*Sociological Studies on the Forest Vegetations to be Found at Central Part of Ohsumi Peninsula. I.**

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CONTENTS

I. Introduction

The present paper, which forms the first part of the result of studies on the forest vegetation types to be found in southern Japan, is a description of typical region of the laurisilvae in southern Kyusyu. The chief object of this study is the statistical analysis of the forest communities upon which classification into association and sociation was aimed. K. Arakawa[1)], a former technician of Kumamoto Regional Forestry Office, had published in 1930 a very important paper based upon his extensive reconnaissance and survey of this district, a part of which was cited for comparison in the present paper. In 1938 S. Amano[2)], a forester of the same office, published a paper concerning on the reproduction of *Distylium racemosum* in which he discussed on the variation of number of individuals and volumes of this tree according to the expositions and elevations, and some of the data of his study was cited in our paper.

More recently, T. Suzuki[3)], an earnest plant sociologist of the Tokyo University, briefly informed the occurrence of *Distylietum* in Central

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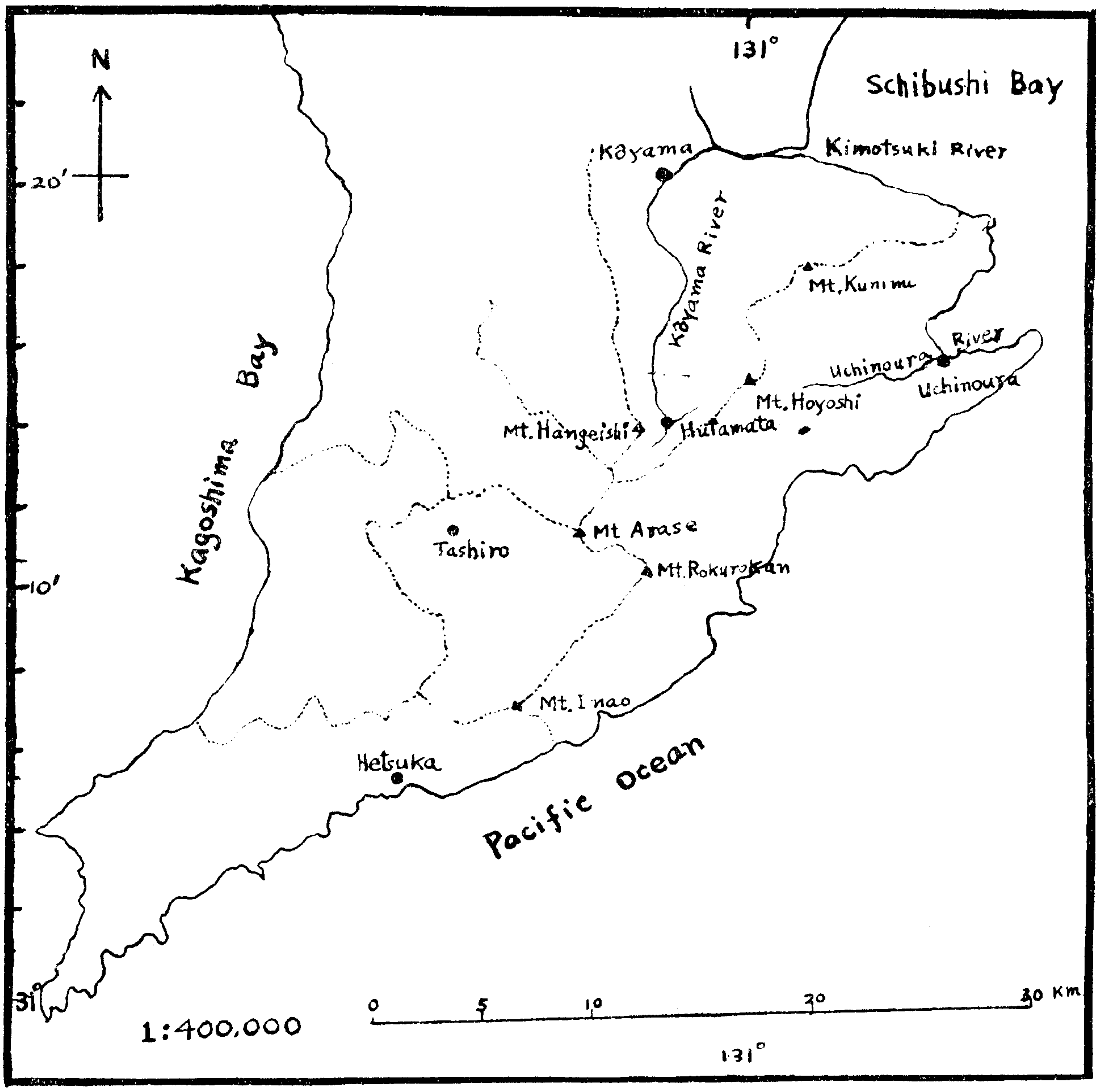

Fig. 1. Map of Ohsumi Peninsula.

