

# The dragonflies of Doñana: 1959-2013

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## ABSTRACT

*The Espacio Natural Doñana, referred to here simply as Doñana, is internationally considered as an area of particular interest for the conservation of Odonata. We have compiled data on the species recorded in this area between 1959 and 2013, including the results of intensive surveys and observations of adults which took place between 2009 and 2013. Of the 42 species recorded, we have only observed 25 species in recent years. There appears to be a considerable reduction in species numbers since 1980's even taking account of five species that had not previously been cited. Due to the absence of some threatened species since the 1980's, the authors consider that a more intensive survey is required to confirm their status. The conservation of the aquatic habitats network in this area is required to preserve high Odonata richness in Doñana.*

## RESUMEN

*El área de Doñana está considerada internacionalmente como un punto de especial interés para la conservación de la fauna de odonatos. Este estudio recopila datos de observaciones de libélulas de Doñana desde 1959 hasta la actualidad, así como de censos y prospecciones de adultos en vuelo realizadas entre 2009 y 2013. De las 42 especies que se consideran observadas en Doñana, sólo se detectan en la actualidad 25, apreciándose una reducción considerable a partir de los años 80, así como la incorporación de cinco nuevas. Entre las especies que no se detectan recientemente se encuentran*

- (1) AGUESSE, P. (1962) Quelques Odonates du Coto de Doñana. *Archivos del Instituto de Acclimatación de Almería*, 11: 9-12.
- (2) BIGOT, L & MARAZANOF, F. (1965) Considérations sur l'écologie des invertébrés terrestres et aquatiques des Marismas du Guadalquivir (Andalousie). *Vie et Milieu*, 16: 441-473.
- (3) COMPTE SART, A. (1982). Odonatos y neurópteros de la Reserva Biológica de Doñana (Huelva). *V Jornadas de la Asociación española de Entomología, Valencia*: 95.
- (4) TESTARD, P. (1972) Observations sur l'activité reproductrice d'une population tardive de *Sympetrum striolatum* Charpentier dans le Sud de l'Espagne (Odon. Libellulidae). *Bulletin de la Société Entomologique de France*, 77: 118-122.
- (5) TESTARD, P. (1975) Note sur l'émergence, le sex-ratio et l'activité des adultes de *Mesogomphus genei* Selys, dans le Sud de l'Espagne (Anisoptera: Gomphidae). *Odonatologica*, 4: 11-26.

(6) DUFOUR, C. (1978) Odonates printaniers dans le Delta du Guadalquivir. *Cahiers des naturalistes*, 32: 41-43.

(7) BELLE, J. (1979) Dragonflies collected in southern Spain in March. *Notulae odonatologicae*, 1: 46.

(8) MONTES, C., RAMÍREZ-DÍAZ, L. & SOLER, A.G. (1982) Variación de las taxocenosis de Odonatos, Coleópteros y Heterópteros acuáticos en algunos ecosistemas del Bajo Guadalquivir (SW, España) durante un ciclo anual. *Anales de la Universidad de Murcia*, 38: 19-100.

(9) FERRERAS-ROMERO, M. & SOLER, A. (1979) Odonatos de las marismas del bajo Guadalquivir, aspectos faunísticos. *Boletín de la Asociación española de Entomología*, 3: 213-218.

(10) HUERTAS-DIONISIO, M. & SÁNCHEZ-RODRÍGUEZ, J.L. (2000) Los odonatos de la provincia de Huelva (Andalucía, España) (Insecta: Odonata). *Boletín de la SOCECO*, 12: 35-81.

(11) FERRERAS-ROMERO, M. & PUCHOL, V. (1984) *Los insectos Odonatos en Andalucía. Bases para su estudio faunístico*. Servicio de publicaciones de la Universidad, Córdoba.

(12) JÖDICKE, R. (1996) Faunistic data of dragonflies from Spain. *Advances in Odonatology*, suppl. 1: 155-189.

