Aeshna juncea (Odonata: Aeshnidae) new to Armenia

Vasil Ananian[1] & Asmus Schröter[2]

[1] 179 Bashinjaghyan St., apt. 23, 0078, Yerevan, Armenia; gomphus@gmx.com

[2] 18 Tsulukidse St., 0190 Tbilisi, Georgia; asmus.schroeter@gmx.de;
https://orcid.org/0000-0002-3655-2304

Abstract. *Aeshna juncea* is reported from Armenia for the first time on the basis of voucher specimens and photographic records. On 30-vii-2018 a putative pair was photographed, and on 3- and 4-viii-2019 several specimens were photographed and examined in the hand. The occurrence of *A. juncea* in the Caucasus region as well as its puzzling regional distribution in relation to its congener *A. serrata* is summarized and discussed.

Further key words. Dragonfly, Anisoptera, Transcaucasus, southern Caucasus ecoregion, new record, gold mining

Introduction

Aeshna juncea (Linnaeus, 1758) is a boreo-montane species with a Holarctic distribution encompassing North America, Europe and Northern Asia to Japan in the east. In the South of its Palearctic range it is confined to mountainous areas of Spain, Portugal, the Balkans, the Caucasus region and Central Asia (Kalkman et al. 2015).

In Turkey *A. juncea* is restricted to the country's North-east, where it is scarce, and found at small lakes and fens between 1 300 and 2 300 m a.s.l. (Kalkman & van Pelt 2006; Kalkman et al. 2015). In Georgia the species occurs in the Caucasus range as well as in the Trialeti and Arsiani ranges to the North of the Javakheti volcanic plateau ('Lesser Caucasus'). (Shengelia 1975; Schröter et al. 2015; Seehausen et al. 2016). *Aeshna juncea* is not known from Iran (Schneider et al. 2018) and the only record of the species from Azerbaijan is given by Kolenati (1846), who mentions a specimen (*sub Aeschna picta* var. *caucasica*) from a lake on Mount Kapaz, Murovdag Range. Akramowski (1948) anticipated the occurrence of *A. juncea* in Armenia 'somewhere in the highlands', but the species was not found in the country until 2018.

Study region and methods

In 2018 data were collected by VA on the occasion of an 'information event' at a gold mine on Mount Amulsar (39.7264°N, 45.7173°E; 2 988 m a.s.l.), on the border of the provinces of Vayots Dzor and Syunik. Additional data were obtained from alpine grasslands at 2 965 m a.s.l. just below the summit. In 2019 targeted surveys to several ponds and lakes in a same general area on the southern slope of Mount Amulsar as well as on the northern and southern foothills of Mount Parakatar (39.6812°N, 45.6481°E; 2 528 m a.s.l.) were carried out by VA (Fig. 1).

A gully in the southern slope of Mount Amulsar with several spoil tips and traces of old blasting works had several small oligotrophic ponds connected by brooks fed by springs and melt-water. These ponds were situated between 2 165 and 2 560 m a.s.l. and were up to *ca* 1.5 m deep, with a slow inflow and outflow of water and a mostly bare rocky bottom. Their banks were densely vegetated with *Carex* spp. and *Juncus* spp. Further down trees of *Crataegus* sp., *Salix* sp. and bushes of *Rosa* sp. also occurred (Fig. 2). A high concentration of chemotrophic bacteria in the water left characteristic rusty staining on submerged rocks and vegetation. One of the ponds was characterized by apparently stagnant water and an oily sheen on the water surface and on muddy patches near the pond. The water was notably darker in colour, possibly because of high levels of submerged freshwater algae. Judging by the numerous tracks and dung, the pond was regularly visited by livestock. The lakes surveyed to the north of Mount Parakatar were situated at the edge of a oak forest at *ca* 1 980–2 030 m a.s.l. They differed structurally from the ponds on Mount Amulsar, being typical forest lakes with standing water. The water's surface was covered with floating aquatic vegetation and the banks were densely vegetated with *Typha* sp., *Phragmites* sp., *Juncus* sp. and *Salix* sp. The lakes were managed for farming carp and hence had an appropriate regime of fluctuating water levels. Lake Allich (2 235 m a.s.l.) to the South of Mount Parakatar was a typical steppe lake densely covered with helophytes. Odonata species recorded syntopically with

