Short Communications

First record of the presence and reproduction of the two-tailed pasha *Charaxes jasius* (Linnaeus 1767) (Lepidoptera: Nymphalidae) in northeastern Italy

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Abstract - *Charaxes jasius* is reported for the first time for the Veneto region, in northeastern Italy. Both adults and caterpillars have been observed in the Euganean Hills (Colli Euganei Regional Park) between August and October 2021. The location is a xerothermic oasis that could provide the suitable environmental conditions for maintaining a population of this species, which is recently expanding its range to northern latitudes.

Keywords: distribution, butterflies, range expansion.

Riassunto - Prima segnalazione della presenza e riproduzione della ninfa del corbezzolo *Charaxes jasius* (Linnaeus 1767) (Lepidoptera: Nymphalidae) in Italia nord-orientale.

Charaxes jasius è segnalata per la prima volta per la regione Veneto, in Italia nord-orientale. Sia gli adulti che i bruchi sono stati osservati all'interno del Parco regionale dei Colli Euganei tra agosto e ottobre 2021. La località è un'oasi xerotermica che può fornire le condizioni ambientali idonee per il mantenimento di una popolazione di questa specie, che sta recentemente espandendo il proprio areale verso latitudini più settentrionali.

Parole chiave: distribuzione, farfalle, espansione dell'areale.

INTRODUCTION

The two-tailed pasha *Charaxes jasius* (Linnaeus 1767) is the only Charaxinae Doherty 1886 inhabiting the Mediterranean Basin, where it mainly occurs along the coasts of Europe, North Africa and the Middle East. In fact, its distribution reflects that of the principal host plant, *Arbutus unedo* L. (Ericaceae), a typical representative tree of the coastal Mediterranean scrub (Tolman & Lewington, 2008). Moreover, being capable of dispersal over long distances, this butterfly can also grow on ornamental *A. unedo* L. trees in continental urban areas, if local climatic conditions are suitable (Cancela & Vasconcelos, 2019). The species is usually bivoltine, flying from April to June and from August to October, with the second generation that hibernates as a larva. However, the development of a third generation is possible under optimal temperature conditions, as in the case of warm winters in Southern Spain (Verdugo, 1984; Abós & Stefanescu, 1999). The adults feed on fermenting fruits, dung and carrions (Aduse-Poku *et al*., 2009). Regarding conservation, *C. jasius* is classified as Least Concern at both national and global levels (Bonelli *et al.*, 2018).

In Italy, the species is found along the Tyrrhenian, Ionian and Ligurian coasts, as well as in Sicily, Sardinia and southern Puglia. On the contrary, it seems to be absent on the western Adriatic coast between northern Puglia and Friuli-Venezia Giulia, where only dispersing individuals have been observed (Balletto *et al.*, 2016). The presence along the eastern Adriatic coast of Croatia, Albania and Greece is, however, well documented (Koren, 2012). Moreover, a few sightings of single adults have been recently reported for different locations in Slovenia, around the Gulf of Trieste (Verovnik *et al.*, 2021). Entomological investigations in the Euganean Hills (Colli Euganei Regional Park), within the Venetian Plain, led us to the discovery of the first known population of this species for northeastern Italy.

METHODS AND RESULTS

For Veneto, the presence of *C. jasius* has never been mentioned historically (Parenzan & Porcelli, 2006) and no data for this species are reported in the recent Atlas by Bonato *et al.* (2014). In 2001, a single adult was observed by EM on the hill of Monte Alto (Torreglia), in the Euganean hills, at about 100 m distant from a patch of *A. unedo* L. trees. The specimen was attracted by a fruit-based bait used for a local faunistic investigation but, since it was not possible to take a photograph or to collect it, the record

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has not been published. Even if no subsequent investigations were carried out in that period by EM, this seemed likely to be a dispersing individual. In fact, the surrounding area has often been inspected for butterfly research between 1994 and 2013 (Moretto *et al.*, 1994; Negrisolo & Calore, 1999; Uliana, 2003; Negrisolo & Uliana, 2006; Turchetto *et al.*, 2006; Bonato *et al.*, 2014) and it is likely that the presence of a population of *C. jasius* would not have gone unnoticed.

