DEPARTMENT OF NATURAL RESOURCES

Division of Conservation

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The Use of Mintrol-5 (Antimycin A) As A Selective Fish Toxicant.

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The problem of overabundant populations of undesirable-sized panfish species is continually confronting fish managers. A feasible solution to this perplexing management problem has been the objective of numerous studies and trial projects. Some of the corrective methods that have been tried include mechanical and chemical fish removal, predator fish stocking, water level manipulation and basin drainage. Of these methods, chemical treatment has generally provided the most immediate and most dependable results.

Effective fish control through the application of various fish toxicants has been approached on complete elimination; partial (selective toward particular species); or spot (total elimination of all species in a restricted area) treatment basis. It is generally concluded that a very drastic reduction or total elimination of an undesirable panfish species is required to achieve reasonable or desired management goals.

Although highly effective, there are occasions or circumstances when total chemical treatment is not readily acceptable or possible to achieve. Therefore, a logical and desirable approach would be to selectively reduce or eliminate certain troublesome panfish without seriously harming the more-desired fish.

Most of the available fish toxicants as well as many other chemicals have been tested for their potential as selective toxicants. Results have been varied and generally not too encouraging. Ever since the exhaustive research that lead to the development and realization of the selective chemical lampricide (3-Triflouromethyl-4-Nitrophenol) fish managers have hopefully and anxiously waited for the development of similar selective fish toxicants. The recent development of antimycin as a fish toxicant offers great possibilities in this direction. Limited experimental use of

antimycin has already provided encouraging results of being useful selective fish toxicant.

Walker, et al, 1964, reported a wide range of responses on 24 species of fish exposed to various concentrations of antimycin, both in the laboratory and in field tests. Among the most sensitive fish to antimycin were trout, perches, and herring. Intermediate in sensitivity were northern pike, sunfishes, suckers, sticklebacks, certain minnows and carp. Least sensitive were freshwater catfishes, bullheads, gars and bowfins.

Field tests conducted in several small northern Wisconsin lakes have resulted in either selective fish kills or a drastic reduction of certain panfish species. These selective or partial fish kills were accomplished through the application of low dosages of the commercial product Fintrol-5, which is a dry formulation of antimycin (active ingredient 1%, inert 99% coated) on silica sand.

Work conducted by Radonski and Wendt (1966) in McGrath and Perch lakes in Oneida County and Harriet Lake in Forest County, showed that a concentration of 0.5 part per billion of antimycin constituted a lethal level to yellow perch. Other fishes in these lakes (large and small bass, bluegills, white suckers, rock bass, golden shiners and bluntnose minnows) were affected in far lesser (but variable) degrees. The three lakes tested were infertile (total alkalinity 2.0 to 5.0 ppm.) and had low pH (5.3 - 6.3).

Niemuth (1967 unpublished) treated Rush Lake, Douglas County with a concentration of 0.5 ppb. antimycin. Rush Lake is 22 acres in size, has a total alkalinity of 38 ppm. and a pH of 6.7. Fish collections following this treatment resulted in the recovery of approximately 2,000 bluegills ranging in size from 1.5 to 4.0 inches. An unknown number of young-of-the-year bluegills (0.5 to 1.3 inches) were also killed. Although some bluegills in the smaller size ranges were killed, post-treatment sampling and observations

showed that many small bluegills as well as some young-of-the-year fish had survived. In this particular situation it did not appear as though a desirable selective kill of bluegills had been achieved. Largemouth bass were virtually unaffected by this treatment. No larger bass were killed and less than a dozen young-of-the-year fingerling bass were found.

Callum and Huish (1967) obtained good kills of bluegills and redear sunfish on a selective basis for size and species on pond experiments conducted in Georgia. Concentrations of 0.5 ppb. antimycin were used under varying conditions of pH. Only a few largemouth bass and golden shiners were affected at this concentration.

At a concentration of 0.5 ppb. available information indicates that larger size (6 inches and over) largemouth bass are not significantly affected by antimycin.

