



**A NEW SPECIES OF *AGRIOCNEMIS* SELYS, 1869 (ZYGOPTERA:
COENAGRIONIDAE) FROM EASTERN INDIA WITH REDESCRIPTION
OF *AGRIOCNEMIS KERALENSIS* PETER, 1981**

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INTRODUCTION

The genus *Agriocnemis* Selys, 1869 consists of some of the smallest odonates in the world distributed throughout the tropical zones of Africa to Australia and Oceania. The genus is essentially an Oriental one, with bulk of the species coming from southern Asia. Currently, there are 42 species recognized under this genus (Schorr & Paulson, 2014). Fraser (1933) included 10 species of *Agriocnemis* in his work on *Odonata of British India*, viz. *A. pygmaea* (Rambur, 1842), *A. femina* (Brauer, 1868), *A. lacteola* Selys, 1877, *A. pieris* Laidlaw, 1919, *A. splendidissima* Laidlaw, 1919, *A. aborensis* (Laidlaw, 1914), *A. dabreui* Fraser, 1919, *A. clauseni* Fraser, 1922, *A. nana* Laidlaw, 1914 and *A. naia* Fraser, 1923; the latter two being from Upper and Lower Myanmar respectively. *Agriocnemis nainitalensis* was described by Sahn in 1965, but was later synonymised with *Ischnura senegalensis* by Mitra (1992). Subsequently, *A. corbeti* was described by Kumar and Prasad in 1978 and *Agriocnemis keralensis* was described by Peters in 1981. Subramanian (2009) in his Checklist of Odonata of India included 9 species, omitting *A. nana* and *A. naia* but adding *A. corbeti* and *A. keralensis*. Mitra and Babu (2010) in their revision of Indian Platycnemididae and Coenagrionidae, suppressed both *A. corbeti* and *A. keralensis*, and considered the former as a junior synonym of *A. pygmaea* and latter as that of *A.*

splendidissima. However, no type specimens were studied. Mitra and Babu (2010) also included *A. nana* Laidlaw, 1914 and cited the report of this species from Kolkata (Mitra and Lahiri, 1980). However, recent field studies based on fresh specimens confirmed the taxonomic validity of *A. keralensis* which is restricted to the south western India (Emiliyamma *et al.*, 2010; Rangnaker *et al.*, 2010; Kiran and Raju, 2013; Varghese *et al.*, 2014). On the other hand, the description of *A. corbeti* is very detailed including the final instar larvae. Hence both *A. keralensis* and *A. corbeti* were retained in the revised checklist of Indian odonates by Subramanian (2014). Thus, currently, ten valid species of *Agriocnemis* are known within Indian limits, the details of which are given in table-1 with their known distributions. Here we describe a new species of *Agriocnemis* sp.nov from Odisha and revalidate the species status of *A. keralensis*.

MATERIAL AND METHODS

Morphological terminology follows Chao (1953) and Watson & O'Farrell (1991). Colouration is given as from the freshly preserved material and photographs taken in life. Measurements are given in millimetres (mm). Adult specimens were collected from Nandankanan (Lat. N 20.398; Long. E 85.821; Alt. 27m) and photographed at Attabira (Lat. N 21.373; Long.

E 83.775; Alt.165m), Odisha and preserved in alcohol. Photographs of body parts were taken with Leica EZ4HD and M205A microscopes. The holotype and paratypes of the new species are deposited in the Central Entomology Laboratory, National Zoological Collections, Zoological Survey of India, Kolkata.

Agriocnemis kalinga sp. nov.
(Figures 1-14, Plate I-II)

Description: All measurements are in mm. Measurements of holotype, paratypes and specimens from Howrah, West Bengal is provided in table-2.

