Amphipoda

Dikerogammarus villosus Sowinsky (Crustacea: Gammaridae) a new immigrant in the Dutch part of the Lower Rhine.

[*Dikerogammarus villosus* Sowinsky (Crustacea: Gammaridae) eine neue Art für das Niederländische Teil des Unterrheins]

Abraham bij de Vaate und Alexander G. Klink

With 1 figure and 1 table

Schlagwörter: *Dikerogammarus*, Crustacea, Rhein, Einwanderer, Exoten

In 1994 and 1995 an exotic amphipod invader, *Dikerogammarus villosus* Sowinsky, was recorded in the Lower Rhine in The Netherlands. The species was found on a standardized artificial substrate (1994) and in small temporal backwaters after a flooding period (1995).

In den Jahren 1994 und 1995 ist das Vorkommen der Amphipode *Dikerogammarus villosus* Sowinsky im Unterrhein nachgewiesen. Dieser neue Einwanderer ist auf einem standardisierten künstlichen Substrat (1994) und in zeitweiligen Tümpeln im Vorland nach einer Hochwasserperiode (1995) gefunden worden.

1 Introduction

In the last decades species richness of macroinvertebrates in the Lower Rhine has been increased as result of water quality improvement (Van Urk & Bij de Vaate 1990; Van den Brink *et al.* 1990). However, this increase has not only been caused by the introduction of indigenous species like the mayfly *Ephoron virgo* (Bij de Vaate *et al.* 1992, but by the introduction of exotic species as well (Van den Brink *et al.* 1990; Bij de Vaate 1993). In 1990 exotic species even dominated the macroinvertebrate communities in the Dutch part of the Lower Rhine (Bij de Vaate & Greijdanus-Klaas 1993). The most important factors for the introduction of these immigrants are considered to be: the interconnection of navigable water systems, shipping, and changes in water chemistry and physics of the River Rhine. After the interconnection of water systems, animals are able to extend their territory by active migration or attached to the hulls of vessels. Intercontinental migration (a.o. *Corbicula fluminea*, *C. fluminalis*, *Rhithropanopeus harrisii*, *Gammarus tigrinus*) on the other hand, is mainly the result of transportation of animals in ballast water of seagoing vessels to interconnected water systems. By the increase of chloride concentration and water temperature in the River Rhine biotopes were created for thermophilous and brackish water macroinvertebrate species (Bij de Vaate 1993). Exotic crustaceans like *Gammarus tigrinus*, *G. zaddachi*, *Echinogammarus ischnus*, *Corophium curvispinum*, and *Atyaephyra desmaresti* were able to take advantage of higher water temperature and/or chloride concentration (Pinkster *et al.* 1992, Van den Brink *et al.* 1993[A], Van den Brink *et al.* 1993[B]). Of these species *C. curvispinum* and *E. ischnus* recently invaded the Lower Rhine; in 1987 and 1991 respectively (Van den Brink *et al.* 1989, Van den Brink *et al.* 1993[A]). In 1994 and 1995 a new exotic amphipod invader, *Dikerogammarus villosus* Sowinsky, has been recorded in the Lower Rhine in The Netherlands. First records of this species are described in this paper.

2 Methods

Macroinvertebrates from the River Rhine were sampled on a regurarly basis with a standardized artificial substrate, consisting of glass marbles (De Pauw *et al.* 1994). A handnet (0.5 mm mesh) was used to sample temporal backwaters.

3 Results and discussion

On May 30, 1994, one specimen of *Dikerogammarus villosus* was found for the first time in The Netherlands on a standardized artificial substrate after a four weeks colonization period in the River Rhine in the vicinity of Tolkamer near the German-Dutch border (Fig. 1). The next catch of 18 specimens of this species was on Februari 13, 1995 in four small temporal backwaters in the river foreland near Millingen a/d Rijn (Fig. 1). This area was flooded in the previous period as the result of an extremely high discharge of the River Rhine. Beside *D. villosus*, 11 other crustacean species were found in these backwaters (Table 1). Including *D. villosus*, seven of them are exotic species that invaded The Netherlands in this century. The catches of *C.* gr. *pseudogracilis* and *N. aquilex* are the first findings of both species in the Dutch part of the Lower Rhine. *N. aquilex* is a groundwater species. Tittizer & Schöll (1993) found specimens of both genera in core samples of the Rhine bottom in the German part of the river.

