Chapter 14. Summary

by Verdel K. Dawson

Many of the ecosystems in the southwestern United States, including those in the Gila River basin in Arizona and New Mexico, have been degraded by introductions of nonnative fishes, and the native fish species have been compromised. A significant complication in the attempts at reclamation of these systems is the fact that many of the native fish species of concern have little recreational or commercial value, and therefore, lack the societal support enjoyed by native fish species in other regions of the country. For example, when sea lamprey began to destroy the multibillion dollar commercial/recreational lake trout fishery in the Great Lakes, there was considerable support from the United States and Canadian governments to develop a program for controlling this invasive species. On the other hand, the spikedace and loach minnow do not enjoy the same level of recreational or commercial value as the lake trout and therefore lack public support for their protection. Ironically, some of the nonnative species that are competing with and preying on the native species, were introduced to the area specifically because they were regarded as desirable in other regions of the country.

Usually the degraded aquatic systems in the southwestern United States will require reclamation of habitat that has been altered by human activity and removal or substantial reduction of nonnative fishes. In this report, characteristics of the life stages, habitat preferences, and physicochemical tolerances of native fishes of concern were compared with those of harmful nonnative fishes to aid in identification of vulnerable conditions for nonnative species around which control strategies could be developed. The geographic ranges of native and nonnative fishes of concern were mapped to identify areas inhabited solely by native or nonnative species, or to identify key intersection areas between native species of concern and nonnative species. This information could be critical in the development of integrated pest management strategies. Also, knowledge of life-history characteristics, such as spawning periods, may be valuable for timing of those management efforts.

Knowledge of the mode of action of candidate piscicides and structure-toxicity relationships can be useful for optimizing selectivity of chemicals or combinations of chemicals. The identification of specific energy production inhibitors may provide leads to the development of new chemical tools for selectively managing fish populations. While this field of endeavor is in relative infancy regarding piscicides, there are considerable advancements being made in the field of agricultural chemicals that may have application in the development of fishery chemicals.

Eradication of undesired fishes began almost 100 years ago. The use of piscicides has increased since then as more nonnative species were being introduced and as better toxicants were becoming available. At least 45 chemicals have either been used as piscicides, or are currently in various stages of development. A rating system was devised to evaluate the potential of these chemicals to be useful to fishery managers in resolving some of the problems caused by nonnative fishes. The ratings were based on taxon selectivity, ease of application, toxicity to nontarget organisms, safety to humans, persistence in the environment, tendency to bioaccumulate, cost, and registration status. Only five of the chemicals achieved ratings of 75 or greater out of a possible score of 100. They included the four toxicants currently registered by the EPA for use as piscicides (antimycin, rotenone, TFM, and Bayluscide®) and the candidate selective piscicide, Squoxin.

Delivery systems have been developed to meet specific management needs and include a variety of formulations and application techniques. Piscicides are generally formulated as either liquids or solids that include inert ingredients to help make them soluble in water. Solid formulations include wettable powders, soluble bars, and granules. Granules are designed either to release the active ingredient as it sinks through the water column or may contain an outer coating that allows for a delayed release of the chemical. Recently, toxic baits have been developed where a toxicant is impregnated into a bait that is consumed by target organisms that are congregated and actively feeding in an isolated area.

Fishery managers have come to realize that the piscicide "silver bullet" does not currently exist. Therefore, research and development of additional chemical tools would seem to be desirable. However, the use of piscicides is closely regulated by the EPA as mandated by Congress. It is estimated that development and registration of a pesticide can take 8 to 10 years and cost $35 to $50 million. Over 100 different tests can be required to register a pesticide; many tests must be conducted under the constraints of a Good Laboratory Practices program. In developing a new piscicide, it is important to have an understanding of the biology of the organism to be controlled. Then chemicals are selected for toxicity screening on the basis of prior knowledge of biological activity of structural classes of chemicals and safety to nontarget organisms. Once a chemical has been selected for development, a series of laboratory and field experiments must be conducted to determine efficacy, residue chemistry, environmental safety, product chemistry, etc., and the results must be submitted for EPA's review. A manufacturer and sponsor must be identified, labels must be developed and approved, and registrations must be maintained.

Before conducting a piscicide treatment, a cost-benefit analysis of the treatment should be conducted. Not only should the cost of the chemical be considered, but also pre- and post-treatment surveys, environmental assessments and impact statements, travel, equipment, labor, permits, analytical support, on-site toxicity tests, advance notification, etc. The costs should be balanced against the benefits of the treatment. Benefits of a treatment are more difficult to assess, especially estimating the benefits of protecting or restoring a threatened or endangered species. This usually takes the form of evaluating the impact of various control options on the ecosystem.

New taxon-specific piscicides needed to help manage the environmental problems caused by nonnative fishes in the southwest are not available. The existing class of registered piscicides are all energy production inhibitors. They all have physicochemical properties that allow their rapid uptake by fish across the gills and subsequent rapid distribution and loss from the body. There are a number of new mitochondrial complex I inhibitor ligands that are possible candidate piscicides, however, fish toxicity data are needed to evaluate their potential. A possible option for developing selective piscicides would be to evaluate the relative toxicities of various combinations of existing general piscicides to target and nontarget fishes.

The concept of pharmacokinetic modeling has been proposed as a mechanism for predicting differences in toxicity between species by evaluating distribution or elimination characteristics of chemicals. More complex models called physiologically based pharmacokinetic models have been used for risk assessment of toxicity. These models are based on the specific physiology of the species and physicochemical characteristics of the compound. However, pharmacokinetic data have not been developed for registered or candidate piscicides and development of physiologically based pharmacokinetic models in fish is in its scientific infancy, so the use of these models to identify species-specific piscicides is premature at this time.

The use of chemicals is still the most direct method of reducing pest numbers, and it is often one of the first methods considered for control. However, it is not likely that the present arsenal of approved selective piscicides would be effective for controlling nonnative fishes in the southwestern United States because the composition of native and nonnative species is different from most areas where selective piscicides are being used. The development and registration of a new selective piscicide specifically for use on nonnative fish species in the southwestern United States would be time-consuming and considerably expensive. That does not mean that fishery managers should just throw up their hands and concede defeat. We recommend that the problems resulting from the invasion of nonnative fishes should be divided into two categories: (1) short-term emergency situations that require immediate action, and (2) longer-term issues that have the luxury of being monitored while research and development are conducted on new and innovative management tools.

The emergency situations should be addressed primarily with the use of one of the currently registered piscicides (antimycin, rotenone, TFM, or Bayluscide®). On the basis of the limited data available, none of the four chemicals demonstrate a margin of safety sufficient to permit selective removal of nonnative fish without harming native species. Therefore, effective use of these chemicals would most likely be as general toxicants rather than as selective toxicants. If critical native species are present, then as many of the native fishes as feasible should be temporarily removed by electroshocking or other capture techniques and placed in refugia until after the reclamation treatment. Unfortunately, the lampricides, TFM and Bayluscide®, are not currently registered for general use outside of the Great Lakes region with the exception of Bayluscide® which is also registered for use in snail control. Therefore, additional permits would be required, such as an emergency exemption or a special local needs (Section 24[c]) permit to use either lampricide in the southwestern United States. Antimycin and rotenone, however, are currently registered as piscicides for use throughout the United States, and their treatment costs are similar. Unless complete eradication of nonnative species can be achieved and reinfestation can be prevented, piscicides probably will have to be reapplied indefinitely to keep nonnative populations in check.

Fish toxicants have long been considered the best rehabilitation tool available for fishery management (Prevost 1960, Hooper et al. 1964, Klar and Schleen 2000). However, there have been many treatment failures reported in the literature. Lopinot (1975) summarized the use of piscicides in the midwestern United States and reported that during 1963-72 about 82% of the treatments were considered successful. Meronek et al. (1996) reviewed 250 fish control projects and concluded 43% were successful, 29% unsuccessful, and 28% as having insufficient data to determine success or failure. There obviously needs to be improvements made in the piscicides, formulations, and methods of application that are available to fishery managers. Greater success in fishery management could probably be achieved if chemical control was considered only as one tool of many to be used in an integrated pest management approach. This would involve a system comprised of chemical, biological, and physical controls. Creative integration of multiple pest management techniques has been successfully used in agriculture and its importance is now being realized in management of aquatic pests. In addition to the use of piscicides, other management tools should be included as part of an integrated management program. Techniques that should be considered include the use of water-level manipulations, barriers, targeted overharvest, stocking predators, sterilants, toxic baits, and gynogenesis.

In situations where populations of native fishes are not imminently imperiled by nonnative species, there may be time for longer-term solutions to be developed. These situations should be monitored to evaluate the extent of any ecological impacts and the rates of resulting ecosystem decline. While these systems are being monitored, efforts should be directed toward development of potential future management techniques. These might include the development and use of selective piscicides, attractants and repellants, immuno-contraceptive agents, viruses, chromosomal manipulations, gynogenesis, and transgenics.

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Literature Cited

Abbas, R., and W. L. Hayton. 1997. A physiologically based pharmacokinetic and pharmacodynamic model for paraoxon in rainbow trout. Toxicology and Applied Pharmacology 145:192-201.

Abo-Khatwa, A. N., A. A. Al-Robai, and D. A. Al-Jawhari. 1996. Lichen acids as uncouplers of oxidative phosphorylation of mouse-liver mitochondria. Natural Toxins 4(2):96-102.

Abrahams, J. P., S. K. Buchanan, M. J. Van Raaij, I. M. Fearnley, A. G. W. Leslie, and J. E. Walker. 1996. The structure of bovine F sub(1)-ATPase complexed with the peptide antibiotic efrapeptin. Proceedings of the National Academy of Sciences 93:9420-9424.

Alaska Department of Fish and Game. 2001. Illegal stocking. *In* Southcentral Alaska Sport Fishing Opportunity. The Alaska Department of Fish and Game, Region II.

Albert, A., editor. 1985. Differences in distribution: the first principle of selectivity. *In* Selective toxicity—The physico-chemical basis of therapy. Chapman & Hall, London.

American Crop Protection Association. 2001. From lab to label: The research, testing, and registration of agricultural chemicals. http://www.croplifeamerica.org/ (February 8, 2001).

American Society for Testing and Materials, Committee E-35 on Pesticides. 1980. Standard practice for conducting toxicity tests with fishes, macroinvertebrates, and amphibians. E729-80. Pages 1-25 *in* Annual Book of ASTM Standards, Part 4b**.** End use and consumer products. American Society for Testing and Materials, Philadelphia, Pennsylvania.

Anonymous. 1959. New chemical assaults lampreys. Chemical and Engineering News 37(29):40-41.

Applegate, V. C., J. H. Howell, J. W. Moffett, B. G. H. Johnson, and M. A. Smith. 1961. Use of 3-trifluoromethyl-4-nitrophenol as a selective sea lamprey larvicide. Great Lakes Fishery Commission Technical Report 1:1-35.

