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Comparative Assessment of Growth Performance of African Catfish (Clarias gariepinus) Fed Selected Commercial and Farm-Formulated Diets

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Abstract

Background: *Aquafeed selection is central to growth monitoring in African catfish production, but growth summaries must be interpreted within the limits of available measurements. This study presents a descriptive assessment of African catfish (Clarias gariepinus) fed one farm-formulated diet and three commercial diets. Initial and final treatment-level body weights from a reported 56-day feeding trial were used to calculate weight gain and specific growth rate (SGR). No inferential statistics were performed. Initial weights for farm-formulated, Blue Crown, Skretting, and Coppens groups were 106.00, 108.67, 111.00, and 105.00 g, and final weights were 338, 428, 295, and 493 g, respectively. Calculated gains were 232.00, 319.33, 184.00, and 388.00 g, with SGR values of approximately 2.07, 2.45, 1.75, and 2.76% day−1. The Coppens tabulated final weight of 493 g reconciles arithmetically with its reported gain, whereas 2,493 g in the narrative does not. The Blue Crown SGR originally reported as 1.46% day−1 is inconsistent with the displayed weights. The recorded growth patterns vary numerically among treatments, but no causal or statistically significant dietary effect can be established from available summary data. Proximate analyses, feeding records, tank replication, and survival require verification of original data.*

Keywords: *African catfish; aquafeed; commercial feed; farm-formulated diet; specific growth rate; weight gain.*

1. Introduction

African catfish (Clarias gariepinus) is important in freshwater aquaculture in West Africa, where farmers balance reliable growth with feed costs and availability. Nutrient adequacy involves more than the labeled crude-protein percentage: essential amino acids, digestibility, dietary energy, ingredient quality, and feeding management jointly determine the nutritional value of a complete diet (National Research Council, 2011). Comparative growth observations are useful, but the feed identities cannot themselves explain biological mechanisms.

Evidence from a controlled comparison in Aquaculture and Fisheries showed that suitably prepared on-farm feeds can support African catfish growth and offer an alternative to industrially manufactured diets, depending on formulation and production context (Limbu et al., 2020). Similarly, a study of local agricultural by-product-formulated diets with equal nominal crude protein and gross energy levels observed variable performance according to ingredient composition (Nyina-Wamwiza et al., 2007). Such work underscores the need to avoid assuming uniform quality for all farm-formulated feeds.

A more recent study in the literature evaluated blends of poultry processed proteins in recirculating-system catfish feeds. Fanizza et al. (2024) reported that ingredient inclusion and digestibility were associated with growth, intake, and fillet-quality outcomes; thus, two complete diets cannot be compared scientifically on brand name or protein percentage alone.

Awolumate and Agbo (2025) addressed lysine, methionine, and nutrient retention in C. gariepinus; Agbo and Awolumate (2026) considered lysine-supplemented groundnut cake in another cultured catfish; and Agbo et al. (2026) investigated boiled lablab meal diets in African

catfish. These works address different formulations and are not an independent validation of the present feeding records. Additional studies by Awolumate and Omosola (2017), Awolumate (2018), and Awolumate and Inyang (2019a, 2019b) address extension, information access, and aquaculture efficiency, providing management context rather than direct evidence of treatment effects.

The study, therefore, aims to describe the published treatment-level initial and final weights, compute arithmetic weight gains and logarithmic SGR values, and discuss the pattern in relation to its applicability.

Additional species-specific research establishes why nutritional comparisons should be interpreted cautiously. Henken et al. (1986) assessed the interaction of dietary protein, energy intake and temperature in African catfish, while Ali and Jauncey (2005) considered protein-to-energy ratios. Experimental investigations of alternative protein ingredients include Nyina-Wamwiza et al. (2010), Djissou et al. (2016), Fawole et al. (2020), and Jimoh et al. (2021). These studies characterised defined ingredients and feeding protocols; their findings are not substitutes for unverified proximate-analysis results in the present four-diet dataset.

2. Materials And Methods

2.1 Source of observations and feeding trial

That study describes a 56-day feeding trial with African catfish and four diets: farm-formulated feed (T1), Blue Crown (T2), Skretting (T3), and Coppens (T4). The source reports feeding at approximately 08:00 and 17:00 hours, with a nominal feeding rate described as 5% of body weight and weekly adjustments. It is unclear whether this percentage applies per day or per feeding; no consumption was inferred from the prescription. Trial site, calendar dates, tank count, number of fish per tank, randomization, and independent replication have not been authenticated in available records.

2.2 Growth indicators

Absolute weight gain (g) = final body weight (g) − initial body weight (g). Specific growth rate (SGR; % day−1) = 100 × [ln(final body weight) − ln(initial body weight)] / 56, where ln denotes the natural logarithm. These are calculations from treatment-level displayed means; they are not the mean of independently available tank-level SGR estimates.

