue 7, November 1 for issue 8 and December 1 for issue 9. In addition to the printed dates of issue, the cover of each has two stamps saying "v universitet postupilo [date]" [accepted by the Moscow university] and "Biblioteka [date]" [library] (Fig. 3a). For issues 6-9 these two dates are as September 13 and 15, October 13 and 15, November 8 and 7, December 13 and 14, respectively. These dates following the printed issuing dates (note the 13 days difference between the calendars used in Warsaw and Moscow) and hence indirectly confirm them. Taking into account that Poland within the Russian Empire used the Gregorian calendar and assuming that the taxon description is valid once it is completely published, we must accept the date of publication of *Somatochlora exuberata* as October 1, 1910, since the publication of the description was completed in issue 7. The same issue contains the complete descriptions of *Leucorrhinia intermedia* and *Sympetrum vulgatum* var. *grandis*, which hence had the same date.

The Russian descriptions of *Somatochlora exuberata* Bartenev 1910 and *Leucorrhinia intermedia* Bartenev 1910 (BARTENEV, 1910b) in issues 6-7, of "*Varshavskiya universitetskiya Izvestiya*" fit all criteria of availability of these newly proposed species group names (ICZN, Art. 11.9, 12). When introduced, these new species names were followed by "sp.n.". The new variation was indicated as "var.n." (BARTENEV, 1910b). According to Art. 45.6.4 of the ICZN, the name *grandis* Bartenev 1910 is also available as a species group name since it should be considered subspecific, as proposed as a variation before 1961.

Hence, the descriptions of *Somatochlora exuberata* and *Leucorrhinia intermedia* have been printed by Bartenev in two languages and in four different editions, one of which was published as fragmented into 4 parts and with some additional confusion, but it is this publication which has a priority as to the date of publication of these two taxa.

Publication of the same paper thrice (BARTENEV, 1910b, 1910c; BARTENEV, 1911) resulted from redistribution of the identical, once printed matter with different covers. All the Russian editions (BARTENEV, 1910b, 1910c; BARTENEV, 1911) indicated the same printing house: Printing House of Warsaw Educational District, Krakovskoe-Predmestye No. 3. The identity of the printed pages suggests that (at least) Bartenev's Russian paper (BARTENEV, 1910b, 1910c; BARTENEV, 1911) was printed once, with pagination starting from page 1, and then the print run was stitched into six different covers of three different editions: the journal "*Varshavskiya universitetskiya Izvestiya*" issues 6-9 of 1910 (BARTENEV, 1910b) (in this case involving confusion in stitching and referencing in the Contents), the preprint issued in 1910 (BARTENEV, 1910c) and the collected paper edition issued in 1911 (BARTENEV, 1911). This practice of redistribution of printed matter with different covers seems to have been common in those times, see the Introduction to a preprint (BARTENEV, 1909: 1) of two other papers by Bartenev: "Printing of the present paper failed to take place in spring of

this year in Tomsk, where in May they managed to print only the cover and title page for the paper "Lists of collections of invertebrates of Zool. Mus. of Tomsk Univ." and to make figures. Thus, as a consequence of my relocation to Warsaw, I had to postpone printing of the paper for more than half a year and, with permission of the Council of Tomsk University, to print it already in Warsaw".

THE FATE OF BARTENEV'S TYPE SPECIMENS

Leucorrhinia intermedia Bartenev, 1910 was described from males and females collected at eight localities (BARTENEV, 1910b, 1910c: 13), all of which are presently located in Zabaikaliskiy Kray province, formerly Chita province: Chita, behind the Ingoda river, 9-VI-1909; Chernovskaya, 10-VI-1909; Shaksha, 12-VI-1909; Sokhondo, 13-VI-1909; V[erkhniy]. Alenuy, 19-VI-1909; between V. Alenuy and Ust'-Alenuy, 21-VI-1909; Kavykuchi Gazimurskiya, 22/24-VI-1909; Uktycha, 29-VI-1909. The exact number of specimens is not known: for five localities "♂♂ and ♀♀" are indicated, for V. Alenuy only "♂♂", for Chernovskaya "1♂ and 1♀", for Sokhondo "1♂". From this system of listing it follows that there should be not less than 25 specimens in total. In spite of the fact that Bartenev's Russian paper was printed in Warsaw, the collection dates were given in the Julian calendar and should be shifted 13 days ahead to correspond to the current calendar. Also those dates were not corrected in the German translation (BARTENEF, 1912a).

Somatochlora exuberata Bartenev, 1910 was described from four localities, all being among the eight from which *L. intermedia* was described: Chernovskaya, 10-VI-1909; Verkhniy Alenuy, 19-VI-1909; Kavykuchi Gazimurskiya, 22/24-VI-1909; Uktycha, 28/29-VI-1909; "1♂" is reported from Chernovskaya and "♂" from Uktycha (either one male for two days or "♂♂" were implied), and "♂♂ and ♀♀" for the two other localities. In total there should be not less than 10 specimens.

Sympetrum vulgatum var. *grandis* Bartenev, 1910 was described from 3 ♂ and 4 ♀ (this time the exact number of specimens was reported) from lake Dalay-Nor (Inner Mongolia) collected on 9-VIII-1909 by S. Sergeev.

No holotypes or otherwise selected specimen(s) were mentioned; hence all these specimens were syntypes; those of *S. exuberata* and *L. intermedia* collected by Bartenev himself, those of *S. vulgatum* var. *grandis* collected by S. Sergeev.

The entire paper(s) (BARTENEV, 1910b, 1910c, 1911; BARTENEF, 1912a) contain no indication where Bartenev's Transbaikalian specimens were preserved. Indirect information suggests that all or at least some of those specimens were donated by Bartenev to Warsaw University. The above given citation from BARTENEV (1909) suggests that in spring 1909 Bartenev was still at Emperor Tomsk University, then he had to pause printing of the cited paper for half a year due to his relocation to Warsaw. His Transbaikalian trip took place in sum-

mer 1909, that is just in this half year, so he left Emperor Tomsk University either before or soon after it and then joined Emperor Warsaw University. In the introduction of the Transbaikalian paper(s), BARTENEV (1910b, 1910c; 1911: 4) wrote that "the work was done and written in Zoological Cabinet of Imperial Warsaw University, in the laboratory headed by Ya.P. Shchelkanovtsev". Issue 6 of "*Varshavskiya universitetskiya Izvestiya*" contained a "Short report on state and activity of Emperor Warsaw University for 1909-1910 academic year" which included the following text (ANONYMUS, 1910: 40): "The Cabinet keeper, A.N. Bartenev, worked on identification and bringing into order his collection of Odonata (mostly of the Palaearctic region). This collection, including 125 species, among which there are new and many rare ones, was donated by him to the Zoological Cabinet of Warsaw University".

In 1915, Warsaw University was evacuated (and Bartenev relocated) first to Moscow and then to Rostov-na-Donu (HUSAINOVA & BELYSHEV, 1971) and was converted into Don University, later Rostov-na-Donu University. During these events the University lost all its collections. We have in our possession a blank of a circular letter signed by "Head of Zoological Cabinet I. V. U., Professor", recently found in Moscow. Here is our translation of its Russian text: "The Zoological Cabinet of the Emperor Warsaw University, due to the war time circumstances, having lost all its furnishings, collections and library, and being re-established at a new place, in Rostov-na-Donu city, is presently concerned, according to the decision of the University Council, to resume, as soon as possible, lectures and courses in the current academic year; being deprived from any possibility of restoring a scientific library necessary for its activity, the Zoological Cabinet decided to address all Russian scientists-zoologists, including you, Dear Sir, in the hope of their sympathetic attitude to the difficult situation the Cabinet suffers, with a kind request not to refuse a bearable help in restoring its scientific library by sending reprints of possibly all your scientific works, papers, notes, reviews etc. Address for correspondence of any kind: Rostov na Donu, City Apartment House, Zoological Cabinet of Warsaw State University".

Some remnants of the collection of the Warsaw University were deposited in Rostov University until the 2nd World War when its building was destroyed (IVANOV, 1993). There is no doubt that the collection of the Zoological Cabinet of Warsaw University was lost as well. E.M. found remnants of some collections from Rostov University still kept in ZIN (specimens on cotton layers) but they contained much more recent specimens only.

At the same time, Bartenev kept his own collection and either did not donate all his specimens to Warsaw University or perhaps even withdrew them later. In a work devoted to Odonata specimens from the collection of the Zoological Museum of Emperor Academy of Science (presently ZIN), he mentioned Transbaikalian specimens of "*S. vulgatum grandis* Bart." and "*Agrion lanceolatum* Sel." with indication "(sobstv. koll)", that means "own coll.[ection]" (BARTENEV,

1912b: 448). There are indications of Transbaikalian specimens in Bartenev's own collection in some other of his works as well. In his monograph on the genus *Sympetrum* (BARTENEF, 1915; 1919), a list is given of all studied specimens for each species from the Zoological Museum, which do not include those collected by Bartenev in Transbaikalia in 1909. The latter, however, were enumerated in a bibliographical section in references to Bartenev's own works, e. g. for *Sympetrum flaveolum* (BARTENEF, 1915: 68), *S. pedemontanum* (BARTENEF, 1915: 133), *S. scoticum* (BARTENEF, 1915: 226, 234, 237) and *S. vulgatum imitans* (BARTENEF, 1915: 293). At the same time, legends to most figures contain the indication "koll. avtora", that means "author's coll.[ection]". Existence of Bartenev's large private collection was acknowledged in the introduction in BARTENEV & POPOVA (1928: 235): "Here, united materials on dragonflies from diverse places of the USSR are published from the collection of A.N. Bartenev. These collections were received from different persons before the revolution and information on them was at first intended for inclusion into a compendium on dragonflies of the USSR in the edition "*Fauna of Russia*" by the Academy of Science. Since this edition is not brought into order yet, it is useful to publish a part of this material as a separate paper."

It is noteworthy that in ZIN, a list is still kept of Odonata destroyed by Bartenev, which contained numerous specimens given to him on loan for his work on a volume of "*Fauna of Russia*" (BARTENEV, 1919). All were returned by Bartenev to the museum but in a completely destroyed state. Most likely, his private collection had the same sad fate in those years of civil war and desolation.

Bartenev's practice to keep his own private collection, which was lost after or, more probably, before his death in 1946 in Alma-Ata (presently Almaty, Kazakhstan), resulted in nearly all type specimens of numerous taxa proposed by him being lost as well. So far the only Bartenev's type specimen which we managed to locate in Russia is the holotype (the only specimen of the type series) of *Trigomphus anormolobatus* Bartenev, 1912, found in ZIN collection by E.M. in 2005; preserved because it already belonged to this collection when Bartenev examined it. Also, in 2011, A.M. found out that, in ZIN, a collection of Odonata (in paper envelopes) is kept which originated from Bartenev, but contained mostly specimens collected in 1930-40s in Central Asia. In this collection, the envelope was found probably containing the wings remaining from syntypes, largely destroyed by Dermestidae, of *Denticnemis bicolor* Bartenev, 1956 (a junior synonym of *Copera tokyoensis* Asahina, 1948).

At the same time, Bartenev used to exchange specimens with foreign odonatologists and even sent them his syntypes. He wrote that he had sent one female specimen of "*Sympetrum vulgatum grandis* Bart." to Réné Martin (BARTENEV, 1912b: 416); this specimen must be a syntype. This, and maybe other Bartenev's syntypes may be kept in R. Martin's collection in Museum National d'Histoire Naturelle in Paris (MNHN).

In his analysis of De Selys Longchamps' collection, RIS (1911) included additional collections which were specially mentioned; among them he mentioned "*Leucorrhinia intermedia*. (Coll. Ris: 1 ♂, 1 ♀ Tschita (ded. Bartenef, Cotypen)" (RIS, 1911: 712) and later added: "Ich verdanke der Güte von Herrn A. Bartenef, dass ich das eine der typischen Exemplare seines *Leptetrum rubrum* untersuchen konnte." (RIS, 1911: 1098). Presently RIS's collection is kept, under W.S. curatorship, in the Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt/Main, Germany (FMS). The two mentioned syntypes of *L. intermedia* are present there in good condition.

Tracing the unfortunate fate of the rest of the type specimens of numerous taxa described by Bartenev, who lived in such troublesome times – both locating still existing ones and, especially, proving the loss of the rest – would be a long, enormous work with very scarce results at most. This is far beyond the scope of this paper.

IMPLICATIONS FOR NOMENCLATURE

There is no taxonomical problem concerning *Sympetrum vulgatum* var. *grandis* Bartenev, 1910: it was synonymised with *Sympetrum vulgatum imitans* Selys, 1886 still by Bartenev himself (BARTENEF, 1915: 293) and this solution is kept until now, so *Sympetrum vulgatum* var. *grandis* Bartenev 1910 is a junior objective synonym of *Diplax imitans* Selys, 1886.

Specification of the correct date of the original description of *Somatochlora exuberata* Bartenev, 1910 exerts consequences as to the valid name of the united species if, following ASAHINA (1938), LOHMANN (1994) and MALIKOVA (2006), *Somatochlora japonica* Matsumura, 1911 is considered as a synonym of *Somatochlora exuberata* Bartenev, 1910. Recently KARUBE et al. (2012) came to this solution, namely the species *S. exuberata* with subspecies *S. e. exuberata* and *S. e. japonica*, based on the analysis of both morphological characters and the mitochondrial ITS1, ITS2, 16s rRNA and nuclear COI sequences. They correctly accepted for the species the valid name *Somatochlora exuberata* Bartenev, 1910, although assumed the preprint (BARTENEV, 1910c) for the earliest published original description.

The species status of *Leucorrhinia intermedia* Bartenev, 1910 used to be doubted by BELYSHEV (1964; 1966) and KOSTERIN (2004; 2005) who once considered it as a subspecies of *Leucorrhinia rubicunda* (Linnaeus, 1758) but later the same authors have restored the species status, although without full certainty (BELYSHEV, 1973; KOSTERIN & ZAIKA, 2010). The most conspicuous character distinguishing *L. intermedia* and *L. rubicunda* is the length of the lobes of the female valvula vulvae: long in the former and very short in the latter (BARTENEV, 1910b, 1910c, 1911; BARTENEF, 1912; 1933; KOSTERIN & ZAIKA, 2010). The difference in the shape of the male hamulus is also significant but more subtle (BARTENEV, 1910b, 1910c, 1911; BARTENEF, 1912a; 1933; BELYSHEV,

1973): in *intermedia* the hamuli are more deeply hollowed out than in *rubicunda*, making the anterior hook appear longer and more slender in the former; also the posterior side of the hamulus is angular in *intermedia* but rounded in *rubicunda*. (DUMONT et al., 2005). The problem of the relationship and status of these two taxa should be solved by analysis of the situation in the zone of the junction or overlapping of their geographical ranges which itself is still to be found (KOSTERIN & ZAIKA, 2010). Another problem concerns the subspecies *Leucorrhinia intermedia ijimai* Asahina, 1961, described from Hokkaido, Japan (ASAHINA, 1961). There is a controversy about its male hamulus shape, which was reported to resemble the European/Siberian species *L. rubicunda* (BELYSHEV, 1973: fig. 106b; note the figure captions for a and b are confused, b in fact showing *ijimai* and a showing the "type") but also to resemble the Asian *L. i. intermedia* by (HIROSE & ITOH, 1993: 5, fig. 21). Hence *rubicunda, intermedia* s. str, and *ijimai* may show a complicated pattern of morphological and evolutionary relationships (DUMONT et al., 2005).

DESIGNATION OF THE LECTOTYPE OF *LEUCORRHINIA INTERMEDIA* BARTENEV, 1910

Of Bartenev's three taxa considered in this paper, we managed to locate in FMS a pair of syntypes of *L. intermedia*. The above mentioned systematic

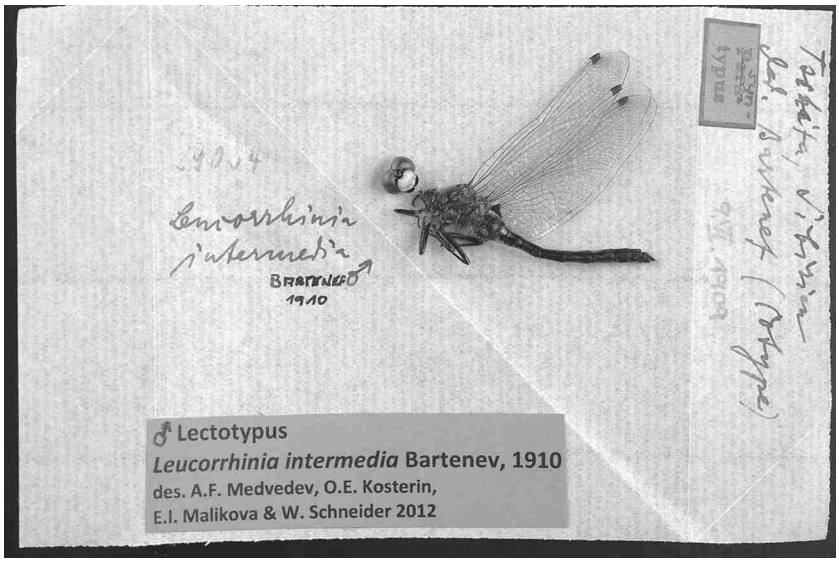

Fig. 4. The lectotype (male) of *Leucorrhinia intermedia* Bartenev, 1910 designated in this paper from a pair of syntypes from Ris' collection kept in Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt/Main, Germany (FMS) and its labels.

problems concerning the relationship of this taxon to *L. rubicunda* and *L. intermedia ijimai* make it highly desirable to have a single name-bearing type of *L. intermedia*, preserved in a European museum and available for examination. Otherwise, the name *Leucorrhinia intermedia* would remain associated with the series of syntypes, of which the number still existing is unknown. There is no information if and where some syntypes beyond the FMS pair are still preserved, what their characters are and if they are homogenous taxonomically. Most probably they are lost, but non-existence cannot be proved for sure. In this situation we find it necessary to designate the lectotype of *Leucorrhinia intermedia* chosen from the FMS pair, which well corresponds to the original description and current notion about this taxon. Besides, lectotype designation fixes the type locality, while the whole syntype series was associated with a mountainous territory of about 500 × 300 km (7° of longitude and 3.5° of latitude).

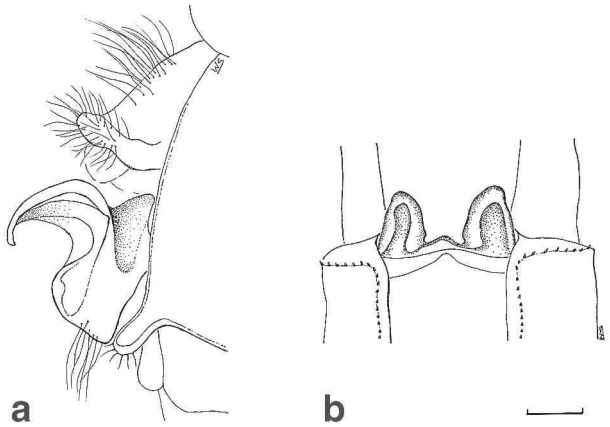

Fig. 5. The genitalia structures of the type specimens of *Leucorrhinia intermedia* Bartenev, 1910 from Ris' collection kept in FMS: (a) the secondary male genitalia structure of the lectotype; – (b) the female genitalia of the paralectotype. – [Scale bar 2 mm]

We had to choose between the male and female syntypes available. Although the most conspicuous character distinguishing *L. intermedia* and *L. rubicunda* is the length of the lobes of the female valvula vulvae, the *rubicunda*-shaped hamulus is the main intrigue over the Japanese taxon *L. intermedia ijimai*. Taking into account these circumstances, we selected the male syntype from "Tschita" (Fig. 4, 5a) from Ris' collection preserved in the Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt/Main, Germany (FMS) as the lectotype of *Leucorrhinia intermedia* Bartenev 1910. It bears the red rectangular label "LECTOTYPUS / *Leucorrhinia intermedia* / Bartenev 1910 / des. A.F. Medvedev, O.E. Kosterin, E.I. Malikova & W. Schneider 2012". This very specimen was described in detail by RIS (1911: 1908) so there is no need to repeat its description here, while Figures 4 and 5a show its general appearance and the hamulus shape, respectively. The female is labelled as the paralectotype; its valvula vulvae is shown in Figure 5b.

By this lectotype designation, we fix the type locality of *Leucorrhinia intermedia* Bartenev, 1910 to be Chita ('Tschita' in the German transliteration), a well

known city in Transbaikalia, East Siberia, presently the capitol of the Russian province of Zabaikalskiy Kray.

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MALE SECONDARY GENITALIA MIMIC THE FEMALE EGG DURING OVIPOSITION FOR SPERM DISPLACEMENT IN THE NON-TERRITORIAL DAMSELFLY *ISCHNURA ASIATICA* (BRAUER) (ZYGOPTERA: COENAGRIONIDAE)

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The ♀ sperm storage organs of *I. asiatica* include the bursa copulatrix and the spermatheca. The spermatheca is joined to the base of the bursa copulatrix by a spermathecal duct. At the tip of the ♂'s secondary genitalia, there is a pair of horns which might be used to remove sperm from the ♀ sperm storage organs. Since each horn of the ♂ genitalia is shorter than the spermathecal duct, the spermatheca might be inaccessible to ♂♂. However, sperm reduction occurs both in the bursa copulatrix and in the spermatheca during copulation. This suggests an alternative mechanism by which the ♂ can cause a decline in the spermathecal sperm. In order to investigate the mechanism of sperm reduction, an interrupted copulation experiment was conducted in the field. The extent of sperm reduction in the spermatheca was related to the width of the head of the secondary genitalia of the mated ♂. ♀♀ have mechano--receptive sensilla which communicate the presence of an egg to the muscles surrounding the sperm storage organs for fertilization. Therefore, the head of the secondary genitalia might mimic the movement of the egg that stimulates the sensilla to induce spermathecal sperm ejection by the ♀.

