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IMPERIAL ETHIOPIAN GOVERNMENT

NATIONAL WATER RESOURCES COMMISSION

ETHIOPIA - FRANCE COOPERATIVE PROGRAM

WABI SHEBELLE SURVEY

IN COLLABORATION WITH

FRENCH MINISTRY OF FOREIGN AFFAIRS

NATIONAL WATER RESOURCES COMMISSION

BCEOM-ORSTOM-EDF IGN_BDPA

VI

BOTANY

Annex : Wild life

October 1974

ORSTOM

CONTENTS

OF THE ENVELOPE

1. Vegetation draft (map)

2. Map of Wild life

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S U M M A R Y

FRENCH MISSION FOR THE STUDY OF THE WABI-SHEBELLE

WATER RESOURCES DEPARTMENT

ADDIS-ABABA - ETHIOPIE

Botanical Mission

(May 9 - July 10. 1970)

J. - L. GUILLAUMET

Botanist at O.R.S.T.O.M.

I - INTRODUCTION

The mission was carried out in order to study the relationship between the soil and the vegetation and to describe the important plant communities of the Wabi-Shebelle basin.

Mr. G. RICHE, ORSTOM soil scientist, had planned several tours in general and the main effort was carried out in the lower part of the river.

Botanical samples were collected, part of which have been sent to the Ethiopian Agricultural Department, the rest being intended for the National Museum of Natural History in Paris and possibly to the Botanical Institute in Florence.

Professor J-F. LEROY, Director of the "Laboratoire de Phanérogamie" of the Museum must especially be thanked for the reception I was given at his laboratory. I must also thank all the botanists of this laboratory who, in spite of their own tasks, assisted me very efficaciously when determining the samples.

Professor R.E.G. PICHI SERMOLLI of Genoa University and Professor MOGGI of the Florence University gave me useful advice ; the latter also gave me the opportunity to work at the Tropical Herbarium of the Botanical Institute and must be thanked very sincerely.

I am also grateful to my friends and colleagues :
J.J.F.E. DE WILDE, professor at the Agricultural Alamaya College and L. AKE ASSI from the Faculty of Sciences at Abidjan.

I finally thank all the members of the Addis-Ababa Mission whose experience and assistance were useful to me.

The vegetation of the Wabi Shebelle has never been subject to a general study. The most recent study regarding Northern Harar and the neighbouring Somalian sector is due to J.B. GILLET (1941) ; R. PICHI SERMOLLI, in 1957, made up the synthesis of all previous studies concerning Eastern Africa (Erythrea, Ethiopia and Somalia) and provided a geobotanical map. I have often referred to this review in order to enable situating the Wabi-Shebelle basin in a more general setting.

As this study is to be used by non-botanists, I have not laid too much stress on the floristic aspect, nor have I overburdened the descriptions with long lists of scientific names but I rather wished to insist upon the physiognomical aspect and ecologic pattern. In the additive can be found a list of the plants and stations where they were collected. It will be easy to find there the floristic composition of the communities mentioned in the report. Mr. G. RICHE provided us with details in the soil-science field.

II - PROSPECTIONS

1°) 14th of May - 24th of May : Arussi and Northern Harar

- Addis Ababa, Kojele, Adaba, Assassa, Mororo, Nazareth, Dixis, Adaba, Titcho, Nazareth, Asbe Teferi, Harar, Jijiga and return to Addis Ababa.

2°) 27th of May to 23rd of June : Wabi Shebelle Lower Valley

- Gode, Imi, Gode, Kelafo, Mustahil, Ferfer, Gode, Kebri-Dahar, Gode.

3°) 26th of June to 6th of July : Harar Region, intermediate zone and intermediate limestone plateaux

- Addis-Ababa, Nazareth, Asbe Teferi, Harar and Gara Mulata, Fich, Harar and return to Addis-Ababa (*).

III - VEGETATION OF THE ETHIOPIAN WABI SHEBELLE BASIN

A. Generalities

From the tops of the mountains bordering the Wabi Shebelle basin in the West and North West (highest peak : Mount Cacca 4.190 m) down to the lower Somali plains, two zones can be considered according to the altitude, climate, vegetation and geological substratum.

1. High altitudes (over 1,700 m)

A tropical altitude climate with characteristic important rainfall, and during some periods of the year, relatively low temperatures. The geological substratum of the high mountains and plateaux exceeding 2,200 m are mainly of volcanic origin (basalt) and very seldom granite can be found (Harar region). The climacic vegetation is of the dense forest type (except at high altitudes) ; it has almost disappeared on account of clearing for crop growing.

Starting from the higher altitudes :

- Alchemilla spp. zone above 3.700 m
- Ericaceae zone, from 3,400 m to 3,700 m
- zone with Juniperus procera and Podocarpus gracilior, from 2,400 m to 3,400 m

---

(*) All these itineraries are shown on the additive map.

2. Medium and low altitudes (under 1,700 m)

The aridity of the climate increases as the altitude lessens. Here and there can be seen parent rocks mainly of sedimentary origin with some basaltic overflows (P.A. MOHR ; G. RICHE and P. SEGALEN, 1969). The vegetation is no longer of a dense forest type and is mainly composed of thickets and local steppes with various trees and shrubs. The country is entirely left to nomadic cattle except the alluvium of the big rivers which are cultivated by sedentary populations.

- Acacia spp. zone from 1,300 to 1,700 m

- Acacia spp. and spp. Commiphora zone, under 1,300 m.

If the vegetation of each of these higher zones is homogeneous in its natural growth as well as when modified by man, the case is different above 2,400 m ' altitude where in compelling climatic conditions the vegetation depends very strictly on the edaphic conditions.

B. High altitudes

Recapitulation and synthesis in table 1.

1. Alchemilla spp. zone

This form of vegetation and the next have only been studied at Boraloucou and succinctly at Gara Mulata (South West of Harar), but probably exists on all the mountain masses of the basin (as explained viva voce by J.J.F.E. DE WILDE). This zone is common to all the Ethiopian mountains and R. PICHI SERMOLLI (1939) has shown that its flora belongs to the general afro-alpine flora described by L. HAUMAN (1933).

The microrelief is very particular (fig. 2) and is composed of elongated levees bordering the small humid depressions. The leves are covered with a thick Alchemilla pedata var. argentea carpet, a chamephyte 20 to 30 cm high. In the depressions the vegetation is more varied but quite as sparse : Kniphofia ind., Ranunculus stagnalis and R. oreophytus, Cardamine africana, Cynoglossum coeruleum, Veronica abyssinica... ; taxa all of which, apart from the first, have paleartic affinities. Several small stands of the particularly remarkable Lobelia rhyncopetalum prevail here and there in this vegetation.

Though this species is present here, the vegetation of Boraloucou cannot be assimilated to the "steppa altimontana a Lobelia rhyncopetalum" (R. PICHI SERMOLLI, 1957) of the Semien summit ; it is more likely a high mountain grassland (Yangambi Congress, 1956).

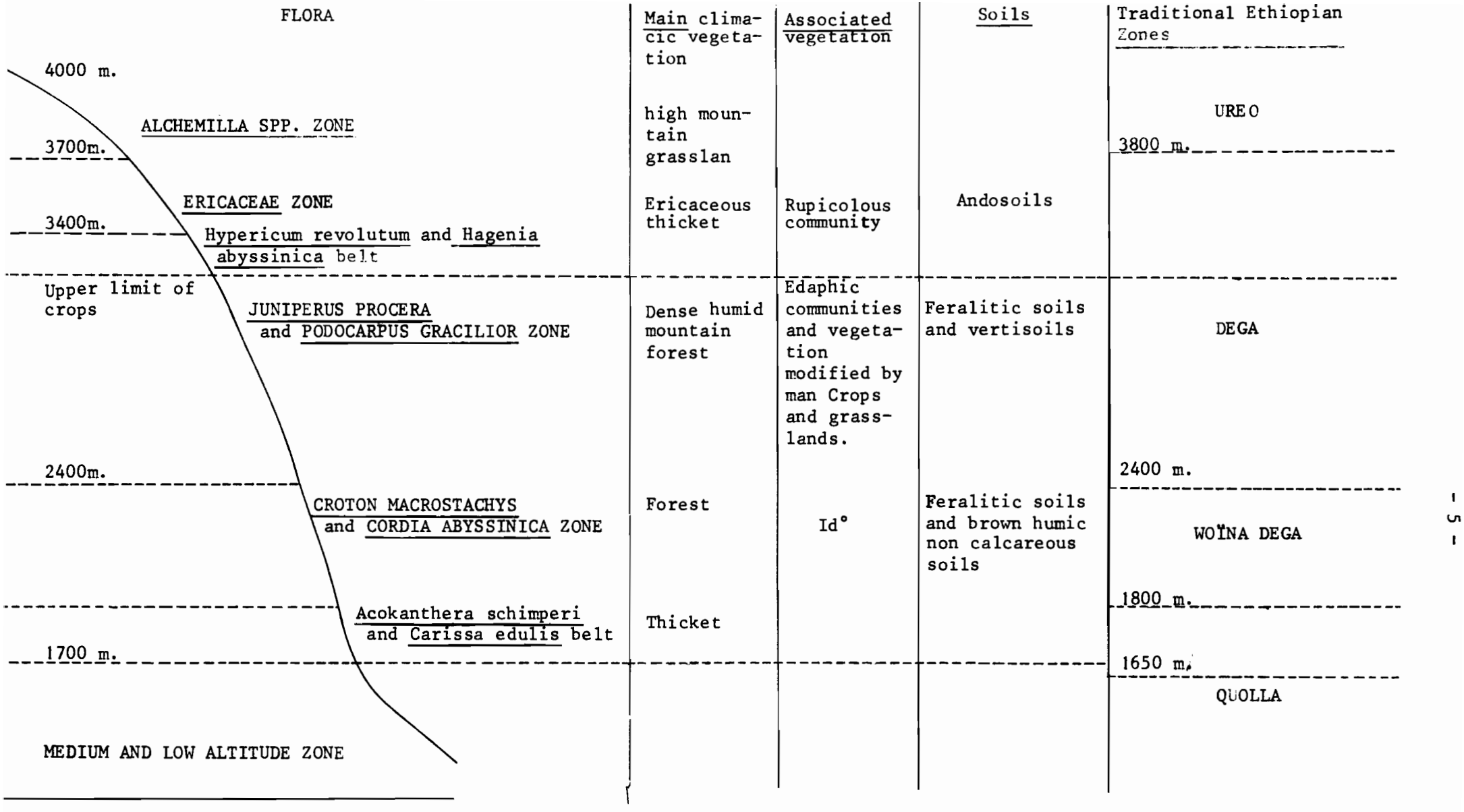


Table 1: High altitude vegetation

2. Rupicolous communities

They are characterised by the presence of Echinops giganteus, many Lobelia rhynchopetalum and also taxa with paleartic affinities : Umbellifereae, Crassulaceae, Juncaceae, Cyperaceae, Graminaceae, etc.

3. Ericaceae zone

This zone is distinct in the Eastern part of the Boracoulou, but in other parts where there are many inhabitants, the vegetation is degraded.

This vegetal community has the aspect of an ericaceous thicket with a discontinuous herbaceous carpet ; about 2 m. high.

Erica arborea prevails, and also, though less frequently, Philippia trimera spp. in the Western part. The lower strata is denser when the upper vegetation is sparse. If the latter is very dense, the former is then only composed of Bryophyta, Lichens and very few Orchidaceae.

The lower strata is composed of prostrated chamephytes (Astragalus, Trifolium, Alchemilla, Hypericum), of erect chamephytes (Helichrysum),hemicryptophytes (Pennisetum, Carex, Scabiosa, ...) and finally of geophytes (Kniphofia, Orchideaceae, ...)

This thicket is irregularly but purposely set on fire and all the more so as the human population is denser.

The soils of this zone and of the former zone according to G. RICHE and P. SEGALEN are andosols.

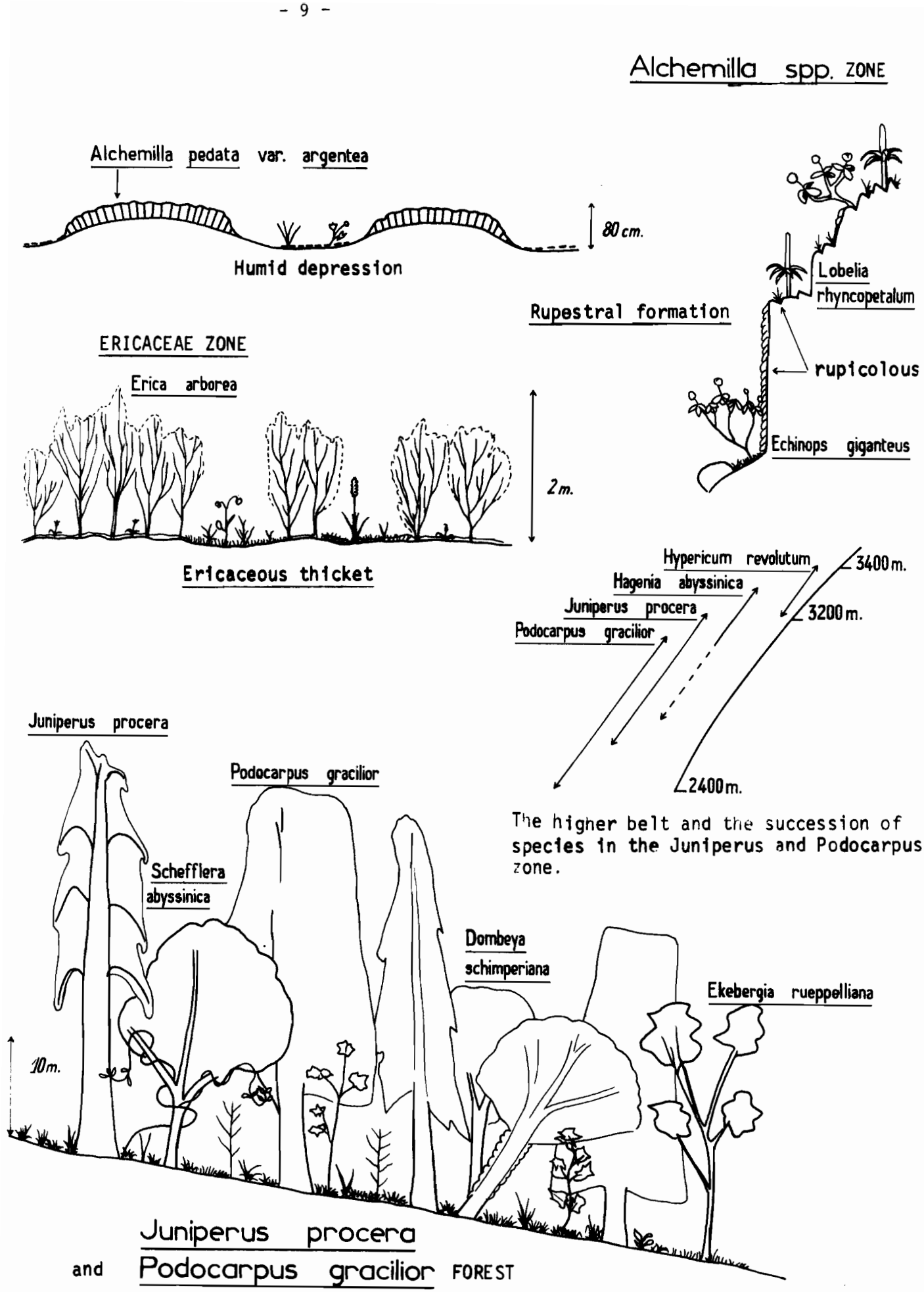
4. Zone of Juniperus procera and Podocarpus gracilior

A complex zone owing to the variety of soils and the mark left by man on this area. In fact this is a vast populated zone dedicated to cultivation, cattle raising and forest working mainly based on the "zigba" (Podocarpus gracilior) and the "tedh" (Juniperus procera). The whole abyssine plateau belongs to this zone : Managosha forest and vestiges even in Addis-Ababa (park at the French Embassy in particular)

a) Juniperus procera and Podocarpus gracilior forest

Exists only in its climacic form on the basin outskirts, especially in the West and North West. On the Gara Mulata slopes it is sparser.

R. PICHI SERMOLLI terms it "foresta secca sempreverde montana", which seems to correspond to the "dry and dense mountain forest" of Yangambi Congress. Because of its physiognomical and ecologic patterns, it can be considered as a dense humid mountain-forest.



The higher belt and the succession of species in the Juniperus and Podocarpus zone.

Fig. 1.

The upper stratum, 30 to 40 m high is mainly composed of the two already mentioned conifers and of Schefflera abyssinica, Ekebergia rueppeliana,... over a middle stratum including Olea spp, Trichilia volkensii, Maesa lanceolata, Galiniera coffeoides, Dombeya schimperiana, Pygeum africanum, ... The shrubby stratum is dominated by Maytenus, Fagara, Phyllanthus, Rosa abyssinica... The herbaceous stratum is very dense and is composed of Gramineae, Cyperaceae and Pteridophyta. No Bryophyte on the ground but many on the trees where they mingle with lichen. Lianas are relatively scarce. Epiphyts as species or growing individually are strangely scarce. Satisfactory regeneration of Juniperus procera and Podocarpus gracilior.

As R. PICHI SERMOLLI remarks, the Podocarpus gracilior is more abundant in the lower part of the zone and Juniperus procera in the higher part, but, contradictorily to this author, two types of forests cannot be differentiated.

The previous existence of this forest is shown by the presence of "tedh" and "zigba" which have been kept among the cultivated crops ; pastures reducing the underwood which becomes more and more gramineous with bushes of Euphorbia and Impatiens. Its aspect is that of a park-forest.

Between this forest and the Ericaceous thicket exists a narrow belt (about 200 m. broad) characterised by a low forest of Hypericum revolutum and Hagenia abyssinica ; the latter finally disappears to the advantage of the former. The mean height is 10 to 12 m ; lichens are abundant and the trunks and branches are hidden by a thick covering of epiphyta, on the trees ; the undergrowth is herbaceous and dense. This vegetation turns gradually into a thicket growing progressively to the higher zone.

b) Types of edaphic vegetation

On several well exposed dry slopes (ex : remainder of forests in the West of Dodola on recent brown rendzina like soil usually grazed), a different facies appears because of more xerophile or heliophile species : Olea africana, Maytenus ovatus, Carissa edulis, Rosa abyssinica, Asparagus, Clematis... The edaphic aridity is made evident by succulents such as : Kalanchoe macrantha, Crassula alba, Aloë,...

