

**AN EVALUATION OF THE FLESH OF THE  
TERRESTRIAL SNAIL *ACHATINA FULICA* AS FOOD  
FOR THE FINGERLINGS OF *OREOCHROMIS  
MOSSAMBICUS* (Peters)**

*by*

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**ABSTRACT**

The terrestrial mollusc *Achatina fulica* is now an important pest in Sri Lanka. The flesh of its foot contains approximately 50% protein, 30% carbohydrate and 11% lipid.

The results of the experiments conducted over a period of 12 weeks using *Oreochromis mossambicus* (*Tilapia mossambica*) fingerlings (3-4 cm. in length and 0.2-0.4 gm. in weight) showed that higher growth rates (average 0.07 gm/day) were exhibited by fishes which were fed with *A. fulica* flesh as supplementary food than those fed with chicken feed (average 0.03 gm/day). Least growth rates (average 0.02 gm/day) were exhibited by fishes which were not fed with any accessory food material.

**INTRODUCTION**

As aquaculture is increasingly gaining much importance, investigations which involve testing the suitability of utilizing various easily available and economical materials as fish food have been given much emphasis especially in developing countries within the last decade.

*Achatina fulica* (Mollusca: Gastropoda) is presently a pest in Sri Lanka. It could be collected in large numbers during certain months and could easily be cultured. This terrestrial snail originated from East Africa where it is still considered by the people as a delicacy. It has a voracious appetite and can cause serious damage to food crops and other plants of commercial importance. It arrived in Ceylon and India in the 1910's.

A few workers have tested the suitability of *Achatina fulica* in the feeding of some aquatic organisms of commercial importance. Costa (1981), for instance, reported the use of the flesh of *Achatina fulica* as a high protein diet for the growth of the juveniles of giant prawn (*Macrobrachium rosenbergii*).

The present study is an attempt to find out whether the flesh of *Achatina fulica* can be used as a suitable and economical food item for the culture and growth of *Oreochromis mossambicus*.

### **Methods and Materials**

Live specimens of *Achatina fulica* were collected at Peradeniya. They were kept in the freezer in the laboratory for at least 24 hours before being killed, unshelled and eviscerated. This was done to avoid production of too much mucous during the preparation process. Only the foot musculature was selected for making the fish food. They were dried in an electric oven for 2 days at 60° C and then pounded into a rough powder which was later stored in closed glass bottles.

The *O. mossambicus* fingerlings were collected from the Colombo (Beira) Lake. They were placed in an acclimation tank for 1 week. From this tank 165 fingerlings measuring 3–4 cm in total length were selected and divided into 3 groups (A, B and C) of 55 each. After recording their weights (which ranges from 0.2–0.4 gm), fingerlings from groups A, B and C were transferred respectively to Tanks A, B and C which had been filled earlier with green water from the storage Tank D.

All the 5 rectangular tanks used in these experiments were made of concrete, had the same size (1.8m x 3.7m x 1.1m) and were constructed adjacent to one another. The experiments were carried out at the premises of the Ministry of Fisheries, Inland Fisheries Division, Galle Face, Colombo.

The fingerlings in Tank A were fed with dried coarsely grounded flesh of *Achatina fulica* daily. The fingerlings in Tank B were fed daily with dried 'Leybes' brand chicken feed. This is presently the main type of feed used by Inland Fisheries Division, Ministry of Fisheries, to feed fishes at their fish breeding stations. The experiments in Tanks A and B were conducted to determine the comparative growth rates.

The fingerlings in Tank C were used as controls. They were not given any prepared food. They fed on the rich phytoplankton available in the tank.

The fingerlings from Tanks A and B were given food twice daily at 9.00 a.m. and 3.30 p.m. The total amount of *Achatina* meal and chicken feed given every day to the fingerlings in Tanks A and B respectively was 5% of their total body weight. In addition to these, algal food was available naturally in the tanks.

Every 2 weeks a group of 15 fingerlings were collected randomly from each of the Tanks A, B and C, weighed individually, and then placed back in their respective tanks.

