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EXAMINING THE BIODIVERSITY IN THE KETA LAGOON COMPLEX RAMSAR SITE, THE LARGEST COASTAL WETLAND IN GHANA

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Contents

Abstract	4
1. Introduction.....	5
1.1 The objective of the research	5
2. Methodology	6
2.1 The bird surveys and the assessment of human-induced threats to bird populations	6
2.2 The assessment of aspects of fish population dynamics	7
2.3 The mapping of the Flora within the KLCRS	7
3. Results and analysis	9
3.1 The bird surveys and the assessment of human induced threats to bird populations	9
3.2 The assessment of aspects of fish population dynamics	15
3.3 The mapping of the Flora within the KLCRS	19
<i>Vegetation cover</i>	<i>21</i>
<i>Plant species in the five communities</i>	<i>22</i>
<i>Plants found in only one community.....</i>	<i>27</i>
<i>Plants common to all communities.....</i>	<i>29</i>
4. Discussion	29
5. Conclusion	30
6. References	31
Appendix.....	33

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Abstract

Ramsar sites are known for preserving biodiversity. This study takes the Keta Lagoon Complex Ramsar Site in Ghana as a case study and examines the various biodiversity at the site. The study thus examined, through a survey, bird populations in seven communities surrounding the site, aspects of fish population dynamics, and the mapping of Flora within the site. The methodology combined point counts, point transects, line transects, and opportunistic observations to survey birds in seven surrounding communities, along with a questionnaire assessing human-induced threats to bird populations. The study also sampled fish to explore population dynamics. Vegetation was mapped to assess plant diversity across the site. The results suggest the need for measures to protect and enhance the sustainability of the biodiversity in the area. The study therefore recommends conservation through education and awareness-raising to inform surrounding communities about the importance of biodiversity and biological processes at the Keta Lagoon Complex Ramsar Site.

Keywords: Keta Lagoon, Ramsar site, biodiversity, awareness creation, vegetation

1. Introduction

Wetlands play the role of maintaining biodiversity and as such are protected (Shah & Atisa, 2021). The Keta Lagoon complex (05°55'N 00°49'E) is a Ramsar site and an Important Bird Area (IBA) in the country (Fig. 1). The lagoon is an extensive, brackish water-body located at the extreme southeast, near the international border with Togo and to the east of the Volta River estuary. The site comprises the open water of the lagoon and the surrounding floodplains and mangrove swamps. The lagoon is bordered by numerous settlements and the surrounding flood-plain consists of marsh, scrub, farmland, and substantial mangrove stands, which are heavily exploited for fuelwood. Lagoon fishing, salt extraction, and vegetable cultivation are the occupations of the residents of the surrounding communities (Ramsar, 2015). The site is considered the most important coastal wetland for birds in Ghana and supports over 150 resident and migratory bird species estimated to number over 100,000 individuals (eBird, 2021). The KLCRS has been designated a wetland of international importance and a Ramsar site since 1992. According to Ramsar Sites Information Service (2015), the KLCRS covers part of the Volta River estuary, several small islands and a complex of lagoons. The vegetation in the area is predominantly swamps, scrublands, and mangrove forests, which communities heavily exploit for fuelwood and commercial fishing. In terms of ecosystem services, wetland biodiversity provides supporting, provisioning, regulating, and cultural services, including nutrient cycling, seed dispersal, meat provision, pest control, pollination, scavenging, and ecotourism, among others (Gaston, 2022). However, the lack of knowledge on the value of wetlands coupled with the negative attitudes especially of the inhabitants of the surrounding communities continue to pose threats to the management and sustainability of the biodiversity within Ramsar site (Shah & Atisa, 2021). Human activities are well documented to impact natural ecosystems and wildlife (Etayeb, 2015). Human activities affect biological processes and life in Ramsar sites, as seen in waterbirds on rice fields (Yu et al., 2025) and in the effects of human activities on environmental and biodiversity conservation (Wuwer, 2009).

Given the significance of Ramsar sites and their importance to a country's socio-economic development, this study explores the biodiversity present in the KLCRS in Ghana.

1.1 The objective of the research

The study examined the biodiversity in the KLCRS in three explorations. First, it conducted bird surveys to understand current population status and distribution, bird species richness within the lagoon complex, and human-induced threats to bird populations. Second, it assessed fish population dynamics to determine species present, dominant species, size ranges, species variation between communities, and the lengths at which individual species reach maturity. Lastly, the study mapped the Flora within the KLCRS.

2. Methodology

2.1 The bird surveys and the assessment of human-induced threats to bird populations

The study surveyed communities in the KLCRS (Fig. 1) for existing bird species and assessed human-induced threats to bird populations at the site.

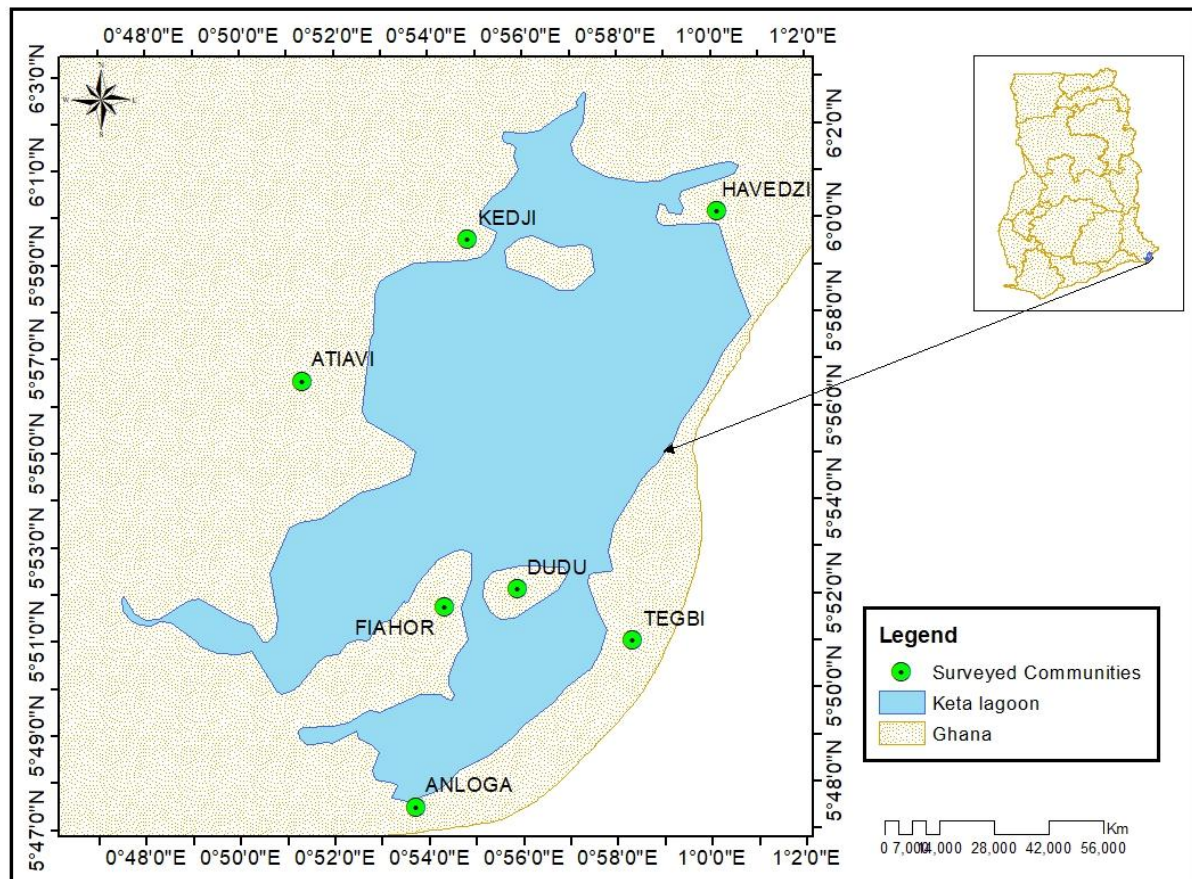


Fig. 1: Map of Keta Lagoon Complex Ramsar site with surveyed communities.