East of the basin beyond Asbe Teferi, on some of the rocky slopes, Euphorbia abyssinica reaching the upper zone can form real monospecific forests in the higher part and a dense and rich undergrowth.

On the basaltic plateau, some non-cultivated hills with ferrallitic soils still show the remains of forests in which the climate can be recognized.

Such remains but poorer still, exist along the rivers : Budleia monostachya, Hypericum revolutum, Acanthus ind, Rosa abyssinica, Vernonia spp... In the West, the stand along the river banks consists practically only in Acacia (xiphocarpa ?) which alone can be seen in the cultivated areas.

The flora of marshes, also very much grazed, consists mainly in Juncaceae and Cyperaceae with a few Umbelliferae, Orchidaceae and various small plants of the creeper type.

c) Herbaceous formations

Almost the whole plateau covered with fertile vertisols is cultivated. Cattle-raising is very important in this region ; no improvement of the natural conditions, no growing of cattle-food have been planned to feed the animals. They graze in the fields when the harvest is over and on unploughed land. The excessive number of animals results into an intense general overgrazing. It is really surprising to see what the cattle can eat, at least in May and June, but the poor state of the animals is not at all astonishing. Those grazing in the forest find more suitable feed.

R. PICHI SERMOLLI considers that all these plant communities belong to the "savana montana" but he also remarks that the latter represents "un tipo di vegetazione dovuto all'azione intensa e prolungata dell'aomo". For apparent reasons this term is not used here.

The following examples taken in Arussi give an idea of the general scantiness of pastures on the high plateaux.

c.1. Vertisols with a shallow ash covering (Dixis plateau)

Short tufts of grass : Pennisetum schimperi representing about 10 % of the total vegetation.

This Graminaceae is only partly grazed, the rest being almost completely eaten up. Nevertheless one can still recognize : Eragrostis atrovirens, Kyllinga bulbosa, Alchemilla spp.,... and a few unimportant therophytes. In bare places can also be found rosetted hemicryptophytes : Haplocarpha schimperi.

c.2. Vertisols with many pebbles and rocks.

The covering is poorer still as among the many pebbles, rocks or heaped up rocks, grow xerophytes which are useless as cattle-food : Kalanchoe macrantha, Dorstenia barnimiana and ind. Aloe ; Pennisetum schimperi disappears to the advantage of the Digitaria abyssinica, ind. Kyllinga, Xanthium spinosum and several Graminaceae and Cyperaceae of small import.

c.3. Hydromorphic soils

The microrelief consists in successive big flat hillocks separated from one another by not well drained depressions. On the hillocks in this season : Cyperus rigidifolius, ind. Trifolius, Cardus eremocephalus, ind. Sporobulus only, can be seen. In the depressions can be found Alchemilla pedata, ind. Cyperus, ind. Lactuca,... Here also exist short plants about 5 cm high with no real nutritive value.

c.4. Chernozem

Meadow not exceeding 5 cms'growth with here and there tufts of Pennisetum schimperi and covering up to 90 % of the area. A complete list of the plants reveal mainly Graminaceae : Themeda trianda, Dichanthium annulatum, Aristida adoensis, Andropogon cf. distachyus, Digitaria abyssinica, Eragrostis tenuifolia, Harpachne schimperi, Sporobolus blepharophyllus and very few other plants : Fimbristylis ovata, Plantago albicans, Sida cuneifolia, Polygala abyssinica, Hypoxis ind., Indigofera ind.

All these plants are quite impoverished compared to what they are in other stations.

These soils put forward by G. RICHE and P. SEGALEN are of interest as they reveal an herbaceous stand of ancient steppe or savannah type. One wonders whether they exist only since the land clearing took place in a forest which must have consisted in Juniperus procera and Podocarpus gracilior or, whether on the opposite, the graminaceous vegetation has always existed.

c.5. Brown, acid, humic, ash covered soils with a hydromorphic trend.

The vegetation has been studied in a small "U" shaped valley with a marshy bottom (Juncaceae, Cyperaceae, Umbelliferae, etc. see paragraph c.3.). The microrelief of the slopes is strange, it is still more pronounced than on hydromorphic soils (paragraph c.3.) consisting in dry hillocks with moderately humid depressions in between. On the former, Pennisetum schimperi are mainly visible and between the tufts grows a continuous carpet of Oxalis obliquifolia, Kyllinga bulbosa, Lobelia minutula, Haplosciadium abyssinicum,... in the basins small hydrophytes : spp. Alchemilla, Xyris and ind. Mesanthemum, Anagallis, ... (fig. 1)

5. Zone of Croton macrostachys and Cordia abyssinica

Agriculture is not so elaborate and intensive there as in the previous zone ; its influence on the vegetation is more scattered and inorganised.

The crops are distinctly thermophilous : maize, sorgho, "tchatt" and coffee instead of corn, barley, tef and various peas. The agricultural technics are similar to those in the rest Africa. The agricultural methods together with uncontrolled cattle-raising result in the degradation of the vegetation which consists mainly in shrubs and bushes forming the landscape. Apparently no climacic forests exist now in this zone.

The granite between Harar and Jijiga, the limestones in the neigbourhood of the latter give rise to interesting floristic variations.

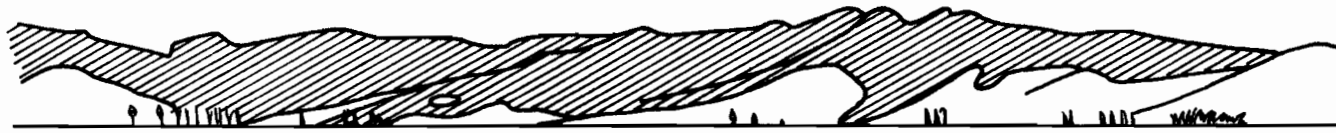
Therefore can be distinguished :

- the forest with Croton macrostachys and Cordia abyssinica
- the Terminalia brownii facies
- the Euphorbia abyssinica stands
- the forms of degradation
- the Acokanthera schimperi and Carissa edulis belt

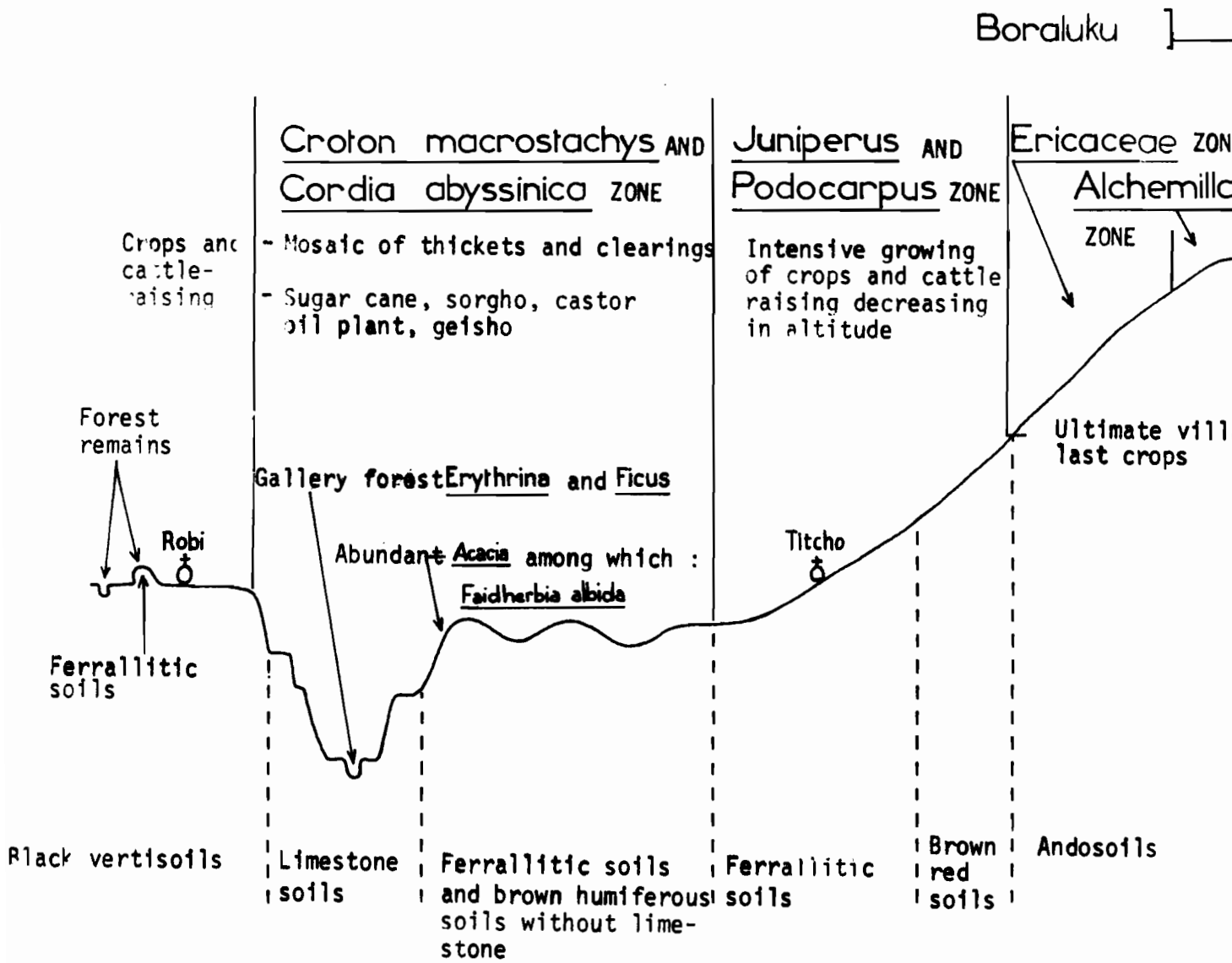
a) The forest with Croton macrostachys and Cordia abyssinica

A very much divided deciduous forest as it has already been said which is characterised, apart from the two species above mentioned, by several others in particular : Euphorbia abyssinica and parent species "**candelabrum shaped**", Erythrina abyssinica, spp. Olea, spp. Acacia, Ficus cf. thonningii, Myrsine africana, and Cassia, Aloe, Asparagus, Dicrostachys, Grewia, Euclea schimperi, Zyziphus mucronatus, etc...

It is difficult to relate this forest to the types proposed by R. PICHI SERMOLLI for comparable communities. It can physiognomically be described as a "mountain deciduous low forest"



LOCATION OF THE FOREST WITH *Juniperus* AND *Podocarpus* SOUTH OF Dodola.



Robi _ Titcho _ Mount Boraluku

Fig. 2.

b) Terminalia brownii facies

Between Harar and Jijiga on the precambrian granites which resulted into a very rough and chaotic relief with gorges, the cliffs of which are often very steep, the vegetation is characterized mainly by Terminalia brownii particularly recognizable in May - June because of its abundant dark red winged fruits. Other less visible species are also very characteristic.

The nature of the relief has prevented the growing of crops and the vegetation is hardly degraded. Physiognomically the vegetation is shrubby and its determinism is edaphic.

c) Euphorbia abyssinica stands

On the warmer slopes of rocky hills, Euphorbia abyssinica forms dense and monospecific stands in the upper stratum with a very dense stratum of the thicket-type : Cissus, Asparagus, Entada, Carissa, Hibiscus,... for R. PICHI SERMOLLI these stands are "il tipo piu xerofila della boscaglia sempreverde montana".

d) Forms of degradation

Being too numerous, it would have been useless to study them and only their main characteristics will be given :

- Graminaceae almost completely lacking
- ruderal plants and sub-shrubs predominating
- pronounced xerophily marked by microphylly and spinescence
- mosaic distribution : grassy spaces and passages separated by thickets.

Finally, the Terminalia brownii like the Euphorbia abyssinica stands, do not present any possibilities of agricultural development nor any economical interest. They locally provide fire wood and timber. The degraded vegetation has no other use except as a meagre grazing for a few domestic animals.

e) Acokanthera schimperi and Carissa edulis belt

This belt which is a mosaic of thickets and graminacean vegetation, the present aspect of which is probably due to human activity, constitutes the lower limit of high-mountain vegetations and the transition with the shrubby communities comprising spp. Acacia and Commiphora spp. It is also the limit of two phytogeographical territories. Its importance is consequently much greater than one could suppose from the space it occupies.

A mosaic of thickets comprising Acokanthera schimperi, Carissa edulis, spp. Rhamnus, spp. Gymnosporia, Calpurnia aurea, Jasminum floribundum, spp. Acacia, roton dichogamum, Halleria abyssinia, spp. Grewia, and herbaceous stretches with Cynodon dactylon, Eragrostis tenuifolia, Brachiara semiundulata, Themeda triandra, Polygala sphenoptera, Pentanisia cf. schweinfurthii Blepharis cf. linariifolia,...

These plant communities must be comprised in the "boscaglia e fruticeto sempreverdi montani" corresponding to the following definition by R. PICHI SERMOLLI : "Il fruticeto sempreverde montano consiste di dense cenosi di arbusti sempreverdi, alberelli e rampicanti tra i quali si notano talora alberi piu alti sparsi" and especially in one of the "evergreen scrub formation" types, described by J.B. GILLETT and probably, in that type, mainly comprising Acokanthera schimperi and Cadia purpurea.

6. Conclusions

The study of the vegetation in high altitudes has been carried out in several points of the Basin, in Harar and Arussi, but in this province, along the Atabe road (Robi) - Ticho - Mount Boraluku - Asséla practically orientated Eastward - Westward, the most synthetical aspect of the superimposition of the zones is visible : Figure 2 recapitulates the general aspects.

C. Medium and low altitudes

This vegetation covers the most part of the Wabi Shebelle Basin. In spite of the fact that it stretches in latitude (about 4°) as well as in altitude (from 1,700 m to less than 200 m) and in spite of the variety of the plant communities due to the variety of rocks and soils, this region is remarkably homogeneous owing to two essential features :

- the arid climate being a restricting factor, the least edaphic variations have important consequences on the vegetation. In the highest zones, the climate alone played a part in the vegetation determinism.

- Geographically, this region belongs to the African Horn which from Erythrea stretches almost to Zanzibar. The flora of South Eastern Harar, of Bale and of part of the Sidamo, belongs to this general formation which is essentially different from that consisting in the flora of the plateau and abyssine summits.

1. Acacia spp. zone

Though this zone cannot be easily defined, its reality is nevertheless very important. It forms the highest (in altitude) part of the zone comprising spp. Acacia and Commiphora spp. and has not yet reached full growth.

Physiognomically it appears as a scanty thicket with many shrubs 5 to 6 m. high. Very well represented between Harar and Fik, its aspect can be described as follows : a not very thick shrubby stand (4 to 5 m high) with spp. Acacia, Rhus, Anogeissus, Cussonia, Combretum molle rising above an herbaceous stand comprising some gramineae covering about 30 %, the vegetation generally not rising above 30 cm though the inflorescence often reaches 80 or 90 cm (fig. 4).

Some brown soils, probably deriving from limestone, are covered with a particular vegetation lower than the Acacia mellifera, Aristida adscensionis, Sericocopsis pallida... There is pratically no herbaceous vegetation under the trees.

The vegetations on the Fik lava flows (red soils of the same region), are similar to the more Southern vegetation which is however sparser.

This zone more or less corresponds to the "deciduous scrub formation" (described by J.B. GILLETT) of Harar between 1,200 m and 1,500 m and is but an aspect of the "boscaglia xerophila" of R. PICHI SERMOLLI.

2. Acacia and Commiphora spp. zone

Three important plant communities can be distinguished as a result of edaphic conditions :

- vegetation depending on the presence of water in the soil
- vegetation on drained soils
- vegetation on rocky outcrops

a) Vegetation depending on the presence of water in the soil

- Fringing forests
- Suaeda fruticosa and Cadaba glandulosa communities on downs near the streams
- Senra zoës and various annual communities in the momentarily flooded depressions
- Sporobolus helvolus and Acacia sp. communities more or less flooded
- Marshy communities

a.1. Fringing forest

- Thespesia danis and Zizyphus mauritiaca communities
- Tamarix nilotica community
- Hyphaene community
- Terminalia cf. brevipes community

A differentiation of these various communities is justified when they occupy important areas. Of course the passage from one community to another is progressive.

The section starting from the Wabi Shebelle on figure 3, shows a frequent distribution. But in more sandy places, river meanders in the Imi region and West of Jijiga, the Tamarix nilotica forest sometimes covers large areas. The Hyphaene palmgroves also spread largely from Mustahil either as an unmixed stand or mixing with Terminalia cf. brevipes.

The Thespesia danis and Zizyphus mauritiaca practically exists all along the rivers, though it is sometimes very sparse in some places.

With the Terminalia cf. brevipes community, can also be seen other similar species in the depressions, especially in the Fafan depressions.

When the gallery forests are large enough, they are the main source of timber. The only persisting herbaceous plants in particular the Gramineae, form the undergrowth. Though the trees and bushes are deciduous, the leaves persist long enough.