Applegate, V. C., J. H. Howell, and M. A. Smith. 1958. Use of mononitrophenols containing halogens as selective sea lamprey larvicides. Science 127:336-338.

Ari, A. B. 1990. Chemical control of wild spawnings of *Tilapia zillii* and *Oreochromis aureus* in common carp (*Cyprinus carpio*) nursery ponds. Israeli Journal of Aquaculture/Bamidgeh 42(1):31-32.

Arizona Game and Fish Department. 2001. Animal abstracts-fish. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix. http://www.gf.state.az.us/w_c/edits/hdms_abstracts_fish.html (June 16, 2003).

Arizona Revised Statues. 1988*a*. Title 3, Chapter 2, Articles 5 and 6.

Arizona Revised Statutes. 1988b. Title 49, Chapter 2, Article 6.

Arnold, L., I. Lee, M. Kim, E. Song, D. Lider, F. Lottspeich, and B. Kadenbach. 1997. The subunit structure of cytochrome-c oxidase from tuna heart and liver. European Journal of Biochemistry 248:99-103.

Ball, R. C. 1948. Recovery of marked fish following a second poisoning of the population in Ford Lake, Michigan. Transactions of the American Fisheries Society 75:36-42.

Bandani, A. R., B. P. S. Khambray, J. L. Faull, R. Newton, M. Deadman, and T. M. Butt. 2000. Production of efrapeptins by *Tolypocladium* species and evaluation of their insecticideal and antimicrobial properties. Mycological Research 104:537-544.

Bechmann, G., H. Weiss, and P. R. Rich. 1992. Non-linear inhibition curves for tight-binding inhibitors of dimeric ubiquinol-cytochrome c oxidoreductase: Evidence for rapid inhibitor mobility. European Journal of Biochemistry 208(2):315-325.

Berger, B. L., R. E. Lennon, and J. W. Hogan. 1969. Laboratory studies on antimycin A as a fish toxicant. U.S. Fish and Wildlife Service, Investigations in Fish Control 26.

Bills, T. D., M. A. Boogaard, D. A. Johnson, D. C. Brege, R. J. Scholefield, R. W. Westman, and B. E. Stephens. 2003. Development of a pH/alkalinity treatment model for applications of the lampricide TFM to streams tributary to the Great Lakes. Journal of Great Lakes Research 29:510-520.

Bills, T. D., L. L. Marking, G. E. Howe, and J. J. Rach. 1988. Relation of pH to toxicity of lampricide TFM in the laboratory. Great Lakes Fishery Commission Technical Report Series 53.

Biota Information System Of New Mexico (BISON). 2000. Version 1/2000. The New Mexico Department of Game and Fish, Santa Fe, and The Fish and Wildlife Information Exchange (Fisheries and Wildlife Department, Virginia Tech, Blacksburg, Virginia). http://www.cmiweb.org/states/nmex_main/fish.htm.

Bomford, M., and P. O'Brien. 1995. Eradication or control for vertebrate pests. Wildlife Society Bulletin 23(2):249-255.

Bomford, M., and R. Tilzey. 1997. Pest management principles for European carp. Pages 9-20 *in* J. Roberts and R. Tilzey, editors. Controlling carp: exploring the options for Australia. Commonwealth Scientific and Industrial Research Organization Land and Water, Griffith New South Wales.

Bonneau, J. L., and D. L. Scarnecchia. 2001. Tests of a rotenone-impregnated bait for controlling common carp. Journal of the Iowa Academy of Sciences 108:6-7.

Boogaard, M. A., T. D. Bills, J. H. Selgeby, and D. A. Johnson. 1996. Evaluation of piscicides for control of ruffe. North American Journal of Fisheries Management 16:600-607.

Boogaard, M. A., T. D. Bills, and D. J. Johnson. 2003. Acute toxicity of TFM and a TFM/Niclosamide mixture to selected species of fish including lake sturgeon *(Acipenser fulvescens*) and mudpuppies (*Necturus maculosus*) in laboratory and field exposures. Journal of Great Lakes Research 29(Supplement 1).

Bowers, C. C. 1955. Selective poisoning of gizzard shad with rotenone. Progressive Fish-Culturist 17(3):134-135.

Boyer, P. D. 1997. The ATP synthase - a splendid molecular machine. Annual review in Biochemistry 66:717-749.

Brandt, U. 1997. Proton-translocation by membrane-bound NADH:ubiquinone-oxidoreductase (complex I) through redox-gated ligand conduction. Biochimica et Biophysica Acta 1818:479-491.

Braysher, M. 1993. Managing vertebrate pests. Principles and strategies. Australian Government Publishing Service, Canbeera.

Bridges, W. R. 1958. Sodium cyanide as a fish poison. U.S. Fish and Wildlife Service, Special Science Report Fish 253. 11 pp.

Brown, G. C. 2001. Regulation of mitochondrial respiration by nitric oxide inhibition of cytochrome c oxidase. Biochimica et Biophysica Acta 1504(1):46-57.

Burggren, W., J. Dunn, and K. Barnard. 1979. Branchial circulation and gill morphometrics in the sturgeon (*Acipenser transmontanas*). Canadian Journal of Zoology 57:2160-2170.

Burress, R. M., P. A. Gilderhus, and K. B. Cumming. 1976. Field tests of isobornyl thiocyanoacetate (thanite) for live collection of fishes. U.S. Fish and Wildlife Service, Investigations in Fish Control 71. 13 pp.

Burress, R. M., and C. W. Luhning. 1969*a*. Field trials of antimycin as a selective toxicant in channel catfish ponds. U.S. Fish and Wildlife Service, Investigations in Fish Control 25. 12 pp.

Burress, R. M., and C. W. Luhning. 1969*b*. Use of antimycin for selective thinning of sunfish populations in ponds. U.S. Fish and Wildlife Service, Investigations in Fish Control 28. 10 pp.

Carey, J. H., and M. E. Fox. 1981. Photodegradation of the lampricide 3-trifluoromethyl-4-nitrophenol (TFM). 1. Pathway of the direct photolysis in solution. Journal of Great Lakes Research 7:234-241.

Carmody, B., editor. 2003. Safeguarding Australia. Reed International Books, Australia Printing, Ltd. Australian Environment Review 18(7):6.

Carp Control Coordinating Group. 2000. Economics of carp management. *In* National management strategy for carp control, 2000-2005. Murray-Darling Basin Commission.

Carson, R. 1962. Silent spring. Houghton Mifflin, New York. 257 pp.

Cascon, S. C. 1965. Ichthyothereol and its acetate, the active polyacetylene constituents of *Ichthyothere terminalis* (Spreng.) Malme, a fish poison from the Lower Amazon. Journal of the American Chemical Society 87(22):5237-5241.

Chew, S. F., and Y. K. Ip. 1993. Respirations in the muscle of the mudskipper, *Boleopthalmus boddaerti*. Comparative Biochemistry and Physiology B 104B:681-688.

Chiayvareesajja, S., N. Rittibhonbhun, M. Hongpromyart, and P. Wiriyachitra. 1997. Toxicity of the Thai piscicidal plant, *Maesa ramentacea*, to freshwater fishes in ponds. Aquaculture 158:229-234.

Christie, W. J. 1974. Changes in the fish species composition of the Great Lakes. Journal of the Fisheries Research Board of Canada 31:827-854.

Clarkson, R. W. In press. Effectiveness of electrical fish barriers associated with the Central Arizona Project. North American Journal of Fisheries Management.

Cleeter, M. W., J. M. Cooper, V. M. Darley-Usmar, S. Moncada, and A. H. Schapira. 1994. Reversible inhibition of cytochrome c oxidase, the terminal enzyme of the mitochondrial respiratory chain, by nitric oxide. Implications for neurodegenerative diseases. Federation of European Biological Sciences Letters 345(1):50-54.

Clugston, J. P. 1986. Strategies for reducing risks from introductions of aquatic organisms: the Federal perspective. Fisheries (Bethesda) 11(2):26-29.

Coler, R. A., and C. Asbury. 1980. Acute toxicity of dissolved ozone to eggs and larvae of selected freshwater fish species. Ozone: Science and Engineering 2(2):177-182.

Connell, F. H. 1939. Sterilizing ponds. Progressive Fish-Culturist 44:35-36.

Conolly, R. B., B. D. Beck, and J. I. Goodman. 1999. Stimulating research to improve the scientific basis of risk assessment. Toxicological Sciences 49:1-4.

Crane, M. S., and B. T. Eaton. 1997. Spring Viraemia of carp virus (*Rhabdovirus carpio*): a biological control agent? Pages 87-107 *in* J. Roberts and R. Tilzey, editors. Controlling carp: exploring the options for Australia. Commonwealth Scientific and Industrial Research Organization Land and Water, Griffith New South Wales.

Cumming, K. B. 1975. History of fish toxicants in the United States. Pages 5-21 *in* P. H. Eschmeyer, editor. Rehabilitation of fish populations with toxicants: a symposium. American Fisheries Society, Special Publication 4.

Cumming, K. B., R. M. Burress, and P. A. Gilderhus. 1975. Controlling grass carp (*Ctenopharyngodon idella*) with antimycin, rotenone, and thanite and by electrofishing. Progressive Fish-Culturist 37(2):81-84.

Darrouzet, E., J. P. Issartel, J. Lunardi, and A. Dupuis. 1998. The 49-kDa subunit of NADH-ubiquinone oxidoreductase (Complex I) is involved in the binding of piericidin and rotenone, two quinone-related inhibitors. Federation of European Biological Sciences Letters 431(1):34-38.

Daugherty, W. E., P. C. Rugen, S. M. Dustin, L. P. Schleen, and J. G. Weise. 1987. Sea lamprey management in the Great Lakes in 1986. Annual report to the Great Lakes Fishery Commission.

Davies, W. D., and W. Shelton. 1983. Sampling with toxicants. Pages 119-213 *in* L. A. Nielsen and D. L. Johnson, editors. Fisheries techniques. American Fisheries Society, Bethesda, Maryland.

Dawson, V. K. 2003. Environmental fate and effects of the lampricide Bayluscide: A review. Journal of Great Lakes Research 29(Supplement 1).

Dawson, V. K. 1973. Photodecomposition of the piscicides TFM (3-trifluoromethyl-4-nitrophenol) and antimycin. M.S. Thesis, University of Wisconsin-La Crosse. 65 pp.

Dawson, V. K., T. D. Bills, and M. A. Boogaard. 1998. Avoidance behavior of ruffe exposed to selected formulations of piscicides. Journal of Great Lakes Research 24(2):343-350.

