

THE VEGETATION OF DANGS DISTRICT IN GUJERAT

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A B S T R A C T

The Dangs district is situated between 20°30' and 21°5' N and 73°15' and 74° E. The whole district is mountainous.

The forests are generally dry deciduous, though, in protected and moister spots moist- and mixed-deciduous types also are found. *Tectona-Terminalia* is the dominant tree community. Their associated common tree species are *Adina cordifolia* Hook. f., *Anogeissus latifolia* Wall., *Dalbergia latifolia* Roxb., *Garuga pinnata* Roxb., *Lagerstroemia* species, *Lannea coromandelica* (Hout.) Merr. and *Ougeinia oojeinensis* (Roxb.) Hochr. *Wrightia tinctoria* Br. is abundant as an understorey tree. *Bambusa arundinacea* Retz. and *Dendrocalamus strictus* Nees are common.

The vegetation has been studied by quadrats at different forest sites, namely Bandripada, Billaya, Chikarda, Chikarmatibari, Dhavlidhar, Dholeambar, Ghadvi, Ghogli, Kotbha, Laochali, Mahal, Mulchond, Pimpri, Piplemar, Piplimal, Raiwad, Shivbara, Susarda and Waghai. Relationship of vegetation with habitat features has been discussed. Reference has been made to species useful for timber, minor forest produce and medicinal value.

INTRODUCTION

The Dangs district in Gujarat state is situated approximately between 20°30' and 21°5' N and 73°15' and 74° E. The district headquarter is at Ahwa, a small town about 100 km east of Billimora station on Bombay-Ahmedabad railway line. A narrow-gauge branch-line also runs from Billimora to Waghai. Ahwa is 30 km from Waghai. Billimora-Ahwa-Subir is the only satisfactory motorable road in the district. Fair-weather roads connect Ahwa with several smaller towns in all directions.

Till a few years ago the district was a very backward and underdeveloped area. The population of the district is about 30,000 of which Ahwa alone has about 4000 people. Great water scarcity and consequent absence of industries are said to be the causes of such thin habitation. After independence, due to the efforts of the State government and local officers, multipurpose development programmes have been started.

The area of the district is about 1700 square km out of which over 1550 sq. km is under forests, that is, excepting the precipitous slopes and areas under habitation the entire district is under forest. The District Forest Officer used to be the Political Agent with all executive powers of a District Magistrate. This shows the dominant role which forests play in the administration of the district. The forest revenue is the back-bone of the district development programme. Dangs is classed as the second best teak area in western India, second only to Dandelli in North Kanara. The sawmill and timber depot at Waghai are an important asset to the revenue of the state. Dangs is inhabited by tribal people, whose main source of livelihood is from forest product of one description or other. Due to scarcity and irregularity in supply of water, agriculture is poor and only limited.

The district is botanically very rich. A large num-

ber of medicinal plants grow here and many more can be grown profitably. Cottage industries and occupations based on forest products, such as basketry, beekeeping and systematic collection of minor forest products are now being popularized and organized in the district.

For better utilization of all forest products, proper botanical exploration and knowledge of the vegetation is essential and a closer study of the vegetation of this district was, therefore, considered useful.

PREVIOUS WORK

The district did not receive much attention from botanical explorers till about a decade ago. Dalzell and Gibson (1861) were probably the earliest botanical explorers of this area and their collections are referred in a few instances by Hooker (1897) and Cooke (1908). Saxton and Sedgwick (1918) made collections in northern Gujarat. Santapau (1955) made botanical collections in the region Billimora to Waghai in 1953 and 1954, and published a list of 475 plants. The area dealt in this work lies chiefly west of Waghai.

The present study of the vegetation of this district was started in 1958.

TOPOGRAPHY

The whole of the Dangs district is hilly; the four rivers, Gira, Purnea, Khapri and Ambika, are almost perennial and their riverbeds are deep and rocky. Their tributaries are seasonal and generally dry up after the rains. The four main rivers and their tributaries cut the country into a number of deep more or less valleys irregularly in various directions. The slopes towards the eastern part of the district are more steep, with hills up to about 1000 m high, they gradually merge into the plains of Gujarat on the western coast, the altitude in western part being about 100 m only. Ahwa and Malegaon are about 500 m above sea-level.

GEOLOGY AND SOIL

The main rock system in the Dangs is the Deccan trap; it varies in texture at different places. The horizontal strata of the trap are conspicuous on precipitous slopes and on hill crests. In plain areas and in valleys the trap rocks form deep, red soils. Accumulation of leaf-debris of teak, bamboo and other deciduous plants renders the soil blackish or brownish and fertile—the 'Regurs'. The flat tops, plateaus and upper slopes have shallow soil. Shifting cultivation has caused denudation of soil in these areas.

The fertile 'Regur' soils dry up during winters and summers, and crack forming wide fissures; during the rains, however, they become very soft and adhesive.

CLIMATE

The rainfall occurs chiefly from June to September, the average annual rainfall being about 2100 mm.

The temperature touches minimum during January when it comes to approximately 7.2°C. The mercury stays high during April, May and June when it touches about 44.5°C (Santapau loc. cit.)

VEGETATION

Botanical collections were made in several parts of the district, representing various vegetation types; about a thousand plant specimens were collected in different seasons. Spot identification was done as far as possible. Ample field notes and photographs supplemented the collections. The plants were processed in the camp and finally identified at Poona Herbarium, and some with the help of the Central National Herbarium, Calcutta.

The vegetation was studied in quadrats (of 5 m radius), usually laid in straight transects. Actual number of trees, shrubs and climbers falling within the quadrats was noted. The percentage of quadrats in which different species were recorded is shown in Table. The numbers in brackets in the Table pertain to saplings of those species.

Most of the forest staff and local people know plants by their local names. Familiarity with local names of the area under study greatly helps in field work. Particularly, when plants are not in flower and fruit or even leaf and a botanist is at his wits end, the local staff can usually help with the vernacular name.

Appendix I gives a list of 133 forest species of Dangs along with their available local names.

The vegetation was studied at twenty-five different forest sites in the district. The data are summarised in Table. The general account of forest vegetation of Dangs as a whole is first given, followed by short account and specific features of vegetation at the different forest sites.

The chief vegetation type in Dangs is the dry-or

sometimes moist-deciduous type. At some moist spots in riverain areas and valleys evergreen species are also present giving these forests an appearance of mixed deciduous type.

