

GOLD COAST

**THE VEGETATION ZONES
OF
THE GOLD COAST**

BY

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THE VEGETATION ZONES OF THE GOLD COAST



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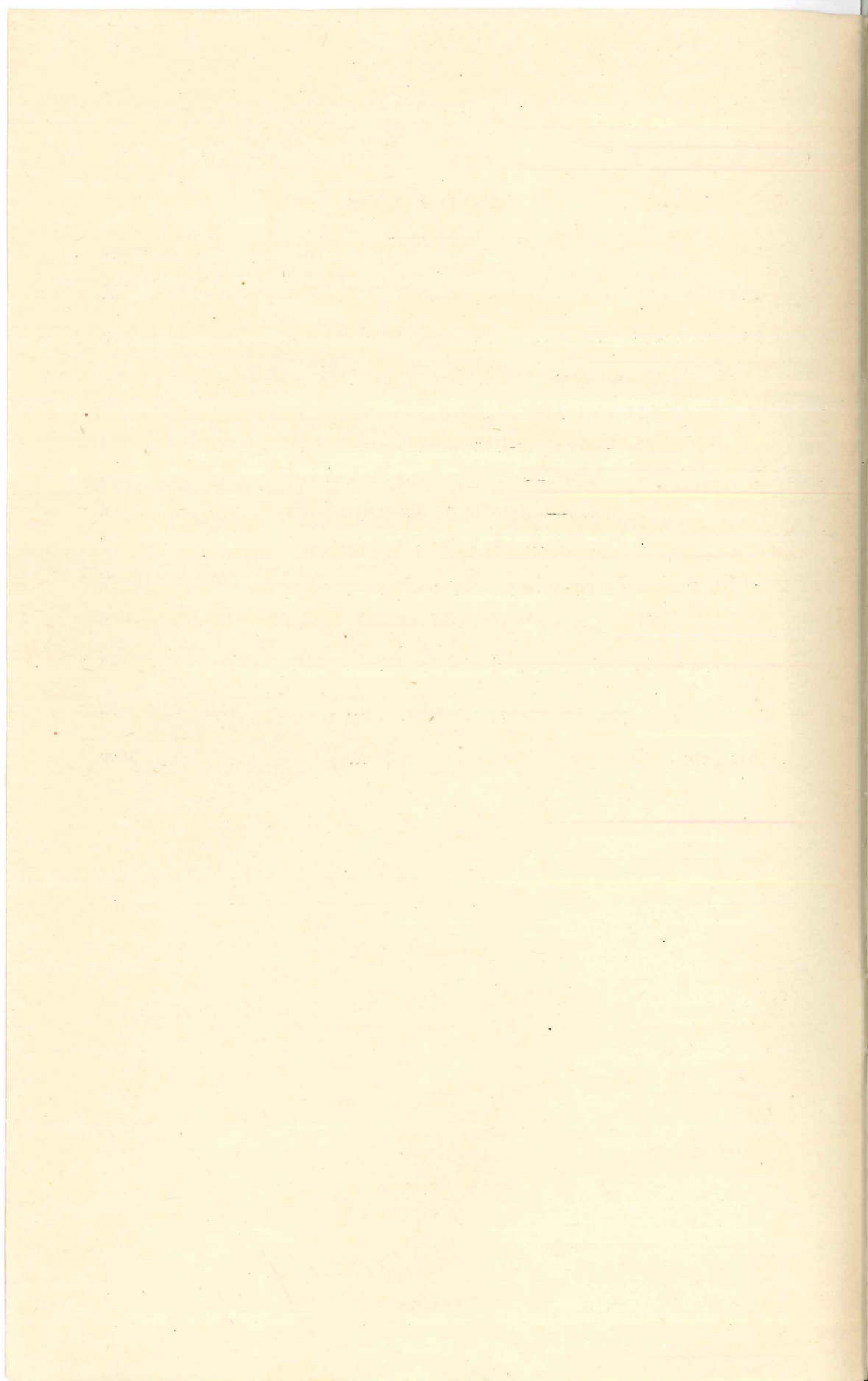
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P R E F A C E

This paper aims at giving a generalised account of the natural vegetation of the Gold Coast. There is great scope for detailed work in the study of the complex ecological problems of this tropical vegetation, and it is hoped that this paper and the accompanying map will form a useful basis for it.

The map showing the vegetation zones has been prepared from personal observations and from Forestry Department records, mainly enumeration surveys.

