NSUK Journal of Science & Technology, Vol. 6: No. 2. 2016. pp. 105 - 107 ISSN: 1597- 5527

DISTRIBUTION AND GROWTH CONDITIONS OF NIGERIA LEECH (*Aliolimnatis michaelseni*) FOUND IN MINNA, NORTH CENTRAL NIGERIA

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ABSTRACT

Leeches have been used extensively for commercial purposes and in different medical fields for the treatment of various disorders. *Aliolimnatis michaelseni* distribution was examined using two trapping devices, a metal funnel trap and burlap sacks and the effect of different culture conditions on the growth and mortality rates using 2 aquaria. Results showed that leeches were found in sites $S_1$12 (1.04%), S_3 484(41.87%), S_5 456(39.47%), S_7 7(0.61%), S_8 7(0.61 %), S_9 185(16.00%) and S_{10} 5(0.43%) out of 1156 sampled. All sites with leeches have both submerged vegetation and littoral rock cover. There was a positive correlation between the number of leeches and mean pH, while a negative correlation exists among leeches number and mean conductivity, turbidity and temperature. Also, culture condition $C_1$with 15 cm depth of non-chlorinated water showed a combined growth rate of 40.78% while $C_2$with five 5cm of sand from the leeches habitat and 10 cm of non-chlorinated water was 59.29%for the 3 months respectively. There was a significant difference in the growth rate at $p<0.05$ between the two conditions. C_2 showed a better growth condition than C_1. Mortality rate for C_1 was 76.74% and C_2 18.25%. There was a significant difference in the mortality rates at $p< 0.05$ of the two culture methods. Physico-chemical parameters were constant throughout the study period. Therefore, this study revealed that leeches are available in our environment and can be cultured artificially in aquaria for commercial purposes.

Keywords: Leech distribution, Culture condition, Growth and Mortality rates, Physico-chemical parameters

INTRODUCTION

Leeches belong to the phylum Annelida and the subclassHirudinea. They are segmented, have a clllitellumand are hermaphrodites. They differ from the earthworms in that they do not have bristles and the external segmentation differs from the internal segmentation of their organs, with two suckers, one at each end.

They have a semelparous, but potentially iteroparous life cycle (Davis and Everrete, 1975; Peterson, 1983; Baird *et al.*, 1986). There are biogeographic studies in the USA relating leech distribution to environmental factors (Beck, 1954; Mann, 1955; Hoving, 1986), there are few studies addressing how these factors relate to the distribution and there is dearth of information on studies on leech distribution in Nigeria.

Thesaliva of medicinal leeches has bioactive compounds such as strong anticoagulants. These anticoagulants containproteins and peptides secreted by leech's salivary glands while sucking the blood to prevent it from coagulation. Leeches are distributed in a variety of habitats, such as in freshwaters, seas, ponds, oases and deserts. They make up an important component in food chain as predators, vectors and preys of aquatic animals (Sawyer, 1986). Most leeches live in freshwater, while some can be found in terrestrial and marine environments as well. Most leeches are hematophagous(Sawyer *et al*., 1981). Almost 700 species of leeches are currently recognized, of which some 100 are marine, 90 terrestrial and the remainder freshwater taxa (Yang, 1996).

Leeches have bright commercial potential and are usually bred for medical purposes. In China and India, traditionalists and other scientific researchers have shown growing interest in culturing and breeding leeches (Pennuto and Butler, 1993, Trontelj and Utevsky, 2005;). Food availability, substrate, water depth, water currents; size and nature of body of water; hardness and pH, temperature of the water, dissolved oxygen, siltation and turbidity, and salinity determine leech distribution in freshwater environments (Sawyer *et al*., 1981).

The objective this study is to describe habitats and the distribution of local medicinal Leech *Aliolimnatis michaelseni*, the effects of environmental factors on their abundance and to determine their growth conditions.

MATERIALS AND METHODS

The Nigeria Leech *Aliolimnatis michaelseni* distribution was studied in Minna North Central Nigeria. Ten sites were selected from clusters of ponds such that it can be sampled in three days. Leeches were collected using two trapping devices (Pennuto and Butler, 1993) and by visually inspecting the undersides of rocks. The two trapping methods were a metal funnel trap and a burlap sack. Funnel traps were 17.5cm tall and 14.5cm in diameter. The funnel was made of 1mm mesh plastic window screen with an apex opening of 1cm. burlap sacks measured 90 x 30cm with a mesh of approximately 1mm. a funnel trap and a burlap sack constituted a trap pair (Plates 1a and b). 10 trap pairs were baited with frozen fish parts and placed at 50m intervals in litoral areas (S1 – S10) at a depth of less than or equal to 1m, traps were set at dusk and retrieved at dawn. Captured leeches were counted and preserved in 10% formalin solution. Presence of vegetation, surface area, temperature, pH and conductivity were recorded.

