3.1.b. COASTAL LAGOONS OF GHANA

by Christopher GORDON

1. Introduction

Ghana has a coastline of 550 km along which there are about fifty lagoons (Mensah 1979), many of them less than 0.5 km^2 (Biney 1984). Kwei (1977) differentiates two types of lagoon: those which are associated with perennial rivers and are open to the sea, and closed lagoons which, for most of the year are cut off from the sea by sand bars (see fig. 3.9).

Very little is known about the majority of these lagoons but a few have been examined with variable intensity by a number of authors, and Mensah (1979) reviews the literature to that date. The most intensive work is a survey of the physico-chemical characteristics of 15 lagoons by Biney (1982, 1984), the results of which are summarised in Tables 3.6 and 3.7. Data on the Amansuri wetlands will be treated separately.

2. The geology and geography of the coastal plains

The coastal plains of Ghana have been divided into three main sections by Dickson and Benneh (1970):

1.The south east coastal plain is up to 80 km wide and the land is flat with a general elevation of less than 75 m. In some places the land is below sea level and is periodically invaded by the sea.

2. Between Accra and the Songaw lagoon the coast is sometimes cliffed and is composed of mid Devonian sandstone, grits shales.

3. Further east the coast line is fairly smooth and is characterised by sandbars. It includes the Volta delta and the Keta lagoon. This portion of the coast is made up of recent unconsolidated sand clay and gravel. The central plain is composed of red continental deposites limonitic sand, sandy clay and gravel.

3. Climate (see Fig. 3.7)

The climate of the Ghana coast is closely associated with the position of the Inter-tropical Convergence Zone (Walker 1962) which marks the meeting place of two air masses the monsoon (wet) from the south and the Harmattan (dry) from the north. In August it is in its most northerly position and in January its most southerly.

Rainfall: The whole coastal plain has 2 rainy seasons, the principal one reaching its maximum in May-June and the minor in October. The west has the highest rainfall in the country and the principal rainy season is well marked. The east has the lowest rainfall in the country.

Temperatures: Average maximum temperatures are highest in February and lowest in August.

Humidity: Relative Humidities reach 95-100% during the night and early morning but by mid-afternoon this falls to 75% in the south west and 65% in the south east. Periods of a few days with very low humidity may occur in December, January or February.

Winds: The south west monsoon is the prevailing wind and it is only on rare occasions that the I.T.C.Z. comes below the coast. Land and sea breezes have the greatest effect on the variation of surface wind. Speeds are generally low with minima in November and December, and maxima in August and September. Data from five synoptic coastal meteorological stations has been presented in Table 3.8.

