

THE PARASITES OF THE FRESH WATER FISHES OF LOUISIANA

I. Incidence and Distribution of Parasitism

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INTRODUCTION

In 1960 an intensive and long-range comprehensive study was undertaken to determine the degree and/or presence of parasitism in the freshwater fishes of Louisiana. Under a cooperative arrangement the fish examined in this study were collected and identified or classified by members of the survey team and by the field units of Louisiana Wildlife and Fisheries Commission (Bailey, Lagler). Dissection, parasitic identifications and the laboratory aspect of this study were for the most part conducted in the laboratories of Loyola University. Fish collections were continued for over eighteen months and included specimens from fifty-four (54) watersheds (or bodies of water). These represented all sections of the State of Louisiana (see Plate I). A total of eighteen hundred and seven (1807) fishes were examined. The fishes catalogued represented fifty-two (52) species and seventeen (17) families. These are listed below:

Lepisosteidae—Gars

Lepisosteus oculatus (Winchell)—spotted gar
Lepisosteus spatula (Lacépède)—alligator gar

Amiidae—Bowfins

Amia calva (Linnaeus)—bowfin

Clupeidae—Herrings

Alosa chrysochloris (Rafinesque)—skipjack herring
Dorosoma cepedianum (Le Sueur)—gizzard shad
Dorosoma petenense (Günther)—threadfin shad

Esocidae—Pikes

Esox americanus vermiculatus (Le Sueur)—grass pickerel
Esox niger (Le Sueur)—chain pickerel

Cyprinidae—Minnows and Carps

Carassius auratus (Linnaeus)—goldfish
Cyprinus carpio Linnaeus—carp
Notemigonus crysoleucas (Mitchill)—golden shiner
Notropis venustus (Girard)—blacktail shiner
Notropis maculatus (Hay)—taillight shiner
Phenacobius mirabilis (Girard)—suckermouth minnow
Pimephales notatus (Rafinesque)—bluntnose minnow
Pimephales vigilax (Baird and Girard)—bullhead minnow

Catostomidae—Suckers

Erimyzon oblongus (Mitchill)—creek chubsucker
Erimyzon sucetta (Lacépède)—lake chubsucker
Ictiobus bubalus (Rafinesque)—smallmouth buffalo
Minystrema melanops (Rafinesque)—spotted sucker
Moxostoma poecilurum (Jordan)—blacktail redhorse

Ictaluridae—Freshwater Catfishes

Ictalurus furcatus (Le Sueur)—blue catfish
Ictalurus melas (Rafinesque)—black bullhead
Ictalurus natalis (Le Sueur)—yellow bullhead
Ictalurus punctatus (Rafinesque)—channel catfish
Pylodictis olivaris (Rafinesque)—flathead catfish

Anguillidae—Freshwater Eels

Anguilla rostrata (Le Sueur)—American eel

Cyprinodontidae—Killifishes

Fundulus chrysotus (Günther)—golden topminnow

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Lucania parva venusta (Baird and Girard)—rainwater killifish