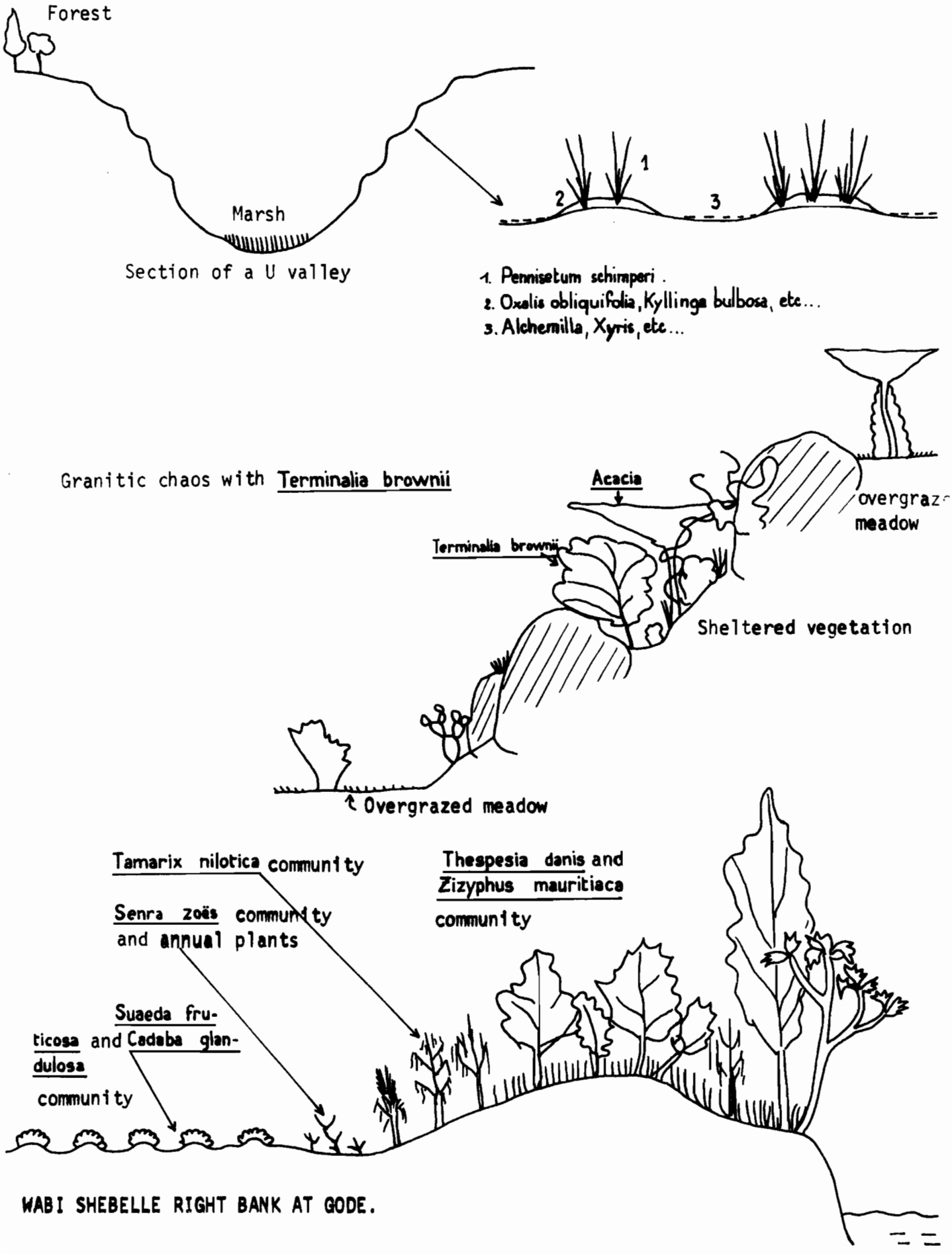

Forest
Marsh
Section of a U valley
1
2
3
1. Pennisetum schimperi .
2. Oxalis obliquifolia, Kyllinga bulbosa, etc...
3. Alchemilla, Xyris, etc...
Granitic chaos with Terminalia brownii
Acacia
overgrazed meadow
Terminalia brownii
Sheltered vegetation
Overgrazed meadow
Tamarix nilotica community
Senra zoäs community and annual plants
Suaeda fruticosa and Cadaba glandulosa community
Thespesia danis and Zizyphus mauritiaca community
WABI SHEBELLE RIGHT BANK AT GODE.

Fig. 3.

a.2. Suaeda fruticosa and Cadaba glandulosa communities

On the dunes near the rivers. From the river bed and stretching away can be seen first a bushy zone : Suaeda fruticosa with Tamarix nilitoca here and there, with a carpet of Cenchrus ciliaris, therophyte and perennial Sporobolus helvolus. The succulent leaves of the Suaeda fruticosa is very much appreciated by cattle.

a.3. Senra zoës community and various annual plants

This community appears in the depressions after rainfall and is mainly composed of annual plants : Latipes senegalensis, Zygophyllum decumbens, Polygala erioptera, Phyllanthus spp., Boerhavia spp., Tribulus spp., Euphorbia spp., Indigofera spp., Corchorus spp... All these plants provide the cattle with an important complementary food but unfortunately during a too short period.

a.4. Sporobolus helvolus and Acacia spp. community

Whether near important rivers or in low zones at the foot of hills, this community stands out among all the others as particularly green. Physiognomically it is a savannah with more or less trees ; the other communities can be denser as in the outkirts of Kelafo and right bank of the Wabi Shebelle, or in the opposite, practically inexistent as in the West of Gode along the cliff.

The Sporobolus helvolus is surely one of the only perennial Gramineae of the non-salted low zones. It constitutes an important complementary food for animals, but these areas are always small and very often cultivated.

a.5. Marshy plant communities

In some temporarily flooded low zones, the predominating communities mainly consist in helophytes and the flora is always very poor.

Near Mustahil, four species can mainly be found in the large depression on the left bank of the river : Scirpus maritimus, Cyperus cf. fenzelianum, Ipomoea sp., Indigofera sp. and Dichantium annulatum. The different soils have no influence on the vegetation stand, flooding conditions only, have a slight influence on the relative importance of the five main species. The secondary species, consisting exclusively in Alchemilla and Sporobolus, play no important part but indicate very local micro-habitats.

Puddles and several other marshy stations presenting no economic or floristic interest will not be mentioned here. Besides, a short view of these swampy communities is given by R. PICHI SERMOLLI. Let us just mention here the gramineaen stands of the seasonal river-beds in the neighbourhood of Imi : Sorghum cf. arundinaceum, Paspalidium geminatum, Echinochloa pyramidalis and Urochloa aff. trichopus.

b) Vegetation on drained soils

- Aristida spp. and Cenchrus spp. community
- Gyrocarpus habebensis and Cassia spp. community
- Halophyte community.

The differenciation made between the latter type and other shrubby communities on rocky outcrops is probably rather conventional. In fact, the flora has more in common with the latter than with the communities growing on drained soils. But considering only the nature of the edaphic substratum, and this for reasons of conveniency from the soil scientist's point of view, they must be differentiated as the substratum is not meagre as for the communities to be studied next.

b.1. Aristida spp. and Cenchrus spp. community

This community, or more exactly all the communities corresponding to such subtle determinisms which could only be defined after long studies, covers the vast vertisol stretches of the Lower Wabi Shebelle Valley. The study of the latter has been undertaken mainly in the Gode region and in the Danan and Fafan depressions.

Physiognomically, it is a low "meadow" 10 to 15 cm high hardly covering 60 % of the ground in May - June ; most of the graminean components are annual plants such as : Aristida papposa and A. cf. adscensionis, Enneapogon elegans, Setaria acromelaena, Urochloa cf. trichopus, Cenchrus setigerus, C. ciliaris, Tetrapogon spathaceus, Dignathia hirtella, which means that except during the rainy season, the vegetation completely disappears. The nomadic cattle breeders have taken advantage of this vegetal surge and lead their herds on these pasture lands at the suitable period and later bring them back to the thickets on the hills or to the halophyte stands.

In humid places (depressions remaining damp for a longer period), the herbaceous carpet may cover 90 % of the soil and Leguminoseae, Crotalaria and Indigofera may enrich it.

b.2. Gyrocarpus habebensis and Cassia ind. community

This community can be seen in the Western end of the Gode plain, in the neighbourhood of Danan and along the Fafan. It seems to be located on yellow probably colluvial soils.

A shrubby stand, 5 to 6 m high, with Gyrocarpus habebensis and Cassia predominating with Acacia and Dicrostachys spp., and ephemearal herbaceous stand comprising Aristida spp. and here and there some perennial Justicia and Blepharis tufts.

This vegetation shows, more than any other, signs of overgrazing. On the opposite of other vegetal communities, it seems to have been locally burnt down.

b.3. Halophyte communities

Situated on saline soils connected with gypsum, they are much varied and impossible to define accurately in such a brief study. They appear in three main places at the foot of slopes, in the depressions (Ferfer) and plains (Kelafo, Danan, Imi,..).

R. PICHI SERMOLLI considers them physiognomically as steppes. The soil is bare between low bushes : spp. Limonium, Suaeda cf. vermiculata, Atriplex halimus, Salsola cf. foetida all having more or less fleshy leaves. In some cases (Ferfer depressions) abundant or even predominating Urochondra setulosa and frequent Cucumella kelleri. All these species are particularly characteristic and can be found nowhere else. The Ferfer depressions are the richest and their vegetation also comprises Cenchrus biflorus here and there and several Limonium species. Near Kelafo, a low dense thicket of Suaeda cf. vermiculata, Disperma eremophila, Sporobolus spicatus.

These are certainly the most interesting communities in the permanently available pasture lands, which is very fortunate considering the soils themselves are not interesting.

c) Vegetation on rocky outcrops

For reasons of conveniency and to make their understanding and utilization easier for non-botanists, this type of vegetation has been differentiated from the former by a rough characterization of the nature of the substratum rather than by floristic or physiognomical criterium which do not appear so clearly.

	SOIL	VEGETATION
Acacia spp. zone 1300 m		
Acacia spp. and Commiphora spp. zone	Water in the soil	
	- Natural levees	Ripicolous forests.
	- Dunes	Suaeda fruticosa community
	- Temporary and engorgement floodings	Sporobolus helvolus and Acacia spp. community
	- Marsh.	Marshy community.
	Drained soils	
	- alluvions	Aristida spp. and Cenchrus spp. community
	- colluvions	Gyrocarpus habebensis and Cassia spp. community
	- salt content	Halophyte community.
	Rocky outcrops	
	- Gypsum	Boswellia spp. and Jatropha rivae thicket.
	- Gabredarre limestone	Thicket with Boscia minimifolia and Delonix elata
	- Antalo limestone	Thicket with Commiphora sp. and Andropogon cyrtocladus
	- Upper sandstone	Thicket with Gardeniae ind. and Cordia gharaf.

Table 2 : Medium and low altitude vegetation

Table 2 gives a general view of the vegetation from low to mean altitude.

Independently of the type of parent-rock on which it grows, the vegetation physiognomically belongs to the thicket type, its flora is remarkably homogeneous and common to 80 % of the vegetation with some local characteristics now and then. Finally, the species seem to be geographically distributed following a South-East Nord-West direction but this can only be confirmed by the study of the distribution of species in the whole African Horn.

The various communities which are going to be examined belong, according to R. PICHI SERMOLLI, to the "boscaglia serofila rada" : "... vegetazione aperta costituita di plante legnose, e di emicrittofite cespitose e scapose nella quale i grossi arbusti cespugliosi e le graminacee perenni sono dominanti e nella non mancano mai alberi sparsi che sono caratteristici rappresentanti di questa boscaglia". The mean height is about 3 to 5 m, the density of the herbaceous stratum only depends on the intensity of grazing.

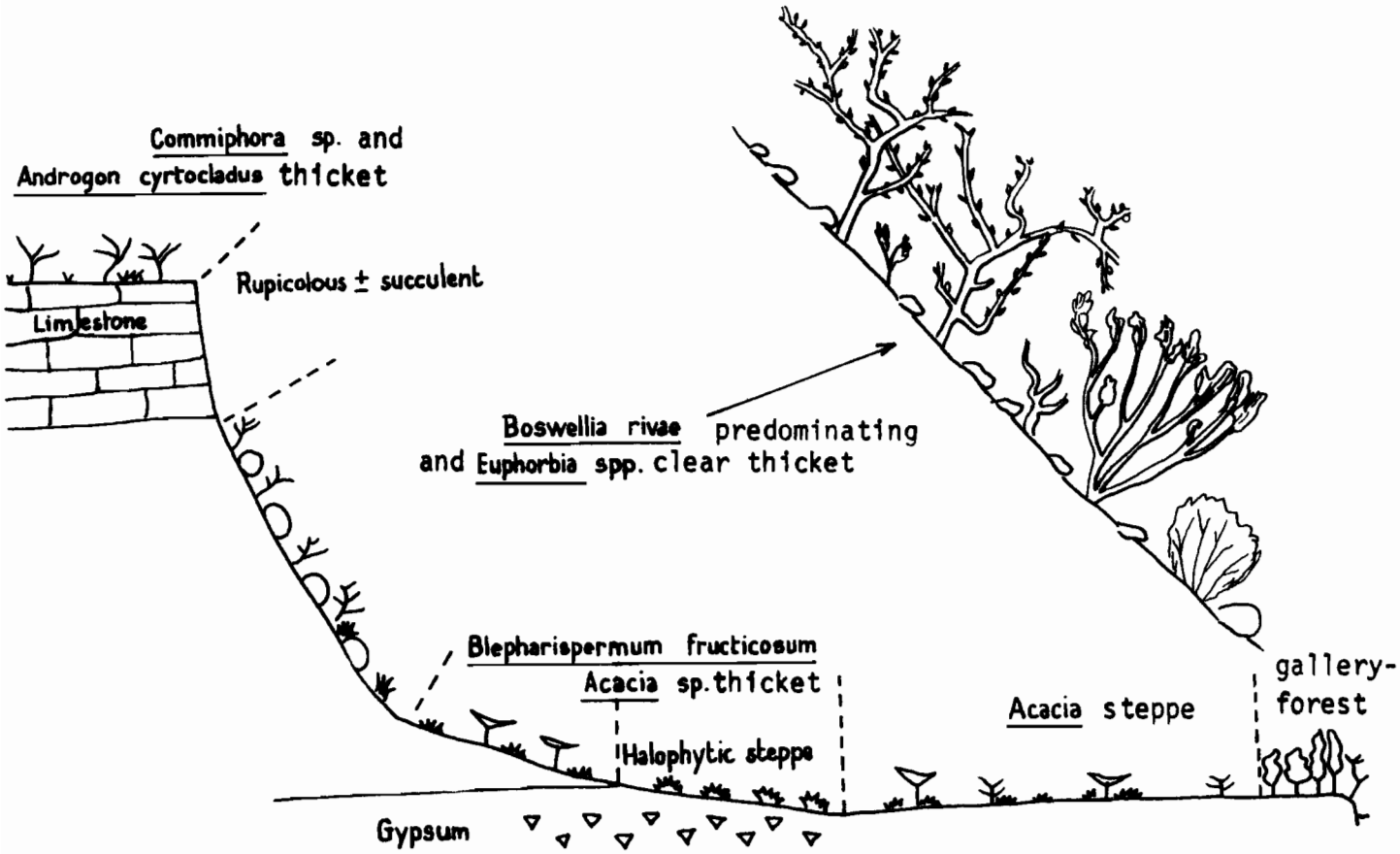
This community widely spreads in Africa at this altitude. J.B. GILLETT who studied it in Somalia calls it "tree Acacia open woodland" and the species given in his "Acacia bussei association" can practically all be seen in the Lower Wabi Shebelle Valley.

Among the most common trees and shrubs must be mentioned : Acacia spp., Boscia coriacea, minimifolia, angustifolia, Boswellia rivae, Commiphora spp., Grewia spp., Pterolobium stellatum, Delonix baccal and elata, Maerua spp., Sesamothamnus rivae, Croton spp., Cordia ghara (the most common and the most ubiquist), Kelleronia splendens, Jatropha rivae,...

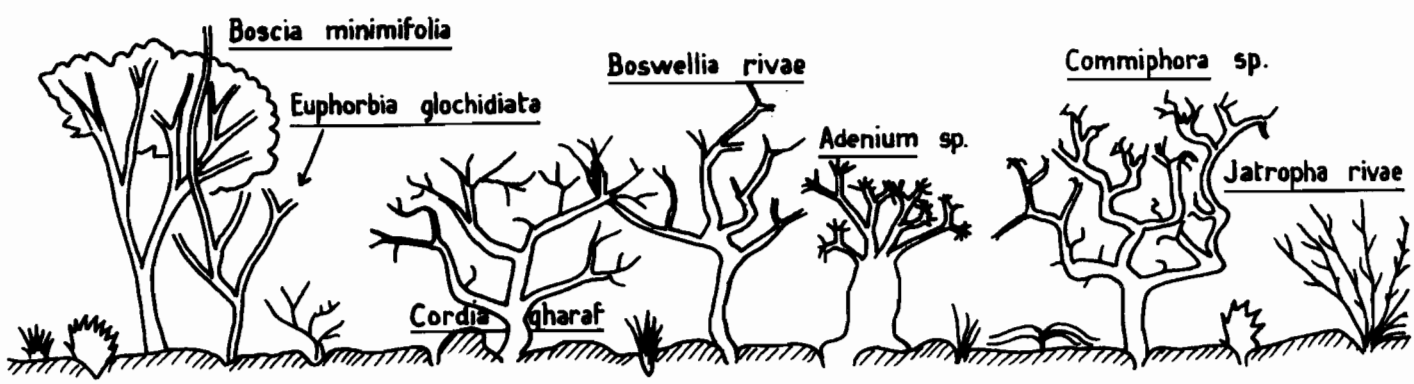
The undergrowth plants mainly consist in Acanthaceae belonging to the genus Barleria, Disperma, Anisotes, Dychoriste, Neuracanthus, ... Compositeae, Labiateae, several kinds of Malvaceae, Hibiscus, Gossypium, Abutilon.

Gramineae are scarce, forming scattered tufts which are mainly : Chrysopogon aucheri, Chloris ind. (characteristic of the big limestone hilltops beginning at Yebreth Mazga), Andropogon cyrtocladus, Aristida ind. Some plants belonging to the Velloziaceae family are still scarcer.

Succulent plants are relatively scarce, few big cactus-like Spurges except in the Fafen depressions upstream of Kebri-Dahar, but several small or moderately high, Euphorbia glochidiata in particular and Monadenium, Edithcolea, Dorstenia. The beautiful Adenium with its unshapely trunk and big red blossom must also be mentioned.



Section of the summit of Wabi Shebelle cliffs at Yebreth Mazga



Boswellia sp. and Jatropha rivae thicket.

Fig. 4.

According to the nature of the parent-rock : four communities can be seen :

- Boswellia spp. and Jatropha rivae community, on gypsum
- Boscia minimifolia and Delonix elata community, on the Gabredarre limestone
- Commiphora sp. and Andropogon cyrtocladus community, on the Antalo limestone
- Gardeniae ind. and Cordia gharaf community or upper sandstones.

The latter is the most difficult to define as regards the floristic aspects. The Gardeniae ind. (n° 3214) only is characteristic, Cordia gharaf is commonly seen everywhere but is particularly abundant here.

As a general rule, the thicket growing on gypsum is floristically the most abundant and the poorest grows on the Antalo limestone. The vegetation is particularly dense on the upper sandstone certainly because of the presence of real soil, but it appears as a mosaic of tight thickets separated by large stretches of annual Gramineae (mainly Dactyloctenium aegyptiacum and Aristida spp. The thicket growing on the Antalo limestone, is not very dense but is the most homogeneous.

e) Conclusions

Because of the very arid climate, the plant communities depend strictly on the edaphic conditions ; figure 4 shows the most frequent catena which can also be seen (varying in some of the details) in the whole Lower Valley.

Without going into the details of geographical distribution of vegetal species of no interest here, one must nevertheless insist upon the enrichment in species from the North to the South : viz., the floristic luxuriance increases from Fik to Mustahil.

This may partly result from the larger variety of conditions in the Lower Valley than in the intermediate region, but the growth of other species is particularly obvious from Kelafo to Mustahil. The Kebri-Dahar region is also very original.