Ohsumi at the 14th general meeting of the Botanical Society of Japan.

The writers desire to express their thanks to M. Hukuoka and E. Emoto, foresters of the Hutamata Working Station, for the many kindness they showed, for the assistance in the field survey, for supplying us with many useful information regarding the progress of the work, and for the loan of the meteorological data, upon which Table I and II were constructed. Our thanks are also due to H. Kayano, S. Tikusi, and M. Miyadono, classmates of the junior author at Kagosima Agricultural College, for the assistance in the field survey. Opportunity may here be taken to express his thanks to many members of field lecture meeting of plant sociology held at the Hutamata district under the leadership of the senior author in summer 1950, the result of which

was also cited as the sample plots I and II in the present paper.

II. General description of the district

Central Ohsumi, a central part of Kimotuki Peninsula, Prov. Ohsumi, occupies the northern half of Kunimi Range and lies between latitude 31°10′ and 31°18′N. It consists of steep mountains, and the main peaks are Mt. Hoyosi (967 m.) and Mt. Hangeisi (880 m.). Near these peaks exsist many peaks viz., Mt. Kunimi (880 m.), southward Mt. Inao (959m.), Mt. Kareki (1020 m.), Mt. Koba (800 m.), Mt. Rokurokan (754 m.), Mt. Arase (833 m.) and Mt. Shôgatsu (890 m.). The district concerned is about 8 km. distant from the Pacific coast and 15 km. from the Kagoshima Bay.

Underlaying rock of the district is granite, the outercrops of which are seen along the many ravines.

The average rainfall over the district is high, and the river draining it is many. The River Hirose raising from Mt. Kunimi and Mt. Hoyoshi runs eastwards to the Uchinoura Bay on the Pacific coast and the River Kôyama raising from Mt. Hoyoshi and Mt. Hangeishi runs as a tributary of the River Kimotsuki to the Shibushi Bay. The areas particularly dealt with in the present study are the forests along the upper part of the River Kôyama.

III. Climate

1. Rainfall

In the district rainfall data are available for Hutamata Working Station which lies at about 16 km. south of Kôyama-machi where records have been kept for period of two years by the employee of the Kanoya District Forestry Office since 1949. The annual totals for 1949 and 1950 are respectively 5789 mm. and 5794 mm. The distribution of the rainfall through the year is shown in Table I. From these figures it seems obvious that at Hutamata district the annual rainfall is enormously higher than those of the same year at its surrounding meteorological stations. The monthly distributions of rainfall and temperature at Hutamata Working Station is shown also in graphical form (Fig. 2).

A reason which suggests itself for the abundance of precipitation of the district is that the prevailing wind strikes this parts of mountains and up draught created by the steepness of terrain causes a great expansion and cooling of the air with a consequent excessive development of mist and rain.

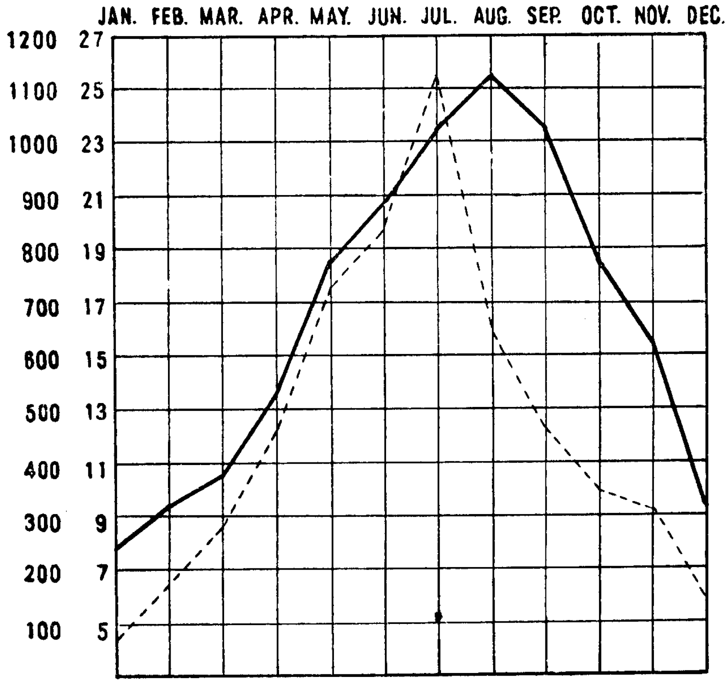

Fig. 2. Hydrotherm figure for Hutamata Working Station. Temperature in °C (dotted line), precipitation in mm. (continuous line).

