DON'T DUMP BAIT: Marine Bait Worms as a Potential Vector of Non-Native Species

A recently completed study by researchers from the University of Connecticut and SUNY Purchase reinforces concerns that live marine bait, such as bait worms, and more particularly, the seaweed or other material they are packed in, can serve as a vector or pathway by which organisms from one region can be introduced into another. Some organisms, when introduced into a new habitat either by accident or on purpose, do survive and become established. These are considered non-native introductions, but if the organism then becomes dominant in its new environment, it is labeled "invasive". The definition of an invasive species is "*a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health*" (Invasive Species Advisory Committee, 2006).

Live marine sand worms *(Nereis virens)* are packed with a brown seaweed called wormweed *(Ascophyllum nodosum)* to keep them cool and moist during transport to retail operations where they are sold for bait. (Photo: T. Getchis, CT Sea Grant)

Study Background

Between 2006 and 2009, research teams led by University of Connecticut researchers Charles Yarish, Robert Whitlatch, and Senjie Lin and SUNY Purchase researcher George Kraemer examined samples of live marine worms purchased from retail bait shops in Connecticut and Long Island, New York for non-native invertebrate animals, seaweeds (macroalgae), and harmful, toxin-producing phytoplankton species (microalgae). The study, funded by the U.S. Environmental Protection Agency Long Island Sound Study, with additional support from Connecticut Sea Grant, involved using a combination of visual and microscopic inspection and sophisticated molecular biological techniques to detect whether non-native organisms were being transported with bait worms, and if so, whether the number and type of non-native organisms varied by purchase location or time of year.

Boxes of sand worms (*Nereis virens*) were purchased from four different bait retailers in Connecticut and New York twice a month between June and October and bi-monthly between November and May over an 18-month sampling period. The worms are commonly packed with a seaweed called wormweed (*Ascophyllum nodosum*) to keep them moist and cool during shipping. The seaweed in each box was divided into three parts to facilitate examination for macroalgae, microalgae, and invertebrates. In the samples assigned for macroalgae research, the wormweed and any salt marsh grass (*Spartina alterniflora)* mixed in with it were examined for signs of other macroalage species growing on them. Pieces from each sample were incubated at three temperatures, 5°, 15°, and 25°C, for 10 days following a typical light cycle to encourage growth of these "hitchhikers" so that they could be positively identified.

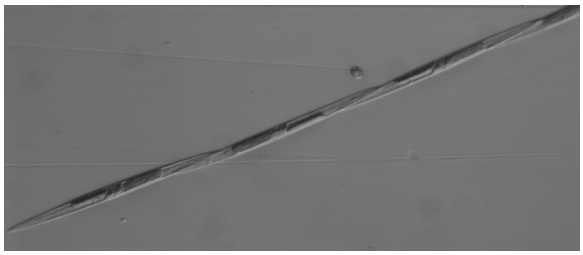
The samples destined for microalgae investigation were shaken in sterilized water and filtered. The filtrate was then divided into sub-samples for either examination by microscope, initial DNA extraction, or culturing at 5°, 15°, and 25°C for 10 days under intense light followed by DNA extraction. The DNA samples were then run through a complicated molecular biological technique called polymerase chain reaction (PCR) and sequencing to determine what species of microalgae were present. The results of the PCR were validated by comparing the gene sequences to known sequences reported in GenBank, the National Institutes of Health genetic sequence database containing a collection of all publicly available DNA sequences.

From the samples reserved for invertebrate analysis, all invertebrates dislodged from the wormweed or marsh grass were collected and preserved. They were then identified to the lowest practical taxonomic category using a dissecting microscope and taxonomic keys.

Results

Fourteen species of macroalgae and two species of harmful microalgae were identified from the samples. In addition, 23 different taxa of invertebrate animals were discovered in the samples, including five amphipod species, four gastropod species, four bivalve mollusk species, three annelid species, two arachnid species, the larvae of two insect species, and one isopod, copepod and ostracod species each. Higher summer temperatures led to a higher diversity and abundance of the seaweed and phytoplankton species identified, as well as greater abundance of the invertebrate species. The complete study results are available on the EPA Long Island Sound Study web site. Full Report

One of the harmful microalgal species identified, *Pseudo-nitzschia multiseries* (below), is not native to Long Island Sound, and was found in 58% of the samples. Microalgae are single-celled plants commonly called phytoplankton, which form the basis of the food web. Under certain conditions, they can grow very quickly, amassing in huge numbers called "blooms" which can tinge the water with red, brown, or green color, depending on the species involved. While most microalgae are not harmful, some species are capable of producing powerful neurotxins, which are retained by shellfish or finfish that feed on the microalgae. As these organisms are then consumed, the toxin is passed along the food chain in increasingly greater concentrations. These are referred to as harmful algal blooms or HABs (although a bloom is not necessary for the toxin to be present in dangerous levels). *Pseudo-nitzschia multiseries* produces the neurotoxin domoic acid which can cause death in birds and marine mammals, and amnesic shellfish poisoning in humans. Humans that consume shellfish harvested from areas where a bloom of this species is occurring may suffer from short-term memory loss and difficulty breathing, but the affliction can also be fatal.



Pseudo-nitzschia multiseries, a needle-shaped diatom or microalgae, can produce a toxin that causes amnesic shellfish poisoning in humans. (Photo: S. Lin, UConn)

Implications

The sand worms and blood worms commonly sold for bait in Connecticut and New York, are harvested from the intertidal flats of the Gulf of Maine. While most of the species identified in this study are not new to Long Island Sound (indicating they are either native to the Sound or were introduced at some point in time prior to this investigation), they may be different genetic entities from what is already present. In addition, these bait worms are typically shipped to other parts of the U.S., including the West Coast, as well as Europe. If the seaweed in which the worms are packed is dropped into the water, it is possible that any organisms it is harboring could survive and become established in that body of water. In some cases, this could lead to unwanted environmental, economic, or human health consequences. The results of this project confirm what other studies have suggested, that bait worm packaging can be a vector for non-native species, some of which can potentially become invasive, and that even marine worms shipped from Maine have the potential for bringing something new with them to Long Island Sound.

What Can Anglers Do? Dispose of Unused Bait and Seaweed in the Trash

The simple solution is to discard the seaweed or any material in which bait worms are packed, along with the carton/bag and any unused bait in the trash, not in the water. Doing so minimizes the risk of non-native species being introduced from one area of the coast to another via this pathway. Anglers will help protect the waters in which they fish by preventing unwanted organisms from travelling with the live bait. This will benefit the environment, economy, and human health.

For more information:

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