

Platygomphus benritarum sp. nov. and rediscovery of *Anormogomphus heteropterus* Selys, 1854 (Odonata: Anisoptera: Gomphidae) from Tezpur, Assam, India

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Abstract. *Anormogomphus heteropterus* is redescribed based upon a single male specimen. Discrepancies and inaccuracies in previous illustrations of this species that could cause confusion are pointed out. *Platygomphus benritarum* sp. nov. is described on the basis of a single male specimen collected at Tezpur, Sonitpur District, Assam, India. *Platygomphus benritarum* differs from its congeners and other, similar species such as *Asahinagomphus insolitus* (Asahina, 1986) by its thoracic markings and shape of the abdomen and cerci.

<http://www.zoobank.org/urn:lsid:zoobank.org:pub:20B73E04-1C97-4F40-B9A3-17DCEB6DB7D5>

Key words. Dragonfly, description, endemic, new species, species discovery, taxonomy, Assam, Northeast India

Research Article

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All relevant data are within the paper.

Introduction

The Gomphidae is the second largest family of dragonflies. Due to small interspecific differences, their shy habits, and relatively low population densities, gomphids remain understudied in terms of their diversity and ecology. This is particularly evident in South and Southeast Asia where many new species and even genera have been described recently (e.g., Kosterin, 2016; Karube & Kosterin, 2018; Karube, 2021). Northeast India and the Eastern Himalaya region are very rich in terms of gomphid diversity, with 26 of the known species being endemic to this region (Kalkman et al., 2020). Due to a lack of intensive surveys, gomphids remain poorly studied there as well, though. Many species are known only from their type specimens, many of which are missing or in poor condition, making it difficult to establish and directly compare reliable diagnostic characters.

In this paper, *Platygomphus benritarum* sp. nov. is described on the basis of single male specimen collected at Tezpur, Assam, India. Additionally, we comment on the morphology of *Anormogomphus heteropterus* Selys, 1854. Despite surveys at the same locality over five months, no additional individuals of both these species could be collected. *Platygomphus benritarum* is morphologically distinct; distinguished from its congeners by the shape of its cerci, vesica spermalis, and characters of wing venation.

Material and methods

Both specimens used in this study were collected at Tezpur, Sonitpur District, Assam, during the period from March through June 2020.

Specimens were captured using insect nets, preserved in 99% Ethanol, and are now deposited in the Research Collections, National Centre for Biological Sciences (NCBS), Bangalore, India. Examination and photography was done using Leica (Leica Microsystems, Germany) stereomicroscopes and a Canon 1200D camera outfitted with a Canon 50-mm macro lens (Canon Inc., Japan). Multiple images were stacked to generate greater depths of field for close-up images. Scale bars were added using the Leica Application Suite (Leica Microsystems, Germany) or ImageJ. Morphological terms follow Garrison et al. (2006). All measurements are given in mm. Abbreviations in the text: FW = forewing; HW = hindwing; Ax & Px = antenodal and postnodal nervures; Pt = pterostigma; S1–10 = abdominal segments 1–10; V1–4 = segments of vesica spermalis. The holotype male of *Anormogomphus heteropterus*, deposited in the Royal Belgian Institute of Natural Sciences, Brussels, was photographed by Julien Lalanne (see Fig. 3) for comparisons with our collected male. For illustrations of *Anormogomphus heteropterus* Selys, 1854 wings, see Williamson (1907). For other illustrations of *Anormogomphus* spp., see Selys & Hagen (1858, Plate 7), Fraser (1926) and https://virtualcollections.naturalsciences.be/archives/dossier_illustration_selys_and_severin/others/go73a. Illustrations of anal appendages are compiled in Figure 4.

For illustrations of *Platygomphus dolabratus* Selys, 1854 vesica spermalis, see Plate 4 in Fraser (1940) and Plate 7 in Selys & Hagen (1858). For the original illustrations of *P. dolabratus* and *P. feae* Selys, 1891, see: http://virtualcollections.naturalsciences.be/archives/dossier_illustration_selys_and_severin#b_start=0&c7=Platygomphus.

***Anormogomphus heteropterus* sp. nov.**

Figs 1–2

Material examined

Holotype

m# (IBC-BO403): Parvati Nagar (N 26.6262, E 92.7752, alt.: 71 m), Tezpur, Assam, India, 25.iv.2020, Anuja Mital leg.

Description of male

Head (Fig. 1a). Eyes pale brown, darker dorsally. Face uniformly yellow, marked as follows: labium light brownish, labrum with medial and postclypeus with paired dark yellow markings, and frons slightly greenish. Labrum 2.5 times as wide as long, frons expanded. Ocellar region depressed and black between lateral ocelli and frons. First antennal segment black at the base, remainder yellow; second antennal segment black at the base, remainder orange-yellow; filament black. Median ocelli

wider than lateral ocelli. Vertex and occipital ridge yellow, black at their boundary.