Poeciliidae—Livebearers

Gambusia affinis (Baird and Girard)—mosquitofish

Mollienesia latipinna (Le Sueur)—sailfin molly

Serranidae—Sea Basses

Roccus chrysops (Rafinesque)—white bass

Roccus mississippiensis (Jordan and Eigenmann)—yellow bass

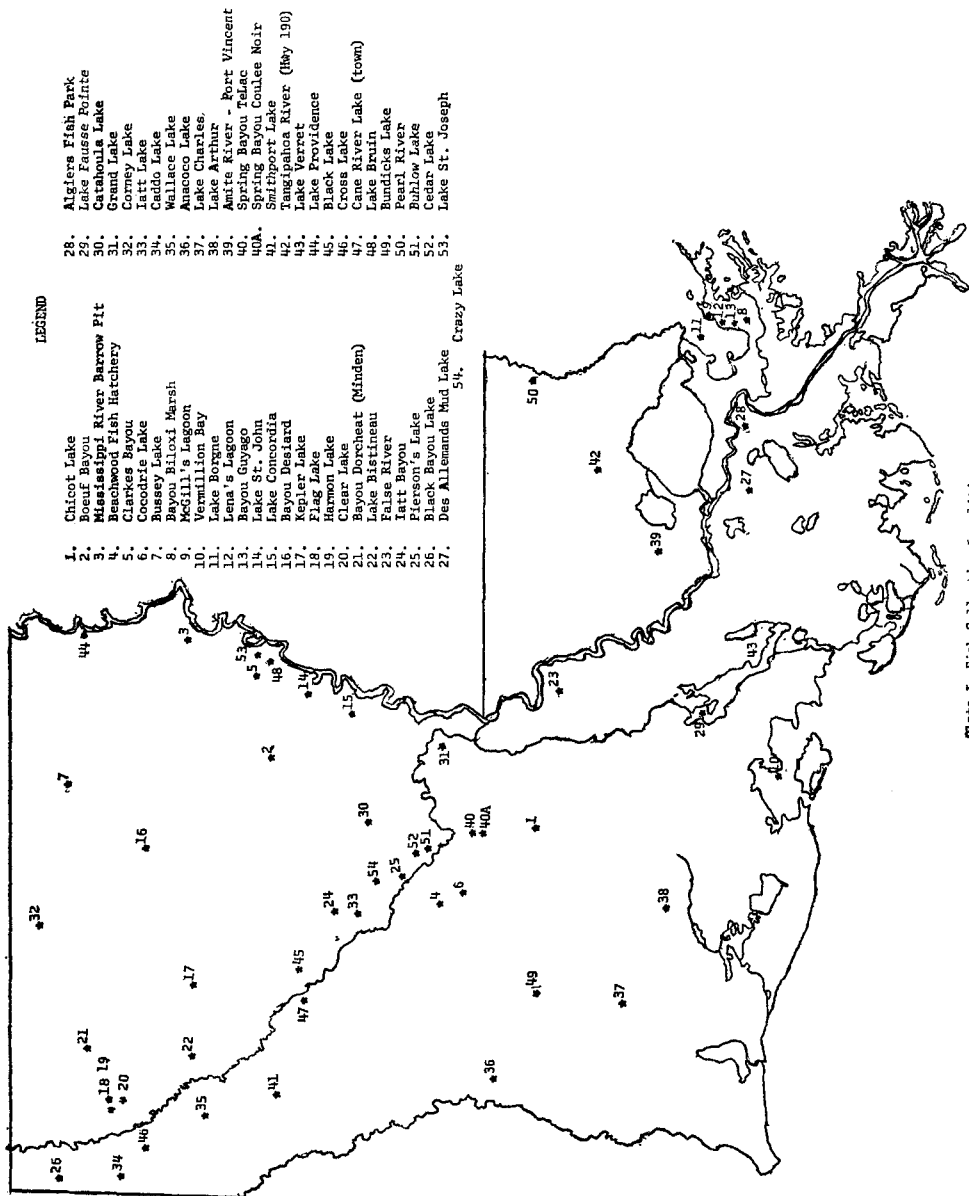


Plate I Fish Collection Localities

Centrarchidae—Sunfishes

- Centrarchus macropterus* (Lacépède)—flier
- Chaenobryttus gulosus* (Cuvier)—warmouth
- Lepomis cyanellus* (Rafinesque)—green sunfish
- Lepomis humilis* (Girard)—orangespotted sunfish
- Lepomis macrochirus* Rafinesque—bluegill
- Lepomis megalotis* (Rafinesque)—longear sunfish
- Lepomis microlophus* (Günther)—reardear sunfish
- Lepomis punctatus* (Valenciennes)—spotted sunfish
- Lepomis* spp.—sunfish
- Micropterus salmoides* (Lacépède)—largemouth bass
- Pomoxis annularis* Rafinesque—white crappie
- Pomoxis nigromaculatus* (Le Sueur)—black crappie

Sciaenidae—Drums

- Aplodinotus grunniens* Rafinesque—freshwater drum
- Cynoscion arenarius* Ginsburg—sand seatrout
- Micropogon undulatus* (Linnaeus)—Atlantic croaker

Cichlidae—Cichlids

- Tilapia mossambica* Peters—Java tilapia

Mugilidae—Mulletts

- Mugil cephalus* Linnaeus—striped mullet

Atherinidae—Silversides

- Labidesthes sicculus* (Cope)—brook silverside

Bothidae—Lefteye Flounders

- Paralichthys lethostigma* Jordan and Gilbert—southern flounder

MATERIALS AND METHODS

A variety of methods were used in the collection of fishes. These included traps, rotenone, trammel nets, seines, and gill nets. While some of the fishes were iced temporarily all were preserved in formalin before dissection. This preservative was found to be the most practical considering the distances from collection sites to the laboratories.

