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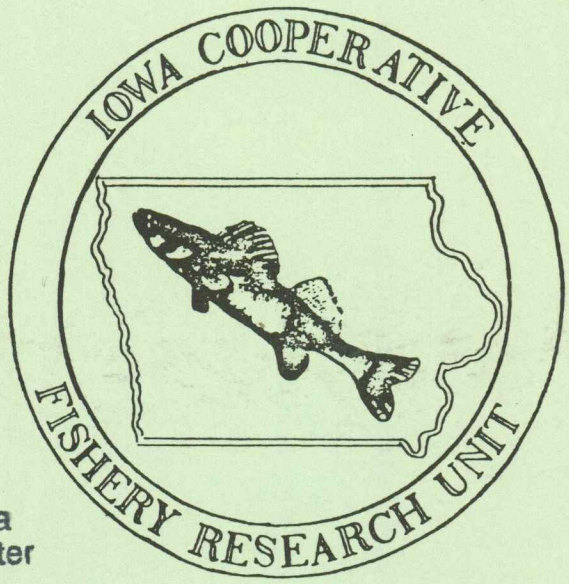
IOWA COOPERATIVE FISHERY RESEARCH UNIT



Cooperators

Iowa State University of Science and Technology

Iowa State Conservation Commission

U.S. Department of the Interior, Fish and Wildlife Service

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This report includes material on the research, teaching, and extension activities in aquatic ecology and fishery biology of the entire Department of Animal Ecology at Iowa State University, in addition to the activities of the Cooperative Unit staff and students. Since this report is one of progress, the data presented may be incomplete and conclusions reached should be regarded as tentative. Consequently, permission to publish any of the information herein is withheld.

COOPERATING ORGANIZATIONS

** Iowa State Conservation Commission
** Iowa State University
** U.S. Fish and Wildlife Service
Iowa Natural Resources Council
Ames Laboratory, USDE/ISU
New York Sea Grant Institute, NOAA
Iowa Dept. of Environmental Quality
U.S. Environmental Protection Agency
U.S. Army Corps of Engineers
Soil Conservation Service, USDA
National Animal Disease Laboratory, USDA
Engineering Research Institute, ISU
Iowa State Water Resources Institute
Story County Conservation Board
Iowa Lakeside Laboratory
Iowa State Agric. Experiment Station

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** Official Cooperating Agencies, Iowa Cooperative Fishery Research Unit.

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PROJECT 2051: NUTRIENT RUNOFF AND WATER QUALITY IN IOWA
Subproject: Evaluation of Iowa Lakes for Restoration

LEADER: Roger W. Bachmann
PERSONNEL: Research Associates Mark Johnson, Marianne Moore, Terry Noonan
Research Assistants James Barnum, Bradley Jones

FINANCED: Iowa Conservation Commission
Iowa Department of Environmental Quality
U. S. Environmental Protection Agency

OBJECTIVES: To evaluate 107 Iowa lakes for present limnological conditions and uses.

To establish priority ranking of Iowa lakes for restoration.

PROGRESS: The final report was submitted to the ICC on August 28, 1980. All of the lakes were found to be in the eutrophic category though there was a broad range of differences from the most to the least eutrophic. Many had problems with summer algal blooms and about a third had significant problems with winter fishkills. Most of these problems can be attributed to a combination of shallow water depths and high concentrations of plant nutrients in land runoff from nonpoint sources.

Subproject: Blue Lake Restoration Study

LEADER: Roger W. Bachmann
PERSONNEL: Research Assistants Pat Sorge, Steven Paulsen

FINANCED: Iowa Conservation Commisison

OBJECTIVES: To monitor the effects of lake restoration activities on Blue Lake.

To determine changes in the character of Blue Lake as a result of restoration activities.

PROGRESS: Blue Lake is an oxbow lake in the floodplain of the Missouri River. During 1980 a restoration program was carried out consisting of dredging of the northern portion of the lake and the construction of a well and pipeline to provide supplemental water. During the dredging process, there were local impacts as sediments and nutrients were brought into suspension. These materials did not disperse beyond the immediate dredging area. Water quality changes caused by dredging were short term, and it can be expected that water quality will return to normal after dredging is completed.

The dredging process was completed in the spring of 1981. The lake is being monitored for a one-year period to determine the effectiveness of the restoration procedures.

Subproject: Swan Lake Restoration

LEADER: Roger W. Bachmann
PERSONNEL: Research Assistant Susan Beck

FINANCED: Iowa Conservation Commission
U. S. Environmental Protection Agency

OBJECTIVES: To determine the causes of water quality problems in Swan Lake.

To make recommendations for the restoration of Swan Lake.

PROGRESS: Swan Lake is an artificial impoundment in Carroll County. It lies within Swan Lake State Park which is maintained by the Carroll County Conservation Board. A sampling program was initiated on the lake in the spring of 1980 to determine limnological conditions in the lake. Problems were found with excessive levels of algal chlorophylls and plant nutrients. Because of shallow depths and an insufficient watershed area to maintain water levels in dry years, the lake has frequent winterkills. Preliminary recommendations include increasing the lake volume by draining and excavation, providing a supplemental water source, and providing artificial aeration in the winter.

A final report is being drafted and preliminary engineering plans are being made for the restoration program.

PROJECT 2233: Water Quality Enhancement of Lakes by Mechanical Pumping

LEADER: Robert C. Summerfelt

Subproject (1): Summer Aeration to Prevent Oxygen Depletion of Ice-covered Lakes

INVESTIGATORS: Brian R. Holt, Arnold McAlexander, Timothy Cross

FINANCED: Iowa State Water Resources Research Institute
Iowa Agriculture and Home Economics Experiment Station

OBJECTIVE: To evaluate summer aeration as a lake management and lake restoration strategy to prevent summer stagnation and to prevent winterkill of the lake's fish population.

