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Hemimysis anomala G. O. Sars (Crustacea: Mysidacea) — Immigration of a Pontocaspian mysid into the Baltic Sea

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Hemimysis anomala G.O. Sars, originally an endemic Pontocaspian mysid, was found in late summer 1992 at two localities in the coastal waters of SW Finland. This is the first observation of the occurrence of this deep sublittoral species in the northern Baltic Sea. *H. anomala* occurs swarming in wave-exposed archipelago habitats in the sublittoral belt of *Mytilus* and red algae. The swarms avoid direct light, aggregating in rocky crevices, under stones and in the cavities of the boulder shore to form larger groups in the daytime; but during the night dispersing in the algal zone, from 2 to 12 m in depth. Breeding females were found as late as at the end of October and females with fully developed ovocytes in April, indicating a long summer breeding period compared with other coastal Mysidacea in the northern Baltic. Because eurytopic crustacean populations have been introduced since the 50s from Pontocaspian estuaries into the freshwater reservoirs of the river Dnieper, the Volga and also into the Baltic basin, *H. anomala* seems to be a young anthropochorous neoimmigrant distributed via man-made water routes, instead of being a real glacial relict, not previously observed. The possibility of abrupt migration in the ballast waters of ships along Volgo-Baltic water routes is not, however, to be excluded.

1. Introduction

Enclosed continental seas, such as the Baltic, the Black Sea and the Caspian sea have been isolated from each other for a long time, although zoogeographical connections have been traced back to the Ice Age (e.g. Bacescu 1966, Banarescu 1991, Mordukhai-Boltovskoi 1964, 1979). During historic time the physical barriers have been weakened due to man's activities. In recent years discussions have been carried out concerning the ecological effects of species accidentally introduced into semienclosed brackish seas and other waters (Por 1978, Leppäkoski 1984, 1991, Carlton 1989).

Many species of Caspian fauna have extended their distribution into European fresh waters (Bacescu 1966). At least nine Caspian species are known in the Baltic Sea basin which is adjacent to and communicating with the Pontoazov basin at several localities. *Cordylophora caspia* (Hydrozoa), *Theodoxus fluviatilis* and *Dreissena polymorpha* (Mollusca), *Corophium curvispinum* (Amphipoda) are early Pontocaspian immigrants. Because of introductions into the River Niemen and into the River Daugava, new neoimmigrat gammarids and mysids are expected to penetrate the Baltic Sea from Kursky Bay and the Gulf of Riga(Mordukhai-Boltovskoi 1964, 1979). Other crustaceans which do not breed in the Baltic (Haahtela 1963), have immigrated from the western Baltic, e.g. *Eriocheir sinensis* (Decapoda).

2. Observations

The genus *Hemimysis* G.O. Sars 1869, is a group of small-sized and usually red coloured mysid shrimps belonging to the family Mysidae (Mysidacea. Crustacea). Although only six *Hemimysis* species are known (Mauchline 1980, Alcaraz et al. 1986) they display an extraordinary zoogeographical and ecological distribution. *H. lamornae* has a vast distribution from subarctic Icelandic waters to the North Sea and western Baltic waters and to the Mediterranean, the subspecies *H. lamornae pontica* living in the Black Sea (Tattersall & Tattersall 1951, Bacescu 1954, Makings 1977, Astthorsson 1987, Kohn & Gosselck, 1989). In the Mediterranean two hypogean species, *H. spehmcola* and *H. margalefi,* inhabit marine

caves (Ledoyer 1963, Macquart-Moulin & Patriti 1966, Gaudy & Guerin 1979. Alcaraz et al. 1986). *H. serrata* is endemic for the Black Sea, whereas *H. anomala* G.O. Sars 1907 is a Pontocaspian endemic with freshwater populations in the rivers that flow into the Black and Caspian Seas (Sars 1907, Bacescu 1936, 1938, 1954, Mordukhai-Boltovskoi 1964, 1970, 1979, Dediu 1966). These freshwater populations originate from artificial introductions of mysids into river reservoirs in the 50s and 60s in the former U.S.S.R. (Zhuravel 1960. Lubyanov 1963, Mordukhai-Boltovskoi 1979).

