ARTÍCULO DE INVESTIGACIÓN

Confirmation of the presence of *Lestes macrostigma* (Eversmann, 1836) (Odonata: Lestidae) in the "Laguna de Fuente de Piedra" Natural Reserve (Malaga, South Spain)

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ABSTRACT

We introduce new data about 14 species of dragonflies in the Nature Reserve "Laguna de Fuente de Piedra". We especially highlight the persistence of *Lestes macrostigma* (Evers.,1836) in that area, after fourteen years with no trace of them in Andalusia. Populations of this species are clearly regressive along its European distribution.

Key words: Odonata, *Lestes macrostigma*, conservation, "Laguna de Fuente de Piedra Nature Reserve", Málaga.

RESUMEN

Confirmación de la persistencia de *Lestes macrostigma* (Eversmann, 1836) (Odonata: Lestidae) en la Reserva Natural Laguna de Fuente de Piedra (Málaga, Sur de España)

Se presentan nuevos datos sobre catorce especies de odonatos en la Reserva Natural "Laguna de Fuente de Piedra". Concretamente, advertimos de la persistencia de *Lestes macrostigma* (Evers.,1836) en la zona, tras catorce años sin ser observada en Andalucía. Las poblaciones de esta especie se consideran en clara regresión a lo largo de toda su distribución europea.

Palabras clave: Odonata, *Lestes macrostigma*, conservación, Reserva Natural Laguna de Fuente de Piedra, Málaga.

INTRODUCTION

Considered a Palaearctic oriental species (whose eastern limit is in Mongolia). It is apparently very rare in the Mediterranean, where we can find it in specific places in Greece, Italy, France and the Iberian Peninsula. The Iberian populations are located on the most western point, far from the rest of the European colonies. In Spain, this species has only been mentioned ten times since 1950 (OCHARAN *et. al*., 2006). In Andalusia, it is only known in coastal provinces, concentrating around the areas of Doñana and the Antequera depression. Furthermore, it can also be found in certain places in Almería (NAVÁS, 1924; BENÍTEZ MORERA, 1950) and near the capital city of Cádiz (GONZÁLEZ DEL ROSARIO, 1994).

Its distribution seems to be connected with acid, stagnant and sometimes brackish water (CONESA GARCÍA, 1985; ASKEW, 2004), where masses of well preserved *Scirpus maritimus* L. exist. Iberian mentions are scarce, indicating that its distribution is limited and fragmented (OCHARAN et *al.*, 2006). It is believed that the populations are decreasing all over Europe due to still unknown causes (SAHLÉN *et al*., 2004). All this has resulted in its being specified as 'Vulnerable' in the *Libro Rojo de los Invertebrados de España* (VERDÚ & GALANTE, 2006) as well as in the *Libro Rojo de los Invertebrados de Andalucía* (BAREA-AZCÓN *et al*., 2008).

The lack of recent mentions in Andalusia is motivating some specific investigations in order to determine the conditions of its populations in those areas where there have traditionally been found a greater number of specimens. Thus, FERRERAS-ROMERO *et al.* (2005) sampled in two occasions two different localities in the area of Doñana. The first visit was made during the end of March/ beginning of April 2005 and the second one during the second fortnight of April. No specimens of *L. macrostigma* were observed during the investigation.

According to existing bibliography, the second nucleus of the population of *L. macrostigma* in Andalusia is located in the Antequera depression. In this area, the first mentions date from the beginning of the 80´s, having been observed in Laguna Salada, la Ratosa and Fuente de Piedra (to be more precise in the canals which surround its perimeter) (CONESA GARCÍA, 1985). Subsequently, in 1994, it was again seen in the Laguna de Fuente de Piedra (H. EHMANN in JÖDICKE, 1996). Due to the fact that since then its presence in the area had not been manifested, on 14th April 2007 and coinciding with the time of year it had been observed in 1981 and 1994, the canals which surround the Laguna de Fuente de Piedra were visited, but its presence was not determined (unpublished data).

The aim of this survey has been to study the chorology of the species and check its presence in the Nature Reserve after fourteen years of inexistent documented mentions. Above all, the lack of information about the reasons for its decline in its area of distribution make necessary for its conservation, a confirmation of the current status of all its populations and the real threats to which each of them is exposed.

