

***Orthetrum nitidinerve* in the southern Iberian Peninsula: Two breeding populations in the Seville Province (Odonata: Libellulidae)**

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Abstract

In late June and early September 2013, more than 170 years after the first record of *O. nitidinerve* in the Iberian Peninsula, the reproduction of this species in Spain was confirmed for the first time by the capture of teneral individuals. The records were taken at two small streams in the Seville province. Phenology observations and reproductive behaviour are commented upon.

Resumen

Orthetrum nitidinerve en el sur de la península ibérica: dos poblaciones reproductoras en la provincia de Sevilla (Odonata: Libellulidae) – A finales de junio y principios de septiembre de 2013, más de 170 años después de la primera cita de *O. nitidinerve* en la península ibérica, fue confirmada por primera vez la reproducción de esta especie en España en base a la captura de individuos recién emergidos (*teneral*). Los registros fueron realizados en dos pequeños arroyos de la provincia de Sevilla. Se comentan observaciones sobre fenología y comportamiento reproductor.

Zusammenfassung

Orthetrum nitidinerve auf der südlichen Iberischen Halbinsel: Zwei reproduzierende Populationen in der Provinz Sevilla (Odonata: Libellulidae) – Mehr als 170 Jahre nach dem ersten Nachweis von *O. nitidinerve* in Iberien wurde Ende Juni und Anfang September 2013 die Reproduktion der Art durch den Fang frisch geschlüpfter Individuen erstmals für Spanien bestätigt. Die Nachweise gelangen an zwei kleinen Bächen in der Provinz Sevilla. Phänologische Beobachtungen und Fortpflanzungsverhalten werden kommentiert.

Introduction

The distribution area of *Orthetrum nitidinerve* (Selys, 1841) includes only the countries of the central and western Mediterranean basin, from the Atlantic coast in Morocco (DUMONT 1976) to the Maltese Islands (SCIBERRAS et al. 2010). The strongest populations are located in the Maghreb (BOUDOT et al. 2009; KHELIFA et al. 2012). In the Iberian Peninsula, it has been recorded recently in Portugal (DE KNIJF & DEMOLDER 2010) and there are many records from Spanish coastal provinces, however it is less frequent in the interior (BUTLER 1992; OCHARAN et al. 2006). *Orthetrum nitidinerve* was first reported from an Andalusian locality in the 19th century and described under the synonym *Libellula baetica* by RAMBUR (1842, 66 f.: «J'ai pris cette espèce en Espagne, dans les environs de Malaga...»). This record then was also cited by SELYS & HAGEN (1850: 16) under the correct specific name that had been assigned by Selys one year prior to Rambur's description. Many other records of *O. nitidinerve* from the Iberian Peninsula are very old (e.g., MCLACHLAN 1889; see RIS 1910: 182). Hitherto, the only record from the province of Seville was published by NAVÁS (1902, 1906), however without specifying either the location or the exact date of capture.

Orthetrum nitidinerve belongs to a chorological type geographically restricted to the western Mediterranean, which comprises 13 only species (FERRERAS-ROMERO 1999). The inclusion of this species, which is endemic to the Maghreb and the Iberian Peninsula, among those in need of protection, was already proposed late in the 20th century (FERRERAS-ROMERO 1998). However, neither European directives nor Spanish or Andalusian legislation include *O. nitidinerve* among the legally protected species. The Red Book of Invertebrates of Spain (OCHARAN et al. 2006) assessed this species as «Vulnerable» (VU), which was adopted in the Atlas and Red Data Book of Threatened Spanish Invertebrates (TORRALBA-BURRIAL et al. 2011). A review for the Mediterranean area by BOUDOT et al. (2009) considers *O. nitidinerve* as rare in southwestern Europe, with only a small number of large populations. In the Odonata Red List of the IUCN (RISERVATO et al. 2009) *O. nitidinerve* is tagged as «Least Concern» (LC). The European Red List of Odonata (KALKMAN et al. 2010) considers it as «VU», both in the whole of Europe as well as in the context of the 27 member states of the European Union (EU 27).

Contrary to other European *Orthetrum* species, knowledge of the biology, ecology and behaviour of *O. nitidinerve* is particularly scarce. The most abundant information was given by KHELIFA et al. (2012, 2013). Reproductive activity was observed in the middle reaches of the Barbate River, in the Cádiz Province, by HAMPE (1998, 2004). Although BUTLER (1992) collected three larvae in a small coastal stream in the province of Málaga, it was recently stated that no breeding population was known from the Iberian Peninsula with certainty (CANO-VILLEGAS et al. 2012). Nevertheless, it took more than 170 years since the first Iberian records of *O. nitidinerve* until the first actual proofs of successful breeding which are presented in this study.

