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SHORT COMMUNICATION

Record of *Ichthyophis* cf. *hypocyaneus* from the Menoreh mountain range, Central Java with notes on morphology and natural history

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The Menoreh Mountain Range is a geological uplift located on the southern part of Central Java, mainly comprises complex mosaic of Oligo-Miocene karstic limestone and ancient volcanic substrates, including andesitic and basaltic formations. This range is consisted of three distinct mountains: Mt Ijo, Mt Menoreh and Mt Gajah (Bemmelen, 1949; Widagdo et al., 2018). The karst system in Menoreh originated from reef limestone carved by denudational processes which resulted in a rugged valley topography with various springs, creek and cave networks (Kurniawan & Sadali, 2018). This range is known for its biodiversity and considered as part of the Merapi-Merbabu-Menoreh UNESCO Biosphere Reserves. While several herpetological surveys have been conducted on this region, no published literature documented the occurrence of caecilians (Yudha et al., 2015; Qurniawan et al., 2012; Qusway & Sifa, 2019).

Caecilians (order Gymnophiona) are a group of limbless vermiform amphibians that are among the most poorly known animals due to their elusive behavior, often associated with fossoriality. Compared to the other amphibians, caecilians are rarely encountered and remain poorly recorded. They are distributed in tropical parts of the world, including tropical South America, Central America, Africa, and tropical Asia. On the island of Java, there are three known species of caecillians, all belonging to the genus *Ichthyophis,* which are *I. hypocyaneus, I. javanicus,* and *I. bernisi.* However, their taxonomic status remains uncertain. Iskandar (1998) recognized *I. hypocyaneus* as the only valid taxon from Java, casting doubt on the other two due to vague localities and descriptions based on only a single specimen. Alhadi et al. (2021) recognized two species in their book: The species with a yellow ventrolateral stripe,

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I. hypocyaneus from West Java, and the species without such a stripe, *I. javanicus* from Central Java.

I. hypocyaneus had once been considered extinct due to a lack of observation since the original specimen was described (Iskandar & Colijn, 2000); however, more observations of this species have been confirmed by Iskandar & Colijn (2000); Kusrini (2007), and Borzee *et al.* (2017); as more observations being reported, this species is now listed as Least Concern by IUCN. Most reports concerning *I. hypocyaneus* originate from West Java. In their study, Borzee *et al.* (2017) elucidate the habitat characteristics of this species, identifying its presence in marshy grassland ecosystems within Halimun-Salak National Park. This context emphasizes the ecological significance of such habitats for the conservation and study of *I. hypocyaneus*, highlighting the need for ongoing research into their distribution and habitat preferences in the region. According to the IUCN, this species is distributed in Central Java; however there are still no published data especially on their ecology from the Menoreh Mountain Range. Here, we present a short report on *I.* cf. *hypocyaneus* from the Menoreh Mountain Range in Central Java (Fig. 1), including notes on its taxonomy, morphology, habitat, and potential threats.