Reasons will be found not so much in the climatic variations as in the origin of the various elements which contributed to the existence of the vegetal stand in the Lower Wabi Shebelle Valley.

IV. Remarks on the economic interest of natural vegetal formations and the possibilities of their development.

At present the deforestation of the basin is very important ; the rate of afforestation, whether natural or not, is under the 25 % recommended by experts and only of 2,8 % for the whole of Ethiopia.

The only forests with valuable species can now only be seen on the large peripheral mountain-masses ; they are everywhere intensely worked and cleared. The plateau in general is woodless apart from eucalyptus, and a sylviculture program seems necessary. In the lower parts of the basin, the available wood can only be used as fire-wood and as rough timber. In order to avoid bringing wood from Arussi, the problem of sylviculture in Ogaden ought to be examined. The species concerned, whether native or exotic, must be planted elsewhere than in naturally or artificially irrigated soils. Species such as Terminalia (cf : brevipes, spinosa, stuhlmannii) should be taken into account by the experts. Apart from traditional local use, none of the plants present much technical or alimentary interest. Basically useful for nomads, they are not very important in up-to-date economics apart from the collect of incense from several Boswellia and Commiphora which can be a small source of income.

On the plateaus where the sedentary farmer is also a cattle-breeder, there are no real pasture-lands and the animals feed as they can. Let us remind that "tef" has become an excellent forage very much appreciated in the Union of South Africa as it dries very quickly (P. GOUROU, 1966).

In the lower part of the Basin, nomadic life is the only possibility for cattle raising. It implies a sort of transhumance which takes the cattle from the river banks, during the rainy season, to the salted vegetation and thickets growing on limestone and gypsum, in the dry season. This food is too poor and transient and is hardly sufficient for the cattle already existing. Irrigation is the necessary condition for development. In order to give up the present form of cattle raising, the creation of pasture lands planted with native and exotic species must be studied. The Cenchrus type in particular, well represented in the lower valley, has proved successful in many tropical countries. The thickets must be given up or only considered as complementary grazing and left for the grazing of wild herbivores which under control should be an important source of meat.

V. Vegetation outline

This sketch has been drawn consecutively to prospections and aerial trips completed by the study of aerial photographies. The hypsometry has been drawn from sheets at 1/1.000.000 published by D. SURVEY, WAR OFFICE and AIR MINISTRY and the geology from the sketch by P.A. MOHR published in the "Agro-economical study of the Wabi Shebelle Basin".

We do not pretend after only two months ' sojourn, giving a map of the vegetation in the Ethiopian part of the Wabi Shebelle Basin, but at best, an interpretation of the basic features of the vegetal landscape and its floristic content.

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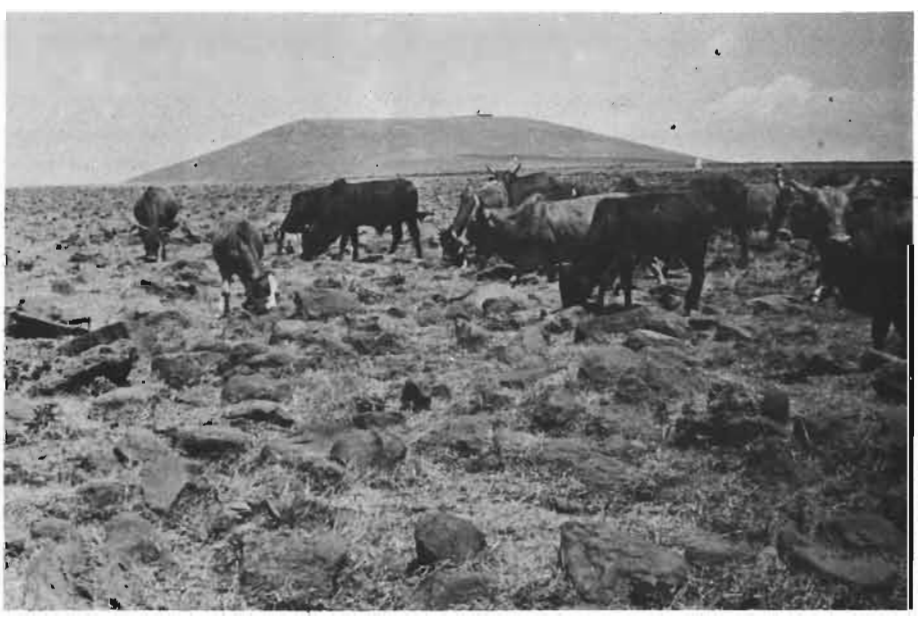
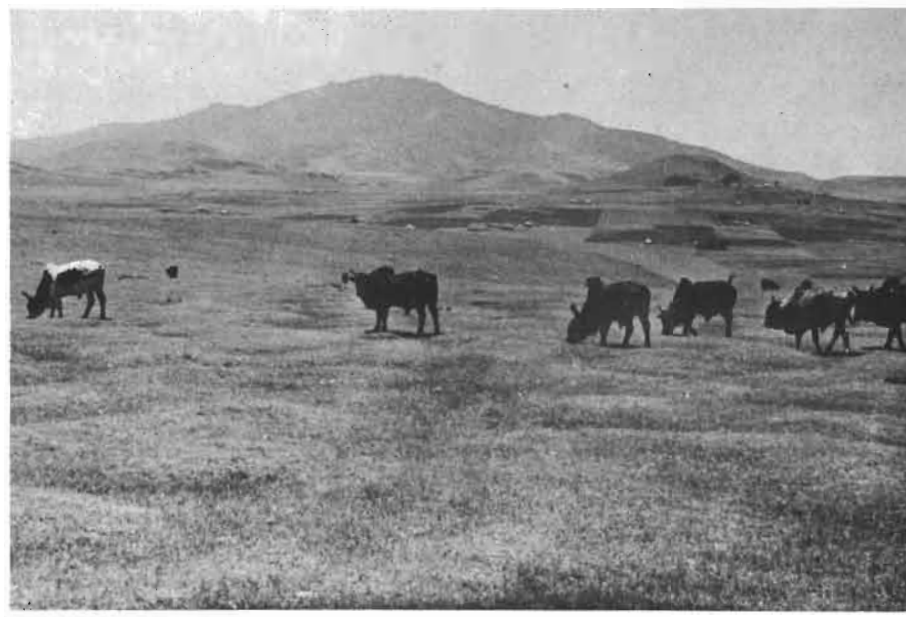
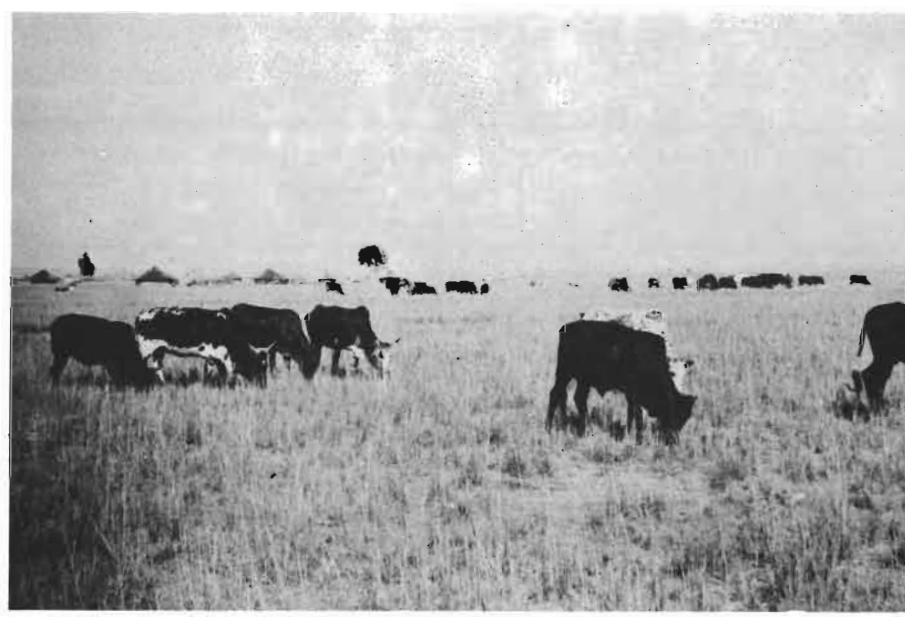
1. Juniperus procera and Podocarpus gracilior forest.



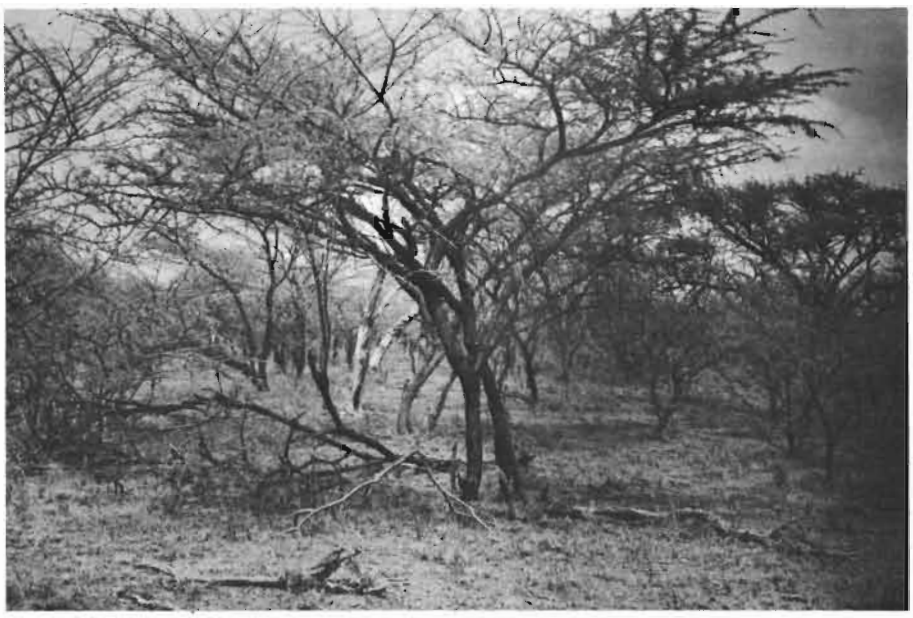
2. Vertisols with many stones and rocks



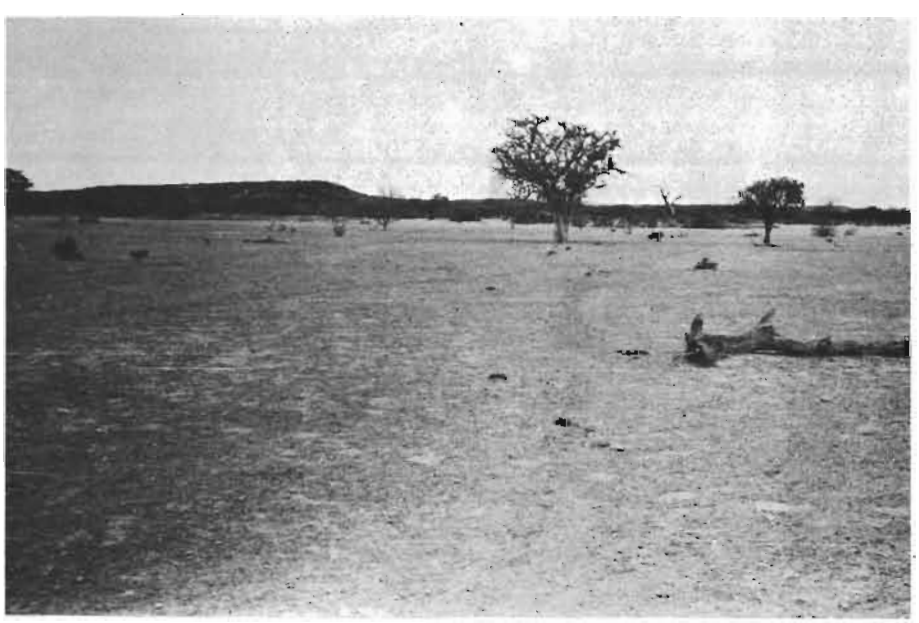
3. Brown humiferous soil with hydromorphic trend



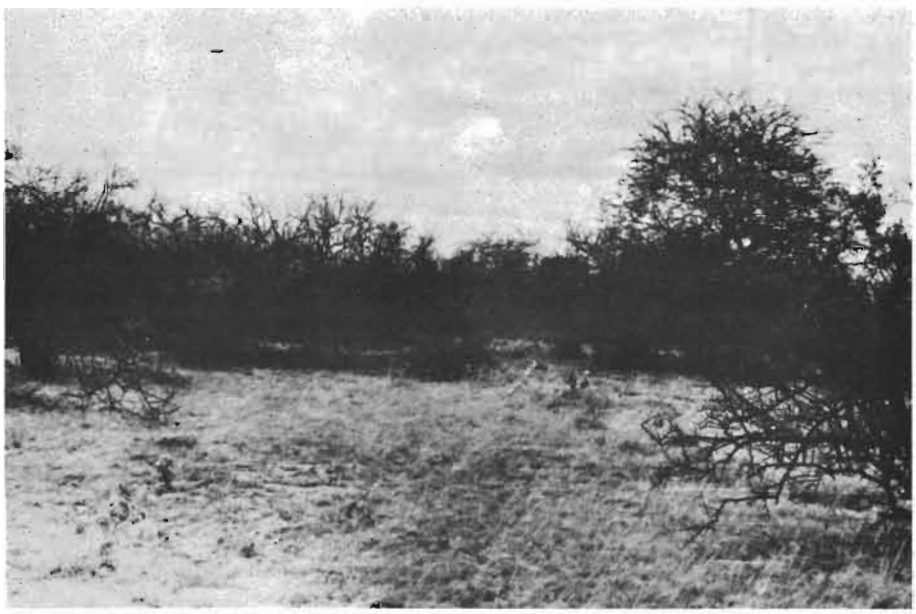
4. Chernozem



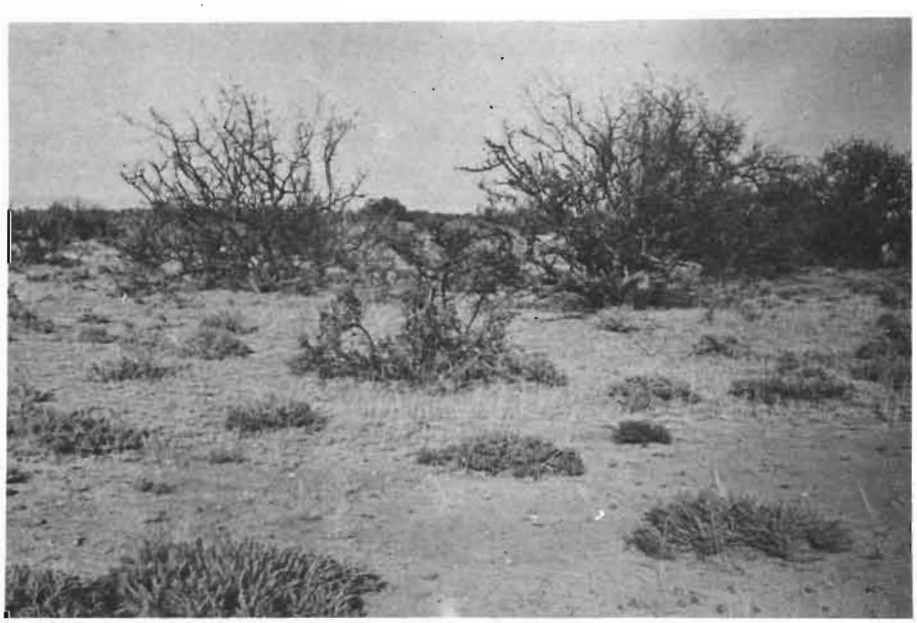
5. Sporobolus helvolus and Acacia spp. community



6. Spp. Aristida and Cenchrus spp. overgrazed community



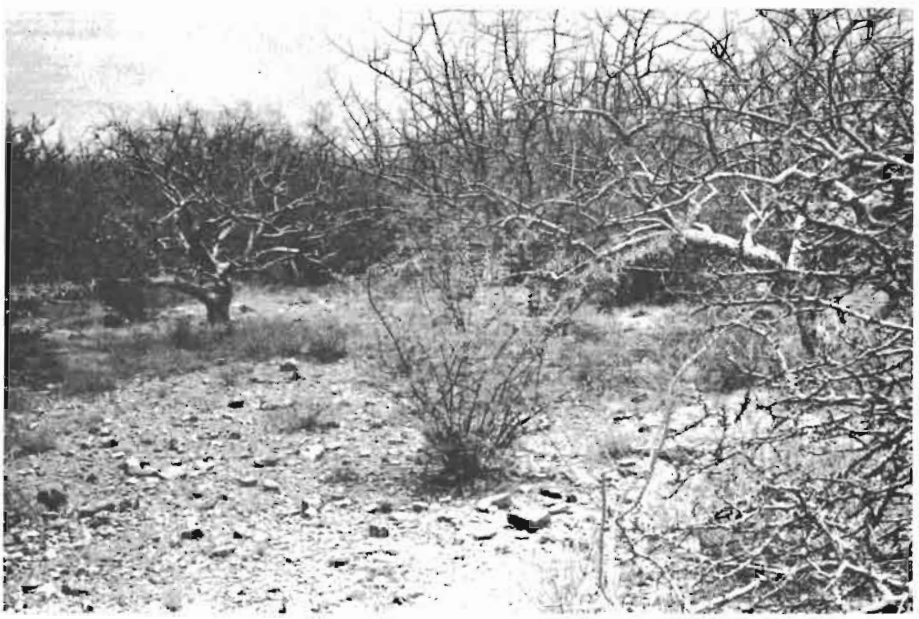
7. Gyrocarpus habebensis and Cassia spp. community



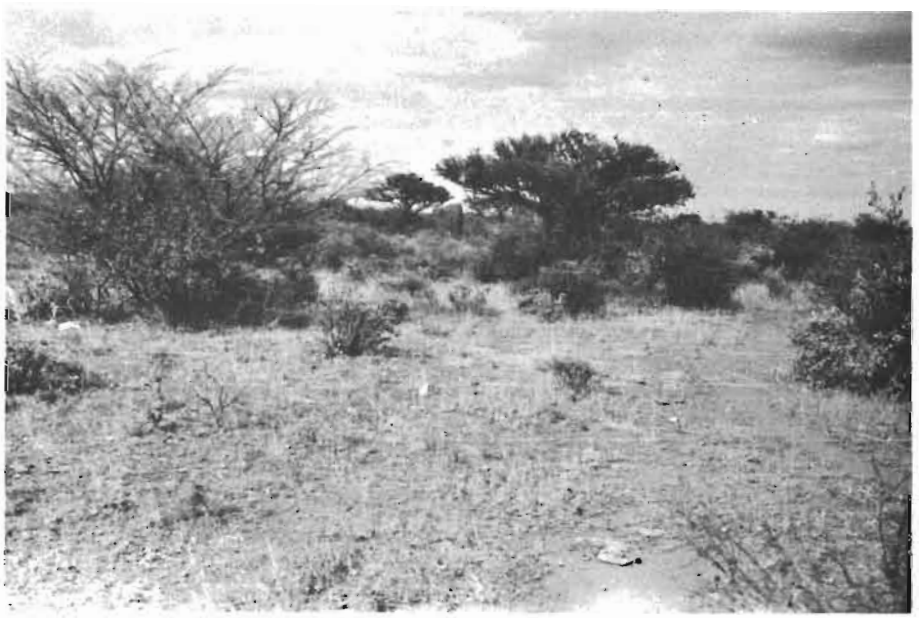
8. Foremost : halophyte community,
and in the back ground thicket growing on gypsum

9. Limestone table and ripicolous vegetation

10. Boswellia spp. and Jatropha rivae thicket on gypsum



11. Commiphora spp. and Andropogon cyrtocladus thicket on Antalo limestone



12. Gardeniae sp. and Cordia gharaf community on sandstone.

A D D I T I V E I

List of species collected and of stations

The determinations were made consecutively to two visits to the "Herbariums of the Museum National d'Histoire Naturelle" in Paris and of the Botanical Institute in Florence, partly with the assistance of M. H. HEINE, Mmmes M. KERAUDREN - AYMONIN and A. RAYNAL, MM. J.M. BOSSER, J.J.F.E. DE WILDE, L. AKE ASSI, H. JACQUES FELIX, J.P. LEBRUN, N. HALLE, J. RAYNAL.