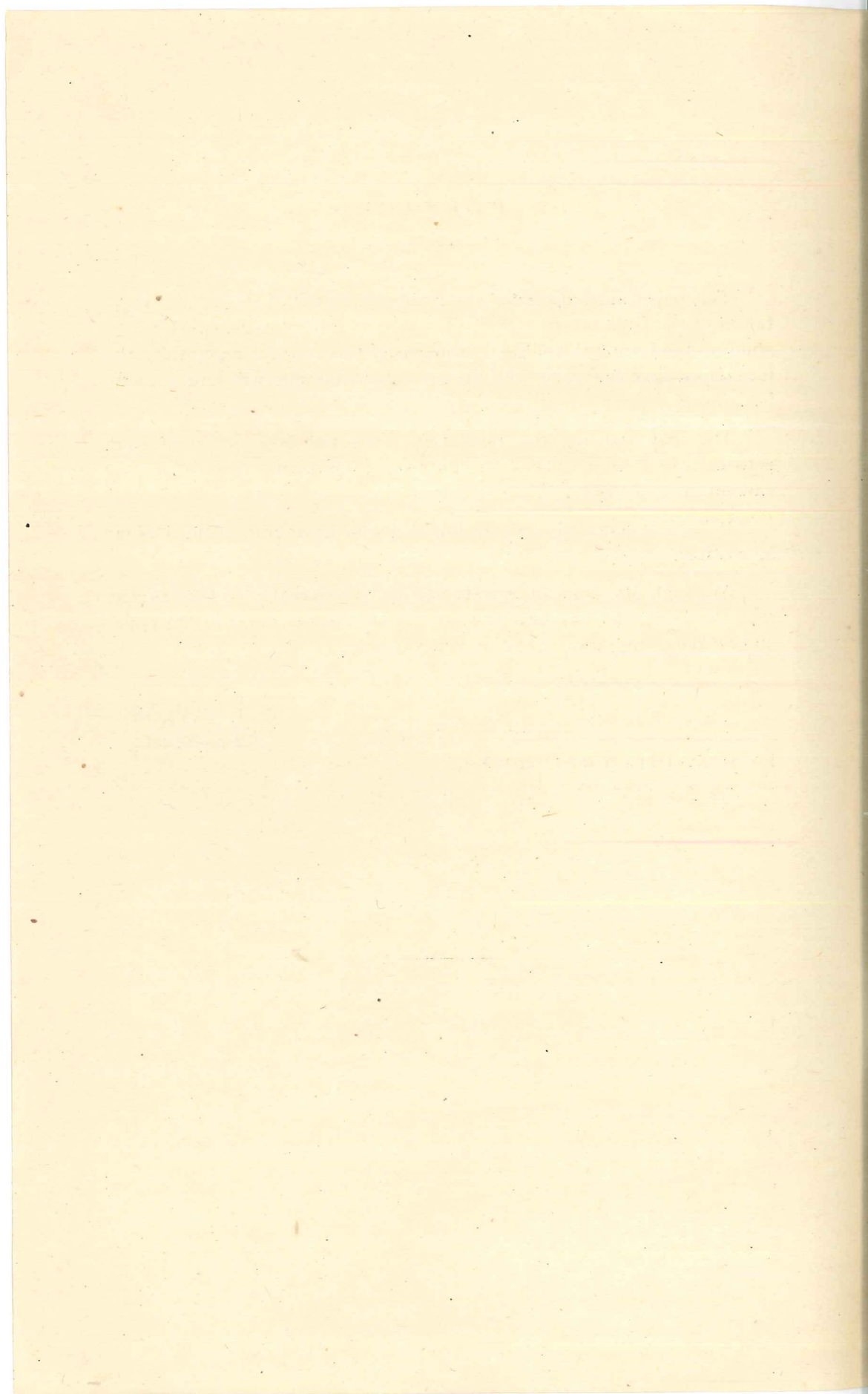
Being a generalised work, technical details have been avoided as far as possible.

Although Mr. Duncan Stevenson, Chief Conservator of Forests, has read the draft, the responsibility for any statements made in the paper and for delimiting the vegetation zones is mine.

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FORESTRY DEPARTMENT, KUMASI.

7th June, 1952.



INTRODUCTION

The Gold Coast, which includes the Colony, Ashanti, the Northern Territories and Togoland under United Nations Trusteeship, is 91,843 square miles in area. It is wholly within the tropics, as it lies between $4^{\circ} 45'N.$ and $11^{\circ} 10'N.$, and $1^{\circ} 13'E.$ and $3^{\circ} 14'W.$ On the south it is bounded by the Gulf of Guinea.

The country is undulating, but the Akwapim, Kwahu, Mampong, Ejura and Gambaga Scarps are prominent, although of no great height, and seldom being higher than 2,000 feet. The greatest altitude, 2,900 feet is in Togoland, where a series of hill ranges runs in a N.E.-S.W. direction. These ranges continue north-eastwards into French Togoland.

The River Volta drains the country north of the Akwapim, Kwahu and Mampong Scarps and the whole of Togoland. The rivers from the southern side of the scarp watershed flow in a southerly direction to the sea.

Geologically, the country is divided by the Kwahu and Mampong Scarps. These are of Voltaian sandstone, and so is most of the country to the north of them, except for the granite in the N.W. and the extreme north. To the west and south of these scarps the main formations are Lower Birrimian and Buem sandstones and conglomerates.

Frost and snow are unknown, and high temperatures prevail throughout the year. The Relative Humidity is generally high, but may drop considerably during the middle of the day in December to April in areas affected by the harmattan. The prevailing wind is from the S.W., but during periods from December to April, the harmattan, blowing from the N.E., may have greater effect, especially in the north. The annual rainfall varies from about 120 inches in the S.W. to 40 inches in the N.E. There is a dry coastal strip beginning between Takoradi and Sekondi, and widening towards the east. The annual distribution of rainfall follows two patterns—a "two-peak" rainfall south of about $8^{\circ} 30'N.$, and a "one-peak" rainfall north of this.