Thorax (Figs 1b, d). Prothorax yellow, with a distinctive black marking, widely expanded on anterior lobe, center of median lobe with paired yellow spots. Pterothorax yellow, marked with black: anterior portion of mesostigma, faint L-shaped markings along dorsal carina, two nail-shaped markings pointing forward on mesepisternum, thin stripe across upper margin of mesepimeron, junction of metepimeron and metepisternum faintly black. Antealar ridge conspicuous, black, and lined with small black spines, junction of dorsal carina forming a small, sharply pointed spine approximately midway between wing base and mesostigma.

Legs black, marked with blackish brown: stripes across tibiae, posteriorly, two stripes on femur, fainter on metafemora. Covered with long, black spines across mid-axis; spines on femur small and sparse. Claws black.

Wings (Figs 1c, e) hyaline, membrane extended and yellow, pterostigma and costal margin pale brown, pterostigmal brace present. Antenodals (1st and 4th primary) 10 on FW, 7 (right), 8 (left) on HW. Postnodals 7 on FW, 7 (left), 8 (right) on HW. Median space and triangles not crossed. One cubito-anal vein each in all wings. Hind margin of HW not excavated, smoothly rounded. Anal triangle one-celled, indistinctly defined. Anal loop absent. Discoidal field of FW starting with two cells, expanded to 8 cells towards margin. MA continuous to wing margin without any branching. Single row of cells between CuA and MP, cells in 2–4 rows near margin. Single row of cells between RP₂ and IRP₂ throughout, two rows in left HW near margin.

Abdomen (Figs 1b, d). Ground color on S1–2 yellow, S3 to anterior half of S7 bluish-gray, yellow from there. Auricles small, yellow; covered with black spines. Marked black as follow: S1–7 with annules at posterior margin, short on S1, longitudinal paired black markings on S2–6: markings connected to black rings on S3–6, faint black spots on S7–10: near posterior border on S7–8, at anterior margin on S9–10. Dorsal section of S10 extended, lateral margin excavated. S10 is expanded between branches of cerci; a hood-like lamina is present, covering downwardly curved, horn-like, paired structures with black apices.

Vesica spermalis (Figs 4a–c). Hamuli yellow. Anterior hamuli thin, long, ending in a shoulder and anteriorly pointed hook, apical spine black. Posterior hamuli long, saddle-shaped, and covered with bristles; anterior margin curved. V1 rounded, junction of V1 and V2 sharply curved. V3 simple, laterally slightly expanded with two yellow spots on ventral face. V4 dark brown, rounded; apices excavated ventrally ending in a small curved filament.

Caudal appendages (Figs 4d–f). Cerci extended 1.6 times as far as epiproct. Cerci blade-shaped, darker on