Plate 1a. Leech Trap

1b. Ventral view of the Leech Trap

Leeches required for culturing were collected from the water bodies around Minna, North Central Nigeria. They were cultured in two aquaria tanks of 41 x 27 x 25 cm filled with water (non-chlorinated) from borehole. Physico-chemical parameters such as Temperature, pH, Hardness; Conductivity were maintained at 28^0C, 6.27, 63 ml/l and 160µsiemen/cm respectively through the period of study. Leeches were cultured in the aquaria for 1 week before the experiment for acclimatization.

Two types of culture conditions C1 and C2 were used to test the growth and mortality rates. For treatment C_1 the leeches were raised in the aquaria with 15 cm depth of water (non-chlorinated), while for treatment C_2 the leeches were raised in the aquaria with five 5 cm of sand from the leeches habitat and 10 cm of water (non-chlorinated) and the experiment lasted for 4 months. The experiment has a total of 10 aquaria with 5 replicates each. Each replicate contain 20 leeches of almost the same size, 200 leeches were collected and introduced into the experimental aquaria. The leeches were fed every month on animal blood from the abattoir and once with artificial boaster (mosquito larvae). Water was changed once every week since the dissolved oxygen would have been used up. Growth rates were taken by measuring the length of the leeches every month before feeding. The experiment lasted for four months and daily observations were made. This method was described by Zulhisyam *et al.* (2011). These physic-chemical parameters were kept constant in both cultures.

Data Analysis

Data generated were analyzed with SPSS software 20.0. Percentages of leech distribution were taken and correlations among variables were determined by Spearman's rank correlation. Independent sample t-test were used to determine the survivorship of leeches.

RESULTS AND DISCUSSION

Distribution of Nigeria Leech

Leeches were found in sites S_1 12(1.04%), S_3 484(41.87%), S_5 456(39.47%), S_7 7(0.61%), S_8 7(0.61 %), S_9 185(16.00%) and S_{10} 5(0.43%), while none was found in S_2 S_4 and S_6 out of 1156 sampled. Sites S_3 and S_5 showed a higher significant distribution. All sites with leeches have both submerged vegetation and littoral rock cover. There was a positive correlation between the number of leeches and mean pH,

while a negative correlation exists among leech numbers and mean conductivity, turbidity, temperature and surface area (Tables 1 and 2). Distribution studies provide information on environmental factors that determine leeches occurrence. To date no data have been available for occurrence and distribution of *Aliolimnatis michaelseni* in Nigeria. Sites that leeches occurred have submerged vegetation and littoral rock cover and are positively correlated with mean pH and negatively correlated mean conductivity, turbidity and temperature. This study agrees with the work of Pennuto and Butler (1993) in North Dakota on ribbon leech, that leech occurrence positively correlates with littoral rock cover; however, it negatively correlates with pH. Darabi-Darestani and Malek (2011) in their study on seasonal variation in the occurrence of *Hurudo orientalis* in Guilan province in Iran observed that temperature, aquatic vegetation and densities directly affected the number of leeches. But in this study temperature has no effect on leech numbers. These countries above have similar weather conditions like Nigeria.

Table 1.Distribution and characteristics of Nigeria Leech (*Aliolimnatis michaelseni*) habitat from June 2014 – February 2015.

Sites	No. of Leeches (%)	Surface Area (m)	Vegetation	Mean pH	Mean Cond. (µsiemen/cm)	Mean Turb. (NTU)	Mean Temp. (C)
GidanKwanu (Afforestation) (S1)	12 (1.04)	680	Sub-merged	6.74	14150	13.72	27.00
GidanPanti 1 (S2)	0	115	non sub-merged Water hyacinth	6.72	21100	22.74	27.13
GidanPanti 2 (S3)	484 (41.87)	46	Sub-merged grasses	6.73	14430	13.71	27.13
Fadipe (S4)	0	67	No vegetation	6.51	19220	22.50	27.50
Bosso Dam (S5)	456 (39.47)	30	Litoral rock cover	6.68	11090	5.88	26.63
Dyata Dam (S6)	0	182	No vegetation	6.19	20710	48.26	26.75
GidanKwanu (S7) FUT Gate	7 (0.61)	59	Sub-merged grasses non sub-merged	6.51	11760	20.93	26.75
Western By-pass (S8)	7 (0.61)	39	Sub-merged grasses	6.73	20000	6.32	27.25
Rice Farm (S9) Behind FUT	185 (16.00)	67.50	Litoral rock cover	6.53	12390	10.37	27.00
David Mark road (S10)	5 (0.43)	62.50	Grasses not sub-merged	6.62	11855	6.07	27.00
	1156	-					

Table 2. Correlation between the number of leeches and mean pH, Conductivity, Turbidity and Temperature

