Summer odonata in the river Guadaiza, Malaga, (Spain)

Odonatos estivales en el río Guadaiza, Málaga, (Spain)

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The river Guadaiza runs from north to south along 20 km through the central area of the range Sierra Bermeja, in the province of Malaga (Spain), before it flows into the Mediterranean. This river has substantial differences between the upper-middle courses, and the lower one. Thus the upper two thirds of Guadaiza belong to the range Sierra Bermeja and are in an excellent state of conservation regarding to water quality and the ecosystems that accompany the river, while the lower course goes into a flat area under a high human activity (Costa del Sol), that causes among other problems a marked summer hydric stress.

Between July and September of 2013 several samplings were carried out in the river Guadaiza in search of summer species of dragonflies, with the aim of get an approximation to the diversity and abundance of these insects in the river.

Various sections of the middle and lower reaches were sampled throughout its banks and the surrounding areas, wherever the vegetation permitted it (dry meanders, paths and trails, abandoned crops, etc.). The samples were divided in 4 areas, (Fig.1).

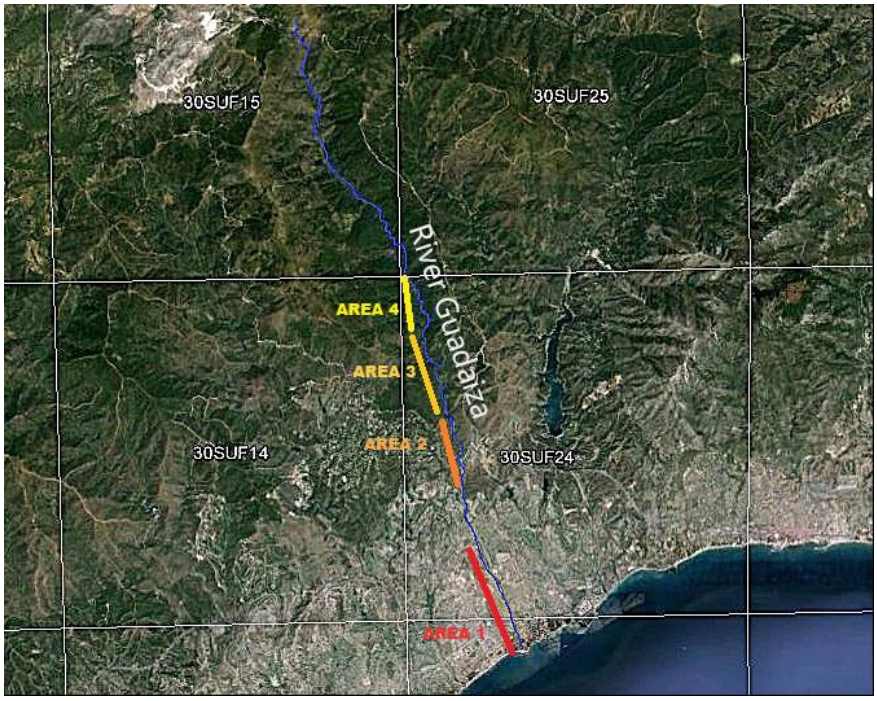

Figure 1. Sampling areas in river Guadaiza, summer 2013. (Source: Google Earth)
Figura 1. Zonas de muestreo en el río Guadaiza, verano de 2013.

Area 1: Final section of the lower reaches, UTM's: UF23, UF24, altitude 0-50 masl. Zone between the mouth of the river and the urban nucleus of La Campana (Marbella). In the whole lower course, the Guadaiza was subjected to channeling works in the 90s. In the margins of the river a thick willow grove of young Salix pedicellata with Nerium oleander and Tamarix africana has developed again. There is an increasingly frequent occurrence of alien species with strong invasive character such as Acacia saligna, Ricinus communis, Eucalyptus camaldulensis and Washingtonia filifera. This area is part of a broad alluvial plain that has traditionally been subject of agricultural holding, and today it's under high urban pressure. The plain is constituted by alluvial and colluvial deposits over which calcareous, eutric and vertic soils develop (GÓMEZ ZOTANO, 2006; CASTILLO, 2012). Hydric stress during the summer is highly severe due to the inter-basin water transfer towards the river Río Verde and the water intakes for irrigation.

