Monitoring the invasion of the aquatic bug *Trichocorixa verticalis verticalis* (Fieber, 1851) in Doñana (SW Spain)

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Photo: Alexandre Portheault

Introduction:

Trichocorixa v. verticalis is a small corixid (< 5.5 mm) (Heteroptera) originally distributed in North America and Caribbean islands, presently occurring as exotic species in South Africa, New Caledonia, Mali, Portugal and Spain. Although it usually inhabits brackish and saline water bodies, this species is a euryhaline insect which may colonize a broad range of waters.
In Southern Spain it was firstly cited in Sanlúcar de Barrameda saltpans (Cádiz, Günther 2004), and later within Doñana National Park boundaries (Millán et al., 2005). It has been also cited in Algarve (Sala & Boix 205)
In this study we report the presence of *Trichocorixa verticalis verticalis* and its coexistence with other native corixids in Doñana National Park
The establishment of this exotic species may be considered to threaten natural macroinvertebres community, and especially to native corixid species. Different phases and intensity of invasion have been detected along different wetlands of the area.

Area of study:

Doñana National Park holds a great wealth of waterbodies, both natural and human made. The largest extension of water conforms the temporary marshes (up to 27,000 Ha in a high flooding season). Also in the area is possible to find large permanent artificial ponds dedicated to fishfarming or small ponds for cattle (zacallones). Furthermore Doñana National Park preserves a large network of temporary ponds. More than 3000 ponds have been identified at a time of a large inundation event (Gómez-Rodríguez, unpublished data). The largest pond densities occur in the contact area between semi-stabilized dunes and stabilized sands (>100 water bodies per km^2) while lowest densities are found in the west of the Park and in the mobile dunes. Flooding regime of temporary ponds and marshes is highly variable among years depending on rainfall pattern and quantity.

Table 1. Number of sampled ponds sorted by corixid species

	2006 (n=74)	2007 (n=95)
Trichocorixa verticalis	21	18
Paracorixa concinna	0	4
Sigara lateralis	13	50
Sigara stagnalis	2	23
Sigara scripta	4	16
Sigara selecta	0	4
Micronecta scholzi	0	5
Corixa affinis	25	78
Without Corixids	24	11

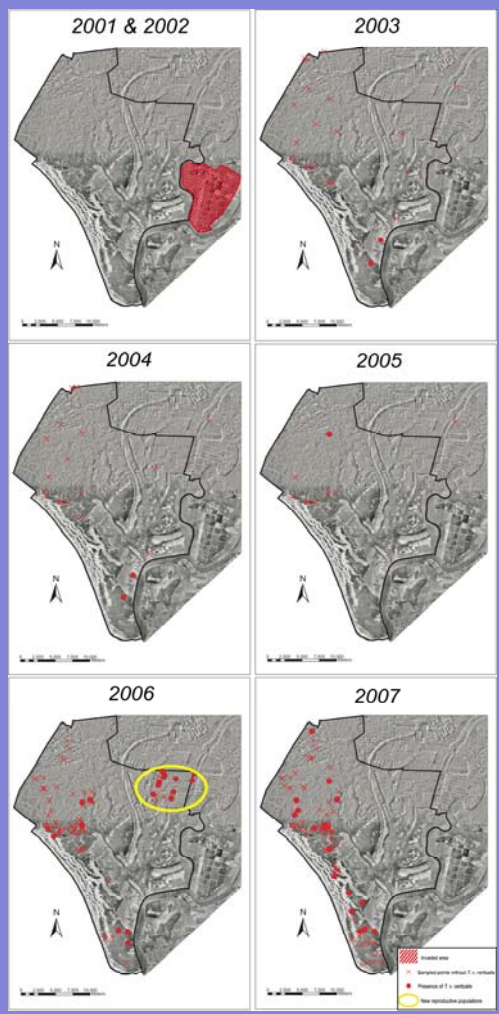


Fig 1. Maps show the evolution of the invasion of *T. v. verticalis*

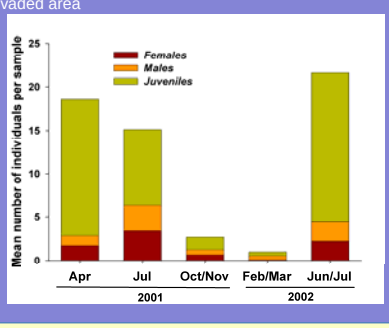
Methods:

