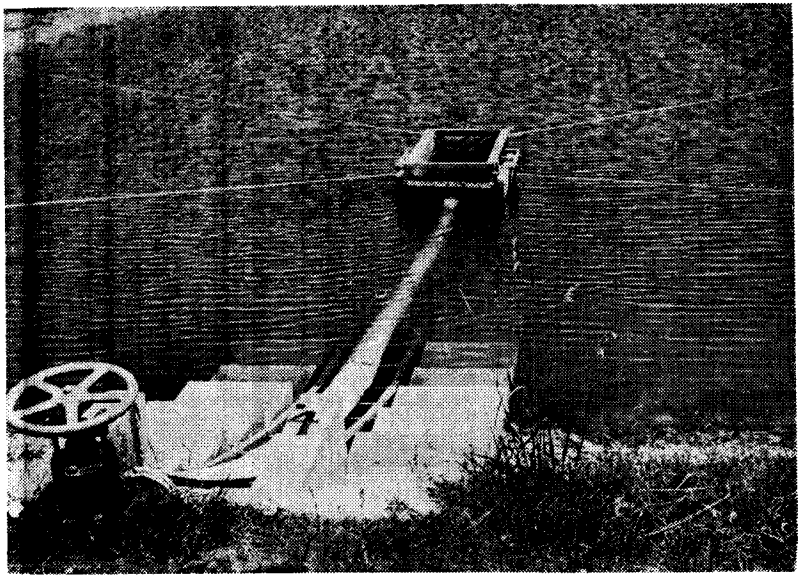

Figure 2. Saran cloth box filter installed.

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

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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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ABSTRACT

Single applications of 0.25 ppm Dylox effectively controlled the tadpole shrimp, *Apus longicaudatus*, and the fairy shrimp, *Streptocephalus texanus*, in hatchery ponds without adverse effects on bass or channel catfish fry. Bass survival in treated ponds was boosted from 20 to 80 per cent by the Dylox treatment.

Plankton populations in the treated ponds appeared unaffected.

INTRODUCTION

The tadpole shrimp, *Apus longicaudatus* (Eubranchiopoda: Notostraca), and a fairy shrimp, *Streptocephalus texanus* (Eubranchiopada: Anostraca), first appeared in large numbers at the National Fish Hatchery, Tishomingo, Oklahoma in May of 1962. Since then, they have recurred annually in increasing numbers.

The abundance of *Apus* and *Streptocephalus* presents serious problems in ponds used to spawn largemouth bass or to rear their fry. Ponds infested with *Apus* become so highly turbid that adult bass refuse to spawn. Fry from these ponds were difficult to collect and growth was poor. Attempts to stock only advanced fry in ponds infested with tadpole shrimp in the hope that fish of this size might be able to utilize them as food met with no success since the *Apus* outgrew the bass. Bass production showed pronounced decline associated with infestations of this species.

As an example, Pond 14 was stocked with 80,000 fry in 1961 and yielded 77,000 fingerlings six weeks later. In 1962 (with *Apus*) the number stocked was 86,000; 15,000 were harvested. Figures for the succeeding years are 1963—116,000 stocked, 16,000 recovered; 1964—125,000 stocked, 35,000 harvested. Recovery of stocked bass during the three-year period was only 20 per cent of the number stocked.

The fairy shrimp present problems of a different nature. Ponds infested with *Streptocephalus* do not become turbid but the active feeding of these organisms reduces the plankton population to such an extent that the available food for bass fry is greatly reduced. In addition, it is difficult to distinguish between schools of bass fry and schools of fairy shrimp for harvesting and restocking operations. Also, considerable effort is required to separate the species prior to restocking. Production data show a decline similar to that which occurred in the ponds infested with *Apus*. Prior to the infestations of fairy shrimp, production in the "B" series of ponds at the hatchery averaged 300,000 fry per pond. After their appearance, production has ranged from zero to 50,000.

