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Physicochemical Parameters of Amazah Rock Pool Habitats of Mosquito Larvae and Species Diversity of Indoor-Resting Mosquito of Nearby Lamingo Communities, Jos-North LGA of Plateau State, Nigeria

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Abstract: Mosquitoes are cosmopolitan and are mostly found in freshwater bodies such as ponds, drainages, sewages, stagnant and slow flowing rivers. The study investigated physicochemical parameters of rock-pool mosquito larval habitats of Amazah and species diversity of indoor-resting mosquitoes in Lamingo villages. Three sampling points (A, B and C) were randomly selected; and physicochemical parameters that include pH, temperature, dissolved oxygen (DO), total dissolved solids (TDS), conductivity, turbidity, salinity and depth were conducted. Adult mosquitoes were sampled from 30 households of nearby communities of the rock pool larval habitats, by pyrethrum spray. Mosquitoes collected, were identified using standard keys. The physicochemical properties results revealed significance difference ($p \leq 0.05$) between Depth and TDS. Total of 252 larvae collected, belongs to Anopheline and Culicine group. *Anopheles* spp., were the most abundant 180, closely followed by *Culex* spp. (72) ($t = 45.089$, $df = 2$, $p < 0.001$). *Anopheles* larval mosquitoes spp., were commonly found in shallow pools with higher TDS levels; while *Culex* spp., were found in deeper pools. Anopheline species appear to prefer polluted and unclean water ponds. A total of 208 (*f*-ratio 14.8159. $p = 0.0006$) indoor-resting adult mosquitoes of nearby communities collected, belongs to 3 genera. *Culex* was the most dominant [RA = 47.11%; closely followed by *Anopheles*, RA = 44.23% and the least was *Aedes*, RA = 8.65%, diversity index (H) = 5.49]. The study concluded with greater health implications and the need for targeted vector control; which may involve proper environmental management strategies that can curtail prevalence of mosquito-borne diseases within the localities.

Keywords: *Abundance, Diversity, Indoor-Resting, Mosquitoes, Physicochemical.*

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I. INTRODUCTION

Mosquitoes are cosmopolitan and mostly found in freshwater bodies such as ponds, drainages, sewages, stagnant and slow flowing rivers (Attaullah et al., 2023). They are both indoor and outdoor dwelling organisms; and their distribution are critical cues to understanding epidemiological pattern in order to foster possible integrated control of the human pathogens that is of medical importance (Yee et al., 2022; and Attaullah et al., 2023). Three genera of mosquito species – *Culex*, *Anopheles* and *Aedes* are carriers of mosquito-borne diseases, with high risk to both humans and animals (Alyasiri and Jassum, 2025). Changes in climate such as global temperature and urbanization, are known to impact mosquito distribution and diseases (Wilke et al., 2019). This, due to anthropogenic activities, mostly in sub–Saharan Africa, which greatly influence cases of mosquito and other arthropod-borne diseases as well as Neglected Tropical Diseases (NTDs); which is largely influenced by the availability of water (Avramov et al., 2023). Anthropogenic activities such as flooded wetland rice farms, serve as potential and suitable breeding habitats for mosquitoes that

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are vectors of the deadly parasitic and viral diseases (Wong et al., 2024). These are responsible for over 569,000 cases of human mortalities, mostly under five, of which 94 percent are in sub-Saharan Africa as at the year 2023; thus, an increase of over 10% than that of 2022 (WHO, 2024). These statistics are majorly influenced by human activities (Chaves et al., 2021). However, according to WHO reports, there is a drastic decline in malaria incidence up to about 40-60% decrease in rate of mortality in Africa (Li et al., 2024).

The degree of cloudiness owing to the amount of plant detritus of most water bodies seem to largely affects the amount and distance of light penetration that can reach mosquito larvae in an aquatic environment (Juliano et al., 2004). Ortega et al., (2020); states that light penetration affects oviposition in some species like *Aedes aegypti* and *Ae. albopictus*, which are known to oviposit in clear water. This affects the rate of visibility, that in turn, and affect any predatory activities either on the eggs or larvae. Variation in species composition is also influenced by physicochemical parameters such as salinity and pH (Multini et al., 2021). There is established scientific evidence between occurrences of *Plasmodium* parasites of humans and the interplay of human ecology versus biotic and abiotic factors, which serve as drivers of malaria risk (Chaves et al., 2021). Hence, we set out to investigate the physicochemical parameters of rock-pool mosquito larval habitats and species diversity of adult mosquitoes of nearby communities of the localities, largely due to anthropogenic activities fostered by physicochemical parameters of the nearby ecological habitats that possibly serve as reservoir to the indoor-outdoor mosquito species of the local Lamingo communities.

