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Confirmed recent occurrence of the Southern Swallowtail (*Papilio alexanor* Esper, 1799) in Croatia (Lepidoptera: Papilionidae)

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Abstract

Nearly five decades have passed since the last confirmed occurrence of the Southern Swallowtail (*Papilio alexanor* Esper, 1799) in Croatia. The species was not observed at any of the historical sites, but we found it at seven new sites between Split and the region south of the Neretva River. The habitat is very restricted and characterised by steep limestone rock faces with abundance of the larval host plant *Opopanax chironium* (L.) Koch. Due to severe fragmentation and continuing decline inferred from extinction of the species in historically known locations we consider the species as vulnerable (VU) in Croatia according to IUCN criteria.
KEY WORDS: Lepidoptera, Papilionidae, distribution, habitat requirements, conservation, Croatia.

Confirmada la presencia reciente de la macaón meridional (*Papilio alexanor* Esper, 1799) en Croacia (Lepidoptera: Papilionidae)

Resumen

Han pasado cinco décadas desde la última presencia confirmada de la macaón meridional (*Papilio alexanor* Esper, 1799) en Croacia. La especie no se ha observado en las localidades históricas, pero la encontramos en siete nuevos lugares entre Split y la región al sur del Río Neretva. El hábitat está muy restringido y se caracteriza por roquedos calcáreos en pendientes escarpadas con abundancia de la planta nutricia de las larvas, *Opopanax chironium* (L.) Koch. Debido a la severa fragmentación y el declive continuo, inferido por su extinción de las localidades conocidas en el pasado, consideramos a la especie como vulnerable (VU) en Croacia siguiendo los criterios de la UICN.
PALABRAS CLAVE: Lepidoptera, Papilionidae, distribución, características del hábitat, conservación, Croacia.

Introduction

The Southern Swallowtail (*Papilio alexanor* Esper, 1799) is one of the most iconic butterfly species in Europe and has long captivated the interest of lepidopterists. Consequently its distribution and biology are well known throughout most of its range (KÖSTLER, 1991, BOLLINO & SALA, 2004, LAFRANCHIS *et al*., 2015). According to the catalogue of the collection of the Croatian national zoological museum in Zagreb (MLADINOV, 1973) the species was first discovered in Croatia in 1898 in the vicinity of Dubrovnik in southern Dalmatia. Subsequently it was reported from Gruž (a port near Dubrovnik) in the famous 'Berge's Schmetterlingsbuch' (BERGE & REBEL, 1910), the exact locality possibly referring to slopes above the nearby village of Sustjepan (SCHWINGENSHUSS & WAGNER, 1928). Two additional records from Dubrovnik region at Mali Zaton (SCHWINGENSHUSS & WAGNER, 1928) and along the road from Mlini village to Cavtat (BURGERMEISTER, 1964) indicate a wider historical distribution of the species in southern

Dalmatia. However, even BURGERMEISTER (1964) was unable to locate the population above Sustjepan, which he attributed to regular fires that have possibly destroyed the larval habitat. In addition to mentioned records Lorković indicates its general distribution in southern Dalmatia between Metković and Dubrovnik, but also explains that the species was never observed by any local entomologists in Croatia (LORKOVIĆ, 2009). According to BOLLINO & SALA (2004) the species was last recorded in southern Dalmatia in 1969 at Mali Zaton (ex coll. Krüger).

Further north *P. alexanor* was observed on the slopes of Mt. Kozjak above Kaštel near Split by Stauder in 1907 (STAUDER, 1911) and at Trogir 10 kilometres further north (STAUDER, 1921). The same author reports failing to find the species in seemingly suitable habitat above Split, Mosor (STAUDER, 1911) and Biokovo Mountains (STAUDER, 1921), but anticipates its presence on Čiovo and Brač islands (STAUDER, 1921). The latter was corroborated by Müller who found the species near Mirca village on Brač (MÜLLER 1921). It should however be noted that there are several dubious records in his publication which together with lack of listing of the much more common and widespread *Papilio machaon* Linnaeus, 1758 makes his observation unreliable (see WITHRINGTON & VEROVNIK, 2008). A single observation is noted also for Biokovo Mountains but without any detailed location information (NEUSTETTER, 1956). The author resided in Podgora on the south side of the mountains during his trip and saw the species on the way up to the mountains possibly near that village.

Apart from two apparent historical strongholds in Dalmatia the species was reported also from Zadar and Krk Island (BOLLINO & SALA, 2004) without any further details. Both records are hard to verify, but it seems unlikely that the species would not have been observed by Habeler who devoted several decades of surveys to the Lepidoptera of Krk Island (HABELER 2007). Additionally there is a record from central Istria at Pazin (STAUDER, 1913) where Austrian amateur lepidopterist Wilhelm Kraut from Graz collected several specimens. Unfortunately his material was never seen by Stauder or any other prominent lepidopterist, so there is room left for doubt. The species was not recorded during an extensive long term study of butterfly fauna of central Istria (KOREN & LADAVAC, 2010).