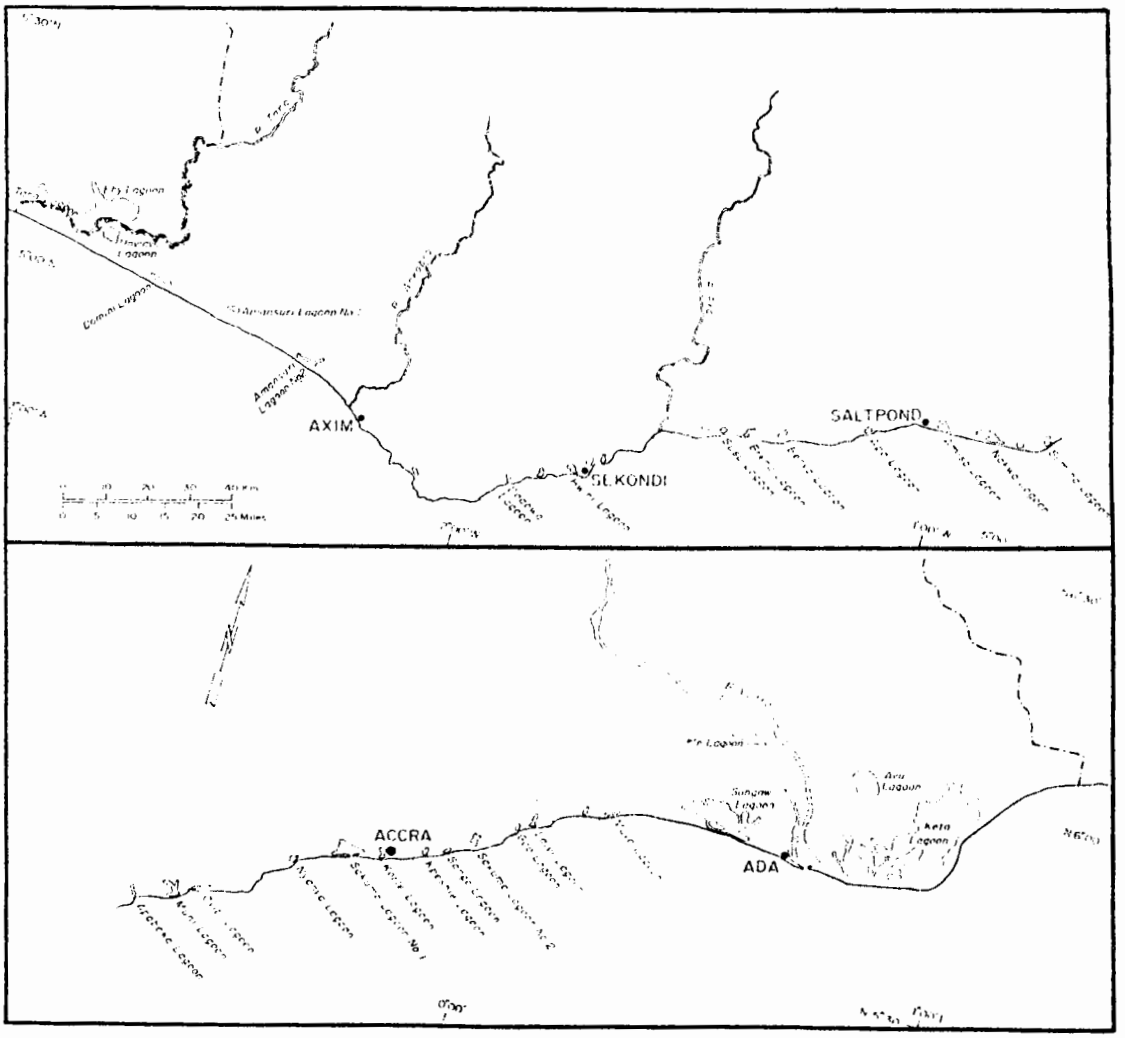


Figure 3.9 Coastal lagoons of Ghana

Table 3.6 Physical characters of the major lagoons (from Biney 1982,1984)

	LAGOON TYPE	SURFACE AREA (km^2)	MEAN DEPTH (m)	MAX. DEPTH (m)	TEMPERATURE (^oC)	pH	CONDUCTIVITY $10^{-3}S.cm^{-1}$	SALINITY	SECCHI depth (cm)
KETA	Closed	250.0	0.80	2.0	32.5	8.1	31.2	18.7	35.0
ANGAW	"	50.0	1.75	4.0	29.5	7.2	4.1	2.3	85.3
LAIWI	"	0.7	0.70	2.5	28.8	8.1	22.3	13.6	48.0
GAO	"	1.1	0.71	2.0	29.6	8.1	21.0	12.1	70.0
CHEMU	"	0.2	0.48	0.8	36.3	8.2	29.1	18.0	27.8
SAKUMO II	"	3.5	0.55	1.0	29.5	8.0	3.3	1.9	14.0
KPESHIE	"	1.8	----	---	29.4	8.0	36.2	22.7	35.0
KORLE	Open	2.7	0.45	1.0	25.3	7.0	54.8	32.4	24.7
SAKUMO I	"	20.0	0.90	3.0	25.2	7.1	22.4	13.1	9.1
OYIBI	"	1.5	----	---	28.1	7.0	1.93	1.1	19.0
MUNI	"	4.5	0.60	1.0	28.3	7.0	65.3	39.3	76.0
MAKWA	"	8.0	0.75	2.0	28.5	7.6	53.8	31.5	56.0
AMISA	"	3.0	0.50	1.5	30.1	7.0	18.5	11.4	22.0
FOSU	Closed	2.5	0.55	1.5	28.1	7.3	14.5	8.7	23.0
BENYA	Open	4.5	----	---	27.5	7.4	63.8	38.0	100.0

