

**DISTRIBUTION, CHARACTERISTIC AND BEHAVIOR OF  
*Rhinocypha anisoptera* SELYS, 1879 (ODONATA: ZYGOPTERA:  
CHLOROCYPHIDAE) IN EAST JAVA**

**DISTRIBUSI, KARAKTERISTIK DAN PERILAKU  
*Rhinocypha anisoptera* SELYS, 1879 (ODONATA: ZYGOPTERA:  
CHLOROCYPHIDAE) DI JAWA TIMUR**

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(diterima Oktober 2020, direvisi November 2020, disetujui Desember 2020)

**ABSTRAK**

*Rhinocypha anisoptera* tersebar di Sumatera dan Jawa. Di Jawa, jenis ini tercatat di Gunung Wilis, Gunung Arjuno, Gunung Welirang, Gunung Kawi, Nongkojajar, Gunung Tengger, Gunung Semeru, Kawah Ijen, Baju-Kidul, dan Gunung Kelud. Karena kurangnya keberadaan koleksi spesimen jenis ini dari lokasi-lokasi tersebut, karakteristik dan perilaku khas untuk populasi yang ada di Jawa belum pernah dilaporkan secara rinci. Studi ini melacak kembali keberadaan *R. anisoptera* pada lokasi-lokasi tersebut di atas yang sebelumnya dilaporkan oleh Lieftinck pada tahun 1934, dengan tambahan informasi keberadaan di Gunung Anjasmoro. Karakter pembeda utama *R. anisoptera* adalah sayap belakang seluruhnya gelap kecuali bagian pangkal sayap dengan warna biru metalik sekitar 4 – 5 % dari luas sayap. Berbeda dengan Chlorocyphidae lainnya, *R. anisoptera* cenderung lebih sering bertengger pada permukaan daun dibandingkan dahan, ranting pohon, atau batu di pinggir sungai.

**Kata kunci:** karakteristik, Gunung Anjasmoro, lokasi baru, *Rhinocypha anisoptera*.

**ABSTRACT**

*Rhinocypha anisoptera* is distributed in Sumatra and Java. In Java, this species was previously recorded from Mount Wilis, Mount Arjuno, Mount Welirang, Mount Kawi, Nongkojajar, Mount Tengger, Mount Semeru, Ijen Crater and Baju-kidul, with most recent encounter at Mount Kelud. Despite the vast encounter localities, there was lack of specimens collected to reveal its typical characteristic and behavior. This study confirmed the existence of *R. anisoptera* at most localities in East Java as reported in 1934 by Lieftinck, with additional new distribution in Mount Anjasmoro. *R. anisoptera* is typically characterized by dark coloration at the hind wing leaving transparent in the bases with metallic blue-tinged covering 4–5 % area in mid-section of the hindwing. Differ from other Chlorocyphidae, *R. anisoptera* perch on leaves more frequently compared to perching on twigs and rocks near waterways.

**Keywords:** characteristic, Mount Anjasmoro, new location, *Rhinocypha anisoptera*.

**INTRODUCTION**

East Java is a large province in Java Island with total coverage of 47,995 km<sup>2</sup>. It harbors diverse geographical conditions, including ocean, volcanic mountains, and savanna. Some portions of this province are intended for conservation area in the form of protected forest, forest park, national park, and nature reserve. The protected forests cover a total of 3,217.75 km<sup>2</sup> area (BPS

Jatim 2015). This geographical condition affects the diversity of flora and fauna therein. Insects are among many faunas that need to be thoroughly explored in this province, particularly Odonata (dragonflies and damselflies).

Currently, there have been 176 Odonata species described from Java (Lieftinck 1954, Lupiyaningdyah et al. 2019). Meanwhile, the most recent survey in Yogyakarta resulted in

88 species recorded (Setiyono 2014).

