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Size, sex and seasonal dynamics in the dietary composition of *Brycinus nurse* (Pisces: Characidae), from Asa reservoir, Ilorin, Nigeria

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Abstract: Specimens of the characid *Brycinus nurse* (N = 980) were collected in Asa reservoir, Nigeria, from November 1991 to October 1993. The diet was analyzed from stomach contents using the frequency of occurrence, numerical and gravimetric methods. Fish sex affected occurrence, number and weight of food items. The relative importance index (RI) indicates that diet varied seasonally. There was also a noticeable switch from insectivorous habits in small fish (less than 18 cm) to herbivorous feeding habits in larger fish. The ability of the fish to evolve trophic strategies that ensure optimum foraging despite seasonal changes can account for its success in the lake.

Key words: *Brycinus nurse*, Characidae, dietary composition, Nigeria.

The fish *Brycinus nurse* is native to freshwater systems in Africa, thriving well in both lacustrine and riverine conditions. Boulenger (1909) observed that they are found in the lower Nile to Lake Victoria, Lake Rudolf and Chadbasin. *Brycinus nurse* is commonly regarded as an omnivore because of its ability to utilize just about anything in its environment, its unlimitation to a strict feeding regime and its ability to feed voraciously on plants and animal matter in its habitat (August 1967).

Food and feeding habits have been known to vary for individual fish with respect to size, age, life history stage, kinds of food available, season, time of the day, as well as locality in which they are found (Lagler 1956). Similar investigations in the tropics have shown that the natural food of fish tends to vary quantitatively and qualitatively with seasons of the year (Ananichev 1961, Arawomo 1976, Ugwumba 1992, Ekpo 1993). Factors like size, age, sex, life history stage, time of feeding and food available have also been identified as being equally important in affecting the food quality of fishes in the tropics (Imevbore and Bakare 1970, Ikusemiju and Olaniyan 1977, Fagade 1978, Akintunde 1986).

This study was carried out to ascertain if there was sex, size and season related changes in the diet of *B. nurse* in Asa reservoir.

Asa reservoir has a surface area of 302 ha with a maximum depth of 14 m and is located approximately 4 km south of Ilorin township (8º28' - 8º52' N and 4º35' - 4º45' E), Nigeria.

MATERIALS AND METHODS

Nine hundred and eighty specimens of *B. nurse* were collected by bimonthly sampling, from November 1991 to October 1993. The fishes were caught using surface set gillnets of 3.81 to 5.00 cm mesh sizes. Their weights (± 0.5 g) and total lengths (± 0.5 cm), were recorded and the stomachs were removed and preserved in 4% formaldehyde. The specimens were deposited in a deep freezer in the Fisheries and

Hydrobiology Laboratory, University of Ibadan, Nigeria. In the laboratory, the stomachs were opened and the contents analyzed. The prey items were identified to the lowest taxonomic level using keys by Mellanby (1938) and Ward and Whipple (1950).

The frequency of occurrence, numerical and gravimetric methods (Hynes 1950, Ricker 1968, Hyslop 1980) were used in the analysis of the stomach contents. Since each of these methods emphasizes on the importance of different categories of food items, the relative importance index (RI) of each food item based on the absolute importance index (AI) (George and Hadley 1979, Hyslop 1980) was estimated.

The male and female mean values were subjected to T-test to ascertain if significant differences existed between them.

RESULTS

Number of fishes in each size class were 12-14 cm: 137, 15-17 cm: 533, 18-20 cm: 266, 21-23 cm: 44.

Table 1 indicates that in all the food items except Copepoda, higher values of percentage occurrence were recorded in females than the males. However only the eggs and adults of *P. adusta* (family Polymitaciidae), unidentified seeds, plant parts and detritus recorded significantly higher values in females as compared to the male fishes respectively. Similarly, female fishes were also found to feed on significantly higher numbers and weights of *P. adusta* adults and unidentified seeds respectively. Significantly, higher numbers, but not weights of *P. adusta* eggs were also recorded for females. Male fishes however fed on significantly

TABLE 1
Comparative analysis of the gut content of male and female B. nurse *in Asa Reservoir, Ilorin, Nigeria*