Table I.

Table showing the monthly distributions of rainfall in mm. for Hutamata Working Station.

Months / Years	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1949	23.5	132.6	178.8	576.1	638.9	1044.3	1096.4	865.3	184.9	496.9	337.0	214.7	5788
1950	145.6	224.2	384.3	314.0	834.2	618.1	1176.7	467.0	757.0	411.0	291.0	121.0	5794

The large proportion of the rain is precipitated during the "Baiu season", a rainy season in southern Japan, and typhoon which usually occurs from July to August.

2. Other climatic factors

The temperature of summer in the district is of course high, but in winter not so low as the inland of Central Kyusyu. This owes its origin to the warm current surrounding the peninsula, and this involves intimate connection with the vegetation of the district. The monthly distribution of temperature for Hutamata Working Station is shown in Table II.

Table II.

Table showing the monthly distributions of temperature in °C for 1949 and 1950 at Hutamata Working Station.

Months / Years	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Average annual
1949	7.1	9.1	11.4	12.9	17.8	20.0	22.7	25.3	23.9	17.5	14.5	10.5	15.1
1950	7.6	9.2	10.1	13.7	19.7	21.3	24.3	25.8	23.2	19.5	16.3	7.8	16.5
Mean	7.4	9.2	10.8	13.3	18.7	20.7	23.5	25.6	23.6	18.5	15.4	9.2	15.8

As the sample plots were laid down at higher elevations than the Hutamata Working Station which is situated at an elevation of approximately 300 m., monthly and mean annual temperatures at 500 m., 700 m. and 900 m. above the sea level were converted from the data of Tashiro meteorological station (182 m. above the sea level) based on the rate of successive decrease of temperature for Kyusyu district which was culculated by T. Hirata (Table III).

Table III.

Table showing the monthly and mean annual temperatures in °C at different elevations.

Months / Elevations	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean annual
500 m.	4.8	7.4	9.1	12.2	17.6	19.5	22.2	23.5	22.2	17.2	13.9	7.1	14.2
700 m.	3.2	6.2	8.0	11.4	16.9	18.7	21.4	22.1	21.3	16.4	13.0	5.8	13.2
900 m.	1.4	5.1	6.9	10.7	16.2	18.0	20.6	20.8	20.4	15.6	12.1	4.6	12.1

IV. Method

The object of this paper is an intensive survey of the plant communities of the district and their ecological relationships. The work was begun 1950 when sample plots were laid down at various elevations to analyse the composition of the communities. The preliminary work of survey involves a series of reconnaissance. During these reconnaissance a rudimentary knowledge of the communities was acquired and suitable sites were chosen for quadrats and belt transects. Six quadrats varying in size from 100 m. × 100 m. to 50 m. × 50 m. were laid down at different elevations. The objects of these quadrats were to obtain information with regard to the floristic composition, frequency and cover grade. As the climax forest of the district has four to five layers and the first layer up to 25 m. high is mingled with lianes and creepers, the accurate estimation of the cover grade of the individual trees belonging to the first and second layer from the ground was so difficult and even if possible so waste the time that breast height diameter down to 6 cm. of all individuals belonging to the respective tree layers was estimated by the callipers. The height of trees was estimated by eyes. It is not difficult to decide the dominants of each tree layers by the above method on the assumption that crown project area of a tree approximately corresponds to the area of breast height diameter of the same individual.

Of five belt transects, one of which measuring 300 m. by 4 m., was laid down on the mountain side of Mt. Hoyoshi at an elevation of approximately 700 m. and the other four varying in length from 25 m. to 100 m. and 2 m. in width were laid down in each quadrat mentioned above. The object of these belt transects was to obtain information with regard to the floristic compositions, frequencies and cover grades of the shrub and herbaceous layer, and to study the number of individuals and frequencies of tree seedlings important to the silvicultural purposes.

