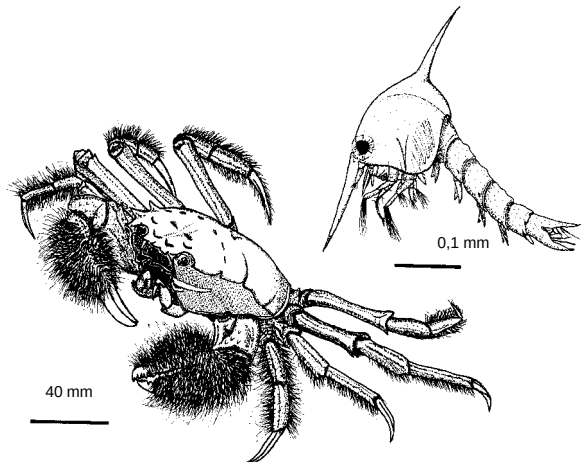
Eriocheir sinensis *(Milne-Edwards,* 1854), (Brachyura, Decapoda)

Common names: Chinese Mitten Crab (English), Chinesische Wollhandkrabbe (German)



Eriocheir sinensis. Adult and zoea-larvae.

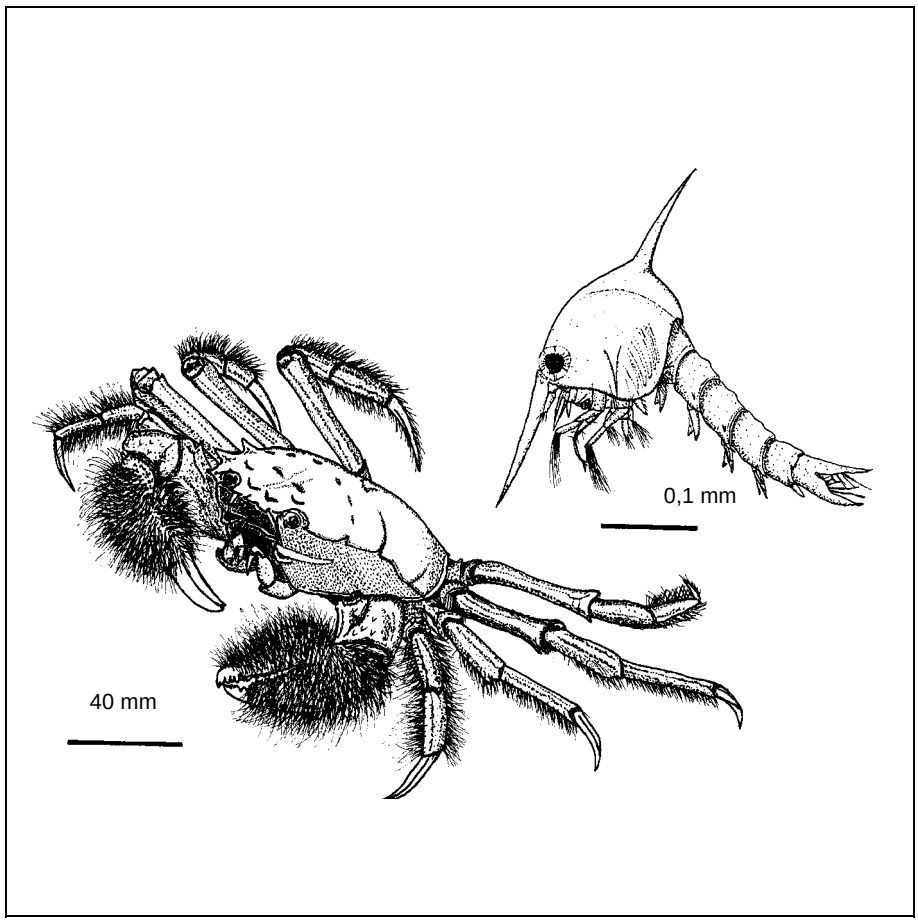
Known coastal distribution of *Eriocheir sinensis.*