Bird Survey Technique

We used a combination of point counts, point transects, line transects, and opportunistic observations to survey birds in seven communities surrounding the Keta Lagoon, namely Atsiavi, Havedzi, Tegbi, Anloga, Fiahor, Dudu Island, and Kedji. We used direct observations and vocal records to determine bird species occurrence. The survey lasted from 7 am to 11:30 am each sampling day during both the dry season (January) and the wet season (May). Bird identifications were guided by *Birds of Western Africa* by (Borrow & Demey, 2014).

Threat assessment

The proximate human activities or processes that were found to impact, or are impacting, or may impact the status of birds were assessed as direct threats. These threats assessment followed the IUCN Threats Classification Scheme (Version 3.2) for each sampling community.

Seven trained persons administered questionnaires across the seven communities around the keta lagoon complex to gather information to answer the following questions:

1) Do community members feed on birds?

2) What is the reaction of community members towards bird eggs in the breeding season?

The sample size was not clearly defined across the different communities where the questionnaire was administered due to differences in the number of people living there. As a result, the data were pooled together from the various communities to answer the questions. Data collection lasted six days and ran from 7:00 am to 4:30 pm each day.

2.2 The assessment of aspects of fish population dynamics

Fish samples were caught over five months from waters around five communities: Atiavi, Anloga, Fiakor, Havedzi, and Tegbi in the Volta Region of Ghana. The gears used for fish capture varied depending on the species targeted. Gears used included cast nets, set nets, and modified “*Watsa*” nets with heavy nets which are either used as “hand drawn” pelagic and bottom trawls. Cast nets and set nets caught redbelly and black-chinned tilapias, Schlegel’s goby, and mojarras. The modified nets used as trawls targeted the shads, mojarras, crabs, schlegel’s goby and tilapias. Fish caught were kept on ice and transported for further analysis. Morphometric (length and weight) data were taken for every fish and the fishes were dissected to determine their sexes as well as determine their maturity by looking for matured gonads (eggs and testes).

2.3 The mapping of the Flora within the KLCRS

The flora assessment complemented ongoing fauna, physico-chemical, and socio-economic assessments within the area of intervention to provide a holistic overview of existing biodiversity in the landscape. Vegetation mapping and sampling were conducted in May 2022. Sampling points were established within 1km proximity of sampling points for macrobenthos and other physico-chemical parameters.

Vegetation cover was assessed in five communities namely Anloga, Atiavi, Fiakor, Havedzi and Tegbi (graphically presented as Fig. 2). In each community the team walks through a stretch of the wetland, if accessible, or uses a canoe to obtain a synoptic view of the heterogeneity of the vegetation or otherwise. To inventorize the vegetation, plant sampling was also undertaken in four 10 m x 10 m plots in each community, following Environmental Protection Agency (2002) protocol . The study plots were selected in such a way that they were

representative of that stand (see Braun-Blanquet, 2007). This was done by demarcating only areas that were a little heterogeneous. Within each study plot, all the species encountered, as well as the number of individuals of each species were recorded.

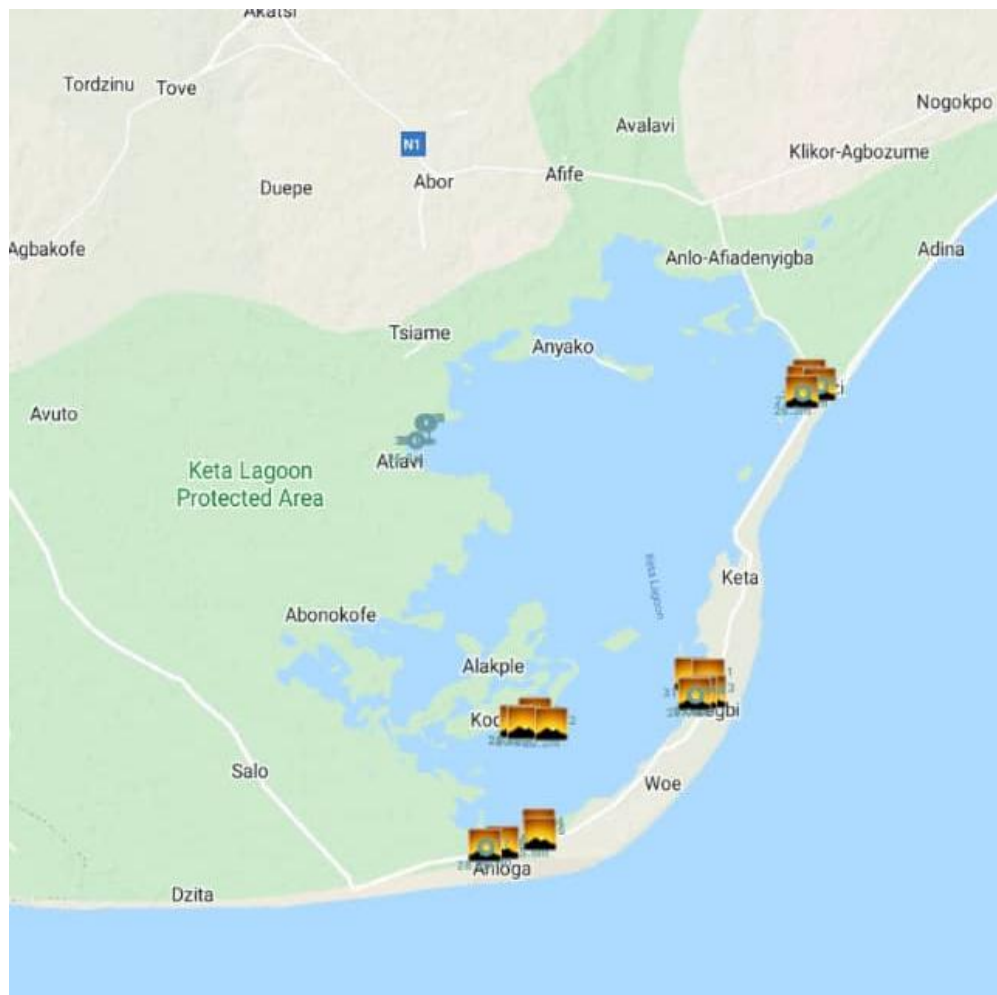


Fig. 2: Vegetation sampling points

All the plant species encountered were identified, using relevant identification manuals. Specimens including branches and whole of species that could not be identified in situ were brought to the School of Biological Sciences Herbarium, University of Cape Coast for identification. All the plant species were classified into their various taxonomic families. Vegetation cover was determined and classified for each community, using a Relevé Protocol (Braun-Blanquet, 2007).

3. Results and analysis

3.1 The bird surveys and the assessment of human induced threats to bird populations

Overview of bird survey

We recorded 24448 individuals of 133 bird species (Table 1), including Palearctic migrants, intra-African migrants, and resident bird species. Some recorded species are of conservation concern and are listed as 'Near Threaten' on the IUCN Red List of Threatened Species (BirdLife International, 2016). A total of 17601 individuals of 100 bird species belonging to 35 families were recorded during the dry season while 4846 individuals of 102 bird species were recorded in the wet season. Another key output of the survey was a visually confirmed sighting of a mixed-morph Western Reef Heron (*Egretta gularis*) at Fiahor (Appendix A). Bird abundance was significantly higher in the dry season compared to the wet season ($W = 6344$, $p < 0.01$; Fig. 3).

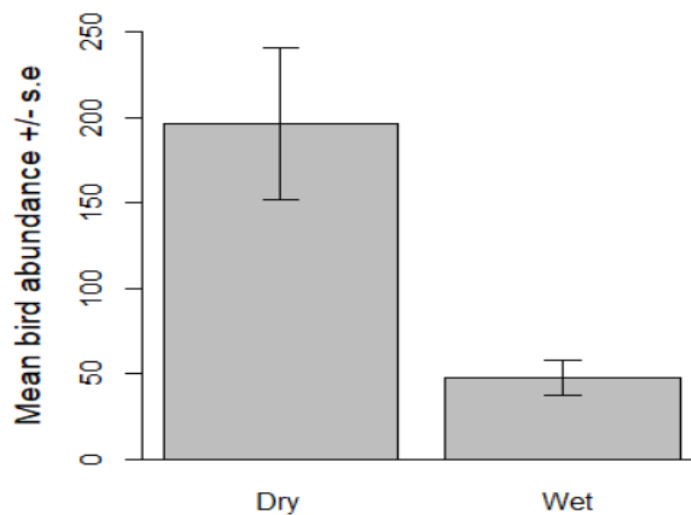


Fig. 3: Comparing bird abundance (mean $\pm$ SE) in the dry and wet seasons on the Keta lagoon complex.

