

Sampling the Charleston Bump: *Finding a Needle in a Haystack*

A Photo Documentary
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Photos courtesy of E. Wenner



Research platform

A research platform intended for studying deep sea habitats should include the following characteristics:

- a stable platform capable of handling rough seas
- outfitted for multiple purpose sampling
- manned with a capable crew
- modern navigation technology
- provide on site sampling and video documentation



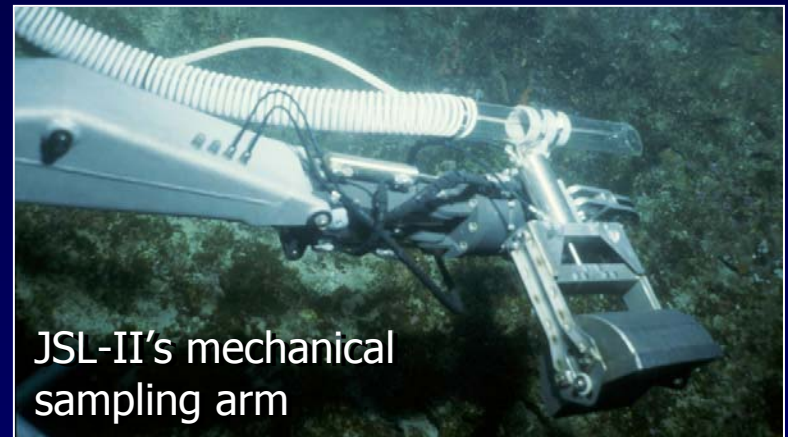
The Research Vessel *Seward Johnson*, of the Harbor Branch Oceanographic Institution (HBOI)



How to Get There from Here?

A manned submersible is able to do the following:

- sample small scale features and animals *in situ* (i.e., in their natural habitats)
- perform in environments with complex topography
- allow for human observation of habitats and associated organisms