The Forest Department has been raising species of *Tectona*, *Terminalia*, *Adina*, *Dalbergia*, etc. in several parts of the district for last over eighty years and today, *Tectona grandis* Linn. f.—*Terminalia crenulata* Roth community is the dominant community in Dangs. Its commonest associates are *Adina cordifolia* Hook. f., *Dalbergia latifolia* Roxb., *Garuga pinnata* Roxb., *Lannea coromandelica* Merr., *Mitragyna parvifolia* Korth., *Ougeinia oojenensis* Hochr., and less frequently *Acacia chundra* Willd., *Butea monosperma* Taub., *Diospyros melanoxylon* Roxb., *Erythrina suberosa* Roxb., *Grewia tilaefolia* Vahl, *Kydia calycina* Roxb., *Lagerstroemia lanceolata* Wall., *Schleichera oleosa* (Lour.) Oken and *Terminalia bellirica* Roxb.; *Wrightia tinctoria* Br. is the most abundant tree in lower storey and is present in almost all forests studied.

In dense forests the trees form two or three storeys. The middle storey is formed in moist valleys only.

The top canopy is formed by trees of *Acacia chundra* Willd., *Adina cordifolia* Hook. f., *Albizia lebbbeck* Benth., *A. procera* Benth., *Bridelia squamosa* (Lam.) Gehr., *Dalbergia lanceolaria* Linn. f., *D. latifolia* Roxb., *Diospyros melanoxylon* Roxb., *Garuga pinnata* Roxb., *Lagerstroemia lanceolata* Wall., *L. parviflora* Roxb., *Lannea coromandelica* Merr., *Miliusa tomentosa* J. Sinclair, *Mitragyna parvifolia* Korth., *Ougeinia oojenensis* Hochr., *Pterocarpus marsupium* Roxb., *Salmalia malabarica* Schott. & Endl., *Stereospermum personatum* Chatter., *Syzygium cumini* Skeels, *Tectona grandis* Linn. f., *Terminalia arjuna* Wight & Arn. and *T. crenulata* Roth.

The second storey, wherever present, and the low stature forests are formed by small medium-sized trees such as *Aegle marmelos* Corr., *Bauhinia purpurea* Linn., *Boswellia serrata* Roxb., *Butea monosperma* Taub., *Careya arborea* Roxb., *Cassia fistula* Linn., *Elaeodendron glaucum* Pers., *Emblia officinalis* Gaertn., *Grewia tilaefolia* Vahl, *Heterophragma quadriloculare* Schum., *Holoptelea integrifolia* Planch., *Kydia calycina* Roxb., *Madhuca indica* Gmel., *Oroxylum indicum* Vent., *Schleichera oleosa* Oken, and *Spondias pinnata* Kurz.

The understorey is formed of yet smaller trees such as *Bauhinia racemosa* Lam., *Casearia elliptica* Willd. (syn. *C. tomentosa* Roxb.), *Gardenia resinifera* Roth, *Mallotus philippensis* Muell.-Arg., *Morinda tinctoria* Roxb., *Wrightia tinctoria* R. Br., *W. tomentosa* Roem. & Schult., *Zizyphus mauritiana* Lam. and *Z. glaberrima* Santapau.

The commonest climbers and scandent shrubs are *Abrus precatorius* Linn., *Acacia torta* Craib, *Butea parviflora* Roxb., *Cissus repanda* Vahl, *Coc-*

culus hirsutus Diels, *Combretum ovalifolium* Roxb., *Milletia racemosa* Benth., *Mucuna prurita* Hook., *Teramnus labialis* Spr., *Tinospora cordifolia* Miers, *Ventilago calyculata* Tul. and *Zizyphus rugosa* Lam.

Three bamboo species are found in Dangs, namely, *Bambusa arundinacea* Retz., *Dendrocalamus strictus* Nees and *Oxytenanthera monostigma* Bedd. The bamboos are common in the moist valleys. *Bambusa arundinacea* Retz. forms the top canopy in moist localities with deep clayey, black soils.

The undergrowth is formed of shrubs like *Calycopteris floribunda* Lam., *Carissa congesta* Wight, *Carvia collosa* Brem., *Desmodium* spp., *Flacourtia indica* Merr., *Maytenus senegalensis* (Lamk.) Exell. (syn. *Gymnosporia spinosa* Fiori), *Helicteres isora* Linn., *Holarrhiza antidysenterica* Wall., *Leea indica* Merr. and *Woodfordia fruticosa* Kurz. *Sorghum halepense* Pers. is present in dense clumps in some moister spots.

The herbaceous flora varies from season to season. After the rains, there is dense growth of herbs and ferns, which dries out by November-December.

RELATIONSHIP WITH HABITAT FEATURES

Some tree species indicate preference for certain habitats, e.g. *Albizia procera* Benth., *Lannea coromandelica* Merr., *Pongamia pinnata* Pierre, *Syzygium cumini* Skeels and *Terminalia crenulata* Roth prefer moister localities, and in riverain areas *Pongamia pinnata* Pierre attains large height. These species are less frequent on shallow soils at tops of hills. *Acacia ferruginea* DC., *Anogeissus latifolia* Wall., *Boswellia serrata* Roxb., *Ougeinia oojeinensis* Hochr. and *Sterculia urens* Roxb. are more common on shallower soils at upper slopes and tops of hills.

Emblica officinalis Gaertn. is common on middle and upper slopes. *Garuga pinnata* Roxb. and *Schleichera oleosa* Oken are commoner on lower slopes of hills though they are also found on middle and upper slopes and on tops. *Carvia callosa* Brem., *Helicteres isora* Linn. and *Wrightia tinctoria* R. Br. are more common on middle and upper parts of slopes than on lower ones; whereas *Casearia elliptica* Willd. and *Xeromphis* species were observed more on lower slopes, plains and in valleys. An examination of the occurrence of various tree and shrub species on the different slopes and plain areas suggests that most of the species do not have any very distinct correlation with aspect of slope, yet, in few instances some species do seem to indicate preference for certain aspects. *Acacia chundra* Willd., *Bambusa arundinacea* Retz., *Butea monosperma* Taub., *Casearia elliptica* Willd., *Dalbergia* sp., *Lagerstroemia* species and *Pongamia pinnata* Pierre are more common on level plain areas such as at Piplimal, Raiwad and Waghai. *Terminalia bellirica* Roxb. too is

common on plain areas, particularly its regeneration was found more abundant on plain areas than on steeper slopes.

Erythrina suberosa Roxb. and *Garuga pinnata* Roxb. were observed to be more common on western and north-western aspects such as at Bandripada, Dholeambar, Ghogli, Laochali and Susarda.