Laguna Dulce (photo: RMF)

*algunas con alto riesgo de amenaza, por lo que sería necesario intensificar las prospecciones para confirmar su desaparición. La reducción del número de especies de odonatos se puede considerar un indicador del deterioro de los hábitats acuáticos. El mantenimiento del buen estado de conservación de esta importante red de hábitats acuáticos contribuiría a garantizar la riqueza de odonatos en Doñana.*

## INTRODUCTION

The odonatofauna of Doñana has never been intensively studied. However, a large number of short papers has been published reporting lists of species recorded since 1959. This information provides a general view about the species richness and gradual changes experienced in the last five decades. AGUESSE<sup>1</sup> provided a preliminary list of 15 species observed in 1959. BIGOT & MARAZANOF<sup>2</sup>, within a study of aquatic macroinvertebrates, reported six Odonata species. From 1966 to 1976, COMPTE SART performed frequent surveys in The Doñana Biological Reserve (the central area of the park) where he obtained considerable information from which only a congress abstract was published (COMPTE SART 1982)<sup>3</sup>. The specimens collected are preserved in the scientific collection of the



Madrid Natural Sciences Museum (MNCN). There was an increased interest in the dragonflies of Doñana during the 1970's (TESTARD 1972<sup>4</sup>; 1975<sup>5</sup>; DUFOUR 1978<sup>6</sup>; BELLE 1979<sup>7</sup>; MONTES et al. 1982<sup>8</sup>). An initial review was then carried out by FERRERAS-ROMERO & SOLER<sup>9</sup>, in which one species from the preliminary list, *Lestes sponsa*, was questioned. From the 1980's onwards, the interest in Doñana's dragonflies decreased, although there are some records included in general studies covering wider areas including Huelva province (HUERTAS DIONISIO & SÁNCHEZ RODRÍGUEZ 2000)<sup>10</sup>, Andalucía (FERRERAS-ROMERO & PUCHOL 1984)<sup>11</sup> and Spain in general (JÖDICKE 1996<sup>12</sup>; WEIHRAUCH & WEIHRAUCH 2003<sup>13</sup>). The most recent studies report a list of species identified as nymphs within the aquatic macroinvertebrate community (FLORENCIO et al. 2014)<sup>14</sup> or specifically concerning the presence of *Lestes macrostigma* (FLORENCIO & DÍAZ-PANIAGUA 2012)<sup>15</sup>, including recent observations of adults of other species (CANO-VILLEGAS et al. 2010<sup>16</sup>; MUÑOZ & FERRERAS-ROMERO 2011<sup>17</sup>). Finally, the atlases of threatened invertebrates include precise and particular information for threatened Odonata species of Doñana (VERDÚ, NUMA & GALANTE 2011<sup>18</sup>; PRUNIER et al. 2013<sup>19</sup>).

## METHODS

We have checked all references which include data on Odonata from Doñana. We have classified the reported observations in relation to the date and UTM geographic coordinates (10Km x10Km squares) in which they were recorded. We have only considered data on adults, we have not included records of nymphs. The area included in this study is shown in Figure 1. We have also considered data from scientific collections of the MNCM. From 2009 to 2013 (inclusive), we made frequent visits to the western area of Doñana and recorded the adults. In 2011, 2012 and 2013, we carried out monthly censuses recording data on adults around 9 ponds in the sandy area of the National Park. Between April and July in 2013, we also recorded data around 120 ponds throughout the National Park.

(13) WEIHRAUCH, F. & WEIHRAUCH, S. (2003) Spring Odonata records form Alentejo (Portugal), Andalusia and Extremadura (Spain). *Opuscula Zoologica Fluminensia*, 207: 1-18.

(14) FLORENCIO, M., DÍAZ-PANIAGUA, C., GÓMEZ-RODRÍGUEZ, C. & SERRANO, L. (2014) Biodiversity patterns in a macroinvertebrate community of a temporary pond network. *Insect Conservation and Diversity*, 7: 4-21.

(15) FLORENCIO, M. & DÍAZ-PANIAGUA, C. (2012) Presencia de *Lestes macrostigma* (Eversmann, 1836) (Odonata: Lestidae) en las lagunas temporales del Parque Nacional de Doñana (sudeste de España). *Boletín de la Sociedad Entomológica Aragonesa*, 50: 579-581.

(16) CANO-VILLEGAS, F.J., CONESA-GARCÍA, M.A. & IRURITA, J.M. (2010) Nuevos datos de *Lestes macrostigma* (Eversmann, 1832) (Odonata) en el Parque Nacional de Doñana (Andalucía, España). *Boletín de la Sociedad Entomológica Aragonesa*, 46: 518-520.

