DETERMINATION OF INTESTINE LENGTH TO STANDARD LENGTH RATIO OF SOME FISHES FROM THE IKPOBA RIVER AND OVIA RIVER, NIGERIA WITH A REVIEW OF CULTURE OF *PARACHANNA OBSCURA* (PISCES: CHANNIDAE)

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ABSTRACT

The gut length to standard length ratios of twelve fish species from the Ovia and Ikpoba Rivers were calculated to work out their feeding level in the food chain. The mean ratio of five species Brycinus macrolepidotus Smith, 0.9 Parachanna obscura (Gunther), 1.0, Papyrocranus afer Gunther, 0.35, and Xenomystus nigri Gunther 0.75, classify them as carnivores. Four species Synodontis eupterus Boulenger, 4.4 S.schall (Bloch and Schneider) 4.8, Tilapia mariae Boulenger, 3.5, and T. zilli (Gervais), 4.7, are herbivores. Three intermediate ratio species B. longipinnis (Gunther), 1.3,Chrysichthys furcatus (Gunther) 1.6, and Clenopoma kingsleyae Gunther, 1.8, are omnivores. The body depth of seven of the species was measured and expressed as percentage of the standard length to ascertain the accomodative capacity of the fish for the gut. In addition a review of culture of snake head fish Parachanna obscura is presented

Keyword : Intestine length, standard length ratio, fishes, Parachanna obscura culture.

INTRODUCTION

The structure, length and conformation of the intestine are closely related to the fish diet (Nikolsky, 1978; Miller and Harley 2002). The intestine is variable in length according to the diet of the fish species. It is short in carnivores, very long and coiled in herbivores and is intermediate in length in omnivores (Hickman *et al* 2001)

Bond (1979) recognized four feeding behaviour: carnivores, herbivores, detritivores and limnivores. Most of the studies on feeding behaviour have been on the assessment of the gut contents to the reglect of absolute measurement of intestine length and body length ratio. Morphometric classification measurements such as intestine length to body length ratio can coroborate gut contents classification of feeding manner and can help to determine the feeding manner more exactly than gut contents analysis alone. It also helps to ascertain the adaptative food of the fish species and to select the right ingredients to formulate the balanced complete supplementary feed. A fish species with very high ratio will require more plant items than animal proportion in the feed while a species with a low ratio needs more animal materials than plant proportion. This paper is aimed to reveal the ratio of the intestine length to fish body length of some fishes from the Ovia River at Iguoriakhi and Ikpoba River at Benin City

MATERIALS AND METHOD

The Ovia River takes its source from Akpata hill in Ekiti state and flows through Iguoriakhi (20km from Benin City) in lat. 6.5°N and Long. 5.8°E. The Ikpoba River flows through Benin city in location between Lat 6.5°N and Long. 5.8°E. The two rivers drain through the Benin River into the Atlantic Ocean . Fish samples were collected from March to July 2006 with a baited fishing cage set for 48 hours. They were identified with Olaesebikan and Raji (1998), Idodo Umeh (2003).

The standard length (SL) was taken as the body length. It was measured from the tip of the snout to the base of the caudal fin of each fish specimen. Each fish specimen was slit open with a pair of scissors and dissected to expose the viscera. The intestine was cut at the anterior and posterior ends and detached from the fish body. Mesenteric connective tissues were detached in order to display and straighten the intestine length. Intestine length was measured in cm and expressed as a percentage of the SL. This gives the number of times the intestine length contained the body length.

RESULT

A total of 164 fish specimens in twelve species were examined. Five species *Brycinus longipinnis* (Characidae) feather back *Papyrocranus afer* (Notopteridae), tilapia *Tilapia mariae, T. zilli* (Cichlidae), feather back *Xenomystus nigri* (Notopteridae) were collected from the Ikpoba, River, Seven species *B. macrolepidotus* (Characidae), bagrid cat fish *Chrysichthys furcatus* (Bagridae), climbing perch *Ctenopoma kingsleyae* (Anabantidae), reedfish *Erpetoichthys calabaricus* (Channidae), upside down catfish *Synodontis eupterus* and *S. schall* (Mochokidae) were obtained form the Ovia River at Iguorhiaki.