Kydia calycina Roxb. and *Ougeinia oojeinensis* Hochr. were frequently found on eastern and north-eastern aspects such as at Billaya, Dhavli-dhar, Mahal and Mulchond. *Adina cordifolia* Hook. f. was seen to be common on some northern and north-eastern aspects as at Chikarda and Mulchond.

Almost all forests in Dangs belong to the state and are, therefore, now subjected to limited biotic interference. Shifting cultivation, felling and lopping for fuel and browsing in past have, however, considerably retarded the development of many of these forests. Many forests are now protected forests, others are reserved giving restricted rights to inhabitants. Difference in degree of biotic interference brings about noticeable differences in vegetation.

In view of this relationship of vegetation with habitat features, the plant communities at the different habitat sites are not quite uniform, and though within the general scope of vegetation type described above, they show some distinct features. These features are briefly described below.

Bandripada: This forest is situated at about 3 km west of Ahwa. The Bandripada nala runs on the steep western slope making small falls. The soil is alluvial near base and gravelly, greyish brown above. A reserved forest on western slope was studied. The slope is rather steep. The vegetation was studied from base of the nala to the top of the plateau. *Terminalia crenulata* Roth, *Trema orientalis* Blume and *Syzygium cumini* Skeels were noticed only on foot of the hill in valley. *Anogeissus latifolia* Wall., *Garuga pinnata* Roxb. and *Tectona grandis* Linn. f. are common on middle and upper slopes. *Dendrocalamus strictus* Nees and *Wrightia tinctoria* R. Br. form the second storey on the slopes. Small clumps of *Dendrocalamus* are common all over. Trees of *Dillenia pentagyna* Roxb. are occasionally seen.

Billaya Hill: This is the highest peak, near Waghai, about 6 km north-east of Waghai town. Its altitude is about 370 m. This is a reserved forest area. The two slopes of the hill were studied. The eastern slope towards the river Khapri is rather gradual. Its soil is gravelly, coarse, reddish brown. The western slope is steep (leading down to the village Dungarda or Jharia) and has greyish or dark brown gravelly soil, usually shallow, deep at few places. The top of the hill has reddish brown, less decomposed shallow soil. Though it is a reserved forest, yet, access of cattle and human hand

is frequently seen, particularly on western slope which is nearer to cultivated fields and habitation of the village. The forest has many old and dead trees and bamboo clumps.

The vegetation on both slopes is rather sparse with very open canopy. Teak is abundant. Other common trees on the hill are *Anogeissus latifolia* Wall., *Diospyros melanoxylon* Roxb., *Grewia tilaefolia* Vahl, *Lannea coromandelica* Merr., *Ougeinia oojainensis* Hochr. and *Terminalia crenulata* Roth. *Dendrocalamus strictus* Nees is common. *Bambusa arundinacea* Retz. clumps are present on lower slopes and near nala. Trees of *Lannea coromandelica* Merr. and *Schleichera oleosa* Oken were seen only on western slope. *Wrightia tinctoria* R. Br. is abundant on both slopes but more on the top and on the western slope. Commonest shrub is *Helicteres isora* Linn. *Carvia callosa* Brem. is present nearer the top.

Trees of *Buchanania lanzan* Spr., *Cassia fistula* Linn., *Cordia dichotoma* Forsk. f., *Kydia calycina* Roxb., *Madhuca indica* Gmel., *Mitragyna parvifolia* Korth., *Salmaal malabarica* Schott. & Endl. and *Soymida febrifuga* Juss. were observed on this hill but incidentally did not fall within any quadrat. Shrubs of *Homonium riparia* Lour. are present in the dry bed of Khapri river.

Chikarda : This is a reserved forest area near Waghai. The area is almost level ground slightly sloping north. The dominant community is the *Tectona grandis*-*Terminalia crenulata* Roth community. Trees of *Adina cordifolia* Hook. f. and *Ougeinia oojainensis* Hochr. are commonly seen. The commonest shrubs are *Casearia*, *Helicteres* and *Holarrhena*.

Chikarmatibari : This forest is near Subir. The north-east aspect of the hill above the nala was studied. *Terminalia* is not very common in this Teak forest. *Anogeissus latifolia* Wall. and *Garuga pinnata* Roxb. are common all over the hill. The undergrowth is formed chiefly by *Carvia callosa* Brem., *Helicteres isora* Linn., *Sorghum halepense* Pers. and *Wrightia tinctoria* R. Br.

Dhavlidhar : It is a small hill about 12 km north-east of Ahwa. An eastern slope was studied. The soil is greyish and shallow ; rock boulders are visible. The forest is open to various agencies of interference. *Anogeissus latifolia* Wall., *Tectona grandis* Linn. f., *Terminalia crenulata* Roth and *Wrightia tinctoria* R. Br. are the more conspicuous species. *Lannea coromandelica* Merr. and *Ougeinia oojainensis* Hochr. occur in small numbers in upper parts of the hill slopes.

Dholeambar : These forests are situated about 6 km south-east of Subir. A western slope was studied. Trees of *Garuga pinnata* Roxb., *Wrightia tinctoria* R. Br. and *Tectona grandis* Linn. are most common. *Terminalia* is less frequent. The under-

growth is chiefly of *Carvia callosa* Brem. and *Helicteres isora* Linn.

Ghadvi : These are protected forests situated at about 16 km north of Ahwa. The vegetation was studied on a gentle south-west slope along the bank of Sukumal nala. The soil is gravelly but deep. Browsing and lopping are seen occasionally. The commonest plants here are Teak, *Terminalia* and *Wrightia*. Trees of *Albizia* sp., *Anogeissus latifolia* Wall., *Bauhinia racemosa* Lam., *Diospyros melanoxylon* Roxb., *Emblia officinalis* Gaertn., *Erythrina variegata* L. var. *orientalis* Merr., *Ficus* sp., *Grewia tilaefolia* Vahl, *Mitragyna parvifolia* Korth and *Ougeinia oojainensis* Hochr. were also observed here. *Helicteres isora* Linn. bushes were common in undergrowth.