Due to lack of recent records, the Southern Swallowtail was presumed extinct not just in Croatia, but also in the entire former Jugoslavia (COLLINS & MORRIS, 1985). Regardless of that, the general field guides (e.g. LAFRANCHIS, 2004, TOLMAN & LEWINGTON, 2008) still reported its distribution in Istria and Dalmatia. Only a single report indicates a contiguous presence of *P. alexanor* in Dalmatia. It is listed from two altitudinal belts between zero and 1000 m on the north side of Biokovo Mountains (MIHOCI *et al*., 2011). However, it is not clear whether these are actual observations, or unknown historical records. Namely, the authors also list *Zerynthia cerisy dalmacijae* Sala & Bollino, 1994, which has not been observed in Croatia since its original description (ŠAŠIĆ & MIHOCI, 2011).

In order to confirm the presence of *P. alexanor* in Dalmatia the majority of known historical localities were visited by the first author in the last two decades, resulting in no new observations whatsoever. Based on firsthand experience with the habitat in neighbouring Montenegro, where the species has been recently rediscovered (ŠVARA *et al*., 2015), we decided to change the tactics and search for suitable habitats instead. Here we present new records for *P. alexanor* in Dalmatia and discuss behaviour, habitat selection, conservation status and potential threats for the species in Croatia.

New records

First adults of *P. alexanor* were observed at the beginning of May 2014 in the region south of Split on steep scree below rock faces. During a repeat visit to the region on 22nd of May 2014 we found the species at the site of the first observation and four additional localities. Typical habitat present at all sites where adults were observed is characterised by steep limestone rock faces with lush vegetation on adjacent slopes or scree (Fig. 1). The most important attribute of the habitat was,

however, the abundance of larval host plant *Opopanax chironium* (L.) Koch, which was sometimes growing also in fissures on rock faces. Adults were gliding along rock walls, occasionally settling on flowers, predominantly large flowered thistles (Fig. 2) like *Cirsium eriophorum* (L.) Scopoli. Nectaring was observed also on *Vicia cracca* L. Adults were usually present in low numbers, at most up to five specimens were observed simultaneously. A surprising additional record arrived from a photo of *P. alexanor* taken on the southern slopes of Biokovo Mountains in 2014 (Zvonko Glibota, pers. comm.).

In the year 2015 we have widened our search, but with less success. A single specimen of *P. alexanor* was observed above Split in a seemingly suitable habitat, however without the presence of the host plant. More importantly we found the species also in southern Dalmatia just south of the Neretva River Valley. Here, we observed also first, second and third instar larvae of *P. alexanor* feeding on terminal and sub-terminal umbels of *Opopanax chironium* (Fig. 3). They were extremely numerous; up to 11 larvae could be counted on a single plant. Currently *Opopanax chironium* is the only known host plant of the species in Croatia as noted already by SCHWINGENSHUSS & WAGNER (1928). Several additional sites with suitable habitat and larval host plant were found in the region and should be monitored for the presence of adults or larvae in the future years.

Discussion

Despite several decades without any reliable records the Southern Swallowtail apparently survived in Dalmatia, but remained unnoticed. This could be attributed to lack of surveys in general in the region and also in particular for the species. Another important factor is scarcity of adults and extreme affiliation to their usually very localized and inaccessible larval habitat. Such distribution limitations are known throughout the range of the species (BOLLINO & SALA, 2004). It is therefore not surprising that we observed only a single, possibly wandering, specimen outside larval habitat on the slopes above Split. Even in this case it is likely that the larval habitat is somewhere in the vicinity, so further surveys in the area are required.

Given the known historical distribution, our records vaguely correspond to the southern and central Dalmatian centres of distribution, although there is almost no overlap with known historical distribution (Fig. 4). The records from Krk Island and Istria remain unverified, but the historical presence of the species in Istria cannot be entirely excluded, as the host plant *Opopanax chironium* is still present there (OTOPAL & KALIGARIČ, 2012, FCB, 2014). The host plant is distributed also on Brač Island (FCB, 2014), so this is another region requiring further surveys. *P. alexanor* was recorded from neighbouring Herzegovina at higher altitudes (SCHAWEDRA, 1913, SIJARIĆ, 1970), so studies in Dalmatian hinterland could also provide additional records.