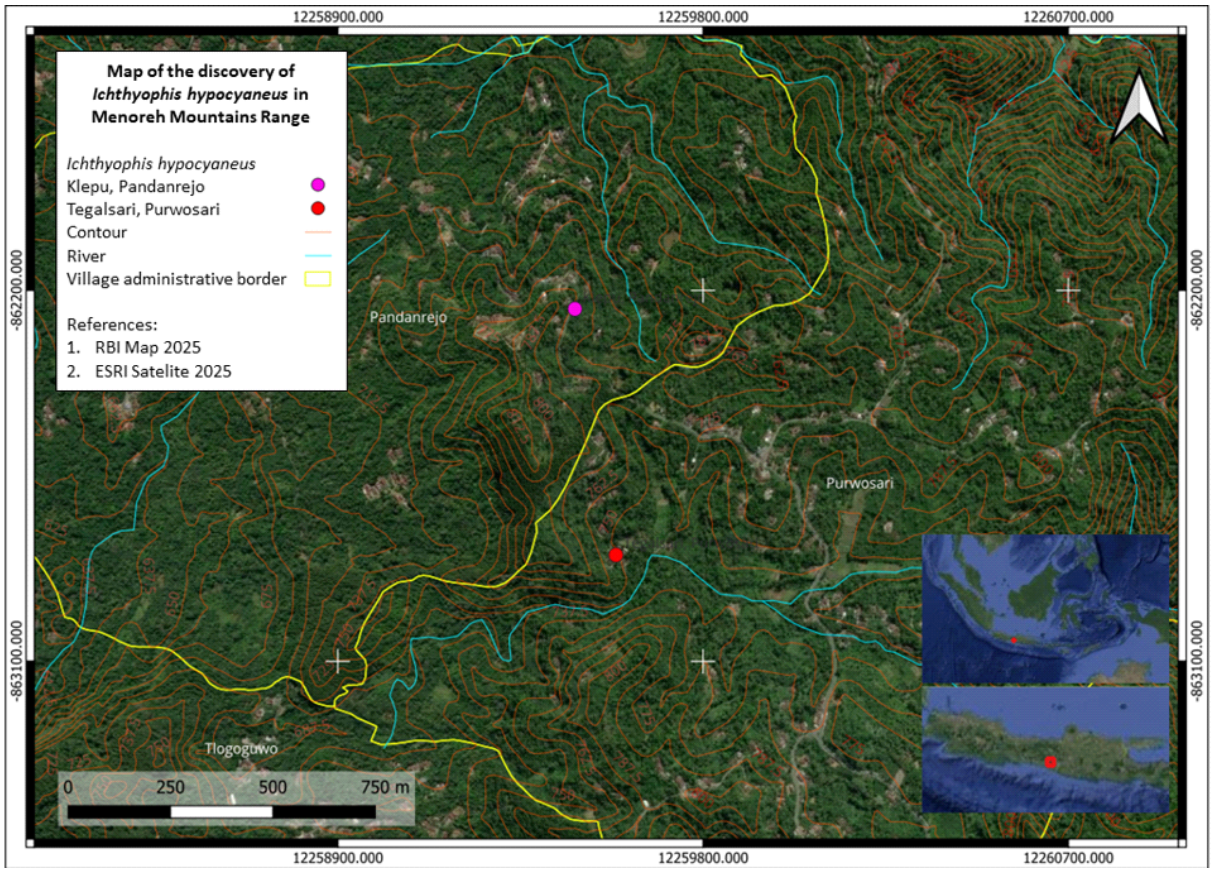

Figure 1. Map of *Ichthyophis* cf. *hypocyaneus* encounters in the Menoreh Mountain Range.

The first specimen was discovered on April 29, 2025, at 8:45 pm local time (Fig. 2A). We found a single individual of *I.* cf. *hypocyaneus* in the village of Purwosari, district of Girimulyo, located within the Menoreh Karst region of Kulon Progo Regency, Yogyakarta, Indonesia (7°40' S, 110°10' E; elevation ~750 m asl). We discovered the specimen slithering among the moist leaf litter in the path along a forested slope, around 1 meter above a small stream (Fig. 3A). According to the local guides, this stream flows perennially, though the rainfall might easily affect its discharged volume. The site is surrounded by mixed agroforestry plantations consisting of *Syzygium*, coffee (*Coffea* sp.), banana (*Musa* sp.), interspersed with native vegetation including bamboo (bambusoid), aroids (including *Homalomena*), *Ficus*, *Sanchezia,* and various ferns. An in-situ photograph could not be taken as the animal was attempting to flee. We noted this species could move quickly, seemingly in response to avoid the light from the headlamp. Upon capture, the mucus secretions on the skin made the specimen slippery and difficult to grab. We also noticed that the individual actively wiggled backward to evade handling.

