

## New records of the Chinese mitten crab, *Eriocheir sinensis* H. Milne Edwards, 1853, from the Volga River, Russia

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### Abstract

Single adult specimens of the Chinese mitten crab have been regularly found in the Volga River since the mid-1970s, most likely originating from the eastern Baltic Sea via the Volga-Baltic Canal. Three new records of *Eriocheir sinensis* H. Milne Edwards, 1853 are reported from the Kuibyshev Reservoir, Volga River, Russia, found in fishing nets in October 2002 and April-May 2007. The origins and possible vectors for the introduction of these crabs are discussed.

*Key words:* Crustacea, Brachyura, *Eriocheir sinensis*, Volga River basin, migration, hull fouling

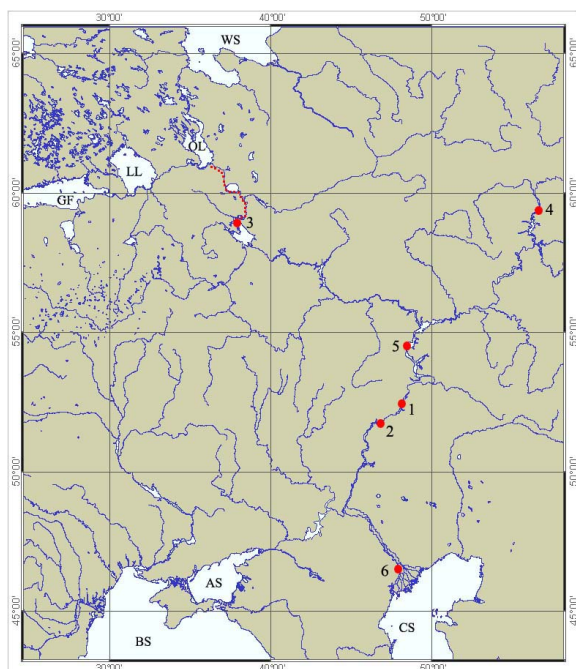
### Introduction

The Chinese mitten crab *Eriocheir sinensis* H. Milne Edwards, 1853 (Crustacea: Brachyura: Varunidae) was introduced into Europe at the beginning of the 20th century from ballast water of ships, being first found in a German river the Aller, at Rethem, 100km from the sea, during 1912 (Panning and Peters 1932). The species spread rapidly reaching the Baltic Sea via the Kiel Canal and was first recorded in the eastern Gulf of Finland in 1933 (see review in Herborg et al. 2003). From the eastern Baltic the mitten crab invaded the inland waters of European Russia, including the Ladoga (Berger and Naumov 2002) and Onega lakes (Panov 2006) in the Baltic Sea basin; then, via navigable canals, into the Severnaya Dvina River in the White Sea basin (Berger and Naumov 2002, Panov 2006)

and Volga River in the Caspian Sea basin (Anikin 2002, Slynko et al. 2002). During the last decade numbers of mitten crab captures in the eastern Baltic Sea have increased, with the estuaries of north-western Europe (Ojaveer et al. 2007) serving as a breeding area for crabs found in the brackish water of the Baltic Sea and its basin.

Chinese mitten crabs were introduced into the largest navigable European river, the Volga River (see Slynko et al. 2002) Russia after the opening in 1964 of the reconstructed Volga-Baltic Canal system, linking the upper Volga Basin with the Gulf of Finland via Onega and Ladoga lakes (Figure 1). In the Volga River basin, *E. sinensis* was first recorded in mid-1970s from the Saratov Reservoir (Anikin 2002). After that *E. sinensis* spread to other parts of the Volga River and its tributaries (Anikin 2002, Zolotukhin 2002, Zolotukhin and Nazarenko

2002, Shakirova and Salakhutdinov 2004, Alexeivna and Istomina 2005, Anonymous 2006) and in 2002 it was first found in the basin of Southern Caspian Sea (Robbins et al. 2006 and Annex).



**Figure 1.** Records of *Eriocheir sinensis* in the Volga River basin (see Table 1 for details). CS – Caspian Sea, BS – Black Sea, AS – Azov Sea, WS – White Sea, GF – Gulf of Finland (Baltic Sea), LL –Ladoga Lake, OL – Onega Lake. Volga-Baltic canal system indicated by dotted line. For localities of numbers see Annex

### New Records

The purpose of the present study is to report three new records of *E. sinensis* from the Kuibyshev Reservoir, central Volga River. The first mitten crab captured from the Kuibyshev Reservoir was a female with carapace width 70 mm (measured by F. Shakirova) collected on 25 October 2002 and trapped in fishing nets at a depth of 8 m. A local fisherman preserved this crab for decorative purposes (V.A. Dugalev pers. comm.), but it has not been deposited in an institution for safekeeping.

Recently, in April 2007, an adult male crab was recorded captured in fishing nets, but the specimen was only photographed and not preserved (I. Kurbakov pers. comm.). A third

adult male was recorded in the same area of the Kuibyshev Reservoir on 22 May 2007, 48.4500° N, 54.3730°E in fishing nets from a depth 12 m, at 14°C (Figures 2-3, Annex). The specimen was deposited in the collections of the Tatarstan



**Figure 2.** *Eriocheir sinensis*: dorsal view of male specimen, carapace width 68 mm, carapace length 64mm, wet weight 148 g. Collected from Kuibyshev Reservoir (central Volga River) on 22 May, 2007. Photo by Firdauz M. Shakirova



**Figure 3.** *Eriocheir sinensis*: ventral view of male specimen collected from Kuibyshev Reservoir (Volga River) on 22 May 2007. Photo by Firdauz M. Shakirova

Branch of the Federal State Scientific Institute “GosNIORKh”). Of interest is the fact that the capture of this crab in the navigable waterway is ca. 2000 km from the Baltic Sea!