II. MATERIALS AND METHODS

➤ *Study Area*

This study was conducted at Amazah (Mazah) and Lamingo villages of Jos North Local Government Area (LGA), Plateau State, Nigeria. The geographical coordinates were at Latitude- 9°57'5.4396''N and Longitude 8°54'59.58''E., and Latitude 9º54`47.31948 N and Longitude 8º56`31.0434 E, respectively (Figure 1). These areas are known for its diverse and rich ecological features that provides suitable habitats for various vectors such as mosquitoes and flies, as well as other potential disease-carrying insects like tsetse flies. The locations consist of mix of housing types, ranging from traditional mud buildings to modern structures. Additionally, there are agricultural fields in Lamingo area with long stretch of rivers that culminated into the popular Lamingo Dam; where crops such as ice, maize, potatoes and vegetables are cultivated. These serve as potential larval habitats, located within and around the residential houses of the localities.

➤ *Collection of Larvae*

Mosquito larvae were collected between the hours of 8-10 am, through random sampling from each study location (Figure 2) by use of a soup ladle, and for extensive water bodies standard dippers soup ladle dipper, 0.105 L capacity with some form of modification (using sweep nets, mesh size 0.5 mm) with long handles for small larvae (Robert *et al*., 2002) were used. The number of dips taken per habitat of the rock pools, was determined by the size of the water body, ranging from 10-20 dips per 10m length of the water body. Proper care was taken not to disturb the water in order not to make larvae dive downwards. All sample collection were duly labeled, stating the date, time and place of collection. Water from each pool was collected in a white bowl and carefully observed for the presence of pre-imaginal mosquito larvae. The geo-coordinates of each site were taken by use of a digital GPS compass.

➤ *Determination of Physicochemical Parameters*

Parameters such as electrical conductivity was by micro-Siemens/cm (µS/cm), turbidity, total alkalinity, total dissolve solutes, dissolve oxygen of the water in each breeding site; was done using a multiparameter waterproof meter (Hana®HI-9828), according to protocols by American Public health Association (APHA, 2005). Digital pH meter was used to determine the hydrogen concentration of the water bodies. The calibrated multi-meter, dipped into the water, allowed to stabilize and the reading was recorded for at each point (APHA, 2005). While free carbon dioxide (CO_2) was according to Association of Official Analytical Chemists –AOAC, (2012). The Alsterberg azide method was used to determine the dissolve oxygen content in the breeding sites. From each habitat, 250ml of water was drawn in a stopper bottle (the water was allowed to over flow to expel air bubbles (AOAC 2012). Lastly, dissolved oxygen (DO) was recorded in mg/L,

$$DO = \frac{V_1 \times N(D) \times 8 \times 10}{V_2}$$

Where:

D = Sodium

V_1 = Titer volume of sodium thiosulphate used

N = Normality of thiosulphate used = 0.025N

V_2 = Volume of water sample titrated (8, 10) = constant.

➤ *Pyrethrum Spray Collector for Indoor Mosquito Vector*

The indoor-resting mosquito were collected between the month of April and June 2024; by used of Pyrethrum Spray Catcher (PSC) method (Russell *et al*., 2022). In each household, collection took place between 06:00am and 09:00 am. Priorities were given to rooms that hosted at least 3-5 persons (mostly children) the previous night. Food and water were removed from the house, where applicable. White sheets were spread out on the floor and over furniture. Two levels of spray were used, inside sprays include roofs and walls, while outside sprayed were around the roof eaves. The house was closed for 20 minutes after which the white sheets were brought outside where there is sufficient light to recover and count the dead and/or dying mosquitoes and gently collected in a clean transparent bottle.