Odonata has important roles in the ecosystem as well as renowned among human. As adult, they serve as predator to other smaller insects (Corbet 1962), while being in its larval stage, they feed on tadpoles and small fishes. Furthermore, Odonata is recognized as a reliable bioindicator for water pollution. Its preferences on specifically clean habitat makes Odonata vulnerable to environmental alteration as their ability to detect chemical compound by sensitive sensilla in their antennas (Nugrahani et al. 2014). Hence, this vulnerability and sensitivity affect its population (Klym & Quinn 2003). Deforestation and habitat alteration that occur in Java have depopulated Odonata, which could lead to local extinction of sensitive species.

A group of beautiful damselflies that commonly known as jewels (Chlorocyphidae) is also distributed in Java, in which the genus *Rhinocypha* is also part of it. Two species recorded in Java are *Rhinocypha anisoptera* and *R. heterostigma*. The first is known to distribute more widely rather than the endemic latter (Baskoro et al. 2018). *Rhinocypha anisoptera* was firstly described by de Selys-Longchamps in 1879 based on Sumatran specimens. He stated that *R. anisoptera* has metallic black color with yellowish longitudinal pattern on thorax. Forewings are narrow and hindwings are 7 mm broader, with rounded ends. Krüger, in 1898, further elaborated the details on female characters. Adult female is similar to male with less yellow pattern on chepal and thorax. In 1912, Ris concisely described the species based on East Java specimens (without locality) from among Jacobson's collections and agreed on

original description of de Selys-Longchamps in exception for size and shape. Ris also reconfirmed the distinction from its close counterpart, *R. heterostigma*.

Lieftinck, in 1934, briefly added information regarding habitat and localities of *R. anisoptera* in East Java which habitat is mountainous forest rocky streams with heavy stones. He recorded it from mountainous forests in East Java, namely Mt. Wilis, Mt. Arjuno, Mt. Welirang, Mt. Kawi, Nongkojajar, Mt. Tengger, Mt. Semeru, Ijen Crater and Baju-kidul. This species was reconfirmed existing in Mt. Ijen after more than 80 years later (Pamungkas 2016). In recent update on its distribution and conservation status, *R. anisoptera* remains in Least Concern (LC) category of IUCN Red List (Gunther 2019). Abdillah (2019) also reported their existence in Mangli Springs at Mount Kelud steeps. Despite its unpopularity compared to its counterpart *R. heterostigma*, the specimens of *R. anisoptera* were observed sold in international online markets, such as Ebay.com and Bicbugs.com (pers. obs.).

While some descriptive accounts made for this species, it was still incomplete, due to no detail description for male appendages. Thus, this study intended to fill this gap of information, in addition to detail behavior that previously unknown and to update its distribution in East Java.

## MATERIALS AND METHODS

### Locations

Observation sites for *R. anisoptera* were some districts in East Java; Blitar, Jombang, Kediri, Lumajang, Malang, Mojokerto, and Pasuruan; all of which were based on preliminary surveys conducted in January

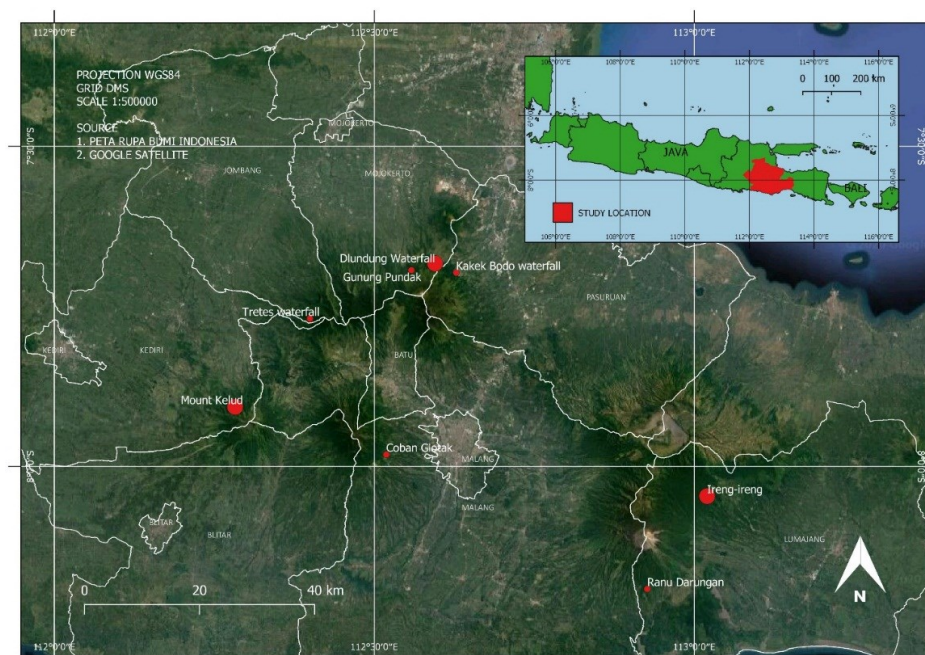
**Table 1.** Study Location.

