

Botany in Equatorial Guinea & in the Island Nation of São Tomé and Príncipe

Anitra Thorhaug, School of Forestry and Environmental Studies, Yale University

INTRODUCTION Equatorial Guinea is one of the smallest (28,051 km²) and most botanically interesting of the West African nations. This nation has a small human population of just over half a million and a small terrestrial spatial extent (28,051 km²), but a rich flora with both offshore volcanic islands and its mainland part forms a portion of one of the legendary world hot spots the Cameroon Forest (Figure 1). The oceanic space of the archipelago is very rich and far larger (500,000 km²). The island archipelago portion of Equatorial Guinea is comprised of Bioko Nor and Sur, Annabon, and geologically the archipelago includes the island nation of São Tomé and Príncipe (Figure 2). All of these islands are a botanist's dream. There are two portions of the nation of Equatorial Guinea :1) the mainland portion ,which reaches east from the coastline inland to the Cameroon highland jungles of Central West Africa, with plant species and ecosystems similar to the Cameroon Highlands included in the Guinea hotspots and one of the three richest biodiversity areas in Africa (Figure 1): and 2.) the two offshore Islands (Bioko and Annabon), which are onto themselves a botanical ecosystem akin the Galapagos or Hawaiian islands for their endemism, although crops species have been brought from the African mainland for millennium and Europe from for five hundred years(Figure 2). Equatorial Guinea has 3250 plants species with 66 endemic plant species and 23 (while others estimate 61) threatened plant species. Threats are increasing : government mining, petroleum and gas business, make this nation the number three exporter of oil and Gas in Africa. Offshore fisheries and exploitation by foreign nations of the timber are also accelerating. I had the excellent fortune of being sent there in winter of 1992 by the United Nations and welcomed as the guest of the government so that I could look first hand at the nation.

The nations' mainland (Figures 1 & 2) borders Cameroon highlands on the Equatorial Guinea mainland north coast, Gabon to the east and south, while the chain of Atlantic islands included in Equatorial Guinea have Nigeria to the north and Cameroon and Gabon to the east as their neighbors. Spatially the terrestrial portion of the mainland is only 26,017 km², São Tomé and Príncipe lie further away from the mainland and cover approximately 836 km², and while the Equatorial Guinean island of Bioko covers over 2000 km², Annobon is the furthest from the mainland coast with an territorial area of 44 km². But due to the line of volcanic islands, the archipelago of Equatorial Guinea and Annabon plus St Tomé and Príncipe have an enormous oceanic space of 500,000 km². Situated in the Gulf of Guinea, there are a series of neighbors to the north of the islands with neighbors (west to east) Liberia, Cote d'Ivoire, Ghana, Togo, Benin, Nigeria, and Cameroon.

BACKGROUND of GEOLOGY, OCEANIC and ATMOSPHERIC CURRENTS AFFECTING the BOTANY of the TWO NATIONS

Equatorial Guinea is unusual in several ways which includes being composed of a series of offshore volcanic islands which are theorized by some to be formed in the Triassic-Jurassic period when the Atlantic Ocean between Africa and South America was being formed. A prevalent geological theory is that the "Cameroon line" was a fracture from a triple junction point in the Atlantic and became a geological fault about 80 million years ago extending along a zone from Mount Cameroon eastward toward Lake Chad and westward to the Gulf of Guinea but the fracture did not continue to extend toward the European plate (a failed arm of the fault). The fault contains the Mbere rift Valley and the Cameroon Highland Mountains. This theory attributes the fault line formation to the African plate rotating counterclockwise which opened up magma conduits so that a line of volcanoes formed which includes Annobon and Bioko. The oceanic portion of the line of volcanoes are clear in the satellite photos (Figure 2) showing the string of offshore islands and sea mounts, of which 9 are active (receiving shocks 3 times in the last hundred years). Also, an eruption occurred in 2000 in the string of craters and crater lakes (Lake Nyos) in the mainland portion of the fault. The most