From 2001 to 2007, within the framework of several research projects, we have been collecting samples from several sampling points in Doñana National Park and its surroundings by using different methodologies depending on the aims of the projects. All sampling points were pinpointed via GPS.
In 2001 and 2002 we sampled in Veta la Palma estate every three months. This state, located outside Doñana National Park, is a fish farm with 3,000 Ha flooded, divided in large artificial ponds with semipermanent flooding regime. We used a quantitative sampling methodology: A PVC pipe section of 20 cm diameter was inserted into the mud to isolate the water within. Using a plastic jar, all the water was then scooped out and sieved through a 250 μm mesh, taking care not to extract sediments. The sieved material was then fixed with formalin. Samples were later identified and quantified under a microscope.
2003, 2004 and 2005 samples were provided by the Doñana Biological Reserve Natural Processes Monitoring Team (Equipo de Seguimiento de Procesos Naturales de la Reserva Biológica de Doñana-CSIC), including samples from the marshland, natural temporary ponds and permanent artificial ponds. They used both traps (5 mm mesh size) and a dip net (1 mm mesh size) for sampling. Samples, preserved in ethanol (70%), were sorted and counted under a microscope at the lab. We used these data qualitatively, only to detect the presence of *T. v. verticalis*.
Finally, we sampled in 2006 and 2007 with a dip net (1mm mesh size) in natural temporary ponds and artificial permament ponds in Doñana National Park. All captured corixids were retrieved and fixed with ethanol (70%), except *Corixa affinis* in order to its largest size, and identified with a microscope at the lab.

Table 2. Percentages of presence of each corixid species recorded in the ponds where *T. v. verticalis* occurred in 2007. (*Corixa affinis* excluded)

	Sigara lateralis %	*Sigara stagnalis* %	*Sigara scripta* %	*Sigara selecta* %	*Trichocorixa verticalis* %	*Micronecta scholzi* %	# total corixids
Caño Arenilla	50	0	25	0	25	0	8
Laguna Estratificada	67	0	0	0	33	0	3
Zacallón Malvón	29	53	18	0	3	0	31
Zacallón de la Angostura	33	0	0	0	67	0	3
Puntal de Zalabar	25	31	31	0	13	0	16
Laguna Larga o del Carrizal	60	39	0	0	1	0	277
Carril al norte Sombrete	0	0	0	0	100	0	1
Zacallón poco salinos	90	2	6	0	4	0	300
Nevazo de la Higuera	88	8	3	0	3	1	78
Camino de Martinazo	60	0	0	0	20	0	5
Orión	0	0	0	0	100	0	1
Poil	25	25	0	0	50	50	4
Moral	0	0	0	0	100	0	1
JIM	75	0	0	0	25	0	4
Caño Martinazo	0	0	0	50	50	0	2
Nevazo del Toro	0	0	0	0	100	0	1
Raya Pinar	0	0	0	0	100	0	1
Laña	78	6	6	0	11	0	18

Fig 2. Seasonal abundances of *T. v. verticalis* in an invaded area



Results and Discussion:

We have found an increase in the occurrence of *T. v. verticalis* since 2001 (Fig 1). We also recorded different status of invasion in the area, for example the area sampled in 2001 and 2002 is neatly invaded and holds reproductive populations. In this area *T. v. verticalis* has outcompeted the native species of corixids, and it occurred in percentages over 75% of presence. We have found a similar pattern in 2006 in the area where we detected reproductive population (Fig 1). It is remarkable that this area is a recovered area where several shallow temporary ponds have been constructed recently.
The Fig 2 shows the population dynamic of this species in the area sampled in 2001 and 2002 (Veta la Palma estate), with population peaks occurring in spring and early summer.
On the other hand at the other points where *T. v. verticalis* was detected, we only were able to detect adults. These individuals are probably vagrant coming from the adjacent reproductive populations. *T. v. verticalis* has been detected coexisting with other six species of corixids. In any case this exotic species was more likely to be found than the less common native corixid species *(Sigara scripta, Sigara stagnallis* and *Sigara selecta,* Table 1 and 2).
It is also remarkable that *T. v. verticalis* has not been already recorded in the marshes, although at the end of the flooding season it is brackish.
In conclusion, the presence of *T. v. verticalis* is a real menace for biodiversity conservation in the area. The reproductive populations are sources of vagrant individuals that could establish new population in ponds where it does not exit yet. Moreover if it is considered that these reproductive populations outcompete native corixids as we found.

References:
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