Dawson, V. K., K. B. Cumming, and P. A. Gilderhus. 1975. Laboratory efficacy of 3-trifluoromethyl-4-nitrophenol (TFM) as a lampricide. U.S. Fish and Wildlife Service, Investigations in Fish Control 63.

Dawson, V. K., K. B. Cumming, and P. A. Gilderhus. 1977. Efficacy of 3-trifluoromethyl-4-nitrophenol (TFM), 2',5-dichloro-4'-nitrosalicylanilide (Bayer 73), and a 98:2 mixture as lampricides in laboratory studies. U.S. Fish and Wildlife Service, Investigations in Fish Control 77.

Dawson, V. K., W. H. Gingerich, R. A. Davis, and P. A. Gilderhus. 1991. Rotenone persistence in freshwater ponds: effects of temperature and sediment adsorption. North American Journal of Fisheries Management 11:226-231.

Dawson, V. K., L. L. Marking, and T. D. Bills. 1976. Removal of toxic chemicals from water with activated carbon. Transactions of the American Fisheries Society 105(1):119-123.

Dawson, V. K., T. M. Schreier, M. A. Boogaard, N. J. Spanjers, and W. H. Gingerich. 2002. Rapid loss of lampricide from catfish and rainbow trout following routine treatment. Journal of Agricultural and Food Chemistry 50(23):6780-6785.

Degli-Esposti, M. 1998. Inhibitors of NADH-ubiquinone reductase: an overview. Biochimica et Biophysica Acta 1364:222-235.

Degli-Esposti, M., A. Ghelli, M. Crimi, E. Estornell, R. Fato, and G. Lenaz. 1993. Complex I and complex III of mitochondria have common inhibitors acting as ubiquinone antagonists. Biochemical and Biophysical Research Communications 190(3):1090-1096.

Degli Esposti, M., A. Ghelli, M. Ratta, D. Cortes, and E. Estornell. 1994. Natural substances (acetogenins) from the family Annonaceae are powerful inhibitors of mitochondrial NADH dehydrogenase (Complex I). The Biochemical Journal 301:161-167.

Dent, D. R. 1995*a*. Principles of integrated pest management. *In* D. R. Dent, editor. Integrated pest management. Chapman & Hall, London.

Dent, D. R. 1995*b*. Defining the problem. *In* D. R. Dent, editor. Integrated pest management. Chapman & Hall, London.

Dent, D. R. 1995*c*. Programme planning and management. *In* D. R. Dent, editor. Integrated pest management. Chapman & Hall, London.

Dent, D. R. 1995*d*. Control measures. *In* D. R. Dent, editor. Integrated pest management. Chapman & Hall, London.

Desert Fishes Team. 2003. Status of federal and state listed warm water fishes of the Gila River Basin, with recommendations for management. Report number 1, October 15, 2003. 20 pp.

Dobrev, I. D., M. E. Andersen, and R. S. H. Yang. 2002. Simulating interaction thresholds for human exposure to mixtures of trichlorethylene, tetrachlorethylene, and 1,1,1-trichlorethane. Silico Toxicology. Environmental Health Perspectives 110:1031-1040.

Drahota, Z., M. Vrbacky, H. Rauchova, and M. Kalous. 1996. Inhibition of mitochondrial cytochrome C oxidase by dicarbanonaborates. Biochemistry and Molecular Biology International 39(6):1267-1273.

Dykstra, W. W., and R. E. Lennon. 1966. The role of chemicals for the control of vertebrate pests. Pages 29-34 *in* E. F. Knipling, chairman. Pest control by chemical, biological, genetic, and physical means: A symposium. U.S. Department of Agriculture ARS 33-110.

Engler, M., T. Anke, O. Sterner, and U. Brandt. 1997*a*. Pterulinic acid and pterulone, two novel inhibitors of NADH: Ubiquinone oxidoreductase (complex I) produced by a Pterula species. I. Production, isolation and biological activities. Journal of Antibiotics 50(4):325-329.

Engler, M., T. Anke, O. Sterner, and U. Brandt. 1997*b*. Pterulinic acid and pterulone, two novel inhibitors of NADH: Ubiquinone oxidoreductase (complex I) produced by a Pterula species. I. Production, isolation and biological activities**.** Journal of Antibiotics 50(4):325-329.

Engstrom-Heg, R. 1971. A lightweight Mariotte bottle for field, laboratory, and hatchery use. Progressive Fish Culturist 33:227-231.

EPA (U.S. Environmental Protection Agency). 1996*a*. Guidance on FIFRA Section 24(c) registrations. http://www.epa.gov (January 11, 2001).

EPA. 1996*b*. Emergency exemptions and the FQPA. http://www.epa.gov (June 28, 2002).

EPA. 1998*a*. Reporting requirements for risk/benefit information. Final Rule. http://www.epa.gov (October 5, 1998).

EPA. 1998*b*. Biopesticide decision document: Canola oil. http://www.epa.gov (September 30, 2002).

EPA. 2002. What are Biopesticides? http://www.epa.gov (May 16, 2002).

Fang, N., and J. E. Casida. 1997. Novel bioactive cube insecticide constituents: isolation and preparation of 13-*homo*-13-oxadehydrorotenoids. Journal of Organic Chemistry 62:350-353.

Fang, N., and J. E. Casida. 1999. Cube resin insecticide: identification and biological activity of 29 rotenoid constituents. Journal of Agricultural and Food Chemistry 47(5):2130-2136.

Fang, N., J. C. Rowlands, and J. E. Casida. 1997. Anomalous structure-activity relationships of 13-*homo*-13-oxarotenoids and 13-*homo*-13-oxadehydrorotenoids. Chemical Research and Toxicology 10(8):853-858.

FDA (U.S. Food and Drug Administration). 1999. Guidance Document Number 61. U.S. Food and Drug Administration. Approval of New Animal Drugs for Minor Uses and Minor Species, Section E Aquatic Species.

FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act). 1947. United States Code of Federal Regulations, Title 7, Chapter 125, June 25, 1947. Amended in 1972, 1988, and 1996.

Finlayson, B. J., R. A. Schnick, R. L. Cailteux, L. DeMong, W. D. Horton, W. McClay, and C. W. Thompson. 2002. Assessment of antimycin A use in fisheries and its potential for reregistration. Fisheries (Bethesda) 27(6):10-18.

Finlayson, B. J., R. A. Schnick, R. L. Cailteux, L. DeMong, W. D. Horton, W. McClay, C. W. Thompson, and G. J. Tichacek. 2000. Rotenone use in fisheries management administrative and technical guidelines manual. American Fisheries Society, Bethesda, Maryland.

Forney, D. R. 1999. Importance of pesticides in integrated pest management. *In* N. N. Ragsdale and J. N. Seiber, editors. Pesticides: Managing risks and optimizing benefits. American Chemical Society, Washington, D.C.

Freund, R., and B. Kadenbach. 1994. Identification of tissue-specific isoforms for subunits Vb and VIIa of cytochrome c oxidase isolated from rainbow trout. European Journal of Biochemistry 221:1111-1116.

Friedrich, T., P. Van Heek, H. Leif, T. Ohnishi, E. Forche, B. Kunze, R. Jansen, W. Trowitzsch-Kienast, G. Hoefle, H. Reichenbach, and et al. 1994. Two binding sites of inhibitors in NADH:ubiquinone oxidoreductase (complex I). Relationship of one site with the ubiquinone-binding site of bacterial glucose:ubiquinone oxidoreductase. European Journal of Biochemistry 219:691-698.

Froese, R., and D. Pauly, editors. 2002. FishBase. World Wide Web electronic publication. http://www.fishbase.org (January 2, 2003).

Fukano, K. G., and F. F. Hooper. 1958. Toxaphene (chlorinated camphene) as a selective fish poison. Progressive Fish-Culturist 20(4):189-190.

Gibaldi, M., and D. Perrier. 1982. Pharmacokinetics. Marcel Dekker, Inc., New York.

Gilbert, A. H. 1999. Benefit cost analysis of the eight-year experimental Sea Lamprey Control Program on Lake Champlain. Report submitted to the Fisheries Technical Committee, Lake Champlain Fish and Wildlife Management Cooperative.

Gilderhus, P. A. 1972. Exposure times necessary for antimycin and rotenone to eliminate certain freshwater fish. Journal of Fisheries Research Board of Canada 29:199-202.

Gilderhus, P. A. 1979. Efficacy of antimycin for control of larval sea lampreys (*Petromyzon marinus*) in lentic habitats. Great Lakes Fishery Commission Technical Report 34:6-17.

Gilderhus, P. A. 1982. Effects of an aquatic plant and suspended clay on the activity of fish toxicants. North American Journal of Fisheries Management 2:301-306.

Gilderhus, P. A. 1985. Solid bars of 3-trifluoromethyl-4-nitrophenol: A simplified method of applying lampricide to small streams. Great Lakes Fishery Commission Technical Report 47.

Gilderhus, P. A., J. L. Allen, and V. K. Dawson. 1986. Persistence of rotenone in ponds at different temperatures. North American Journal of Fisheries Management 6:129-130.

Gilderhus, P. A., B. L. Berger, and R. E. Lennon. 1969. Field trials of antimycin A as a fish toxicant. U.S. Fish and Wildlife Service, Investigations in Fish Control 27.

Gilderhus, P. A., and R. A. Burress. 1983. Selective control of common carp: ineffectiveness of 2-(digeranylamino)-ethanol (GD-174) in pond trials. North American Journal of Fisheries Management 3(1):61-66.

Gingerich, W. H., and J. J. Rach. 1985. Uptake, metabolism, and elimination of rotenone in bluegills (*Lepomis macrochirus*). Aquatic Toxicology 6:179-196.

Gingerich, W. H., G. R. Stehly, K. J. Clark, and W. L. Hayton. 1998. Crop grouping: A proposal for public aquaculture. Veterinary and Human Toxicology 40(Supplement 2):24-31.

GLFC (Great Lakes Fishery Commission). 1985. TFM (3-trifluoromethyl-4-nitrophenol) vs. the sea lamprey: A generation later. Great Lakes Fishery Commission Special Publication 85-6. 17 pp.

GLFC. 1992. Strategic vision of the Great Lakes Fishery Commission for the decade of the 1990s. Great Lakes Fishery Commission, Ann Arbor, Michigan. 38 pp.

GLFC. 1998. Sea Lamprey Integration Committee Meeting, 98-2. Great Lakes Fishery Commission, October 28-30, 1998.

GLFC. 2001. Strategic vision of the Great Lakes Fishery Commission for the first decade of the new millennium. Great Lakes Fishery Commission, Ann Arbor, Michigan. 40 pp.

Graham, E. H. 1944. Natural principles of land use. Oxford University Press, New York.

Greenbank, J. 1940. Selective poisoning of fish. Transactions of the American Fisheries Society 70:80-86.

Gresswell, R. E. 1991. Use of antimycin for removal of brook trout from a tributary of Yellowstone Lake. North American Journal of Fisheries Management 11:83-90.