Ghogli forest : The area is situated about 3 km west of Ahwa. It is a reserved forest and is of dry deciduous type. There is no clear demarcation into first and second storey tree growth here. Teak is the dominant tree species. Its commonest associates are *Anogeissus latifolia* Wall., *Erythrina suberosa* Roxb., *Garuga pinnata* Roxb., *Lannea coromandelica* Merr., *Ougeinia oojainensis* Hochr. and *Terminalia crenulata* Roth. These trees are usually very robust here. *Casearia elliptica* Willd., *Helicteres isora* Linn., *Xeromphis spinosa* (Thunb.) Keay (syn. *Randia brandisii* Gamble), *Wrightia tinctoria* R. Br. and *Zizyphus* sp. are chief species in undergrowth. *Milletia racemosa* Benth. is a common climber. The ground is covered with saplings of bamboos, and a number of herbs and grasses. *Apluda* and *Haplanthus* are common in summers. Two slopes, one a gentle eastern and other a steep western slope, were studied. The soil on both is greyish brown and coarse. A comparison of the two slopes shows that there is no conspicuous difference in the percentage occurrence of the chief constituents of vegetation. *Holarrhena antidysenterica* Wall. and *Mitragyna parvifolia* Korth. were observed chiefly on western slope.

Kotbha : These forests are situated at about 12 km north of Ahwa, and are protected forests. The area is almost plain and the soil is blackish and deep clayey. *Wrightia* is very common in the undergrowth of *Tectona*-*Terminalia* forest. Regeneration of *Tectona*, *Terminalia bellirica* Roxb., *T. crenulata* Roth, *Lagerstroemia* and *Anogeissus* is observed.

Laochali : It is situated 20 km north of Ahwa on the bank of river Purnea. The hill slope from the Rest House to the valley is protected area, it is the northern aspect. The soil is deep and dark brown. There is dense undergrowth and humus on the ground. *Tectona* and *Wrightia* are commonest species. After rainy season the climber *Milletia* and shrubs of *Leea indica* Merr., *L. macrophylla* Roxb., *Helicteres isora* Linn. and species of *Ari-*

saema, *Curcuma* and *Desmodium* make dense, almost impenetrable ground cover.

One western slope from river Purnea to the hill top was studied. The soil is greyish brown on slope, shallow and reddish near base. Vegetation is disturbed due to proximity of the river where men and their cattle come for bath, etc. The flat top, into which this slope leads, is under agriculture. *Tectona*, *Anogeissus*, *Garuga* and *Terminalia* are commonest tree species. *Wrightia tinctoria* R. Br. and *Helicteres isora* Linn. are abundant in lower storey, the former being more common near base of the slope and the latter towards upper parts of the slope. Among other tree species noticed here a few may be mentioned: *Acacia chundra* Willd., *Butea monosperma* Taub., *Emblica officinalis* Gaertn., *Ougeinia oojeinensis* Hochr. and *Schrebera swietenoides* Roxb.

Mahal: Mahal is situated about 30 km north of Ahwa. The forests are reserved and are said to be one of the best in Dangs. Large areas are covered with *Bambusa arundinacea* Retz. which usually occupies lower parts of slopes with deep, moist and rich alluvial soil. From distance the pale yellow clumps are a conspicuous sight. It was observed in profuse flowering in June 1958. The vegetation along the river Purnea is rich. Shrubs of *Homonium riparia* Lour., *Securinega virosa* Pax & Hoffm. and *Syzygium cumini* Skeels and trees of *Ficus* species and *Pongamia pinnata* Pierre are seen along the bank.

One transect was laid about 3 km from Mahal on Bandripada road from top of a hill going down on eastern slope into the valley and up on western slope to the top of another hill. The soil is blackish, coarse. The vegetation here comprises chiefly bamboos. *Dendrocalamus strictus* Nees occurs all over the hills. Unlike other hills, Teak and *Terminalia* are very abundant. Teak plantation has been undertaken on these hills. *Mitragyna parvifolia* Korth. is common on eastern slope, but not observed on the western slope here. *Mellettia racemosa* Benth. climbs on a number of trees, bends them, strangulates them, and often finishes them.

Mulchond: This is a protected forest area near Ahwa on way to Pimpri; the forest is of dry deciduous type. A northern slope was studied. The soil is brown, gravelly with considerable humus. *Adina cordifolia* Hook. f., *Ougeinia oojeinensis* Hochr. and *Terminalia crenulata* Roth are commonest associates of teak. *Helicteres isora* Linn., *Holarrhena antidysenterica* Wall., *Leea macrophylla* Roxb. and *Xeromphis* sp. are common in undergrowth. *Dioscoreas* are frequently met.

Pimpri: This forest, on a western slope about 18 km west of Ahwa, is a protected forest and is densely wooded; the dominant community is

Tectona-Terminalia. Trees of *Garuga pinnata* Roxb. and *Wrightia tinctoria* R. Br. also are common. The undergrowth is same as at Mulchond.

Piplemar-Chankal: Chankal is a reserved forest about 10 km north-east of Ahwa. Vegetation on a northern slope was studied. The soil is blackish with lots of pebbles. *Garuga pinnata* Roxb. and *Ougeinia oojeinensis* Hochr. are commonest associates of teak here. *Terminalia* trees are fewer. Very tall trees of *Garuga pinnata* Roxb. occur near nala. The undergrowth is dense and plants of *Casearia elliptica* Willd., *Helicteres isora* Linn., *Holarrhena antidysenterica* Wall. and *Milletia racemosa* Benth. are very common. *Adiantum* is abundant in ground cover.

Piplimal: This is a dense reserved forest area along Dhaudiya nala 15 km north-east of Ahwa; here the riverain vegetation was studied. The soil is washed away by the nala and is shallow with large boulders. The forest is of moist deciduous type. *Acacia chundra* Willd., *Butea monosperma* Taub. and *Pongamia pinnata* Pierre trees are common. *Holarrhena antidysenterica* Wall. and *Celastrus paniculata* Willd. occur in the undergrowth.

Raiwad: This is almost a plain level area about 4 km east of Waghai, along the bank of river Khapri. There are slightly raised mounds of earth within the area. The soil is deep reddish brown or chocolate coloured, alluvial and rich in humus. This is a reserved forest and its general appearance is of a mixed evergreen type. The first storey trees are tall forming a dense canopy. Climbers are frequent. Trees of *Ficus* species, *Mangifera indica* Linn. and *Pongamia pinnata* Pierre are present with *Tectona* and *Terminalia* trees. Among other trees observed in this area mention may be made of *Acacia chundra* Willd., *Dalbergia latifolia* Roxb., *Mitragyna parvifolia* Korth., *Miliusa tomentosa* J. Sinclair and *Supindus emarginatus* Vahl. *Wrightia tinctoria* R. Br. is abundant in understory. The clumps of *Bambusa arundinacea* Retz. are present all over, chiefly along the nala and on foot hill. *Butea* sp., *Combretum* sp., *Dalbergia* sp. and *Milletia racemosa* Benth. are common climbers in the area.

