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The Endangered Dragonfly *Ceriagrion citrinum* Campion, 1914 (Zygoptera: Coenagrionidae) from West Africa and Efforts to Protect it

La Libellule Menacée *Ceriagrion citrinum* Campion, 1914 (Zygoptera: Coenagrionidae) d'Afrique de l'Ouest et des Efforts pour sa Protection

Die gefährdete Libelle *Ceriagrion citrinum* Campion, 1914 (Zygoptera: Coenagrionidae) Westafrikas und Bemühungen zu ihrem Schutz

Séverin Tchibozo

Summary: *Ceriagrion citrinum* is a very rare threatened damselfly species that nowadays clearly occurs only in southern Benin in the Gnanhouizoumè Community Forest and especially in the Lokoli Swamp Forest. Both areas are not yet protected and are endangered by human activities. A largely privately initiated project is in the process of sensitising the local population, primarily through the youth, to conservation issues with the help of this rare dragonfly.

Key words: Odonata, swamp forest, threatened habitat, Benin

Résumé: *Ceriagrion citrinum* est une espèce de demoiselle menacée très rare qui, de nos jours, n'est clairement présente que dans le Sud du Bénin, dans la forêt communautaire de Gnanhouizoumè et surtout dans la forêt marécageuse de Lokoli. Ces deux zones sont toujours non protégées et menacées par les activités humaines. Un projet d'initiative largement privée est en train de sensibiliser la population locale, principalement par le biais des jeunes, aux questions de conservation à l'aide de cette libellule rare.

Mots clés: Odonate, forêt marécageuse, habitat menacé, Bénin

Zusammenfassung: *Ceriagrion citrinum* ist eine sehr seltene bedroht Kleinlibellenart, die heutzutage eindeutig nur im Süden Benins im Gnanhouizoumè Community Forest und vor allem im Lokoli Swamp Forest vorkommt. Beide Gebiete sind bisher noch nicht geschützt und durch menschliche Aktivitäten gefährdet. Ein weitgehend privat initiiertes Projekt ist dabei, die lokale Bevölkerung, vornehmlich über die Jugend mit Hilfe dieser seltenen Libelle für Fragen des Naturschutzes zu sensibilisieren.

Schlüsselwörter: Odonata, Sumpfwald, bedrohter Lebensraum, Benin

1. Introduction

Ceriagrion citrinum is a rare species of dragonflies, which was originally described by Campion (1914) on the basis of a single male caught in the vicinity of Lagos (Nigeria) at the end of the 19th century. This single specimen with date of capture and location somewhat doubtful is deposited in the British Museum in London (Fig. 1 A) .

