

Discovery of a new population of the endangered *Calopteryx exul* in central North Algeria (Odonata: Calopterygidae)

Abdelmadjid Chelli¹, Rabah Zebza² & Rassim Khelifa³

¹ Laboratoire de Zoologie Appliquée et d'Ecophysiologie Animale, Faculté des Sciences de la Nature et de la Vie, Université de Bejaia, Algeria; mchelli70@yahoo.fr

² Département de Biologie, Université 8 Mai 1945 Guelma, BP. 401 Guelma 24000, Algeria; rabahzebsa@yahoo.fr

³ Biodiversity Research Centre, University of British Columbia, 2212 Main Mall Vancouver, B.C. V6T1Z4, Canada; rassimkhelifa@gmail.com

Abstract. A new population of the endangered North African endemic damselfly *Calopteryx exul* Selys, 1853, is reported from Algeria. The species was found on the Bousselam river in Bejaia province, central North Algeria, in three different localities. Reproductive behaviour was observed. These new findings extend the known geographic range of the extant populations of the species in Algeria.

Further key words. Damselfly, Zygoptera, North Africa, Maghreb

Introduction

Calopteryx exul is a Maghrebian endemic species known from Algeria, Tunisia, and Morocco. It is confined to streams and rivers (BOUDOT et al. 2009) and is currently listed as endangered in all the IUCN red lists. Among the most important threats to its survival are habitat pollution and fragmentation resulting from increasing human population. In Algeria, this damselfly was not recorded from 1910 (MARTIN 1910) until 2007, when a new population was discovered on the Seybouse river in Northeast Algeria (KHELIFA et al. 2011). Later, different sub-populations were recorded in the Seybouse watershed (KHELIFA et al. 2016), some of which were quite large, with more than a thousand individuals. Unfortunately, many of the sub-populations became extinct, driven mainly by habitat disturbance, including bank degradation and irrigation (KHELIFA & MELLAL 2017). This represented a dramatic loss of territory for the species at the national and North African level.

With the current condition of the Seybouse population, which is the last known population in Algeria, and due to the increasing anthropogenic pressure on aquatic systems in the country, the long term national survival of the species has come into doubt. Here we report for the first time a new population in three different localities (three sub-populations) in Bousselam river, Bejaia province, central North Algeria, and present some abiotic parameters of the water of each locality.

Study area and methods

We visited Bousselam river near Tichi Haf dam in Bejaia province, 50 km south east of Bejaia town, central North Algeria. We sampled three localities on April,

May and June 2019. The distance between locality 3 and locality 2 is 3 km, 10 km between locality 2 and locality 1, and 13 km between locality 1 and locality 3. The river banks were dominated by *Typha angustifolia*. Other Odonata species found co-occurring with *C. exul* were *C. haemorrhoidalis*, *Erythromma lindenii*, *Ischnura graellsii*, *Platycnemis subdilatata*, *Onychogomphus uncatatus*, *O. forcipatus unguiculatus*, and *Gomphus lucasii*.

List of sampling sites

Indicated are localities, coordinates, altitude in meters above sea level, pH value, water flow [m/s], dissolved oxygen [%] and bank vegetation.

(1) Tichi Haf upstream (36.430778°N, 4.728000°E), 300 m a.s.l.; pH 8.73, 0.71 m/s, 21.5%, *Typha angustifolia* (2) Tichi Haf downstream (36.420778°N, 4.619000°E), 240 m a.s.l.; pH 8.63, 0.37 m/s, 34.6%, *Typha angustifolia* (3) Hammam Sidi Yahia (36.411056°N, 4.586917°E), 214 m a.s.l.; pH 7.35, 0.37 m/s, 28.9%, *Typha angustifolia* and *Scirpus lacustris*.



Fig 1. Habitat of *Calopteryx exul* at Hammam Sidi Yahia, oued Bouselam, Bejaia province, Algeria (30-v-2019). Photo: RZ

Results

A total of 163 individuals (cumulative count) of *Calopteryx exul* were recorded as follows:

(1) 2 individuals 16-iv-2019; 13 individuals 30-iv-2019; 43 individuals 31-v-2019; 32 individuals 19-vi-2019 (2) 5 individuals 30-iv-2019; 15 individuals 31-v-2019; 19 individuals 19-vi-2019 (3) 3 individuals 30-iv-2019; 11 individuals 31-v-2019; 20 individuals 19-vi-2019.

Breeding activity including territoriality, copulation and oviposition was recorded in the three localities.

Discussion

From the mid 19th to the early 20th century, *C. exul* was recorded in different localities in Algeria. Most of these sites occurred in the Northeast in the Constantine region (SELYS in LUCAS 1849; MCLACHLAN 1897; MARTIN 1901, 1910). Other records were reported from the central North in Algiers (MARTIN 1910) and between Médéa and Blida (KOLBE 1885), and in the Northwest in Sebdou (MORTON 1905). Until recently, the only existing population was the one discovered in the Seybouse watershed more than a decade ago. The population reported here in Bejaïa does not correspond to any historical locality reported for the species.

The new recorded localities are about 240 km away from the Seybouse river, thus expanding the geographic range of the existing populations to the West. The elevation of the new localities agree with the known altitudinal range of the species: *i.e.*, from *ca* 30 m a.s.l. in Tunisia (JÖDICKE et al. 2000) to 1900 m a.s.l. in Morocco (JACQUEMIN & BOUDOT 1999). The environmental features as well as the odonate



Fig 2. *Calopteryx exul* male at oued Bousselam, Bejaia province, Algeria (30-v-2019). Photo: RZ

community observed in Bousselam river are relatively similar to those recorded in the Seybouse river (KHELIFA et al. 2011).

From a conservation perspective, the new population represents good news for a species nationally and globally threatened. It is located within a complex lotic water network, a habitat feature auguring well for its regional survival because, (a) as yet undetected subpopulations might occur; these would increase the present population size estimate, (b) the potential overall regional habitat of this species might be larger than presently believed, suggesting that future colonization might increase the area of the species' regional distribution, and (c) different refugia will exist for the species in case of increasing habitat degradation, pollution or drought such as those observed in the Seybouse population in Northeast Algeria (KHELIFA et al. 2016; KHELIFA & MELLAL 2017).

The priority projects under way that focus on *C. exul* in Algeria include: increasing knowledge of its geographic distribution, developing efficient methods to estimate population size, and predicting the effect of climate change, and particularly of drought events, and of anthropogenic factors on colonization and extinction. The present climate context is of particular importance given the recent severe droughts which occurred during the last few years in Algeria, which are expected to increase in frequency and severity in the future (IPCC 2014).

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