



Rediscovery of *Anisogomphus ceylonicus* (Odonata: Gomphidae) based on its larva

Anisogomphus ceylonicus (Hagen in Selys, 1878) is one of the rarest of the Sri Lankan Odonata. It was first discovered from Ramboda over 140 years ago based on a female specimen, which was originally described as *Gomphus ceylonicus* and later assigned to the genus *Heliogomphus* by F. C. Fraser (Bedjanič & van der Poorten 2013). Almost a century later, Lieftinck (1971) collected an immature male and its exuvia of a clubtail dragonfly from Rambukpath Oya, 10 miles northwest of Hatton in 1962 and described as *Anisogomphus solitaris*. However, Bedjanič & van der Poorten (2013) recognized that *H. ceylonicus* is conspecific with *A. solitaris*, and thus reassigned it to the genus *Anisogomphus*. Since the discovery of the species, only these two records have ever been documented (Bedjanič *et al.* 2014), despite odonatological surveys and numerous biodiversity explorations conducted on the island.

According to the taxonomic descriptions, the adult *A. ceylonicus* can be distinguished by the combination of characters including characteristic wing venation, predominantly black prothorax with yellow pyriform dorsal spot, well-interrupted broad mesothoracic collar, long narrow antehumeral stripe pointed at both ends, isolated upper mesepisternal spot, middle lateral yellow thoracic stripe interrupted, lateral yellow markings on abdominal segments 1–3, a dorsal basal yellow patch on abdominal segment 7 and the anal appendages of the male (Bedjanič & van der Poorten 2013). The larvae can be distinguished by the long movable hook, down-curved palpus with faintly serrated inner surface, characteristic shape of ligula, long dorso-ventrally flattened third antennomere with long setae and very short fourth antennomere (de Fonseca 2000). Despite its placement in the genus *Anisogomphus*, it should be noted that *A. ceylonicus* differs considerably from other

Anisogomphus based on both adult and larval characters (Lieftinck 1971, de Fonseca 2000) and its generic placement needs to be reviewed.

Even though both sexes of the species as well as the larval exuvia is descriptively known (Lieftinck 1971), the available knowledge on the species beyond its taxonomic descriptions, is very limited. The emerging male collected in 1962 was collected in March from a stream in a steep ravine with the riparian vegetation consisting of bushes and some indigenous vegetation and surrounded by tea and rubber plantations (Brinck *et al.* 1971, Lieftinck 1971). No other information on its habitat and habits is known. *A. ceylonicus* is recognized as a globally Critically Endangered species and the possibility of it being extinct due to habitat degradation or pollution has also been expressed as there were no records of the species for over 50 years despite some targeted surveys (Bedjanič *et al.* 2014, Bedjanič *et al.* 2021).

As a part of an ongoing study on odonates in the montane region of Sri Lanka, a field survey was conducted in the foothills of Haputale Mountains in February 2021. An unusual gomphid larva was encountered during the survey and field observations and subsequent comparisons with taxonomic literature identified it as a larva of *A. ceylonicus*. Thus, here we report the third record of *A. ceylonicus*, confirming living evidence of the species almost six decades after its last documented record. The observation presented here was recorded at Nikapotha (6.7470 N, 80.9656 E. alt. 748 m a.s.l.), between Beragala and Koslanda along Colombo-Batticaloa highway, Badulla District, Sri Lanka. The stream where the observation was made (Fig. 1) had a moderate flow rate with rocks and boulders. Semi disturbed riparian vegetation with some herbaceous plants, shrubs and trees, was present along the stream. It had been partially blocked by the local community using boulders to create a small pool with a width of about 6 m, for washing and bathing. The substrate of this area primarily consisted of sand with some scattered pebbles and cobbles.

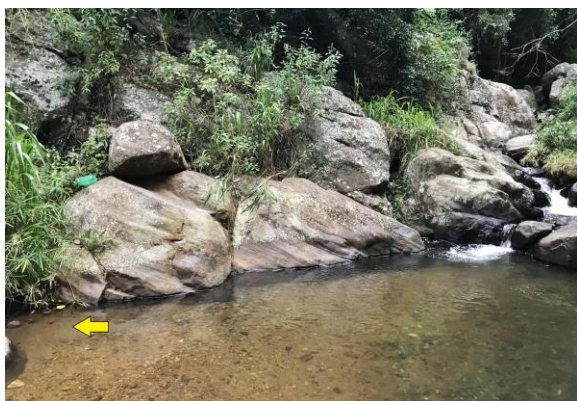


Figure 1. Habitat of *Anisogomphus ceylonicus* at Nikapotha; arrow indicates the microhabitat where the larva was found.

A survey was conducted in the site on 3 February 2021. Odonates were recorded using the visual encounter survey method and potential micro-habitats were sampled for larvae using a hand net. All odonate larvae collected were examined in detail, photographed and released back to the original location. Larval identifications were based on Lieftinck (1971) and de Fonseka (2000), and morphological terminology follows Tennessen (2019).