INTRODUCTION

In Odonata, males of most species displace the rival sperm stored in the female sperm storage organs (WAAGE, 1979). During copulation, the male inserts the lateral appendages on the secondary genitalia into the female sperm storage organs where the rival sperm masses are stored. The lateral appendages are used for trapping the sperm and then the sperm is removed by the males' copulatory

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abdominal movements. Thereafter, insemination with his own sperm occurs. Such a direct sperm removal process must be an efficient way to gain high fertilization success for the current copulating males, resulting in the high last-male sperm precedence reported for many species (e.g. FINCKE, 1984; SIVA-JOTHY & TSUBAKI, 1994; SAWADA, 1995).

Ischnura damselflies have been used in the study of sexual selection, particularly for clarifying sperm displacement mechanisms (reviewed in CÓRDOBA-AGUILAR et al., 2003). As in other zygopteran species, the male secondary genitalia of *Ischnura* is situated in the second abdomen sternite with the penis stem and the penis head (WAAGE, 1984). The penis stem is highly chitinized and the dorsal side bears a large and pliant membrane. The penis head is sclerotized and terminates in a small flap of cuticle normally folded back along the ventral side. At the tip of the male secondary genitalia, there is a pair of horns used for direct sperm displacement (ROBINSON & NOVAK, 1997). Female sperm storage organs consist of a bursa copulatrix and a spermatheca. The former connects directly and ventrally to the vagina and dorsally to the spermatheca via the narrow spermathecal duct. MILLER (1987) showed that the narrow spermathecal duct in the *Ischnura elegans* female does not allow males to remove much of the spermathecal sperm. However, CORDERO & MILLER (1992) found that the penis horn reach the end of the spermatheca in a virgin female of *I. graellsii*, and suggested that males can remove any volume of the spermathecal sperm in the mated female.

TAJIMA & WATANABE (2009) clarified that the number of spermatozoa stored in both the bursa copulatrix and the spermatheca decreased during copulation in *I. asiatica,* although each appendage of the male genitalia was significantly shorter than the spermathecal duct. No pairs in which the appendages reached the spermatheca in in-copula specimens were collected from the field (TAJIMA & WATANABE, 2009). Therefore, males of *I. asiatica* are not able to directly remove rival sperm stored in the spermatheca. Thus there must be an alternative mechanism by which males of *I. asiatica* remove spermathecal sperm indirectly.

For odonate females, mechano-receptive sensilla on their vaginal plates are used to communicate the presence of an egg to the muscles surrounding the sperm storage organs for fertilization throughout oviposition (MILLER, 1990). CÓRDOBA-AGUILAR (1999) indicated that sperm ejection induced by stimulation of the female sensory system was an indirect sperm-removal mechanism. During copulation, the penis enters the female genital duct and then the penis head becomes situated between the vaginal plates. Since the in-and-out movements of the penis head are carried out by males during the copulation, the penis head must stimulate the sensilla as if an egg was passing between the vaginal plates. Consequently, spermathecal sperm ejection must be induced. In fact, when males of *I. asiatica* insert their secondary genitalia into the female internal genitalia,

the penis head is in the vagina and the horns are in the bursa copulatrix or the entrance of the spermathecal duct (TAJIMA & WATANABE, 2009). Thus, the penis head contacts the vaginal plates. In the present study, we conducted an interrupted copulation experiment and examined the relationship between the number of spermatozoa remaining in the spermatheca and the width of the penis head of her mate. Because males with wide penis heads might stimulate the female sensory system more strongly, a wider penis head would be expected to remove more rival sperm from the spermatheca.

MATERIAL AND METHODS

The copulation process of *I. asiatica* consists of three distinct behavioral stages as described in TAJIMA & WATANABE (2009). In stage I, the male rhythmically depresses and stretches the first and the second abdominal segments. In stage II, the male initially thrusts the third abdominal segment with high frequency but the frequency of the thrusts then gradually decrease. Stage III is a phase without any apparent movement of the abdomen in either the male or the female. Sperm removal from the female sperm storage organs occurs during stage I. The sperm is transferred during stage II and III (TAJIMA & WATANABE, 2010).

An interrupted copulation experiment was conducted at a pond located in Tsukuba city, Ibaraki prefecture, in the warm temperate zone of Japan. In July of 2008 and 2009, many copulating pairs were found in tandem from early morning to noon along the edge of the pond.

Copulating wheels were collected when we walked slowly along the edge of the pond between 05:00 and 11:00 on sunny days with little wind (a total of 8 days). The wheels were gently captured in a net without any disturbance and immediately moved into a small cylinder cage with 2-mm mesh (30 cm in diameter, 20 cm in height). Each pair that remained in the wheel position during stage I in the cage was used for the experiment (31 pairs).

Copulation interruption just after the end of stage I was conducted by separating the pair gently by hand. Immediately after the interrupted copulation, the abdomen length of each individual was measured using a digital caliper. Males were then put into a vial of absolute ethanol, while females were placed into a plastic cup in a shaded box with an ice pack to reduce their activity and transported to the laboratory.

The sperm count procedure was described in TAJIMA & WATANABE (2009). Females were decapitated, and their abdomens were cut with dissecting scissors. They were placed in insect Ringer's solution and dissected to detach the sperm storage organs using fine forceps. The spermatheca was easily identified from the bursa copulatrix. They were individually put into respective tissue-homogenizers containing 0.5 ml of insect Ringer's solution and ruptured. The sperm samples were then mixed by gentle pipetting. The number of spermatozoa was counted more than five times in each sample using a blood-haemocytometer under a stereomicroscope (×75). Because the volume of the bursa copulatrix and spermatheca is much smaller than 0.5 ml of insect Ringer's solution (bursa copulatrix: about 0.005mm^3, spermatheca: about 0.003mm^3), we did not consider the volume of both organs for estimating the number of spermatozoa.

Males preserved in a vial of absolute ethanol were placed in Ringer's solution and dissected to detach the secondary genitalia. The size of the secondary genitalia was measured using an ocular micrometer under a stereomicroscope (×75). We used fine forceps to fix the secondary genitalia horizontally to measure its size.

RESULTS

All females in tandem pairs contained sperm in the bursa copulatrix and/or spermatheca, indicating that these females had mated. The mean length of the abdomen was 23.9 ± 0.1 mm for females (± S.E., n = 31) and 23.2 ± 0.2 mm (± S.E., n = 31) for males. The length of the abdomen for males was significantly larger than that for females (Mann-Whitney U-test, U = 284, P = 0.006). The mean width of the penis head was 300.0 ± 2.4 μm (± S.E., n = 31). The average number of spermatozoa contained in the bursa copulatrix was 5,151.5 ± 837.2 (± S.E., n = 31), ranging from 0 to 21,000, and that in the spermatheca was 9,090.9 ± 1,364.0 (± S.E., n = 31), ranging from 1,000 to 31,000.

Just after stage I of the copulation, the number of bursal spermatozoa in each pair was decreased to less than the half of the initial number, ranging from 21,000 to 0 (Fig. 1). The males must have performed some sperm removal. The horns on the tip of the penis are observed to be inserted easily into the bursa copulatrix due to their length. The bursal sperm can then be directly removed by the horns. However, there was no relationship between the number of spermatozoa that remained in the bursa copulatrix and the width of the penis head of the mated male. This indicates that the size of the penis head itself did not affect bursal sperm removal.

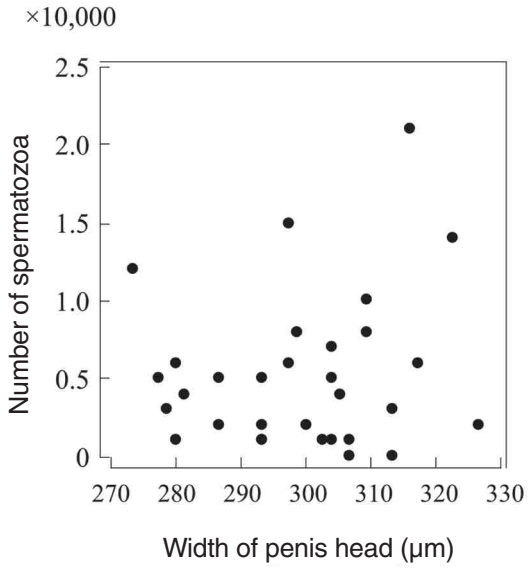

Fig. 1. Relationship between the width of the penis head and the number of spermatozoa remaining in the bursa copulatrix when copulation is interrupted just after stage I (F = 0.69, P = 0.41).

Although the penis head is located in the vagina during stage I, the number of spermatozoa in the spermatheca of females was not greatly decreased. Instead, there was a wide variation in the number of spermatozoa, from 1,000 to 31,000, indicating that not all males removed spermatozoa from the spermatheca, probably because the length of the horns of the male penis was not sufficient to reach the spermatheca of the female. The sperm decrease in the spermatheca was not caused by direct sperm removal using the horns. However, the number of spermatozoa that remained in the spermatheca

significantly decreased with the width of the penis head of the mated male (Fig. 2). The width of the penis head was suggested to be related to spermathecal sperm removal during stage I. The regression line indicates that males with a penis head that was about 325 μm in width removed almost all of the sperm stored in the spermatheca.

DISCUSSION

Odonata females store sperm both in the bursa copulatrix and in the spermatheca (WAAGE, 1984), and they fertilize their eggs just before oviposition (CORBET, 1999). Although SIVA-JOTHY & HOOPER (1995, 1996) pointed out that most eggs may be fertilized by bursal sperm due to positional effects immediately after copulation, the sperm originally stored in the spermatheca may be used for fertilization in females of the species with relatively longer life spans (NAKAHARA & TSUBAKI, 2007). Therefore, it is important for males to achieve sperm precedence by removing all sperm in the bursa copulatrix and spermatheca of females.

Males of *Ischnura* species have a pair of horns in their secondary genitalia but the function of the horns seems to differ among the species (ROBINSON & NOVAK, 1997). The horns of *I. graellsii* males can enter into the spermatheca so as to directly remove sperm from the spermatheca (CORDERO & MILLER, 1992). In contrast, MILLER (1987) found that no horns entered the spermathecal duct in *I. elegans* during copulation, indicating that the horns are not used for spermathecal sperm removal. However, at the tip of the male secondary genitalia of *I. asiatica*, as well as in other *Ischnura* species, there is a pair of horns used for direct sperm displacement from the bursa copulatrix (TAJIMA & WATANABE, 2010). The length of the horns and the spermathecal duct in females in *I. asiatica* were about 350 μm and about 610 μm,

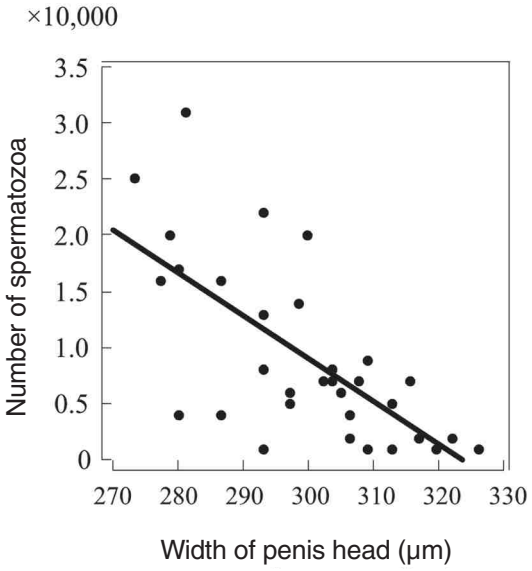

Fig. 2. Relationship between the width of the penis head and the number of spermatozoa remaining in the spermatheca when copulation is interrupted just after stage I. Solid line (Y = 123,000-381X) represents a regression line ($F = 27.3$, $P < 0.01$).

respectively, while the widths of the horns and spermathecal duct were about 37 μm and about 50 μm respectively (TAJIMA & WATANABE, 2009). Because the spermathecal duct is significantly longer than the horns, it is unlikely that there were any copulatory pairs in which the horns reached the spermatheca, though the horns were found in the bursa copulatrix. Therefore, males of *I. asiatica* could not reach the spermatheca as in the case of *I. elegans*.

During copulation, males transferred about 64,500 and about 43,000 spermatozoa into the bursa copulatrix and the spermatheca respectively (TAJIMA & WATANABE, 2010). Most solitary females before copulation in the field were experienced ones that contained about 46,000 and about 30,000 spermatozoa in the bursa copulatrix and the spermatheca respectively (TAJIMA & WATANABE, 2009). In the present study, females were interrupted just after stage I of the copulation, at which point the male had still to finish removing the rivals' sperm, stored in the bursa copulatrix and the spermatheca - about 5,200 and about 9,100 spermatozoa respectively but with a large variation in the number. Because the male has to start to transfer his own sperm after stage I of the copulation, few males could remove sperm further. Consequently, such a large variation in the number of spermatozoa remaining in the spermatheca suggested that there was a large variation in the sperm displacement rate in *I. asiatica*. A low or high sperm displacement rate might result in a low or high number respectively of the mating male's own sperm being transferred into the female sperm storage organs. Therefore, a large variation of males' fertilization success in the field is likely to occur.

MILLER (1987) described the morphology of the female genital tract in *I. elegans* and stated that sensory stimulation by the male could lead to sperm removal. Females have two vaginal plates bearing mechano-receptive sensilla which communicate the presence of an egg to the muscles surrounding the sperm storage organs for fertilization. These muscles might have the function of inducing the release of sperm stored in the spermatheca (CÓRDOBA-AGUILAR, 2003). In *Calopteryx haemorrhoidalis asturica*, the appendages of the male secondary genitalia are too wide to enter into the spermatheca but the behavior of the shaft of the secondary genitalia stimulates the mechano-receptive sensilla to induce spermathecal sperm ejection (CÓRDOBA-AGUILAR, 1999). Since the morphology of the female sperm storage organs in *I. asiatica* are similar to those in *I. elegans*, TAJIMA & WATANABE (2009) pointed out that such stimulation of the female sensory system might be one likely explanation for the spermathecal sperm decrease.

The penis head contacts the vaginal plates bearing the mechano-receptive sensilla during copulation in *I. asiatica* (TAJIMA & WATANABE, 2009). In stage I of the copulation, the male depresses and stretches the first and second abdominal segments (TAJIMA & WATANABE, 2010). The penis head of the male must be used to stimulate the mechano-receptive sensilla during stage I, because

the width of the penis head was related to the number of spermatozoa remaining in the spermatheca. The present study suggests that spermathecal sperm were not directly removed using the penis horns but were rather removed by stimulating the female sensory system. Therefore, with the abdominal movement that occurs in stage I of copulation, the penis head might mimic the movement of the egg. Since males with wide penis heads stimulate the female sensory system more strongly, the width of the penis head was positively correlated with the amount of sperm ejected from the spermatheca. The width of the penis head is considered to be an important trait that affects the sperm displacement rate from the spermatheca in *I. asiatica*. Further study is needed to clarify the spermatozoan dynamics in relation to the morphology of the male secondary genitalia and the female vaginal sensilla.

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ODONATA OF VIDARBHA REGION, MAHARASHTRA STATE, CENTRAL INDIA

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A survey of water bodies of the Vidarbha region of central India was conducted during 2006-2012. A total of 82 spp. were recorded. The study adds 13 new spp. for the Vidarbha region and 6 spp. for Maharashtra state. Of the total, 23 spp. were abundant or very common, 26 were common, 24 rare and 9 very rare. The study shows that ecological disturbances in Vidarbha due to industrial and human activities are a threat to the odon. fauna. *Mortonagrion varralli* and *Copera ciliata,* which were recorded by earlier workers in this region, were not found during this survey. However, protected small and big water bodies used for agriculture and domestic usage provide valuable habitat for Odonata.

INTRODUCTION

Odonates are prominent freshwater insects and play an important role in wetland and terrestrial food chains as predators. They are also reliable indicators of overall ecosystem health. The odonate fauna of the Indian region is well documented. The taxonomy of adults is well worked out and descriptions are available for almost all the reported species (FRASER, 1924, 1933, 1934, 1936; SUBRAMANIAN, 2009a).

India harbours 463 species and subspecies belonging to 140 genera in 19 families (SUBRAMANIAN, 2009a). Prior to 1955, only 28 odonate species were recorded from central India, including the Vidarbha region (FRASER, 1933-1936). The scientists of the Zoological Survey of India (ZSI) and various odonatologists from the academic institutes of this region have often surveyed various parts of

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Vidarbha but their studies were mostly localized to a small area (Tab. 1). Here we provide a comprehensive account of the diversity of odonates of the Vidarbha region based on fresh field studies and past records.

STUDY AREA

The study area (Fig. 1) classified biogeographically as the Central Deccan Plateau and covers the districts of Amravati, Akola, Bhandara, Buldana, Chandrapur, Gadchiroli, Gondia, Nagpur, Wardha, Washim and Yavatmal. Topographically, the region is flat undulating terrain, devoid of any major hill ranges. Large numbers of wetlands, such as ponds and lakes, dot this landscape. The Satpura Range lies to the North of Vidarbha. The Melghat hills of Amravati district form the southern offshoot of the Satpura Range. The Wainganga, a major tributary of the Godavari, is the largest river of Vidarbha. Other rivers that drain this region are the Wardha and Kanhan, which are also the tributaries of the Godavari river. To the North, six small rivers, the Khandu, Khapra, Sipna, Gadga, Dolar and Purna, drain into the Tapti river.

The region has three main seasons: the wet monsoon and post-monsoon season from June to October, the cool dry winter from October to March and the hot dry season from April till the onset of rains in the beginning of June. The temperature of Vidarbha ranges from a minimum of 12-25°C to a maximum of 30-48°C, with relative humidity varying from 10-15% to 60-95%. Annual precipitation is 1700 mm. About 90% of the precipitation takes place from June to September.

The forest types found in this area are classified as sub-tropical hill forests, tropical moist deciduous forests and tropical dry deciduous forests (CHAMPION & SETH, 1968). These forests are cur-

Table I
Summary of Odonata studies of the Vidarbha region, Maharashtra state (MS)

Reference	No. of species	New addits to MS	Area
FRASER, 1933, 1934, 1936	28		
MITRA, 1986	21	11	Bhandara and Nagpur city
ANDREW, 1995	31	12	Ghodazari forest, Navegaon National Park and Brahmapuri town
PRASAD, 1996	46	10	Wardha district
ANDREW & TEMBHARE, 1997	43	02	Nagpur city
KALASKAR & KALASKAR, 1998	20	*	Pench National Park
ANDREW & CHANDR ASHEKHAR, 2001	48	05	Umrer town
KULKARNI et al., 2002	01	01	Melghat Tiger Reserve
KULKARNI et al., 2004	38	02	Pench National Park
KULKARNI et al., 2006	41	*	Tadoba National Park
KULKARNI & PRASAD, 2005	24	*	Melghat Tiger Reserve
TALMALE & KULKARNI, 2003	19	*	Paddy fields of Bhandara district
PATANKAR et al., 2008			Nagpur city (NEERI)
TIPLE et al., 2008	62	18	Nagpur city
BABU et al., 2009	05	05	Nagpur, Maharashtra

Table II
Details of study areas

Area	Longitude	Latitude	Altitude (m)	Annual mean temp. (ºC)	Average annual rainfall (mm)
Nagpur city	79.07684	21.14939	319	26	1090
Pench Tiger Reserve forest	79.22791	21.70165	491	25	1057
Tadoba Tiger Reserve forest	79.40094	20.1999	232	27	1342
Gondakhairi lake	78.93848	21.15803	339	26	1055
Koradi lake	79.09058	21.25645	293	27	1045
Linga lake	79.09555	21.25757	293	27	1045
Bhandara region	79.66461	21.16988	259	27	1240
Ghorpad Dam	78.7615	21.27277	384	26	1011
Bor Dam and wild life sanctuary	78.70485	20.97173	363	27	1036
Kanhan river	79.22705	21.22637	280	27	1104

rently restricted to Melghat Tiger Reserve in Amravati district, Tadoba Andhari Tiger Reserve in Chandrapur district and Pench Tiger Reserve in Nagpur district.

MATERIAL AND METHODS

Odonates were collected, photographed and identified. The details of the study areas are provided in Table II. The collections were made from and around Nagpur city, Pench Tiger Reserve forest, Tadoba Tiger Reserve forest, Gondakhairi lake, Koradi lake, Linga lake, Bhandara region, Ghorpad Dam, Bor Dam, Kanhan river and temporary and permanent flowing or still water bodies of Vidarbha (Fig. 1). A monthly survey was undertaken during the monsoon (July-August) and post monsoon period at all sites. The adult specimens were identified with the help of identification keys provided by FRASER (1933-1936), MITRA (1986), SUBRAMANIAN (2009a) and ANDREW et al. (2008). All nomenclature follows SUBRAMANIAN (2009b).

The species were categorized on the basis of their abundance; for the categories see Table III.

RESULTS AND DISCUSSION

The compilation of all the studies on the Vidarbha region together with the present records, results in a total of 82 species referable to 47 genera, of 9 families (Tab. III). This study adds 13 new species for Vidarbha region and 7 species for the Maharashtra state. Of the 82 species, 23 were abundant or very common, 26 were common, 24 rare and 9 very rare. The highest number of odonates belong to the Libellulidae (38 species), followed by the Coenagrionidae (21), Aeshnidae (6), Gomphidae (5), Platycnemididae, Protoneuridae and Lestidae (3 species of each), Macromiidae (2) and Chlorocyphidae (1) (Fig 2).