The parasitological examination of each fish included a thorough study of the body surface, mouth, eyes, gills, fins, and a dorsal antero-posterior incision. The viscera were examined macroscopically and microscopically. All parasites were preserved in formalin until ready for cytological staining and mounting. Delafield's hematoxylin and eosin and triple carmine were used to stain the whole mount and section preparations. Glycerine was used for some of the round-worm preparations.

DISCUSSION

This research project was undertaken because no complete or comprehensive study of the parasites of the fresh water fishes had ever been undertaken in the State of Louisiana, as has been accomplished in many other states or regions of the United States. Many of these latter works are excellent and are considered invaluable to the Wildlife and Fisheries Commissions and/or Conservation Departments of these states. A representative listing of the investigators responsible for these projects include Bangham and his associates, Cook, Essex, Fischthal, Fritts, Haderlie, Huggins, Hunter and his associates, E. P. Meyer, M. C. Meyer, Mueller, Pearse, Van Cleave, and Ward. Bennett and his associates and F. Sogandares-Bernal and his associates have conducted Louisiana fish parasite studies for many years. The former investigator has specialized in the Trematoda, while the latter has concentrated on the parasites of marine or brackish water fishes. Bennett (1938) published a partial checklist of the trematodes of Louisiana Vertebrates. He and his associates (Corkum, Hopkins, Sparks, Melugin, and Miller) have continued to conduct excellent research activities in this field.

In the current project an examination of eighteen hundred and seven (1807) fishes revealed that one thousand and ninety-three (1093), or 60.4%, harbored at least one species of parasite (Plate III). An