Figure 2. Specimens of *Ichthyophis* cf. *hypocyaneus.* Specimens from Purwosari, Girimulyo, Yogyakarta Province (A). Photo by Alfonsus T.E. Saputro. Specimens from Pandanrejo, Kaligesing, Central Java Province (B). Photo by Zulqarnain Assidiqi.

Figure 3. Habitat of *Ichthyophis* cf. *hypocyaneu*s in the Menoreh Mountain Range. Habitat of the first specimen at the narrow trail in a forested slope situated above the streams (A). Habitat of the second specimen found in the interprovincial roadway connecting Central Java Province and the Special Region of Yogyakarta (B).

We observed another individual on May 14, 2025, at 7:48 pm local time, in Pandanrejo Village, Kaligesing District, Purworejo Regency, Central Java Province, Indonesia (7°72’ S, 110°12’ E; altitude ~700-800 m asl) by author ZA (Fig. 2A). The individual was found on an asphalt road running through a mixed matrix of plantation and agroforest (Fig. 3B). This specimen was found quite far from the perennial water bodies, at around ~110 m from the nearest stream. The surrounding vegetation is consisted of plantation and agroforestry, including cassava (*Manihot utilissima*), banana (*Musa* sp.), teak (*Tectona grandis*), coconut (*Cocos nucifera*), bamboo (bambusoid), Arecaceae, Fabaceae, Asteraceae and Euphorbiaceae. When first encountered, the individual remained passive in the middle of the paved road, showing minimal response to photography or flashlight. However, after author ZA relocated the animal to a wet, muddy substrate, it started to be more active. We only documented this specimen via a photograph (Fig. 2B) and subsequently released it back into its natural habitat.

We recorded external morphometric data from the live specimen using digital calipers (to the nearest 0.1 mm) for the following measurements: total length, head length, head width, distance from nostril to eye, distance from snout to eye, distance from tentacle to nostril, distance from tentacle to eye, and body width. We subsequently euthanized and dissected the specimen to examine its dentition, counting the tooth sockets across the premaxillary+maxillary, vomeropalatine, dentary, and splenial (Fig. 4).

