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1989-1990 Annual Progress Report

# Electrofishing Survey on the Illinois River

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31 May 1990

## DISCLAIMER

The findings, conclusions, and views expressed herein are those of the researchers and should not be considered as the official position of the United State Fish and Wildlife Service or the Illinois Department of Conservation.

## ACKNOWLEDGMENTS

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TABLE OF CONTENTS



List of Figures



Tables



List of Appendices

# INTRODUCTION

## Program Goal

The overall goal of the program is to evaluate the effects of management practices, biotic interactions, and environmental conditions on fish populations in a large floodplain-river system.

## Background

The program builds on a data set begun in 1956 when Dr. William C. Starrett of the Illinois Natural History Survey initiated an annual electrofishing survey of the Illinois River. The survey was supported from a variety of sources until 1985 when funding lapsed. Field work resumed in the fall of 1989 with support from the federal program in sport fish restoration and the Illinois Department of Conservation.

## Relationship to Other Programs

There are 5 major fish sampling programs, besides F-101-R, on the Illinois Waterway (which includes the Illinois River and the connecting navigable waterways in the Chicago area), which are coordinated through exchange of information and periodic meetings.

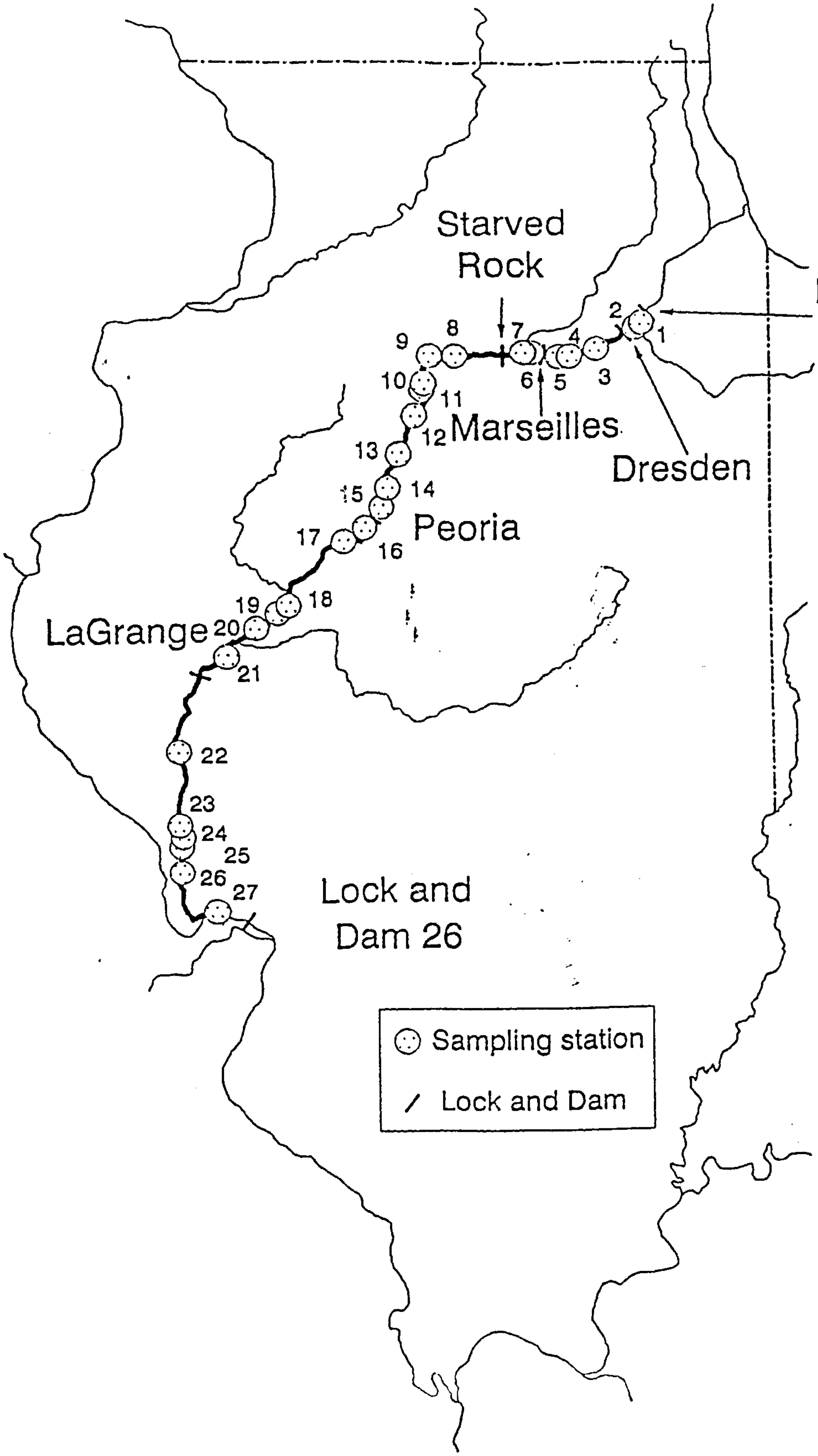
1. The Metropolitan Water Reclamation District of Greater Chicago conducts fish surveys in the waterways of the District, but not in the Illinois River.

2. The U.S. Geological Survey contracts with Region V of the U.S. Environmental Protection Agency for electrofishing surveys in the streams and smaller tributary rivers of the upper Illinois River basin. The USGS program is a pilot program, part of the National Water Quality Assessment Program (NAWQA). Their 3-year field program ends this summer, and may be repeated at intervals of several years.

3. Southern Illinois University is studying the population dynamics of sauger and walleye in the upper Illinois River in the vicinity of the Starved Rock Lock and Dam (Figure 1), with support from the federal aid program and the Illinois Department of Conservation.

4. The Long-Term Resource Monitoring (LTRM) Program of the U.S. Fish and Wildlife Service supports a field program on the LaGrange Pool of the Illinois River which includes fish sampling within the pool, but not elsewhere in the river. The fish sampling will begin this summer and continue for 6 years. The LaGrange Pool LTRM is directed by the same people, Dr. Richard Sparks and Mr. K. Douglas Blodgett, who direct F-101-R and insure that the 2 programs exchange information and do not duplicate effort.

