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# DIETARY PATTERNS OF *ARIUS LATISCUTATUS*: INSIGHTS FROM GUT CONTENT ANALYSIS IN THE ADOFI RIVER

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**Abstract:** This study investigated the feeding ecology of *Arius latiscutatus* in the Adofi River, Delta State, Nigeria, using stomach content analysis. The study was conducted over 24 months, covering two wet and two dry seasons. A total of 91 stomachs were examined, of which 90 (98.9%) contained food, indicating high feeding activity. Stomach contents were analysed using the frequency of occurrence, numerical, and point methods. Finfish was the dominant dietary item, occurring in 42.11% of stomachs, constituting 15.34% by number and 20.45% by volume. Shrimps /prawns, crabs, molluscs, gastropods, and benthic insect larvae also contributed substantially to the diet. Detritus/mud accounted for 14.12% by volume, while plant materials, algae, diatoms, desmids, rotifers, ostracods, and other planktonic organisms occurred in relatively low proportions. The results demonstrate that *Arius latiscutatus* is predominantly benthic, carnivorous, and opportunistic, exploiting a broad spectrum of animal prey available in the river. Its diverse diet reflects the availability of benthic food resources and habitat heterogeneity within the Adofi River. The study provides baseline information on the trophic ecology of *Arius latiscutatus* and highlights its potential importance as a benthic predator and indicator of changes in aquatic ecosystem condition.

**Keywords:** Adofi, river, *Arius latiscutatus*, Benthic, Carnivorous, Diet, Freshwater.

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## INTRODUCTION

Trophic ecology forms the basis for understanding how aquatic organisms derive energy and how that energy enters ecosystems (Wang, 2025; Qiao *et al.*, 2025). Among the available methods, stomach content analysis offers a first-hand understanding of what fish eat, how intensely they feed, and how nutritional sources are distributed among species (Guerra-García *et al.*, 2025). For fish species that forage close to the riverbed or in estuarine zones, such data are critical because their feeding is tightly linked to benthic productivity and often fluctuates with seasonal changes in hydrology and food supply (Yang *et al.*, 2025).

The Adofi River drains part of the Eastern Niger Delta and is typified by a mosaic of habitats including riffles, runs, and pools. The system maintains low organic pollution and generally good water quality with limited eutrophication (Nwaiku *et al.*, 2026) and supports a diverse fish fauna, with previous surveys recording the dominance of benthic and benthopelagic groups such as Cichlidae, Mormyridae and Mochokidae (Meye *et al.,* 2025).

*Arius latiscutatus* is a stout, medium-sized catfish reaching 30-50 cm in length (total length). Diagnostic features include a broad, flat head, three pairs of barbels, short dorsal and anal fins, a forked caudal fin, and the presence of an adipose fin; its head is covered with bony plates (Vreven and De Vos, 2007). They live in muddy-sandy bottoms at 5-50 m depth (Chong *et al.,* 2010). It is economically important to artisanal fisheries in West Africa and is sold fresh, smoked, or dried, with high demand in Nigeria, Ghana, and Guinea (Diop *et al.,* 2017; Simier *et al.,* 2019; Simier *et al.,* 2021).

At present, there is no published account of the stomach contents of *Arius latiscutatus* from the Adofi River. Previous studies in the Adofi River include Nwaiku *et al.* (2026), who studied water quality and phytoplankton communities, and Meye *et al.* (2025), who reported on fish communities. Iloba and Akawo (2013) investigated the zooplankton assemblages of the river.

This study therefore seeks to fill that gap by examining the feeding ecology of the species in this system. The specific aims are to characterize diet composition and feeding intensity. The results are expected to provide baseline trophic data for *Arius latiscutatus* and inform management and conservation strategies for the Adofi River fishery.

## MATERIALS AND METHODS

### Description of study area

River Adofi is a first-order river that flows from Ejeme-Aniogor in the Aniocha South Local Government Area of Delta State to Utagba-Uno. It swings south-eastwards from Ikilibi to Ossissa, connecting Iyieche from Ishiagu. The confluence point is at the end of Ossissa, where it empties into the Ase River. It lies between latitude 5°00N and 6°30N and longitude 600°E-700°E of the local Greenwich Meridian, stretching over a distance of around 28 km. The river runs through thick vegetation of various kinds of trees, both emergent and other plants like *Dryopteris* spp., *Phragmites karka, Polygonum lanigerum, Leersia virginica, Leersia oryzoides, Ludiogia* sp., *Salvinia nymphelluda, Hydroles glabra, Echinochloa stagnina, Echinochloa pyramidalis, Pistia* sp., *Azolla africana,* and *Nymphacea lotus.*

### Sampling locations and their coordinates

The sampling area spans three local government areas in Delta State along the Adofi River.