Grewe, P. 1997. Potential of molecular approaches for the environmentally benign management of carp. Pages 119-129 *in* J. Roberts and R. Tilzey, editors. Controlling carp: exploring the options for Australia. Commonwealth Scientific and Industrial Research Organization Land and Water, Griffith New South Wales.

Gu, Z. M., L. Zeng, J. T. Schwedler, K. V. Wood, and J. L. McLaughlin. 1995. New bioactive adjacent bis-THF annonaceous acetogenins from *Annona bullata*. Phytochemistry 40(2):467-477.

Gupta, S., S. B. Krasnoff, D. W. Roberts, and J. A. A. Renwick. 1991. Structures of the efrapeptins: Potenent inhibitors of mitochondrial ATPase from the fungus *Tolypocladium niveum*. Journal of the American Chemistry Society 113:707-709.

Hamilton, S. E. 1974. A review of the literature on the use of Bayluscide in fisheries. U.S. Fish and Wildlife Service, Special publication. 26 pp.

Hanson, L. H., and P. J. Manion. 1978. Chemosterilization of the sea lamprey, *Petromyzon marinus*. Great Lakes Fishery Commission Technical Report 16:1-35.

Hardewig, I., P. L. van Dijk, C. D. Moyes, and H. O. Portner. 1999*a*. Temperature-dependent expression of cytochrome-c oxidase in Anarctic and temperate fish. American Journal of Physiology 277:508-516.

Hardewig, I., H. O. Poertner, and L. S. Peck. 1999*b*. Thermal sensitivity of mitochondrial function in the Antarctic Notothenioid Lepidonotothen nudifrons. Journal of Comparative Physiology 169:597-604.

Harris, J. H. 1995. Carp: the prospects for control? Water 22(2):25-28.

Hayes, R., W. J., and E. R. Laws, Jr., editors. 1991*a*. Handbook of pesticide toxicology. Pages 1-496 *in* General principles. Volume 1. Academic Press, Inc., San Diego, California. ISBN 0-12-334161-2.

Hayes, R., W. J., and E. R. Laws, Jr., editors. 1991*b*. Handbook of pesticide toxicology. Pages 497-1121 *in* Classes of pesticides. Volume 2. Academic Press, Inc., San Diego, California. ISBN 0-12-334161-2.

Hayes, R., W. J., and E. R. Laws, Jr., editors. 1991*c*. Handbook of pesticide toxicology. Pages 1125-1576 *in* Classes of pesticides. Volume 3. Academic Press, Inc., San Diego, California. ISBN 0-12-334161-2.

Hazel, J. R., and C. L. Prosser. 1974. Molecular mechanisms of temperature compensation in poikilotherms. Physiological Reviews 54:620-677.

He, K. A. N., Zeng, L. U., Ye Qing, Shi Guoen, N. H. Oberlies, Zhao Geng-Xian, C. J. Njoku, and J. L. McLaughlin. 1997. Comparative SAR evaluations of annonaceous acetogenins for pesticidal activity. Pesticide Science 49(4):372-378.

Henderson, C., Q. H. Pickering, and C. M. Tarzwell. 1959. Relative toxicity of ten chlorinated hydrocarbon insecticides to four species of fish. Transactions of the American Fisheries Society 88(1):23-32.

Hinds, L. A., and R. P. Pech. 1997. Immuno-contraceptive control for carp. Pages 108-118 *in* J. Roberts, and R. Tilzey, editors. Controlling carp: exploring the options for Australia. Commonwealth Scientific and Industrial Research Organization Land and Water, Griffith New South Wales.

Hinton, M. J., and A. G. Eversole. 1979. Toxicity of ten chemicals commonly used in aquaculture to the black eel stage of the American eel. Proceedings of the World Mariculture Society 10:554-560.

Hochachka, P. W., and G. W. Somero. 1971. Biochemical adaptation to the environment. Pages 100-156 *in* W. S. Hoar and D. J. Randall, editors. Volume VI. Fish physiology. Academic Press, New York.

Hoff, J. G., and J. R. Westman. 1965. Experiments with a Dibrom-malathion formulation as a selective piscicide. New York Fish and Game Journal 12(1):99-107.

Hogue, C. C. 1999. Avoidance responses of rainbow trout and Utah chub to rotenone. North American Journal of Fisheries Management 19:171-179.

Holden, P. B. 1991. Ghosts of the Green River: impacts of Green River poisoning on management of native fishes. Pages 43-54 *in* W. L. Minckley and J. E. Deacon, editors. Battle against extinction—native fish management in the American West. The University of Arizona Press, Tucson.

Hollingworth, R. M., K. I. Ahammadsahib, G. Gadelhack, and J. L. McLaughlin. 1994. New inhibitors of complex I of the mitochondrial electron transport chain with activity as pesticides. Biochemistry Society Transactions 20:230-233.

Hollingworth, R. M., and G. Gadelhak. 1998. Mechanisms of action and toxicity of new pesticides that disrupt oxidative phosphorylation. Reviews in Toxicology 2:253-266.

Hooper, F. F., J. E. Williams, M. H. Patriarche, F. Kent, and J. C. Schneider. 1964. Status of lake and stream rehabilitation in the United States and Canada with recommendations for Michigan waters. Michigan Department of Conservation, Inst. Fish, Research Report 1688. 56 pp.

Howell, J. H., E. L. King, Jr., A. L. Smith, and L. H. Hanson. 1964. Synergism of 2',5-dichloro-4'-nitrosalicylanilide and 3-trifluoromethyl-4-nitrophenol in a selective lamprey larvicide. Great Lakes Fishery Commission Technical Report 8:1-21.

Hubert, T. D. 2003. Environmental fate and effects of the lampricide TFM: A review. Journal of Great Lakes Research 29(Supplement 1).

Hubley, R. C. 1990. Registration activities and sea lamprey control research on lampricides in 1989. Annual report to the Great Lakes Fishery Commission.

Hughes, G. M. 1980. Functional morphology of fish gills. Pages 15-36 *in* B. Lahlou, editor. Epithelial transport in the lower vertebrates. Cambridge University Press, London and New York.

Hunn, J. B. 1972. The effect of exposure to thanite on the blood chemistry of carp. Progressive Fish-Culturist 34(2):81-84.

Huston, J. E. 1955. Selective poisoning of carp with calcium carbide. Quarterly report of the Colorado Fishery Research Union 2(1 and 2):17-21.

Ikegaya, H., H. Iwase, K. Hatanaka, K. Sakurada, K. Yoshida, and T. Takatori. 2001. Diagnosis of cyanide intoxication by measurement of cytochrome c oxidase activity. Toxicology Letters 119(2):117-123.

Jackson, C. F. 1956. Control of the common sunfish or pumpkinseed, *Lepomis gibbosus*, in New Hampshire. New Hampshire Fish and Game Department, Technical Circular (12):1-16.

Jackson, C. F. 1962. Use of chlorine for reclaiming ponds. New Hampshire Fish and Game Department, Federal Aid in Fish Restoration, Job Completion Report, Project FW-2-R-9, Job II. 7 pp.

Jewess, P. J. 1994. Insecticides and acaricides which act as the rotenone binding site of mitochondrial NADH:ubiquinone oxidoreductase; competitive displacement studies using tritium-labeled rotenone analog. Biochemistry Society Transactions 22:247-251.

Jewess, P. J., and A. L. Devonshire. 1999. Kinetic microplate-based assays for inhibitors of mitochondrial NADH:ubiquinone oxidoreductase (complex I) and succinate:cytochrome c oxidoreductase. Analytical Biochemistry 272(1):56-63.

Joint Standing Committee on Conservation/Standing Committee on Fisheries and Aquaculture. 1999. National Task Force on the Prevention and Management of Marine Pest Incursions). http://www.ea.gov.au/coasts/imps/seastar.html (January 23, 2003). Implementation plan, http://www.nre.vic.gov.au/web/root/domino/cm_da/nreccm.nsf/2fc3379bd0005bd64a2566cf00283d52/76fa0946181de2654a256b66007ce9d4/$FILE/MayWorkshop.pdf (June 24, 2003).

Kanayama, R. K. 1963. The use of alkalinity and conductivity measurements to estimate concentrations of 3-trifluoromethyl-4-nitrophenol required for treating lamprey streams. Great Lakes Fishery Commission Technical Report 7.

Kikuchi, K., S. Itoi, and S. Watabe. 1999. Increased levels of mitochondrial ATP synthase beta-subunit in fast skeletal muscle of carp acclimated to cold temperature. Fisheries Science (Tokyo) 65:629-636.

Klar, G. T., and L. P. Schleen. 2000. Standard operating procedures for application of lampricides in the Great Lakes Fishery Commission integrated management of sea lamprey (*Petromyzon marinus*) control program. U.S. Fish and Wildlife Service, Marquette Biological Station, Marquette, Michigan, Special Report 92-001.3.

Klussman, W. G., M. A. Champ, and J. T. Lock. 1969. Utilization of anhydrous ammonia in fisheries management. Proceedings of the Southeastern Association of Game and Fish Commissioners 23:512-519.

Kolar, C. S., and D. M. Lodge. 2002. Ecological predictions and risk assessment for alien species. Science 298:1233-1236.

Konar, S. K. 1969. Laboratory studies on two organophosphorus insecticides, DDVP and phosphamidon, as selective toxicants. Transactions of the American Fisheries Society 98(3):430-437.

Konar, S. K. 1970. Nicotine as a fish poison. Progressive Fish-Culturist 32(2):103-104.

Konishi, K., and T. Tanaka. 1999. Inhibitory effects of tannins on the NADH dehydrogenase activity of bovine heart mitochondrial complex I. Biological and Pharmaceutical Bulletin 22(3):240-243.

Krasnoff, S. B., and S. Gupta. 1992. Efrapeptin production by Tolypocladium fungi (Deuteromycotina:Hyphomycetes): Intra and interspecific variation. Journal of Chemical Ecology 18:1727-1742.

Krasnoff, S. B., S. Gupta, R. J. St. Leger, J. A. A. Renwick, and D. W. Roberts. 1991. Antifungal and insecticidal properties of the efrapeptins: Metabolites of the fungus *Tolypocladium niveum*. Journal of Invertebrate Pathology 58:180-188.

Kubo, I., S. Komatsu, and M. Ochi. 1986. Molluscicide from the cashew *Anacardium occidentalis* and their large scale isolation. Journal of Agricultural and Food Chemicals 34:970-973.

Kuepper, G., R. Thomas, and R. Earles. 2002. Use of baking soda as a fungicide. Agronomy Technical Note. Appropriate Technology Transfer for Rural Areas, Fayetteville, Arkansas.

Kuntz, I. D. 1992. Structure-based strategies for drug design and discovery. Science 257:1078-1082.