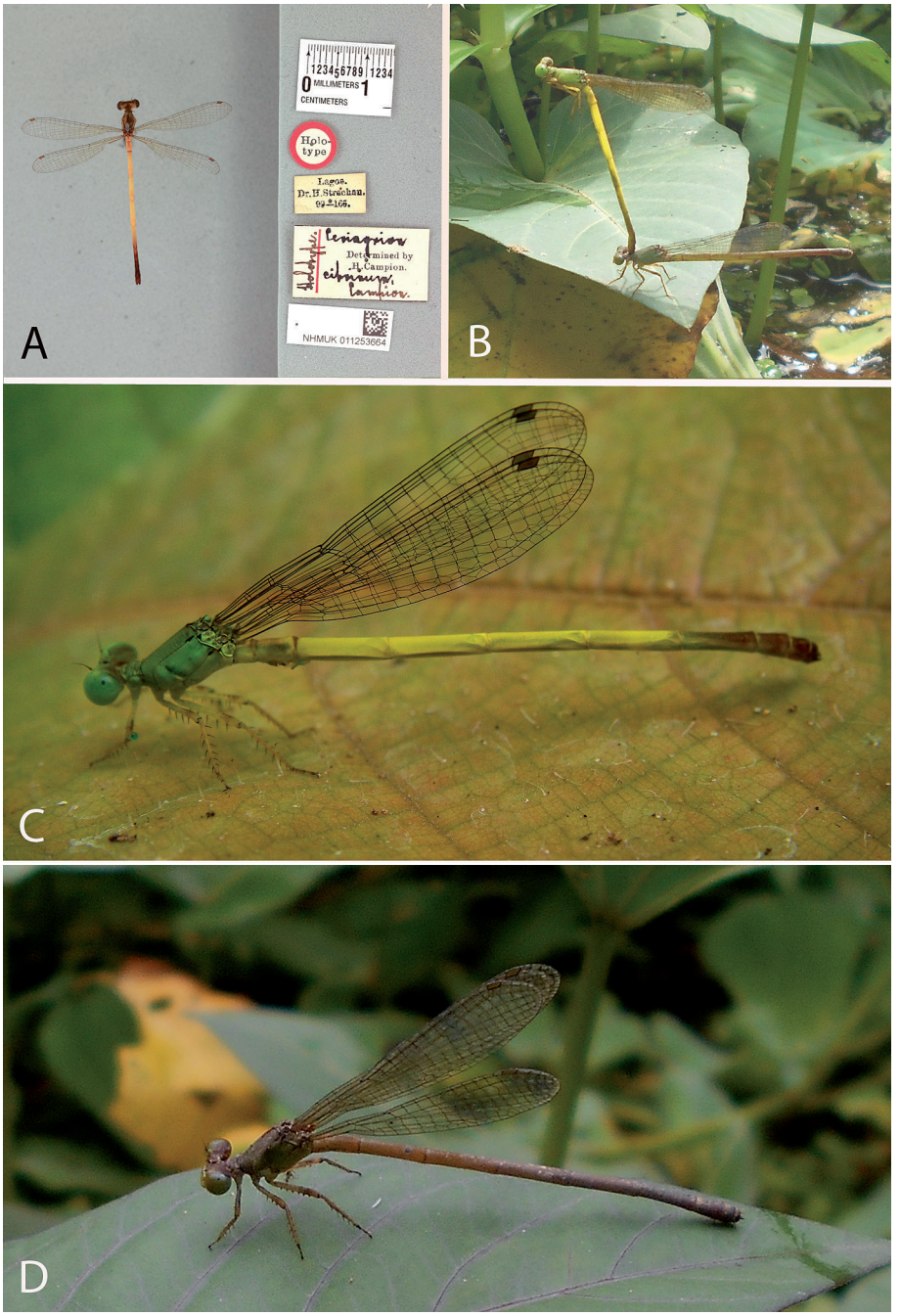


Fig. 1: *Ceriagrion citrinum*. **A** Holotype from the British Museum in London. https://www.gbif.org/occurrence/2350455947 (licensed under http://creativecommons.org/licenses/by/4.0/); **B** Couple in tandem position; **C** male; **D** female.

Abb. 1: *Ceriagrion citrinum*. **A** Holotyp aus dem Britischen Museum in London; **B** Pärchen in Tandemposition; **C** Männchen; **D** Weibchen.

The brief diagnosis of the male in Campion (1914, p. 278) is as follows: "Wings conspicuously yellow; thorax dark greenish yellow above; abdomen for the most part pale lemon; species of intermediate size (abdomen 25.5 mm, hind wings 16.5 mm)." Since Campion nothing else on the description of the female and the biology was published (see Tchibozo 2020). Since the discovery of the species, the first record of the species in Benin (Tchibozo & Dijkstra 2004) and further collections of the species in Benin (Tchibozo & Dijkstra 2004; Tchibozo et al. 2008), no further observations have been made elsewhere and no initiative has been taken to learn more about the species.

Currently the species is only known from the swamp forest «Forêt marécageuse de Lokoli », from a forest near the community of Gnanhouizoumè in the south of Bénin and possibly from southwestern Nigeria (Tchibozo et al. 2008; Dijkstra & Tchibozo 2018). Classified as endangered (EN) by the International Union for Conservation of Nature (IUCN), *C. citrinum* it is included in the Red List of Threatened Species. Nothing is known about the biology of the species other than that males are more numerous than females, outnumbering the latter, based on unpublished sightings in the field by 9 :1. In view of this situation, it seems necessary to identify areas in Benin and Nigeria (http://addo.adu.org.za/index.php?taxon_id=26300) where *C. citrinum* is known to occur so that steps can be undertaken to conserve the habitats and to initiate a timely regional and sustainable conservation plan to safeguard the future existence of this species. The enactment of legislation to protect species is the responsibility of the Ministry of Environment's authority in Benin. The ministry must be presented with convincing arguments to initiate conservation measures that may not be popular with farming communities around the areas from which the species was reported. However, the ministry did not participate in the *Ceragrion*-project, whether for financial or technical reasons or because it did not prioritise the project. Rather the project was launched on the initiative of the author and his Centre de Recherche pour la Gestion de la Biodiversité (CRGB) and was supported by the "Mohamed bin Zayed Species Conservation Fund" from December 2019 to September 2020 with a sum of 5000 $ US.

