ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 10| Issue: 10| October 2024|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2024: 8.402 || ISI Value: 1.188

SEASONAL DIVERSITY OF SNAKES IN AMASSOMA AND ITS ADJOINING TOWNS IN BAYELSA STATE, NIGERIA

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ABSTRACT
A seasonal baseline assessment of the diversity and abundance of snakes in Amassoma and Its Adjoining Towns in Bayelsa State was conducted from January to December 2021. This was done to determine the current status of the distribution and abundance of snakes and measure the effect of weather on the availability of snakes and the stability of the ecosystem. Snakes samples were obtained using traps, fences, visual searches and from Collections of Killed & dead snakes. Result show that a total of 1,007 individuals were collected in the dry season and 1,276 individuals in the wet season representing 14 species of snakes belonging to 6 families was recorded from the different study areas. Of these, 1 species belong to the family Boidae, 5 species under family Colubridae, 2 species of Elapidae, 1 species belonging to family Viperidae, 3 species belong to the family Pythonidae and 2 species belong to the family Lamprophidae. There was more number of individuals captured in the wet season than in the dry season. This may be due to the fact that snakes are more prevalent in the wet season as they attempt to warm up due to decreasing temperatures in their hide-out. Snake diversity and abundance in this study are similar to those obtained in other studies in similar and comparable environments. It can therefore be concluded that snake populations in the Bayelsa state are not under any serious threat and the stability of the ecosystem is assured.

KEY WORDS: *Distribution, Abundance, Reptiles, Bayelsa State, Nigeria*

1.0 INTRODUCTION

Reptiles are vital members of any ecosystem. They occupy a diverse range of habitats and microhabitats, found from deserts to grass-lands, from forests to oceans and from hills to our living houses (Jadesh *et al.*, 2014). They vary from the 'gentle' mundane creatures to the 'dangerous' and fear evoking ones. They play a pivotal part in ecosystem stability as both prey and predators. Reptiles for instance are source of food to birds, carnivores and humans. They also play an important role by providing protein for humans, sold as a luxury food, source of generating income and medicine for the treatment of ailments (Kumar *et al.*, 2014). Conversely, reptiles also consume other animals ranging from rodents, other reptiles to other higher vertebrates including man.

Of all reptiles, Snakes are the most vilified, denigrated and hated. This may be as a result of their lethality and their frequent intrusions into human inhabitation. Therefore they are the most vulnerable and most prone to human attacks either by physical aggression or the use of modern chemicals. Sadly, as their numbers continue to reduce, the ecosystem becomes distorted and skewed, allowing undesirable insects and disease vector rodents to run uncontrolled and unimpeded.

There is therefore an acute need to assess the threat to snakes by determining its seasonal diversity and abundance. Research on the ecology, distribution, abundance, reproduction, and management of snakes nay reptiles is scanty in the Niger Delta particularly Bayelsa State when compared with the volume of available information on other organisms. A detailed study of the diversity, distribution and abundance of snakes is urgently needed to provide a data base for their present population status; inter-specific and intra-specific variations and to provide needed indicators for necessary management strategies. This is the intention of this study.

2.0 MATERIALS AND METHODS

2.1 Study area

Six (6) sampling stations were selected for this study with different activities taking place within and around the environment. These stations are located in Amassoma and its adjoining towns.

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Table 1 Coordinate of the Sampling Stations

S/No	Station	Coordinates		Description/Activities
		Latitude	Longitude	
1	Amassoma (Alomu)	04^0 58' 07.1'' N	006^0 05' 48.7'' E	Living area (Academic activities), farming, fishing, lumbering, hunting.
2	Amassoma (Ogoni)	04^0 58' 4.5'' N	006^0 06^1 06.5'' E	Living area (Academic activities), farming, fishing, lumbering, hunting
3	Toru-Ebeni-Ogobiri	$04^0$59'22.5'' N	006^0 06' 43.2''E	Living area (Academic activities), farming, fishing, lumbering, hunting.
4	Palm wine camp	04^0 59'18.9'' N	006^0 08' 19.7'' E	Natural, Farming, Palm wine tapping, Fishing, lumbering, hunting.
5	Ekeremor camp	04^0 58' 53.2'' N	006^0 09'12.6'' E	Farming, Palm wine tapping, Fishing, lumbering, hunting.
6	Old airport camp (OAC)	04^0 58' 46.7'' N	006^0 10' 19.2'' E	Farming, Fishing, lumbering, hunting.