Impact: * = possibly harmful, ** = harmful, *** = very harmful, ? = not known, $ = beneficial

Resources/Environment			**Uses of the Sea**		
Commercial stocks	**	Crabs are preying upon native species and after mass occurrences native species were locally driven extinct	Fisheries	***	Crabs feed on fishes caught in traps and nets. Nets will be damaged.
Other biota	**	Competition for space and food.	Aquaculture	**	In freshwater ponds the crabs feed on the cultured fish and their food.
Human health	?	Second intermediate host for human lung fluke parasite in Asia.	Water abstractions	**	Clogging of water intake filters during mass occurrences
Water quality	?		Aquatic transport	?	In some countries imported for human consumption.
Habitat modification	** *	Burrowing activities of crabs result in damages of dikes, river banks and port installations.	Tourism	$/*	(tourist attraction during mass migration)
Special considerations			Others	$	Recently exported for re-stocking purposes from Germany to China.

Vulnerable habitats: This migrating species occurs in rivers, estuaries and marine habitats of cold-temperate to tropical climate areas from lower shorelines to about 10 m in depth. This species is tolerant to highly polluted water.

Biology: The life-cycle of the predominantly night active Chinese Mitten Crab is characterised by migrations in waters with changing salinities. Larvae develop in marine waters. Their upstream migration (in spring) is aided by currents in estuaries. During rising tides larvae migrate into the water column and are carried upstream. Young crabs and young adults actively migrate upstream. In their native distribution living crabs have been found 1400 km upstream the river Jangtsekiang. Two year old adults migrate downstream to the marine conditions in summer. This movement may take several months during which they become reproductively mature. Crabs live in burrows in the banks of rivers. It feeds on a wide variety of plants, invertebrates, fishes and also detritus. Snails and clams are the main food.



Eriocheir sinensis

Eriocheir sinensis (Milne-Edwards, 1854) (Brachyura, Decapoda)

Common names: Chinese Mitten Crab, Mitten Crab, Chinese Freshwater Edible Crab (English), Crabe Chinois (France), Chineesche Wolhandkrab (Dutch), Chinesische Wollhandkrabbe (German), Kinesiske Uldhandskrabbe (Danish), Kinesisk Ullhandskrabba (Swedish), Villasaksirapu (Finnish), Kraba welnistoreki (Polish), Kinijos Krabas (Lithuanian), Kitajskij mokhnatorukij krab (Russian)

Identification: The square shaped carapace of adult crabs, clearly distinguishes it from other European brachyuran crabs. It can attain a carapace width of 5 cm. Males have a hair-like covering on the claws forming mitten-like claws. The colour varies from yellow to brown, rarely purple and red.