PROGRESS: The study began 1 October 1977 and will terminate 1 October 1982. McFarland Lake winterkilled in the 1977-78 winter. It was aerated in the summers of 1978, 1979, and 1980 by use of a Quintero-Garton type of axial-flow pump. No winterkill has occurred since summer aeration began and BOD at the time of ice-cover, approximately 1 December each year, has gone down each year in relation to the volume of water pumped during the summer.

Subproject (2): Summer Growth of Bluegill: Evaluation of Effects of Destratification on Growth of Bluegill

INVESTIGATORS: Timothy Cross and Arnold McAlexander (M.S. Thesis) and Christopher Gledhill.

FINANCED: Iowa Agriculture and Home Economics Experiment Station
National Wildlife Federation Conservation Fellowship

OBJECTIVE: To evaluate summer growth of bluegill in relation to conditions of lake stratification and artificial destratification by mechanical mixing.

PROGRESS: Bluegill growth has been described for the summers of 1979 and 1980, and back-calculations, using the body length-scale radius relationship, have been made for prior years. A sample will be collected in September or October 1981 to describe growth in the summer of 1981. A final report is expected by mid-1982. McAlexander's M.S. thesis (in absentia) will cover the growth prior to artificial aeration and for the summer of 1979.

Subproject (3): Chlorophyll a and BOD dynamics in two small Iowa lakes in relation to artificial aeration

INVESTIGATOR: Brian R. Holt (M.S. Thesis)

FINANCED: Iowa Agriculture and Home Economics Experiment Station
National Wildlife Federation Conservation Fellowship
Iowa State Water Resources Research Institute

OBJECTIVE: To examine the relationship between algal biomass, as measured by chrolophyll a and BOD, and to characterize BOD and chlorophyll a concentrations in relation to experimental efforts at lake aeration by artificial mixing with an axial-flow pump.

PROGRESS: Field data have been collected, key punched and preliminary analyses completed. Holt's thesis is being written in absentia.

Subproject (4): Sediment Oxygen Demand in Two Small Iowa Lakes in Relation to Mechanical Mixing

INVESTIGATOR: Timothy K. Cross

FINANCED: Iowa Agriculture and Home Economics Experiment Station
Iowa State Water Resources Research Institute

OBJECTIVE: To describe the seasonal dynamics of sediment oxygen demand and determine the influence of artificial aeration by mechanical pumping.

PROGRESS: Field collections began May 1978 and will terminate mid-April 1982. A master's thesis by Timothy K. Cross is in preparation.

The study will examine effects of sediment sample size and final oxygen content on sediment BOD determinations. Comparisons will be made of sediment BOD in McFarland and Horticulture Lakes in Story County.

Subproject (5): Respiration of the Bluegill, Lepomis macrochirus, under conditions of low temperature and reduced concentrations of oxygen

INVESTIGATOR: Ruth A. Williams (M.S. Thesis)

FINANCED: Iowa Agriculture and Home Economics Experimental Station

OBJECTIVE: To determine oxygen consumption of bluegill under conditions of low temperature (<10 C) and at two levels (high and low) of oxygen saturation.

PROGRESS: A modified flowing-water procedure was developed to measure oxygen consumption of bluegill at the "routine" metabolic level. Experiments covered a temperature range from 2 to 20 C but concentrated between 2 and 8 C. Williams expects to complete her thesis by the end of fall semester.

PROJECT 2284: THE USE OF FISH BEHAVIOR IN TOXICITY TESTING

LEADER: Gary J. Atchison
INVESTIGATORS: Gary J. Atchison, Mary Henry, Cyndi Bailey, Gail Morris

FINANCED: Iowa Agriculture Experiment Station
Columbia National Fisheries Research Laboratory

OBJECTIVES: Determine the relative sensitivities of a variety of behaviors of fish, including coughing, feeding, locomotor patterns and social hierarchy maintenance, to toxic substances.

Determine the effect of a variety of toxic substances on specific behavior patterns of fish.

Compare the utility of behavioral toxicity tests and standard full-life cycle toxicity tests is establishing no-effect concentrations of toxicants in aquatic ecosystems.

PROGRESS: Data collection has been completed on the effects of two chemicals, methyl parathion and copper, on bluegill behavior. Work on an organochlorine insecticide will soon begin. Most of this work is being done by Mary Henry at the Columbia National Fisheries Research Laboratory in Columbia, Missouri. Some copper work has been done at ISU.

Methyl parathion concentrations (control, 3.5 µg/ℓ, 35 µg/ℓ and 350 µg/ℓ) were distributed via a proportional diluter to 315-liter glass tanks holding five two-year old bluegill each. Fish were acclimated to the test tanks for at least one week until territories were established and had become stable and all individuals were feeding regularly. Each population was observed directly for 1/2 hour once daily. Eleven behaviors were monitored over a 96-hour control period and a 96-hour treatment period. Frequencies of occurrence for each behavior along with which individual fish performed them were recorded.

Data are now being statistically analyzed. However, certain trends seem apparent. Effects of methyl parathion are evident primarily as increased jerks (a sequence of partial or total body twitches) and jerk swimming (a sudden and rapid movement of the fish through the water, executed through one flexion of the body and fins). The lowest concentrations of methyl parathion caused hyperactivity in test fish, but at 350 µg/ℓ activity was suppressed. In addition, methyl parathion caused a breakdown in territory maintenance and social hierarchy. Territories of dominant individuals became smaller and less actively defended. Social hierarchy changes were especially apparent during feeding. In control tanks, dominant individuals generally fed first and consumed most. This was reversed at the higher methyl parathion concentrations.