Adult Male: Head: Labium, labrum, mandible, clypeus, anterior frons and genae light green in life which turns into to light sky blue or pale white upon preservation in alcohol. Base of labrum is black; clypeus with three black markings. Median and lateral ocellus are dark brown. Antennae, vertex, occiput and post ocular area are black. Centre of the occiput with thick horizontal light green mark which is followed on either side after a narrow black interruption by “hockey stick” or “L” shaped light green mark of same width. Eyes are light green below with a black cap above. *Thorax:* Prothorax black dorsally, light green anteriorly, laterally and posteriorly. Synthorax is light green with broad black antehumeral and posthumeral stripes. *Legs:* Fore, mid and hind coxae, trochanter and femur light green with black spines. The flexor surface of femur is black. Tibia and tarsus pale green. *Wings:* Transparent, pterostigma diamond shaped and yellow. Pterostigma of hind wing is brighter than fore wing. Two antenodal and six post nodal crossveins present in fore and hind wings.

Abdomen: Terga largely black; tergum 1, narrow at base and broad at apex, sides and apical border light green; terga 2 with the dorsum broadly black, except at the sub-apical and apical end where the black is constricted, enclosing a greenish yellow patch; at the base there are a pair of oval yellow spots broadly separated medially, resembling a ‘hood mark’; tergum 3 to 6 with broadly black and the sides greenish yellow, with the sub-apical end and the apical end constricted so as to enclose a greenish yellow patch on sides, terga 7 the same, except that the enclosed

subapical patch is bright yellow, terga 8 and 9 bright yellow, marked on the proximal end with a small black triangle with its apex pointing to the distal end and continuing as an indistinct black line, with two thin black lines perpendicular to it, just after the centre (the entire pattern reminiscent of an ‘anchor’), terga 10 yellow with a broad ‘X’ mark on the dorsum. These patterns on tergum 8-10, are much more distinct and clearly marked on sub-adult individuals as compared to mature individuals where the yellow is more brighter and extensive, largely obliterating the black markings. Sterna light green in segments 1-3 which gradually changes into bright yellow in segments 4-10. Secondary genitalia typical of the genus.

Anal appendages: Superiors yellowish with black tips, slightly longer than segment 10, curved a little downwards as seen from the sides. The inferiors pale yellow with black tip, considerably shorter, broad at base as seen from side and below; the apex curved inwards as seen from above.

Adult Female: The head, thorax and abdomen of adult female are light green. The black markings of labrum and clypeus are similar to male. The occiput is black as in male with light orange “hockey stick” markings. The pro, synthorax and abdomen are without black markings. Legs are light green with black spines. Wings and pterostigma are similar to male.

Diagnosis: A tiny damselfly, possibly the smallest described thus far from India, with the abdomen about 13-14 mm and hindwing 8-11 mm, labrum non-metallic, superior anal appendages longer than inferior, tergum 2 of abdomen of male marked with a characteristic ‘cobra hood’ like marking, ground colour bright yellow with black on dorsum, yellow pterostigma and bright yellow tip to abdomen. The differences from all other valid species of *Agriocnemis* from India are given in Table-1. In many aspects, the *A. kalinga* sp.nov is very close to *Agriocnemis keralensis* Peter, 1981. However, it can be distinguished by (1) overall ground colour bright yellowish than greenish yellow, including the tip of abdomen being yellow rather than ochreous; (2) distinct “hockey stick” shaped markings in the occiput; (3) bright yellow pterostigma without black; (4) hood mark of segment 2 broadly confluent with black apical tip distally in *sp nov*; narrowly

connected in *A. keralensis*; (5) difference of patterns in abdominal segments 8-10; (6) shape of anal appendages.

Material examined (in alcohol): Holotype ♂, INDIA: Odisha, Nandankanan, Kanjia Lake, 11.viii.2009, Manoj V. Nair leg, NZC Reg. No. 4982/H13. Paratype, 1♂, same data of holotype, 7.viii.2009, NZC Reg. No. 4983/H13. Other materials: same data of holotype 1♀, 31.vii.2009, Manoj V. Nair leg; NZC Reg. No. 4984/H13. West Bengal, Howrah district, Panchala, 1♂ 2♀, 30.xi.2011, P. Dawn leg. NZC Reg. No. 4985/H13.

