

Odonatological advances in the Algarve region, Portugal

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ABSTRACT

This paper presents new data on nine anisopteran and summarises the results of surveys conducted throughout the Algarve between 2011 and 2013. Knowledge on the distribution of the three species included in the Annex IV of the European Habitats Directive (M. splendens, G. graslinii and O. curtisii) is updated, and exuviae of other three species (C. boltonii, O. trinacria and B. impartita) are reported for the first time. Eight of the nine reported species show a larger distribution than previously published.

RESUMEN

Este artículo presenta los resultados de seguimientos realizados en el Algarve entre los años 2011 y 2013, resumiendo datos nuevos sobre nueve especies de anisópteros. Se actualiza asimismo la distribución de tres especies incluidas en el Anexo IV de la Directiva Europea Habitat (M. splendens, G. graslinii and O. curtisii) y se documenta por primera vez las exuvias de tres especies (C. boltonii, O. trinacria and B. impartita). Ocho de las nueve especies estudiadas presentan áreas de distribución más amplias que las previamente publicadas.

INTRODUCTION

The Algarve, extending from 37°00'N to 37°30'N and 9°00'W to 7°25'W, with an area of almost 5,000 km², is the southernmost natural and administrative region of mainland Portugal. It has a Mediterranean climate or, according to the Köppen-Geiger classification, a predominant Csa climate type, being Csb in the western

(1) AEMET & IM (Agencia Estatal de Meteorología de España & Instituto de Meteorología de Portugal) (2011) *Atlas Climático Ibérico – Iberian Climate Atlas*.

(2) LOHR, M. (2005) Libellenbeobachtungen in Südportugal (Odonata). *Libellula*, 24(1/2): 87-107. Erratum in *Libellula*, 25(1/2): 117-118.

(3) DE KNIJF, G. & H. DEMOLDER (2010) Odonata records from Alentejo and Algarve, southern Portugal. *Libellula*, 29(1/2): 61-90.

(4) MALKMUS, R. (1996) Libellen im Gebiet des unteren Rio Guadiana, Portugal. In: Jödicke, R. (ed.), *Studies on Iberian Dragonflies. Advances in Odonatology*, Suppl. 1: 123-126.

(5) MALKMUS, R. (1998) Frühjahrsbeobachtungen von Libellen in Portugal. *Libellula*, 17(1/2): 91-96.

(6) MALKMUS, R. & T. RUF (2008) Herbstaktive Libellen in Südportugal (Odonata). *Libellula*, 27(1/2): 123-132.

(7) GARDINER, A. (1997) *Western Algarve Dragonfly Atlasing Project*. Annual Report to Recorders. (unpubl.)

(8) MALKMUS, R. (2002) Die Verbreitung der Libellen Portugals, Madeiras und der Azoren. *Nachrichten des Naturwissenschaftlichen Museums der Stadt Aschaffenburg*, 106: 117-143.

side where the Atlantic Ocean influence is greater (AEMET & IM 2011)¹. Fóia, at an altitude of 902 m in the Serra de Monchique, is the highest point in the Algarve. Only a very small part of the rest of the region lies above the 500 m contour. A large river, the Rio Guadiana, flows into the Atlantic Ocean along the eastern border of Algarve, but there is little other permanent running waters. Most rivers and streams have only seasonal flow, usually in winter and spring, and become dry in summer and early autumn, though stagnant pools remain in the riverbed. Artificial ponds, created to supply water for agriculture, livestock and as a water resource for fighting forest fires, have become numerous since the 1990's.

The odonatological assemblage of Algarve comprises 20 species of Zygoptera and 29 of Anisoptera, and has been quite well studied in recent years. The most important papers are those by LOHR (2005)² and by DE KNIJF & DEMOLDER (2010)³, and the studies by MALKMUS (1996, 1998)^{4,5} and by MALKMUS & RUF (2008)⁶. Distribution maps are provided by GARDINER (1997)⁷, MALKMUS (2002)⁸ and BOUDOT et al. (2009)⁹.