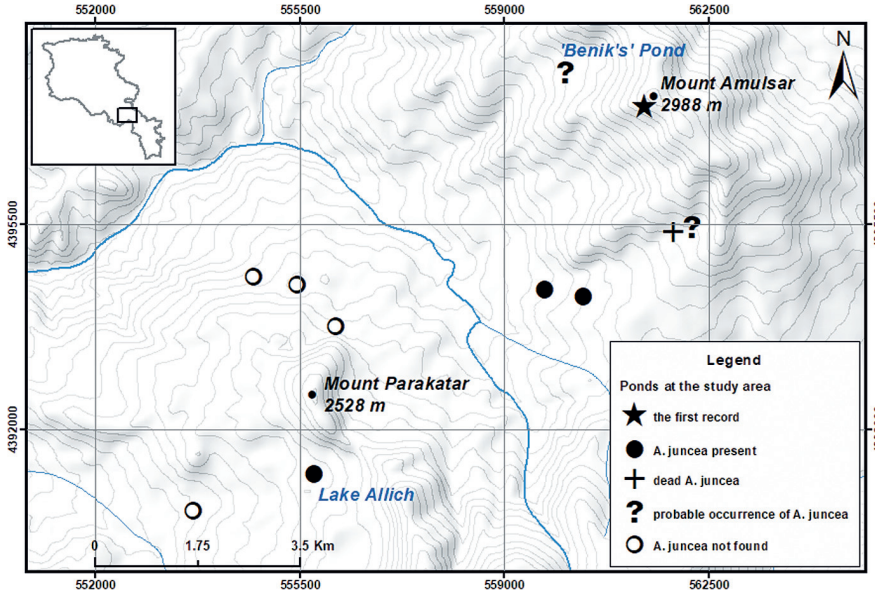

Fig. 1. Map of the study area in Armenia with topographic position of the sampling sites.

Fig. 2. Habitats of *Aeshna juncea* at Mount Amulsar, Vayots Dzor Province, Armenia (03-viii--2019). Photo: VA

A. juncea on Mount Amulsar in 2019 included *Lestes dryas, Enallagma cyathigerum* and *Sympetrum flaveolum*, all in small numbers. Other species of Odonata recorded at various ponds on Mount Parakatar included *Lestes barbarus*, *L. sponsa*, *L. virens, Ischnura elegans*, *Enallagma cyathigerum*, *Erythromma viridulum*, *Anax imperator, Libellula depressa*, *Sympetrum fonscolombii*, *S. vulgatum decoloratum* and *S. flaveolum*.

Results

On 30-vii-2018 a pair of *Aeshna* cf. *juncea in copula* was photographically documented while perching on a plant low above the ground on Mount Amulsar (Fig. 3; see discussion). On 03-viii-2019, more than ten individuals were observed at several ponds on Mount Amulsar, including a pair *in copula* and an ovipositing female (Fig. 4). Two males and a female were caught and released after photographic documentation and taking samples (legs) for further genetic analysis (cf. Fig. 5). At least 50 dead mature individuals of *A. juncea* were found floating and scattered over the water surface of one pond of which some were collected (Fig. 6). On Mount Parakatar, a single patrolling individual of *A. juncea* was recorded at Lake Allich, on 04-viii-2019.