5. The Illinois Department of Conservation (IDOC) samples fish populations along the Illinois River (F-67-R), concentrating on habitats which are not sampled by our program (F-101-R). The 2 programs have been carefully coordinated since the inception of the IDOC program in 1973. Our sampling stations (mostly side channels) are always connected to the river during the low flow


Starved
Rock
Brandon
Roads
Marseilles
Dresden
Peoria
LaGrange
Lock and
Dam 26
1
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6
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27
Sampling station
Lock and Dam

Fig. 1

period in the fall when we sample. IDOC samples other types of habitats (tailwaters, backwaters and floodplain lakes)--some within parks and conservation areas owned and managed by IDOC which may be isolated or intermittently connected to the river. Mr. William Bertrand, Northern Streams Biologist, IDOC, compared the habitats sampled by the 2 programs in the following table:

| Habitat | % of project sites | | |
|---|---|---|---|
| | F-101 | F-67 | Both |
| side channel | 69 | 9 | 42 |
| main channel border | 23 | 48 | 35 |
| tailwater | 0 | 19 | 8 |
| backwater (lake and slough) | 0 | 24 | 11 |
| combination side ch. and main ch | 8 | 0 | 4 |

In summary, F-101-R updates the longest-term data set on fish populations available for the entire Illinois River. There is no other program which duplicates the sampling scheme or the period of record.

## Benefits to Fisheries

The effectiveness of management techniques for fisheries, pollution control, and habitat enhancement can be evaluated and improved through the use of long-term data sets. The 30-year data set on the Illinois River can be used to discriminate long-term trends in fish populations from short-term variability. These trends can be associated with natural events (floods and droughts) and man-made interventions (water level manipulation, pollution, land use, habitat improvement, introduction of nonnative fishes). The data set has proven useful in documenting the effects on fish populations of sewage and industrial pollution from Chicago and habitat degradation due to excessive sediment loading (Mills, Starrett, and Bellrose, 1966; Sparks and Starrett, 1973; Sparks, 1981).

It is especially important to update the data set and continue such evaluations during the next 8 years when several multi-million-dollar habitat rehabilitation projects for fish and wildlife are undertaken on the Illinois River. These projects are cost-shared by the state and the federal government as part of the Environmental Management Program for the Upper Mississippi and Illinois rivers. Other projects which are expected to have beneficial effects on fisheries are the completion of major sewage control works in Chicago (including the Tunnel and Reservoir Project, TARP) and improved soil conservation practices in the drainage basin and along tributaries.

# METHODS

## General Approach

The general approach is to electrofish 26 stations along the Illinois River (Figure 1) using standardized techniques, so results are comparable across the entire long-term (30-year) record. Changes in the electrofishing catch rate are associated with changes in the annual water regime, water and sediment quality, habitat quality, food availability, and fish and wildlife management practices. We examine upstream-downstream patterns within years to detect site-specific effects (point-source pollution, local habitat quality). Year-to-year trends which are common to many sites reflect the largescale effects of floods, droughts, and basinwide landuse changes.

## Equipment and Training

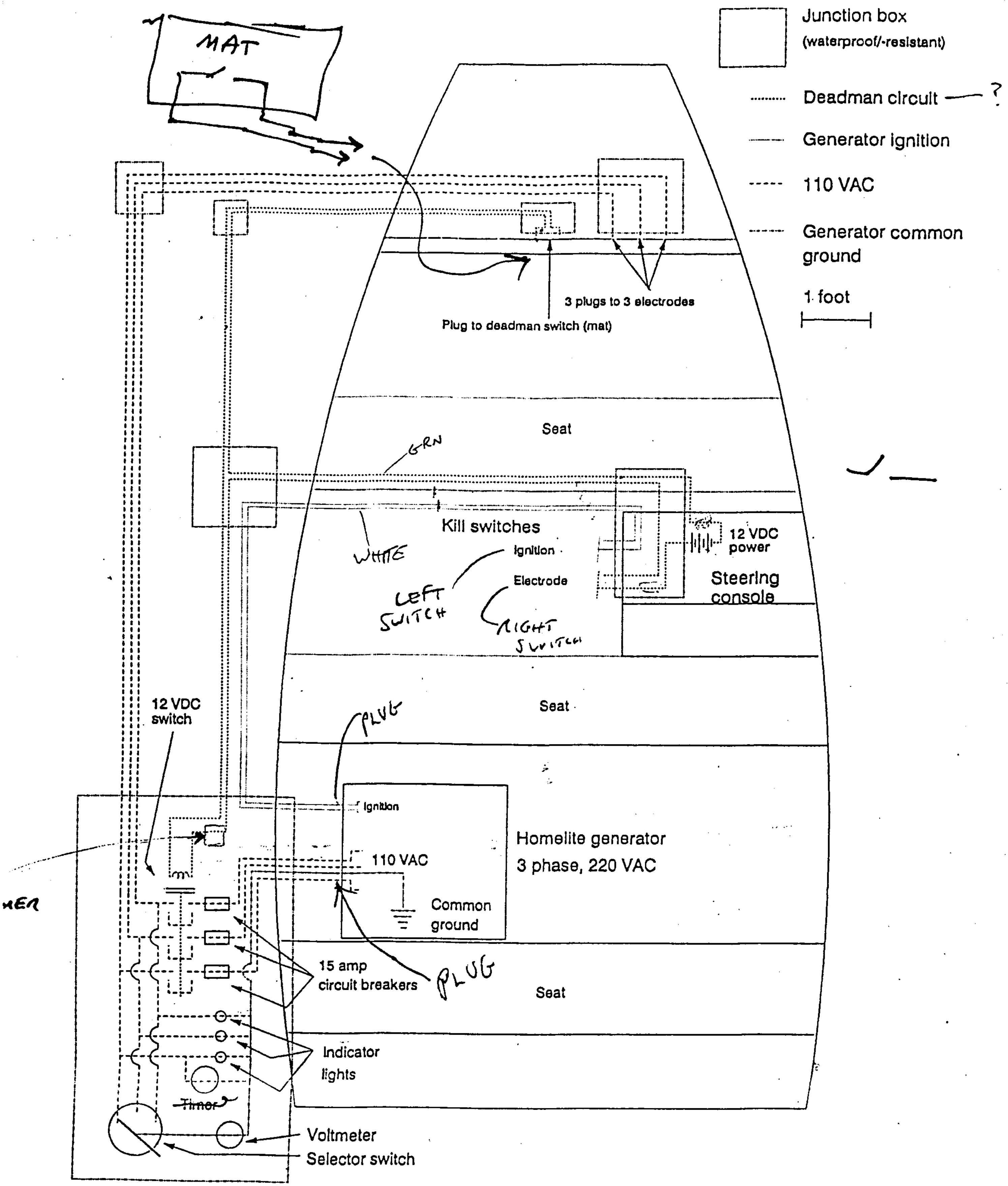
Mr. K. Douglas Blodgett participated in the electrofishing school offered by the U.S. Fish and Wildlife Service. Based on what he learned, the boat-mounted electrofishing gear we used was not up to modern standards of safety. Consequently, Mr. Blodgett modified the gear (Figure 2), adding a mat-actuated deadman switch for the dipper, and independent kill switches for the electric field and for the generator which are operated by the driver.