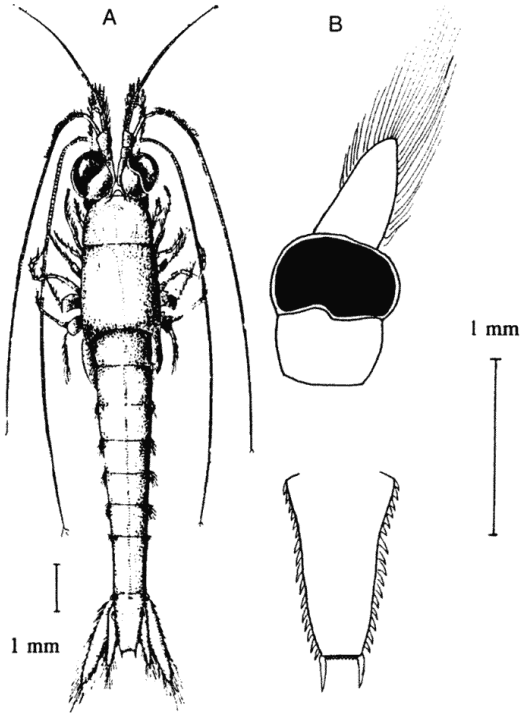

Fig. 1. A. *Hemimysis* sp., dorsal habitus according to Bacescu (1954). — B. *H. anomala*, eye with antennal scale and telson.

In late summer, 1992, V. Hietalahti observed swarms of an unknown red coloured mysid shrimp during his underwater photographic survey at Korpskär, Dragsfjärd, in the SW archipelago of the Finnish Baltic (59°57'N, 22°17'E). The species turned out to be *Hemimysis anomala,* never before reported in the northern Baltic Sea. A further search revealed *H. anomala* also at Storsundsharun in the Tvärminne area (66°40'N, 32°90'E). Later, *Hemimysis* swarms were detected also at other localities in Dragsfjard and Tvärminne-Ekenäs archipelago, but not at every place examined. Also, although carefully looked for, *Hemimysis* was not found from Helsinki-Porkkala area in the Gulf of Finland nor from the more western parts of the Archipelago Sea. Large number of breeding females in April and May 1993 indicate, however, that populations of this species have established themselves in the Baltic Sea.

Because of its exceptional appearance, its swarms and its habitat selection behaviour, *H. anomala* is also easy for divers to recognize *in situ* (Fig. 2). Morphological characteristics of the species are illustrated in Fig. 1. *H. anomala* is relatively small; the adult animals are 8-11 mm in length, the females slightly exceeding the size of the males. The colour of dark adapted animals is deep purple red. The colour generally intensifies with age, but short-term changes can be observed as well. These changes may be due to light and temperature variations. The species has large eyes with a dorsal notch in the margin of each eye. The antennal scale is broad and roundish with long setae in the outer margin, but without distal spines. Unlike other Baltic mysids the telson of *H. anomala* is broad and unclefted with distal spines in the corners.