The observed *A. ceylonicus* larva (Fig. 2) represented an intermediate instar with the wing sheath reaching the base of abdomen segment 3. The larva was found near the stream bank under some aquatic vegetation. The substrate at the microhabitat of the observed larvae consisted of sand (Fig. 1). Four *Paragomphus* larvae and two *Anax immaculifrons* Rambur, 1842 larvae were also recorded in the same habitat. The site was revisited in April 2021, but no adults or larvae of *A. ceylonicus* were observed even though early instar *Paragomphus* larvae were abundant.

Description of larva: Sandy brown in colour with black eyes and a dark abdomen tip. Prementum (Fig. 2B) longer than the maximum width. Palpus down curved with faintly serrated inner margin and less than half the length of movable hooks. Movable hooks long and gradually curved ending with a sharply pointed apex. Ligula concave with a distinct anterior directed tooth in the middle. A dense ridge of setae along the margin of the ligula. Antenna with four antennomeres and the third antennomere elongated and covered with long setae (Fig. 2C). Legs are covered in sandy brown setae. Fore and mid tibiae with apical triangular burrowing hooks. Abdomen (Fig. 2D) widest in the middle. A faint dark pattern on either side of the mid dorsal carina of the

abdomen. Minute dorsal spines and small lateral spines on abdominal segments 7, 8 and 9. Epiproct and cerci are of equal length and paraprocts slightly longer. Cercus with a straight outer margin and outward curved inner margin forming a tapering apex. Paraproct also with a straight outer margin and a curved inner margin but with a less tapering apex compared to the cerci. Epiproct is with a slightly tapering rounded apex.

The morphological characters of the observed larva match well with the description and diagrams of *A. ceylonicus* exuvia by Lieftinck (1971). The distinct shape of the ligula and features in the antennae clearly support its identification compared to the larvae of other Sri Lankan gomphids (de Fonseka 2000). The habitat and elevation of the location also agree with the limited information that has been reported by previous authors. The new locality reported here is about 45 km southeast of the type locality of the species and is located on the southeastern slope of the central highlands of Sri Lanka (Fig. 3).

Based on the limited records available, it seems that the species inhabits semi disturbed streams with a sandy substrate in montane and sub-montane habitats between the elevations of 300-900 m. It is possible that the species may occur in suitable habitats across the highlands of Sri Lanka even though occurrence records are extremely rare. As the emerging male was collected in March 1962 (Lieftinck 1971) and the present observation of intermediate instar larva was made in February, the species is likely on the wing at least in March and April, which is the period prior to the beginning of the southwestern monsoon in Sri Lanka. Based on the observations presented here, it seems that *A. ceylonicus* can tolerate some aquatic pollution caused by detergents and soap at least in its early larval stages. However, further studies are required to understand how water quality affects its larval development and emergence.

Anisogomphus ceylonicus is one of the few Odonates of Sri Lanka with no photographic records of a living specimen available hitherto. The present observation provides the first photographs of a live *A. ceylonicus* larva and the most recent documentation of the species. These observations, coupled with previous work (Lieftinck 1971, Bedjanič & van der Poorten 2013), provide an improved understanding of the species, which might enable further targeted surveys to be made. Extensive surveys in