Several improvements were made to increase the ease of timing the sampling runs and measuring electrical output. The voltage to each electrode can now be measured at the beginning and end of each run, to insure that all electrodes are functioning and that the output is the same from station to station. A timer was wired into the control circuit so that it runs whenever the field is on. This is a more accurate timing method than punching a stopwatch whenever the field is turned on or off.

None of these improvements changed the field strength or other electrical characteristics of the electrofishing rig, which, as far as we can ascertain, have remained the same during the 30-year duration of the survey. The generator and the electrodes are the same as Dr. W. C. Starrett used when he initiated the survey.

Dr. Richard E. Sparks wrote down the field techniques for the electrofishing program (Appendix A)--the first time these techniques had been codified in writing. Dr. Sparks' knowledge of Starrett's sampling technique and locations is based upon interviewing his two assistants, Mr. Dennis Dooley and Mr. Kenneth Walker, and observing their technique for 2 years after the death of Dr. Starrett in 1971.

All participants in the 1989 electrofishing survey read the methods manual (Appendix A), suggested improvements in the explanation, and trained with the modified equipment on the Illinois River in the vicinity of Havana before the sampling began. In addition to Dr. Sparks and Mr. K.D. Blodgett, other crew members included Mr. Brian Todd and Mrs. R.E. Sparks.



Junction box
(waterproof/-resistant)
Deadman circuit
Generator ignition
110 VAC
Generator common ground
1 foot
MAT
3 plugs to 3 electrodes
Plug to deadman switch (mat)
Seat
GRN
WHITE
Kill switches
Ignition
Electrode
LEFT SWITCH
RIGHT SWITCH
12 VDC power
Steering console
Seat
12 VDC switch
PLUG
Ignition
110 VAC
Common ground
Homelite generator
3 phase, 220 VAC
15 amp circuit breakers
PLUG
Seat
Indicator lights
Timer
Voltmeter
Selector switch


Fig. 2

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# RESULTS

## Data Management

All of the historical data have now been transcribed into machine readable form on the Prime computer at the Illinois Natural History Survey in Champaign. These data must still be verified against the paper records and transcribed into RBase for DOS. Programs must still be written to transcribe data into one format which now exist in 3 different formats: the Sparks-Starrett set (1956 to 1978), the Lubinski set (1979 to 1985), and the new data collected on this project (1989). The original data, in the original formats, has been copied and archived, but a working database needs to be created in a common format that is easily searched by a user.

The 1989 data were entered using coding, a database structure, and entry screens developed during this segment (Appendix B). The results were tabulated by station using RBase (Appendix C). Appendix C is 143 pages long, so copies were not attached to all of these annual reports, but are available from Dr. Sparks INHS, Mr. William Bertrand, Project Officer, IDOC, and Mr. Larry Dunham, Grants Administration, IDOC.

## 1989 Results

There was an episode of high water between 1 September and 1 October (Figure 3) which caused us to stop sampling. We were able to start again on the upper Illinois River, where the river first fell to normal levels, then follow the subsidence of the flood downstream. We resampled the 2 stations where we had been interrupted, Big Blue Island (Illinois River Mile 58) and Upper Bath Chute (IRM 113). All the stations were completed before the water temperature dropped below our cut-off point of 58°F. Sampling locations, dates, and times, and physical-chemical conditions are reported in Table 1. Electrofishing catch (lbs per hour and number of individuals of each species per hour) are reported by station in Appendix C.

## Comparison to Previous Results

Although we have not done detailed comparisons for every species, we have had time to compare the largemouth bass catches in various reaches of the river throughout the 30-year period of the survey. The abundance of largemouth bass in different locations and in different years generally parallels that of other sport fish which utilize slow-moving backwaters to spawn. These include bluegill, white crappie, and black crappie. The results reported in Figure 4 are representative of these other species as well.

Most of these sport fish were taken in LaGrange and Peoria pools, which have the greatest remaining acreages of backwaters and floodplain habitat. (Compare the mean catch by pool, far right column, Figure 4.)