active volcano is connected with a large fracture zone evidently on the African Continent itself including Lake Chad and Mount Cameroon. The island of Bioko (previously named Fernando Pó) is the farthest island north in the volcanic archipelago in the Bight of Biafra. The structure of the island is cones of two volcanoes reaching 3,008 m named Pico de Santa Isabel. Bioko is primarily of volcanic origin, resting on a sedimentary base, and having thickly wooded mountains, with predominantly a steep, rocky coast. Bioko is just offshore of Cameroon (25 mile to Cameroon's west) and Nigeria (to Bioko's northeast). The smaller and more distant (latitude 1° 24' S) island of Annobón with the small area of 44 km² is primarily composed of a volcano 900 m high and is part of Equatorial Guinea. The mainland portion of Equatorial Guinea is Rio Muni with its terrestrial area of 26,017 km². Its width is 130 km with an average western seaboard to mountains length of 200 km. Rio Muni has small offshore islands of Corisco, Elobey Grande and Elobey Chico. Rio Muni's coastal plain is composed of sediment which is about 15 km deep with a tiered escarpment of strata at 300 m, 500 m, and 600 m, where a granite plateau formed being the western extension of the Gabonese Crystal Mountains. As one progresses eastward up into the mountains the land becomes heavily forested and higher so that mountains can reach 1200 m. The Mbini (formerly the Benito) River drains about 60 percent of the area. The entire mainland portion of the nation Rio Muni, as in many other West African nations, is drainage basins of a dominant river system. The central mainland area lies in conjunction with the upland forests of the Congo and thence eastward to the interior tropical African jungles, especially the Cameroon Highlands and the Gabonese Crystal Mountains. The geography of the two portions of the nation obviously differs greatly especially with large rivers on the mainland portion.

The climate is humid, tropical with an average temperature in the Islands' area 25°C, which does not vary greatly. Equatorial Guinea generally has a hot, humid tropical climate with average annual rainfall varies from 1,800 mm in the north-east to 3,500 to 4,000 mm in the south-west (Cape San Juan) of Río Muni, over 2,500 mm in Bioko, and reaching over 10,000 mm in some interior places in Rio Muni. Seasonal rains are greatest December through February which are accompanied by highly energized storms.

The Central West African nations north of Cameroon have a portion of the Basement complex of West Africa covered by sedimentary formations. Also there are sandstone deposits, both having rich oil reserves, as in Nigeria. There is a ridge of volcanic highlands which form the western end of the East African Rift Valley. Running to the south west (as already mentioned), this volcanic fracture zone includes the islands of Bioko, San Tomé, Príncipe and Annobon (Figure 2). The edge of the West African tectonic plate (less studied than other plates) lies close to the island chain and is active. Terrigenous sediment predominates over much of the oceanic region. In the Gulf of Guinea, 90% of the sediments are terrigenous. The shelf grows deeper rapidly on the west side of the archipelago islands except in Bioko which sits on part of the continental shelf.

The oceanic setting of the island chain is highly interesting since it involves a set of currents and counter currents which bring the mid-Atlantic equatorial waters past the island portions of the nation. The cooler and nutrient-rich Benguela Current flows along the Southern-Western African Coast from the south to north reaching Rio Muni, where it turns west (away from the coast) toward Bioko, and may be found at differing seasons and wind conditions east, west or south of Bioko. This brings a richness of phytoplankton not yet fully explored. The Guinea Current flows eastward and south-eastward along the coast of the Gulf of Guinea, reaching its end at Bioko. The waters near Bioko are those of upwelling and potentially excellent fisheries and rich marine plants. The South Equatorial Current flows westward near the equator and then south. The above currents are mainly wind driven. Several large rivers draining nations to the east and north of Bioko on the African continent produce ocean current velocities from their mouths outward into the sea tens of kilometers due to rainy season discharges. Thus the currents around Rio Muni and the islands especially Bioko are complex and changing with far fewer scientific records and studies than on the Western Hemisphere's South Equatorial Atlantic coast. These currents potentially bring spores and seeds of marine plants and occasionally terrestrial plants into the convergence of the Equatorial Guinea area, although this rafting and current dispersal is not well studied.

Atmospheric mixing also occurs in the strong air patterns over the tropical Atlantic bringing offshore winds having strong meteorological events. The large-scale, seasonal wind patterns originate from the Azores and The Canary Island pressure centers in the Atlantic. Prevailing winds are from the northeast in the northern part and from south to southeast in the southern part of the region except in the Gulf of Guinea, where wind directions vary considerably. The south-west monsoon dominates being the strongest yearly wind event which reaches the furthest north in summer. Violent tropical Atlantic storms are common and highly energized. Lightening in these storms is frequent and consistently causes forest fires which rage until rains extinguish them.

