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Faunal Parasitic Survey of the African Palm Weevil Larva (*Rhynchophorus phoenicis*) in Bayelsa State, Nigeria

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Abstract

The nutritious viability of the African palm weevil has made it an excellent choice to ameliorate food security in rural communities. Therefore, protecting the environment in such a way to diminish parasitic contamination of the ecosystem can boost survival of the edible larva and improve nutrition in rural communities. This study survey parasitic organisms associated with the African palm weevil and summitted that the African palm weevil larva is vulnerable to parasitic organisms, both insects feeding and zoonotic. The dependent of the larva on organic matter for life substance constitute a critical feature predisposing the larva to diverse parasitic organisms. The larva sampled in this study 86 was gotten from rural palm wine tappers. The formalin ether sedimentation method was employed for parasitological analysis of the edible larva. A total of 31 parasitic organism were reported in this study, unevenly distributed across the sampled communities. The parasites were *Steinernema africanum* was 5 (16.1%) and *Heterorhabditis* Species had 9 (29.0). Other parasitic organism reported were *Fasciola* species 7 (22.5%), *Taenia* specie 6 (19.4%) and *Chiomastrix mensneli* 4(12.9%). The assemblage of both insect parasitic and zoonotic parasites in the edible larva depict threat to the safety of the larva and zoonotic risk to consumers.

Keywords: African Palm Weevil, Edible Insect, Parasitic Organisms, *Rhynchophorus phoenicis,* Zoonotic Parasites.

Introduction

The African Palm weevil larvae, *Rhynchophorus phoenicis* locally referred to Bayelsa suya have long been recognized as a delicacy among the Ijaw people, particularly in the rural areas where they are not only eaten for the taste but also valued for their excellent nutritional attributes. These larvae are highly nutritious, containing sufficient number of proteins, essential fatty acids and micronutrients which are significant in maintaining proper metabolic functions and preventing malnutrition in resource-limited rural communities (Siddqui et al., 2024; Akwa & Gitau, 2024; Anakware et al., 2016). The nutrient-dense profile of the palm weevil makes it an important supplement to conventional protein sources such as meat, fish, and legumes (Akwa & Gitau, 2024 Uzakah & Immanuel, 2024). Because of its nutritious status in quality lipids and proteins, the palm weevil larvae contribute to food security and nutritional diversity (Siddqui et al., 2024; Ayensu et al 2020; Mba et al., 2018), particularly among rural populations with economic barriers to conventional animal protein source. The insect larva can be eaten roasted, boil or fried. However, in some rural areas of Bayelsa state, the Bayelsa suya is eaten raw due to belief and taste preference.

In Bayelsa State, the eating of the African palm weevil larva, *Rhynchophorus phoenicis* has a cultural affiliation, the larva is termed Bayelsa suya. These larvae are harvested from decaying and felled oil palm trees typical of the pattern in Bayelsa State. The harvesting and sales of the African palm weevil larva represent an important livelihood source for many small income households, particularly fishermen, retirees, farmers and hunters who are actively involved in the business of harvesting and marketing of the edible insect larva (Bayelsa suya). Of resent, the marketing of the African palm weevil in Bayelsa State has metamorphose into a viable micro-economic activity with dealers making cool income from it, a scenario which has made the Bayelsa suya stand out in the local informal economy across Ijaw land. Far from the economic relevance of the Bayelsa suya, it portrays cultural significance in the Ijaw tradition served during community festivals, family gatherings, or as a special delicacy prepared through frying.

As the Nigerian population continue to rise, there is the likelihood of the population rising above it carrying capacity, if nothing is done to improve food security. Nevertheless, the African palm weevil portray a suitable alternative to conventional protein sources if free from parasitic invasion both cultivated or from the wild. Also, consuming the African palm weevil larva together with the conventional protein source can form a reliable and nutritionally rich opportunity to combat malnutrition and food insecurity (Adesina et al., 2023; Reynolds et al., 2022; Ayensu et al 2020). Measures to sustain the edible larva can mean a viable indigenous practice that could conform with modern goals of food security and rural development on account of global interest for sustainable and choice of protein source (Thomas et al., 2021). However, parasitic infiltration can jeopardize the relevance of the edible insect larva as a good alternative to protein source.

