Underwater Observation

- ***Description and method of use***

Underwater observations can be made by snorkeling, by using SCUBA, or with underwater video cameras. The observer must be able to identify the fish observed without having them in hand. Diver/snorkeler observations can be recorded on underwater writing tablets and video can be recorded. Fish can be counted across the entire width of streams, using single or multiple observers depending on stream width and visibility. Observations can also be made along transects of known length and width (Pratt, 2004; Buckland et al. 1993). Schill and Griffith (1984) describe the use of PVC pipe to maintain multiple observers in the same relative position along a transect. An alternate to transects is to count fish within a specified radius from a given point (Graham, 1992), which is effectively point sampling.

Fish length can be estimated visually, or by aligning the snout and tail with adjacent objects and measuring that distance (Cunjak and Power, 1986). Objects are magnified by 20%-30% underwater, and some investigators have applied a correction factor to visual estimates of length to compensate for this (e.g., Mullner et al. 1998). There are often significant differences between length-frequency distributions based on visual observations and those based on measurement of electrofished individuals (Roni and Fayram, 2000; Mullner et al. 1998).

Because the fish are actually observed in their habitat, rather than removed from it, direct observation can be used to determine specific habitat relationships that are difficult or impossible to determine using any other means (Cunjak and Power, 1986). The effort required to count fish in a section is much lower, in terms of person-hours, than is required to conduct removal-method population estimates by electrofishing (Hankin and Reeves, 1988; Cunjak et al. 1988).

- ***Habitat considerations***

Snorkeling or SCUBA can be used in a wide variety of situations, but is not possible in extremely small or shallow streams, or in extremely high velocity habitats. Accurate counts are difficult or impossible in very shallow habitats (Cunjak et al. 1988; Hillman et al. 1992). Video cameras are most effective where there are no obstructions to camera manipulation.

Visibility and cover are both considerations in direct observations. One would expect that dense cover, such as weed beds and cobble or boulders would reduce the proportion of fish present that are observed.

Comparisons of day and night counts have yielded inconsistent results. Thurow and Schill (1996) reported no significant differences between them, while Roni and Fayram (2000) reported night counts to be much higher. Undoubtedly the differences between night and day counts will vary among habitats, among species and, in some cases, between seasons.

- ***Selectivity/Efficiency***

Because observational methods do not allow any way of marking or removing fish, efficiency has usually been estimated by comparing counts to electrofishing depletion estimates. Some authors have reported highly significant regressions between counts and electrofishing estimates for salmonid species (Hillman et al. 1992; Mullner et al. 1998; Roni and Fayram, 2000; Hankin and Reeves, 1988), while other authors have reported counts to vary widely in efficiency (e.g., Cunjak et al. 1988). In this approach, and other methods that correlate on estimation method with another, it is important to remember that there is error associated with both estimates and that the regression predicts the mean of the dependent variable (Bakke, 2000).

Any factor that affects visibility can affect observation efficiency. Thus, count efficiencies are often lower for smaller fish (Cunjak et al. 1988; Thurow and Schill, 1996). Efficiency is expected to be lower for sedentary and cryptic species. Differences in preferred habitats, which differ in ease of observation (e.g. cover versus no cover, shallow versus deep, riffles versus pools), can cause efficiency to vary among species (Cunjak et al. 1988; Hankin and Reeves, 1988; Hillman et al. 1992; Roni and Fayram, 2000).

Some studies have shown count efficiency to be lower when fish densities are high (Cunjak et al. 1988; Roni and Fayram, 2000). This is likely to be more of a concern if multiple species are being examined, and may be particularly problematic for schooling species (Hillman et al. 1992).

- ***Quantification of Effort***

Effort is usually expressed in terms of fish observed per length or area of stream or shoreline or per transect of known length and width. The latter can then be expressed ascounts per unit area if desired.

- ***Fish Injury/survival***

One of the advantages of direct observation is that it is benign.