Ratios of Intestine Length to Body Length

The results of the measurements are presented in Table 1 . The ratios of intestine length to body length were less than 1.5, that is, 150% in five species viz *B macrolepidotus* (1.0 i.e 100%) *E. calabaricus* (0.9 i.e. 90%), *P. obscura* (1.0 i.e. 100%), *Papyrocranus afer* (0.35 i.e 3.5%) and X. *nigri* (0.75 i.e. 75% The ratios were less than 2 in three species. These were 1.3 i.e 130% in *B. longipinnis* 1.6 i.e. 160% in *C. furcatus* and 1.8 i.e. 180% in *Ctenopoma kingsleyae*. The ratios were more than 2 in four species viz *S. eupterus* (4.4 i.e. 440%), *S. schall* (4.8 i.e 480%) *T. mariae* (3.5 i.e. 350% and *T. mariae* (3.5 i.e. 350%) and *T. zillii* (4.7 i.e. 470%).

Considering the relevance of the body depth in accomodating the gut, the body depth BD of seven species was measured and expressed as percentage of the standard length (SL). The results are presented in Table 1. It was revealed that the body depth of both *Synodontis eupterus* and *S. schall* was the same 34.5% of SL and was less than BD of *B.macrolepidotus* 41.7%, *C. kingsleyae* 52.6% and was greater than BD in *C. furcatus* 30.3%, in *P. obscura* 30.3%also and in *E. calabaricus* 10.3%.

Table 1: The mean intestine length (IL), Standard Length (SL) and their ratio, and body depth percent of SL in selected fish species from Ikpoba River and Ovia River .

Taxa	n	IL	SL	IL/SL	%	HL%SL	BD % SL	Remarks	Locality (River)
Brycinus longipinnis	5	10.4	8.2	1.3	130	.	.	Carnivore	Ikpoba
B. macrolepidotus	4	26.2	26.6	1.0	100	24.4	41.7	Carnivore	Ovia
Chrysichthys furcatus	5	48.2	30.9	1.6	160	27.0	30.3	Carnivore	Ovia
Ctenopoma kingsleyae	2	17.0	9.4	1.8	180	35.7	52.6	Carnivore	Ovia
Erpetoichthys calabaricus	3	25.1	29.2	0.9	90	8.9	10.3	Carnivore	Ovia
Papyrocranus afer	3	11.0	31.5	0.35	35	.	.	Carnivore	Ikpoba
Parachanna obscura	5	24.1	23.2	1.0	100	27.8	30.3	Carnivore	Ovia
Synodontis eupterus	35	41.4	9.5	4.4	440	43.5	34.5	Herbivore	Ovia
S, schall	90	46.3	9.6	4.8	480	43.5	34.5	Herbivore	Ovia
Tilapia mariae	5	56.9	16.3	3.5	350			Herbivore	Ikpoba
T. zilli	4	73.5	15.7	4.7	470		—	Herbivore	**Ikpoba**
Xenomystus nigri	3	9.8	13.1	0.75	75			Herbivore	**Ikpoba**

DISCUSSION

The result of this investigation presented in Table 1 revealed that five species B. macrolepidotus (100%) E. calabarious (90%), P. obscura (100%), Papyrocranus afer (35%) and X. nigri (75%) had 100% or lower percentages. Judging from the assertion that fish species with intestine length less than 100% of body length are carnivores, it is acceptable that these fish species are carnivores. And four species S. eupterus (440%), S. schall (480%) T. Mariae (350%) and T. zilli (470%) are herbivores. Species of intermediate ratio less than 200% can be classified as omnivores. These are B.longipinnis (130%) C.furcatus (160%) and Ctenopoma kingsleyae (180%). they are omnivores that show inclination to carnivory. As there is no specifically rigid demarcatory ratio for ominivores between canivores and herbivores and since the canivores limit may extend close to 2(Edema and Ojeh, 2006), the three intermediary species can be ranked as obligate carnivores. Corroboratively Bond (1979) classified cod Gadus morhua with ratio 1.05 - 1.5 as a carnivore, and flat fish Jordanella floridae with ratio 2.5 - 2.7 as a herbivore.
A comparison with studies from elsewhere is shown in Table 2.

It is advisable that fish farmers should use supplementary feed composition in desirable proportions of animal and plant based items. Carnivores should have much more animals (75%) than plants (25%) compounded in the diet. Herbivores should have much more plants (75%) than animals (25%) in the food combination. And omnivores should be fed with equal proportions of animal (50%) and plant (50%) materials in the diet.

Table 2: The mean intestine length (IL), to Standard Length (SL) ratio, in selected fish species.