Table 3.7 Chemical characters of the major lagoons (from Biney 1982,1984)

	Na meq/l	K meq/l	Ca meq/l	Mg meq/l	Cl meq/l	HCO_3 meq/l	SO_4 meq/l	PO_4-P $10^{-6}g/l$	NO_3-N $10^{-6}g/l$
KETA	271.4	8.9	19.4	11.8	291.5	2.0	21.6	20	1700
ANGAW	37.4	1.0	1.9	1.1	34.9	1.1	3.1	10	6300
LAIWI	195.2	8.5	9.8	9.6	212.9	2.3	13.8	10	2700
GAO	184.1	8.3	7.7	9.5	188.7	1.3	11.9	40	8600
CHEMU	250.2	9.8	16.2	15.0	279.7	2.8	18.5	600	3000
SAKUMO II	27.1	1.5	2.8	1.6	29.3	2.1	3.1	90	1800
PKESHIE	315.2	11.8	18.3	16.4	353.8	2.3	17.8	110	3400
KORLE	435.6	12.5	16.7	83.6	505.6	3.7	29.7	860	3000
SAKUMO I	187.6	1.1	6.9	28.1	203.7	0.1	23.5	30	4800
OYIBI	14.8	0.7	1.4	2.4	16.6	1.7	1.3	80	2000
MUNI	527.2	13.7	21.1	91.2	611.8	2.2	27.7	70	300
NAKWA	422.3	12.0	18.1	86.0	491.5	2.0	25.1	70	300
AMISA	152.5	4.3	5.2	22.6	176.6	1.2	10.3	30	600
FOSU	126.1	4.3	5.7	8.6	135.8	3.2	8.8	70	200
BENYA	509.7	15.1	20.3	92.6	591.5	2.1	52.4	20	0

Table 3.8 Meteorological data for coastal stations in Ghana

	AXIM	SEKONDI	SALTPOND	ACCRA	ADA
Insolation					
mean hours/y	2556	2235	2374	2410	2235
month of max.	Nov	Oct	Nov	Nov	March
month of min.	June	Aug	Aug	Aug	Aug
mean daily cloud cover %	73	62	57	67	59
Wind speed annual					
mean km/hr	6.5	4.7	5.4	10.4	10.1
month of max.	Aug	Aug	Aug	Aug	Aug
direction	sw	sw	sw	sw	sw
Rainfall mean annual					
total mm	2129	1186	1106	732	1032
month of max.	Jan (51.3)	Jan (32.8)	Jan (12.5)	Jan (15)	Jan (75)
month of min.	June (535.2)	June (280)	June (358)	June (190.3)	June (393)
Evaporation annual					
Potential mm	1632	1830	1550	2058	1953
Air temperature					
annual mean °C	26.3	26.2	26.5	26.8	28.0
month of max.	Feb	April	Feb	Feb	Feb
(daily range)	21-33.3	21.6-32.7	21.3-33.4	21.3-33.9	22.4-34.4
month of min.	Aug	Sept	Aug	Aug	Aug
(daily range)	21-27.6	20.3-29.4	20.5-28.2	20.6-29.9	21.5-30.2