Lake Champlain Fish and Wildlife Management Cooperative. 1999. A comprehensive evaluation of an eight year program of sea lamprey control in Lake Champlain. New York State Department of Environmental Conservation, Vermont Department of U.S. Fish and Wildlife, and U.S. Fish and Wildlife Service, Essex Junction, Vermont.

Lamsa, A. K., C. M. Rovainen, D. P. Kolenosky, and L. H. Hanson. 1980. Sea lamprey (*Petromyzon marinus*) control—where to from here? Report of the Sea Lamprey Integration Committee Control Theory Task Force. Canadian Journal of Fisheries and Aquatic Sciences 37:2175-2192.

Landolt, J. L., K. I. Ahammadsahib, R. M. Hollingworth, R. Barr, F. L. Crane, N. L. Buerck, G. P. McCabe, and J. L. McLaughlin. 1995. Determination of structure-activity relationships of *Annonaceous acetogenins* by inhibition of oxygen uptake in rat liver mitochondria. Chemico-Biological Interactions 98(1):1-13.

Law, F. C. P., S. Abedini, and C. J. Kennedy. 1991. A biologically based toxicokinetic model for pyrene in rainbow trout. Toxicology and Applied Pharmacology 110:390-402.

Lech, J. J., and C. N. Statham. 1975. Role of glucuronide formation in the selective toxicity of 3-trifluoromethyl-4-nitrophenol (TFM) for the sea lamprey: comparative aspects of TFM uptake and conjugation in sea lamprey and rainbow trout. Toxicology and Applied Pharmacology 25:542-552.

Lee, D. P. 2001. Northern pike control at Lake Davis, California. Pages 55-62 *in* R. L. Cailteux, L. DeMong, B. J. Finlayson, W. Horton, W. McClay, R. A. Schnick, and C. Thompson, editors. Rotenone in fisheries: Are the rewards worth the risks? American Fisheries Society, Trends in Fisheries Science and Management 1, Bethesda, Maryland.

Lehninger, A. L. 1975. Uncoupling and inhibition of oxidative phosphorylation. Pages 519–520 *in* Chapter 19, Oxidative phosphorylation and mitochondrial structure. Biochemistry, second edition. Worth Publishers, Inc., New York.

Le Maire, E. H. 1961. Experiments to determine the effect of pH on the biological activity of two chemicals toxic to ammocoetes. Fisheries Research Board of Canada, Biological Report Series 690.

Lennard, M. S. 1993. Genetically determined adverse drug reactions involving metabolism. Drug Safety 9:60-77.

Lennon, R. E. 1966. Antimycin—a new fishery tool. Wisconsin Conservation Bulletin, March-April 1966.

Lennon, R. E. 1970. Control of freshwater fish with chemicals. Pages 129-137 *in* Proceedings of the Fourth Vertebrate Pest Conference, West Sacramento, California, March 1970.

Lennon, R. E., and B. L. Berger. 1970. A resume on field applications of antimycin A to control fish. U.S. Fish and Wildlife Service, Investigations in Fish Control 40. 19 pp.

Lennon, R. E., J. B. Hunn, R. A. Schnick, and R. M. Burress. 1970. Reclamation of ponds, lakes, and streams with fish toxicants: a review. Food and Agriculture Organization of the United Nations Fishery Technical Paper 100. 99 pp.

Lennon, R. E., and C. R. Walker. 1964. Laboratories and methods for screening fish-control chemicals. U.S. Fish and Wildlife Service, Investigations in Fish Control 1. 15 pp.

Lentsch, L. D., C. W. Thompson, and R. L. Spateholts. 2001. Overview of a large-scale chemical treatment success story: Strawberry Valley, Utah. Pages 63-79 *in* R. L. Cailteux, L. DeMong, B. J. Finlayson, W. Horton, W. McClay, R. A. Schnick, and C. Thompson, editors. Rotenone in fisheries: Are the rewards worth the risks? American Fisheries Society, Trends in Fisheries Science and Management 1, Bethesda, Maryland.

LesVeaux, J. F. 1959. Summary report of survey to evaluate the need for specific fish toxicants in sport fishing waters. Progressive Fish-Culturist 21:99-110.

Lewis, W. M. 1968. Isobornyl thiocyanoacetate as a fish drugging agent and selective toxin. Progressive Fish-Culturist 30(1):29-31.

Leynen, M., L. Duvivier, P. Girboux, and F. Ollevier. 1998. Toxicity of ozone to fish larvae and *Daphnia magna*. Ecotoxicology and Environmental Safety 41(2):176-179.

Li, W., A. P. Scott, M. J. Siefkes, H. Yan, Q. Liu, S. Yun, and D. A. Gage. 2002. Bile acid secreted by male sea lamprey that acts as a sex pheromone. Science 296:138-141.

Lloyd, S. W. 1987. Use of antimycin A in live-haul tanks to remove scaled fish from fingerling channel catfish populations. Progressive Fish Culturist 49:131-133.

Lopinot, A. C. 1975. Summary on the use of toxicants to rehabilitate fish populations in the Midwest. Pages 1-4 *in* P. H. Eschmeyer, editor. Rehabilitation of fish populations with toxicants: a symposium. American Fisheries Society, Special Publication 4.

Lowman, F. G. 1958. Experimental selective rotenone killing of undesirable fish species in flowing streams. Texas Game and Fish Commission, Federal Aid to Fish Restoration, Job Completion Report, F-9-R-4, Job E-3. 2 pp.

Lowman, F. G. 1959. Experimental selective rotenone killing of undesirable fish species in flowing streams. Texas Game and Fish Commission, Federal Aid to Fish Restoration, Segment Completion Report, F-9-R-6, Job E-3. 5 pp.

Lummen, P. 1998. Complex I inhibitors as insecticides and acaricides. Biochimica et Biophysica Acta 1364(2):287-296.

Lutz, R. J., and R. L. Dedrick. 1985. Physiological pharmacokinetics: relevance to human risk assessment. Pages 129-149 *in* A.P. Li, editor. New approaches in toxicity testing and their application in human risk assessment. Raven Press, New York.

MacPhee, C., and R. Ruelle. 1969. A chemical selectively lethal to squawfish *(Ptychocheilus oregonensis and P. umpquae*). Transactions of the American Fisheries Society 98(4):676-684.

Maklashina, E., and G. Cecchini. 1999. Comparison of catalytic activity and inhibitors of quinone reactions of succinate dehydrogenase (Succinate-ubiquinone oxidoreductase) and fumarate reductase (Menaquinol-fumarate oxidoreductase) from *Escherichia coli*. Archives of Biochemistry and Biophysics 369(2):223-232.

Mallat, J., R. D. McCall, J. F. Bailey, and J. Seelye. 1994. Effects of lampricides on the gill ultrastructure of larval sea lampreys and rainbow trout fry. Canadian Journal of Zoology 72:1653-1664.

Mallat, J., R. L. Ridgeway, and C. Paulsen. 1985. Ultrastructural effects of 3-trifluoromethyl-4-nitrophenol on gills of the larval lamprey *Petromyzon marinus*. Canadian Journal of Zoology 63:155-164.

Maniak, P. J., R. D. Lossing, and P. W. Sorensen. 2000. Injured Eurasian ruffe, *Gymnocephalus cernuus*, release an alarm pheromone that could be used to control their dispersal. Journal of Great Lakes Research 26(2):183-195.

Marking, L. L. 1970. Juglone (5-hydroxy-1,4-naphthoquinone) as a fish toxicant. Transactions of the American Fisheries Society 99(3):510-514.

Marking, L. L. 1972. Salicylanilide I, an effective non-persistent candidate piscicide. Transactions of the American Fisheries Society 101(3):526-533.

Marking, L. L. 1974. Toxicity of 2-(digeranylamino)-ethanol, a candidate selective fish toxicant. Transactions of the American Fisheries Society 103(4):736-742.

Marking, L. L. 1975. Effects of pH on toxicity of antimycin to fish. Journal of the Fisheries Research Board of Canada 32(6):769-773.

Marking, L. L. 1977. Method for assessing additive toxicity of chemical mixtures. Pages 99-108 *in* F. L. Mayer and J. L. Hamelink, editors. Aquatic Toxicololgy and Hazard Evaluation, American Society for Testing and Materials STP 634.

Marking, L. L. 1992. Evaluation of toxicants for the control of carp and other nuisance fishes. Fisheries (Bethesda) 17(6):6-12.

Marking, L. L., and T. D. Bills. 1975. Toxicity of potassium permanganate to fish and its effectiveness for detoxifying antimycin. Transactions of the American Fisheries Society 104:579-583.

Marking, L. L., and T. D. Bills. 1976. Toxicity of rotenone to fish in standardized laboratory tests. U.S. Fish and Wildlife Service, Investigations in Fish Control 72.

Marking, L. L., and T. D. Bills. 1977. Chlorine: Its toxicity to fish and detoxification of antimycin. U.S. Fish and Wildlife Service, Investigations in Fish Control 74.

Marking, L. L., and T. D. Bills. 1981. Sensitivity of four species of carp to selected fish toxicants. North American Journal of Fisheries Management 1:51-54.

Marking, L. L., T. D. Bills, and J. J. Rach. 1983. Chemical control of fish and fish eggs in the Garrison Diversion Unit, North Dakota. North American Journal of Fisheries Management 3:410-418.

Marking, L. L., and J. W. Hogan. 1967. Toxicity of Bayer 73 to fish. U.S. Fish and Wildlife Service, Investigations in Fish Control 19. 13 pp.

Marking, L. L., and L. E. Olson. 1975. Toxicity of the lampricide 3-trifluoromethyl-4-nitrophenol (TFM) to non-target fish in static tests. U.S. Fish and Wildlife Service, Investigations in Fish Control 60.

Marsh, P. C., and C. A. Pacey. In press. Immiscibility of native and nonnative species. Proceedings: restoring native fish to the lower Colorado River, interactions of native and nonnative fishes. U.S. Fish and Wildlife Service, Albuquerque, New Mexico, and U.S. Bureau of Reclamation, Boulder City, Nevada.

Matsuno-Yagi, A., and Y. Hatefi. 1993. Studies on the mechanism of oxidative phosphorylation. ATP synthesis by submitochondrial particles inhibited at F0 by venturicidin and organotin compounds. Journal of Biological Chemistry 268(9):6168-6173.

Matsuno-Yagi, A., and Y. Hatefi. 1996. Ubiquinol:cytochrome c oxidoreductase. The redox reactions of the bis-heme cytochrome b in ubiquinol-sufficient and uniquinol-deficient systems. Journal of Biological Chemistry 271(11):6164-6171.

Matsuno-Yagi, A., and Y. Hatefi. 1999. Ubiquinol:cytochrome c oxidoreductase. Effects of inhibitors on reverse electron transfer from the iron-sulfur protein to cytochrome b. Journal of Biological Chemistry 274(14):9283-9288.

