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Food Habits of Rainbow Trout Stocked in Argyle Lake, Illinois

Larry A. Jahn and Daniel J. Lendman
Department of Biological Sciences
Western Illinois University
Macomb, IL 61455

ABSTRACT

Rainbow trout were stocked in Argyle Lake, a 95-acre impoundment in the Lamoine River drainage, McDonough County, Illinois, in October, 1989, as part of the state's put-and-take program. Trout food habits examined during 1989-1991 showed that cladocerans were the major food item found in fall but dipterans were also common. In winter, stomachs contained trichopterans and other benthic invertebrates as well as organic matter, indicating trout switched to benthic foraging. With prolonged ice cover, juvenile bluegills became the major food item with up to 6 per stomach recorded. Immediately after ice-out, dipterans were the most abundant item with cladocerans dominating somewhat later. Food items for trout were similar to those of juvenile bluegills in the fall and spring. As a result, trout may benefit largemouth bass/bluegill populations by reducing numbers of juvenile bluegills during the winter and lessening food competition between juvenile bass and remaining bluegills.

INTRODUCTION

Rainbow trout (*Oncorhynchus mykiss*) have been stocked in certain Illinois lakes to provide anglers with additional fishing opportunities. Because many trout are not caught and survive until the following summer, their food habits may impact those of resident fishes. No prior trout food habit studies in Illinois have extended beyond 30 days after stocking, so the present study was initiated to investigate what foods trout utilize after that time.

MATERIALS AND METHODS

Rainbow trout that were stocked in October of 1989 and 1990 and averaged 10.5 ± 0.43 in. (7.6 ± 0.2 oz) and 9.9 ± 0.76 in. (7.2 ± 0.5 oz), respectively, were studied in Argyle Lake, McDonough County, Illinois. About 9,500 trout (100 per acre) were stocked each year. These trout were reared at the Jake Wolf Memorial Fish Hatchery, Manito, Illinois. Trout were collected for food habits via angler catches during the fishing season. In addition, largemouth bass (*Micropterus salmoides*) and bluegill (*Lepomis macrochirus*) were collected for stomach content analysis using electrofishing and seining in the fall of 1989 and spring and fall of 1990.

Stomach contents of trout and larger bass were taken by inserting a clear plastic tube into the stomach of each fish. This method removed at least 95% of stomach contents (Gilliland and Clady 1981) and it allowed fish to be returned alive to the lake or the anglers. Water was poured down the tube to flush any contents into a collection bag with 10% formalin. Whole bluegill and smaller bass collected were preserved in 10% for later dissection. Food items were classified to order and recorded as percent occurrence by month for each species. All other organic matter was designated as detritus. Morisita's index of community similarity (Eckblad 1989) was used to determine dietary overlap. Index values could range from 0.0 to 1.0; a value of 0.6 or higher was considered to be the threshold for food competition (Kruse and Durham 1989).

RESULTS AND DISCUSSION

The percentage of trout containing food was high throughout the study; 85-100% of fish sampled contained some form of food at all sampling times (Tables 1 and 2). Trout began feeding several days after being stocked. Those sampled on opening day of trout season both years contained up to several hundred *Daphnia*, even though trout were in the lake for 3 or 4 days. *Daphnia* remained the most prevalent item from October through December in both 1989 and 1990 with 72-100% containing several hundred of them. Similar feeding habits were found for rainbow trout in Payne Lake, Alberta, Canada, where *Daphnia* predominated summer food items (Barton and Bidgood 1980). Trout under 9.9 in. fed heavily on *Daphnia* in summer and fall in Lake Washington (Beauchamp 1990). Lake Argyle trout also ate dipterans (mostly chironomids) in fall of both years (Tables 1 and 2) with lesser amounts of coleopterans and hemipterans.

Trout switched to more benthic foraging beginning in December since *Daphnia* were not found then. Dipterans were most frequently found in stomachs (50% occurrence) followed by odonates and hemipterans (Table 2). In January, 1991, large trichopterans (1.0-1.5 in) were found in about one third of the trout which contained one or more of these larvae. Hatchery-reared rainbow trout fed heavily on trichopterans in the Salmon River, New York in winter (Johnson 1981). Argyle Lake trout contained other benthic organisms including other dipterans, odonates, hemipterans, ephemeropterans and amphipods. In addition, one to six juvenile bluegills (under 2 in.) occurred in 10% of stomachs in January, 1991, but increased to 38% in February and became the predominate food item.

Trout returned to feeding on available zooplankton and insect larvae during March through May (Tables 1 and 2). Chironomids were the major item found early in March until *Daphnia* became abundant later in the month. More insect larvae were consumed as they increased in spring and a variety of invertebrates were also eaten including coleopterans, dipterans, gastropods, odonates, and trichopterans suggesting more limnetic foraging. Similar feeding was found in trout in the prairie pothole region in Manitoba, Canada (Olenick 1981) where limnetic insect larvae were consumed almost exclusively from May through August.

Corn and marshmallows appeared in many months because of their use as bait by anglers, especially in October and November when trout fishing had just begun and fishing pressure was high (Tables 1 and 2). No trout were caught after May, perhaps because the surface water was warming and less dissolved oxygen caused unsuitable conditions for trout survival.