MATERIAL AND METHODS

During 2008 we decided to again visit the Nature Reserve Laguna de Fuente de Piedra (Fig. 1) to make a more exhaustive research in direct reference to those made in previous years because only one sampling is not conclusive to determine the presence or absence of a species. We made seven samplings, from the middle of February to the middle of June. We visited the same places where the species had been observed in 1981. Of all the areas we visited only two (Site 1: Datum EU50 UTM 30S 343433 4107667;



Figure 1: Nature Reserve "Laguna de Fuente de Piedra", Málaga, Spain.
Figura 1: Mapa de situación de la Reserva Natural "Laguna de Fuente de Piedra", Málaga, España.

Site 2: Datum EU50 UTM 30S 344271 4109336) maintained the adequate characteristics for *L. macrostigma* to survive, so we mainly evaluated the presence of water running free and *Scirpus maritimus* L. From the second sampling we observed the general degradation the canals had suffered since the 80´s, we also decided to visit a small seasonal pond located near the Laguna de Fuente de Piedra and another section in the peripheral canal where there still remained well-conserved *Scirpus maritimus* populations (Site 3: Datum EU50 UTM 30S 344837 4111613). We visited all the locations until they completely dried up.

The vegetation in the four areas that we visited was mainly of *Scirpus maritimus* and other species of rush (*Scirpus* spp.). Occasionally *Tamarix africana* Poir could be seen. All the resources were seasonal, although it was the pond which conserved more water for longer periods. We visited further areas, canals and ponds, which conserved water for longer periods of time, but most, had an excess of living matter, probably deriving from the nearby towns. No *S. maritimus* was observed.

In each visit two or three researchers, counting with the help of 35 cm diameter collecting nets, identified all the adult dragonflies that were present in each of the sampling places. They made annotations on whether exuviae, tenerals or breeding behaviour had been observed.

RESULTS

We observed fourteen different species of dragonflies (Table 1), being the Lestidae family (5 spp) the best represented from the four that are present in the area. The richness of species was significantly greater in the pond (13 spp) than in the rest of places that we visited, in which we observed 3 species maximum.

All throughout the research, we only found *Lestes macrostigma* in the pond in three out of the six samplings. There were more than sixty specimens a short time after they emerged. We would like to highlight the fact that the species showed a clear preference for the areas in the pond where *Scirpus maritimus* was present. There we found dense populations; we did not observe any specimens in the area in which the vegetation was made up of other species of the genus *Scirpus*. The collected exuviae and the observed layings always made use of *S. maritimus* as substratum.

Regarding its life cycle, we would like to emphasize that on April 13th there were no signs of *L. macrostigma* in the pond until its appearance was reported on April 30th. The greater density of population of the species was observed in the middle of May, during which time we observed tenerals

Table I: Observed results in the studied area in different dates. “R”, breeding behaviour; “T” , tenerals; “E”, exuviae.
Tabla I: Datos observados en el área estudiada en diferentes fechas. Se incluye información adicional sobre observaciones de comportamiento reproductor “R”, ejemplares teneral “T” y recogida de exuvias “E”.

	Site 1 16-02-08	Site 2 16-02-08	Site 1 16-03-08	Site 2 16-03-08	Site 3 16-03-08	Pond 16-03-08	Site 1 13-04-08	Site 2 13-04-08	Site 3 13-04-08	Pond 13-04-08	Site 1 30-04-08	Site 2 30-04-08	Site 3 30-04-08	Pond 30-04-08	Site 1 14-05-08	Site 2 14-05-08	Site 3 14-05-08	Pond 14-05-08	Site 1 08-06-08	Site 2 08-06-08	Site 3 08-06-08	Pond 08-06-08	Pond 13-07-08
Lestes viridis (Vander Linden, 1825)																							1♂
Lestes barbarus (Fabricius, 1798)																		3♂					2♂
Lestes virens (Charpentier, 1825)																							4♂ y 2♀
Lestes macrostigma (Eversmann, 1836)														6♂ y 3♀ TE				> 60 T				8♂ y 5♀ R	
Sympecma fusca (Vander Linden, 1820)					1♀	1♂				8♂ y 6♀ R				8♂ y 4♀ R				1♂ y 1♀					
Enallagma cyathigerum (Charpentier, 1840)										1♂													
Ischnura pumilio (Charpentier, 1825)															1♂								
Ischnura graellsi (Rambur,1842)			4♂ T		6♂ y 2♀	7♂ y 3♀ T			4♂ y 9♀ T	6♂ y 8♀ T	5♂ y 3♀ T		9♂ y 7♀ T	15♂ y 10♀T R	15♂ y 10♀TR		7♂ y 3♀ T	> 60 T R		2♂ y 1♀		10♂ y 7♀	6♂ y 4♀
Anax ephippiger (Burmeister, 1839)						4♂ y 1♀ R				2													
Anax imperator (Leach, 1815)														1♂ y 1♀ R								1♂	
Anax parthenope (Sélys, 1839)						2																	
Orthetrum cancellatum (Linnaeus, 1758)														1♂									
Crotothemis erythraea (Brullé, 1832)														2♂				1♂				1♂	1♂
Sympetrum fonscolombei (Sélys, 1840)						5♂ y 2♀	1♂ y 1♀ T		1 T	3♂ y 3♀T R	3♂ y 1♀ T			6♂ y 4♀ T R	15 T		1 T	1♂		1♀		4♂ y 1♀	2♂ T



