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Survival and response of *Gymnarchus niloticus* Cuvier, 1829 fed natural and artificial diets

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Abstract
The growth and survival of exogenous larvae of *Gymnarchus niloticus* fed commercial dry feed, decysted *artemia* and fry of *Clarias gariepinus* (live feed) was observed over a period of 28 days. The larvae of *Gymnarchus niloticus* had an average length of 4.5cm and an average weight of 0.4g at the time of collection. After endogenous feeding, 180 larvae were distributed into each of the nine tanks at 20 larvae per tank and fed *ad libitum* thrice a day. There was significance difference ($P<0.05$) in the growth rate and survival of the larvae in the three treatments. Although, the highest growth rate and survival were observed in larvae fed with live feed, followed by those fed decysted *artemia* and least in larvae fed with commercial feed, the present study showed the possibility of utilization of decysted *artemia* and commercial diet for rearing *Gymnarchus niloticus* larvae. This may pave way for the development of acceptable diet for *Gymnarchus niloticus*.

Keywords: Nile knifefish, Lekki lagoon, inert diet.

1. Introduction
Gymnarchus niloticus, commonly refer to as Nile knifefish, Trunkfish or simply as Aba aba is a choice fish use for ceremonial purposes either as live fish or in smoked form. *Gymnarchus niloticus* is relished as food fish among fish population in Nigeria due to its good taste with solid flesh, ability to attain a very good weight of up to 15kg [11] and good market price (about six times the price of popular *Clarias gariepinus*).
However, *G. niloticus* has been classified as an endangered species [14] because of the captured technique employed by local fishermen that usually capture both parents and offspring from their nest during breeding season. This species is therefore in danger of going into extinction unless something is done urgently to enhance its propagation on a commercial scale. *Gymnarchus niloticus*, though recognized as culturable species, it still depends on feeding on other fish species and thus cannot be cultured on commercial bases. Stocking of post yolk fry from the wild has been met with little or no success due to lack of appropriate feed, which always leads to mass mortality.
There is therefore a need to discover feed that is acceptable to *G. niloticus* at lowest possible cost, while at the same time satisfying the nutritional and physiological requirement of the fish species ensuring high conversion ratio so that the fish can be sustainably cultured. This study is aimed at investigating the effects of natural diet and inert diet on the growth and survival of *G. niloticus* larvae.

2. Materials and Methods
The study was carried out in an indoor hatchery using nine plastic tanks, each with 100litres capacity. Newly hatched larvae of *G. niloticus* were obtained from fishermen at Lekki lagoon and kept for ten days until expiration of endogenous feeding. On the final day of yolk absorption, *Gymnarchus niloticus* larvae were randomly selected into the nine plastic tanks at 20 fish per tank. At this stage, larvae had an average weight of 0.5g and average length of 5.4cm.
Gymnarchus niloticus larvae were fed to satiation with the experimental diets thrice daily for twenty eight days. Treatment one was fed with 3 – 10 days old fry of *Clarias gariepinus* collected from the nearby hatchery. Treatment two was fed with decysted *artemia* while treatment three was fed with commercial diet. Each treatment was replicated thrice using complete randomized design (CRD) method.
Physiochemical water parameters were monitored and analyzed with Hach Test kit, Model FF-1A. pH, dissolved oxygen and temperature readings were recorded. An aerator was used for

effective circulation of oxygen in all the plastic tanks for the fishes. Also, changing of water and siphoning was done every day to prevent pollution. Dead larvae were counted to estimate the survival. At the end of 28th days, 10 larvae were removed from each tank and batch weighed. The percentage growth rate was determined from the formula 100 x [(final weight (g)-initial weight (g)] / time (days) x Initial weight (g) [1]; Specific growth rate (%) =[ln final weight (g)-ln initial wt (g)] / time (day) [9]. Survival (%) =100 x no of survived fish / no of initial fish [1].

3. Results

The water temperature ranged from 26.5 to 30.2 ºC for the duration of the experiment. The pH ranged from 6.4 to 8.0 while the dissolved oxygen fluctuated between 5.0 and 7.2 mg/l.

Growth performance of *G. niloticus* was evaluated based on the different diets. Mortality rate within the first two weeks was between 0% and 1% in all treatments. However, there was a fall out by the 3rd week when mortality rate increased to 38%, 51% and 78% in larvae fed live feed, decysted *artemia* and commercial feed respectively (Table 1).

Table 2 shows that the Mean weight gain was 1.15 ± 0.12g/day for *G. niloticus* larvae fed on live feed as against 0.86 ± 0.04g/day and 0.74 ± 0.05g/day for those fed with decysted *artemia* and commercial diets respectively. Larvae fed live feed had better performance than those fed inert feed. Among those fed inert feed, decysted *artemia* performed better than commercial diet. Percentage survival was least (11%) in larvae fed commercial diet and highest (52%) in larvae fed live feed.

Table 1: Percentage mortality rate of *Gymnarchus niloticus* fed live feed, decapulated artemia and commercial diet

WEEK	Live feed(*Clarias gariepinus* fry)	Decapsulated *Artemia*	Commercial diet
1	1	1	0
2	1	1	1
3	36	49	77
4	10	12	11
TOTAL	48	63	89

Table 2: Growth and percentage survival of *Gymnarchus niloticus* fed live feed, decapulated artemia and commercial diet

Parameters	Live feed (*Clarias gariepinus* fry)	Decapsulated *Artemia*	Commercial diet
Initial weight (g)	0.50 ± 0.0^{a}	0.50 ± 0.0^{a}	0.50 ± 0.0^{a}
Final weight (g)	1.65 ± 0.15^{b}	1.36 ± 0.07^{a}	1.24 ± 0.06^{a}
Mean weight gain(g)	1.15 ± 0.12^{b}	0.86 ± 0.04^{a}	0.74 ± 0.05^{a}
Growth Rate (%/day)	4.11 ± 0.34^{b}	3.07 ± 0.21^{a}	2.64 ± 0.17^{a}
Specific Growth Rate (%)	1.85 ± 0.002^{b}	1.55 ± 0.003^{a}	1.53 ± 0.001^{a}
Survival (%)	52^{c}	37^{b}	11^{a}

Means in a row with the different superscript are significantly different (P<0.05)

4. Discussion

Larvae fed with live feed had the highest growth rate and survival. This agrees with earlier findings [3, 7] that reported the efficacy of natural feed for early rearing of *Clarias gariepinus*. Better growth and survival were achieved in *Clarias gariepinus* [12] using live feed as compared with commercial diet. Another author [6] also reported that *Clarias macrocephalus* performed better on live organism than on formulated diet. Live feeds used in most research works include brine shrimp, rotifers, copepods and other zooplankton [5, 13, 4] but the choice of *Clarias gariepinus* fry as live feed in this experiment was predicated by the piscivorous nature of *Gymnarchus niloticus*.

Among larvae fed with inert feed, those fed with decapsulated *artemia* had the highest growth rate and survival. This finding agrees with earlier works [8, 2] who reported that *Artemia* is well accepted by marine species. Superior growth and survival of larvae fed *artemia* has been attributed to smaller size of *artemia*, its superior fatty acids composition and higher energy content [10].

5. Conclusion

Gymnarchus niloticus will accept inert feed if it is the first feed it was fed with immediately after yolk absorption although *Gymnarchus niloticus* grew best (P<0.05) on live feed, followed by artemia and least using commercial diet. Further research should be carried out to determine growth performance of *Gymnarchus niloticus* on inert feed beyond 4 weeks.

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