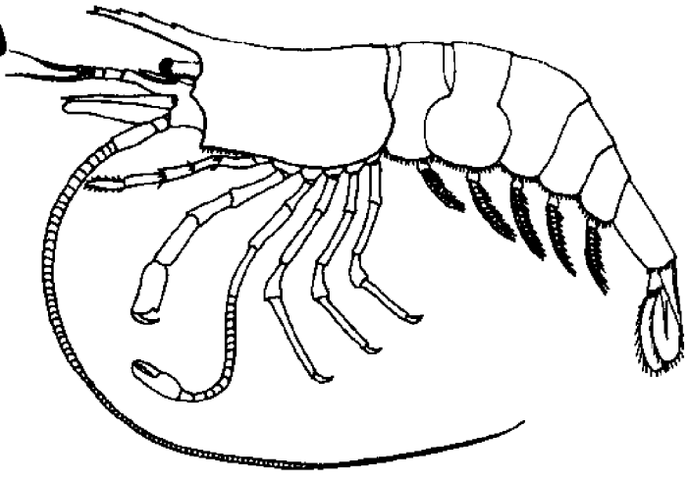
RIU-TL-79-001 c. 2

FACT SHEET

University of Rhode Island
Marine Advisory Service / NOAA Sea Grant



THE ROLE OF GRASS SHRIMP, PALAEMONETES PUGIO, IN A TIDAL MARSH ECOSYSTEM P 833

by Barbara L. Welsh
(edited by John Shea)

Dead Spartina, a type of sea grass, is a source of abundant energy to an embayment. Small particles of Spartina make up a significant portion of the seston expelled from a marsh such as that in Bissel Cove, Rhode Island. Spartina has to be broken up by an organism. Amphipods such as crayfish and shrimp, it has been established, speed up the reduction of detritus, in other aquatic grassy ecosystems. For the sea grass in Bissel Cove, the simple grass shrimp, Palaemonetes pugio, was suspected of fulfilling this role.

One might expect that an abundant shrimp population might exert a substantial impact on the dominant energy sources while also channeling a good portion of that energy throughout its own population. Barbara L. Welsh, a marine ecologist, while working on research sponsored by NOAA Sea Grant, decided to find out if this was true.

A study was done of the Bissel Cove area for one year. By measuring the grass shrimp population and flow rate of organic debris into the embayment at periodic intervals, a picture of the grass shrimp interaction with the Bissel Cove ecosystem was developed.

The shrimp can assimilate grass detritus with high fiber content. Therefore, it should be well adapted to extracting the high protein available in Ulva, a type of seaweed, despite the Ulva's large portion of tough, fibrous material. It was found that the grass shrimp can reduce large amounts of Ulva into a fine brown silt in a very short time -- several days.

To give you an idea of how the grass shrimp fits into its ecosystem, take a look at the diagram on the back. The shrimp feeds on the detritus floating in the water. From what it takes in, 40 percent is given out as respiration; the remaining 60 percent either becomes part of the shrimp itself or is excreted as dissolved organic material (DOM) and fecal pellets. The DOM and fecal pellets are packaged into protein-rich products which are eaten in turn by other life forms at different energy levels of the food web. Some of the waste is even reconsumed by the shrimp.

The shrimp's waste material, rich in ammonia, phosphates, nitrates, and nitrites serves as a fertilizer which accelerates the growth of bacteria and diatoms (a type of algae) on the organic material suspended in the Bay. Growth of local water plants such as Ulva and Enteromorpha are stimulated as well.

Another point worth mentioning is that the grass shrimp can survive in the low oxygen environment caused by the high rates of decomposition in the Bay.

The grass shrimp, while supplying its own energy needs:

- Accelerates the breakdown of accumulated detritus resulting from the growth of sea grasses and macroalgae in the embayment.

- Grinds up the marsh grass detritus and repackages it as fecal pellets and dissolved organic material, thus making it available to a variety of other life forms.

In this way, the efficiency of energy transfer through the food web is increased.

GLOSSARY

embayment--formation of a bay, depression of the land about a river mouth so that the sea overflows it, or formation resembling a bay.
seston--minute material moving in water, including living organisms (plankton and nekton) and non-living material (plant debris and suspended soil particles).
detritus--particles of broken organic material.
DOM--Dissolved Organic Material
Sea Grasses--Ulva, Spartina, Enteromorpha, Ruppia.

9/79

TIDAL MARSH
ENERGY FLOW CHART