Some Procedures for Assessing Organisms Associated with Rocky Substrata

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Studies of food habits in fishes are more meaningful if they determine not only what the fishes eat but also measure the prey that are potentially available to them. This is particularly important in studies that consider competition and feeding selectivity among predators. To measure potentially available food, or to determine if a resource becomes limiting, one must take consistent and quantitative samples of the biota within the feeding area. Furthermore, to evaluate the selectivity of a predator, one must consider organisms that are not preyed upon along with those that are.

An investigation of prey availability must also consider both temporal and spatial variations in density and distribution. Temporal variations, including seasonal changes and differences in distributions between day and night, can be profound, and understanding their patterns is important in determining how resources are utilized (Hobson and Chess, 1976).

It is a major task to monitor potentially available prey owing to the tremendous numbers and variety of organisms involved. Taxonomic problems are especially frustrating since many invertebrate groups, including the gammaridean amphipods and ostracods, are either difficult to work with, or poorly known, or both. Furthermore, to fully understand the interspecific relationships, taxa must be distinguished to species, and this is complicated by the fact that our knowledge of the systematics of many groups remains incomplete.

It is important to remember, however, that the availability of a given prey is not determined simply by its abundance. Availability is also determined by the predator's feeding strategy as well as the behavior and morphology of the prey. Thus studies of prey behavior should be an integral part of a comprehensive evaluation of food habits in fishes.

Background

The techniques described here, among others, were developed to monitor a variety of marine communities during comprehensive studies of feeding activities in fishes at Catalina Island, California (Hobson and Chess, 1976; Hobson and Chess, in prep.) Some of the same techniques are now being used in studies on the coast of northern California. This report considers methods developed to assess the organisms associated with rocky substrata accessible to divers using compressed air.

Selecting and Marking Study Sites

Preliminary surveys are important in selecting specific locations that characterize the general study area. Although it may be self-evident that data must be collected from a site that typifies the habitat under study, some investigators fail to meet this basic requirement. Study sites are usually selected on the basis of dominant or persistent floral components or type of substrata. Once the site is selected, spikes or stakes driven into the bottom permanently mark the places to be periodically monitored. For each assessment, a measuring tape (usually 25 m long) is laid out between the markers, and the macro-organisms within 2 m of the line are quantified.

Visual Assessments

Quantitative observations. Larger organisms within the transect area can be enumerated by simple visual count while swimming along the line. Macroalgae are assessed as to percent cover and relative species abundance.

Supplemental observations. It is important to include the many general, non-quantitative observations that are made during the course of a study--both inside and outside of the study site. General impressions gained from casual observations frequently provide meaningful insight into behavior and distribution of both invertebrates and fishes. Often such insight is needed for meaningful analysis of the quantitative data.

Collecting Procedures

Fishes. For gut content analysis, most fishes are collected by spear, but quinaldine is used to sample the most cryptic forms. The spears are multipronged and vary in length from 2 to 8 feet to meet the differing needs in collecting various sizes and species of fishes.

Algae associates. The organisms associated with the 3 or 4 most dominant species of macroalgae are collected by placing bags (fine mesh or plastic) over the algae and cutting it free. To evaluate substrata preference of the associated organisms an attempt is always made to collect a single species of algae in each bag. Other arborescent forms such as certain hydroids and ectoprocts are collected in the same manner when analyses of their associates are warranted.

Plankton. Organisms occurring in midwater are collected by pushing a meter net through the water column at a specific depth for a specific length of time. This method permits precise measurements of the organisms occurring at specific depths above particular substrata or habitats (see Hobson and Chess, 1976, 1978).

Epifauna. An airlift device, as described earlier (Chess, 1978), is used to quantitatively collect the epifauna from rock bottoms. The procedure described in this report is basically the same but employs a more versatile device (Fig. 1). Organisms are collected from within a .25 m^2 quadrat, using the airlift like a vacuum cleaner. The organisms are drawn up the tube, through a one-way valve and into a mesh collecting bag.

Figure 1. Flexible airlift device.

The modified device is made of flexible plastic corrugated swimming pool cleaner hose (38 mm I.D., 3 m long) rather than rigid PVC pipe. Two advantages of the flexible airlift is portability and ease of use in rough water. It can be easily coiled and stowed in a small boat. In strong wave surge the tube's flexibility allows it to sway back and forth, enabling the operator to maintain position and direct the nozzle of the airlift much easier than with the rigid tube.

As with the earlier device, this airlift is powered by low pressure air from a scuba regulator, either the diver's or a separate unit. Both devices are held vertical in the water by a donut buoy attached to the top and lead weights to the bottom. It is convenient to have the air supply (scuba tank) suspended in the water so that the valve and regulator are not damaged by striking the bottom and to increase mobility of the whole apparatus. Certain small steel or aluminum air tanks are buoyant when only partially filled (about 1500 psi). The manifold used to introduce air into the tube is a 12 cm length of PVC pipe glued top and bottom around a perforated portion of the tube. An even flow of small bubbles from the perforations causes less turbulence and is more efficient than if large bubbles from a single air inlet were employed. The one-way valve at the top of the tube prevents escapement of organisms back down the tube. It can be easily fabricated of wet-suit neoprene by first gluing a piece about 15 cm long into a cylinder of sufficient diameter to slip over the tip of the tube, then cutting two opposite sides from the top about 1/3 down and gluing the margins of the inside edges of the cut together, thereby forming a closed slit at the top. It allows easy flow of air and material into the bag and prevents its return. The collecting bags are fabricated of .333 mm plankton net material.

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WASHU-W-79-001 C2

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Fish Food Habits Studies Proceedings of the Second Pacific Northwest Technical Workshop

October 10-13, 1978

Lake Wilderness Conference Center
Maple Valley, Washington

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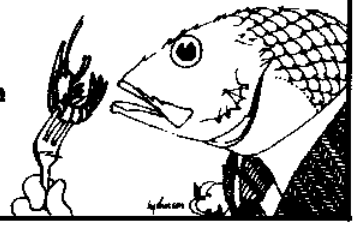
A Washington Sea Grant Publication
University of Washington
Seattle



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