Some critical or difficult groups are still being studied by the experts and their determination will be given later.

The names, apart from few exceptions, are the same as those used by Cufodontis, G. in Bull. Jard. Bot. Brussels since Dec. 1953.

2590. Thalictrum rhyncocarpum Qu. Dill and Rich.	Ranunculaceae
2591. Galium cf aparinoides Forskal	Rubiaceae
2592. Peperomia abyssinica Miq.	Piperaceasae
2593.	Polypodiaceae
2594. Asplenium aethiopicum (Burm.) Bech.	Polypodiaceae
2595. Impatiens abyssinica Hook. f.	Balsaminaceae
2596. Canarina eminii Aschers ex Schw.	Campanulaceae
2597. Impatiens cf. rothii.	Balsaminaceae
2598. Polystachya sp.	Orchidaceae
2599. Polystachya sp.	Orchidaceae
2600. Maesa lanceolata Forsk.	Myrsinaceae
2601. Pennisetum schimperi Hochst.	Gramineae
2602. Oxalis obliquifolia Steud. ex Rich.	Oxalidaceae
2603. Kyllinga bulbosa Beauv.	Cyperaceae
2604. Haplosciadium abyssinicum Hochst.	Umbellifereae

2605. Alchemilla pedata Hochst. ex Rich	Rosaceae
2607. Lobelia minutula Engler	Lobeliaceae
2608. Mesanthemum sp.	Eriocaulaceae
2609. Helichrysum sp.	Compositeae
2610. Venidium ?	Compositeae
2611. Anagallis serpens Hochst. ex DC. ssp serpens	Primulaceae
2612.	Compositeae
2613. Xyris sp.	Xyridaceae
2614. Ranunculus multifidus Forsk.	Ranunculaceae
2615. Eriocaulon sp.	Eriocaulaceae
2616. Aristea sp.	Iridaceae
2617. Kniphofia sp.	Liliaceae
2618.	Umbellifereae
2619. Juncus oxycarpus Kunth	Juncaceae
2620. Pycreus sp.	Cyperaceae
2621. Mohria schimperi (Hochst.) Pic. Serm.	Iridaceae
2622. Eulophia sp.	Cyperaceae
2623. Trichodesma ?	Borrasinaceae
2624. Crotalaria sp.	Papilionaceae
2625. Dorstenia barnimiana Schwfth. var. ophioglossoides Engl.	Moraceae
2626.	Amaryllidaceae
2627. Curculigo sp.	Hypoxydaceae
2628. Craterostigma sp.	Scrofulariaceae
2629. Senecio sp.	Compositeae
2630. Plectranthus sp.	Labiateae
2631. Trifolium sp.	Papilionaceae

2632. Crassula cf. muscosa (L.) Roth	Crassulaceae
2633. Lagarosiphon cf. schweinfurthii	Hydrocharitaceae
2634. Potamogeton nodosus Poir.	Potamogetonaceae
2635. Acanthus sp.	Acanthaceae
2636. Rosa abyssinica R. Br.	Rosaceae
2637. Maytenus ovatus (Wall. ex W. et A.) Loes.	Celastraceae
2638. Olea africana Miller	Oleaceae
2639. Osyris sp.	Santalaceae
2640. Deroemera cf. acuminata Rendle et Schlecht	Orchidaceae
2641. Crassula alba Forsk.	Crassulaceae
2642. Pellea calomelanos (L.) Link.	Polypodiaceae
2643. Kalanchoe macrantha Baker	Crassulaceae
2644. Aloe sp.	Liliaceae
2645. Themeda triandra Forsk.	Gramineae
2646. Dichanthium annulatum Stapf	Gramineae
2647. Aristida adoensis Hochst.	Gramineae
2648. Pennisetum schimperi Hochst.	Gramineae
2649. Andropogon cf. distachyus L.	Gramineae
2650. Digitaria abyssinica Stapf	Gramineae
2651. Eragrotis tenuifolia Hochst.	Gramineae
2652. Harpachne schimperi Hochst. ex. Richard	Gramineae
2653. Sporobolus blepharophyllus A. Rich.	Gramineae
2654. Fimbristylis ovata	Cyperaceae
2655. Plantago albicans L.	Plantaginaceae
2656. Sida cuneifolia A. Gray	Malvaceae
2657. Polygala abyssinica R. Br.	Polygalaceae
2658. Sporobolus sp.	Gramineae

2659. Potamogeton schweinfurthii Bennett.	Potamosetonaceae
2660. Cladium mariscus R. Br.	Cyperaceae
2660[b] Lemna minor L.	Lemnaceae
2661. Xanthium spinosum L.	Compositeae
2661[b] Xanthium spinosum L.	Compositeae
2662. Digitaria abyssinica Stapf	Gramineae
2663. Kyllinga sp.	Cyperaceae
2664. Aloe sp.	Liliaceae
2665. Aloe sp.	Liliaceae
2666. Euphorbia sp.	Euphorbiaceae
2667. Cyperus rigidifolius Steud.	Cyperaceae
2668. Alchemilla pedata Hochst. ex Rich.	Rosaceae
2669. Trifolium sp.	Papilionaceae
2670. Sporobolus sp.	Gramineae
2671. Cyperus sp.	Cyperaceae
2672. Sonchus ?	Compositeae
2673. Lactuca ou Sonchus ?	Compositeae
2674. Carduus eremocephalus Chiov.	Compositeae
2675. Crotalaria agathiflora.	Caesalpiniaceae
2676. Budleia polystachya Fresen.	Loganiaceae
2677. Hypericum revolutum Vahl.	Hypericaceae
2678. Pennisetum schimperi Hochst.	Gramineae
2679. Eragrostis atrovirens (Desv.) Trin.	Gramineae
2680.	Gramineae
2681. Lactuca ?	Compositeae
2682. Haplocarpha schimperi (Schtz-Bip) Beauverd	Compositeae
2683. Solenostemon ?	Labiateae

2684. Nuxia congesta R. Br.	Loganiaceae
2685. Myrsine africana L.	Myrsinaceae
2686. Sparmannia ricinocarpa (E. et Z.) O. Ktze	Tiliaceae
2687. Thymus schimperi Ronn.	Labiateae
2688. Erica arborea L.	Ericaceae
2689. Swertia sp.	Gentianaceae
2690. Dryopteris oligantha (Desv.) C. Chr.	Polypodiaceae
2691. Helichrysum ?	Compositeae
2692.	Labiateae
2693. Senecio ?	Compositeae
2694. Verbascum cf. schimperianum Boiss.	Borraginaceae
2695. Hebenstretia dentata L.	Selaginaceae
2696. Plectocephalus varians (Rich.) C. Jeffrey	Compositeae
2697. Asplenium a thiopicum (Burm.) Bech.	Polypodiaceae
2698. Pellaea quadripinnata (Forsk.) Prantl.	Polypodiaceae
2699. Satyrium crassicaule Rendle	Orchidaceae
2700. Ranunculus multifidus Fosk	Ranunculaceae
2701. Juncus effusus L.	Juncaceae
2702. Agrostis schimperana Hochst. ex Steud.	Gramineae
2703. Berula erreata (Huds.) Coville	Umbellifereae
2704. Pycreus sp.	Cyperaceae
2704^{b} Pycreus elegantulus C.B. Cl.	Cyperaceae
2705. Eleocharis sp.	Cyperaceae
2706. Scirpus brachyceras Hochst.	Cyperaceae
2707. Lythrum rotundifolium Hochst. ex A. Rich.	Lythraceae
2708. Anagallis serpens Hochst ex Dc. ssp. serpens	Primulaceae
2709. Alchemilla gr. abyssinica-cryptantha	Rosaceae

2710. Cardamine hirsuta L.	Crucifereae
2711. Acacia ind.	Caesalpiniaceae
2712. Blepharis linariifolia Pers.	Acanthaceae
2713. Pentanisia cf. schweinfurthii Hiern	Rubiaceae
2714. Jasminum floribundum R. Br.	Oleaceae
2715. Cissus ind.	Ampelidaceae
2716. Acacia ind.	Mimosaceae
2717. Calpurnia aurea(Lam.) Bak.	Papilionaceae
2718. Croton dichogamum Pax	Euphorbiaceae
2719. Eragrostis tenuifolia Hochst.	Gramineae
2720. Brachiaria gemiundulata (Hochst.) Stapf	Gramineae
2721. Cynodon dactylon (L Rich. in Pers.	Gramineae
2722. Themeda trianda Forsk.	Gramineae
2723. Acalypha sp.	Euphorbiaceae
2724. Polygala sphenoptera Fresen.	Polygalaceae
2725. Selaginella yemenensis Spr.	Selaginellaceae
2726. Anthericum ?	Liliaceae
2727. Grewia sp.	Tiliaceae
2728. Galiniera coffeoides Delile	Rubiaceae
2729. Impatiens hochstetteeri Warb.	Balsaminaceae
2730. Pentanisia ouranogyne s. Moore	Rubiaceae
2731. Otostegia cf. repanda Benth.	Labiateae
2732. Faidherbia albida (Del.) A. Chev.	Mimosaceae
2732[b] Diaphananthe schimperiana (A. Rich.) Summerhayes	Orchidaceae
2733. Plantago palmata Hook. f.	Plantaginaceae
2734. Euphorbia sp.	Euphorbiaceae
2735. Maytenus undatus (Thunb.) Blakelock	Celastraceae

2736.	Callitriche stagnalia Scop.	Hallormagaceae
2737.	Rosa abyssinica R. Br.	Rosaceae
2738.	Geranium simense Hochst. ex Rich.	Geraniaceae
2739.	Anagallis serpens Hochst. ex DC. spp. serpens	Primulaceae
2740.		Proteaceae ?
2741.		Rubiaceae
2742.	Arundinaria alpina L.	Gramineae
2743.	Bersama abyssinica Fresen. subsp. abyssinica	Melianthaceae
2744.		Cyperaceae
2745.	Loxoscaphe nigrescens (HK.) Moore	Polypodiaceae
2746.	Asplenium protensum Schrad.	Polypodiaceae
2747.	Pteris quadriaurita Retz	Polypodiaceae
2748.	Polystichum fuscopaleaceum Alston	Polypodiaceae
2749.	Pteris cretica L.	Polypodiaceae
2750.	Caucalis incognita Norm.	Umbellifereae
2751.	Solanum sp.	Solanaceae
2752.	cf. Vigna	Papilionaceae
2753.	Cardamine africana L.	Crucifereae
2754.	Poa cf. leptoclada Hochst. ex Rich.	Gramineae
2755.	Kniphofia sp.	Liliaceae
2756.		Orchidaceae
2757.	Halothrix sp.	Orchidaceae
2758.	Habenaria decorata Hochst.	Orchidaceae
2759.		Compositeae
2760.	Kniphofia cf. abyssinica Sch.	Liliaceae
2761.	Haplocarpha rueppellii(Schtz-Bip) Beauverd	Compositeae
2761[b]	Haplosciadium abyssinica Hochst.	Umbellifereae

2762. Trifolium sp.	Papilionaceae
2763. Astragalus sp.	Papilionaceae
2764. Helichrysum sp.	Compositeae
2765. Helichrysum sp.	Compositeae
2766. Scabiosa sp.	Dipsacaceae
2767. Hypericum peplidifolium A. Rich.	Hypericaceae
2768. Cf. Eriosema	Papilionaceae
2769. Trifolium sp.	Papilionaceae
2770.	Labiateae
2771. Pennisetum humile Hochst. ex Rich.	Gramineae
2772. Matricaria ?	Compositeae
2773. Cyanotis sp.	Commelinaceae
2774.	Compositeae
2775. Alchemilla gr. abyssinica-cryptantha	Rosaceae
2776. Alchemilla pedata Hochst.ex Rich.	Rosaceae
2777. Erica arborea L.	Ericaceae
2778. Carex monostachya A. Rich.	Cyperaceae
2779. Lobelia rhynchopetalum (Hochst. ex Rich.) Hemsley	Lobeliaceae
2780.	Compositeae
2781.	Umbellifereae
2782. Bartsia longiflora Hochst. ex Benth.	Scrofulariaceae
2783. Ranunculus stagnalis Hochst. ex Rich.	Ranunculaceae
2784. R. oreophytus Del.	Ranunculaceae
2785. Cardamine africana L.	Crucifereae
2786. Cynoglossum coeruleum Hochst.	Borraginaceae
2788. Umbilicus botryoides Hochst. ex Rich.	Crassulaceae
2789. Sedum cf. ducis-aprutii Cort.	Crassulaceae

2790. Veronica abyssinica Fresen.	Scrophulariaceae
2791. Philippia trimera Engl. ssp. abyssinica (Pich. et Hein.) Hedberg	Ericaceae
2792. Erica arborea L.	Ericaceae
2793. Asplenium aethiopicum (Burm.)Bech.	Polypodiaceae
2794. Luzula johnstonii Buchen.	Juncaceae
2795. Carex sp.	Cyperaceae
2796. Agrostis cf. gracilifolia Hubb.	Gramineae
2797. Pentachistis pictigluma (Steud.)Pilg.	Gramineae
2798. Crassula sp.	Crassulaceae
2799. Echinops giganteus Richard	Compositeae
2800.	
2801. Hypericum lanceolatum Lam.	Hypericaceae
2802. Echinops hochnelii Schwfth.	Compositeae
2803. Viola abyssinica Steud. ex Oliv.	Violaceae
2804. Discopodium pennivervium Hochst.	Solanaceae
2805. Euphorbia sp.	Euphorbiaceae
2806. Euphorbia sp.	Euphorbiaceae
2807. Kleinia cf. squarrosa Cuf.	Compositeae
2808. Hypericum quartinianum A. Rich.	Hypericaceae
2809. Rumex nervosus Vahl	Polygonaceae
2810. Rubia cordifolia L. var. discolor (Tupez)Engler	Rubiaceae
2811. Gaertnera sp.	Rubiaceae
2812. Vernonia sp.	Compositeae
2813. Flugea ou Phyllanthus sp.	Euphorbiaceae
2814. Euclea schimperi (X.) Dandy	Ebenaceae
2815. Combretum aff. molle R. Br. ex G. Don	Combretaceae
2816. Lannea sp.	Anacardiaceae

2817. Botriochloa insculpta (Hochst.) A. Camus	Gramineae
2818. Schima nervosum (Rottl. ex Willd.) Stapf	Gramineae
2819.	Gramineae
2820.	Compositeae
2821. Phyllanthus sp.	Euphorbiaceae
2822. Toddalia asiatica (L.)Harms	Rutaceae
2823. Myrsine africana L.	Myrsinaceae
2824. Clerodendron myricoides R. Br.	Verbenaceae
2825. Vernonia cf. amygdalina Delile	Compositeae
2826. Polystachya sp.	Orchidaceae
2827. Maytenus cf. undatus (Thunb.) Blakelock	Celastraceae
2828. Negripteris scioana (Chiov.)Pich. Ser.	Polypodiaceae
2829. Polygala sphenoptera Fres.	Polygalaceae
2830. Phyllanthus sp.	Euphorbiaceae
2831. Gerbera ?	Compositeae
2832.	Cyperaceae
2833. Bromus cognatus Steudel	Gramineae
2834. Hypericum revolutum Vahl.	Hypericaceae
2835. Acacia sp.	Mimosaceae
2836. Medicago sp.	Papilionaceae
2837. Terminalia brownii Fres.	Combretaceae
2838. Cadaba farinesa Forsk.	Capparidaceae
2839.	Rubiaceae
2840. Vangueria apiculata K. Schum.	Rubiaceae
2841. Allophyllus rubifolius (Hochst.) Engl.	Sapindaceae
2842. Capparis tomentosa Lam.	Capparidaceae
2843. Caucanthus auriculatus (Radlk.) Niedenzer	Malpighiaceae

2844.	Rubiaceae
2845. Commiphora ?	Burseraceae
2846. Pouzolzia hypoleuca Wedd.	Urticaceae
2847. Canthium bogosense (Mart) Penzig	Rubiaceae
2848. Grewia mollis Juss.	Tiliaceae
2849. Ficus sp.	Moraceae
2850. Ocimum sp.	Labiateae
2851 Craterostigma sp.	Scrophulariaceae
2852. Pterodiscus sp.	Pedaliaceae
2853. Caralluma sp.	Asclepiadaceae
2854. Euphorbia sp.	Euphorbiaceae
2855. Ormocarpus sp.	Papilionaceae
2856. Barleria eranthemoides R. Br ex C.B. Clarke	Acanthaceae
2857. Eragrostis aulacosperma Steud.	Gramineae
2858. Sporobolus festivus Hochst.	Gramineae
2859. Tragus berteronianus Schult.	Gramineae
2860. Actiniopteris semiflabellata Pich. Serm.	Polypodiaceae
2861. **Pellaea** calomelanos (L.) Link.	Polypodiaceae
2862. Crassula sp.	Crassulaceae
2863. Illisanthes sp.	Scrofulariaceae
2864. Crabbea hirsuta Harv.	Acanthaceae
2865. Rhoicissus tridentata (L.f.) Wild. et Drum.	Ampelidaceae
2866. Grewia villosa Willd.	Tiliaceae
2867. Sterculia setigera Delile	Sterculiaceae
2868. Combretum molle R. Br.	Combretaceae
2869. Grewia sp.	Tiliaceae