Botanically, during glacial periods, these islands's environmental conditions from Bioko to Annabon were not changed as greatly as the mainland flora's conditions so that the island flora formed a botanical refuge with ancient African plants which still occur on these islands (or their successors) (Leal , 2004). Possibly, the islands' conditions were sufficiently different from the temperatures and humidity of the mainland (due to the conservative tendency of the ocean water) that the island temperatures remained sustainably tropicalsubtropical for a range of plant species (or their predecessors) found there today. The mainland became drier, while the islands retained humidity from aerosols, fogs, dews, and other oceanic moisture. The next question is what occurred to the oceanic and nearshore marine flora of the islands versus mainland during these climatic upheavals? The marine flora is still not well defined at the inception of the second millennium except for the mangroves, although the intertidal contains large stands of seagrasses and a rich array of red and brown algae, and the benthic habitats contain a richness of marine plants helping to support a rich fisheries. This question marine benthic history remains unanswered at present.

BIODIVERSITY and ITS THREATS, PROTECTED AREAS, and FOREST DIVERSITY in EQUATORIAL GUINEA

Protected areas are 16.8% of the total land in 2003 (WRI, 2009) located in 10 protected sites locations. Of the 3250 plant species, 66 are endemic and 23 are threatened (various authors' estimates run from 21 to 61 threatened species probably due to recent threats of logging plus forest removal for agriculture). Protected animal species associated with the forest habitat are also present having one of the highest areas of animal species (194 species of mammals, 418 birds, and 91 reptiles) (World Resources Institute 2009) in Africa. For example, the mainland highland forest areas have been called the third richest in species of birds in Africa (Stuart, 1986, Gartlan, 1989, and Statterfield et al. 1998).

Loss of biodiversity is an ongoing environmental problem. FAO has expressed concern about the rate of conversion of lowland forests into agriculture which rate is unsustainable. As these critical forest habitats are destroyed and converted to farmland, both plant and animal species are lost. Many of the International treaties dealing with plant and animal species exportation, sales, exploitation within the nation, biodiversity and other treaties have been agreed to by the government, which is an active member of the United Nations. Equatorial Guinea is a party to the following treaties: Biodiversity, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Ship Pollution. All these treaties are signed, but not ratified. (This is not meant by me as a statement of adherence to the treaties, but is set forth as a factual statement of legal signatures.) The biological assessment and evaluations of the flora and fauna of the islands have been described in a number of recent publications (Collar and Stuart, 1988, Jones and Tye, 1988, Jones, 1994, Atkinson et al., 1991, 1993, Leal, 2004, 2005) and more below where details are found. Endemism at the generic, specific and sub-specific level appears extremely high for such a small land area. As with island faunas elsewhere, the high taxonomic rank of endemic forms indicates that the process of relictualization has occurred on these islands for millions of years. Hilton-Taylor (2000) has predicted that many critical species on these islands have small populations which are threated with extinction. Much of the protected area is in covered in forestland, little is protected for other ecosystems such as wetlands, nothing for marine ecosystems. In the opinion of this writer more wetland area should be set aside, especially on the south coast of Rio Muni and the islands. Also any coral reefs should be set aside as protected. Forests cover 79% of the inland portion of the mainland Rio Muni and

much of the offshore islands (although on the islands, due to historical colonial farming much area is secondary forest therein definitions and amounts vary between estimates). The most critical ecosystems botanically are those on the islands full of endemism and secondly those in proximity to the Cameroon highlands, one of the highest terrestrial biodiversity areas on the planet besides Pacific coral reef systems. According to FAO, forests presently dominate 52.8% of about 1.6 million hectares of the nation, which are being harvested at 0.89% per annum. FAO estimates about 600,000 ha of forests are virgin. According to FAO, there has been a recent rapid change in forest cover. Between 1990 and 2000, Equatorial Guinea lost an average of 15,200 hectares of forest per year (0.82%). From 2000 and 2005, 0.89% per annum. Thus, from 1990 and 2005, Equatorial Guinea lost a total of 12.3% of its forest cover (228,000 hectares). Wetlands of international importance include only three Ramsar sites made official in 2005. (There are more deserving of the Ramsar site certification). The number of tree species in the IUCN red list include 1 critically endangered, 3 endangered and 11 vulnerable species.