Table 1: Bird species observed during bird survey at Keta Lagoon complex

Species Primary Name	Species Scientific Name	Abundance
Shikra	<i>Accipiter badius</i>	6
Great Reed Warbler	<i>Acrocephalus arundinaceus</i>	13
Marsh Warbler	<i>Acrocephalus palustris</i>	4
Greater Swamp Warbler	<i>Acrocephalus rufescens</i>	2
Common Sandpiper	<i>Actitis hypoleucos</i>	1015
African Jacana	<i>Actophilornis africanus</i>	58
Black Crake	<i>Amaurornis flavirostra</i>	10
African Openbill	<i>Anastomus lamelligerus</i>	262
African Darter	<i>Anhinga rufa</i>	3
Plain-backed Pipit	<i>Anthus leucophrys</i>	4
Little Swift	<i>Apus affinis</i>	171
White-rumped Swift	<i>Apus caffer</i>	15
Great Egret	<i>Ardea alba</i>	756
Grey Heron	<i>Ardea cinerea</i>	1103
Goliath Heron	<i>Ardea goliath</i>	193
Intermediate Egret	<i>Ardea intermedia</i>	2712
Purple Heron	<i>Ardea purpurea</i>	69
Squacco Heron	<i>Ardeola ralloides</i>	18
Ruddy Turnstone	<i>Arenaria interpres</i>	19
Western Cattle Egret	<i>Bubulcus ibis</i>	426
Senegal Thick-knee	<i>Burhinus senegalensis</i>	2
Striated Heron	<i>Butorides striata</i>	88
Sanderling	<i>Calidris alba</i>	585
Dunlin	<i>Calidris alpina</i>	62
Red Knot	<i>Calidris canutus</i>	5
Curlew Sandpiper	<i>Calidris ferruginea</i>	144
Little Stint	<i>Calidris minuta</i>	2
Green-backed Camaroptera	<i>Camaroptera brevicaudata</i>	3
Fine-spotted Woodpecker	<i>Campethera punctuligera</i>	2
Lesser Striped Swallow	<i>Cecropis abyssinica</i>	6
Mosque Swallow	<i>Cecropis senegalensis</i>	2
Black Coucal	<i>Centropus grillii</i>	7
Pied Kingfisher	<i>Ceryle rudis</i>	1617
Kentish Plover	<i>Charadrius alexandrinus</i>	1839
Little Ringed Plover	<i>Charadrius dubius</i>	1
Common Ringed Plover	<i>Charadrius hiaticula</i>	1795
White-fronted Plover	<i>Charadrius marginatus</i>	700
Kittlitz's Plover	<i>Charadrius pecuarius</i>	571
White-winged Tern	<i>Chlidonias leucopterus</i>	71
Black Tern	<i>Chlidonias niger</i>	14
Diederik Cuckoo	<i>Chrysococcyx caprius</i>	7
Splendid Sunbird	<i>Cinnyris coccinigastrus</i>	6

Table 1: Continue

Species Primary Name	Species Scientific Name	Abundance
Copper Sunbird	<i>Cinnyris cupreus</i>	2
Variable Sunbird	<i>Cinnyris venustus</i>	19
Western Marsh Harrier	<i>Circus aeruginosus</i>	2
Zitting Cisticola	<i>Cisticola juncidis</i>	45
Winding Cisticola	<i>Cisticola marginatus</i>	111
Pied Crow	<i>Corvus albus</i>	128
Malachite Kingfisher	<i>Corythornis cristatus</i>	7
Snowy-crowned Robin-Chat	<i>Cossypha niveicapilla</i>	1
Western Plantain-eater	<i>Crinifer piscator</i>	2
Eastern Plantain-eater	<i>Crinifer zonurus</i>	4
African Palm Swift	<i>Cypsiurus parvus</i>	90
Fulvous Whistling Duck	<i>Dendrocygna bicolor</i>	14
White-faced Whistling Duck	<i>Dendrocygna viduata</i>	2095
Black Heron	<i>Egretta ardesiaca</i>	19
Little Egret	<i>Egretta garzetta</i>	35
Western Reef Heron	<i>Egretta gularis</i>	366
Black-winged Kite	<i>Elanus caeruleus</i>	3
Yellow Bishop	<i>Euplectes capensis</i>	8
Grey Kestrel	<i>Falco ardosiaceus</i>	4
Eurasian Kestrel	<i>Falco tinnunculus</i>	7
Common Moorhen	<i>Gallinula chloropus</i>	22
Collared Pratincole	<i>Glareola pratincola</i>	396
Woodland Kingfisher	<i>Halcyon senegalensis</i>	14
Black-winged Stilt	<i>Himantopus himantopus</i>	1675
Melodious Warbler	<i>Hippolais polyglotta</i>	3
Ethiopian Swallow	<i>Hirundo aethiopica</i>	48
Barn Swallow	<i>Hirundo rustica</i>	219
Wire-tailed Swallow	<i>Hirundo smithii</i>	49
Little Gull	<i>Hydrocoloeus minutus</i>	3
Caspian Tern	<i>Hydroprogne caspia</i>	344
Oriole Warbler	<i>Hypergerus atriceps</i>	1
African Pygmy Kingfisher	<i>Ispidina picta</i>	1
Little Bittern	<i>Ixobrychus minutus</i>	9
Dwarf Bittern	<i>Ixobrychus sturmii</i>	1
Eurasian Wryneck	<i>Jynx torquilla</i>	1
Bar-breasted Firefinch	<i>Lagonosticta rufopicta</i>	5
Red-billed Firefinch	<i>Lagonosticta senegala</i>	8
Purple Starling	<i>Lamprotornis purpureus</i>	9
Splendid Starling	<i>Lamprotornis splendidus</i>	3
Yellow-crowned Gonolek	<i>Laniarius barbarus</i>	18

Southern Fiscal	<i>Lanius collaris</i>	5
Lesser Black-backed Gull	<i>Larus fuscus</i>	69
Bar-tailed Godwit	<i>Limosa lapponica</i>	9

Table 1: Continue

Species Primary Name	Species Scientific Name	Abundance
Black-tailed Godwit	<i>Limosa limosa</i>	2
Bronze Mannikin	<i>Lonchura cucullata</i>	31
African Gray Hornbill	<i>Lophoceros nasutus</i>	1
Yellow-throated Longclaw	<i>Macronyx croceus</i>	30
White-throated Bee-eater	<i>Merops albicollis</i>	16
Swallow-tailed Bee-eater	<i>Merops hirundineus</i>	3
Little Bee-eater	<i>Merops pusillus</i>	10
Reed Cormorant	<i>Microcarbo africanus</i>	1208
Yellow-billed Kite	<i>Milvus aegyptius</i>	32
Black Kite	<i>Milvus migrans</i>	57
Western Yellow Wagtail	<i>Motacilla flava</i>	17
Eurasian Curlew	<i>Numenius arquata</i>	12
Eurasian Whimbrel	<i>Numenius phaeopus</i>	49
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	137
Quailfinch	<i>Ortygospiza atricollis</i>	2
Northern Grey-headed Sparrow	<i>Passer griseus</i>	106
Village Weaver	<i>Ploceus cucullatus</i>	143
Black-necked Weaver	<i>Ploceus nigricollis</i>	3
Compact Weaver	<i>Ploceus superciliosus</i>	6
Pacific Golden Plover	<i>Pluvialis fulva</i>	3
Grey Plover	<i>Pluvialis squatarola</i>	126
Yellow-rumped Tinkerbird	<i>Pogoniulus bilineatus</i>	1
Yellow-fronted Tinkerbird	<i>Pogoniulus chrysoconus</i>	2
Senegal Parrot	<i>Poicephalus senegalus</i>	2
Tawny-flanked Prinia	<i>Prinia subflava</i>	1
Double-spurred Francolin	<i>Pternistis bicalcaratus</i>	1
Piapiac	<i>Ptilostomus afer</i>	3
Common Bulbul	<i>Pycnonotus barbatus</i>	533
Greater Painted-snipe	<i>Rostratula benghalensis</i>	1
Laughing Dove	<i>Spilopelia senegalensis</i>	647
Roseate Tern	<i>Sterna dougallii</i>	59
Common Tern	<i>Sterna hirundo</i>	52
Arctic Tern	<i>Sterna paradisaea</i>	6
Little Tern	<i>Sternula albifrons</i>	34
Red-eyed Dove	<i>Streptopelia semitorquata</i>	2