P. alexanor is listed as data deficient (DD) in the Red Data List of Croatian Butterflies (ŠAŠIĆ *et al*., 2013). Based on new observations this assessment could be modified to vulnerable (VU) under IUCN criteria (IUCN, 2001) B2ab (ii, iii, iv) – with area of occupancy of less than 500 km^2, severe fragmentation and continuing decline inferred from extinction of the species in historically known locations. The species is strictly protected in Croatia (ANONYMOUS, 2009) so collecting of adults and larval stages is illegal. As majority of habitats where the species occurs are outside human impact, large scale collecting, especially of the larval stages is likely to be the most eminent threat to the species in Croatia. Therefore we hope the information provided here on the species habitat and distribution will not be misused for collecting purposes.

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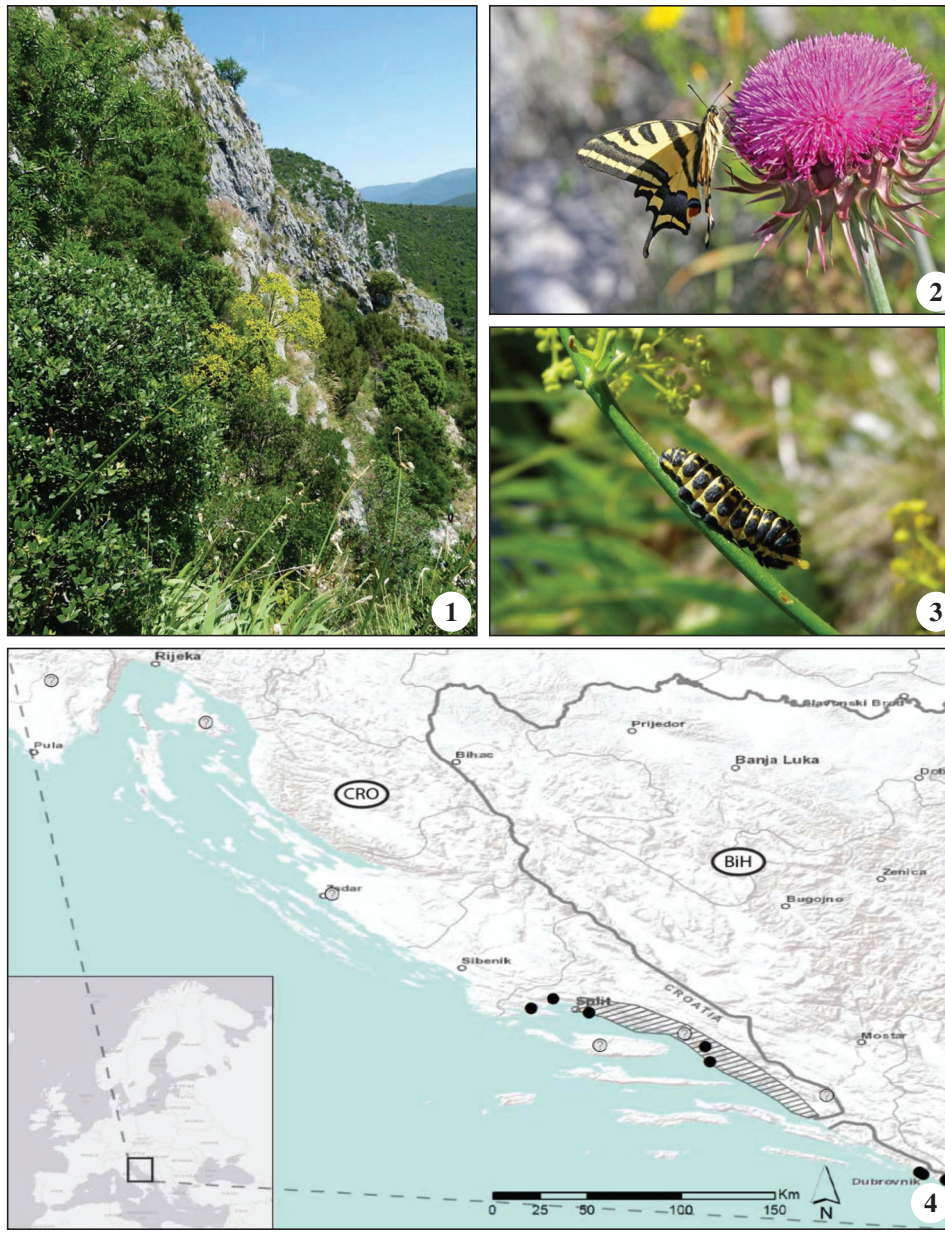

Figures 1-4.– 1. A typical habitat of *Papilio alexanor* Esp. in Croatia with larval host plant *Opopanax chironium* (L.) Koch in the foreground. **2.** Adult male *Papilio alexanor* Esp. feeding on *Cirsium eriophorum*. **3.** Third instar caterpillar of *Papilio alexanor* Esp. resting on *Opopanax chironium*. **4.** Distribution of *Papilio alexanor* Esp. in Croatia. Lined area represents the extent of currently confirmed distribution, while black dots denote historical observations. White dots with a question mark show questionable or imprecise records.