Area 2: Final section of the middle reaches of the river, UTM: UF24, altitude 97-131 masl. Zone between the urbanization of La Quinta and the dike of the Guadaiza reservoir. It has not undergone channeling works, so the original riparian vegetation is well preserved, with a mature willow grove occupying the banks of the river of Salix pedicellata with Nerium oleander, Tamarix africana and Quercus faginea. Invasives species Acacia saligna and Ricinus communis increase their presence each year. Although the river continues its course over alluvial and

colluvial deposits, in this section begins the typical boxing-in of the rivers' valleys in Sierra Bermeja. The geology of the increasingly steep hillsides is composed by the characteristics peridotites and serpentines of this range. An autochthonous pine forest of Pinus pinaster develops over them. Water stress due to anthropogenic causes, though less severe than in zone 1 because there are no irrigation intakes until reaching La Quinta, remains important due to the water transfer to river Río Verde.

Area 3: Second tranche of the middle reaches of the the river, UTM: UF24, altitude 131-239 masl. Area that occupies from the dike of Guadaiza dam to the final point of the tranche, located 3300 meters upstream. This area includes the reservoir of Guadaiza, from whose head the river presents an excellent condition with mature willow groves of Salix pedicellata surrounded by well developed mature forests of Pinus pinaster, Quercus faginea, Quercus suber and Quercus canariensis. The valley here is developed mainly over gneisses, schists, phyllites and quartzites, after passing through a zone of peridotites and serpentines (GÓMEZ ZOTANO, 2006; CASTILLO, 2012). Hydric stress in this area is the typical one of the Mediterranean climate, with not anthropogenic factors that aggravates it (CASTILLO, 2012). The water quality is excellent.

Area 4: Third sampled section in the middle reaches of the river, UTM: UF24, altitude 248-294 masl. Includes the vicinity of so known as Cortijo de La Máquina, in the heart of the Guadaiza Valley. It shares botanical and geological features with area 3, with mature Mediterranean forests developing on the slopes of the valley, mainly over gneisses and micaschists, and with a willow grove of Salix pedicellata, oleander, tamarisk and andalusian oaks growing along the banks of the river. There is also a small and abandoned citrus plantation. Hydric stress during summer is the typical of the Mediterranean climate and water quality is excellent due to the total absence of inhabited areas in the whole valley.

As a result of samplings the following species were found:

Calopteryx haemorrhoidalis (Vander Linden, 1825): Area (1), 21-09-13: 8 ♂, 5 ♀, 3 exuviae. Area (2), 10-07-13: 23 ♂, 19 ♀, 7 exuviae. Area (3), 07-07-13: 15 ♂, 10 ♀.10-07-13: 18 ♂, 16 ♀. 17-07-13: 16 ♂, 12 ♀. 27-07-13: 19 ♂, 14 ♀. Area (4), 10-08-13: 7 ♂, 10 ♀, 3 exuviae.
Lestes viridis (Vander Linden, 1825): Area (4), 10-08-13: 1 ♂.
Ischnura graellsii (Rambur, 1842): Area (1), 21-09-13: 12 ♂, 10 ♀ Zona (3),10-07-13: 4 ♂, 2 ♀.
Ischnura pumilio (Charpentier, 1825): Area (1), 21-09-13: 4♂, 2♀.
Enallagma cyathigerum (Charpentier, 1840): Area (3), 10-07-13: 3 ♂, 5 ♀.
Erythromma lindenii (Selys, 1840): Area (2), 10-07-13: 6 ♂, 1 ♀.
Platycnemis acutipennis (Selys, 1841): Area (3), 07-07-13: 3 ♂, 5 ♀.10-07-13: 6 ♂, 3 ♀. 17-07-13: 2 ♂, 1 ♀. 27-07-13: 5 ♂, 3 ♀.