Anault and Radonski (1967) reported that largemouth bass, gizzard shad, carp, golden shiners, fathead minnows, bluegills, green sunfish, and mosquito fish were killed at concentrations of 1 to 5 ppb. antimycin, but catfish remained unharmed until the concentration was increased to 20 ppb.

Lennon, (1966) reported that antimycin is also toxic to fish eggs.

Further testing on the selective quality of antimycin was conducted in Rush Lake by increasing (Nimuth, unpublished) the concentration level to 0.75 ppb. Post treatment fish collections resulted in the recovery of approximately 12,000 - 1.5 to 4.5 inch bluegills; 400 young-of-the-year fish (sample collection) and 25 larger bluegills ranging in size from 6.0 to 9.0 inches. Pre-treatment survey work indicated that the population of larger bluegills 6.0 inches and over in Rush Lake was not very abundant.

At this slightly higher concentration (0.75 ppb.) largemouth bass young-of-the-year fingerlings were very noticeably affected. Approximately 3,600 dead fingerling bass ranging in size from 1.5 to 3.6 inches were recovered. As in the earlier treatment, none of the larger bass present in the

lake were killed.

In summary, followup surveys showed a very drastic reduction in the bluegill population; a significant but not complete kill of largemouth bass fingerlings; and no mortality whatsoever among the larger bass. As a sidelight, one white sucker 20 inches in length was not killed by the 0.5 ppb. concentration but did succumb to the later treatment of 0.75 ppb.

Additional tests to determine the effects and selectivity of antimycin on other fish species were conducted in the fall of 1967 in two natural farm ponds located in Washburn County. One pond was used for the rearing of walleye fingerlings and contained only this single fish species. The second pond, used for rearing muskellunge fingerlings contained not only muskellunge, but also fathead minnows which had been introduced as forage. Both ponds had been seined and fingerling fish harvested to a very low number prior to treatment. These ponds were treated with antimycin at a concentration of 0.75 ppb.

As expected, there was a delayed reaction in the effect of the toxicant on the fish present. This was due to the cold water temperatures (48°F. and lower).

In the walleye pond dead fingerlings were first observed and collected two days after treatment. At the same time other seriously distressed walleye fingerlings were also observed. By the 4th day it was apparent that all of the walleye fingerlings in the pond were dead. The walleyes ranged from 3.3 to 4.7 inches and averaged 3.7 inches. This pond was later treated with 1.0 ppm. rotenone and no walleye fingerlings were observed or recovered.

The results obtained in this experiment strongly indicate that walleye fingerlings, like yellow perch, are very susceptible to low level concentrations of antimycin.

The application of 0.75 ppm. antimycin to the muskellunge rearing pond resulted in an indefinite conclusion as to the toxicity of antimycin to muskellunge. Periodic visits to the pond during a 16-day period following treatment resulted in the recovery of 6 dead muskellunge fingerlings. The first appearance of dead muskellunge occurred 9 days after the pond had been treated. Dead fish recovered ranged from 7.8 to 10.5 inches and averaged 8.75 inches.

Even though a few muskies died, live muskellunge fingerlings were observed on each visit to the pond including the last days of this experimental period. Most of the fish observed appeared to be lively and active when disturbed or startled. However, a few fish showed definite signs of being affected by the toxicant. Sick fish were more lethargic in their reactions and without too much effort could be captured with a dip net. not These fish also had a noticeable fungus growth developing around the fins and in the belly region. This related condition is apparently due to a loss of the protective body mucous. A similar physical change was reported by Radcnski (1966) and Walker (1964) was also noted in the dead fish collected in Rush Lake and in the walleye rearing pond.

The fathead minnows in this muskellunge rearing pond were not resistant to the antimycin treatment. Dead and dying fatheads were observed the day following treatment. Within the next couple of days most of the minnows were dead. By the seventh day only an occasional minnow was still swimming, with death inevitable.?

This toxicity study was continued for as long as possible. In early November, however, the test had to be terminated because the pond was becoming ice-covered, and it was also necessary to rid the pond of any remaining fish. On November 3 the pond was treated with 1.0 ppm. rotenone. The pond froze over immediately thereafter and it was impossible to determine how many muskellunge were killed. Only one muskellunge 11.5 inches was

actually seen or recovered after the rotenone treatment.