Vinaceous Dove	<i>Streptopelia vinacea</i>	101
Sandwich Tern	<i>Thalasseus sandvicensis</i>	54
African Green-Pigeon	<i>Treron calvus</i>	1
Spotted Redshank	<i>Tringa erythropus</i>	22
Common Greenshank	<i>Tringa nebularia</i>	325
Green Sandpiper	<i>Tringa ochropus</i>	12

Table 1: Continue

Species Primary Name	Species Scientific Name	Abundance
Marsh Sandpiper	<i>Tringa stagnatilis</i>	53
Common Redshank	<i>Tringa totanus</i>	212
African Thrush	<i>Turdus pelios</i>	14
Blue-spotted Wood Dove	<i>Turtur afer</i>	8
Spur-winged Lapwing	<i>Vanellus spinosus</i>	43
Pin-tailed Whydah	<i>Vidua macroura</i>	1
Wilson's Indigobird	<i>Vidua wilsoni</i>	2

Threats to birds' population

The level one common direct threat identified at the site is biological resource use with intentional subsistence small scale hunting and collecting of eggs of birds. With logging and wood harvesting as well as fishing and harvesting aquatic resources being the level two threats to the survival of bird's population at the site. These threats were recoded as on-going in all parts of the lagoon complex.

Overview of hunting and harvesting of birds and eggs

A total of 674 responses were received across seven communities around the keta lagoon complex. Out of this, 442 (65.6%) were males and 232 (34.4%) were females. A total of 214 (31.8%) individuals acknowledged eating birds while 460 (68.2%) people did not eat birds (Fig. 4). Also, 400 (59.3%) of the respondents were found to have seen bird eggs whereas 274 (40.7%) of the respondents had not seen bird eggs before. Out of the 400 people who responded to having seen bird eggs, 241 (60.3%) people do not harvest bird eggs, while 157 (39.3%) people harvest bird eggs. Only one person reported destroying the eggs, and another person did nothing to the eggs (Fig. 5).

Logging and wood harvesting, and fishing and harvesting aquatic resources

Of the same respondents, 23 (3.4%) indicated that the lagoon provided them with firewood, while for 668 (98.8%) of the respondents, the lagoon serves as a source of fishing where they harvest various fish species, and 26 (3.8%) of the respondents also harvested other aquatic resources such as salt.

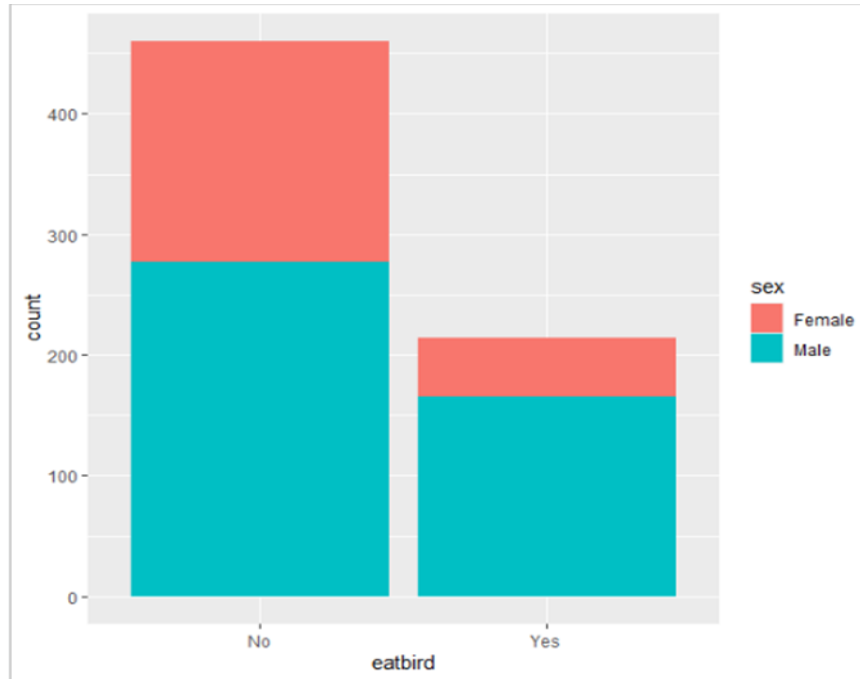


Fig. 4: Frequency of males and females who eat bird eggs by sex.

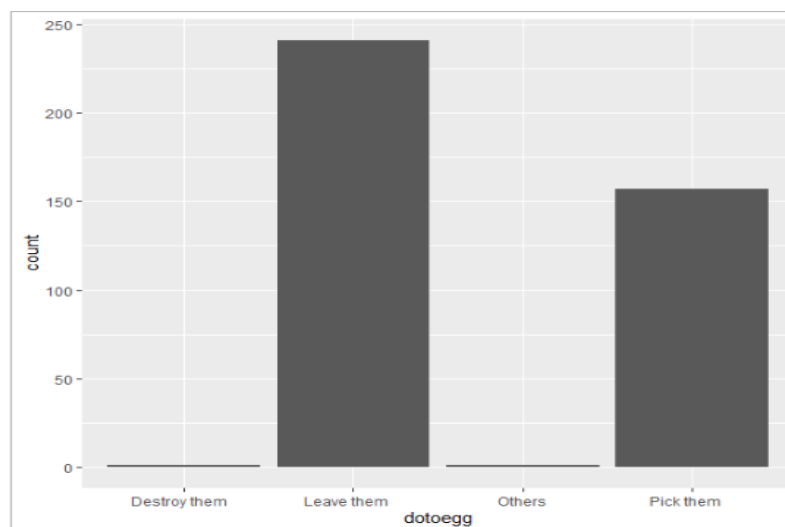


Fig. 5: The reaction of respondents upon seeing bird eggs.

3.2 The assessment of aspects of fish population dynamics

Number of species

A total of 4203 were collected which comprised of 10 species belonging to seven families. From Fiakor, there were four species from two families; from Anloga, eight species from six families; from Atsiavi, five species from four families; from Havedzi and Tegbi, seven species from five families were encountered. In all, Anloga has the largest number of species from the largest number of families and the most diverse.

Most dominant species

The most dominant species are the tilapias; *Coptodon zillii* (redbelly tilapia) and *Sarotherodon melanotheron* (black chinned tilapia) although their numbers varied from community to community. For three communities (Anloga, Fiakor and Tegbi) out of the five, redbelly tilapia recorded more numbers than black chinned tilapia whereas in the other two communities (Atiavi and Havedzi), black chinned recorded more.

Species variation across communities

The tilapia species, that is the redbelly and black chinned tilapia were common in all five communities although their respective numbers varied from community to community. *Porogobius schlegelii* (Schlegel's goby) which was the second dominant species occurred in all communities except Fiakor where none was encountered. *Ethmalosa frimbriata* (shad) were encountered in all communities although larger numbers were from Tegbi, Anloga and Fiakor (over 200 individuals) while those of Atiavi and Havedzi were just a few (less than 20). *Eucinostomus melanopterus* (mojarra) was encountered in all communities except Fiakor. Most of the individuals were from Tegbi (more than 100) while the rest were from the other three communities, all having respective number of individuals less than 50. The banded jewel fish (*Hemichromis fasciatus*) was only encountered at Fiakor and Anloga whereas none was encountered from the other four communities. Other species which were also encountered but not major species included the swim crab (*Callinectes* sp), encountered in Havedzi, the Guinean sprat (*Pellonula leonensis*) and Senegal needlefish (*Strongylura senegalensis*) encountered at Anloga as well as the African moony (*Psettias sebae*) was encountered at Tegbi. In all, there was some variations of species between communities as some species present in some communities are absent in others.