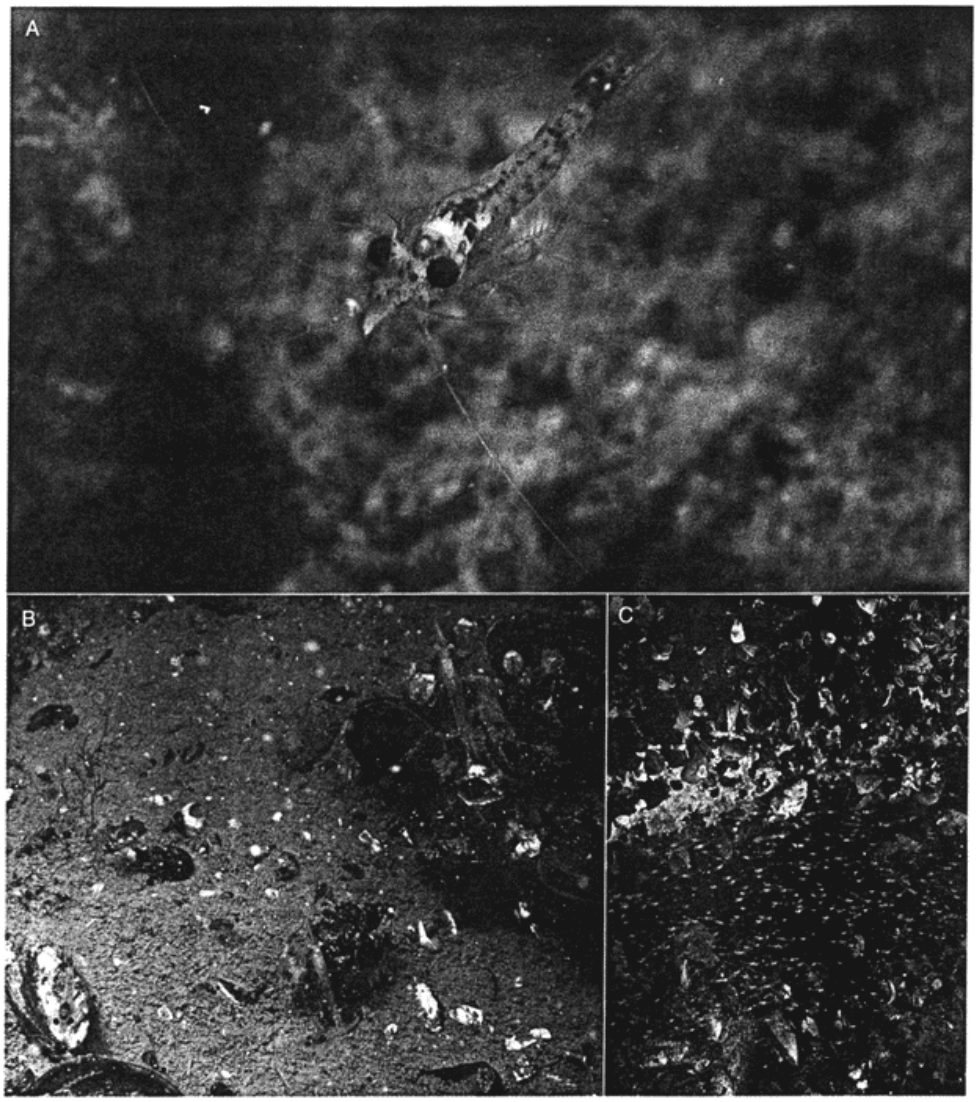

Fig. 2. A. The habitus of swimming *Hemimysis anomala*, G.O. Sars 1907. Note the large black eyes and red chromatophores in the carapax and telson. Yellow spots of the statocysts on the uropods can been also seen. — B. Feeding *Hemimysis* individuals swimming near the sediment surface. Compare their orientation to the two individuals of *Neomysis integer* on the right. — C. Swarming *H. anomala* in a rocky cavity covered by *Mytilus edulis*.

H. anomala is a deep water sublittoral species. Bacescu (1954) gives a depth range of 6 to 10 m, even to 20 m in the Black Sea and to 30 m in the Caspian Sea. In the Dnieper the species is recorded even from deeper waters down to 50 m. (Zhuravel 1960). Our observations in the Baltic suggest distribution in the deeper phytal zone (4-12 m) characterized by beds of *Mytilus* sp. and red algae. The localities preferred by *Hemimysis* are moderately or fully exposed shores of the outer archipelago. *H. anomala* individuals swim actively back and forth within a small swarm. The swarms avoid direct light, aggregating in rocky crevices, under stones and in the cavities of the boulder shore to form larger groups in the daytime, dispersing in the sublittoral algal zone (2-12 m) during the night. At night the animals swim more individually and occasionally leave the swarms. A tendency to occur in habitats with reduced daytime light seems to be characteristic also for other members of the genus *Hemimysis* (Bourdillion and Castelbon 1983, Fossaa 1986). The species is evidently a summer breeder in the Baltic Sea. Breeding females were found in the end of October and females with fully developed ovocytes in late April indicating the long breeding period compared to that of other coastal mysids in the northern Baltic.