INCIDENCE OF PARASITISM BY LOCALITY

| 4AP No. | LOCALITY | FISH STATISTICS | | | | | | | | PARASITISM STATISTICS | | | | | | | |
|---------|----------------------------|------------------|----------|-------|----------|------|------------|-------|----------|-----------------------|-----------|-------|----------|-------|--------|-------|--|
| | | Number Collected | Infested | | Negative | | Trematodes | | Cestodes | | Nematodes | | Acanthoc | | Others | | |
| | | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | |
| 1. | Chicot Lake | 30 | 21 | 70.0 | 9 | 30.0 | 21 | 70.0 | 4 | 13.3 | 6 | 20.0 | 1 | 3.3 | 0 | 0.0 | |
| 2. | Boeuf Bayou | 6 | 5 | 83.3 | 1 | 16.7 | 5 | 83.3 | 0 | 0.0 | 1 | 50.0 | 0 | 0.0 | 0 | 0.0 | |
| 3. | Miss. River Barrow Pit | 64 | 52 | 81.2 | 12 | 18.8 | 48 | 75.0 | 4 | 6.3 | 17 | 26.5 | 1 | 1.5 | 1 | 1.5 | |
| 4. | Beachwood Fish Hatchery | 25 | 1 | 4.0 | 24 | 96.0 | 1 | 4.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | |
| 5. | Clarks Bayou | 42 | 20 | 47.6 | 22 | 52.4 | 17 | 40.4 | 4 | 9.5 | 2 | 4.7 | 0 | 0.0 | 0 | 0.0 | |
| 6. | Cocodrie Lake | 32 | 16 | 50.0 | 16 | 50.0 | 15 | 46.8 | 4 | 12.5 | 6 | 18.7 | 4 | 12.5 | 0 | 0.0 | |
| 7. | Bussey Lake | 35 | 18 | 51.4 | 17 | 48.6 | 10 | 28.5 | 3 | 8.5 | 8 | 22.3 | 2 | 5.7 | 0 | 0.0 | |
| 8. | Bayou Biloxi Marsh | 3 | 3 | 100.0 | 0 | 0.0 | 2 | 66.6 | 1 | 33.3 | 2 | 66.6 | 0 | 0.0 | 0 | 0.0 | |
| 9. | McGill's Lagoon | 10 | 4 | 40.0 | 6 | 60.0 | 4 | 40.0 | 3 | 30.0 | 2 | 20.0 | 2 | 20.0 | 0 | 0.0 | |
| 10. | Vermillion Bay | 23 | 16 | 69.5 | 7 | 30.4 | 6 | 26.0 | 0 | 0.0 | 11 | 47.8 | 12 | 52.1 | 0 | 0.0 | |
| 11. | Lake Borgne | 2 | 2 | 100.0 | 0 | 0.0 | 1 | 50.0 | 0 | 0.0 | 2 | 100.0 | 0 | 0.0 | 0 | 0.0 | |
| 12. | Lena's Lagoon | 14 | 9 | 64.2 | 5 | 35.8 | 6 | 42.9 | 4 | 28.5 | 3 | 21.4 | 0 | 0.0 | 1 | 7.1 | |
| 13. | Bayou Guyago | 34 | 23 | 67.6 | 11 | 32.4 | 0 | 0.0 | 15 | 44.1 | 5 | 14.7 | 4 | 11.7 | 0 | 0.0 | |
| 14. | Lake St. John | 158 | 49 | 31.1 | 109 | 68.9 | 12 | 7.5 | 2 | 1.3 | 13 | 8.2 | 35 | 22.1 | 0 | 0.0 | |
| 15. | Lake Concordia | 108 | 82 | 75.9 | 26 | 24.1 | 30 | 27.7 | 5 | 4.6 | 23 | 21.3 | 65 | 60.1 | 2 | 1.8 | |
| 16. | Bayou Desiard | 41 | 17 | 41.4 | 24 | 58.5 | 4 | 9.7 | 1 | 2.4 | 14 | 34.1 | 4 | 9.7 | 0 | 0.0 | |
| 17. | Kepler Lake | 63 | 52 | 82.5 | 11 | 17.5 | 48 | 76.1 | 8 | 12.7 | 16 | 25.3 | 16 | 25.3 | 0 | 0.0 | |
| 18. | Flag Lake | 5 | 3 | 60.0 | 2 | 40.0 | 1 | 20.0 | 3 | 25.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | |
| 19. | Harmon Lake | 21 | 19 | 90.4 | 2 | 9.5 | 17 | 80.9 | 4 | 19.0 | 4 | 19.0 | 7 | 33.3 | 1 | 4.9 | |
| 20. | Clear Lake | 14 | 5 | 35.7 | 9 | 64.3 | 5 | 35.7 | 0 | 0.0 | 2 | 14.2 | 0 | 0.0 | 1 | 7.1 | |
| 21. | Bayou Dorcheat (Minden) | 1 | 1 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 | 1 | 100.0 | |
| 22. | Lake Bistineau | 1 | 1 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 | 1 | 100.0 | |
| 23. | False River | 3 | 3 | 100.0 | 0 | 0.0 | 3 | 100.0 | 0 | 0.0 | 1 | 33.3 | 0 | 0.0 | 3 | 100.0 | |
| 24. | Iatt Bayou | 42 | 30 | 71.4 | 12 | 28.6 | 13 | 30.9 | 3 | 7.3 | 17 | 40.1 | 21 | 50.0 | 1 | 2.3 | |
| 25. | Pierson's Lake | 19 | 15 | 78.9 | 4 | 21.1 | 3 | 15.7 | 4 | 21.1 | 12 | 63.1 | 9 | 47.3 | 0 | 0.0 | |
| 26. | Black Bayou Lake | 37 | 33 | 89.2 | 4 | 10.8 | 6 | 16.2 | 6 | 16.2 | 12 | 32.4 | 31 | 83.7 | 1 | 2.7 | |