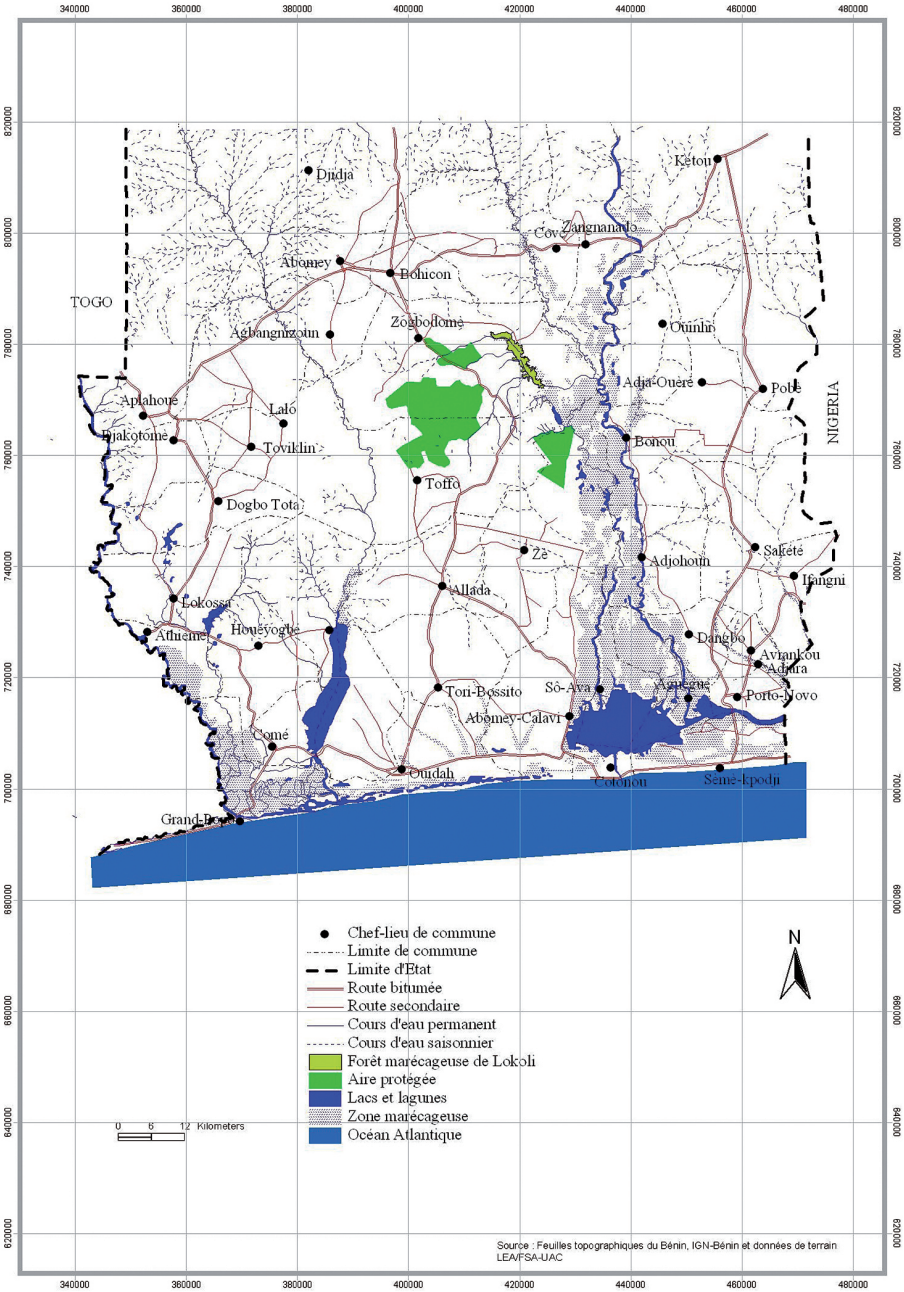
2. Current distribution, habitat quality and actual and potential threats

From June 22th, 2002 to December 26th, in the same year only two males were observed in the Gnanhouizoumè Community Forest (06°55'N ; 02°24'E). From May 20th, 2002 to July 9th, 2002 nine males were observed in the Lokoli Swamp Forest (07°02'N ; 02°15'E) (Fig. 2 A).

There are no other habitats known to exist in southern Benin, and the species is undoubtedly very rare. Specimens were caught with a butterfly net, identified and in some cases photographed. Thereafter they were released. No individual was killed. The sampling design involved direct observations of adult specimens for one day a week (8:00 a.m. to 5:30 p.m.) by canoe. Several expeditions into the Lokoli Swamp region before and after 2002 and plans exist to summarize the observations that were made between 2002 and 2019. In 2006 two volunteers as part of their studies spent weeks in the Lokoli Swamp Forest to observe *C. citrinum*. An unfinished and unpublished report exists, concluding that "Globalement l'on constate une forte concentration de *C. citrinum* dans les sites auparavant exploités par l'Homme mais désormais laissés à l'abandon, comme certaines voies de pirogues presque impraticables" (Overall, there is a high concentration of *C. citrinum* in sites previously exploited by humans but now neglected, such as some almost impassable canoe routes).