In Table III, the species recorded for the first time from the Vidarbha region are asterisked (*), and those which were previously unrecorded in the Maharashtra state are marked by #, viz.: *Caconeura ramburi, Prodasineura verticalis, Pseudag-*

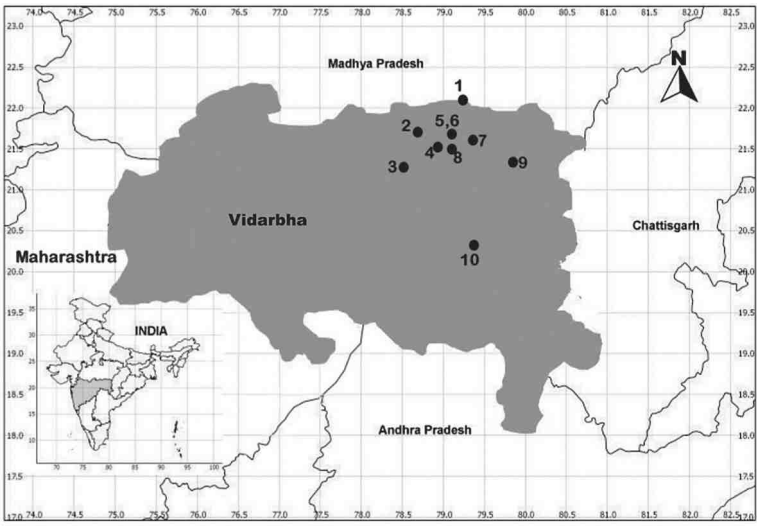

Fig. 1. Odonata collection sites in the Vidarbha region of central India: (1) Pench Tiger Reserve; – (2) Ghorpad Dam; – (3) Bor Dam; – (4) Ling lake; – (5) Koradi lake; – (6) Gondhakahari lake; – (7) Kanhan river; – (8) Nagpur city; – (9) Bhandara; – (10) Tadoba Tiger Reserve.

rion malabaricum, Anax parthenope, Gynacantha dravida, *Ictinogomphus distinctus* and *Aethriamanta brevipennis*.

Anax parthenope, a very widely distributed species, was recorded only from North India and Western Ghats while *Aethriamanta brevipennis* was earlier reported from Bihar, West Bengal and Western Ghats (PRASAD & VARSHNEY, 1995).

The following species are 'Data Deficient' under IUCN guidelines. *Ictinogomphus distinctus* (DOW, 2009b) has been reported from Santragachi, Howrah and

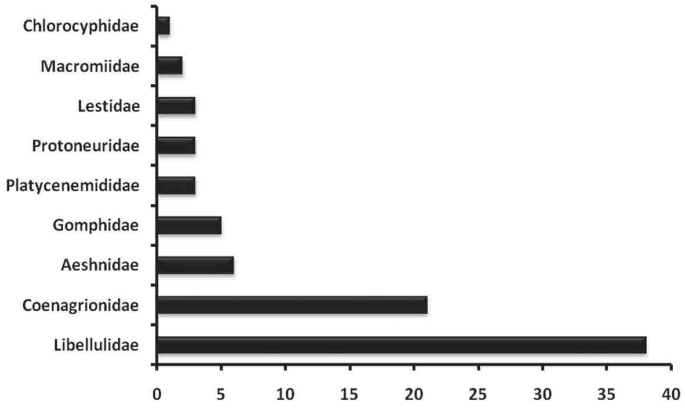

Fig. 2. The number of odonate species encountered in different families in the Vidarbha region.

Table III

Odonates of Vidarbha region, their occurrence and status – [*: new record in Vidarbha; – #: new record for Maharashtra state; – abundance acronyms (after TIPLE et al., 2008): VC: very common (> 100 sightings); – C: common (50-100 sightings); – R: rare (2-15 sightings); – VR: very rare (< 2 sightings)]

Species	Status	Distribution
Zygoptera		
Protoneuridae		
Caconeura ramburi (Fraser, 1922)*#	VR	Pench National Park, Nagpur
Disparoneura quadrimaculata (Rambur, 1842)	C	throughout Vidarbha
Prodasineura verticalis (Selys, 1860)*#	C	Gorewada, Futala & Ambazari lake, Nagpur city
Platycnemididae		
Copera ciliata (Selys, 1963)	R	Todoba National Park, Chandrapur
Copera marginipes (Rambur, 1842)	VC	throughout Vidarbha
Copera vittata deccanensis Laidlaw, 1917	C	throughout Vidarbha
Coenagrionidae		
Aciagrion pallidum (Selys,1891)	C	Futala & Ambazari lake, Nagpur city
Aciagrion occidentale Laidlaw, 1919*	VR	Sonegao lake, Nagpur city & Todoba National Park, Chandrapur
Agriocnemis lacteola (Selys,1877)	R	Ambazari lake, Nagpur city
Agriocnemis femina (Brauer, 1868)	C	throughout Vidarbha
Agriocnemis pygmaea (Rambur, 1842)	VC	throughout Vidarbha
Paracercion calamorum (Ris,1916)	R	Nagpur city
Paracercion malayanum (Selys, 1876)*	R	Futala, Nagpur city
Ceriagrion cerinorubellum (Brauer, 1865)	R	Gorewada & Ambazari lake, Nagpur city
Ceriagrion coromandelianum (Fabricius, 1798)	VC	throughout Vidarbha
Ceriagrion olivaceum Laidlaw, 1914	R	Tadoba & Pench National Park
Enallagma parvum (Selys,1876)	C	throughout Vidarbha
Ischnura aurora (Brauer, 1865)	VC	throughout Vidarbha
Ischnura senegalensis (Rambur, 1842)	C	throughout Vidarbha
Mortonagrion varralli (Fraser, 1920)	R	Nagpur city and paddy field Bhandara
Pseudagrion decorum (Rambur, 1842)	VC	throughout Vidarbha
Pseudagrion hypermelas (Selys,1876)	R	Ambazari lake, Nagpur city
Pseudagrion malabaricum Fraser, 1924*#	C	Gorewada, Futala & Ambazari lake, Nagpur city
Pseudagrion microcephalum (Rambur, 1842)	R	Gorewada, Futala & Ambazari lake, Nagpur city
Pseudagrion rubriceps (Selys, 1876b)	VC	throughout Vidarbha
Pseudagrion spencei Fraser, 1922*	C	Nagpur city, Todoba & Pench National Park; Bor Wildlife Sanctuary
Rhodischnura nursei (Morton,1907)	VC	throughout Vidarbha
Lestidae		
Lestes elatus Hagen in Selys, 1862	R	Ambazari lake, Nagpur city
Lestes umbrinus Selys, 1891	VC	throughout Vidarbha
Lestes viridulus Rambur, 1842	R	Nagpur city, Todoba & Pench National Park, Bor Wildlife Sanctuary
Chlorocyphidae		
Libellago lineata indica (Fraser, 1928)	C	throughout Vidarbha

Table III, continued

Species	Status	Distribution
Anisoptera		
Aeshnidae		
Anax guttatus (Burmeister, 1839)	VC	throughout Vidarbha
Anax immaculifrons (Rambur, 1842)	C	throughout Vidarbha
Anax parthenope (Selys, 1839)#	VR	Futala lake, Nagpur city
Gynacantha bayadera Selys, 1891	C	throughout Vidarbha
Gynacantha dravida (Lieftinck, 1960)#	R	Ambazari lake, Nagpur city
Hemianax ephippiger (Burmeister, 1839)	C	throughout Vidarbha
Gomphidae		
Anormogomphus heteropterus Selys, 1854*	R	Futala lake, Pench National Park, Nagpur
Ictinogomphus rapax (Rambur, 1842)	VC	throughout Vidarbha
Ictinogomphus distinctus Ram, 1985*#	R	Futala lake, Nagpur city
Macrogomphus annulatus (Selys, 1854)	C	Futala & Ambazari lake, Nagpur city
Paragomphus lineatus (Selys, 1850)	C	throughout Vidarbha
Macromiidae		
Epophthalmia vittata (Burmeister, 1839)	C	Futala lake, Maharajbag garden Nagpur city & Bor Wildlife Sanctuary, Wardha
Macromia flavicincta (Selys, 1874)*	VR	Futala lake & Agriculture nursery, Nagpur city
Libellulidae		
Acisoma panorpoides Rambur, 1842	C	throughout Vidarbha
Aethriamanta brevipennis (Rambur, 1842)#	VR	Nagpur city
Brachydiplax sobrina (Rambur, 1842)	VC	throughout Vidarbha
Brachythemis contaminata (Fabricius, 1793)	VC	throughout Vidarbha
Bradinopyga geminata (Rambur, 1842)	VC	throughout Vidarbha
Cratilla lineata calverti (Foerster, 1903)	R	Sonegao lake, Nagpur city
Crocothemis servilia (Drury, 1770)	VC	throughout Vidarbha
Diplacodes lefebvrii (Rambur, 1842)*	R	Futala & Ambazari lake, Nagpur city and Melghat, Amravati
Diplacodes nebulosa (Fabricius, 1793)	R	Gorewada, Futala & Ambazari lake, Nagpur city
Diplacodes trivialis (Rambur, 1842)	VC	throughout Vidarbha
Indothemis carnatica (Fabricius, 1798)*	VR	Futala lake, Nagpur city and Melghat, Amravati
Lathrecista asiatica (Fabricius, 1798)	C	throughout Vidarbha
Neurothemis fulvia (Drury, 1773)	C	throughout Vidarbha
Neurothemis intermedia (Rambur, 1842)	C	throughout Vidarbha
Neurothemis tullia (Drury, 1773)	C	throughout Vidarbha
Orthetrum sabina sabina (Drury, 1770)	VC	throughout Vidarbha
Orthetrum japonicum internum MacLachlan, 1894	VR	Seminary Hills, Nagpur city
Orthetrum chrysis (Selys, 1891)	C	throughout Vidarbha
Orthetrum glaucum (Brauer, 1865)	VC	throughout Vidarbha
Orthetrum luzonicum (Brauer, 1868)	R	Gorewada, Futala & Ambazari lake, Nagpur city
Orthetrum pruinosum neglectum (Rambur, 1842)	VC	throughout Vidarbha
Orthetrum taeniolatum (Schneider, 1845)	R	Seminary Hills, Nagpur city

Table III, continued

Species	Status	Distribution
Palpopleura sexmaculata (Fabricius, 1787)	VR	Gorewada lake, Nagpur city and Godia
Pantala flavescens (Fabricius, 1798)	VC	throughout Vidarbha
Potamarcha congener (Rambur, 1842)	C	throughout Vidarbha
Rhodothemis rufa (Rambur, 1842)	R	Futala lake, Nagpur city
Rhyothemis variegata (Linnaeus, 1763)	VC	throughout Vidarbha
Tetrathemis platyptera (Selys, 1878)	R	Gorewada lake, Nagpur city
Tholymis tillarga (Fabricius, 1798)	C	throughout Vidarbha
Tramea virginia (Rambur, 1842)	C	throughout Vidarbha
Tramea basilaris burmeisteri (Kirby, 1889)	VC	throughout Vidarbha
Tramea limbata similata (Rambur, 1842)	R	Gorewada, Futala & Ambazari lake, Nagpur city
Trithemis aurora (Burmeister, 1839)	VC	throughout Vidarbha
Trithemis festiva (Rambur, 1842)	C	throughout Vidarbha
Trithemis kirbyi (Selys, 1891)*	R	Futala lake & Kanan river, Nagpur city
Trithemis pallidinervis (Kirby, 1889)	VC	throughout Vidarbha
Urothemis signata (Rambur, 1842)*	VR	Futala lake, Nagpur city
Zyxomma petiolatum (Rambur, 1842)	R	Futala & Ambazari lake, Nagpur city

West Bengal; *Macromia flavicincta* (DOW, 2010) has been reported from Bengal and Western Maharashtra (Pune & Mahabaleshwar), while *Caconeura ramburi* (DOW, 2009a) was supposed to be endemic to Western Ghats (FRASER, 1933) but was recently reported from the Similipal Tiger Reserve, Eastern Ghats, Orissa (DAS et al., 2012). The fourth species, *Gynacantha dravida* (MITRA & DOW, 2010), an Indian endemic, has been reported from Western Ghats and North and North-East India. *Indothemis carnatica* and *Pseudagrion malabaricum* were earlier reported from Western Ghats and West Bengal.

Interestingly, *Mortonagrion varralli* and *Copera ciliata*, which were recorded by earlier workers from this region, were not found during this study (ANDREW & TEMBHARE, 1997; KULKARNI et al., 2004). The probable causes of this could be the loss of habitats by ever expanding urbanization along with the broader climatic changes. Since the last decade, the cities of this region have expanded, causing loss of natural habitats of odonates. Urban development is expected to have a deleterious impact on animal populations with reduction in the area of natural and semi-natural habitats. The quality of residual habitats may also be adversely affected by various forms of pollutants (TIPLE & KHURAD, 2009). Although KULKARNI et al. (2012) have reported 101 species from the entire Maharashtra state, this survey reports 82 species from Vidarbha, which covers only 30% of the area of the state. The Vidarbha region forms a unique resource of odonate diversity and the present observations support the importance of this region in providing valuable habitat for Odonata, probably due to the presence

of rivers, dams and temporary and permanent flowing or still water bodies with dense shrub and tree vegetation. The observations recorded in the present study may prove valuable as a reference for assessing the changes in future due to the environmental conditions in the Vidarbha region.

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SHORT COMMUNICATIONS

DESCRIPTION OF THE LAST INSTAR LARVA OF *ORCHITHEMIS PULCHERRIMA* BRAUER FROM SARAWAK, MALAYSIA (ANISOPTERA: LIBELLULIDAE)

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A ♂ larva is described and illustrated. The labium, with its lack of large mental setae, frontal margin and palpal shape, is similar to that in some *Orthetrum* spp. So are also the small eyes, but the rounded shape of the head is not.

INTRODUCTION

Orchithemis pulcherrima is found commonly in lowland swamp throughout Sundaland (LIEFTINCK, 1954) and has also been recorded from Thailand (HÄMÄLÄINEN & PINRATANA, 1999) and the Philippines (HÄMÄLÄINEN & MÜLLER, 1997). Two other species of the genus, *O. pruinans* and *O. xanthosoma*, are also found in Sarawak (DOW & UNGGANG, 2010) but are less commonly encountered.

METHODS

Several larvae were obtained from the Sarawak Planted Forest Project. The exuviae of the male larva described was cleaned and illustrated using a flatbed scanner, stereo microscope and micrometric eye piece, the specimen was laid out, but not flattened and the labium was detached.

ORCHITHEMIS PULCHERRIMA BRAUER

Figures 1-3

M a t e r i a l. – 1 ♂ final instar larva, BORNEO, Sarawak: Bintulu Division, stream near Kakus Nursery, collected 28-IV-2011, hatched 4-VIII-2011.

HABITUS (Fig. 1). – Total length 15 mm. Shape typical libellulid with small head and thorax.

H e a d (Fig. 1). – Rounded in profile, both frontally and rearwards. Frons slightly protruberant, masking the vertically set clypeal area. The surface is covered with patches of long setae, particularly on the margins and centrally by scattered shorter setae. The frontal margin curves around to the lateral areas and then continues to curve to the rear of the head, then straightening to the central area. The lateral and rear margins bear mixed fields of long and shorter setae. The ground colour is pale brown with darker patches around the ocelli and on the occiput. Eyes are small only just breaking the outline of the lateral margin and slightly curved rearwards.

Antennae 7-segmented, with scattered long setae present on segments 1-6.

Ratios segments 1-7 = 0,5: 1,0: 2,0: 1,2: 1,5: 1,5: 1,3.

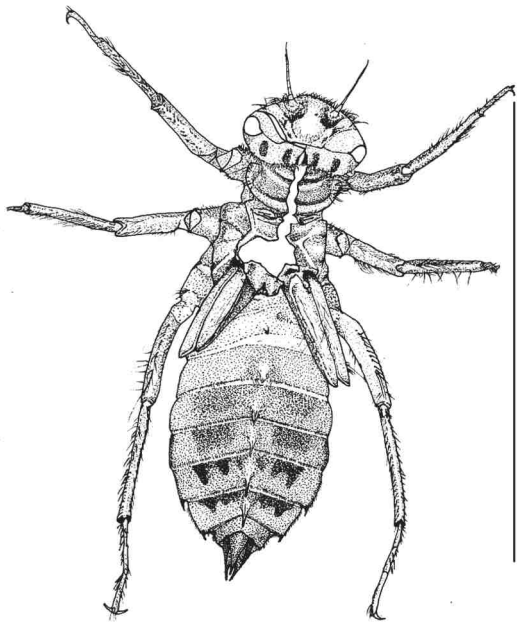
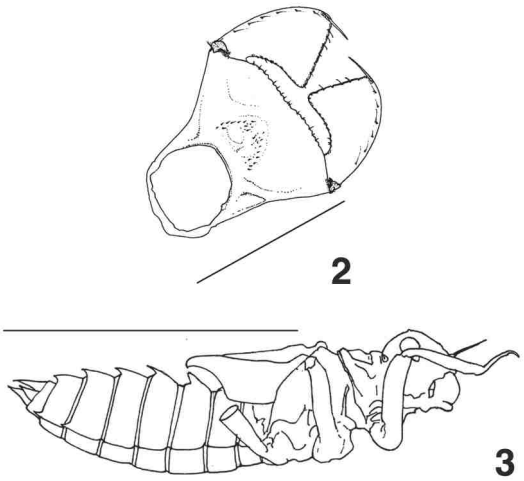


Fig. 1. *Orchithemis pulcherrima*: habitus of male exuviae, dorsal view [bar 15 mm].

Labium (Fig. 2). – Basket shaped, the unflattened prementum having a length:width ratio of 5,0:5,3. The central area is scooped near to the base, this being surrounded by a field of small, stout setae about 15 on either side, each pointing forwards. They are more numerous centrally, petering out laterally. The frontal margin has a small central lobe and a series of 7 shallow dentations on either side, small setae being present in the hollows. There are 6 palpal setae and a longer, stouter end hook. Each palp has a straight distal margin with 8 feeble incisions, two small setae are sometimes present in the hollows. The inner margin is sim-

ilarly incised with feebler setae sometimes present. The hinge rests at the base of the middle pair of legs.

T h o r a x (Fig. 1). – The pronotum of the prothorax is saddle-shaped with a raised margin fringed with long setae on the frontal terminations. Wing cases are divided in the exuviae and their tips reach to the middle of segment 5. The outer wing cases are darkened at their tip. The legs are of medium length for a libellulid and have no visible banding. The tibiae have plentiful long and short setae present, except on the hind legs where they become sparser and spinier.



Figs 2-3. *Orchithemis pulcherrima*, male: (2) labium (unflattened), dorsal view [bar 2.5 mm]; – (3) abdomen, with RHS wing case cut out to show dorsal spines, lateral view [bar 10 mm].

A b d o m e n (Fig 1). – Ovate in dorsal view and the protruding anal appendages produce a tapered effect, the surface being covered in very short adpressed setae which are set in granular bases and long, finer setae which are mainly present laterally. It is widest at the margin between segments 6 and 7. Dorsal spines (Fig. 3) are present on segments 4-9. The two basal spines are short, that on 4 set almost vertically, that on 5 is atypically stouter and blunted, its true shape concealed by a dense covering of setae, the succeeding setae are longer and become more flattened, the longest being on segment 9 which is horizontal. No spine is recurved, although the spine on segment 5 is difficult to analyse as described above. All dorsal spines have a coating of setae. Lateral spines are present on segments 8 and 9, they are stout and sharp and slightly incurved, that on segment 9 being fractionally longer than that on segment 8. The small fine marginal setae become longer and stouter on segments 8 and 9. The abdominal surface is pale, particularly on the basal segments which are normally concealed by the wing cases, distally it grades through a mid-brown colour and then becomes dark brown on segment 10. There are 5 longitudinal darker stripes on the dorsum, the central one occupying the spinal ridge, the others being on the flanks. All markings darken distally. Anal appendages are long, pointed and equal in length to segments 9 and 10 when measured at their mid-point. The straight, finely pointed cerci are fractionally less than half the length of the paraprocts, which are incurved at their points. The epiproct tapers to a fine point and is just shorter than the paraprocts,

it has a dense field of fine setae on its lateral margins; the male projection is not visible in dorsal view.

COMPARATIVE MATERIAL

Two other larvae were collected from the same site near Kakus Nursery on 28-IV-2011. One male, which died before emergence and one female, which hatched on 19-VIII-2011. Both agree structurally in all main aspects with the described individual. In the female however a tiny row of 4 setae running from the central scoop is visible (the floor of the prementum normally being creased or folded it is only possible to see this feature where the crease misses this area). The tibiae of middle and hind leg have faint bandings. The dead male larva has undivided wing cases.

DISCUSSION

The larva of *O. pulcherrima* is unremarkable, being a typical libellulid in shape and with a mix of features found in larger SE Asian members of the family. The labium with its lack of large mental setae, frontal margin and palpal shape, is similar to that in some members of the *Orthetrum* genus. The small eyes are also similar to those of that genus, but the rounded head shape is not.

Despite careful searching in other areas where adults were commonly flying, this is the only locality where larvae were obtained. The site was an open swampy area close to a river and had a small trickle flowing through it. Species flying close by were *Podolestes orientalis, Brachydiplax chalybea, B. farinosa, Rhyothemis aterrima,* and *Tyriobapta torrida,* other larvae found here include *Heliaeschna simplicia, B. chalybea* and *T. torrida*.

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HE WHO IS TOO SLOW IS PUNISHED BY LIFE: *CALOPTERYX VIRGO* (L.) ENTANGLED BY THE TENDRIL OF A VETCH DURING EMERGENCE (ZYGOPTERA: CALOPTERYGIDAE)

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At a rivulet in the western fringe area of Munich, Germany, an immature ♂ was photographed with its right forewing tightly entwined around by the tendril of a vetch. Obviously the tendril had entangled the not yet unfolded wing briefly after emergence. The living insect was unable to escape from its bonds. This is only the third published case of a biotic interaction of this type.