| Residence  | Location             | Altitude (m) | District  |
|--|----------------------|--------------|-----------|
| Anjasmoro Mountain   | Tretes Waterfall     | 1150         | Jombang   |
| Kawi Mountain  | Coban Glotak         | 1000         | Malang    |
| Arjuno - Welirang Mountains                                | Kakek Bodo Waterfall | 920          | Pasuruan  |
|  | Dlundung Waterfall   | 912          | Mojokerto |
|  | Mount Pundak         | 1000         | Mojokerto |
| Mount Semeru   | Ireng-ireng          | 1200         | Lumajang  |
|  | Ranu Darungan        | 850          | Lumajang  |
| Mount Kelud (Grouped as Distance and altitude similiarity) | Sumber Mangli        | 780          | Kediri    |
|  | Sumber Clangap       | 791          | Kediri    |
|  | Dewi Kilisuci        | 839          | Blitar    |

2018. Some of these locations were historically reported as *R. anisoptera* localities (Lieftinck 1934). In addition, new location at Mount Anjasmoro and Mount Kelud was also surveyed.

Lieftinck provided information regarding habitat of *R. anisoptera* which was fast flowing streams in forested area at 500–2200 m elevation. With this information, the surveys were focused at some potential locations. As mentioned by Lieftinck (1934), resurvey was

conducted in Arjuno–Welirang Mountains, Mount Kawi and Mount Semeru. Precisely, Kakek Bodo Waterfall, Dlundung Waterfall and Mount Pundak in Arjuno–Welirang Mountains, Coban Glotak in Mount Kawi, Ireng-ireng and Ranu Darungan in Mount Semeru. We also resurvey Sumber Mangli at Mount Kelud steeps as reported by Abdillah in 2019. Furthermore, the surveys were also conducted in different new locations which are Tretes Waterfall in Mount Anjasmoro and



**Figure 1.** Recorded locations of *Rhinocypha anisoptera*. (●) population under average; (●) population above average (average: 7.125 individuals). (Modified from Google Maps, 2020)

Sumber Clangap, Dewi Kilisuci waterspring along the slope of Mount Kelud.

The study sites were located at different conservation areas. Kakek Bodo Waterfall, Tretes Waterfall and Mount Pundak were parts of Raden Soerjo Grand Forest Park within the Arjuno, Welirang-Anjasmoro Mountain Range. Coban Glotak, Dlundung Waterfall, Dewi Kilisuci Waterspring, Sumber Clangap and Sumber Mangli are located within protected forest managed by the State Forest Company (Perum PERHUTANI). Ireng-ireng and Ranu Darungan are parts of Bromo Tengger Semeru National Parks.

### Methodology

The research had been conducted from January 2018 to August 2020. It used visual day flying methods by observing the targeted species during its active time between (08.00 to 15:00) (Virgiawan et al. 2015). *R. anisoptera* was identified based on description provided in Lieftinck (1934) and photographed specimen from the Museum of Natural History London, United Kingdom (NHUMK 012495619). Individuals were counted and their activities were noted. Three individual were collected in order to measure its bodily parameters such as total body length and length of hind wings. The measured specimen was inaccessible as they loss after the measurement. The morphological terms followed Theischinger & Hawking (2006).

During the observation to collect specimen and distribution, we observed and recorded *R. anisoptera* behaviors in four categories: perching/basking, flying/hovering, eating and mating.