Size ranges

Table 2: Size ranges of fish species according to communities

SPECIES/COMMUNITY	ATIAVI	ANLOGA	FIAXOR	HAVEDZI	TEGBI
<i>Coptodon zilli</i>	4.5-12.8	5.6-12.4	4.8-14.4	6.3-12.4	4.4-12.3
<i>Sarotherodon melanotheron</i>	4.2-11.4	5.8-13.6	5.1-13.2	4.8-13.9	3.6-12.4
<i>Eucinostomus melanopterus</i>		8.1-11.3		6.4-11.8	8.8-14.5
<i>Porogobius schlegelii</i>	4.6-10.4	5.9-13.5		4.3-11.2	6.0-11.5
<i>Ethmalosa frimbriata</i>		8.2-10.1	6.1-11.2	6.3-11.8	6.6-11.2
<i>Hemichromis fasciatus</i>		8.4-15.7	6.2-17.7		
<i>Pellonula leonensis</i>			10.7-11.2		
<i>strogylura senegalensis</i>			31.1-33.1		
<i>Psettias sebae</i>					8.0-8.8
<i>Callinectes sp.</i>				2.9-7.3	

Length at Maturity

Table 3: Length at maturity for male and female species according to communities

Species name	size at maturity	ATIAVI		ANLOGA		FIAXOR		HAVEDZI		TEGBI	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
<i>Coptodon zilli</i>	<i>smallest</i>	5.2	4.8	6.2	5.6	4.8	4.6	6.5	6.3	4.5	4.4
	<i>largest</i>	12.8	11.7	12.4	11.1	14.4	12.4	11	12.4	12.3	11.4
<i>Sarotherodon melanothron</i>	<i>smallest</i>	4.2	4.4	6.4	5.8	5.3	5.1	5.8	4.9	3.7	3.6
	<i>largest</i>	11.4	10.7	13.6	11.7	13.2	12.2	13.1	12	12.4	11.8
<i>Eucinostomus melanopterus</i>	<i>smallest</i>			8.7	8.1			6.4	6.7	8.3	8.6
	<i>largest</i>			9.9	11.3			10.5	11.8	14.2	14.5
<i>Porogobius schlegelii</i>	<i>smallest</i>	4.6	4.6	7.6	5.9			4.6	4.3	6.5	6
	<i>largest</i>	10.4	10.1	13.5	12			11.3	10	11.2	11
<i>Ethmalosa frimbriata</i>	<i>smallest</i>			8.2	8.2	6.2	6.1	6.3	6.6	7.6	7.9
	<i>largest</i>			10	10.1	11.2	11	11.8	11	11.2	11
<i>Hemichromis fasciatus</i>	<i>smallest</i>			8.6	7.3	6.4	6.2				
	<i>largest</i>			15.7	10.4	17.7	14.5				
<i>Pellonula leonensis</i>				10.7	11.2						
<i>Strogylura senegalensis</i>	<i>smallest</i>				31.1						
	<i>largest</i>				33.1						
<i>Psettias sebae</i>	<i>smallest</i>									8	
	<i>largest</i>									8.8	

All the fishes of various lengths represented in table 3 have either eggs for females and testes for males which are clearly visible as some of these eggs and testes are ripe.

Table 4: Fish species present at the five sampling sites

SPECIES/COMMUNITY	ATIAVI	ANLOGA	FIAXOR	HAVEDZI	TEGBI
<i>Coptodon zillii</i>	✓	✓	✓	✓	✓
<i>Sarotherodon melanotheron</i>	✓	✓	✓	✓	✓
<i>Eucinostomus melanopterus</i>		✓		✓	✓
<i>Porogobius schlegelii</i>	✓	✓		✓	✓
<i>Ethmalosa frimbriata</i>		✓	✓	✓	✓
<i>Hemichromis fasciatus</i>		✓	✓		
<i>Pellonula leonensis</i>		✓			
<i>strogylura senegalensis</i>		✓			
<i>Psettias sebae</i>					✓
<i>Callinectes sp.</i>				✓	

Table 5: Number of fish species per sampling site

COMMUNITY	NUMBER OF SPECIES
ATIAVI	3
ANLOGA	8
FIAXOR	4
HAVEDZI	6
TEGBI	6

3.3 The mapping of the Flora within the KLCRS

A total of 79 plant species were encountered in the adjoining wetlands of the five communities namely Anloga, Atiavi, Fiakor, Havedzi and Tegbui. These plant species belonged to 39 families, with Euphorbiaceae being the family with the highest number of species of seven, followed by Poaceae and Malvaceae with six and five species respectively. Twenty families including included Acanthaceae, Asclepiadaceae, Lamiaceae and Passifloraceae had only one species each.

Table 6: List of plant species in Keta lagoon complex

Family	Name
Acanthaceae	<i>Avicennia germinans</i> L. (L.)
Aizoaceae	<i>Sesuvium portulacastrum</i> (L.) L. <i>Trianthema portulacastrum</i> Linn.
Amaranthaceae	<i>Alternanthera pungens</i> H.B. and K. <i>Amaranthus spinosus</i> Linn. <i>Gomphrena celosioides</i> Mart. <i>Pupalia lappacea</i> (Linn.) Juss.
Apocynaceae	<i>Catharanthus roseus</i> (L.) G. Don <i>Thevetia peruviana</i> (Pers.) K. Schum.
Arecaceae	<i>Cocos nucifera</i> Linn. <i>Elaeis guineensis</i> Linn. <i>Borassus aethiopum</i> Mart. <i>Phoenix dactylifera</i> Linn.
Asclepiadaceae	<i>Calotropis procera</i> (Willd.) Ait. f.
Asteraceae	<i>Lactuca capensis</i> Thunb. <i>Lactucataraxracifolia</i> (Wild.) Schum. <i>Tridax procumbens</i> Linn. <i>Vernonia cinerea</i> (Linn.) Less.
Bignoniaceae	<i>Newbouldia laevis</i> Seem.
Cactaceae	<i>Opuntia humifusa</i> (Raf.) Raf.
Caesalpiniaceae	<i>Cassia occidentalis</i> Linn. <i>Dialium guineense</i> Willd.
Cannaceae	<i>Canna indica</i> Linn.
Caparaceae	<i>Cleome viscosa</i> L.
Commelinaceae	<i>Commelina benghalensi</i> L.
Convolvulaceae	<i>Ipomoea triloba</i> Linn.
Cucurbitaceae	<i>Luffa aegyptiaca</i> Mill. <i>Momordica charantia</i> Linn.
Cyperaceae	<i>Cyperus articulatus</i> L.

	<i>Pycreus lanceolatus</i> (Poir) C. B. Clarke
	<i>Rhynchospora corymbosa</i> (L.) Britton
Euphorbiaceae	<i>Croton lubatus</i> L.
	<i>Euphorbia hirta</i> Linn.
	<i>Jatropha gossypifolia</i> Linn.
	<i>Mallotus oppositifolius</i> (Geisel.) Muell. Arg.
	<i>Phyllanthus amarus</i> Schum. et Thonn.
	<i>Ricinus communis</i> L.
	<i>Securinega virosa</i> (Roxb. ex Willd.) Baill.
Flacourtiaceae	<i>Oncoba spinosa</i> Forsk.
Lamiaceae	<i>Hyptis suaveoleus</i> Poit.
Meliaceae	<i>Azadirachta indica</i> A. Juss.
Malvaceae	<i>Abutilon mauritianum</i> (Jacq.) Medic
	<i>Gossypium indica</i> L
	<i>Malvastrum coromandelianum</i> (Linn.) Garcke
	<i>Sida acuta</i> Burm.f.
	<i>Thespesia populnea</i> (L.) Soland ex Corrêa
Mimosaceae	<i>Leucaena leucocephala</i> (Lam.) De Wit.
	<i>Schramkia leptocarpa</i> DC
	<i>Acacia</i> sp
	<i>Pithecellobium dulce</i> Benth.
Nyctaginaceae	<i>Boerhavia diffusa</i> Linn.
Onagraceae	<i>Ludwigia decurrens</i> Walt
Papilionaceae	<i>Abrus precatorius</i> Linn.
	<i>Centrosema pubescens</i> Benth.
	<i>Indigofera errecta</i> Hochst. ex A.Rich.
	<i>Sesbania pubescens</i> DC
Passifloraceae	<i>Passiflora foetida</i> Linn.
Poaceae	<i>Paspalum vaginatum</i> SW.
	<i>Setaria barbata</i> (Lam.) Kunth
	<i>Sporobolus pycamidalis</i> P. Beauv.
	<i>Sporobolus pycamidalis</i> P. Beauv.
	<i>Sporobolus pycamidalis</i> P. Beauv.
	<i>Imperata cylindrica</i> (L.) Raeusch.
Portulacaceae	<i>Talinum triangulare</i> (Jacq.) Willd.
Pteridaceae	<i>Acrostichum aureum</i> Linn.
Rhizophoraceae	<i>Rhizophora racemosa</i> G. F. W. Meyer
Rubiaceae	<i>Chassalia kolly</i> (Schumach) Hepper
	<i>Oldenlandia corymbosa</i> Linn.
Sapindaceae	<i>Blighia sapida</i> Konig
Scrophulariaceae	<i>Capraria biflora</i> Linn.