This ecoregion of the four islands of Príncipe, São Tomé, and Bioko and Annobon in the Gulf of Guinea, off the west coast of central Africa support high numbers of endemic species, including several endemic genera and families. This area has been compared with other island centers of endemism (e.g. Galápagos or the Hawaiian archipelagos including their underwater seamounts, which in the case of Equatorial Guinea's seamounts are underexplored. Being volcanic there should be submarine lava tubes which may have fantastic marine flora and animals as do those lava tubes near the Canary Islands.) Evolutionary features typical of island faunas and floras, such as gigantism, dwarfism and unusual ecological, physiological and behavioral adaptations are also found in a range of species.

The Guinean hotspot (Figure 3) (an estimated 9,000 vascular plant species and 1,800 endemic species) includes two distinct sub-regions, which incorporate several important Pleistocene forest refugia created by the retraction and fragmentation of forests of the last 80 million years: 1.) Upper Guinea hotspot stretches from southern Guinea into eastern Sierra Leone and eastward through Liberia, Cote d'Ivoire and Ghana into western Togo; 2.) Nigeria-Cameroon hotspot, extends along the coast from western Nigeria to the Sanaga River in southwestern Cameroon. The two sub-regions are separated by the Dahomeny Gap in Benin, an area of farmland, savanna and highly degraded dry forest.

The Upper Guinean hotspot includes the four islands in the Gulf of Guinea: Bioko and Annobon, and São Tomé and Príncipe. Bioko is considered geologically to be a continental-shelf island, whereas the remaining three are considered oceanic (See Figure 2). The flora of these islands is highly distinctive. The island of Bioko has 1105 plant species of which 12% are endemic (Excell, 1973). There are 37 endemic plant species on Príncipe, 95 on São Tomé (along with one endemic genus), and 20 endemic species on Annobon (Figueiredo, 1994, WWF and IUCN, 1994). Only 16 of the region's endemic plants are shared by more than one island. This emphasizes the high degree of isolation under which these island's floras evolved and it indicates that potentially each island received its flora separately from the mainland. (The patterns of current of wind and water would be potentially possible to corroborate this theory.) The Rubiaceae, Orchidaceae, and Euphorbiaceae are characteristic of the islands' flora having high generic diversity and high numbers of endemics according to Figueiredo (1994). Significant endemic radiations among other plant genera (e.g. *Begonia* and *Calvoa*) are also found. The Pteridophyte flora of the islands is also considered particularly rich (Figueiredo 1998). The islands are distinguished as Centers of Plant Diversity (WWF and IUCN 1994). For instance giant begonias (*Begonia crateris* and *B. baccata*)

are found as are other plant and animal gigantism and dwarfism. Some international agencies and NGO's have proposed to protect the remaining areas of primary forest on São Tomé and Príncipe as national parks. A law establishing procedures for the proclamation and management of a protected area system was passed in 1999. The proposed parks would protect the largest remaining habitat blocks, including areas of primary forest. São Tomé and Príncipe are preparing to declare protected areas for the Parques Naturais d'Ôbo, which will cover a total of 293 km². It is pleasing to be able to state that the entire island of Annobon was recently ratified as a protected area. Let us hope these legal status declarations have

some effect. The second Guinean sub-region, Nigeria-Cameroon, extends along the coast from western Nigeria to the Sanaga River in southwestern Cameroon going inland toward the east. Important montane regions, including the Cameroon Highlands (Mt. Cameroon, at 4,095 m is the highest peak in West Africa) and with south ends of the range of ecosystems in mainland Equatorial Guinea (Rio Muni) as well as on the island (Bioko). Part of the value of the region is the high number of both endemic plants and animals. Also the rapid development of farming and forestry as well as population growth in these areas puts the species in threat. As previously mentioned, FAO is concerned about lower altitude mainland areas being rapidly converted into forests. There are a number of economically important species found among the outstanding plant species in this second Guinean hotspot. This region forms the origin for a series of important cultivated plants. The original native oil palm (*Elaeis guineensis*) (widely cultivated throughout the tropics for palm oil) is found along with valuable timber species including African ebony (*Diospyros gracilis*), two genera of African mahogany (*Entandophragma* and *Khaya*), and iroko (*Milicia excelsa*), which have been widely exploited. In the Bamenda Highlands a distinct subregion within the Cameroon Mountains 120 plant species are endemic. The subregion has rare woods such as Mahogany, ironwood, cam wood and mimosup . In a smaller sub-region within these highlands, the Kilum-Ijim forests within these highlands have *Arundinaria alpine* (Alpine Bamboo) and quantities of endemic species. These forests form the habitat for a food web of animals with 62 mammalian species (11 are endemic). There exist 36 endemic bird species, 40 amphibian endemics, 9 reptiles and possibly a large number of endemic fish. Butterflies species exceed 950 with over 100 endemics.