The water from the bottom of Tanks A, B and C was siphoned out regularly every 3 days so as to clean the tanks of faecal and other waste matter. The level of the water was later topped up with green water from the storage tank.

The experiments were conducted for a period of 12 weeks and the analysis-of-variance technique was used to compare the growth rates of the fingerlings in Tanks A, B and C.

### Results

The chemical analysis of the foot muscles of the *Achatina fulica* indicated that the mean percentages of protein, carbohydrate and lipid present were 49.6%, 33.3% and 10.7% respectively. (Table II).

#### Tank A (Supplementary food : *Achatina fulica* flesh)

A rapid positive growth was observed in the fingerlings of *Oreochromis mossambicus* in Tank A. The increase in the mean weight of the fishes for the 12-week experimental period was 5.65 gm and the average growth rate was 0.41 gm/week.

The mean weight conversion coefficient and weight conversion efficiency were 0.07 and 7% respectively.

#### Tank B (Supplementary food : Chicken feed)

The increase in the mean weight during the whole experimental period was 2.35 gm and the average growth rate was 0.20 gm/week.

The mean weight conversion coefficient and weight conversion efficiency were 0.05 and 5% respectively.

#### Tank C (Control)

A comparatively slow rate of growth was observed. The increase in the mean weight of the fingerlings for the whole experimental period was 1.94 gm and the average growth rate was 0.1617 gm/week.

**TABLE 1**  
Some morphometric characters of *Achatina fulica*

Specimen No.	Shell length (cm)	Foot length (cm)	Diameter (cm)	Body weight	
				With shell (gm)	Without shell (gm)
1.	7.12	3.65	3.96	23.6	15.4
2.	4.70	3.32	3.12	29.8	19.0
3.	7.72	4.35	3.92	29.3	19.2
4.	6.43	3.75	3.80	20.9	11.8
5.	6.30	4.32	3.56	38.9	14.7
6.	7.85	4.61	3.60	34.8	17.8
7.	7.58	4.15	4.02	31.8	17.9
8.	6.52	3.93	3.62	30.0	12.8
9.	7.37	4.30	3.18	29.8	19.7
10.	8.36	4.74	3.88	45.8	25.5

**TABLE 2**  
The chemical composition of the foot of *Achatina fulica*

No. of Snail	Percentage of dry weight				Total % of protein + carbohydrate + lipid + ash		
	Protein	Carbohydrate	Lipid	Ash			
1.	..	..	48.30	32.30	7.80	12.53	100.93
2.	..	..	47.80	34.02	10.35	6.53	98.70
3.	..	..	50.02	30.80	13.32	5.94	100.08
4.	..	..	49.87	33.70	11.76	6.87	102.20
5.	..	..	50.01	32.07	10.31	7.72	100.11
6.	..	..	47.85	34.56	12.35	6.68	101.44
7.	..	..	50.04	32.78	13.16	3.76	99.74
8.	..	..	47.56	35.86	14.16	3.98	101.56
9.	..	..	45.05	39.67	7.63	8.97	101.32
10.	..	..	46.37	34.21	14.31	7.73	102.62
11.	..	..	49.31	35.61	7.31	8.29	100.52
12.	..	..	50.01	33.21	7.89	8.21	99.32
13.	..	..	50.32	32.70	11.71	6.68	101.41
14.	..	..	51.21	34.10	6.93	8.36	100.60
15.	..	..	49.76	35.61	8.76	7.99	102.12
16.	..	..	50.07	33.71	14.37	3.38	101.53
17.	..	..	53.01	30.07	11.01	6.46	100.55
18.	..	..	50.71	32.01	6.78	11.58	101.08
19.	..	..	49.35	34.71	14.82	4.11	102.99
20.	..	..	50.06	32.77	11.07	7.17	101.07
21.	..	..	52.01	30.01	8.91	8.46	99.39
22.	..	..	50.11	30.98	9.71	12.28	103.08
23.	..	..	50.81	31.07	11.61	7.21	100.70
Total mean %	..	..	49.55	33.33	10.70	7.43	101.00

### Discussion

The results of the experiments conducted indicate that higher growth rates (average 0.07 gm/day) were exhibited by the *O. mossambicus* fingerlings which were fed with *Achatina fulica* flesh as supplementary food than those fed with chicken feed (average 0.03 gm/day).

