

## DIET SEASONALITY AND OVERLAP OF *CHRYSICHTHYS* SPECIES ON LAKE KAINJI, NIGERIA

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### ABSTRACT

Seasonality and overlap of diet of *Chrysichthys* species in Kainji Lake was studied for a period of one year. A total of two hundred and forty five *Chrysichthys nigrodigitatus* and one hundred and nineteen *Chrysichthys auratus longifilis* were used during the study. *Chrysichthys* species food items ranged from plant to animal materials. Seasonal variations of diet showed that plant material dominated the diet of both species in rainy and dry seasons. While zygoptera and *Lumbiculus* were absent in the diet of *Chrysichthys auratus longifilis* in rainy season, zygoptera and nematode were absent in dry season. There was significant correlation ( $p < 0.01$ ) of the items between the two species. There was also high level of association between their diets, which indicated that both species have similar diet. Lake Kainji is a good environment for the survival of *Chrysichthys* species.

**KEYWORDS:** *Chrysichthys* species, overlap, diet, seasonality, Kainji Lake, Nigeria

### INTRODUCTION

It has been established that standing waters such as lakes and swamps are chemically and physically stable environment on a year - to - year basis but may undergo considerable seasonal change within the year (Welcomme, 2001). Some of the fishes found in such environment to some extent utilize their feeding specialization to feed on a variety of food items apart from food that drops into the water. However, some are opportunistic changing their diet to abundant or available food items in the environment. Abundance of a potential food species often determines whether or not fish will eat it because availability is a key factor in determining what a fish will eat (Lagler *et al.*, 1977)

Fishes appear to be dynamic in their feeding in different water bodies (Welcomme, 1985), which is evident from several water systems (Chilver and Gee, 1974). Some studies have indicated that *Chrysichthys nigrodigitatus* and *Chrysichthys auratus longifilis* inhabiting lakes depended on items such as detritus, insects, molluscs, crustaceans, fish fry and plant materials (Sturm, 1984; Ajayi, 1987). In some riverine system, fish, crustacean, gastropod, insects, plant remains/materials and detritus might be depended upon (Asuquo, 2000; Ogbeibu and Ezeunara, 2005; Oransaye and Nakpodia, 2005). This shows that a particular food item may be preyed upon by other species of fish apart from individual species exploiting other different resources during the year.

This study tends to look at the seasonal diet and overlap among *Chrysichthys* species in the lake.

### MATERIALS AND METHODS

Lake Kainji (9°50' and 10°55'N; 4°25' - 4°45' E) is the largest man - made lake in Nigeria created in 1968 after damming of the River Niger at Kainji to provide hydroelectric power. It is located between the borders of Sub Saharan and Northern Guinea Savanna Zones.

Fishes were sampled monthly between January 2006 and December 2006. Fishes were caught using three fleet of experimental gill nets and supplemented with local fishermen catches. The fishes were placed

Table 1. Percentage frequency of occurrence (%F) and percentage volume (%) for food items of *Chrysichthys nigrodigitatus* and *Chrysichthys auratus longifilis*.

Food item	<i>C. nigrodigitatus</i>		<i>C. auratus longifilis</i>	
	% F	% N	% F	% N
Fish fry	16.80	17.60	0.23	1.50
Diptera	37.40	25.20	2.11	2.15
Unidentified insect	10.70	11.50	0.61	0.98
Insect fragments	11.10	9.20	0.63	0.79
Zygoptera	0.40	0.02	-	-
Copepoda	18.90	8.40	1.08	0.73
Cladocera	7.80	7.70	0.44	0.48
Sand/mud	7.10	3.80	0.42	0.33
Algae	38.20	18.30	2.16	1.37
Plant matter	67.40	60.40	3.69	4.32
Mollusc	51.60	10.00	2.92	0.85
Nematode	7.30	9.90	0.14	0.85
Detritus	37.80	24.40	2.15	2.09
Lumbriculus	0.40	0.02	-	-

Table 2. Showing measure of association or overlap between *Chrysichthys nigrodigitatus* and *Chrysichthys auratus longifilis*

Species	Number of different prey items in species (A and B)	Number of joint prey items shared by both species (C)	Measure of association or overlap (S = 2 C / A + B)
<i>Chrysichthys Nigrodigitatus</i>	14	12	0.92
<i>Chrysichthys auratus longifilis</i>	12	12	