(17) MUÑOZ, J.D. & FERRERAS-ROMERO, M. (2011) Abundante presencia de *Lestes macrostigma* (Eversmann, 1836) (Odonata, Lestidae) en el área de Doñana (Sur de España) en 2010. *Boletín de la Asociación española de Entomología*, 35: 281-287.

Table 1. Species recorded in Doñana from 1959 to 2013: Conservation status, number of records, number of UTM (10km x10Km) squares and dates of the first and last record for each species.

Species	Conservation Status	Observations (1959-2013)	UTM 10Km x 10Km	1st record	Last record
<b>ZYGOPTERA</b>					
<i>Calopteryx haemorrhoidalis</i>	LC <sub>3</sub>	1	1	1977 <sup>6</sup>	
<i>Ceragrion tenellum</i>	LC	4	2	1977 <sup>6</sup>	1995 <sup>32</sup>
<i>Coenagrion mercuriale</i>	NT <sub>1</sub> , VU <sub>2</sub> , VU <sub>3</sub>	1	1	1977 <sup>6</sup>	
<i>Coenagrion puella</i>	LC <sub>1</sub> , VU <sub>3</sub>	2	2	1977 <sup>6</sup>	1978 <sup>7</sup>
<i>Coenagrion scitulum</i>	LC <sub>1</sub> , VU <sub>2</sub> , VU <sub>3</sub>	13	6	1959 <sup>1</sup>	2013 <sup>*</sup>
<i>Enallagma cyathigerum</i>	LC	10	5	2005 <sup>35</sup>	2011 <sup>*</sup>
<i>Erythromma lindenii</i>	LC	5	4	1977 <sup>6</sup>	2013 <sup>*</sup>
<i>Erythromma viridulum</i>	LC	4	4	1959 <sup>1</sup>	2013 <sup>*</sup>
<i>Ischnura graellsii</i>	LC	241	24	1959 <sup>1</sup>	2013 <sup>*</sup>
<i>Ischnura pumilio</i>	LC	8	5	1977 <sup>6</sup>	2006 <sup>33</sup>
<i>Pyrrosoma nymphula</i>	LC	1	1	1977 <sup>6</sup>	
<i>Chalcolestes viridis</i>	LC	15	7	1966-76 <sup>3</sup>	2013 <sup>*</sup>
<i>Lestes barbarus</i>	LC	48	10	1959 <sup>1</sup>	2013 <sup>*</sup>
<i>Lestes dryas</i>	NT <sub>1</sub> , VU <sub>3</sub>	30	5	1966-76 <sup>3</sup>	1977 <sup>6</sup>
<i>Lestes sponsa</i> **	LC1	2	1	1959? <sup>1</sup>	
<i>Lestes macrostigma</i>	NT <sub>1</sub> , VU <sub>2</sub> , VU <sub>3</sub>	61	10	1959 <sup>1</sup>	2013 <sup>*</sup>
<i>Lestes virens</i>	LC	104	16	1959 <sup>1</sup>	2013 <sup>*</sup>
<i>Sympecma fusca</i>	LC	41	11	1972 <sup>4</sup>	2013 <sup>*</sup>
<i>Platynemus acutipennis</i>	LC <sub>1</sub> , DD <sub>2</sub>	2	1	1977 <sup>6</sup>	1978 <sup>7</sup>
<b>ANISOPTERA</b>					
<i>Aeshna isocetes</i>	LC <sub>1</sub> , DD <sub>2</sub> , VU <sub>3</sub>	1	1	1978 <sup>7</sup>	
<i>Aeshna mixta</i>	LC	53	13	1959 <sup>1</sup>	2013 <sup>*</sup>
<i>Anax ephippiger</i>	LC	25	10	1966 <sup>3</sup>	2013 <sup>*</sup>