## RESULTS AND DISCUSSION

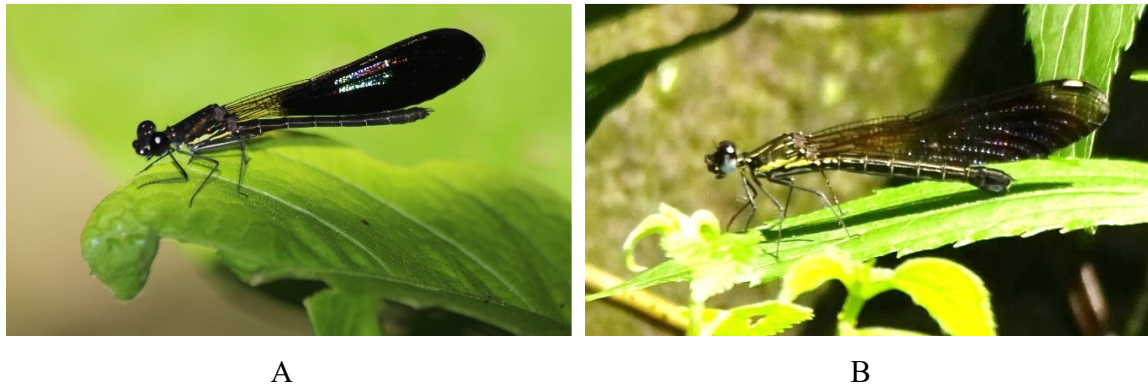
### Distribution

**Table 2.** Observed population of *Rhinocypha anisoptera* per site.

| Location             | Amount (individual) |
|----------------------|---------------------|
| Kakek Bodo waterfall | 6                   |
| Tretes waterfall     | 3                   |
| Coban Glotak         | 5                   |
| Mount Pundak         | 7                   |
| Ireng-ireng          | 8                   |
| Ranu Darungan        | 2                   |
| Dlundung waterfall   | 8                   |
| Mount Kelud          | 18                  |
| <b>Average</b>       | <b>7.12</b>         |

Based on the results of observations at several predetermined locations (Table 2), Mount Kelud was the location with the most abundant *R. anisoptera* with 18 individuals in three sites: Dewi Kilisuci waterspring (3 individuals), Sumber Clangap (2 individuals), and Sumber Mangli (13 individuals). Overall, the average population of *R. anisoptera* was 7.12 individuals per site. By referring to this number, Ireng-ireng, Dlundung waterfall and Mount Kelud were above average, while other sites were below average. The first three sites with above average *R. anisoptera* population are protected area, with limited access which maintain the dense vegetation and canopy. Other sites were generally with less vegetation and sparse canopy cover, partially resulted from more frequent access by human.

Kakek Bodo waterfall in Mount Arjuno, Tretes waterfall in Mount Anjasmoro, and Mount Pundak on the slopes of Mount Welirang are parts of Raden Soerjo Forest Park area. The three locations received intense pressure from human



**Figure 2.** *Rhinocypha anisoptera*, (A) Male, (B) Female.

activities, especially tourism. Tourism and other human activities present disturbance to wildlife species, resulting in their avoidance from the source of disturbances. Mount Pundak is located in the Arjuno-Welirang mountains which has a forest with dense canopy and less human activity. *R. anisoptera* at Mount Pundak can be found spread in almost every water springs with 7 individual of *R. anisoptera*. Habitat suitability and least human activity lead the population of *R. anisoptera* found on Mount Pundak are reasonably abundant. On the contrary, Kakek Bodo waterfall on the slopes of Mount Arjuno and Tretes waterfall on the slopes of Mount Anjasmoro are tourist attraction, many tourists visit them and thus influenced the *R. anisoptera* habitat. With the same type of habitat characteristics but more human activity, they inhabit by less individual compare to Mount Pundak.