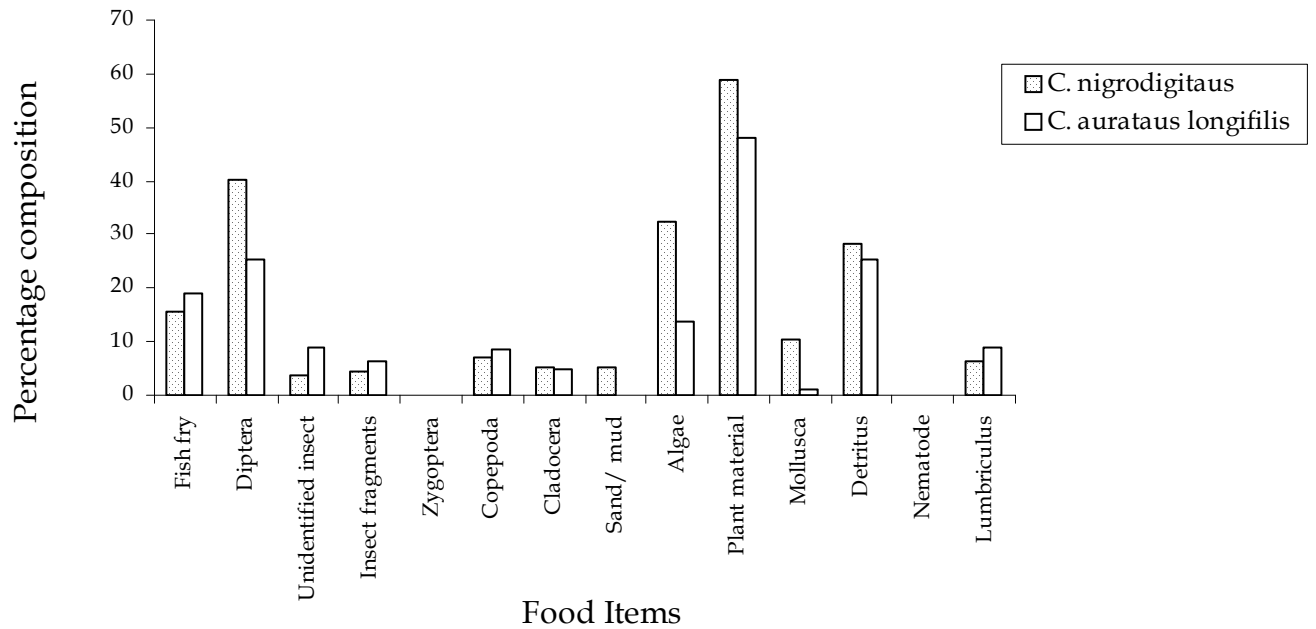


Figure 1. Variation of the percentage composition of items ingested by *Chrysichthys nigrodigitatus* and *Chrysichthys auratus longifilis* in rainy season