Food items	Frequency of occurrence		Numerical		Gravimetric	
	Male %	Female %	Male N%	Female N%	Male W%	Female W%
FLAGELATTA						
Volvox	1.22	3.27	0.06	0.36	0.002	0.003
BIVALVIA						
Aspatharia sinuata	0.31	0.82	0.05	0.08	0.0009	.001
Copepoda	0.82	0.61	0.03	0.03	0.002	0.0006
BRANCHIOPODA						
Ceriodaphnia eggs	15.82	24.29	11.05*	8.18	0.03**	0.02
Ceriodaphnia sp.	13.67	20.51	18.70***	12.26	0.05**	0.03
EPHEMEROPTERA						
Povilla adusta eggs	2.65**	8.37	4.92*	8.29	0.03	0.05
Povilla adusta	16.12**	34.80	10.61***	17.1	0.08**	0.11
ARACHNIDA						
Watermite	0.41	0.61	0.01	0.03	0.0006	0.0004
CYPRINIDAE						
Barbus scale	0.92	1.12	0.19	0.05	0.007	0.002
Barbus sp.	0.20	0.31	0.03	0.10	0.007	0.01
CHLOROPHYCEAE (Green algae)						
Spirogyra	1.84	2.76	0.13	0.27	0.006	0.004
HIGHER PLANTS						
Unidentified seeds	5.71**	15.10	8.71***	15.10	0.13**	0.27
Plant parts	21.22*	42.65	12.26	12.96	0.10	0.09
Detritus	23.67**	47.55	-	-	0.18	0.20

Significantly different at *P < 0.05, **P < 0.01, ***P < 0.001(T-test)

higher numbers and weights of *Ceriodaphnia* sp. (family Daphinidae) and *Ceriodaphnia* eggs as compared to females.

The relative importance indices of the major food items, for the various size classes are as shown in Fig. 1. It indicates that *P. adusta* eggs were the most important food item in the length groups 12-14 cm and 15-17 cm, while seeds were the most important food item in the length groups 18-20 cm and 21-23 cm. Detritus was found to be the least important food item in all the length groups.

Seasonal variation in the relative importance indices, of the major categories of food items of the various size classes of *B. nurse* is illustrated in Fig. 2. In the wet season, plant seeds were the most important food items, in fishes from 15 to 23 cm, however, the length group 12-14 cm fed predominately on *P. adusta* eggs. In the dry season, *P. adusta* eggs were the most important food item in all the length groups except 12-14 cm which fed on *Ceriodaphnia* sp.

The RI values of plant parts, *Ceriodaphnia* sp., *Ceriodaphnia* eggs, *P. adusta* eggs and detritus were higher in the dry season than in the wet season. Conversely, the RI value of seeds and *P. adusta* were higher in the wet season.

DISCUSSION

Plant seeds washed into the lake from near and far were prominent in terms of occurrence, number and weight. The abundance of the eggs of *P. adusta* in the dry season can be reasonably attributed to the presence of large numbers of egg laying individuals of the ephemeropteran. The changes in feeding habits at different times of the year in relation to food availability has been previously reported in *Citharinus* sp. (Arawomo 1976), *O. niloticus* (Maitipe and Desilva 1985), bagrid cat fishes (Ajayi 1987), *Heterotis niloticus* (Ugwumba 1992) and *S. melanotheron* (Ugwumba and Adebisi 1992).

It was interesting to note that in the size group 12-14 cm, there was maintenance of animal diets in both seasons. This was in agreement with Tudorancea *et al.* (1988) in Lake

Fig. 1. Relative importance index (RI) of the major food items in the diet of *B. nurse* from Asa reservoir, Ilorin, Nigeria.