In 2020, efforts began to safeguard a region of the Lokoli Swamp forest that appeared

to be home to a sizeable population of *C. citrinum*. From January to August, 2020, fifty seven males and twenty females were inventoried in the Lokoli Swamp Forest and seen to mate (Fig. 1 C) (TCHIBOZO 2020). The 57 individuals were observed by sight without being caught. The counts were done in a line so as not to re-count the same individual twice. Visual observations and identification by sight were the methods of choice when



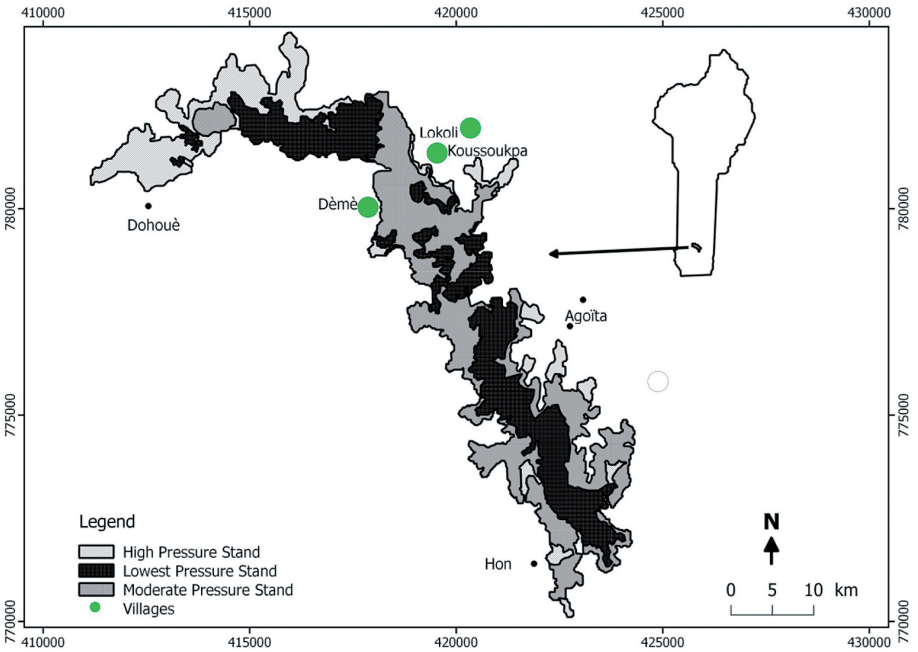


Fig. 2: Map of southern Benin (left page) and enlarged map of Lokoli Swamp Forest (above) with the three neighbouring villages (circles). Left page: Modified from Ahossou et al. 2017; above: from Ahossou et al. 2017.

Abb. 2: Karte von Süd-Benin (linke Seite) und vergrößerter Ausschnitt mit dem "Lokoli Swamp Forest" (oben) mit den drei benachbarten Dörfern (Kreise) . Linke Seite: Verändert nach Ahossou et al. 2017; oben: aus Ahossou et al. 2017.

specimens could not be caught and inventories were made by sight at different locations during breaks of *C. citrunum* on leaves and branches of shrubs, ferns and other aquatic plants. The observations suggest that this area of the swamp contains suitable habitats for the species, i.e. a suitable habitat for the for the adult specimens seems to be an undisturbed, slow-moving or stagnant freshwater body with plenty of aquatic plants and small flying prey around for the adult dragonflies (Fig. 3 A). The few times specimens of the species were caught unfortunately do not allow an estimation of population size. This region has not yet been declared a protected site and all habitats of *C. citrinum* are owned by local communities.

Although there is no permanent settlement in the Lokoli swamp forest area, some general threats have been identified mainly by the staff of the CRGB such as are deforestation due to logging, use and diversion of water by pastoralists, pollution, fishery activities and encroaching agricultural activities (see also Ahossou et al. 2017). Occasionally taro (*Colocasia esculenta*) is planted in small areas for family consumption in the swamp and we fear that it will expand to a large area in the future (Fig. 3 B).

Our recommendations to the authorities to educate the people, who use the swamps for these purposes, about the consequences of their actions have not yet been successful, but it is hoped that greater public awareness will lead to pressure from the public to safeguard the Lokoli swamp and its fauna and flora for future generations. *C. citrinum* as a spectacularly attractive and rare species of dragonfly can help in swaying public and official opinion. The CRGB is currently working on this.