Etymology: Gender neutral; named after the historical kingdom. Kalinga (Odiya: କଳିଙ୍ଗ, Devnagari: कलिंग, an early republic (c. 265 BCE), in eastern India which comprised most of the modern state of Odisha, the current stronghold of this species.

Habitat and Distribution: Adults were found on the edge of lakes and pond with aquatic vegetation, flying close to the ground. In eastern India, they are found in the state of Odisha (Photographic records: Khurda, Mayurbhanj, Sambalpur & Bargarh districts) and West Bengal (Photographic records: Panchala, Howrah; Narendrapur, South 24 Parganas districts).

The status of *Agriocnemis keralensis* Peter, 1981

Agriocnemis keralensis was described by Peters in 1981 from 3 specimens (2 males and 1 female, all teneral) collected from Karamana, south Trivandrum, Kerala. It was thought to be similar to *A. peiris* by the author in many respects, but still had distinct characters to enable it be given a species status. The author surmised that the green and the ochreous colour of the specimens collected might later change to blue on maturity. However, Mitra and Babu (2010), invalidated it considering it a junior synonym of *A. splendidissima* as the shape and size of anal appendages, wing characteristics etc. agree with immature forms of *A. splendidissima*. The decision was also furthered by the fact that the original description was based on teneral individuals and that no specimens were available in India for further examination, the holotypes and paratypes being deposited in Berlin Zoological Museum.

However, recent field studies, photographs and specimens confirms the taxonomic validity of *A. keralensis* Peter, 1981 (Emiliyamma *et al.*, 2010; Rangnaker *et al.*, 2010; Kiran and Raju, 2013; Varghese *et al.*, 2014) which is distributed along the west coast in southern India. Based on recent studies, *A. keralensis* Peter, 1981 is redescribed.

Redescription of *Agriocnemis keralensis* Peter, 1981

Material: 3 males and 1 female collected on 18.viii.2009 from a water-logged meadow adjacent to the backwaters of Vembanad lake at Coconut Lagoon Resort, Kumarakom, Kottayam district, Kerala (9.633N, 76.418E; Alt:1m), all collected by the first author.

Adult male: Length of abdomen: 14 mm; Hindwing: 9-9.5 mm

Head: Labium pale yellow with a black strip; labrum pale yellow; anteclypeus, base of mandibles, genae and post clypeus greenish yellow, the latter narrowly black at base; frons greenish yellow; vertex and occiput black with the latter having greenish yellow median horizontal stripe boarded by two post-ocular spots of same colour on either side, thus having five disjoint parts; eyes black above, green at sides and fading below. *Prothorax*: black on dorsum, except the anterior lobe which is bright yellow; posterior lobe with its central portion produced into a rounded lobe, the entire posterior margin thinly bordered with yellow. *Thorax*: Black on dorsum to as far as the antero-lateral suture, marked with greenish-yellow antehumeral stripes on either side; laterally greenish yellow marked with a broad black stripe on the postero-lateral suture; beneath greenish yellow fading to ventral sides. *Legs*: pale creamy white with extensor surface of femora black, 4-5 black spines on hind tibiae.

Wings: Hyaline, 6 post-nodal nervures in forewings, 5 in hind-wings; arc situated beyond the distal antenodal nervure. Pterostigma of both forewing and hindwing twice as long as broad with oblique posterior frame; dirty yellow, with a suffused black spot in the proximal corner.

Abdomen: Segment 1 with tergum black with sides and apical border yellow; segment 2 with the tergum broadly black with paired yellow spots resembling the hood mark of a cobra, except at

the apical end where there is a broad yellow band, with a fine black line conjoint with the 'hood'; segments 3 to 5 with the tergum narrowly brownish black and the sides greenish yellow, with the basal, sub-apical and the apical end constricted so as to enclose a greenish yellow patch, segment 6 with broadly brownish black with no apical constriction, segment 7 brownish on tergum and ochreous on sides, with a hint of basal constriction and fading gradually into broad ochreous base, 8, 9 and 10 bright ochreous.

