

Crangonyx pseudogracilis Bousfield, 1958 – the first alien amphipod crustacean in freshwaters of Iberian Peninsula (Portugal)

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ABSTRACT

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Crangonyx pseudogracilis, a North American crangonyctid amphipod, was found in a stream of Santarém District (Portugal) in September 2011. It is the first record of this species from the Iberian Peninsula. Exact time, mode of introduction and distribution of *C. pseudogracilis* in the area remain unknown. So far its occurrence was reported only from several countries in north-western Europe. A short overview upon the species general distribution, ecology and invasive potential is provided.

RÉSUMÉ

Crangonyx pseudogracilis Bousfield, 1958 – le premier crustacé amphipode non-natif dans les eaux douces de la péninsule ibérique (Portugal)

Mots-clés :
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Crangonyx pseudogracilis, un amphipode crangonyctid d'Amérique du Nord, a été trouvé dans un ruisseau du district de Santarém (Portugal) en Septembre 2011. Il est le premier enregistrement de cette espèce dans la péninsule ibérique. La date et le mode d'introduction et la répartition de *C. pseudogracilis* dans la région restent inconnus. Jusqu'ici, sa présence n'a été signalée que dans plusieurs pays du nord-ouest de l'Europe. Un bref aperçu sur la distribution de l'espèce, l'écologie et son potentiel invasif est fourni.

The genus *Crangonyx* groups nearly 50 species, of which 42 are native and primarily endemic to North America (Zhang and Holsinger, 2003; Väinölä *et al.*, 2008). *Crangonyx pseudogracilis* Bousfield, 1958 has the widest geographic distribution among all congeneric species. According to Zhang and Holsinger (2003) it occurs west of the Appalachian Mountains, from the Great Lakes in the north to Louisiana and Texas in the south. Some isolated populations, very similar in morphological terms, were found also in Arizona and Nevada yet their taxonomic status remains obscure. In the native area, *C. pseudogracilis* inhabits a wide range of surface freshwater habitats, including among others: streams, rivers, swamps, ponds and

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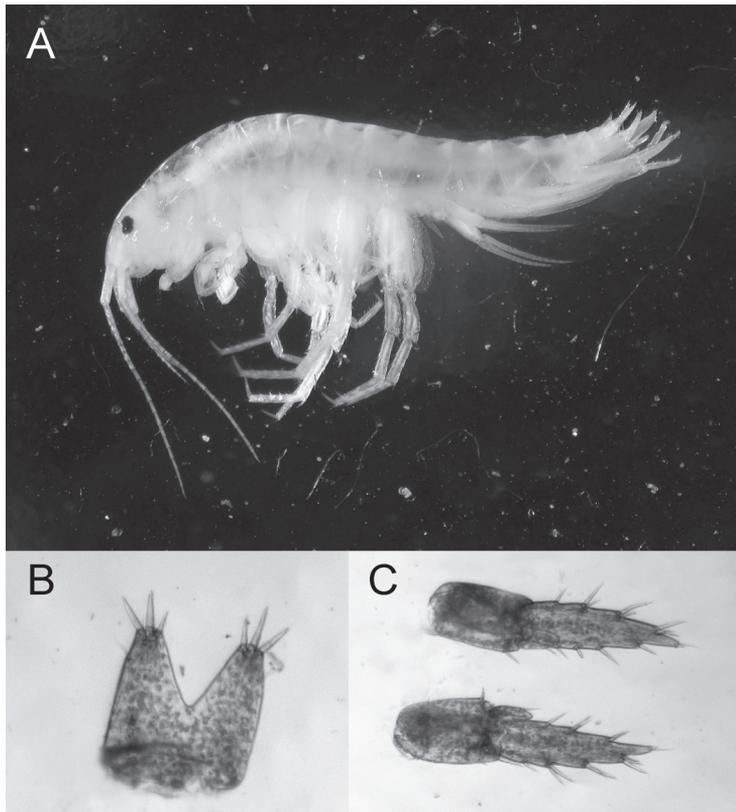


Figure 1

Crangonyx pseudogracilis found in Santarém District, Portugal. A – habitus, B – telson, C – uropods III (Photographs by M. Grabowski).

lakes; a few populations are known also from caves (Holsinger, 1976; Zhang and Holsinger, 2003).