2.3 Descriptive analysis and exclusions

Values are presented descriptively, without a claim of significance or causation. No ANOVA, Duncan grouping, standard errors, or confidence intervals were calculated. Reported FCR and PER were excluded from comparative interpretation because feed intake, biomass, and diet protein records were not supplied, and the indices are not mutually credible under standard definitions. Laboratory proximate values, mortality, and water-quality measurements were also not reconstructed from secondary literature.

The absence of authenticated independent tank-level records also precludes a defensible test of treatment effects. Hurlbert (1984) described pseudoreplication as an important source of invalid inferential conclusions where observations within a shared experimental unit are treated as independent replicates.

3. Results

Table 1. Treatment-level growth measurements and the indices.

Treatment	Initial (g)	Final (g)	Gain (g)	SGR (% day−1)
T1 Farm-formulated	106.00	338.00	232.00	2.07
T2 Blue Crown	108.67	428.00	319.33	2.45
T3 Skretting	111.00	295.00	184.00	1.75
T4 Coppens	105.00	493.00	388.00	2.76

Note: Values are arithmetic descriptions of reported treatment-level means.

All four treatments show final weights greater than initial weights. The tabulated Coppens final weight of 493 g agrees with the reported 388 g gain (493 − 105 = 388 g), whereas the contradictory 2,493 g narrative figure would imply a gain of 2,388 g. Based on the currently displayed values, the numerical order of gains is Coppens, Blue Crown, farm-formulated, and Skretting. For Blue Crown, 428 − 108.67 = 319.33 g rather than exactly 320 g.

Table 2. Description of Specific Growth Rate

Diet	Originally reported	Recalculated over 56 days
Farm-formulated	2.07	2.07
Blue Crown	1.46	2.45
Skretting	1.74	1.75
Coppens	2.76	2.76

4. Discussion

4.1 Interpretation of growth patterns

Research specifically examining African catfish nutrition reinforces the multifactorial nature of growth. Henken et al. (1986) tested different protein and energy intakes under two water temperatures and showed that growth and feed-utilisation conditions change with fish size and temperature. Ali and Jauncey (2005) investigated approaches to optimising the dietary protein-to-energy ratio. These findings explain why numerical growth differences among complete feeds cannot be attributed to crude protein content alone; this study has neither verified protein–energy ratios nor controlled feed formulation.

The tabulated growth summaries show positive net increases in mass in all four dietary groups, but cannot by themselves establish superior feed efficacy. Growth endpoints integrate feed eaten, nutrient availability, husbandry, and fish condition. National Research Council (2011) identifies protein and energy balance as key nutritional considerations, while Nyina-Wamwiza et al. (2007) showed that different locally available ingredients can yield different performance despite comparable nominal protein and energy densities. The present trial did not independently control these nutritional dimensions, so its descriptive diet ranking does not provide evidence that protein level was responsible.

The literature on on-farm feeds offers important context: Limbu (2020) evaluated two farm-produced diets against an industrial diet over eight weeks in triplicate pond groups and demonstrated that outcomes depend on the specific feed formulation. This published experimental result cannot be transferred quantitatively to the four current diets or used to assign missing feed consumption values. Nevertheless, it supports considering farm-formulated feeds as formulations to characterize rather than as inherently inferior or equivalent to branded alternatives.

4.2 Protein quality, digestibility, and feed manufacture

Evidence from carefully characterised replacement diets further illustrates formulation dependence. Nyina-Wamwiza et al. (2010) evaluated fishmeal replacement using local agricultural by-products and assessed growth, digestibility and feed efficiency in juvenile African catfish. Djissou et al. (2016) tested mixtures of earthworm and maggot meals under isoproteic and isoenergetic conditions. Fawole et al. (2020) assessed black soldier fly larvae meal as a fishmeal substitute, including physiological indicators. Jimoh et al. (2021) examined fish visceral meal in a 56-day African catfish trial and considered economic as well as biological outcomes. These are external experimental studies, not measurements of the diets used in the current manuscript.

The catfish trial by Fanizza et al. (2024) in Aquaculture Reports provides directly relevant external evidence that mixtures of processed protein sources can alter digestibility and intake. With the highest tested processed-protein inclusion, the authors reported less favorable growth and feed efficiency than in their comparison diets. This study strengthens the case for characterizing ingredients and amino acid supply rather than attributing the current numerical differences to feed branding. In another study, Nyina-Wamwiza et al. (2007) found that groundnut and bean meals had potential for use in African catfish diets, but the feed source and replacement ratios mattered.

Awolumate and Agbo (2025) reviewed nutrient retention through experiments involving lysine and methionine supplementation, while Agbo and Awolumate (2026) reported an intervention involving lysine-supplemented groundnut-cake diets. Agbo et al. (2026) examined the incorporation of lablab meal and its effects on physiological indicators in C. gariepinus. These publications reinforce the biological relevance of ingredient selection and the availability of essential amino acids. However, none proves that the particular Blue Crown, Skretting, Coppens, or farm-formulated batches in the present comparison had a given nutrient profile.

