the major inherent problems and suggest the directions in which the possible solutions lie are a number of the region's outstanding fisheries scientists. In order of their appearance on the program, they are: Dr. William Davies, Auburn University, who will speak in the context of ponds and community lakes; Mr. George Fleener, Missouri Department of Conservation, who will speak in the context of rivers and streams; Mr. Robert Jenkins, Bureau of Sport Fisheries and Wildlife, who will speak in the context of large lakes and reservoirs; and Dr. Edwin Joseph, South Carolina Wildlife and Marine Resources Department, who will speak in the context of estuaries and coastal waters. Dr. Richard Anderson, University of Missouri, will summarize and analyze the Panel presentations.

As we commence, I wish to express my personal thanks for the willingness of the Panelists to participate in this challenging Theme Session. I am especially appreciative of their cooperation in completing drafts of their papers several weeks ago in order to furnish advance copies to our distinguished Summarizer, to permit him to develop a more meaningful discussion.

Let us proceed....................

MANAGING SMALL IMPOUNDMENTS AND COMMUNITY LAKES

by

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ABSTRACT

Farm ponds and community lakes continue to attract a large number of fishermen. The manageability of these waters for increased fish production offers opportunities for substantial gains in terms of benefits to fishermen from management input costs.

Intensive culture of channel catfish, tilapia and mirror carp can provide sport fishing opportunities, especially where fishing pressure is intense. Almost a ton of channel catfish per acre has been harvested by sport fishermen from intensively managed ponds. Problems associated with intensive culture are nutrition, disease, and the diminished aesthetics of fishing an intensively managed pond.

Present management practices for bass-bluegill ponds are adequate, but intense study of optimum rates of exploitation and fertilization should provide for more efficient techniques.

Strategy and tactics for the future should consider energy flow patterns in fish communities. Study of how these patterns are altered and what are the losses when fishing or other stresses are applied, should provide new management concepts. Stability in fish populations requires further study. In this respect, base-line data on stable and unstable multi-species fisheries need to be developed.

INTRODUCTION

Sport and commercial production of fish in farm ponds and community lakes will continue to be highly desirable as a method of land and water utilization, especially near large urban centers where carefully managed waters can appreciably increase yields to fishermen.

While the use, location and ease of draining determine the suitability for fish production in farm ponds, most ponds are capable of producing a crop of fish. Most community lakes, however, are especially constructed for recreational use with sport fish production as their primary function. Popularity of these waters for fishing is indicated by the results of a recent survey in Alabama relating preference of sport fishermen to various water types (Table 1). Although Alabama fishermen had a wide variety of fishing waters to choose from, a large proportion chose to fish in small impoundments.

Public or community lakes undoubtably receive the greatest amount of fishing pressure on a per acre basis. Byrd and Crance (1965) reported that 20 managed community lakes in Alabama received an average annual rate of 135 fishermen trips per acre. These fishermen caught an average of 173 pounds per acre, or approximately 11.5 times what could be expected from unmanaged waters (Swingle, 1952). The demand for public or private fishing waters can increase dramatically where population pressures are substantial. In southern California, for example, fishing pressure on public reservoirs averages 300-400 fisherman trips per acre or approximately 2.5 times what is experienced on Alabama community lakes. (Personal communication, Mike Lembeck, Calif. Game and Fish).

Table 1. Fishing Trips to Various Alabama Freshwater Resources, 1971. (Alabama Statewide Comprehensive Outdoor Recreation Plan, In Progress)

Fishing Water Resource	Alabama Resident Fishing Participation	Percentage
Private ponds or lakes	9,309,074	33
Public lakes	1,415,226	5
Reservoirs	9,162,150	33
Rivers	4,489,676	16
Creeks	2,455,772	9
Salt or brackish water	1,277,335	5
Total	28,109,233	

The manageability of a typical farm pond or community lake offers opportunities for substantial gains in terms of benefits to fishermen from management input costs. Recentlv however, there appears to be a tendency for state and federal agencies to de-emphasize their small impoundment research and management programs. One reason is that these waters tend to attract the "contemplative" fisherman who pursues his sport with little fanfare; as a result his requirements are sometimes neglected in an increasingly competitive and demanding world.

This paper will attempt to summarize what we already know about managing small impoundments, and where research advances are necessary.