THE AMANSURI WETLANDS

1. Geography and morphology

The blackwater Amansuri lagoon and its surrounding wetlands are situated on the western coast of Ghana, 50 km from the border with the Ivory Coast, (Lat 5°00'N, long 2°35'W) (fig. 3.9). The land is very flat, most of the drainage basin being below 50 m. A line of sand dunes along the coast makes drainage difficult. The coastal plain extends 5-10 km inland where there are undulating hills reaching 200 m high. The total area of the catchment basin is 1010 km^2 and the area of the wetlands is 75 km^2 with 2.6 km^2 (5%) open water. The wetlands are dentritic in shape with no islands, its maximum dimensions are 18 km E-W and 10 km N-S. Most of the wetlands dry up in the dry season (Nov.-Mar.) with only the area of open water still flooded. The mean depth of the open water is 2.8 m and of the swamp 0.5 m, maximum depth measured was 5 m.

2. Climate and geology

The Amansuri basin is characterised by high rainfall in two main wet seasons and a uniformly high temperature. This climate is classified as equatorial monsoon and owes its rains to low pressure areas over the Sahara attracting southwest winds from below the equator. The climate is similar to that of Axim (Table 3.8). The rocks of the area

are Apollonian and are obscured by a cover of Pleistocene to Recent sand and gravel (Junner 1940). Patches of podsolic sand are found underneath the swamp over the coast (Ahn 1961).

3. Hydrography and hydrology

The swamp is exorheic, the main outflow being the Amansuri rivers, the main inflows are the Adenimunio Evini, Bosoke and Eivla rivers. In the dry season water levels drop by 1-2 m and the whole system effectively becomes stagnant.

4. Physico-chemical characters of the water

(Sampling time 17.5.82, 10.00 am)

	Sedge zone	Open water = 1 m
Temperature °C	28	29
Transparency m	1.10	0.9
pH	6.95	5.85
Conductivity $10^{-6}S.cm^{-1}$	230	130
Salinity ‰	0.07	0.05
Alkalinity meq/l	0.36	0.28
Na mg/l	17.0	8
K "	2.0	5
Ca "	1.6	2.4
Mg "	3.0	2.4
Cl "	21.5	36.9
SO_4 "	20.3	14.2
$N-NO_3$ "	0.2	0.02
$P-PO_4$ "	0.01	0.01
O_2 "	6.0	7.0

Normally the water column in the body of the open water is mixed by daily land and sea breezes, but stratification can develop within hours in calm weather. Insufficient baseline data is available to comment on the nutrient budget of the area.

5. Flora and fauna

GROUP	DOMINANT SPECIES	COMMENT
Macrophytes sedge zone	Rhynchospora wallichiana Fuirena umbellata	sedges found in up to 0.5 m water
Nymphaea zone	Nymphaea lotus, N. maculata Nymphoides indica, Cyrtosperma senegalense	found in up to 1.5 m water
Raphia zone	Raphia hookeri, R. vinifera, Vossia cuspidata	found in up to 3.0 m water
Phytoplankton	Scenedesmus quadricauda Melosira granulata	

Invertebrates	Povilla adjusta Chironomus transvaalensis
Fish	Chrysichthys vellifer Hemichromis fasciatus Tilapia aurea
Other vertebrates (Birds)	Anhinga rufa Porphyrio alba, Bubulcus ibis

6. **Human activities and management**

There are four towns of between 1000-5000 pop; most villages are much smaller. The density in the whole drainage area is below 50 persons/km^2. Villages are sited on the periphery of the swamp or on the coast. Development is poor, only one road, closed in the rainy season, cuts through the basin. Coconut plantations cover most of the arable land and the small scale production of coconut oil is the major industry. Most fishing is carried out by inhabitants of a lake village (pop. 500) built on wooden piles within the swamp. Methods used include nets, traps, lines and an indigenous poison. The Raphia palms are tapped and the sap drunk fresh as palm wine or distilled into gin. Hunting for food is carried out by the local population. Tourism is limited by the inaccessibility of the area. No disease or pest control programs are in operation; local taboos provide a form of protective legislation controlling the disposal of waste, building sites and fishing methods.