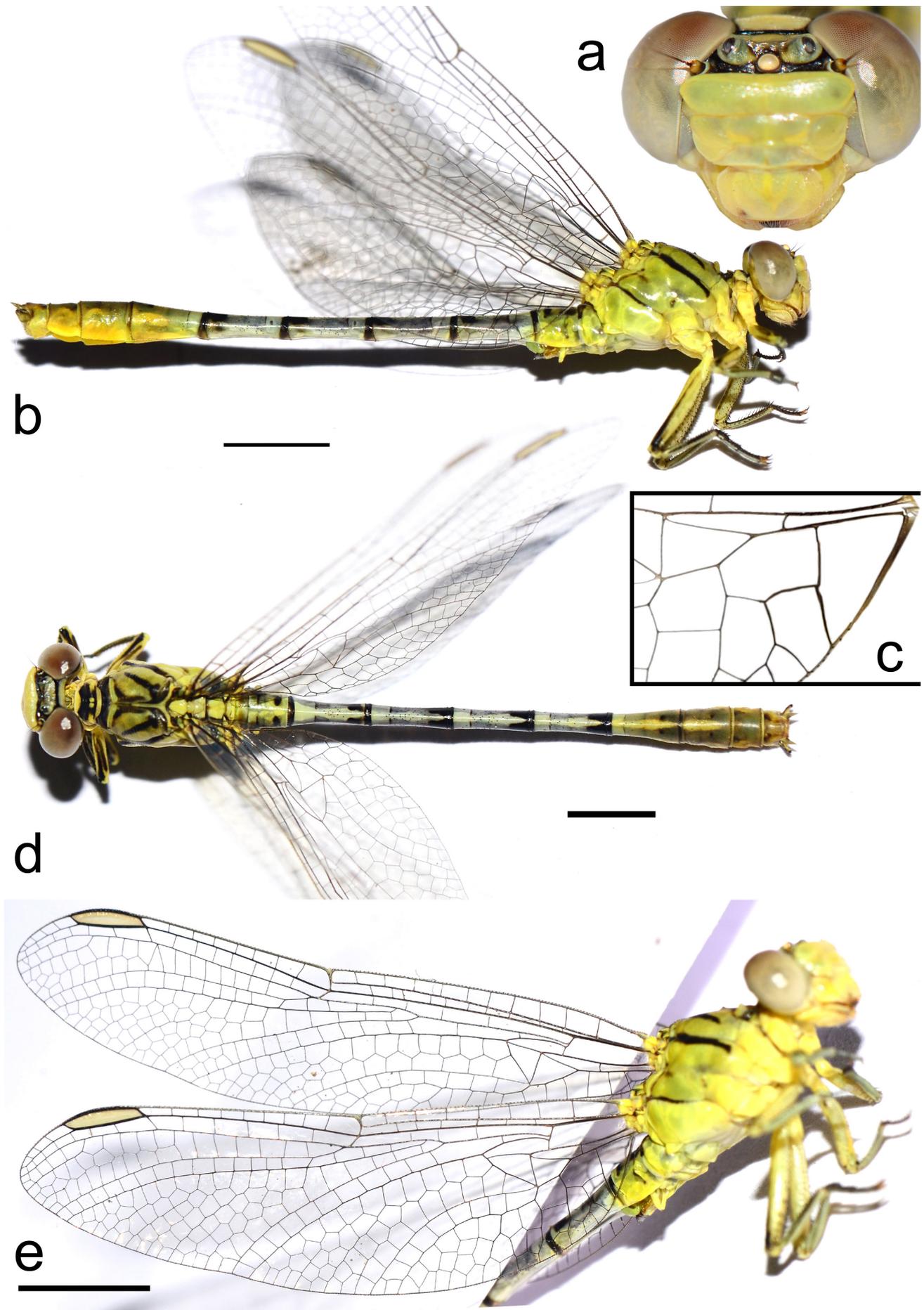


Figure 1. *Anormogomphus heteropterus* Selys, 1854. Male (IBC-BO403). (a) head; (b) lateral habitus; (c) base of left HW; (d) dorsal habitus; (e) right FW & HW [scale bar = 5 mm].

inner side, with a small basal spine, lower margin curved slightly inwards. Epiproct fused at base, widely divergent, appearing triangular in lateral view, upper margin ridge-like; ending in upwardly pointed black spines.

Measurements. Abdomen + caudal appendages = 27.1, FW = 24.6, HW = 23.2.

Discrepancies in previous illustrations

Three different sources have provided illustrations of the caudal appendages of *Anormogomphus heteropterus*, viz., 1) Selys & Hagen (1858), 2) unpublished watercolor painting by Severin (see Material and methods for the link), and 3) Fraser (1926; republished

in 1934). These three sources do not agree well with each other, and the first two are very schematic, not showing any finer details of the structure. Only Drawing 1 (Fig. 4a) depicts the structure of cerci accurately. In Drawing 2 (Fig. 4b), the basal spine of cerci is not figured at all, whereas in Drawing 3 (Fig. 4c) the basal spine of cerci seems exaggerated, and the paraprocts are very thin and curved sharply upwards. In the holotype male, the cerci are broken, which might explain the discrepancy in the illustrations by Selys, especially with regard to the first two of the three illustrations mentioned above. The third drawing in Fig. 4a-iii seems to be showing the broken appendages of the holotype (compare with Fig. 3c). The male described in the present study has a peculiar structure at the base of the caudal appendages (highlighted with an arrow in