Catfish, Tilapia, and Carp

Fishermen vary in their criteria used for determining a successful fishing trip. One unit of measurement that appears to be appropriate for an increasing number of fishermen is pounds per fishing hour, regardless of the species caught. In this respect management techniques that maximize production of harvestable size fish are appropriate.

Research findings at the Auburn University Agricultural Experiment Station show that maximum catch results from stocking fingerling channel catfish (*Ictalurus punctatus*) and giving daily supplemental feeding (Prather, 1964). When 4-inch fingerlings were stocked at a rate of 3,000 per acre in February and given daily feeding from March to October, 0.7 lb fish was produced by October. In one pond opened to public fishing, the catch during a 15-month period was approximately 1,900 lb per acre. A total of 749 persons fished per acre and harvested approximately 67 per cent of the catfish stocked.

Continuing sport fishing experiments at Auburn University with channel catfish have indicated that fingerlings can be added to fertilized ponds in combination with largemouth bass (*Micropterus salmoides*) and bluegill (*Lepomis* macrochirus). The addition of 100 fingerling catfish per acre does not seriously interfere with the growth of sunfishes, and can add an additional 75 lb per acre to the normal catch of bass and bluegills. Although channel catfish will reproduce in ponds, very few young will escape predation when bass are present. Therefore, restocking with large fingerlings is necessary every 2 or 3 years.

Another successful combination for fertilized ponds is stocking 50 largemouth bass and 500 channel catfish with approximately 1,000 fathead minnows (*Pimephales promelas*) per acre. Fingerling catfish stocked in February reached an average weight of 0.6 lb by September and provided good fishing for 2 or 3 years with light fishing pressure. One special requirement for raising catfish in this manner is that no other species be present to reproduce and compete with the catfish for food. The 50 bass per acre are added to help control wild fish; the fathead minnows are added to ensure good bass survival.

Pond and water supply requirements for channel catfish are about the same as those for bass and bluegill combinations, such as an adequate but not excessive water supply. An exception is that ponds of 1/3 to 1/2 acre in size can often be successfully managed for catfish fishing, while generally being too small for bass and bluegill combinations.

Two species of tilapia (*T. aurea* and *T. mossambica*) have been used to augment sport fish production in ponds. When stocked with predacious fish, a large percentage of the reproduction reach a harvestable size. In one experiment 10,000 *T. aurea* fingerlings, 10,000 fathead minnows and 600 bass fry were stocked in a 1.95-acre pond during the period April to June. The pond was fed at an average rate of 23.8 lb per acre per day over a 200-day period. *T. aurea* are relatively difficult to catch with hook and line unless conditioned to feeding on the bottom by being fed a pelletized ration. Fishing was first permitted in August and continued until the pond was drained in October. Fishing success for both bass and tilapia averaged 4.1 lb per fisherman hour; average weight from the sport catch was 0.56 lb for tilapia and 0.46 lb for bass. At draining, the population consisted of 76.6 per cent of harvestable size fish.

In similar experiments, *T. mossambica* proved less desirable than *T. aurea*. The latter appeared less prolific and reproduction could be controlled to a greater extent by stocking large numbers of fingerlings.

In addition to the problem of small size, there is the difficulty of overwintering. Kelly (1957) and McBay (1961) reported that fingerling tilapia died when the water temperature dropped below 48.2 F; therefore some warm water facility must be available to overwinter a relatively large number if fish are to be stocked the following spring in sufficient numbers to effectively control reproduction.

The Israeli strain of mirror carp (*Cyprinus carpio*) should prove to be popular with sport fishermen because of its unusually fast growth rate, delicate flavor, and wariness to being caught. One experiment where 1,000 carp fingerlings per acre were stocked in January in a 2.1-acre fertilized farm pond and fed a pelletized ration produced good fishing by July. Public fishing during the period July to August yielded fish that averaged 5.12 lb; the largest fish were two that weighed 10.2 lb. These fish were not especially easy to catch; only 34 per cent of the fishermen were successful. Beukema (1970) reported that this species becomes decreasingly vulnerable after being exposed to a relatively intense fishery.