Notes were made on the aspect, slope and topographic features.

Readings of aneroid barometer were recorded at every sample plots and necessary points.

For the estimation of frequency and cover grade the following scale was adopted.

+ One or two individuals.
1. Present in small number and cover the area less than $^1/_4$ of the sample plot.
2. Present in more individuals, but cover the area less than $^1/_4$ of the sample plot.
3. Cover the $^1/_2$–$^1/_4$ area of the sample plot.
4. Cover the $^1/_2$–$^3/_4$ area of the sample plot.
5. Cover the $^3/_4$–1 area of the sample plot.

V. Forest vegetation in general

The forest areas of the district are most climax covered with broad-leaved evergreen trees — *Distylium, Castanopsis, Quercus spp.* and *Machilus spp.*, even the conifers such as *Podocarpus spp.* —, but in the district there is considerable variation with different atmospheric humidity, temperature and wind velocity according to the elevations. *Podocarpus macrophylla* occurs as scattered mainly in rather open forests on or near the tops of ridge where the soil is much better drained and the light intensity in the lower layers of the forest increased, while *Podocarpus Nagi* with elliptic leaves occurs generally in wetter forests along the ravine at low altitudes.

In general the lower areas less than approximately 300 m. above the sea level (in northern part down to 600 m.) are dominated by *Castanopsis cuspidata*, though in some places *Machilus Thunbergii* locally dominates, but at higher elevation ranging from 300 to 800 m. above the sea level *Distylium racemosum* association with different sociation is developed which is probably the most densely stocked among the broad-leaved evergreen forests to be found in Ohsumi Peninsula. *Quercus acuta* association with or without scattered *Abies firma* as a first layer tree is a common community above this level. The characteristic feature of this association which belongs to the warm temperate rain forest is a luxuriant occurrence of mosses on the trunks and branches of trees and an abundant descent of firm ferns — *Hymenophyllum barbatum* and *Hymenophyllum polyanthos* — from trunk to the forest floor which are generally restricted on the lower part of tree trunks and rock surfaces at lower altitudes. The most frequent mosses occurring on trunks and branches are *Pterobryum arbuscula*, *Bazzania pompeana* and *Homaliodendron scalpellifolium* and less frequent are *Thinidium japonicum*, *Stereodon Oldhami* and *Stereodon fertilis*.

Above this level the *Quercus acuta* association gives place to *Abies firma* association, the lower limit of which often descends, together with *Quercus acuta*, down to 350 m. above the sea level along the ravine in the district. It is very interesting to say that the lower limit of occurrence of these species in this southern part of Kyusyu is much lower than those in northern Kyusyu, at where they occur usually down to approximately 700 m. above the sea level. This inverse phenomenon which is also seen at Isl. Kurosima, a small island off the south coast of Satsuma Peninsula, seems to be attributed to the high atmospheric humidity of the district, as these trees prefer the mist belt zone of mountain areas with high atmospheric humidity nearly all the year round. At above approximately 900–1000 m. above the sea level Momi fir gradually decreases its number of individuals, and occurs as stunted probably owing to the high wind velocity, and the deciduous trees conspicuously increase in both number of species and individuals, though yet evergreen trees are fairly abundant, by which the forest becomes temperate tone of colour. Of main tree species forming the first layer up to 10m. high deciduous trees are *Cornus Kousa*, *Lindera triloba*, *Acer rufinerve*, *Acer Sieboldianum*, *Symplocos coreana*, *Stewartia serrata*, *Sapium* *japonicum*, *Clethra barbinervis* and *Carpinus carpinoides*, and as common evergreens occur species essentially belonging to the lower zone as scattered and stunted, viz. *Camellia japonica* var. *spontanea*, *Daphniphyllum macropodum*, *Neolitsea aciculosa*, *Neolitsea sericea*, *Ilex crenata*, *Torreya nucifera*, *Pieris japonica*, *Vaccinium bracteatum*, *Dendropanax trifidum*, *Microtropis japonica* and *Trochodendron aralioides*, the latter two of which seem to be characteristic trees of the warm temperate "mist belt forest" which is represented by the *Quercus acuta* forest at most places in southern Kyusyu. The common species essentially belonging to the second layer up to 2–3 m. high are *Rhododendron vististylum*, *Viburnum erosum*, *Wikstroemia trichotoma*, *Abelia serrata*, *Meisteria cernua*, *Skimmia japonica* and *Symplocos myrtacea*, a predominant species of this layer. As lianes and creepers occur *Tripterigium Regelii*, *Hydrangea petiolaris*, *Euonymus radicans* and *Rhus orientalis*. In the ground flora *Ardisia japonica* var. *angusta*, a dwarf shrub up to 15 cm. in height which makes dense mat of fairly large areas by the spreading of its rhizoms, is a most abundant. Other main herbs are *Salvia nipponica*, *Ainsliaea apiculata*, *Scutellaria violacea*, *Carpesium rosulatum*, *Isodon lanceus*, *Clinopodium micranthum*, *Lamium humile* and *Viola Boissieuana*.