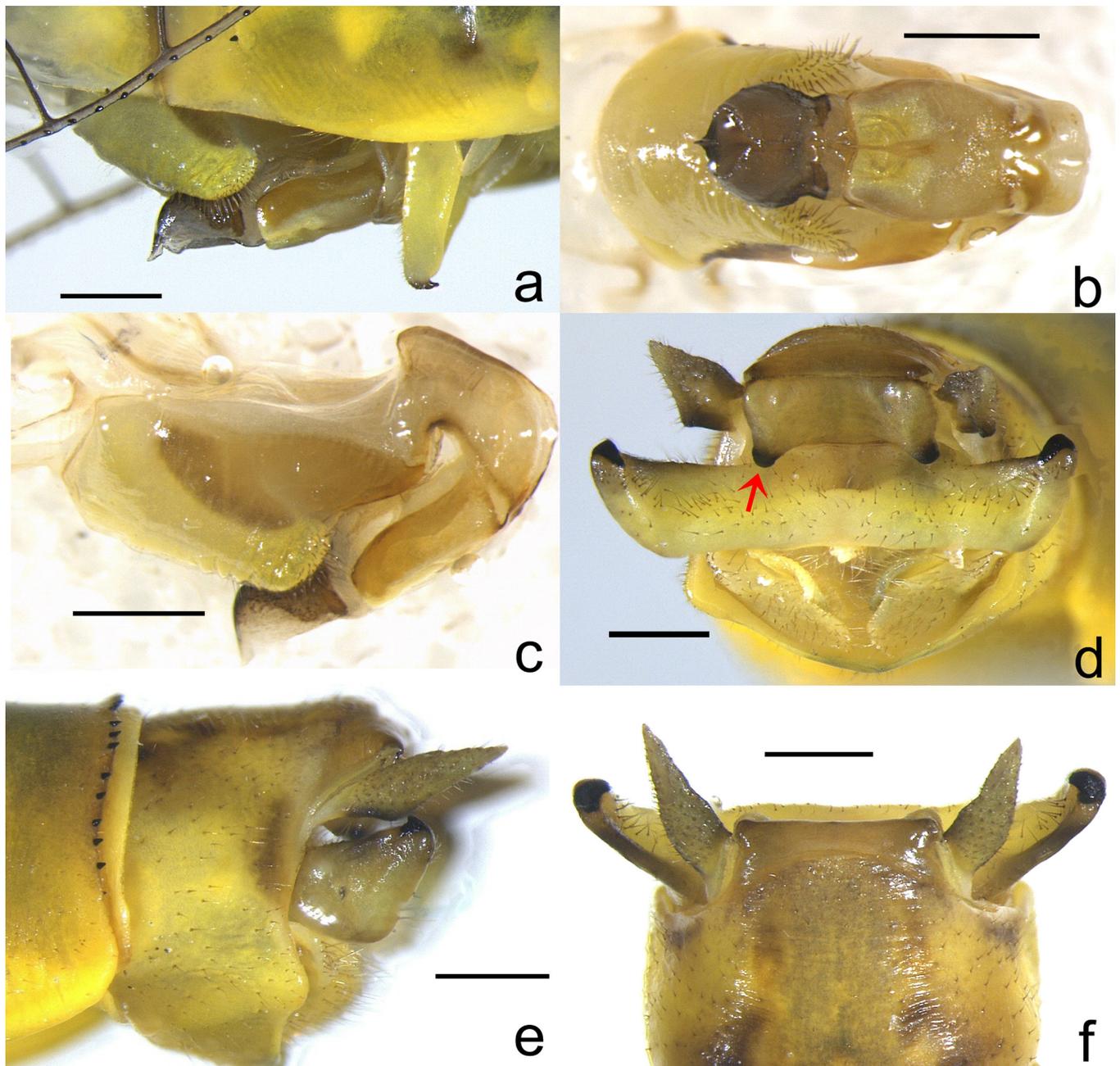


Figure 2. *Anormogomphus heteropterus* Selys, 1854. Male (IBC-BO403). Hamuli: (a) lateral, (b) ventral, (c) lateral view of hamuli; caudal appendages: (d) posterior, (e) lateral, and (f) dorsal views [scale bar = 0.5 mm].