INTRODUCTION

In biotic interactions between Odonata and plants, one can generally distinguish between interactions with an impact on the insect and those with an impact on the plant. The latter is primarily represented by egg-laying of endophytically ovipositing species. Other published interactions, where Odonata probably had an adverse affect on plants, are extremely rare. In the renowned German series of the 'handbook of plant diseases', the volume on 'animal pests on cultivated plants' includes one short chapter on the Odonata (TOMASZEWSKI, 1949). The appropriate paragraph is chiefly built on an earlier literature study compiled by SCHMIDT (1939), who listed three "curious things" he found regarding Odonata as plant pests. One of these refers to *Lestes viridis* (Vander L.) ovipositing into twigs of pear trees in Trento, Italy, which is a normal egg-laying behaviour of this species. The second is based on a publication by V. Stackelberg (1932, in SCHMIDT, 1939) in Russian, quoting a Japanese note on *Lestes temporalis* Sel. damaging trees and (with a question mark) yellow raspberries in Japan. Thirdly, an observation by a Mr Bugnion is quoted, which describes the damage done by a migrating swarm of *Anax ephippiger* (Burm.) to a Moroccan garden. Allegedly,

in the absence of animal food, the dragonflies had fed there on Eucalyptus, Mimosa and Pomegranate shoots during three days. All in all, a so-called damage of plants caused by Odonata can well be relegated to the realm of pure fantasy. On the other hand, interactions between plants and Odonata with an impact on the insect are found much more often in the literature; especially plentiful are publications that describe or depict an observation of Odonata caught by insectivorous plants, such as *Drosera* spp., (e.g., VAN ACHTERBERG, 1973). All other interactions with a harmful effect on Odonata can be regarded as accidental. This includes the lethal entanglement of an egg-laying female *Sympetrum vulgatum* (L.) by a string of algae that drowned the dragonfly (HUNGER, 2005) and a male *Crocothemis erythraea* (Brullé) that was glued with its wings to the sticky secretions of several stems of the caryophyllacean perennial herb *Silene inaperta* (L.) (TORRALBA-BURRIAL & OCHARAN, 2007). Another potential lethal trap for dragonflies is the entangelement on hooked and barbed plant surfaces of seeds or leaves, for instance the barbed inflorescences of hooked bristlegrass *Setaria verticillata* (L.) P.Beauv. (e.g., SAMWAYS, 1991; PAPAZIAN, 1998; JOURDE, 2000, 2009; ARNOLD, 2013). MARTENS & SUHLING (2003) give an overview on most of the then published cases.

In this note, we report one case of probably the most unusual trapping of an odonate by a plant, namely the entanglement of the living insect by a tendril of a climbing plant.

OBSERVATION

On 3 June 2012 at 13:20 h CEST, on a sunny and warm (25°C) day, one of us (LE) was slowly walking along the 'Erlbach', a rivulet in the 'Moosschwaige' estate north of Germering, in the western fringe area of Munich, Upper Bavaria, Germany (approximately 48°09'N, 11°23'E). In the area visited, the rivulet ran as the effluent of a large pond through a small sparse forest. As LE was photographing some of the frequently occurring *Calopteryx virgo* (L.) individuals, he was attracted to a male perching on low grass on the brookside. When he approached the fully developed, yet immature, male damselfly, he noticed that it was perching close to its exuviae and that its right forewing had not unfolded and was entwined around by the tendril of a vetch (Fabaceae: *Vicia* sp.) that was growing in the riparian vegetation (Fig. 1a, b). The tendril of the vetch had tightly entangled the stunted wing several times and the damselfly was unable to escape from these bonds and its position.

DISCUSSION

The linear growth of twining plant species can happen remarkably fast. While ill in bed, DARWIN (1875) watched a potted hop plant (*Humulus lupulus*) growing in his well-warmed room, and found that the tip of the bine completed a revolution in two hours and 30 minutes around a supporting stick. Probably the fastest plant growth on Earth can be found in bamboo shoots (tribe Bambuseae), with a growth rate of 0.4 mm/min or 57 cm per day (DENFFER et al., 1978). A similar pace of growth can also be applied to the tendrils of many climbing plants

– specialized stems, leaves or petioles with a threadlike shape that are used for support or attachment. Typical representatives of this type of plants are the Cucurbitaceae, the Passifloraceae, *Vitis vinifera* or legumes like *Pisum sativum* and many *Vicia* species. Considering their rate of growth, one can well imagine how our observation came into existence: the *Calopteryx virgo* male emerged from its exuviae at cool ambient temperatures, probably early in the morning, obviously close to the tendril of a vetch. Tendrils that are not attached yet to a support perform a rotating movement in search of a support, for which the term 'circumnutation' was coined by DARWIN (1875). As soon as a suitable support is touched during this search, the tendril executes a flexion and then winds itself several times around the support. Obviously the tendril touched the not yet unfolded forewing of the freshly emerged damselfly and then was faster with its subsequent entanglement of this 'support' than the *C. virgo* male was able to expand and harden its wings. At the time of the observation, the living damselfly was no longer in the teneral stage and was already fully developed. Therefore, emergence most likely had happened more than 24 hours before.

Fig. 1. Two views of a male *Calopteryx virgo*, with its right forewing stunted and entwined around by the tendril of a vetch (*Vicia* sp.), perching close to its exuviae in the riparian vegetation of a rivulet near Munich, Upper Bavaria, Germany (3 June 2012). – [Photographs by L. Erfurth]

Our observation is not the first published case of this type of biotic interaction; however, this seems to be an extremely rare phenomenon. BROWN (1900) in a short note describes a record of an *Anax junius* (Drury) entangled by the tendril of a wild balsam apple *Echinocystis lobata* (Michx.) Torr. & A.Gray. Obviously the dragonfly "… had settled upon the vine and, becoming somewhat benumbed

by the cool of the evening, was easily entrapped by the outreaching tendril, which had wound itself quite tightly, twice about the insect's body, near the joint of the seventh and eighth abdominal segments." A second case was published by MIYAKAWA (1982), pertaining to a *Calopteryx atrata* Sel. that was trapped by the tendril of burr cucumber *Sicyos angulatus* L. in Japan. All in all, our record emphasizes the fact that emergence is the most critical phase of life in an odonate, when even tendrils of climbing plants are able to have a lethal impact because they grow faster than the slowly expanding and hardening insect.

ACKNOWLEDGEMENTS

Thanks to MARTIN SCHORR, Zerf, and ANTONIO TORRALBA-BURRIAL, Oviedo, for their help to obtain reprints of relevant literature.

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OBITUARY

GORDON PRITCHARD

A brief appreciation of the odonatological work of Dr G. Pritchard (1939-2012), Professor Emeritus of the University of Calgary (Canada), is followed by his odonatological bibliography (1963-2008). Among his main interests were, e.g., odonate prey capture and the structure and operation of the organs involved, the biology of *Argia vivida* in the Alberta (Canada) thermal springs, and various aspects of life history and behaviour. Other studies of importance include his work on the ecological classification of odonate mating systems, larval identification by means of cellulase acetate electrophoresis and egg development in relation to temperature. From Colombia he described *Cora chiribiqueta* sp. n., 2001.

After a long illness, Dr Gordon Pritchard, Professor Emeritus of the University of Calgary (Canada), passed away on the 23rd of December 2012, aged 73. The world odonatological community has lost a prominent and highly respected colleague, and the young odonatologists an unforgetable teacher.

Gordon was of British origin (born 1939) and commenced his odonatological career at the University of Alberta (Edmonton, Canada), where he was awarded a PhD in 1963. In the mid 1960s he moved to the University of Calgary and stayed there during the rest of his life.

His odonatological work covers half of a century, with diverse, broad and well-defined research interests. In the 1960s, he focused on prey, prey capture and the morphology and operation of the organs involved. During the 1970s-

Fig. 1. Dr Gordon Pritchard, toasting at the Symposium Banquet, Trevi, Italy, 21 August 1991.

Fig. 2. One of the SIO Council meetings in Calgary, Canada, 18 August 1983. From left to right: Dr P.S. Corbet, Dr G. Pritchard, Dr M.J. Westfall, Dr M.J. Parr, Dr J. Legrand, Dr S. Asahina, Dr B. Kiauta, Dr J.-G. Pilon (Chair) and Dr J.M. van Brink.

1990s, his attention was attracted by *Argia vivida* and, consequently, to the thermal water environments where it lives in Alberta. In the 1990s he extended his interests to the tropics of the New World, from where he also described a new species, *Cora chiribiqueta* sp. n. (2001). Also of importance are Gordon's studies on the ecological classification of odonate mating systems (1992b), larval identification by means of cellulose acetate electrophoresis (1993c), and egg development in relation to temperature and strategies for dealing with different thermal environments (1996b) as well as various other topics (e.g. 1987, 1993a, 2008).

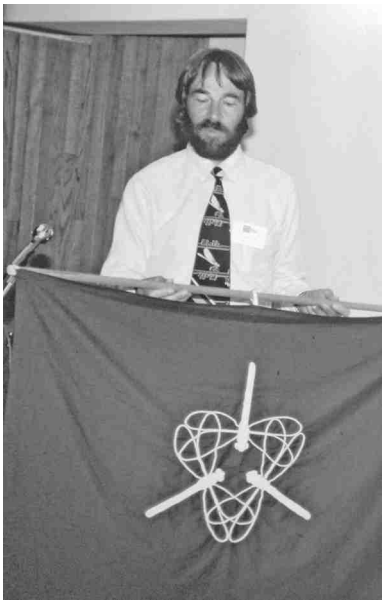

Fig. 3. Dr G. Pritchard, at the Closing Ceremony of the Calgary Symposium, Canada, 19 August 1983.

Gordon was a respected member of the International Odonatological Society (SIO) and of the World Dragonfly Association (WDA). He was an early member of the former and a Charter Member and President (2007-2009) of the latter. He was particularly active also in the Canadian Section of SIO and, during 1988-1992, a frequent author in its newsletter *Walkeria*. At its Charter Meeting, during the 10th International Symposium of Odonatology (Johnson City/TN, 1989), Gordon also joined the Dragonfly Society of the Americas (DSA).

During many years and almost to his very last days, Gordon was a splendid and meticulous peer reviewer of manuscripts submit-

ted to *Odonatologica* and served as a member of the Editorial Boards of *Odonatologica*, *Advances in Odonatology*, *Notulae odonatologicae* and the *International Journal of Odonatology*. Dealing with manuscripts submitted by young or less experienced workers, he invested great efforts in their modification, amendment and improvement, and completely reshaped some originally unacceptable manuscripts to meet the standards of an international periodical. In his modesty, more often than not, he declined a reference to this work in the acknowledgements, saying he did nothing but merely the normal duty of a member of an Editorial Board.

It goes without saying that, whenever he could, Gordon participated in the International Symposia of Odonatology, i.e., in 1977 (Gainesville/FL, USA), 1979 (Montreal, Canada), 1981 (Chur, Switzerland), 1985 (Paris, France), 1988 (Madurai, India), 1989 (Johnson City/TN, USA) and in 1991 (Trevi, Italy). He hosted and splendidly organized the 7th International Symposium of Odonatology (1983) in Calgary (including the memorable celebration of the 80th birthday of Dr S. Asahina, the doyen of Japanese odonatology, for whom he coined the nickname "Shoshi", generally used outside Japan and ever since). Gordon's Symposia presentations always received much attention. He participated also in all related field trips; some of his scientific statements made during these were tape-recorded by Dr P.S. Corbet and are referred to in his 1999 handbook.

Gordon will be missed not only by his old colleagues and friends but also, and most particularly, by the younger generation of odonatologists in North America, Europe and SE Asia, who have lost a dear teacher, a precious model scientist, a tutor and a sincere friend.

Fig. 4. Dr G. Pritchard, after crossing the Pers- and Morteratsch glaciers, Upper Engadine, Switzerland, 24 August 1981, at the Post-Symposium Glacier Tour of the Chur Symposium.

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All photographs by M.A.J.E. Kiauta.

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ODONATOLOGICAL ABSTRACTS

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2003

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There are no endemic butterflies in Pohnpei or in any other remote Caroline isls, whereas 8 of the 15 odon. spp. recorded in Pohnpei are endemics. Compared with butterflies, the odon. population of Pohnpei also appears more stable over time. All 14 spp. recorded during the 1940s and 1950s by M.A. Lieftinck (1962, *Insects Micronesia* 5: 1-95) were collected also during the recent surveys. 6 of them represent radiation within Teinobasis.

(19584) FELLOWES, J.R. et al., [Eds], 2003. Report of rapid biodiversity assessments at Wuzhishan Nature Reserve, central Hainan, China, 1999 and 2001. *Sth China Forest Biodiv. Surv. Rep. Ser.* (Online simplified Version) 24: ii + 27 pp. − (Kadoorie Farm & Bot. Garden, Lam Kam Rd., Tai Po, N.T., Hong Kong, SAR, China).
Commented records of 29 odon. spp. Those of Heliogomphus reflexus, Merogomphus paviei and Phaenandrogomphus tonkinicus are apparently the first from Hainan.

(19585) FELLOWES, J.R. et al., [Eds], 2003. Report of a rapid biodiversity assessment at Jiaxi Nature Reserve, western Hainan, China, June 1999. *Sth China Forest Biodiv. Surv. Rep. Ser.* (Online simplified Version) 25: ii + 23 pp. − (Kadoorie Farm & Bot. Garden, Lam Kam Rd., Tai Po, N.T., Hong Kong, SAR, China).
Commented records of 24 odon. spp.

(19586) FELLOWES, J.R. et al., [Eds], 2003. Report of a rapid biodiversity assessment at Diding Headwater Forest Nature Reserve, West Guangxi, China, July 1999. *Sth China Forest Biodiv. Surv. Rep. Ser.* (Online simplified Version) 26: ii + 18 pp. − (Kadoorie Farm & Bot. Garden, Lam Kam Rd., Tai Po, N.T., Hong Kong, SAR, China).
Commented records of 16 odon. spp. That of Protosticta beaumonti is a new provincial record.

(19587) FELLOWES, J.R. et al., [Eds], 2003. Report of rapid biodiversity assessments at Cenwanglaoshan Nature Reserve, Northwest Guangxi, China, 1999 and 2002. *Sth China Forest Biodiv. Surv. Rep. Ser.* (Online simplified Version) 27 : ii + 34 pp. – (Kadoorie Farm & Bot. Garden, Lam Kam Rd., Tai Po, N.T., Hong Kong, SAR, China).
Commented records of 23 odon. spp.

(19588) FELLOWES, J.R. et al., [Eds], 2003. Report of a rapid biodiversity assessment at Dawangling Headwater Forest Nature Reserve, West Guangxi, China, August 1999. *Sth China Forest Biodiv. Surv. Rep. Ser.* (Online simplified Version) 28: ii + 17 pp. – (Kadoorie Farm & Bot. Garden, Lam Kam Rd., Tai Po, N.T., Hong Kong, SAR, China).
Commented records of 14 odon. spp.

(19589) FELLOWES, J.R. et al., [Eds], 2003. Report of a rapid biodiversity assessment at Guanyinshan Nature Reserve, central Guangdong, China, August 2000. *Sth China Forest Biodiv. Surv. Rep. Ser.* (Online simplified Version) 30: ii + 19 pp. – (Kadoorie Farm & Bot. Garden, Lam Kam Rd., Tai Po, N.T., Hong Kong, SAR, China).
Commented records of 29 odon. spp.

(19590) FELLOWES, J.R. et al., [Eds], 2003. Report of a rapid biodiversity assessment at Shimentai National Nature Reserve, North Guangdong, China, August 2000. *Sth China Forest Biodiv. Surv. Rep. Ser.* (Online simplified Version) 31: ii + 18 pp. – (Kadoorie Farm & Bot. Garden, Lam Kam Rd., Tai Po, N.T., Hong Kong, SAR, China).
Commented records of 23 odon. spp.

(19591) FELLOWES, J.R. et al., [Eds], 2003. Report of rapid biodiversity assessments at Chebaling National Nature Reserve, Northeast Guangdong, China, 1999, 2000 and 2001. *Sth China Forest Biodiv. Surv. Rep. Ser.* (Online simplified Version) 32: ii + 26 pp. – (Kadoorie Farm & Bot. Garden, Lam Kam Rd., Tai Po, N.T., Hong Kong, SAR, China).
Commented records of 25 odon. spp.

(19592) FELLOWES, J.R. et al., [Eds], 2003. Report of rapid biodiversity assessments at Jiulianshan Nature Reserve, South Jiangxi, China, 2000, 2001 and 2003. *Sth China Forest Biodiv. Surv. Rep. Ser.* (Online simplified Version) 33: ii + 21 pp. – (Kadoorie Farm & Bot. Garden, Lam Kam Rd., Tai Po, N.T., Hong Kong, SAR, China).
Commented records of 29 odon. spp.

(19593) FELLOWES, J.R. et al., [Eds], 2003. Report of rapid biodiversity assessments at Damingshan National Nature Reserve, central Guangxi, China, April and September 2000. *Sth China Forest Biodiv. Surv. Rep. Ser.* (Online simplified Version) 34: ii + 20 pp. – (Kadoorie Farm & Bot. Garden, Lam Kam Rd., Tai Po, N.T., Hong Kong, SAR, China).
Commented records of 23 odon. spp.

(19594) HADEN, G.A., J.P. SHANNON, K.P. WILSON & D.W. BLINN, 2003. Benthic community structure of the Green and Colorado rivers through Canyonlands National Park, Utah, USA. *SWest. Naturalist* 48(1): 23-25. (With Span. s.). – (Dept Biol. Sci., P.O. Box 5640, North Arizona Univ., Flagstaff, AZ 86011, USA).
The seasonal and site occurrence of the odon. gen. Argia, Erpetogomphus, Gomphus, Ophiogomphus and Stylurus, collected from cobbles and pools in the Green and Colorado rivers and in the Cataract Canyon, is stated for March, July and Oct.

(19595) LANDWER, B.H.P. & R.W. SITES, 2003. Redescription of the larva of Gomphus militaris Hagen (Odonata: Gomphidae), with distributional and life history notes. *Proc. ent. Soc. Wash.* 105(2): 304-311. – (Enns Ent. Mus., Dept Ent., Univ. Missouri, Columbia, MO 65211, USA).
The final instar larva is described, diagnosed and illustrated from Missouri, Texas and Kansas. A previous description is erroneously attributed to this sp., but actually pertains to Arigomphus lentulus. Data on life history based on larval and adult collections are added.

(19596) MACAULAY, D. & S. DUNNE, 2003. *Survey of the odonate fauna in Caribou Mountain Wildlife Park*. Alberta Lepidopterists' Guild, Edmonton. 23 pp. – (Authors' addresses not stated.).
The Park is situated within the Subarctic Subregion of Alberta (Canada). 21 spp. were recorded. Full collection data and a locality map are provided.

(19597) MARINOV, M.G., 2003. *Horologiya, biotopna i habitatna obv'rzanost na nasekomite ot razred Odonata v B'lgariya* – [*Chorology, biotope and habitat requirements of Odonata in Bulgaria*]. PhD thesis, Inst. Zool., Bulg. Acad. Sci., Sofia. 196 pp.,

App. excl. (Bulg.). – (Author: Freshw. Ecol. Res. Gr., Univ. Canterbury, P.O. Box 4800, Christchurch-8140, NZ).
This is a complete and meticulously documented survey of the odon. fauna (68 spp.) of Bulgaria, with an overview of distribution and taxonomy of each sp., incl. its Bulgarian distribution map and vertical distribution and adult phenology graphs. The phenology and biogeographic composition of the fauna are discussed and habitat types are described and classified. The Bulgarian Red List is included and a comprehensive bibliography is appended.

(19598) PROKOP, J., G. FLECK & A. NEL, 2003. New dragonflies from the Lower Miocene (Ottnangian/Karpatian) of the Cypris Shale in western Bohemia (Odonata: Libellulidae). *N. Jb. Geol. Paläontol.* 2003(9): 561-576. (With Germ. s.). – (First Author: Dept Zool., Charles Univ., Viničná 7, CZ-128-44 Praha-2).
Prorhyothemis bubiki gen.n.,sp.n. and ?Onychothemis rihai sp.n. are described and illustrated.

(19599) ROWE, R.J., 2003. Agonistic behaviour in final-instar larvae of Austrocnemis splendida (Odonata: Coenagrionidae), and a challenge to the 'Agriocnemidinae'. *Aust. J. Zool.* 51: 51-59. – (Sch. Trop. Biol., James Cook Univ., Townsville, Qld 4811, AU).
Larval agonistic displays are reported from A. splendida. 16 major displays were distinguished. The agonistic behaviour repertoire of A. splendida is contrasted with published information on other coenagrionid larvae, especially with Agriocnemis pygmaea, putatively a member of the same subfamily. Marked differences in larval display behaviour between A. splendida and A. pygmaea provide evidence against a close relationship between these spp. No support is found for including A. splendida in the Agriocnemidinae. It is postulated that the Agriocnemidinae are an artificial construct, its components linked through convergence in form of the reduced wing structures of these very small dragonflies. (See also *OA* 14534).

(19600) SHARMA, R.H. & S.S. TALMALE, 2003. Predation of dragonfly Ictinogomphus rapax (Rambur) (Odonata: Anisoptera) by robberfly Stenopogon pradhani (Joseph & Parui) (Diptera: Asilidae). *J. Bombay nat. Hist. Soc.* 100(2): 632. – (First Author: High Altitude Zool. Fld Stn, Zool. Surv. India, Opp. Saproon Gurudwara, Solan-173 211, HP, India).
An observation from Sanjay Gandhi National Park, Mumbai, India, 20-III-2001.

(19601) SMITH, S.G.F. & L. MENDOZA, 2003. Ionocytes in the dragonfly nymph Erythemis simplicicollis (Say). *Proc. 9th Symp. nat. Hist. Bahamas*, San Salvador/Bahamas, pp. 135-139. – (Dept Biol.,Le Moyne Coll., Syracuse, NY 13214, USA).
Anax junius and E. simplicicollis larvae were obtained from a biological supply company. Presence and location of ionocytes (ion transport cells) were compared between the 2 spp., of which the latter occurs also in brackish environments. The larvae were kept in tanks of 3 different salinities for a total of 13 days and then subjected to a silver nitrate staining technique to allow the identification of ionocytes on the gill tissues. Patches of ionocytes were found at the base of the rectal gill leaflets in E. simplicicollis, but none were seen in A. junius, regardless of salinity. Patch density of ionocytes in E. simplicicollis increased as the salinity increased, which suggests that this sp. is able to respond to changes in salinity.