The submersible Johnson Sea-Link II is deployed from the R/V Seward Johnson



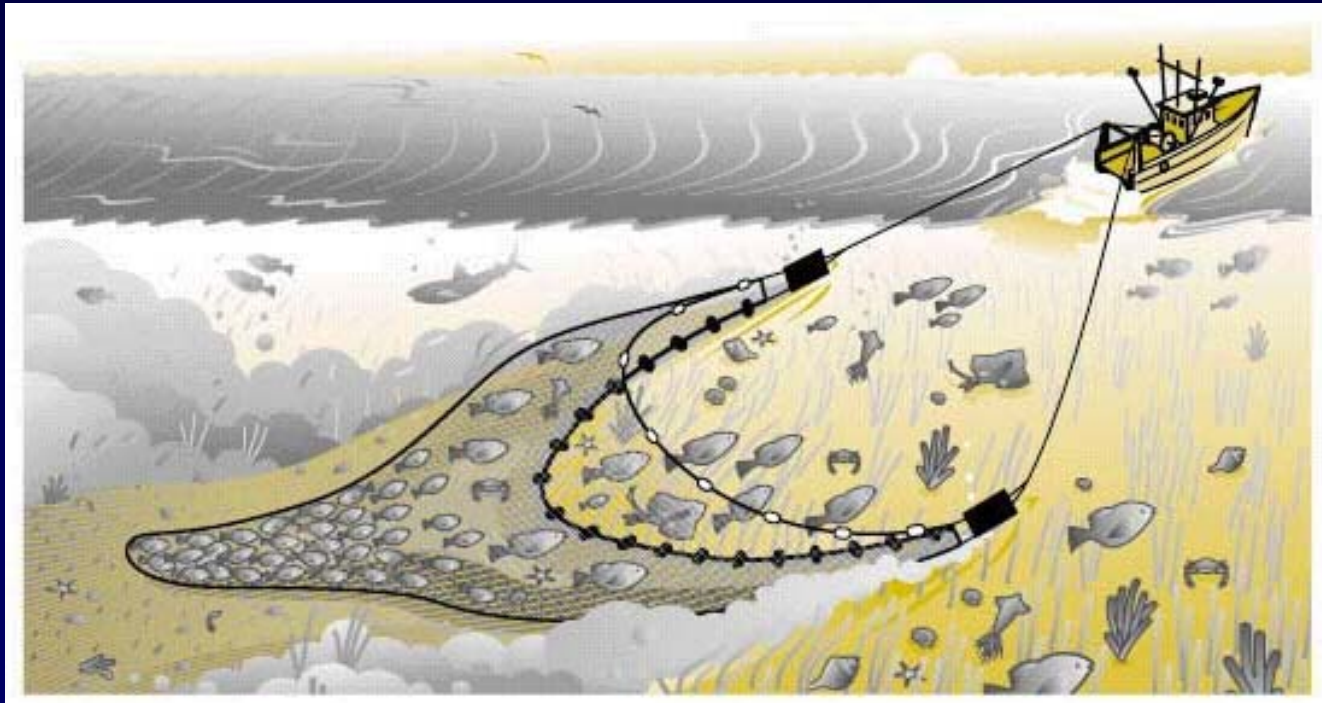
Choose your gear carefully

The Charleston Bump is characterized by rocky substrate (seafloor) with many exposed ledges. There are limited choices in the types of gear that can successfully sample such irregular substrates.



What not to use!

Sampling gear such as trawls can't be used on a rocky-bottom seafloor, as they would be torn up and would hang-up on the rock outcrops as they are towed.



Trawls are intended for sandy and soft seafloor habitat areas.



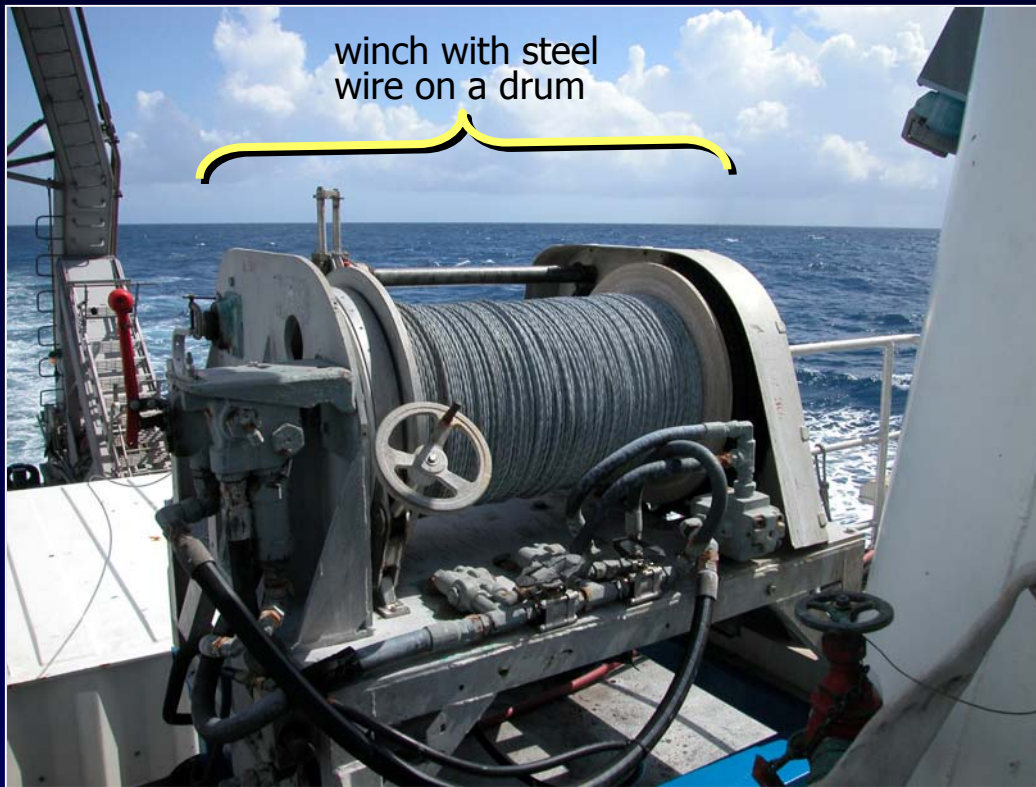
Rugged is good!

Scientists studying the Charleston Bump must use relatively indestructible gear, such as dredges, that can withstand being dragged over rocks.



An inexpensive but nearly indestructible pipe dredge.