Anal appendages: Ochreous-brown with black inner surfaces and tips, the inferior pale yellow; the superiors slightly longer than segment 10, very slightly curved down as seen from the sides, the apex straight and blunt as seen from above; inferiors considerably shorter, broad at base as seen from side.

Adult female: Similar to adult male size and colouration except that the ochreous part of abdomen is replaced with yellowish green and tergum of abdominal segments 8-10 is broadly black.

Habitat and distribution: Found in the paddy fields, ponds, backwaters and coastal marshes of west coast of India (Kerala and Goa).

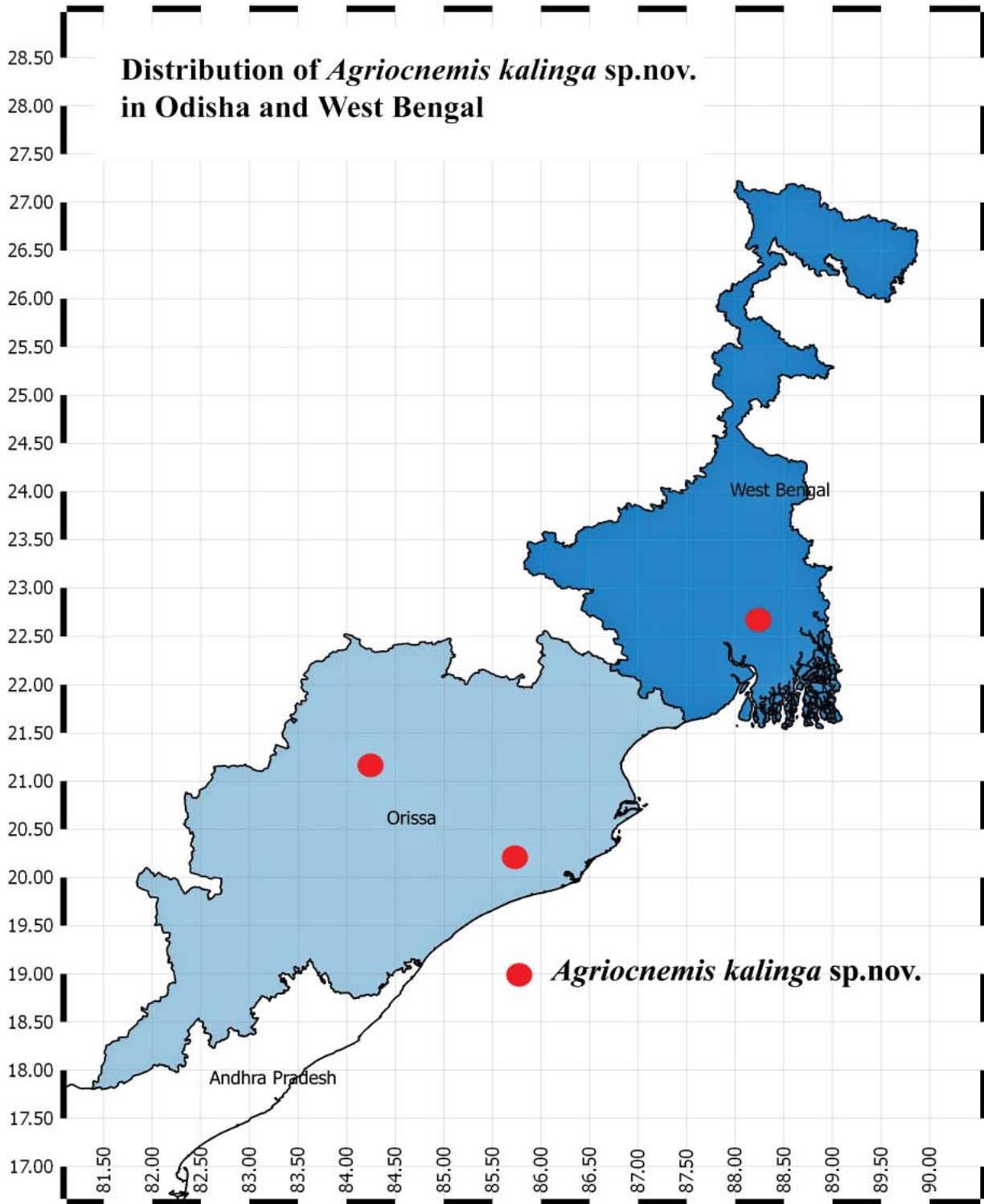
DISCUSSION

Fraser (1933) classified the members of the genus into two natural groups based on the colour of labrum and length of anal appendages. In the first group, comprising of *A. pygmaea* and *A. femina* labrum is metallic blue and anal appendages are of variable length. In the second group, labrum is non-metallic and anal appendages are more or less homogenous, superiors being considerably longer than inferiors. In this group, second abdominal segment of *A. lacteola*, *A. peiris* and *A. splendidissima* is devoid of "cobra hood" marking. Remaining species including *A. corbeti* has a "cobra hood" marking which was not mentioned in the original paper but illustrated (Kumar and Prasad, 1978). The presently described species can be distinguished from other members of the genus found in India by its diminutive size, overall yellowish ground colour with bright yellow tip of abdomen and distinct "hockey stick" shaped markings in the occiput.