It was unfortunate that this experiment had to be terminated without a more definite conclusion. Apparently some muskellunge were able to survive this concentration of antimycin (0.75 ppb.) while other fish perished. There is a possibility that size and/or individual resistance may be factors in the ability of some fish to survive.

Work by Vezina (1967) and Walker et al (1964) indicates that antimycin is not harmful to aquatic plants, bottom fauna, plankton, insects, amphibians, turtles, birds or mammals at the concentration usually used for fish eradication. This feature, together with its rapid detoxification, irreversible action and ease of application make antimycin an extremely attractive fish toxicant.

The antimycin in Fintrol-5 is formulated on silicon and is released uniformly as the material settles through 5 feet of water. The weight of the silicon causes it to sink very rapidly. This characteristic poses the question: Will the antimycin be fully released if the silicon settled onto or even into the bottom silt when applied in water less than 5 feet in depth? Until this question is resolved and to avoid any possible loss of toxicity, possibly Fintrol-5 should be applied at a depth of around 5 feet or more. Under this limitation, shoal areas can often be adequately covered by circulating treated water toward shore using a motor powered boat. Normal wind and wave action also helps circulate toxic water into the shoal areas. To treat shallow, muddy or weedy bays, the best approach may be to dissolve the required amount of Fintrol-5 and apply as a solution. A liquid formulation of antimycin is now available which could be used in areas requiring special consideration. Other formulations of Fintrol (such as Fintrol-15) release at depths other than 5 feet. Such formulations are available upon special order from the manufacturer.

Fintrol can be applied very easily and uniformly by using either a hand operated or mechanized seed and/or fertilizer spreader. Lennon, Berger, and Gilderhus (1967) developed a relatively inexpensive powered spreader for treating larger bodies of water. For treating smaller lakes and ponds a hand operated unit such as the (Ortho Whirlybird Spreader) works very well. For example, it took approximately one hour to apply 23½ pounds of Fintrol-5 uniformly over the surface area of Rush Lake which is 22 acres in size. The Ortho and other similar spreaders are available through many local hardware stores or garden supply centers. Some workers prefer to dribble the antimycin directly into the prop wash as the boat travels. This is a relatively simple but effective method.

It is suggested that in selective application of antimycin the material be spread as uniformly as possible over the surface area of the lake. This should insure better coverage and avoid the possibility of highly toxic areas.

GLOSSARY

A list of common and scientific names of fish families and fishes used in this report.

Fish Families:

Common Name	Scientific Name
Gar Family	Lepisosteidae
Bowfin Family	Amiidae
Herring Family	Clupeidae
Salmon Family	Salmonidae
Sucker Family	Catostomidae
Minnow Family	Cyprinidae
Catfish Family	Ictaluridae
Sunfish Family	Centrarchidae
Stickleback Family	Gasterosteidae
Perch Family	Percidae

Fishes:

Yellow Perch	*Perca flavescens* (Mitchill)
Walleye	*Stizostedian vitreum* (Mitchill)
Muskellunge	*Esox masquinongy* Mitchill
Northern Pike	*Esox lucius* Linnaeus
Smallmouth Bass	*Micropterus dolomieui* Lacepède
Largemouth Bass	*Micropterus salmoides* (Lacepède)
Green Sunfish	*Lepomis cyanellus* Rafinesque
Redear Sunfish	*Lepomis microlophus* (Günther)
Bluegill	*Lepomis macrochirus* Rafinesque
Pumpkinseed	*Lepomis gibbosus* (Linnaeus)
Rock Bass	*Ambloplites rupestris* (Rafinesque)
Carp	*Cyprinus carpio* Linnaeus
Golden Shiner	*Notemigonus crysoleucas* (Mitchill)
Fathead Minnow	*Pimephales promelas* Rafinesque
Bluntnose Minnow	*Pimephales notatus* (Rafinesque)
White Sucker	*Catostomus commersoni* (Lacepède)
Gizzard Shad	*Dorosoma cepedianum* (LeSueur)
Mosquitofish	*Gambusia affinis* (Baird and Girard)

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