Species	N	Species	N
Gammarus pulex	2	*Niphargus aquilex*	2
G. roeseli	4	*Crangonyx* gr. *pseudogracilis**	3
*G. tigrinus**	252	*Asellus aquaticus*	6
*Chaetogammarus ischnus**	226	*Proasellus coxalis*	2
*Dikerogammarus villosus**	18	*Atyaephyra desmaresti**	12
*Corophium curvispinum**	148	*Rhithropanopeus harrisii**	1

Table 1. Crustacea found in four small temporal backwaters in the River Rhine foreland near Millingen on February 13, 1995, after an extremely high discharge of the River Rhine (N = number of specimens; * = exotic species).

D. villosus is one of the two indigenous *Dikerogammarus* species in the River Danube (Brtek & Rothschein 1964, Humpesch & Moog 1994). The other species, *D. haemobaphes*, was recently found in the River Main (Schleuter *et al.* 1994), one of the tributaries of the River Rhine. Colonization of the River Main was possible via the Main-Donau canal, opened for shipping in September 1992. In contrast to *D. villosus*, *D. haemobaphes* is a widely spread and dominant species in the Danube section between Kehlheim and Jochenstein, river km 2414-2202 (Tittizer *et al.* 1994). As the result of drift during flooding in both the River Main and the River Rhine, *D. haemobaphes* would be expected to be found in the downstream area of the River Rhine, and not *D. villosus*. However, from literature it could be concluded that *D. villosus* is a more salt tolerant species. The species was found in the Azov Sea and in the estuaries of rivers discharging into the Black Sea; *D. haemobaphes fluviatilis* is only reported from rivers in the Ponto-Caspian area (Dudich 1927, Cărăuşu *et al.* 1953). From this point of view, chloride concentration in the Lower Rhine should provide for a better environment for *D. villosus* in comparison with *D. haemobaphes fluviatilis*, which seems to be a freshwater species (Cărăuşu *et al.* 1953). Therefore further colonization the Lower Rhine and its estuary by *D. villosus* is expected in the near future.

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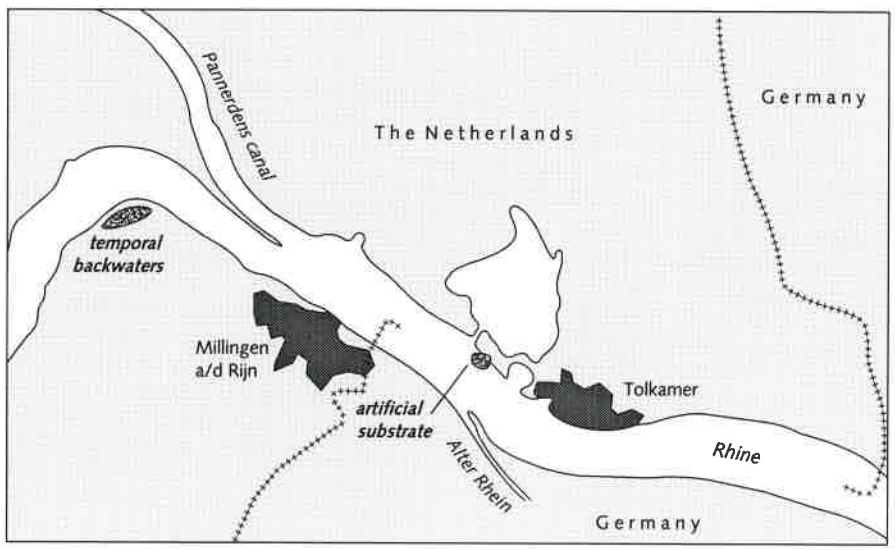
Figure 1. Locations (in italics) were *D. villosus* was found.


Germany
The Netherlands
Pannerdens Canal
temporal
backwaters
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a/d Rijn
artificial
substrate
Tolkamer
Rhine
Alter Rhein
Germany