Discovery of this new species of *Agriocnemis* from relatively under-explored regions of the country highlight the importance of intensive field surveys in revealing hitherto unknown species. Moreover, distribution and biology of many species of *Agriocnemis* in India is poorly known. Hence it is important to carry out detailed field studies to document biology and ecology of such species.

Key to male *Agriocnemis* Selys, 1869 of India

1. Labrum metallic blue, anal appendages of variable length 2
 Labrum non metallic, anal appendages more or less similar 3
2. Superior anal appendage longer than inferiors *A. pygmaea*
 Superior anal appendages shorter than inferiors *A. femina*
3. With "cobra hood" mark in the tergum of second abdominal segment 4
 Without "cobra hood" mark in the tergum of second abdominal segment 5
4. a. Abdominal segment 8 entirely black, FW with 6-7 post nodal nervures *A. clauseni*
 b. Abdominal segment 8 ochreous with a black anchor mark on dorsum and tergum of second abdominal segment with a pair of blue eyespots *A. dabruei*
 c. Abdominal segment 8 blue with black markings which enclose two blue spots
 *A. nana*
 d. Abdominal segments brick red with black markings *A. corbeti*
 e. Abdominal segment 8-10 bright ochreous; 5 postocular spots *A. keralensis*
 f. Abdominal segment 8-10 bright yellow and 10 marked with black "X" mark on dorsum; 3 postocular spots *A. kalinga* sp.nov.
5. a. Abdominal segments 4-10 white, unmarked *A. lacteola*
 b. Abdominal segments 4-6 white with black apical rings confluent with a subapical arrow-head *A. pieris*
 c. Abdomen dark blue with black tergal markings largely obscuring blue ground colour *A. splendidissima*



Map-1: Distribution of *Agriocnemis kalinga* in Odisha and West Bengal.

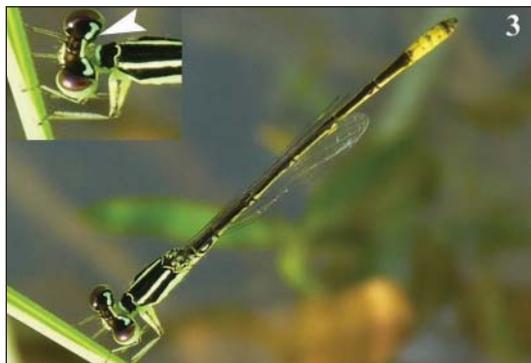
Table-1. A comparative account of *Agriocnemis* Selys, 1869 of India