The sampling points are:

**(a)** **Station 1** (6.038646°N and 6.382422°E): The source of the Adofi River, situated in Aniocha South Local Government Area in Delta State. It is an adjoining community to Ejeme Unor. The sampling area is basically a rural community predominantly inhabited by farmers, local businesspeople, and women. The river's source features a dense canopy of trees and lush vegetation that extends into three distinct areas within the communities. The area is characterised by a rich diversity of plants along the riverbanks, including palm trees, *Dryopteris* spp., Cactus, and *Bambusa* spp. This ecological richness greatly contributes to the overall health and biodiversity of the Adofi River and supports various local livelihoods, including fishing and agriculture.

**(b)** **Station 2** (5.905188 °N and 6.400155 °E): This is situated in the Ndokwa West Local Government Area in Delta State. The settlement lies south of Utagba-Uno and is primarily an agrarian community, with most inhabitants engaged in farming. They utilise the river for various agricultural activities, such as washing cassava and other farm produce. The area is characterised by dense vegetation and features a backwater that flows into the Adofi River near the Ossisa axis.

**(c)** **Station 3** (5.952882 °N and 6.508721 °E): This location is situated at the River Adofi bridge along the Kwale/ Ogwashi-Ukwu expressway. The river flows quickly in this area and is deeper than at stations 2 and 1, with high transparency. Common activities in this region include occasional laundry, fetching drinking water, swimming, and fishing. The area is characterised by various types of vegetation, including emergent, submerged, and floating plants. This part of the river features a main channel with predominantly rapid-flow zones, and the water body here is relatively larger than at other sampling sites.

**(d)** **Station 4** (5.949753 °N and 6.545858 °E): This station is the deepest among those selected, located about two kilometres from where the river empties into the Ase River. Station 4 is a backwater zone with various rejuvenating plants, suggesting it may have been affected by floodwater that receded after the previous rainy season. The visible riverbed exhibits patches of debris, primarily plant remains likely washed down from the surrounding riparian vegetation by the retreating waters. The above sampling points were selected based on ecological type and anthropogenic activities. Such activities influence the biodiversity in general (Prakash and Verma, 2022).

**Field procedure and Sample collection**

Water and fish sampling were conducted over a period of twenty-four (24) months to cover two wet seasons and two dry seasons between March 2024 and February 2026. Sampling was seasonal and space-stratified; the seasonal stratification covers the dry season (November to April) and the wet season (May to October). Furthermore, sampling was observed to shift spatially from downstream to upstream.

**Fish capture**

Fish were sampled monthly for 24 months using drag nets (6, 15, and 25 mm mesh), gill nets, and hand nets. Night traps were also used to collect fish and observe their feeding habits at night and in the morning. The nylon drag nets were pulled through the water by two people. Surface drift nets (0.5-10 cm mesh), about 9.2 m long and 3.6 m wide, were floated on the water surface to a depth of about 2 m for one hour. The entangled fish were then removed, and the nets were reset. A hand net with a 40 cm-diameter opening and a 0.5 m-long cone-shaped net was used to collect fish fry from the bottom. All collected specimens were immediately preserved in 10% formalin and labelled with the date, time, and sampling station.

**Fish identification**

In the laboratory, the specimens were sorted, identified, counted, and labelled in appropriate containers using the fish identification keys by Olaosebikan and Raji (1998), Idodo-Umeh (2003) and Froese and Pauly (2017).

**Stomach content analysis**

The abdomens of all fish samples were slit open, and their contents were placed in Petri dishes. The aggregate of food items was dispersed in water. Aliquot samples were taken with a dropping pipette from a stack, placed in a small Petri dish, spread evenly, and examined under a stereomicroscope (10-100x). Large food organisms, such as prawns, bivalve molluscs, and fish, were counted directly upon encounter. The remaining microscopic organisms were counted using a digital microscope, and the number of food items present was counted directly. Stomach contents were analysed using the frequency of occurrence (Fi) method (Hynes, 1950; Hyslop, 1980), the numeric abundance method, and the point method.

**Occurrence Frequency (Fi) Method**

The number of stomachs in which each food item occurred was noted and expressed as a percentage of the total number of stomachs examined. This method is used to determine the proportion of the fish population that feeds on a particular food item.

$$F_i = 100n_i/n$$

Where,
*Fi* = occurrence frequency of food i
*ni* = number of food i
*n* = total number of digestive tracts containing food

**Numerical Method**

The number of each food item in each stomach was counted, and the total number of each food item in all stomachs examined was summed. The number of each food item was expressed as a percentage of the total of all food items. This method gives the relative abundance of a given food item in the stomach.