Nevertheless, there remains considerable scope for increasing our knowledge of the Odonata in the Algarve, especially the detailed distribution and flight period of species, the habitats used by larvae, and the impacts of land use changes and global warming on the species' distribution. The present study presents updated distribution maps for nine anisopteran species. Data are presented using a 5 km UTM grid (WGS84; EPSG:32629), and maps were prepared using QGIS version 2.2.0 - Valmiera. This paper summarises the results of surveys conducted throughout the Algarve between 2011 and 2013, when I visited almost 300 locations on several dates, covering both running and standing waters, permanent as well as temporary. All the 245 map squares were visited at least once, including those that contain only a small proportion of land. The 2011 survey covered only adults; in 2012 and 2013, adults and exuviae were searched for every time, and larvae were sampled in the spring months. Additional data were also provided by occasional collaborators to the www.odonata-algarve.info blog, or were collected from Flickr and Biodiversity4All.org.

The maps display three classes of information: i. squares with previously published data on adults and exuviae, ii. squares with new records based on adults; iii. squares with new records based on exuviae and adults. For selected species, where the data justify it, additional categories were included.



Macromia splendens larva (photo: NSL)

(9) BOUDOT, J.-P., V.J. KALKMAN, M. AZPILICUETA AMORÍN, T. BOGDANOVIĆ, A. CORDERO RIVERA, G. DEGABRIELE, J.-L. DOMMANGET, S. FERREIRA, B. GARRIGÓS, M. JOVIĆ, M. KOTARAC, W. LOPAU, M. MARINOV, N. MIHOKOVIĆ, E. RISERVATO, B. SAMRAOUI & W. SCHNEIDER (2009) Atlas of the Odonata of the Mediterranean and North Africa. *Libellula Supplement*, 9: 1-256.

RESULTS

Macromia splendens

Macromia splendens (Pictet, 1843), a species included in the Annex IV of the European Habitats Directive and considered Vulnerable in the IUCN Red List of Threatened Species, was firstly reported from the Algarve in 1997 (MALKMUS 1998)⁵. In 2003 LOHR (2005)² discovered one exuvia and observed one adult in Ribeira de Seixe.

The species was noticed again during the surveys that I conducted. Seven exuviae were found in 2012, and one larva, four exuviae and one adult were found in 2013, all of them in a stretch of the Ribeira de Seixe, in a location

where continuous strips of numerous *Alnus glutinosa* and some *Salix salviifolia australis* cover the channel, filtering the daylight and maintaining moderate levels of water and air temperatures even in summer. *Hedera helix* is very abundant, and *Osmunda regalis* and *Smilax aspera* also occur near the water. In 2013, between May and July, I conducted six surveys, each one taking about 2 h checking a length of approximately 300 m. Even with this considerable effort, the numbers of exuviae, larvae and adults were low, and I suspect the population is small and, consequently, fragile.

MALKMUS (1998)⁵ conducted a survey in Ribeira do Vascão in 1997, and WEIHRAUCH & WEIHRAUCH (2003)¹⁰ conducted another one in the same lotic system in 2001. Both reported observations of adults of *M. splendens*. I conducted surveys in the same stretches of Ribeira do Vascão in 2012 and 2013 without any results. LOHR

Gomphus graslinii
after emergence
(photo: NSL)



(2005)² conducted a survey in Ribeira de Odeleite in 2003 and collected one exuvia. I conducted surveys in 2012 and 2013 without any results. If Ribeira de Odeleite and Ribeira do Vascão populations of *M. splendens* remain alive, there is a strong possibility that they are composed by a very limited number of individuals, but the hypothesis that the population of Ribeira de Seixe is nowadays unique in the Algarve cannot be rejected.

