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SPECIES COMPOSITION AND DISTRIBUTION OF LEECH (ANNELIDA: CLITELLATA) IN ZARIA, NORTHERN GUINEA SAVANA, NIGERIA

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ABSTRACT

Leeches are distributed worldwide and are found in aquatic and humid terrestrial environments. They play important roles in trophic systems as parasites, predators and prey and, in determining water quality and biodiversity of aquatic and wetland ecosystems. This study was carried out to determine the species composition and effects of physico-chemical parameters on the distribution of leeches in Zaria located within the northern guinea savanna zone of Nigeria. Leeches were collected from August - October 2019 in rice farms and the banks of a stream and a pond with the aid of forceps. The pH, temperature, electrical conductivity and total dissolved solids of each sampled location were taken in-situ using a Hanna Instrument. The average of each physico-chemical parameter was recorded as mean ± Standard Error. A total of 12 leeches belonging to 3 families were collected (Erpobdellidea: Erpobdella octoculata, Glossiphoniidae: Placobdella costata and Hirudinidae: Hirudo species). The species composition (3) which constitutes 25% and abundance (9) constitutes 75% of leeches were highest in the rice farm. Temperature, pH and electrical conductivity (EC) were relatively higher in the rice farm as compared with the stream and pond. However, the physico-chemical parameter did not affect the distribution and abundance of Erpobdella octoculata which was collected in all sampled locations. Species composition of leeches in Zaria was generally low due to reduced precipitation and vegetation type in the study area. Temperature, electrical conductivity, pH and total dissolved solids have effects on the distribution and abundance of Placobdella costata and Hirudo species. Intense survey of Leeches species composition is recommended in the study area.

KEYWORDS: Leech, Composition, Distribution, Physico-chemical parameters, Guinea Savanna

INTRODUCTION

Leeches (Phylum Annelida; Class Clitellata) are distributed worldwide in aquatic and humid terrestrial habitat (Langer, et al. 2017; Yapici et al., 2017). Most aquatic species live on surface plants in fresh water, such as pools, streams, and ponds (Davies and Wilkalies, 2001; Yapici et al., 2017). Leeches are hermaphroditic (Davies and Wilkalies, 2001; Yapici et al., 2017), most live up to approximately a year and their life cycle depends on feeding habits and habitat (Yapici et al., 2017).

There are over 680 species of leeches, about 480 of these are freshwater species and approximately half of the total species of leeches are parasitic, feeding either on the blood of vertebrates or haemolymph of invertebrates; others are predaceous, scavenging or macrophagous, feeding on smaller invertebrates (Sket and Trontelj, 2008; Bielecki et al., 2011). Thus, they are important components of wetland and aquatic ecosystems by controlling prey and hosts populations and, being fed upon by other carnivorous species (Cichocka et al., 2015; Lunghi et al., 2018; Marinković et al., 2019).

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Leeches are useful indicators of water quality and biodiversity in an ecosystem (Saglam, 2018). The presence of specific leech species is often closely related to basic aquatic circumstances and the presence of certain animals (Saglam, 2018).

There is limited information on the physico-chemical characteristics of aquatic environments that are inhabited by leeches (Spyra and Krodkiewska, 2013) and the effects of these parameters on leech distribution. Furthermore, the available information on species distribution and ecology of leech assemblages is incomplete (Marinković et al., 2019). Numerous geographical regions remain to be adequately surveyed (Langer et al., 2017; Yapici et al., 2017). Although leeches are known to occur in Nigeria, its study has not attracted much attention even though conditions exist for their survival (Woke and Eze, 2014). Records of Nigerian leeches are largely lacking as previous studies have focused on their medicinal importance (Woke and Eze, 2014). There is therefore a need for more studies on the species distribution and ecology of leeches in Nigeria especially in the savanna vegetation zones. Hence, this research was carried out to determine the species composition of leeches in Zaria and the effect of some physicochemical parameters on their distribution.

MATERIALS AND METHODS

Study Area: The study area Zaria, Kaduna state, Nigeria is located between latitude 11°5' 7.9476" N and longitude 7°43'11.8020" E. The climate of Zaria has a northern guinea vegetation type and is characterized by a clear distinction between dry and rainy seasons which last from late October to early April and mid-April to early October, respectively. The coordinates of each sampled location was taken with a GPS meter latrex© (Table 1).

Sample Collection and Identification: Collection was done from August-October 2019. Leeches were collected from water bodies using hand net (Elliot and Kutschera, 2011) and on vegetation surrounding water bodies using forceps. The collected leeches were placed into specimen bottles containing water from the sample location, covered with gauze to prevent leeches from suffocating and transported to the Parasitology laboratory of the Department of Zoology, Ahmadu Bello University, Zaria. All collections were done in the morning hours between 6:30am and 8am. Leeches were flattened between two clean slides and preserved in 10% formalin. The morphological characteristics of preserved leeches were observed under a dissecting microscope and identification was done following the guidelines by Sket and Trontelj (2008), Mandal (2009) and Ben Ahmed et al. (2015).

Measurement of physicochemical parameters: The temperature, pH, electrical conductivity (EC), and total dissolved solids (TDS) of each sampled location were measured in-situ using a Hanna instrument.