Plate 9

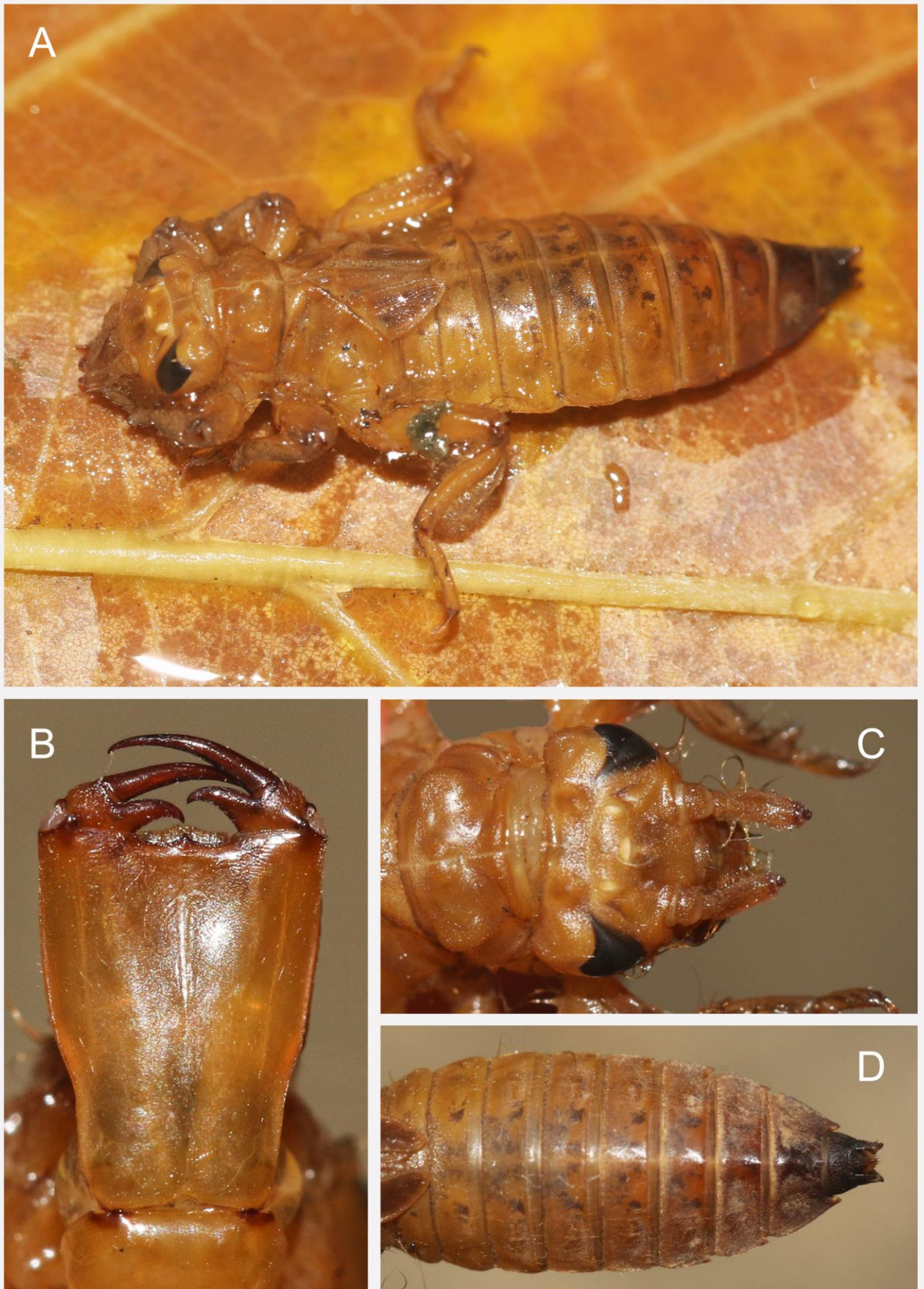


Figure 2. *Anisogomphus ceylonicus* larva: (A) dorsolateral view of the full body, (B) ventral view of the labium, (C) dorsal view of the head, and (D) dorsal view of the abdomen

potentially suitable habitats, especially in February, March and April, incorporating both adult and larval survey techniques, might yield further records of the species. Any such records would add crucial information on the biology and ecology of this globally Critically Endangered species and support its conservation in the future.

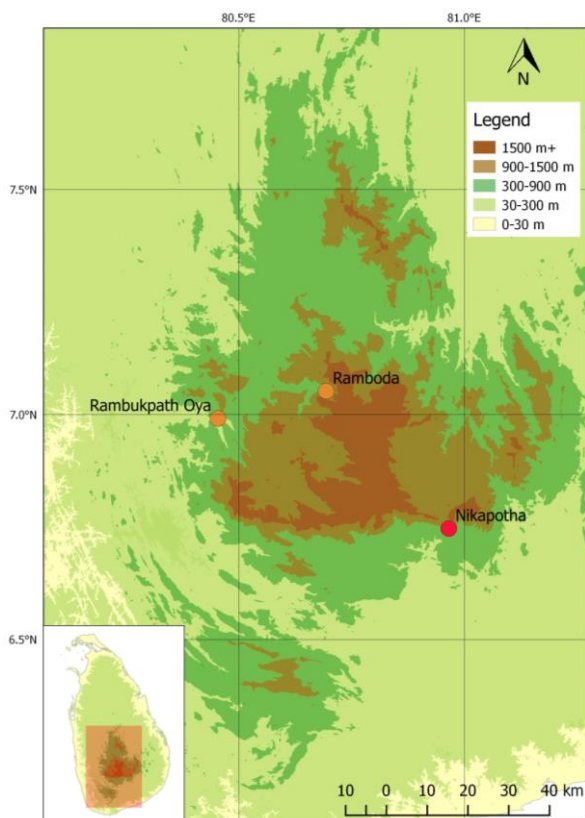


Figure 3. Distribution of *Anisogomphus ceylonicus* in Sri Lanka; historical records (orange), new locality record (red)

Acknowledgements

We express our gratitude to Rufford Foundation grant (No. 26652-1) for funding the survey. We also thank Devaka Weerakoon (University of Colombo, Sri Lanka) and the Butterfly Conservation Society of Sri Lanka for their support.

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Submitted: 10 Sep 2021, Accepted: 4 May 2022
Section Editor: Tosaphol S. Keetapithchayakul

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