

***Dikerogammarus villosus* (Sowinsky, 1894) (Crustacea, Amphipoda) colonizes next alpine lake – Lac du Bourget, France**

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Abstract

Dikerogammarus villosus has been recorded for the first time in the alpine lake – Lac du Bourget, French Alps. Low abundance of the alien species in gathered samples suggests that the colonization is just in its initial stage. Two native gammarid species: *Gammarus fossarum* (Koch, 1835) and *G. pulex* (Linnaeus, 1758) are still present in the lake. The invader has most probably reached the lake through the Canal de Savières joining the lake to the Rhone River in which it has been already present since late 1990s.

Key words: *Dikerogammarus villosus*, biological invasions, alien species, alpine lakes

Dikerogammarus villosus (Figure 1) has been naturally distributed in the lower courses of large rivers in the Black and Caspian Sea basins (Mordukhai-Boltovskoi 1969). From there it has spread to Western Europe through the southern and central migration corridors used by several other Ponto-Caspian hydrobionts (Bij de Vaate et al. 2002, Grabowski et al. 2007). The species has extended its range very rapidly. Outside its natural area of distribution, it was found first in the upper Danube in 1992 (Nesemann et al. 1995) and soon after, it was recorded in high abundance in the lower Rhine River from where it has spread throughout many other European countries (Bij de Vaate and Klink 1995, Bij de Vaate et al. 2002). In 2003 this species was also



Figure 1. *Dikerogammarus villosus* (specimen preserved in EtOH, Photograph by Michał Grabowski)

discovered in the Bug River in Poland (Konopacka 2004), where it migrated along the central migration corridor, through the Pripet-Bug connection.

In 1997, it was recorded for the first time in the French inland waters, in the Saone River (Devin et al. 2001, Bollache 2003), and in 1998 it was found also in the Rhone and Meuse rivers. Most probably from the Rhone system it was introduced to several alpine lakes: Lake Léman in 2002 (Bollache 2004), Lake Neuchâtel (2003), Lake Bienné (2005), Lake Morat (2006) and in Lake Zürich (2006) (Lods-Crozet and Reymond 2006, Steinmann et al. 2006). In 2003, it was recorded for the first time in Lake Garda in Italian Alps (Casellato et al. 2006).

On August 1st, 2007 we have sampled two sites (Figure 2) on Lac du Bourget in Savoie department on the outskirts of French Alps, on the mean altitude of some 231 m asl. It is one of the largest (surface of 44.5 km²) and deepest (mean depth 85 m, maximum depth 145 m) lakes of the country, formed during the Würm glaciation some 19,000 years ago. The lake is fed by the rivers Leysse, Tillet and Sierroz. It drains towards the river Rhône through the artificial canal de Savières. The lake is an important area for tourist activities (boating, thermal baths in Aix-les-Bains) and undergoes eutrophication.

Our first sampling point (Figure 3) was a tourist village of Chatillon on the north-western shore of the lake few kilometers from the entrance of the Savières canal. The sample was taken with the standard hydrobiological hand-net from the shallow littoral of the lake (depth 25-50 cm) composed of stones overgrown with algae and zebra mussel colonies. The amphipod community composed of the alien *Dikerogammarus villosus* and native *Gammarus fossarum* (Koch, 1835). The newcomer clearly dominated in abundance over the local species.

The second sampling point (Figure 4) was located in yacht marina of Aix-les-Bains, a town on the south-eastern shore of the lake, near the mouth of a Sierroz River flowing to the lake. Sample was taken with the same method and from the same substrate as previously. Besides the above two species, another native – *Gammarus pulex* (Linnaeus, 1758) was found in the place. Abundance of the alien species was very low and the site was clearly dominated by the natives.

Relatively high abundance of *D. villosus* in the sampling site near the entrance of the Savières canal joining the lake to the Rhone

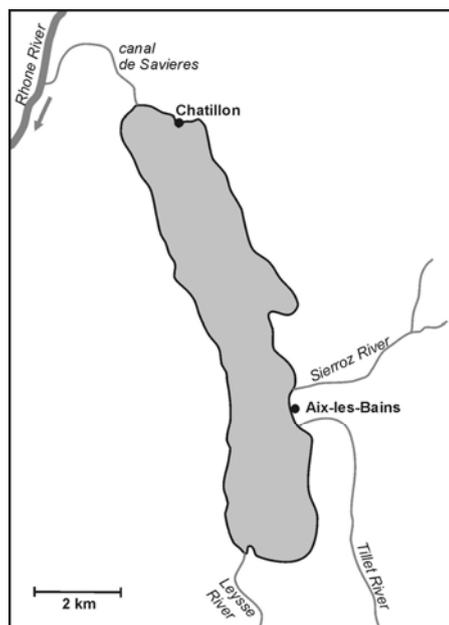


Figure 2. Lac du Bourget (France) with sampling localities



Figure 3. Sampling site in Chatillon. Photograph by Michał Grabowski



Figure 4. Sampling site in Aix-les-Bains. Photograph by Michał Grabowski

River contrasting with very low abundance on the opposite side of the lake may suggest that colonization of this waterbody has began very recently. Knowing the high competitiveness of the species and its abilities of efficient eradication of local invertebrate fauna (Devin et al. 2003, Dick and Platvoet 2000), we may expect a rapid and complete change in the composition of macroinvertebrate communities in the lake as it was observed in other freshwater systems (Van Riel et al. 2006).

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Annex

Records of amphipod species in Lac du Bourget, France.

Location	Record coordinates		Record date	Raw	Raw	Raw	Collectors
	Latitude, °N	Longitude, °E		abundance of <i>D. villosus</i>	abundance of <i>G. fossarum</i>	abundance of <i>G. pulex</i>	
Lac du Bourget in Chatillon	45.8000	5.8500	01.08.2007	116	40	-	Baçela, Grabowski, Wattier
Lac du Bourget in Aix-les-Bains	45.7000	5.9167	01.08.2007	4	89	2	Baçela, Grabowski, Wattier