The 1948 census gave the population as 4,118,450. This is unevenly distributed. The S.W., the west and the country to the north of the Kwahu-Mampong Scarps has a scanty population, except for the N.E. and N.W. corners. The population is mainly an agricultural one.

The natural vegetation of the Gold Coast is essentially a climatic one, with particular reference to rainfall and the length of the dry season. Some of it has been greatly altered by man, mainly in the pursuits of agriculture and hunting. During the last 50 years or so, devastation has taken place around the mining areas. There are now few places, if any, where true primeval or virgin forest and savannah-woodland can be seen. Although these changes have taken place and are continuing,

the tree growth, whether of the High Forest or Savannah-Woodland, is a very prominent feature of the Gold Coast, except for the coastal strip east of Takoradi. Even this strip is not devoid of trees. A traveller passing along the roads in the High Forest Zone is very conscious of trees, but little realises the numbers of small farms which are scattered throughout the forest.

The vegetation falls into four physiognomic formations, namely, the High Forest, Savannah-Woodland, Coastal Scrub and Grassland, and Strand and Mangrove. Except for the Strand and Mangrove, the boundaries between the zones are not always definite. It is not uncommon to find outliers of one formation within the margins of the adjacent zone.

No attempt has been made to map the Derived Savannah-Woodland, for although its boundaries can be determined in places, it would be guess work in others, unless a very detailed study were given to it. For physiognomic and other reasons, it has been included in the Savannah-Woodland Zone.

It may be mentioned that a broader view must be taken of the term "Association" when applying it to a tropical forest with its numerous species. In such a forest, the size of the unit which will give a true representation of it is considerably larger than for forests where the number of species is small.

THE VEGETATION ZONES OF THE GOLD COAST

I—THE FOREST ZONES

The Closed Forest, or High Forest, lies within the "two-peak" rainfall belt. In former times it probably extended to the northern limit of this range, but as a more open type than exists to-day, and with patches of Savannah-Woodland occupying those sites with poor, shallow soils and bad drainage. Such areas can be recognised easily in parts of the Afram Plains.

The rain is brought by the S.W. Monsoon. The March and November rain storms, which begin and end in the rainy season in the "two-peak" rainfall area, are usually from the N.E. Local topography, as in Togoland, may affect the direction from which the rain comes.

In the S.W., the annual rainfall is never less than 85 inches and may reach 120 inches. The isohyets, which are more or less N.W.-S.E., decrease to 50-55 inches. This rainfall is characterised by the twin peaks occurring in May-June and September-October. It is not uncommon for the second peak to be the greater. There is often a brief dry period in August, but this is not a consistent feature. The Relative Humidity is high at all times, and may reach near saturation point. The exception to this is during the severe spells of harmattan in the northern exposed edge of the High Forest, when the noon Relative Humidity falls considerably. The intensity of the harmattan diminishes towards the south. It must be remembered that the harmattan does not blow continuously throughout the dry season.

The High Forest has a storeyed structure. The ground flora is usually sparse and the shrub layer is not dense. Grasses are typically absent except for the broad-leaved *Leptaspis cochleata* and *Streptogyne gerontogaea*. Another broad-leaved grass is *Olyra latifolia* but it is more usual on the edges of open places, such as roads. In the tree crop there is a closed lower canopy, in which the trees are typically heavy crowned and branched low. They do not reach a height much greater than 60 feet. Above these is the upper canopy; the trees comprising it have tall straight stems, and many are small crowned. It is typically a closed canopy about 130 feet high. Lastly, there are the emergents, which may reach a height of up to 200 feet, and they do not form a closed canopy. Entwined through the crop are lianes, some of which go right up into the crowns of the bigger trees. The younger age classes of the species belonging to the upper canopies are to be found in the lower storeys. The forest is a heterogeneous collection of uneven aged trees. Over a large enough area, it is possible to find all the age classes.

Deviations occur from this stratified pattern. The forest may be "over-mature", when there will be a preponderance of old trees, with a relative scarcity of trees in the lower canopy. The forest may be "immature" when it may be described as being in the "pole stage" with a high proportion of stems up to about 5 feet girth breast height,

and few old trees. Man may have interfered with the forest, and so upset its structure. Edaphic factors, such as freshwater swamp or semi-swamp conditions, bring about a specialised flora, with a decreased stocking of trees and a reduction in the number of species.

The natural regeneration of this forest is not understood properly, but observations of the composition of various crops tend to indicate that the forest is made up of mosaics, each of which owes much of its regeneration to a certain period. These mosaics require an intimate knowledge of the forest before they can be seen, and even then, they are not always easy to discern.