There is abundant regeneration of tree species, and saplings of *Aegle*, *Albizia*, *Butea*, *Diospyros*, *Lagerstroemia*, *Madhuca*, *Pongamia*, *Salmalia*, *Schleichera*, *Syzygium* and *Terminalia* were observed.

Shivbara: These are dense forests situated 10 km southeast-east of Subir, about 20 km north-east of Ahwa. A gentle southern aspect was studied. The soil is brown, deep and with considerable amount of humus. *Tectona grandis* Linn. f. is the dominant tree species here too, with a number of associated species, such as *Acacia ferruginea* DC., *Albizia procera* Benth., *Anogeissus latifolia* Wall., *Bauhinia racemosa* Lam., *Careya arborea* Roxb.,

Casearia elliptica Willd., *Cassia fistula* Linn., *Dalbergia latifolia* Roxb., *Erythrina* sp., *Gmelina arborea* Roxb., *Grewia tilaefolia* Vahl, *Kydia calycina* Roxb., *Lagerstroemia lanceolata* Wall., *Mitragyna parvifolia* Korth., *Ougeinia oojeinensis* Hochr., *Pterocarpus marsupium* Roxb., *Spondias pinnata* Kurz., *Stereospermum personatum* Chatt., *Terminalia bellirica* Roxb. and *Wrightia tinctoria* R. Br. *Sorghum halepense* Pers. is abundant in undergrowth. *Carvia callosa* Brem. and *Curcuma* sp. are very common.

Sasarda : It is a small hill situated about 16 km south-east of Waghai. The vegetation was studied on a north-eastern slope, which has brownish soil with boulders. There is typical *Tectona-Terminalia* community with *Acacia chundra* Willd., *Anogeissus latifolia* Wall., *Dendrocalamus strictus* Nees, *Garuga pinnata* Roxb., *Lannea coromandelica* Merr., *Mitragyna parvifolia* Korth. and *Ougeinia oojeinensis* Hochr.

Waghai : 4 km south-east of Waghai on Nasik road is a reserved forest on an almost plain level area. It is an experimental plot. The soil is brown, deep and gravelly. *Bambusa arundinacea* Retz. is the commonest species. *Casearia elliptica* Willd. is a very abundant shrub here. Saplings of *Butea monosperma* Taub., *Diospyros melanoxylon* Roxb., *Mitragyna parvifolia* Korth. and *Ougeinia oojeinensis* Hochr. are common on ground cover.

ECONOMIC PLANTS

Timber : Teak is by far the most important forest produce of the Dangs district and in quality it is ranked second only to the Dandelli teak. Other timber species are *Acacia chundra* Willd., *A. ferruginea* DC., *Adina cordifolia* Hook. f., *Anogeissus latifolia* Wall., *Dalbergia latifolia* Roxb., *Mitragyna parvifolia* Korth., *Ougeinia oojeinensis* Hochr., *Pterocarpus marsupium* Roxb. and *Terminalia crenulata* Roth.

Matchwood : *Ailanthus excelsa* Roxb., *Garuga pinnata* Roxb., *Kydia calycina* Roxb., *Lannea coromandelica* Merr., *Salmalia malabarica* Schott. & Endl., *Spondias pinnata* Kurz and *Trewia nudiflora* Linn. are the matchwood species growing in Dangs. These are exploited for this purpose.

Bamboos : Bamboos abound in several parts of Dangs. They are largely exploited. A number of domestic articles are locally made from bamboo ; it is used in making houses, mats, fans, carts, agricultural implements and several smaller articles such as containers, carriers, etc.

Minor forest produce : Several tannin yielding plants occur in the district e.g. *Acacia nilotica* (Linn.) Del., *Garuga pinnata* Roxb., *Terminalia crenulata* Roth. *Diospyros* leaves are used for making Bidi wrappers. Leaves of *Butea monosperma* Taub. are used for making 'Thalis' or

'Pattals' for serving food in parties. Fruits of a large number of species are edible.

Medicinal Plants : A number of valuable medicinal plants grow wild in the district. Many of them can have good market. The State Forest Silviculturist has established a medicinal plant farm at Waghai for cultivation and expansion of medicinal plants.

Among the important medicinal plants growing wild in this district mention may be made of the following :

Adhatoda vasica Nees, *Asparagus racemosus* var. *javanicus* Baker, *Barleria prionitis* Linn., *Boerhaavia diffusa* Linn., *Centelia asiatica* Urban, *Centratheum anthelminticum* (Willd.) Kuntze, *Datura* sp., *Eclipta prostrata* (Linn.) Linn., *Helicteres isora* Linn., *Hemidesmus indicus* (L.) Schult., *Holarrhena antidysenterica* Wall., *Operculina turpethum* (Linn.), *Silva Manso*, *Psoralea corylifolia* Linn., *Solanum* sp., *Sphaeranthus indicus* Linn.

Several common tree and shrub species yield products of medicinal value e.g. *Azadirachta indica* Juss., *Cassia fistula* Linn., *Oroxylum indicum* Vent., *Soymida febrifuga* Juss., *Vitex negundo* Linn., etc.

The Dangs district is still incompletely explored botanically and ecologically. More intensive collections in different seasons of the year are required. Of particular interest shall be the exploration of valleys and riverain areas near Waghai, Mahal and Subir, though discovery of other better and more densely vegetated spots is also not excluded.

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APPENDIX I

FOREST SPECIES IN DANGS AND THEIR LOCAL NAMES

<i>Abrus precatorius</i>	Gunj, Chanoti Gunj.
<i>Acacia nilotica</i>	Babul, Bawal.
(syn. <i>A. arabica</i> auct. non L.)	
<i>A. chundra</i>	Khair.
<i>A. ferruginea</i>	Kanti, Kagar.
<i>Adina cordifolia</i>	Haladwan, Hed, Haldarvo.