Figure 1. Distribution of *Macromia splendens* in Algarve (5 km side squares grid)



Orange square: adults, larva and exuviae - new data from Ribeira de Seixe, 2012 and 2013.
Blue square: adults - new data from Ribeira de Seixe, 2013; data by LOHR (2005)², 2003.
Grey squares: data by MALKMUS (1998)⁵ and by WEIHRAUCH & WEIHRAUCH (2003)¹⁰ from Ribeira do Vascão, 1997 and 2001; by LOHR (2005)² from Ribeira de Odeleite, 2003.

Gomphus graslinii

Gomphus graslinii Rambur, 1842, another species included in the Annex IV of the European Habitats Directive and considered Near Threatened in the IUCN Red List of Threatened Species, was firstly reported from the Algarve in 2003 by LOHR (2005)² after the finding of several exuviae in Ribeira de Seixe and Ribeira de Odeleite. VIEIRA et al. (2010)¹¹ and Dinis Cortes (photograph posted in Flickr) to Ribeira do Vascão, and DE KNIJF & DEMOLDER (2010)³ to Ribeira de Seixe, reported new observations and enlarged the knowledge on the distribution of the species in the region.

In 2012 and 2013 *G. graslinii* was confirmed in the same lotic systems (i.e. Ribeira de Seixe, Ribeira de Odeleite and Ribeira do Vascão), given that I collected several exuviae and observed a few adults in all of them. I also witnessed an emergence in May 2, 2013, in Ribeira do Vascão. The

(10) WEIHRAUCH, F. & S. WEIHRAUCH (2003) Spring Odonata records from Alentejo (Portugal), Andalusia and Extremadura (Spain). *Opuscula zoologica fluminensia*, 207: 1-18.

(11) VIEIRA, C., V. GONÇALVES, A.C. CARDOSO & I. PATANITA (2010) Registo de quatro novas espécies de Odonata para a Ribeira do Vascão, Sítio de Interesse Comunitário do Guadiana (Portugal). *Boletín de la Sociedad Entomológica Aragonesa*, 47: 461-462.

2012 and 2013 surveys added two new squares to the map of the distribution of the species in Algarve and confirmed the occurrence in another two. The stretches of the Ribeira de Seixe, Ribeira de Odeleite and Ribeira do Vascão where I found *G. graslinii* were also surveyed for the Red Swamp Crayfish *Procambarus clarkii* (Girard, 1852). It appears that the invasive plague is not present there, even if it begins to become common in many lotic systems in the region.

Figure 2. Distribution of *Gomphus graslinii* in Algarve (5 km side squares grid)



Orange squares: adults and exuviae - new data from Ribeira de Seixe, Ribeira de Odeleite and Ribeira do Vascão, 2012 and 2013; data by LOHR (2005)² and by DE KNIJF & DEMOLDER (2010)³ from Ribeira de Seixe, 2003 and 2009.

Blue square: adults - new data by Dinis Cortes (photograph posted in Flickr) from Ribeira de Odeleite, 2010.

Grey squares: data by LOHR (2005)² from Ribeira de Odeleite, 2003; by VIEIRA *et al.* (2010)¹¹ from Ribeira do Vascão, 2009.

Oxygastra curtisii

Oxygastra curtisii (Dale, 1834), the third Odonata species occurring in the Algarve included in the Annex IV of the European Habitats Directive and considered Near Threatened in the IUCN Red List of Threatened Species, was firstly reported from the Algarve in 1995 by MALKMUS (1996)⁴. In 2001 more than 70 exuviae have been reported by WEIHRAUCH & WEIHRAUCH (2003)¹⁰, and in 2003 some exuviae were collected and reported by LOHR (2005)².

In 2012 and 2013 I found adults on the wing at four permanent lentic water bodies, and exuviae were collected at three of them. From the Algarve, it was the first time that the taxon was observed in habitats that are not the typical ones. However, the presence of *O. curtisii* in lentic systems also was previously reported in other regions (LEIPELT & SUHLING 2001¹², HERBRECHT & DOMMANGET 2006¹³,

(12) LEIPELT, K.G. & F. SUHLING (2001)

Habitat selection of larval *Gomphus graslinii* and *Oxygastra curtisii* (Odonata: Gomphidae, Corduliidae). *International Journal of Odonatology*, 4(1): 23-34.