	<i>Scoparia dulcis</i> Linn.
Solanaceae	<i>Datura metel</i> Linn.
	<i>Physalis angulata</i> Linn.
Sterculiaceae	<i>Waltheria indica</i> Linn.
Tiliaceae	<i>Corchorus olitorius</i> Linn.
	<i>Grewia carpinifolia</i> Juss.
Typhaceae	<i>Typha australis</i> L.
Verbenaceae	<i>Lantana camara</i> L.
	<i>Stachytarpheta indica</i> (Linn.) Vahl.

Vegetation cover

Although 79 different plant species were found in the study communities, the vegetation cover in the five communities was fairly homogeneous and was dominated mainly by three plants namely *Avicennia germinans*, *Cyperus articulatus*, *Paspalum* spp. and *Sesuvium portulacastrum*. *Paspalum* spp. had the highest percentage cover (39%) in all the five communities (Fig. 6).

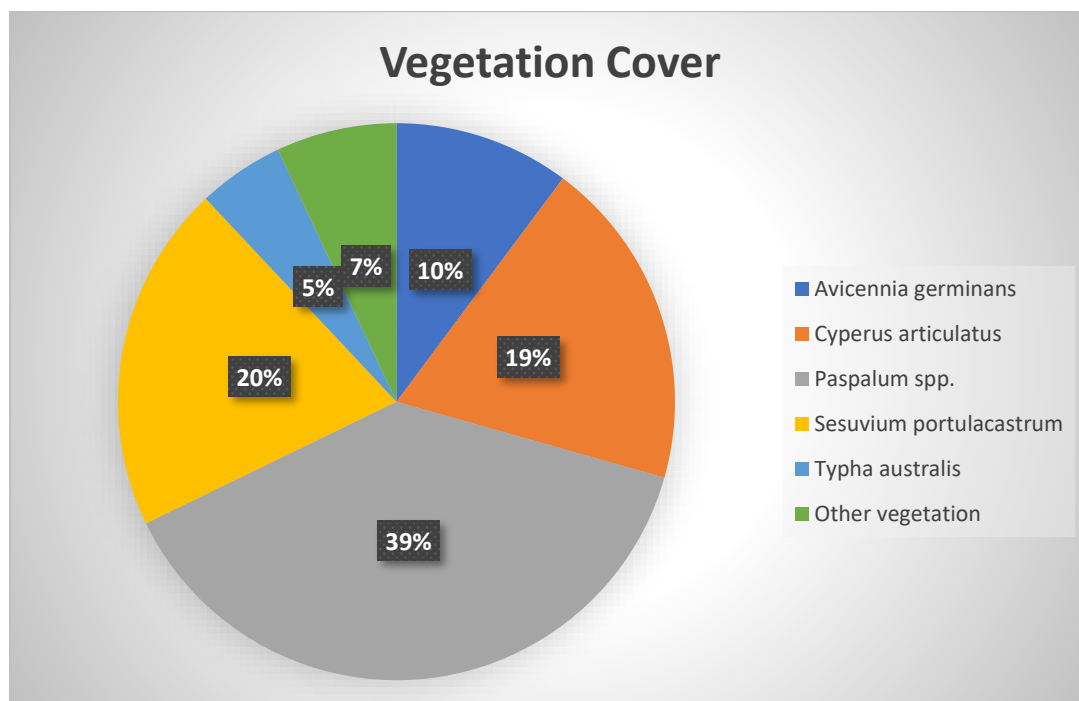


Fig. 6: General overview of vegetation cover at project location

Table 7: Percentage vegetation cover of communities

Plant	Anloga	Atiavi	Havedzi	Fiaxor	Tegbui
<i>Avicennia germinans</i>	10	3	5	30	3
<i>Cyperus articulatus</i>	17	33	24	7	15
<i>Paspalum</i> spp.	40	35	39	41	37
<i>Sesuvium portulacastrum</i>	23	25	23	15	15
<i>Typha australis</i>	7	-	-	-	18
Other vegetation	3	4	9	7	12

Atiavi, Tegbui and Havedzi recorded the lowest coverage of *Avicennia* spp. probably due to fishing pressure in these localities. It was observed that the species was regenerating naturally along the banks of the lagoon. Interactions with the members of the community revealed that fisherfolks and other community members do not plant the *Avicennia* spp. Although they are actively harvested for brush parks (Atidza fishing). This occurrence therefore results in species removal and fragmentation leading to reduction in coverage.

Avicennia spp. However, recorded a relatively high coverage in Fiaxor largely because of an ongoing mangrove reforestation activity in the community by an NGO (Sea Water Solutions). Cutting of the plant for fishing may be low due to education and community sensitization.

Plant species in the five communities

The plant species found in each community are listed in Tables 8-12. Anloga, Atiavi, Havedzi, Fiaxor and Tegbui recorded 25, 27, 38, 32 and 47 plant species respectively.

Table 8: List of plant species at Anloga

Plant name	Family
<i>Avicennia germinans</i> L. (L.)	Acanthaceae
<i>Azadirachta indica</i> A. Juss.	Maliaceae
<i>Boerhavia diffusa</i> Linn.	Nyctaginaceae
<i>Calotropis procera</i> (Willd.) Ait. f.	Asclepiadaceae
<i>Corchorus olitorius</i> Linn.	Tiliaceae
<i>Cassia occidentalis</i> Linn.	Caesalpiniaceae
<i>Cyperus articulatus</i> L.	Cyperaceae
<i>Cyperus esculentus</i> Linn.	Cyperaceae
<i>Elaeis guineensis</i> Linn.	Arecaceae

<i>Imperata cylindrica</i> (L.) Raeusch.	Poaceae
<i>Ipomoea triloba</i> Linn.	Convolvulaceae
<i>Leucaena leucocephala</i> (Lam.) De Wit.	Mimosaceae
<i>Ludwigia decurrens</i> Walt	Onagraceae
<i>Paspalum vaginatum</i> SW.	Poaceae
<i>Passiflora foetida</i> Linn.	Passifloraceae
<i>Phyllanthus amarus</i> Schum. et Thonn.	Euphorbiaceae
<i>Physalis angulata</i> Linn.	Solanaceae
<i>Pycnus lanceolatus</i> (Poir) C. B. Clarke	Cyperaceae
<i>Sesbania pubescens</i> DC	Papilionaceae
<i>Sesuvium portulacastrum</i> (L.) L.	Aizoaceae
<i>Sporobolus pycnoides</i> P. Beauv.	Poaceae
<i>Trianthema portulacastrum</i> L.	Aizoaceae
<i>Tridax procumbens</i> Linn.	Asteraceae
<i>Typha australis</i> L.	Typhaceae
<i>Vernonia cinerea</i> (Linn.) Less.	Asteraceae