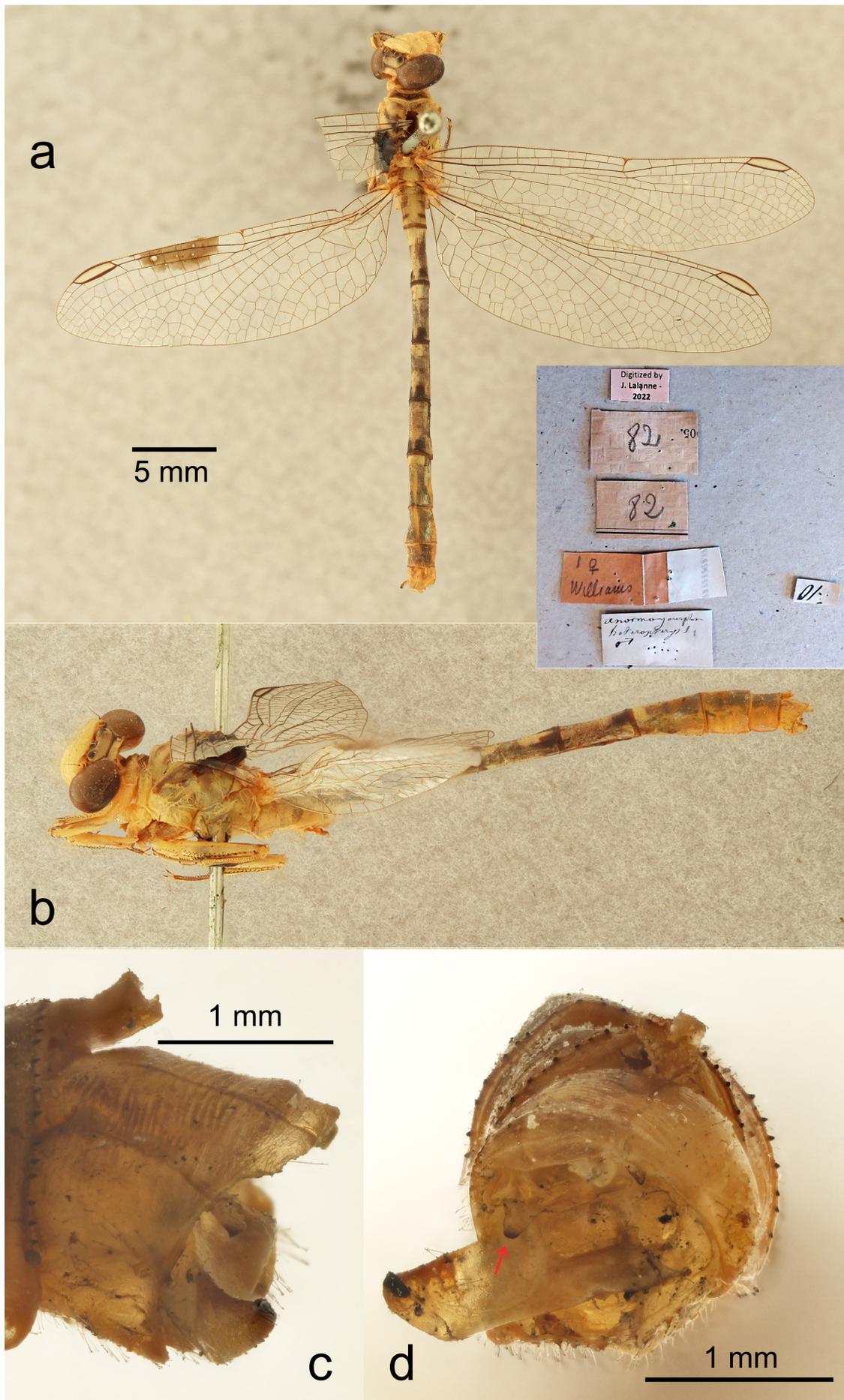


Figure 3. *Anormogomphus heteropterus* Selys, 1854. Holotype Male. (a) dorsal habitus, (b) lateral habitus, (c) lateral, (d) frontal, and (e) dorsal views of caudal appendages.

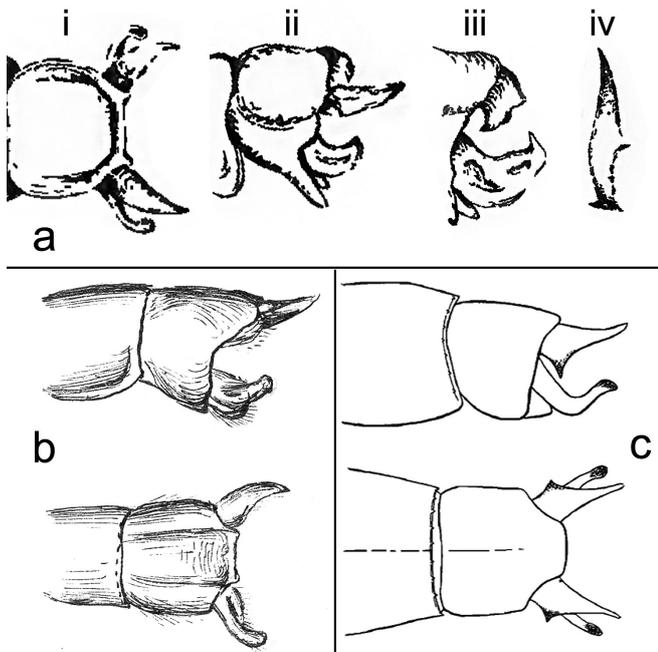


Figure 4. *Anormogomphus heteropterus* Selys, 1854. A compilation of illustrations modified after (a) Selys & Hagen, 1958: i) dorsal view, ii) lateral view, iii) lateral view of broken appendages, iv) cerci; (b) unpublished drawing by Severin (see Material and methods); and (c) Fraser (1934).

Fig. 2d), made up of two lobes with black apices. These structures appear to be sclerotized extensions of the S10, but they were not mentioned in any description or considered in any illustration of this species. From the examination of the type specimen it is clear that they are present (pointed out with an arrow in Fig. 3d). Additionally, in Fraser (1926, p. 735), the figure for *A. kiritshenkoi* Bartenev, 1913 clearly shows these structures, but they are not explicitly discussed anywhere. This evidence clearly suggests that these basal structures are a characteristic of the genus *Anormogomphus* Selys, 1854, but this still needs to be confirmed and described for *A. kiritshenkoi* by studying fresh specimens.

Diagnosis

Superficially, this species resembles some members of *Burmogomphus* Williamson, 1907, *Cyclogomphus* Selys, 1854, and *Platygomphus* Selys, 1854. From these genera it is differentiated by: (a) single-celled anal triangle (Fig. 1c), (b) base of HW rounded (not excavated; Fig. 1c), (c) lateral margin of S10 curved (Fig. 2e), (d) shape of caudal appendages (Figs 2d–f), and (e) shape of vesica spermalis (Figs 2a–c). This species belongs to the genus *Anormogomphus* based on the shape of its caudal appendages (cerci pointed with basal spine, and epiproct divaricate), tornus of HW rounded with a single-celled anal triangle, anterior hamuli with an apical hook, and a pale ground coloration with an unmarked face.

Anormogomphus heteropterus differs from *A. kiritshenkoi* Bartenev, 1913 by: (a) cerci with a reduced basal spine (basal spine prominent in the former), (b) smaller size (abdomen length 25–27 vs. 29–31 in *A. kiritshenkoi*), (c) thorax with black markings (unmarked in the former), and (d) black annules with dorsal markings on S1–7 (abdomen unmarked in *A. kiritshenkoi*). *Anormogomphus kiritshenkoi* also has a much more westerly distribution with no known records from east of Kashmir in India.

Habits and habitat

This species was observed on the terrace of a residential building while resting on an ornamental plant (*Dracaena* sp.) at around 18.00 h. This building is situated in a semi-urban area, surrounded by many buildings. There are some ponds nearby and the Brahmaputra River is ~1 km away. *Anormogomphus* spp. are weak fliers known to occur in sandy areas. The locality in which our single male was encountered is most definitely not the natural habitat of this species, and the banks of Brahmaputra River nearby and the surrounding region might be where this species breeds. The male observed by us appeared to have freshly emerged judging by its shiny wings and abdomen.