	Number of Leeches	Mean pH	Mean Conductivity	Mean Turbidity	Mean Temperature
Number of Leeches	1				
Mean pH	0.309687	1			
Mean Conductivity	-0.07177	0.610398	1		
Mean Turbidity	-0.35916	-0.80503	-0.71467	1	
Mean Temperature	-0.26749	0.290055	0.473213	-0.14334	1

Growth and Mortality rates

In C_1 the initial growth rate for July was 49.29%, while for August, September and October were 46.60%, 33.48% and 33.76% respectively. For C_2 initial growth rate for July was 51.01%, August 53.39% while September and October were 66.52% and 66.25% respectively (Fig.1). There was a significant difference in the growth rate at P <0.05between the two conditions. C_2 showed a better growth condition than C_1.Determining the optimum growth condition is very important for leech culture and survivorship. In some leeches like *Hellobdellastagnalis* mortality is influenced by bloodstock density and density of their offspring (Mann, 1962).

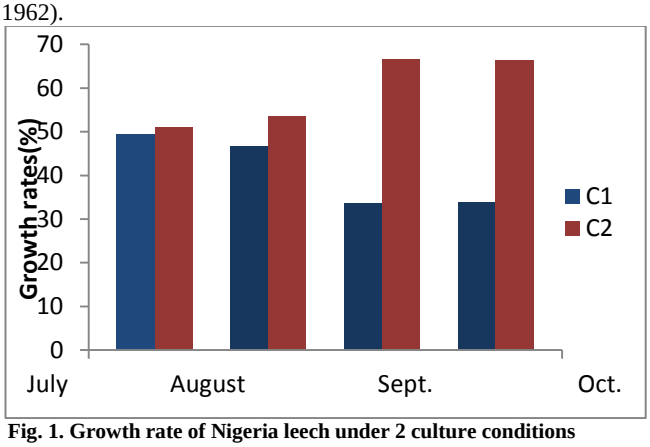

Fig. 1. Growth rate of Nigeria leech under 2 culture conditions

Physico-chemical parameters of growth conditions

The physico-chemical parameters were constant at 28^0C, 6.27, 63 ml/l and 160 µsiemen/cm for the months of July, August, September and October, respectively. There was no cocoon deposited in the two culture conditions because both surfaces of the aquaria were covered with water and there were no damp places for the leech to deposit their cocoon. This is in accordance with previous study that the cocoons of medicinal leech *H. medicinalis* are normally deposited in damp places above the water line on the shore or bank (Elliot and Mann, 1979). Sawyer (1986) also stated that some leeches deposit their cocoons among moss, leaves or humus and other substrates. This study showed that cocoon cannot be deposited in a completely wet environment. The physico-chemical parameters of the water used in the culturing process were in accordance with Zulhisyam *et al.* (2011) that these factors determine the distribution, availability and survival of leech.

Mortality rates for C_1 in July, August, September and October were 85.70%, 84.6%, 66.67% and 70.00% while in C_2 July and August were 14.30%, and 15.38% while for September and October were 13.33% and 30.00%, respectively. There was a significant difference in the mortality rates with P < 0.05 of the two culture methods (Fig. 2). In this experiment, the different culture methods produced contrasting results on their growth and mortality rates. In culture C1 there was a low growth and mortality rates compared to culture C2 which is low. This result conformed to works carried out in Australia where leeches cultured in non-chlorinated water without sand have very high mortality and low growth rates compared to those cultured in aquaria with sand (Zulhisyam *et al.*, 2011).

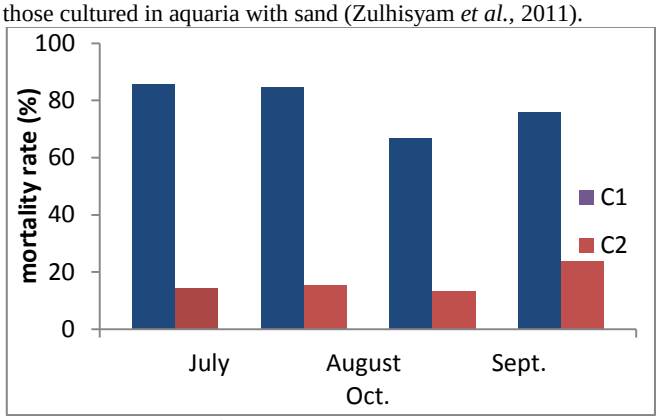

Fig. 2. Mortality rate of Nigeria leech under two culture onditions

ACKNOWLEDGMENTS

This study was sponsored by **TETFUND/FUTMINN/2014/06,** from the Federal University of Technology Minna.

The Nigeria leech was identified by Mark Siddall, Curator and Professor, Sackler Institute of Comparative Genomics & Invertebrate Zoology, American Institute of Natural History, Central Park West NY., USA.

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