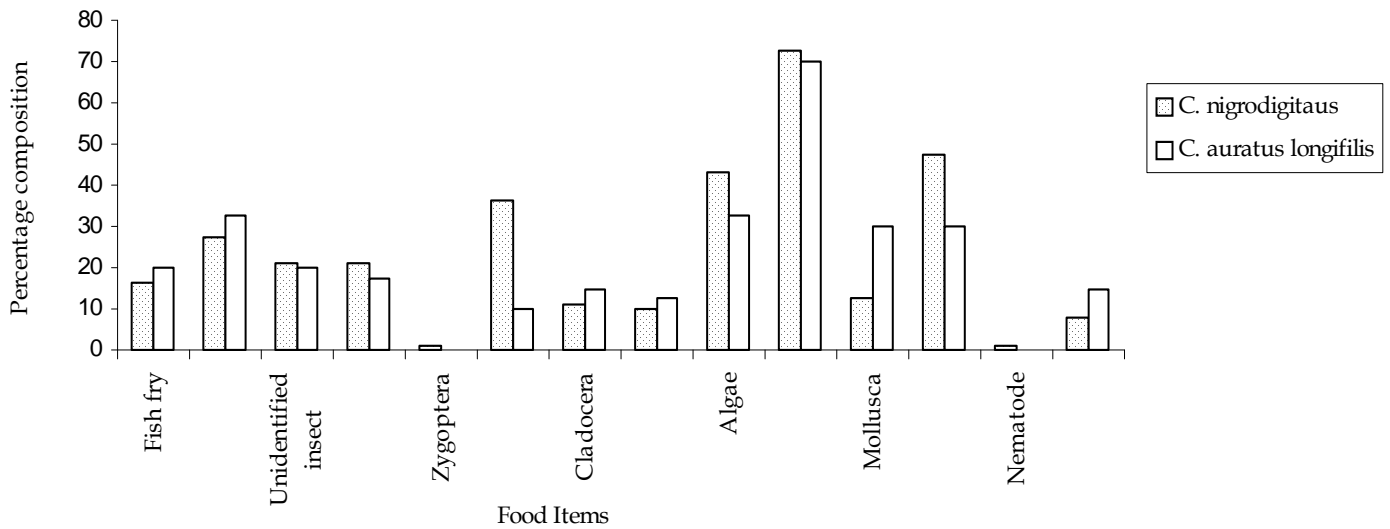


Figure 2. Variation of the percentage composition of items ingested by *Chrysichthys nigrodigitatus* and *Chrysichthys auratus longifilis* in rainy season

immediately on ice after capture and subsequently in 4% formalin, and then taken to the laboratory for analysis. Lengths (standard and total) were measured in millimeters and weight taken in grams.

Food items were sorted and identified using manuals by Mellanby (1979) and Jeje and Fernando (1986) Frequency of occurrence (Hyslop, 1980) and volumetric method (Cailliet *et al.*, 1986) were employed to analyse stomach contents.

Analysis of variance was used to compare the diet of these species. Seasonal changes in diet between the two species were evaluated using student's t – distribution and Index of similarity between the diets of species was determined using method according to Barbour *et al.* (1973)

## RESULTS AND DISCUSSION

A total of three hundred and sixty four *Chrysichthys* species, comprising of two hundred and forty five *Chrysichthys nigrodigitatus*, and one hundred and nineteen *Chrysichthys auratus longifilis* were analysed. Total lengths ranged from 10.50 -36.00cm and 10.50-19.60cm for *Chrysichthys nigrodigitatus* and *Chrysichthys auratus longifilis* respectively, which were significantly different ( $p>0.05$ ).

Fourteen and twelve distinct prey items were found in the diets of *Chrysichthys nigrodigitatus* and *Chrysichthys auratus longifilis* respectively (Table 1). This shows that food of *Chrysichthys* species is diversified. This could be due to their feeding habit as reported by Idodo – Umeh (2003), Ogbeibu and Ezeunara (2005) that this species of fish are omnivores or diverse plant and animal communities in the lake.

Both species of *Chrysichthys* fed on fish fry, insects, diptera, crustaceans, algae, plant material sand/mud, nematode, detritus as items in their diets, which were significantly different ( $p>0.05$ ). This was also reported by Sturm (1984) and Asuquo (2000) in Tiga Lake and Cross River Estuary respectively. The absence of zygoptera and *lumbriculus* species in the diet of *Chrysichthys auratus longifilis* and their presence in that of *Chrysichthys nigrodigitatus* could be as a result of difference of feeding intensity or non - specialized mode of feeding as reported by Sturm (1984) and Welcomme (2001).

Seasonal variations show that during the rainy season, plant materials dominated the diets of both species, followed by diptera (Figure 1). The absence of zygoptera and *Lumbriculus* species could be as a result of unavailability of such items during that period. Ogbeibu and Ezeunara (2005) reported that ecological conditions governed by seasonal diversity of food items could influence the feeding habit, diets and feeding intensity of fish species.

In dry season, plant materials was the most dominant item in the diets of both species of *Chrysichthys* but for *Chrysichthys nigrodigitatus*, detritus followed as the more dominant then algae while algae and diptera were the more dominant food item for *Chrysichthys auratus longifilis* (Figure 2). This could be attributed to food preferences by this species of fishes or as a result of temporal changes in abundance of food organisms in the environment as reported by Ekanem (2003). There was significant correlation between items in rainy and dry seasons ( $p<0.01$ )

Overlap value (0.92) for the two *Chrysichthys* species indicates that there is high level of association between the diets of these species (Table 2). Gerking (1994) did report dietary overlap of 0.61 and concluded that that there was similarity in the diets of the fishes studied because on a scale of overlap index, values greater than 0.5 depicts similar diet.