Parasitic infestation can retard developmental sequence of every host organism (Khatter, 2021; Arora & Arora, 2010) including the edible insect larva and reduce quality. The presence of parasitic organisms will potentially put consumers on health risk and encourages food insecurity. Despite the diary significant of the African palm weevil, there is no profitable data on the parasitic organisms associated with the Bayelsa suya dating rural communities in Bayelsa State, and many have been exposed to a variety of health risk due to unawareness. Therefore, a good understanding on the parasitic organisms associated with the African palm weevil will be beneficial to guide the rural residents on the right way of handling and preparation of the edible African palm weevil larva and reduce the chances of infection that could have occurred from improper handling of the Bayelsa suya. Nevertheless, this study is aimed at surveying the faunal parasitic organisms associated with the African palm weevil larva.

Materials and Methods

Study Area

This study was carried in three rural communities in Bayelsa State, southern Nigeria. The sampling communities were Otuokpoti, Onuebum and Nembe.

Nembe, is located in a riverine zone and characterized by dense mangrove vegetation, stagnant freshwater swamps, and traditional palm wine tapping. The area lacks comprehensive sanitation infrastructure and exhibits minimal waste management practices with GPS coordinate of 4.5367º N Latitude and Longitude 6.4033º E.

Otuokpoti, is a rural Island community where palm wine tapping and larvae harvesting co-exist with moderate infrastructural development. There are limited access roads and basic sanitation facilities are lacking. Otuokpoti is located on Latitude 4.08007º N and Longitude 6.3138º E.

Onuebum Situated proximal to Federal University otuoke. The community can be described as a peri-urban zone combining agricultural activity, fragmented forest cover, and emerging residential housing and influx of resident from Otuoke. Onuebum is located on Latitude 4.787 and Longitude 6.323ºE.

Sampling Method /Collection of the African Palm Weevil larva

This study was carried out between February – May, 2025 which depict late dry season. The study employed the simple random sampling method. In this study, three communities in two local government area council were randomly selected and sampled. A total of 86 freshly gotten larva of the African palm weevil was bought from the palm wine tappers in Nembe, Onuebum and Otuokpoti. The purchase larva was conveyed in a clean rubber container and was quickly taken to the laboratory for parasitological examination in adherence to standard parasitological guidelines for sample handling.

Laboratory Assay of the Palm Weevil Larva

In the laboratory, each of the African palm weevil larva was physically evaluated for surface body parasites and visible infective stage. The larvae were weighed and the bowel emptied into a petri dish, the mouth part was also removed and examined separately. Direct wet mount using normal saline and the formal-ether sedimentation method were employed for the parasitological analysis of the larva.

For the direct wet mount, 5 ml of the African palm weevil larva was homogenized in normal saline in a clean glass beaker as documented in Arora and Arora (2010) and a smear was examined under x4 and x10 objective of light microscope for parasite eggs, larva, cysts and trophozoite as documented in Arora and Arora (2010).

For the formalin-ether sedimentation, 10 ml of the African palm weevil larva homogenate were filtered into centrifuge buckets and centrifuge at 2,000 rpm for 2 minutes and the liquid lying above the sediment were discarded. The procedure was repeated as documented in Arora and Arora (2010) and 7 ml of formalin saline was then added to the sediment and allowed to settle for 30 minutes to fix. There after 3ml of ether was added and adequately stirred to mix and centrifuged at 2,000 rpm for 3 minutes and the centrifugal buckets were allowed to settle and the liquid above the sediment were discarded and the sediment examined under x4 and x10 objectives of the light microscope according to Cheesbrough (2005) and Arora and Arora (2010). A drop of 1 % Lugol's iodine solution was added to each of slid covered with cover slip to enhance visibility and structural contrast of protozoan cysts and helminth eggs.

Parasite Identification

Observed parasites were identified using general morphological characteristics as documented in Laboratory identification of parasites of public health concern (2025) and Cheesbrough (2005).

Data Analysis

Data in this study was presented in tables and charts and the result analysed using simple percentages. The one-way ANOVA was used to analyse significant level on parasite species assemblage against study site.

Results

Infection of the African palm weevil larva with parasitic organisms

Among the 86 larvae of the African palm weevil sampled, 28 (32.6%) were reportedly infected with parasites and 58 (67.4%) were uninfected with any parasites form. Among the 28 infected, 9 (32.1%) occur in Nembe, 7 (25.0%) were reported in Otuokpoti and 12 (28.9%) were infected from Onuebu communities respectively.