Problems with Intensive Culture

Problems associated with intensive culture of sport fish are disease, nutrition, water quality, production costs, and the diminished aesthetics of fishing intensively managed ponds. All except the latter have been investigated in some detail. Rogers (in press) discusses clinical signs and treatment procedures for viruses, bacteria, fungi and parasite diseases. Of these, bacterial diseases appear to be the most serious threat; for example, immunization techniques against such diseases as *Aeromonas* and *Columnaris* infections are badly needed.

Inadequate nutrition and poor water quality become increasingly important as the level of culture intensifies. Nutritional requirements and feeding rates have been discussed by various authors (Prather and Lovell, 1971; Lovell, 1973; Hastings and Dupree, 1969); however, with the recent cost increases for feed ingredients, some recommendations are no longer practical. This is especially true for recommended protein levels and the desired proportion of protein to come from animal sources. In nature most fish consume high protein foods and simply do not do well in ponds without an adequate protein source. One possible method for circumventing this problem would be to establish bait minnow populations in combination with the cultured species for forage, and feed a lower percentage of protein in the ration.

Methods for improving the aesthetics associated with fishing intensively managed ponds require more attention. The pleasing sights, sounds and smells associated with fishing can be lost with large numbers of fishermen. For example, management inputs might be: (1) landscaping with shrubs and hedges to reduce visual contact between fishermen, (2) convenient, but unobtrusive trash containers to help reduce litter and maintenance, and (3) fish attractors marked by brush to provide "targets" for casters.

Breeding for Efficiency

The advancements that have occurred through selective breeding in agricultural animals suggest that this should be a fertile field for improvement of fish stocks. Most pond fishes can be considered as unselected strains of wild fish, with the exception of the common carp. Hatchery operators probably select their brood fish on the basis of phenotype, or those adults that have expressed a fast rate of growth. A more realistic approach that needs to be followed is to select individuals for breeding only if they produce offspring that have the desired traits. Other characteristics important to intensive culture of sport fish are disease resistance, fecundity, spawning habits, catchability, pugnacity, and appearance (color).

BASS-BLUEGILL MANAGEMENT

Management of bass-bluegill combinations in small impoundments in the Southeast usually involves stocking correct numbers of fish in new ponds, fertilizing, balance checks, corrective stocking, partial poisoning, and regulation of the fishery.

Stocking

The objective of various methods of stocking ponds is to establish fish populations that produce in subsequent years satisfactory harvests of fish. Such populations are defined by Swingle (1950) as "balanced populations." Two important characteristics of "balanced ponds" are that between 40 and 85 per cent of the fish population be of harvestable size, and that both bass and bluegill reproduce successfully each year. In a balanced pond reproduction is controlled by density dependent factors, by predation and other forms of natural mortality; fishing serves to crop the harvestable size fish thereby releasing resources for growth of intermediate size fish. The recommended stocking rate to produce a balanced pond after one year is 100 bass fingerlings and 1,000 to 1,500 bluegill fingerlings per acre. Higher production and better bass survival results when 1,000 fathead minnows are stocked per acre in the fall with the bluegill fingerlings (Swingle, 1966). By the following summer, practically all fathead minnows will have disappeared from the pond; however, their presence provides for increased conversion of primary production into fish protein, which in turn is readily consumed by bass and bluegill.

Recommended stocking rates for the future should consider the specific desires of the landowner and fisherman. Special purpose stocking procedures will become increasingly important as they are refined.

Several stocking procedures designed to produce larger than average bluegill (greater than 0.25 lb) in ponds are presently being considered at the Auburn University Agricultural Experiment Station. Increasing predation pressures in ponds by overcrowding the bass can limit survival of young-of-the-year bluegill, when bluegill fingerlings are stocked at the recommended rate of 1,000-1,500 per acre. This allows for a maximum or near maximum rate of growth for bluegill. Overcrowding the bass is best accomplished by stocking adult bass at a rate of 2-3 per acre. Recent developments in hatchery production of adult bass (Snow, 1968) show that it is now possible to produce bass for large scale stocking. However, an overcrowded bass population permits only a fraction of the carrying capacity of the pond to be expressed; as a result some restraints on fishing are necessary, and optimum rates of harvest need to be determined.