About 95% of juvenile bluegills (under 4 in.) sampled in November, 1989, consumed many *Daphnia*, similar to the trout (Table 3). In May, 1990, bluegills again fed on *Daphnia* but the percent occurrence of chironomids was nearly as high. Juvenile largemouth bass were mainly piscivorous in fall of both years, but in spring, the smaller juveniles consumed cladocerans, dipterans, and hemipterans in addition to small fish (Table 4). Trout and bluegills had substantial dietary overlap in both fall, 1989, and spring, 1990, using Morisita's index of community similarity (Table 5). However, trout and bluegills did not show substantial dietary overlap in fall, 1990, because bluegills were sampled in early September when they were eating abundant chironomid larvae and other insects. *Daphnia* were virtually absent from bluegill stomachs during September (Table 3). Trout and largemouth bass did not have substantial dietary overlap in fall 1989 and 1990 (Table 5) but they did in spring, 1990, when bass fed on aquatic insects and zooplankton in addition to small fish. Thus, trout may have competed with juvenile bluegills and largemouth bass during October through November and March through April when eating *Daphnia* and aquatic insects. This is similar to other studies in which trout of similar sizes to Argyle trout were planktivorous and competed with Kokanee salmon, speckled dace, and Utah chub for a zooplankton forage base (Johnson 1982; Schniedervin and Hubert 1985; Stuber et al. 1985). Kruse and Durham (1989) found that trout did not compete with juveniles of native warmwater species in three small impoundments in Illinois. However, Argyle Lake trout remained in the lake longer and in greater numbers, since 60-100% were caught by anglers within 30 days after stocking in these three lakes. Their food was mostly canned corn used as bait by fishermen.

By remaining in the lake for up to 7 mo., trout may have helped reduce small bluegills by direct predation in winter and utilizing plankton and insects that bluegills also ate. Juvenile largemouth bass may have benefitted due to trout reducing juvenile bluegills which feed on similar food as young bass. Since bluegills can overpopulate and stunt if their numbers increase dramatically (Bennett 1970), trout may benefit a bass/bluegill fishery by utilizing the same food resources as juvenile bass and bluegills as well as consuming juvenile bluegills during the winter.

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Table 1. Percent occurrence of food items in rainbow trout stomachs in Argyle Lake from October, 1989 through May, 1990.

Food type	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
Cladocera	72	100	44	0	70	83	89	67
Diptera	39	68	33	50	91	70	67	67
Trichoptera	0	0	0	0	0	30	22	50
Odonata	0	0	0	0	37	43	33	50
Coleoptera	28	37	11	0	30	26	67	50
Hemiptera	6	0	0	0	0	17	0	0
Ephemeroptera	6	0	0	0	0	0	0	0
Detritus	78	53	78	100	43	56	67	100
Gastropoda	0	0	0	0	0	22	44	67
Corn	22	21	44	0	26	35	22	50
Marshmallows	39	26	0	0	9	9	0	0
No. Fish	21	19	9	4	27	23	9	6
No. with food	18	19	9	4	23	23	9	6
Percent	86	100	100	100	85	100	100	100

Table 2. Percent occurrence of food items in rainbow trout stomachs in Argyle Lake from October, 1990 through March, 1991.

Food type	Oct.	Nov.	Dec.	Jan	Feb.	Mar
Cladocera	97	96	50	1	0	0
Diptera	53	46	50	35	29	77
Trichoptera	0	0	0	32	10	12
Odonata	0	21	43	15	11	23
Coleoptera	23	32	0	2	0	7
Hemiptera	23	0	36	15	21	0
Ephemeroptera	0	0	0	10	13	9
Amphipoda	0	0	0	13	29	0
Podacopa	0	0	0	1	0	0
Megaloptera	0	0	0	1	2	0
Detritus	77	79	100	94	91	98
Corn	37	36	29	2	7	69
Marshmallows	30	18	0	0	0	0
Waxworms	0	0	0	21	10	12
Bluegills	0	0	0	10	41	0
Mollusca	0	0	0	0	3	0
No. Fish	37	28	14	134	53	23
No. with food	30	28	14	126	48	18
Percent	86	100	100	94	91	78

Table 3. Percent occurrence of food items in juvenile bluegill stomachs in Argyle Lake.

Food type	Nov. 1989	May 1990	Sept. 1990
Cladocera	98	56	0
Diptera	30	54	70
Odonata	2	22	0
Coleoptera	20	3	3
Mollusca	0	50	0
Trichoptera	0	0	19
Hemiptera	0	0	3
Amphipoda	5	0	8
Detritus	5	43	62
No. Fish	44	75	53
No. with food	44	69	37
Percent	100	92	70

Table 4. Percent occurrence of food items in juvenile largemouth bass stomachs in Argyle Lake.

Food type	Nov. 1989	May 1990	Sept. 1990
Unid. Fish	59	38	13
Bluegills	37	0	75
Green Sunfish	7	0	0
Largemouth Bass	6	0	0
Hemiptera	4	19	75
Diptera	0	38	0
Cladocera	0	19	0
Crayfish	9	13	13
No. Fish	81	25	8
No. with food	54	16	8
Percent	67	64	100

Table 5. Dietary overlap of juvenile bluegills and bass with rainbow trout in Argyle Lake using Morisita's index of community similarity.

	Morisita's values
Fall 1989	
Bluegills (N=44)	0.957
Largemouth Bass (N=54)	0.002
Spring 1990	
Bluegills (N=69)	0.879
Largemouth Bass (N=16)	0.608
Fall 1990	
Bluegills (N=37)	0.425
Largemouth Bass (N=8)	0.070