Platygomphus benritarum sp. nov. Joshi & Mital

Figs 5–6

Holotype

m# (IBC-BO402): Rudra Padh Temple on the bank of Brahmaputra River (N 26.6158, E 92.7711, alt.: 64 m), Tezpur, Assam, India, 6.v.2020, Shantanu Joshi and Anuja Mital leg.

Etymology

Named in honor of Monisha “Ben” Behal (founder, North East Network), and Rita Banerji (founder, Green Hub) for their pioneering work across two decades. Both women have been empowering and training the youth of northeast India to become change-makers, working towards creating ecological security, sustainable livelihoods, and social change. The species epithet is the feminine genitive plural created from combining the two names Ben and Rita.

Holotype male

Head (Fig. 5a). Eyes turquoise blue. Labium yellow, face dark brown, covered with hairs on the sides, faint yellow paired spots on labrum, anteclypeus paler brown, large paired blue spots covering almost the entire post-

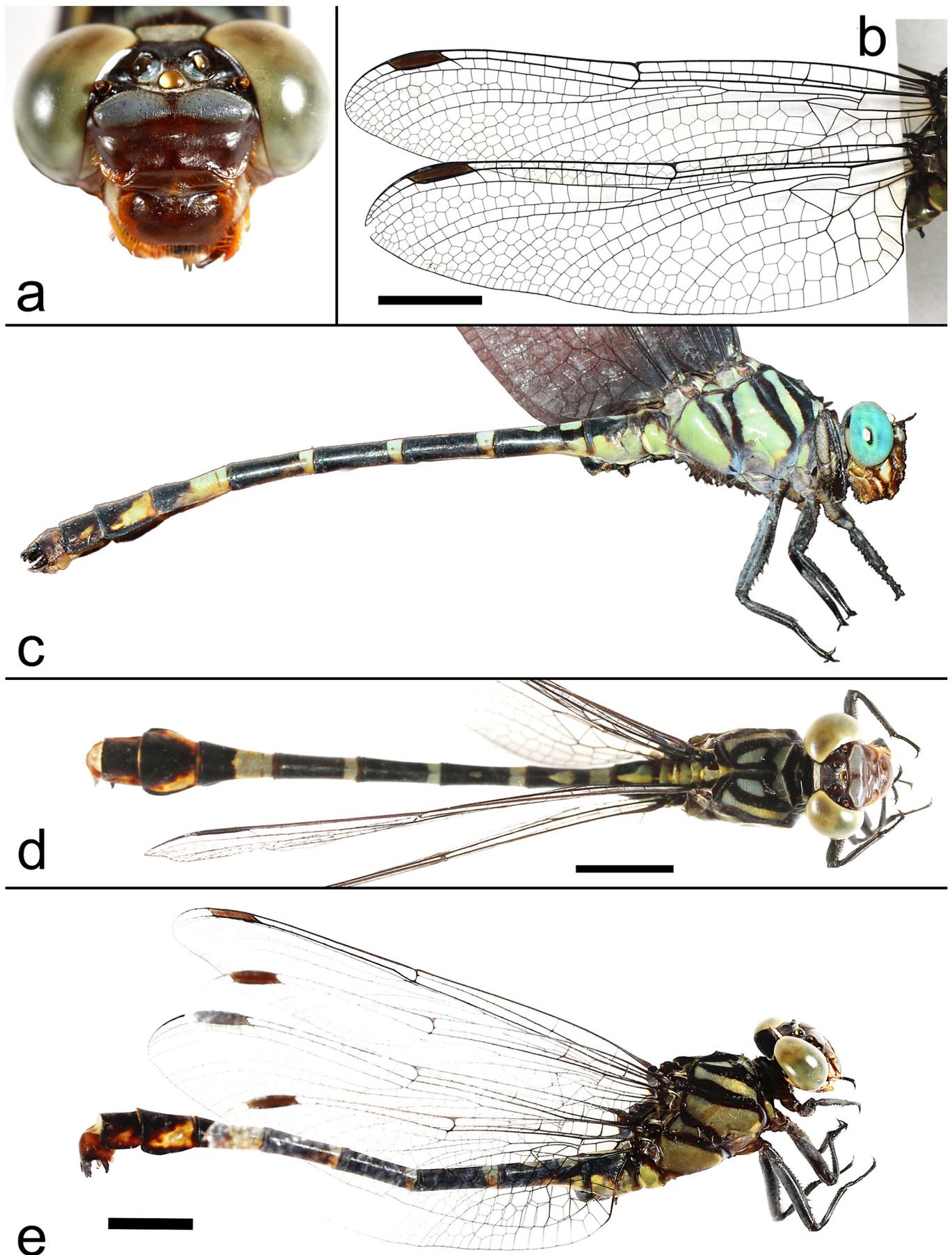


Figure 5. *Platygomphus benritarum* sp. nov. Holotype male (IBC-BO402) (a) head; (b) right FW & HW; (c) lateral habitus (live); (d) dorsal habitus; (e) lateral habitus [scale bar = 5 mm].