In recent years, a dramatic change has occurred in the technology and enthusiasm applied to bass fishing. Bass fishing in "balanced ponds" is at best a compromise, and from the principles involved it does not appear possible to have the best bluegill and bass fishing in the same pond. Good bluegill fishing requires that a large percentage of the population be of harvestable size (too large for bass to eat), whereas good bass fishing requires that bluegill be small enough to provide for a substantial forage base. Swingle (1949) and Regier (1963) experimented with bass in combination with various bait fishes in fertilized ponds. Usually the bait fish populations disappeared after 1 year due to bass predation. However, production of bait fishes such as golden shiners, and fathead minnows has been dramatically increased by feeding a pelletized ration (Prather, 1957, 1958). This may mean that sufficient forage can be maintained through supplemental feeding for a relatively large number of bass. Altering the stocking rate of bass fingerlings to fit the potential production of bait fish in farm ponds would appear to be one promising method for creating good bass fishing.

Balance Checks, Corrective Stocking and Partial Poisoning

There are a variety of reasons for unbalance in small impoundments, such as competition with wild fish already present in the pond, stocking a new pond with adult fish, heavy mortality among hatchery fish and removal of bass by fishing before they have spawned. Because of these and other causes, balance checks are important, especially during the second summer after stocking. A seining method described by Swingle (1956) is usually employed, although catch records and other sampling techniques can be used. These methods give an indication of growth and reproduction dynamics of bass and bluegill populations in ponds. If one or both species fail to reproduce, or insufficient food resources remain for intermediate size fish to reach harvestable size, then corrective measures are required.

Corrective stocking with bass fingerlings has been used to prevent or correct overcrowded forage fish populations (Byrd and Crance, 1965). If balance checks during the second summer after stocking indicate poor bass reproduction, 50-200 bass fingerlings can be added per acre to help reduce bluegill spawn. However, little evidence is available to indicate that adding bass fingerlings to established ponds is of any value, unless some fish biomass is removed and fish are added as advanced fingerlings and in large enough numbers.

Partial poisoning with rotenone is often an effective and economical method of restoring balance when bluegill become overcrowded. Hooper and Crance (1960) reported that marginal and sectional poisoning was effective in correcting unbalance in several of Alabama's state owned public fishing lakes. Usually removal of 50-150 lbs per acre is recommended. However, standing crop, mean size of the crowded species and predator abundance are factors that must be taken in account in deciding what weight to remove.

Regulation of the Fishery

Bass-bluegill populations in small impoundments can be overfished from the standpoint of causing populations to be unbalanced. When a pond is first opened, fishing is usually at its best. Ideally a quota system, which restricts the catch to about 10 lb per week per acre during the first several months of fishing should be used. Later the pond can be fished more intensively until approximately 1/2 of the standing crop is removed (150 to 200 lb per acre from fertilized ponds in the Southeast). However, when public fee fishing is permitted it becomes more difficult to control the catch. Elrod (1971) reported that fishermen in a 25.5-acre pond removed approximately 48 per cent of the total catch during the first 2 weeks of a 5-month season. When bass and bluegill are removed at this rate, there is a tendency for the pond to become overcrowded with bluegill.

Methods for preventing the excessive removal of bass in a short time span are needed. The success of quotas and/or creel limits depends on whether those fish survive after being hooked and released. In this respect, factors affecting hooking mortality in ponds (especially when live bait is used) need to be well documented. Another interesting possibility is whether the Florida subspecies of largemouth bass can be used to lower the catch rate in ponds. The Florida subspecies in California is caught significantly less frequently from the same reservoir than is the northern subspecies (Personal communication, Mike Lembeck, Calif. Fish and Game).

Stunted black crappie (*Pomoxis nigromaculatus*) populations usually result when uninformed fishermen stock a few adults in small impoundments. A dominant year class usually prevails; interspecific competition results in stunted populations of bass, bluegill and black crappie. Black crappie reproduction is usually suppressed in subsequent years until natural and fishing mortality reduce stock abundance to a level where another dominant year class is produced. When fishing pressure is relatively intense, control of reproduction by regulating stock abundance may be one possible method for damping the highs and lows of the cycle. However, insufficient quantitative information is available on the growth, mortality and reproductive biology of crowded black crappie populations to make management recommendations. In this respect black crappie populations in large impoundments do not generally fluctuate to the extent that they do in small impoundments. Why these fish maintain relatively strong, non-fluctuating populations is not well understood and deserves further study.