The copper experiment was set up just as the methyl parathion experiment except that treatments included control, 30 µg Cu/ℓ, 50 µg Cu/ℓ and 1000 µg Cu/ℓ. Copper exposure resulted in increased respiratory disruptions, especially coughs, but fewer locomotor behavior changes. As copper concentration increased, coughs increased. Territoriality and social hierarchy effects were much less pronounced,

and changes perhaps will not be significant. Feeding was affected as fish were less successful in capturing live prey and often spit the item out when captured. This is in agreement with another feeding experiment performed at ISU on effects of copper in juvenile bluegill feeding behavior.

Work will continue on statistical analysis of methyl parathion and copper effects data and on the organochlorine compound data collection and analysis. Work is being initiated on further fish feeding experiments to assess feeding behavior alteration as a toxicity testing tool. We are also initiating experiments on biochemical changes as they relate to behavioral changes.

PROJECT 2345: BIOLOGY AND SPORT ANGLER HARVEST OF YELLOW PERCH IN WEST OKOBOJI LAKE, IOWA

LEADER: Wayne A. Hubert
INVESTIGATORS: Dennis N. Schmitt, Mark B. Sandheinrich, Wayne A. Hubert

FINANCED: Iowa Conservation Commission
Iowa Cooperative Fishery Research Unit

OBJECTIVES: Determine the impact of angler harvest on perch stocks.

Describe the biological characteristics of the perch stocks: growth, sex ratios, population structure, mortality, diet.

Describe the distribution of fish in the lake and the physical and biological factors governing the distribution patterns.

PROGRESS: Variation in catch-per-unit effort (CPUE) and diet of yellow perch captured in monofilament gill nets at five depths in this deep glacial lake was evaluated during summer 1980. The CPUE was found to vary by sampling depth, time of day, and sampling month. Temperature and oxygen concentrations associated with stratification were more important than substrate, cover, or benthic prey availability in determining depth distribution. Evidence of diurnal on- and off-shore migrations was not observed. This was probably due to the inability of the yellow perch to compensate for pressure changes associated with such movement. Variation in stomach contents among fish samples at different depths suggested little movement between depths and demonstrated the need to consider sampling location as a source of variation when assessing the diet of yellow perch stocks.

During summer 1981 a study of the mechanisms of intraspecific resource partitioning by different size classes of yellow perch in the lake population was conducted. Monofilament gill nets were used to determine differences in the size-frequency distribution of perch in the main basin, deep bays, and shallow bays and at different depths within these areas. Results indicated a significant difference in the average length of yellow perch in the main basin and the deep bays of the lake. Significant differences in the sex ratio of perch at different depths were also found. The results suggest that sampling location may greatly influence estimations of mortality rates. This study also indicated areas of possible intraspecific competition within the population and laid a foundation for future work involving competitive interactions between yellow perch and other sport fish.

PROJECT 2378: BIOLOGICAL DATA FOR MANAGEMENT OF WALLEYES AND OTHER FISHES

INVESTIGATOR: K. D. Carlander

FINANCED: Agriculture and Home Economics Experiment Station
Iowa State University

OBJECTIVES: Summarize and publish in Volume 3 the available data on Perciform fishes other than the Centrarchidae.

Maintain a bibliography for use by staff and students.

Develop and demonstrate methods of utilizing the data.

PROGRESS: In the last 15 to 20 years many scientists have apparently used body-scale regressions as predictive equations in calculating lengths from scale measurements. This practice is contrary to previous methods and results in greater variance because differences in scale size are not properly adjusted. I had suspected for several years that this method was used in some papers, but methods were not sufficiently described to be sure. In late 1979, I became aware that the regressions were being used rather widely in this fashion. This usage developed with general availability of computers which facilitated calculation of regressions. Papers calling attention to this use and to errors which may result were given at the Educators Section of the American Fisheries Society in Louisville, Kentucky, in September, 1980, at the Midwest Fish and Wildlife Conference in St. Paul, Minnesota, in December, and published in Fisheries (Vol. 6, No. 1).

A more serious problem with the use of the regressions as predictive equations has been the great increase in calculation of body-scale regressions from samples not covering adequate ranges of lengths. Tabulation of the intercept values, $\underline{a}$, of the regressions used in growth studies on centrachids and North American percids indicated a much greater variation in these values than is biologically reasonable. Two papers analyzing these data and the philosophy of calculating lengths from scale measurements, and recommending standard $\underline{a}$ values for several species were prepared, submitted to Transactions of the American Fisheries Society, and returned for revision. These revisions and a paper for a symposium on age and growth at the A.F.S. meetings in Albuquerque, September 1981, are now being prepared.

Standard $\underline{a}$ values for all studies where it is not clear that the sample is adequate for properly describing the body-scale relationship should improve the accuracy of growth data and thus aid in their interpretation for fishery management decisions. The use of standard $\underline{a}$ values should be particularly helpful with the types of collections usually made in management surveys and routine inventory.

This emphasis upon body-scale regressions has slowed the compilation of Volume 3 of the Handbook of Freshwater Fishery Biology, but new publications for inclusion in the volume have been recorded as they arrive and the first drafts of the sections on white perch, Morone americana, and white bass, M. chrysops, have been completed.