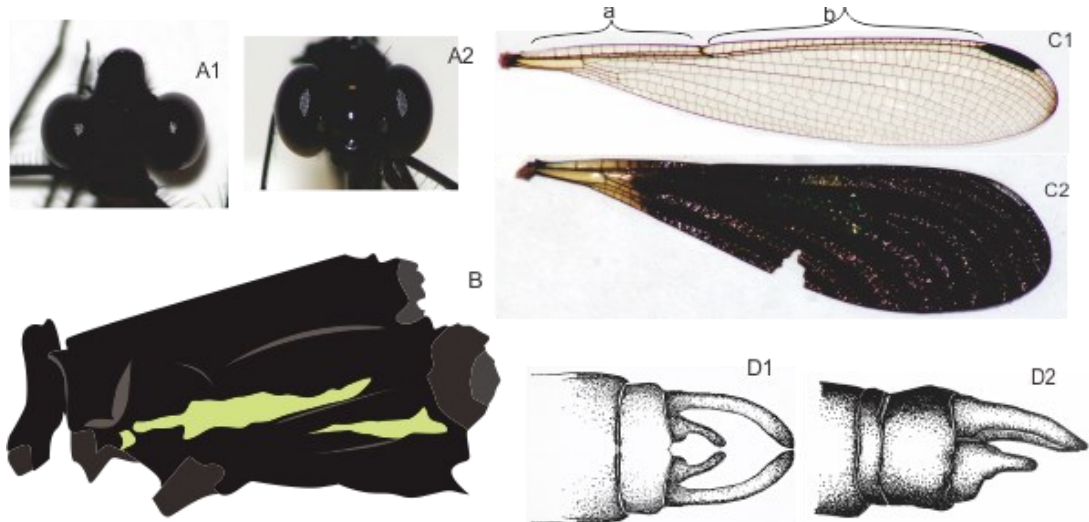
Our survey confirmed the existence of *R. anisoptera* at the localities such as Mt. Arjuno, Mt. Welirang, Mt. Kawi, and Mt. Semeru even after 85 years of no confirmation (Gunther 2019). Survival of this species in those locations indicated the preservation of its natural habitat.

### Characteristics

*R. anisoptera* firstly described by Selys in 1879 from Sumatran specimens. Eleven years later, Krüger (1898) added some descriptions including the female, also from Sumatran collections. The description shows that abdomen length: 18.5–21 mm, hind wing: 25–29.5 mm (Krüger 1898; de Selys-Longchamps 1879). Ris (1912) is the first who described *R. anisoptera* based on Javan specimens (5 male, 1 female). He confirmed that all male description is in line with de Selys-Longchamps' descriptions, the hindwing rather larger than Selys depicted. Pamungkas (2016) described *R. anisoptera* from East Java has black eyes and grey on the bottom, black abdomen, and wings with blue-green reflection. We added some details of the male with pictures, but we did not success to collect the female, thus we only present brief descriptions, more details refer to Krüger (1898).

Male: body length 30.2 mm, HW 26.8 mm, Fig.2A and 3A1-D2. Collected from Dlundung Waterfall.

Head generally black, except lower half of eyes grey, frons, mandibula and labrum metallic black (Fig. 3-A1, A2). Thorax black with narrow yellow stripes on each sides, prothorax entirely black,



**Figure 3.** Specimen of *Rhinocypha anisoptera* (Male), A1. Head (dorsal), A2. Head (frontal), B. Thorax (lateral), C1. Forewing, C2. Hindwing, D1. Anal appendages (dorsal), D2. Anal appendages (lateral).

synthorax dorsal black, mesanepisternum black with narrow yellow stripes elongated that start from just behind meso-katepisternum to 1/3 before metapleural suture, metepimeron black with 1/2 narrow yellow stripes close to distal (Fig. 3-B); Forewing hyaline, pterostigma black and long, dull yellow hyaline in median (Fig. 3-C1). Antenodal crossveins: 14 (Fig. 3-C1a), postnodal crossveins: 29-30 (Fig. 3-C1b); Hindwing 1/5 of proximal dull yellow hyaline, 4/5 dark metallic dark with 4-5% light blue-green hue of the wing as measurement by ImageJ, the width 7 mm broader than forewing (Fig. 3-C2). Abdomen black; Annal appendages: cerci from dorsal view: twice as long as S10, curved inward, pointed tip, from lateral view it curved downward; paraproct appendage: 1/3 shortened than cerci, proximal enlarged half way then shrink and curved with obtuse tip.