Prolific regeneration results each year from the vast quantities of seed which fall on the forest floor. After a month or two, much of this regeneration has disappeared through competition and lack of light. Light demanding species take advantage of gaps in the forest, and shade bearers progress where conditions are suitable for them. Recent silvicultural research has shown that while the seedlings of some species require a certain amount of shade in early youth, they need increased overhead light but not open conditions, for their development. This is noticeable with the *Entandrophragma* and *Khaya* species.

The struggle for light in the High Forest is shown by the initial height development. Trees reach to within fairly near limits of their maximum height growth before putting on any marked girth increment. It is typical of the trees of the upper and emergent canopies that they grow straight. To a large degree this is due to the source of light being overhead, but even where there is side light available from gaps in the forest, most of the species grow straight and not towards the gap.

In the High Forest, the farms are either permanent (cocoa) or transitory (food). The general system of creating a farm in the High Forest is to cut the climbers, shrubs, and small trees, and fell most of the trees in the upper and emergent canopies. This is done from about October to March, and towards the end of the dry season, the felling debris is burnt in piles. Burning of the brushwood is also used to kill the large trees which are not easily felled, such as *Ceiba pentandra*, which is huge and has soft wood not easily axed, and *Cylicodiscus gabunensis* with its hard wood and very spreading crown. Planting and sowing of the food crops begin in April with the coming of the rains. Cocoyam (*Xanthosoma saggitifolium*) tubers and plantain (*Musa sapientum* var *paradisiaca*) suckers are planted. Then corn (*Zea mays*) is sown. Garden eggs (*Solanum melongena*), okro (*Hibiscus esculentus*) and pepper (*Capsicum annuum*) are also sown, and sometimes beans. Yams (*Dioscorea spp.*) are grown but not in any great quantity. In the High Forest zone they are confined to its northern parts, but are not a typical forest crop. Only one crop of corn is taken off, and this is harvested about four months after sowing. The garden eggs, okro, pepper and beans are picked as they ripen. After the first year the farm contains only plantains and cocoyams. These continue to give good crops until the fourth or fifth year, when the farm is usually abandoned. The fallow period depends

a great deal on the land shortage. This may be seven years or more. Near the towns, the fallow period is very much reduced, and the soil has degenerated so much that only cassava (*Manihot esculenta*) is grown.

When it is intended to create a cocoa farm, cocoa beans are sown thickly in beds very close to water. The young seedlings are planted in a farm such as that described above. In about four years' time a cocoa plantation is established and the food crops are suppressed.

Abandoned food farms may develop into secondary forest if given the chance. This is composed mainly of fast growing, light demanding tree species and shrubs. A small, short lived, conspicuous tree in a first fallow is *Musanga cecropioides*, which forms a gregarious, even-aged crop. It is unusual to find it in a second fallow which has not carried high forest for some years. It is noteworthy that this species does not appear to regenerate itself on the area already carrying it, nor after the mother trees have been felled. In the second and later fallows, its place may be taken by *Trema guineensis*, another small tree with a short life. If the soil has deteriorated considerably, then the regrowth is mainly a shrubby one.

The High Forest has been divided into two types—the Rain Forest and the Moist Semi-Deciduous Forest. From the physiognomic point of view, there is no significant difference between these two types. The division has been made floristically.

Within both types are found Freshwater Swamp Communities, which owe their existence to edaphic factors. These communities contain a specialised flora. They are not rich in trees, either in species or numbers. The principal trees found in them are *Alstonia*, *Berlinia*, *Carapa*, *Cleistopholis*, *Lannea*, *Macrolobium*, *Mitragyna* and *Uapaca*. *Raphia* palms and the climbing palms, *Ancistrophyllum* and *Calamus*, are very conspicuous, and so are the perennial herbs of the Marantaceae.

1—THE RAIN FOREST

The Rain Forest is situated in the S.W. It lies in an area of high rainfall and very high Relative Humidity. The harmattan has no real effect here. The annual rainfall is from 70–120 inches, and there is no month without rain. The higher peak is in May–June and the smaller in October–November.

The country is generally low lying, but contains numerous small steep hills, with freshwater swamps in the valleys.

This is the only case where the High Forest now reaches the sea—on the rising ground in the vicinity of Cape Three Points. Further west, it is never far from the sea, being separated from it by a belt of lagoons and coconut plantations.

The Rain Forest is typified by the *Cynometra-Lophira-Tarrietia* Association, and by the complete absence of *Celtis* and *Triplochiton*. It is true that *Cynometra ananta* and *Lophira procera* do occur outside this type and that *Tarrietia utilis* is often semi-gregarious, but they are dominants which do represent this forest. When found outside the defined limits of this type, these species are usually only locally common, and not typical of an Association.

Although there is some deciduousness amongst the trees of the upper and emergent canopies, they are the trees which are not confined to the Rain Forest. The type trees, *Cynometra*, *Lophira* and *Tarrietia* are not deciduous. *Bombax*, *Ceiba*, *Entandrophragma* spp. and *Khaya* spp., which are found over most of the High Forest, are deciduous for a short period. (As will be seen later, deciduousness is more related to the sexual state of the tree than to climate). The lower canopy is not deciduous. In it are found *Cola chlamydantha*, *Diospyros sanza-minika*, *Pentadesma butyraceae*, *Protomegabaria stapfiana*, and *Strombosia pustulata*. The shrubs do not form a particularly dense layer. They are represented by *Bertiera racemosa*, *Conopharyngia chippii* and *Randia hispidula*. *Mussaenda chippii* is a common climber.