Figure 2: Tandem of *Lestes macrostigma* (Evers.,1836). (Photo: Francisco J. Cano).
Figure 2: Tandem de *Lestes macrostigma* (Evers.,1836). (Foto: Francisco J. Cano).

but not breeding behaviour. On June 8th we only found 12 specimens in the pond, 8 males and 5 females, being them in tandem (Fig. 2).

DISCUSSION

After fourteen years without confirmation of the presence of *Lestes macrostigma* in Andalusia, this research confirms its persistence. However, we must stress that we have noted a significant mitigation in the presence of the species in the Nature Reserve. It has completely disappeared from the canals that traditionally supported most of its populations in Fuente de Piedra. The reasons for its disappearance in the canals are various, but they may be related to several agricultural and urban dumplings' that were made within the last decades. In 1982, an olive oil toxic waste dumping, which affected the populations that had been found the previous year in the peripheral canals in the small lake (CONESA GARCÍA & GARCÍA RASO, 1983) was confirmed, together with the saturation of the canals after the Laguna de Fuente de Piedra burst its banks end of the 90´s, and the decrease in ground-water level due to extractions. The difference in the richness of species between the pond and the canals may be related to the decreasing seasonal nature observed in the first one and the existence of a greater variety of microhabitats; the areas of the canals that we visited showed a severe drop in the level of water during May, and they were completely dry by the beginning of June.

Consequently, the presence of *Scirpus maritimus* has been significantly reduced around the Laguna de Fuente de Piedra area, being this the main laying substratum for this species.

The specimens existent in the pond are probably the only remaining colony of this species in the area, as Laguna Salada and La Ratosa are affected by the agricultural use of its surroundings. For that reason we must stress that nowadays it is probably the only known pond in the Iberian Peninsula which is essential for the conservation of the species in Spain.

The results that we obtained contrast with the existing data of *L. macrostigma* in the Laguna de Fuente de Piedra because on April 11th 1981 (CONESA GARCÍA & GARCÍA RASO, 1983) and 1994 (H. EHMANN in JÖDICKE, 1996), the adults were already flying in the area. And what's more, the presence of large population densities of this species in 1981 (299) implies that the beginning of its appearance had to be in the beginning of April. We found the first specimens on April 30th and observed the greater density of population of the species on May 14th. This suggests the emergence started end of April. The lack of rain and the high temperatures that we have in summer are persisting until mid-autumn and this may possibly explain the changes taking place in the phenology. This contrasts with research carried out in other parts of Europe, where the global warming

seems to be anticipating the phenology of the odonatofauna (HASSALL *et al*., 2007; DINGEMANSE & KALKMAN, 2008). This implies that, considering the fluctuations observed in the beginning of the emergence, it is necessary to extend the sampling until the middle of May to be able to confirm the presence or absence of *L. macrostigma* in other areas within its Iberian distribution.

ADDENDA

On the 26th of October 2008, we decided to make a new sampling of the area to complete the odonathological catalogue of the Nature Reserve Laguna de Fuente de Piedra. We observed two typical autumn species, *Aeshna mixta* and *Sympetrum striolatum,* in breeding behaviour.

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