Female: body length unknown, HW unknown. Fig.2B. Locality: Tretes Waterfall.

Head black; Thorax black with more yellow stripes than male, prothorax yellow

spot on each sides, synthorax black, antehumeral stripes yellow, mesaeipisternum black with 1/3 narrow yellow stripe on distal, metanepisternum long yellow stripes from proximal to distal, metepimeron large triangle yellow stripe, wings yellow hyaline, pterostigma pale white; Abdomen black, bigger than male, S1-S3 clear yellow spot on the margin, S4-S10 small and thin yellow stripe on the margin, S8-S10 enlarged.

### Behaviors

The intensity of sunlight penetrating the canopy affects both dragonflies and damselflies activities such as hunting and mating. However, light intensity is needed to improve their color patterns which attract mating partner (Svensson & Waller 2013). As improved colors, damselflies including *R. anisoptera* use light to obtain their prey visuals (Miller 1995).

### Perching/basking

*R. anisoptera* was found perching on leaves frequently rather than on twigs and rocks near waterways. The position while



**Figure 4.** Perching position of *Rhinocypha anisoptera*, (A) on a twig, (B) on a leaf.

they perch is horizontally on a flat surface and usually on the middle of the leaf or close to the tip of a twig or tree branch. One of the plants that are often used as perching spot is *Elatostema* spp. by the river. Perching activity occurs when the sun penetrates the canopy and touches the twig, tree branch or rock which gives a bright and warm spot.

#### **Flying/ hovering**

Male *R. anisoptera* fly and move from one tip of twig to another which is not far, around 3 meters with several perch points if disturbed or catch their preys. When other dragonfly species approaches, the male seems disturbed and need to defend their territory. *R. anisoptera* will fly and fight. But if human approaches, *R. anisoptera* will fly further to higher place or to denser vegetation nearby.

Based on our observations, some damselfly species have become competitors in defending the territory of this species. We recorded *R. anisoptera* together with *Heliocypha fenestrata* and *Euphaea variegata* are often chasing each other over the rocks or around the footbridges at Kakek Bodo Waterfall. *R. anisoptera* were found

fighting and chasing each other with *E. variegata* over rocks, twigs or leaves for perch spots along the riparian at Mount Pundak, Ireng-ireng, Ranu Darungan, Coban Glotak, Dlundung Waterfall, and Mount Kelud. Another damselfly that was caught to fight with *R. anisoptera* is *Vestalis luctuosa* in Ranu Darungan and Mount Kelud.

#### **Eating**

Adult *R. anisoptera* perches when the sky is clear to wait for its prey to approach and then catch it. They prey on small insects that usually fly around the bushes. *R. anisoptera* eats their prey while perching.

#### **Mating**

*R. anisoptera* is relatively sedentary to maintain territory and contests to attract the mating partner. While the female approaching, the male will fly and following the female. The mating process is unknown, not observed yet.

#### **CONCLUSION**

*Rhinocypha anisoptera* was observed to exist within the seven study locations in East Java, namely Kakek Bodo Waterfall,

Tretes Waterfall, Coban Glotak, Mount Pundak, Ireng-ireng, Ranu Darungan, Dlundung Waterfall, and Mount Kelud. This study added two new localities for *R. anisoptera* in Mount Kelud and Mount Anjasmoro. Typical morphological character of *R. anisoptera* was its hindwing that has metallic dark coloration on the most entire part leaving the wing bases, while 4–5% of the mid-section of hindwing with metallic blue-green pattern. This damselfly prefers to perch on leaves frequently rather than on the tip of twig, tree branch or a top of rock, while the males show territorially defensive.

#### ACKNOWLEDGEMENT

We would like to thank the extended family of KUTRIK, the entomology study group, especially to the participants of “Ekspedisi Lembah Mahameru” in 2019 and “Ekspedisi Kelud” in 2020 who had helped in data collection. Special gratitude to M. Azmi Dwi Susanto who assisted in collecting the data. We also thank Frendi Irawan and Nanang Kamaluddin from Indonesia Dragonfly Society that helps in species identification.

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