- Aegle marmelos*
Ailanthus excelsa
Albizia lebbek
A. odoratissima
A. procera
Andropogon pumilus
Anogeissus latifolia
Azadirachta indica
Bambusa arundinacea
Bauhinia foveolata
B. purpurea

B. racemosa

Boswellia serrata
Bothriochloa pertusa
Bridelia squamosa
Buchanania lanzan
Butea monosperma
B. parviflora
Caesalpinia sepiaria
Calotropis gigantea
Calycotris floribunda
Careya arborea
Carissa congesta
Carua callosa
Casearia elliptica
Cassia auriculata
C. fistula
Celastrus paniculatus
Chrysopogon fulvus
Cissus repanda
Combretum ovalifolium
Cordia dichotoma
Cymbopogon martini
Dactyloctenium aegyptium
Dalbergia lanceolaria
D. latifolia
D. paniculata
D. volubilis
Dendrocalamus strictus
Desmodium sp.
Dichanthium annulatum
Dillenia pentagyna
Diospyros melanoxylon
Dolichandrone sp.
Elaeodendron glaucum
Embelia tsjeriamcottam
Emblia officinalis
Ensete superbum
Erinocarpus nimmonii
Erythrina suberosa
Eulaliopsis binata
Euphorbia neriifolia
Feronia limonia
Ficus asperrima
F. bengalensis
F. glomerata
F. religiosa
F. rumphii
Flacourtia indica
Gardenia turgida
Garuga pinnata
Glycosmis pentaphylla
Gmelina arborea
Grewia tilaefolia
Gymnosporia : see *Maytenus*.
- Bili, Bel.
 Adusa, Maharukha.
 Saras, Shiras, Kalio Saras.
 Kala Saras.
 Kilai, Kinai.
 Gondawel.
 Dhamoda.
 Nimbara, Limdo.
 Katas, Vans, Kalak, Bambu.
 Kanchanar.
 Kanchanar, Shweta Kanchanar,
 Champa Kathi.
 Apta, Rakta Kanchanar, Asundro,
 Ashitra.
 Dupalio, Gugal.
 Ganya Marvel.
 Asana
 Char, Achar.
 Khakhro, Palas.
 Phulsum.
 Chillar.
 Moto Ankado, Rui.
 Ukshi.
 Kumbia, Kumbhi.
 Karwandi.
 Karvi.
 Kirmira Munjhal Dholi, Un.
 Tarwad.
 Bahawa.
 Mal Kangnan, Kangwal, Kangni.
 Dongri Gavati.
 Nandan, Gando Velo.
 Madvel.
 Bhokar, Vad Gundo, Gundo.
 Rosha.
 Makara.
 Dandosi.
 Sissam.
 Pathad, Kalpasi.
 Niloti, Patri, Alei.
 Narvans, Manvel Wasa.
 Chikiti, Pandadiyo.
 Manvel.
 Karmal.
 Timbru, Tambari.
 Medsing.
 Alan.
 Wawding.
 Avoli, Awala, Amala.
 Chiwani.
 Chera.
 Pangara, Jugariyo, Khakhro.
 Babar.
 Thor, Kantalo Thor.
 Kawath.
 Karwat.
 Wad, Vadh.
 Umro, Umbar.
 Pipalo, Piparo.
 Payar.
 Galgugar.
 Pendri.
 Kakad.
 Kirmira.
 Shiwani, Shiwan.
 Dhaman.
- Helicteres isora*
Hemidesmus indicus
Heteropogon contortus
H. triticeus
Heynea trijuga
Holarrhena antidysenterica
Holoptelea integrifolia
Hymenodictyon excelsum
Ischaemum pilosum
Jasminum arborescens
Kydia calycina
Lagerstroemia lanceolata
L. parviflora
Lannea coromandelica
Lantana camara var. *aculeata*
Leea macrophylla
Macaranga peltata
Madhuca indica
Mallotus philippensis
Mangifera indica
Maytenus senegalensis
Melia dubia
Meyna laxiflora
Miliusa tomentosa
Milletia racemosa
Mimusops elengi
Mitragyna parvifolia
Mnesithea laevis
Morinda tinctoria
Moringa oleifera
Mucuna pruriata
Mussaenda frondosa
Oroxylum indicum
Ougeinia ojeinensis
Oxytenanthera monostigma
Pongamia pinnata
Pterocarpus marsupium
Radermachera xylocarpa
Randia : see *Xeromphis*
Salmaal malabarica
Sapindus emarginatus
Schleichera oleosa
Schrebera swietenoides
Sorghum halepense
Soyimida febrifuga
Spondias pinnata
Sterculia urens
Stereospermum personatum
Syzygium cumini
Tamarindus indicus
Tectona grandis
Terminalia bellirica
T. chebula
T. crenulata
Thespesia populnea
Tinospora cordifolia
Trema orientalis
Woodfordia fruticosa
Wrightia tinctoria
W. tomentosa
Xeromphis spinosa
Xylia xylocarpa
Zizyphus mauritiana
Z. rugosa
Z. xylopyrus
- Marada Shingi, Atai, Kewani.
 Upalsari, Sarsaparilla, Sariva.
 Kusali.
 Bhale Kusali.
 Nimbara.
 Kuda, Dudhkuda, Indra Jiv.
 Papera, Vaval.
 Kadvai.
 Kunda.
 Jui, Kusari.
 Moti Haravani, Warang.
 Nana.
 Bondara.
 Modal, Mavedi.
 Ghanceri.
 Jina.
 Chandola.
 Mahudo, Mahwa.
 Shendri, Kapilo.
 Amba, Ambo.
 Picharum.
 Limbara, Nimbara.
 Alu.
 Humb.
 Velbivla.
 Bakul.
 Kalam, Kadamb.
 Lawla.
 Alio, Al.
 Saragao.
 Kuhili, Kavach.
 Bhutakes.
 Tentu, Aralu.
 Tiwas, Tanach.
 Chira.
 Karanj.
 Bibla, Beo, Hiradkhan Biyo.
 Kharsing.
- Shimlo, Samar.
 Riha, Arithi.
 Kosumb, Koshim.
 Mokho.
 Boru.
 Rohini.
 Ambada.
 Kandol, Kadayo.
 Padal, Patala.
 Jambu, Jambul.
 Chinch, Ambli.
 Sag.
 Beheda.
 Hirada.
 Sadasa, Ain, Sajad.
 Bhendi, Paras Piplo.
 Gulwel, Galo.
 Gol.
 Dahiti, Dhaiti, Dhavdi.
 Kuda, Dudhi, Runchallo Dudblo.
 Bhurali Kuda.
 Gela, Gal.
 Jambha.
 Bor.
 Turan.
 Ghatbor.