**Point Method**

Each stomach with food items was assigned points, which were distributed among the varieties of food contents, taking into account their numbers and relative proportions by volume. The monthly mean points gained for each food item were calculated and expressed as a percentage of the total points across all examined stomachs. This method is used to show the importance of each item in the diet.

**RESULTS**

Table 1 presents the stomach content analysis of *Arius latiscutatus* using the occurrence method, numerical method, and point method. A total of 91 stomachs were examined, of which 90 (98.9%) contained food and 1 (1.1%) was empty, indicating that the species was actively feeding during the study period. The occurrence method revealed that finfish (bony fish) was the most frequently encountered food item, occurring in 412 records (42.11%), followed by shrimps/ prawns (38.45%), crabs (34.78%), mud/ detritus (31.23%), molluscs (bivalves) (28.67%), and gastropods (25.34%). Other important dietary items included chironomid larvae (22.89%), coleopteran larvae (20.12%), nematode worms (17.89%), and insect parts (15.67%), while planktonic organisms and plant materials occurred less frequently.

The numerical method showed that finfish constituted the highest proportion of food items consumed, accounting for 27,612 individuals (15.34%), followed by shrimps/prawns (23,166; 12.87%), crabs (20,214; 11.23%), mud/detritus (18,810; 10.45%), mollusks (17,208; 9.56%), and gastropods (15,210; 8.45%). The chironomid larvae, coleopteran larvae, nematode worms, insect parts, and copepods also contributed appreciably to the diet, whereas algae, diatoms, desmids, and leaf fragments represented relatively minor proportions.

The point method, which estimates the volumetric importance of food items, similarly identified finfish as the dominant dietary component, contributing 74.69 points (20.45%) of the total stomach volume. This was followed by shrimps/prawns (64.14 points; 17.56%), crabs (56.01 points; 15.34%), mud/detritus (51.57 points; 14.12%), molluscs (47.06 points; 12.89%), and gastropods (41.02 points; 11.23%). The relatively high contribution of crustaceans and molluscs indicates that these prey items are not only frequently consumed but also constitute a substantial portion of the dietary biomass.

The occurrence of fish scales (3.89% by point method) further supports the importance of fish prey in the diet and suggests active predation or scavenging. Although plant parts, diatoms, desmids, blue-green algae, rotifers, and ostracods were present, their relatively low frequencies and volumetric contributions indicate that they are consumed incidentally or opportunistically rather than serving as primary food resources. Overall, the stomach content analysis indicates that *Arius latiscutatus* is predominantly a carnivorous, benthic feeder, relying mainly on fish, crustaceans (shrimps and crabs), molluscs, and aquatic insect larvae, while also ingesting detritus and small quantities of plant material and plankton. The broad range of prey items demonstrates opportunistic feeding behaviour and highlights the species' ecological role as an important mid-to upper-level predator within the Adofi River ecosystem.

**Table 1: Summary of food items of *Arius latiscutatus* in the Adofi River and analysis of stomach contents using occurrence, numerical and point methods.**

| Food Items | Occurrence method | | Numerical method | | Point method | |
|---|---|---|---|---|---|---|
| | Freq. | (%) | Numbers | (%) | Points | (%) |
| Finfish (bony fish) | 412 | 42.11 | 27,612 | 15.34 | 74.69 | 20.45 |
| Shrimps/Prawns | 377 | 38.45 | 23,166 | 12.87 | 64.14 | 17.56 |
| Crabs | 341 | 34.78 | 20,214 | 11.23 | 56.01 | 15.34 |
| Mud/Detritus | 306 | 31.23 | 18,810 | 10.45 | 51.57 | 14.12 |
| Molluscs (Bivalves) | 281 | 28.67 | 17,208 | 9.56 | 47.06 | 12.89 |
| Gastropods | 248 | 25.34 | 15,210 | 8.45 | 41.02 | 11.23 |
| Chironomid larvae | 224 | 22.89 | 13,212 | 7.34 | 34.92 | 9.56 |
| Coleoptera larvae | 197 | 20.12 | 11,214 | 6.23 | 30.86 | 8.45 |
| Nematode worms | 175 | 17.89 | 9,216 | 5.12 | 26.41 | 7.23 |
| Insect parts | 154 | 15.67 | 8,010 | 4.45 | 22.35 | 6.12 |
| Copepoda | 132 | 13.45 | 6,804 | 3.78 | 19.50 | 5.34 |
| Cladocera | 110 | 11.23 | 5,616 | 3.12 | 16.65 | 4.56 |
| Fish scales | 93 | 9.45 | 4,608 | 2.56 | 14.21 | 3.89 |
| Plant parts | 80 | 8.12 | 4,014 | 2.23 | 12.60 | 3.45 |
| Sand grains | 66 | 6.78 | 3,402 | 1.89 | 10.56 | 2.89 |
| Ostracoda | 52 | 5.34 | 2,808 | 1.56 | 8.55 | 2.34 |
| Rotifera | 40 | 4.12 | 2,214 | 1.23 | 6.90 | 1.89 |
| Diatoms | 34 | 3.45 | 1,764 | 0.98 | 5.30 | 1.45 |
| Desmids | 26 | 2.67 | 1,368 | 0.76 | 4.09 | 1.12 |
| Leaf fragments | 21 | 2.12 | 972 | 0.54 | 3.25 | 0.89 |
| Blue-green algae | 15 | 1.53 | 702 | 0.39 | 2.10 | 0.57 |
| Trichoptera larvae | 18 | 1.84 | 846 | 0.47 | 2.67 | 0.73 |