Material and Methods

Odonata were investigated from 20-vi-2013 to 09-x-2013 at two small streams running through extensive agricultural lands in the sub-basin of the Corbones river, a left tributary in the Guadalquivir river catchment basin, in the Seville Province, Andalusia, Spain: The Salado stream, near Osuna (37°13'N, 05°04'W; 260 m a.s.l.), and the Lavadero stream, near Marchena (37°19'N, 05°26'W; 110 m a.s.l.).

The Salado stream had a width of 2.5 m during summer, a laminar flow, was about 30 cm deep with some deeper pools in the flow course, and the stream-bed was thick sand. The bank vegetation consisted of tamarisk *Tamarix africana*, spiny rush *Juncus acutus*, Mediterranean hair grass *Rostraria cristata* and common oleander *Nerium oleander*. This locality was visited four times, first on 20-vi-2013 and again in August, September, and October 2013 (Tab. 1).

The Lavadero stream had a width of 1.5 m, a slow laminar flow due to the existence of water knotgrass *Paspalum paspalodes*, a depth around 30 cm, with small pools, a bed of silt, and very discontinuous vegetation on the banks, formed exclusively of spiny rush. This stream was visited 17 times in 2013, between 20-vi-2013 and 06-x-2013 (Tab. 2).

Dragonflies were searched for directly along the streams, in the bank vegetation and in the surroundings. Several individuals were caught for identification with an insect net and records of teneral were taken by photographs. The time spent in the field during each visit ranged from 45 to 60 minutes.

In order to harmonize time specifications with solar time, where the solar noon is identical to 12:00 hours, we have subtracted 2 h from the Spanish CEST in the following text and tables and refer to Coordinated Universal Time UTC.

Results

Salado stream (Osuna)

On 20-vi-2013, at 13:30 h UTC, a teneral male of *Orthetrum nitidinerve* was observed, perched on *Juncus acutus* on the stream bank, 1 km SE of Osuna. The sky was absolutely clear, imperceptible wind and maximum temperature 31°C. The end of the left forewing was not fully extended, inhibiting the maiden flight of the dragonfly, which facilitated its observation and photographic record. All other records during the four visits are listed in Table 1. Other species present were *Calopteryx haemorrhoidalis* (Vander Linden), *Lestes viridis* (Vander Linden), *Ischnura graellsii* (Rambur), *Coenagrion caeruleum* (Fonscolombe), *Platycnemis latipes* Rambur, *Anax parthenope* (Selys), *Orthetrum brunneum* (Fonscolombe), *O. chrysostigma* (Burmeister), *O. coerulescens* (Fabricius), *Crocothemis erythraea* (Brullé), *Sympetrum fonscolombii* (Selys), *S. striolatum* (Charpentier), and *Trithemis kirbyi* Selys.

Table 1. Observations of *Orthetrum nitidinerve* at the Salado stream near Osuna, Seville Province, Spain. All time specifications in Coordinated Universal Time UTC. – Tabelle 1: Beobachtungen von *Orthetrum nitidinerve* am Salado-Bach bei Osuna, Provinz Sevilla, Spanien. Alle Zeitangaben in Koordinierter Weltzeit UTC.

Date	Tenerals	Mature adults	Tandems	Ovipositions
20-vi-2013 13:30 h	1♂	–	–	–
15-viii-2013 11:30 h	–	14♂, 1♀	–	–
06-ix-2013 14:30 h	–	7♂, 2♀	2	2
09-ix-2013 11:30 h	–	–	–	–

Lavadero stream (Marchena)

On 22-vi-2013, at 11:30 h UTC, a teneral male was observed, perched on dry herbaceous vegetation along the stream (Fig. 1, 2), less than 1 km SW of Marchena. The sky was absolutely clear, wind was imperceptible and the maximum temperature was 35°C.

On subsequent visits to the Lavadero stream, tenerals, mature adults of both sexes and reproductive activity were observed. The latter included mating flights, approaches to the oviposition sites, and egg-laying (Tab. 2). On 2 July, between 15:00 and 16:00 h, the formation of a tandem in the air was observed with a duration of less than 5 sec., immediately followed by solitary oviposition. Individuals of *O. nitidinerve* were perched on dry vegetation and soil clods of dry agricultural exploitations; some males were perched on the vegetation in small moist areas along the stream bank, waiting for the arrival of females. Females were observed only at wider sections of the channel during mating and oviposition. On 11 July, two males and five females were observed, most of which showed a significant deterioration of their wings.

Other species observed at this stream were *I. graellsii*, *Anax ephippiger* (Burmeister), *A. imperator* Leach, *A. parthenope*, *O. brunneum*, *O. cancellatum* (Linnaeus), *O. chrysostigma*, *O. coerulescens*, *C. erythraea*, *S. fonscolombii*, *Trithemis annulata* (Palisot de Beauvois), and *T. kirbyi*.

