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FEEDING CHRONOLOGY AND FOOD HABITS OF THE BLACKTAIL SHINER, *NOTROPIS VENUSTUS* (CYPRINIDAE), IN BAYOU SARA, LOUISIANA

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ABSTRACT. Blacktail shiners, *Notropis venustus*, were collected in Bayou Sara, West Feliciana Parish, Louisiana, every three hours over a 24-hour period on two different days (12–13 April and 27–28 June, 1975) to determine feeding chronology and food habits of this species. Peak feeding activity was just prior to sunset. Feeding was sporadic at night, lowest just prior to sunrise, and increased steadily after sunrise. *Notropis venustus* is predominantly carnivorous. Terrestrial insects were the major food items. Feeding activity appeared to be a function of the availability of food organisms.

Hoar (1942) believed that his study of feeding rhythmicity for two salmonid species was the first of its kind. Studies of diel feeding rhythms in North American cyprinids are few (Starrett 1950; Phillips 1969; Hoyt 1970; Tarter 1970; Barber and Minckley 1971; White and Wallace 1973; Mathur and Ramsey 1974; Heins and Clemmer 1975) considering that there are about 230 species of North American cyprinids (Bailey 1966).

The objectives of this investigation were to determine the 24-hour feeding chronology and food habits of the blacktail shiner, *Notropis venustus* (Girard), in Bayou Sara, Louisiana. Systematics of *N. venustus* were studied by Gibbs (1957), but the only information yet available on life history of this, the most abundant and most widely distributed cyprinid in Louisiana (Douglas 1974), pertain to habitat (Gibbs 1957) and parasites (Dolley 1940; Arnold et al. 1967; Arnold et al. 1968). Hale (1963) listed food items from 16 specimens of *N. venustus* taken from Lake Texoma, Oklahoma.

MATERIALS AND METHODS. Specimens were collected on 12–13 April and 27–28 June, 1975, in Bayou Sara, 1.4 km N Hollywood, West Feliciana Parish, Louisiana. Two collection dates, in spring and summer, were chosen to deter-

mine if feeding rhythms were correlated with sunset time. Collections were made every three hours over a 24-hr period with a 3-m (6-mm mesh) seine. Specimens were preserved in 10 percent formalin upon capture. A total of 400 specimens, 25 from each collection time of the two different sampling dates, was examined for feeding rhythm "Percent fullness" of each alimentary tract (gut) was estimated visually and designated as empty, less than 25 percent, 26–50 percent, 51–75 percent or 76 percent to full. A total of 50 specimens was examined to determine percent occurrence and volume of food items. Rate of movement of food through the gut was determined by the method of White and Wallace (1973).

DIEL FEEDING CHRONOLOGY AND MOVEMENT OF FOOD THROUGH THE ALIMENTARY TRACT. Change in gut fullness was used to obtain an estimate of feeding activity over a 24-hr period. The peak in gut fullness for fish collected in April occurred at sunset (Fig. 1). Two feeding peaks were noted for specimens obtained in June. The major peak occurred at sunset; however, 28 percent of the fish collected then had guts which were less than 25 percent full. In

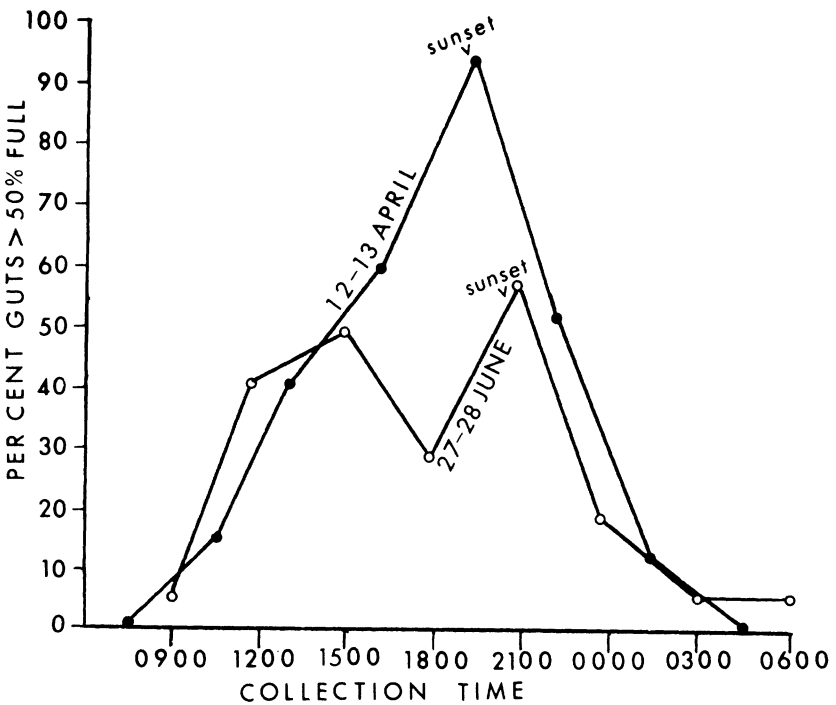

Fig. 1. Feeding chronology of *Notropis venustus* in Bayou Sara, Louisiana, on 12–13 April and 27–28 June, 1975, as determined by the percent of fish with guts greater than 50 percent full.