4.3 Measurement accuracy and limits of growth indices

SGR requires logarithmic rather than arithmetic proportional growth. Correcting the displayed Blue Crown weights yields approximately 2.45% day−1, not the reported 1.46% day−1; this changes its descriptive placement but does not reflect tank-level variation. Likewise, the Coppens narrative weight of 2,493 g conflicts with both its tabulated final weight and tabulated gain. Reporting the internally compatible 493 g as provisional is preferable to silently treating either figure as an independently verified measurement.

The reported FCR and PER data are excluded from the conclusions. Under standard definitions, PER = 1/(FCR × dietary protein fraction) when FCR and PER use consistent feed and gain data. Substitution of the original published indices implies that protein fractions approach or exceed the entire feed mass, indicating a fundamental discrepancy in measurement or calculation. Independent feed intake, biomass changes, and batch-specific proximate analysis are necessary to resolve it. Neither external reference diets nor general published feed-conversion ranges may be used as substitutes.

4.4 Fish-farm management and dissemination of feeding practices

Awolumate and Omosola (2017) examined fish-farming extension services in Lagos State, focusing on a context where production guidance can influence management

decisions. Awolumate (2018) examined information and communication technologies among fish farmers in Lagos State, while Awolumate and Inyang (2019a) investigated constraints on the use of fish-farming information in Akwa Ibom. These papers concern information access rather than controlled fish growth, but support the practical need for farmers to understand ration adjustment, feed recordkeeping, and interpretation of measured outputs.

Awolumate and Inyang (2019b) analyzed technical efficiency differences among fish farms in Kaduna State. This economic and management perspective is relevant because feed purchase price, stocking, input usage and management affect farm outcomes. The descriptive 56-day weights cannot establish cost effectiveness without feed prices and verified feed consumption. Accordingly, selecting one of the four feeds for general commercial use is beyond the evidential scope of this study.

4.5 Study limitations

Experimental-unit uncertainty has a specific statistical implication: even if individual-fish weights were later recovered, fish sharing a tank would not necessarily provide independent treatment replicates. Hurlbert (1984) emphasised that valid inference requires replication at the level at which a treatment is independently imposed. Consistent with that principle, this manuscript retains descriptive statistics only and does not reconstruct treatment significance from means.

The most important restrictions are incomplete original replication information, absent tank-level feed consumption and biomass records, unverified proximate compositions, conflicting growth numbers, and unavailable mortality and water-quality logs. Measurements from different experimental units cannot be treated as independent without knowing how treatments were allocated. No independent p-values, standard errors, group letters, survival percentages or feed-efficiency values are supplied or inferred. Thus, all statements about the four diets remain descriptive.

5. Conclusion

Treatment-level body weight increased during the reported 56-day feeding period for all four diets. On the internally consistent displayed values, the calculated weight gains were 232.00, 319.33, 184.00, and 388.00 g for farm-formulated, Blue Crown, Skretting, and Coppens, respectively; calculated SGR values were approximately 2.07, 2.45, 1.75, and 2.76% day−1. These are numerical summaries, not statistically established treatment effects. The reported Coppens final-weight discrepancy and Blue Crown SGR discrepancy are identified transparently. Confirmed diet composition, tank-level growth, measured intake, and husbandry records are required for stronger biological or economic interpretation.

Acknowledgements And Declarations

Declarations

Conflict of interest: The authors declare no conflicts of interest or competing interests relevant to this study.

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Data availability: Treatment-level summary values are reported in this manuscript. Original tank-level records, feed-intake measurements, and proximate-analysis results were not supplied for independent verification. The corresponding author should confirm whether any underlying records can be shared before submission.

Author contributions: Oluwakemi Temitope Oteniya did Conceptualization, data collection, investigation, data curation, formal analysis, literature review, and preparation of the original manuscript draft. Samuel Awolumate: Conceptualization, methodology, supervision, validation, interpretation of results, manuscript review and editing, and overall research guidance. Both authors reviewed and approved the final version of the manuscript and agree to be accountable for the integrity of the work.

Ethical approval: The original fish-study ethical review or animal-care approval status and any applicable approval identifier were not documented in the available source manuscript. The authors must verify the relevant institutional requirements and report the correct status before submission. The market survey and participant consent wording in the previous draft were not applicable to this fish-feeding study.

Related-publication disclosure: The author discloses that this manuscript is based on experimental work reported in Oluwakemi Temitope Oteniya's thesis, Comparative Growth Analysis of Catfish Fed Three Commercial Fish Feeds: Juvenile to Post-Juveniles Phase. The present manuscript develops a journal article from the feeding trial, focusing on the comparative growth performance and feed-utilization indices of catfish fed the diets evaluated in the study.

The author's related publications on fish nutrition, dietary supplementation, growth performance, and feed utilization address overlapping research themes. However, based on the currently available bibliographic information, these publications do not appear to report the same feeding experiment. Any other outputs derived from the same experimental data will be disclosed to the editor, as

applicable, to facilitate assessment of the manuscript's originality and relationship to previously disseminated.

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