(19602) TALMALE, S. S. & P.P. KULKARNI, 2003. Odonata in paddy fields of Bhandara district, Maharashtra. *Bionotes* 5(3): 67-68. – (First Author: Central Zone Regn. Cent., Zool. Surv. India, Jabalpur-482 002, MP, India).
A list of 19 spp., incl. 8 spp. that are for the first time recorded from paddy fields, bringing the number of the known paddy field Odon. in India up to the 30 spp. mark.

(19603) WILLMANN, R., 2003. Evolution und Vielfalt der Insekten. *In*: S.R. Gradstein, R. Willmann & G. Zizka, [Eds], *Biodiversitätsforschung*, pp. 27-40. [Kleine Senckenberg-Reihe 45]. ISBN 3-510-61354-6. (With Engl. s.). – (Author: Inst. Zool. & Anthropol., Univ. Göttingen, Berliner Str.28, D-37073 Göttingen).
Assuming there are ca 10 Mio extant insect spp. and that a sp. exists on average ca 1 Mio yr, the number of spp. since Paleozoic is estimated at over 1 billion. Some of the many problems of phylogenetic relationships between the orders and other higher taxa are outlined. For example, according to the morphology of the head, the Ephemeroptera and Odon.+Neoptera should be sister groups, while the

molecular evidence indicates the Ephem. + Odon. are monophyletic. It is emphasized that results of the DNA research and those of "classical" morphology are often in disagreement.

(19604) ZÁVODSKÁ, R., I. ŠAUMAN & F. SEHNAL, 2003. Distribution of PER protein, pigment-dispersing hormone, prothoracicotropic hormone, and eclosion hormone in the cephalic nervous system of insects. *J. biol. Rhythms* 18(2): 106-122. – (Third Author: Inst. Ent., Czech Acad. Sci., Branišovská 31, CZ-370 05 České Budějovice).
Investigations performed on adult insects revealed that putative components of the central pacemaker, the protein period (PER) and the pigment-dispersing hormone (PDH) are immunocytochemically detectable in discrete sets of brain neurons throughout the insects. Here, Ischnura elegans is among the taxa examined.

(19605) ZHANG, B., H. PANG, F. JIA & G. LIANG, 2003. An investigation of Odonata from Dawuling Nature Reserve of Guangdong. *Natural Enemies of Insects* 25(2): 55-58. (Chin., with Engl. s.). – (Inst. Ent. & St. Key Lab. Biocontrol, Zhongshan Univ., Guangzhou-510275, China).
A checklist of 49 spp. Calicnemia erythromelas, Ischnura mildredae, Nepogomphus walli and Sympetrum uniforme were not previously recorded from Guangdong (China).

(19606) ZHU, C., K. MURAOKA & H. MIZUNO, 2003. CG simulation of dragonflies based on aerodynamics. *Joho Shori Gakkai Kenkyu Hokoku* 2003(15): 31-36; [ISSN 0919-6072]. (Jap., with Engl. s.). – (Authors' address stated as: Tohoku Inst. Technol., Japan).
[Authors' abstract] : A dragonfly is a kind of a familiar insect by which the sense of season can be shown. The expression of a dragonfly by CG can be expected as an element which will improve the sense of season in landscape simulation, virtual reality, etc. In this paper, the flight model of a dragonfly, based on aerodynamics, is proposed. In this model, a dragonfly can be made to fly in real time, considering the force caused by the flapping of the wings, steep rise, sudden stop, hover and rapid turn, which are the flight characteristics of a dragonfly, can be performed. Furthermore, depending on the control-points placed in the space, the flight route of a dragonfly can be established easily.

2004

(19607) KHARCHENKO, L.P., V.A. MIKHAYLOV, V.N. GRAMMA & L.V. MALOVICHKO, 2004. Insects in nutrition of Merops apiaster L. (Aves: Coraciiformes: Meropidae). (3rd report). *Kharkov ent. Soc. Gaz.* 11(1/2): 137-142. (Russ., with Engl. s.). – (First Author: Dept Zool., Kharkov St. Pedag. Univ., Blukhera 2, UKR-61168 Kharkov).
In 125 excrements, 2250 insect specimens were found (Stavropol distr., Russia). The honey bees were dominant, the odon. were represented by the remains of 6 fam. (total 4.0% in 30.4 samples, the Coenagrionidae prevailing).

(19608) KULKARNI, P.P., M. PRASAD & S.S. TALMALE, 2004. Insecta: Odonata. *Conserv. Area Ser.*, Zool. Surv. India 2004 (Fauna Pench Natn. Park): 175-206. – (First Author: Western Regn. Stn, Zool. Surv. India, Vidyanagar, Sector 29, Pune-411 044, Maharashtra, India).
Records of 38 spp., with descriptive notes. Copera ciliata and C. vittata deccanensis are new to the fauna of Maharashtra, India.

(19609) MACIAS, M., A.J. GREEN & M.I. SÁNCHEZ, 2004. The diet of the glossy ibis during the breeding season in Doñana, Southwest Spain. *Waterbirds* 27(2): 234-239. – (Second Author: Ciudad Parque Santa Eufemia, C/Triana No. 13, pl b2, ES-41940, Tomares, Sevilla).
A detailed study is presented on the diet of ibis (Plegadis falcinellus) from an expanding colony Doñana, based on fecal samples (mainly from adults) and 36 regurgitates (mainly from large chicks) from 15 nests. Fecal contents were dominated by aquatic Coleoptera (present in 100% of the samples) and odon. larvae (93%). In regurgitates these 2 insect orders were occurring in 41% and 29%, respectively. The odon. larvae were represented mainly by Aeshna mixta, Anax imperator and Sympetrum fonscolombii.

(19610) *RESUMOS 25 CONGRESSO BRASILEIRO DE ZOOLOGIA*, 2004. Soc. Brasil. Zool., Curitiba. vi + 509 pp. (Port.) – (Publishers: Depto Zool., UFPR, Caixa postal 19020, BR-81531-980 Curitiba, PR).
[Odonatol. titles]: *Querino, R.B. & N. Hamada*: Microimenóptero aquatic parasitóide de ovos de Argia sp. (Odonata: Coenagrionidae) (p. 149); – *Costa,*

J.M. & L.O.I. Souza: Diversidade dos Odonata (Insecta) no região das cabeceiras do rio Paraguai, Mato Grosso, Brasil (p. 176); – *Carvalho, A.L., E.R. Calil & P.H.R. Souza*: Descrições de três larvas de Castoraeschna Calvert, 1952 (Insecta, Odonata, Aeshnidae) (p. 176); – *Marins, A. & H.P. Romanowski*: Lista preliminar da odonatofauna do Parque Estadual de Itapuâ, Viamão, RS, Brasil e sua relação con ambiente (p. 176); – *Carvalho, A.L.*: Sobre uma libélula (Odonata, Calopterigidae) ilustrada no Breviário de Belleville (Jean Pucelle, ca 1323-1326, Paris) (pp. 176-177); – *Costa, J.M. & L.O.I. Souza*: Primeiro registro de Argia dives Förster, 1914 (Insecta, Odonata: Coenagrionidae) no Brasil (p. 177); – *Bernardo, C.T.S., R.H.F. Macedo & J.R. Pujol-Luz*: Padrões morfométricos e comportamentais de libélules do familia Coenagrionidae (Odonata, Zygoptera) (p. 177); – *Salgado, L.V.G. & A.L. Carvalho*: Chave para os gêneros de Corduliidae (Odonata) ocorrentes no sudeste do Brasil (p. 177); – Chave para as larvas de ultimo estádio dos gêneros de Gomphidae (Odonata) ocorrentes no sudeste do Brasil (p. 177); – *Saviato, M.J., P.S. Stringari & R.R. Laps*: Análise preliminar das larvas de Odonata em dios cursos de água no Parque das Nascentes, Blumenau, SC (p. 178); *Carvalho Filho, F.S., P.P. dos Santos, A.P.S. Palheta, T.X. Carneiro & M.C. Esposito*: Composição e distribução de libélulas no Bosque Rodrigues Alves (Belém, PA) (p. 178); – *Zillikens, A., R.C. Campos, D. Lira, M.F.S. de Jesus, M. Manfredini, A.F. Cordeiro, C.M. do Espirito Santo & J. Steiner*: Ocorrência de Leptagrion (Zygoptera: Coenagrionidae) em Bromeliaceae em Santa Catarina (p. 178); – *Oliveira, A., P. Moreno & M. Callisto*: Inventário da diversidade de macroinvertebrados bentônicos na Estação Ambiental de Petí-CEMI, MG (p. 450); – *Almeida, E.F., D.F. Baptista & J.L. Nessimian*: Impacto da captação de água sobre a macrofauna bentônica em riachos da Serra do Mar utilizando o substrata pedra (p. 451).

(19611) ZHANG, D.-z. & Z.-m. ZHENG, 2004. Research progress and status of Odonata of China. *J. Shaanxi Normal Univ.* (Nat. Sci.) 32 (Suppl.): 71-74. (Chin., with Engl. s.). – (Sch. Life Sci., Ningxia Univ., Yinchuan, Ningxia-750021, China).
The progress of the research on Odon. in China is reviewed, incl. that on morphology, distribution, ecology, biology and molecular biology. 50 bibliographic references are appended.

2005

(19612) HANEL, L., A. DOLNÝ & J. ZELENÝ, 2005. Odonata (Vázky). *In*: J. Farkač et al., [Eds], *Red list of threatened species in the Czech Republic: Invertebrates*, pp. 125-127, Agentura ochrany přirody, Praha, ISBN 80-86064-96-4. (Czech). – (Second Author: Dept Biol. & Ecol., Fac. Sci., Univ. Ostrava, Chittussiho 10, CZ-71000 Ostrava).
44 spp. are listed in the categories: CR(RE) (regionally extinct), CR (critically endangered), EN (endangered), VU (vulnerable) and NT (near threatened).

(19613) KULKARNI, P.P. & S.S. TALMALE, 2005. Insecta: Odonata. *Wetland Ecosyst. Ser*., Zool. Surv. India 7 (Fauna Nathsagar Wetland): 115-127. – (First Author: Western Regn Stn, Zool. Surv. India, Vidyanagar, Sector 29, Pune-411 044, Maharashtra, India).
Records of 13 spp., with descriptive notes; – Maharashtra, India.

(19614) LABANDEIRA, C.C., 2005. The fossil record of insect extinction: new approaches and future directions. *Am. Ent*. 51(1): 14-29. – (Dept Paleontol., Natn. Mus. Nat. Hist., Smths. Instn, Washington, D.C., USA).
The fossil record of insect extinction at the family level is characterized by 2 basic modes: background extinction, which represents an ambient level of taxa extirpation and mass extinctions, which are occasional severe events in which taxa eliminated significantly above background levels. The most significant mass extinction, at the end-Permian (Permian-Triassic: P-T), divides the history of insects into 2 major evolutionary faunas: an earlier Paleozoic Evolutionary Fauna of apterygotes, paleopterans, and basal clades of orthopteroids and hemipteroids; and a subsequent Modern Evolutionary Fauna of more derived clades of orthopteroids and hemipteroids and especially holometabolous insects. In addition to the P-T event, 4 other extinctions are documented by multiple types of data: Late Pennsylvanian, Late Jurassic, later Early Cretaceous; and the end-Cretaceous (Cretaceous-Paleocene: K-P). There also is an analogous record of insect origination that is characterized by major, above-background events. 4 methods are used to detect insect extinction in the fossil record. The taxic approach is widely used, whereby the temporal durations of

fossil taxa are tallied for each geologic unit of interest and analyzed in a manner analogous to demography used in ecology. By contrast, the phylogenetic approach uses clades as the basic units of interest. A recent approach uses proxy data such as quantification of plant-insect associations across major boundaries in lieu of an insect body-fossil record. Last, the clustering of times of origin from modern co-evolved plant-insect associations provides data for likely interruptions from major paleoenvironmental perturbations. Pluralism, emphasizing multiple approaches to determine the ecological dynamics of insects during an extinction, is the best strategy to evaluate insect demise or survival in the fossil record.

(19615) SCHACHTNER, J., M. SCHMIDT & U. HOMBERG, 2005. Organization and evolutionary trends of primary olfactory brain centers in Tetraconata (Crustacea + Hexapoda). *Arthr. Struct. Develop.* 34: 257-299. – (Third Author: Fachb. Biol., Tierphysiol., Univ. Marburg, D-35032 Marburg).
A review paper. The odon. are represented by Aeshna cyanea and Hemicordulia tau. The information on the latter is here published for the first time.

(19616) SY, T. & M. SCHULZE, 2005. Erstnachweis der Helm-Azurjungfer (Coenagrion mercuriale) in Sachsen (Odonata, Coenagrionidae), *Ent. Nachr. Ber*. 49(3/4): 215-219. (With Engl. s.). – (RANA, Mühlweg 39, D-06114 Halle/Saale).
C. mercuriale is reported from Saxony (Germany) for the first time. A population, discovered in the Ausgraben ditch near Dölzig (Delitzsch distr.), is here described.

(19617) TEPLITSKY, C., S. PLENET, J.-P. LÉNA, N. MERMET, E. MALET & P. JOLY, 2005. Escape behaviour and ultimate causes of specific induced defences in an anuran tadpole. *J. evol. Biol*. 18: 180-190. – (First Author: Dept Pop. Biol., Evol. Biol. Cent., Norbywägen 18/D, SE-75236 Uppsala).
In the presence of Aeshna cyanea larvae, the Rana dalmatina tadpoles developed deeper tail fins, but the exposure to Gasterosteus aculeatus (stickleback) also induced longer tails and deeper tail muscles. This indicates specific morphological responses to different types of predator (fish, sit-and-wait dragonfly larva).

(19618) WARD-CAMPBELL, B.M.S., F.W.H. BEAMISH & C. KONGCHAIYA, 2005. Morphological characteristics in relation to diet in five coexisting Thai fish species. *J. Fish Biol*. 67: 1266-1279. – (Dept Biol., Burapha Univ., Chonburi-20131, Thailand).
The odon. were represented in the diet of the riffle-dwelling Xenentodon cancila and Monopterus albus.

2006

(19619) BALIK, S., M.R. USAOGLU et al. [11 joint authors], 2006. A preliminary study on the biological diversity of Bozalan lake (Menemen-Izmir). *Ege Univ. J. Fish. aquat. Sci*. 23(3/4): 291-294. (Turk., with Engl. s.) – (Second Author: Ege Universitesi, Su Ürünleri Fakültesi Su Ürünleri Temel Bilimler Bölümü, TR-35100 Bornova, Izmir).
4 odon. genera are reported from the lake; – Turkey.

(19620) BURMEISTER, E.-G., 2006. Im Regenwald am Fuss der Anden. *Mitt. Thüring. Entomologenverb*. 13(1): 72-80, 1 pl. excl. (With Engl. s). – (Zool. Staatssammlung, Münchhausenstr. 21, D-81247 München).
Includes a note on the habitat of Polythore spaeteri larva in the area of the "Panguana" Stn, located on the Rio Yuyapichis, a tributary of the Rio Pachitea, Peru. See also *OA* 15431.

2008

(19621) BAKER, R.A., 2008. An English zoologist's travels in Montenegro 110 years ago. *Natura montenegrina* 7(3): 383-387. – (Fac. Biol. Sci., Univ. Leeds, Leeds, LS2 9JT, UK).
Malcolm Burr (1878-1954), a well-known British entomologist, an authority on Dermaptera and Orthoptera, one of the founders of the Int. Congr. Ent., visited Montenegro (and some other Balkan countries) in 1898. Some of his insect records made in Montenegro during that trip are listed here, including a reference to Anax ephippiger. A brief outline of his biography and a general appreciation of his work are also provided.

(19622) SY, T., 2008. Ein neuer Fundort der Scharlachlibelle Ceriagrion tenellum (de Villers, 1789) in Sachsen-Anhalt (Odonata, Coenagrionidae). *Ent. Nachr. Ber*. 52(1): 61-64. – (RANA, Mühlweg 39,

D-06114 Halle/Saale).
A C. tenellum population 4 km E of Gardelegen, distr. Salzwedel (Sachsen-Anhalt, Germany) is brought on record, described and its origin is discussed.

2009

(19623) BALL, O.J.-P., S.R. POHE & M.J. WINTERBOURN, 2009. *The littoral macroinvertebrate fauna of 17 dune lakes on the Aupouri Peninsula, Northland*. Envir. Sci. Dept, North Tec, Whangarei Mail Centre. 36 pp. − (First Author & Publishers: Envir. Sci. Dept, North Tec, P.B. 9019, Whangarei Mail Centre, NZ).
8 odon. spp. were recorded from various lakes. Tramea loewii, Xanthocnemis zealandica and Hemocordulia australiae were most abundant in all lakes, whereas Ischnura aurora was found in 2 lakes only. Lake habitats are described and the recorded fauna is analysed.

(19624) SHARMA, G., V.V. RAMAMURTHY & R. KUMAR, 2009. Collection of damselflies and dragonflies (Odonata: Insecta) in National Pusa Collection, Division of Entomology, Indian Agricultural Research Institute, New Delhi, India. *Biol. Forum* 1(2): 47-50. − (Second Author: Natn. Pusa Collection, Div. Ent., Indian Agric. Res. Inst., Pusa Campus, New Delhi, India).
A checklist of 273 spp.

2010

(19625) AGUZZI, S., 2010. *Studio sulla comunità di odonati del Lago Boscaccio*. Natura Boscaccio: i Quaderni, 77 pp. ISBN none. <www.naturaboscaccio.it> − (c/o Dipto Biol. Anim., Univ. Pavia, Pavia, Italy).
A thorough treatment of the odon. fauna (20 spp.) of lake Boscaccio (Milano prov., Italy). Gomphus flavipes is for the first time reported from the province and G. vulgatissimus represents the first provincial record since the 1960s.

(19626) BERNARD, R.S., 2010. Découverte de Perithemis tenera (Say, 1839) (Odonata: Libellulidae), une nouvelle libellule pour le Québec. *Naturaliste can.* 134(1): 23-24. − (Author's address not provided).
A P. tenera population is reported from lake Bolvin in Granby, 15-VIII-2007. The sp. was not recorded previously from Quebec (Canada).

(19627) CLOPTON, R.E., T.J. COOK & J.J. CIELOCHA, 2010. Nubenocephalus nickoli n. sp. and Nubenocephalus xunantunichensis n. sp. (Apicomplexa: Eugregarinida: Actinocephalidae) parasitizing damselflies (Odonata: Zygoptera) in Belize, Central America. *Comp. Parasitol.* 77(2): 125-136. − (First Author: Dept Nat. Sci., Peru St. Coll., Peru, NE 68421, USA).
N. nickoli sp. n. is described from adult Hetaerina americana and H. titia, and N. xunantunichensis sp. n. from adult Argia chelata. N. nebraskensis is reported from Argia apicalis (Nebraska, USA) for the first time.

(19628) HEISER, M. & T. SCHMITT, 2010. Do different dispersal capacities influence the biogeography of the western Palearctic dragonflies (Odonata)? *Biol. J. Linn. Soc.* 99: 177-195. − (Biogeography, Fachbereich 6, Univ. Trier, D-54286 Trier).
The biogeography of the western Palearctic has been intensively studied for more than a century. Recent advances in genetics have allowed the testing of old theories based on distribution patterns, although these analyses are obviously restricted to a reduced number of specific genetic data sets. On the other hand, an increased knowledge on the distributions of species and advances in computer capacities have allowed more detailed biogeographical analyses based on species presence/absence. In the present study, the Odon. were selected as the study group. For all 162 spp. native to the western Palearctic, their respective presence or absence in 97 predefined biogeographical regions was compiled. Using cluster analyses and principal component analyses, both based on Jaccard similarity coefficients, the differentiation among these regions and species is analysed. In subsequent analyses the data set was reduced to the Zygoptera, Anisoptera, and the western Palearctic endemics. All analyses consistently showed different faunal regions and faunal elements. In particular, the (1) western and (2) eastern Mediterranean; (3) central and (4) northern Europe; and (5) the British Isles were invariably found in all cases. Although the 2 major Mediterranean regions were characterized by several endemic faunal elements, northern Europe and the British Isles lacked such elements, but were characterized by faunal compositions strongly deviating from

the rest of the western Palearctic region. Moderate differences between Zygoptera and Anisoptera existed, with the latter more clearly redrawing the Mediterranean refuge areas, whereas the former reflected to a greater extend the postglacial expansion patterns from these regions. In general, these findings underline the old biogeographical theories, but refine especially the understanding of the Atlanto- and Ponto-Mediterranean regions. Central Europe, comprising the area with the highest species numbers of the region studied, unravels as a crossroad of postglacial immigrations, but might also represent a region of in situ glacial survival.

(19629) LOCKWOOD, M., 2010. New records of Cordulegaster bidentata Selys, 1842 (Odonata: Cordulegastridae) from the Catalan Pyrenees. *Boln Soc. ent. aragon.* 46: 506-508. (Span., with Engl. s.). – (Grupo Oxygastra, Institució Catalana d'Hist. Nat., Carrer del Carme 47, ES-08001 Barcelona).
New records are described and the situation of the sp. in the region and its habitat choice are discussed.

(19630) STONIS, J.R., D. DAPKUS, A. AUKSORIŪTE & A. VILKAS, 2010. List of Lithuanian names for damselflies and dragonflies (Insecta, Odonata). *Naujos ir retos lietuvos Vabzdžiu Rūšys* 21: 155-165. (Lithuanian, with Engl. s.). – (First Author: Zool. Dept, Vilnius Pedagog. Univ., Studentu 39, LT-08106 Vilnius).
Lithuanian vernacular names are proposed for 72 spp.