Fertilization

Pond fertilization with N-P-K has been used in the Southeast for a number of years to increase fish production and to control aquatic weeds (Swingle, 1965). In new ponds, or where weed control is necessary, best results are obtained by using 8-8-2 fertilizer at the rate of 100 lb per acre (equivalent to 40 lb of 20-20-5 per acre) per application during the period from February to October. Approximately 10 to 12 applications are usually sufficient to maintain growth of plankton. Lawrence (1954) suggested using fertilizer platforms submerged 18-20 inches under the water instead of broadcasting fertilizer from the shore. Surface currents distribute the dissolved nutrients effectively throughout the photic zone. In 1963, Swingle, et al suggested that phosphate fertilizer alone may be satisfactory after a pond had received complete fertilization for 3-5 years. Either 40 lb of superphosphate or 15 lb of triple superphosphate per acre per treatment may be applied where only phosphate is needed. However, only carp, goldfish and channel catfish were used in these production experiments. Results from later experiments indicated that production in bass-bluegill ponds may decrease when only phosphate is added. (The Fisheries Research Annual Reports of the Alabama Agricultural Experiment Station, Auburn University).

Pond fertilization, although routinely recommended for the relatively infertile waters of the Southeast, still requires further study. Some questions that merit attention are: (1) what level of $CaCO_3$ is required for efficient use of N-P-K by plankton populations, (2) at what rate of water flow through a pond does it become uneconomical to fertilize, (3) how does fertilization influence the buildup and die-off of undesirable blue-green algae (especially *Anabaena* and *Microcystis*) and (4) is the recommended time and frequency of fertilizer application appropriate today? This early recommendation (Smith and Swingle, 1942) was designed for control of submerged aquatic weeds and mosquitos, rather than what was necessary for maximum fish production, and may be excessive.

STRATEGY AND TACTICS FOR THE FUTURE

Although there is much yet to be learned about managing the relatively simple fish populations discussed thus far, ever greater unknowns exist concerning the dynamics and potential production of more complex, multi-species pond fisheries. It seems unlikely that conventional population dynamic models will be very useful for solving these management problems. Interactions between species influencing growth, reproduction and mortality are not easily incorporated into yield models. Also this approach is often time consuming and expensive.

A few fishery workers have approached the problem by studying energy flow patterns in fish communities (Gerking, 1962; Warren and Davis, 1967). How energy patterns are altered and what are the energy losses, when fishing or other stresses are introduced, would be of interest to the fish manager. Also of interest would by systems of altering fish communities in such a way as to divert a maximum amount of energy into fish flesh. In this respect simple production experiments have given us methods for high production, but little insight as to how it occurred. Mathematical models could specify and thereby provide a means of quantifying some generally held ecological concepts about the dynamics of growth, reproduction and mortality in fish communities. Recognized interactions within the biotic community and as influenced by abiotic factors could guide the construction of the model.

The adaptability of fish populations to stress is well known, but at some point homeostatic mechanisms break down and a community transformation takes place. The result can either be a new equilibrium or a constantly fluctuating population. Non-stable populations are not necessarily unproductive. For example, our best bass fishing comes from expanding populations in lakes and reservoirs. Nor do non-stable populations always indicate stress, as evidenced by cyclic black crappie populations in small impoundments. However, economic and social factors dictate that the objective of pond fisheries management should be to maintain a relatively stable fish community that will give satisfactory fishing. Swingle (1950) attempted to define these conditions for bass-bluegill populations in the Southeast. The fish population values and ratios proposed by Swingle become meaningful only when compared to previously studied populations producing desirable or undesirable fishing. Base line data of this type are needed for more complex multi-species fisheries if fish managers are to know how to manage for stability. Often easily obtained and inexpensive indices can be used for describing communities, such as growth rate, condition and year-class-strength. The latter may be especially useful since it reflects the state of several biotic and abiotic variables.

LITERATURE CITED

Alabama Outdoor Recreational Survey. (In Progress). (From Hunting and Fishing Study, 1971), Auburn University Agricultural Experiment Station, Auburn, Alabama.

Beukema, J. J. 1970. Angling experiments with carp (*Cyprinus carpio* L.) II. Decreasing catchability through one-trial learning. Netherlands Journal of Zoology, 20(1):81-92.