Discussion

Our data represent the first records of *A. juncea* in Armenia. Earlier reports of the species for the country are erroneous or premature (Steinmann 1997; Boudot 2017). Individuals photographed in 2018 were not identified to species level until 2019 and these were considered to represent either *A. serrata* or *A. juncea*. However, the thoracic pattern of the individuals photographed showed clear similarity with *A. juncea* specimens collected in 1996 and 2002 in a similar habitat near Erzurum, north-eastern Turkey (Wasscher 2002). This applied also to individuals of both sexes collected and examined in-hand in 2019 at Mount Amulsar which also had a strikingly extended pale thorax pattern (cf. Fig. 5). Moreover, the apical half of the males' anal appendages in dorsal view was distinctly narrower than shown by Askew (2004) for European specimens. In terms of thoracic coloration these Armenian individuals thus differed strikingly from individuals of the Caucasus main range which mainly have narrower pale stripes, rather similar to typical individuals from central and northern Europe (AS unpubl.; cf. Seehausen et al. 2019: figs 1, 2). However, individual variability of *A. juncea* in terms of both coloration and anal appendages throughout the species' Palearctic range has long been known and discussed by a number of authors (Belyshev 1973; Haritonov et al. 2007; Borisov & Haritonov 2008; Belevich & Yurchenko 2010; Schröter 2012). A systematic analysis of both genetics and morphological variability of these populations of the Caucasus region, and their relation to other Asian and European populations would be highly desirable.

Fig. 3. Copula of *Aeshna* cf. *juncea* on the top of Mount Amulsar, Vayots Dzor Province, Armenia (30-vii-2018). Photo: VA

Aeshna juncea is found at high altitudes elsewhere in its Asiatic range and has been observed as high as 5 000 m a.s.l. in the Afghan Hindu Kush (Wojtusiak 1974). The highest record with evidenced successful reproduction of the species was obtained in the Kyrgyz Tian Shan at 3 016 m a.s.l., with larvae records from adjacent Tajik Pamir at even 3 120 m a.s.l. (cf. Schröter 2012). Although no successful breeding has been detected in Armenia yet, the photographic documentation of a mating pair at the upper limits of occurrence on Mount Amulsar suggests that *A. juncea* might also reproduce at around 3 000 m. a.s.l. in Armenia.

Due to limited data, the phenology of *A. juncea* in Armenia is poorly known but it is likely to be similar to other countries and mountainous areas of the Caucasus region. In Turkey, the species is on the wing from the end of July to the end of August (Kalkman & van Pelt 2006). In the Russian Caucasus, emergence was recorded from mid July and the flight period lasts 80–90 days depending on local

Fig. 4. Ovipositing female of *Aeshna juncea*. Mount Amulsar, Vayots Dzor Province, Armenia (03-viii-2019). Photo: VA

climatic conditions (Ketenchiev & Tikhonova 2011). In Georgia, tenerals were recorded as early as 29-vi (1 120 m a.s.l.), while mature individuals were seen at various altitudes until mid September, including an ovipositing female at 2 430 m a.s.l. on 13-ix-2015 (cf. Schröter et al. 2015; Seehausen et al. 2016).

Aeshna juncea in the Armenian Highlands is at the southern limit of its global range, and the regional distribution of this species in the southern Caucasus remains puzzling. According to current knowledge, *A. juncea* is absent from the Javakheti volcanic plateau. This high plateau between the upper sources of the Kura river in the west and the Samsari and Javakheti ranges in the east represents the Georgian part of the Armenian Highlands just to the north of the Armenian border. Several of the numerous lakes and fens of this volcanic plateau above 2 000 m a.s.l. harbour strong populations of *Aeshna serrata* which seems to replace *A. juncea* there. This regional stronghold of *A. serrata* apparently separates the Armenian and Turkish populations of *A. juncea* from the populations of the Caucasus main range and from the few scattered sites known from the Trialeti range to the North of the volcanic plateau (cf. Shengelia 1975; Schröter et al. 2015; Seehausen et al. 2016).

