

## Effect of location on hematological composition and lead concentration of common toad (*Bufo regularis*) in Abeokuta, Nigeria

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### ABSTRACT

The study examined the effect of location on hematological compositions and lead load of common toad (*Bufo regularis*) in Abeokuta, Nigeria. Sixteen samples of *Bufo regularis* were collected from four different locations in Abeokuta (Hospitals, Mechanic villages, Residential areas, and Quarry sites) and subjected to laboratory analysis to assess the impact of environmental degradation on the biochemical composition of the species. The result indicated that the hematological compositions of *Bufo regularis* in the studied areas were significantly different ( $P < 0.05$ ) in all the locations and were significantly higher in the residential area. It was also observed that there was a significant difference ( $P < 0.05$ ) in the blood lead load of *Bufo regularis* collected in the studied area and was highest in Mechanic villages ( $7.45 \pm 3.54$ ). The study observed that environmental conditions of the study area affect the well-being of living organisms, especially toads (*Bufo regularis*). Proper garbage management and an effective environmental awareness campaign against improper dumping of refuse were suggested for management considerations.

**Keywords:** Hematology, lead load, blood content, location, environment

### INTRODUCTION

Anurans are the largest group of amphibians. Approximately 5,891 species are found in this group (Beebe and Griffiths, 2005). Members of the family Bufonidae are known as the "true toads" (Frost, 2006). It is largely found in forested areas with coniferous, deciduous, and mixed woodland, especially in wet locations (Stokeo, 1980; King *et al.*, 2012; Onadeko *et al.*, 2013; Channing and Rodel, 2019). It also inhabits open countryside, fields, copses, parks, and gardens, and often occurs in dry areas well away from standing water. The common toad can reach about 15 cm (6 in) in length. The body is broad and squat and positioned close to the ground. The forelimbs are short with the toes of the forefoot turning inwards. The hind legs are short relative to other frogs' legs and the hind feet have long, un-webbed toes. There is no tail. The skin is dry and covered with small wart-like lumps. The colour is a fairly uniform shade of brown, olive-brown, or greyish-brown,

sometimes partly blotched or banded with a darker shade (Onadeko *et al.*, 2013).

The impact of environmental pollutants on amphibian populations is influenced by climate change, habitat modification, urbanization, industrialization, and other anthropogenic behavior and activities (Hayes *et al.*, 2010). Various other alterations of groundwater supplies, surface water flow, ponds, lakes, and rivers will similarly affect the transport of chemicals released into the environment or sometimes aid the concentration of such chemical components in such habitat. Environmental contaminants (such as herbicides), climate change, and invasive species are potent agents of habitat modification which has a gross impact on toad ecology (D'Amore *et al.*, 2010; Shine, 2010). Frogs and toads are good biological indicators assessing quality and changes in a given ecosystem. Anurans are responsive to changes to their ecosystem and ingest toxic chemicals by their

skin and larval gill membranes. It has been observed that they are inadequately capable of detoxifying pesticides which they ingest, inhale, or consume from contaminated foods which allows accumulation of organochlorine pesticides in their bio-systems (Simon *et al.*, 2011).

Occasionally, toads and frogs do consume toxic chemicals with their permeable skin which makes them a model for evaluating the impact of ecological influences that could contribute to decreases in their population. For contamination research such as the environmental effect of agricultural chemicals, toads and frogs are widely used as biological markers (Zaghloul *et al.*, 2020). Some scientific findings have assessed the effect of metal accumulations in toads and frogs under laboratory (Herkovits and Helguero 1998, James and Little, 2003) and field conditions (Flyaks and Borkin 2004, Fenoglio *et al.* 2006). Studies have shown that highest concentration of metals were found in the digestive tracts of tadpoles of *Rana catesbeiana* (Burger and Snodgrass 1998) while in the case of tadpoles of *Bufo raddei*, Zhang *et al.* (2007) reported that the ATPase activity increased with increasing value of cadmium and lead concentrations which indicates that the ATPase activity may be a warning signal of pollutant-induced damages in the ionic and osmoregulatory system of the tadpoles. This study is assessing the effect of location on hematological composition and lead concentration of *Bufo regularis* in Abeokuta, Nigeria.