April, only one fish examined during peak feeding activity had a gut less than 25 percent full. The scarcity of adequate food organisms is a possible explanation. Feeding decreased during night and then increased steadily after sunrise.

By measuring rate of movement of food through the gut, we determined that food in the gut of *N. venustus* at any given time represented food consumed during the previous two hours. The gut analysis of fish collected at 3-hr intervals, therefore, reflected changes in feeding rates over the period considered. Digestion rate was equal for both collection dates. Water temperature, a primary factor determining digestion rate, was 23°C on 12 April and 25.5°C on 28 June when digestion was determined.

FOOD HABITS. Mean percent volume and occurrence of food items of 50 *N. venustus* is presented in Table 1. The major food items of the fish collected in April were isopterans, represented by the common eastern subterranean termite *Reticulotermes flavipes*, and odonates.

Most food items ingested in April were terrestrial. Large numbers of winged *R. flavipes* swarmed over Bayou Sara and probably were ingested at the surface of the water. *Reticulotermes flavipes* is known to swarm in southern Louisiana from early February to early May (Weesner 1965). Small, flat, brown seeds were the predominant plant material found in the guts. A large sand bolus, which comprised 75–100 percent of the gut volume, was found in several fish collected at 1630 hours. No food organisms were noted intermingled among the sand grains comprising the bolus. If *N. venustus* were feeding on benthic organisms one might expect a few sand grains to be present in the gut, but the absence of food organisms with the sand bolus seemed unusual. Hale (1963) noted that *N. venustus* ingested a higher percentage of sediment than did *N. lutrensis*.

The food of specimens collected in June differed markedly from that of specimens obtained in April (Table 1). Termites and dipterans were the predominant food organisms. The ingested dipterans were winged adults.

Notropis venustus appears to be primarily a surface feeder in Bayou Sara, possibly because of the scarcity of benthic invertebrates in this stream. Odonate larvae were the only benthic macroinvertebrates found in the guts, and were the only macrobenthos collected while seining. Many seine hauls through both riffles and pools did not reveal the presence of macrobenthic organisms (e.g., dipterans, coleopterans). Hale (1963) reported than *N. venustus* predominantly ingested

TABLE 1

Percent occurrence and volume of food items in Notropis venustus on 12–13 April and 27–28 June. Fifty fish were examined.

Food Item	% occurrence		% volume	
	12–13 April	27–28 June	12–13 April	27-28 June
Isoptera				
Reticulotermes flavipes	72	80	56	26
Diptera	16	64	5	19
Odonata	16	40	10	10
Coleoptera	8	0	3	0
Plant Material	20	20	2	3
Unidentifiable Material	92	100	27	42

bottom dwelling organisms as a possible means of alleviating competition for food with the surface-feeding *N. lutrensis.*

The preponderance of terrestrial insects as food items in *N. venustus* agrees with the findings of Starrett (1950) and Stone (1940) for *N. spilopterus*, another member of the subgenus *Cyprinella.* Starrett also noted a large amount of plant material and a low volume of dipteran larvae. White and Wallace (1973), however, stated that terrestrial insects and plant material were relatively unimportant in the diet of *N. spilopterus* in Michigan, with the diet consisting almost entirely of macroinvertebrate larvae. Thus it appears that the predominance of terrestrial insects in the diet of *N. venustus* from Bayou Sara was correlated with the scarcity of benthic food organisms.

DISCUSSION. Several stimuli, acting individually or collectively, are responsible for feeding periodicity in fishes. Peak feeding on both collection dates occurred at maximum temperature for that day. Decrease in night feeding was the pattern in both April and June when there was a 10°C and 1.5°C drop in temperature, respectively, from sunset to sunrise.

Photoperiod has been postulated as a factor influencing feeding rhythmicity (Keast and Welsh 1968). The feeding chronology of most cyprinids studied consists of a peak during late afternoon or dusk followed by decreased feeding at night with increased feeding intensity after sunrise. For carnivorous species, light is probably more of a factor influencing the movement of food organisms (making them more available for consumption) than it is a feeding stimulus. Peak feeding in *N. venustus* was on winged insects which are more prevalent during the twilight hours. Starrett (1950) correlated peak feeding activity

of several species of shiners in the Des Moines River with the emergence of ephemeropterans and trichopterans mainly during late afternoon and at dusk. Keast and Welsh (1968) noted clearcut shifts in the food items of *Lepomis gibbosus* with hour of day, and these shifts conformed, in part, with what is known of cycles of activity in the food organisms consumed. Ide (1942) found that brook trout (*Salvelinus fontinalis*) contained no *Simulium* in the morning, prior to their emergence, but contained large numbers at the height of emergence during forenoon.