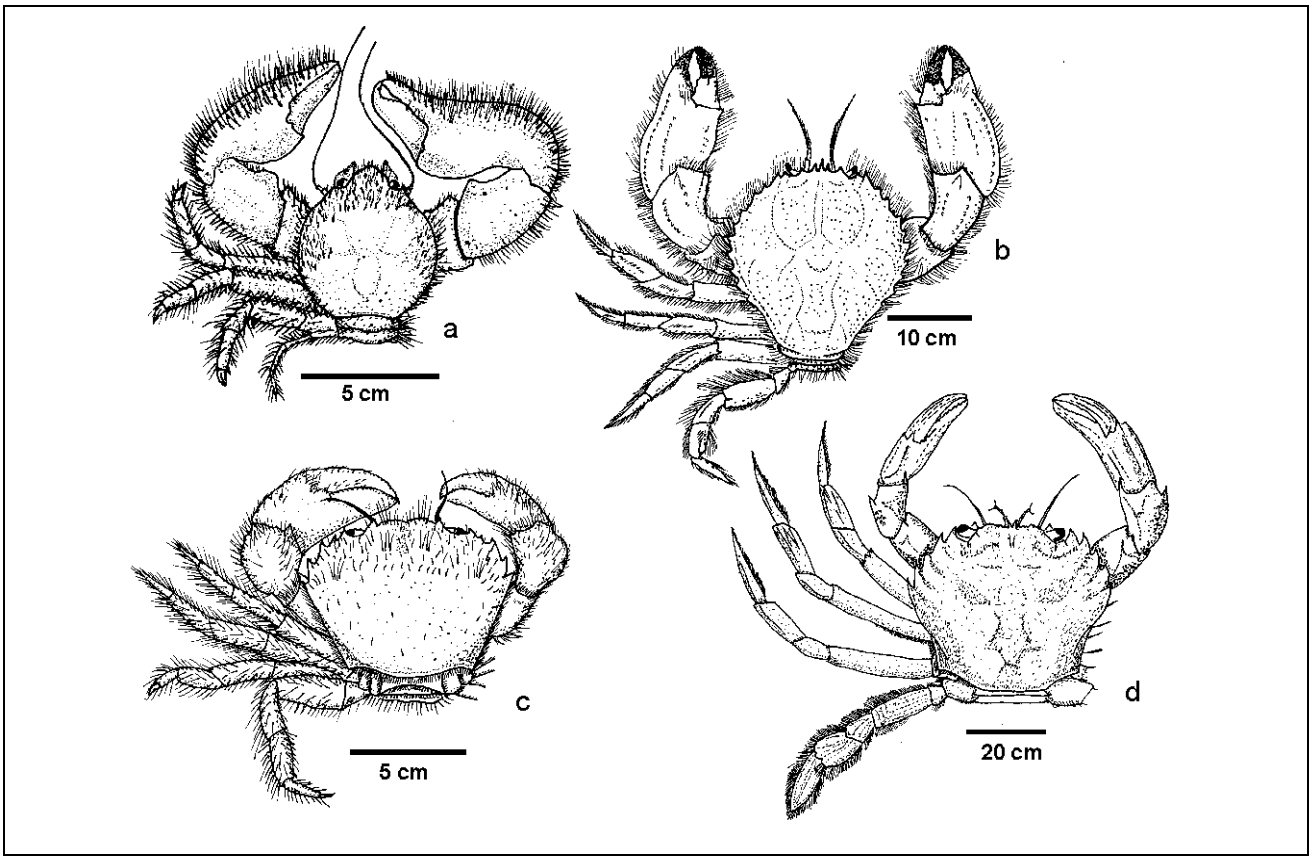
Generalised life history: Although the life history of *E. sinensis* has been well studied in previous years, studies on population DNA have not been undertaken and so it is not possible to separate populations and determine their origin.
Chinese Mitten Crabs are night active and undergo migrations along estuaries and rivers. Most crabs live for two years rare species grow older. After one year the crabs attain full size. Crabs hatch as a zoea and develop to the settlement of the megalopa. Larval stages occur in marine and estuarine regions of rivers and move upstream aided by tidal currents by means of vertical migration. Young crabs and young adults actively migrate upstream following settlement. In their native distribution in China crabs have been found 1400 km upstream the river Jangtsekiang.
The diet of the crabs includes a wide range of plants, invertebrates, fishes and also detritus. Gastropods and bivalves are the predominate food component [1, 12, 21, 22].

Reproduction: Two year old adults migrate downstream in summer and reach marine conditions after several months during which they became mature. In the marine environment the life-cycle completes after reproduction.