(13) HERBRECHT, F. & J.-L. DOMMANGET (2006) Sur le développement larvaire d'*Oxygastra curtisii*

(Dale, 1834) dans les eaux stagnantes (Odonata, Anisoptera, Cordullidae). *Martinia*, 22(2): 89-94.



Macromia splendens habitat at Ribeira de Seixe (photo: NSL)

Adolfo Cordero-Rivera pers. comm.). Additionally, it was possible to confirm the occurrence of *O. curtisii* in the lotic systems listed previously, as well as to find the species in other lotic systems and other stretches of the waters where it was known. The 2011 to 2013 surveys added 10 new squares (15 localities) to the distribution map of the species, four of them from permanent lentic systems.

In comparison to the other two protected species (*i.e.* *M. splendens* and *G. graslinii*), which typically occur sympatrically with *O. curtisii*, the latter species presents a much wider regional distribution. AZPILICUETA-AMORÍN et al. (2009)¹⁴ recognized the dispersing capability of *O. curtisii*, a feature that agrees with the wider presence of the taxon in Algarve.

(14) AZPILICUETA-AMORÍN, M., M. VILA & A. CORDERO-RIVERA (2009) Population genetic structure of two threatened dragonfly species (Odonata: Anisoptera) as revealed by RAPD analysis. In: Habel, J.C. & T. Assmann (eds.), *Relict Species: Phylogeography and Conservation Biology*. Springer-Verlag Berlin Heidelberg: 295-308.

Figure 3. Distribution of *Oxygastra curtisii* in Algarve (5 km side squares grid)

Orange squares: adults and exuviae - new data from Ribeira de Seixe, Ribeira da Perna da Negra, Ribeira de Monchique, Ribeira da Boina, Fonte da Benémola, Ribeira da Asseca, Ribeira de Alportel, Ribeira de Odeleite, Ribeira do Leitejo and Ribeira do Vascão, 2011 to 2013; data by GARDINER (1997)⁷, by MALKMUS (1998)⁵ from Fonte da Benémola and Ribeira do Vascão, 1997; by WEIHRAUCH & WEIHRAUCH (2003)¹⁰ from Ribeira do Vascão, 2001; by LOHR (2005)² from Ribeira da Boina and Ribeira de Seixe, 2003; by DE KNIJF & DEMOLDER (2010)³ from Ribeira da Asseca and Ribeira do Vascão, 2009; data by Dinis Cortes (photograph posted in Flickr) from Ribeira de Monchique, 2011.

Orange squares with diagonal light gray lines: adults and exuviae - lentic systems - new data from Barragem da Boiça, Barragem das Eirinhas and a pond near Javali, 2012 and 2013; data by Nelson Viegas (pers. comm.) from Ribeira dos Carunchos, 2013.

Blue square: adults - new data by Nelson Fonseca (pers. comm.) from Morgado de Arge, 2013.

Blue square with diagonal light gray lines: adults - lentic systems - new data from Barragem do Bico Alto, 2013.

Grey squares: data by GARDINER (1997)⁷, by MALKMUS (1996, 1998)^{4,5} from Ribeira da Foupana and Ribeira dos Cadavais, 1995 and 1997; by LOHR (2005)² from Caldas de Monchique, Ribeira de Odelouca and Ribeira de Odeleite, 2003; by DE KNIJF & DEMOLDER (2010)³ from Ribeira do Arade and Ribeira de Odeleite, 2009.

Aeshna mixta

Aeshna mixta Latreille, 1805 was firstly reported from the Algarve in 1992 by GARDINER (1993)¹⁵, and again in 1993 by GARDINER & STURGESS (1994)¹⁶, always in the Quinta da Rocha area. Successful reproduction only once was confirmed, in 2003, when LOHR (2005)² discovered one exuvia in a pond near Ludo.