TABLE SHOWING PERCENTAGES OF QUADRATS, IN WHICH VARIOUS FOREST SPECIES WERE RECORDED

Forest Site	Bandripada, 3 km west of Ahwa (12 quad.), west slope.	Billaya hill, 6 km north-east of Waghai, (25 quad.), east slope.	Billaya hill, 6 km north-east of Waghai (10 quad.), west slope.	Chikarda, near Waghai (10 quad.), almost level.	Chikarnatibari, near Subir (24 quad.), northeast-east slope.	Dhavidhar, 12 km northeast of Ahwa (12 quad.), east slope.	Dholeambar, 6 km east of Subir, (11 quad.), west slope.	Ghadvi, 16 km north of Ahwa, near Sukumal (10 quad.), south-west slope	Ghogli, 3 km west of Ahwa (10 quad.), east slope.	Ghogli, 3 km west of Ahwa (10 quad.), west slope.
1	2	3	4	5	6	7	8	9	10	11
TREES :										
<i>Acacia chundra</i> (Roxb.) Willd.	—	—	—	—	—	8	—	—	—	—
<i>Adina cordifolia</i> Hook. f. ex Brand.	—	4	—	50	20	—	—	—	20	—
<i>Albizia lebbek</i> (Linn.) Benth.	—	4	10	—	—	—	—	—	—	—
<i>A. procera</i> Benth.	—	—	—	—	—	—	—	—	—	17
<i>Anogeissus latifolia</i> Wall. ex Bedd.	51	8	20	10	24	51(8)	9	10	20	17
<i>Bambusa arundinacea</i> Retz.	17	16	—	—	—	—	—	—	—	—
<i>Bauhinia racemosa</i> Lam.	—	—	—	—	—	—	—	—	10	—
<i>Bridelia squamosa</i> (Lam.) Gehr.	—	12	—	—	—	—	—	—	—	—
<i>Buchanania lanzan</i> Spr.	—	—	—	—	—	—	—	—	—	—
<i>Butea monosperma</i> (Lamk.) Taub.	—	4	—	30	8	—	—	—	—	—
<i>Cassia fistula</i> Linn.	—	4	—	—	—	—	—	—	(10)	—
<i>Dalbergia latifolia</i> Roxb.	8	8	10	10	4	8	36	—	—	—
<i>Dendrocalamus strictus</i> Nees	51	20	40	30	—	—	—	—	—	—
<i>Diospyros melanoxylon</i> Roxb.	—	8(12)	20	—	—	(8)	9	10	—	8
<i>Emblia officinalis</i> Gaertn.	8	4	—	10	—	17	—	20	—	—
<i>Erythrina suberosa</i> Roxb.	25	—	—	—	—	—	27	10	30	17
<i>Ficus glomerata</i> Roxb.	8	—	10	20	—	—	—	—	20	—
<i>Garuga pinnata</i> Roxb.	42	8(4)	10(10)	—	32	8	53	20	40	25
<i>Gmelina arborea</i> Roxb.	—	4	—	—	—	—	—	—	—	—
<i>Grewia tilaefolia</i> Vahl	8	8	20	10	8	8	9	10	20	—
<i>Hymenodictyon excelsum</i> Wall.	—	—	—	10	—	—	—	—	—	—
<i>Kydia calycina</i> Roxb.	—	4	—	—	4	—	18	10	—	—
<i>Lagerstroemia lanceolata</i> Wall.	—	8	10	—	4	8	—	—	—	—
<i>Lannea coromandelica</i> (Hout.) Merr.	—	—	50	10	4	25	—	(10)	20	17
<i>Millettia tomentosa</i> (Roxb.) J. Sinclair	—	4	—	—	12(4)	8	9	—	—	—
<i>Mitragyna parvifolia</i> (Roxb.) Korth.	—	—	—	20	4	25	9	10	—	42

Contd.

AT DIFFERENT FOREST SITES IN DANGS (FIGURES IN BRACKETS DENOTE SAVINGS)

		12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Kotbha, 12 km north of Ahwa (20 quad.), almost level.		20	20	—	—	—	—	—	—	50	17	6	—	17	10	—
Laochali, 20 km north-east of Ahwa (10 quad.), west slope.		—	10	10	(17)	—	50	5	5	—	8	—	—	(42)	10	20
Laochali, 20 km north-east of Ahwa (10 quad.), north slope.		10	—	10	—	(6)	—	—	—	10	(8)	12	—	—	10	20
Mahal, 30 km north-west of Ahwa (6 quad.), east slope.		—	—	—	17	—	—	5	10	—	—	—	5	—	—	10
Mahal, 30 km north-west of Ahwa (16 quad.), west slope.		50(20)	50(10)	—	—	—	—	—	10(10)	—	—	6	10	25	20	—
Mulchond, 6 km west of Ahwa (10 quad.), north slope.		—	—	—	—	—	—	—	—	—	8(66)	72	—	—	—	90
Pimpri, 18 km west of Ahwa (20 quad.), west slope.		(10)	—	—	—	6	—	—	—	—	8	—	5	—	—	—
Piplemar, 10 km north-east of Ahwa (20 quad.), north slope.		15	10	—	—	—	20	10	—	—	8(8)	6	—	8	10	—
Piqliamal, 15 km north-east of Ahwa (10 quad.), almost level.		—	—	—	—	—	—	—	—	—	—	6	—	—	—	10
Raiwad, 4 km east of Waghai (12 quad.), level.		—	20	—	17	12	—	—	—	40	—	6	—	—	—	40
Raiwad, 4 km east of Waghai (16 quad.), level.		—	—	10	17	18(6)	—	—	—	—	—	—	5	—	—	—
Shivbara, 10 km east of Subir (20 quad.), south slope.		10	10	—	100	72	—	5	—	—	8	12	20(5)	(17)	10	—
Susarda, 16 km south-east of Waghai (12 quad.), north-east slope.		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Susarda, 16 km south-east of Waghai (10 quad.), north-west slope.		—	(10)	—	—	—	—	—	—	(15)	(18)	—	—	8	—	(20)
Waghahi, 4 km from town (10 quad.), level.		10	20	10	—	—	—	10	5	—	—	—	10	—	30(10)	10
		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	6	—	—	—	—	—	—	—	8	—	—
		20	40	20(20)	—	12	—	20	30	10	—	6(6)	20	25	40(40)	10
		—	—	—	—	—	—	—	—	—	—	—	5	—	10	10
		(10)	10	—	17	36	—	—	15	—	—	6	5	8	—	10
		—	—	—	—	—	—	5	—	—	—	12	—	17	10	40
		—	—	—	34	6	—	—	(15)	—	—	—	5	25(8)	—	—
		35(30)	—	10	—	6	—	—	5	—	—	6	30	17	—	—
		15	—	10	—	—	20	5	5	20	—	—	5	8	30	—
		—	—	—	—	—	—	—	—	—	17	—	—	—	—	(10)
		10	—	—	68	(6)	10	—	10	—	17(8)	24	5	17	30	(30)

Table Contd.