3.1.c. LES LAGUNES DU TOGO : LE SYSTEME LAGUNAIRE DU LAC TOGO (Fig. 3.10)

par Bertrand MILLET

1. **Géologie**

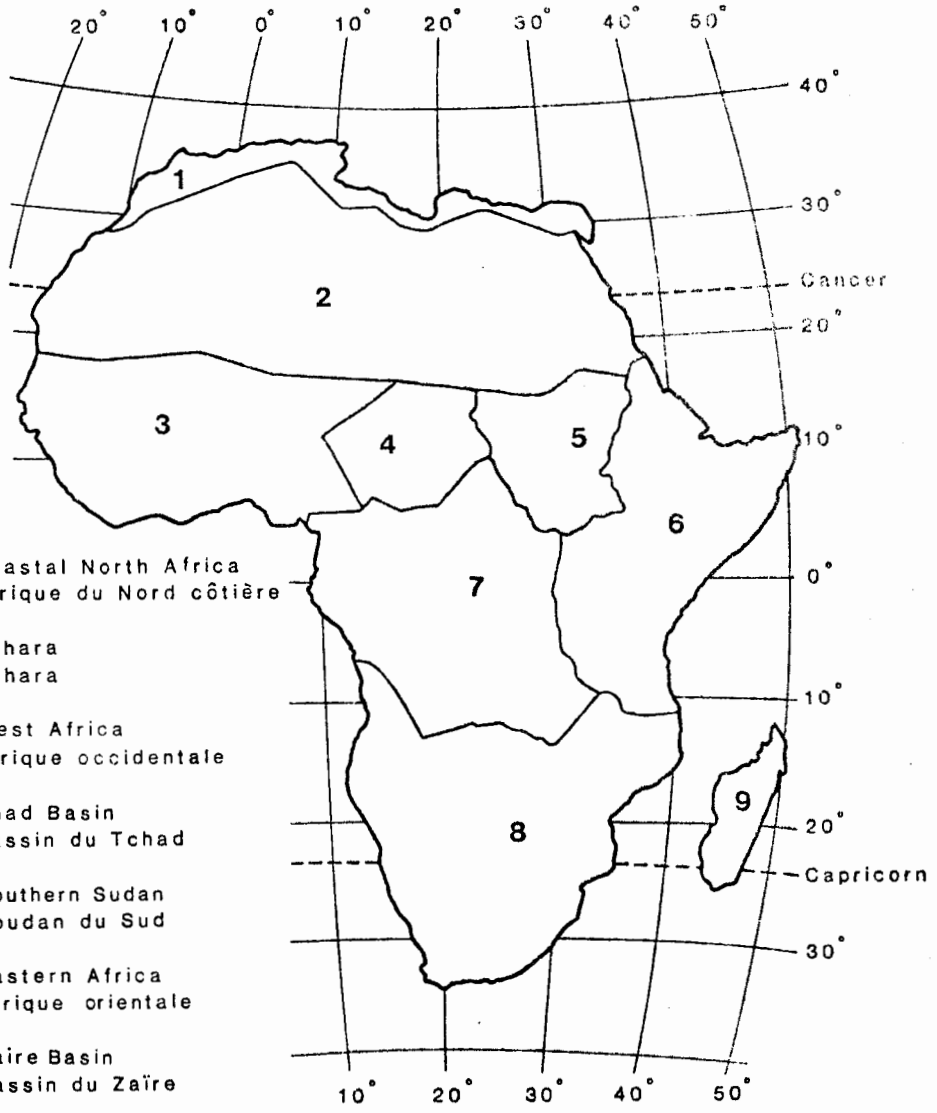
Les lagunes togolaises se situent dans une dépression littorale du bassin sédimentaire côtier du Togo inondée lors de la dernière transgression marine (nouakchottien du Sénégal).