4. Gee or Minnow Traps

- ***Description and method of use***

Gee traps or minnow traps are widely used by anglers to collect small fish for bait, and are readily available at sporting goods stores. They are typically circular, slightly tapered toward the ends, and made of metal or, more recently, plastic with inward facing funnels at each end. The traps split into two halves so that fish can be removed or bait added, and they can be nested for storage. Although the term ‘standard’ minnow trap is sometimes used, these traps are commercially available in a variety of materials, dimensions, mesh sizes, and colours.

Consequently these aspects of the traps, including the dimensions of the funnel openings, should be described. Three custom-designed minnow traps, constructed of lengths of 7.5 cm diameter pipe with a funnel at one or both ends were described by Culp and Glozier (1989). Minnow traps are usually deployed on the bottom without anchors, and attached with rope to a fixed object or a buoy so that they can be retrieved. Culp and Glozier (1989) found that baiting traps with commercial trout pellets in cloth bags significantly increased catch. Minnow traps are small and light and are easily deployed and retrieved by one person. (Fig.7)

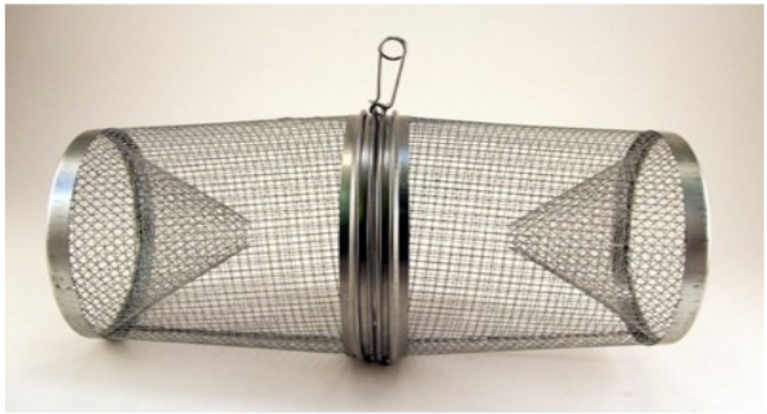

Fig – 4.11

- ***Habitat considerations***

Minnow traps are typically used in low velocity stream or littoral habitats. Water depth must be sufficient to submerge the trap entrances. The traps described by Culp and Glozier (1989) were anchored in riffle habitats, but anchoring commercially available minnow traps in fast currents can be problematic, as the trap shape can be distorted when a significant amount of force is applied, creating openings along the joint between the two halves of the trap. Because they are small, minnow traps can be deployed amongst aquatic vegetation or woody debris.Although no published reports were found, the seasonal differences in catches reported for most gears would be expected to also apply to minnow traps.

- ***Selectivity/Efficiency***

The maximum size of fish that minnow traps can catch is determined by the size of the funnel openings, which are usually quite small, and the minimum size retained is determined by the size of the mesh.

Minnow trap catches of the pairs of species were uncorrelated, as were those of plastic traps. This contrasts with trap net and gill net catches which were correlated. The correlation of catches in some gears and not in others may indicate that different factors determined catch for different species. For example, differences in size distributions among species and in size-efficiency among gears, or behavioural differences in response to bait, could contribute to a lack of correlation. The relative efficiency of gears in determining species richness depends upon the habitats to be sampled.

Jackson and Harvey (1997) found that in a lake where the diversity of small species was high, baited minnow traps captured more species than trap nets or gill nets, but fewer than plastic traps. They noted the advantages of a small gear that can be set in dense cover for capturing species that inhabit these areas.

- ***Quantification of Effort***

Effort is usually expressed in terms of catch per trap per length of time set, with 'overnight' catches often used, as they are for other passive gears. As with all funnel gear, fish do escape from these traps. Culp and Glozier (1989) found that mean escape time was shortest from double funnel opaque traps (approximately 35 minutes), longer from single funnel opaque traps (approximately 110 minutes), and longest from single funnel transparent traps (approximately 300 minutes).

- ***Fish Injury/survival***

Trapped fish are subject to the stress of capture and handling but are usually injury free.