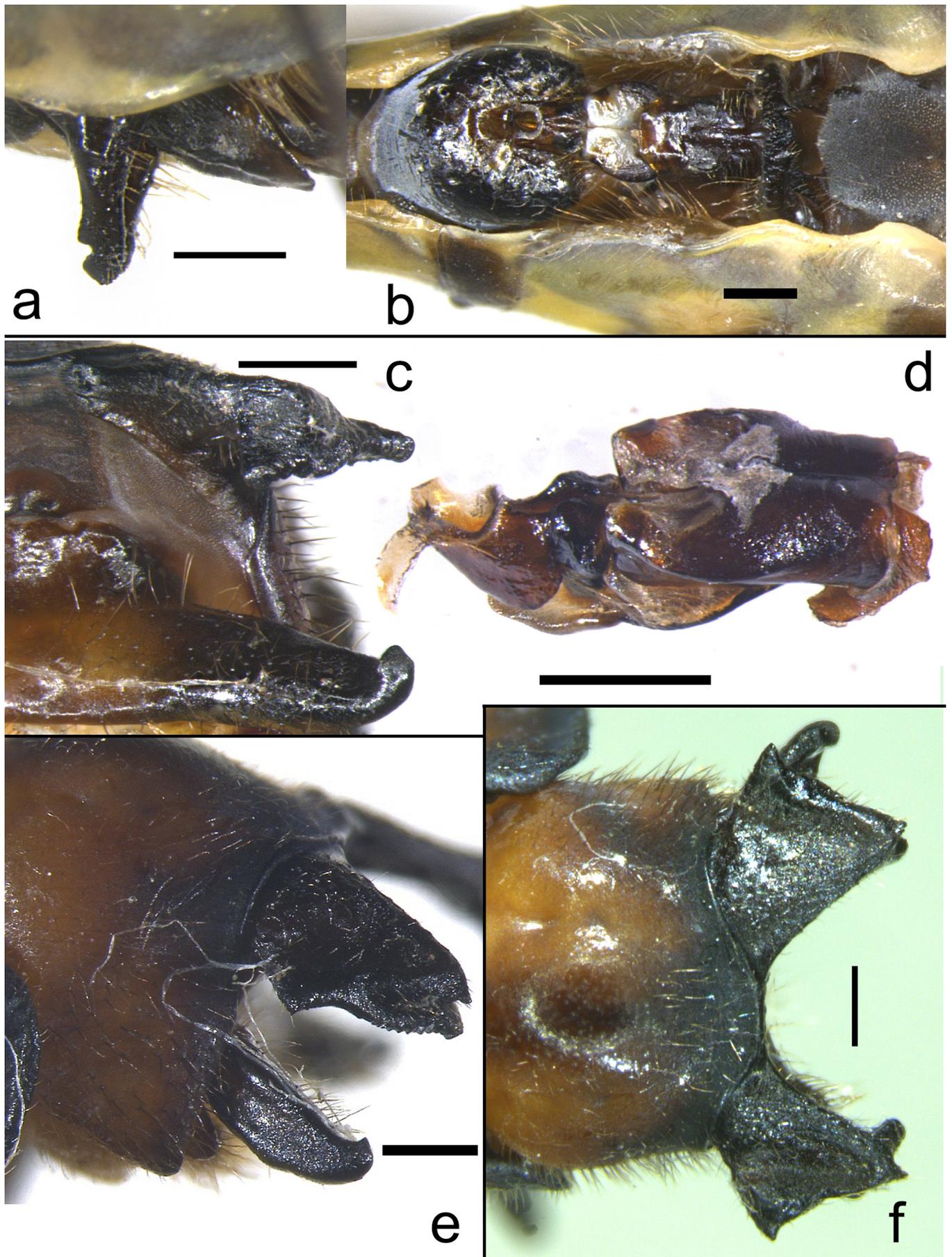


Figure 6. *Platygomphus benritarum* sp. nov. Holotype male (IBC-BO402). (a) hamuli lateral; (b) hamuli ventral; (c) caudal appendages posterior; (d) vesica spermalis lateral view; caudal appendages: (e) lateral; and (f) dorsal [scale bar = 0.5 mm].

frons, postfrons with brown setae. Blue and brown bands on the first and second segments of antenna, filament black. Labrum 2.3 times as wide as long. Ocellar region sky-blue, junction of frons and vertex white, vertex black, occiput pale bluish yellow, occipital ridge black with a yellow spot.

Thorax (Figs 5c–e). Prothorax yellow with median lobes. Pterothorax black, marked with greenish yellow as follows: mesothoracic collar, dorsally with oval spots, stripe on mesepisternum, laterally broadly yellow with black stripes across sutures.