2.2 Sampling Strategy

Extensive survey of snakes was made during day and night throughout the forests, and aquatic habitats such as streams, rivers, lakes, ponds, rice paddies, ditches and pools in these sampling locations. Drift fences and pitfall traps, refuge and pipe traps (Metal plates, PVC-tubes), Visual Search, Visual Encounter Survey (VES) and refuge examination was conducted to obtain live and dead samples of snake. Different snakes were collected in the sampling stations that were dead and killed either accidentally or deliberately.

2.3 Identification of Samples

After making careful observations, the collected specimens were identified; morphometric and meristematic measurements were taken and classified. Samples were identified using keys provided by Smith, 1943; Das, 2002; Leviton et al, 2003 and Whitaker and Captain, 2008.

Plate 1: ***Naja nigricollis***

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Plate 2: ***Naja Melanoleuca***

Plate 3: ***Bitis Gabonicus`***

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2.4 Data Analysis

Snake were identified and counted monthly and the seasonally counts recorded for each species counted. The dry season spanned from January – March and From November –December. The wet season spanned from April – October. Percentage Numerical Abundance for each family and percentage Species abundance was calculated for each season.

Diversity indices were calculated for each season to determine the ecological status of the survey areas and determine seasonal implications. Shannon-weaver diversity index was calculated using the following;

Shannon-weaver diversity index (Hs) = -∑Pi In Pi (Shannon weaver, 1963) …….. (1)

Where:

Hs = Shannon-weaver diversity index

I = count denoting the ith species ranging from 1n

Where Pi = proportion of the ith species represented

Equitability or Evenness index using the formular:

Equitability or Evenness (E) = Hs/Log_2S ……(2)

Where:

E = Equitability index

Hs = Shannon weaver index

Simpson's diversity index using the following:

Simpson's diversity index (D) = $1/Pi^2$ ……(3)

3.0 RESULT

The results of the study are captured in Tables 2 – 5 and Figures 1 and 2.

Table 2 below show the seasonal numerical abundance and Species diversity of Snakes in Bayelsa State

Table 2: Seasonal Species diversity and Richness of Snakes in Bayelsa State

Taxa	Common Name	No. of individual in wet season	No. of individual in dry season.
Colubridae			
Nerodia sipedon sipedon	Banded water Snake	77	65
Elaphe obsoleta obsolete	Black rat snake	152	112
Nerodia erythrogaster	Plainbelly water snake	84	48
Opheodrys aestivus	Grass snake or Green grass snake	102	84
Telescopus semiannulatus	Common tiger snake /Tiger cat snake	78	30
Pythonidae			
Python sebae	African rock python	107	92
Python regius	Ball Python, Royal Python	80	86
Python molurus	Black-tailed python, Indian python	152	96
Boidae			
Calabaria reinhardtii	Calabar python, Calabar ground boa	30	31
Viperidae			
Bitis gabonicus	Gaboon viper	28	33
Lamprophiidae			
Lamprophis fuliginosus	African house snakes	126	102
Boaedon fuliginosus	Brown House Snake/ African House Snake	200	167
Elapidae			
Naja nigricollis	Black-necked spitting cobra	29	15
Naja melanoleuca		31	46
Total		1276	1007

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Table 3 show the percentage Abundance of each family of snakes in the study locale. Result show that Colubridae (33.66%) > Pythonidae (27.20%) > Lamprophiidae (26.71%) > Elapidae (6.05%) > Viperidae (3.27%) and Boidae (3.07%).