CURRENT FOREST STATUS

There is currently estimated to be 40 km² of primary forest on Príncipe, and 240 km² on São Tomé. Over larger areas of both islands, secondary forest vegetation is regenerating on old plantations. On Annobon, much of the forest, with the exception of the high peaks of Santa Mina and Quioveo, has been modified by humans over several centuries but remains important habitat for endemic species. Many of the endemic species have adapted to modified habitats on the cocoa and coffee plantations because of the use of shade trees to protect crops. Some International agencies have for decades proposed to protect the remaining areas of primary forest on São Tomé and Príncipe as national parks. A law establishing procedures for the proclamation and management of a protected area system was passed in 1999. The proposed parks would protect the largest remaining habitat blocks, including areas of primary forest, as has been done with Annobon. Concerns exist over the protection and status of the remaining areas of drier forest on São Tomé, and for the long-term survival of species confined to lowland forests of these islands. The remaining lowland forest habitats are being gradually cleared for agriculture. Knowledge of many species of conservation concern is so poor that it is difficult to assess whether the proposed national parks on São Tomé and Príncipe will adequately protect these populations.

Threats to Plant Species

During the sixteenth century, a large area of dry forest in the north and northeast of São Tomé was cleared for sugar cane production. After the decline of this cash crop at the end of that century, some of this forest recovered. From the middle of the nineteenth century, large coffee and cocoa plantations were established on both Príncipe and São Tomé, which led to the widespread modification and destruction of primary rain forest. Rain forest in the north of Príncipe was also severely modified during a campaign against sleeping sickness from 1911-16. However, many endemic species adapted to the shade forest found in plantations. After the 1930s, and especially following independence in 1975, many plantations were abandoned, and there was some regeneration to secondary forest. Since the mid-1980s, land reforms have led to the development of market gardening and consequent land conversion from coffee and cocoa plantations. Some secondary forest areas have also been cleared once more for agricultural use. This is of some concern because it will put pressure on endemic species that have adapted to secondary and plantation shade forest, and it will also increase pressure on remaining primary forest areas. Agricultural practices on Annobon have traditionally been based on a forest agricultural system that was less damaging to biodiversity than the large-scale plantations of Príncipe and São Tomé. However, there remains a danger that

agricultural encroachment in the primary montane forest zones of Pico Quioveo and Pico Santa Mina will result in irreversible damage to these habitats.

PLANT INTRODUCTIONS: The crop plants of the colonial plantations such as cocoa and coffee are introduced plants, as are those which the pre-colonial groups brought with them, namely, the Fang, Bantus, Bubis and other tribes. Earlier biodiversity on the four islands may have been particularly susceptible to the introduction of non-native species. On all four islands, a number of terrestrial mammals, both domestic and wild, have been introduced over the centuries (Dutton 1994) some of which have done damage to native species. For example, recent introductions of terrestrial gastropod species have been recorded on all three islands (Gascoigne 1994a). Little direct exploitation of the endemic terrestrial wildlife occurs. Medicinal plant use is almost exclusively concerned with non-endemic species.

Educational Botany and Botanical Groups There is the Universidad Nacional de Guinea Ecuatorial (Equatorial Guinea National University), founded in 1995 in Bata (on the Mainland) with a medical school and other active professional schools. Botanical activity is found in the Agricultural School and the Fishing and Forestry School. None of the islands, nor Fernando Pó, has a University. Citizens wishing higher education have been accustomed to going to Europe, Russia, or the USA for university training, where many of the present government engineers, administrators and scientists have been schooled.

