

# NOTES AND NEWS

## A NEW INVASIVE SPECIES IN THE NORTH-EAST OF FRANCE, *HEMIMYSIS ANOMALA* G.O. SARS, 1907 (MYSIDACEA)

BY

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### INTRODUCTION

Originating from the Ponto-Caspian area, *Hemimysis anomala* G.O. Sars, 1907 occurs at many localities in quite variable salinity, i.e., from fresh water to sea water of 18‰ (Băcescu, 1954; Komarova, 1991). The species prefers lentic habitats and was reported from the coastal areas of the Black Sea and the Caspian Sea, and up to 50 km upstream the various rivers flowing into those seas (Băcescu, 1954; Komarova, 1991).

Between the 1950s and 1960s, *H. anomala* was introduced into various sites in Moldavia (Komarova, 1991) and Lithuania (Mordukhai-Boltovskoi, 1979) as a food complement for breeding fish. From there, it reached the Baltic Sea where it was observed for the first time in the Gulf of Finland in 1992 (Salemaa & Hietalahti, 1993), and it had reached England in 2004 (Holdich et al., 2006).

The first observation of the species in the Rhine basin was reported from the Neckar river in 1997 (Schleuter et al., 1998), then in the river Main in 1998 (Schleuter & Schleuter, 1998). In 1999, *H. anomala* was also found in the stomach of young percid fish in the delta of the Rhine, in the Netherlands (Kelleher et al., 1999). Its presence was reported from the Danube in 1999 (Wittmann et al., 1999).

### OBSERVATIONS IN FRANCE

Specimens of Mysidacea collected in the north-east of France (Alsace, Bas-Rhin) were sent to the Natural History Museum in London, and identified as

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Fig. 1. *Hemimysis anomala* G.O. Sars, 1907 from Alsace (TL = 6.5 to 11.0 mm).

*Hemimysis anomala* G.O. Sars, 1907 (fig. 1). Specimens collected in January 2006 had a total length between 6.5 mm and 11.0 mm. This is the first observation of *H. anomala* in Alsace. No other published data on the presence of this species in other French areas exist at this time, to my knowledge. Another species of Mysidae of Ponto-Caspian origin, *Limnomysis benedeni* (Czerniavsky, 1882) had already been observed in the river Rhine in 1997 (km 294; Wittmann & Ariani, 2000). It was, at the time, the first freshwater mysid present in France; probably this species has continued its progress upstream the Rhine since. However, our investigations did not result in any observations of *Limnomysis benedeni* at the various locations described in this paper.

#### DISTRIBUTION

The observations of *Hemimysis anomala* described herein were carried out at day and by night, by SCUBA diving. A 0.5 m diameter swarm made up of countless individuals was observed for the first time during daytime in an isolated gravel pit in Alsace in June 2005 (48°20'09.49"N 7°34'00.61"E, fig. 1), at shallow

depth (0.5 m) in a concrete pipe connecting the two parts of that gravel pit. The second observation was made in the feeder canal of the river Ill in October 2005 (48°25'30.54"N 7°42'44.13"E). This canal has a maximum depth of 6 m, and has a low current velocity and accumulations of rocks from the bottom to the shore intended to stabilize the banks. It was under these rocks that swarms of *H. anomala* were observed by daylight. More recently, in January 2006, isolated individuals were observed at night in the river Rhine close to Neuf-Brisach (48°01'17.11"N 7°34'58.39"E). In the same period, huge and active swarms (approx. 1.5 by 5 m) were observed by daylight under a pier in a still water lake (48°21'5.28"N 7°36'36.40"E), with a water temperature of 3°C and a frozen lake surface. At night, in this same gravel pit, the swarms of *H. anomala* were not under the pier any more but dispersed on the bottom (up to 7 m depth). The dates mentioned here do not correspond to the chronology of appearance of *H. anomala* in Alsace: they simply inform about the first observations made and the sites at which these were carried out.

#### DISCUSSION

The Ponto-Caspian area is a source of many invasive species of animals characterized by a strong adaptability, probably due to their evolution under hydrological conditions with extremely variable ranges of salinity: from 18‰ to fresh water (Zenkevitch, 1963). During the last two centuries, many channels have been built in Europe, allowing the migration of many of those species, which movements were facilitated by human river transports (Jądzewski, 1980). In our case, the opening of the channel Danube-Main to shipping in 1992, is one of the important factors for the range extension of species coming from the Ponto-Caspian area. The World Wildlife Fund (WWF) estimates that 4,000 different species can be transported during a journey in the ballast water of a single boat (United Nations Conference on Ballast Water, 2004).

Ricciardi & Rasmussen (1998) indexed *Hemimysis anomala* as a potentially highly invasive species, able to survive in incomplete water exchanges in the ballast tanks of ships. It thus appears probable that *H. anomala* arrived in Alsace by a route from the Danube, the channel of the Danube to the Main, and then from the Main to the Rhine. Bij de Vaate et al. (2002) first described this route, called "the Southern Corridor". Range extension via the Baltic Sea, the North Sea, and the delta of the Rhine in the Netherlands is also possible, as the discovery of *H. anomala* at these various sites may testify. The arrival of this small mysid in the north-east of France through the Rhine System was, therefore, predictable and already anticipated.

Now let us try to figure out the way of colonization of some alluvial systems related to the Rhine, like those secluded gravel pits. The two gravel pits in which



Fig. 2. *Hemimysis anomala* G.O. Sars, 1907 prefers sheltered zones during daylight hours.

*H. anomala* was observed are located near the river Ill. This river discharges into the Rhine, and is regularly in communication with the gravel pit during spring floods. It is most probable that *H. anomala* arrived in these gravel pits via the Rhine and the Ill. The discovery of *H. anomala* in the feeder canal of the Ill in the region of Plobsheim (48°25'30.54"N 7°42'44.13"E) pleads in favour of this assumption. It is also possible that the distribution of aquatic plants and regular fish stocking by fisheries societies could have contributed to the transfer of *H. anomala* into those gravel pits. Considering the large swarms observed and the low reproduction rate of *H. anomala* (cf. Ketelaars et al., 1999), it is probable that the invasion started a few years ago, whereas an initial, massive introduction seems not very credible.

Studies undertaken in the Netherlands (Ketelaars et al., 1999) showed that *H. anomala* has an omnivorous diet, preferably feeding on zooplankton but also on phytoplankton in cases of low abundance of the zooplankton. The species is also detritivorous and cannibalistic (pers. obs.). The younger stages are mainly feeding on phytoplankton.

Only a few studies have been carried out to investigate the impact of *H. anomala* on phytoplankton and zooplankton populations. Competition with other planktivorous and/or detritivorous species will surely take place.

My observations confirm that *H. anomala* avoids direct light during the day, preferring the lower zones, under bridges and various shelters. Territorial competition with other species could thus intervene as well, particularly for the spaces in cavities under various rocks and other rough places in the habitat that also provide shelters for other species (fig. 2).

*H. anomala* was introduced in the Soviet Union as a fish feed (Gasjumas, 1968), so there is hope that various fishes, like percids, will find this small crustacean tasty enough to control the excessive proliferation of this new, invading species also in France.

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