| 27. | Des Allemands Mud Lake | 27 | 9 | 33.3 | 18 | 66.7 | 7 | 25.9 | 3 | 11.1 | 3 | 11.1 | 5 | 14.9 | 3 | 11.1 | |
| 28. | Algiers Fish Park | 96 | 48 | 50.0 | 48 | 50.0 | 8 | 8.3 | 2 | 2.1 | 27 | 28.0 | 32 | 33.3 | 0 | 0.0 | |
| 29. | Lake Fausse Pointe | 47 | 9 | 19.2 | 38 | 81.8 | 5 | 10.6 | 3 | 6.3 | 7 | 14.8 | 2 | 4.2 | 0 | 0.0 | |
| 30. | Catahoula Lake | 1 | 1 | 100.0 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 | 1 | 100.0 | 1 | 100.0 | 0 | 0.0 | |
| 31. | Grand Lake | 90 | 50 | 55.5 | 40 | 44.4 | 42 | 46.7 | 10 | 11.1 | 20 | 22.2 | 5 | 5.5 | 1 | 1.1 | |
| 32. | Corney Lake | 8 | 8 | 100.0 | 0 | 0.0 | 2 | 25.0 | 1 | 12.5 | 6 | 75.0 | 2 | 25.0 | 0 | 0.0 | |
| 33. | Iatt Lake | 43 | 26 | 60.5 | 17 | 39.5 | 22 | 51.1 | 8 | 18.6 | 9 | 20.9 | 2 | 4.6 | 2 | 4.6 | |
| 34. | Caddo Lake | 16 | 15 | 93.8 | 1 | 6.2 | 12 | 75.0 | 1 | 6.2 | 4 | 25.0 | 10 | 62.5 | 1 | 6.2 | |
| 35. | Wallace Lake | 35 | 32 | 91.4 | 3 | 8.6 | 30 | 85.7 | 10 | 28.6 | 12 | 34.2 | 4 | 11.4 | 0 | 0.0 | |
| 36. | Anacoco Lake | 19 | 16 | 84.2 | 3 | 15.7 | 15 | 78.9 | 8 | 42.0 | 7 | 36.8 | 1 | 5.2 | 0 | 0.0 | |
| 37. | Lake Charles | 5 | 3 | 60.0 | 2 | 40.0 | 1 | 20.0 | 0 | 0.0 | 2 | 40.0 | 1 | 20.0 | 0 | 0.0 | |
| 38. | Lake Arthur | 4 | 3 | 75.0 | 1 | 25.0 | 3 | 75.0 | 1 | 25.0 | 3 | 75.0 | 0 | 0.0 | 1 | 25.0 | |
| 39. | Anite River - Port Vincent | 54 | 40 | 74.0 | 14 | 25.9 | 33 | 61.1 | 9 | 16.6 | 13 | 24.0 | 1 | 1.8 | 1 | 1.8 | |
| 40A. | Spring Bayou TeLac | 38 | 31 | 81.5 | 7 | 18.4 | 28 | 73.6 | 3 | 7.8 | 10 | 26.3 | 1 | 2.6 | 0 | 0.0 | |
| 40B. | Spring Bayou Coulee Noir | 100 | 44 | 44.0 | 56 | 56.0 | 30 | 30.0 | 20 | 20.0 | 15 | 15.0 | 3 | 3.0 | 1 | 1.0 | |
| 41. | Smithport Lake | 17 | 16 | 94.1 | 1 | 5.8 | 11 | 64.7 | 1 | 5.8 | 14 | 82.3 | 1 | 5.8 | 0 | 0.0 | |
| 42. | Tangipahoa River (Hwy 190) | 18 | 5 | 27.7 | 13 | 72.3 | 4 | 22.2 | 0 | 0.0 | 3 | 16.6 | 1 | 5.5 | 1 | 5.5 | |
| 43. | Lake Verret | 27 | 27 | 100.0 | 0 | 0.0 | 22 | 81.4 | 2 | 7.4 | 4 | 14.8 | 16 | 59.2 | 1 | 3.7 | |
| 44. | Lake Providence | 44 | 33 | 75.0 | 11 | 25.0 | 4 | 9.1 | 3 | 6.8 | 9 | 20.4 | 31 | 70.4 | 0 | 0.0 | |
| 45. | Black Lake | 13 | 13 | 100.0 | 0 | 0.0 | 7 | 53.8 | 1 | 7.7 | 9 | 69.2 | 7 | 53.8 | 0 | 0.0 | |
| 46. | Cross Lake | 21 | 17 | 80.9 | 4 | 19.0 | 15 | 71.4 | 1 | 4.7 | 9 | 42.8 | 4 | 19.0 | 0 | 0.0 | |
| 47. | Cane River Lake | 34 | 26 | 76.4 | 8 | 23.5 | 24 | 70.5 | 8 | 23.5 | 22 | 64.7 | 1 | 2.9 | 0 | 0.0 | |
| 48. | Lake Bruin | 21 | 17 | 80.9 | 4 | 19.1 | 6 | 28.5 | 0 | 0.0 | 11 | 52.3 | 11 | 52.3 | 0 | 0.0 | |
| 49. | Bundicks Lake | 17 | 13 | 76.4 | 4 | 23.6 | 13 | 76.4 | 1 | 5.9 | 2 | 11.8 | 3 | 17.6 | 0 | 0.0 | |
| 50. | Pearl River | 9 | 4 | 44.4 | 5 | 55.5 | 4 | 44.4 | 0 | 0.0 | 3 | 33.3 | 0 | 0.0 | 0 | 0.0 | |
| 51. | Buhlow Lake | 36 | 16 | 44.4 | 20 | 55.5 | 5 | 13.8 | 1 | 2.7 | 10 | 27.7 | 7 | 19.4 | 1 | 2.7 | |
| 52. | Cedar Lake | 30 | 22 | 73.3 | 8 | 26.7 | 16 | 53.3 | 6 | 20.0 | 7 | 23.3 | 2 | 6.6 | 1 | 3.3 | |
| 53. | Lake St. Joseph | 25 | 22 | 88.0 | 3 | 12.0 | 22 | 88.0 | 0 | 0.0 | 3 | 12.0 | 2 | 8.0 | 0 | 0.0 | |
| 54. | Crazy Lake | 61 | 23 | 37.7 | 38 | 62.3 | 3 | 4.9 | 1 | 1.6 | 18 | 29.5 | 15 | 24.5 | 0 | 0.0 | |
| TOTALS | | 1807 | 1093 | 60.4 | 714 | 39.5 | 694 | 38.4 | 182 | 10.0 | 446 | 24.7 | 385 | 21.3 | 27 | 1.4 | |

