



**NOAA Teacher at Sea  
Rebecca Bell  
Onboard NOAA Ship DELAWARE II  
August 13 – 28, 2008**

**NOAA Teacher at Sea: Rebecca Bell]**  
NOAA Ship DELAWARE II  
Mission: Ecosystems Monitoring Survey  
Geographical area of cruise: North Atlantic  
Date: August 16, 2008

**Weather Data from the Bridge**

Time: 1807 (GMT)  
Latitude: 36.05.40 N  
Longitude: 75.24.30 W  
Air Temp °C: 25.3 °C  
Sea Water Temp: 26.7 °C

**Science and Technology Log**

The most common zooplankton we have seen so far are salps, amphipods, arrow worms and copepods. Pteropods (sea butterfly) have been in a number of samples but are not numerous.

Salps look like clear, jelly-like marbles. We've encountered these animals in warm, shallow water. They are holoplanktonic relatives of sea squirts (Urochordata). Salps are filter feeders, using cilia to move suspended particles from the water. They feed by pumping water through a sieve to remove bacteria and nanoplankton, and are thus, a very important link in the food chain. Some species of salps form huge chains by budding. They show both sexual and asexual life stages. For more about salps and photos see:

<http://www.divediscover.whoi.edu/expedition10/hottopics/salps.html>

Amphipods are also extremely common crustaceans. There is no carapace (shell-like covering), but their bodies are flattened side-to-side, much like a shrimp. Their bodies are segmented with 6 segments in the head, 8 in the thorax and 6 in the abdomen.<sup>1</sup> They have a brood pouch on their thoracic limbs. They have a variety of limbs used for feeding, crawling or jumping. One group lives off a host, feeding on salp tissues. Some types live in tubes; others use their back legs to



**On left: small barrel-shaped copepods; Center: white, arrow worms; Top right: amphipods**

anchor themselves while they sway to and fro in the water column. Some species swim rapidly while others stay near the bottom of the ocean. Many will move vertically in the water column, moving near the surface during the day, and sinking again at night. The species we are catching has large compound eyes that can be seen by the naked eye. For more about amphipods and a photo <http://www.divediscover.whoi.edu/expedition10/daily/critter/amphipod.html>

Copepods are very common crustaceans, with more than 200 species and 10,000 families.<sup>2</sup> We have found more of these than any other organism. Copepods are omnivorous. Some groups graze on microplankton; other groups of copepods prey on larger plankton, including other copepods. They are an important link in the food chain as well, moving carbon from a microscopic level to a larger trophic (feeding) level. They are eaten by jellyfish, fish, comb jellies and arrow worms. Copepods have “antennae” that have special sensors that detect water movement around them. They are able to move toward prey by contracting a muscle that runs in a circle around their bodies. For more about copepods and photos, see <http://www.divediscover.whoi.edu/expedition10/daily/critter/copepod.html>



**Becky examines the catch using a hand lens.**

Arrow worms (Chaetognatha) are common along coasts, but we did not catch any out away from shore. Arrow worms are classified in their own group, distinct from Annelids (earthworms), round worms and flatworms, which are all separate groups of worms. They are predators, often waiting to ambush their prey. When their cilia detect prey, usually copepods, the arrow worm contracts 2 muscles that run dorsally and ventrally (top to bottom) to strike. Their mouths have spines that grab the prey and smaller “teeth” produce a venom that subdues the prey. The prey is swallowed whole. Arrow worms, in turn, are eaten by jellyfish, copepods and fish.<sup>2</sup>

Sea Butterflies were not common, but they are very interesting. Sea butterflies (pteropods) are holoplanktonic mollusks, related to snails. Basically, they are shell-less snails. Their foot is modified into winglike structures (ptero= winged) that they flap as they swim through the water. Their bodies are tube-shaped and clear. The bodies and wings of the species we have seen are an orange-pink color. They are

predators and are preyed upon by fish, sea birds and whales.

- NOAA Photo Library, Sea Butterfly: <http://www.photolib.noaa.gov/brs/nuind8.htm>
- Photo Sea Butterfly: <http://www.polartrec.com/gallery/2007/bering-ecosystem-study/emily-davenport/pteropod.jpg.html>
- Sea Butterfly and other photos: <http://www.arcodiv.org/watercolumn/pteropod/index.html>

**References:**

Information for these paragraphs were modified and combined from the following sources:

<sup>1</sup> Newell, G.E. and Newell, R.C.; Marine Plankton: A Practical Guide; 5th edition; 1977; Hutchinson & Co; London.

<sup>2</sup> Johnson, William S. and Allen, Dennis M.; Zooplankton of the Atlantic and Gulf Coasts: A Guide to Their Identification and Ecology; 2005; Johns Hopkins University Press.

**Personal Log**

This morning we saw dark clouds in the distance. You could see rain falling from the clouds. Nearby we could see the tail of a water spout disappearing into the clouds.

We sampled our southern-most station and are now heading north along the coast just south of Chesapeake Bay. The samples we are pulling now have a lot of diatoms.