# SOCK FILTERS FOR SCREENING FISH

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## ABSTRACT

Several water filters constructed of Saran cloth of different porosities were tested for efficiency in filtering undesirable fish from hatchery pond water supplies. A cloth filter bag, attached to pond water supply pipes, gave promising results. Thirteen ponds tested with these filters were free of wild fish (fish not stocked in test ponds by hatchery personnel) after periods ranging from four to 29 weeks. The remaining four test ponds contained a total of 16 wild fish. Control ponds were heavily infested with wild fish species introduced through the water supply.

## INTRODUCTION

Many lakes in Southeast Texas are filled by pumping water into them from rivers or other reservoirs which contain wild fish populations (fish occurring naturally in the water supply). The introduction of these wild fish severely complicates fishery management efforts for the lakes. The introduction of a few individuals of an undesirable fish species, especially before game species become well established, normally results in large populations of undesired fish in lakes of this region.

This introduction of wild fish through the water supply has also been a serious problem at fish hatcheries operated by the Texas Parks and Wildlife Department. These fish have reduced hatchery production and have often infested waters stocked by the hatchery. They have also interfered with efforts to conduct controlled experiments in hatchery ponds.

Buck and Whitacre (1960) found that Saran cloth filters were effective in removing undesirable fish from a contaminated water supply. They tested two filter designs: a sock filter and a floating box filter. The box filter was reported to be more dependable. Sills (1963) has also used box and sock filters.

We have tested both bag and box filters similar to those used by Buck and Whitacre. It was convenient to conduct these tests at the Sheldon State Fish Hatchery. Data for this report were collected under Dingell-Johnson Project F-12-R.

## MATERIALS AND METHODS

Water for the Sheldon State Fish Hatchery is taken from Sheldon Reservoir. It passes through an unscreened intake and is discharged into hatchery ponds through pipes with an inside diameter of six inches. The maximum flow of water through a discharge pipe is about 500 gallons per minute.

Each pond is three-quarters of an acre in area and will hold three acre-feet of water.

Sock filters (figure 1) were made of Saran filter cloth of two different porosities. These cloths were woven from 0.008-inch diameter thread. One cloth had a thread count of 52 by 52 per square inch with a mesh of approximately 0.01 inch in diameter. The other cloth had a thread count of 44 by 44 per square inch with a slightly larger mesh. These filters were constructed into four "types" based on cloth used (thread count) and length of filter. Saran cloth having a thread count of 52 by 52 square inch was used to make filter types A and B, which were 10 and five feet long, respectively. Saran cloth having a thread count of 44 by 44 per square inch was used to make filter types C and D, also 10 and five feet long, respectively. All socks were 10 inches in diameter. The socks had a six-inch-wide collar made of nylon twill, which was attached to the water discharge pipe. The nylon served to reinforce the section of filter in contact with the pipe.

The box filter (figure 2) consisted of a wooden frame 27 inches wide, 34 inches deep and 60 inches long, which was lined with Saran

filter cloth having a thread count of 52 by 52 per square inch. The box had to be placed 25 feet from the discharge pipe to allow free vertical movement. Water was conducted to the box through a canvas tube seven inches in diameter. The box was anchored by tying the corners to stakes driven in the pond levee. This arrangement allowed the box, which was floated by styrofoam, to move vertically with the rise and fall of the water level.

All filters were attached to water discharge pipes using stainless steel worm drive clamps. After a pond was filled, the filter was left attached to the discharge pipe ready for use if more water was needed. The sock filters and the canvas tube of the box filter were supported by wooden frames (figures 1 and 2).

Five control ponds were used. Water for these ponds was passed through boxes lined with plastic window screen containing 16 meshes per linear inch. This method was commonly used on the hatchery to eliminate wild fish.

Experimental and control ponds were incorporated into the normal hatchery routine. The dates a pond was filled and drained were recorded. When the hatchery stocked fish were removed from a drained pond, any wild fish which may have been present were noted.

