Enclosure (pop, drop and throw) Traps

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

Enclosure traps surround fish from a relatively small area at a single point in time. Kushlan (1974) described hand-held samplers made of garbage cans or wash tubs with the bottom removed that are plunged through the water and into the substrate, thus trapping fish.

Drop traps are typically constructed of mesh stretched around a rigid frame, with an open bottom. They are suspended from structures placed on or driven into the bottom. The trap is released remotely, usually by a rope attached to a simple release mechanism, and falls into the water. The fish within it are removed using a dipnet. One variation has a base that rests on the bottom and which is lifted with the trap, so that fish can be easily removed. These traps can be used repeatedly at the same location or moved from place to place. (Fig.8)

Fig – 4.12

Throw traps are similar to drop traps. Kushlan (1981) described 1 metre square or 1.5 metre square by 0.5 metre high box-like frames of metal pipe, with netting on all four sides. The traps are thrown by one or two persons and the enclosed fishes are collected by dip netting. Kushlan (1981) reported two people could collect 15 samples with a 1 m2 throw net in about 4 hours. It took more time to collect samples with the larger trap and because there was little or no gain from using a larger trap with respect to sampling efficiency, Kushlan (1981) recommended using 1 m2 traps.

Peterson and Rabeni (2001) describe a similar quadrat sampler for use in riffles that can be operated by one person. Two 1 m by 1m rigid frames are attached 0.5 m apart to corner pieces that extend 0.25 m below the bottom frame, forming 'legs'. Mesh is fastened to the frames, forming three straight sides and a bag that extends beyond the frame on the side that is placed downstream. The sampler is placed in a riffle and secured to the stream bed. Then the substrate within the sampler is disturbed by kicking, dislodging fish which move or are swept into the collection bag. Peterson and Rabeni (2001) stated that 12 samples could be collected by one person in about 15 minutes.(Fig.9)

Fig – 4.13

Larson et al. (1986) described a buoyant **pop net** consisting of a 4.3 m diameter mesh cylinder that is open at the top. The perimeter mesh is collapsible and attached to a floating collar. The net is set on the bottom by divers. The collar is released by remotely triggered solenoids and floats to the surface, enclosing the area above it. Then the entire device is lifted by cranes mounted on two boats. The net can be removed from the floating collar to facilitate fish removal. This gear cannot be used effectively in high winds (Larson et al. 1986). Dewey et al. (1989) described two smaller pop nets, 1.8 m wide by 3.1 m long by 1.8 m high. One of these was enclosed on the bottom and was used for sampling unvegetated habitats. The other had a retractable bottom panel, allowing it to be set in vegetated habitats, and the bottom to be closed after the net was released. These nets are quite time consuming and labour intensive to use.(Fig.10)

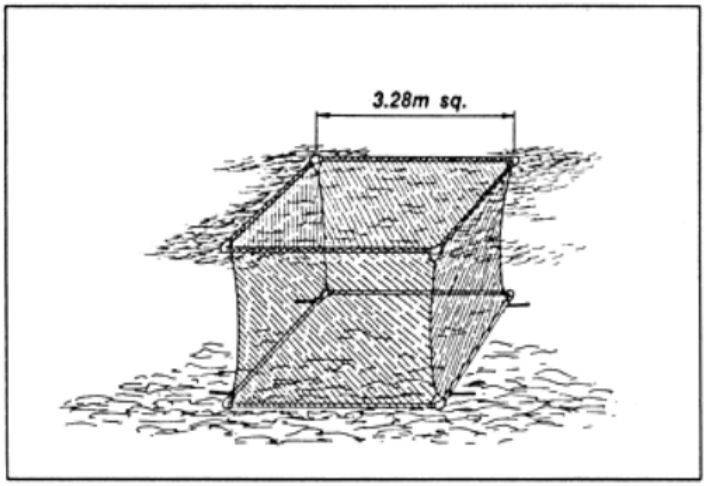

Fig – 4.14

- ***Habitat considerations***

The drop, throw and pop traps are designed for use in habitats with little or no current and are often employed in vegetated habitats where seining or electrofishing is difficult. Although they used it to sample riffles, Peterson and Rabeni (2001) reported that the capture efficiency of their quadrat sampler decreased with current velocity for certain families of fishes. They experienced difficulty deploying their traps in fast currents and recommended that they not be used in riffles deeper than 0.25 m or where currents are faster than 1 m/s.