### Reproduction in the Volga River basin

Despite these three new records and others of *E. sinensis* from the Volga River reservoirs including a single record of an ovigerous female in the Rybinsk Reservoir (see Zolotukhin and Nazarenko 2002), reproduction of this species in freshwater conditions of this watershed is

unlikely. According to Ojaveer et al. (2007), it is the estuaries of northwestern Europe that are probably serving as the principal area of reproduction of the mitten crab specimens recorded in the eastern Baltic Sea.

### Origins of Volga River specimens

The real issue with regard to the records from around the Volga River basin (see Figure 1) is how had these mitten crabs been introduced? Although Schellenberg (1928) states that juvenile mitten crabs can migrate ca. 1000 km while growing to adult size, these most recent specimens from the Volga River are not juveniles. The carapace width measurements of two specimens were 70 and 64mm and consequently suggest that these are fully mature crabs. Is it possible that some mitten crabs are actively walking (migrating) through this catchment area from the Baltic via the reconstructed Volga-Baltic Canal system into the Caspian/Volga River basin? For example the specimen caught at site 3 (see Figure 1) may have migrated from the Baltic region. Reports of mitten crab movements through European canal systems are not new. Hoestlandt (1959, Figure 2) monitored the penetration of *Eriocheir sinensis* into the Garonne, on the Atlantic coast of France. This started in 1953 and by 1959 Chinese mitten crabs were first captured in the Languedoc lagoons (Petit, 1960) bordering the Mediterranean Sea in southern France. According to Petit the crabs had reached the lagoons by following the Garonne canal system (Languedoc-Roussillon) via the Canal de Midi. In 1967 and 1968 further specimens were captured from this lagoon, but the present day status of this population remains unknown and a population may not have become established (Petit and Mizoule 1974). These “French” crabs were also not juveniles for carapace width measurements of 75mm (Petit, 1960) and 69-73 mm (Petit and Mizoule 1974) were reported. None of these French scientists offered an explanation of how this swift introduction had taken place, except that the crabs had “moved” through the canal system.

An alternative to the migration scenario is that these mature mitten crabs are being transported through the calm European waterways as hull fouling on slow moving vessels such as barges. If correct, then are the mitten crab records reported here from around the Volga River basin

(see Figure 1) and the Garonne canal, France, just fallen “hitch-hikers” deposited at random throughout their respective catchment areas? Moreover, are the recent records of single *Eriocheir sinensis* specimens in the Azov and Black Sea basins (Murina and Antonovsky 2001, Kamentseva 2002, Gomiou et al. 2002) the consequence of numerous independent introductions from the hulls of slow moving shipping transversing the “northern” (Panov et al. 2007), “central” and “southern” invasion corridors (sensu Galil et al. 2007) from the Baltic region? Further, as a result of these independent invasions, is it possible that a mitten crab population could become established and adapted to the brackish water conditions of the Black, Asov and Caspian seas? Such a population would have its origins based on individual mature adults and not the larval or juvenile introductions as per the ballast water of trans-oceanic maritime shipping. Completion of the mitten crab life cycle could be established in this region to include mating of the invasive adults and the easterly migration of developing juveniles back into the freshwater catchment of the Volga River from the Black and Asov Seas. Such an establishment process would take time.

However, of major concern is the possible transportation of ovigerous crabs through the invasion corridor by hull fouling such as the single specimen ovigerous female caught in the Rybinsk Reservoir (see Zolotukhin and Nazarenko 2002) and that reported by Petit and Mizoule (1974) of 26 February 1968 captured in the Lagunes du Languedoc. If released into a suitable Black Sea environment or even the far eastern boundaries of the Mediterranean, the independent invasions of ovigerous mitten crabs could speed up the establishment of a reproducing population of *E. sinensis* in the Ponto-Caspian region.

### Future Research

Is it possible that hull fouling of inland waterway shipping has become a significant vector for dispersing mitten crabs internally within continental Europe? A programme should be established to research the origins of subsequent mitten crabs collected along the Volga River invasive corridor and in the Black, Asov and Caspian seas, by comparing DNA sequences with those populations from the Baltic regions. Such research should also confirm the possible vector

for these individual invasions i.e. active migration or hull fouling on slow moving shipping in calm inland waterways.

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**Annex**

Records of *Eriocheir sinensis* in the Volga River basin

Site No. (Map Ref.)	Locality	Record coordinates		Record date	Number of collected specimens	Collector/Reference
		Latitude, °N	Longitude, °E			
1	Saratov Reservoir	52.4667	48.1833	1970s	1	Anikin (2002)
1	Saratov Reservoir	52.4667	48.1833	1995	1	Anikin (2002)
2	Volgograd Reservoir	51.8167	46.9333	1995	1	Anikin (2002)
1	Saratov Reservoir	52.4667	48.1833	1996	1	Zolotukhin and Nazarenko (2002)
3	Rybinsk Reservoir	59.1000	37.7500	2001	5	Zolotukhin 2002, Slynko et al. 2002
4	Kama Reservoir	59.3333	56.5500	2001	1	Alexevnina and Istomina 2005
5	Kuibyshev Reservoir	54.5000	48.4167	25.10.2002	1	VA Dugalev
6	near Asrtakhan, Lower Volga	46.4167	47.9667	October 2006	1	Anonymous (2006)
5	Kuibyshev Reservoir	54.5000	48.4167	April 2007	1	I Kurbakov
5	Kuibyshev Reservoir	54.3730	48.4500	22.05.2007	1	FM Shakirova