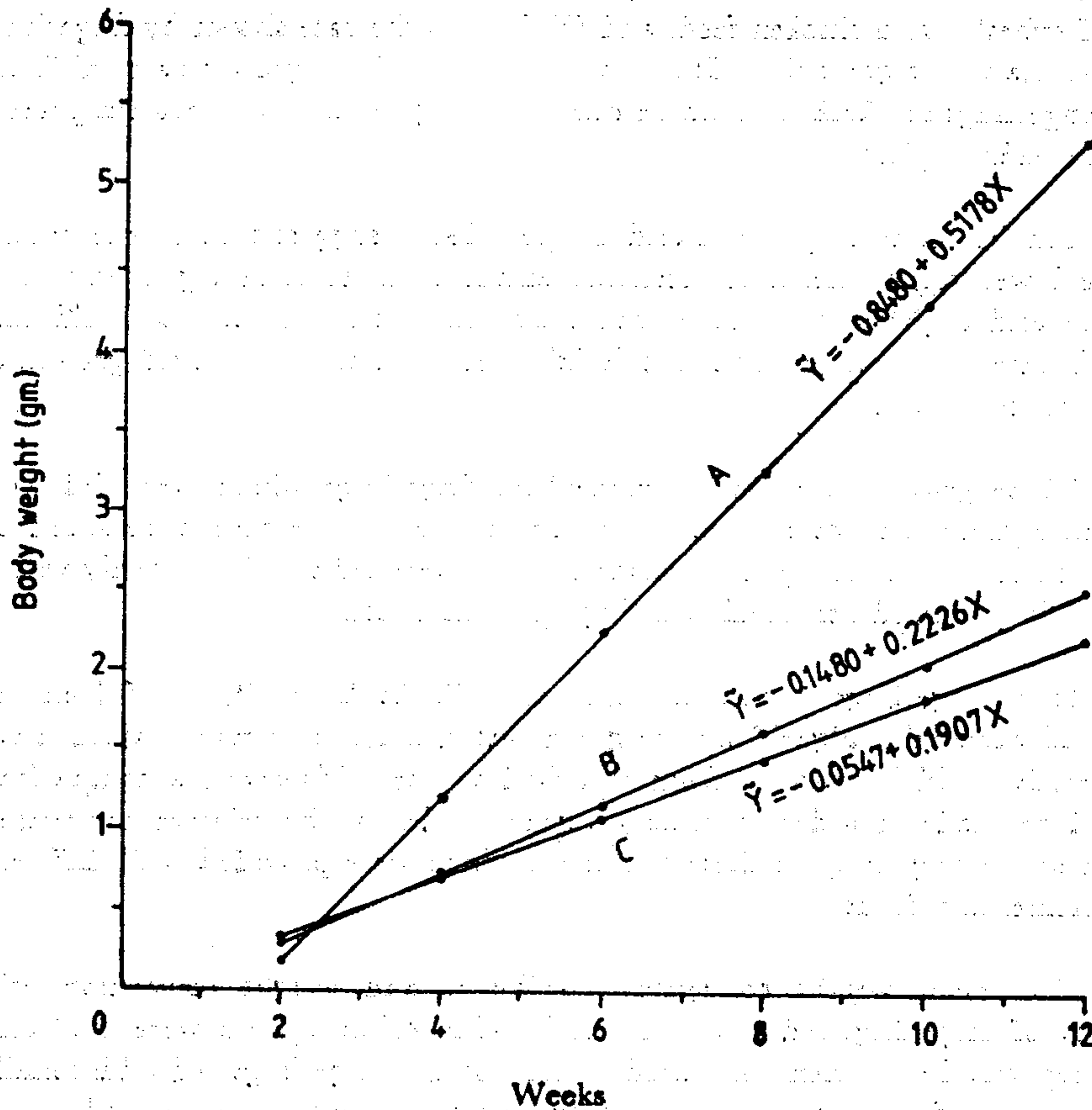
The biweekly increase in the mean weight of the fingerlings in Tanks A, B and C differ significantly at 5% level. The rapid growth of fishes in Tank A in which fingerlings were fed with *Achatina fulica* flesh as supplementary food contributed significantly to this difference.