## DISCUSSION

Sock filters were used on a total of 17 ponds at the Sheldon State Fish Hatchery in 1964 (table 1). The individual filters were used for various lengths of time. The test period for a specific filter began when water was first turned on to fill the pond and ended when the pond was drained. Of the ponds filtered by sock filters, 13 contained no wild fish when drained. From the remaining ponds which contained wild fish, a total of 16 such fish were recovered. All control ponds contained abundant populations of wild fish.

Sock filters became less reliable the longer they were used. This was because small holes began to form in the filters as they became older. There were probably several causes of the holes in the filter cloth. Some of them appeared to be due to aging with a resultant weakening and breaking of the threads. Other holes may have been made by insects or small animals. Usually a hole could be patched and the bag filter used again. Several patched filters, which were not used in the experiments, were made to give service for two seasons in routine hatchery operations.

Even in the cases in which sock filters failed, to a degree, to keep wild fish out of an experimental pond, large populations of wild fish never developed. Production of hatchery fish in these ponds did not appear to be affected. The wild fish present were not only few in number, but were large enough to be easily removed by hand.

Debris had to be removed from the 10-foot sock filters periodically, varying from once each day to once a week. The varying frequency depended primarily on the varying volume of small fish occurring in the water supply. The five-foot filters under the same conditions had to be emptied more frequently and, to this extent, were considered less desirable. Considering efficiency, cost and maintenance, the best filter length for use on the Sheldon State Fish Hatchery would seem to be about seven feet.

Neither porosity of Saran cloth used appeared to be superior to the other. Filtering efficiency and durability appeared equal.

Several ponds were filled using the box filter. However, this filter was considered unsuitable. The primary trouble was caused by silt and other fine materials collecting on the side of the Saran liner. As debris collected, the water level rose in the box filter. Eventually the box tilted to one side, allowing unfiltered water to flow into the pond. This fault might have been corrected by securing a tight-fitting lid to the box. However, at this point the sock filter had exhibited qualities considered desirable for use on the hatchery. Following are the reasons the sock filter was preferred to the box filter:

1. The cost of a 10-foot sock filter was about one-third of the cost for the box filters, including canvas tube.

2. It took less time to construct and install the sock filters than it did the box filters.

3. The sock filters were much lighter, more portable, and required less storage space than the box filters.

4. Maintenance of sock filters was easier than maintenance of the box filters. The sock filters were self cleaning to a limited degree. Water entering a filter fell through the first foot or so of the sock. The force of the water washed fish and debris toward the bottom of the sock, where it did not interfere with the filtering process. Material which collected on the sides of the box filters had to be removed by scraping or brushing. The box filters had to be cleaned more often than

Table 1. Results of Saran sock filter experiment in Sheldon Hatchery ponds.

| Filter type[1] | Weeks tested | Wild fish recovered[2] |
|---|---|---|
| B | 6 | None |
| B | 9 | gizzard shad (*Dorosoma cepedianum*), one |
| C | 5 | None |
| D | 4 | None |
| D | 6 | None |
| D | 8 | None |
| Control | 12 | bluegill (*Lepomis macrochirus*), abundant<br>white crappie (*Pomoxis annularis*), common<br>darters (*Etheostoma* spp.), abundant |
| A | 8 | None |
| A | 9 | None |
| A | 9 | None |
| A | 10 | None |
| A | 11 | None |
| A | 11 | None |
| A | 16 | None |
| Control | 13 | bluegill, common<br>warmouth (*Chaenobryttus gulosus*), common |
| Control | 17 | gizzard shad, abundant<br>yellow bass (*Roccus interruptus*), common<br>redear sunfish (*Lepomis microlophus*), abundant<br>bluegill, abundant<br>log perch (*Percina caprodes*), common |
| A | 29 | None |
| C | 32 | bluegill, four |
| D | 27 | bluegill, eight<br>redear sunfish, one |
| Control | 26 | gizzard shad, abundant<br>golden shiner (*Notemigonus crysoleucas*), rare<br>warmouth, rare<br>bantom sunfish (*Lepomis symmetricus*), rare<br>green sunfish (*L. cyanellus*), rare<br>redear sunfish, rare<br>bluegill, abundant |
| D | 30 | sunfish (*Lepomis* sp.), one<br>blue catfish (*Ictalurus furcatus*), one |
| Control | 32 | yellow bass, rare<br>log perch, rare |