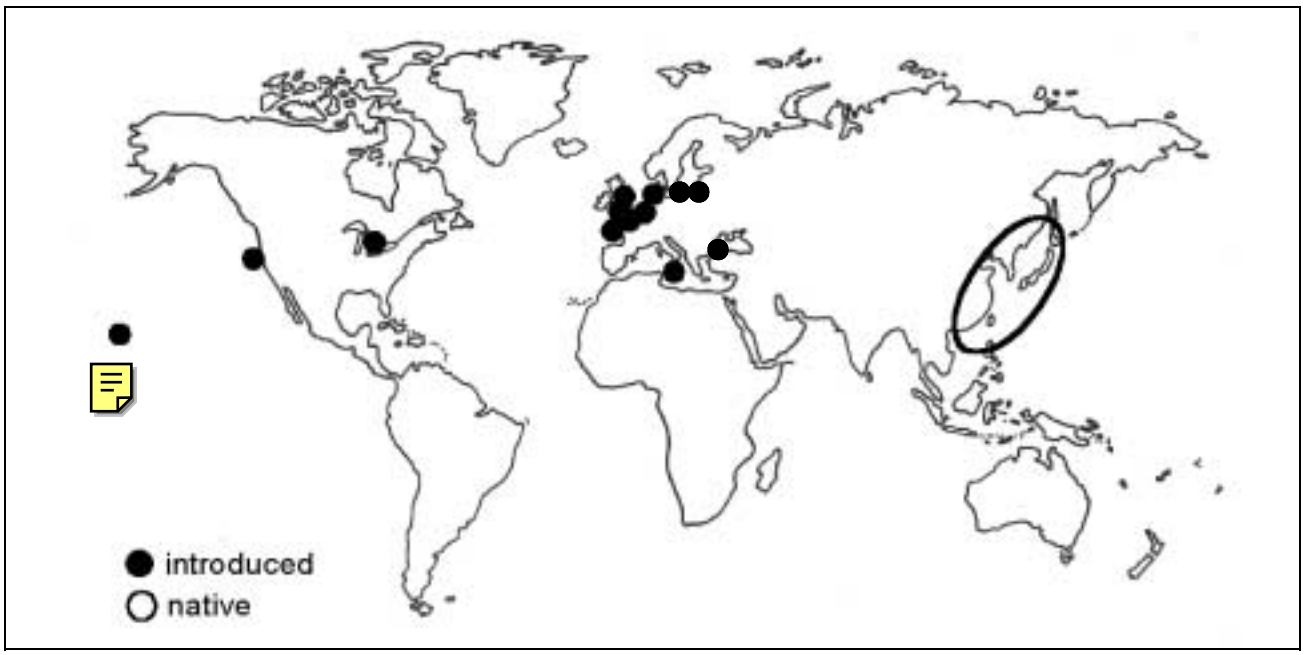
Relative abundance: Conditions in China and Europe are similar and this may explain its successful invasion in Northern Europe from 1912. As there are no migrating native decapods in estuarine waters and rivers of the North Sea there has been little competition for the invader. Because of favourable conditions, little competition and an abundant food supply the crabs became abundant in German waters during 1930s-40s. More than 21 million juveniles were caught (approx. 240,000 kg) in the German rivers Elbe, Ems, Havel, Saale and Weser during their upstream migration in 1936 [20, 22]. Following the late 1940s their abundance decreased because of increased water pollution in German rivers. The water pollution may have effected the abundance of the crabs prey. The Chinese Mitten Crab itself is able to tolerate heavily polluted waters. Crab populations in the Netherlands and the United Kingdom showed similar developments, but in much lower numbers.
Following the recent improvement of the water quality in rivers [25] crabs have again become abundant in European rivers. Similar patterns have taken place in the Thames river (Clarke pers. comm.) and in Dutch waters (Wolff pers. comm.). In spring 1998, 850 kg of juveniles (ca. 75,000 crabs) were caught in the river Elbe by hand in two hours only (Strauch unpubl. data.). The daily catch could amount to 2,000 kg of juveniles (180,000 crabs). Such numbers are comparable to or even higher than in the mid 1930s (up to 2,500 kg of crabs caught per day).