Matsuno-Yagi, A., and Y. Hatefi. 2001. Ubiquinol:cytochrome c oxidoreductase (complex III). Effect of inhibitors on cytochrome b reduction in submitochondrial particles and the role of ubiquinone in complex III. Journal of Biological Chemistry 276(22):19006-19011.

Mayo, K. R., J. H. Selgeby, and M. E. McDonald. 1998. A bioenergetics modeling evaluation of top-down control of ruffe in the St. Louis River, western Lake Superior. Journal of Great Lakes Research 24:329-342.

McCarraher, D. B., and J. L. Dean. 1959. The results of four years of fish eradication work with toxaphene in Nebraska. Presented at the 21st Midwest Wildlife Conference, Minneapolis, Minnesota, December 7-9, 1959. 10 pp. (mimeo)

McClay, W. 2000. Rotenone use in North America (1988-1997). Fisheries (Bethesda) 25(5):15-21.

Meronek, T. G., P. M. Bouchard, E. R. Buckner, R. M. Burri, K. K. Demmerly, D. C. Hatleli, R. A. Klumb, S. H. Schmidt, and D. W. Coble. 1996. A review of fish control projects. North American Journal of Fisheries Management 16:63-74.

Meyer, F. P. 1965. The experimental use of Guthion as a selective fish eradicator. Transactions of the American Fisheries Society 94(3):203-209.

Meyer, F. P. 1989. Registration activities and sea lamprey control research in 1988. Annual report to the Great Lakes Fishery Commission.

Meyer, F. P., and R. A. Schnick. 1976. The approaching crisis in the registration of fishery chemicals. Pages 5-14 *in* Proceedings of the Thirtieth Annual Conference of the Southeastern Association of Game and Fish Commissioners.

Miller, E. D., and M. L. Madsen. 1964. The use of sodium cyanide in Nebraska fisheries management. Presented at 13th Annual Meeting of Great Plains Fish. Workers Association 12 pp. (mimeo)

Miller, R. R. 1961. Man and the changing fish fauna of the American Southwest. Papers Michigan Academy Science Arts, Letters 46:365-404.

Miller, W. J., and D. Laiho. 1997. Upper Colorado River Basin Recovery Implementation Program: feasibility evaluation of non-native fish control structures. Final report to the Colorado River Water Conservation District, Glenwood Springs, Colorado. Prepared by Miller Ecological Consultants, Inc.

Minckley, W. L. 1973. Fishes of Arizona. Arizona Game and Fish Department, Phoenix, Arizona.

Minckley, W. L., and G. Meffe. 1987. Differential selection by flooding in stream-fish communities of the arid American Southwest. Pages 93-104 *in* W. J. Matthews and D. C.

Heins, editors. Community and evolutionary ecology of North American stream fishes. University of Oklahoma Press, Norman.

Miro, O., J. Casademont, A. Barrientos, A. Urbano-Marquez, and F. Cardellach. 1998. Mitochondrial cytochrome c oxidase inhibition during acute carbon monoxide poisoning. Pharmacology and Toxicology 82:199-202.

Moffitt, J. W. 1958. Lake trout and sea lamprey. Minnesota Conservation Volunteer 21(126):18-23.

Mohanty, D. K., D. K. Chatterjee, and B. S. Giri. 1993. Effective combination of urea and bleaching powder as a piscicide in aquaculture operations. Journal of Aquaculture in the Tropics 8(2):249-254.

Morrison, B. R. S. 1987. Use and effects of piscicides. Angling and wildlife in freshwaters: ITE Symposium 19:47-52.

Morrison, B. R. S. 1988. The use of rotenone in fisheries management. Scottish Fisheries Aberdeen, Information Pamphlet 15. 17 pp.

Moyle, P. B., and C. C. Cech, Jr. 2000. Fishes: an introduction to ichthyology. Fourth edition. Prentice Hall, Englewood Cliffs, New Jersey.

Murphy, S. D. 1975. Pesticides. *In* L. J. Cassarett and J. Doull, editors. Toxicology: The basic science of poisons. MacMilllian Publishing Company, New York, Toronto, London. 768 pp.

Nagamune, H., Y. Fukushima, J. Takada, K. Yoshida, A. Unami, T. Shimooka, and H. Terada. 1993. The lipophilic weak base (Z)-5-methyl-2-[2-(1-naphthyl)ethenyl]-4-piperidinopyridine (AU-1421) is a potent protonophore type cationic uncoupler of oxidative phosphorylation in mitochondria. Biochimica et Biophysica Acta 1141(2-3):231-237.

National Parks and Wildlife Service. 2002. Predation by *Gambrusia holbrooki* - The plague minnow. Draft Threat Abatement Plan. National Parks and Wildlife Service, Hurstville, New South Wales.

National Research Council of Canada. 1985. TFM and Bayer 73: lampricides in the aquatic environment. Environmental Secretariat, Ottawa, Canada. Publication NRCC 22433.

Neely, W. B. 1979. Estimating rate constants for uptake and clearance of chemicals by fish. Environmental Science and Technology 13:1506-1510.

Nelson, D. L., and M. M. Cox. 2000. Chapter 19 Oxidative phosphorylation and photophosphorylation. Pages 659-721 *in* Lehinger principles of biochemistry. Third edition. Worth Publishers, New York, New York. ISBN 1-57259-153-6.

Nevada Pesticides Act [1:269:1955] – (Nevada Revised Statutes - A 1971, 1133; 1975, 187), 1955.

New Mexico Statutes. 1978. Chapter 76, Article 4.

Nicholls, P., and J. He. 1993. Direct and indirect effects of valinomycin upon cytochrome c oxidase. Archives of Biochemistry and Biophysics 301(2):305-10.

Nichols, J. W., J. M. McKim, G. J. Lien, A. D. Hoffman, S. L. Bertelsen, and C. A. Gallinat. 1993. Physiologically-based toxicokinetic modeling of three waterborne chloroethanes in channel catfish (*Ictalurus punctatus*). Aquatic Toxicology 27:83-112.

Nicholson, R. A., S. H. Roth, A. Zhang, J. Zheng, J. Brookes, B. Skrajny, and R. Bennington. 1998. Inhibition of respiratory and bioenergetic mechanisms by hydrogen sulfide in mammalian brain. Journal of Toxicology and Environmental Health. Part A, 54(6):491-507.

Nicolaou, K., J. Pfefferkorn, F. Schuler, A. Roecker, G. Cao, and J. Casida. 2000. Combinatorial synthesis of novel and potent inhibitors of NADH:ubiquinone oxidoreductase. Chemistry and Biology 7(12):979-992.

Nimi, A. J., and S. L. Morgan. 1980. Morphometric examination of the gills of walleye, *Stizostedion vitreum vitreum* (Mitchell) and rainbow trout, *Salmo gairdneri* (Richardson). Journal of Fish Biology 16:685-692.

Oliver, J. E., C. N. Lamb, and R. H. Smith, Jr. 1983. Oxidative degradation of the piscicide Squoxin in aerated river water. Journal of Agricultural and Food Chemistry 31(6):1178-1183.

Olson, K. R. 2002*a*. Vascular anatomy of the fish gill. Journal of Experimental Zoology 293:214-231.

Olson, K. R. 2002*b*. Gill circulation: regulation of perfusion distribution and metabolism of regulatory molecules. Journal of Experimental Zoology 293:320-335.

Ouchane, S., I. Agalidis, and C. Astier. 2002. Natural resistance to inhibitors of the ubiquinol cytochrome c oxidoreductase of rubrivivax gelatinosus: Sequence and functional analysis of the cytochrome bc sub(1) complex. Journal of Bacteriology 184(14):3815-3822.

Pacey, C. A., and P. C. Marsh. 1998. Resource use by native and non-native fishes of the lower Colorado River: literature review, summary, and assessment of relative roles of biotic and abiotic factors in management of an imperiled indigenous ichthyofauna. Submitted to U.S. Bureau of Reclamation, agreement number 7-MT-30-R0012.

Panikkar, B. M. 1960. Low concentrations of calcium hypochlorite as a fish and tadpole poison applicable for use in partly drained ponds and other small bodies of water. Progressive Fish-Culturist 22(3):117-120.

Parker, S. P., editor. 1994. Dictionary of scientific and technical terms. Fifth edition. McGraw Hill: New York. 1,792 pp.

Paul, D., and S. K. Raut. 1987. Comparative studies on the toxicity of Endosulphan in some freshwater fishes under different pH and hardness of water. Current Science 56(7):318-319.

Perschbacher, P. W., and J. Sarkar. 1989. Toxicity of selected pesticides to the snakehead, *Channa punctata*. Asian Fisheries Science 2(2):249-254.

Pesticides Action Network North America. 2003. PAN pesticides database. http://www.pesticideinfo.org/Index.html (September 22, 2003).

Prather, E. E., J. R. Fielding, M. C. Johnson, and H. S. Swingle. 1953. Production of bait minnows in the Southeast. Alabama Polytechnic Institute, Agricultural Experiment Station, Circular 112. 71 pp.

Prentice, J. A., P. P. Durocher, and D. L. Pritchard. 1976. Evaluation of anhydrous ammonia for fishery management uses. Proceedings of the Annual Conference of the Southeastern Association Game and Fish Commission 30:88-98.

Prevost, G. 1960. Use of fish toxicants in the province of Quebec. Canadian Fish Culturist 28:13-35.

Quilliam, J. P., and R. Stables. 1968. The effect of cunaniol, a polyacetylenic alcohol isolated from the plant *Clibadium sylvestre*, on piscine behavior. British Journal of Pharmacology 3(3):679-680.

Rach, J. J., and W. H. Gingerich. 1986. Distribution and accumulation of rotenone in tissues of warmwater fishes. Transactions of the American Fisheries Society 115:214-219.

Rach, J. J., J. A. Luoma, and L. L. Marking. 1994. Development of an antimycin-impregnated bait for controlling common carp. North American Journal of Fisheries Management 14:442-446.

Radonski, G. C. 1967. Antimycin: useful in perch control? Wisconsin Conservation Bulletin 32(2):15-16.

Ram, K. J., G. R. M. Rao, S. Ayyappan, C. S. Purushothaman, P. K. Saha, K. C. Pani, and H. K. Muduli. 1988. A combination of commercial bleaching powder and urea as a potential piscicide. Aquaculture 72:287-293.

Ramaprabhu, T., S. D. Tripathi, D. K. Chatterji, S. Jena, and K. M. Das. 1990. Use of ammonia as a fish toxicant in ponds. Aquacultura Hungarica 6:97-103.

Rauchova, H., M. Battino, R. Fato, G. Lenaz, and Z. Drahota. 1992. Coenzyme Q-pool function in glycerol-3-phosphate oxidation in hamster brown adipose tissue mitochondria. Journal of Bioenergetics and Biomembranes 24(2):235-241.