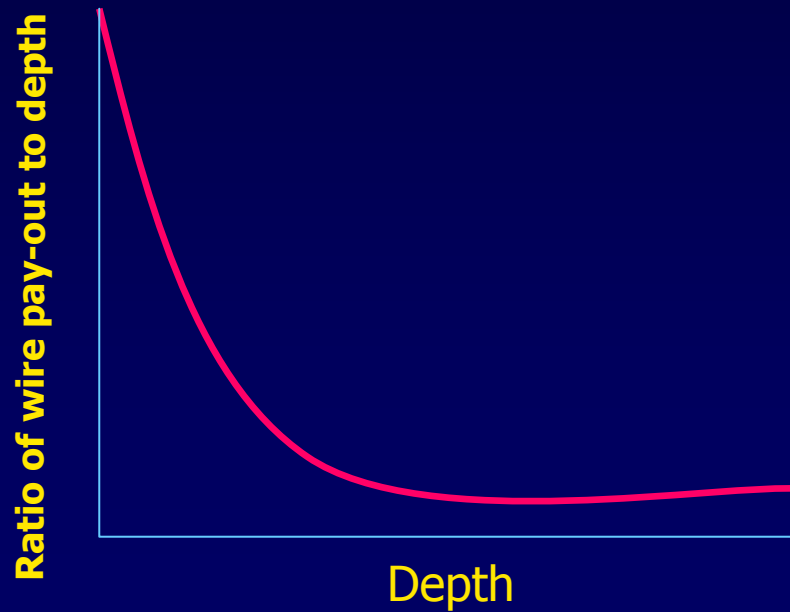


Sampling gear is attached to strong wire that is wound around a drum. Typically, the wire consists of many strands of small diameter steel wires that are woven together, making it very strong.

The wire is payed-out and hauled-in using a *winch*. Some winches can hold miles of wire.



When deploying an instrument that needs to be towed, determining the amount of wire to let out is very important. The amount will vary depending on the wire's weight and drag, as well as the towing speed and water's depth.



Types of Sampling Gear Used at the Charleston Bump

Quantitative sampling gear allows for sampling of a known area of the sea floor, or a known volume of water. The gear must be capable of being deployed so that sampling is efficient.

Non-quantitative sampling gear is designed to provide representative organisms but not to provide valid abundance measurements for a particular habitat.



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Deciding what gear to use largely depends on the habitat being sampled.



Quantitative Sampling Gear Used at the Charleston Bump

Neuston nets

These types of nets are towed at the surface to sample plankton – small organisms that are unable to swim, but instead drift with the currents. Scientists can determine the number of organisms per unit volume of water filtered.



The neuston net has a large rectangular opening.



Quantitative Sampling Gear Used at the Charleston Bump

Neuston nets



The neuston net is towed at the surface for a measured length of time. Since the area of the net opening is known, the volume of water passing through the opening per minute can be determined.



Bongo nets

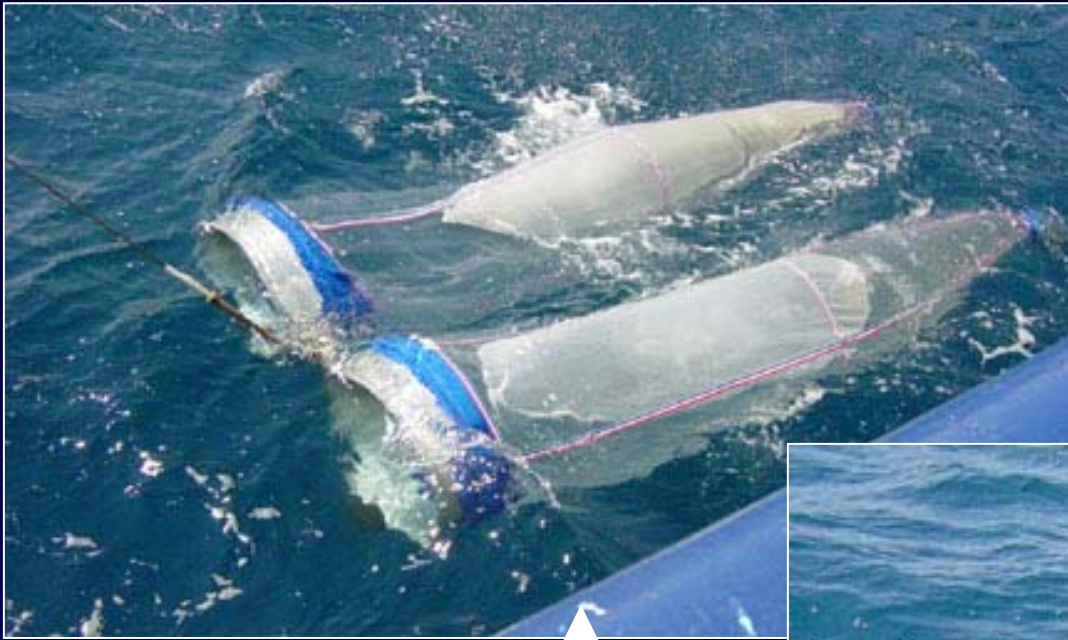
Bongo nets are deployed to sample plankton at mid- to near-bottom depths. They are also used to determine the number of organisms per unit volume of water filtered.