Species	Conservation Status	Observations (1959-2013)	UTM 10Km x 10Km	1st record	Last record
<i>Anax imperator</i>	LC	29	10	1967 <sup>3</sup>	2013 <sup>*</sup>
<i>Anax parthenope</i>	LC	48	14	1965 <sup>2</sup>	2013 <sup>*</sup>
<i>Brachytron pratense</i>	NT <sub>1</sub> , EN <sub>2</sub> , EN <sub>3</sub>	3	1	1972 <sup>4</sup>	1977 <sup>6</sup>
<i>Gomphus pulchellus</i>	LC	2	1	1972 <sup>4</sup>	1977 <sup>6</sup>
<i>Paragomphus genei</i>	LC	5	3	1972 <sup>4</sup>	2005 <sup>35</sup>
<i>Brachythemis impartita</i>	LC	7	6	1984 <sup>12</sup>	2013 <sup>*</sup>
<i>Crocothemis erythraea</i>	LC	145	21	1972 <sup>4</sup>	2013 <sup>*</sup>
<i>Diplacodes lefebvrii</i>	LC	26	10	1972 <sup>4</sup>	2013 <sup>*</sup>
<i>Libellula depressa</i>	LC	1	1	2001 <sup>13</sup>	
<i>Libellula fulva</i>	LC	1	1	1977 <sup>6</sup>	
<i>Libellula quadrimaculata</i>	LC	2	2	1978 <sup>7</sup>	
<i>Orthetrum cancellatum</i>	LC	83	15	1959 <sup>1</sup>	2013 <sup>*</sup>
<i>Orthetrum chrysostigma</i>	LC	28	11	1965 <sup>2</sup>	2013 <sup>*</sup>
<i>Orthetrum coerulescens</i>	LC	3	3	1972 <sup>4</sup>	2013 <sup>*</sup>
<i>Orthetrum nitidinerve</i>	LC <sub>1</sub> , VU <sub>2</sub> , VU <sub>3</sub>	2	2	1959 <sup>1</sup>	2000 <sup>18</sup>
<i>Orthetrum trinacria</i>	LC	37	7	1984 <sup>34</sup>	2013 <sup>*</sup>
<i>Sympetrum fonscolombii</i>	LC	246	22	1959 <sup>1</sup>	2013 <sup>*</sup>
<i>Sympetrum meridionale</i>	LC <sub>1</sub> , DD <sub>2</sub>	26	11	1959 <sup>1</sup>	2013 <sup>*</sup>
<i>Sympetrum sanguineum</i>	LC	8	4	1959 <sup>1</sup>	1976 <sup>9</sup>
<i>Sympetrum striolatum</i>	LC	33	12	1959 <sup>1</sup>	2013 <sup>*</sup>
<i>Trithemis annulata</i>	LC	5	5	2000 <sup>35</sup>	2013 <sup>*</sup>

Conservation Status indicates the classification of each species in Mediterranean IUCN Red List (1), Spain Red List (2), Andalusian Red List (3) : LC=Least Concern; NT= Near threatened, VU: Vulnerable, DD: Data deficient, EN: Endangered. 1st record and last record refers to bibliographical references in the main text. Species observed during this study \*. This species is questioned \*\*.



18: VERDÚ, J.R., NUMA, C. & GALANTE, E. (eds) (2011) *Atlas y Libro Rojo de los Invertebrados amenazados de España (Especies Vulnerables)*. Dirección General para la Biodiversidad, Ministerio de Medio Ambiente, Madrid.

19: PRUNIER, F., RIPOLL RODRÍGUEZ, J. & CHELMICK, D. (2013) Segundo Atlas de odonatos en Andalucía: incorporando 25 años de investigación. *Boletín Rola*, 3: 5-42.