2870. Heeria insignis (Del.) O. Ktze	Anacardiaceae
2871. Combretum molle R. Br.	Combretaceae
2872. Adiantum incisum Forsk.	Polypodiaceae
2873. Arthropteris orientalis (Gmel.) Post.	Polypodiaceae
2874. Bauhinia fassagensis Schwfth.	Caesalpiniaceae
2875. Tamarix nilotica (Ehrenb) Bunge	Tamaricaceae
2876.	Compositeae
2879. Kalanchoe deficiens (Forsk) Asch. et Schwfth.	Crassulaceae
2880. Euclea schimperi (DC.) Dandy	Ebenaceae
2881. Heliotropium cinerascens Steud. ex D.C.	Borraginaceae
2882. Barbeya oleoides Schweinf.	Ulmaceae
2883.	Labiateae
2884. Helichrysum ou Polycarpa ?	Compositeae
2885. Matthiola sp.	Crucifereae
2885^{b} Matthiola sp.	Crucifereae
2886. Acacia sp.	Mimosaceae
2887. Agelanthus ?	Loranthaceae
2888. Fagaropsis gilletti Chiov.	Rutaceae
2889. Zyzyphus mucronatus Willd.	Rhamnaceae
2890. Myrsine africana L.	Myrsinaceae
2891.	Anacardiaceae
2892. Dodonaea viscosa (L.) Jacq.	Sapindaceae
2893. Euclea schimperi (DC))Dandy	Ebenaceae
2894. Premna schimperi Engl.	Verbenaceae
2895. Olea africana Miller	Oleaceae
2896. Grewia bicolor Roth.	Tiliaceae
2897. Heeria insignis (Del.) O. Ktze	Anacardiaceae

2898. Cussonia holstii Harms	Araliaceae
2899. Ruttya fruticosa Lindau	Acanthaceae
2900. Pelargonium quinquelobatum Hochst. ex Rich.	Geraniaceae
2901. Hibiscus sp.	Malvaceae
2902. Polygala abyssinica R. Br.	Polygalaceae
2903. Commelina sp.	Commelinaceae
2904. Lactuca sp.	Compositeae
2905. Chascanum sp.	Verbenaceae
2905[b] Cissampelos pareira L. var. orbiculata	Menispermaceae
2906. Cenchrus ciliaris L.	Gramineae
2907. Enneapogon elegans (Nees ex Steud.) Stapf	Gramineae
2908. Tetrapogon villosus Desv.	Gramineae
2909. Andropogon sp.	"
2910. Cymbopogon sp.	"
2911. Schima nervosum (Rottb. ex Willd.) Stapf	"
2912. Phyllanthus sp.	Euphorbiaceae
2913. Ocimum ou Becium ?	Labiateae
2914. Lantana rugosa Thunberg	Verbenaceae
2915. Otostegia cf. repanda Benth.	Labiateae
2916. Ruellia sp.	Acanthaceae
2917.	Convolvulaceae
2918. Acacia sp.	Mimosaceae
2919. Dicrostachys glomerata (Forsk.) Chiov.	Mimosaceae
2920. Grewia cf. ferruginea Hochst.	Tiliaceae
2921. Boerhavia sp.	Nyctaginaceae
2922. Kalanchoe cf. brachycalix A. Rich.	Crassulaceae
2923. Indigofera sp.	Papilionaceae

2924.	Hibiscus sp.	Malvaceae
2925.		Liliaceae
2926.	Tragus cf. racemosus (L.) All.	Gramineae
2917[b]	Agelanthus sp.	Loranthaceae
2918[b]		Loranthaceae
2919[b]	Agelanthus ?	"
2920[b]	Heeria insignis (Del.)O. Ktze	Anacardiaceae
2921[b]	Fluegea ou Phyllanthus ?	Euphorbiaceae
2922[b]	Erythrococca abyssinica Pax	Euphorbiaceae
2923[b]	Peucedanum sp.	Meliaceae
2924[b]	Tragus bertoronianus Schult.	Gramineae
2925[b]	Tetrapogon spathaceus Hack.	"
2926[b]	Kleinia sp.	Compositeae
2927	Vernonia amygdalina Delile	Compositeae
2928.	Euphorbia sp.	Euphorbiaceae
2929.	Lannea sp.	Anacardiaceae
2930.	Thunbergia gregori S. Moore	Acanthaceae
2931.	Adenium sp.	Apocynaceae
2932.	Barleria hochstetii Nees	Acanthaceae
2933.	Aristida papposa Trin. et Rupr.	Gramineae
2934.	Euneapogon elegans (Nees ex Steud.) Stapf	"
2935.	Euphorbia glochidiata Pax	Euphorbiaceae
2936.	Acacia sp.	Mimosaceae
2937.	Acacia cf. asak Willd.	Mimosaceae
2938.	Cordia gharaf (Forsk.) Aschers	Borraginaceae
2939.	Zizyphus hamur Engler	Rhamnaceae
2940.	Grewia sp.	Tiliaceae

2941. Barleria acanthoides Vahl	Acanthaceae
2942. Abutilon sp.	Malvaceae
2943. Ecbalium trisacanthus (Schw.) C.B. Cl.	Acanthaceae
2944. Suaeda fruticosa Forsk.	Chenopodiaceae
2945. Cenchrus ciliaris L.	Gramineae
2946. Sporobolus helvolus (Trin.) Dur. et Schinz.	Gramineae
2947. Senra zoës Schwfth et Volkens	Malvaceae
2948. Eragrostis ciliaris L. R. Br.	Gramineae
2949. Boscia coriacea Pax	Capparidaceae
2950. Zizyphus mauritiaca Lam.	Rhamnaceae
2951. Thespesia danis Oliver	Malvaceae
2952.	"
2952[b] Cenchrus setigerus Vahl	Gramineae
2953. Cadaba glandulosa Forsk.	Capparidaceae
2954. Cenchrus ciliaris L.	Gramineae
2955. Cenchrus ciliaris L.	"
2956. Tetrapogon spathaceus Desv.	"
2957. Kelleronia splendens Schinz.	Zygophyliaceae
2958. Boswellia rivae Engler	Burseraceae
2959.	Convolvulaceae
2960. Gossypium somalense (Gürke) Hutch.	Malvaceae
2961. Cf. Commiphora erlangeriana Engler	Burseraceae
2962. Kedrostis gisel (J.F. Gmel.) C. Jeffrey	Cucurbitaceae
2963. Barleria eranthemoides R. Br. ex C.B. Clarke	Acanthaceae
2964. Tinnaea ?	Labiateae
2965. Tapinanthus ?	Loranthaceae
2966. Acacia sp.	Mimosaceae

2966[b]	Euphorbia sp.	Euphorbiaceae
2967.	Salvadora persica L.	Salvadoraceae
2968.		
2969.		Velloziaceae
2970.	Euphorbia sp.	Euphorbiaceae
2971.	Euphorbia sp.	Euphorbiaceae
2972.	Cordia gharaf (Forsk.) Aschers	Borraginaceae
2973.	Lannea ?	Anacardiaceae
2974.	Momordica spinosa (Gilg) Chiov.	Cucurbitaceae
2975.	Acacia senegal Willd.	Mimosaceae
2976.	Acacia sp.	Mimosaceae
2977.	Commiphora sp.	Burseraceae
2978.	Jatropha rivae Pax	Euphorbiaceae
2979.	"	"
2980.	"	"
2981.	"	"
2982.	"	
2983.	Tapinanthus sp.	Loranthaceae
2984.	Tapinanthus sp.	Loranthaceae
2985.		
2986.	Blepharis ciliaris (L.)B.L. Burtt.	Acanthaceae
2987.		Velloziaceae
2988.	Lactuca sp.	Gramineae
2989.	Chrysopogon aucheri Stapf	Gramineae
2990.	Crotalaria sp.	Papilionaceae
2991.	Dobera glabra (Forsk) Juss. ex Poiret	Salvadoraceae
2992.	Terminalia brevipes Pampan (?)	Combretaceae

2993.	Acacia sp.	Combretaceae
2994.	Tamarix nilotica (Ehrenb.) Bunge	Tamaricaceae
2995.	Caralluma russelliana (Courb. ex Brongn.) Cuf.	Asclepiadaceae
2996.		Labiateae
2997.	Cadaba sp.	Capparidaceae
2998.	Cissus sp.	Ampelidaceae
2999.	Aristida cf. adscensionis L.	Gramineae
3000.	Tetrapogon triangulatus Hochst.	Gramineae
3001.	Dignathia hirtella Stapf	"
3002.	Tetrapogon spathaceus Hack	"
3003.	Cenchus ciliaris L.	"
3004.	Balanites orbicularis Sprague	Agialidaceae
3005.	Cadaba heterotricha Stocks	Capparidaceae
3006.	Rhynchosia sp.	Papilionaceae
3007.	Polygala cf. arenaria Willd.	Polygalaceae
3008.	Polygala erioptera DC.	Polygalaceae
3009.	Setaria sp.	Gramineae
3010.	Urochloa cf. trichopus Stapf	"
3010^{b}	Setaria acromelaena Hochst.	"
3011.		
3012.	Indigofera sp.	Papilionaceae
3013.	Indigofera sp.	Papilionaceae
3013^{b}	Indigofera sp.	Papilionaceae
3014.	Corchorus sp.	Tiliaceae
3015.		Labiateae
3016.	Urginea, Dipcadi ou Albucca ?	Liliaceae
3017.	Zygophyllum decumbens Delile	Asclepiadaceae
3018.	Phyllanthus sp.	Euphorbiaceae

3019. Farsetia sp.	Crucifereae
3020. Phyllanthus sp.	Euphorbiaceae
3021. Polygala erioptera DC.	Polygalaceae
3022. Boerhaavia sp.	Nyctaginaceae
3023. Boerhavia sp.	"
3024. Euphorbia sp.	Euphorbiaceae
3024[b] Tribulus sp.	Zygophyllaceae
3025	
3026	
3027. Aristida sp.	Gramineae
3028. Latipes senegalensis Kunth.	Gramineae
3029. Heliotropium subulatum Hochst.	Borraginaceae
3030. Cenchrus montanus Roxb.	Gramineae
3031. Setaria verticillata Beauv.	Gramineae
3032. Amaranthus cf. angustifolius Lam.	Amaranthaceae
3033.	Compositeae
3034. Indigofera sp.	Papilionaceae
3035. Limonium cylindrifolium (Forsk.) Verdcourt	Plumbaginaceae
3036. Suaeda cf. vermiculata Forsk.	Chenopodiaceae
3037. Cucumella kelleri (Coq.) C. Jeffrey	Cucurbitaceae
3038. Sterculia setigera Delile	Sterculiaceae
3039. Zygophyllum sp.	Zygophyllaceae
3040. Grewia ?	Tiliaceae
3041.	
3042. Tinnea ?	Labiateae
3043. Barleria eranthemoides R. Br. ex C.B. Cl.	Acanthaceae
3044. Barleria acanthoides Vahl.	Acanthaceae

3045. Heliotropium strigosum Willd.	Borraginaceae
3046. Farsetia sp.	Crucifereae
3047. Chaetostichium minimum (Hochst) C.E. Hubbard	Compositeae
3048. Tripogon cf. leptophyllus (A. Rich) Cuf.	Gramineae
3049. Cylocheilon sp.	Verbenaceae
3050. Sorghum cf. arundinaceum Roem.et Schult.	Gramineae
3051. Paspalidium geminatum (Forsk.) Stapf	Gramineae
3052. Echinochloa pyramidalis Hitch. et Chase	Gramineae
3053. Urochloa aff. trichopus Stapf	Gramineae
3054.	Cyperaceae
3055. Matthiola cf. erlangeriana Engl.	Crucifereae
3056. Cf. Cucumis	Cucurbitaceae
3057. Coccinia grandis (L.) Voigt.	Cucurbitaceae
3058. Dalechampia ?	Euphorbiaceae
3059. Triumfetta sp.	Tiliaceae
3060. Heliotropium cinerascens Steud.	Borraginaceae
3061. Solanum sp.	Solanaceae
3062. Solenostemon	Labiateae
3063.	Compositeae
3064. Abutilon sp.	Malvaceae
3065. Acacia sp.	Mimosaceae
3066. Neuracanthus polyacanthus (Lindau) C.B. Clarke	Acanthaceae
3067.	Compositeae
3068. Euphorbia glochidiata	Euphorbiaceae
3069. Dorstenia sp.	Moraceae
3070. Cadaba glandulosa Forsk.	Capparidaceae
3071.	

3072. Pterolobium stellatum (Forsk.) Chiov.	Papilionaceae
3073. Boscia minimifolia Chiov.	Capparidaceae
3074.	
3075. Edithcolea sp.	Asclepiadaceae
3076.	Convolvulaceae
3077. Cuscuta sp.	Convolvulaceae
3078. Tribulus sp.	Zygophyllaceae
3079. Tribulus sp.	Zygophyllaceae
3080. Tribulus sp.	Zygophyllaceae
3081. Cadaba mirabilis Gilg.	Capparidacaceae
3082.	Solanaceae
3083. Lycium sp.	Solanaceae
3084. Justicia sp. (forsan J. urbaniana Lindau)	Acanthaceae
3085. Sesbania sp.	Papilionaceae
3086.	Convolvulaceae
3087. Euphorbia sp.	Euphorbiaceae
3088. Sesbania sp.	Papilionaceae
3089. Gyrocarpus habebensis Chiov.	Hernandiaceae
3090. Cassia sp.	Caesalpinieae
3091. Monadenium sp.	Euphorbiaceae
3092.	Velloziaceae
3093. Chloris sp.	Gramineae
3094. Andropogon cyrtocladus Stapf	Gramineae
3095. Aristida sp.	Gramineae
3096. Pavonia sp.	Malvaceae
3097.	Convolvulaceae
3098. Blepharispermum fruticosum Klatt	Compositeae

3099.	Barleria parviflora R. Br. ex T. Anders	Acanthaceae
3100.	Barleria hochstetteri Nees	Acanthaceae
3101.	Hibiscus sp.	Malvaceae
3102.		
3103.	Boswellia rivae	Burseraceae
3104.	Euphorbia sp.	Euphorbiaceae
3105.		Euphorbiaceae
3106.		Asclepiadaceae
3107.		
3108.		
3109.	Suaeda cf. vermiculata Forsk.	Chenopodiaceae
3110.	Disperma eremophila Milne-Redhead	Acanthaceae
3111.	Sporobolus spicatus (Vahl) Kunth.	Gramineae
3112.	Lactuca ou Sonchus ?	Compositeae
3113.	Senra incana Cav.	Malvaceae
3114.	Cyperus sp.	Cyperaceae
3115.	Enicostema axillare (Lam.)A. Raynal ssp. axillare	Gentianaceae
3116.	Atriplex halimus L.	Chenopodiaceae
3117.	Polygala cf. arenaria Willd.	Polygalaceae
3118.	Cystanche tubulosa (Schenk) Hook. f.	Orobanchaceae
3119.		Mimosaceae
3120.	Stefaninia telefiifolia Chiov. ?	Crucifereae
3121.	Euphorbia sp.	Euphorbiaceae
3122.	Euphorbia sp.	Euphorbiaceae
3124.	Aeluropus lagopoides (L.) Trin. ex Trimen	Gramineae
3125.	Phyla nodiflora (L) Greene	Verbenaceae
3126.		

3127. Reseda sp.	Resedaceae
3128. Barleria sp. sectio Prionitis	Acanthaceae
3129. Aloe aff. ruspoliana Bak.	Liliaceae
3130. Euphorbia sp.	Euphorbiaceae
3131.	
3132. Polygala cf. arenaria Willd.	Polygalaceae
3133. Helichrysum sp.	Compositeae
3134. Cf. Gardenia	Rubiaceae
3135. Caesalpinia bessac Chiov.	Caesalpiniaceae
3136. Grewia tenax (Forsk.) Fiori var. glechomifolia	Tiliaceae
3137. Premma resinosa Schau.	Verbenaceae
3138.	Velloziaceae
3139.	Velloziaceae
3140. Euphorbia sp.	Euphorbiaceae
3141.	
3142. Anisotes sp. (A. ukambensis Lindau ?)	Acanthaceae
3143. Cenchrus biflorus Roxb.	Gramineae
3144. Barleria sp. sectio Prionitis	Acanthaceae
3145.	
3146. Grewia tenax (Forsk.) Fiori var. erythraea	Tiliaceae
3147. Anisotes sp. (A. trisulcus Nees)	Acanthaceae
3148. Euphorbia sp.	Euphorbiaceae
3149.	
3150. Indigofera sp.	Papilionaceae
3151. Blepharispermum fruticosum Klatt	Compositeae
3152. Salsola cf. foetida Delile	Chenopodiaceae
3153. Scirpus maritimus L.	Cyperaceae

3154. Eragrostis sp.	Gramineae
3155. Urochondra setulosa (Trin.) Hubbard	Gramineae
3156. Limonium axillare (Forsk.) O. Kuntze	Plumbaginaceae
3157. Limonium axillare (Forsk.) O. Kuntze	Plumbaginaceae
3158. Salvia ou Tinnea	Labiateae
3159. Delonix baccal (Chiov.) Bak.	Caesalpiniaceae
3160. Sporobulus fruticulosus Stapf	Gramineae
3161.	Papilionaceae
3162. Cf. Caesalpinia	Caesalpiniaceae
3163. Solanum sp.	Solanaceae
3164.	Compositeae
3165.	Euphorbiaceae
3166. Dorstenia crispa Engl.	Moraceae
3167. Monadenium ellenbeckii N.E. Br. ?	Euphorbiaceae
3168. Commiphora sp.	Burseraceae
3169. Dichantium annulatum Stapf	Gramineae
3170. Indigofera sp.	Papilionaceae
3171. Scirpus maritimus L.	Cyperaceae
3172. Cyperus fenzelianus Steud.	Cyperaceae
3173. Ipomoea sp.	Convolvulaceae
3173^{b}	Asclepiadaceae
3174. Crotalaria sp.	Papilionaceae
3175. Euphorbia sp.	Euphorbiaceae
3176.	Umbellifereae
3177. Dyschoriste sp.?	Acanthaceae
3178. Nemacanthus sp. (N. robecchii(Lindau) C.B. Cl.)	Acanthaceae
3179. Puppalia lappacea (L.) Juss.	Amarantaceae