PROJECT 2421: ADULT PADDLEFISH MOVEMENT IN POOL 13, UPPER MISSISSIPPI RIVER

LEADER: Wayne A. Hubert
INVESTIGATORS: Peter Southall, John Pitlo (ICC), Wayne A. Hubert

FINANCED: Iowa Conservation Commission
Iowa Cooperative Fishery Research Unit

OBJECTIVES: Determine the spring and summer movement patterns of sexually mature paddlefish.

Identify staging areas, spawning sites, and post-spawning dispersal of sexually mature fish.

Describe the physical characteristics of habitat utilization by paddlefish.

Identify staging areas, spawning sites, and post-spawning dispersal of sexually mature fish.

Describe the physical characteristics of habitat utilization by paddlefish.

Identify the associations of paddlefish with specific types of habitat or navigation improvement structures.

PROGRESS: Radio telemetry investigations of paddlefish, an important sport and commercial fisheries species in the Upper Mississippi River bordering Iowa, were initiated in June, 1980. Six fish were surgically implanted with 49 MHz radio transmitters and monitored daily throughout the summer months by boat tracking. Field study was resumed in March, 1981. Three gravid female and seven mature male paddlefish were implanted with radio transmitters. These fish, together with three still transmitting from 1980, were monitored daily through the spring and into the summer in Pools 12 and 13 of the Mississippi River.

Pre-spawn paddlefish tend to congregate below navigation dams. Upstream migration during spring high water periods occurred through opened gates of Lock and Dam 12. Fish were highly mobile during the spawning period and commonly utilized main channel border and side channel habitats. After the spawning period, fish exhibited downstream migration and returned to Pool 13 where tailwater and backwater habitats were predominantly used. Reduced daily movement of post-spawn fish was also observed.

One possible spawning area was identified in Pool 12. Use of this area as a spawning site should be positively confirmed by collection of paddlefish eggs in spring. Subsequent protection of this site should be carried out. Gate openings of the navigational dams during spring high water periods should be continued to allow upstream migration of paddlefish.

PROJECT 2458: FISH MANAGEMENT IN POOL 9, UPPER MISSISSIPPI RIVER

LEADER: Wayne A. Hubert
INVESTIGATORS: Dennis Schmitt, Wayne A. Hubert

FINANCED: Upper Mississippi River Basin Commission
U. S. Fish and Wildlife Service

OBJECTIVES: Define the fish community of the main channel and select two species for study.

Determine the movement of fish in response to passage of commercial and recreational vessels.

Define the fish associations with definable habitat types.

PROGRESS: Field work was initiated in June 1980 to define the fish community in navigated and unnavigated channel habitats. Hoop nets and drifted trammel nets were utilized. Sampling was performed in three reaches of the river between Lansing, Iowa, and Victory, Wisconsin.

Thirty-six species were collected from channels of Pool 9 in 1980. The main channel border produced significantly greater numbers of 9 species, while side channels produced significantly greater numbers of 3 species with hoop nets. A total of 28 species was found in main channel border samples and 23 species in side channels with one hoop net type, while 19 and 18 species were found in main channel border and side channel samples, respectively, with the second hoop net type. Species diversity and similarity indices showed little difference between channel types.

Seventeen species were captured in the main channel of Pool 9 with drifted trammel nets. The mean catch per unit effort was low, 3.8 fish per kilometer drifted. Sand waves and other irregularities occurring in the bottom of the main channel probably contribute to relative inefficiency of the nets.

Factors influencing the catch with hoop nets and drifted trammel nets were assessed. The results showed that environmental variables significantly accounted for variation in catch with both gear types.

Rescoping of the time schedule and budget for completion of the Upper Mississippi River "Master Plan" by the Upper Mississippi River Basin River Commission forced curtailment of field studies planned for 1981 and 1982. A report assessing the impacts of potential alterations to channel habitats by either vessel passage or channel maintenance was assembled in 1981. Little information existed on the direct impacts of commercial navigation on fish. The report identified several potential impacts; however, the extent of alteration was largely speculative and could not be predicted.

PROJECT 2465: INTENSIVE CULTURE OF FRESHWATER FISHES

LEADER: John G. Nickum

PERSONNEL: Gene Barickman, John Ringle

FINANCED: New York Sea Grant Institute
Iowa State Conservation Commission

OBJECTIVES: (General):
To develop diets, rearing techniques, and systems for rearing all life stages of selected fishes under intensive conditions.

(Current):
To determine the effects of selected diets and environmental conditions on the growth and survival of newly hatched walleyes.

To determine the structure and digestive capabilities of the gastro-intestinal tract of newly hatched walleyes.

To determine the feasibility of expanding laboratory methods for culturing walleye fingerlings to practical production levels.

PROGRESS: Studies in the spring of 1981 demonstrated clearly that walleye fry do not require motile food items. Brine shrimp (Artemia sp.) cysts were decapsulated by chemical treatment, rinsed thoroughly and fed to walleye fry as a first feed. Consumption of the cysts was high in all units; however, the cysts did not appear to provide satisfactory levels of essential nutrients since few fish survived past three weeks. In other tests, diets of dry feed (W-14) and pond plankton diets did not result in survival rates significantly different from those obtained with brine shrimp cysts. In all cases, it appeared that the fry entered into energy and/or nutrient deficits prior to the initiation of feeding.

Cannibalism was not a substantial problem in fry feeding tests conducted in cylindrical rearing units; however, it has been difficult to maintain feed in suspension in adequate density for efficient feeding within such units. Light conditions also appear to influence the incidence of cannibalism in walleye fry.