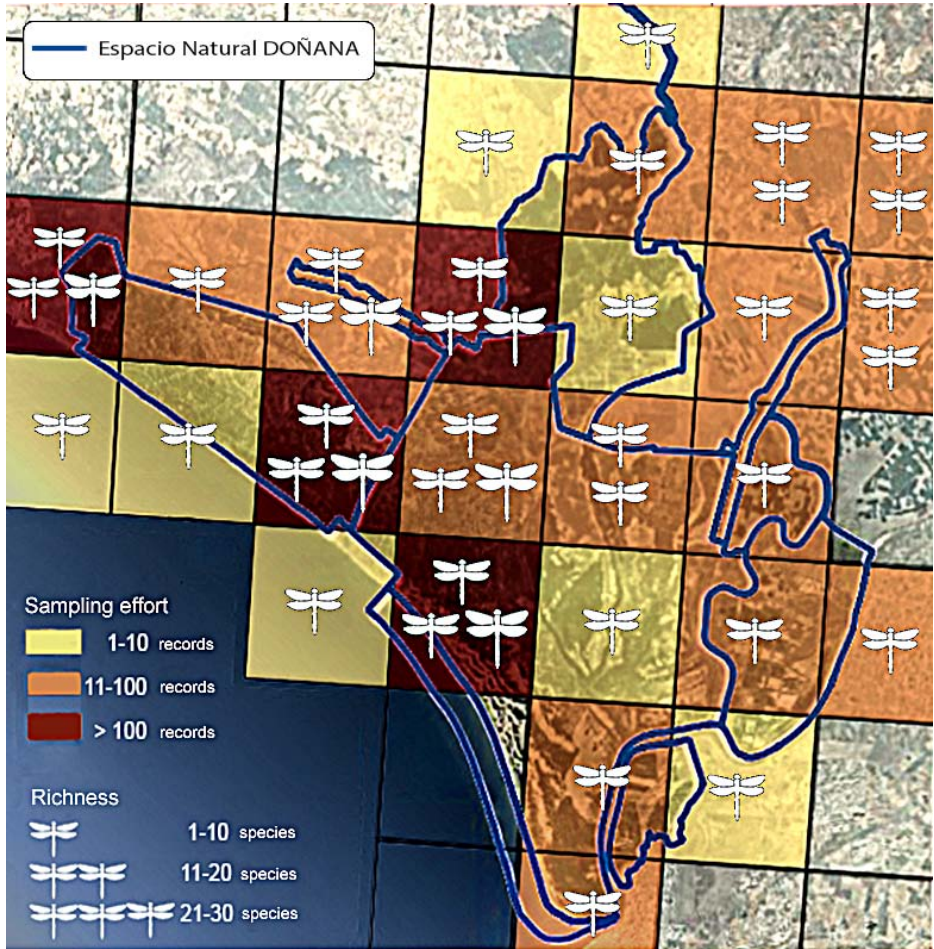
20: BOUDOT, J.-P., KALKMAN, V., AZPILICUETA AMORIN, M., BOGDANOVIC, T., CORDERO RIVERA, A., DEGABRIEME, G., DOMMANGET, J.-L., FERREIRA, S., GARROGOS, B., JOVIC, M., KOTARAC, M., LOPAU, W., MARINOV, M., MIHOKOVIC, N., RISERVATO, E., SAMRAOUI, B. & SCHNEIDER, W. (2009) Atlas of the Odonata of the Mediterranean and North Africa. *Libellula Supplement*, 9: 1-256.

## RESULTS

From 1959 to 2013, a total of 43 species have been reported in Doñana, although the identification of one of them has been questioned (BOUDOT et al. 2009)<sup>20</sup>. The dubious species is *Lestes sponsa*, only reported by AGUESSE<sup>1</sup>, who later questioned its identification (FERRERAS-ROMERO & SOLER)<sup>9</sup>. Taking account of this probably mis-identification, the total number of species recorded is, therefore, 42. The species reported with the highest frequency (between 1959-2013) were *Sympetrum fonscolombii*, *Ischnura graellsii*, *Crocothemis erythraea* and *Lestes virens*. In contrast, six species (*Calopteryx haemorrhoidalis*, *Coenagrion mercuriale*, *Pyrrhosoma nymphula*, *Aeshna isocetes*, *Libellula depressa*, and *L. fulva*) were cited only once, and another 13 species had five sightings or fewer (Table 1). The first list of dragonflies from Doñana included 15 species<sup>1</sup>. The highest number of species reported during a single year was 29 in 1977. Between 1959 and 1980 the accumulated total was 37 species. Since 1980 and, despite the addition of five new species (*Brachythemis impartita*, *Enallagma cyathigerum*, *Libellula depressa*, *Orthetrum trinacria* and *Trithemis annulata*), the number of species observed decreased to between 25 and 30 species (Figure 2). Throughout Doñana, there are particular areas in which higher species richness is recorded. However, the number of species reported per 10Km x 10Km UTM square is positively correlated with the number of reported observations. In general, Doñana has low accessibility for visitors, and, therefore, most observations are concentrated in the vicinity of the main roads surrounding the park or in visitors' centres. In contrast, areas located in the most inner areas of the park have been poorly studied (Figure 1).