Table 9: List of plant species at Atiavi

Plant name	Family
<i>Abutilon mauritianum</i> (Jacq.) Medic	Malvaceae
<i>Acacia</i> sp	Mimosaceae
<i>Alternanthera pungens</i> H.B. and K.	Amaranthaceae
<i>Avicennia germinans</i> L. (L.)	Acanthaceae
<i>Azadirachta indica</i> A. Juss.	Maliaceae
<i>Boerhavia diffusa</i> Linn.	Nyctaginaceae
<i>Capraria biflora</i> Linn.	Scrophulariaceae
<i>Centrosema pubescens</i> Benth.	Papilionaceae
<i>Commelina benghalensis</i> L.	Commelinaceae
<i>Cyperus articulatus</i> L.	Cyperaceae
<i>Gossypium indica</i> L	Malvaceae
<i>Imperata cylindrica</i> (L.) Raeusch.	Poaceae
<i>Indigofera errecta</i> Hochst. ex A.Rich.	Papilionaceae
<i>Lactuca capensis</i> Thunb.	Asteraceae
<i>Malvastrum coromandelianum</i> (Linn.) Garcke	Malvaceae
<i>Oldenlandia corymbosa</i> Linn.	Rubiaceae
<i>Opuntia humifusa</i> (Raf.) Raf.	Cactaceae
<i>Paspalum vaginatum</i> SW.	Poaceae
<i>Passiflora foetida</i> Linn.	Passifloraceae
<i>Phyllanthus amarus</i> Schum. et Thonn.	Euphorbiaceae
<i>Physalis angulata</i> Linn	Solanaceae

<i>Pupalia lappacea</i> (Linn.) Juss.	Amaranthaceae
<i>Securinega virosa</i> (Roxb. ex Willd.) Baill.	Euphorbiaceae
<i>Sesuvium portulacastrum</i> (L.) L.	Aizoaceae
<i>Sporobolus pycnandalis</i> P. Beauv.	Poaceae
<i>Thespesia populnea</i> (L.) Soland ex Corrêa	Malvaceae
<i>Thevetia peruviana</i> (Pers.) K. Schum.	Apocynaceae
<i>Trianthema portulacastrum</i> L.	Aizoaceae

Table 10: List of plant species at Havedzi

Plant name	Family
<i>Abutilon mauritianum</i> (Jacq.) Medic	Malvaceae
<i>Acacia</i> sp	Mimosaceae
<i>Acrostichum aureum</i> Linn.	Pteridaceae
<i>Alternanthera pungens</i> H.B. and K.	Amaranthaceae
<i>Amaranthus spinosus</i> Linn.	Amaranthaceae
<i>Avicennia germinans</i> L. (L.)	Acanthaceae
<i>Azadirachta indica</i> A. Juss.	Maliaceae
<i>Boerhavia diffusa</i> Linn.	Nyctaginaceae
<i>Calotropis procera</i> (Willd.) Ait. f.	Asclepiadaceae
<i>Capraria biflora</i> Linn.	Scrophulariaceae
<i>Cassia occidentalis</i> Linn.	Caesalpiniaceae
<i>Catharanthus roseus</i> (L.) G. Don	Apocynaceae
<i>Cleome viscosa</i> L.	Capparaceae
<i>Croton lubatus</i> L.	Euphorbiaceae
<i>Cyperus articulatus</i> L.	Cyperaceae
<i>Euphorbia hirta</i> Linn.	Euphorbiaceae
<i>Gossypium indica</i> L	Malvaceae
<i>Hyptis suaveoleus</i> Poit.	Lamiaceae
<i>Imperata cylindrica</i> (L.) Raeusch.	Poaceae
<i>Indigofera errecta</i> Hochst. ex A.Rich.	Papilionaceae
<i>Lactuca capensis</i> Thunb.	Asteraceae
<i>Lantana camara</i> L.	Verbenaceae
<i>Mallotus oppositifolius</i> (Geisel.) Muell. Arg.	Euphorbiaceae
<i>Momordica charantia</i> Linn.	Cucurbitaceae
<i>Newbouldia laevis</i> Seem.	Bignoniaceae
<i>Opuntia humifusa</i> (Raf.) Raf.	Cactaceae
<i>Paspalum vaginatum</i> SW.	Poaceae
<i>Passiflora foetida</i> Linn.	Passifloraceae

<i>Phyllanthus amarus</i> Schum. et Thonn.	Euphorbiaceae
<i>Physalis angulata</i> Linn	Solanaceae
<i>Pupalia lappacea</i> (Linn.) Juss.	Amaranthaceae
<i>Ricinus communis</i> L.	Euphorbiaceae
<i>Sesbania pubescens</i> DC	Papilionaceae
<i>Sesuvium portulacastrum</i> (L.) L.	Aizoaceae
<i>Thespesia populnea</i> (L.) Soland ex Corrêa	Malvaceae
<i>Trianthema portucastrum</i> L.	Aizoaceae
<i>Tridax procumbens</i> Linn.	Asteraceae
<i>Waltheria indica</i> Linn.	Sterculiaceae

Table 11: List of plant species at Fiavor

Plant name	Family
<i>Abrus precatorius</i> Linn.	Papilionaceae
<i>Abutilon mauritianum</i> (Jacq.) Medic	Malvaceae
<i>Acacia</i> sp	Mimosaceae
<i>Avicennia germinans</i> L. (L.)	Acanthaceae
<i>Azadirachta indica</i> A. Juss.	Maliaceae
<i>Boerhavia diffusa</i> Linn.	Nyctaginaceae
<i>Capraria biflora</i> Linn.	Scrophulariaceae
<i>Cassia occidentalis</i> Linn.	Caesalpiniaceae
<i>Cleome viscosa</i> L.	Caparaceae
<i>Cocos nucifera</i> Linn.	Areaceae
<i>Commelina benghalensi</i> L.	Commelinaceae
<i>Cyperus articulatus</i> L.	Cyperaceae
<i>Datura metel</i> Linn.	Solanaceae
<i>Gossypium indica</i> L	Malvaceae
<i>Indigofera errecta</i> Hochst. ex A.Rich.	Papilionaceae
<i>Jatropha gossypifolia</i> Linn.	Euphorbiaceae
<i>Momordica charantia</i> Linn.	Cucurbitaceae
<i>Newbouldia laevis</i> Seem.	Bignoniaceae
<i>Opuntia humifusa</i> (Raf.) Raf.	Cactaceae
<i>Paspalum vaginatum</i> SW.	Poaceae
<i>Phyllanthus amarus</i> Schum. et Thonn.	Euphorbiaceae
<i>Physalis angulata</i> Linn.	Solanaceae
<i>Pupalia lappacea</i> (Linn.) Juss.	Amaranthaceae
<i>Rhynchospora corymbosa</i> (L.) Britton	Cyperaceae
<i>Ricinus communis</i> L.	Euphorbiaceae
<i>Scoparia dulcis</i> Linn.	Scrophulariaceae

<i>Sesbania pubescens</i> DC	Papilionaceae
<i>Sesuvium portulacastrum</i> (L.) L.	Aizoaceae
<i>Thespesia populnea</i> (L.) Soland ex Corrêa	Malvaceae
<i>Trianthema portulacastrum</i> L.	Aizoaceae
<i>Typha australis</i> L.	Typhaceae
<i>Waltheria indica</i> Linn.	Sterculiaceae

Table 12: List of plant species at Tegbui

Plant name	Family
<i>Amaranthus spinosus</i> Linn.	Amaranthaceae
<i>Avicennia germinans</i> L. (L.)	Acanthaceae
<i>Azadirachta indica</i> A. Juss.	Maliaceae
<i>Blighia sapida</i> Konig	Sapindaceae
<i>Boerhavia diffusa</i> Linn.	Nyctaginaceae
<i>Borassus aethiopum</i> Mart.	Arecaceae
<i>Calotropis procera</i> (Willd.) Ait. f.	Asclepiadaceae
<i>Canna indica</i> Linn.	Cannaceae
<i>Cassia occidentalis</i> Linn.	Caesalpiniaceae
<i>Catharanthus roseus</i> (L.) G. Don	Apocynaceae
<i>Chassalia kolly</i> (Schumach) Hepper	Rubiaceae
<i>Cleome viscosa</i> L.	Caparaceae
<i>Cocos nucifera</i> Linn.	Arecaceae
<i>Commelina benghalensi</i> L.	Commelinaceae
<i>Croton lubatus</i> L.	Euphorbiaceae
<i>Dialium guineense</i> Willd.	Caesalpiniaceae
<i>Gomphrena celosioides</i> Mart.	Amaranthaceae
<i>Grewia carpinifolia</i> Juss.	Tiliaceae
<i>Lactucataraxracifolia</i> (Wild.) Schum.	Asteraceae
<i>Lantana camara</i> L.	Verbenaceae
<i>Leucaena leucocephala</i> (Lam.) De Wit.	Mimosaceae
<i>Luffa aegyptiaca</i> Mill.	Cucurbitaceae
<i>Momordica charantia</i> Linn.	Cucurbitaceae
<i>Newbouldia laevis</i> Seem.	Bignoniaceae
<i>Oncoba spinosa</i> Forsk.	Flacourtiaceae
<i>Panicum maximum</i> Jacq.	Poaceae
<i>Passiflora foetida</i> Linn.	Passifloraceae
<i>Paspalum vaginatum</i> SW.	Poaceae
<i>Phoenix dactylifera</i> Linn.	Arecaceae
<i>Physalis angulata</i> Linn	Solanaceae
<i>Pithecellobium dulce</i> Benth.	Mimosaceae