There are a series of donor government projects and multi-governmental projects (EU and other regional groups). Overseas development projects from Spain, Portugal, USA, EU have been central in the botanical research being carried out. Also there are a series of various disciplinary projects at an International level by African Development Bank, African Union, BDEAC, CEMAC, FAO, G-77, IBRD, ICAO, ICRM, IDA, IFAD, IFC, IFRCs, ILO, IMF, IMO, IOC, ITSO, ITU, MIGA, NAM, OIF, OPCW, UNCTAD, UNESCO, UNIDO, UNWTO, UPU, WFTU, WHO, WIPO, UNDP, and other international agencies. Thus, during the past thirty years much more information has been obtained about the flora of Equatorial Guinea than previously.

Anthropological history

Probably the original mainland inhabitants were pygmies (groups of Pygmies are presently located in scattered locations in Rio Muni). Historically recorded are waves of Bantu migrations occurred in the 1600-1800 after the Portuguese had claimed the area. Later migrations included the Fang tribes from the Cameroon into Rio Muni displacing Neolithic populations and the Bubi (chiefly into Bioko where they became the first human inhabitants). Migrations between the 17th and 19th centuries brought further coastal tribes (such as Ndowes, Bujebaes, Balengues, Kombis and Bengas) along with their languages. The Fang comprise about 80% of Equatorial Guinea's population, while the Bubi comprise about 15% along with some Fernandinos. Probably the Annobon population was brought by the Portuguese from Angola for colonial plantations, which also was the case in São Tomé, and Príncipe. At present there are also Europeans, other African groups, and Asians living in Equatorial Guinea.

Recent Human History

The history of the small nation has been a bit strained in the twentieth century. After being a Portuguese colony, for hundreds of years, in 1778, the island of Bioko, adjacent islets, and commercial rights to the mainland between the Niger and Ogoue Rivers were ceded to Spain in exchange for territory in the Western Hemisphere and then governed from Buenos Aires. These areas were ruled by Spain until 1958. Colonization began in the early sixteenth century when São Tomé became the world's largest sugar producer and, after this crop's decline, the island grew to be an important slave trading post. Annobon became a Spanish colony in the eighteenth century and now forms part of Equatorial Guinea. In the nineteenth century, coffee and cocoa plantations were established on São Tomé and Príncipe so that Africans from Angola chiefly were moved to the islands to work on the estates. These islands have remained populated and became an independent country in 1975.

The Republic of Equatorial Guinea is now an African democracy which exports oil. Since its recent beginnings to pump gas and oil to export abroad in 1992, it has rapidly become Africa's

number three in exports of gas and oil ranking after Nigeria and Angola. Equatorial Guinea also has other natural mineral resources such as gold, bauxite, diamonds, tantalum, sand and gravel. The sea in this portion of Africa has plentiful fish for the native artisanal fishermen, although dangerously offshore rights are sold to foreign fishing companies.

The population of Equatorial Guinea is slightly greater than a half a million of which about half live in the major cities with Malabo the nation's capital. Average life expectancy is 49.7 years in Equatorial Guinea. Median age is 18.83 year with fertility rates over 4. Infant mortality rate is 85.13 deaths per 1000 births (WHO, 2005). About 52% work as farmers, arborists and artisanal fishermen. Artisanal fishing is important in the coastal and island areas, while arbors, livestock and farming are central employment sectors in the mainland and growing inland replacing forest-based livelihoods. Little English is spoken, although knowledge of Portuguese, Spanish, and French are common with the inhabitants, who also speak several indigenous languages such as Fang and Bubi. The population of São Tomé and Príncipe is 206,000 of which 95% live in São Tomé who are chiefly farmers, with 2300 fishermen. The São Tomé average life expectancy is 65.3 years with 63.8 of men and 66.7 for women. The São Tomé median age is 14 with 4.39 fertility rate. A series of other employment sectors are available, although the population is very young. There is some service work.

Equatorial Guinea now has the second highest per capita income in the world, after Luxembourg, although this is derived by simply dividing the GDP by the population. This ranking has several effects. The United Nations can no longer provide the nations the loans and other newly industrializing nations' services. Second, the other nations expect a developed nation set of standards from this young democracy which is independent from Spain only some 50 years.

Two emerging regional governance issues are the following: first, a great deal of piracy occurs along the Bay of Guinea coastline in general, both within these territorial waters and those of all the adjacent nations of Gulf of Guinea. A second regional problem is the illegal immigration of citizens of many West African nations along the general coastline from Gabon to Liberia then northward into Morocco and thence into Europe in small boats. Both trends are occurring in increasing numbers.

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