Surveys that I conducted in 2012 and 2013 supports a new status of *A. mixta* in Algarve, as dozens of exuviae were found in 14 new squares (18 localities) and also in the one (2 localities) that was primarily drawn based on the LOHR (2005)² record. *A. mixta* is a resident taxon and reproduces both in lentic and lotic systems fairly spread throughout Algarve.

(15) GARDINER, A.J., (1993) The dragonflies of Quinta da Rocha: September to December 1992. *A Rocha Observatory Report for the Year 1992*: 89-91.

(16) GARDINER, A.J. & P. STURGESS (1994) Dragonflies on Quinta da Rocha in 1993. *A Rocha Observatory Report for the Year 1993*: 80-84.

Figure 4. Distribution of *Aeshna mixta* in Algarve (5 km side squares grid)



Light orange squares: exuviae - new data from ponds near the Casa da Guarda Florestal and the Parque Eólico de Vila do Bispo, near Serominheiro, Vale Fuzeiros, Vale da Águia, Pedra Alva, Aterro Sanitário do Sotavento, from lago grande W (Morgado do Reguengo Golf), Lago de São Lourenço (Quinta do Lago), and Aldeia Nova - Mata de Monte Gordo (brackish pond), from Fonte da Benémola and Barragem da Arrancadinha, and from Barranco do Tamejoso, Ribeira do Vascão and Ribeira da Foupana, 2012 and 2013; data by LOHR (2005)² from a pond near Ludo, 2003.

Boyeria irene

Boyeria irene (Fonscolombe, 1838) was firstly reported from the Algarve by MALKMUS (2002)⁸. LOHR (2005)² reported the finding of several exuviae in Ribeira de Aljezur, Ribeira da Boina, Ribeira de Odelouca and Ribeira de Odeleite, and DE KNIJF & DEMOLDER (2010)³ added Ribeira do Arade to the list of lotic systems where the species occurs.

Results from the surveys conducted from 2011 to 2013 contributed to present an updated and more widespread distribution (10 new squares, comprising 17 localities). *B. irene* was found in the same localities where *M. splendens* and *G. graslinii* occur, as well as the same localities in lotic

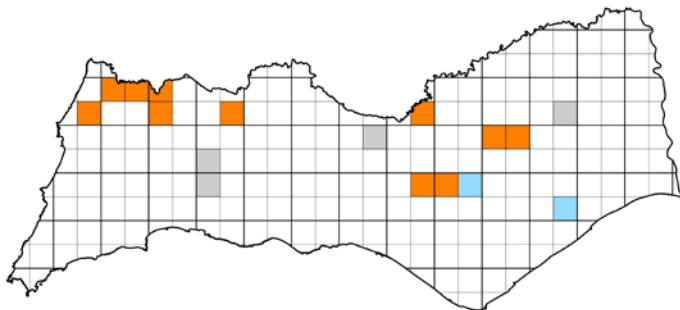


The two forms of *Boyeria irene* females identified in their exuviae: f. *typica* (left) and f. *brachycerca*, with short appendages (right) (photos: NSL)

systems where *O. curtisii* was found, but in comparison with *M. splendens* and *G. graslinii* this aeshnid is more widespread and occurs in a larger range of lotic habitats, from the shaded, temperate and permanently running waters of Ribeira de Seixe and Ribeira da Perna da Negra, to the characteristic Mediterranean streams of Ribeira do Arade, Ribeira do Leitejo, Ribeira de Odeleite and Ribeira do Vascão. The occurrence of *B. irene* in the northeastern border of the region reported by MALKMUS (2002)⁸ without geographical details or a locality description could not be confirmed.

B. irene females occur in two forms (f. *brachycerca*, with short appendages, and f. *typica*, with very long appendages), which can also be identified in the exuviae according to the criterion mentioned by WENGER (1959)¹⁷. A total of 322 exuviae were collected in a 300 m length stretch of Ribeira de Seixe, in Aug 4, Aug 20, and Sep 12, 2012, being 54.7% from males and 45.3% from females. The f. *brachycerca* dominates the exuviae collection, as only 10 (7.1%) out of the 140 studied female exuviae presented the characteristic cerci of the f. *typica*.