On 20 August 2021, DB found some adults (2 ♂ and 1 ♀) on the hill of Monte Ceva (Battaglia Terme, 100-200 m a.s.l.), at a distance of approximately 2 km as the crow flies from the site where it was first observed in 2001. On 7 September 2021, a male (Fig. 1) and another flying adult were observed at the same location of the previous sighting. The habitat is a xerothermic Mediterranean shrub composed by *A. unedo* L., *Cistus salviifolius* L. and *Erica arborea* L., occupying south-facing hillsides with a rocky siliceous substrate. In particular, the adults were always found between 11 am to 1 pm around *A. unedo* L. trees. On 15 October 2021, another survey in the area led to the finding of two caterpillars. They measured 19 and 17 mm in length, respectively, and the longer one was characterised by two dorsal spots, which are typical of the last two instars (Fig. 2). Both specimens were observed on a silk mat spun along the primary vein of two southeast-facing leaves of *A. unedo* L., at approximately 2 metres from the ground.

DISCUSSION

The finding of both adults and caterpillars of *C. jasius* in 2021 suggests that the Euganean hills could provide suitable environmental conditions for maintaining a population of this species. In fact, the area is characterised by milder weather than the surrounding Venetian Plain, hosting a unique flora for the Veneto region (Gubler *et al.*, 2018), which includes the northernmost Italian population of *A. unedo* L., the two-tailed pasha's host plant (Argenti *et al.*, 2019). In addition, Monte Ceva is notorious for being an important xerothermic oasis, where the southern exposure and the heat-collecting dark magmatic rock favour a biodiversity-rich Mediterranean vegetation (Masin *et al.*, 2021). We also hypothesize that the presence and reproduction of this butterfly may have been favoured by climate change and, in particular, by the warmer winters recorded in recent years. An analogous explanation has also been suggested to justify recent records of *C. ja-*

Fig. 1 - A male observed in the xerothermic oasis of Monte Ceva on 7 September 2021. / Un maschio osservato nell'oasi xerotermica del Monte Ceva il 7 Settembre 2021.

Fig. 2 - A caterpillar observed in the xerothermic oasis of Monte Ceva on 15 October 2021. / Un bruco osservato nell'oasi xerotermica del Monte Ceva il 15 Ottobre 2021.

sius from Central Spain (Cancela & Vasconcelos, 2019; Mingarro *et al.*, 2021) and the Atlantic coast of Southern France (Simeoni & Dissard, 2020), where the climate is becoming more suitable than in the past.

Global warming is well known to cause shifts of range to higher latitudes and altitudes in many butterfly species (Parmesan *et al.*, 1999). As a result, European butterfly communities show a progressive increase in their community temperature index (CTI), which corresponds to an increment in the number of species associated with warmer temperatures in a certain community (Devictor *et al*., 2008). However, this change is not fast enough to compensate for the higher pace of rising temperatures and can represent a threat to biodiversity (Devictor *et al.*, 2012). In this respect, the presence in the Euganean Hills of a Mediterranean species like *C. jasius* emphasises the need to investigate how climate change is affecting the composition of the entire butterfly communities in the area. This becomes even more crucial given the position of the Euganean territory at the limit between the Italian peninsular communities and the Alpine ones (Menchetti *et al.*, 2021).

Regarding the origin of the Euganean records, one can speculate that adults of *C. jasius* have reached the Veneto region flying from Central Italy (Tuscany) or from the Istrian Peninsula, which represent the nearest sites of the known range (both at a distance of about 150 km from Monte Ceva as the crow flies). The use of molecular markers could provide an answer even though currently available data show a low variation over the Mediterranean (Scalercio *et al.*, 2020), probably because of the high dispersal capacity of this species. Nonetheless, we cannot exclude with certainty a human-mediated introduction through ornamental plants or an intentional release of specimens by amateurs.

Finally, another aspect to investigate is how the intensity and duration of extreme cold episodes could affect the mortality rates of different larval stages during the winter. Stefanescu & Planas (2003) observed that a minimum temperature range between -8 °C and -12 ºC for about 10 days constitutes a threshold for the mass death of caterpillars. According to these authors, local extinctions in continental sites are however quickly balanced by the dispersal capacity of the species, which allows a prompt recolonisation. In this regard, we think that such extreme temperatures are unlikely to occur in the location of Monte Ceva, taking into consideration the data collected by ARPAV (2021) in nearby hills during the last ten years. However, further research is needed to monitor the stability of the Euganean population in the coming years as well as to clarify the factors behind the apparent range expansion of this species to northern latitudes.

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