Legs black, profemora internally marked yellow, covered with black spines; coxae yellow. Venter of thorax and base of legs slightly pruinose. Wings (Fig. 5b). Base of wings and membranes yellow. Pterostigma dark brown, pterostigmal brace present. Antenodals (1st and 5th primary) 12 (right), 13 (left) on FW, 9 (right), 10 (left, one incomplete nervure at end) on HW. Postnodals 8 on all wings. Base of HW slightly excavated. Anal triangle three-celled, triangular and slightly curved along the margin. Anal loop absent. One cubito-anal vein each in all wings. Discoidal field of FW starting with two rows of cells, three rows from the level of node; expanded towards the margin. Single rows of cells between CuA and MP, and between RP₂ and IRP₂, two rows near margin.

Abdomen (Figs 5c–e). Narrow up to anterior half of S7, S8 expanded, S9–10 tapering. Black marked with yellow. S1 to base of S3 laterally greenish yellow, S3–7 with basal annules, broken on S3 and extensive on S7. Auricles triangular, pointed. S2–3 with a mediadorsal triangular marking pointing posteriorly, small faint dorsal spots on S4–5. Markings gradually turning yellowish brown, especially from S7. S9 with paired dorsal markings along lateral margins and a small marking on the posterior border; S10 dark brown.

Vesica spermalis (Figs 6a, b, d). Genital lobe expanded, brown. Anterior hamuli short, simple, rounded, and covered with setae on apices. Posterior hamuli longer, shaped like a wrench; apical anterior margin notched, apices anteriorly curved, ending in a spine. V2 simple, rounded at edges, ventrally marked white. V3 curved at base, with a ventral beak-like prepuce, broadening on the apices, V4 with protuberances ventrally, saddle-shaped extensions; apical filaments short, apices anteriorly curved.

Caudal appendages (Figs 6c, e, f). Black, epiproct brown at base and laterally. Cerci 1.2 times longer than epiproct. Cerci expanded, trilobate; lateral margin forming a sharp spine at base, outer edge serrated, apices ending in two spines. Epiproct slightly divaricate, ending in an upwardly curved spine.

Measurements. Abdomen + caudal appendages = 32.9, FW = 32.6, HW = 31.



Figure 7. Type locality of *Platygomphus benritarum* sp. nov. at the Rudra Padh Temple, Tezpur, Assam, India (Photo: Manisha Kumari).

Diagnosis

This species is placed in the genus *Platygomphus* due to the shape of the male genitalia (ending with divergent apical filaments, Fig. 6d), and anal triangle three-celled and curved along the margin. From *P. dolabratus* and *P. feae*, this species can be distinguished by: (a) the shape of its caudal appendages (bilobate, similar in *P. feae* but medial ridge prominent with the two lobes less furcated; Figs 5e–f), (b) markings on face (labrum, clypeus, antefrons brown with pale bluish frons in *P. benritarum* vs. face extensively yellow; Fig. 5a), and (c) shape of apical flagellum of V4 (short and thick, vs. long in *P. dolabratus* and *P. feae*; Fig. 5d). *Platygomphus benritarum* is also smaller (32.9 mm) than both of its congeners (40 mm in *P. dolabratus* and 35–37 mm in *P. feae*). Nodal index of *P. benritarum* is lower than that of *P. dolabratus*, comparable to *P. feae*. This species also resembles *Asahinagomphus insolitus* (especially with regard to the shape of its caudal appendages), but differs from it by the lateral thoracic markings, three-celled and curved anal triangle (two-celled and not curved in *A. insolitus*), hamuli (anterior hamuli small and simple) and vesica spermalis (apices of V4 simple without filaments in *Asahinagomphus*).

Habits and habitat

A single male was found resting on a large *Ficus* tree situated about 5–6 meters from the banks of Brahmaputra River near the Rudra Padh Temple at around 17.00 h. The habitat along the banks is dominated by grasses, sparse trees, paddy fields, and marshlands along with some forest patches and tree plantations (Fig. 7). *Platygomphus* spp. (especially *P. dolabratus*) are known to prefer lowland rivers with sandy banks and sparse vegetation, which also seems to apply to this species.

Discussion

Both species discussed here were found on the outskirts of the small city of Tezpur, Assam, which is an unlikely place for encountering rare Gomphids. The discovery of two rare species in low-lying areas of the Brahmaputra Basin is surprising since most of the endemic diversity of Northeast India, especially among gomphids, is centered in the Himalayan foothills. However, this might be so because large rivers such as the Brahmaputra are difficult to sample and have been largely neglected with regard to Odonata. The habitats in which both species were discovered matches well the known ecologies of their respective genera.

Our rediscovery and redescription of *A. heteropterus* adds important information to the known morphology of this species and also extends its known distribution to Assam in Northeast India. Fraser (1926) mentioned that *A. heteropterus* “appears to be much rarer than *A. kiritshenkoi*”, which seems hold true. There have been few records of *A. heteropterus* from the western Himalayas (Prasad, 1975, Singh & Prasad, 1976) and Northeast India (Srivastava & Sinha, 1995, Mitra, 2006) in recent decades, but all of these records are of females and provide no new illustrations or details on the morphology of either sexes. *Platygomphus benritarum* might be the first odonate species endemic to the Brahmaputra Basin, but this can only be ascertained after more intensive surveys in neighboring regions.

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