Considerable areas of the Rain Forest are covered by Freshwater Swamp Communities. These consist of a tangle of climbing palms and raphias and also *Alchornea cordifolia*, *Carapa procera*, *Macaranga* spp., *Randia lanepoolei* and *Spondianthus preussii*. Often they form a more or less closed canopy at about 20-30 feet. Emerging through this canopy are isolated trees—*Alstonia boonei*, *Berlinia* spp., *Macrolobium* spp., *Uapaca* spp. and *Xylopia staudtii*. In some wet places, especially those partial swamps which tend to dry out a bit during January and February, are to be found small, almost pure stands of *Mitragyna ciliata*, a medium sized tree.

The first exploitation of mahogany and cedars for export began in about 1891. It continues to this day, although operations are now further removed from the sea. Originally, much use was made of the Rivers Ankobra and Tano for getting the logs to the sea, but nowadays these are transported mainly by road and rail.

Devastation of the forest has been caused by the gold and manganese mines through repeated cutting for timber, poles and firewood. Large areas around the mines now support a scrub vegetation where *Alchornea*, *Anthocleista* and *Harrungana* predominate, and scarcely a tree of any size is to be found. The fertility of the soil in these areas has deteriorated considerably.

Very little cocoa farming is to be found in this forest. Except near the towns, there are no large food farms. The devastated areas described above are fit for only cassava, because of the poor state of the soil.

The low lying, damp nature of much of the land makes it suitable for rice cultivation. This crop is increasing in importance. Along the coast, coconut plantations are common.

2—THE MOIST SEMI-DECIDUOUS FOREST

Various attempts have been made to give this forest a suitable name. Although "Moist Semi-Deciduous" is not an ideal name, it is considered descriptive. For varying periods between October and April, many of the species in the upper and emergent canopies are deciduous. The application of the term "semi-deciduous" to such a tropical forest requires an explanation. In it certain trees of the upper and emergent canopies shed their leaves during the period which coincides with the dry season. They are not all deciduous at the same time, nor are all trees of the same species leafless together. If a deciduous tree is not going to flower and fruit, then its leafless period is short compared with another one of the same species which is going to produce flowers. *Ceiba pentandra* is a conspicuous example. Shortly after leaf shedding, one branch may come into leaf. This branch will not bear flowers, but the others will. The two species of *Terminalia*—*T. ivorensis* and *T. superba*—show different phenological characteristics. *T. superba* begins shedding its leaves and fruits in January, at the height of the dry season. *T. ivorensis* retains its leaves and fruits till March, i.e. at the end of the dry season, and then shed them all. *Mansonia altissima*, behaves similarly to *T. ivorensis*. The *Terminalias* and *Mansonia*, like many others, flower when in full leaf. The physiology of the phenomenon of deciduousness requires further study.

The lower canopy is evergreen, including almost all the young trees of the species belonging to the upper and emergent canopies. The general atmospheric conditions under this canopy are moist. Drier conditions are to be found along the northern limits of this type during the harmattan period, but this is for only a short duration.

The annual rainfall is from 50–70 inches, although this may be exceeded in some of the higher altitude areas. There are two "peaks" in May–June and September–October, which are usually separated by a short dry spell.

Much of the country lying within this forest type is over 500 feet above sea level. The Kwahu, Mampong and Ejura Scarps and the hills of Western Ashanti are prominent features.

Most of the High Forest Zone is occupied by the Moist Semi-Deciduous Forest. It contains many useful timber trees. The principal families represented in the upper and emergent canopies are the Leguminosae, Meliaceae, Moraceae, Sapotaceae, Sterculiaceae and Ulmaceae.

Three Associations may be recognised :—

- (a) *Lophira*-*Triplochiton*.
- (b) *Celtis*-*Triplochiton*.
- (c) *Antiaris*-*Chlorophora*.

(a) *Lophira*—*Triplochiton* Association

This occurs to the immediate north and east of the Rain Forest, and is really the ecotone between this type and the Moist Semi-Deciduous Forest. *Celtis* and *Triplochiton* are to be found in mixture with *Cynometra* and *Lophira*. Just as the latter pair become scarce towards the north, so do the *Celtis* and *Triplochiton* decrease towards the south.

In an ecotone, no species can be considered as being at its optimum. So to call this the Lophira-Triplochiton Association is more conveniently descriptive than it is ecologically correct. But as the forest which has been placed in this Association is floristically intermediate between the Rain Forest and the typical part of the Moist Semi-Deciduous Forest, it is considered justifiable.