Figure 5. Distribution of *Boyeria irene* in Algarve (5 km side squares grid)



Orange squares: adults, larvae and exuviae - new data from Ribeira de Seixe, Ribeira da Perna da Negra, Ribeira de Monchique, Fonte da Benémola, Fonte Filipe, Ribeira de Odeleite, Ribeira do Leitejo and Ribeira do Vascão, 2011 to 2013; data by LOHR (2005)² from Ribeira de Aljezur, 2003; by DE KNIJF & DEMOLDER (2010)³ from Ribeira de Seixe, 2008 and 2009; by João Tiago Tavares (pers. comm.) from Ribeira de Aljezur and Ribeira de Seixe, 2011.

Blue squares: adults - new data by Nelson Fonseca (pers. comm.) from Ribeira da Asseca and Ribeira de Alportel, 2011 and 2012.

Grey squares: data by LOHR (2005)² from Ribeira da Boina, Ribeira de Odelouca and Ribeira de Odeleite, 2003; by DE KNIJF & DEMOLDER (2010)³ from Ribeira da Boina and Ribeira do Arade, 2009.

(17) WENGER, O.-P. (1959)
Die beiden ♀ Formen von
Boyeria irene (Odonata-
Aeschnidae). *Mitteilungen
der Schweizerischen
Entomologischen
Gesellschaft*, 23(2/3):
304-311.

Cordulegaster boltonii

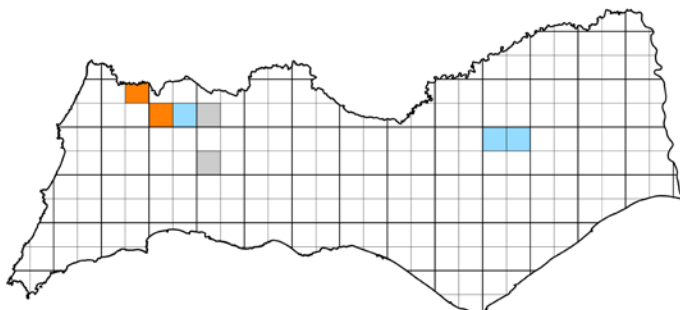
The Cordulegasteridae family is represented in mainland Portugal by *Cordulegaster boltonii* (Donovan, 1807), and from the Algarve only a few records of adults were published (GARDINER 1997⁷, MALKMUS 2002⁸, LOHR 2005², DE KNIJF & DEMOLDER 2010³). *C. boltonii* appears to be an uncommon species according to the scarce records within the published data on the Odonata assemblages from the region.

In 2013, I collected one larva and four exuviae in Ribeira de Seixe, being the first known records of successful breeding of the species in Algarve. Not far from that locality an adult female was photographed and captured, and the specimen was deposited in the MUHNAC - Museu Nacional de História Natural e da Ciência, Lisboa (MB07-030788). Besides the already known population in the area of Serra de Monchique, a few observations of single adults are reported to the 'serra algarvia', not far from Ribeira de Odeleite, suggesting that the distribution of the species in the region is broader than initially expected. To the region, 4 new squares (5 localities) were added.

Cordulegaster boltonii
female (photo: NSL)



Figure 6. Distribution of *Cordulegaster boltonii* in Algarve (5 km side squares grid)



Orange squares: adults, larvae and exuviae - new data from Ribeira de Seixe, 2013; data by DE KNIJF & DEMOLDER (2010)³ from Ribeira de Seixe, 2008.

Blue squares: adults - new data from Ribeira de Odeleite and from 'serra algarvia', 2013; by Guillaume Réthoré (pers. comm.) from Serra de Monchique, 2011; by João Tiago Tavares (pers. comm.) from 'serra algarvia', 2009; data by GARDINER (1997)⁷.

Grey square: data by GARDINER (1997)⁷; by LOHR (2005)² from Ribeira da Boia, 2003.