Ray, D. E. 1991. Pesticides derived from plants and other organisms. Pages 585-636 *in* W. J. Hayes, Jr., and E. R. Laws, Jr., editors. Handbook of pesticide toxicology. Volume 2. Academic Press, Inc., San Diego, California. ISBN 0-12-334161-2.

Rinne, J. N. 1991. An approach to management and conservation of a declining regional native fish fauna: southwestern United States. Pages 56-60 *in* N. Maruyama et al., editors. Wildlife Conservation: Present trends and perspectives for the 21st century. International Symposium Wildlife, 5th International Congress Zoology, Tskuba and Yokohama, Japan, August 21-25, 1990.

Rinne, J. N. 1995. The effects of introduced fishes on native fishes: Arizona, southwestern United States. Pages 149-159 *in* D. P. Philipp et al., editors. Protection of aquatic biodiversity. Proceedings of the World Fisheries Congress, Theme 3. Oxford & IBH Publishing Company Pvt. Ltd., New Delhi, India.

Rinne, J. N. 2003. Native and introduced fishes: their status, threats and conservation. Pages 193-213 *in* Malchus, Ffolliott, DeBano, and Neary, editors. Riparian areas of the Southwestern United States: hydrology, ecology, and management. Lewis Publishers, Boca Raton, Florida.

Rinne, J. N., and W. L. Minckley. 1991. Native fishes of arid lands: a dwindling resource of the desert Southwest. U.S. Department of Agriculture Forest Service General Technical Report RM-206. 45 pp.

Rinne, J. N., J. Simms, and J. Blasius. In press. Changes in fish assemblages in the Gila River, Arizona-New Mexico: epitaph of a native fish fauna. J. N. Rinne, R. M. Hughes, and R. Calamusso, editors. Changes in large river fish assemblages in North America: implications for management and sustainability of native species. American Fisheries Society, North American Journal of Fisheries Management Special Publication.

Rinne, J. N., and P. R. Turner. 1991. Reclamation and alteration as management techniques, and a review of methodology in stream renovation. Pages 219-244 *in* W. L. Minckley and J. E. Deacon, editors. Battle against extinction—native fish management in the American West. The University of Arizona Press, Tucson.

Ross, E. M. 1995. Pharmacodynamics: Mechanisms of drug action and the relationship between drug concentration and effect. Pages 29-41 *in* Goodman and Gilman, editors. The pharmacological basis of therapeutics. Ninth edition. 1,905 pp.

St. Amant, J. A., W. C. Johnson, and M. J. Whalls. 1964. Aqualin as a fish toxicant. Progressive Fish-Culturist 26(2):84-88.

Sanger, A. C., and J. D. Koehn. 1997. Use of chemicals for carp control. Pages 37-57 *in* J. Roberts, and R. Tilzey, editors. Controlling carp: exploring the options for Australia. Commonwealth Scientific and Industrial Research Organization Land and Water, Griffith New South Wales.

Satoh, T., H. Miyoshi, K. Sakamoto, and H. Iwamura. 1996. Comparison of the inhibitory action of synthetic capsaicin analogues with various NADH-ubiquinone oxidoreductases. Biochimica et Biophysica Acta 1273(1):21-30.

Schäperclaus, W. 1963. Regelung des Fischbestandes in Seen durch Polychorpinen-vergiftung. Dtsch. Fisch.-Ztg. 10(3):65-68.

Scheide, D., R. Huber, and T. Friedrich. 2002. The proton-pumping NADH:ubiquinone oxidoreductase (complex I) of *Aquifex aeolicus*. Federation of European Biological Sciences Letters 512(1-3):80-84.

Schleen, L. P., and G. T. Klar. 1999. Integrated management of sea lampreys in the Great Lakes 1999. Annual report to the Great Lakes Fishery Commission.

Schneider, J. C., and R. N. Lockwood. 1997. Experimental management of stunted Bluegill Lakes. Michigan Department of Natural Resources, Fisheries Division. Fisheries Research Report 2040.

Schnick, R. A. 1972. A review of literature on TFM (3-trifluoromethyl-4-nitrophenol) as a lamprey larvicide. U.S. Fish and Wildlife Service, Investigations in Fish Control 44.

Schnick, R. A. 1974. A review of the literature on the use of antimycin in fisheries. U.S. Fish and Wildlife Service, Fish Control Laboratory, La Crosse, Wisconsin.

Schnick, R. A., F. P. Meyer, and D. L. Gray. 1986. A guide to approved chemicals in fish production and fishery resource management. University of Arkansas, Little Rock, Arkansas. Cooperative Extension Service Bulletin MP-241.

Schoettger, R. A. 1970. Toxicology of Thiodan in several fish and aquatic invertebrates. U.S. Bureau of Sport Fisheries and Wildlife Investigations in Fish Control 35. 31 pp.

Schoenherr, A. 1977. Density dependent and density independent regulation of reproduction in the Gila topminnow, *Poeciliopsis occidentalis* (Baird and Girard). Ecology 58:438-444.

Schuler, F., and J. E. Casida. 2001. The insecticide target in the PSST subunit of complex I. Pest Management Science 57(10):932-940.

Schuler, F., T. Yano, S. D. Bernardo, T. Yagi, V. Yankovskaya, T. P. Singer, and J. E. Casida. 1999. NADH-quinone oxidoreductase: PSST subunit couples electron transfer from iron-sulfur cluster N2 to quinone. Proceedings of the National Academy of Sciences 96(7):4149-4153.

Sea Lamprey Integration Committee. 2001. Sea Lamprey Integration Committee Meeting minutes. Great Lakes Fishery Commission Interim Meeting, Columbus, Ohio, November 1-2, 2001.

Selbig, W. R. 1974. Aerial application of antimycin: A fish toxicant. Wisconsin Department of Natural Resources Bureau of Fish and Wildlife Management Report 68.

Shaban, H., P. Gazzotti, and C. Richter. 2001. Cytochrome c oxidase inhibition by N-retinyl-N-retinylidene ethanolamine, a compound suspected to cause age-related macula degeneration. Archives of Biochemistry and Biophysics 394(1):111-116.

Shepard, B. B. In press. Removal of nonnative fish stocks to conserve or restore native fish stocks. P. Ferreri, editor. American Fisheries Society.

Shimomura,Y., T. Kawada, and M. Suzuki. 1989. Capsacin and its analogs inhibit the activity of NADH-coenzyme Q of the mitochondrial respiratory chain. Archives of Biochemistry and Biophysics 270:573-577.

Siegler, H. R., and H. W. Pillsbury. 1946. Use of derris to reclaim ponds for game fish. Journal of Wildlife Management 10:308-316.

Shiva, S., P. S. Brookes, R. P. Patel, P. G. Anderson, and V. M. Darley-Usmar. 2001. Nitric oxide partitioning into mitochondrial membranes and the control of respiration at cytochrome c oxidase. Proceedings of the National Academy of Sciences 98(13):7212-7217.

Smith, M. W. 1935. The use of copper sulphate for eradicating the predatory fish population of a lake. Transactions of the American Fisheries Society 65:101-113.

Smith, M. W. 1950. The use of poisons to control undesirable fish in Canadian fresh waters. Canadian Fish Culturist 8:17-29.

Solman, V. E. F. 1950. History and use of fish poisons in the United States. Canadian Fish Culturist 8:3-16.

Soong, M. K., and A. B. O. Merican. 1958. The use of endrin as a piscicide in mining pool and fish ponds in Malaya. Proceedings of the Indo-Pacific Fisheries Council 8(2):19-25.

Spateholts, R. L., and L. D. Lentsch. 2001. Utah's rotenone sandmix: A formulation to maintain fish toxicity in seeps and springs. American Fisheries Society, Fisheries (Bethesda) 26(6):107-118.

Srivastava, U. S., and S. K. Konar. 1965. On the use of phosphamidon for eradication of freshwater fish predators. Experimentia 21(7):390-391.

Srivastava, U. S., and S. K. Konar. 1966. DDVP as a selective toxicant for the control of fishes and insects. Progressive Fish-Culturist 28(2):235-238.

Stanley, J. G., J. M. Martin, and J. G. Jones. 1975. Gynogenesis as a possible method for producing monosex grass carp (*Ctenopharyngodon idella*). Progressive Fish-Culturist 37(1):25-26.

Stefferud, J. A., and D. L. Propst. 1996. A lightweight, constant-flow device for dispensing liquid piscicides into streams in remote areas. North American Journal of Fisheries Management 16:228-230.

Stehly, G. R., and W. L. Hayton. 1989. Disposition of pentachlorophenol in rainbow trout (*Salmo gairdneri*): Effect of inhibition of metabolism. Aquatic Toxicology 14:131-148.

Strasser, H., A. Vey, and T. M. Butt. 2000. Are there any risks in using entomopathogenic fungi for pest control, with particular reference to the bioactive metabolites of mearhizium, Tolypocladium, and Beauveria species? Biocontrol Science and Technology 10:717-735.

Stucky, N. 2003. Daughterless carp. Mississippi Interstate Cooperative Resource Association, Bettendorf, Iowa. River Crossings 12:4-5.

Summerfelt, R. C., and W. M. Lewis. 1967. Repulsion of green sunfish by certain chemicals. Journal of the Water Pollution Control Federation 39(12):2030-2038.

Surber, E. W. 1948. Chemical control agents and their effects on fish. Progressive Fish-Culturist 10(3):125-131.

Takahashi, N., A. Suzuki, Y. Kimura, S. Miyamoto, S. Tamura, T. Mitsui, and J. Fukami. 1968. Isolation and physiological activities of piericidin B, a natural insecticide produced by *Streptomyces*. Agricultural and Biological Chemistry 32:1115-1122.

Tamura, S., N. Takahashi, S. Miyamoto, R. Mori, S. Suzuki, and J. Nagatsu. 1963. Isolation and physiological activities of piericidin A, a natural insecticide produced by *Streptomyces*. Agricultural and Biological Chemistry 27:576-582.

Tan, A. K., R. R. Ramsay, T. P. Singer, and H. Miyoshi. 1993. Comparison of the structures of the quinone-binding sites in beef heart mitochondria. Journal Biological Chemistry 268:19328-19333.

Tang, Y. 1961. The use of saponin to control predaceous fishes in shrimp ponds. Progressive Fish-Culturist 23(1):43-45.

Tarr, B. D. 1985. Squoxin toxicity and phthalate accumulation kinetics in fish. PhD Thesis, Washington State University.

Thomas, M., A. M. Bhagwat, and P. T. Muthe. 1997. *Euphorbia antiquorum*, a potential piscicide in prawn culture. Journal of Animal Morphology and Physiology 44(2):89-94.