Table 1: Infection of the African palm weevil larva with parasitic Organisms

Study site	No of larva Sampled (%)	No Infected (%)
Nembe	27 (31.4)	9 (32.1
Otuokpoti	27 (31.4)	7 (25.0)
Onuebu	32 (37.2)	12 (28.9)
Total	**86 (100)**	**28 (100)**

Parasitic Organisms Associated with the African palm Weevil

A total of 31 parasitic organism were found in the African palm weevil larva. These parasitic organisms were reported in all the locations were the Bayelsa soya were examined in an uneven distribution. For instance, the occurrence of *Steinernema africanum* was 5 (16.1%) and *Heterorhabditis* Species had 9 (29.0). Other parasitic organism reported were *Fasciola* species 7 (22.5%), *Taenia* specie 6 (19.4%) and *Chiomastrix mensneli* 4(12.9%).

Table 2: Parasitic Organism of the African palm Weevil larva

	Samples sites			
Parasitic Organism	**Nembe (%)**	**Otuokpoti (%)**	**Onuebum (%)**	**Total (%)**
Chiomastrix sp	3 (33.3)	1 (12.5)	0	4 (12.9)
Fasciola sp	2 (22.2)	2 (25.0)	3 (21.4)	7 (22.6)
Heterorhabditis	0	3 (37.5)	6 (42.9)	9 (29.0)
Taenia sp	2 (22.2)	0	4 (28.6)	6 (19.4)
Steinernema africanum	2 (22.2)	2 (25.0)	1 (7.1)	5 (17.8)
Total	**9 (100)**	**8 (100)**	**14 (100)**	**31 (100)**

Classification of parasitic organism infecting the African palm weevil

The parasitic organisms reportedly associated with the African palm weevil larva as seen in this study were both insects parasitic and zoonotic parasites. The insect parasitic organisms reported in this study was14 (45.2%) and were *Steinernema africanum* and *Heterorhabditis* Species and the animal infecting parasitic organism reported in study was 17 (54.8%) including *Chiomastrix mensneli, Fasciola* species and *Taenia* species.

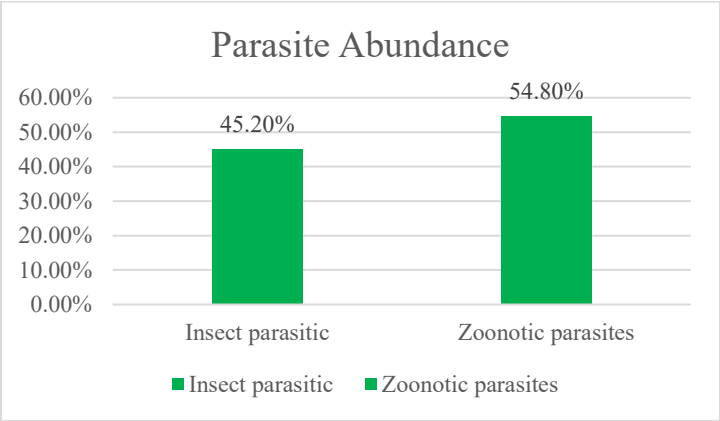


Figure 1: Classification of parasitic organism infecting the African palm weevil

Parasite prevalence in relation to larva part dissected

Parasitic organisms associated with the African palm weevil was distributed between the mouth part and the bowel of the larva. The distribution was uneven. For instance, organisms such as *Steinernema africanum, Heterorhabditis* Species were seen around the mouth part and the bowel while parasites like *Chiomastrix mensneli*, *Fasciola* species and *Taenia* species were recovered from the bowel of the African palm weevil.

