

## *Dikerogammarus villosus* SOWINSKY (Crustacea: Gammaridae) a new immigrant in the Dutch part of the Lower Rhine

[*Dikerogammarus villosus* SOWINSKY (Crustacea: Gammaridae) ein Neueinwanderer im niederländischen Teil des Rheins]

Abraham bij de Vaate and Alexander G. Klink

Mit 1 Abbildung und 1 Tabelle

**Schlagwörter:** *Dikerogammarus*, Amphipoda, Crustacea, Neozoen, Niederrhein, Rhein, Niederlande, Fluß, Faunistik, Erstfund

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)

1994 und 1995 wurde die Amphipoda-Art *Dikerogammarus villosus* SOWINSKY erstmals im Rhein in den Niederlanden festgestellt. Der Neueinwanderer wurde auf standardisiertem Kunstsubstrat (1994) und in zeitweiligen Tümpeln im Vorland nach einem Hochwasser (1995) gefunden.

### 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 & al. 1990). However, this increase has not only been caused by the introduction of indigenous species like the mayfly *Ephoron virgo* (BIJ DE VAATE & al. 1992), but by the introduction of exotic species as well (VAN DEN BRINK & 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 & GREIJANUS-KLAAS 1993). The interconnection of navigable water systems, shipping and changes in water chemistry and physics of the River Rhine are considered to be the most important factors for the introduction of these immigrants. In connecting water systems animals are able to extent their territory by active migration or by displacement, attached to the hulls of vessels. Intercontinental migration (e. g. *Corbicula fluminea*, *C. fluminalis*, *Rhithropanopeus harrisi*, *Gammarus tigrinus*) on the other hand, is mainly the result of transportation in ballast water. The increase of chloride concentration and water temperature in the River Rhine has created habitats for thermophilous and halophilous species (BIJ DE VAATE 1993). Exotic Crustacea like *Gammarus tigrinus*, *G. zaddachi*, *Echinogammarus ischnus*, *Corophium curvispinum* and *Athyaeophya desmaresti* were able to take advantage of higher water temperature and/or chloride concentration (PINKSTER & al. 1992, VAN DEN BRINK & al. 1993a, VAN DEN BRINK & al. 1993b). *Corophium curvispinum* invaded the Lower Rhine in 1987, *Echinogammarus ischnus* in 1991

(VAN DEN BRINK & al. 1989, VAN DEN BRINK & al. 1993a). In 1994 and 1995 a new amphipod invader, *Dikerogammarus villosus*, was recorded in the Lower Rhine in The Netherlands.

## 2 Methods

Samples of macroinvertebrates were taken regularly with standardized artificial substrates, consisting of glass marbles (DE PAUW & al. 1994). A handnet (0,5 mm) was used in temporal backwaters.

## 3 Results and discussion

On May 30, 1994, one specimen of *Dikerogammarus villosus* was found on the artificial substrate after a four weeks colonization period in the River Rhine at Tolkamer near the German-Dutch border (Fig. 1); this is the first record for the Netherlands. The next catch of 18 specimens was on February 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. Besides *D. villosus*, 11 other Crustacea were found there (Tab. 1). Including *D. villosus*, 7 of them are exotic species, that invaded The Netherlands in this century. The catches of *Crangonyx gr. pseudogracilis* and *Niphargus aquilex* are the first records in the Dutch part of the Lower Rhine. *N. aquilex* is a groundwater species. TITZNER & SCHÖLL (1993) found specimens of both genera by core-sampling of the bottom in the German part of the River Rhine.