Cordulegaster boltonii
larva (photo: NSL)

Orthetrum trinacria

The occurrence of *Orthetrum trinacria* (Selys, 1841), an Afrotropical odonate that became a resident species in southern Europe, was firstly reported from the Algarve by MALKMUS (2002)⁸. LOUREIRO (2012)¹⁸ presented a review with new data on the distribution of the species in the region, but only records of adults were included. Here, the first records of exuviae are presented, updating the status of the species to Algarve, as successful reproduction was confirmed for the first time. Exuviae were found in 12 squares (16 localities) during the 2012 and 2013 field surveys. All of them were permanent lentic water bodies and they are spread along Algarve.

(18) LOUREIRO, N.S. (2012) New data on the distribution of *Orthetrum trinacria* in the Algarve, southern Portugal (Odonata: Libellulidae). *Libellula*, 31(1/2): 77-87.

Figure 7. Localities where *Orthetrum trinacria* exuviae were found in Algarve (5 km side squares grid)



Light orange squares: exuviae - new data from ponds near Serominheiro, Almarjão, Pedra Alva, Aterro Sanitário do Sotavento, Barrada, Cova da Muda, Ribeira de Álamo and Aldeia Nova - Mata de Monte Gordo (brackish pond), from lago 14 and lago grande W (Morgado do Reguengo Golf), and Lago de São Lourenço (Quinta do Lago), and from Açude da Barrada, Barragem do Pessegueiro, Barragem da Arrancadinha, Barragem das Eirinhas and Barragem de Vale de Asno.

Diplacodes lefebvrii

Diplacodes lefebvrii (Rambur, 1842), another Afrotropical odonate nowadays resident in Europe, was firstly recorded from the Algarve in 1985, when an adult female was collected by S. and C. Aguiar near Odeleite (FERREIRA & GROSSO-SILVA 2006)¹⁹. However, only once exuviae were found in the region by LOHR (2005)², even though GARDINER & STURGESS (1995)²⁰ reported a teneral at the Quinta de Rocha pond in September 1994.

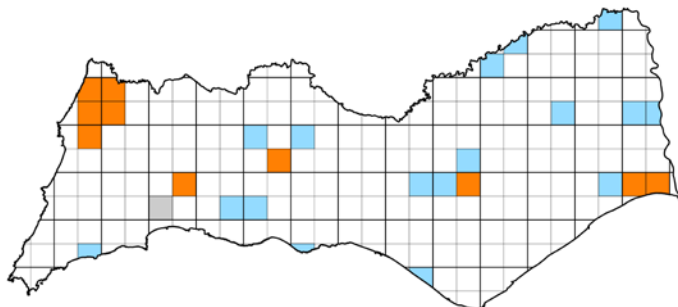
In 2012 and 2013, I searched for *D. lefebvrii* exuviae. In 13 ponds and small reservoirs, all of them artificial permanent lentic systems, the effort was successful. Also, in 2012 I found two exuviae in a slow flowing stretch of a seasonal stream (Ribeira das Alfambras), still a lentic system. This is an unusual reproductive habitat for this species, but the 2011-2012 rainy season was almost dry and no extrapolation can be made from the occurrence, even if adults have occasionally been observed in similar lotic systems. Looking at the distribution map of the species, it appears that *D. lefebvrii* completes its life cycle widely in Algarve. To the one square drawn after the survey of LOHR (2005)² nine more squares were added after the surveys that I conducted. Besides the exuviae, I searched for adults, and collected a few available data based on other sources. The distribution of the species on the wing was further enlarged, and from

(19) FERREIRA, S. & J.M. GROSSO-SILVA (2006) On the Dragonflies of Portugal - Study of a collection from the 1980s (Insecta, Odonata). *Boletín de la Asociación española de Entomología*, 30(3/4): 11-23.