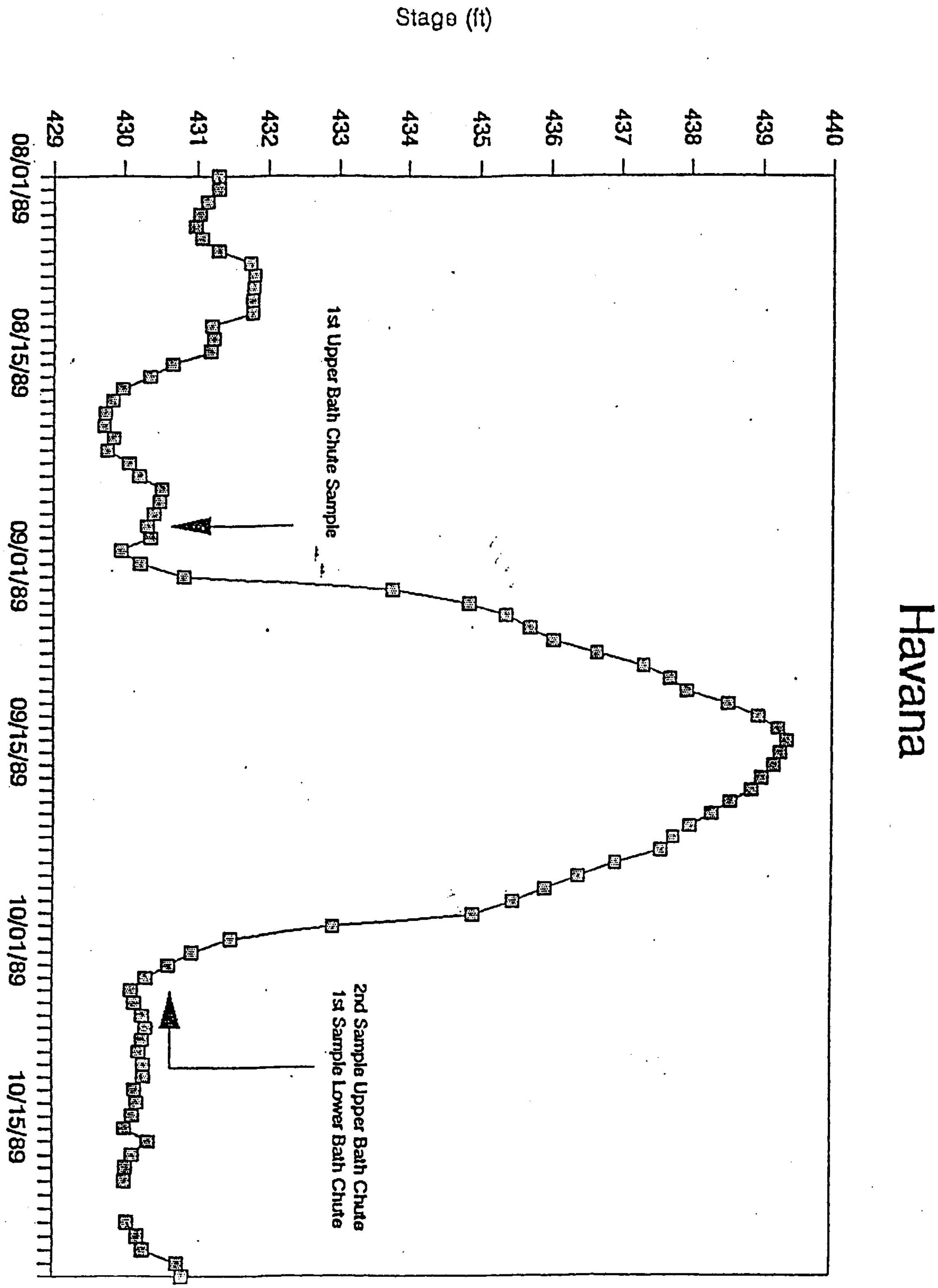
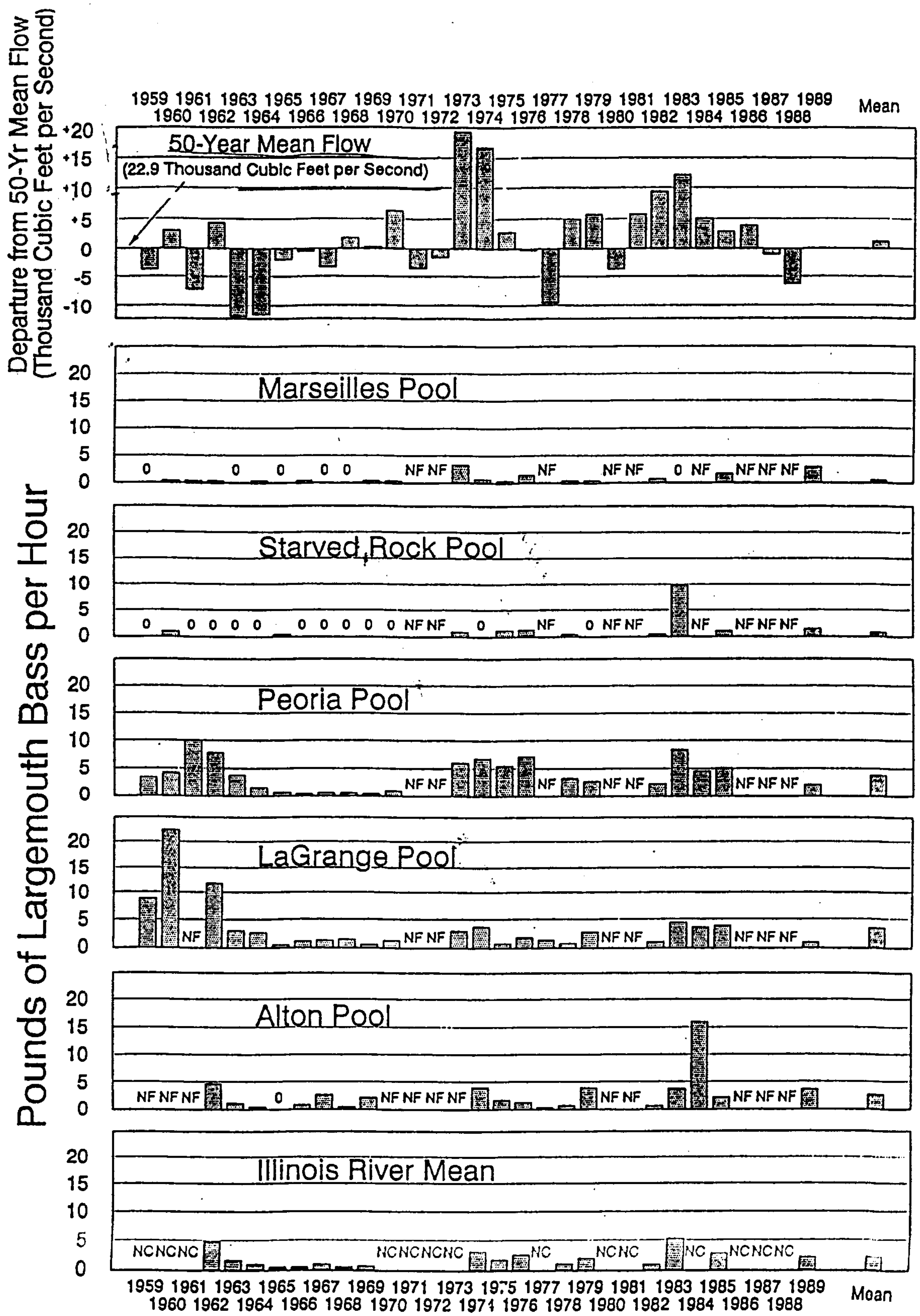

Havana
Stage (ft)
429
430
431
432
433
434
435
436
437
438
439
440
08/01/89
08/15/89
09/01/89
09/15/89
10/01/89
10/15/89
1st Upper Bath Chute Sample
2nd Sample Upper Bath Chute
1st Sample Lower Bath Chute