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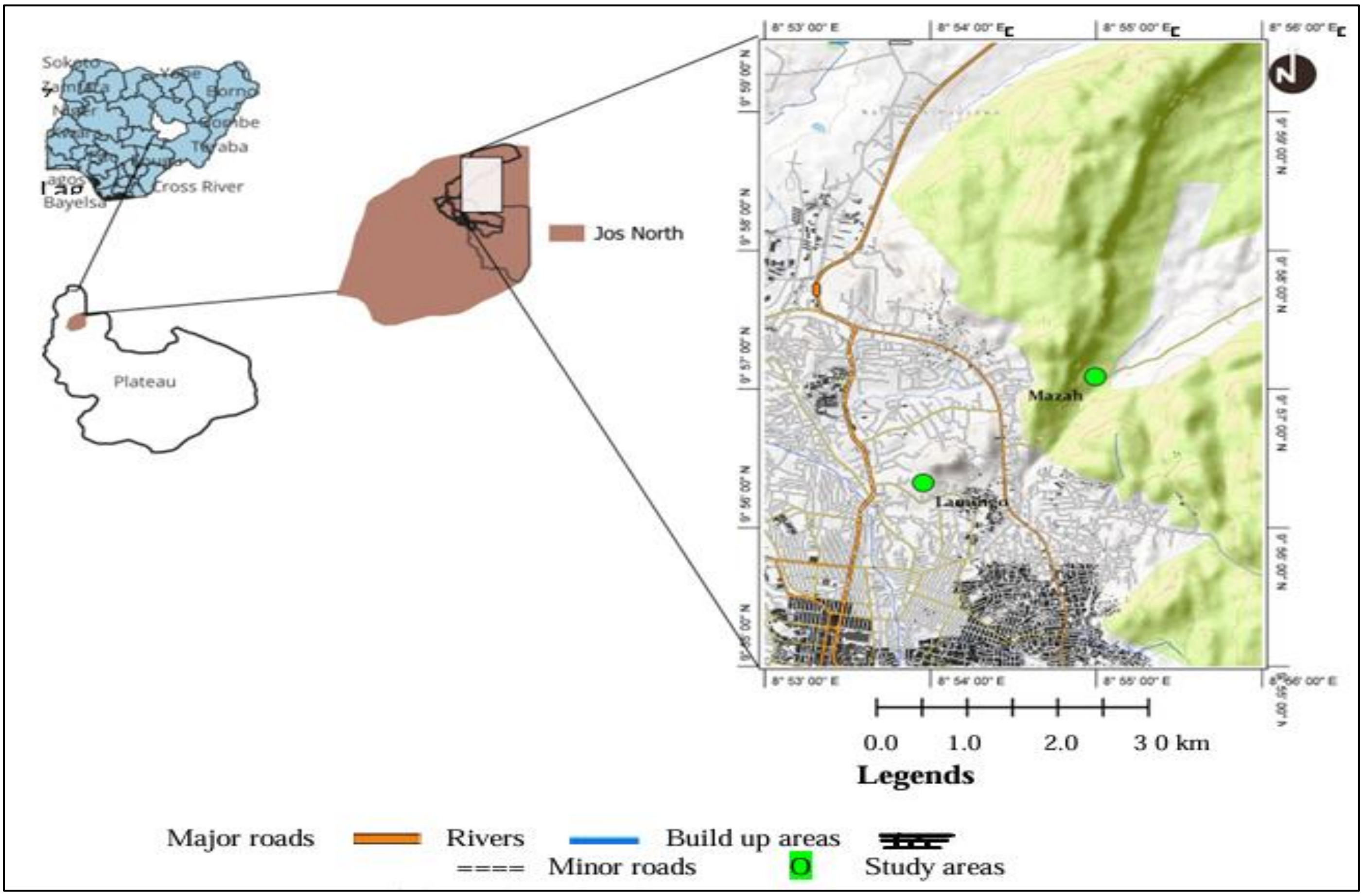

Fig 1 Map of the Rock Pool and Lamingo Study Areas.