analysis of this group showed that six hundred and ninety-four (694) or 38.4%, contained trematodes; one hundred and eighty-two (182), or 10.0%, were parasitized by cestodes; four hundred and forty-six (446), or 24.7% were infested by nematodes; three hundred and eighty-five (385), or 21.3%, were the hosts of acanthocephalans, and twenty-seven (27), or 1.4%, were associated with such forms as leeches and arthropods. Bennett (1956) in studying fish parasites in the Louisiana Dingell-Johnson Project F-5-R area found a high incidence of parasitism. He stated that one or more kinds of parasites were found in ninety-six percent (96%) of game fishes and eighty-seven percent (87%) of the rough fishes. Miller and Bennett (1957) studied six hundred and twenty-nine (629) fishes which represented fourteen (14) families and thirty-one (31) species. These were taken from twenty-six (26) localities. In this research report Miller and Bennett discussed only the incidence of digenetic trematode parasitism. They stated that three hundred and eighty-six (386) of the six hundred and twenty-nine (629), or 61.3%, were parasitized. This is still somewhat higher than recorded in the current survey (Plate III). The

PLATE III

| HOST NO. | FISH HOST | INCIDENCE OF PARASITISM BY HOST | | | | | | | | | | | | | | |
|----------|-------------------------------------|---------------------------------|------|----------|-----|-----------------------|-----|------------|-----|----------|-----|-----------|-----|---------|----|--------|
| | | FISH STATISTICS | | | | PARASITISM STATISTICS | | | | | | | | | | |
| | | Number of Fishes | | Infested | | Negative | | Trematodes | | Cestodes | | Nematodes | | Acantho | | Others |
| No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | |
| 1 | <i>Alosa chrysochloris</i> | 4 | 0 | 0.0 | 4 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 2 | <i>Anguilla rostrata</i> | 2 | 1 | 50.0 | 1 | 50.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 50.0 |
| 3 | <i>Amia calva</i> | 2 | 1 | 50.0 | 1 | 50.0 | 0 | 0.0 | 1 | 50.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 4 | <i>Aplodinotus grunniens</i> | 7 | 4 | 57.1 | 3 | 42.8 | 2 | 28.6 | 1 | 14.3 | 3 | 42.8 | 1 | 14.3 | 0 | 0.0 |
| 5 | <i>Carassius auratus</i> | 1 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 6 | <i>Centrarchus macropterus</i> | 23 | 8 | 34.8 | 15 | 65.1 | 4 | 17.4 | 6 | 26.0 | 6 | 26.0 | 0 | 0.0 | 0 | 0.0 |
| 7 | <i>Chaenobryttus gulosus</i> | 154 | 123 | 79.8 | 31 | 20.1 | 78 | 50.6 | 12 | 7.7 | 50 | 32.5 | 39 | 25.3 | 3 | 1.8 |
| 8 | <i>Cynoscion arenarius</i> | 4 | 2 | 50.0 | 2 | 50.0 | 2 | 50.0 | 0 | 0.0 | 0 | 0.0 | 1 | 25.0 | 0 | 0.0 |
| 9 | <i>Cyprinus carpio</i> | 3 | 1 | 33.3 | 2 | 66.6 | 1 | 33.3 | 0 | 0.0 | 0 | 0.0 | 1 | 33.3 | 0 | 0.0 |
| 10 | <i>Dorosoma cepedianum</i> | 59 | 10 | 16.9 | 49 | 83.0 | 4 | 6.7 | 3 | 5.1 | 2 | 3.3 | 5 | 8.4 | 1 | 1.6 |
| 11 | <i>Dorosoma petenense</i> | 64 | 7 | 10.9 | 57 | 89.1 | 0 | 0.0 | 0 | 0.0 | 2 | 3.1 | 7 | 10.9 | 0 | 0.0 |
| 12 | <i>Erimyzon oblongus</i> | 6 | 3 | 50.0 | 3 | 50.0 | 0 | 0.0 | 3 | 50.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 13 | <i>Erimyzon sucetta</i> | 1 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 14 | <i>Esox americanus vermiculatus</i> | 12 | 1 | 8.3 | 11 | 91.7 | 1 | 8.3 | 0 | 0.0 | 1 | 8.3 | 0 | 0.0 | 0 | 0.0 |
| 15 | <i>Esox niger</i> | 1 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 16 | <i>Fundulus chrysotus</i> | 3 | 2 | 66.6 | 1 | 33.3 | 0 | 0.0 | 0 | 0.0 | 1 | 33.3 | 2 | 66.6 | 0 | 0.0 |
| 17 | <i>Gambusia affinis</i> | 1 | 1 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 |
| 18 | <i>Ictalurus furcatus</i> | 2 | 2 | 100.0 | 0 | 0.0 | 1 | 50.0 | 0 | 0.0 | 2 | 100.0 | 0 | 0.0 | 0 | 0.0 |
| 19 | <i>Ictalurus melas</i> | 6 | 3 | 50.0 | 3 | 50.0 | 0 | 0.0 | 2 | 33.3 | 1 | 16.7 | 0 | 0.0 | 0 | 0.0 |