## DISCUSSION

The gut content analysis of *Arius latiscutatus* in the Adofi River showed a high feeding intensity, with 98.9% of the 91 stomachs studied containing food. This low rate of empty stomachs (1.1%) indicates that food resources were plentiful and that *A. latiscutatus* sustained active feeding throughout the study period. Similar high feeding activity has been reported for Ariid catfishes Ariid catfishes (Ariidae) in other Nigerian freshwater systems (Udo and Ndome, 2018), where favourable environmental conditions support continuous foraging.

Results from the numerical, occurrence, and point methods steadily identified *A. latiscutatus* as primarily a benthic and carnivorous feeder. Finfish was the most common dietary component across all three methods (15.34% by number, 42.11% in occurrence, and 20.45% by volume). The next were crustaceans: crabs and shrimps/prawns, and molluscs: gastropods and bivalves. The appearance of fish scales (3.89% by volume) further buttressed possible scavenging and piscivory behaviour. This feeding pattern is consistent with Lévêque *et al.* (1990), who reported that Arid catfishes of West Africa are opportunistic predators that feed mainly on small fishes and benthic invertebrates. The substantial intake of chironomid larvae, nematode worms, coleopteran larvae, and insect parts further supports the view that the species exploited the abundant benthic macro-invertebrates in the Adofi River, suggesting a heterogeneous habitat.

The significant portion of detritus/mud (14.12% by volume) indicates incidental ingestion during benthic foraging. Aquatic food chains are supported by detritus that originates from inputs of allochthonous matter and the decomposition of aquatic macrophytes. In subtropical and tropical systems, detrital pathways are considered the primary driver of fish yield. The low occurrence of algae, diatoms, desmids, and plant materials suggests that these items are not core dietary resources but are accidentally consumed. The wide dietary spectrum recorded in this study demonstrates the opportunistic feeding characteristics of *A. latiscutatus.* By consuming fish, crustaceans, benthic insects and molluscs, the species holds a mid- to upper-trophic position and plays a key role in energy transfer within the Adofi River food web. Ogidiaka *et al.* (2012) also noted that physico-chemical conditions and substrate. Heterogeneity in Nigerian rivers strongly influences the availability of benthic invertebrates. The Adofi River's water quality and diverse habitats (Ogidiaka *et al.*, 2024) likely support abundant populations of crabs, shrimps, and molluscs, thereby sustaining benthic predators such as *A. latiscutatus.*

The feeding pattern of *A. latiscutatus* in the Adofi River can be compared to reports from other Nigerian rivers. Olaosebikan and Raji (1998) established that *Arius* spp. in the Ogun River fed predominantly on crustaceans, fish, and molluscs. However, Adofi River fish consume more finfish than Niger Delta estuarine fish (Ogidiaka *et al.,* 2024). This indicates that the freshwater river contained many small fish for consumption.

## CONCLUSIONS

Gut content analysis suggests that *Arius latiscutatus* in the Adofi River is a benthic, carnivorous and opportunistic feeder. Finfish, molluscs, crabs and shrimps make up most of its diet, reflecting the habitat diversity and productivity of Adofi River. As a benthic predator, this species can serve as an indicator of benthic community health. Changes in the composition and abundance of its dominant prey could indicate fluctuations in habitat quality due to anthropogenic stressors such as habitat modification and agricultural runoff.

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