During the 1930s, Crawford (1937) and Tattersal (1937) found the species in England, in the vicinity of London, and identified it as *Eucrangonyx gracilis* (Smith, 1871). Until the 1990s, *C. pseudogracilis* has spread widely through the navigable canals in the British Islands, occurring in numerous localities in England, Wales and north-eastern Scotland (Gledhill *et al.*, 1993). In the 1970s it was found near Dublin in Ireland (Holmes, 1975), where it has also spread, reaching Northern Ireland in the mid-1980s (Dick *et al.*, 1999). In the late 1970s and in the 1980s it was found in the Netherlands and in Belgium (Pinkster *et al.*, 1980; Martin, 1986). Later on, it has spread throughout north-western Europe, occurring now from the Mosel and Rhine to the German Danube; on the Scandinavian Peninsula it reaches east to Finland (Silfverberg, 1999; Tittizer *et al.*, 2000; Bernerth and Stein, 2003; Berthold and Kaiser, 2004). Until now, the species has not been reported from Central and Eastern Europe nor from the Mediterranean region including the Iberian Peninsula. So far, nothing is known about the pathways and vectors of the species spread and introductions. Zhang and Holsinger (2003) hypothesised that it may have been introduced to Europe with ballast waters and that its spread may be related to the presence of artificial canals and transportation of live fish and/or aquatic plants.

In September and October 2011, an abundant population of *C. pseudogracilis* (Figure 1) was unexpectedly found by the junior authors in a small stream near the town of Granho, Santarém district, in Portugal (39.096622°, -8.641719°). The location of the sampling site is shown on Figure 2A. The sample was taken from an area of approximately 2 m², with a benthic hand-net (equilateral triangle, 30 cm wide, with a 900 µm mesh size), from a slowly flowing stream with muddy bottom and very rich aquatic vegetation (Figure 2B). The vegetation cover of the

