

### Background

**A**lthough notorious for clogging pumping stations, eroding levees and stealing bait, the Chinese mitten crab poses a perhaps equally significant, albeit less recognized, human health threat as a host for a group of parasites known as lung flukes. Flukes, which come in Asian and North American varieties, can be acquired by eating uncooked or under-cooked infected mitten crabs. People infected with flukes may develop tuberculosis-like symptoms, resulting in permanent lung damage. Flukes can also track into the brain.

None of this would be such a serious concern—and wildlife officials could focus on dealing with the crabs' ecological consequences in the San Francisco Bay-Delta—but for the fact that these furry-clawed crustaceans are a delicacy in Asia and a prized culinary treat within immigrant communities in San Francisco and Los Angeles. Despite prohibitions on their sale, there is a flourishing black market in live mitten crabs. In addition, it is legal, with a fishing permit, to recreationally trap, and eat, mitten crabs.

Because of this, health officials have expressed concerns that mitten crabs could introduce Asian lung flukes or increase the prevalence of existing American lung flukes through the crabs' sheer number.

Mitten crabs were first seen in the Bay-Delta in 1992. In the last decade, their numbers have reached tens of thousands, perhaps even a million. States like Oregon and Alaska are now on high alert, worried mitten crabs will next burrow into the Northwest's economy. In



Chinese mitten crab, *Eriocheir sinensis*. Photo: Carolynn Culver

1998, a male Japanese mitten crab, a close relative of the Chinese species, was pulled from the Columbia River in Oregon, fanning concerns of an alien invasion.

### The Project

The purpose of this project was to determine whether lung flukes are present in Bay-Delta mitten crabs or crayfish and whether requisite snail hosts are present in sufficient abundance to sustain a future infestation in the Bay-Delta.

To do this, Sea Grant marine researchers led by Dr. Jenifer Dugan of the Marine Science Institute at UC Santa Barbara collected more than 900 mitten crabs by trawl or hand from the North and South bays, the Tracy Fish Collection Facility and several South Bay creeks. Most of the crabs collected were adults, the ones most likely to have eaten infected snails and thus to show evidence of parasitism.

Muscle tissue, gills and digestive glands from dissected crabs were microscopically examined for evidence of flukes. More than 400



The divots are mitten crab burrows, which accelerate erosion. Photo: Carolynn Culver

adult crayfish were similarly examined.

In the second phase of their work, researchers collected freshwater snails, in all 10 species from 8 families.

Flukes begin their life-cycle in snails and thus infestations can occur only when snails are abundant. The crabs' range must also overlap with that of the snails, and most importantly, the crustaceans must consume snails. After developing in crustaceans, flukes complete

their life-cycle in the warm bodies of mammals, including people.

### The Findings

Of the more than 1,300 crabs and crayfish examined, none harbored lung flukes. The scientists concluded that the chances of becoming infected with a lung fluke by eating mitten crabs from the Bay-Delta is negligible at this time.

This conclusion is statistically sound and not an artifact of sample size since in endemic regions, between 20 and 80 percent of mitten crab populations would be expected to be infected with flukes.

In terms of future risk, the scientists believe that an outbreak could occur in the future. All the requisite hosts are present in sufficient abundance and distribution for the transmission and spread of a fluke infestation. For this reason, they caution the public about the safety of continuing to eat mitten crabs, even though currently the risk appears very small.

Flukes, theoretically, could be introduced through ballast water discharges of infected eggs, juvenile snails or mitten crabs, or through the importation of infected feral or domestic mammals—dogs, cats, foxes, raccoons or possums. It is also possible that infected people, who excrete fluke eggs in their feces, could introduce the parasite into the Bay-Delta.

The scientists recommend monitoring parasitism in mitten crabs in the Bay-Delta and developing a risk assessment model based on the size of the mitten crab population and the prevalence of flukes in people living near the Bay area.

### Cooperating Organizations

California Department of Fish and Game  
California Department of Water Resources  
Marine Science Institute in Redwood City  
Santa Clara Valley Water District  
Tracy Fish Facility Improvement Program

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