The Leguminosae and Meliaceae are well represented—the latter by *Entandrophragma angolense*, *E.cylindricum*, *Guarea cedrata*, *Khaya ivorensis* and *Lovoa klaineana*. Leguminous trees are *Cynometra anata*, *Daniellia similis*, *Distemonanthus benthamianus*, *Parkia bicolor* *Piptadenia africana*. In the Sterculiaceae, *Tarrietia utilis* is rare, but *Cola cordifolia*, *Pterygota macrocarpa* and *Sterculia rhinopetala* begin to appear. The understorey species are those of the Rain Forest, except that *Diospyros sanza-minika* becomes infrequent.

An outlier of this Association occurs on the top of the Atewa Range, where an altitude of 2,420 feet is recorded.

Where farming has taken place along the margins of this forest, it tends to change towards the Celtis-Triplochiton Association by the disappearance of *Cynometra*, *Lophira* and *Tarrietia*.

(b) *Celtis*—*Triplochiton* Association

Except for a strip on the south-east, the forest of this Association occupies the remainder of the High Forest area south of the line of the Kwahu and Mampong Scarps and its continuation to the N.W. *Celtis adolfi-frederici*, *C.soyauxii*, *C.zenkeri* and *Triplochiton scleroxylon* are common. In the Meliaceae, *Lovoa* becomes rare, and *Entandrophragma utile* makes its appearance, particularly towards the north. *Khaya authothea* is found in the N.W. In the Leguminosae, *Cylicodiscus gabunensis* and *Piptadenia africana* are very common, whilst *Parkia bicolor* is rare. The Sterculiaceae is well represented by *Cola cordifolia*, *Pterygota macrocarpa*, *Sterculia elegantiflora*, *S.rhinopetala*, *S.stragacantha* and *Triplochiton scleroxylon*, while *Cistanthera papaverifera* and *Mansonia altissima* become more frequent towards the north. Common understorey species are *Corynanthe pachyceras*, *Hymenostegia afzelii*, *Lecaniodiscus cupanicles*, *Monodora myristica* and *Myrianthus spp.* Among the shrubs, *Mussaenda erythrophylla*, with its enlarged red sepal, replaces *M.chippii* which has an enlarged white sepal.

Large areas of this Association have been and are being farmed for foodstuffs and cocoa. Where Secondary Forest has resulted, are to be found the quick growing light demanders—*Albizzia gummifera*, *A.zyygia*, *Funtumia elastica*, *Pycnanthus angolensis*, *Terminalia ivorensis*, *T.superba* and *Triplochiton scleroxylon*. Also; those trees not usually felled by the farmers, such as *Amphimas pterocarpoides*, *Bombax buonopozense*, *Ceiba pentandra*, *Chlorophora excelsa* and *Piptadenia africana*. Near the towns, repeated farming has reduced the vegetation to scrub, with an occasional big tree—often *Bombax*, *Ceiba*, *Celtis*, *Chlorophora* or *Triplochiton*—a relic of the former forest. Many of the cocoa farms and food farms contain a skeleton structure of the forest, as it is common practice in this part of the Gold Coast not to fell all the trees when creating a farm out of the forest. The forest trees help to maintain the atmospheric conditions required by the cocoa crop.

(c) *Antiaris*—*Chlorophora* Association

The northern limits of the High Forest, the Togoland High Forest and the strip on the south-east adjoining the Coastal Scrub and Grassland are included in the *Antiaris*—*Chlorophora* Association. This is sometimes referred to as a "Dry Type", but it is misleading. Parts of it, especially on the higher ground, receive a greater rainfall than areas in the *Celtis*—*Triplochiton* Association. The question of water availability becomes important here, for the northern limits of this Association are more exposed to the drying effects of the harmattan than the forests to the south.

Another factor to be considered is that the soils from the Voltaian sandstones in the north of this Association are probably less retentive of water than clay soils.

Celtis and *Triplochiton* are still common, but to a lesser degree than in the *Celtis*—*Triplochiton* Association. Along the Scarps and in Togoland, *Celtis* may be locally rare. Towards the north, *C. soyauxii* tends to be replaced, numerically, by *C. adfio-frederici* and *C. zenkeri*.

The Moraceae (*Antiaris africana*, *Chlorophora excelsa* and *Morus mesozygia*) and the Sterculiaceae (*Cistanthere papaverifera*, *Cola cordifolia*, *Mansonia altissima*, *Pterygota macrocarpa*, *Sterculia* spp. and *Triplochiton*) are well represented; as are the general *Aningueria* and *Chrysophyllum* (Sapotaceae). *Khaya ivorensis* is replaced by *K. grandifoliola*, except on the southern strip of this Association, where *K. grandifoliola* does not occur. Towards the N.W., *K. anthotheca* is found. *Piptadenia africana* becomes infrequent towards the northern margin. Both there and in the southern strip of this Association, *Cylicodiscus gabunensis* is absent.

In addition to the understorey species found in the *Celtis*—*Triplochiton* Association are *Chidlowia sanguinea* and the apparently endemic *Talbotiella gentii*, both of which occur in the north.

This forest is slightly different in structure from the rest of the High Forest, for there is no significant differentiation between the emergent and upper canopies. The upper storey is uneven and broken.