(20) GARDINER, A.J. & P. STURGESS (1995) Dragonflies on Quinta da Rocha in 1994. In: *A Rocha Observatory Report for the Year 1994*: 50-53. A Rocha Trust, Portimão.

the six squares provided by published data (five only with adults and one with exuviae and adults) it was updated to 27 squares (17 only with adults and 10 with exuviae and adults).

Figure 8. Distribution of *Diplacodes lefebvrii* in Algarve (5 km side squares grid)



Orange squares: adults and exuviae - new data from Ribeira das Alfambras, from ponds near Almarjão, Bemparece, Carrascalinho, Serominheiro, Vale Fuzeiros, Sesmarias, Cova da Muda, Ribeira do Álamo and Aldeia Nova (brackish pond), from lago 14, lago pequeno, lago grande and lago grande W (Morgado do Reguengo Golf), and from Barragem de Vale de Boi, Barragem dos Álamos, Barragem de Vale do Asno and Barragem da Arrancadinha, 2011 to 2013; data by LOHR (2005)² from ponds near Maria Vinagre (where exuviae were found), 2003; by DE KNIJF & DEMOLDER (2010)³ from ponds near Bemparece, Piegões and Vale Fuzeiros, 2008.

Blue squares: adults - new data from Parque Municipal do Sítio das Fontes de Estômbar and Lago de São Lourenço (Quinta do Lago), from ponds near Pedra Alva, Javali, Castelhanos and Bentos, from Barragem da Boiça and Barragem do Pessegueiro, and from Ribeira de Algre, 2011 to 2013; data by FERREIRA & GROSSO-SILVA 2006)¹⁹ from a pond near Odeleite, 1985; by DE KNIJF & DEMOLDER (2010)³ from a pond near São Bartolomeu de Messines, 2008; by Helder Conceição (photograph posted in Flickr) from Mata da Conceição de Tavira, 2009; by José Viana (photograph posted in Flickr) from Lago de São Lourenço (Quinta do Lago), 2010; by Tom Kompier (photograph posted in Biodiversity4All.org) from a pond near Alcaria, 2010; by Dinis Cortes (pers. comm.) from Praia do Evaristo, 2011; by Florian Weihrauch (pers. comm.) from Ribeira do Vascão, near the bridge of the N122/IC27, 2006; by Guillaume Réthoré (pers. comm.) from a pond near Alcaria, 2013; by Martin Hodges (pers. comm.) from Paul de Budens, 2011; by Nelson Fonseca (pers. comm.) from Silves Golf, 2010 to 2012, and a pond near Açor, 2012.

Grey square: data by GARDINER & STURGESS (1995)²⁰, GARDINER & WALLIS (1996)²¹ and JONES (1996)²² from Quinta da Rocha, 1994 and 1995.

Brachythemis impartita

Successful breeding of *Brachythemis impartita* (Karsch, 1890) in Algarve is reported here for the first time. Adults were found and exuviae were collected in Barragem do Morgado do Reguengo in 2012 and 2013. A few adults were observed in the proximities of Vilamoura, as well as in the brackish pond of Aldeia Nova where I unsuccessfully tried to find exuviae. The species was firstly reported from

Algarve by GARDINER (1997)⁷, but as *B. leucosticta*. Meanwhile the occurrence of an enormous population of *B. impartita* in the margins of the Barragem do Alqueva is known, where DE KNIJF & DEMOLDER (2010)³ counted more than 10,000 adults in 2008. Another population was recently observed in the margins of the Barragem da Mina de São Domingos, both in Alentejo.

Figure 9. Distribution of *Brachythemis impartita* in Algarve (5 km side squares grid)



Orange square: adults and exuviae - new data from Barragem do Morgado do Reguengo (Morgado do Reguengo Golf), 2012 and 2013.

Blue squares: adults - new data from Vilamoura, 2011, and from Aldeia Nova (brackish pond), 2013; by Guillaume Réthoré (pers. comm.) from Vilamoura, 2013.

Grey square: data by GARDINER (1997)⁷.

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Crocothemis erythraea (foto: Enrique Calzado)