## MATERIALS AND METHODS

### Study area

Abeokuta (city under the rock) was founded about 1830 by Sodeke (Onaikomaya *et al.*, 1992) and is the largest town and the capital city of Ogun State. It is situated in the southwestern part of Nigeria, geographically located at 7°9'39"N and 3°20'54"E on the east bank of the Ogun River, near a group of rocky outcrops in a wooded savanna (Adedokun, 2002), 48 miles (78km) north of Lagos by railway or 81 miles (130km) by water. As of 2006, Abeokuta and the surrounding area had a population of 449,088 (Hoiberg, 2010). Two main climatic conditions exist, the rainy season lasting for between seven and eight months between April and October with an interruption in August and the dry season; running from November till

February. Annual rainfall ranges between 1400mm and 1500mm while the temperature is usually between 26°C and 28°C (Ayoola, 2022).

### Samples collection

Using visual encounter surveys, samples of *Bufo regularis* were captured and collected by hand following Oropeza-Sanchez *et al.* (2018) from four different locations in the study area; Hospitals, Residential areas, Mechanic villages, and Quarry sites. Four samples of *Bufo regularis* were randomly selected from the collections made in each location. The toads were sacrificed humanely according to international standards by euthanizing them with Xylocaine and blood samples were immediately collected from the vein at the leg of the samples with a fine syringe of 1ml into labelled hematocrit tubes. The hematological assessment was carried out on collected blood samples according to Hyslop, (1980) and Fawole and Oso, (1998). The euthanized toads were then dissected to get samples from different body parts. The 16 samples were grounded differently using Mortar. Samples, 0.5mm of each from different locations was poured into a test tube with the addition of 10ml nitric acid and 5ml hydrogen peroxide and heated together in an electric heater. After being heated, 50ml of distilled water was added. After some hours it was filtered into sample bottles. A Flame Atomic Absorption Spectrometer was used in analyzing the concentration of lead. All procedure was guided using the guidelines of Whiteside (1981).

### Statistical analysis

Analysis of Variance (ANOVA) was used to compare the Laboratory results of *Bufo regularis* data using SPSS Version 20.0. The descriptive statistics (mean  $\pm$  SE) of readings were further subjected to the Duncan Multiple Range tests (DMR) in order to ascertain the actual locations of significant differences.

## RESULTS

The result of the hematological assay of toads found in the studied locations is shown in Table 1. The result showed that there were significant differences ( $P < 0.05$ ) in the samples among the locations. Samples from the residential areas had higher Pack Cell Volume (PCV), Hemoglobin (HB), Red Blood Cell (RBC), and White Blood Cell (WBC) than those in other locations while samples from quarry sites had

the lowest PVC, HB, and RBC. The WBC was lowest in samples found in the mechanic villages. Table 2 showed the result of the metal (lead) load composition of *Bufo regularis* in the studied locations. The lead (PB) content was assessed and a significant difference ( $P < 0.05$ ) in the lead content in *Bufo regularis* was found in

the four locations. The lead content was highest from samples collected from the mechanic village areas ( $7.45 \pm 3.54$ ) followed by those found in the residential areas ( $7.00 \pm 3.13$ ). The least was observed in samples found in the hospital areas ( $2.25 \pm 1.79$ ).

**Table 1:** Hematological composition of *Bufo regularis* from the study sites

Treatment	Hospitals	Mechanic villages	Residential Areas	Quarries
PCV	$38.00 \pm 7.58^b$	$38.50 \pm 5.04^c$	$39.25 \pm 4.15^d$	$29.50 \pm 6.89^a$
HB	$12.60 \pm 2.48^b$	$12.78 \pm 1.68^c$	$13.03 \pm 1.35^d$	$9.85 \pm 2.30^a$
RBC	$5.38 \pm 1.12^b$	$5.39 \pm 0.77^b$	$5.55 \pm 0.61^c$	$4.17 \pm 0.95^a$
WBC	$15.03 \pm 0.36^c$	$12.03 \pm 0.53^a$	$15.58 \pm 0.24^d$	$14.70 \pm 9.73^b$
NEUTR	$37.25 \pm 0.48^a$	$39.25 \pm 2.46^d$	$38.50 \pm 1.66^c$	$37.63 \pm 0.65^b$
LYM	$57.25 \pm 1.25^c$	$55.75 \pm 2.29^a$	$59.50 \pm 1.55^d$	$56.50 \pm 0.29^b$
EOS	$4.25 \pm 0.25^a$	$4.25 \pm 0.48^a$	$4.25 \pm 0.41^a$	$4.25 \pm 0.25^a$
MONO	$1.00 \pm 0.41^a$	$1.00 \pm 0.41^a$	$1.00 \pm 0.00^a$	$1.00 \pm 0.41^a$
BAS	$0.00 \pm 0.00^a$	$0.00 \pm 0.00^a$	$0.00 \pm 0.00^a$	$0.00 \pm 0.00^a$

Means with the same super script along the rows are significantly different ( $P < 0.05$ ).