3180. Cuscuta sp.	Convolvulaceae
3181. Ocimum ind.	Labiateae
3182. Terminalia cf. stuhlmanii	Combretaceae
3183. Terminalia cf. spinosa Engl.	Combretaceae
3184.	Asclepiadaceae
3185. Grewia villosa Willd.	Tilliaceae
3186. Kleinia cf. squarosa	Compositeae
3187. Delonix elata (Torner) Gamble	Caesalpiniaceae
3188.	"
3189. Cordia aff. gharaf (Forsk.) Aschers	Borraginaceae
3190.	
3191. Melanthera sp.	Compositeae
3192. Croton cliffordii Hutch. et Bruce	Euphorbiaceae
3193. Grewia tenax (Forsk.) Fiori	Tiliaceae
3194. Terminalia sp.	Combretaceae
3195. Acacia sp.	Caesalpiniaceae
3196. Euphorbia sp.	Euphorbiaceae
3197. Euphorbia sp.	Euphorbiaceae
3198. Dorstenia crispa Engl.	Moraceae
3199. Neuracanthus polyacanthus (Lindau) C.B. Clarke	Acanthaceae
3200. Andropogon cyrtocladus Stapf	Gramineae
3201.	Solanaceae
3202. Aerva lanata (L.) Juss. ex Schult.	Amaranthaceae
3203. Kleinia sp.	Compositeae
3204. Kleinia longiflora	Compositeae
3205. Commiphora erlangeriana Engler	Burseraceae
3206. Enteropogon rupestris (J.A. Schm.) A. Chev.	Gramineae

3207. Cymbopogon sp.	Gramineae
3208. Negripteris scioana (Chiov.) Pich. Ser.	Polypodiaceae
3209. Terminalia polycarpa Engl. et Diels.	Combretaceae
3210. Peucedanum sp.	Umbellifereae
3211.	Euphorbiaceae
3212. Cf. Echidnopsis dammanniana Spr. ex N.E. Br.	Asclepiadaceae
3213.	Malvaceae
3214.	Rubiaceae
3215. Acacia sp.	Caesalpiniaceae
3216. Delonix elata (Torner) Gamble	Caesalpiniaceae
3217. Asparagus sp.	Liliaceae
3218. Cucumis ficifolius A. Rich.	Cucurbitaceae
3219.	Gramineae
3220. Digitaria pennata (Hochst) Cooke	Gramineae
3221. Orobanche cernua Loeffling var.nepalensis Reuter	Orobanchaceae
3222. Melanthera sp.	Compositeae
3223. Erythrina cf. melanacantha Taub. ex Harms	Papilionaceae
3224. cf. Hernandia	Hernandiaceae
3225. Gossypium somalense	Malvaceae
3226.	
3227. Elionurus royleanus Nees ex Rich.	Gramineae
3228.	
3229. Sesamothamnus rivae Engl.	Pedaliaceae
3230. Sanseviera sp.	Liliaceae
3231. Dalechampia ?	Euphorbiaceae
3232. Clitoria ternatea L. fa. albiflora	Papilionaceae
3233. Euphorbia sp.	Euphorbiaceae

3234. Anisopappus ?	Compositeae
3235. Sericocomopsis pallida (Sp. Moore) Schinz	Amarantaceae
3236. Thespesia danis Oliver	Malvaceae
3237. Tylophora sp.	Asclepiadaceae
3238. Cucumis dipsaceus Spach.	Cucurbitaceae
3239. Coceinia grandis (L.) Voigt.	Cucurbitaceae
3240. Euphorbia sp.	Euphorbiaceae
3241. Blepharispermum lobatum Klatt	Compositeae
3242.	Papilionaceae
3243. Cadaba cf. divaricata Gilg	Capparidaceae
3244. Leptadenia sp.	Asclepiadaceae
3245. Terminalia orbicularis Engl. et Diels	Combretaceae
3246. Euphorbia sp.	Euphorbiaceae
3247. Momordica spinosa (Gilg) Chiov.	Cucurbitaceae
3248. Cucumis dipsaceus Spach.	Cucurbitaceae
3249. Euphorbia sp.	Euphorbiaceae
3250. Monadenium maius (Pax) N.E. Br.	Euphorbiaceae
3251. Phyllanthus sp.	Euphorbiaceae
3252. Potentilla reptans L.	Rosaceae
3253. Orobanche minor Sutt.	Orobanchaceae
3254. Gunnera perpensa L.	Gunneraceae
3255. Alepidea penduncularis (Steud) Rich.	Umbellifereae
3256.	Gentianaceae
3257. Xyris sp.	Xyridaceae
3258. Satyrium crassicaule Rendle	Orchidaceae
3259. Epilobium schimperianum Hochst.	Lythraceae
3259[b] Satyrium crassicaurle Rendle	Orchidaceae
3260 Salix subserrata Willd.	Salicaceae

3261. Myrica salicifolia Hochst. ex Rich.	Myricaceae
3262. Dombeya schimperiana Rich.	Sterculiaceae
3263. Euphorbia obovalifolia Rich.	Euphorbiaceae
3264. Zinnia peruviana (L.) L.	Compositeae
3265. Hypoestes verticillaris (L.f.) Soland. ex Roem. et Schult.	Acanthaceae
3266. Sporobolus sp.	Gramineae
3267. Chrysopogon aucheri Stapf	Gramineae
3268. Botriochloa pertusa (L.) A. Camus	Gramineae
3269. Heteropogon contortus Stapf	Gramineae
3270. Acacia sp.	Mimosaceae
3271. Aristida adscensionis L.	Gramineae
3272.	Labiateae
3273. Acacia mellifera Benth.	Mimosaceae
3274. Blepharis sp.	Acanthaceae
3275. Sericocomopsis cf. pallida (Sp. Moore) Schinz	Amaranthaceae
3276. Rhynchosia sp.	Papilionaceae
3277. Pavonia ?	Malvaceae
3278. Hibiscus sp.	Malvaceae
3279. Solanum sp.	Solanaceae
3280. Acacia sp.	Mimosaceae
3281. Tapinanthus sp.	Loranthaceae
3282. Commiphora sp.	Burseraceae
3283. Commiphora sp.	Burseraceae
3284. Ipomoea sp.	Convolvulaceae
3285. Adenium ind.	Apocynaceae
3286. Cymbopogon proximus Stapf	Gramineae

3287. Triumfetta sp.	Tiliaceae
3288. Pavonia ?	Malvaceae
3289.	Euphorbiaceae
3290. Polycarpeae ?	Compositeae
3291.	Convolvulaceae
3292. Pavonia cf. pirottae (Terracc.) Chiov.	Malvaceae
3293. Lissochilus	Orchidaceae
3294. Heliotropium sp.	Borraginaceae
3295. Acacia sp.	Mimosaceae
3296. Thesium schweinfurthii Engl.	Santalaceae
3297. Teclea pilosa (Engl.) Verdoon	Rutaceae
3298.	
3299.	Cyperaceae
3300. Portulacca cf. quadrifida L.	Portulacaceae
3301. Dorstenia cf. crispa Engl.	Moraceae
3302.	Cucurbitaceae
3303. Boscia angustifolia A. Rich.	Capparidaceae
3304. Phyllogeiton discolor (K I.) Herzog	Rhamnaceae
3305. Combretum molle R. Br.	Combretaceae
3306. Grewia bicolor Roth.	Tiliaceae
3307. Zizyphus mucronatus Willd.	Rhamnaceae
3308. Moringa rivae Chiov.	Moringaceae
3309. Cf. Sarcostemma	Asclepiadaceae
3310. Euphorbia sp.	Euphorbiaceae
3311. Urginea ou Chlorophytum ?	Liliaceae
3312.	Rubiaceae

3313. Heteromorpha trifoliata (Wendl.) Eckl. et Zeyh.	Umbellifereae
3314. Fagara chalybea (Engl.)Engl.	Rutaceae
3315.	Mimosaceae
3316. Asparagus sp.	Liliaceae
3317. Helichrysum sp.	Compositeae
3318. Dioscorea quartiniana A. Rich.	Dioscoreaceae
3319.	Compositeae
3320. Adenium sp.	Apocynaceae
3321.	Mimosaceae

LIST OF THE STATIONS

I - Alchemilla Spp. zone.

2776, 2779, 2790, 2800.

II - Ericaceae zone.

2756, 2775, 2777, 2778, 2791, 2792.

III - Juniperus procera and Podocarpus gracilior.

Forest : 2596-2600, 2683-2698 (on hill), 2733-2755, 2802-2804, 2820-2836, 3251-3253, 3255, 3261-3263.

River banks : 2675-2677, 2621-2630, 2632-2658.

Swamp : 2699-2710, 2610-2620, 3254, 3256-3260.

Pools : 2633-2634, 2659-2660 bis.

Slopes with Euphorbia abyssinica : 2813-2819.

Various : 2808-2812, 2927-2929, 2930.

Dry slope : 2635-2644.

Vertisoil with thin dusty covering : 2666-2674.

Vertisoil with many dusty pebbles : 2661-2665.

Chernozem : 2645-2657.

Brown acid humiferous soils on ashes with hydromorphic trend: 2601-2609.

IV - Croton macrostachys and Cordia abyssinica zone.

Terminalia brownii facies : 2837-2874, 2917bis-2925bis, 2917-2926.

V - Acacia Spp.zone.

Thickets on limestone : 2711-2728, 2880-2916, 3299-3309

" on black soils : 3250, 3264-3270, 3280-3289, 3294-3298, 3310-3321.

on basalt : 3271-3279, 3290-3293

Ravines : 3730-3732

Forest galleries : 2875-2876, 2879, 2727-2729.

VI - Acacia Spp. and Commiphora Spp. zone.

Vegetation linked to the existence of water in the soil.

.Forest galleries : 2992-2998.

·Swamps : 3169-3173.

.Other forms : 2544-2953, 2966, 2991, 3004-3005, 3012-3030, 3033-3034, 3050-3063, 3124-3126, 3182-3183, 3198-3205, 3209-3210, 3232-3239.

Vegetation on drained soils.

. Aristida Spp. and Cenchrus Spp.communities :

2952 bis, 2955-2956, 2999, 3006-3011.

. Gyrocarpus habebensis and Cassia Sp. community :

3806-3090.

. Halophyte community : 3035-3049, 3109-3116, 3152,3157.

Vegetation on rocky outcrops.

. Gypsum : 2957-2965, 2966bis, 2969-2990, 3069-3075, 3117, 3123, 3133-3142, 3173bis, 3206-3208, 3211-3212, 3219-3231.

. Basalt : 2931-2943.

. Antalo limestone : 3091-3108, 3123-3132, 3143-3151, 3158-3168.

. Gabredarre limestone : 3184-3197, 3240-3249.

. Upper sandstones : 3213-3216.

. Degraded zones : 3076-3083, 3174-3181, 3217-3218.

ANNEX I

NOTES ON THE KNOWLEDGE OF THE VEGETATIVE MILIEU ACQUIRED BY THE NOMADS OF THE LOWER VALLEY OF THE WABI SHEBELLE (ETHIOPIA)

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In the course of the mission undertaken in the Ethiopian part of the basin of the Wabi Shebelle at the Ethiopian Government's request and for the French Mission of the Wabi Shebelle survey, I studied the vegetation and flora of the lower basin of this river in Ogaden.

I was accompanied and assisted by a young man of the region : Abdi Hassan from the village of Danan. He was then twenty four years old, was very well acquainted with the surrounding nature and revealed himself to be a remarkable observant. Abdi Hassan's main occupation had always been to look after the herds and he had acquired all his knowledge from other shepherdsor while journeying with his family.

His presence facilitated the collecting of plants. The Somali names which he told me made my task casier since this nomenclature was more adaptable than numbers. Besides, his comments on the characteristics and uses of plants made me more familiar with the latter.

I felt it useful to write these few notes adding some personal remarks giving an idea of the knowledge of plants among Somali shepherdsin Ethiopia.

(*) In the Somali language this name means "River of panthers" and in order to be pronounced correctly in French it must be spelt "Wabi Shebelle" and not "Wabi Shebelli".

The plant environment

The Wabi Shebelle and its tributaries have cut out wide valleys in the gypsum and limestone big detached tabular forms of relief. On these rocky soils vegetation is mainly represented by thickets from 3 to 5 m. high and growing more or less densely though they are never impenetrable. According to the nature of the substratum [gypsum, limestone or sandstone], several floristical varieties may be observed. The trees and shrubs most commonly seen are : Acacia var. sp., Commiphora var. sp., Boscia var. sp., Boswellia rivae Engler, Delonix baccal [chiov] Bak. and D. Elata [Torner] Gamble, Pterolobium stellatum [Forsk.] Chiov. Maerua var. sp., Sesamothamnus rivae Engl., Croton var. sp., Grewia var. sp., Cordia Gharaf [Forsk.] Aschers, Kelleronia splendens Schinz, Jatropha rivae Pax. The undergrowth mainly consists of Acanthaceae [Barleria, Disperma, Anisotes, Dychoriste, Neuracanthus], Malvaceae [Hibiscus, Gossipium, Abutilon] Compositae and Labieceae : therbaceous plants are few and Gramineae grow in very scattered tufts : Chrysopogon aucheri Stapf., Andropogon cyrtocladus Stapf., Chloris sp. and Aristida var. sp. Succulent plants are very few. These thickets constitute grazing areas during the dry season and many traces reveal the movement of cattle.

The groups growing on alluvial or colluvial soils are mostly Gramineae and annual plants. During the rainy season this land is verdant and provides the cattle with good grazing. Unfortunately, some weeks later all vegetation has disappeared and only dust is left.

The vegetation related to the existence of water in the soil is represented by fringing forest, savannahs with Sporobolus helvolus and Acacia var. sp., on the dunes it consists of Suaeda fruticosa, and in the swampy areas of Cyperaceae. Finally, the groups growing on saline soils [Simonium spp., Suaeda cf. verniculata Forsk., Salsola cf. foetida Delile, Atriplex halimus L., ...] are the most interesting plants on permanent pastures.

On the whole, the vegetation seems relatively unvaried and the flora is poor though very original.

The inhabitants

The fertile and irrigable lands of the valley of the Wabi Shebelle are inhabited by a Yerbarre population given to farming and livestock breeding and more or less converted to Islamism. They dwell in big close villages, cultivate sorghum, maize and sesame under irrigation and also raise some livestock such as cattle, goat and sheep. Formerly, shepherds predominated among them.

The latter belong to the Somali ethnical group occupying Somalia, part of the French territory of Afars and Issas, the South of the Ethiopian province of Harrar or Ogaden and the North-Eastern part of Kenya. They represent half a million people in Ethiopia and Kenya. They are ethnically homogeneous and speak a cuchitic language including several dialects.

They mainly practise nomadism on a small scale and raise oxen, thick-tailed sheep, goats, donkeys and horses used to carry their goods. They only move along short distances : when the alluvial plains of the Wabi Shebelle and of its tributaries are dry, the herds are taken to saline soils and among the thickets of the limestone tablelands.

Apart from small villages where some of these people have settled in the vicinity of traders come from other provinces of Ethiopia, Somali people live in family encampments, moving from one to another. These shelters may easily be identified because of the circular thorn bush fencing intended to keep wild animals away.

They usually do not practise cultivation and merely buy sorghum and some other complementary vegetables from the Yerbarre farmers. They keep the Moslem alimentary rules very strictly and it is out of the question for them to eat the flesh of animals which have not been ritually slaughtered, this excluding wild animals as food. Since they consider their herds as their main signs of wealth, livestock is only eaten on very important occasions. Even fish, which abunds in the river, is usually avoided as it "scratches one's throat".

Consequently, meat represents but a very small proportion of the food which is essentially derived from plants [mainly sorghum flour] and from milk. Cows, goats, ewes and she-camels provide milk which is used in various forms [fresh or curds, churned or not, butter]. Most of the household utensils are used to collect and prepare milk. When during the dry season the herds leave the valleys to graze on thickets, the shepherds only sustenance is milk which they either drink directly from the udder or prepared in some way or other. Complementarily, they collect such items as the honey of bees or of Mellipones, plants, etc... This diet is such that at the end of this period and in order to be fit to feed once again mainly on flour, Somali people eat the roots of Jatropha rivae as a purgative.

It is easily understood that in order to sustain himself to Somali nomad must be perfectly acquainted with the environment in which he lives and where he finds all he has.

Names of plants

All the plants we came across have names (*) which I proved to be exact by cross-checking them either several days later or with other people; even small annual plants presenting a very short vegetative cycle are known and have a name.

Abdi Hassan was seldom ignorant of the name of a plant and, as he was particularly trustworthy, he never deceived me. He often know the plant but had forgotten its name, as for instance for an Euphorbia sp. (n° 2970) (**) the name of which was told us by a child and confirmed by an old man. However, he did not know the Velloziaceae (n° 2987) but immediately compared it to n° 2969 which he know though it is somewhat different [n° 2987 : big stiff leaves ; n° 2969 : small leaves curling round tall stems]. Finally, he was ignorant of the name of the Cuscuta sp. (n° 3077), but not of the plant itself since when he was shown a bit of the latter he told me that it climbed up other plants.

(*) These names are not given here since it is difficult if not impossible to write them down otherwise than phonetically. This has only been done for some non-identified plants or as examples.

(**) The numbers correspond to those of the samples collected for the herbarium of the "Laboratoire de Phanérogamie du Muséum National d'Histoire Naturelle de Paris" and for the Botanical Laboratory of the Addis Ababa University.

Several different plants are given the same name but their differences are known even when they are very slight : they are like "the two fingers of a hand" [Indigofera n° 3012 and 3013] Stapf, Cenchrus setigerus Vahl, Tetrapogon spathaceus Desv., Latipes senegalensis Kunth, all of them being small annual plants with a same name like the big perennial plants Echinochloa pyramidalis Hitch. and Chax and Paspalidium geminatum (Forsk) Stapf. which are well differenciated since the seeds of the latter can be collected and eaten. A single name exists for all the various Indigofera plants, not only for n° 3012 and 3013 but also for n° 3034 which greatly differs because of its size. For the Acanthaceae chamephytes which are very numerous in some places, and for Barleria acanthoids Vahl., B. eranthemoids R. Br. ex C.B.Cl., B. Hochstetii Nees, Blepharis ciliares (L.) B.L. Burtt., Ecbalium trisacanthus (Sckw.) C.B.Cl., only one name is given although their specific characteristics are perfectly well known.