Fishes from Tank A grow approximately (a) 2.3 times faster than those in Tank B in which chicken feed was used as supplementary food, (b) 3.5 times, quicker than those in Tank C in which no accessory food material was given.

The 'Leybes' brand chicken feed which was used as supplementary food in Tank B contains only 16.2% protein ('Leybes' manufacturer (British

the growth of Oreochromis mossambicus fingerlings in tank A (A) tank B (B) and tank C (C) during the 12 week experimental period.

Figure 1 shows the growth of Oreochromis mossambicus fingerlings in tank A (A) tank B (B) and tank C (C) during the 12 week experimental period. The growth of fingerlings in tank A (A) was significantly higher than in tank B (B) and tank C (C).



**Fig. 1. Growth of Oreochromis mossambicus fingerlings in tank A (A) tank B (B) and tank C (C) during the 12 week experimental period**

The growth of fingerlings in tank A (A) was significantly higher than in tank B (B) and tank C (C). The growth of fingerlings in tank B (B) was significantly higher than in tank C (C).

The growth of fingerlings in tank A (A) was significantly higher than in tank B (B) and tank C (C). The growth of fingerlings in tank B (B) was significantly higher than in tank C (C).

Ceylon Corporation)—personal communication). *Achatina fulica* flesh, on the other hand, is a balanced food containing 49.6% protein, 33.3% carbohydrate and 10.7% lipid.

The protein content of *Achatina fulica* is about three times the amount available in the chicken feed. The growth rate registered by the fingerlings fed on *Achatina* was more than : (a) 2 times the rate exhibited by fishes fed on 'Leybes' brand chicken feed, and (b) 3 times the rate shown by fingerlings fed on natural algae only. It is possible that this high growth rate exhibited by fingerlings in Tank A could be due to the high quantity of protein present in the *Achatina* flesh.

Studies made by Jackson and Cooper (1982) suggest that *O. mossambicus* have lower requirements for essential amino acids such as e.g. methionine, lysine and arginine than other fishes like carp, trout or salmon, and that catabolism of excess proteins in this fish species leads to improved growth at high protein levels.

These growth rates in *O. mossambicus* fingerlings which were fed with *Achatina fulica* flesh as accessory food are similar to the results obtained by Sitasit and Sitasit (1976) for *S. niloticus* which were fed supplementarily with a specially prepared fish meal with high protein content.

Since fingerlings in both tanks, namely Tanks A and B, also fed on the naturally available algae from the green water, a certain amount of nutritive materials could have come from this food source. However, a comparison could be made in order to obtain a general idea of the relative conversion rates of the fingerlings in these two tanks which were provided with different supplementary foods.

The mean weight conversion coefficient and weight conversion efficiency of fingerlings fed supplementarily with *Achatina fulica* were 0.07 and 7% respectively. When compared to that of the fingerlings fed additionally with chicken feed these values were higher by 0.02 and 2% respectively.

It was also seen that there were no significant differences in the mortality rates of the fingerlings fed on *Achatina* flesh, chicken feed and natural algae.

These experiments indicate that the flesh of *Achatina fulica* which is a cheap source of protein could be profitably utilized in the culture of *O. mossambicus*.

The results of the present study and those of Costa (1978) suggest that *Achatina fulica* could be a source of high protein food for aquatic organisms of

commercial importance, and the proper exploitation of this inexpensive and easily available foodstuff could in future give rise to interesting economic possibilities for aquacultural practices in Sri Lanka.

#### ACKNOWLEDGEMENTS

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