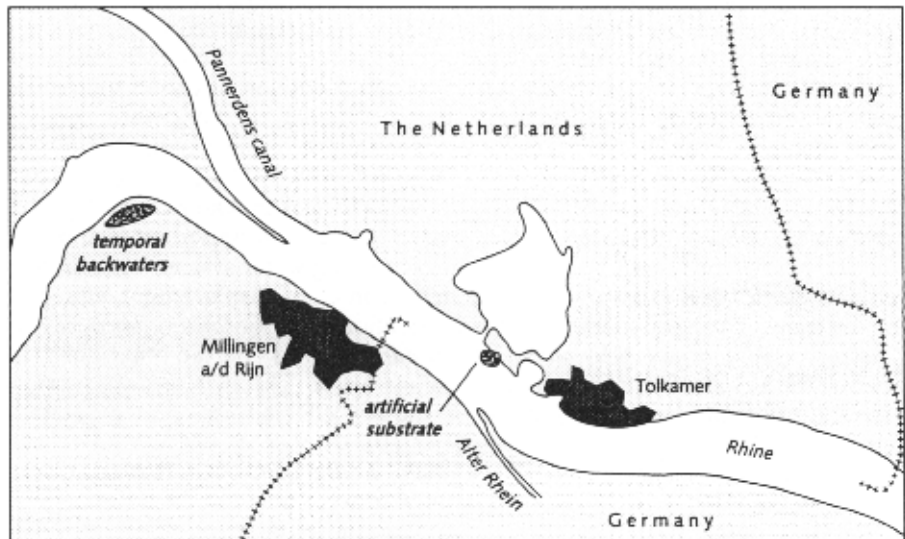


Abb.1: Locations (in italics) where *D. villosus* was found

Tab. 1: Crustacea (\* = exotic species) found in four small temporal backwaters in the foreland of the River Rhine near Millingen on February 13, 1995 after an extremely high flood

Species	Number	Species	Number
<i>Gammarus pulex</i>	2	<i>Niphargus aquilex</i>	2
<i>G. roeseli</i>	4	<i>Crangonyx</i> gr. <i>pseudogracilis</i> *	3
<i>G. tigrinus</i> *	252	<i>Asellus aquaticus</i>	6
<i>Chaetogammarus ischnus</i> *	226	<i>Proasellus coxalis</i>	2
<i>Dikerogammarus villosus</i> *	18	<i>Athyaephyra desmaresti</i> *	12
<i>Corophium curvispinum</i> *	148	<i>Rhithropanopeus harrisi</i> *	1

*D. villosus* is one of the two indigenous species of that genus in the River Danube (BRTEK & ROTHSCHHEIN 1964, HUMPESEH & MOOG 1994). *D. haemobaphes* was recently found in the River Main (SCHLEUTER & al. 1994). colonization of the River Main was possible via the Main-Donau-Kanal, opened in September 1992. In contrast to *D. villosus*, *D. haemobaphes* is widely spread and dominant in the Danube section between Kelheim and Jochenstein (km 2414-2202)(TRITZNER & al. 1994). As the result of drift during flooding in both the River Main and the River Rhine *D. haemobaphes* is expected to be found in the downstream area of the River Rhine and not *D. villosus*. According to literature *D. villosus* is a more salt tolerant species. It has been found in the Azov Sea and in the estuaries of rivers discharging in the Black Sea; *D. haemobaphes fluviatilis* is only reported from freshwater sections of rivers in the ponto-caspian area (DUDICH 1927, CARAUSU & al. 1953). From this point of view, chloride concentration in the Lower Rhine should provide for a better environment for *D. villosus* than for *D. haemobaphes fluviatilis*, which seems to be a freshwater species (CARAUSU & al. 1953). Therefore further colonization of the Lower Rhine and its estuary by *D. villosus* is expected in the near future.

#### Acknowledgements

Dr. M. Schleuter provided us with additional information on *Dikerogammarus*. Els Knaapen checked the English text.

#### References

- BLI DE VAATE, A. (1993): Exotic aquatic macroinvertebrates in the Dutch part of the River Rhine: causes and effects.- In: VAN DIJK, G. M. & E. C. L. MARTELJN (eds.): Ecological rehabilitation of the river Rhine, the Netherlands research summary report (1988-1992).- Institute for Inland Water Management & Waste Water Treatment report No. 50-1993 of the project "Ecological Rehabilitation of the rivers Rhine and Meuse": 27-29, Lelystad.
- BRTEK, J. & J. ROTHSCHHEIN (1964): Ein Beitrag zur Kenntnis der Hydrofauna und des Reinheitszustandes des Tschechoslowakischen Abschnitts der Donau.- Biologické Práce 10,5, 62 S., Bratislava.
- BLI DE VAATE, A. & A. KLINK & F. OOSTERBROEK (1992): The mayfly *Ephoron virgo* (Olivier), back in the Dutch parts of the rivers Rhine and Meuse.- Hydrobiol. Bull. 25:237-240, Amsterdam.
- BLI DE VAATE, A. & M. GREIJLDANUS-KLAAS (1993): Monitoring macroinvertebrates in the river Rhine. Results of a study executed in the Dutch part in 1990.- Institute for Inland Water Management & Waste Water Treatment report No. 52-1993 of the project "Ecological Rehabilitation of the rivers Rhine and Meuse" Lelystad.