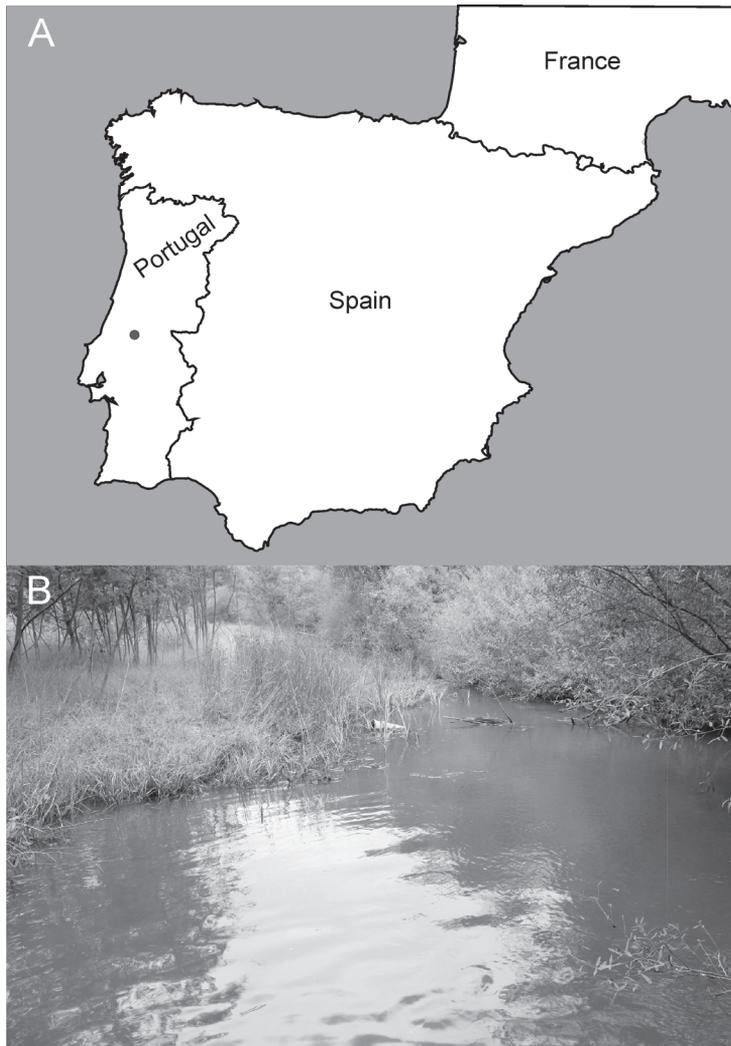


Figure 2

First record of *Crangonyx pseudogracilis* found in the Iberian Peninsula. A – location of the sampling site, B – sampling site (Photograph by M. Rachalewski).

riverbank consisted of *Cynodon dactylon* and *Salix atrocinerea* and in the shallow water we found *Cyperus longus* and *C. eragrostis* and *Scirpus lacustris*. Basic physicochemical parameters of the water were measured, including temperature (13.1 °C), conductivity (245 $\mu\text{S}\cdot\text{cm}^{-1}$), pH (6.92) and saturation with oxygen (10.26 $\text{mg}\cdot\text{L}^{-1}$, 96.4%). Among the 340 individuals gathered, the majority was found among roots of *Scirpus lacustris*. The animals were fixed in 98% ethanol and identified to the species level, based on the features provided by Zhang and Hoslinger (2003). *Crangonyx pseudogracilis* was the only amphipod found at the site. The reference samples are stored in the institutional collections kept by the authors.

The conditions in which *C. pseudogracilis* has been found in Portugal, fit within the wide range of its habitats in Europe, that includes almost all kind of inland waterbodies, clean and polluted, fresh- or even brackish waters (Martin and Holdich, 1986; Pinkster *et al.*, 1992). The biology of this alien crangonyctid in Europe was studied by Hynes (1955), Sutcliffe and Carrick (1981), Pinkster and Platvoet (1983) and Dick *et al.* (1998, 1999). According to these authors, *C. pseudogracilis* is reproducing throughout the year with peaks of breeding activity in spring and late summer. In opposition to gammarids, males of *C. pseudogracilis* are much smaller

than females (respectively 3–4 mm and up to 11 mm). Crangonyctids do not form precopulatory pairs. After copulation, eggs are laid into the broodpouch. The average brood size is 33 eggs, with a maximum of 108. Depending on temperature, the young hatch after 7 to 65 days. They reach maturity after two-three months and may live up to two years. During that time, the female is able to produce up to 8 broods. Kirkpatrick *et al.* (2006) suggested the use of this species as an “early warning indicator” in the Multispecies Freshwater Biomonitor (MFB) of water quality. Slothouber Galbreath *et al.* (2004, 2010) reported that *C. pseudogracilis* was introduced to Europe with its microsporidian parasite. The pathogen is vertically transmitted and has a feminizing effect on infected animals causing overproduction of female offspring. According to the above mentioned authors such manipulation may in fact promote population growth.

MacNeil *et al.* (1999) showed that *C. pseudogracilis* suffers heavy intraguild predation from European *Gammarus* species, due to its relatively small body size. However, mean brood size and breeding potential is higher in *C. pseudogracilis* than in several native European freshwater gammarids (Hynes, 1955; Pinkster *et al.*, 1992; Guerao, 2003; Grabowski *et al.* 2007), which may compensate for the predation pressure. Concluding, the species has large invasive potential, particularly in warm and relatively polluted waters of the Iberian Peninsula. The epigeal amphipod freshwater fauna of the Iberian Peninsula has not been thoroughly studied, yet its high level of endemism is already known (Pinkster, 1993; Väinölä *et al.*, 2008). Being the first amphipod invader in inland waters of the Iberian Peninsula, *C. pseudogracilis* may pose a serious threat to local species, such as *Echinogammarus lusitanus* (Schellenberg, 1943) or *E. meridionalis* Pinkster, 1973 – endemics occurring in Portuguese lowland streams (Pinkster, 1993). Thus, further studies upon the species dispersal ability, ecology, interaction with local amphipods and other freshwater macroinvertebrates are highly required.

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