<i>Pupalia lappacea</i> (Linn.) Juss.	Amaranthaceae
<i>Rhizophora racemosa</i> G. F. W. Meyer	Rhizophoraceae
<i>Ricinus communis</i> L.	Euphorbiaceae
<i>Schramkia leptocarpa</i> DC	Mimosaceae
<i>Sesbania pubescens</i> DC	Papilionaceae
<i>Sesuvium portulacastrum</i> (L.) L.	Aizoaceae
<i>Setaria barbata</i> (Lam.) Kunth	Poaceae
<i>Sida acuta</i> Burm.f.	Malvaceae
<i>Sporobolus pycnoidalis</i> P. Beauv.	Poaceae
<i>Stachytarpheta indica</i> (Linn.) Vahl.	Verbenaceae
<i>Talinum triangulare</i> (Jacq.) Willd.	Portulacaceae
<i>Thespesia populnea</i> (L.) Soland ex Corrêa	Malvaceae
<i>Trianthema portulacastrum</i> L.	Aizoaceae
<i>Tridax procumbens</i> Linn.	Asteraceae
<i>Typha australis</i> L.	Typhaceae

Plants found in only one community

Community	Plants
Anloga	<i>Corchorus olitorius</i> <i>Elaeis guineensis</i> <i>Ipomoea triloba</i> <i>Ludwigia decurrens</i> <i>Pycnus lanceolatus</i> <i>Vernonia cinerea</i>
Atiavi	<i>Centrosema pubescens</i> <i>Malvastrum coromandelianum</i> <i>Oldenlandia corymbosa</i> <i>Securinega virosa</i> <i>Thevetia peruviana</i>
Fiavor	<i>Abrus precatorius</i>

	<i>Cocos nucifera</i> <i>Datura metel</i> <i>Jatropha gossypifolia</i> <i>Rhynchospora corymbosa</i> <i>Scoparia dulcis</i>
Havedzi	<i>Acrostichum aureum</i> <i>Euphorbia hirta</i> <i>Hyptis suaveoleus</i> <i>Mallotus oppositifolius</i>
Tegbui	<i>Blighia sapida</i> <i>Borassus aethiopum</i> <i>Luffa aegyptiaca</i> <i>Canna indica</i> <i>Lactuca taraxracifolia</i> <i>Dialium guineense</i> <i>Chassalia kolly</i> <i>Gomphrena celosioides</i> <i>Grewia carpinifolia</i> <i>Oncoba spinosa</i> <i>Phoenix dactylifera</i> <i>Pithecellobium dulce</i> <i>Rhizophora racemosa</i> <i>Schramkia leptocarpa</i> <i>Talinum triangulare</i>

Plants common to all communities:

Avicennia germinans

Azadirachta indica

Boerhavia diffusa

Cyperus articulatus

Paspalum vaginatum

Physalis angulata

Sesuvium portulacastrum

Trianthema portulacastrum

4. Discussion

The KLCRS is home to millions of biodiversity. The vulnerability on the preservation, conservation and sustainability of biodiversity has called for the establishment of Ramsar site in order to ensure that biodiversity and biological resources and processes are not only maintained but are made sustainable. To the communities surrounding the site, the site is a means to a sustainable livelihood however, they ignore to ensure the conservation and sustainability of the site. The results from the study highlighted how the activities of the people in the communities around the Ramsar site affects the biodiversity and the biological processes that exist in the site.

The study has also outlined the unique biodiversity in the KLCRS focusing on the surrounding communities, with the documentation of 24448 individuals of 133 bird species, and the discovery of the existence of a mixed morph Western Reef Heron (*Egretta gularis*) at Fiahor, the presentation of 27 fish species, and the existence of 79 plant species belonging to 39 families of flora. The plants that are common among the communities are also outlined. The difference in species abundance and richness between seasons could be attributed to migration and breeding. During the dry season, most of the Palearctic migrants such as the terns, gulls, plovers etc. were resident at the site in large numbers. However, during the wet season, these migrants had left the wintering sites to the breeding ground with few individuals remaining while other intra African migrants such the cuckoos, pratincoles, etc were returning to the site to breed. The Keta lagoon complex and surrounding vegetation serves as a breeding, foraging and roosting grounds for both migratory and resident birds (Mattah et al., 2024). Examples of birds breeding at the lagoon complex are Great Heron *Ardea alba*, Intermediate Heron *Ardea intermedia*, Purple Heron *Ardea purpurea*, Black-winged Stilt *Himantopus Himantopus*, Collared Pratincole *Glareola pratincole*, etc. Birds that breed there are at the risk of losing their eggs to human harvesting as egg harvesting is a common practice carried out by the locals during the breeding season and is deemed a cheap source of protein. The frequency at which this happens is likely going to reduce the reproductive success of birds and affect their population size over a period of time. Egg

harvested target both ground nesting and tree nesting birds which makes both nesting guilds vulnerable.

The study showed that small-scale fishing, salt mining, and farming are common activities carried out by the local people on and around the lagoon. These activities coupled with the mangroves and other vegetation around the lagoon provide foraging, roosting, and breeding grounds for birds (Gyampoh et al., 2026; Mattah et al., 2024). These resources altogether make the Keta lagoon an important site for both migrants and resident birds, as well as other biodiversity including the fish and plant species. Similarly, the shallow edges of the water and vegetation provide foraging opportunities for shallow water feeders (Sun et al., 2025; Battley, 2003). Deepwater feeders such as the Terns and Gulls were also recorded in areas where the water was deep and extensive, as seen from (Kwaśna et al., 2024). The lagoon complex is known to support livelihood opportunities of inhabitants by serving as a considerable natural capital. However, livelihood activities such as fishing, farming, mangrove harvesting, salt mining, hunting and harvesting of birds and eggs puts pressure on biodiversity at the site. Thus, measures are needed to ensure biodiversity conservation and protection as well as enhance the sustainability in the area.

5. Conclusion

The lagoon complex supports a range of biodiversity from bird species, fish species, and plant species, thus, the complex being a Ramsar site requires preservation, conservation, protection and sustainability. However, the human activities within the communities have great impact on the lagoon, ranging from intentional subsistence small scale hunting and collecting of eggs of birds, logging and wood harvesting as well as fishing and harvesting aquatic resources are threats to the species of biodiversity in the lagoon. These activities if not regulated and carried out sustainably may result in the loss of important populations of biodiversity species. We highly recommend conservation education and awareness creation be carried out to educate members of the communities within the lagoon complex on the importance of species and populations at the site to the maintenance of biodiversity and biological processes and the sustainability of the KLCRS.

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Appendix:

Pictures of some species encountered during bird survey at Keta Lagoon complex



A hybrid Western Reef Heron *Egretta gularis*



A white morph Western Reef Heron *Egretta gularis*



Bar-breasted Firefinch *Lagonosticta rufopicta*



Common Sandpiper *Actitis hypoleucos*



Roseate Tern *Sterna dougallii*



Pied Kingfisher *Ceryle rudis*



Striated Heron *Butorides striata*



Striated Heron *Butorides striata*



Purple Heron *Ardea purpurea*



Fulvous Whistling Duck *Dendrocygna bicolor*



Lesser Black-backed Gull *Larus fuscus*



Yellow-throated Longclaw *Macronyx croceus*

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