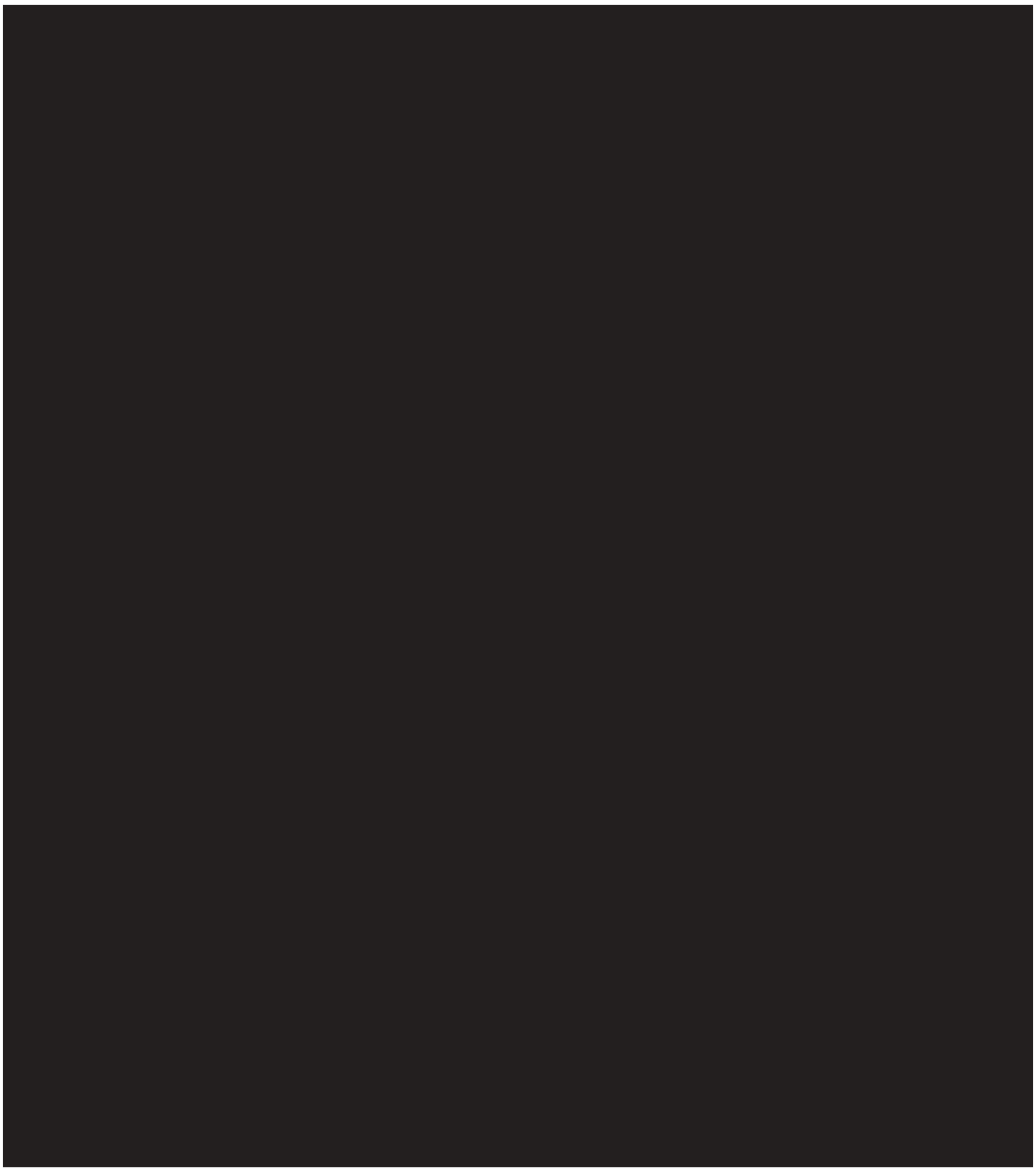

Fig. 2. Seasonal values of the relative importance index of the major food items in *B. nurse* during the wet and dry season in Asa reservoir, Ilorin, Nigeria.

Awasa, where juveniles of *O. niloticus* showed no evident seasonal pattern in feeding. The fact, however, that these size groups of *B. nurse* showed a transition in animal diet from *P. adusta* eggs in the wet season to *Ceriodaphnia* in the dry season is a further indication of selectivity of food, depending on relative abundance of food organisms as well as fish size.

However, in *B. nurse*, there was a noticeable switch from insectivorous habits in size less than 18 cm to herbivorous feeding habits in sizes equal to or greater than 18 cm.

Victor and Brown (1990) reported changes in diet in relation to size in *B. nurse*, and *B. longipinnis* in a perturbed river in Benin City.

Similar observations have been made in other tropical fishes, *Oreochromis niloticus* (Akintude 1986), fry of *S. melanotheron* (Ugwumba and Adebisi 1992) and *H. niloticus* (Ugwumba 1992). This can be accounted for by the relative availability of the various food items in the immediate vicinity of each size group and not necessarily by differences of food selection habits of the various size groups. This is an indication of low degree intraspecific competition of food among various size groups of the fish.

The observed variation in dietary composition with sex was accounted for by the bigger sizes attained by females enabling them to utilize larger food items available, while the small sizes of the males placed them at a disadvantage.

Sex related variations as well as size and seasonal variations were observed in the dietary composition of *B. nurse* in Asa reservoir, Ilorin, Nigeria. Furthermore, it was seen that what determined the diet of the species in its environment is not its particular food item, but the food item that was dominant in the environment. The ability to utilize this wide variety of food items available in its habitat accounted for the prominence of the species in Asa reservoir.