Fig. 3




NF = Not Fished
NC = Not Calculated

Fig. 4

# Table 1

| Collection number | Date | Site | Pool | River mile lower | River mile upper | Time elapsed (hours) | Time CST | Velocity (ft/sec) | Temperature (degrees C) air | Temperature (degrees C) water | DO (mg/l) | Secchi (inches) | Conductivity (mmhos) | Volts | Depth min. | Depth max. | Depth ave. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1989-04 | 02-Sep | Mortland Island | 8 | 18.7 | 19.0 | 0.50 | 09:05 AM | 0.87 | 22.5 | 26.0 | 5.5 | 11.25 | 630 | -0- | -0- | -0- | -0- |
| 1989-03 | 01-Sep | Dark Chute | 8 | 23.8 | 25.7 | 1.00 | 05:30 PM | 0.60 | 27.5 | 27.5 | 6.3 | 10.50 | 650 | 150 | -0- | -0- | -0- |
| 1989-05 | 02-Sep | Hurricane Island | 8 | 26.4 | 27.1 | 1.00 | 03:30 PM | 0.71 | 27.0 | 26.0 | 6.3 | 9.75 | 650 | -0- | -0- | -0- | -0- |
| 1989-06 | 02-Sep | Crater-Willow Islands | 8 | 29.1 | 30.8 | 0.93 | 06:00 PM | 1.28 | 25.5 | 25.5 | 6.0 | 8.75 | 650 | 185 | -0- | -0- | -0- |
| 1989-07 | 03-Sep | [a]Big Blue Island | 8 | 57.9 | 59.0 | 1.00 | 11:15 AM | 2.08 | 21.0 | 26.0 | 5.7 | 8.50 | 640 | 180 | -0- | -0- | -0- |
| 1989-30 | 04-Oct | [a]Big Blue Island | 8 | 57.8 | 58.9 | 1.01 | 02:30 PM | 1.43 | 17.0 | 20.0 | 10.5 | 13.70 | 510 | 230 | 1.0 | 6.0 | 3.0 |
| 1989-29 | 04-Oct | Grape-Bar Islands | 7 | 85.7 | 87.0 | 1.00 | 10:10 AM | 0.63 | 7.0 | 18.5 | 8.8 | 10.10 | 490 | 235 | 0.5 | 8.0 | 2.0 |
| 1989-27 | 03-Oct | Sugar Creek Island | 7 | 95.7 | 96.3 | 1.00 | 12:10 PM | 0.80 | 10.0 | 18.0 | 8.8 | 11.00 | 500 | 230 | 0.6 | 4.0 | 3.0 |
| 1989-26 | 03-Oct | Lower Bath Chute | 7 | 106.6 | 107.3 | 1.03 | 09:40 AM | 0.95 | 7.5 | 17.0 | 8.3 | 15.00 | 490 | 245 | 0.5 | 10.0 | 3.0 |
| 1989-01 | 29-Aug | [a]Upper Bath Chute | 7 | 112.9 | 113.2 | 0.43 | 11:00 AM | 1.25 | 28.0 | 26.0 | 6.1 | 10.00 | 550 | 150 | -0- | -0- | -0- |
| 1989-28 | 03-Oct | [a]Upper Bath Chute | 7 | 112.5 | 113.2 | 1.00 | 03:40 PM | 1.25 | 14.5 | 19.0 | 9.9 | 11.50 | 500 | 230 | 1.0 | 9.0 | 3.5 |
| 1989-25 | 02-Oct | Turkey Island | 7 | 148.0 | 148.4 | 0.78 | 03:30 PM | 0.80 | 19.5 | 21.0 | 12.0 | 9.50 | 580 | 220 | 0.5 | 3.0 | 2.0 |
| 1989-24 | 02-Oct | Pekin | 7 | 154.6 | 155.5 | 1.03 | 12:25 PM | 0.59 | 18.0 | 18.0 | 13.1 | 9.50 | 510 | 205 | 0.5 | 9.0 | 2.5 |
| 1989-22 | 29-Sep | Lower Peoria Lake | 6 | 163.0 | 163.5 | 0.50 | 10:55 AM | -0- | 14.5 | 16.0 | 15.1 | 8.30 | 470 | 210 | 0.5 | 3.0 | 2.0 |
| 1989-23 | 29-Sep | Upper Peoria Lake | 6 | 170.8 | 170.9 | 0.25 | 02:00 PM | 0.00 | -0- | 17.8 | -0- | 7.10 | 510 | 210 | 0.5 | 3.0 | 2.0 |
| 1989-21 | 27-Sep | Chillicothe Island | 6 | 180.1 | 181.0 | 1.00 | 04:14 PM | 0.53 | 22.5 | 17.8 | 13.5 | 11.00 | 520 | 213 | 0.6 | 6.0 | 2.0 |
| 1989-19 | 27-Sep | Henry Island | 6 | 193.3 | 194.5 | 1.00 | 09:29 AM | 0.79 | 8.0 | 16.5 | 11.7 | 9.30 | 510 | 210 | 0.5 | 6.0 | 2.5 |
| 1989-20 | 27-Sep | Lower Twin Sisters | 6 | 202.6 | 203.2 | 0.87 | 12:50 PM | 0.77 | 15.5 | 19.0 | 13.0 | 14.40 | 520 | 210 | 1.0 | 5.0 | 2.5 |
| 1989-18 | 26-Sep | Upper Twin Sisters | 6 | 203.0 | 203.5 | 1.03 | 04:30 PM | 0.80 | 19.0 | 18.9 | 12.1 | 14.30 | 550 | 197 | 1.0 | 8.0 | 3.5 |
| 1989-16 | 26-Sep | Hennipen Island | 6 | 207.5 | 208.1 | 1.02 | 10:13 AM | 0.95 | 11.5 | 16.8 | 11.4 | 13.00 | 550 | 200 | -0- | -0- | -0- |
| 1989-17 | 26-Sep | Clark Island | 6 | 214.9 | 215.6 | 1.00 | 01:45 PM | 1.04 | 16.5 | 19.0 | 12.6 | 15.60 | 550 | 200 | 1.0 | 6.0 | 3.5 |
| 1989-11 | 21-Sep | Bulls Island | 5 | 240.2 | 240.8 | 1.00 | 09:23 AM | 1.14 | 23.0 | 18.1 | 9.8 | 19.80 | 520 | 180 | 0.5 | 3.0 | 2.0 |
| 1989-12 | 21-Sep | Bulls Island Bend | 5 | 241.1 | 241.6 | 1.01 | 12:20 PM | 1.19 | 23.9 | 20.5 | 9.9 | 16.80 | 575 | 175 | 0.5 | 3.0 | 1.5 |
| 1989-15 | 25-Sep | Ballards Island | 4 | 247.7 | 248.1 | 1.00 | 02:40 PM | 0.14 | 22.0 | 21.0 | 11.8 | 13.10 | 560 | 175 | 1.0 | 3.0 | 1.5 |
| 1989-13 | 21-Sep | [a]Johnson Island | 4 | 249.7 | 249.8 | 0.30 | 02:45 PM | 0.48 | 27.1 | 21.5 | 9.9 | 19.50 | 510 | 180 | 0.5 | 6.0 | 3.5 |
| 1989-14 | 25-Sep | [a]Johnson Island | 4 | 249.7 | 249.8 | 0.59 | 12:40 PM | 0.63 | 18.5 | 18.0 | 11.0 | 21.00 | 540 | 180 | 0.3 | 6.0 | 2.5 |
| 1989-10 | 20-Sep | Waupecan Island | 4 | 260.2 | 261.1 | 1.00 | 06:10 PM | 1.92 | -0- | 20.0 | 10.4 | 16.00 | 560 | 200 | 0.5 | 6.0 | 2.0 |
| 1989-08 | 20-Sep | Mouth of DuPage River | 3 | 276.8 | 277.8 | 1.00 | 10:30 AM | 0.32 | -0- | 21.8 | 9.0 | 25.75 | 490 | 185 | 1.3 | 4.0 | 2.5 |
| 1989-09 | 20-Sep | Treats Island | 3 | 279.1 | 280.0 | 1.00 | 01:00 PM | 0.58 | 26.9 | 22.3 | 9.3 | 25.20 | 495 | -0- | 0.5 | 4.0 | 2.0 |
| 1989-02 | 01-Sep | [b]Brickhouse Slough | 26 | 207.4 | 209.0 | 0.75 | 01:00 PM | -0- | 24.0 | 24.0 | 5.9 | 20.50 | 380 | 190 | -0- | -0- | -0- |

[a] Site was sampled twice

[b] Collection 1989-02 was from Brickhouse Slough on the Mississippi River

Low catches of sport fish followed years of below-average flows, particularly in the 1960s. A recovery pattern was evident in LaGrange and Peoria pools during the high-water years in the early 1970s. There is less dilution of pollution and increased stress on fish during low flows. Low water levels reduce access to the backwaters and floodplain for spawning and rearing of the young.