*Coenagrion scitulum*  
(photo: RMF)





## DISCUSSION

Due to the large number of species recorded and the fact that many are threatened, Doñana is considered an area of special interest for the conservation of Odonata (CORDERO-RIVERA 2006)<sup>21</sup>. The community of present species reflect the characteristics of the aquatic habitats found in this area. Doñana is a Ramsar site, which includes important aquatic habitats suitable for Odonata. This results in high species richness and abundance of

Figure 1. Number of Odonata species and number of observations recorded throughout the boundaries of the Espacio Natural Doñana (in 10 x10Km UTM grid squares).

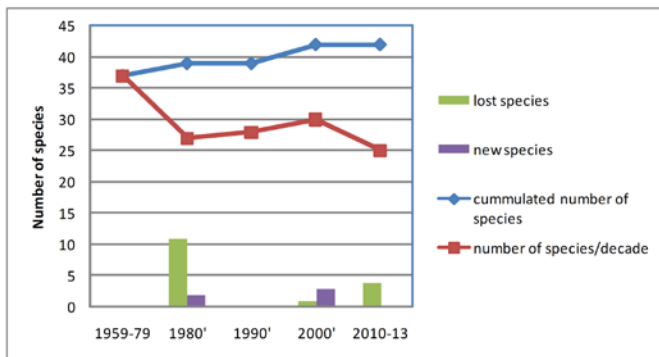


Figure 2. Richness over time.

21: CORDERO RIVERA, A. (2006) Spain. In: Dijkstra, J.K & Lewington, R. 2006 *Field Guide to the Dragonflies of Britain and Europe*. British Wildlife Publishing, The Old Dairy, Milton on Stour, Gillingham, Dorset, UK.: 53-54.

22: DÍAZ-PANIAGUA, C., FERNÁNDEZ-ZAMUDIO, R., FLORENCIO, M., GARCÍA-MURILLO, P., GÓMEZ-RODRÍGUEZ, C., PORTHEAULT, A., SERRANO, L. & SILJESTRÖM, P. (2010). Temporary ponds from the Doñana National Park: A system of natural habitats for the preservation of aquatic flora and fauna. *Limnetica*, 29: 41-58.

23: SERRANO, L., REINA, M., MARTÍN, G., REYES, I., ARECHEDERRA, A., LEÓN, D. & TOJA, J. (2006). The aquatic systems of Doñana (SW Spain): watersheds and frontiers. *Limnetica*, 25: 11-32.

individuals. Nevertheless, most water bodies in Doñana are temporary, including the extensive marsh and the numerous ponds. In contrast, permanent ponds or lakes are scarce, although more than 200 small ponds have been excavated historically throughout the sandy area of the park in order to provide water for cattle and wild mammals in the dry periods. These semi-artificial ponds (locally named “zacayones”) have increased the number of permanent waters (DÍAZ-PANIAGUA et al. 2010)<sup>22</sup> and also favour the reproduction of species which spend a long period as a nymph. Lotic habitats are very scarce, as there are only a small number of temporary streams, in which water runs only after heavy rain. These streams persist as small unconnected ponds until summer (SERRANO et al. 2006)<sup>23</sup>.

Most of the Odonata species found are typical of temporary lentic and shallow habitats, or generalist species, with short nymphal period such as *Sympetrum fonscolombii*, *Lestes virens* or *Ischnura graellsii* (DIJKSTRA & LEWINGTON 2006)<sup>24</sup>. Other species with longer nymphal periods are frequently found in zacayones, widely spread through the park. The zacayones provide habitats for *Orthetrum* nymphs and for members of the Aeshnidae family (FLORENCIO et al. 2013)<sup>14</sup>. The geographic location of Doñana, in the far south of the Iberian Peninsula, further explains the richness of its Odonata. Mediterranean, Eurosiberian and Ethiopian



species (TORRALBA & OCHARAN 2007)<sup>25</sup> all coincide and coexist in Doñana. In spite of the increase in numbers resulting from species that have expanded their range in recent years, a considerable reduction in the overall number of species has been found during the years of the intensive surveys.

The six species only found once may be considered migrant individuals for which Doñana does not seem to contain their optimum habitats. A further two species, *Libellula quadrimaculata* and *Platycnemis acutipennis*, have been recorded on only two occasions. The former is an established migrant and can occur almost anywhere, the latter is a permanent running water species that is unlikely to breed on Doñana. Over the study period, new species have been found including *Brachythemis impartita*, *Orthetrum trinacria* and *Trithemis annulata*, which are all of afrotropical origin, whose range expansion has been reported in other areas of the Iberian Peninsula (TORRALBA & OCHARAN 2007)<sup>25</sup>.