Photos by Project Oceanica (left) and E. Wenner (right)



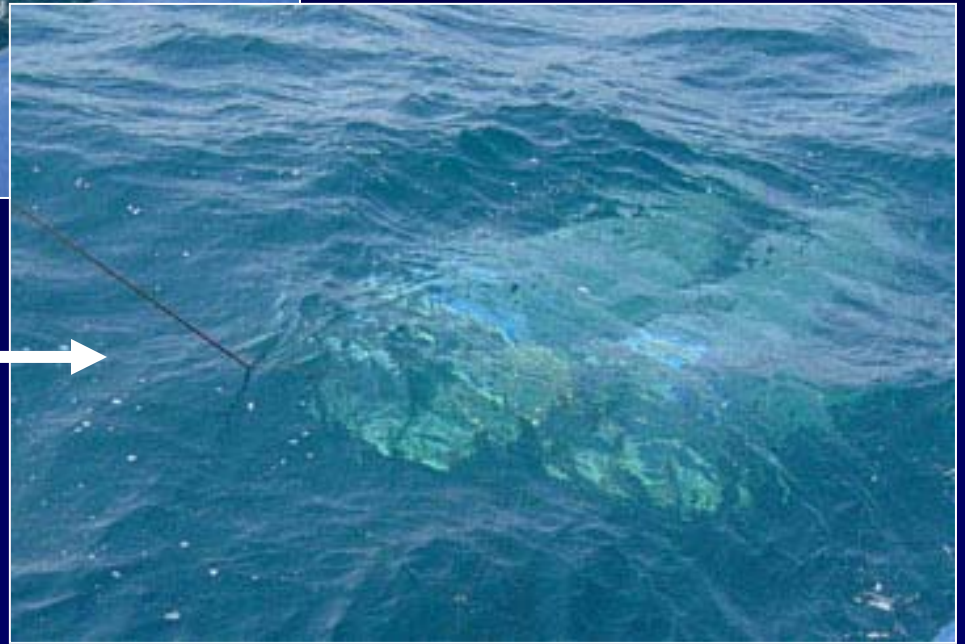
Bongo nets



Bongo nets at the surface....

...and being lowered at greater depths.

Often, the two nets have different mesh sizes so they capture different sized particles and organisms.





When each tow is completed, the material caught within the net (either neuston or bongo) is washed into a cod end, then transferred into a bucket.

In the lab, the water is carefully poured through a sieve (a wire screen) to separate the plankton.



Video and Still Camera

A large amount of data collected for studies of the Charleston Bump are in the form of visual images. Both video- and still cameras that are mounted on the submersible are used to examine and record the seafloor habitats.



Video camera system mounted on the JSL-II submersible.



Video and Still Camera

Video transects are made during the dive. A video transect is a timed segment of video recorded as the sub moves along a straight path at a constant speed. These transects allow for the determination of numbers of organisms per unit area along the sampling line. This type of sampling is dependent on having accurate start and end positions.



The tapes are analyzed on board the ship. Organisms and other habitat features encountered during transects are recorded.



Non-Quantitative Sampling Gear

As described earlier, *non-quantitative* sampling gear is designed to provide representative organisms but not to provide valid abundance measurements for a particular habitat.

These types of sampling gear were used in early voyages by deep sea explorers.