The below-average flows of 1987-1989 apparently have not affected the mean catch from the Illinois River as much as the low flows in the 1960s, probably because of improved waste treatment and improved oxygen levels in the channels. Although the 1989 catch from LaGrange Pool is as low as in 1963-1970, it has been offset by the improved catches of game fish from the upstream pools (Marseilles and Starved Rock). These pools are heavily influenced by effluents from the Chicago/Joliet area and few largemouth bass were taken here prior to 1973 (note the number of zeros in the early years).

The largemouth bass catch from LaGrange Pool during the high water years of the early 1970s and 1980s is much less than in 1960 and 1962. The catch from Peoria Pool is about the same during all 3 periods, although a higher catch would be expected during the higher flows of the 1970s and 1980s. The decline in catch is attributable to a decline in the quality of the backwaters in both pools. The backwaters have filled with watery sediment, become increasingly turbid, and lost their aquatic vegetation. These conditions are inimical to nest-building sport fish which are sight predators and must see both to breed and to feed. The sediments have come from increased soil erosion in the drainage basin and increased sediment delivery by channelized tributaries.

The above discussion is representative of the type of analysis and narrative report we expect to generate for other species during the course of this project, culminating in a comprehensive assessment and recommendations at the end of the 5-year investigation.

Appendix A - Long-Term Electrofishing Survey of the Illinois River

Field Methods

Prepared by

Richard E. Sparks

6 September 1989

Revised: 29 May 1990

1. **Goals.** The goals of the long-term electrofishing survey (LTEF) are to detect upstream-downstream and year-to-year trends in fish populations of the Illinois River and to relate these trends to changes in water and habitat quality.
2. **General approach.** The objective is to sample the same stations using the same methods every year, so that results will be comparable across years and differences in catch per unit effort will reflect real changes in fish populations, rather than differences in sampling technique. The task then is to duplicate the field methods used by Starrett, Sparks, and Lubinski.

   The stations are all in areas permanently connected to the main channel of the Illinois River, even during low river stages. No isolated backwaters are sampled because water quality conditions and fish populations can diverge markedly from conditions in the flowing channels and mainstem lakes.

   Sampling is conducted in a 6-week "window" extending from the last week in August to the end of the first week in October. The actual sampling requires 4 5-day weeks, but allowances have to be made for weather, water levels, and equipment breakdowns. Sampling is initiated late in the summer, so that young-of-the-year (yoy) of species such as largemouth bass have grown large enough to be taken in the 1/4-inch mesh dip nets. Sampling does not extend beyond the first week of October because the distribution of fish within the river changes markedly when the water temperature drops below 58°F (15°C), usually during the second or third week of October.

   Sampling effort is based on equal time (normally 60 minutes of electrofishing) rather than equal distance at each sampling station. Most stations encompass an area larger than can be sampled in 60 minutes at the standard rate of movement, so subareas are selected within the station (see details on how to select subareas below).

   Starrett used a stratified sampling design, concentrating on the best fish habitat available within each station. "Best" means habitat likely to produce the greatest diversity of species, including sport fish (crappies, sunfishes, and bass), more specifically, habitat with structure such as brush piles, stumps, undercut banks, riprap, pilings, and even boat docks at two locations (Rapp's Boat Yard and Detweiler Park). There are a few stations (e.g. Pekin) along the main channel where there is little or no structure, and Starrett also intentionally sampled unstructured habitat as he moved from one structure to another with the generator on (they could not shut off the field independently of the generator).

The next items give particulars about the field methods, and are listed in the order in which they should be read. Item 3, water levels, is first among these because it is the basis for a "go" or "no go" decision.

3. Water levels. Fish are concentrated in permanent channels and backwaters during low river stages and disperse widely during high stages. Starrett fished only when water levels were low and stable so results were obtained under consistent water level conditions. There are gaps in the data during years when water levels rose and electrofishing was discontinued. Gaps are preferable to introducing another source of variation in catch per unit effort.

   Check water levels by calling the NWS and COE or listening to the weather radio before you electrofish. If the river is no more than 2.5 ft. above flat pool at stations above Starved Rock dam or 1.5 feet above flat pool at stations below Starved Rock and rising less than 6 inches in 24 hours at the station to be sampled that day, fish; otherwise, cease and desist (better luck next year). Another indication of low, stable water levels is when the wickets are up on the Peoria and LaGrange dams and the Corps of Engineers refers to the river as being "in pool" or at "pool stage".

4. Survey the site. Look over the entire sampling site. If you cannot see the entire site when you first approach it, drive through the entire area before planning your sampling runs.

5. Plan the sampling runs. The netter and driver agree on a sampling plan that optimizes these objectives: (1) 15-min. or 30-min. sampling runs should cover entire site (i.e., if the site is over a mile long and has similar habitat throughout its length, don't concentrate all the sampling runs in the upstream end only), (2) concentrate on structure, but fish unstructured areas as you move from structure to structure (e.g., from one brushpile to another), and (3) plan a crossing at higher speed with the electric field on (crossing from one side to another), except in wide areas, such as Peoria Lake. Optimization means that you don't fulfill one objective to the exclusion of the others. For example, if you have a long side channel with only 1 brushpile, you should fish that brushpile as long as you would in another area with multiple brushpiles, then go on to the unstructured habitat--don't spend more time there because you are trying to fulfill objective (2), concentrating on structure.

6. Water quality measurements. Driver fills in the station description sheet, dipper makes the measurements within the area which will be covered by the first run. It's best to anchor the boat instead of trying to hold position with the outboard because the propellor and wave wash disturbs the water column and the sediments and may alter water quality. If an instrument does not work, spend no more than 15 minutes trying to fix it, then do the remaining water quality measurements and begin electrofishing. Turbidity has the lowest priority because it is redundant: it correlates well with Secchi disk visibility, and the Secchi always works!

7. Electrofishing. Remember that you are trying to duplicate what your predecessors did. Starrett and Sparks used the Queen Merrie with one dipper on the bow platform and 1 driver. The only kill switch was

operated by the driver and it shut off the gasoline motor of the generator. When that happened, the dipper had to climb down, go to the back of the boat and restart the engine. The driver started the timing watch when the motor started and stopped it whenever the motor stopped.

