FISH ENCLOSURES FOR RESEARCH IN MARSHES

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Abstract: A sturdy, economical enclosure for fisheries research in shallow wetlands constructed from livestock panels and poultry netting is described. The pens, which enclosed areas up to 183 m², retained 82% of enclosed fish over two summers. The pens may also have applications for fish rearing or aquaculture.

Key Words: fish, fish enclosures, marsh fisheries.

Fisheries work in marshes is made difficult by shallow water, unconsolidated substrates, abundant aquatic vegetation, and furbearers that destroy nets. Specialized gear, such as throw traps, overcome fish sampling problems (Dewey et al. 1989, Carlson and Berry 1990), and enclosures (pens) have been used to hold or exclude adult fish for research (Robel 1962, Crivelli 1983) or aquacultural purposes (Milne 1976). We describe here a reusable pen designed for long-term (4 month) research on the effects of fish on aquatic vegetation (Kolterman 1990).

Working in the marsh environment in Sand Lake National Wildlife Refuge, South Dakota, we enclosed adult common carp (Cyprinus carpio) of two sizes (15-30 cm, 31-60 cm) and black bullheads (Ictalurus melas) (20-35 cm) in
pens. We required pens with 2.5-cm mesh to prevent these fish from escaping, and that were strong enough to be embedded into a sand-mud substrate. The pens had to withstand winds up to 90 km/h and 1-m waves in water depths of 0.5-1.0 m. We constructed 12 pens in 1988 and used them in both 1988 and 1989.

Livestock (cattle) panels (1.3 x 4.9 m) were used as a frame for construction of the sides of the pen. The panels, which are available at most farm supply stores, are made of galvanized wire 1 cm in diameter. Poultry netting (2.5 cm mesh) with a width of 1.2 m was cut into 4.9-m lengths and attached to each panel with brass hog rings (Figure 1). Two workers could attach the netting to a panel in about 30 min. The top 10 cm of each panel was not covered with netting, making the panels easier to handle. A finished panel weighed about 12 kg and could be loaded into a standard size pickup truck.

On shore near the placement sites, the ends of two panels were wired together. Four to five pairs were then stacked onto a 4.9-m flat-bottomed boat for transport into the marsh. At the placement site, a pair of panels was removed from the boat and set in place. Workers could force panels about 25 cm into the substrate by standing on the horizontal bars near the bottom of each panel. Additional panels were placed adjacent to the end of the previous pair, embedded, and wired together to ensure that there were no openings between them. A steel fence post was placed inside each corner for support and to cover small gaps between panel ends.

In water depths of 0.8 m or more, we added another 0.9-m section of poultry netting to the exposed portion of the sides, which extended the netting to about 1 m above the water. Fence posts (2.6 m) were used to keep the additional netting erect.

Joining panels under water to complete a pen was the most time-consuming and difficult phase of construction; each pen required about four worker-hours to put it in place. At least two workers were needed to erect the pens because of the difficulty of working in the water.

The pens were removed in late summer, essentially by reversing the construction process. After extracting the fence posts, we cut the wires at each corner and removed the individual side panels from the substrate. The poultry netting was left attached during storage. When we used the pens again in 1989, no alterations or repairs were needed.

Nine pens were built in the shape of a regular octagon with a calculated enclosed area of 115 m$^2$, and three were built in the shape of a regular decagon with a calculated enclosed area of 183 m$^2$. Using polygonal shapes required measuring the angle of each corner to ensure that the pen was well-proportioned and enclosed an area of the desired size. We constructed a floating, corner template from wood, using a 135$^\circ$ angle for octagonal pens and a 144$^\circ$ angle for decagonal pens.

The enclosed areas of our finished pens were 2 to 5% smaller than predicted (range = 95-99.9% of predicted area), which was probably due to some overlap at each corner. Square or rectangular pens may be easier to erect but would