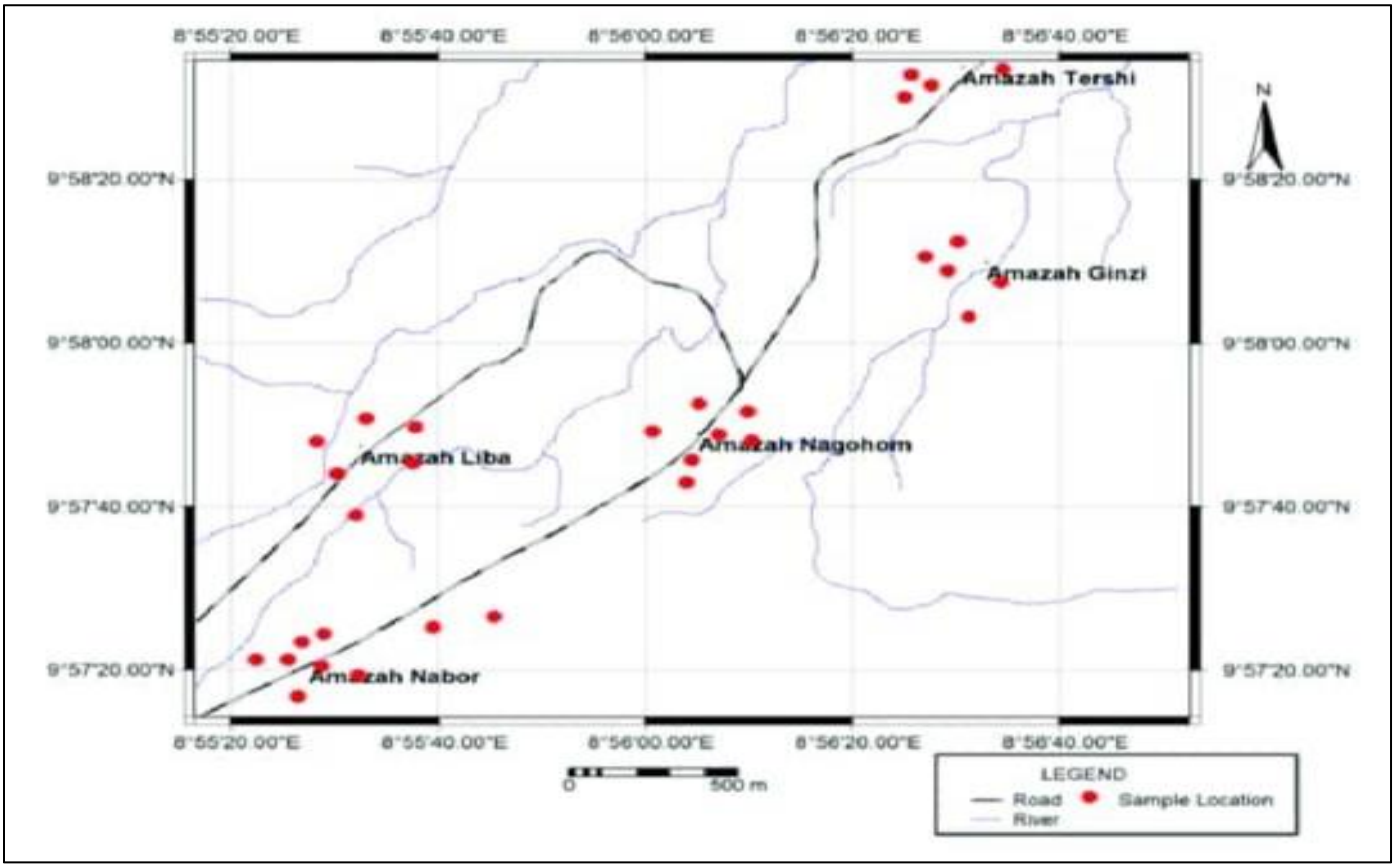

Fig 2 Map of Rock-Pool Larval Habitats in Amazah Communities.

➢ *Morphological Identification of Mosquito Vectors*

All adult mosquito vectors collected, were transported to the laboratory for identification under a dissecting microscope by use of identification keys (Gyawali et al., 2022). All samples were temporary preserved on moist filter papers in petri dishes as described by WHO (2013), and transferred to the Insectary Research Unit of the Department of Science Laboratory Technology, University of Jos for detail identification.

III. DATA ANALYSIS

Descriptive statistics (mean and standard deviation) was used for sample characterization. Species-composition and abundance of mosquito larvae in the rock-pools were analyzed using graphs (SPSS version 21.0). Means standard deviation for physicochemical parametric was by Kruskal-Wallis nonparametric analysis; and χ^2 to determine level of significance. Data for adult mosquito sampling were subjected to One-way Analysis of Variance (ANOVA) and χ^2 tests by used of SPSS Version 21.0. Level of significance was determined at $p < 0.05$. The collected specimens (n) were categorized into genera and species base on taxonomic keys (Gyawali et al., 2022). Specimens were analyzed by Shannon Wiener Diversity index (*H`*). Simpson and Margalef indices were used for relative abundance and distribution. Relative abundance (RA) and distribution (C) was calculated according to Sengil et al., (2011).

IV. RESULTS

➢ *Species Composition and Relative Abundance of Mosquito Breeding in Rock Pool Habitats*

A total of 252 mosquito larvae were collected and identified. These belongs to two genera (Figure 3). These, *Anopheles* and *Culex*. *Anopheles* larvae were the most abundant 180 ($t = 45.089$, $df = 2$, $p < 0.001$) across the various sampling points. *Culex* (72) on the other hand were less.