(19631) ZANDIGIACOMO, P. & F.M. BUIAN, 2010. Riperti di Selysiothemis nigra (Odonata, Libellulidae) lungo il litorale Alto-Adriatico. *Boll. Soc. Naturalisti "Silvia Zenari"*, Pordenone 34: 77-84. (With Engl. s.). – (Dipto Biol. & Protez. Plante, Univ. Udine, Udine, Italy).
Between 2004-2010, S. nigra was discovered at 4 localities along the coast of the northern Adriatic, between Venice and the mouth of the Isonzo river, Italy. These are described and it is suggested the northward expansion of the sp. is likely to be due to the recent climate change.

2011

(19632) [EISEN, G.] SJÖBERG, F., 2011. *Der Rosinenkönig oder von der bedingungslosen Hingabe an seltsame Passionen*. Galiani, Berlin. 236 pp. ISBN 978-3-86971-033-4.
On the life and work of Gustav Eisen (1847-1940), a Swedish zoologist of German extraction, well-known as the founder of the Sequoia National Park (USA). He described various animal spp., after him is named Eisenia (Oligochaeta: Lumbricidae). G.E. supplied his Sth American odon. material to P.P. Calvert, who named after him Enallagma eiseni from Mexico.

(19633) FERREIRA DOS REIS, E., N. SILVA PINTO, F.G. CARVALHO & L. JUEN, 2011. Environmental integrity effect on fluctuating asymmetry in Erythrodiplax basalis (Kirby) (Libellulidae: Odonata). *EntomoBrasilis* 4(3): 103-107. (Port., with Engl. s.). – Authors' postal addresses not stated).
The effects of the removal of riparian vegetation on the levels of fluctuating asymmetry (FA) in hindwing traits of E. basalis were examined. Unlike in various Zygoptera spp., no FA was detected in E. basalis from different habitats. It is assumed that this is due to high mobility of the anisopterans as compared with that of the Zygoptera.

(19634) LOUREIRO, N.S., 2011. *Libélulas e libelinhas (Odonata) no Algarve*. Guidas digitais biodiversidade e natureza, No. 1. Ebook, 134 pp. ISBN 978-989-97560-0-7. http//biblioteca.turismodoalgarve.pt/multimedia/associal/0234.pdf (Port., with Engl. & Germ. s's).
A guide to the Odon. of Algarve, Portugal, with photographs, diagnostic descriptions, statements on habitats, distribution maps etc. for all spp.

(19635) ROWE, R.J., C. DAVIES, D. DAVIES, S.R. POHE & E.H. SIMPSON, 2011. Tramea loewii (Odonata: Libellulidae), a dragonfly newly arrived in New Zealand. *N. Z. Jl Zool*. 38(2): 189-193. – (First Author: Sch. Marine & Trop. Biol., James Cook Univ., Townsville, AU).
2 adult ♀ observed at Lake Rotekawau, Northland on 28-III-2005 and 23-I-2007, respectively and larvae found at nearby Lake Waipara in 2007 indicate T. loewii had bred in New Zealand. Morphological characters are provided to enable identification of adults and larvae in the field. – See also *OA* 19623, 19637.

(19636) TALMALE, S.S., 2011. A preliminary list of Odonata from the Singhori Wildlife Sanctuary, Madhya Pradesh. *Bionotes* 13(4): 159-160. – (Cen-

tral Zone Regn. Cent., Zool. Surv. India, 168-169 Scheme No. 5, Vijayanagar, Jabalpur-482 002, MP, India).
A checklist of 26 spp.

(19637) WINTERBOURN, M.J., S.R. POHE & O.J.-P. BALL, 2011. Establishment of larval populations of the dragonfly Tramea loewii Kaup, 1866 (Odonata: Libellulidae) in lakes of northern New Zealand. *N. Z. Jl Zool*. 38(2): 173-179. − (First Author: Sch. Biol. Sci., Univ. Canterbury, P. B. 4800, Christchurch-8140, NZ).
The sp. was first seen in New Zealand in 2005, on the Aupouri Peninsula, Northland, and is likely to be self-introduced from Australia. In Nov. 2008, a survey was conducted at the 17 lakes in Peninsula and larvae in various instars were found in 8 of them. The most abundant prey items in the guts of 17 late-instar larvae were Corixidae, chironomid and zygopteran larvae. The potential effect of T. loewii on resident lake fauna is briefly discussed. − See also *OA* 19623, 19635.

2012

(19638) BUCZYŃSKI, P., 2012. Dragonflies (Odonata). *In*: R. Kornijów & P. Buczyński, [Eds], *Lake Skomielno*, pp. 238-256, Mantis, Olsztyn, ISBN 978-83-62860-10-4 (Bilingual: Pol./Engl.). − Publishers: Słowicza 11, PO-11-041 Olsztyn).
The lake is situated in the Podlasie-Polesie region, Poland. Its fauna and that of the adjoining habitats (36 spp.) is described, the odon. communities and their composition are thoroughly analysed and discussed. None of the recorded spp. is redlisted in Poland, but Aeshna viridis and Leucorrhinia caudalis are of particular conservation interest.

(19639) BUCZYŃSKI, P. & P, BIELAK-BIELECKI, 2012. Crocothemis servilia (Drury, 1773) (Odonata: Libellulidae) introduced with aquarium plants to Lublin (Poland). *Annls Univ. Mariae Curie-Sklodowska* (C) 67(2): 21-26. (With Pol. s.). − (First Author: Dept Zool., UMCS, Akademicka 19, PO-20.033 Lublin).
A ♀ larva was found in a heated aquarium (26-28°C) in a pet shop. The adult emerged on 12-VIII-2012. There is evidence that the larva was introduced with aquatic plants. This is the first record of this kind in Poland. The similar previous records of C. servilia in Europe are reviewed.

(19640) BUCZYŃSKI, P., G. TOŃCZYK & E. BUCZYŃSKA, 2012. Materials to the knowledge of some aquatic insects (Plecoptera, Odonata, Heteroptera, Trichoptera, Coleoptera) of the Gorce mountains. *Teka Kom. Ochr. Kszt, Środ. Przyr*. 9: 16-27. (With Pol. s.). − (First Author: Dept Zool., UMCS, Akademicka 19, PO-20.033 Lublin).
Cordulegaster bidentata is the only odon. sp. recorded (May 2006); − S Poland.

(19641) BUSH, A., G. THEISCHINGER, D. NIPPERESS, E. TURAK & L. HUGHES, 2012. Dragonflies, climate canaries for river management. *Diversity Distrib*. 2012: 12 pp.; − DOI: 10.111/ddi.12007. − (First Author: Dept Biol. Sci., Macquarie Univ., North Ryde, Sydney, NSW-2109, AU).
Data were analysed from standard bio-assessment monitoring at over 850 sites spanning a 9° latitude gradient in E Australia. Climate explained 3 times as much variations in turnover of odon. spp. than odon. and other macroinvertebrate assemblages at family level. The dissimilarity of odon. and varying turnover in each macroinvertebrate assemblage meant surrogacy amongst groups were low. On the basis of the influence of climate on turnover of macroinvertebrate assemblages, odon. spp. distribution appears highly sensitive to climatic factors, making this taxon a potentional useful indicator of climate change responses. However, the low surrogacy amongst assemblages also suggest that a shift in the focus of conservation management from the specific taxa to the functional composition of assemblages across a diverse range of habitat is needed.

(19642) CHANDANA, E.P.S., A.C.D. RAJAPAKSHA & W.G.K.H. SAMARASEKARA, 2012. A survey of odonate assemblages associated with selected wetland localities in southern Sri Lanka. *Asian J. Conserv. Biol*. 1(2): 67-73. − (Dept Zool., Fac. Sci., Univ. Ruhuna, Matara, Sri Lanka).
28 spp. are listed from 6 localities.

(19643) CHEONG, Y.J. & Y.W. CHEONG, 2012. [A project report on] *Radio tracking of large Odonata species in forest fragments in Singapore*. Nature Soc. Singapore, ii + 11 pp. − (Authors: NUS High Sch., Hwa Chong Instn, Singapore).
Subsequent to the work published (2011) by S. Levett & S. Walls (*J. Br. Dragonfly Soc*. 27/1: 59-68), this is a pilot study on collecting information on odon. spatial and temporal behaviour by radio

tracking. 3 ♀ and 1 ♂ of 3 spp. were used. The best results were obtained with a ♀ Macrogomphus quadratus (weight 1.018 g, body length 80 mm, hindwing 54 mm) that could be tracked for 8 days, with the signal getting gradually weaker over the last 2 days. The attached transmitter (incl. antenna and battery) had a weight of 0.22 g. The equipment and methodology are described, the results are discussed and some suggestions for future work in this field in Singapore are provided.

(19644) ENDERSBY, I.D. 2012. The names of Victoria's dragonflies (Insecta, Odonata). *Proc. R. Soc. Victoria* 123(3): 155-178. – (56 Looker Rd, Montmorency, Vic-3094, AU).
The chronology of the naming of Victoria's (Australia) 76 spp. is given, with short biographical notes on the authors. From a study of the original descriptions, the etymology of the 76 spp. and 44 gen. known from the state is elucidated or inferred.

(19645) *ERJAVECIA*. Bulletin of the Slovenian Odonatological Society (ISSN 1408-8185), No. 27 (31 Oct. 2012). (Slovene and Engl.). – (c/o M. Bedjanič, Rakovlje 42/A, SI-3314 Braslovče).
B. Kiauta (pp. 1-4) contributed a retrospective article on the life and odonatol. work of A. Lazzarini (1871-1945) in Friuli-Venezia Giulia, Italy. *A. Šalamun* (pp. 5-7) writes on Selysiothemis nigra and some other spp. in Slovenia. In 5 articles (mostly reports on field workshops) are presented records from various regions of Slovenia. In addition, noteworthy spp. from a fishpond nr Žalec are outlined by *M. Bedjanič* (pp. 38-42) and the information on Ophiogomphus cecilia in central Slovenia is provided by *M. Bedjanič & A. Šalamun* (pp. 43-44). Five articles are related to the odonatology of the Balkan, incl. a note on the foundation of the Soc. of Odonatologists of Serbia. *A. Pivko-Knežević* (pp. 36-37) writes on the presentation of the Slovenian Odonatol. Soc. at the Lent Festival in Maribor. The issue is traditionally concluded by *M. Bedjanič*'s (27th) Supplement to the odonatol. bibliography of Slovenia (pp. 47-52; entries 851-905).

(19646) FARKAS, A., T. JAKAB, A. TÓTH, A.F. KALMÁR & G. DÉVAI, 2012. Emergence patterns of riverine dragonflies (Odonata: Gomphidae) in Hungary: variations between habitats and years. *Aquat. Insects* 34 (Suppl. 1): 77-89. – (First Author: Dept Hydrobiol., Univ. Debrecen, Egyetem tér 1, HU-4032 Debrecen).
On the emergence patterns in Gomphus flavipes, G. vulgatissimus, Onychogomphus forcipatus and Ophiogomphus cecilia at 4 sites along the Tisza and Szamos rivers and at some other selected localities in Hungary, as revealed during a 5-yr study, based on exuviae.

(19647) FLECK, G., 2012. Preliminary notes on the genus Aeschnosoma Selys, 1870 (Odonata: Anisoptera: Corduliidae s.str.). *Annls Soc. ent. Fr.* (N.S.) 48(1/2): 225-228. (With Fr. s.). – (32 ave du Maréchal Joffre, F-31800 Saint-Gaudens).
Briefly described and illustrated are A. pseudoforcipula sp.n. and A. heliophila sp.n. (both from the Brazilian Central Plateau, related to the Amazonian A. forcipula and A. auripennis, respectively) and A. louissiriusi sp.n. (form northern Brazil; not closely related to any known sp.). Based on larval and adult derived characters, the genus Aeschnosoma appears closely related to the Australian Pentathemis Karsch and also to the Madagascan Libellulosoma Martin. The clade Aeschnosomata nov. is erected to receive the 3 genera. Some putative plesiomorphies would place this clade sister group of the remaining Corduliidae s.str.

(19648) FLECK, G. & U.G. NEISS, 2012. The larva of the genus Paracordulia Martin, 1907 (Odonata: Corduliidae s.s.) and a generic key to the larvae of Corduliidae s.s. in South America. *Zootaxa* 3412: 62-68. – (First Author: 32 ave du Maréchal Joffre, F-31800 Saint-Gaudens).
Paracordulia is currently considered a monotypic genus, though J. De Marmels (1983, *Odonatologica* 12: 5-13) described (but not named!) a ♀ that seems sufficiently different from P. sericea (Sel.) to be considered as not conspecific. No Paracordulia larvae were so far described. Here, the ultimate instar is described and illustrated of a ♀ larva from the tributary of Rio Negro (Amazonas state, Brazil). The larva was reared to the adult that also slightly differs from those hitherto described, therefore no specific name can be assigned to the described larva.

(19649) FLECK, G., U.G. NEISS & N. HAMADA, 2012. The larva of Dicterias Selys, 1853 (Odonata: Heliocharitidae [= Dicteriatidae]) and taxonomic and phylogenetic notes on Heliocharitidae. *Zootaxa* 3164: 32-40. – (First Author: 32 ave du Maréchal Joffre, F-31800 Saint-Gaudens).

The ultimate instar larva of D. atrosanguinea is described and illustrated for the first time. It is morphologically very close to that of Heliocharis amazona. The larvae of these 2 monotypic genera are compared and a larval diagnosis for the fam. is provided. The fam. Heliocharitidae (= Dicteriatidae) shares derived characters with some Calopterygidae. The larvae of Heliocharitidae are also amazingly similar to those of some Megapodagrionidae; the long-legged Megapodagrionidae related to Megapodagrion could be related to Heliocharitidae and could represent a basal stem within the Calopterygoidea.

(19650) HAUZLER, Ž., 2012. [*Residents' consciousness about the importance of conservation of the Natura 2000 areas in the Ljubljansko Barje Landscape Park*]. Graduation Thesis, Fac. Envir. Sci., Univ. Nova Gorica. xi + 61 pp., 3 App. excl. (Slovene, with Engl. s.). − (Author's current address unknown).
Includes reference to Coenagrion ornatum, Cordulegaster heros and Somatochlora flavomaculata (pp. 20, 28); − Slovenia.

(19651) HOLUŠA, O. & K. HOLUŠOVA, 2012. The first findings of larvae of Cordulegaster insignis (Odonata: Cordulegastridae) in Macedonia. *Acta Mus. beskidensis* 4: 151-154. (With Czech s.). − (First Author: Dept Forest Prot. & Wildlife Mngmt, Fac. Forestry, Mendel Univ., Zemědělská 3, CZ-61300 Brno).
The larvae of various instars are reported from the village of Novačani nr Veles, central Macedonia (6-VII-2012).

(19652) HOLUŠA, O. & V. KŘIVAN, 2012. A population of Cordulegaster insignis (Schneider, 1845) in Macedonia (Odonata: Cordulegastridae). *Acta Mus. Moraviae* (Sci. biol.) 97(2): 1-5. − (First Author: Dept Forest Prot. & Wildlife Mngmt, Fac. Forestry, Mendel Univ., Zemědělská 3, CZ-61300 Brno).
The observation of a number of teneral specimens over a period of 2 yr is reported from the village of Novačani nr Veles, central Macedonia (2010-2011).

(19653) HUDAK, H.C., 2012. *Libellen*. Ars Scribendi, Etten-Leur. 24 pp. Hardcover (20.8 × 20.8 cm). ISBN 978-90-5566-792-5. (Dutch). − The original American edn: 2009, *Dragonflies*, Weigl, North Mankato, MN, USA).
Directed at children aged 6-9. A didactically well presented basic information on fossil record, morphology, life history and the life of Anisoptera, illustrated with photographs of N American spp.

(19654) HUSAIN, A., H.J HUSAIN & G. SHARMA, 2012. New records of dragonflies (Insecta: Odonata: Anisoptera) from Chhatarpur district, Madhya Pradesh, India with their conservation status and distribution. *J. new biol. Rep*. 1(1): 12-16. − (First Author: 41 Hari Vihar, Vijay Park, Dehra Dun-248 001, India).
A commented list of 6 spp.

(19655) JEZIORSKI, P. & O. HOLUŠA, 2012. An updated checklist of the dragonflies (Odonata) of the Czech Republic. *Acta Mus. beskidensis* 4: 143-149. (With Czech s.). − (First Author: Na Bělidle 1, CZ-73564 Havířov-Suchá).
A list of 73 spp., all based on voucher specimens. Of these, 71 spp. are from Bohemia and 69 from Moravia.

(19656) KARUBE, H., I. KAWASHIMA & T. SATO, [Eds], 2012. [*Guidebook of the Special Exhibition 2012: the big exhibition of dragonflies, supreme rulers of the air*]. Kanagawa Prefect. Mus. Nat. Hist., Odawara. 166 pp. Softcover (21.0 × 28.5 cm). ISBN none. (Jap., with some articles in Engl.). − (Eds & Publishers: Kanagawa Prefect. Mus. Nat. Hist., 499 Iryuda, Odawara, 250-0031, JA).
The nicely produced book has 2 parts, titled "All about dragonflies" and "Dragonflies of Japan and the World". Some of the numerous articles were contributed (in Engl.) by some foreign workers (*A. Cordero-Rivera*, *M. Hämäläinen*, *M. Samways* and *H. Zhang*).

(19657) KOREN, T., D. TRKOV, K. VUKOTIĆ & M. ČRNE, 2012. New records of the rare dragonfly Selysiothemis nigra (Vander Linden, 1825) (Insecta: Odonata) in Bosnia and Herzegovina. *Natura Sloveniae* 14(2): 65-69. (With Slovene s.). − (First Author: Inst. Biodiv. Stud., Sci. & Res. Cent., Univ. Primorska, Giordana Bruna 6, SI-6130 Izola).
The sp. is recorded from Klepci nr Čapljina (2 ♀, 8-VII-2012) and from the Hutovo Blato Nature Park (ca 20 ♂ & ♀, 6-VIII-2012).

(19658) KOSTERIN, O.E., G. CHARTIER, J. HOL-

DEN & F.S. MEY, 2012. New records of Odonata from Cambodia, based mostly on photographs. *Cambodian J. nat. Hist*. 2012(2): 150-163. (With Camb. s.). – (First Author: Inst. Cytol. & Genet., SB RAS, Lavrentiev ave 10, Novosibirsk, 630090, Russia).

Euphaea ochracea, Lestes nodalis, Gynacantha phaeomeria, G. demeter, Microgomphus chelifer, Amphithemis curvistyla, Orthetrum triangulare, Rhyothemis plutonia and Tetrathemis platyptera are reported for the first time from Cambodia, rising the number of spp. known from that country up to the 135 mark. New distributional records for 93 spp. are provided from a number of localities in the Cardamom Mts. Ectoparasitic midges (Forcipomyia/Pterobosca) are brought on record from 1 coenagrionid and 11 libellulid spp.

(19659) KULIJER, D., D. VINKO, M. BILLQVIST & J.J. MEKKES, 2012. Contribution to the knowledge of the Odonata fauna of Bosnia and Herzegovina: results of the ECOO 2012. *Natura Sloveniae* 14(2): 23-38. (With Slovene s.). – (First Author: Nat. Hist. Mus. Bosnia & Herzegovina, Zmaja od Bosne 3, BA-71000 Sarajevo).

Records of 52 spp. from 36 localities, gathered during 6-12 Aug. 2012. Among the noteworthy spp. are Ceriagrion tenellum, Coenagrion hastulatum, C. ornatum, Caliaeschna microstigma, Lindenia tetraphylla, Cordulegaster heros, Somatochlora metallica and Selysiothemis nigra.

(19660) MARINOV, M, 2012. Description of female Hemicordulia hilaris Lieftinck, 1975 (Anisoptera: Corduliidae) with brief notes on the biogeography of the genus. *Rec. Auckland Mus*. 48: 97-105. – (Freshw. Ecol. Res. Gr., Univ. Canterbury, P.B. 4800, Christchurch-8140, NZ).

The ♀ is described and illustrated for the first time, based on 6 specimens from Cook Isls, Fiji and Tonga. 2 scenarios of the distribution history of the genus are discussed and it is concluded that molecular study is required to resolve the pending problems of taxonomy and biogeography.

(19661) MEZQUITA-ARANBURU, I. & F.J. OCHARAN, 2012. Odonates from Gipuzkoa. *Munibe* 60: 51-75. (Span., with Engl. & Basque s's). – (First Author: Depto Ent., Soc. Cien. Aranzadi, Zarroagagaina 11, ES-20014 Denostia/San Sebastián).

43 spp., from 27 localities in Basque Country (Spain) are listed and the fauna is briefly discussed. Of particular interest are the records of Coenagrion mercuriale, C. scitulum, Oxygastra curtisii and Orthetrum albistylum. These are the results of a systematic survey, carried out during 2006-2011.

(19662) MICHALSKI, J., 2012. *A manual for the identification of the dragonflies and damselflies of New Guinea, Maluku and the Solomon Islands*. Kanduanun Books, Morristown/NJ. viii + 561 pp., 8 col. pls excl. Hardcover (22.0 × 28.2 cm). ISBN 978-0-615-63726-6. – (Author: 223 Mount Kemble Ave, Morristown, NJ 07960, USA).

A magnificent handbook and an exalted milestone in the odonatology of the New Guinea region. It is bound to trigger and propagate more interest in this odonatological hot spot, of which it is said to harbor "many hundreds"of spp. that still await discovery and description. The book will greatly facilitate the future taxonomic work, presenting, summarizing and analysing a wealth of information, much of which is scattered in numerous, often not readily available journal publications. The descriptive keys and the additional, very lucid comparisons of morphologically similar taxa are enhanced by 1275 figs showing structural peculiarities of all of the 620 treated spp. Over 100 of these are original, the others are reproduced from primary publications, among these ca 870 from various works of M.A. Lieftinck. This, too, is an advantage of the book. The project was conceived some 20 years ago and was faced with various problems of scientific, technical and financial nature. It deserves a profound respect and admiration, the Author, a professional biologist, was able to bring it to such an excellent conclusion solely in his spare time.