Similar species: Similar species in Europe are (a) *Porcellana platycheles* (Pennant): The species showes a hair-like covering on the claws, but not as dense as E. sinensis. The carapace of *P. platycheles* is longer than broad and not like the square shaped habitus of *E.sinensis*. With max. 15 mm carapace length the species is much smaller. (b) *Atelecyclus rotundatus* (Olivi): Less hair-like covering on the claws than *E. sinensis*, carapace almost circular. (c) *Necora puber* (Linnaeus): Carapace of similar shape but no hair-like covering on the claws, paddle-shaped dactyls on fifth pleopod enable swimming of the crabs which is different from *E. sinensis* and (d): *Pilumnus hirtellus*

(Linnaeus): the small crab (carapace less than 15 mm) shows densely hairy covering on pleopods and carapace, on claws not as dense as *E. sinensis*. No native crab shows a dense hairy-like covering of the claws and a square shaped carapace as *E. sinensis*. In Asia four *Eriocheir* species are described: *E. sinensis* (Milne-Edwards), *E. japonicus* de Haan, *E. leptognathus* Rathbun and *E. rectus* Stimpson and all are morphologically very similar. It is possible that a further species may exist in Europe, but was overlooked.



World-wide distribution: Area of origin are waters in temperate and tropical regions between Vladivostock (Russia) and South-China [19, 23], including Japan and Taiwan. Centre of occurrence is the Yellow Sea (temperate regions off North-China, see open circle on world map) [21]. Records outside Europe: Mediterranean Sea, Black Sea, Hawaii, Great Lakes, and San Francisco Bay (see solid lines on world map) [Saizev pers. comm., 4, 5, 6, 7, 10, 17, 27].



World-wide distribution of *Eriocheir sinensis.*

Range Expansion in Europe: It was first recorded from the German river Aller in 1912 and may have been released with ballast water discharges. Its establishment was influenced by the suitable conditions of climate and salinity and the lack of competition from other species. Before the arrival of *E. sinensis* in European waters, no native brachyuran crab migrated between brackish and freshwater habitats.

Specimens have been found 700 km upstream the Elbe in Germany. The species probably spread into the Baltic Sea via the Kiel Canal (German coast 1926). The greater abundance in Europe is in the German rivers Elbe and Weser [1, 3, 9, 12, 16, 19, 23, 26, 28, 29, 30].

Invasion patterns: Chinese Mitten Crabs have become abundant in some polluted estuaries. Occasionally individuals have been found beyond their currently established populations and such appearances may well proceed their subsequent establishment where conditions are suitable. Frequent observations are made about the edge of the North and Baltic Seas. It is unlikely that the species is able to attain self-sustaining populations in the Baltic Sea.

Abiotic factors:

Temperature	Highly tolerant species occurs in climates of tropical to cold-temperate regions; the temperature tolerance goes down to the freezing point.
Salinity	High salinity tolerance is shown by the migration into marine, brackish and freshwater habitats.
Oxygen	High tolerance towards low oxygen conditions.
pH	High tolerance towards the pH value.
Exposure to air	On their migrational routes crabs may be exposed to air for several hours. Crabs even cross dikes and streets.

Further likely areas for colonisation: Regions where further establishment is possible may be characterized by cold-temperate to tropical regions with estuarine habitats. Highly contaminated waters do not appear to exclude their establishment.

Main vectors: Introducing vectors are **shipping** (**ballast water** and **hull fouling** of vessels) and imports of living species for **aquaria** and for **human consumption** [4, 8, 11, 15, 23]. Range extensions are likely following the active migration of larvae and adult species via rivers and canals [2, 3, 14, 18, 27].

Control measures/management options: Trapping of crabs has not been found to be effective in controlling damage by crabs in river banks and from crabs feeding on trapped fish or in commercial pond aquaculture. Crabs have been used as bait for eel fishing, to produce fish meal, cosmetic products and for human consumption [6, 13, 22, 24].

Reference material: Universität Hamburg, Zoologisches Institut und Museum, Martin-Luther-King-Pl. 3, 20146 Hamburg, Germany.

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