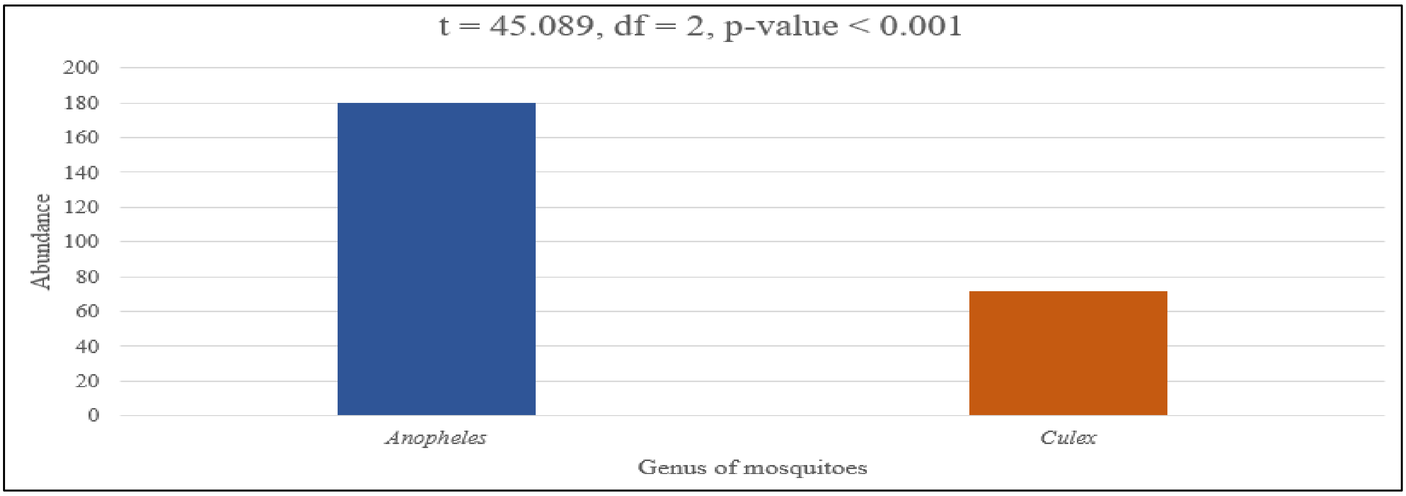

Fig 3 Species Composition and Relative Abundance of Mosquito Breeding in Rock Pool Habitats.

➢ *Relative Abundance of Larval Species Across Sampling Points*

The abundance across the three different sampling points (A, B and C) were analyzed. Point A had 85 mosquitoes, points B and C had 108 and 59 larval species mosquitoes respectively (Figure 4). There was no statistically significant difference ($p > 0.382$) $F= 0.965$, $df = 2$); of mosquito larval species identified.

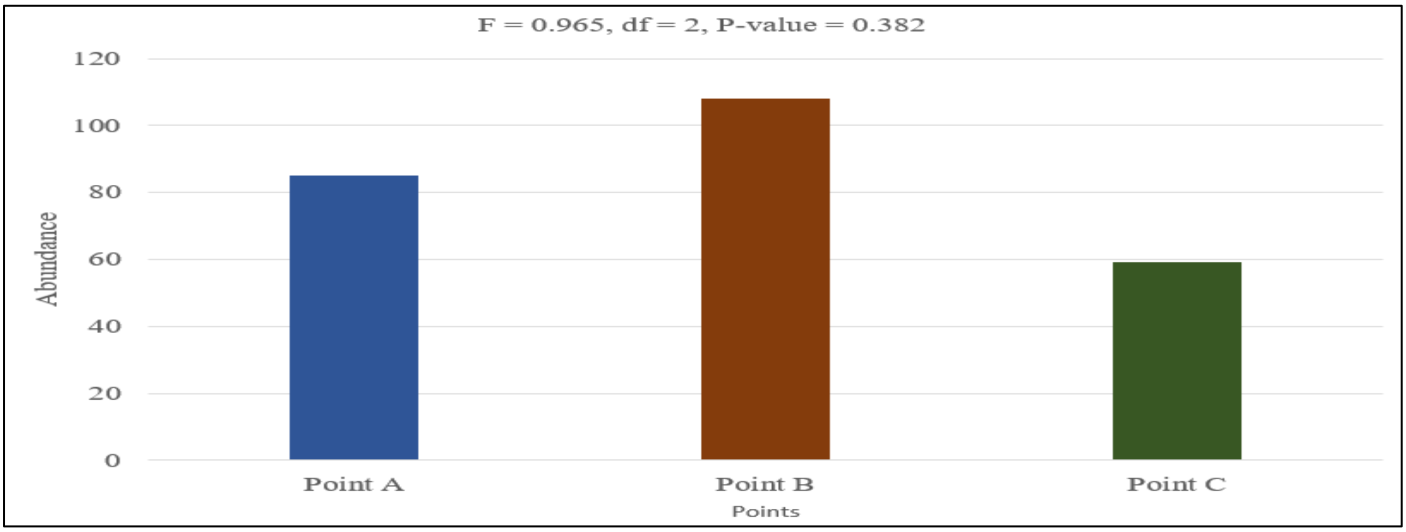

Fig 4 Relative Abundance of Mosquito Species Across Sampling Points.

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➢ *Physicochemical Conditions at Sampling Points of Rock Pool Habitats*

Comparative analysis of the physicochemical conditions (Table 1) with respect to the sampling points revealed that the depth of the rock pools varied significantly across the different sampling points ($p < 0.001$). Point A had the shallowest pools with an average depth of 6.25cm, while point C had the deepest pools with an average of 15.79cm. Total dissolve solute (TDS) also showed significant difference ($p < 0.001$), with point C recording the highest TDS level valued at 390.78 mg/L. Salinity levels also differed significantly ($p < 0.001$) across the three points with point A having the highest salinity valued at 203.34 ppt. Temperature range also varied significantly ($p < 0.001$), with point C being the highest, and valued at 30.01℃ as at the time assessment. The pH level was slightly alkaline, with significant difference ($p < 0.05$) across the different points. Point A had the highest pH level 7.65, while Point B and C had 6.79 and 7.45 respectively. Conductivity also varied significantly ($p < 0.001$), with Point A being the highest, at 553.69 µS/cm. Dissolved oxygen (DO) and Carbon dioxide levels were significantly different; with the highest at points A ($5.05±1.01^a$) and ($16.92±0.73^a$) respectively.