(19663) MOHAMED, Z.Y.A., K.S.M. OSMAN, I.E.E. MOHAMED & S.M. BAKRY, 2012. Impact of water-pH values on the consumption capacity of certain aquatic insects preying on different medical snails. *J. evol. Biol. Res*. 4(2): 39-51. – (Dept Zool. & Ent., Fac. Sci. in Oena, South Valley Univ., Egypt).

As revealed by the results of a laboratory study, belostomatids and Anax imperator, Crocothemis erythraea and Ischnura pumilio larvae could be the most successful predators on the harmful snails Bulinus truncates, Melanoides tuberculata, Biomphalaria alexandrina and Cleopatra bulimoides. –

(*Abstracter's note*: The odon. identification should be considered with caution, since "a key to the Italian Odonata" was used, but it is not listed in the References).

(19664) MORENO PALLARES, M.I. & G.H. GILLOT MONROY, 2012. Spatial and temporal distribution of dragonfly naiads in wetlands La Vaca and Santa Maria del Lago, Bogotá, Colombia. *Acta biol. colomb*. 17(2): 281-294. (Span., with Engl. s.). – Depto Biol., Fac. Cien., Univ. Nac. Colombia, Carrera 30 No. 45-03, Edificio 421, Oficina 205, Bogotá, Colombia).
A journal paper based on the Dissertation listed in *OA* 18976.

(19665) NEL, A., G. BECHLY, J. PROKOP, O. BÉTHOUX & G. FLECK, 2012. Systematics and evolution of Paleozoic and Mesozoic damselfly-like Odonatoptera of the 'protozygopteran' grade. *J. Paleontol*. 86(1): 81-104. – (First Author: Entomologie, Mus. Natn. Hist. Nat., 45 rue Buffon, F-75005 Paris).
The Paleozoic to Mesozoic grade 'Protozygoptera' is revised. It appears to be composed of two main lineages, namely the superfamily Permagrionoidea, and the Archizygoptera. The latter taxon forms a monophyletic group together with Panodonata (= crown-Odonata plus their closest stem-relatives). Therefore, the 'Protozygoptera' as previously understood is paraphyletic. Diagnostic characters of the 'Protozygoptera', Permagrionoidea and Archizygoptera are re-evaluated. The Permolestidae is considered as a junior synonym of the Permagrionidae. The following new taxa are described: Permolestes sheimogorai sp. n., P. soyanaiensis sp. n., Epilestes angustapterix sp. n., Solikamptilon pectinatus sp. n. (all in Permagrionidae); Lodeviidae fam. n. (for Lodevia); Luiseiidae fam. n. (including Luiseia breviata gen. n., sp. n.); Kennedya azari sp. n., K. pritykinae sp. n., K. ivensis sp. n., Progoneura grimaldii sp. n. (all in Kennedyidae); Engellestes chekardensis gen. n., sp. n. (in Bakteniidae); and Azaroneura permiana gen. n., sp. n. (in Voltzialestidae). The Kaltanoneuridae and Oboraneuridae are revisited. The evolution of protozygopteran Odonatoptera during the transition from the Permian to the Triassic is discussed. The larger taxa of the permagrionoid lineage apparently did not cross through the Permian-Triassic boundary, unlike the more gracile Archizygoptera. This last group shows a remarkable longevity from the Late Carboniferous to the Early Cretaceous. It also presents a great taxonomic and morphological stability, with genera ranging from the Permian to the Triassic, and a wing venation pattern nearly unchanged from the Late Carboniferous to the Late Triassic. The mass extinction at the end of the Permian period seemingly had a minor effect on these tiny and delicate insects.

(19666) *ODONATOLOGICAL ABSTRACT SERVICE* (ISSN 1438-0269), No. 36 (Dec. 2012). – (Distributor: M. Schorr, Schulstr. 7/B, D-54314 Zerf).
Abstract Nos 11767-12121.

(19667) OGAWA, H., M. NOSAKA, N. HASHII, M. YOKOYAMA & N. TSURUSAKI, 2012. Insect records made during the 2011 faunal survey of the Tottori Sand Dunes, with comments on the fauna of Sakyu Oasis. *Nat. Hist. Res. San'in* 7: 31-40. (Jap., with Engl. s.). – (Lab. Biol., Fac. Regional Sci., Tottori Univ., Koyama-minami 4-101, Tottori, 680-8551, JA).
Lists 3 odon. spp.

(19668) OLBERG, S. & O.J. LØNNVE, 2012. Ischnura pumilio (Charpentier, 1825) (Odonata, Coenagrionidae) in Norway. *Norw. J. Ent*. 59: 229-233. – (BioFokus, Gaustadalléen 21, NO-0349 Oslo).
The adults and larvae are reported from a sandpit pond at Bergsdalen in Nittedal, N. of Oslo (May-June 2012). I. pumilio is new to the fauna of Norway, and this is its northernmost record.

(19669) ROSSET, V., J.P. SIMAIKA, F. ARTHAUD, G. BORNETTE, D. VALLOD, M.J. SAMWAYS & B. OERTLY, 2012. Comparative assessment of scoring methods to evaluate the conservation value of pond and small lake biodiversity. *Aquat. Conserv. Mar. Freshw. Ecosyst*. 2012: 14 pp.; wileyonlinelibrary.com; DOI: 10.1002/aqc.2287 – (First Author: Univ. Appl. Sci. West. Switzerland, Hepia Geneva Technol., Archit. & Landscape, CH-1254 Jussy-Geneva).
It is hypothesized that scores to assess the conservation value of assemblages can vary markedly according to the type of method used. To test this, 4 types of scoring methods were applied differing in the weight given to Red List categories and in the expression of the score, i.e. either using mean per sp. or the assemblage as a whole, on sets of odon.

and macrophyte data collected from varied types of small lakes and ponds in France, Switzerland and Sth Africa. The comparison of the different types of methods showed that the type of method used had a marked impact on the assessment of the conservation value of a water body: the expression per sp. or per assemblage as the weight given to Red List categories changed the value of a given water body. Overall, results also confirmed that the different types of methods could be applicable in different geographical areas and types of standing water bodies, independently of the original area where the method was developed. Results illustrated that, besides the species richness assessment commonly used, calculating conservation value as a mean per sp. is useful because it provides additional information. Overall, using methods expressed as a mean per sp. and coupling the Red List with other criteria gave the best performance.

(19670) ŠÁCHA, D. & L. RACKO, 2012. New site of the species of the European Community interest: Coenagrion ornatum (Odonata: Coenagrionidae) in northern Slovakia. *Folia faun. slovaca* 17(1): 7-9. (Slovak. with Engl. s.). – (First Author: Podtatraského 31, SK-031-01 Liptovský Mikulás).
A rather large population was discovered (2010, 2011) in Šuja (alt. 476 m). The habitat is described and the odon. assemblage is listed.

(19671) SICREE, A.A., 2012. The flying dragons of the Carboniferous. *Smoke Signals* [Newsletter of the Apache Junction Rock & Gem Club] 2012 (Apr.): 2-4. – (c/o R. Ginn, 691 N Velero St., Chandler, AZ 85225, USA).
A short (popular style) sketch of the protodonate occurrence in the world. Quite informative, with taxonomic nomenclature and stratigraphic terminology.

(19672) SUTTON, P.G., 2012. Key identification features for the Red-veined Darter Sympetrum fonscolombii (Selys, 1840) and other Odonata in Corfu (Kérkira). *Bull. amat. ent. Soc*. 71(501): 45-49. – (1 Fir Tree Close, Flitwick, Beds., MK45 1NZ, UK).
Notes and photographs on morphology and coloration of S. fonscolombii, Lestes barbarus, Coenagrion pulchellum and Ischnura elegans; – Corfu, Greece.

(19673) TAKAHARA, T., Y. KOHMATSU, A. MURAYAMA, H. DOI, H. YAMANAKA & R. YAMAOKA, 2012. Inducible defense behavior of an anuran tadpole: cue-detection range and cue types used against predator. *Behav. Ecol*. 2012: 6 pp.; – DOI 10.1093/beheco/ars044. – (First Author: Inst. Sustainable Sci. & Development, Hiroshima Univ., 1-3-1 Kagamiyama, Higashi-Hiroshima, 739-8530, JA).
It was hypothesized that the distance at which prey spp. detect predator cues would be related to avoiding detection by the predator. To test this, laboratory experiments were performed here using Hyla japonica tadpoles and Anax parthenope julius larvae. Tadpole activity level was reduced as a function of exposure to chemical cues from the dragonfly predator, but activity levels did not change when tadpoles were exposed to potential visual cues from the dragonfly predator, but activity levels did not change when tadpoles were exposed to potential visual cues from the dragonfly. The distances of which tadpoles detected predator cues were longer than those over which the dragonfly predator detected tadpoles. The differences in cue-detection ranges between tadpoles and dragonfly predators are related both to predator avoidance by tadpoles and effective foraging strategies by dragonfly predators. Chemical cue detection as a trigger of inducible defense by prey spp. may shape predator-prey relationships in aquatic habitats.

(19674) TALMALE, S.S., 2012. Dragonfly & damselfly (Insecta: Odonata) diversity of Veerangana Durgavata Wildlife Sanctuary, Damoh, Madhya Pradesh. *J. Sci. Information* (Special Issue) 3: 12-16. – (Central Zone Regn. Cent., Zool. Surv. India, Jabalpur-482 002, MP, India).
A commented list of 32 spp.

(19675) TERNOIS, V., E. FRADIN, A. GAJDOS & J.-L. LAMBERT, 2012. *Pré-atlas des odonates de Champagne-Ardenne. Bilan cartographique des programmes IVOD et CILIF (synthèse 2011)*. Soc. fr. Odonatol., Champagne-Ardenne 26 pp. ISBN none. – (First Author: c/o CPIE du Pays de Soulaines, Domaine de Saint Victor, F-10200 Soulaines-Dhuys).
The Champagne-Ardenne (France) distribution maps of 65 spp., based on 215.000 records, contributed by almost 1200 workers.

(19676) TRAPERO-QUINTANA, A. & R. NOVE-

LO-GUTIÉRREZ, 2012. Description of the final stadium larva of Erythrodiplax bromeliicola Westfall, 2000 (Odonata: Libellulidae) with notes on variation in adults from Cuba. *Zootaxa* 3545: 59-66. − (First Author: Depto Biol., Univ. de Oriente, Ave. Patricio Lumumba, Santiago de Cuba-90500, Cuba).
The larva is described and illustrated from Cuba. The light brown scape and pedicel and creamy pale flagellum of the antenna, plus the abundant short reddish, spiniform setae on the integument of the body surface and epiproct comprise an exclusive combination of characters in the larva of this sp. Information on larval habitat and a key for the larvae of the 5 Erythrodiplax spp. occurring in Cuba are provided, and details on morphological variation of an adult Cuban population are presented.

(19677) TRATNIK, A., 2012. [*Seasonal changes in species composition of adult dragonflies in the Draga pri Igu area*]. Poročilo o samostojnem terenskem delu, Dept Biol., Univ. Ljubljana. 12 pp. (Slovene). − (Dept Biol., Univ. Ljubljana, Večna pot 111, SI-1000 Ljubljana).
An undergraduate student work. Seasonal occurrence of 31 spp. is analysed at a locality S of Ljubljana, Slovenia.

(19678) VILAS SOUTO, J., 2012. Aeshna isosceles (Müller, 1767) (Odonata: Aeshnidae), primera cita para Galicia (N.O. Peninsula Ibérica). *Arquivos ent*. 7: 83-84. (With Engl. s.). − (Feliciano Borrera 11-D-2°A, ES-15706 Santiago de Compostela).
Various individuals were sighted at a channel adjacent to Lagoa de Traba (Galicia, Spain), 16-VI-2011).

(19679) VILLANUEVA, R.J.T., 2012. Review of the Philippine taxa formerly assigned to the genus Amphicnemis Selys, 1: overview and descriptions of three new genera (Odonata: Coenagrionidae). *Zool. Meded. Leiden* 86(8): 579-604. − (D3C Gahol Aptmnt, Lopez Jaena St., Davao City-8000, The Philippines).
The said spp. are reviewed and Luzonobasis gen. n., Pandanobasis gen. n. and Sangabasis gen. n. are erected. Amphicnemis isabela is synonymised with A. glauca and transferred to Lusonobasis gen. n. A. cantuga and A. mcgregori are transferred to Pandanobasis gen. n. A. braulitae, A. circularis, A. dentifer and A. furcata are transferred to Sangabasis gen. n. The rest of the Philippine Amphicnemis spp. are transferred to Pericnemis Hag. Pandanobasis curacha sp. n. (holotype ♂: Samar Isl., 22/28-V-1997) and P. daku sp. n . (holotype ♂: Leyte Isl., 28-VI-1989) are described and illustrated. Holotypes are deposited in RMNH, Leiden).

(19680) VINKO, D., 2012. [Report of the Odonata Working Group]. *In*: P. Presetnik, [Ed.], *Ekosistemi Jadrana: Črna Gora, 2009*, pp. 51-54, Društ. Štud. Biol., Ljubljana. ISBN 978-961-93251-2-4. (Slovene). − (Slovenska 14, SI-1234 Mengeš).
A commented list of 23 spp. from 13 localities that are not specified but are mostly situated on Skadar lake or elsewhere in the Mediterranean region of Montenegro. Erythromma najas, Lestes dryas and Aeshna cyanea (larva) are among the noteworthy records.

(19681) VINKO, D., 2012. Report on the work of the Odonata Working Group. *In*: N. Sivec & T. Santl Temkiv, [Eds], *Raziskovalni Tabor študentov biologije: Vransko, 2007*, pp. 67-76, Društ. Štud. Biol., Ljubljana. ISBN 978-961-93251-1-7. (Slovene, with Engl. s.). − (Slovenska 14, SI-1234 Mengeš).
31 spp. are reported from 29 localities; − Vransko region, Slovenia.

(19682) VINKO, D. & M. BEDJANIČ, 2012. Slovensko odonatološko društvo (SOD). *Trdoživ* 1(1): 16. (Slovene). − (First Author: Slovenska 14, SI-1234 Mengeš).
On the objectives and work of the Slovenian Odonatological Society.

(19683) VUNDTSETTEL, M.F. & N.V. KUZNETSOVA, 2012. Ecological characteristics of the river Yakhroma and its benthic fauna. *Vest. Astrakhan gos. techn. Univ.* (Rybnoe Hozyaystvo) 2012(1): 15-21. (Russ., with Engl. s.). − (Dept Ecol., Dmitrov Branch, Astrakhan State Techn. Univ., Astrakhan, Russia).
Includes a list of 13 odon. spp., 7 of which also(?) as larvae, from the Yakhroma river, a tributary of the Volga, N of Moscow (Russia).

(19684) WILLIAMSON, D.I., 2012. Introduction to larval transfer. *Cell develop. Biol*. 1(6): 5 pp.; DOI: 10.4172/2168-9296.1000108. − (14 Pairk Beg, Port Erin, Isle of Man, IM9 6NH, UK).
"Larval transfer" is a theory that attemps to explain

the origin of larvae, and it is accepted by very few workers. Here, the author claims that an ancestor of Odon. acquired larvae by hybridization with a thysanuran.

(19685) ZABŁOCKI, P. & M. WOLNY, 2012. Materials to the knowledge of some protected, rare and interesting species of dragonflies (Insecta: Odonata) of Silesia (SW Poland). *Opolski Roczn. muzeal*. 19: 9-48. (Pol., with Engl. s.). – (Dzial Przyrody, Muz. Slaska Opolskiego, Lesnicka 28, PO-47-154 Góra sw. Anny).
Data on the distribution of 31 selected spp. in Silesia (Poland) is presented, based on 314 records from 101 localities. Among these, Epitheca bimaculata, Leucorrhinia caudalis, Sympetrum depressiusculum, S. fonscolombii and S. pedemontanum are of particular interest.

(19686) ZABŁOCKI, P. & M. WOLNY, 2012. The first locality of Somatochlora arctica (Zetterstedt, 1840) (Odonata: Corduliidae) in the Opole region (SW Poland) with comments on the dragonfly list of the Opole voivodship. *Parki nar. Rezerv. Przyr*. 31(3): 87-96. (Pol., with Engl. s.). – (Dzial Przyrody, Muz. Slaska Opolskiego, Lesnicka 28, PO-47-154 Góra sw. Anny).
S. arctica is reported from a locality situated E of Kamieniec. This is the fourth locality in Upper Silesia (Poland) from where its larvae were recorded. So far, 61 spp. are known from the Opole prov. These are listed and some comments are provided.

(19687) ZHANG, H.-C., D.-R. ZHENG, B. WANG, Y. FANG & E.A. JARZEMBOWSKI, 2012. The largest known odonate in China: Hsiufua chaoi Zhang & Wang gen. & sp. nov. from Middle Jurassic of Inner Mongolia. *Chin. Sci. Bull*. 2012: 6 pp. ; – DOI: 10.1007/s11434-012-5567-3 – (First Author: Lab. Palaeobiol. & Stratigraphy, Nanjing Inst. Geol. & Palaeontol., Chin. Acad. Sci., Nanjing-210008, China).
The new gen. is erected and the new sp. described and illustrated in Campterophlebiidae, based on a forewing from Haifanggou Formation in Ningcheng co. The size of the Permian and Mesozoic odon. is discussed in terms of competition for prey between Odon. and Protodonata, and predation pressure from contemporary aerial vertebrates.

2013

(19688) ABDELSALAM, K.M. & K. TANIDA, 2013. Diversity and spatio-temporal distribution of macro-invertebrate communities in spring flows of Tsuya stream, Gifu prefecture, central Japan. *Egypt. J. aquatic. Res*. 2013: 12 pp.; – http//dx.doi.org/10.1016/j.ejar.2013.03.003 – (First Author: Natn. Inst. Oceanogr. & Fish., Qayat Bey, El-Anfoushy, Alexandria, Egypt).
Calopteryx atrata, Planaeschna milnei and Anotogaster sieboldii are listed from the stream.

(19689) *BOLETIN DE LA SOCIEDAD ODONATOLOGICA DE ANDALUCIA* (ISSN 2255-5242), No. 1 (Febr. 2013). Edited by M.A. Conesa García (C/Apamares 39, ES-29016 Malaga), F.J. Cano Villegas & A.B. Sánchez. (Span., with Engl. titles).
Anonymous: [On the objectives and program of the Society] (pp. 2-4); – *Conesa García, M.A.*: Some Odonata in the bog reserve area "Padul" (Granada), Spain (pp. 5-6); – *Conesa García, M.A. & A.B. Sánchez*: About Gomphus vulgatissimus (Linnaeus, 1758) larvae (pp. 7-8); – Some Odonata in nature reserve of Villafranca de los Caballeros (Toledo), Spain (pp. 9-10); – *Conesa García, M.A., P. Camacho & F. Cano Vilegas*: About the distribution of Selysiothemis nigra (Vander Linden, 1825) in the province of Malaga, Andalucía, Spain (pp. 11-13); – *Anonymous*: Odonatological conference at Natural Park "Los Alcornocales", Cádiz, Spain (pp. 14-15; Engl. with list of recorded spp.); – [*Author not stated*]: Contribution to the knowledge of the Odonata of the high mountains in eastern Andalusia (Granada and Almeria), Spain (pp. 16-22).

(19690) DEMAYO, C.G., M.J. RICO & M.A.J. TORRES, 2013. Relative warp analysis of variations in the fore- and hindwings of selected populations of male Neurothemis t. terminata (Ris, 1911). *Sci. Int. Lahore* 25(2): 277-284. – (Dept Biol. Sci., Coll. Sci. & Math., MSU-Iligan Inst. Technol., Iligan, Philippines).
Specimens from several populations in N Mindanao (the Philippines) were analysed. To illustrate variations in wing shape, landmark data was subjected to relative warp analysis and the resulting scores were subjected to Multivariate Analysis of Variance (MANOVA) and Canonical Variate Analysis (CVA). The results display significant variations between populations, suggesting that each population

represents discrete panmictic units, which could be due to ♂ territorial behaviour.

(19691) DOLNÝ, A., H. MIŽOČOVÁ & F. HARABIŠ, 2013. Natal philopatry in four European species of dragonflies (Odonata: Sympetrinae) and possible implications for conservation management. *J. Insect Conserv*. 17(2): 9 pp.; – DOI: 10.1007/s10841-013-9564-x. – (First Author: Dept Biol. & Ecol., Fac. Sci., Inst. Envir. Technol., Univ. Ostrava, CZ-710-00 Ostrava).
In Europe, S. depressiusculum is classified as vulnerable, with a high risk of extinction. It is a habitat specialist; the presumed main reason for its vulnerability is the destruction of its natural habitats. Published information regarding dispersal rate and philopatry is not available, although these are evolutionary strategies that can play key roles in susceptibility to environmental change. The rate of philopatry in S. depressiusculum is here compared to that in 3 congeners, which are abundant but not endangered, viz.: S. sanguineum, S. striolatum and S. vulgatum. Data were collected in a very isolated site in the Czech Republic, more than 100 km distant from another known population of the sp. Using exuviae collection (6,157 specimens) and capture-mark-recapture (2,188 adults marked) methods, the acquired data allowed a comparison between the numbers of emerged individuals and adults returning to the maternal site. A great difference was found between the philopatry of S. depressiusculum and the 3 other spp. While in S. depressiusculum philopatry was almost 100%, in the other spp. it was <10%. It is suggested that the high rate of philopatry can influence the vulnerability of S. depressiusculum in a landscape altered by humans. Strict protection of the natal sites is very important for a sp. having this evolutionary strategy, and reintroductions and translocations should also be undertaken to reduce the extinction risk.

(19692) ENGEL, M.S. & N.P. KRISTENSEN, 2013. A history of entomological classification. *Annu. Rev. Ent.* 58: 585-607. – (First Author: Div. Ent., Nat. Hist. Mus. and Dept Ecol. & Evol. Biol., Univ. Kansas, Lawrence, KS 66045, USA).
The classification of insects has attempted to most effectively communicate information about this hyperdiverse lineage of life and, not surprisingly, has had a considerably rich historical development. This history can be coarsely segregated into 4 periods: the Pre-Linnean era, the first century spanning Linnaeus's *Systema naturae* to Darwin's *On the origin of species*, the Darwinian era up to the Cladistic Revolution, and the Hennigian era leading to today. The major events of each of these episodes are briefly summarized and some of the more notable researchers highlighted, along with their influence on the current understanding of insect relationships and how this is reflected in the current classification of the Hexapoda.