Taxa	IL/SL	Locality	Remarks	Source
Brycinus longipinnis	1.3	Ikpoba	Carnivore	Present study
B. longipinnis	1.0	Okhuo	Carnivore	Edema and Ojeh (2006)
Ctenopoma kingsleyae	1.8	Ovia	Carnivore	Present study
C. kingsleyae	0.94	Okhuo	Carnivore	Edema and Ojeh (2006)
Papyrocranus afer	0.35	Ikpoba	Carnivore	Present study
P. afer	0.22	Okhuo	Carnivore	Edema and Ojeh (2006)
Parachanna . obscura	1.00	Ovia	Carnivore	Present study (2002)
P. obscura	0.70	Okhuo	Carnivore	Edema and Ojeh (2006)
Tilapia mariae	3.5	Ikpoba	Herbivore	Present study
T. mariae	3.0	Ikpoba	Herbivore	Edema and Ogbetuo (2002)
T. mariae	9.7	Okhuo	Herbivore	Edema and Ojeh (2006)

A Review of Culture of *Parachanna obscura* (pisces channidae)

Nigerian snakeheads are *Parachanna africana* and *P. Obscura*. *Parachanna obscura* is more encountered and is mainly addressed in this paper.
Based on five specimens P. *obscura* (Total length 34cm, Standard length 29cm, Head length 32.5%, Body depth 15.2%, mouth width 10.4%, snout length 6.2%, Eye diameter 3.5% and postorbital length of head 23.5% of standard length), it was revealed that the trunk and tail were twofold of the head region.
The head length was 32.8%, while the cylindrical fleshy trunk and tail (excluding the tail fin) were 67.2% of the standard length (SL). The body depth (5% more than mouth width) was 15.2% of SL and about 50% of head length (32.8%) and was shorter than the post orbital region of head (23.5%) which was treefold the snout(6.2%) that was shorter than the mouth width(10.4%). This arrangement creates an extensive bucco-pharyngeal space for ingesting prey.

The dorsal fin based was longer (59.0% of SL) than the anal fin base (32.8% of SL). Correspondingly the number of rays (42) on the dorsal fin was more than the 30 rays on the and fin. The relatively shorter anal fin base predisposes the flat belly surface to balance this fish on a substratum. And the caudal fin was rounded. This configuration of the median fins enables the lift force that is just enough to propulse the fish to the air-water interface to gulp air.

Air Gulp Breathing Habit

Parachanna africana can tolerate poor water quality as may be found in enclosures because they are endowed with suprabranchial breathing organ, which they use to gulp air from the surface. This habitual gulping of air also happens in oxygenated water. This is because they are obligate air breathers and they would die off if they are restrained from reaching the surface (Bond. 1979). Therefore they can live well in ponds. However this process gives feeding space advantage to the predatory fish over the potential prey (fish) and the fish farmer.

Protective scales

(counted to be 60 along, 7½ rows above and 11½ below the lateral line) serve as covering to keep the skin intact and from entry of microbes, parasites and diseases.

Exclusion of snakehead fish from culturable fishes.

The inventory of culturable fish species in Nigeria is presented in Table 3. It can be seen from the table that the Aquaculture Development Programme (ADP) 1988)excluded the snake head fish from the list of recommended 24 culturable fish species in Nigeria . Also Marioghae (1999) excluded them from the six culturable fish species in Nigeria . And they were not listed by Changadeya *et* al (2003) among the four fish species that can be successfully farmed in Nigerial and total of 21 indigenous fish species farmed in Africa . Three other species *Clarias anguillaris , Oreochromis aureus and T. zilli* occurring in Nigeria can be cultured It may also be useful to consider *Liza grandisquamis, Mugil bananensis, M. curema, Tilapia guineensis , Hemichromis fasciatus and Pomadasys jubelini* selected by Ugwumba (1988) to be cultured in Nigeria.

Table 3. List of Culturable fishes in Nigeria

Fishes	ADP9 (1988)	Saheed (1995)	Marioghae (1999)	Changadeya *et al* (2003)
Bagrus bayad	√			
Crysichthys nigrodigitatus	√		√	√
Citharinus citharus	√			
Clarias gariepinus	√	√	√	√
Cyprinus carpio	√	√		
Elops lacerta	√			
Gymnarchus niloticus	√			
Heterobranchus bidorsalis	√	√	√	
H. longifilis	√	√	√	
Heterotis nilotcus	√	√	√	√
Hybrids (*Heteroclarias*)		√		
Hypothymichthys molitrix	√			
Labeo coubie	√			
Lates niloticus	√			√
Liza falcipininis	√			
Lutjanus spp	√			
Megalops atlanticus	√			
Mulgil cephalus	√			
Oreochromis niloticus	√	√	√	
Parachanna obscura		√		
Sarotherodon galilaeus	√			
Synodontis filamentosus	√			
Tilapia guineensis	√	√		
T. melanopleura	√			
T. melanotheron	√			
T. zilli	√	√		
Total	24	10	6	4

Criteria for Culturable Fish Selection

ADP (1988) Listed 7 characters of culturable fish. These are: fast growth; acceptance of supplementary food; resistant to diseases, tolerant to poor water quality; popular and marketable; low cost of production and ability to breed easily in captivity.