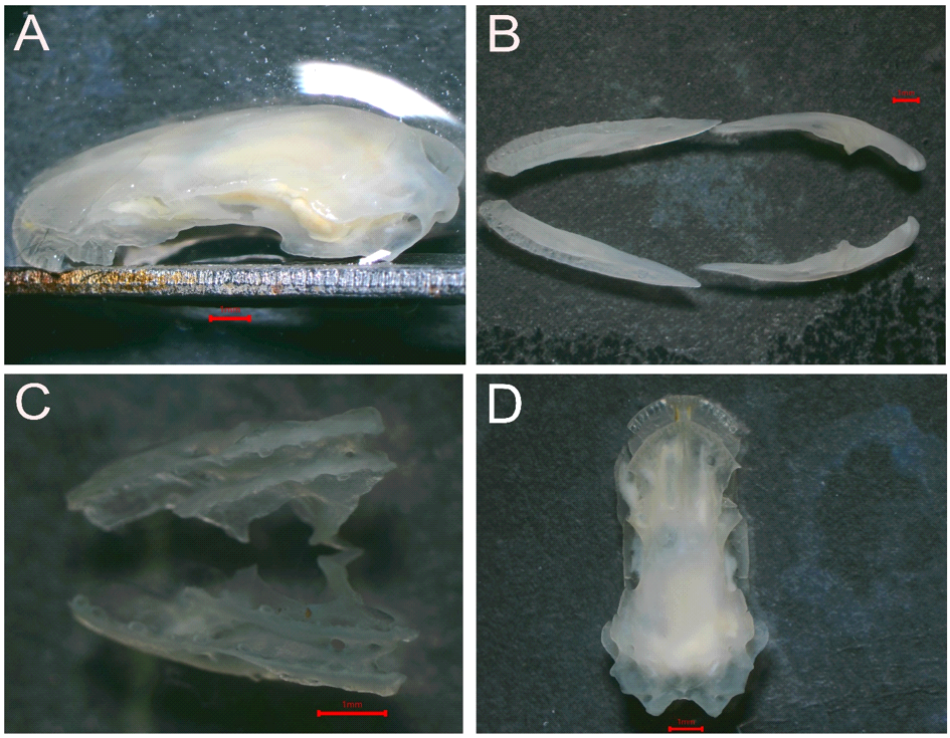

Figure 4. The cranial element from first specimen. Red bar showing 1 mm scale. Lateral view of cranium with detached maxillary (A). Dorsal view of mandibular element including the dentary (B). Ventral view of maxillary element (C). Ventral view of cranium (D). Photos by Satria M. Aziz.

The adult specimen possessed an elongated, cylindrical body with a total length of 359 mm and a subequal diameter throughout its length (body width 16.8 mm). The head was slightly narrower than the body, featuring a blunt snout, a head length to the first nuchal fold of 12 mm, and a head length to the first body annulus of 20 mm. The eyes were visible as distinct dark spots covered by skin, each surrounded by a narrow white ring, with a snout-to-eye distance of 4.9 mm and a distance from nostril to eye of 4 mm. A pair of white tentacles was clearly visible on both sides of the head, located closer to the eye than to the nostril (distance from tentacle to eye: 1.5 mm; distance from tentacle to nostril: 3.5 mm) and positioned closer to the mouth margin than to the eye. The head width measured 6.8 mm between the eyes and 11 mm at the first fold. We recorded a total of body annuli count of 324. The tail was short and tapering, containing 10 tail annuli before terminating in a blunt tip. Dorsal coloration was uniformly black, while the venter was paler. A thin, discontinuous yellow lateral stripe extended from the posterior margin of the eye to the tip of the tail, though this stripe appeared fainter across several body segments. Regarding specimen dentition, we recorded 15–15 premaxillary-maxillary, 13–13 vomeropalatine, 19–19 dentary, and 11–11 splenial teeth.

Table 1. Morphological, meristic, and mensural comparison of the *Ichthyophis* cf. *hypocyaneus* specimen from the Menoreh Mountain Range with historical known published data for *I. hypocyaneus*, *I. javanicus*, and *I. bernisi*

Morphological Character	***I.* cf. *hypocyaneus* "Menoreh" (This Study)**	***I. hypocyaneus* (Taylor, 1968)**	***I. javanicus* (Taylor, 1960, 1968)**	***I. bernisi* (Salvador, 1975)**
Head Length (mm)	12	NA	9.4	12.2
Head Width (1st Nuchal Groove) (mm)	11	9	6	10
Distance Tentacle to Eye (mm)	1.5	1.5	1	1.5
Distance Tentacle to Nostril (mm)	3.5	2.9	2.3	3.5
Distance Eye to Snout (mm)	4.9	4.6	NA	5
Distance Eye-Eye (mm)	6.8	5.8	4.5	6.2
Number of Annuli on Body	324	314-320	348 - 351	294
Number of Annuli on Tail	10	7	10	4
Total Length (mm)	359	260	210	290
Tail Length (mm)	4.9	5	4.5	2.7
Body width (middle) (mm)	16.8	10.1	6	14
Premaxillary-Maxillary Teeth	15-15	20-20	19-19	13-13
Vomeropalatine Teeth	13-13	19-19	18-19	12-12
Dentary Teeth	19-19	19-19	19-19	14-14
Splenial Teeth	11-11	11-11	12-12	9-9
Yellow Lateral Stripe	Present (Faint)	Present	Absent (Unicolor)	Present