Platycnemis latipes (Rambur, 1842) : Area (2), 10-07-13: 12 ♂, 14 ♀. Area (3), 07-07-13: 10 ♂, 9 ♀.10-07-13: 12 ♂, 14 ♀. 17-07-13: 8 ♂, 6 ♀. 27-07-13: 9 ♂, 7 ♀. Area (4), 10-08-13: 4 ♂, 4 ♀.
Aeshna mixta (Latreille, 1805): Area (3), 18-09-13: 2 ♂.
Anax imperator (Leach, 1815): Area (1), 21-09-13: 6 ♂, 2♀, 5 exuviae. Area (2), 10-07-13: 3 ♂, 1 ♀. Zona (3), 07-07-13: 2 ♂, 2 ♀.10-07-13: 4 ♂, 1 ♀. 17-07-13: 1 ♂. 27-07-13: 2 ♂, 1 ♀. Zona (4), 10-08-13: 5 ♂, 2 ♀.
Boyeria irene (Fonscolombe, 1838): Area (3), 10-07-13: 2 ♂, 1 ♀, 4 exuviae. 17-07-13: 1♂, 1♀. 27-07-13: 2♂, 1♀, and 12 exuviae. Area (4), 10-08-13: 1♀, 26 exuviae.
Gomphus graslinii (Rambur, 1842): Area (3),10-07-13: 1 ♂. 27-07-13: 1 exuvia.
Onychogomphus forcipatus ssp. unguinulatus (Linnaeus, 1758): Area (2), 10-07-13: 3 ♂. Area (3), 07-07-13: 7 ♂.10-07-13: 13 ♂, 2 exuviae. 17-07-13: 8♂. 27-07-13: 13♂, 2 ♀. 1 exuvia.
Onycogomphus uncatus (Charpentier, 1840): Area (3), 07-07-13: 5 ♂.10-07-13: 10 ♂, 5 exuviae. 17-07-13: 10♂, 1♀. 27-07-13: 6♂, 8 exuviae. Area (4), 10-08-13: 7 ♂, 1♀, and 6 exuviae.
Cordulegaster boltonii (Donovan, 1807): Area (3), 10-08-13: several exuviae. Area (4), 10-08-13: 1 exuvia.
Macromia splendens (Pictet, 1843): Area (3), 27-07-13: 3 exuviae.
Oxygastra curtisii (Dale, 1834): Area (3), 27-07-13: 2 exuviae.
Orthetrum chrysostigma (Burmeister, 1839): Area (1), 21-09-13: 8 ♂, 5 ♀. Area (2), 10-07-13: 1 ♂. Area (3),10-07-13: 2 ♂.
Orthetrum coerulescens (Fabricius, 1798): Area (4), 10-08-13: 1 ♂.
Crocothemis erythraea (Brullé, 1832): Area (2), 10-07-13: 1 ♂. Area (3),10-07-13: 1 ♂.
Trithemis kirbyi (Selys, 1891): Area (3), 10-07-13: 1 ♀.
Trithemis annulata (Palisot de Beauvois, 1807): Area (3),10-07-13: 1 ♀.
Zygonyx torridus (Kirby, 1889): Area (1), 21-09-13: 3 ♂. Area (2), 10-07-13: 6 ♂, 3 ♀. Area (3), 07-07-13: 14 ♂, 12 ♀.10-07-13: 23 ♂, 20 ♀. 17-07-13: 19 ♂, 18 ♀. 27-07-13: 19 ♂, 14 ♀. Area (4),10-08-13: 6 ♂, 3 ♀.

From the results of the samplings stands out that Macromia splendens (CR), Zygonyx torridus (VU), Gomphus graslinii (EN) and Oxygastra curtisii (EN)1 breed in the river.

The Ethiopic element Zygonyx torridus appear as a particularly abundant species during the summer, with numerous adult specimens patrolling their territories along the river (Fig.2), especially over the rapids where the course becomes faster and more rugged. Some specimens of this species were identified in the lower course, less than one kilometer from the mouth, where the summer hydric stress is accused because course diversions and irrigation intakes.

[1] Level of threat of these species in Spain (CR: Critically Endangered; EN: Endangered; VU: vulnerable).

Figure 2. Zygonyx torridus (Kirby, 1889) patrolling its territory in area 3, July 17, 2013.
Figura 2. Zygonyx torridus (Kirby, 1889) patrullando su territorio en la zona 3, (17-07-13)

The other three species were located only in the middle reaches, already beyond the Guadaiza dam, where the conservation of ecosystems associated with the river and with valley forests is much higher. Only one adult male of Gomphus graslinii was sighted during the samplings (Fig. 3), the rest of records of these three taxa of spring emergence are exuviae.

Figure 3. Male of Gomphus graslinii (Rambur, 1842) in area 3 on July 10, 2013
Figura 3. Macho de Gomphus graslinii (Rambur, 1842) en la zona 3, (10-07-13)

For both Gomphus graslinii and Oxygastra curtisii these would be their first record in Guadaiza (PRUNIER et al., 2013; MORENO-BENITEZ et

al, 2013). Therefore this river becomes a new location for these two protected species. They breed here along with critically endangered species Macromia splendens recorded for the first time in the river in 2012 (GAVIRA & CARRASCO, 2012) and found again during our samplings in 2013. This way the Guadaiza turns out to be the 12th river of Andalusia where is known so far that these 3 species coexist (JIMÉNEZ, 2013).

It should be noted that these records correspond to sampling during the months of July, August and September and only in the middle and lower courses of the river. Therefore the reflected diversity in the present text most likely would rise with the expansion of sampling to the rest of the year and the entire basin.

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