Data analysis: Species composition was represented as percentages and physicochemical parameters as mean $\pm$ Standard error.

Table 1: GPS coordinates and description of sampled locations in Zaria

Sample Location	Coordinates	Description
Rice farm	11°11'2.4"N 7°40'30"E	A puddle of water surrounded by with rice plants.
Stream	11°10'51.6"N 7°40'33.6"E	Stream surrounded with soya beans plants.
Treatment Pond	11°7'48"N 7°39'0"E	Sewage treatment pond with grasses at the banks.

Key: N= North; E=East; °= degree; '= minutes "= seconds

RESULTS

A total of 12 leeches were collected belonging to 3 families which included the Erpobdellidae; Erpobdella octoculata (3) constitutes 25%, Glossiphoniidae; Placobdella costata (1) constituting 8.33% and Hirudinidae; Hirudo species (8) constituting 66.66% (Table 2). Species composition (3) which constitutes 25% and abundance (9) constitutes 75% were high in the rice farm, while the lowest species composition and abundance was recorded in the stream. Erpobdella octoculata was found in all locations sampled. The average range of each physico-chemical parameters collected in-situ include: temperature (24.33±0.38 - 25.60±1.10)°C, pH (8.72±2.05 - 9.81±1.29), EC (166.67±48.22 - 257.00±39.00)Ωm and TDS (78.33±18.19 - 113.50±3.50)mg/L as presented in Table 3.

Table 2: Species Composition and abundance of Leeches collected in the sampled locations in Zaria

Family/ Species	Rice Farm (%)	Stream (%)	Treatment pond (%)	Total
Erpobdellidae				
Erpobdella octoculata (Linnaeus, 1758)	1(8.33)	1(8.33)	1(8.33)	3(25.00)
Glossiphoniidae				
Placobdella costata (Muller, 1846)	1(8.33)	0(0.00)	0(0.00)	1(8.33)
Hirudinidae				
Hirudo spp. (Linnaeus, 1758)	7(58.33)	0(0.00)	1(8.33)	8(66.66)
Total	9(75.00)	1(8.33)	2(16.66)	12(100)

Key: %= percentage; sp.= species

Table 3: Mean ± standard error of physico-chemical parameters of water bodies in the sampled locations in Zaria

Location	Temperature (°C)	pH	EC (Ωm)	TDS (mg/L)
Rice Farm	25.60±1.10	8.72±2.05	257.00±39.00	113.50±3.50
Stream	24.68±0.28	9.07±1.83	166.00±25.00	79.00±8.00
Treatment pond	24.33±0.38	9.81±1.29	166.67±48.22	78.33±18.19

DISCUSSION

The species composition and abundance of leeches in Zaria was low when compared with that recorded by Woke and Eze (2014) in Port Harcourt. This could be attributed to reduced precipitation and vegetation type in Zaria as compared with Port Harcourt. Zaria is situated in the Guinea Savanna vegetation zone and experiences reduced rainfall and sparse vegetation while Port Harcourt has Forest vegetation characterised by high precipitation and dense vegetation cover. The high species composition and abundance recorded in the rice farm may be due to the fact that blood meal was available for the leeches to feed on in the form of rice farmers. The low number of leeches recorded in streams could be due to the fact that the fast flowing water made it difficult for leeches to attach to vegetation. Woke and Eze (2014) reported a pH and temperature range of 4.40-4.58 and 21-23°C respectively, these values are relatively low when compared to those obtained in this study (pH: 8.72-9.81 and temperature: 24.33-25.60 °C) indicating that leeches can survive in aquatic habitats with pH range from neutral to slightly alkaline and low temperature. Spyra and Krodkiewska (2013) reported P. costata in water bodies with pH and temperature range of 6.2 to 7.4 and 6.0-24.0°C respectively.

The presence of E. octoculata in all the water bodies sampled could be attributed to its mode of feeding and the fact that it can survive under varying habitat conditions. This is supported by the findings of Kutschera (2003) who reported that E. octoculata feeds as a predator, fluid sucker and scavenger.

Placobdella costata was recorded in only one location (rice farm), this may be due to the availability of host's blood. According to Spyra and Krodkiewska (2013), P. costata is a very rare species that occur in small numbers and its presence in any habitat is associated with host availability. Although P. costata has been primarily linked to the pond turtle, it feeds on the blood of other vertebrates (Spyra and Krodkiewska 2013). The presence of Hirudo species in the sewage treatment pond may indicate its ability to thrive in varying ecological conditions. Elliott and Kutschera (2011) reported that Hirudo species thrive in ponds with high temperature with suitable host especially amphibians. The presence of amphibians in the sewage treatment pond was reported by Anele et al. (2020). Whereas, E. octoculata is relatively not affected by pH, EC, TDS and temperature hence its presence in the three locations sampled, the distribution of P. costata and Hirudo species may be affected by physico-chemical parameters.

CONCLUSIONS

The species of leeches in the sampled area in Zaria belongs to 3 families; Erpobdellidae; Erpobdellida spp., Glossiphonidae; Placobdella spp. and Hirudinidae; Hirudo species. Temperature, pH, electrical conductivity and total dissolved solids affect the distribution of P. costata and Hirudo species but had no effect on E. octoculata.

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