Walleye fingerlings of 30-40 mm size were successfully harvested from rearing ponds and transferred to 1200 L tanks in both 1980 and 1981. Fish fed dry diets at 10-minute intervals for 16 hours per day adapted to these diets more readily than those fed at 30-minute intervals. No differences were noted between circular and rectangular tanks as long as the water supply to each is directed in such fashion as to maintain feed particles in suspension. Prophylactic treatments to control bacterial infections (Flexibacter columnaris, and Aeromonas sp.) were essential at the time of transfer of fingerlings and when temperatures exceeded 24°C.

Mortalities associated with high temperatures (29°C) and low dissolved oxygen levels were experienced. It was also determined that it is desirable to avoid netting or otherwise handling walleye fingerlings when water temperatures exceed

21°C. Outbreaks of bacterial infections invariably followed any netting or handling of fish at temperatures exceeding 21°C. The only chemicals found to control these infections satisfactorily are not currently approved for such use.

Growth rates of approximately 5 cm per month were obtained during summer months with W-14 diets. It is not known, however, whether such a growth rate can be maintained during other seasons, even if optimal water temperatures are maintained.

PLANS FOR NEXT YEAR: Several short manuscripts are in preparation. Plans for pilot scale facilities and for production level rearing tests are being developed. Materials for studies describing the structure and digestive capabilities of the digestive tract of larval walleyes have been collected and will be processed.

PROJECT 2465: FACTORS AFFECTING FISH POPULATIONS IN IOWA WATERS

SUBPROJECT: Pesticide Monitoring of Des Moines River Fish

LEADER: Wayne A. Hubert
INVESTIGATORS: Edward D. Ricci, John Richard (DOE), Wayne A. Hubert

FINANCED: Engineering Research Institute, Iowa State University
Iowa Cooperative Fishery Research Unit

OBJECTIVES: Determine current concentrations of pesticide residues in Des Moines River fish and water.

Determine concentrations of pesticide residues in sediments within impounded reaches of the Des Moines River

PROGRESS: Des Moines River water and fish were collected for analysis of pesticides and PCBs in June and September of 1980 and June of 1981. Four locations were sampled: the Des Moines River 30 km above Saylorville Reservoir at Boone, Saylorville Reservoir, the Des Moines River 50 km above Red Rock Reservoir at Des Moines, and Red Rock Reservoir. The June 1981 samples are presently being analyzed.

Atrazine, a herbicide, and dieldrin, an insecticide, were the only pesticides found in all water samples, although the mean values were 328 pptr for atrazine and only 5 pptr for dieldrin. The herbicides alchlor, cynazine, propochlor, and 2,4-D were detected in concentrations in water similar to atrazine at most locations during both months. Concentrations for all pesticides in water were higher in the June than in the September sampling period. No apparent lethal concentrations of pesticides were detected.

Although herbicides are rapidly metabolized and not concentrated within fish, the chlorinated hydrocarbon insecticides are highly bioaccumulated in fish tissue. Organochlorines investigated were the insecticides dieldrin, DDT and its degradative products DDD and DDE, as well as the industrial chemical group, the polychlorinated biphenyls or PCBs.

The fish species used to monitor residues of chlorinated hydrocarbons in the biota was the common carp, Cyprinus carpio. Carp were captured by electroshocking and hoop netting. Five samples consisting of equal weights of lateral muscle tissue from ten fish of the same age were prepared from collections at each location. Resultant samples were of Age II to Age IV fish. Percentage fat in lateral muscle tissue and mean total length of fish in each sample were also determined.

Although the use of aldrin which is the parent compound of dieldrin, DDT, and the PCBs was banned in the 70s, these chemicals are persistent in the tissue of organisms. Concentrations of dieldrin ranged from 10 to 128 ppb on a wet weight flesh basis. In both June and September, significantly higher concentrations of dieldrin occurred in the reservoirs compared to their upstream sampling locations.

The average fish sample consisted of approximately 54% DDE and only 26% DDD and 20% DDT. Concentrations of total DDT ranged from 18 to 159 ppb on a wet weight flesh basis. As with dieldrin, mean levels of total DDT declined at each sampling location from the June to the September sampling periods.

Concentrations of PCBs ranged from 14 to 189 ppb on a wet weight flesh basis. Mean levels of PCBs in fish tissue declined at each sampling location from June to September. Residues of PCBs were significantly higher in carp from the riverine sampling location within the metropolitan area of Des Moines compared to the other three sites during both June and September.

Bioconcentration of dieldrin, DDT, DDD, DDE, and PCBs was clearly evident. Concentrations of chlorinated hydrocarbons in fish were 10^4 and 10^5 times higher than those detected in water.

The Food and Drug Administration standards of 300 ppb of dieldrin, 5 ppm of DDT, and 2 ppm of PCBs in food fish were not exceeded by any sample. However, dieldrin was found in concentrations as high as 128 ppb in carp from the river at Des Moines and 110 ppb in fish from Red Rock Reservoir.

Because of the chlorinated hydrocarbons' sorption to particulate matter and resultant deposition in reservoirs, sediment from Red Rock Reservoir is being analyzed this summer for organochlorine residues. Core samples of sediment have been taken along 5 transects which extend from the delta region of Red Rock Reservoir to the dam.

Results from the June and September 1980 water and fish samples were presented at the annual Army Corps of Engineers Water Quality Conference in April 1981. A paper presenting these same results has been reviewed and accepted by the Pesticides Monitoring Journal.