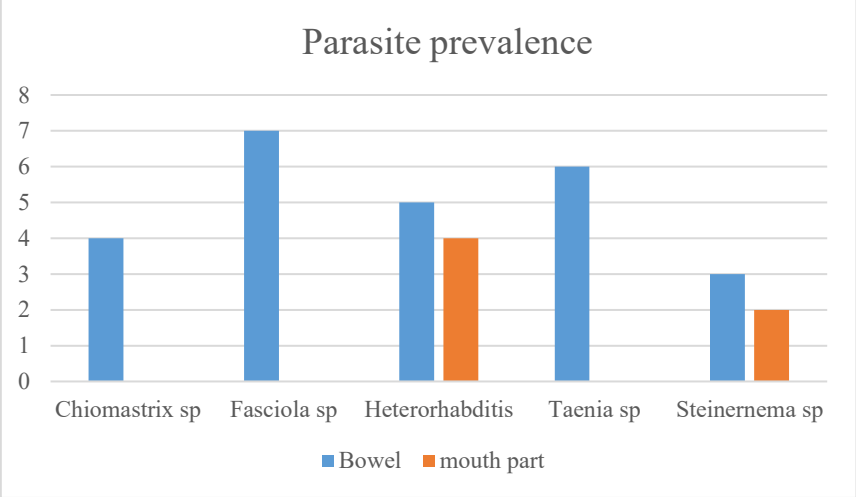


Figure 2: Parasite prevalence in relation to larva part Dissected

Discussion

The nutritious viability of the African palm weevil has made it an excellent choice to ameliorate food security in rural communities in Bayelsa State. Therefore, protecting the environment such to diminish parasitic contamination of the ecosystem can boost survival of the African weevil larva and improve the rural economy in terms of marketing the edible larva. This study assessed faunal parasitic organisms associated with the edible larva and reported that the edible insect larva is a carrier of parasitic organisms, both insect parasitic and zoonotic parasites. The assemblage of parasitic organisms in the African palm weevil larva reflects the versatile nature of parasites and their ability to sufficiently adapt in a variety of environment. This observation supports the report that parasites are capable of surviving virtually in every habitable ecosystem (Marcoggliese, 2023; Kornyychuk et al., 2023). The result concurs with Ebenebe and Okpoko (2015) and Thomas et al. (2021) who reported microbial associated with the edible larva from the African palm weevil.

The parasites reported in this study were both insects and mammal parasitic. This observation depicts the intricate survival pattern and mode of ecological habitat of the African palm weevil larva. The assemblage of insect parasitic nematodes like *Steinernema* species and *Heterorhabditis* species suggest risk for the African palm weevil. *Steinernema* species and *Heterorhabditis* are incumbent enemies of the edible larva and other insect species. However, the ecological constituent of the African palm weevil predisposes the larva to infections of the

parasitic nematodes. This observation supports the report that entomopathogenic nematodes including species of *Steinernema* species and *Heterorhabditis* are natural biological regulators of insect populations including palm weevil (Singh et al., 2023; Nurashikin-Khairuddin et al., 2022; Aneni et al., 2019; Denno et al., 2008). This observation suggests that a concrete control strategy for entomopathogenic species can mean a sustainable technique for the African palm weevil larva and enhance alternative protein source for society.

The overall larva vulnerability in this study was 32.6%. However, the highest susceptibility occurred in Onuebum 42.9%, next was Nembe 32.1% and the larva in Otuokpoti (25.0%) recorded less susceptibility. This observation depicts the hygienic attributes of the sampled rural communities. The result reveal deficient in sanitation infrastructure and poor attitude toward personal cleanliness in the study area. For instance, it was notice during the study that there was no conventional method of disposing waste and majority of the populace defecate in the waterside and bushes. This attitude increases food web contamination and facilitate rapid spread of parasites. Such behaviours increase vulnerability of the larva to parasitic infectivity and threaten choice of protein source. This observation is in conformance with Gizaw et al. (2019) who reported that parasites contamination of the environment thrives in localities with poor sanitation system, insufficient waste management system and indiscriminate defection, typical of the study area.

Other parasitic organisms reported were *Fasciola* species, *Taenia* species, Chiomastrix species. While Chiomastrix is a commensal protozoan, *Fasciola* and *Taenia* species are recognised zoonotic parasites. Nevertheless, the larva serves as a paratenic host, facilitating the spread zoonotic parasites to human. Therefore, the occurrence of *Fasciola* and *Taenia* species depict health risk particularly among populations with the habit of eating raw or inadequately prepared form of the larva. The distribution of parasitic organisms between the mouthpart and bowel of the African palm weevil is indicative of contamination along food chain. The result as seen in this study implied that, ecosystem disturbance directly impacts on food web, endangering inhabiting organisms. This scenario concurs with Khatter (2021) who reported that human disturbance of the environment alters parasite communities and increases the likelihood of rapid spread of infectious disease.

Conclusion

Considering the results, the study summits that the African palm weevil larva is vulnerable to parasitic organisms, both insects feeding and zoonotic. The dependent of the larva on organic remains for life substance constitute a critical feature predisposing the larva to diverse parasitic organisms. The uninformed populations in rural communities feeding and trading on the Africa palm weevil larva with no standard handling or preparatory mechanism are vulnerable to zoonotic infections.

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