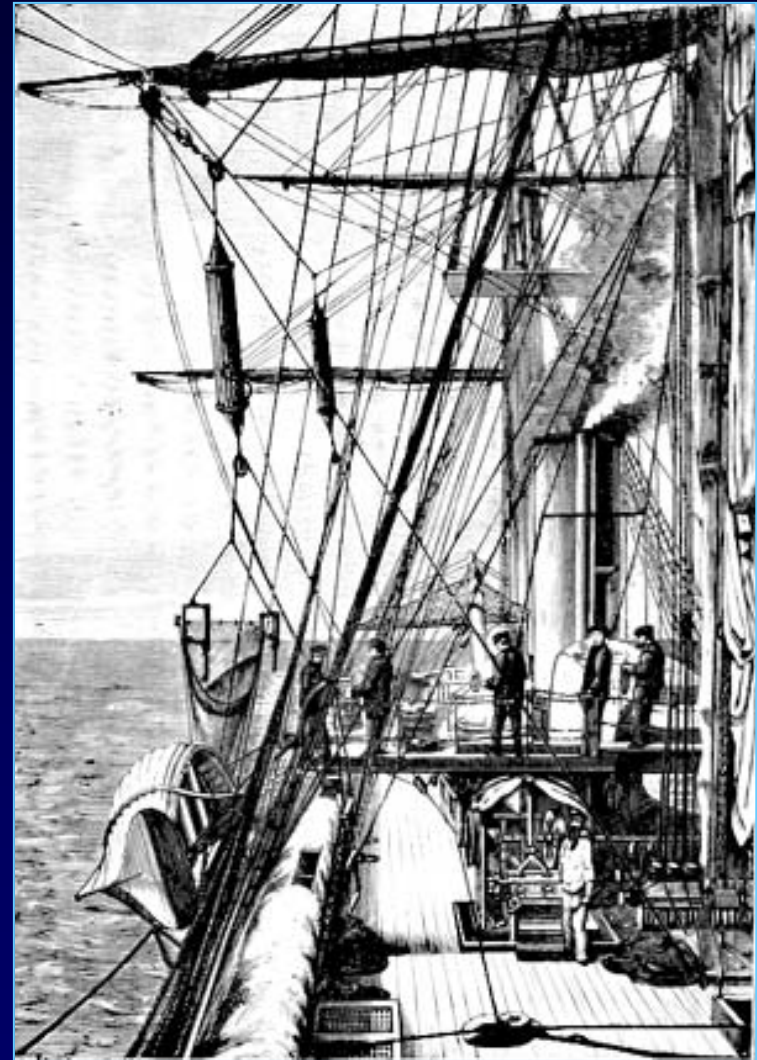


Illustration courtesy of
<http://life.bio.sunysb.edu/marinebio/challenger.html>

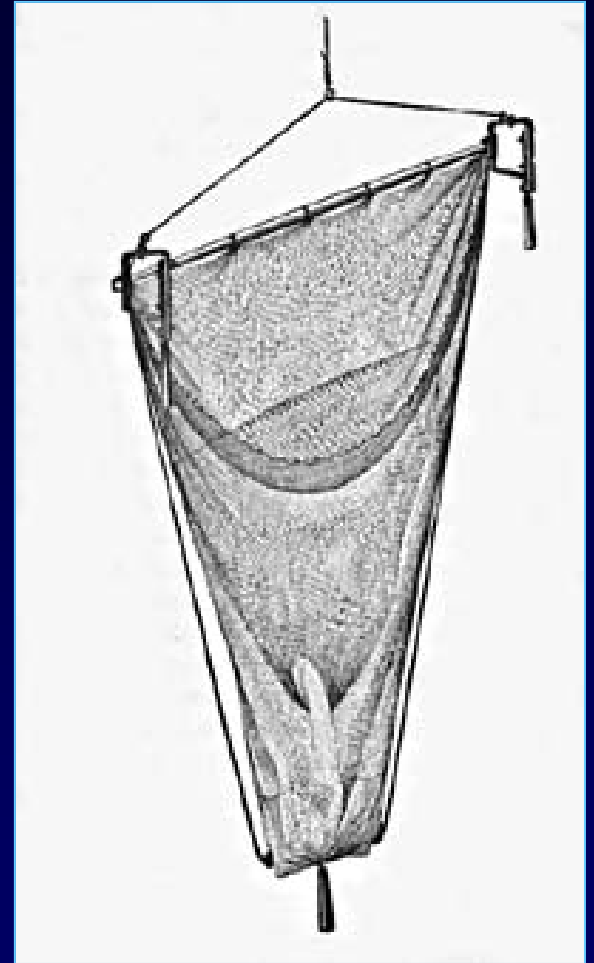


Non-Quantitative Sampling Gear



Non-quantitative types of gear may not be "high tech" but they are effective for collecting organisms.