1	2	3	4	5	6	7	8	9	10	11
<i>Ougeinia oojinensis</i> (Roxb.) Hochr.	8	24	20	30	8	25	36	10	20	25
<i>Pongamia pinnata</i> (Linn.) Pierre.	—	4	—	—	—	—	—	—	—	—
<i>Pterocarpus marsupium</i> Roxb.	—	—	—	—	—	17	—	—	—	—
<i>Salmalia malabarica</i> (DC.) Schott. & Endl.	—	4	—	—	—	(8)	—	—	—	—
<i>Schleichera oleosa</i> (Lour.) Oken.	8	—	30(10)	—	12(4)	17	11	—	20	—
<i>Schrebera swietenoides</i> Roxb.	8	—	—	—	—	—	9	—	—	—
<i>Spondias pinnata</i> (Linn. f.) Kurz.	—	(4)	—	10	12(4)	—	—	—	(10)	—
<i>Sterculia urens</i> Roxb.	—	4	10	—	—	—	9	—	—	—
<i>Stereospermum personatum</i> (Hassk.) Chatt.	—	—	—	—	—	—	—	—	—	—
<i>Tectona grandis</i> Linn. f.	76	72(12)	50	70	60	66	72	40	70(10)	68
<i>Terminalia bellirica</i> Roxb.	8	—	10	—	8(4)	—	—	(20)	—	8
<i>T. crenulata</i> Roth.	25	4	30	60	28	34	9	30	30	42
<i>Wrightia tinctoria</i> R. Br.	59	32(44)	100	20	76(4)	68(8)	90	40(20)	80(10)	68
SHRUBS and CLIMBERS :										
<i>Bauhinia</i> sp.	—	4	—	—	—	8	—	20	—	—
<i>Butea monosperma</i> (Lamk.) Taub.	8	4	—	—	—	—	—	—	10	8
<i>B. parviflora</i> Roxb.	17	—	—	—	—	25	—	—	—	—
<i>Caesalpinia</i> sp.	—	—	—	—	12	—	—	—	—	—
<i>Carvia callosa</i> Brem.	—	4	—	—	92	—	45	—	—	—
<i>Casearia elliptica</i> Willd.	17	8	—	40	16	8	9	—	40	51
<i>Celastrus paniculata</i> Willd.	—	4	—	—	—	17	—	—	—	—
<i>Cissus repanda</i> Vahl	—	4	—	—	—	—	—	—	—	8
<i>Dalbergia</i> sp.	—	12	10	—	—	—	—	—	—	—
<i>Dioscorea</i> sp.	—	—	—	—	—	—	—	10	—	—
<i>Flacourtia indica</i> (Burm. f.) Merr.	—	—	—	—	—	—	—	—	—	8
<i>Helicteres isora</i> Linn.	8	32	20	50	100	25	54	20	30	17
<i>Holarrhena antidysenterica</i> Wall.	8	12	—	30	8	—	—	20	—	42
<i>Leea indica</i> (Burm.) Merr.	—	—	—	—	8	—	—	—	—	—
<i>L. macrophylla</i> Roxb.	8	—	—	—	—	—	—	—	—	—
<i>Meyna laxiflora</i> Robyns.	8	—	—	10	4	25	9	—	—	—
<i>Milletia racemosa</i> Benth.	17	—	—	—	8	—	27	—	40	25
<i>Securinea virosa</i> (Roxb.) Pax & Hoffm.	—	—	—	—	—	8	—	—	—	—
<i>Sorghum halepense</i> Pers.	—	—	—	—	80	—	—	—	—	—
<i>Xeromphis spinosa</i> (Thunb.) Kçay.	17	—	—	20	—	8	9	—	10	25
<i>Zizyphus</i> sp.	—	8	—	—	4	8	—	10	—	25

12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
20	20	—	17	18	40	5	30(5)	—	—	—	25	42(17)	—	(20)
—	—	—	—	—	—	—	—	60	8(17)	—	—	—	—	—
5	—	—	—	—	—	—	5	—	—	—	5	17	—	—
—	—	—	—	—	—	—	—	—	(25)	(12)	(5)	—	—	—
—	(10)	20	—	(6)	—	—	—	10	(8)	—	—	—	(20)	10(10)
—	20	—	—	—	—	—	—	—	—	—	—	—	—	10
10	—	—	—	—	—	—	5	—	—	—	10	—	—	—
10	10	—	—	—	—	10	5	—	—	—	—	—	—	—
—	—	(20)	—	—	(10)	—	—	—	—	—	(5)	(8)	—	—
50(20)	70	60(20)	34	72	70(20)	80	35	20	60	(12)	70	66	90	70(10)
5(25)	—	10	17	—	—	—	10(10)	—	(25)	—	20	(8)	10	40
20(25)	30	20	—	12	40(20)	35	10	40(10)	34	48	20	42	50	20
60(20)	50(10)	40	17	36	—	35	95	80	60	—	95	60	60	(20)
10	—	10	—	12	—	—	5	—	—	—	—	—	10	10
—	10	10	34	—	—	—	—	—	33	—	—	34	—	30
—	20	20	17	—	—	—	5	—	17	—	—	—	—	—
—	—	10	—	—	—	—	—	—	—	—	5	—	—	—
—	—	—	—	—	—	10	—	—	—	—	45	—	10	—
20	10	5	—	50	—	—	50	30	50	30	10	8	10	80
—	10	—	—	—	20	—	5	—	—	—	—	—	—	—
30	—	—	—	—	—	—	—	—	—	—	—	8	—	—
—	—	—	—	—	—	5	—	—	33	—	—	—	—	20
—	—	—	—	—	40	—	—	—	—	—	—	—	20	—
—	—	—	17	—	—	—	—	—	8	—	—	—	—	—
55	60	60	85	84	50	20	30	10	33	30	25	66	50	10
20	10	30	—	—	80	15	20	40	42	24	—	—	—	—
20	—	70	—	—	10	30	10	—	—	—	10	—	—	—
30	—	60	—	6	40	10	—	—	—	—	—	—	—	—
—	—	10	—	—	—	—	10	10	8	6	—	8	—	—
—	20	90	—	18	—	—	35	—	—	30	15	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	17	—	—
—	—	—	—	—	—	—	—	—	—	—	95	—	—	—
10	10	—	—	—	20	—	5	—	—	—	—	—	—	20
—	—	—	—	—	—	—	5	—	33	—	5	8	10	10