Table 3: Seasonal % Abundance of Snakes in Bayelsa State

Taxa	Wet (No. of Individuals)	% Abundance	Dry (No. of Individuals)	% Abundance
Colubridae	493	38.63	339	33.66
Pythonidae	339	26.56	274	27.20
Boidae	30	2.35	31	3.07
Viperidae	28	2.19	33	3.27
Lamprophiidae	326	25.54	269	26.71
Elapidae	60	4.70	61	6.05
Total	1276	100	1007	100

Table 4 and Figure 1 show seasonal percentage (%) species diversity of snakes. Result reveal that wet and dry season have the same species diversity. Colubridae (35.71%) > Pythonidae (21.42%) > Lamprophiidae (14.28%) & Elapidae (14.28%) > Boidae (7.14%) & Viperidae (7.14%).

Table 4: Seasonal % Species Diversity of Snakes in Bayelsa State

Taxa	Wet (No. of Species)	% Species Diversity	Dry (No. of Species)	% Species Diversity
Colubridae	5	35.71	5	35.71
Pythonidae	3	21.42	3	21.42
Boidae	1	7.14	1	7.14
Viperidae	1	7.14	1	7.14
Lamprophiidae	2	14.28	2	14.28
Elapidae	2	14.28	2	14.28
Total	14	100	14	100

Table 5 and Figure 2 show the diversity indices of wet and dry seasons. Shannon -weaver index (2.46) in the dry season > Shannon-weaver index (2.45) in wet season. Equitability index (Evenness) (0.938) was also dry season > Equitability index (Evenness) (0.931) in the wet season. Simpson's Index was however higher in the wet season than in the dry season (10.95) > (10.92).

Table 5: Seasonal Diversity Indices of Snakes in Bayelsa State

Taxa	Wet Season (No. of Individuals	Dry (No. of Individuals)
Colubridae	493	339
Pythonidae	339	274
Boidae	30	31
Viperidae	28	33
Lamprophiidae	326	269
Elapidae	60	61
Shannon weaver index	2.45	2.46
Equitability index (Evenness)	0.931	0.938
Simpson's Index	10.95	10.92

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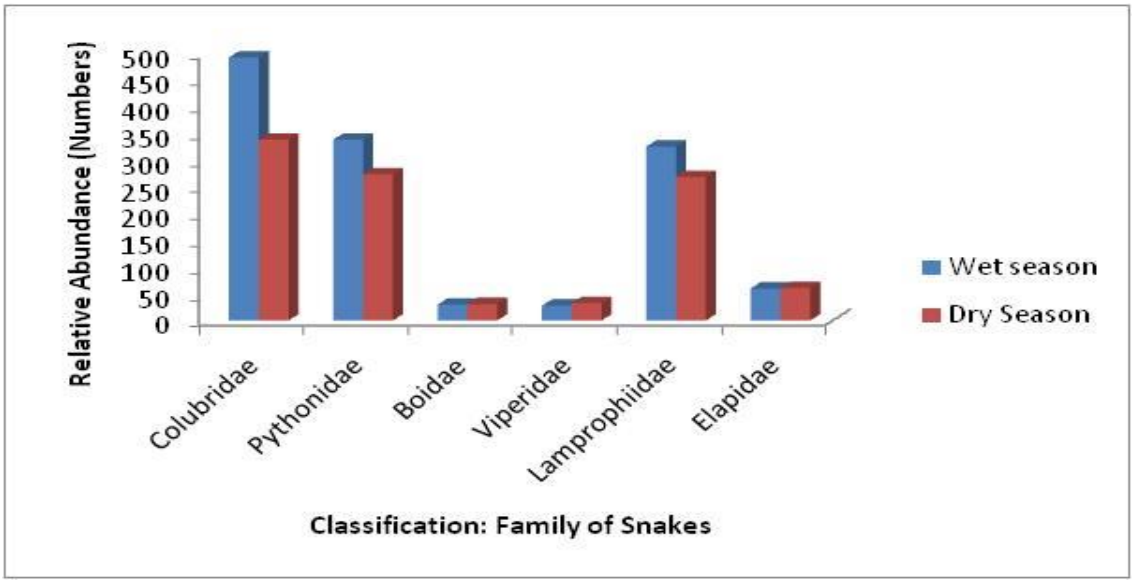

Figure 1: Season Abundance of Snakes in Bayelsa State.