According to Shengelia (1964) *A. juncea* was 'recorded in the mountain forest and mountain steppe zone of eastern Georgia (Bakuriani, Bogdanovka)'. Although the occurrence of the species around Bakuriani, a small skiing resort in the Trialeti range at the northern slopes of the volcanic plateau, was recently confirmed (Schröter et al. 2015; see also Bartenev 1924), the location 'Bogdanovka' appears doubtful for several reasons. 'Bogdanovka', todays Ninotsminda, is a small town on the Javakheti volcanic plateau and situated within the known distribution area of

Fig. 5. Male of *Aeshna juncea*. Mount Amulsar, Vayots Dzor Province, Armenia (03-viii--2019). Photo: VA

A. serrata. Not surprisingly, *A. juncea* has never been observed or collected there during recent surveys, which record only *A. serrata* (Durand & Rigaux 2015; Rodríguez Martínez & Conesa García 2015; Schröter et al. 2015; Seehausen et al. 2016; Durand 2019; see also Bartenev 1919). Moreover, a thorough examination of the remnants of the odonate collection of the Georgian National Museum (GNM; the former 'Georgian Museum') did not reveal any specimens of *A. juncea* from either Ninotsminda or any other place of the Javakheti volcanic plateau (AS unpubl.; see also Ananian & Muddeman 2019). As Shengelia's statement is very general with no indication of the observer or number of specimens, one can only speculate as to the author's source of information.

In this context it seems all the more puzzling that *A. serrata*, except for a single male collected on 02-viii-1955 at Ardenis Pond, at a distance of some 4.5 km from the Georgian border (Akramowski 1964; cf. Ananian & Tailly 2016), has never been recorded from Armenia since. This is even more surprising as suitable lakes and marshland also exist in the adjacent Armenian part of the Javakheti volcanic plateau (*e.g.*, Arpi lake) and the Georgian Madatapa lake which harbours a strong population comprising hundreds to thousands of individuals annually (cf. Schröter et al. 2015), comes as close as two kilometres to the Armenian border.

Fig. 6. Dead individuals of *Aeshna juncea* on one of the ponds at Mount Amulsar, Vayots Dzor Province, Armenia (03-viii-2019). Photo: VA

For the time being, against the background of the apparent absence of *A. juncea* from the Javakheti vulcanic plateau and the discovery of this species in Armenia as presented above, the distribution pattern of these two closely related species seems to be beyond any causal explanation. Due to the vastness, difficulty of access and limited exploitation level of the area it can, of course, neither be ruled out that small pockets of *A. juncea* might co-exist with *A. serrata* on the Javakheti volcanic plateau, nor that *A. serrata* may occur on adjacent Armenian territory.

The occurrence of *A. juncea* in the South of Armenia also sheds new light on the record of an alleged female of *A. serrata* from NW Iran reported by Rastegar et al. (2013), which has already been cautiously doubted by Schneider et al. (2018). Only further research can establish the true nature of this highly interesting pattern of regional distribution of these two congeners.

The status of the species at the Lake Allich requires verification, and the only breeding population of *A. juncea* in Armenia is confined to a small restricted area on Mount Amulsar. The total water surface area of ponds with known or supposed reproduction of *A. juncea* hardly exceeds 2 ha. The largest of the ponds, called 'Benik's Pond' (*ca* 1.03 ha; 39.7307°N, 45.7009°E), which has not been surveyed yet, has been enlarged and cleaned of shoreline macrophytes, at least since June 2018 (Maxar Technologies and CNES/Airbus images via GoogleEarth™). The natural habitat of this pond is threatened, as the water is apparently planned to be used for mining or other purposes.

The cause of the abovementioned mass death of *A. juncea* on one of the ponds (39.7057°N, 45.7221°E) on Mount Amulsar remains unexplained (cf. Fig. 6). Sudden changes in weather conditions are unlikely to be involved, as no dead insects were found on the other ponds. However, within *ca* 30 m from that pond's shore, in a shallow inflowing brook there was also found a recently deceased Grey Partridge *Perdix perdix* with no external signs of injuries. Thus some kind of poisoning of insects and the bird, related to nearby spoil tips and other past or present mining activities cannot be ruled out. It seems that from the moment of its discovery in Armenia *A. juncea* is already being threatened by the country's mining industry. Being a boreal relict with extremely localised distribution, restricted habitat and low population density, it is a matter of urgency that *A. juncea* and its habitats be put under legal protection in Armenia.

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