Table 1 Comparative Analysis of the Physicochemical Conditions with Respect to the Sampling Points in Rock Pool Habitats

Point	**Depths (cm)**	**TDS (mg/L)**	**Salinity (ppt)**	**Temp. (℃)**	**pH**	**Conductivity (µS/cm)**	**DO**	**CO_2**
A	$6.25±1.34^c$	$389.18±4.56^a$	$203.34±3.26^a$	$28.08±0.69^b$	$7.65±0.22^a$	$553.69±4.09^a$	$3.44±0.91^b$	$4.78±0.23^c$
B	$12.93±3.85^b$	$382.59±6.63^b$	$192.33±2.46^b$	$27.16±0.39^c$	$6.79±0.10^c$	$527.78±2.21^b$	$3.04±1.00^c$	$8.27±0.67^b$
C	$15.79±0.76^a$	$390.78±6.87^a$	$188.39±0.93^c$	$30.01±0.39^a$	$7.45±0.52^b$	$514.51±29.77^c$	$5.05±1.01^a$	$16.92±0.73^a$
p-v	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

P-V (p- Values are Expressed as M±SEM. Significant Difference, was at $p < 0.05$, TDS = Total Dissolved Solute. ($p < 0.001$) Across the Points with Point C Showing Notably Higher CO_2 Levels at 16,92 mg/L.

➢ *Physicochemical Parameters and Species Diversity of Rock Pool Mosquito Breeding Sites*

The physicochemical properties of the rock pools (Table 2) revealed that depth and Total Dissolved Solutes (TDS) were found to be significantly different ($p < 0.05$). *Anopheles* mosquito species were commonly found in shallower pools with higher TDS levels ($386.19±7.18^a$), whereas *Culex* species were found in deeper pools, valued at $12.45±4.66^a$. There were no significance differences ($p > 0.05$) between physicochemical parameters (temperature, pH, conductivity, dissolved oxygen, and carbon dioxide). However, between the Anopheline and Culicine mosquitoes, there was significant difference ($p = 0.001$, $t = 45.089$, $df = 1$).

Table 2 Comparative Analysis of Physicochemical Conditions in Relation to Mosquito Species

Genus of Mosquitoes	**Depths (cm)**	**TDS (mg/L)**	**Salinity (ppt)**	**Temperature (℃)**	**pH**	**Conductivity (µS/cm)**	**Dissolved (O_2)**	**CO_2**
Anopheles	$10.90±4.57^b$	$386.19±7.18^a$	$195.76±6.79^a$	$28.12±1.20^a$	$7.23±0.49^a$	$534.38±20.40^a$	$3.57±1.26^a$	$8.85±4.57^a$
Culex	$12.45±4.66^a$	$388.07±6.62^a$	$193.53±5.75^b$	$28.18±1.30^a$	$7.23±0.49^a$	$531.00±23.05^a$	$3.83±1.24^a$	$9.79±4.71^a$
P-value	0.016	0.057	0.015	0.723	0.978	0.254	0.128	0.144

$P < 0.05$, TDS = Total Dissolved Solute, ppt = Parts Per Thousand.

➢ *Species Composition and Distribution of Adult Mosquitoes*

Two hundred and eight (208) adult mosquito species from 30 houses were collected. These were identified to belong to three genera. The female *Culex*, were the most dominant genus (RA = 47.11%) with constant distribution C = 100%) in the study area. *Anopheles* mosquitoes were the second most dominant in the study area (RA = 44.23%), with a constant distribution (C = 66%). While *Aedes* mosquitoes were the least dominant (RA = 8.65%) with infrequent distribution (C = 33%). There was no significant difference ($p > 0.05$) in species composition of the mosquitoes collected (*f*-ratio 14.8159, p-value is 0.0006), between and within treatments as indicated on Table 3.

Table 3 Relative Abundance and Species Composition of Adult Mosquitoes in Lamingo Villages

Mosquitoes	**No.**	**RA (%)**	**Status**	**C (%)**	**Status**	**P-value**	**SS**	**df**	**MS**	***f-ratio***
Cx quinquefasciatus	98	47.12	Dominant	100	Constant		794.133	2	397.066	
An. gambiae	92	44.23	Dominant	66.1	Frequent	0.028	321.600	12	26.800	14.815
Ae. aegypti	18	8.65	<Dominant	33.1	Sporadic		1115.733	14		
Total	208	100.00								

RA = Relative Abundance, C= Distribution.