Man has been the cause of much damage to the forest of the *Antiaris*—*Chlorophora* Association. On the north and Togoland, it adjoins the savannah-woodland. On account of the fires made in the interests of hunting and farming, this poorer form of vegetation has encroached a great deal into the High Forest Zone. These fires resulted in the Derived Savannah-Woodland now found to the immediate north of the High Forest and in parts of the Togoland. It is likely that in former times the High Forest extended to near the 8°30' N. parallel of latitude, as this is the possible limit of the "two-peak" rainfall zone. It would not be continuous High Forest, as there are parts of the Afram Plains which probably never carried a tree vegetation. They are, where the flat bedded rocks come near to the surface and so create areas of poor drainage, which are either flooded by rain or very dry. In the latter condition, the soil cracks, and often the only vegetation is a grass growing in tussocks.

Fires from the northern grass areas caused by farming and hunting in the transition zone have made inroads into the High Forest. Although they would not cause the High Forest to disappear immediately, they would have a cumulative effect, both in killing the trees and in bringing about soil deterioration. This led to colonisation by grasses and the establishment of a savannah-woodland vegetation, perpetuated by periodic fires.

There is present day evidence of Derived Savannah-Woodland, where it is reasonably near High Forest and protected from fires, forming a closed canopy and being invaded by High Forest species.

The southern edge of the Moist Semi-Deciduous Forest has suffered little damage by fire, probably on account of the greater humidity because this forest is near to the sea. Also, situated where it is, the harmattan has little effect on it. However, this southern strip has been heavily farmed, and over much of it only relic trees are to be found—isolated *Antiaris africana*, *Bombax buonopozense*, *Ceiba pentandra*, *Chlorophora excelsa*, *Cola cordifolia*, *Spathodea campanulata* and *Triplochiton scleroxylon*. The Secondary Forestry species, *Albizzia gummifera* and *A. zygia* and the oil palm, *Elaeis guineensis* are common.

Some of the worst devastation caused by farming within the High Forest is to be seen in the Bisa area, where the Krobos felled almost every tree before farming. Hardly a tree remains from the original forest. The cocoa farms have failed, and the present day vegetation is a scrub growth about 15 feet high.

II—THE SAVANNAH-WOODLAND ZONE

This formation is represented by one type.

THE GUINEA SAVANNAH-WOODLAND

The Guinea Savannah-Woodland extends over the area north of the High Forest and reaches to the S.E. of the Gold Coast. It is typically composed of short statured trees, usually not forming a closed canopy, and often very widely spaced. The ground flora is composed of a more or less continuous layer of grass, which is a feature of this formation. Some of the grass species attain a height of about 12 feet.

As has been said previously, it is very likely that large tracts of the southern part of the area now covered by this type were formerly High Forest, but possibly of a somewhat more open nature than the present day *Antiaris-Chlorophora* Association.

The true Guinea Savannah-Woodland is a climatic climax, but the Derived Guinea Savannah-Woodland has been brought about by biotic means. Periodic grass fires—in many localities these are annual—sweep across the country during January to April. They are mainly caused for hunting.

Most of the area lies within the "one-peak" rainfall zone, where the peak is in August–September. Although the annual precipitation is seldom less than 40 inches and may reach 50 inches, it is the intense dry season which is the limiting factor on the vegetation. From November to April the noon Relative Humidity is extremely low and the soil is very hard. The actual precipitation is not a true indication of the availability of water. At the beginning of the rainy season, much of the rain runs off the hard baked soil and is lost to the vegetation.

Many of the trees are fire resistant or fire-hardy and have thick bark. Root suckers play their part in regeneration. The shoots of seedlings may be burnt back annually for a few years, and only succeed when the root system is sufficiently large to throw up a vigorous shoot.

In the southern part of the Guinea Savannah-Woodland riverain forest is found. A similar forest exists as outliers, usually on higher ground with good drainage. In the upper canopy are *Azelia africana*, *Albizia gummifera*, *Antiaris africana*, *Antrocaryon micraster*, *Bombax buonopozense*, *Bosquiea angolensis*, *Ceiba pentandra*, *Chlorophora excelsa*, *Cistanthera papaverifera*, *Cola cordifolia*, *Erythrophleum guineense*, *Pterygota macrocarpa*, *Ricinodendron africanum*, *Terminalia superba* and *Triplochiton scleroxylon*. The lower canopy contains *Caloncoba dusenii*, *Celtis scotelliodes*, *Monodora myristica*, *Napoleona parviflora*, *Teclea grandifoliola* and *Trichilia prieuriana*. *Mallotus oppositifolius* and *Mussaenda elegans* occur among the shrubs.

Further north, the riverain forest gives way to riverain woodland containing *Anogeissus schimperi*, *Celtis integrifolia*, *Cola laurifolia*, *Cynometra vogelii*, *Lannea* spp. and *Parinari polyandra*.