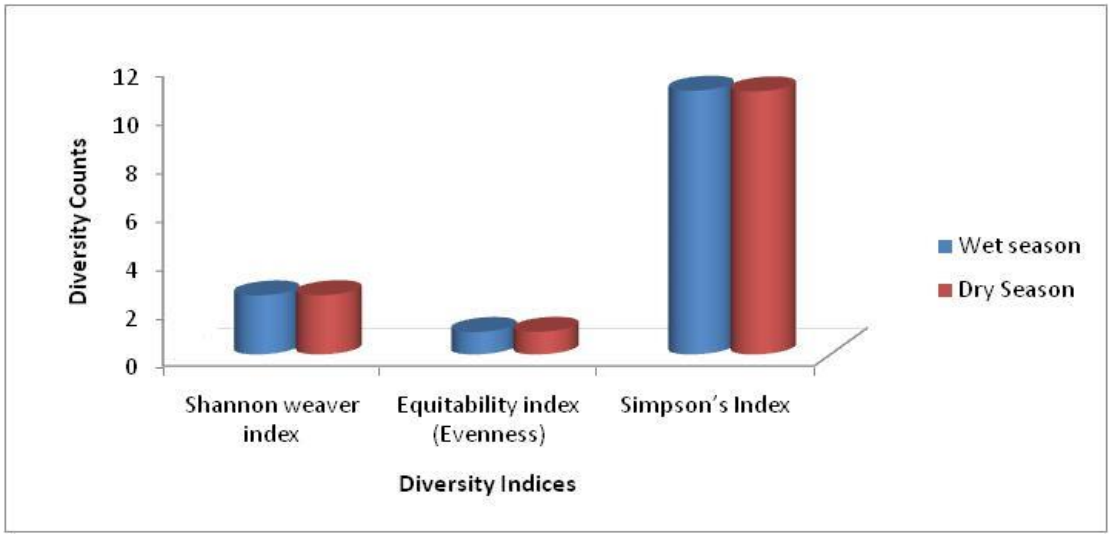

Figure 2: Season Diversity Indices of Snakes in Bayelsa State.

3.2 Discussion of Results

From the present study, it was found that 14 species of snakes belonging to 6 families were recorded from the different parts of Amassoma and its adjoining towns. Of these, 1 species belong to the family Boidae, 5 species under family Colubridae, 2 species of Elapidae, 1 species belonging to family Viperidae, 3 species belong to the family Pythonidae and 2 species belong to the family Lamprophidae. This observation is in contrast with the findings of Lalremsanga et al (2018) who observed more species (49) of snakes from fewer families (5)

There was more number of individuals captured in the wet season than in the dry season. The physical conditions of an organism's environment, temperature, light, moisture and the food resources it contains primarily determine the distribution of the organism in space and time (Daniels, 1992). It is indicated from the data that the appearance and abundance of snakes during the study period was highly influenced by the rainfall. Reptiles, which are homiothermic are sensitive to change in weather conditions and respond strongly to such changes in air and water temperatures, precipitation, and hydroperiod (length of time and seasonality of water presence) in their environments. Since snakes are cold blooded organisms, they tend to appear more during lower temperatures to receive warmth and regulate their body temperature. Therefore, they were more prevalent in the wet season. Another reason may be the higher hunting of human during flooding season and farming after flooding and rains. It may also be caused by the destruction of their hiding place, destruction of their common habitat and their increase search for prey to feed.

This may be caused by the vegetation type in the region, less human and industrial activities.

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4.0 CONCLUSION

The present study revealed the current status on the distribution of snakes in Amassoma and its adjoining towns. The findings of this study reveal a total of 1,007 individuals were collected in the dry season and 1,276 individuals in the wet season representing 14 species of snakes belonging to 6 families was recorded from the different study areas. Of these, 1 species belong to the family Boidae, 5 species under family Colubridae, 2 species of Elapidae, 1 species belonging to family Viperidae, 3 species belong to the family Pythonidae and 2 species belong to the family Lamprophidae. The percentage Abundance of each family of snakes in the study locale show that Colubridae (33.66%) > Pythonidae (27.20%) > Lamprophiidae (26.71%) > Elapidae (6.05%) > Viperidae (3.27%) and Boidae (3.07%).