Because it was a nuisance to restart the generator motor, Sparks and Starrett left it on for the entire 15-minute or 30-minute run and when they made a rapid crossing from one side to another (crossings usually take much less than a minute, if you don't stun any fish). The other reason the generator was, and still is left on, is that crossings sometimes shock fish that are not commonly taken otherwise, such as bigmouth buffalo, and for this reason the dipper looks backward and stays ready during the crossing. If a school of fish is shocked during a crossing, the boat circles back to pick them up, and the generator is left on to hold them. The entire process usually takes less than 5 minutes.

Dipper starts the generator and steps on the mat (driver makes sure generator switch is up or generator won't start). Driver switches on field and records the starting electrode voltages, then switches off the field and moves the boat to the first site. Driver makes sure the dipper is ready, then switches on the field and makes the approach to the brushpile or shoreline. This approach procedure duplicates what Sparks and Starrett did when they fished without a field switch. Do not dip fish when you are checking the electrode voltage.

In general, the dipper should stay on the mat and the driver should leave the field switch on during the entire run, to duplicate the Sparks-Starrett technique. Do not "sneak up" on brushpiles or switch the field on and off. Remember that the dipper had to start the generator (watch went on at the same time), run to the bow, climb up on the platform and pick up his net, and then the driver would move into the brushpile or other structure.

Fish from upstream to downstream at a pace so the fish are coming up around you instead of drifting rapidly downstream away from you. An exception is made when you approach a large brushpile in moderate to fast current. If you approach from the upstream side, fish are carried into the brushpile and downstream away from you before you can maneuver the boat around the brushpile to the downstream side. In this case, fish on the downstream side of the brushpile, rather than on the upstream side..

Ideal depth is less than 3 feet.

Fish all around a structure until fish stop coming up, then move on.

Back up and circle to pick up fish, if doing so will yield more fish or more different kinds of fish than you are getting right in front of you.

Dipper uses hand signals to show driver where the dipper wants to go.

Go for the unusual specimen, even if it means you miss a few gizzard shad or carp. Remember that the addition of one new species to the sample provides more information than the addition of a few more individuals of the more abundant species.

The driver should help the dipper flip the net to dump the fish. Wear gloves to prevent injury from spines. Break or clip spines to remove fish, if necessary. If the driver cannot free fish quickly from the net, the dipper should grab the second net and continue dipping. The driver's primary responsibleities are to maneuver the boat and assist the dipper, but he can also dip any fish he can reach.

The long-handled dip nets should be used. Dipper inspects them frequently for tears in the mesh which would bias the sample against small fish.

The driver should expect to be steering and shifting constantly, to maintain optimum speed and position for the dipper. Even at idle, the boat will move too fast for the dipper to recover fish efficiently. Shift in and out of neutral for more precise speed control. Warn the dipper of overhanging branches and any fish he does not see. If the boat is parallel and close to shore or some obstruction, back the stern away from shore before going forward. If you try to turn and go forward, the stern will swing into shore and strand the prop. Use the current to "ferry" the boat in the direction you want to go; i.e., you angle the bow slightly to the left into the current to cause the current to move you left--the greater the angle, the greater the pushing effect of the current. In electrofishing, you often end up pointing the bow in some direction other than your intended direction of travel. In some side channels, particularly in the upper river, the current moves you at about the right speed, so the driver keeps the bow pointed toward shore and the electrodes in 3 feet of water or less while the current carries the boat downstream. Occasionally, you will become hopelessly entangled or stranded. Shut everything off (including the timer), and extricate yourself by poling, with the dipper's assistance.

The dipper is an active participant in maneuvering the boat and warding off obstacles, with the aid of his dip net. The dip net is also used as a depth gage for the driver's benefit--the dipper is often aware that the boat is in danger of being stranded before the dr~~iver is~~.

Although the electrofishing time at each station is 60 minutes it is possible to cover some of the smaller stations thorough~~ly in 45~~ minutes. Just record the actual time spent (it should be in blocks of 15 minutes). Do not go back over an area which has already been fished. Record electrode voltages and end time.

The goal is for the dipper, driver, and equipment to function together like a maximally efficient predator, spending just the right time to capture fish from brush piles, but moving on when the catch rate drops, and moving at just the right speed to maximize shocking and capture in unstructured areas.

8. Safety. Both dipper and driver wear hearing protection, life jackets, and rubber boots. Dipper also wears rubber gloves. Use standard hand signals for directions and for engine kill. Dipping large numbers of fish is exhausting, so driver and dipper should trade places at the end of 15 or 30 minutes. In addition to safety considerations, capture efficiency of a tired dipper is reduced. All participants in electrofishing must first read and sign the form which acknowledges their comprehension of the dangers involved.
9. Work up fish. One person handles the fish, the recorder keeps his hands and the data sheets clean. Although Starrett recorded body depths of carp and took scales from largemouth bass, we will not be doing either this year.

   Enter date and river mile on every sheet--sheets sometimes get separated.

Note on the data sheet in the comment column which fish are archived or unidentified and preserved in formalin. Unidentified fish should be identified as soon as possible and the correct name entered in the data sheet.

New location records should be noted (check dot maps in *Fishes of Illinois*) and the specimen archived for the Survey ichthyological collection.

Work up any rare or endangered species or gamefish in distress first, photograph the rare species, and return them to the water as quickly as possible.

Until the codes are familiar, write out common names of fishes and common descriptions of lesions. However, do use standard terminology for lesions, and double check terminology in the evening on the houseboat.

When doing groups of similar-sized fish, record the length of the largest and smallest member of the group, the number of individuals in the group, and the group weight.

Wet the balance pan and check the zero adjustment before weighing the first fish. Empty water and slime out of the balance pan frequently, to avoid errors. Interpolate weights of small fish to the nearest 0.025 lb., i.e., a fish between 0.2 and 0.3 lbs. might be 0.220, 0.225, 0.250, 0.275, or 0.300. For fish above 1 lb., round off to the nearest 0.1 lb.

10. **Complete the data sheets.** Number the fish data sheets, make sure each sheet has date and location at the top. Draw the sampling runs on the xerox copy of the site, taken from navigation charts or USGS maps. Also note number of brushpiles and crossings. Use the standard symbols shown in the example on back of the site description sheet.

    For each run, the electrode time should be recorded. Remember that the electrode timer reads in 100ths of an hour, not in minutes. Fifteen minutes is 0.25 on the clock and half an hour is 0.50. The clock runs when someone is on the mat and the electrode switch is up, even if the generator is turned off! Hence you inadvertently run the clock if the dipper stays on the mat as you run from one substation to another. To prevent this, the driver should switch off the field switch whenever he switches off the generator.

    Place field data sheet on top, site map next, then the fish data sheets in order by page number. Staple package together and place in field data box.