EXPERIMENTAL WORK

Live *Apus* and *Streptocephalus* were shipped to the Fish Farming Experimental Station at Stuttgart, Arkansas for tests concerning possible chemical controls for these organisms. Identifications of the specimens were made using keys provided in Pennak (1953). Aquarium studies were conducted using applications of 0.25 ppm active ingredient of Dylox (50% W.P.), methyl parathion (4 lb/gal E.C.), and Korlan (25% W.P.). Both *Apus* and *Streptocephalus* showed rapid responses to Dylox and methyl parathion. Within six hours, all specimens were immobilized but death did not occur in all individuals until about 24 hours after application. Korlan was less rapid in its action but was equally effective. Thirty hours were required for knock-down and 48 hours had elapsed before all the shrimp had died. Toxicity data previously determined indicated that largemouth bass and channel catfish should be unaffected by treatments of 0.25 ppm Dylox. Plankton and bottom organisms likewise had shown no adverse effects in pond trials using Dylox as a control for the anchor parasite.

Tests were conducted in aquaria at Tishomingo using Dylox, Malathion, and rotenone. Results from the application of 0.25 ppm Dylox were in close agreement with laboratory results obtained at Stuttgart. The addition of bass, bluegill and channel catfish fry to the test aquaria indicated that the fish experienced no adverse effects from the chemical during the 24-hour test period and the following 72 hours. Malathion

at the rates of 0.5 and 1.0 ppm killed bass and bluegill fry within one hour but channel catfish were unaffected. Twenty-three hours elapsed before the *Apus* and *Streptocephalus* expired. Rotenone applied at the rates of 2 and 4 ppm killed both species within ten hours but the fairy shrimp were far more susceptible than the tadpole shrimp.

POND TREATMENTS AND RESULTS

Pond treatments were made with rotenone and Dylox. Rotenone was applied in one pond prior to stocking at the rate of 4 ppm in an effort to clear it of *Apus*. The toxicity had dissipated after five days but the zooplankton did not return for two weeks after the treatment. The *Apus* were killed but restocking of the pond had to be delayed due to the slow recovery of the plankton population.

Dylox was applied in eight ponds at the rate of 0.25 ppm active ingredient. Applications were made using a boat bailer to distribute the dissolved material in the wake of an outboard motor. Bass fry stocked in the ponds for rearing were harvested four to eight weeks later and production figures were recorded. These data are provided in Table 1. Total fry survival in the treated ponds was 80 per cent.

After the harvest of the fingerling bass, the ponds were refilled for use in rearing channel catfish fry. *Apus* reappeared in one pond and *Streptocephalus* returned in four ponds. These ponds were successfully retreated with 0.25 ppm Dylox without apparent harm to the catfish fry. Production data from these ponds will not be available until later this fall.

DISCUSSION

Of the various chemicals found to be toxic to *Apus* and *Streptocephalus*, Dylox was considered the most effective and compatible treatment since it could be used in the presence of bass, bluegills, and catfishes. Single treatments of 0.25 ppm Dylox effectively controlled both species of shrimp. A comparison of harvest data from treated ponds with those of previous years when no effort was made to control the shrimp indicated an 80 per cent survival of bass in treated ponds compared to a three-year average of 20 per cent in untreated ponds. Based on results of the three previous years, treating with Dylox boosted production by 435,000 fish.

Plankton populations appeared unaffected in ponds treated with Dylox. Although no quantitative checks were made at Tishomingo, data collected at the Fish Farming Experimental Station support this observation.

Pond treatments with Dylox were not expensive in view of the low concentrations required to kill *Apus* and *Streptocephalus* and the increased production which resulted from its use.

Rotenone was highly effective but it presented problems concerning the immediate re-use of ponds and could not be used in the presence of fish.

LITERATURE CITED

Pennak, R. W. 1953. Fresh-Water Invertebrates of the United States. Ronald Press Co., New York. 769 pp.

Table 1. Results of Treating Eight Bass Rearing Ponds With 0.25 ppm Dylox For the Control of Tadpole and Fairy Shrimp

Pond No.	Pond Area (A.)	No. of Fish Stocked	No. of Fish Harvested	Per Cent Survival	Effects on Shrimp	Remarks
5	1.0	80,000	55,500	69	Exc. kill	
5½	1.0	70,000	69,200	99	Exc. kill	
6	1.7	120,000	68,000	57	Exc. kill	
8	2.2	100,000	53,000	53	Exc. kill	Believed to have been error in stocking
10B	0.7	73,000	73,000	100	Exc. kill	
13	0.75	70,000	55,000	79	Exc. kill	
15B	1.0	123,000	123,000	100	Exc. kill	*Apus* very bad
17	1.4	82,000	82,000	100	Fair kill	Only Dylox treated pond in which any surviving *Apus* or *Streptocephalus* were found.