The seasonal percentage (%) species diversity of snakes reveal that wet and dry season have the same species diversity. Colubridae (35.71%) > Pythonidae (21.42%) > Lamprophiidae (14.28%) & Elapidae (14.28%) > Boidae (7.14%) & Viperidae (7.14%).

The diversity indices of wet and dry seasons reveal that Shannon -weaver index (2.46) in the dry season > Shannon- weaver index (2.45) in wet season. Equitability index (Evenness) (0.938) in the dry season > Equitability index (Evenness) (0.931) in the wet season. Simpson's Index was however higher in the wet season than in the dry season (10.95) > (10.92).

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APPENDICES

Appendix I: Computation of Diversity Indices in Dry Season in Bayelsa State.

Taxa	No.	n/N	Pi	Pi^2	InPi	PiInPi
Colubridae						
Nerodia sipedon sipedon	65	65/1007	0.0645	0.004	-2.74	-0.176
Elaphe obsoleta obsolete	112	112/1007	0.111	0.012	-2.19	-0.243
Nerodia erythrogaster	48	48/1007	0.047	0.0022	-3.05	-0.143
Opheodrys aestivus	84	84/1007	0.083	0.0068	-2.48	-0.205
Telescopus semiannulatus	30	30/1007	0.03	0.0009	-3.50	-0.105
Pythonidae						
Python sebae	92	92/1007	0.091	0.00828	-2.39	-0.217
Python regius	86	86/1007	0.085	0.0072	-2.46	-0.209
Python molurus	96	96/1007	0.095	0.009	-2.35	-0.223
Boidae						
Calabaria reinhardtii	31	31/1007	0.031	0.00096	-3.47	-0.107
Viperidae						
Bitis gabonicus	33	33/1007	0.032	0.001	-3.44	-0.11
Lamprophiidae						
Lamprophis fuliginosus	102	102/1007	0.101	0.1	-2.30	-0.232
Boaedon fuliginosus	167	167/1007	0.165	0.027	-1.80	-0.297
Elapidae						
Naja nigricollis	15	15/1007	0.015	0.0002	-4.20	-0.063
Naja melanoleuca	46	46/1007	0.045	0.002	-3.10	-0.139
Total	1007			0.09154		-2.469

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Appendix II: Computation of Diversity Indices in Wet Season in Bayelsa State.

Taxa	No. of individual	n/N	Pi	Pi^2	InPi	PiInPi
Colubridae						
Nerodia sipedon sipedon	77	77/1276	0.06	0.0036	-2.81	-0.1686
Elaphe obsoleta obsolete	152	152/1276	0.12	0.0144	-2.12	-0.2544
Nerodia erythrogaster	84	84/1276	0.065	0.004	-2.73	-0.17745
Opheodrys aestivus	102	102/1276	0.08	0.0064	-2.52	-0.2016
Telescopus semiannulatus	78	78/1276	0.061	0.0037	-2.80	-0.1708
Pythonidae						
Python sebae	107	107/1276	0.083	0.0068	-2.48	-0.2058
Python regius	80	80/1276	0.062	0.0038	-2.78	-0.1723
Python molurus	152	152/1276	0.12	0.0144	-2.12	-0.2544
Boidae						
Calabaria reinhardtii	30	30/1276	0.023	0.00053	-3.77	-0.08671
Viperidae						
Bitis gabonicus	28	28/1276	0.022	0.00048	-3.81	-0.0838
Lamprophiidae						
Lamprophis fuliginosus	126	126/1276	0.09	0.0081	-2.40	-0.216
Boaedon fuliginosus	200	200/1276	0.156	0.024	-1.85	-0.2866
Elapidae						
Naja nigricollis	29	29/1276	0.022	0.00048	-3.81	-0.0838
Naja melanoleuca	31	31/1276	0.024	0.00057	-3.73	-0.0895
Total	1276			0.09126		-2.45376