Feeding activity of *N. venustus* appears to depend on food availability. The feeding peak at sunset on both collection dates apparently was due to a photoperiodic effect which caused termites to swarm and become available for consumption by fishes. A distinct feeding peak was not noted for *N. chrysocephalus isolepis* from Bayou Sara (Hambrick and Hibbs, 1976), because food is continually available for this omnivorous species.

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LITERATURE CITED

ARNOLD, J. G., JR., H. E. SCHAFER, D. GEAGAN, and R. L. VULLIET. 1967. The parasites of the freshwater fishes of Louisiana. I. Incidence and distribution of parasitism. Proc. Southeastern Assoc. Game and Fish Comm. 20: 462–468.

ARNOLD, J. G., JR., H. E. SCHAFER, and R. L. VULLIET. 1968. The parasites of the freshwater fishes of Louisiana. II. Checklist of parasites. Proc. Southeastern Assoc. Game and Fish Comm. 21: 531–543.

BAILEY, R. M. 1966. Cypriniformes. Pp. 649–650, *in* McGraw-Hill Encyclopedia of Science and Technology, vol. 3, McGraw-Hill, New York, 662 pp.

BARBER, W. E., and W. L. MINCKLEY. 1971. Summer foods of the cyprinid fish *Semotilus atromaculatus*. Trans. Amer. Fish. Soc. 100: 283–289.

DOLLEY, J. S. 1940. A new lernaean (parasitic copepod) from minnows in Lafayette County, Mississippi. Trans. Amer. Micr. Soc. 59: 70–77.

DOUGLAS, N. H. 1974. Freshwater fishes of Louisiana. Claitor Publ. Co., Baton Rouge, Louisiana, 443 pp.

GIBBS, R. H., JR. 1957. Cyprinid fishes of the subgenus *Cyprinella* of *Notropis*. III. Variation and subspecies of *Notropis* venustus (Girard). Tulane Stud. Zool. 5: 175–203.

HALE, C. H. 1963. A comparative study of the food of the shiners *Notropis lutrensis* and *Notropis venustus*. Proc. Oklahoma Acad. Sci. 43: 125–129.

HAMBRICK, P. S., and R. G. HIBBS, JR. 1976. Spring diel feeding activity of the southern striped shiner, *Notropis chrysocephalus isolepis* Hubbs and Brown, in Bayou Sara, Louisiana. Proc. Louisiana Acad. Sci. 39: 16–18.

HEINS, D. C., and G. H. CLEMMER. 1975. Ecology, foods and feeding of the longnose shiner, *Notropis longirostris* (Hay), in Mississippi. Amer. Midland Nat. 94: 284–295.

HOAR, W. S. 1942. Diurnal variations in feeding activity of young salmon and trout. J. Fish. Res. Bd. Canada 6: 90–101.

HOYT, R. D. 1970. Food habits of the silverjaw minnow, *Ericymba buccata* Cope, in an intermittent stream in Kentucky. Amer. Midland Nat. 84: 226–236.

IDE, F. P. 1942. Availability of aquatic insects as food of the speckled trout, *Salvelinus fontinalis*. Trans. N. Amer. Wildl. Conf. 7: 442–450.

KEAST, A., and L. WELSH. 1968. Daily feeding periodicities, food uptake rates, and dietary changes with hour of day in some lake fishes. J. Fish. Res. Bd. Canada 25: 1133–1144.

MATHUR, D., and J. S. RAMSEY. 1974. Food habits of the rough shiner, *Notropis baileyi* Suttkus and Raney, in Halawakee Creek, Alabama. Amer. Midland Nat. 92: 84–93.

PHILLIPS, G. L. 1969. Diet of minnow *Chrosomus erythrogaster* (Cyprinidae) in a Minnesota stream. Amer. Midland Nat. 82: 99–109.

STARRETT, W. C. 1950. Food relationships of the minnows of the Des Moines River, Iowa. Ecology 31: 216–233.

STONE, U. B. 1940. Studies on the biology of the satinfin minnows, *Notropis analostanus* and *Notropis spilopterus*. Unpubl. Ph.D. dissert., Cornell Univ., Ithaca, New York, 37 pp.

TARTER, D. C. 1970. Food and feeding habits of the western blacknose dace, *Rhinichthys atratulus meleagris* Agassiz, in Doe Run, Meade County, Kentucky. Amer. Midland Nat. 83: 134–159.

WEESNER, F. M. 1965. The termites of the United States: A handbook. National Pest Control Assoc., 70 pp.

WHITE, S. T., and D. C. WALLACE. 1973. Diel changes in the feeding activity and food habits of the spotfin shiner, *Notropis spilopterus* (Cope). Amer. Midland Nat. 90: 200–205.