[1] Filter types A and B were ten and five feet long, respectively, and made of Saran cloth having a thread count of 52 by 52 per square inch. Filter types C and D were ten and five feet long, respectively, and made of Saran cloth having a thread count of 44 by 44 per square inch. Water for control ponds was passed through boxes lined with plastic window screen containing 16 meshes per linear inch.

[2] Fish recovered other than those stocked by hatchery personnel.

did the sock filters. The sock filters were cleaned or changed while the worker stood on the levee at the water control valve. The box filters had to be located out in the pond, and as a result, were more trouble to service.

The box filter was quickly abandoned altogether in favor of the sock filter.

Sock filters constructed of Saran, polyethylene or nylon are being tested in filling larger impoundments. These filters show promise for use as a fisheries management tool. Flows up to 2,500 gallons of water per minute have been filtered through nylon socks.

Figure 1. Saran cloth bag filter installed. Note small fish and debris collected in lower section of bag.

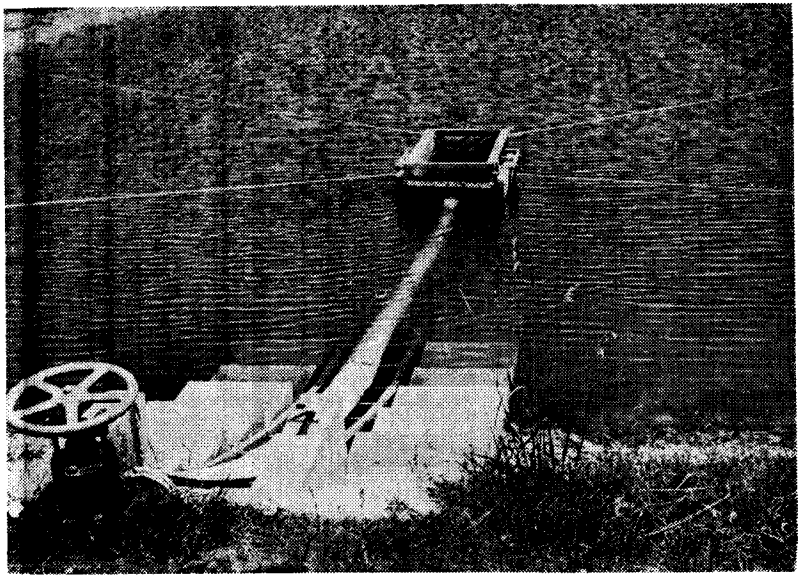

Figure 2. Saran cloth box filter installed.

## CONCLUSIONS

As reported, small holes were discovered in some of the filters. These holes were probably responsible for the failure of four filters to completely remove wild fish. Hatchery personnel were required to remove filters temporarily for cleaning, maintenance and other reasons, but usually not under the supervision of the authors. It is possible that these procedures contributed to the partial failures.

Although the sock filters were not completely effective in eliminating wild fish from the water supply, it is felt that the main hatchery problems of reduced hatchery production and contamination of stocked waters were solved. Saran cloth sock filters are now used routinely at the Sheldon State Fish Hatchery and at several other State hatcheries.

## LITERATURE CITED

Buck, H. D., and Whitacre, M. 1960. A new method and a new material for screening fish. Progressive Fish-Culturist, vol. 22, no. 3, 141-143.

Sills, J. B. 1963. Saran screen fish barriers. Mimeographed, unpublished.

# CONTROL OF *APUS* AND FAIRY SHRIMP IN HATCHERY REARING PONDS

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(The enclosed reprints are a report of experimental findings and do not constitute recommended procedures. The reader is reminded that no chemicals have been approved by either the U.S.D.A. or the Food and Drug Administration for use on fish, for algal control, or for other management purposes.)

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