PROJECT 2479: BIOLOGICAL AND RECREATIONAL ASPECTS OF WATER LEVEL MANAGEMENT OF CLEAR LAKE, IOWA

LEADER: Wayne A. Hubert

INVESTIGATORS: Kenneth D. Carlander, Daniel D. McLean, John G. Nickum
Paul Niemeier, Douglas Stang, Randy Mack, Wayne A. Hubert

FINANCED: Iowa State Water Resources Research Institute
Iowa State University
Iowa Cooperative Fishery Research Unit

OBJECTIVES: Describe the components and the extent of the littoral plant and fish communities of Clear Lake.

Determine the influence of continued water-level fluctuations and water-level stabilization on the littoral plant and fish communities.

Determine the attitudinal differences of recreational users towards fluctuating water levels and water-level stabilization.

PROGRESS: A preliminary survey of the littoral plant community in Clear Lake was completed during the summer of 1980 and has been followed by an expanded survey during the summer of 1981. Species composition, depth profiles of the major vegetation beds, substrate type, and cover-abundance information has been taken to determine the limiting parameters of each plant type. These data, along with information gathered from an extensive literature search, should allow management recommendations to be made concerning the influence of water-level fluctuations on littoral plant communities. Plant species diversity and cover over the two sampling periods have declined apparently due to a combination of muskrat damage, high water levels and shading by extensive algal blooms. The predominant emergent components (1980-1981) were species of bulrushes (Scirpus) and cattails (Typha); submerged components consisted of potomogetons.

Three aquatic habitat types exist on the littoral zone of Clear Lake: vegetated areas, non-vegetated areas, and gravel-rock shoal areas. Four sample sites representing each of the habitat types have been identified and are being sampled for juvenile and adult fish during the summer 1981 with 125-foot experimental gill nets and fyke nets. Yellow perch (14-16 cm) and black bullhead (22-25 cm) dominate the adult fish communities associated with each habitat type. Other species captured, in descending order of abundance, are: black crappie, channel catfish, bigmouth buffalo, common carp, walleye, white bass, white sucker, yellow bass, pumpkinseed, spottail shiner, green sunfish, common shiner, northern pike, muskellunge, and white crappie. The major differences in the fish communities associated with the different aquatic habitat types were evident; however, some within-habitat differences are evident.

Sampling of small and young-of-year fish in littoral vegetation and adjacent open water areas was initially carried out in 1980 to assess the age and species composition of the catch and catch-per-unit-effort in these habitats. During the 1981 sample period, replicate sampling was carried out at these sights. Daily and seasonal fish movements were assessed using 3/4" mesh bag seines.

The 1980 data indicated a predominance of yellow perch (13-14 cm), black bullheads, and a relatively small number of golden shiners and common shiners representing the major forage species. In 1981, preliminary observations show slow growth of the yellow perch population and a decline in the condition of the bullhead population. Seining indicated a successful spawn of temperate basses (yellow or white bass), yellow perch, black bullheads, and spottail shiners, whereas only black bullhead young were found in 1980.

Data on fish movements indicated yellow perch were the predominant fish found within bulrush beds at the beginning of the summer. These were gradually replaced by increasing numbers of bullheads as the summer progressed.

Preliminary management recommendations would involve the introduction of fish predators to control the yellow perch population and promotion of commercial removal of rough fish (bigmouth buffalo and carp) which are unexploited at present.

A preliminary survey of residents from Clear Lake and Ventura, Iowa, was conducted in April, 1981. Seventy-five names were randomly selected from the telephone book, and each person was sent a questionnaire concerning recreation on Clear Lake. Approximately 67 percent of those selected to participate in the preliminary survey responded. An expanded survey of Clear Lake and Ventura, Iowa, residents and an on-site survey of Clear Lake recreation users were begun in June, 1981. Questionnaires were distributed on random dates at five access points to the lake.

PROJECT 2482: AGRICULTURAL STREAM ECOSYSTEMS: STRUCTURE AND FUNCTION FOR UNDERSTANDING WATER QUALITY BENEFITS

LEADER: Roger W. Bachmann
PERSONNEL: Research Assistant James Barnum

FINANCED: Iowa State Water Resources Research Institute
Iowa Agriculture and Home Economics Experiment Station

OBJECTIVES: To provide a description of the basic structure and function of stream ecosystems in intensively managed agricultural watersheds.

To determine if the Iowa Streams fit the stream models developed in other parts of the country or if new models need to be developed for these streams.

To estimate how non-point pollution control programs are likely to affect stream communities.

PROGRESS: A field sampling program has been established on several headwater reaches of some central Iowa streams near Ames. Various physical, chemical, and biological parameters are being monitored and used to evaluate organic matter stream transport and processing, stream community metabolism, and key invertebrate associations. The results will be used to assess the probable results of non-point source pollution control programs in Iowa agricultural watersheds.

PROJECT 2483: RESTORATION OF IOWA LAKES

LEADER: Roger W. Bachmann
PERSONNEL: David Søballe, Steven Paulsen

FINANCED: Iowa Conservation Commission
U. S. Environmental Protection Agency
Lake Associations at Black Hawk Lake and Union Grove Lake

OBJECTIVES: To conduct one-year limnological surveys of Black Hawk and Union Grove Lakes to determine limnological problems.

To make recommendations for the restoration of these lakes.

PROGRESS: Sampling was initiated on Black Hawk Lake and Union Grove Lake in June, 1981. Biweekly sampling visits are being made in summer months with monthly visits planned for the winter. In addition to the lake sampling, information will also be collected on the watersheds and land uses in them in cooperation with local soil conservation agencies.

NEWS NOTES

Future of Cooperative Units: Changes in federal priorities posed a threat to the Cooperative Unit Research Program. No funds for the program were included in the initial budget proposals; however, both the Senate and House of Representatives have added funding for the Cooperative Research Unit Program in their 1982 budgets for the Department of Interior. Loss of federal funding would undoubtedly lead to closure of the Iowa Cooperative Fishery Research Unit, since no alternative sources of funds for Unit staff salaries appear to be available.