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➢ *Anthropogenic Activities and Relative Abundance of Mosquito Vectors in Relation to Locations*

The total population of mosquito vectors collected from six units of houses and in five locations (Areas), revealed evidence of anthropogenic activities. These include, Area 1, which were predominantly filled with carelessly disposed water-holding materials such as puddles, gutters and runoffs. These had highest *Cx. quinquefasciatus* mosquito species (30), followed by *An. gambiae* (19) and the least was *Ae. aegypti* (5). Diversity indices 1.23, 0.56 and 0.50, Shannon wiener, Simpson and Margalef respectively. Area 2 consists of peridomestic containers such as can, plastic Styrofoam, bottles and gutters with stagnant water. Area 3 and 4 were semi-urban and comprised of small businesses along the road, mini supermarkets with runoffs and gutters. Area 5 was observed to be relatively neat environment with some properly disposed-off wastes' cans and few cases of stagnant water, comparable to Areas 1-4. There was no significant difference (p > 0.118), between the habitat conditions of the different Areas. Shannon Wiener diversity index (*H`* = 5.49).

Table 4 Relative Intensity and Abundance of Mosquito Vectors in Relation to Locations

Area		**Mosquito spp.**			**Indices**	
	Cx. quinquefasciatus n (%)	*An. gambiae* n (%)	*Ae. aegyti* n (%)	Shannon Wiener	Simpson	Margalef
1	30 (14.42)	19 (09.13)	5 (2.40)	1.23	0.56	0.50
2	19 (09.13)	14 (06.73)	3 (1.44)	1.15	0.36	0.56
3	12 (05.77)	26 (12.50)	2 (0.96)	0.93	0.49	0.54
4	24 (11.54)	16 (07.69)	3 (1.44)	1.04	0.55	0.53
5	13 (06.26)	17 (08.17)	5 (2.40)	1.14	0.64	0.56
Total	**98**	**92**	**18**	**5.49**	**2.60**	**2.69**

p-Value = 0.118, N = 208, n = No. of Mosquitoes/Study Location or Location.

V. DISCUSSION

The study in Amazah and Lamingo communities provided prove of the existence of suitable ecological habitats that favor breeding of mosquito species, vectors of the deadliest arthropod-borne parasitic diseases in the localities. Multiplication of mosquitoes are often fostered by anthropogenic activities that result in habitat alteration, thereby affecting the biodiversity that often leads to cases of malaria infection; due to increase stagnant waters and domestic run-off gutters; as earlier posited by Josesph et al., (2013); and Cable et al., (2017); their work on global environmental changes that influence the distribution and diversity of mosquito species.

Additionally, alteration of bioecological settings, does result in attributable conditions such as combination of physicochemical factors like pH, dissolve oxygen, temperature and conductivity. The environmental alterations, possibly aid in the fecundity and species composition of mosquitoes of the localities. These are further enhanced by anthropogenic activities such as dug-out pools, furrows and human foot prints, as evidenced by the outcome of this research work and supported by the works of Boerlijst et al., (2023); and Kermelita et al., (2024). Such anthropogenic activities are known to create habitats that favor the multiplication and increase in mosquito density and abundance. Furthermore, mosquito species composition and diversity, seems to be influence by physicochemical parameters. For instance, the outcome of the rockpool larval habitats, indicated that *Anopheles* species, which tends to survive in both clear and turbid pools were more abundant at some collection points, as oppose to *Culex* and *Aedes* species. This position agrees with the species collected by Multini et al., (2021), on their work on influence of pH and salinity of water as breeding sites and community composition of immature mosquito species in Sào Paulo, Brazil.

Similarly, relative abundance of *Anopheles* mosquitoes from rock pool habitats compares favorably with the study by Emidi et al., (2017). It was evident that *Culex* species were often found in much deeper pools. Thus, it can be suggested that shallow pools seem to be beneficial to *Anopheles* species, since it is easily warmth, and tend to accelerate larval growth and reduce time of adult emergence; similar to an earlier finding of Bayoh and Lindsay, (2003). Notwithstanding, this may appear to be species-specific, as hatchability and growth tends to improve growth and increase of *Ae. aegypti* at warmer temperature than *Ae. albopictus* (Doeurk et al., 2025). Nevertheless, Multini et al., (2021) and Avramov et al., (2023); discovered pH and salinity as physicochemical parameters that mostly influence variation in species composition and the type of breeding sites. While Emidi et al., (2017) discovered high salinity and electrical conductivity of the water, to significantly result in increased density of *Anopheles* larvae; Akeju et al., (2022), discovered only electrical conductivity to significantly correlate with abundance of *An. gambiae* and *An. funestus*. On the contrary, Wang et al., (2024), discovered a weak correlation between ambient temperature and relative humidity versus species diversity and/or abundance of the mosquitoes; that result in increased cases of malaria due to host preference or selection. Again, Obi et al., (2019); indicated that the abundance of mosquito larvae were significantly influence by pH of rock pools. On the whole, this study discovered no significant difference between the physicochemical parameters that determine species distribution and abundance of the mosquitoes in the localities.