11. **Specimens.** Place any unidentified or archival fish in formalin. The specimens from each site should go into their own jar, with a label written in no. 2.5 pencil on Rite-in-the-Rain paper giving the date, location, and collector. The label goes in the jar with the fish. Concentrated formaldehyde should be diluted 1:4 with river water. Remember that the disposition of the fish (preserved, buried) should be written on the fish data sheets in the comments column, for the annual report on collecting activities which we submit to the DOC. Also note which fish you took pictures of.

12. Dead fish. Use the shovel to bury dead fish, and note disposition on fish data sheet for the DOC report, as mentioned in item 11.

Prepared by S.D. Edwards and K.D. Blodgett
7 February 1990

Database Name: EFTEMP

| Table | Data Entry Form | Contents |
|---|---|---|
| STATION | STATION (*see figure 1*) | Physical parameters for each collection. |
| FISH | FISH (*see figure 2*) | Individual fish data. |
| SCODES | | Fish codes, scientific and common names. |
| DISPOSIT | | Disposition codes and long forms. |

TABLE: FISH

| Column | Type | Description |
|---|---|---|
| *ID | INTEGER | Sampling session sequence number. Each year may start at 1. |
| *SPECIES | TEXT (3) | Common name code, 3-letter. |
| IND | INTEGER | Number of individual fish. |
| WT | REAL | Weight in pounds. |
| TL | REAL | Total length in inches, lowest if more than 1 individual. |
| HI | REAL | Upper total length, if more than 1 individual. |
| SICK | TEXT (40) | Unhealthy comment codes, separated by spaces (*see unhealthy comment codes below*). |
| WELL | TEXT (15) | Comment codes other than unhealthy, separated by spaces (*see other comment codes, page 2*). |
| DISP | TEXT (3) | Disposition: R = released B = buried P = Preserved. |
| FCOM | NOTE | Additional comments. |

Unhealthy comment codes

(*n* is an optional digit indicating degree and/or number)
0 = not indicated 1 = slight 2 = moderate 3 = severe

| | |
|---|---|
| SOR*n* | Sore(s) |
| TOM → TUM | Tumor or cyst. |
| POP | Popeye. |
| LER | Lernaea. |
| LEE | Leech. |
| LAM | Lamprey. |
| KNO*n* | Knothead. |
| DEF | Deformity, spinal or developmental. |

*Key in R:BASE table.

*Unhealthy comment codes con't...*

| | |
|---|---|
| TOR | Torn or frayed fin. |
| BLO | Blood. |
| FUN | Fungus. |
| SLI | Slime. |
| HOL | Hole in fin or body. |
| SCA | Scales missing or replaced. |
| EROn DOR | Eroded dorsal, adipose, and/or pectoral fins. |
| EROn LOW | Eroded lower appendages: pelvic and/or anal fins, barbels. |
| EROn CAU | Eroded caudal fin. |
| WAVn DOR | Wavy dorsal, adipose, and/or pectoral fins. |
| WAVn LOW | Wavy lower appendages: pelvic and/or anal fins, barbel. |
| MOR | More comments in writing. |

Other comment codes

| | |
|---|---|
| CHI | Chicken carp. |
| MIR | Mirror carp. |
| GOL | Goldfish color. |
| MAL | Male. |
| RIP | Ripe. |
| PRE | Preserved. |
| MOR | More comments in writing. |

TABLE: STATION

| Column | Type | Desciption |
|---|---|---|
| *ID | INTEGER | Sampling session sequence number. |
| SITE | TEXT (40) | Name of sampling site. |
| *POOL | INTEGER | Pool. |
| *DATE | DATE | Date. |
| LMILE | REAL | Lower river mile of sample range. |
| UMILE | REAL | Upper river mile of sample range. |
| +*MILE | REAL | River mile (mean). |
| TIME | TIME | Military CST end time. |
| PER | REAL | Sampling period in hours. |
| VELFT | REAL | Feet traveled for velocity measurement. |
| VELSEC | REAL | Time (seconds) for velocity measurement. |
| + VEL | REAL | Velocity in ft/sec. |
| AIR | REAL | Air temperature in degrees C. |
| TEMP | REAL | Water temperature in degrees C. |
| DO | REAL | Dissolved oxygen in mg/l. |
| SECCHI | REAL | Disk visibility in inches. |
| COND | REAL | Conductivity in umhos/cm. |
| COMM | NOTE | Any comments regarding sampling session. |

*Key in R:BASE table.
+Column calculated.

*STATION columns con't...*

| | | |
|---|---|---|
| VOLTS | INTEGER | Average probe voltage. |
| MINDEP | REAL | Minimum depth. |
| MAXDEP | REAL | Maximum depth. |
| + MEANDEP | REAL | Mean depth. |

TABLE: DISPOSIT

| Column | Type | Description |
|---|---|---|
| DISP | TEXT (3) | Disposition, 1-letter (*see table: FISH, column: DISP, page 1*). |
| LONGDISP | TEXT (11) | Disposition (*see table: FISH, column: DISP, page 1*). |

TABLE: SCODES

| Column | Type | Description |
|---|---|---|
| SPECIES | TEXT (3) | Common name code, 3-letter. |
| SNAME | TEXT (55) | Scientific name. |
| CNAME | TEXT (38) | Common name. |

TABLE: PCODES

| Column | Type | Description |
|---|---|---|
| PNAME | TEXT (13) | Pool name. |
| POOL | INTEGER | Pool number. |
| PLMILE | REAL | Pool lower mile. |
| PUMILE | REAL | Pool upper mile. |

*Key in R:BASE table.
+Column calculated.

File name: LTEFCODE.NOT
Disk name: LTEF - EFTEMP

DATA ENTRY SCREEN FOR INDIVIDUAL FISH

D: ----------------- Sampling session sequence number.

ECIES: -------------------- Three letter fish code (from code sheet).

ND: ---------------- Number of individual fish.

: -------------------- Total length in inches, lowest if more than 1 individual.

: -------------------- Upper total length if more than 1 individual.

T: -------------------- Weight in pounds.

_CK: Unhealthy comment codes (from code sheet) separated by spaces.

LL: --------- Comment codes other than unhealthy separated by spaces (from code sheet).

COM:

_SC] Done [F2] Clear field [Shift-F2] Clear to end [Shift-F10] More
orm: fish Table: FISH Field: SPECIES Page: 1

DATA ENTRY SCREEN FOR STATION INFORMATION

```
.ECTION NUMBER:                         LMILE:
                                        UMILE:
E:
  (YYMMDD)
D:          SITE:

 TEMP:         C

ER TEMP:        C          DO:        ppm      SECCHI:          inches

DUCTIVITY:           micro-mhos per cm

OCITY:            ft per           sec

 TIME:             hours.hundredths     END TIME:          (CST)
TS:            DEPTH (ft) MIN:          MAX:           MEAN:
MENT:

C] Done     [F2] Clear field     [Shift-F2] Clear to end     [Shift-F10] More
n: station     Table: STATION     Field: ID          Page: 1
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