We used published data from Taylor (1960), Taylor (1968), and Salvador (1975) to identify our specimen. We initially intended to use the dataset presented by Wei et al. (2025). However, their current dataset is limited strictly to the sources we have already mentioned. The yellow lateral stripe is a diagnostic character for *I. hypocyaneus* and *I. bernisi*, serving to distinguish these species from *I. javanicus* (Taylor, 1960; Taylor, 1968; Salvador, 1975). We compared the appearance of this specimen with the open-access holotype image of *I. javanicus* BMNH1880.5.7.3 available online at UK Natural History Museum Data Portal (Natural History Museum UK, 2024). Our specimen has a faint yellow striped along the lateral side which is absent in the holotype of *I. javanicus* (Fig. 5). However, we find it difficult to determine whether this specimen belongs to *I. bernisi* or *I. hypocyaneus*. The comparison of our specimen's character with current published data from Taylor (1960), Taylor (1968), and Salvador (1975) failed to show clear diagnostic features between the two. Nonetheless, based on the number of dentary teeth, splenial teeth, and the number of body annuli, this specimen more closely resembles *I. hypocyaneus* rather than *I. bernisi*. Specifically, it shares a closer resemblance to the I. *hypocyaneus* in Taylor (1968) due to its higher counts in the body annuli. However, we note the differences between the number of premaxillary-maxillary teeth and vomeropalatine teeth in our specimen are lower than the number being reported in Taylor (1960) and Taylor (1968) (Table 1).

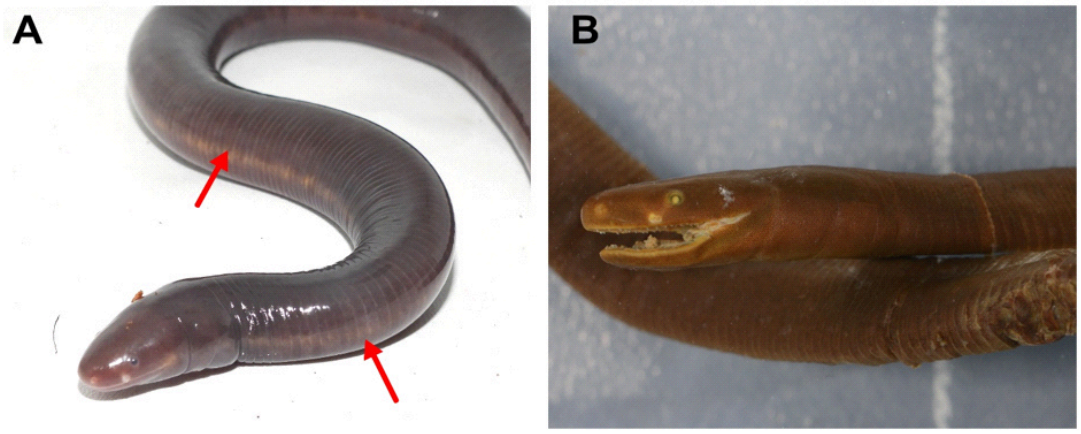

Figure 5. *Ichthyophis* cf. *hypocyaneus* from Menoreh. Red arrow showing faint yellow stripe along the lateral side of body (A). Holotype of unicolor *I. javanicus* BMNH1880.5.7.3 from Natural History Museum Data Portal UK (B).

We therefore identified our specimen as *I.* vf. *hypocyaneus*. We retain "cf." as a taxonomic precaution, as some morphology might not fully match the *I. hypocyaneus* description. Although we considered this specimen more closely associated with *I. hypocyaneus* based on the dentition, we are aware that the number of teeth in caecilians might be influenced by ontogenetic changes; as the individuals grow, the number of teeth tends to increase.

The number of teeth can also be influenced by the change in feeding biology between the larval form and adult form (Wake, 1976; Chuliver & Scanferla, 2019). We noticed that current diagnostic characters available for caecilian species in Java currently lack discriminating power between different variations that exist within a species. Our findings show that dentition numbers can be variable and quite unreliable to use in the determination of species due to the presence of variation between individuals.