<i>Agriocnemis</i> species of the Indian subcontinent				
Sl. No.	Species	Abdomen Length (in mm)	Hindwing length (in mm)	Distribution & Status
GROUP-I: Labrum metallic, anal appendages variable length				
1	<i>A. pygmaea</i> (Rambur, 1842)	16-17	9.5-10	All over India. Very common
2	<i>A. femina</i> (Brauer, 1868)	16-17	10.5-11	Scattered in India in wet areas. Relatively rare.
GROUP-II: Labrum non metallic, anal appendages more or less similar				
GROUP-IIa: Without "cobra hood mark"				
3	<i>A. lacteola</i> Selys, 1877	16-18	9.5-10.5	Central, Eastern & NE India Locally common
4	<i>A. pieris</i> Laidlaw, 1919	16-19	9 to 10	S. Western & NE India. Locally common
5	<i>A. splendidissima</i> Laidlaw, 1919	18	10	Scattered in India in wet areas. Relatively rare.
GROUP-IIb: With "cobra hood mark"				
6	<i>A. clauseni</i> Fraser, 1922	20-22.5	11-13.5	Uttarakhand, NE India. Relatively rare.
7	<i>A. dabruei</i> Fraser, 1919	13-14	9-9.5	Central & NE India. Relatively rare.
8	<i>A. nana</i> (Laidlaw, 1914)	18	10	Eastern India. Relatively rare.
9	<i>A. corbeti</i> Kumar and Prasad, 1978	19	13	Uttarakhand.: Dehradun. Known only from type collection.
10	<i>A. keralensis</i> Peters, 1981	13-14	9-9.5	S.W. India, Kerala and Goa. Locally common.
11	<i>Agriocnemis kalinga</i> sp.nov.	13-14	8-10	Eastern India relatively rare.

Table-2. Measurements of specimens studied.

Measurements (mm)	Holotype (male)	Paratype (male)	Female from type locality	Male from Howrah	Female from Howrah
Abdomen	13.43	12.33	14.23	13.67	14.37
Hind wing	8.11	8.45	10.4	8.52	10.57
Max. Head width (including eyes)	2.55	2.3	2.53	2.54	2.59