Formations détritiques sableuses du cordon littoral sur la rive sud; formations ferrallitiques du Continental Terminal à l'affleurement sur la rive nord.

Bassin versant constitué à 80% de sols issus de l'altération du socle cristallin (gneiss, migmatite, quartzite, amphibolite) dans sa partie amont; et des formations sablo-argileuses du Continental Terminal, dans sa partie aval. Exploitation à ciel ouvert des mines de phosphate du Togo à 6 km en amont du Lac Togo (Lenoir, com. pers.).

Sédimentologie lagunaire: sédiment de faciès sablo-vaseux très fin, très épais, avec bancs de sable à proximité des rives et formations de beach-rocks à proximité du cordon littoral.
La matière organique varie entre 3 et 4% du poids sec.

Granulométrie: la proportion d'argile (0 à 2.10^{-6}m), atteint 47% du sédiment sec en aval du système, et la proportion en sable grossier (200 à 2000.10^{-6}m) atteint 34% du sédiment sec en amont.



1 Coastal North Africa
Afrique du Nord côtière

2 Sahara
Sahara

3 West Africa
Afrique occidentale

4 Chad Basin
Bassin du Tchad

5 Southern Sudan
Soudan du Sud

6 Eastern Africa
Afrique orientale

7 Zaire Basin
Bassin du Zaïre

8 Southern Africa
Afrique australe

9 Madagascar

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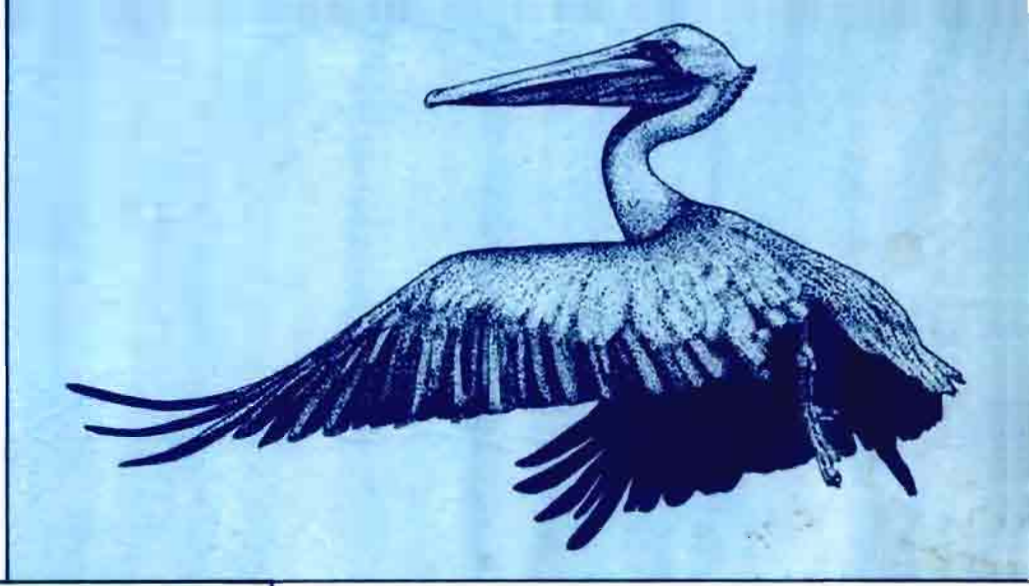

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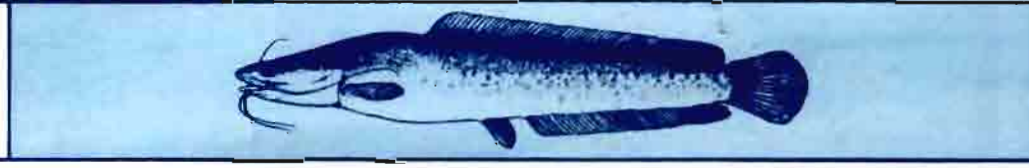

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