Byrd, I. B. and J. H. Crance. 1965. Fourteen years of management and fishing success in Alabama's state-owned public fishing lakes. Trans. Amer. Fish. Soc. 94:129-134.

Elrod, J. H. 1971. Dynamics of fishes in an Alabama pond subjected to intensive angling. Trans. Amer. Fish. Soc., 100(4):757-768.

Gerking, S. D. 1962. Production and food utilization in a population of bluegill sunfish. Ecol. Monogr. 32, 31-78.

Hastings, W. H. and H. K. Dupree. 1969. Practical diets for channel catfish. In. "Progress in Sport Fishery Research. 1968". Bureau of Sport Fish. Wild., Resource Publication 77, p. 224-226.

Hooper, A. D. and J. H. Crance. 1960. Use of rotenone in restoring balance to overcrowded fish populations in Alabama lakes. Trans. Amer. Fish. Soc. 89:351-357.

Kelly, H. D. 1957. Preliminary studies on Tilapia mossambica peters relative to pond culture. Proc. Conf. Southeast. Assoc. Game Commrs. 10:139-149.

Lawrence, J. M. 1954. A new method of applying inorganic fertilizer to farm fish ponds. Progress. Fish Cult. 16:176-178.

Lovell, R. T. 1973. Essentiality of vitamin C in feeds for intensively fed caged channel catfish. The Journal of Nutrition, 103(1):134-138.

McBay, L. G. 1961. The biology of *Tilapia nilotica* Linnaeus. Proc. Conf. Southeast. Assoc. Game Commrs., 15:208-218.

Prather, E. E. 1957. Experiments on the commercial production of golden shiners. Proc. Conf. Southeast. Assoc. Game and Fish Commrs., 10:150-155.

Prather, E. E. 1958. Further experiments on feeds for fathead minnows. Proc. Conf. Southeast. Assoc. Game Commrs. 12:176-178.

__________. 1964. Channel catfish shows promise as farm pond sport fish. Agricultural Experiment Station of Auburn University. Highlights of Agricultural Research, Vol. II, No. 3.

__________, and R. T. Lovell. 1971. Effects of vitamin fortification in Auburn No. 2 fish feed. Proc. Conf. Southeast. Assoc. Game Commrs. 25:479-483.

Regier, H. A. 1963. Ecology and management of largemouth bass and golden shiners in farm ponds in New York. N.Y. Fish Game Journ. 19(2):139-169.

Rogers, W. A. (In Press). Fish diseases. Chapter in McLane's Standard Fishing Encyclopedia and International Angling Guide, Revised Edition. Holt, Rinehart and Winston, N.Y.

Smith, E. V. and H. S. Swingle. 1942. The use of fertilizer for controlling several submerged aquatic plants in ponds. Trans. Am. Fish. Soc. 71:94-101.

Snow, J. R. 1968. Some progress in the controlled culture of the largemouth bass *Micropterus salmoides* (Lac). Proc. Conf. Southeast Assoc. Game Commrs. 22:380-387.

Swingle, H. S. 1949. Experiments with combinations of largemouth black bass, bluegills and minnows in ponds. Trans. Amer. Fish. Soc. Reprinted from Vol. 76, (1946):46-62.

__________. 1950. Relationships and dynamics of balanced and unbalanced fish populations. Auburn University. Agricultural Experiment Station, Bull. 274. 76 pp.

__________. 1952. Farm pond investigations in Alabama. J. Wildl. Manag. 16:243-249.

__________. 1956. Determinations of balance in farm fish ponds. Trans. North Amer. Wildl. Conf. 21:298-322.

__________. 1965. Fertilizing farm fish ponds. Agricultural Experiment Station of Auburn University. Highlights of Agricultural Research 12(1): 11.

__________. 1966. Biological means of increasing productivity in ponds. Proc. FAO World Symposium on Warm-Water Pond Fish Culture, May 18-25. FAO Fisheries Report 44, Vol. 4:V/R-1, 243-257.

__________, B. C. Gooch and H. R. Rabanal. 1963. Phosphate fertilization of ponds. Proc. Southeast Game Commrs. 16:213-217.

Warren, C. E. and G. E. Davis. 1967. Laboratory studies on the feeding, bioenergetics and growth of fish. The Biological Basis of Freshwater Fish Production, S. D. Gerking (ed) 175-214.