PLATE I

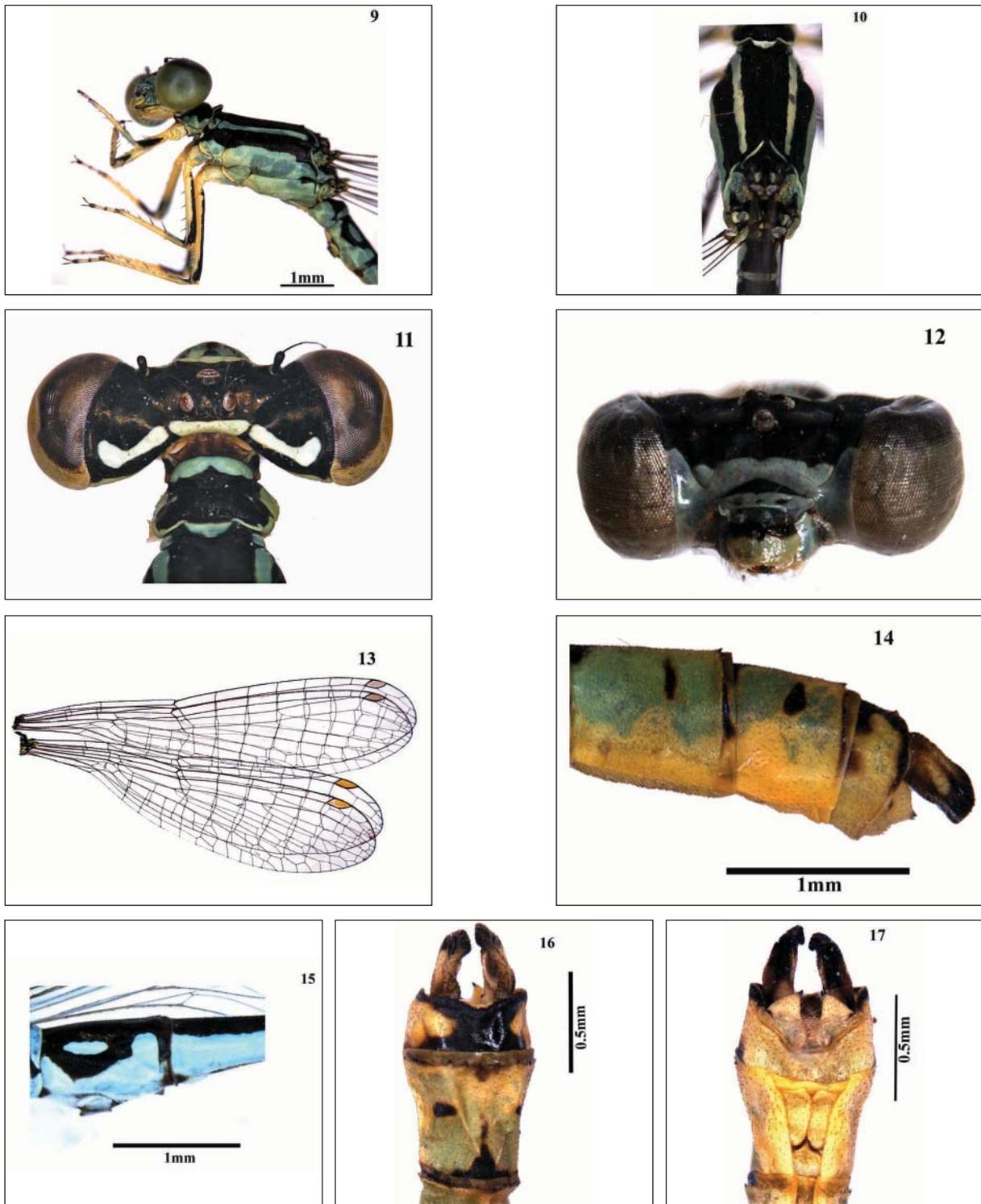


Images 1-4: *Agriocnemis kalinga* sp. nov. from Odisha. 1&3 Male; 2&4 Female. Image 3 inset: Head of male *Agriocnemis kalinga* sp. nov. showing post ocular spots. (Photo. M.V. Nair)

Images 5-6: *Agriocnemis keralensis* from Kerala. 5. Male; 6. In copula. Image 5 inset: Head of male *Agriocnemis keralensis* showing post ocular spots. (Photo. M.V. Nair)

Images 7-8: Habitat of *Agriocnemis kalinga* in Odisha. (Photo. M.V. Nair)

PLATE II



Images 9-17: *Agriocnemis kalinga* sp.nov. Holotype male. 9. Head and thorax ventro-lateral view; 10. Thorax dorsal view; 11. Head dorsal view; 12. Head front view; 13. Wings; 14. Lateral view of abdominal segments VIII-X and anal appendages; 15. Lateral view of secondary genitalia; 16 & 17. Dorsal and ventral view of 10th abdominal segment and anal appendages. (Photo. K.A. Subramanian)

PLATE III



Agriocnemis femina (Brauer, 1868)



Agriocnemis splendidissima Laidlaw, 1919



Agriocnemis splendidissima Laidlaw, 1919 in coupla



Agriocnemis lacteola Selys, 1877 Male



Agriocnemis lacteola Selys, 1877 Female



Agriocnemis pieris Laidlaw, 1919 Male



Agriocnemis pieris Laidlaw, 1919 Female



Agriocnemis clauseni Fraser, 1922 Male

PLATE IV



Agriocnemis pygmaea (Rambur, 1842) Male



Agriocnemis pygmaea (Rambur, 1842) Female



Agriocnemis pygmaea (Rambur, 1842) Female



Agriocnemis pygmaea (Rambur, 1842) Female



Agriocnemis nana (Laidlaw, 1914) Male



Agriocnemis nana (Laidlaw, 1914) Female

SUMMARY

A new species of *Agriocnemis* Selys, 1869 (Zygoptera: Coenagrionidae) is described from Odisha and the status of *Agriocnemis keralensis* Peters, 1981 is discussed. Based on recent field studies, *A. keralensis* is redescribed. A revised key to *Agriocnemis* of India is also provided.

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