## CONCLUSION

*Chrysichthys* species fed on a wide range of food items from plant to animals materials. They relied on the same food items as their dominant diet during rainy and dry seasons but not so with other subsequent items.

*Chrysichthys* species can be said to be omnivorous in the Lake.

## REFERENCE

- Ajayi, T.O. (1987). The food and feeding habits of and the predation on the Family Bagrids (Pisces: Siluroidea) in Lake Kainji, Nigeria. *Arch Hydrobiologia* 109 (4), 583-600
- Asuquo, P. E. (2000). Diet composition of *Chrysichthys nigrodigitatus* and *Pseudotolithus elongates* in Cross-River Estuary, Nigeria. M. Sc. Thesis University of Calabar, Calabar, Nigeria, 153pp

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Barbour, M. G., Craig, R.B., Drysdale, F.R., and Ghiselen, M.T. (1973). *Coastal Ecology of Bodega Head*, Berkeley: University of California Press. 338pp.

Cailliet, G. R., Love, M.S., and Ebeling, A.W. (1986). *Fishes: A field guide and laboratory manual on their structure, identification, and natural history*. Wadsworth Publishing Company, Belmont, California. A Division of Wadsworth, Inc. 194pp.

Chilvers, R. M., and Gee, J.M. (1974). The food of *Bagrus bayad* (Forsk) (Pisces: Siluriformes) and its relationship with *Haplochromis HILGENDORF* (Pisces: Cichlidae), in Lake Victoria, East Africa. *Journal of Fish Biology* 6:483 – 505.

Ekanem, S. B. (2003). The biology and culture of the silver catfish *Chrysichthys nigrodigitatus*. *Journal of Sustainable Tropical Agriculture Research* 10:1 - 7.

Gerking, S.D. (1994). *Feeding ecology of fish*. Academic Press Inc. 525 B street, Suite 1900, San Diego, California, 416pp

Hyslops, E.J. (1980). Stomach content analysis: A review of methods and their Applications. *Journal of Fish Biology*. (17) 4: 411- 429

Idodo - umeh, G. (2003). *Freshwater fishes of Nigeria* (Taxonomy, Ecological notes, Diets and utilization). Idodo Umeh Publishers Limited, Benin City, Nigeria, 232pp

Jeje, C.Y. and Fernando, C.H. (1986). A Practical Guide to the Identification of Nigerian Zooplankton (Cladocera, Copepoda and Rotifera). *Published and Printed by the Kainji Lake Research Institute. 1-142 pp.*

Lagler, K. F., Bardach, J. E., Miller, R. R and May Passino, D. R. (1977). *Ichthyology*. 2<sup>nd</sup> Edition. Wiley and sons Inc. printed in USA. Pp.129 - 163.

Mellanby, H. (1979). *Animal Life in Freshwater*. A guide to freshwater Invertebrates. Chapman and Hall Ltd. Distributed in the U.S.A. by Halsted Press. A Division of John Wiley and Sons, Inc., New York. 308pp

Ogbeibu, A. E. and Ezeunara, P. U. (2005). Studies on the food composition and feeding pattern of fish communities in the Ikpoba River, Southern Nigeria. *Journal of Aquatic Sciences* 20 (2): 17 – 129.

Oronsaye, C. G. and Nakpodia, F.A. (2005). A comparative study of the food and feeding habits of *Chrysichthys nigrodigitatus* (Lecepede) and *Brycinus nurse* in a Tropical River. *Pakistan Journal of Scientific and Industrial Research* 48 (2): 118 – 121

Sturm, M.G. De (1984). On the biology of the Catfish *Chrysichthys auratus* (Geoffroy) in Man-made Tiga Lake in Northern Nigeria. Freshwater Biology Kainji Lake in Nigeria. *Journal of West African Science Association* 16(1): 49 – 58.

Welcomme, R.L. (1985). *River Fisheries*. FAO Fisheries Technical Paper 262. Pp.134 - 146.

Welcomme, R.L. (2001). *Inland Fisheries*. Ecology and Management. Fishing News Books. A Division of Blackwell Science Ltd. 358pp

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