We argue that the current taxonomy of caecilians in Java is in urgent need of revision and redescription due to a lack of taxonomic publications and no reliable diagnostic characters to use besides the original description. To provide adequate diagnostic characters, a redescription of the three original type specimens of *I. hypocyaneus*, *I. javanicus*, and *I. bernisi* needs to be conducted, preferably with extended morphological characters (with statistical analysis), phallus characters, and osteological characters, as we found these are standard approaches often used to study current caecilians systematics (Kamei et al., 2012; Maddock et al., 2018; Acosta-Galvis et al., 2019; Poryakov et al., 2025). Moreover, we are also aware that the diversity of Javan *Ichthyophis* species may currently be underrepresented by their current taxonomy, and molecular phylogenetic studies need to be conducted to elucidate the lineage diversification within this species. While a current study by Nishikawa et al. (2012) recognizes at least two possible lineages within *I. hypocyaneus* (West Java & Central Java), more sample are needed to reveal the true diversity of Javan *Ichthyophis*. Genetic analysis, incorporating both fresh and museum specimens, is also crucial to confirm the species identity of Java's *Ichthyophis*, as well as to resolve the taxonomic status among *I. hypocyaneus*, *I. javanicus*, and *I. bernisi*. We also noted the importance of assessing meristic and mensural variation, as the current published dataset by Wei et al. (2025) might be lacking individual data for these 3 species.

Currently, there is lack of data on *I. hypocyaneus* population size, trends, and ecological requirements (Borzée et al. 2017). According to the IUCN and iNaturalist, the current distribution of *I. hypocyaneus* is associated with mid- to high- elevation gradients, specifically Mt Halimun-Salak, Mt Pangrango, Mt Papandayan, the Dieng Range, and the Menoreh Range. However, this distribution may reflect changes in land use and climate change. According to Kuhl and van Hasselt's description, this species can be found in the marshy landscape of Serang, which is a lowland in nature (Taylor, 1968). This landscape has long been converted into urban areas, and the marsh in the vicinity has been extirpated or severely disturbed. This suggests that caecilians distribution in the past may have been more widespread than it is now, which is limited to mid-high elevation. Although *I. hypocyaneus* generally lives in a fossorial habitat, adult *I. hypocyaneus* are often found on the soil surface (Kupfer et al., 2003).

Whereas the larval stage of this species is aquatic, the adult individual is more terrestrial (Dünker, 2000). Our observations show that adult *I.* cf. *hypocyaneus* can travel on the soil surface quite far from perennial water stream. Gathering natural history information of *I.* cf. *hypocyaneus* can be quite difficult. Currently there is not enough information on predators, prey, and behavior of this species in Menoreh. However, potential predators such as *Bungarus candidus* are one of the reptiles recorded in the Menoreh by Qurniawan *et al.* (2012). This species potentially preys upon the *I. hypocyaneus*, as reported by Grossmann & Schäfer (2000).

Our observation site is located within a region undergoing rapid anthropogenic change, particularly under the government's "Bedah Menoreh" road-building initiative, which aims to connect the New Yogyakarta International Airport with Borobudur and other tourist sites via a highway through the Menoreh Range (Purnomo, 2025). The construction of this road can pose serious risks to the ecological connectivity of the area, including habitat fragmentation through linear infrastructure that separates different forest patches. Land conversion driven by tourism can accelerate the conversion of natural habitats to accomodation, parking areas, and tourism facilities, which might have a negative impact on amphibians. Mining and quarrying of karst for building materials can lead to direct habitat destruction and changes in hydrological regimes. The development of agriculture through the expansion of plantation crops at the expense of native vegetation further reduces habitat quality. Given these threats, it is critical to prioritize habitat protection in the remaining forest tracts and to integrate caecilian conservation into broader landscape management plans. Our records highlight the potential for undiscovered or underreported amphibian diversity in this zone.

Therefore, we recommend that future studies in the region employ systematic soil and litter sampling methods, particularly during the wet season, to assess caecilian population densities. Furthermore, we urge the need for conservation planning that incorporates subterranean fauna, especially in infrastructure development impact assessments to maintain the habitat suitability for *Ichthyophis* species. To support this effort, collaboration with local universities and NGOs is essential for establishing long-term biodiversity monitoring in the Menoreh Range.

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