Saheed (1995) also enumerated the selective criteria for culturable fish species. These include fast growth rate; hardy and resistant to diseases; efficient utilization of natural food resources in the pond; efficient converter of artificial feed; compatible with other culturable fish species; palatable, highly marketable and priced, and adaptable to wetlands. He listed the snake head *Parachanna obscura* and 8 other indigenous fish species that are suitable for culture in Lagos Wetland ponds. This is probably in monoculture systems and not in combination systems.

Ita (1993) selected fast growing culturable species to be *Clarias gariepinus, C. anguillaris, Heterobranchus bidorsalis* and *Heterotis niloticus* without including *P. obscura*.

However the difficulty the snakehead former may face is likely to emanate from the food and feeding requirement. The two areas of problem are the high cost of production, and incompatibility with other culturable fish species.

Food and Feeding Habits

They have three distinct morphological carnivorous fishing adaptations.

Gill rakers are particularly very short and somewhat rudimentary, widely spaced and few (10 on the lower arm of the first gill arch). This branchiospine deficiency excludes them from serious plankton feeding. Plankton resources in a pond are directly useless to them. Stomach is sacculate to store targe food. Intestine is less than 100% SL precisely 70% of SL (Edema and Ijeh 2006). Vertical habitual travel to the surface to gulp air enables the wild fish to explore the bottom, middle and surface for food protein - rich animals such as insects, shrimps and fish which are their food organisms.

The young feed mainly on insects, the adults feed mainly on fish . Reed *et al* (1967) described them as voracious predators. Imevbore and Bakare (1970), also observed that they are carnivorous predators on young fish, shrimps and insects in Kainji Reservoir area Adebisi (1981) observed the stomach of young *P. obscura* contained mainly shrimps and insects while adults from Asejire lake and the swamps in the Lagos, Badagry Road contained fish only, like those from elsewhere reported by Holden and Reed (1972). According to Idodo-Umeh (2003) shrimps, insects and fishes such as small *Tilapia, Brycinus, Alestes* and Epiplays species make the diet.

High Cost of Production

It is probable that high cost of Production may lead to ruinous expenditure. Monoculture of snakehead may be the likely suggested choice. But the fish may be expensive to farm successfully and gainfully alone. The available food in the pond may not be fully harnessed their inability to filter and trap plankton a food suggests that they eat far away from the bottom of the food web. Therefore their proximate complete supplementary feed is principally fish meal, which may be expensive to obtain for them regularly and uneasy to sustain.

Incompatibility with other fishes in polyculture

The use of snakeheads may not produce profitable harvest in polyculture except extraordinary precautionary dry attentions are given. The general appearance of the fish resembles a short python snake. They are potentially harmful to other fishes, they may bite and deform large fish that they cannot swallow, open them to infections, make them less desirable and cheap, in the market

Sivalingam (1972) considered that *Tilapia* alone cannot exploit all the available food in a pond, so proper combination with another species would allow for fuller use of the food species would allow for fuller use of the food available and yield better results than a single species in culture. And that this second species should: be a bottom feeder, has restricted breeding habits, be abundant as fingerlings, be hardy, be able to feed on young tilapia to control their population and be popular and acceptable. He did not recommend *Channa obscura*. Young snakeheads specimens have attractive prizes in an aquarium but it is advised (Reed *et al* 1967) that care must be taken in the selection of the other fish to stock with them because they are voracious predators. This voracious habit has relegated the snakehead fish to the bottom in the ranking of culturable fishes.

According to Bond (1979) they are prized but they are voracious predators that cannot be cultured with another fish likely to be prey to them, they are potentially harmful, are undesirable and were restricted from the aquarium free trade in the United States of America ,. However in tilapia culture in ricefields, for example, a few of them have often been used to control the excess juveniles (Bond, 1979). Suppose snakeheads are obligate piscivores as Adebisi (1981) asserted . the feeding greed habit of snake heads and their inability to trap plankton negate their selection in polyculture systems.

Snakeheads are excluded in species combinations in polyculture systems in Nigeria . Instead other carnivorous fishes endowed with well developed gill rakers such as Tarpon, *Clarias* lazera or *Chrysichthys* are recommended by ADP (1988) to be combined with tilapia using specified ratio.
It is recommended to use a carefully calculated number of *P. obscura* of the same sex to regulate overcrowding (populations) of prolific fishes in a pond in order to quicken their growth.

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