Titcomb, J. W. 1914. The use of copper sulphate for the destruction of obnoxious fishes in ponds and lakes. Transactions of the American Fisheries Society 44:20-26.

Tokito, M. K., and F. Daldal. 1993. Roles in inhibitor recognition and quinol oxidation of the amino acid side chains at positions of cyt b providing resistance to Q sub(o)-inhibitors of the bc sub(1) complex from Rhodobacter capsulatus. Molecular Microbiology 9(5):965-978.

Tormo, J. R., E. Estornell, T. Gallardo, M. C. Gonzalez, A. Cave, S. Granell, D. Cortes, and M. C. Zafra-Polo. 2001. Gamma-lactone-Functionalized antitumoral acetogenins are the most potent inhibitors of mitochondrial complex I. Bioorganic and Medicinal Chemistry Letters 11(5):681-684.

Tormo, J. R., T. Gallardo, R. Aragon, D. Cortes, and E. Estornell. 1999. Specific interactions of monotetrahydrofuranic annonaceous acetogenins as inhibitors of mitochondrial complex I. Chemico-Biological Interactions 122(3):171-183.

Tormo, J. R., M. C. Zafra-Polo, A. Serrano, E. Estornell, and D. Cortes. 2000. Epoxy-acetogenins and other polyketide epoxy derivatives as inhibitors of the mitochondrial respiratory chain complex I. Planta Medica 66(4):318-323.

Toyomizu, M., K. Okamoto, T. Ishibashi, Z. Chen, and T. Nakatsu. 2000. Uncoupling effect of anacardic acids from cashew nut shell oil on oxidative phosphorylation of rat liver mitochondria. Life Sciences 66(3):229-234.

Tsukihara, T., H. Aoyama, E. Yamashita, T. Tomizaki, H. Yamaguchi, K. Shinzawa-Itoh., R. Nakashima., R. Yaono, and S. Yoshikawa. 1996. The whole structure of the 13-subunit oxidized cytochrome c oxidase at 2.8 Å. Science 272:1136-1144.

U.S. Bureau of Sport Fisheries and Wildlife. 1970. Report to the fish farmers: the status of warmwater fish farming and progress in fish farming research. U.S. Bureau of Sport Fisheries and Wildlife, Resource Publication 83:1-124.

USDA (U.S. Department of Agriculture). 1968. Label for Bayluscide 5% Granular Sea Lamprey Larvicide. U.S. Department of Agriculture, October 2, 1968.

USDA (U.S. Department of Agriculture, Agricultural Research Service). 1994. Adoption of integrated pest management in U.S. agriculture. U.S. Department of Agriculture, Agriculture Information.

USDA. 2002. EPA and pesticide registration issues. http://www.ars.usda.gov/is/np/mba/jan97/epa.htm (March 20, 2002).

U.S. Fish and Wildlife Service. 2002. Tilapia removal program on the Virgin River, Clark County, Nevada, and Mohave County, Arizona. Final Environmental Assessment. U. S. Fish and Wildlife Service.

Utah Pesticide Control Act. 1979. Chapter 2, Section 4-14.

Vanderhorst, R., and S. D. Lewis. 1969. Potential of sodium sulfite catalyzed with cobalt chloride in harvesting fish. Progressive Fish-Culturist 31(3):149-154.

Veith, G. D., D. L. De Foe, and B. V. Bergstedt. 1979. Measuring and estimating the bioconcentration factor of chemicals in fish. Journal of the Fisheries Research Board of Canada 36:1040-1048.

Vrieze, L. A., and P. W. Sorensen. 2001. Laboratory assessment of the role of a larval pheromone and natural stream odor in spawning streamlocalization by migratory sea lamprey. Canadian Journal of Fisheries and Aquatic Sciences 58:2374-2385.

Vue, C., J. A. Bernardy, T. D. Hubert, W. H. Gingerich, and G. R. Stehly. 2002. Relatively rapid loss of lampricide residues from fillet tissue of fish after routine treatment. Journal of Agricultural and Food Chemistry 50:6786-6789.

Vuorinen A.H., P. Rossi, and E. M. Vapaavuori. 1995. Combined effects of inorganic carbon and different nitrogen sources in the growth media on biomass production and nitrogen uptake in young willow and birch plants. Journal of Plant Physiology 147:236-242.

Walker, C. R. 1969. Problems in clearance and registration of chemical tools used by fish culturists and fishery biologists. Pages 1-139 *in* Registration and clearance of chemicals for fish culture and fishery management. U.S. Bureau of Sport Fisheries and Wildlife, Washington, D.C.

Walker, C. R., R. Lennon, and B. Berger. 1964. Preliminary observations on the toxicity of antimycin A to fish and other aquatic animals. U. S. Fish and Wildlife Service, Investigations in Fish Control 2.

Walker, J. E. 1994. The regulation of catalysis in ATP synthase. Current opinion in Structural Biology 4(6):912-918.

Westman, J. R., and J. V. Hunter. 1956. Preliminary observations on the lowering of dissolved oxygen by sodium sulfite and its effects on certain fishes, with particular reference to problems in fish management. Progressive Fish-Culturist 18(3):126-130.

Wiggins, M. 1999. Removing nuisance fish species from diked wetlands. Ohio Sea Grant Communications Twine Line 21:3.

Wiley, R. W., and R. S. Wydoski. 1993. Management of undesirable fish species. Pages 335-354 *in* C. C. Kohler and W. A. Hubert, editors. Inland Fisheries Management in North America, American Fisheries Society, Bethesda, Maryland.

Willis, K., and N. Ling. 2000. Sensitivities of mosquitofish and black mudfish to a piscicide: could rotenone be used to control mosquitofish in New Zealand wetlands? New Zealand Journal of Zoology 27:85-91.

Wilson, M. T., G. Antonini, F. Malatesta, P. Sarti, and M. Brunori. 1994. Probing the oxygen binding site of cytochrome c oxidase by cyanide. Journal of Biological Chemistry 269(39):24114-24119.

Windholz, M., editor. 1983. The Merck Index an encyclopedia of chemicals, drugs, and biologicals. Tenth edition. Merck and Company, Inc., 1,463 pp.

Wisconsin Department of Natural Resources. 1999. Horicon Marsh drawdown, burning and carp eradication all part of long range management plan. News release, March 9, 1000. Wisconsin Department of Natural Resources, Fitchberg, Wisconsin.

Wood, E., B. Latli, and J. E. Casida. 1996. Fenazaquin acaricide specific binding sites in NADH: Ubiquinone oxidoreductase and apparently the ATP synthase stalk. Pesticide Biochemistry and Physiology 54(2):135-145.

Xia, D., C. Yu, H. Kim, J. Xia, A. Kachurin, L. Zhang, L. Yu, and J. Deisenhofer. 1997. Crystal structure of the cytochrome bc1 complex from bovine heart mitochrondria. Science 277:60-66.

Yagi, T. 1990. Inhibition by capsacin of NADH-quinone oxidoreductase is correlated with the presence of energy-coupling site I in various organisms. Archives of Biochemistry and Biophysics 281:305-311.

Yankovskaya, V., S. O. Sablin, R. R. Ramsay, T. P. Singer, B. A. C. Ackrell, G. Cecchini, and H. Miyoshi. 1996. Inhibitor probes of the quinone binding sites of mammalian complex II and *Escherichia coli* fumarate reductase. Journal of Biological Chemistry 271(35):21020-21024.

Ye, Q., K. He, N. H. Oberlies, L. Zeng, G. Shi, D. Evert, and J. L. McLaughlin. 1996. Longimicins A-D: novel bioactive acetogenins from *Asimina longifolia* (annonaceae) and structure-activity relationships of asimicin type of annonaceous acetogenins. Journal of Medicinal Chemistry 39(9):1790-1796.

Zheng, J., and V. D. Ramirez. 2000. Inhibition of mitochondrial proton F0F1-ATPase/ATP synthase by polyphenolic phytochemicals. British Journal of Pharmacology 130(5):1115-1123.

Glossary

<	less than
>	greater than
°C	degrees Centigrade
2,4-D®	(2,4-dichlorophenoxy)acetic acid
ADI	Acceptable Daily Intake
ADP	adenosine diphosphate
ATP	adenosine triphosphate
Bayluscide®	2-aminoethanol salt of 2',5-dichloro-4'-nitrosalycylanilide
Bt®	*Bacillus thiurengsis*
CFR	Code of Federal Regulation
Complex I	NADH:ubiqinone oxidoreductase
Complex II	Succinate:ubiquinone oxidoreductase
Complex III	Ubiquinol:ferrocytochrome c oxidoreductase
Complex IV	ferrocytochrome c:oxygen oxidoreductase
Complex V	F0F1-ATP synthase/oxidative phosphorylation uncoupling agents
DANEX-80	80% dimethyl-1,2,2-trichloro-1-hydroxyethylphosphonate
dieldrin	1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo-1,4-exo-5,8-dimethanonapthalene
DDVP	Vapona® or Dichlorvos
DMF	dimethyl formamide
DDT	1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane
Endosulfan or Thiodan®	1,4,5,6,7,7-hexachloro-5-norbornene-2,3-dimethanol cyclic sulfite
EPA	U.S. Environmental Protection Agency
ETS	electron transport system
EUP	end-use products
FDA	U.S. Food and Drug Administration
FAD	Flavin Adenine Diphosphate
FADH2	Reduced Flavin Adenine Diphosphate
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
GD-174	2-(digeranylamino)-ethanol
GLFC	Great Lakes Fishery Commission
GLP	Good Laboratory Practice
ha	hectare
HTH	calcium hypochlorite
km	kilometers
Juglone	5-hydroxy-1,4-napthoquinone
L	liter
L/s	liters per second
LC	lethal concentration
LC_{50}	lethal concentrations to 50% of the test species
LC_{100}	lethal concentrations to 100% of the test species
m	meter
m^3/sec	cubic meter per second
mg/L	ppm (parts per million)
MMF	monomethyl formamde
MUP	manufacturing-use products
NADH	Reduced nicotinamide adenine diphosphate

OP	oxidative phosphorylation
PB	piperonyl butoxide
PCIP	polychlorpinene
PEG	polyethylene glycol
phosphamidon	dimicron
Phostoxin®	aluminum phosphine
P_i	organic phosphate
Salicylanilide I	2',5-dichloro-3-tert-butyl-6-methyl-4'-nitrosalicylanilide
Squoxin	1,1'-methylenebis(2-naphthol)
Sumithion®	O,O-dimethyl-O-[3-methyl-4-nitrophenyl] phosphorodithioate
TFM	3-trifluoromethyl-4-nitrophenol
thanite	isobornyl thiocyanoacetate
µg/L	microgram per liter (parts per billion)
UMESC	Upper Midwest Environmental Sciences Center
USDA	U.S. Department of Agriculture