The depth of drop nets is limited by the weight that can be lifted and suspended and the height of the supporting structure, plus the fact that, for most designs, fish must be dipped from the trap. The area of bottomless drop nets is also limited by the need to be able to dipnet fish from them reasonably efficiently. Kushlan (1974) estimated the maximum habitat depth at which drop nets were effective ranged from 1 m to 1.6 m.

Weight and depth both limit the size of throw traps, and 1.5 m sides and 0.5 m depth is probably about the maximum size that can be used.

Pop nets can be used in deeper water. Larson et al. (1986) used their model in water 2 – 4 m deep. Kushlan (1974) reported using a drop net effectively to sample in stands of emergent vegetation, but dense submergent vegetation would be expected to impede the net's descent and could prevent the trap from sealing at the substrate. A poor seal would also occur where the bottom is uneven, especially if the substrate is hard.

None of these gears can be used where woody debris or other obstructions are present unless the debris can be enclosed by the trap (i.e., does not impair the trap's descent). Vegetation is disturbed when fish are dipnetted from inside drop traps, so the habitat may be altered by repeated sampling at the same location (Kushlan, 1974). Pop nets cannot be used where debris will snag the net.

- ***Selectivity/Efficiency***

  Kushlan (1974) observed that some fast-swimming species were able to avoid falling traps. Comparisons of a 1.0 m square drop trap and 1.0 m square and 1.5 m square throw traps revealed that the 1 metre square throw trap caught more fish and more species than the same sized drop trap, and that the coefficient of variation for the drop trap was much higher (CV = 91% and 38% for the drop and throw traps respectively). Consequently, he concluded that the 1 square metre throw trap was the preferred gear.

  Jordan et al. (1997) evaluated the clearing efficiency for throw traps by determining the recovery rate of marked fish that were placed inside the trap, and their overall efficiency by comparing throw net catches inside blocking nets to density estimates from subsequent poisoning, which were also corrected for recovery efficiency by releasing marked fish inside the nets. In most cases there were no significant differences in size between the throw trap samples and the larger population. Throw trap accuracy did not appear to be affected by the abundance of aquatic vegetation.

  Larson et al. (1986) considered the efficiency of their pop net to be nearly 100%; divers did not observe fish avoidance of the rising pop net collar and mesh. Dewey et al. (1989) reported that there was no significant difference in total fish abundance between pop net catches and seine catches in either vegetated or non-vegetated habitats. However, the variability among catches for both gears was high, especially in non-vegetated habitats where it equaled or exceeded the mean in several cases, and even large differences would have been undetectable.

  Dewey (1992) reported that pop nets and drop nets were equally effective in sampling juvenile fishes in turbid, vegetated environments, and both were more effective than pre-positioned electrofishing arrays under those conditions. Pre-positioned electrofishing arrays caught more fish than either of the nets in clear water, where dip netters could see the fish better.

  Pop traps with fixed bottoms and drop traps that are dropped onto a platform alter or cover the substrate, which could attract some species and reduce the abundance of others. The supporting posts drop traps or the shade of the suspended trap could also attract or repel some species of fish.

- ***Quantification of Effort***

  Effort for these gears can be expressed as catch per deployment or per unit area.

- ***Fish Injury/survival***

  Fish injury and mortality from pop and drop nets should be negligible, but can result from dip netting or net retrieval and subsequent handling.

Recommendations for Bioassessment:

1. Fish Sampling Methods by Wetland Type

- **Floodplain Forests** - Electrofishing boat
  - difficult to use seines and active trap gears, easy to loose passive gears in floods
- **Great Lakes Coastal Wetlands** - Fyke nets possibly in combination with electrofishing
  - active traps may also work but large effort may not be worth it, seines often not feasible
- **Vegetated Intertidal Marsh/Mangrove Swamps** - Flume weir/flume nets or fyke-nets
  - flume weir/block nets can lead to high mortality
  - fyke-nets set in tidal creeks need vertebrate exclusion device (alligators - Ryan King)
  - salinity often too high for electrofishing
- **Freshwater Marshes** - Mini fyke-nets, minnow traps or both (fykes need alligator exclusion device)
  - throw traps if habitat destruction not important and density is important, electrofishing and seining often not feasible
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2. Shallow Water Fish Sampling Methods

- Fyke nets
- Trap nets
- Hoop nets
- Pound nets
- Minnow traps
- Slat trap
- Pop nets
- Drop nets
- Throw nets
- Lift net
- Flume weir
- Electrofishing gear
- Beach seine
- Purse seine
- Light trap
- Tow sled
- Hydraulic pumps