Throughout the Guinea Savannah-Woodland are *Anogeissus schimperi*, *Butyrospermum parkii*, *Detarium senegalense* and *Parkia filicoidea*. *Daniellia oliveri* is common in the south, and particularly so in the Derived Woodland-Savannah, where it is often associated with *Entada sudanica*. *Lophira alata* seems to be absent from the granites of the north and north-west. The *Acacias* are more frequent in the north. *A. albida* is noteworthy because it keeps its leaves on during the dry season and is leafless during the rains. It is associated with cattle on account of its value as a fodder. *Combretums* and *Terminalias* are numerous, and often indicate areas of poor drainage. Other indicators of impeded drainage are *Acacia mellifera* and *Gardenia* spp. *Pseudocedrela kotschyii*, *Lannea* spp. and *Mitragyna inermis* are found in the wetter situations. The savannah mahogany, *Khaya senegalensis*, is riparian. *Borassus flambellifer* is more common in the south, particularly on the edge of shallow depressions.

Parts of the north of the Gold Coast, especially the N.E., have a very sparse tree population. This is due to a settled farming and a density of population of over 100 persons to the square mile. The arable land contains a sprinkling of *Butyrospermum parkii*, *Parkia filicoidea* and *Tamarindus indica*—all of which provide food for the people.

On worked out land in the Guinea Savannah-Woodland, the vegetation consists of a short scrub growth of *Bauhinia rufescens*, *Combretum* spp. and *Piliostigma thonningii*. Fires and grazing tend to keep down the height growth. Another indicator of old farm land is the small shrub *Icacina senegalensis*. It is particularly common around Tamale.

On the sites of old habitations are groups of *Adansonia digitata* and *Tamarindus indica*.

The concept of the ecological catena is applicable to this zone, but not to the High Forest.

III—THE COASTAL SCRUB AND GRASSLAND ZONE

This zone extends as a strip from near Takoradi and widens towards the east. It coincides with an area of low rainfall, which is influenced by the line of the coast running more or less in the same direction as the S.W. Monsoon. Although this dry strip experiences a "two-peak" rainfall, its annual average is about 33 inches. In the neighbourhood of Accra it may not be more than 25 inches.

The present day vegetation fall into two types. From Weija (near Accra) westwards, it is a dense scrub without a grass flora. To the east it is essentially a grassland vegetation, with very few trees. Isolated patches of scrub may be found in the grassland.

It is possible that the vegetation which occupied parts of this coastal plain was of a higher order than it is to-day. It may have been a more open form of the *Antiaris-Chlorophora* Association with a dense layer of shrubs and stragglers, except where grasses now predominate. The grassland may have contained clumps of trees on the better drained soils.

The scrub vegetation is a mixture of High Forest and Guinea Savannah-Woodland species. High Forest tree species are *Antiaris africana* and *Sterculia tragacantha*; shrubs and small trees are *Baphia nitida*, *Dichapetalum flexuosum* and *Hymenostegie afzelii*. Species also found in the southern Guinea Savannah-Woodland are *Fagara xanthoxylodes*, *Mezoneurum benthamianum*, and the tree *Dialium guineense*. *Ximenia americana* is found in the two geographical extremes of the northern Gold Coast and the coastal belt near Cape Coast. Other trees found emerging above the scrub are *Albizzia zygia*, *Bombax bounopozense* and *Ceiba pentandra*, but they are of no real value as indicators.

The characteristic tree of the grassland known as the Accra Plains is *Elaeophorhia drupifera*. Another tree is the introduced *Mangifera indica*.

Termite mounds are conspicuous over much of the Accra Plains. Old ones, which have broken down, support clumps of shrubs such as *Abutilon* spp., *Allophyllus warneckeii*, *Cassia mimosoides*, *Fluggea virosa* and *Grewia carpinifolia*.

Farming must have been more widespread in this belt than it is to-day. About the only food crop which can be grown now is cassava. Most of the foodstuffs needed to support the large coastal population come from the High Forest hinterland.

Guinea Savannah-Woodland is approaching from the east. Some quite extensive stands of young *Anogeissus schimperi* are to be seen near Kpong.

IV.—THE STRAND AND MANGROVE ZONE

This zone comprises a narrow belt along the coast line, broken in places by the topography. It includes the beach, the lagoons and the lagoons which have dried out through the seaward bar becoming permanent. These formations are edaphic ones.

On the sandy foreshore, above high water mark, are *Cannavalia obtusifolia*, *Cyperus maritimus*, *Ipomoea biloba* and *Diodia vaginalis*. The introduced *Opuntia* is established over large areas, often on top of the dune. Next in succession away from the sea come *Thespesia populnea* (introduced), *Phoenix reclinata* and such shrubs as *Baphia nitida*, *Grewia* spp. and *Triumfetta rhomboidea*.

The mangroves of the Gold Coast are not extensive and do not produce big trees. *Laguncularia racemosa* and *Rhizophora racemosa* are found on the seaward side of lagoons in saline conditions. *Avicennia nitida* is found on the landward side of mangrove swamps. It may occur as clumps in areas of dried-up lagoons. Such areas may become quite wet during the rains. The soil in them is black and powdery, and cakes when dry. *Cyperus maritimus* and *Setaria anceps* comprise most of the ground flora of these former lagoons. On raised areas where there is the chance of some drainage, clumps of *Abutilon asiaticum*, *Celtis scotellioides* and *Grewia* spp. may be found.