(19693) GREIG, H.S., S.A. WISSINGER & A.R. McINTOSH, 2013. Top-down control of prey increases with drying disturbance in ponds: a consequence of non-consumptive interactions? *J. Anim. Ecol*. 82: 598-607. – (Sch. Biol. Sci., Univ. Canterbury, P.B. 4800, Christchurch, NZ).
A combination of field assays and mesocosm experiments was used to investigate how disturbance from desiccation moderates top-down control of prey by predators across a gradient of pond duration in New Zealand. Information is given on the Xanthocnemis and Procordulia larvae predation pressure in a mesocosm experiment.

(19694) HESKER, J. & H.-P. ZIEMEK, 2013. Killer mit Fangschlag: Libellenlarven im Biologieunterricht. *Dt. Aquar.-Terrar.-Z*. 2013(4): 28-31. – (Authors'addresses not provided).
In German literature, E.A. Rossmässler (1859, *Das Süsswasser-Aquarium*, Mendelssohn, Leipzig; – reprint, 1995, Natur u. Wissenschaft, Solingen) was probably the first to present some instructions for dragonfly rearing in aquaria and to emphasize the importance of this for observations on their life. Ever since, dragonfly larvae were among the standard freshwater invertebrates kept for educational purposes in school aquaria, but due to the current nature conservation legislation, this tradition is becoming questionable now. Here, the proceedings required for a licence in Germany are outlined and suggestions are given on the selection of spp., period of collecting their larvae in nature, on their maintenance in the aquarium and on the techniques to be applied to render optimal observations of various behavioural phenomena by the pupils. – This is a most informative paper, directed in the first place at the (biology) teachers.

(19695) *IDF-REPORT*. Journal of the International Dragonfly Fund (ISSN 1435-3393), Vols. 52 (Dec.

5, 2012), 53 (Dec. 6, 2012), 54 (Dec. 17, 2012), 55 (Dec. 31, 2012), 56 (Jan. 1, 2013), 57 (Jan. 1, 2013), 58 (Jan. 1, 2013), 59 (Feb. 10, 2013). – (c/o M. Schorr, Schulstr. 7/B, D-54314 Zerf).

From Vol. 53 onwards, the serial has a newly designed cover, and in its title the designation "Newsletter" is replaced by "Journal". – [Vol. 52]: *Schorr, M.*: Libellula virgo Linnaeus, 1758 auf Grönland: eine Neubewertung der Beobachtung von Fabricius (1780) (pp. 1-44); – [Vol. 53]: *Marinov, M. & G. Theischinger*: Description of two new aeshnids from Solomon Islands (Anisoptera: Aeshnidae) (pp. 1-8; **Agyrtacantha browni** sp. n., **Gynacantha amphora** sp. n.); – [Vol. 54]: *Dow, R.A.*: Odonata collected in Gunung Pueh, Kuching division, Sarawak, Malaysia in October 2012 (pp. 1-21); – [Vol. 55]: *Villanueva, R.J.T. & H. Cahilog*: Notes on a small Odonata collection from Tawi-Tawi, Sanga-Sanga and Jolo island, Philippines (pp. 1-32); – [Vol. 56]: *Kosterin, O.E.*: Brief Odonata survey in North Ethiopia during heavy rainy season of 2012 (pp. 1-54); – [Vol. 57]: *Schneider, W. & A. Karim Nasher*: Dragonflies from mainland Yemen and the Socotra archipelago: additional records and novelties (pp. 1-13); – [Vol. 58]: *Theischinger, G.*: A new species of Austropetalia Tillyard from north-eastern New South Wales, Australia (Anisoptera: Austropetaliidae) (pp. 1-8; **A. annaliese** sp. n.); – [Vol. 59]: *Villanueva, R.J.T. & H. Cahilog*: Small Odonata collection from Talaingod, Davao del Norte, Mindanao island, Philippines (pp. 1-26).

(19696) JANCOWSKI, K. & S.A. ORCHARD, 2013. Stomach contents from invasive American bullfrog Rana catesbeiana (= Lithobates catesbeianus) on Southern Vancouver Island, British Columbia, Canada. *NeoBiota* 16: 17-37. – (69A Burnside Rd West, Victoria, BC, V9A 1B6, CA).

Stomach contents were examined from over 5,000 adult and juvenile frogs, collected from 60 sites throughout the active season (Apr.-Oct.). In 9% of individuals the stomach was empty. The vertebrate prey included fish, amphibians, reptiles, birds and mammals. Among invertebrates, insect prey items were most abundant. Zygoptera represented 10.0% of the total prey items: 1947 remains, of which 17% larvae. For Anisoptera the respective figures are 7.5%, 1415, 27%. The odon. were dietary staple, except in April. Results from this study reinforce the earlier conclusion that as an invasive alien, the American bullfrog is an opportunistic and seemingly unspecialised predator that has a uniquely large and complex ecological footprint both above and below the water surface.

(19697) JINGUJI, H., D.Q. THUYET, T. UEDA & H. WATANABE, 2013. Effect of imidacloprid and fipronil pesticide application on Sympetrum infuscatum (Libellulidae: Odonata) larvae and adults. *Paddy Water Envir*. 11: 277-284. – (First Author: Sch. Food & Agric. & Envir. Sci., Miyagi Univ., 2-2-1 Hatatate, Taihaku-ku, Sendai, Miyagi, 982-0215, JA).

The effect was monitored during the rice cultivation period, using an experimental micro-paddy lysimeter (MPL) system. 22 hatched larvae were laid on the soil surface of each MPL. MPLs were treated with imidacloprid, fipronil, and the control MPL was left untreated. The pesticide concentration, S. infuscatum larval and adult populations, and larval emergence time were monitored in each MPL. The maximum imidacloprid and fipronil concentration in paddy water was 52.8 µg/l at 1 day, and 1.3 µg/l at 6 h, respectively, after the pesticide application. Both pesticides dissipated quickly in paddy water, with half-lives of 8.8 and 5.4 days for imidacloprid and fipronil, respectively. The absence of S. infuscatum larvae and exuviae in the fipronil-treated MPL was remarkable. The larval survival decreased to 63.6 ± 18.2, 15.2 ± 2.6, and 0% in the control, imidacloprid-treated and fipronil-treated MPLs, respectively, by 9 days after pesticide application. Emergence in the imidacloprid-treated MPL was also significantly lower than that in the control MPL. The observed decrease in the abundances of S. infuscatum larvae and adults in MPLs seems to be both directly and indirectly associated with nursery-box application of fipronil and imidacloprid.

(19698) JOHNSON, L., B.L. MANTLE, J.L. GARDNER & P.R.Y. BACKWELL, 2013. Morphometric measurements of dragonfly wings: the accuracy of pinned, scanned and detached measurement methods. *ZooKeys* 276: 77-84. – (Last Author: Res. Sch. Biol., Australian Natn. Univ., 116 Daley Rd, Canberra, ACT-0200, AU).

Large-scale digitization of museum specimens, particularly of insect collections, is becoming commonplace. Imaging increases the accessibility of collections and decreases the need to handle individual, often fragile, specimens. Another potential advantage of digitization is to make it easier to

conduct morphometric analyses, but the accuracy of such methods needs to be tested. Here, morphometric measurements of scanned images of dragonfly wings are compared to those obtained using other, more traditional, methods. It is assumed that the destructive method of removing and slide-mounting wings provides the most accurate method of measurement because it eliminates error due to wing curvature. It is shown that, for dragonfly wings, hand measurements of pinned specimens and digital measurements of scanned images are equally accurate relative to slide-mounted hand measurements. Since destructive slide-mounting is unsuitable for museum collections, and there is a risk of damage when hand measuring fragile pinned specimens, it is suggested that the use of scanned images may also be an appropriate method to collect morphometric data from other collected insect species.

(19699) LI, Y., A. NEL, C. SHIH, D. REN & H. PANG, 2013. The first euthemistid damsel-dragonfly from the Middle-Jurassic of China (Odonata, Epiproctophora, Isophlebioptera). *ZooKeys* 261: 41-50. − (Fourth Author: Coll. Life Sci., Capital Normal Univ., 105 Xisanhuanbeilu, Haidian distr., Beijing-100048 Beijing, China).
Sinoeuthemis daohugouensis gen. n., sp. n. is described and illustrated from Jiulongshan Formation near Daohugou village in Inner Mongolia, China. Based on this specimen, the Euthemistidae diagnosis is amended.

(19700) *MERCURIALE*. Zeitschrift der Schutzgemeinschaft Libellen in Baden-Württemberg (ISSN 1618-9124), Vol. 12 (Feb. 2013). (With Engl. s's). − (c/o U. Stephan, Im Westengarten 12, D-79241 Ihringen).
Wildermuth, H.: Libellengewässer, die kommen und gehen (pp. 1-10); – *Bamann, T. & J. Jebram*: Nachweis der Grünen Flussjungfer (Ophiogomphus cecilia) an der nördlichen Iller (pp. 11-14); – *Feldwieser, G.*: Ein weiterer Fund der Grünen Flussjungfer (Ophiogomphus cecilia) im Südosten Baden-Württembergs (pp. 15-16); – *Schmidt, B.*: Widerfund von Leucorrhinia albifrons (Burmeister, 1839) (Odonata: Libellulidae) in Baden-Württemberg (pp. 17-22); – *Schiel, F.-J.*: Nachtrag zur Verbreitung von Kleiner und Glänzender Binsenjungfer (Lestes virens, L. dryas) am Oberrhein (Odonata: Lestidae) (pp. 23-26); – *Bühler, W. & H. Hunger*: Neue Funde der Gabel-Azurjungfer (Coenagrion scitulum) in Südbaden bei Buggingen, Gottenheim und Riegel (Odonata: Coenagrionidae) (pp. 27-32); – *Schmid, F.*: Fehlpaarungen von Sympecma fusca und S. paedisca (Odonata: Lestidae) (pp. 33-36); – *Schiel, F.-J. & H. Hunger*: Vermehrtes Auftreten der Grossen Moosjungfer (Leucorrhinia pectoralis) in der badischen Oberrheinebene 2012 (Odonata: Libellulidae) (pp. 37-44); – *Stephan, U.*: Einfluss der Untersuchungsmethode auf die Erfassung von Cordulegaster Larven (pp. 45-52); – *Wildermuth, H.*: Die Libelle auf der Wäscheleine (pp. 53-56); – *Schmid, F.*: Bemerkenswerte Schlupfhöhen von Zweifleck (Epitheca bimaculata) und Gemeiner Falkenlibelle (Cordulia aenea) an einem See im oberschwäbischen Alpenvorland (Odonata: Corduliidae) (pp. 57-58); – *Borkenstein, A.*: Buntspechte erbeuten frisch geschlüpfte Libellula quadrimaculata (pp. 59-60); – *Nowak, M.*: Intrasexueller Kannibalismus bei Ischnura elegans (pp. 61-62); – *Fiedler, J.*: Blässhuhn mit erbeutetem Tandem der Kleinen Königslibelle (Anax parthenope) (p. 63).

(19701) MEYER-ROCHOW, V.B., 2013. Ethno-entomological observations from North Korea (officially known as the "Democratic People's Republic of Korea"). *J. Ethnobiol. Ethnomed*. 2013, 9: 7, 11 pp.; − (Sch. Engin. & Sci., Jakobs Univ., Rm. 37, D-28759 Bremen).
Based on H. Okamoto & S. Muramatsu (1922, *Kangyo Mohanjo Kenkyo Hokoku* 7: 1-151), in the pre-WW-II (undivided) Korea, Crocothemis servilia and aeshnids were used therapeutically. In the present N Korea, no odon. are used either as food or in traditional medicine, as apparent from the information gathered systematically by the Author from his students during his sabbatical semester at the Pyongyang Univ. of Science & Technology.

(19702) MITRA, T.R., R. BABU & K.A. SUBRAMANIAN, 2013. Anax panybeus Hagen, 1867: an addition to the Odonata (Aeshnidae) of India. *J. threatened Taxa* 5(2): 3682-3683. − (First Author deceased on 3 July 2012; − last Author: Zool. Surv. India, M-Block, New Alipore, Kolkata-700053, India).
2 ♂ from Great Nicobar Island (1-VIII-1984), deposited in the Natn. Zool. Coll., Kolkata are brought on record and described.

(19703) MÜLLER, J., 2013. Rote Listen setzen Staub

an. *Südwestdeutsche Ztg* 2013(4): 1 p., issue of 5 Jan. – (Author's address not stated).
In the Odon. Data Base for Germany, there are at the moment ca 1,200,000 records. This information is used in Red Data Lists, which are often out of date, since the updating requires an enormous investment of work and time. For example, in the Rhineland-Palatinate Red List, published in 1992, Lestes barbarus and Gomphus vulgatissimus are listed as locally "threatened with extinction", whereas their abundance in the past decades significantly increased: due to climate change (Lestes) and due to improved water quality (Gomphus). Therefore, old regional Red Lists should be considered with caution.

(19704) NIXON, M.R., A.G. ORR & P. VUKUSIC, 2013. Subtle design changes control the difference in colour reflection from the dorsal and ventral wing-membrane surfaces of the damselfly Matronoides cyaneipennis. *Optics Express* 21(2): 10 pp. – (Second Author: Australian Sch. Envir., Griffith Univ., Nathan, Q-4111, AU).
In ♂ M. cyaneipennis (Calopterygidae), the hindwings exhibit iridescence that is blue dorsally and green ventrally. These structures are used semiotically in agonistic and courtship display. Transmission electron microscopy reveals these colours are due to near-identical 5-layer distributed Bragg reflectors, one placed either side of the wing membrane. Interestingly the thicknesses of corresponding layers in each distributed Bragg reflector are very similar for all but the second layer for each outer surface. This one key difference creates the significant disparity between the reflected spectra from the distributed Bragg reflectors and the observed colours of either side of the wing. Modelling indicates that modifications to the thickness of this layer alone create a greater change in the peak reflected wavelength than is observed for similar modifications to the thickness of any other layer. This results in an optimised and highly effective pair of semiotic reflector systems, based on extremely comparable design parameters, with relatively low material and biomechanical costs.

(19705) *ODONATOLOGICAL ABSTRACT SERVICE* (ISSN 1438-0269), No. 37 (May 2013), 68 pp. – (Distributor: M. Schorr, Schulstr. 7/B, D-54314 Zerf).
Abstract Nos 12122-12492.

(19706) POHE, S.R., E.H. SAMPSON & R.J. ROWE, no date, received 15 March 2013. *Tramea sp. (Odonata: Libellulidae) resident in mainland New Zealand?* Poster. – (First Author: Sch. Biol. Sci., Univ. Canterbury, P.B. 4800, Christchurch-8140, NZ).
Tramea transmarina and T. loewii are currently recognised as occasional immigrants to New Zealand. In May 2007 a half-grown Tramea larva was collected from a remote Northland dune lake, therefore the authors are questioning whether a Tramea sp. is now resident in New Zealand.

(19707) POHE, S.R., M.J. WINTERBOURN & O.J.-P. BALL, no date, received 15 March 2013. *Are littoral invertebrate communities of Aupouri dune lakes useful indicators of lake condition?* Poster. – (First Author: Sch. Biol. Sci., Univ. Canterbury, P. B. 4800, Christchurch-8140, NZ).
See the comprehensive report listed in *OA* 19623.

(19708) RAMIREZ, A. & P.E. GUTIÉRREZ-FONSECA, 2013. The larvae of Heteragrion majus Selys and H. atrolineatum Donnelly, with key to known species from Costa Rica (Odonata: Megapodagrionidae). *Zootaxa* 3609(1): 96-100. (With Span. s.). – (Dept Envir. Sci., Univ. Puerto Rico, P.O. Box 190341, San Juan, Puerto Rico-00919, PR).
The final instar of the 2 spp. is described and illustrated for the first time, based on reared material from Costa Rica. A key to separate the 5 spp. hitherto known from Costa Rica is provided.

(19709) SAHOO, P.K., S.K. DAS & S.P. PARIDA, 2013. An annotated checklist of Odonata (Insecta) of Kanha Tiger Reserve and adjoining areas, central India. *J. threatened Taxa* 5(1): 3559-3564. – (Second Author: Wildlife Inst. India, Chandrabani, Dehradun, Uttarakhand-248001, India).
The Reserve is situated in the Maikal ranges in the central Indian highlands of Madhya Pradesh. The survey was conducted during Jan.-Dec. 2010. A commented list of 48 spp. is presented.

(19710) SHANKU, A.G., M.A. McPEEK & A.D. KERN, 2013. Functional annotation and comparative analysis of a zygopteran transcriptome. *G3: Genes/Genomes/Genetics Early Online*, published on March 11, 2013 as DOI: 10.1534/g3.113.005637. 52 pp. – (Second Author: Dept Biol. Sci., Dartmouth Coll., Hanover, NH 03755, USA).

A de novo assembly of the Enallagma hageni transcriptome is presented through the use of 454 pyrosequencing. To date, sequence data used in phylogenetic analysis of Enallagma spp. have been derived from either mtDNA of ribosomal nuclear DNA. This transcriptome contained 31,661 contigs that were assembled and translated to 14,813 individual open reading frames. Using these data, an extensive dataset of 634 orthologous nuclear protein-coding genes across 11 spp. of Arthropoda was constructed and Bayesian techniques used to elucidate Enallagma's place in the Arthropod phylogenetic tree. Additionally, it is demonstrated that the Enallagma transcriptome contains 169 genes that are evolving at rates that differ relative to the rest of the transcriptome (29 accelerated and 140 decreased), and through multiple Gene Ontology searches and clustering methods, the first functional-annotation of any palaeopteran's transcriptome in the literature is presented.

(19711) *SYMPETRUM, GRENOBLE*, Revue d'odonotalogie (ISSN 0990-7032), No. 16 (March 2013). − (c/o C. Deliry, 182 rue de la Forge, F-38200 Villette de Vienne).
Deliry, C.: Editorial (p. 3); – *Grand, D.*: Les libellules de la plaine alluviale de Rhône, en particuliers, en amont de Lyon (départements de l'Ain et du Rhône) (pp. 5-15); – *Genoud, D.*: Présence de Platycnemis acutipennis (Selys, 1841) en Plaine de l'Ain (department de l'Ain) à proximité du Rhône (pp. 17-19); – Présence de Lestes virens vestalis (Rambur, 1845) et Lestes barbarus (Fabricius, 1799) en Plaine de l'Ain (department de l'Ain) à proximité du Rhône (pp. 21-22); – Observation de Boyeria irene (Fonscolombe, 1838) en Plaine de l'Ain (department de l'Ain) à proximité du Rhône (pp. 23-24); – *Ulmer, A.*: Calopteryx haemorrhoidalis (Vander Linden, 1825) dans les vallons rhodaniens, une nouvelle espèce pour le département de la Loire (pp. 25-27); – *Bazin, N.*: Gomphus flavipes (Charpentier, 1825) redécouvert sur la Vallée du Rhône (p. 29); – *Mathieu, M.*: Présence d'Oxygastra curtisii (Dale, 1834) confirmée en Isère (pp. 31-32); – *Schleicher, J.*: Les odonates d'une ancienne gravière "Grande Isle" à Châteauneuf du Rhône (Drôme) (pp. 33-40).

(19712) TICHÁNEK, F., 2013. *Odonata communities of drainage ditches in Radovesická spoil heap*. Baccal. Thesis, Fac. Sci., Univ. Sth Bohemia, Ceské Budějovice. iv + 58 pp. (Czech, with Engl. title). − (Author's address not provided).
The adults colonizing drainage ditches (22 spp.) were sampled and their habitat associations were examined. Of particular interest is the occurrence of Coenagrion ornatum, Ischnura pumilio, Lestes barbarus, Cordulegaster boltonii, Orthetrum brunneum, O. coerulescens, Sympetrum pedemontanum and S. striolatum; − Czech Republic.

(19713) TORRALBA-BURRIAL, A. & F.J. OCHARAN, 2013. Iberian Odonata distribution: data of the BOS Arthropod Collection (University of Oviedo, Spain). *ZooKeys* 306: 37-58. − (Depto Biol. Organismos y Sistemas, Univ. Oviedo, ES-33071 Oviedo.
79 spp., without collection data, but with a comprehensive bibliography.

(19714) ZHANG, H. & X. TONG, 2013. Descriptions of the final instar larvae of seven Chinese Chlorogomphidae species, with taxonomic notes on adults (Odonata: Anisoptera). *Zootaxa* 3620(2): 223-244. − (Dept Ent., Coll. Nat. Resour. & Envir., Sth China Agric. Univ., Guangzhou-510642, Guangdong prov., China).
The larvae of 7 spp. from S China are described and illustrated, viz.: Chlorogomphus kitawakii, C. n. nasutus, C. papilio, C. shanicus, C. usudai, C. yokoii and Chloropetalia soarer. The adult ♀ C. kitawakii is described for the first time. Biological information on Chlorogomphidae is provided and a diagnosis of the fam. proposed.

(19715) XU, Q.-H., 2013. Idionyx pseudovictor sp. nov. from Fujian, China (Odonata: Anisoptera: Corduliidae). *Zootaxa* 3683(1): 82-86. − (Dept Biol. & Envir. Engin., Zhangzhou City Univ., Zhangzhou, Fujian-363000, China).
The new sp. is described and illustrated from a ♀ and its (bred) larva. Holotype ♀: Nanjing co., Fujian, China, emerged 13-VI-2012; deposited in Author's instn. Diagnostic characters separating them from adult and larva of I. victor are stated.

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COWLEY, J., 1935. Remarks on the names of some odonates. *Entomologist* 26: 154-156.

FRASER, F.C., 1957. *A reclassification of the Odonata*. R. zool. Soc. N.S.W., Sydney.

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