Discussion

The two Iberian populations of *Orthetrum nitidinerve* studied are not associated with major river systems, as proposed by KALKMAN et al. (2010), but located in

Table 2. Observations of *Orthetrum nitidinerve* at the Lavadero stream near Marchena, Seville Province, Spain. All time specifications in Coordinated Universal Time UTC. – Tabelle 2: Beobachtungen von *Orthetrum nitidinerve* am Lavadero-Bach bei Marchena, Provinz Sevilla, Spanien. Alle Zeitangaben in Koordinierter Weltzeit UTC.

Date	Tenerals	Mature adults	Tandems	Ovipositions
22-vi-2013 11:00 h	1♂	–	–	–
26-vi-2013 17:00 h	2♂	1♂	–	–
02-vii-2013 15:00 h	–	5♂, 3♀	1	1
08-vii-2013 17:30 h	–	4♂, 2♀	–	–
11-vii-2013 14:30 h	–	2♂, 5♀	–	–
22-vii-2013 11:30 h	–	5♂	–	–
01-viii-2013 10:30 h	–	14♂, 2♀	1	–
09-viii-2013 11:00 h	–	7♂	–	–
17-viii-2013 12:00 h	–	9♂	–	–
20-viii-2013 11:00 h	–	3♂	–	–
25-viii-2013 11:30 h	–	–	–	–
04-ix-2013 15:30 h	–	5♂	–	–
05-ix-2013 15:30 h	–	–	–	–
11-ix-2013 15:00 h	1♀	3♂, 2♀	–	–
23-ix-2013 17:00 h	–	–	–	–
25-ix-2013 16:30 h	–	–	–	–
06-x-2013 15:00 h	–	–	–	–

small streams as in the Maghreb. Those watercourses run through agricultural lands dedicated to the cultivation of olive trees and cereals since the Roman age, and – unusual in extensive areas inside the hot southern Iberian Peninsula – they exhibit surface water runoff even during late summer. It is likely that *O. nitidinerve* has already been breeding in these waters for several years, as, during a visit of the Lavadero stream on 22-viii-2012 at 11:30 h UTC, a female of *O. nitidinerve* perching on knotgrass had already been photographed by JMR.

Recent studies suggest that distribution and abundance of co-generic and sympatric species are results of microhabitat segregation due to different preference for light/shade conditions (OKUYAMA et al. 2013). At the Lavadero stream, where only open areas exist (Fig. 2), the more abundant *Orthetrum* species were *O. chrysostigma* and *O. nitidinerve*, in that order. On the other hand, at the Salado stream, where open areas alternate with large shaded areas caused by the cover of large-sized tamarisks, *O. brunneum*, *O. nitidinerve* and *O. coerulescens* were the more abundant species. This habitat occupation is similar to that observed in North African localities, where *O. nitidinerve* maintains stable populations in coexistence with other co-generic species (KHELIFA et al. 2013).



Figure 1. A teneral male of *Orthetrum nitidinerve* perched on dry vegetation at the Lavadero stream near Marchena, Seville Province, Andalusia, Spain (22-vi-2013). – Abbildung 1: Frisch geschlüpftes Männchen von *Orthetrum nitidinerve* auf Sitzwarte am Lavadero-Bach bei Marchena, Provinz Sevilla, Andalusien, Spanien (22.06.2013). Photo: JMR

Reproductive behaviour observed in southern Spain fully matches that described of *O. nitidinerve* in Algeria by KHELIFA et al. (2013): Males remained perched on a support, copulation was completed in the air, females arrived at the oviposition sites in copula, solitary oviposition occurred and was guarded by the male; a behaviour rarely observed in dragonflies (CORBET 1999).

According to BUCCIARELLI et al. (1983) and HARDERSEN & LEO (2011), the apparent rarity of this species can be explained partly by its specific behaviour to return to the streams only in the afternoon, which makes sightings and collecting probably less likely than in other dragonflies. In a study of the odonate fauna in the basin of the river Barbate (100 m a.s.l., Cadiz Province, southern Spain) carried out during the summer of 1997 (HAMPE 1998, 2004), adults were recorded during August and September. In our study, the flight period ranged from mid-June to mid-September and finished coinciding with the first autumnal rains. The teneral were always recorded close to the watercourses, around noon or in the afternoon, in the second half of June (20-26-vi-2013) and in early September. Our emergence data from June coincide with records in Sardinia, where C. Brochard (pers. comm.) collected several exuviae on 19-vi-2013. As in most small Aniso-



Figure 2. The Lavadero stream near Marchena, Seville Province, Andalusia, Spain, breeding habitat of *Orthetrum nitidinerve* (25-vii-2013). – Abbildung 2: Der Lavadero-Bach bei Marchena, Provinz Sevilla, Andalusien, Spanien, Entwicklungsgewässer von *Orthetrum nitidinerve* (25.07.2013). Photo: JMR

ptera (CORBET 1999), *O. nitidinerve* emerges during the day showing scarce synchronization. The record of a newly-emerged female in the first half of September, coinciding with our latest observations of *O. nitidinerve*, indicates that the species is probably able to produce a second generation under favourable conditions in southern Spain, thus exhibiting partial bivoltinism.

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