Quarter to Semester Shift: Iowa State has decided to convert the academic year calendar from a quarter to a semester system effective Fall 1981. Our fisheries and aquatic courses taught in our department are shown on the quarter and semester schedules for comparison. We will have one less course under the semester system because we combined Dr. Carlander's Techniques in Fishery Research and Fishery Resources course into one. More courses will be offered on alternate years, but overall, the number of lectures, discussion and lab hours are not substantially different. At the undergraduate level, we have the same number of lectures but 30 hours more of lab time in Fisheries and Limnological Techniques. At the senior/graduate level, we gained 35 hours of lecture and 30 hours of lab and at the "graduate only" level we gained in total contact time but we will offer the fish course on alternate years.

Quarter to Semester Changes in the Fisheries and Aquatic Ecology Curriculum

Quarter System		Semester System	
	Undergraduate		
361	Prin. Fishery Mgt. (3 cr.-30 hrs. lec.)	440	Fishery Mgt. (2 cr.-30 hrs. lec.)
405	Fund. Limnology (3 cr.-30 hrs. lec.)	410	Limnology (2 cr.-30 hrs. lec.)
461	Fishery & Limno. Tech. (2 cr.-60 hrs. lab)	441	Fish. & Limno. Tech. (2 cr.-90 hrs. lab)
464	Icthyology (4 cr.-30 hrs. lec. & 60 hrs. lab)	321	Ichthyology (4 cr.-30 hrs. lec. & 60 hrs. lab)
	Summary: 4 courses; 90 hrs. lec. & 120 lab.		Summary: 4 courses; 90 hrs. lec. & 150 lab.

Quarter to Semester Changes in the Fisheries and Aquatic Ecology Curriculum
(Continued)

Quarter System	Semester System
Senior/Graduate Level	
560 Fishery Aspects of Water Pollution (3 cr.-30 hrs. lec.)	*544X Aquatic Toxicology and Hazard Evaluation (3 cr.-30 hrs.lec.)
563 Fish Propagation (3 cr.-20 hrs. lec. & 30 hrs. lab, trips, etc.)	*541 Fish Culture (3 cr.-30 hrs. lec. & 45 hrs. lab, trips, etc.)
564 Fish Ecology (3 cr.-30 hrs. lec.)	*520 Fish Ecology (3 cr.-45 hrs. lec.)
565 Fishery Mgt. (4 cr.-20 hrs. lec. & 30 hrs. lab)	543 Adv. Fish Mgt. (3 cr.-30 hrs. lec. & 45 hrs. lab, trips, etc.)
Summary: 4 courses; 100 hrs. lec & 60 hrs. lab, trips, etc.	Summary: 4 courses; 135 hrs. lec. & 90 hrs. lab, trips, etc.
Graduate Only	
605 Adv. Limnology (5 cr.-30 hrs. lec. & 60 hrs. lab)	600 Adv. Limnology (3 cr.-30 hrs. lec. & 45 hrs. lab)
*662 Tech. Fishery Res. (4 cr.-30 hrs. lec. & 30 hrs. lab and disc.)	*640 Fish Res. & Res. Tech. (4 cr.-45 hrs. lec., 45 hrs. lab and disc.)
*663 Fishery Res. (3 cr.-30 hrs. lec. & discussion)	
Summary: 3 courses; 90 hours lec. & hours of lab.)	Summary: 2 courses; 75 hours lec. & 90 hrs. lab & disc.

*Offered in alternate years

PUBLICATIONS

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Canfield, D. E., Jr., and R. W. Bachmann. 1981. Prediction of total phosphorus concentrations, chlorophyll a, and Secchi depths in natural and artificial lakes. Can. J. Fish. Aquat. Sci. 38:414-423.

Carlander, K. D. 1981. Caution on the use of the regression method of back-calculating lengths from scale measurements. Fisheries 6(1):2-4.

Carroll, B. B., W. A. Hubert, and R. L. Warden. 1981. Flow-through systems/North America. Pages 373-382 in Tiews, K. (ed.). Aquaculture in heated effluents and recirculation systems. Vol. II. Berlin. 622 pp.

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Hubert, W. A. 1980. Aquacultural uses of power plant waste heat. Pages 18-31 in Goss, L. B. (ed.). Factors affecting power plant waste heat utilization. Pergamon Press, New York. 230 pp.

Hubert, W. A., and E. D. Ricci. 1981. Chlorinated hydrocarbon residues in water and carp from the Des Moines River, Iowa. In Proc. Seminar on Water Qual. in Corps of Engineers' Reservoirs in Iowa. U.S. Army Corps of Engineers, Rock Island District, Rock Island, Illinois.

Hubert, W. A. 1981. Spring movements of smallmouth bass in the Wilson Dam Failwater, Alabama. J. Tenn. Acad. Sci. 56(2):94-96.

Hughes, D. F., and W. A. Hubert. 1981. Fecundity of largemouth bass from Pickwick Reservoir, Tennessee River. J. Ala. Acad. Sci. 52(2): 53-57.

Hughes, S. G., R. C. Riis, J. G. Nickum, and G. L. Rumsey. 1981. Biomicroscopic and histologic pathology of the eye in riboflavin deficient rainbow trout (Salmo gairdneri). Cornell Veterinarian 71:269-279.

Shephard, B. K., A. W. McIntosh, G. J. Atchison, and D. W. Nelson. 1981. Aspects of the aquatic chemistry of cadmium and zinc in a heavy metal contaminated lake. Water Research 14:1061-1066.