| 20 | <i>Ictalurus natalis</i> | 16 | 5 | 31.2 | 11 | 68.7 | 2 | 12.5 | 2 | 12.5 | 3 | 18.7 | 3 | 18.7 | 1 | 6.3 |
| 21 | <i>Ictalurus punctatus</i> | 35 | 5 | 13.8 | 31 | 86.1 | 2 | 5.5 | 3 | 8.3 | 4 | 11.1 | 1 | 2.7 | 3 | 8.3 |
| 22 | <i>Ictiobus bubalus</i> | 8 | 2 | 25.0 | 6 | 75.0 | 0 | 0.0 | 0 | 0.0 | 0 | 25.0 | 1 | 12.5 | 0 | 0.0 |
| 23 | <i>Labidesthes sicculus</i> | 16 | 3 | 18.7 | 13 | 81.2 | 2 | 12.5 | 0 | 0.0 | 0 | 0.0 | 1 | 6.2 | 0 | 0.0 |
| 24 | <i>Lepisosteus oculatus</i> | 6 | 3 | 50.0 | 3 | 50.0 | 0 | 0.0 | 2 | 33.3 | 0 | 0.0 | 1 | 16.6 | 0 | 0.0 |
| 25 | <i>Lepisosteus spatula</i> | 2 | 1 | 50.0 | 1 | 50.0 | 0 | 0.0 | 1 | 50.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 26 | <i>Lepomis cyanellus</i> | 11 | 11 | 100.0 | 0 | 0.0 | 4 | 36.3 | 0 | 0.0 | 4 | 36.3 | 5 | 45.4 | 1 | 9.0 |
| 27 | <i>Lepomis humilis</i> | 13 | 12 | 92.3 | 1 | 7.6 | 8 | 61.5 | 0 | 0.0 | 3 | 23.0 | 2 | 15.4 | 0 | 0.0 |
| 28 | <i>Lepomis macrochirus</i> | 415 | 348 | 83.8 | 67 | 16.1 | 265 | 63.8 | 62 | 14.9 | 116 | 27.9 | 88 | 21.2 | 7 | 1.7 |
| 29 | <i>Lepomis megalotis</i> | 46 | 27 | 58.7 | 19 | 41.3 | 16 | 34.8 | 1 | 2.1 | 9 | 19.5 | 7 | 16.9 | 0 | 0.0 |
| 30 | <i>Lepomis microlophus</i> | 290 | 217 | 74.8 | 73 | 25.1 | 118 | 40.6 | 19 | 6.6 | 82 | 28.3 | 98 | 33.9 | 5 | 1.7 |
| 31 | <i>Lepomis punctatus</i> | 67 | 59 | 88.0 | 8 | 11.9 | 43 | 64.1 | 25 | 37.3 | 12 | 17.9 | 6 | 8.9 | 0 | 0.0 |
| 32 | <i>Lepomis spp.</i> | 2 | 0 | 0.0 | 2 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 33 | <i>Lucania parva venusta</i> | 1 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 34 | <i>Micropogon undulatus</i> | 21 | 19 | 90.4 | 2 | 9.5 | 5 | 23.8 | 0 | 0.0 | 11 | 52.3 | 10 | 47.6 | 0 | 0.0 |
| 35 | <i>Micropogon salmoides</i> | 153 | 96 | 62.7 | 57 | 37.2 | 73 | 46.4 | 26 | 16.9 | 66 | 43.1 | 86 | 56.1 | 0 | 0.0 |
| 36 | <i>Minytrema melanops</i> | 3 | 1 | 33.3 | 2 | 66.6 | 0 | 0.0 | 0 | 0.0 | 1 | 33.3 | 0 | 0.0 | 0 | 0.0 |
| 37 | <i>Mollinnesia latipinna</i> | 1 | 1 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 |
| 38 | <i>Moxostoma poecilurum</i> | 2 | 1 | 50.0 | 1 | 50.0 | 0 | 0.0 | 0 | 0.0 | 1 | 50.0 | 0 | 0.0 | 0 | 0.0 |
| 39 | <i>Mugil cephalus</i> | 2 | 0 | 0.0 | 2 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 40 | <i>Notemigonus crysoleucas</i> | 27 | 2 | 7.4 | 25 | 92.6 | 0 | 0.0 | 0 | 0.0 | 2 | 7.4 | 0 | 0.0 | 0 | 0.0 |
| 41 | <i>Notropis amabilis</i> | 5 | 1 | 20.0 | 4 | 80.0 | 1 | 20.0 | 0 | 0.0 | 0 | 0.0 | 1 | 20.0 | 0 | 0.0 |
| 42 | <i>Notropis maculatus</i> | 1 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 43 | <i>Paralichthys lethostigma</i> | 1 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 | 0 | 0.0 | 1 | 100.0 | 1 | 100.0 | 0 | 0.0 |
| 44 | <i>Pylodictus olivaris</i> | 1 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 45 | <i>Phenacobius mirabilis</i> | 12 | 0 | 0.0 | 12 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 46 | <i>Pimephales notatus</i> | 3 | 0 | 0.0 | 3 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 47 | <i>Pimephales vigilax</i> | 24 | 0 | 0.0 | 24 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 48 | <i>Pomoxis annularis</i> | 50 | 26 | 52.0 | 24 | 48.0 | 19 | 38.0 | 3 | 6.0 | 15 | 30.0 | 1 | 2.0 | 1 | 2.0 |
| 49 | <i>Pomoxis nigromaculatus</i> | 138 | 42 | 30.4 | 96 | 69.6 | 13 | 9.4 | 2 | 1.4 | 38 | 27.5 | 2 | 1.4 | 5 | 3.6 |
| 50 | <i>Roccus chrysope</i> | 2 | 2 | 100.0 | 0 | 0.0 | 0 | 0.0 | 2 | 100.0 | 0 | 0.0 | 1 | 50.0 | 0 | 0.0 |
| 51 | <i>Roccus mississippiensis</i> | 52 | 38 | 73.1 | 14 | 26.8 | 31 | 59.6 | 5 | 9.6 | 6 | 11.5 | 3 | 5.7 | 0 | 0.0 |
| 52 | <i>Tilapia mossambica</i> | 25 | 1 | 4.0 | 24 | 96.0 | 1 | 4.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| TOTALS | | 1807 | 1093 | 60.4 | 714 | 39.5 | 698 | 38.4 | 182 | 10.0 | 446 | 24.7 | 385 | 21.3 | 27 | 1.4 |