Different gear are designed for different habitat types.



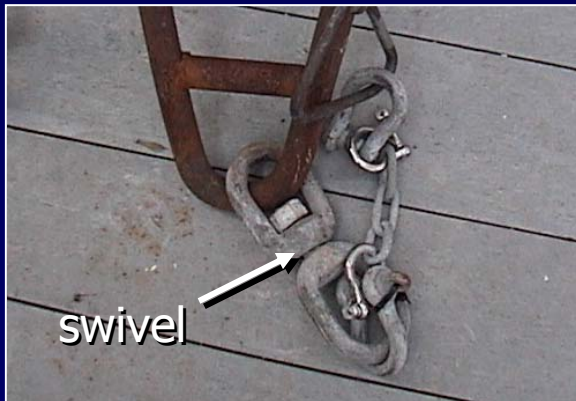
Illustrations courtesy of
<http://life.bio.sunysb.edu/marinebio/challenger.html>

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Non-Quantitative Sampling Gear Used at the Charleston Bump

The pipe dredge is an example of a non-quantitative type of gear. It is designed to drag along the bottom and scrape up sediment, rocks and attached organisms. It weighs about 450 lbs and is attached to a wire by a swivel that allows the device to turn without twisting the wire.



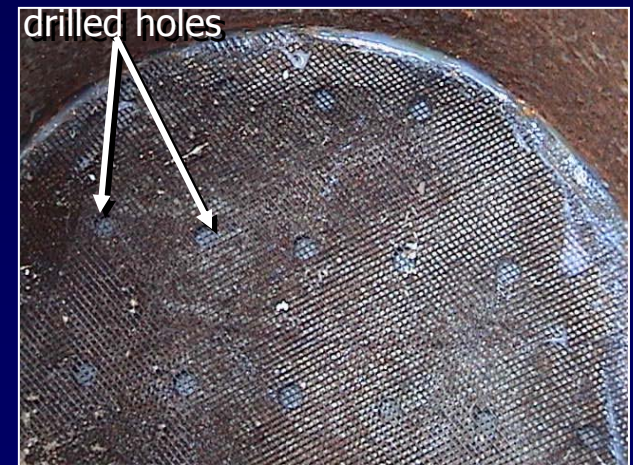
The pipe dredge may be low tech and unglamorous, but it is *effective!*





The pipe dredge includes a weak link that is designed to break should the dredge get snagged on a rock. A safety line is attached at the base that would then upend the dredge and flip it over to free it from a hang and allow it to be retrieved.

At the base of the pipe, holes have been drilled into the iron, and a mesh screen is secured inside. These perforations allow water to pass through during the dredge process.



Does it Work?

Our first haul at the Charleston Bump was disappointing, because we didn't "catch" anything. Not enough wire had been payed out to allow the dredge to effectively stay on the seafloor.



The pipe dredge is deployed from the ship's stern.



Does it Work?

On our second attempt, we used an amount of wire equal to two times the water depth. With this strategy, the dredge worked well!



It was retrieved with corals, hydroids, sponges, rocks and sediment.



Some of the material that was collected in the dredge



Passive Gear

Scientists also use passive gear – or gear that is stationary – such as baited traps to collect motile organisms. Below is a carrion trap used at the Charleston Bump.



Photo courtesy of E. Wenner



What on earth is a carrion trap?

Basically, a carrion trap is a bucket filled with rotting oysters! It is placed on the seafloor by the submersible and is allowed to stay on the seafloor for at least 24 hours.

While it's on the seafloor, organisms are attracted to the new food source and climb in!



Photo courtesy of E. Wenner



What on earth is a carrion trap?

When it is retrieved, the oysters are washed onto a sieve and the organisms are saved.

This device is designed to attract motile organisms that are often dispersed on the seabed.



Photo courtesy of E. Wenner



Some of the organisms that were collected in the carrion trap

Eugonatonotus crassus



Plesionika sp.



Bathynectes longispina



Lysianassid
amphipod



Summary

- Much remains to be known about deep sea life and habitats
- Sampling can be a challenge at deep depths
- A variety of techniques that include quantitative and non-quantitative methods must be used
- Visualization of the habitat and organisms using a submersible and underwater camera provides a wealth of information



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