RESUMEN

Se recolectaron especímenes del charácido *Brycinus nurse* (N = 980) en la reserva Asa, Nigeria, desde noviembre 1991 hasta octubre 1993. Se analizó la dieta con los contenidos estomacales usando los métodos numérico, gravimétrico y de frecuencia de aparición. El sexo del pez afectó la aparición, el número y el peso de los tipos de alimento. El índice de importancia relativa (RI) indica que la dieta varió estacionalmente. También hubo un notable cambio de los hábitos insectívoros en peces pequeños (menos de 18 cm) a los herbívoros en peces más grandes. La habilidad de los peces de evolucionar estrategias tróficas que aseguran una búsqueda de alimento óptima a pesar de los cambios estacionales, puede ser la razón de su éxito en el lago.

REFERENCES

Ajayi, T.O. 1987. The food and feeding habits and the predation on the family Bagridae (Pisces: Siluroidea) in Lake Kainji, Nigeria. Arch. Hydrobiol.109: 583-600.

Akintunde, E.A. 1986. Food and feeding habits of *Tilapia* and *Sarotherodon* species in Lake Kainji, Nigeria. Nig. J. Appl. Sci. 4: 33-52.

Ananichev, A.B. 1961 Comparative biochemical data for some freshwater invertebrates and fish. Biochemistry 26: 16-26.

Arawomo, C.O. 1976. Food and feeding of three *Citharinus* species in Lake Kainji, Nigeria. J. Fish Biol. 9: 3-10.

August, R.J.D. 1967. Notes on juveniles of commercial fish attracted to light on the Volta Lake. Univ. of Ghana Basin Research Project. Technical Report X 21: 7-10.

Boulenger, G.A. 1909. Catalogue of the freshwater fishes of Africa. In the British Museum. 1: 205-208.

Ekpo, A.O. 1993. Growth, feeding and reproductive biology of *Hydrocynus forskalii, Alestes macrolepidotus* and *Channa obscura* in Asejire Reservoir, Nigeria. Ph.D. Thesis, University of Ibadan, Ibadan. 209 p.

Fagade, S.O. 1978. On the biology of *Tilapia guineenisis* (Dumeril) from the Lekki Lagoon, Lagos, Nigeria. Nig. J. Sci. 12: 73-87.

George, E.L. & W.F. Hadley. 1979. Food and habitat partitioning between rock bass (*Ambloplites rupestris*) and small mouth bass (*Micropterus dolomieni*) young of the year. Trans. Amer. Fish. Soc. 108: 253-261.

Hynes, H.B.N. 1950. The food of freshwater stickle backs (*Gasterosteus aculatus* and *Pygosteus pungitius*) with a review of methods used in studies of food of fishes. J. Anim. Ecol. 19: 36-58.

Hysolp, E.J. 1980. Stomach content analysis, a review of methods and their application. J. Fish Biol. 17: 411-430.

Ikusemiju, K & C.I.O. Olaniyan. 1977. The food and feeding habits of the catfishes: *Chrysichthys walkerii* (Gunther) and *Chrysichthys filamentosus* (Boulenger) and *Chrysichthys nigrodigitatus* (Lacepede) in the Lekki Lagoon, Nigeria. J. Fish Biol.10: 105-112.

Imevbore, A.M.A. & O. Bakare. 1970. The food and feeding habits of non cichlid fishes of the River Niger in the Kainji reservoir area. NISER, Ibadan. 15 p.

Lagler, K.F. 1956. Freshwater fishery biology. Brown, New York. 421 p.

Maitipe, P. & S.S. Desilva. 1985. Switches between zoophagy, phytophagy and detrivitory of *Sarotherodon mossambicus* (Peters) population in twelve manmade Srilankan Lakes. J. Fish Biol. 6: 49-61.

Mellanby, H. 1938. Animal life in freshwater. Chapman and Hall, London. 308 p.

Ricker, W.E. 1968. Method of assessment of fish production in freshwater. Blackwell, Oxford. 313 p.

Tudorancea, C, C.H. Fernando & J.C. Paggi. 1988. Food and feeding ecology of *Oreochromis niloticus* (L). juveniles in Lake Awassa (Ethiopia). Arch. Hydrobiol. Suppl. 79: 267-289.

Ugwumba, A.A.A. 1992. The food and feeding habits of *Heterotis niloticus* (Teleostei: Osteoglossidae) in a small tropical man made lake in Ibadan. J. Afr. Zool.106: 113-123.

Ugwumba, A.A.A. &. A.A. Adebisi. (1992). The food and feeding ecology of *Sarotherodon melanotheron* (Ruppell) in a small freshwater reservoir in Ibadan, Nigeria. Arch. Hydrobiol. 124: 367-382.

Victor, R. & C.A. Brown. 1990. The food and feeding habits of two species of characid fish in a perturbed West African River. Revue. De. 2001 Afr. 104: 97-108.

Ward H.B. & G.C. Whipple. 1950. Freshwater biology. Wiley, London. 650 p.