24: DIJKSTRA, K.-D. & LEWINGTON, R. (2006) *Field Guide to the Dragonflies of Britain and Europe*. British Wildlife Publishing, The Old Dairy, Milton on Stour, Gillingham, Dorset, UK.

25: TORRALBA, A. & OCHARAN, F.J. (2007). Composición biogeográfica de la fauna de libélulas (Odonata) de la Península Ibérica, con especial referencia a la aragonesa. *Boletín de la Sociedad Entomológica Aragonesa*, 41: 179-188.

*Lestes macrostigma*  
(photo: CDP).



26: MANZANO, M. & CUSTODIO, E. (2006). El Acuífero de Doñana y su relación con el medio natural. In :GARCÍA-NOVO, F. & MARIN, C. (eds) *Doñana, Agua y Biosfera*. Confederación Hidrográfica del Guadalquivir, Ministerio Medio Ambiente, Madrid: 133-142.

27: DÍAZ-PANIAGUA, C., KELLER, C., FLORENCIO, M., ANDREU, A.C., PORTHEAULT, A., GÓMEZ-RODRÍGUEZ, I. & GOMEZ-MESTRE, I. (2014). Rainfall stochasticity controls the distribution of invasive crayfish and its impact on amphibian guilds in Mediterranean temporary waters. *Hydrobiologia*, 728: 89-101.

28: DUARTE, C., MONTES, C., AGUSTI, S., MARTINO, P., BERNUES, M. & KALFF, J. (1990). Biomasa de macrofitos acuáticos en la marisma del Parque Nacional de Doñana (SO. España): importancia y factores ambientales que controlan su distribución. *Limnetica*, 6: 1-12.

29: MATZUSAKI, S. S., USIO, N., TAKAMURA, N. & WASHITANI, I. (2008). Contrasting impacts of invasive engineers on freshwater ecosystems: an experiment and meta-analysis. *Oecologia*, 158: 673-686.

*Crocothemis erythraea*  
(photo: PFD)

The progressive deterioration of the Doñana aquifer which occurred during recent decades has resulted in the desiccation of ponds or in the shortening of their hydroperiod (MANZANO & CUSTODIO 2006)<sup>26</sup>. This could explain the absence of previously recorded species typically associated with permanent waters. Secondly, it is also important to consider the impact brought about by exotic species and in particular, the case of the American crayfish (*Procambarus clarkii*) which is abundant in the marshes and permanent waters (DÍAZ-PANIAGUA et al. 2014)<sup>27</sup>. Crayfish produce substantial modification of aquatic habitats by destroying or consuming aquatic macrophytes and increasing water turbidity (DUARTE et al. 1990<sup>28</sup>; MATZUSAKI et al. 2008<sup>29</sup>). This results in a reduction in the quality of reproductive habitats for Odonata, especially those species of permanent water, which require dense cover of aquatic vegetation. These include *Brachytron pratense* (VERDU et al. 2011)<sup>18</sup>, and *Coenagrion puella* (DIJKSTRA & LEWINGTON 2006)<sup>24</sup> and it is possible that *Gomphus pulchellus* also falls into this category.

Doñana has a large number of threatened Odonata species. However, only three out of the ten red list species that have been recorded are presently found (Table 1). These being *Lestes macrostigma*, *Coenagrion scitulum* and *Sympetrum meridionale*. The absence of other species, some of them reported more than 30 years ago, suggests that they are no longer present in Doñana. It would be necessary to carry out a thorough survey of the entire park to confirm their absence. Odonata are





bioindicators of the conservation status of aquatic media (BRIERS & BIGGS 2003<sup>30</sup>; OERTLI et al. 2005<sup>31</sup>). The decrease in species richness detected in Doñana in recent decades points to a deterioration of aquatic habitats and particularly the more permanent ones. The restoration and preservation of the important network of aquatic habitats in the park is required to ensure the conservation of the rich Odonata community in Doñana.

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Laguna de la Sanguijuela  
(photo: RMF).

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*Gomphus grashnik* (photo: NSL)