Anthropophilic and zoophilic species may largely be dependent on both human and animals' blood for oviposition, considering the proximity of neighboring communities to the relatively thick rock-pool vegetation of the study locations. Even though *Culex* spp. seems to be the most abundant indoor resting species, cases of malaria infection seems to be most reported following verbal interaction with officials of the nearby healthcare facilities within the localities. Average, temperature, relative humidity, and rainfall distribution may influence the population dynamics that relates with abundance and distribution of the various species that were identified in the mountainous (rock-pools) vegetations. This could equally be applicable to residential communities, where the indoor-resting mosquitoes were sampled.

Furthermore, anthropogenic activities have long been an act that left ancient land marks in form of depressions on rocks, likely footprinted, used for grinding and pounding food substances in olden days. These serve as breeding habitats for the different mosquito species. The discovery in this work is in consonant with the findings of Adebote et al., (2008), their work on mosquito breeding in rock pools on inselbergs, Zaria, Nigeria. The breeding potential of these vectors are largely influenced by bioecological and/or physicochemical factors, which led to increase in species diversity and abundance of mosquitoes as supported by Afolabi et al., (2019); Lapang et al., (2019); Multini et al., (2023) and Kermelita et al., (2024).

Therefore, increase in cases of malaria and other arthropod-borne diseases are not just in rural areas, where the rock pools were predominant; but also, in the nearby urban and semi urban Lamingo communities that borders Amazah rock-pool habitats. Hence, high correlation in terms of species diversity of mosquitoes discovered in the rock-pool habitats; except for *Aedes* species found among the indoor-resting mosquitoes of the residential areas. Anthropogenic activities such as indiscriminate disposal of wastes, cans, used tires, ponds, small earth dams and both animal and human foot prints especially during raining season, usually favor habitat variation and/or alterations that enable the multiplication and abundance, of the mosquito vectors. Furthermore, the rate and availability of mosquitoes in such semi urban areas might largely be due to flight abilities of the mosquitoes from such infested rock pool habitats; possibly in search of suitable and/or preferred human host. This is evident by the species diversity of mosquito from the rock-pool habitats and the indoor-resting mosquitoes species obtained from the nearby Lamingo communities. Therefore, high cases of morbidity and mortality due to malaria infection in the study areas and by extension, the Nigeria society; fostered by anthropogenic activities. This is evident by what other authorities like Wilke et al., (2019); and Kermelita et al., (2024); their work on cases of human activities that creates suitable habitats for mosquito breeding in urban areas. Species of mosquitoes identified from this study, were the most predominant and common, all-over Nigeria, as supported by Chibuke (2022); research conducted in South-East Nigeria; a locality that is over 600 km away from this study sites (Jos –Plateau State). In the same vein, these discoveries are strongly supported by the works of Irikannu et al., (2021), and Attaullah et al., (2023), who equally discovered *Culex quinquefasciatus* to be the most abundant mosquito species, followed by *An. funestus*. Howbeit, *Culex* mosquitoes were the most abundant from the outcome of the knock down indoor-resting mosquito, collected at Lamingo – adjacent communities to the sites of rock-pool habitats.

Other likely conditions that led to increase malaria infection especially within human population for species such as *Ae gambiae,* might be variation in carbon dioxide-rich body odor emission of humans, especially during sleep that tend to be strong attractants or thermotaxis guide as posited by Giraldo et al., (2023); and Fan et al., (2025). More so that most of residential houses sampled, were often overcrowded with 3-4 individuals (mostly children) per room, which could lead to increase concentration of carbon dioxide. Again, their ability to sense and/or detect hosts odor from a very far distance (Wilke et al., 2019); can be associated clues to increase cases of malaria due to infection by *Anopheles* species. Nevertheless, Prasadini et al., (2019), and Zhao et al., (2022); implicate blood group type and human odor as cause of host preference and selection, particularly the female *Aedes aegypti* mosquitoes. There seems to be underlying conditions, which calls for further investigation to unravel the disparities in species diversities and reported cases of malaria infections than other mosquito-arthropod-borne diseases such as filaria and yellow fever.

VI. CONCLUSION

The relative abundance and species diversity of mosquito vectors in the study areas, posed serious health risks to human population of the surrounding villages and the semi-urban nearby communities. Thus, the urgent need for integrated control measures that may include not just prophylaxis but public health awareness and education with respect to the need to use insecticide treated bed nets; and personal protection strategies. Unhealthy anthropogenic practices, such as poor attitude towards waste disposals that enhance breeding and fecundity of mosquitoes in the study areas, should be discouraged.

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