For certain groups of plants it seems that, besides the notion of species, a classification exists which might be compared to our subspecific categories. Only a useful plant has a specific name : this is understandable and Abdi Hassan considered it was unnecessary to name a group of Acanthacea which presented no useful character.

Thus the Amharas have just one name for the different species of Acacia and Dicrostachys or succulent Euphorbias and even use that name for other pulpy plants just as French people make a general use of the word "cactus". On the other hand, Somali people give a different name to all these species.

Nevertheless, this is not a general rule since plants looking very different but comparable from the botanical point of view such as Boerhavia n° 3022 and 3023, Phyllanthus n° 3018 and 3020 have different names and their common characteristics are always known even when they have been collected at long time-intervals or at distant and various places.

I noted some interesting cases such as the different names used for the various parts of a plant and presenting no etymological relation : double names like acorn-oak exist but never pear-tree-pear. For instance I can mention the "fruit-tree" for the Commiphora guidottii Chiov. ; the "gum-tree" or "incense-tree" for the Acacia, Commiphora and Boswellia. In all these cases the various parts of the plant represented by a name are used.

The two names given to the Caralluma russelliana (Corub. ex Brongn.) constitute a most peculiar case since one represents the vegetative part and the other the bloom though this plant is not used. However the bloom is remarkable enough to deserve a special name.

The little I could learn concerning the meaning of the names indicated morphological qualities and characteristics : Peucedanum sp. (n° 3210) is called "chan faroth" : or five-fingered because of its leaf thus shaped and Cucumis dispaceus spach. is called "ilguel" or"camel's eye" because of its fruit.

Finally the Somali nomenclature of plants has a mainly utilitarian origin and is very accurate when necessary. The notion of species or group of morphologically identical plants is perfectly clear and their relationship is distinguished with enough accuracy to allow finding there the notion of wider categories.

Following these general remarks I may give the various information I have collected.

Alimentary plants

I understood that everything that could be eaten actually was but that much was collected only to satisfy one's hunger, either because of dearth or because the day seems long alone with a herd and the usual food is monotonous. Nevertheless this gathering or rather this "picking here and there" represents a considerable addition of food even if it does not seem so to Somali people. It is astonishing to see children and grown-ups alike looking for all this foodstuff and eating it on the spot : while we were prospecting, Abdi Hassan kept on picking here and there.

Very few alimentary plants are systematically gathered and they are even more seldom seen in the local markets. The leaves of Amaranthus cf. angustifolius Lam. from the undergrowth of fringing forests are often collected by the women who also cook them to be served with sorghum ; the seeds of Paspalidium geminatum (Forsk) Stapf. are collected and cooked when cereals are lacking.

Fruits :

Zizyphus hamur Engler and Z.mauriciaca Lam. : pulps ;
Grewia div. esp. : pulps and seeds;
Cordia gharaf (Forsk) Aschers : pulps ;
Dobera glabra (Forsk) Juss ex Poiret : pulps ;
Cucumella kelleri (Coq.)C. Jeffrey : the whole fruit ;
Hyphaene thebaica Mart. : pulps ;
Hyanora sp.: inside of the flower and fruit ;
Pterodiscus sp.: fruit ;
Asclepiadacee (n° 3194) : pulps.

Seeds :

Acacia sp. (n° 2976) ;
Sterculia setigera Delile ;
Paspalidium geminatum (Forsk) Stapf.

Leaves :

Ameranthus cf. angustifoliusolam : cooked leaves.
Ind. plant n° 2985 : raw leaves.

Tubers :

Lactuca sp. (n° 2988) : raw ;
Cyperus sp. (n° 3114) : raw or roasted.

Young shoots :

Edithcolea sp. (n° 3075) : raw.

Flowers :

Hydnora sp.

Some of the fruits are really tasty and those of the various Grewias and of Cordia Gharaf (Forsk) Aschers are even delicious. The other fruits may be compared to those picked by children in the French country-side such as hauthorn, dog-rose and blackthorn berries. The pulp generally represents but a small proportion of the fruit otherwise consisting of many big pips except for Hydnora sp. which produces a considerable eatable mass ; although I did not chance to eat the fruit, the stamens and young ovaries tasted as flavourless as a stale apple.

The soft pips of Acacia sp. (n° 2976) constitute a considerable complementary food and apparently the most important one since many of these trees exist, each bearing abundant fruits. They rather taste like raw beans and much better than raw peas and may possibility be more savoury once cooked.

Some fruits could be considered as vegetables, for instance : the Asclepiadacea (n° 3184) which is really very good and should be cultivated, the fruits of Cucumella kelleri (Coq) C. Jeffrey and of Pterodiscus sp. tasting very much like gherkins and cucumbers.

The tubers of Lactua sp. (n° 2988) and Cyperus sp. (n° 3114), in spite of being small, are very tasty ; the young shoots of Edithcolea sp. (n° 3075) are interesting because of the considerable eatable mass produced.

Plants that can be chewed

I have classed in this caterogy a number of elements of the vegetation which are used to delude one's hunger or thirst by chewing them and which present no nutritive value.

Fruit :

Commiphora cf. erlangeriana Engler : pulp pf the green fruit.

Gum and resin :

Acacia sp. (n° 2936) ;

Acacia sp. (n° 2976) ;

Boswellia rivae Engler.

Bark :

Thespesia danis Oliver ;

Acacia sp. (n° 3065) ;

Sterculia setigera Delile.

Wood :

Commiphora guidottii Chiov. ;

Commiphora sp. (n° 2977) ;

Erythrina cf. melanacantha Taub. ex Harms.

These practically tasteless gums and resins are rather like sweets or chewing-gum ; some are used as incense (Boswellia rivae Engler).

Other produces are used to quench one's thiret, for instance the fruit of Commiphora cf. erlangeriana Engler presenting a very unpleasant taste but very efficacious, or the bark of trees otherwise used as binding material and which by the mechanical action of chewing bring about salivation as when chewing some string. The more or less unsavoury liquid contained in the woody part of the young saplings above mentioned, is also extracted by chewing.

I was told that the roots of an undetermined plant ["meri-meri"] were used for infusions.

Last of all, the leaves of halophytes (Suaeda and especially Limonium) are licked because of their pleasant salty taste.

Plants used as medicines

The information provided by Abdi Hassan only belongs to folk-medicine and consists of cures known by all and used everyday. Specialized healers with a wide knowledge of simples practise the method of burns and scarifications used by most nomadic people from the Africa Horn to Mauritania.

Abutilon sp. (n° 2942) : bark applied or ingested to heal snake bites;

Euphorbia sp. (n° 2971) : healing of wounds by applying latex ;

Jatropha rivae Pax : root mixed with milk as a purgative after the milk diet of shepherds ;

Aloe div. esp. : leaf juice.

- 1st species : - to heal sore eyes ;
  - mixed with milk against impaludism ;
- 2nd species : - applied to heal skin diseases ;

undetermined plant no sample of which could be taken ("tire") : crushed root mixed with sorghum flour to cure urinary retention and kidney trouble ;

root used to make an infusion to cure chills.

Plants used for veterinary medicine

- Cadaba glandulosa Fork : crushed leaves used to heal the wounds of animals, in particular hyena bites ;

undetermined plant (n° 3074) : root to increase lactation ;

"tire" (see further above) : peeled root put in the vulvas of milch animals when they refuse to give milk.

Plants used to make necessary articles and tools

Numerous plants are used to make various items since all the articles needed by Somali people have their origin in the environment. Some utilizations are particularly characteristic.

The hemispheric dwelling consists of wooden arches supporting Chloris sp. (n° 3093) mats and thickly fenced in, in the lower part, by stalks of Andropogon cyrtocladus Stapf. This plant growing on limestone tablelands is supplied by a small local trade, five bunches being sold at market for 3,50 Ethiopian dollars (approximately 7 French Francs).

- Cattle bells : body made of Delonix elata (Torner) Gamble and the batter of Cordia gharaf (Forsk) Achers and Thespesia danis Oliv. ;

- Milk-jugs : - matted root-bark of Asparagus sp. (n° 3217) the inside made waterproof with clotted blood ;
  - wood of Erythrina cf. melanacantha Taub. ex Harms, Commiphora sp. (n° 2977) and C. guidottii Chiov.

- Benches : Commiphora sp. (n° 2977).

- Mortars : Dobera glabra (Forsk.) Juss. ex Poiret ;

- Pestles : Pterolobium stellatum (Forsk.) Chiov. ;

- Wicker-work : Hyphaene thebaica Mart. also used (wood) for building.

The "furniture" of a Somali household is very limited and mainly consists of utensils used to collect, cook and preserve milk products, for instance wooden milk-pots or receptables made of basketwork or wood to carry things, leather bottles to keep butter. One may also add a pestle, a mortar, a winnowing-basket to prepare sorghum, some small benches, various baskets, mats and pots to carry water in. All these items as well as the house mats are loaded on a few camels and donkeys when the family moves to another pasture land.

Other articles may also be mentioned such as :

- mattress : bloom of Aerva lanata (L.) Juss. ex Schult ;

- outdoor mattress to spend the night in the field : Chrysopogon aucheri Stapf.;

- Binding material : bark of Thespesia danis Oliv., Acacia sp. (n° 3065), Sterculia setifera Delile and fibres of Sanseviera sp.

Various utilizations

- Soap : Mormodica spinosa (Gilg.) Chiov. and an undetermined plant: "gassangass" n° 3071 ;

- Nail dye : purple petals of Senra zoes Schwfth. and Valkeres ;

- "Tooth-Brushes" : boughs from Salvadora persica L. ;

- Weaning of new-born babies : Euphorbia latex ;
  Amharas are horrified by this process and use aloe leaves ;

- Asparagus roots to obtain milk curds ;

- Guice from the leaves of a species of Aloe mixed with meat to poison animals.

Fire is made by rubbing sticks according to the universally known method ; the wood generally used is mainly Commiphora and Dobera glabra (Forsk.) Juss. ex Poiret.

Incense

Gums, sweet-smelling resins, incense, myrrh, oliban, etc. constitute a very active source of trading both in Ethiopia (since the Coptic religion uses a large quantity of these products) and in foreign countries. The main producing regions are Erythrea and Ogaden. The trees as well as the produces collected have different Somali names and the Amharas know other names for these various and more or less appreciated categories of incense.

The trees producing incense are Burseraceae ; among the many existent species ; I saw : Boswellia carteri Birdw., B. rivae Engler, Commiphora boiviniana Engler, C. crenulata (Terracc.) Chiov., C. guidottii Chiov...., and several undetermined species.

Finally, I may mention some plants considered as the best for livestock : Tetrapogon spathaceus Desv., Enneapogon elegans (Nees ex Stend) Stapf., Cenchrus setigerus Vahl., Latipes senegalensis Kunth., Grewia div. esp., Suaeda fruticosa Forks., Cadaba glandulosa Forsk., Limoniumm cylindrifolium (Forsk. Verdcourt), Suaeda cf. verniculata Forsk., Cymbopogon sp.(n° 3207)...

These few notes taken incidentally made me better acquainted with the vegetative environment which I was to study and which I scarcely know before. Although they seem very fragmentary, they show how well acquainted the shepherds are of what nature has to give them.

Acknowledgements

Particular mention must be made of Abdi Hassan and his friends for their obligingness, assistance and knowledge. I am also grateful to the Ethiopian who accompanied me and to the botanists of the "Laboratoire de Phanérogamie du Muséum National d'Histoire Naturelle de Paris" and especially to Madame M. Keraudren - Aymonin, Monsieur H. Heine and Monsieur H. Jacques Felix who assisted me so efficiently in the task of determining the samples collected.

I am also very grateful to Monsieur P. Ruais from B.C.E.O.M. who permitted the editing of these documents.

ANNEX II

April 3rd 1972

Note concerning : the creation of a National Park and of a wild game reserve in the Basin of the Wabi Schebelle (see map at 1/1 000 000 included herein).

1) National Park :

- We suggest selecting an area of approximately 3 200 km2 located 70 kms to the South-East of Dire Dawa and 20 kms to the East of Harar since both these towns are equipped with some hotels and may easily be reached from the international airport of Dire Dawa or by the National Road linking them to Addis Ababa.

The limits of the Park would be :

. To the North, the Conduro mountains limiting the basin by a range of peaks over 2 500 m high ;

. To the East, the Fafan river along 100 kms, from its source down to the Galalchia region ;

. To the West, the Errer river from its source down to the Midagalola region - along 80 kms ;

. To the South, along a line linking the Errer to the Fafan at a level with Midagalola (latitude 8° 45').

On this territory, elephants forming herds of at least 100 animals already exist as well as lions, leopards, various species of gazelles, dikdiks, great kudus, oryxes, foxes, jackals, porcupines, cheetahs, bush-pigs, various birds, a large variety of small mammals, many different types of monkeys (mainly cynocephaluses) as well as hyenas some of which are semi-domesticated and constitute night attractions near Harar.

2° Game reserve :

- The lower valley of the Wabi Shebelle is particularly abundant in all kinds of animals, mainly gazelles, water-bucks, crocodiles, hippopotamuses, oryxes, jackals, cynocephaluses and other monkeys, ostriches, bush-pigs, hares, dikdiks and all species of small mammals. Besides, lions may frequently be observed, to the North of Imi and near the Madiso tributary as well as leopards and cheetahs some wild donkeys on the right bank at the level of El Kere and giraffes between El Kere and Godere.

- Bearing in mind the hydroagricultural installations planned and the development of Gode town we suggest that the reserve should be limited 55 kms to the West of that town by the temporary rivers Lac-Dima and Baowa, the former flowing from El Kere and the latter from Danan.

- To the South and West, the reserve would be limited by the ridge of the basin between El Kere and Ghinir along 200 kms.

- To the North it would be limited by the Dare-Ledi river, the junction of the Daketa with the Wabi Shebelle and the Gensalle tributary down to Dukun.

- To the North-East it would be limited by the Dukun- Danan track.

- The whole area would form a rectangle 280 kms long and 140 m wide, the Wabi Shebelle flowing along 220 kms in the middle part - This zone is weakly populated with approximately 7 000 sedentary persons near the village of Imi and 7 500 nomads downstream from this same village ; furthermore, this zone presents many various forms of relief and of vegetation from 300 m to 1 200 m altitude as well as a considerably large pattern of temporary rivers and rivers joining the perennial Wabi Shebelle river.

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IMPERIAL ETHIOPIAN GOVERNMENT

NATIONAL WATER RESOURCES COMMISSION

ETHIOPIA - FRANCE COOPERATIVE PROGRAM

WABI SHEBELLE SURVEY

IN COLLABORATION WITH

FRENCH MINISTRY OF FOREIGN AFFAIRS

NATIONAL WATER RESOURCES COMMISSION

BCEOM-ORSTOM-EDF IGN-BDPA

VI

VEGETATION DRAFT

ESQUISSE DE LA VÉGÉTATION

JANUARY 1974

ORSTOM

IGN

LEGEND

HIGH ALTITUDE *HAUTES ALTITUDES (>1700 m)*

- *Alchemilla* spp. belt / *Etage à Alchemilla spp.*
- ERICACEAE belt / *Etage à ERICACEES*
- *Juniperus procera* and *Podocarpus gracilior* belt / *Etage à Juniperus procera et Podocarpus gracilior*
- Forest / *Forêt*
- Cultivated zone / *Zone cultivée*
- *Croton macrostachys* and *Cordia abyssinica* belt / *Etage à Croton macrostachys et Cordia abyssinica*
- *Terminalia brownii* facies / *Faciès à Terminalia brownii*
- altitude 1700 m / *altitude 1700 m*

MEDIUM AND LOWER ALTITUDE *MOYENNES ET BASSES ALTITUDES (<1700 m)*

- *Acacia* spp. zone / *Zone à Acacia spp.*
- *Acacia* spp. and *Commiphora* spp. zone / *Zone à Acacia spp. et Commiphora spp.*
- *Boscia minimifolia* and *Delonix elata* thicket / *Fourré à Boscia minimifolia et Delonix elata*
- *Boswellia* spp. and *Jatropha rivae* thicket / *Fourré à Boswellia spp. et Jatropha rivae*
- *Commiphora* sp. and *Andropogon cyrtocladus* thicket / *Fourré à Commiphora sp. et Andropogon cyrtocladus*
- *Gardeniae* ind. and *Cordia gharaf* thicket / *Fourré à Gardeniae ind. et Cordia gharaf*
- Halophyte steppe / *Steppes à halophytes*
- Grass communities / *Groupements graminéens*

- International boundary / *Limite d'état*
- Provincial boundary / *Limite de province*
- Boundary of study / *Limite de l'étude*
- HARAR — Provincial capital / *Chef-lieu de province*
- GODE — Sub-provincial capital / *Chef-lieu de sous-province*
- Duhun — District capital / *Chef-lieu de district*
- Dagal — Village / *Village*
- Buloye — Well / *Puits*
- Permanent water course / *Cours d'eau permanent*
- Intermittent water course / *Cours d'eau intermittent*
- Main road / *Route principale*
- Secondary road / *Route secondaire*
- Main trail / *Piste principale*
- Secondary trail / *Piste secondaire*
- Landing field / *Terrain d'atterrissage*
- Lake / *Lac*

Botanic reconnoissance mission undertaken from May to July 1970.
Mission de reconnaissance botanique effectuée de Mai à Juillet 1970.

This map has been established by J.L. GUILLAUMET (ORSTOM)

Cette carte a été dressée par J.-L. GUILLAUMET (ORSTOM)

SCALE 1:1000000

M 10 5 0 10 20 30 40 50 Miles

10 5 0 10 20 30 40 50 Km

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S O M A L I A

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VI

MAP OF WILD LIFE

Proposed National Park & Wild Life Reserve

APRIL 1972

BCEOM

ETHIOPIA

WABI SHEBELLE BASIN

Scale 1 1 000 000

FOUGNAMBIRA NATIONAL PARK

IMI WILD LIFE RESERVE

Limits of National Park and Wild Life Reserve

(A) ELEPHANT
(B) GIRAFF
(C) LION
(D) LEOPARD
(E) JACKAL
(F) SPEKES GAZELLE
(G) PHILIPS DIK DIK
(H) GERENUK
(I) HIPPOPOTAMUS
(J) CROCODILE
(K) GREATER KUDU
(L) BABOON
(M) WILD ASS
(N) SOEMMERING GAZELLE
(O) ORYX
(P) FOX
(Q) OSTRICH
(R) PORCUPINE
(S) BLUE MONKEY
(T) BUSHPIG
(U) SPOTTED HYAENA
(V) CHEETAH
(W) HARE
(X) WATER BUCK
(Y) HUNTING DOG
(Z) VARIOUS BIRDS

S O M A L I A