Keys: PVC= PACK CELL VOLUME; HB= HEMOGLOBIN; RBC= RED BLOOD CELL; WBC= WHITE BLOOD CELL; NEUT= NEUTROPHIL; LYM= LYMPHOCYTE; EOS= EOSINOPHILS; MONO= MONOPHILS; BAS= BASOPHILS

**Table 2:** Lead load contents of *Bufo regularis* from the study area

Treatment	Hospitals	Mechanic villages	Residential Areas	Quarries
LEAD	$2.25 \pm 1.79^a$	$7.45 \pm 3.54^d$	$7.00 \pm 3.13^c$	$5.55 \pm 3.28^b$

Means with the same super script along the rows are significantly different ( $P < 0.05$ ).

## DISCUSSION

Toads are one of the most effective bio-indicators that reflect fluctuations in environmental phenomena (Roelants *et al.*, 2007; Edina Simon *et al.*, 2011, and Samuelson, 2019). Such sensitivity is reflected in their response to surrounding component variations. The result of this work established the role of location in the development and well-being of living organisms, especially toads. The presence or absence of favourable environmental factors like food, water, shelter, air, and others could lead to various effects on the growth and health of animals found in such places and could also determine their growth and development (Wells, 2007). In recent years, blood parameters have been commonly used to observe and follow toad health (Wells, 2007). The result of the

hematological assay of the toad from various locations studied mirrors the well-being of toad resources in the study area. Effluent discharge due to industrial waste and human activities is buried in the soil, diffuse into the atmosphere, or dumped into the surrounding water systems. Toads' dependent ecosystem are ecologically affected due to the resultant effect of these residues and as stated by Kiesecker *et al.*, (2004) and Barret *et al.* (2010), their health and well-being directly or indirectly reflect the collective effect of urbanization and industrial abnormalities arising due to water, soil and air pollution within these ecosystems.

From the studied locations, it was observed that mechanic villages have more lead content than the other locations, this could be attributed to the

residual effect of oil and chemical wastes used in the mechanic villages. Sediments accumulate more heavy metals (PB) in the mechanic villages and these confirm earlier observations by Don-Pedro *et al.* (2004) in the Lagos lagoon. Given the static nature of sediments, they tend to accumulate more toxicants than water which may flow away, drain off, or even evaporate. It was also observed that the lead content was also higher in the Residential area. This could be attributed to the improper waste management lifestyle of humans and its residual home discharges as effluents or wastes into the environment indiscriminately. Environmental pollution that could occur due to careless oil spillage in mechanic villages and human surroundings, indiscriminate waste disposal, and other environmental misuse have an enormous impact not only on environmental resources but also on their dependent living factors as also observed by Carey and Bryant (1995), Otitolaju and Don-Pedro (2002) and Akinsanya *et al.* (2020). It was also observed that the lead content assessed from samples collected from quarry areas were significantly higher too and could also be connected with the impact of rock blast and other used chemical residues in the environment that are washed or leached into the rivers or streams in the area where toad inhabits.

## CONCLUSIONS

Human activities and the use of the environment has an enormous impact (directly or indirectly) on the health and well-being of living resources and their dependent ecosystems. A conscious effort has to be made by man to preserve environmental locations which serve as residual habitats for living organisms especially toads and also to maintain a quality and a safe environment. The influence of urbanization, indiscriminate home waste disposal, industrial effluent discharges, mineral extraction, and other likely environmental potential hazards have to be cautiously and consciously looked into because of their likely impact. Proper garbage management, environmental awareness campaigns against pollution in relatively every social media, and knowledge impartation of the relevance of animal resources to man in schools and colleges are urgently needed to preserve dwindling ecosystems and biodiversity.

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