3. Discussion

Investigations of the general distribution of Mysidacea have been carried out in the Baltic Sea (Segerstråle, 1945, 1957, Järvekülg 1965, Köhn & Gosselck 1989, Salemaa et al. 1986, 1990, Välipakka 1990), but *H. animala* has not previously been found. *Hemimysis* is a species seeking concealment, and it is definitely more difficult to collect from deep stony bottoms than is the shallow littoral *Praunus* and *Neomysis* species. However, we conclude that populations of *H. anomala* have not existed long in Finnish coastal waters and, consequently, the species is an anthropochorous neoimmigrant. The most probable migration route is from Russian river areas via man-made channels. Since the 50s, populations of Mysidacea from Pontocaspian estuaries and brackish lakes (fauna of liman complex) have been introduced into the freshwater reservoirs in the rivers Dnieper and Volga but also into the Baltic drainage area at least in Kaunas and Kegum reservoirs (the rivers Niemen and Daugava) and even in the St. Petersburg region (Gasyunas 1963a, 1963b, 1968, Zhuravel 1959, 1963). *H. anomala* was originally introduced as a deep-water species, although *Mesomysis kowalewskyi* and *Limnomysis benedeini* are the most extensively transplanted Pontocaspian mysids. *M. kowalewsky* was the first to penetrate into the Baltic waters (Järvekülg 1965, Zhuravel 1972), but it has not yet been discovered in Finnish waters. Only a few notes on *H. anomala* could be found in the literature; in the Dneprovskoe reservoir its populations became established in the 60s with 100-200 specimens per square meter in the deeper parts of the reservoir (Lubyanov 1963). Leppäkoski(1984, 1991) notes a possibility for *H. anomala* to occur in the river Niemen reservoirs and in the Kuronskij Firth (Russia and Lithuania). Because *H. anomala* has not been found on the Estonian coast (Jarvekulg 1965), the possibility of migration in the ballast waters of ships cannot be excluded, however. Further investigations of the geographical distribution of *H. anomala* in the northern Baltic will indicate whether the migration has been gradual or abrupt.

Transplantations of Caspian and Black Sea fauna were extensive from the 50s to the 60s in states of the former U.S.S.R. A review of these activities is available as the proceedings of the conference on 'Acclimatization of Animals' held in Kirgizstan in 1963 (Janushevich 1963, editor). The aim of the transplantations was to reconstruct and enrich the communities of the artificial river reservoirs with economically valuable species such as fish and their food organisms. 'Well adapted' species of wide distribution were also considered to provide genetic potential for further evolution of the populations in their new surroundings. Transplantations have been successful in the Ukraine and the Crimea (river basins of the Dnieper , Don, Volga and Manych, Veselyi and Tsimlyanskoe reservoirs) but also in the Aral Sea and — outside the U.S.S.R. — in Lake Balaton in Hungary. The transplanted fauna comprise of mysids and gammarids in particular, but also crayfish, cumaceans, annelids and molluscs — species of the Caspian and Baikalian complexes and glacial relicts (Ioffe 1963, Mordukhai-Boltovskoi, 1963). More than 80% of the introductions of 45 species have been successful (Karpevich 1963). In the Ukraine, mysid populations have occasionally increased to more than 3000 individuals per square meter in shallow water and spread themselves in a few years over vast areas.

Introduction of mysid populations to improve feeding conditions of fish have been carried out in western countries as well (e.g. Fürst 1965, 1967, Murano 1966, Schumacher 1966). Transplantation of *Mysis* populations into new lakes has not always been advantageous; because of their role as top-down regulators of the planktonic communities the mysids may destroy food resources of young fish and totally change the community structure of the lake (Richards 1975). Although *Hemimysis anomala* may distribut itself all through the Baltic Sea in the future, its ecological effects may remain small, because it evidently avoids habitats used by other species of Mysidacea.

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