present study more than doubled the number of collection sites used in the Miller and Bennett survey. These collection sites, fifty-four (54) in number, are shown in Plate I, while Plate II shows the incidence of parasitism by collection sites.

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SUMMARY

This survey of the parasites of the freshwater fishes of Louisiana was undertaken in 1960. Field collections from fifty-four (54) localities were continued until 1962. Eighteen hundred and seven (1807) fishes belonging to seventeen (17) families and fifty-two (52) species were included in this study. One thousand and ninety-three (1093), or 60.4%, were found to be parasitized. An analysis of this group showed the following degrees of parasitism—six hundred and ninety-four (694) fishes with trematodes—38.4%; one hundred and eighty-two (182) fishes with cestodes—10.0%; four hundred and forty-six (446) fishes with nematodes—24.7%; three hundred and eighty-five (385) fishes with acanthocephalans—21.3%, and twenty-seven (27) fishes with such forms as leeches and arthropods—1.4%.

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SOME FISHES FROM THE UPPER MISSOURI RIVER SYSTEM IN COLORADO

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Fishes present in tributaries of the upper Missouri River system in Larimer County, Colorado, were studied during the summer of 1961. Going out from Colorado State University at Fort Collins, it was possible to visit streams, observe the fishes in their natural habitats, and obtain specimens from the area.