- CARASU, S., E. DOBREANU & C. MANOLACHE (1953): Amphipoda forme salmastre si de apa dulce.- In: BODNARIUC, N. & al. (eds.): Fauna republicii populare Romine 4, Crustacea 4: 1-407, (Akad. Rep. Pop. Rom.) Bucuresti.
- DUDICH, E. (1927): Neue Krebstiere in der Fauna Ungarns.- Archivum Balaticum 1: 343-387.
- HUMPESCH, U. H. & O. MOOG (1994): Flora und Fauna der österreichischen Donau.- Limnologie aktuell 2: 81-107, Stuttgart.
- PINKSTER, S., M. SCHEEPMAKER, D. PLATVOET & N. BROODBAKKER (1992): Drastic changes in the amphipod Fauna (Crustacea) of Dutch inland waters during the last 25 years.- Bijdragen Dierkunde 61: 193-204, The Hague.
- SCHLBUTER, M., A. SCHLEUTER, S. POTEL & M. BANNING (1994): Dikergammarus haemobaphes (EICHWALD 1841) (Gammaridae) aus der Donau erreicht über den Main-Donau-Kanal den Main.- Lauterbornia 19: 155-159, Dinkelscherben.
- TITIZER, T. & F. SCHÖLL (1993): Leben an der Stromsohle des Rheins.- Biologie in unserer Zeit 23: 248-253, Weinheim.
- TITIZER, T., H. LEUCHS & M. BANNING (1994): Das Makrozoobenthos der Donau im Abschnitt Kelheim-Jochenstein (Donau-km 2414-2202).- Limnologie aktuell 2: 173-188, Stuttgart.
- VAN DEN BRINK, F. W. B., G. VAN DER VELDE & W. G. CAZEMIER (1990): The faunistic composition of the freshwater section of the River Rhine in The Netherlands: present state and changes since 1900.- Limnologie aktuell 1: 191-216, Stuttgart.
- VAN DEN BRINK, F. W. B., G. VAN DER VELDE & A. BIJ DE VAATE (1989): A note on the immigration of Corophium curvispinum (Crustacea: Amphipoda) into The Netherlands via the River Rhine.- Bull. Zool. Mus. Amsterdam 11: 211-213, Amsterdam.
- VAN DEN BRINK, F. W. B., B. G. P. PAFFEN, F. M. J. OOSTERBROOK & G. VAN DER VELDE (1993a): Immigration of Echinogammarus (Stebbing, 1889) (Crustacea: Amphipoda) into The Netherlands via the Lower Rhine.- Bull. Zool. Mus. Amsterdam 13: 167-170, Amsterdam.
- VAN DEN BRINK, F. W. B., G. VAN DER VELDE & A. BIJ DE VAATE (1993b): Ecological aspects, explosive range extension and impact of a mass invader, Corophium curvispinum Sars, 1895 (Crustacea: Amphipoda), in the Lower Rhine (The Netherlands).- Oecologia 93: 224-232, Berlin.
- VAN URK, G. & A. BIJ DE VAATE (1990): Ecological studies in the Lower Rhine in The Netherlands.- Limnologie aktuell 1: 131-145, Stuttgart.

*Anschriften der Verfasser:* Abraham bij de Vaate, Institute for Inland Water Management and Waste Water Treatment, P. O. Box 17, NL-8200 AA Lelystad, The Netherlands und Alexander G. Klink, Boterstraat 28, NL-6701 CW Wageningen, The Netherlands

*Manuskripteingang:* 13.03.1995