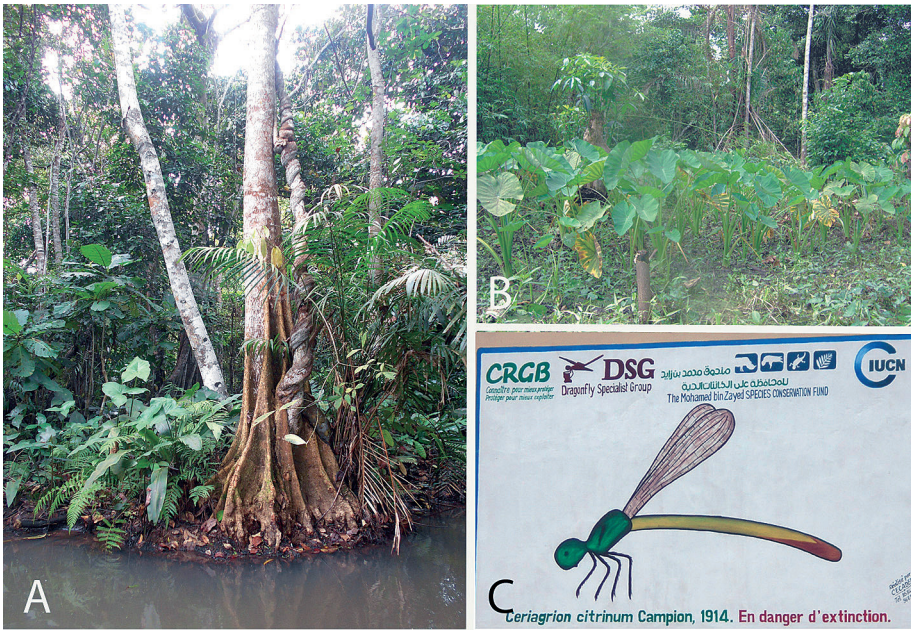


Fig. 3: A Undisturbed area, **B** planting taro and **C** poster on public display to inform people of the status of *Ceriagrion citrinum* (idea and design from S. Tchibozo)
Abb. 3: A Ungestörter Bereich, **B** Anpflanzung von Taro und **C** öffentlich ausgestelltes Poster, um die Bevölkerung über den Status von *Ceriagrion citrinum* zu informieren (Idee und Design von S. Tchibozo).

3. Public communications initiated by the CRGB

In the past, there was little interest in conservation in the community, but the situation began to change when the school children were made aware of the importance of the forest and learned that it contained rare and beautiful species such as the dragonfly *Ceriagrion citrinum*. The children then told their parents about it and gradually attitudes towards the forest changed, due in large part to the presence of *C. citrinum* in the forest. In a nature photo competition in 2009 organised by UICN, Programme Afrique du Centre et de l'Ouest Aires protégées (UICN/PAPACO) a photo of *C. citrinum* was awarded fourth place out of eight selected photos. It is now up to the staff of the Universities of the Republic of Benin to deepen this educational progress and pass on the information to those who might declare the forest a nature reserve. Serving as guardians of nature and creating awareness among non-academics of the importance of natural spaces are important goals in general and in Benin in particular.

Public information for the sustainable conservation of the *C. citrinum,* targeting the local population and visitors to the region, has already been arranged and is supported by the «Mohamed bin Zayed Species Conservation Fund». 327 school children (198 boys and 129 girls) and seven school teachers are assisting with education to enable the continuation of the species and to achieve sustainable conservation of this beautiful dragonfly..

4. Conclusions

In the context of Benin biogeography, the Lokoli forest is rather unique with regard to its variety of ecological habitats and general species abundance of plants (Adomou et al. 2009) and vertebrates including fish (Froese

& Pauly 2020), reptiles (Ullenbruch et al. 2010) and mammals as well as invertebrates (Fournier et al. 2007; Neuenschwander et al. 2011). But its future is in doubt. In view of the threats to it from encroaching agricutural activity and logging businesses, it is necessay to take urgent action to protect the forest and declare it a natural reserve as has been pointed out already more than 10 years ago by Tchibozo et al. (2008) followig an inventory of dragonfly species of the region. This has now become an even more pressing issue with concerning the threatened odonate species *Ceriagrion citrinum*.

We hope that in time the State of Benin will pay more attention to the sustainable protection of the habitats of *C. citrinum* and other threatened insect species. The framework law on the environment of the Republic of Benin indeed provides for the protection of ecosystems and its biodiversity and the government has signed several international agreements on nature conservation, such as the Convention on Biological Diversity (CBD).

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