

SUMMARY

Several species of marine worms and crustaceans are routinely imported into California for use as live bait. The most common of these is the ghost shrimp (a translucent crayfish-like burrowing crustacean found in coastal mud flats along the West Coast). The goal of this project was to evaluate some of the potential risks associated with the live-bait trade, in terms of its potential to spread non-native bait species, their associated parasites, and “hitchhiker” species, which may be present in bait packing materials such as seaweed. A genetics study was also conducted to determine whether importing ghost shrimp from Washington and Oregon to California might “genetically pollute” southern populations.



Two female ghost shrimp. The top specimen's gill chamber is infected by the isopod parasite *Ione cornuta* (see inset). The bottom specimen is brooding (laying eggs). E. Kosman



Bloodworms from Maine packed in seaweed. B. Passarelli

PROJECT

The project was comprised of two main parts. In the first, biologists characterized key attributes of California's live bait trade – the kinds, quantities and origins of animals for sale – through a comprehensive survey of more than 70 marine bait shops in the state. Laboratory experiments were then conducted to evaluate the short-term survivorships of these species in waters typical to Southern California.

The second main part of the project was to focus on specific risks posed by the most commonly

sold live-bait species – the ghost shrimp (*Neotrypaea californiensis*). In particular, biologists evaluated whether the importation of individuals from northern populations might spread new genes to the south. To do this, scientists sequenced two mitochondrial DNA loci (cytochrome oxidase I and cytochrome b) from shrimp collected from Washington, Oregon and California and applied standard phylogeographic analyses to evaluate the degree of genetic differentiation across the region.

They also documented the kinds and abundances of parasites on ghost shrimp purchased from bait shops in Southern California (quarterly for a two-year period) and looked at differences and similarities among these parasites and those on ghost shrimp collected in the field at sites between San Juan Island in Washington and San Diego.

RESULTS

The survey results suggest that each year California imports about two million ghost shrimp from the Pacific Northwest; a million “lugworms” from South Korea; 600,000 blood worms from Maine; and 600,000 pileworms from Maine and Massachusetts.

Laboratory experiments show that these species can survive for five days (the duration of the experiments) at temperatures characteristic of Southern California’s different marine environments.

The mitochondrial DNA data revealed no geographic differentiation along the West Coast, meaning that northern and southern ghost shrimp populations appear to exchange genes regularly. This finding implies that the live-bait trade poses little risk to the native gene pool, and is consistent with the theory that species with long larval periods tend to be genetically homogenous.

Three main taxa of parasites – nematodes, tapeworms and bopyrid isopods – were found on both imported and resident ghost shrimp. The final hosts for the first two species are fishes, while the final hosts for the isopods are ghost shrimp. The only metazoan parasites found in shipments of northern ghost shrimp were

bopyrid isopods and one or more species of nematodes. It remains unclear whether or not these two types of parasites are native to California, and further studies are needed to determine whether isopod larvae can survive in the region’s warmer coastal waters.

The overall prevalence of the bopyrid isopod *Ione cornuta* on imported ghost shrimp was 14 percent, compared with 1.3 percent for wild specimens from the Point Conception area. Isopod infection rates are of interest because the parasite sterilizes its host and can thus reduce wild ghost shrimp populations, which are an important food resource for many animals.

APPLICATIONS

The periwinkle snail, European green crab and certain types of marine algae are examples non-native invasive species believed to have been introduced to California accidentally via releases of live bait. Managers may use the information gathered in the project to develop strategies for preventing or minimizing future releases of animals that may either directly or indirectly introduce new non-native invaders to the state’s coastal waters.



Ghost shrimp burrows at Elkhorn Slough, Monterey County. B. Passarelli



Ghost shrimp purchased from a bait shop in Los Angeles County are inspected for parasites. B. Passarelli



Sea Grant Trainee Bruno Passarelli collects ghost shrimp in mudflats of Tillamook Bay, Oregon. E. Kosman

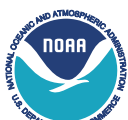
PUBLICATIONS

Pernet, Bruno, Aimee Deconinck, and Lisa Haney. 2010. Molecular and morphological markers for distinguishing the sympatric intertidal ghost shrimp, *Neotrypaea californiensis* and *N. gigas* in the eastern Pacific. *Journal of Crustacean Biology* 30(2): 323-331.

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