Summerfelt, R. C. 1981. Fishery benefits of lake aeration: a review. Pages 419-456 in F. L. Burns and I. J. Powling, editors. Destratification of lakes and reservoirs to improve water quality. Proc. Joint U.S. and Australia Seminar and Workshop, Melbourne, Australia, 19-24 February, 1979. Australian Government Publishing Service.

GRADUATES

LaPerriere, Jacqueline D. 1981. WATER RESOURCES Ph.D. Chemical and physical influences on invertebrate drift in subarctic Alaskan streams. 64 p. Employed as Assistant Unit Leader, Alaska Cooperative Fisheries Unit.

Jones, Bradley L. 1981. ANIMAL ECOLOGY (LIMNOLOGY) M.S. Nonpoint source phosphorus loadings to Iowa rivers and lakes. 81 p. Employed by West Palm Beach Water Management District, West Palm Beach, Florida.

Sorge, Patrick W. 1981. ANIMAL ECOLOGY (LIMNOLOGY) M.S. A limnological evaluation of the Blue Lake restoration project. 218 p. Employed as Wisconsin Department of Natural Resources at Milwaukee, Wisconsin.

COURSES TAUGHT

Herpetology	Menzel
Fishery Management	Atchison
Fundamentals of Limnology	Bachmann
Fishery and Limnology Techniques	Atchison and Bachmann
Ichthyology	Menzel
Fish Propagation	Nickum
Ecology of Fishes	Menzel
Advanced Fishery Management	Hubert
Advanced Limnology	Bachmann
Fishery Resources	Carlander
Aquaculture Potentials in Iowa	Hubert and Nickum

TALKS AND LECTURES

Bachmann, R. W. Prediction of total nitrogen in lakes and reservoirs. Presented at the International Symposium for Inland Waters and Lake Restoration. Portland, Maine. September 1980.

Hubert, Wayne A. Lecture at Iowa Lakeside Laboratory. "Smallmouth bass ecology and management." July 6, 1980.

Hubert, Wayne A. Seminar. Department of Animal Ecology, Iowa State University. "Smallmouth bass habitat and ecology in a Tennessee River mainstream impoundment." September 5, 1980.

Hubert, Wayne A. Talk. Upper Mississippi River Basin Commission, Environmental Work Team. Grafton, IL. "Fishery research on Pool 9, Upper Mississippi River." September 15, 1980.

Hubert, Wayne A. Talk. Iowa State Water Resources Research Institute, Annual Meeting. Des Moines, Iowa. "Clear Lake water level management project." September 25, 1980.

Hubert, Wayne A. Seminar. Water Resources Program, Civil Engineering, Iowa State University. "Clear Lake water level management project." September 30, 1980.

Hubert, Wayne A. Talk. 5th grade. Abbie Sawyer School, Ames, Iowa. "Aquaculture in Japan." December 2, 1980.

Hubert, Wayne A. Lecture. Water Resources II, Iowa State University. "Water quality and fisheries management." January 26 and 28, 1981.

Hubert, Wayne A. Joint Meeting. Iowa-Illinois Chapters, American Fisheries Society. Davenport, Iowa. February 11-13, 1981.

Hubert, Wayne A. and Schmitt, Dennis. Paper presented. "Channel fishes of Pool 9, Upper Mississippi River." February 11-13, 1981.

Hubert, Wayne A. Lecture. Fish Propagation. Department of Animal Ecology, Iowa State University. "Channel catfish spawning and intensive culture." March 23, 1980.

Hubert, Wayne A. Paper. Mississippi River Research Consortium. La Crosse, Wisconsin. "Channel fishes of Pool 9, Upper Mississippi River." April 2, 1981.

Moorman, Robert B. Talk. "Fish Your Pond." WOI, TV, Ames, Iowa. January, 1981.

TALKS AND LECTURES (CONTD.)

Moorman, Robert B. Talk. "Farm Pond Management." WOI, TV, Ames, Iowa. June, 1981.

Niemeier, Paul E., Carlander, Kenneth, and Hubert, Wayne A. Paper. "A history of the Clear Lake fishery." February 11-13, 1981.

Nickum, John G. "Educational Needs of Urban Fishing Managers." Midwest Fish and Wildlife Conference, St. Paul, Minnesota. December 1980.

Ricci, Edward and Hubert, Wayne A. Paper. "Chlorinated hydrocarbon residues in water and carp from the Des Moines River." March 3, 1981.

Ricci, Ed. Talk. ISU Environmental Studies Club. "Chlorinated hydrocarbon pollution in the Des Moines River watershed." April 1, 1981.

Sandheinrich, Mark and Hubert, Wayne A. Paper. "Factors influencing perch distribution in West Lake Okoboji." February 11-13, 1981.

Southall, Peter D. and Hubert, Wayne A. Paper. "Paddlefish telemetry in the Upper Mississippi River." February 11-13, 1981.

Summerfelt, Robert C. "Introduction: Ecology and Management of Winterkill Lakes." Midwest Fish and Wildlife Conference, St. Paul, Minnesota. December, 1980.

Summerfelt, Robert C. "Rx for Sick Lakes: Effects of Artificial Aeration on Ecology of Eutrophic Lakes." Osborn Club, Lecture, Iowa State University, Ames. October 1980.

Summerfelt, Robert C. "Trans-intestinal Expulsion of Surgically Implanted Dummy Transmitters in Channel Catfish." Ecology and Behavioral Ecology of Fishes, Normal, Illinois. May 1981.

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