VI. The vegetation

In the following descriptions the term "co-dominant" refers to trees in the upper canopy whose frequency is less than that of the dominants. "Sub-dominant" refers to slightly smaller trees which are growing between rather than underneath the dominants and co-dominants, their frequencies may be higher or lower than those of the latter. Trees which normally have their crowns beneath those of the dominants and co-dominants are referred to as "second stratum" trees.

1. *Distylium* forest.

The most striking feature of this forest is the development of *Distylium racemosum* S. et Z. (*Hamamelidaceae*) accompanying *Quercus stenophylla* and *Castanopsis cuspidata*. In altitudes it occurs from approximately 300 to 700 m. This community, the largest and the most widely distributed, covers the greater part of inland of Ohsumi Peninsula where atmospheric humidity is very high. The lower limit of this community transfers to the *Castanopsis* association and its upper limit is gradually replaced by the *Abies firma* association or by the *Quercus acuta* association when *Abies firma* is scattered or absent. Even in the lowerpart of the *Abies firma* association *Distylium racemosum* occurs abundantly as a dominant of the second stratum. The areal of this association is not yet known fully, but it seems occur in the inland forest of the Pacific slope of southern Kyusyu. The senior author observed this association within the district of jurisdiction of Aya District Forestry Office, Prov. Hyuga. The occurrence of this association in Shikoku has not yet been known, but *Abies firma* association with *Distylium racemosum* as a dominant of the second stratum was recorded.

Table IV.

Table showing the number of individuals and volumes (in m³) per ha. of tree species belonging to the first stratum in sample plots I-V which belong to the *Distylium racemosum* association.

Sample plots / Species	I	II	III	IV	V	VI	
						C	%F
Distylium racemosum	**66** **184.4**	**60** **146.5**	**40** **78.7**	**100** **189.9**	**96** **132.5**	3.1	82
Quercus stenophylla	32 62.2	20 40.7	24 45.5	12 18.5	56 57.4	+	9
Castanopsis cuspidata	20 62.9		16 56.5	8 10.0	32 14.5	0.7	23
Quercus acuta	9 16.6	12 31.3	12 10.1	12 18.0	24 78.0	0.8	23
Machilus Thunbergii	7 14.2	4 3.7	12 23.3	12 40.8	8 10.7	0.3	9
Actinodaphne longifolia	4 5.3	8 10.9	12 3.2	4 3.7	8 10.1		
Machilus japonica	2 1.5	8 6.9		4 2.9			
Cinnamomum japonicum	1 1.3						
Neolitsea aciculosa	1 1.1						
Symplocos prunifolia	1 1.3						
Nauclea racemosa	1 2.3						
Cornus controversa	2 1.6						
Illicium japonicum	2 2.0						
Camellia japonica var. *spontanea*	1 1.1						
Ternstroemia gymnanthera	1 1.0					+	4
Prunus serrulata			4 2.7				
Daphniphyllum macropodum						0.3	14
Actinodaphne lancifolia		8 15.6	4 3.2				
Total	150 361.7	120 255.6	124 223.4	152 373.9	224 399.3		

Remarks. In the lateral columns the upper figures indicate the number of individuals and those of the lower indicate the volumes in m³.
In sample plot VI, the area of which is 220 m. × 10 m., average cover grades (C) and the percentage frequencies (%F) are shown for comparison.

Table V.

Table showing the number of individuals and volumes (in m^3) per ha. of main tree species in sample plots laid down in different working areas of Kanoya District Forestry Office (after management plan report of Kanoya District Forestry Office).

Places and altitudes	Tatedani national forest, compartment 32, 400-500 m.				Tatedani national forest, compartment 34, 400-500 m.				Higasidake national forest, compartment 23, ±350 m.				Higasidake national forest, compartment 25, 500-600 m.			
Diameter classes and totals (T)	L	M	S	T	L	M	S	T	L	M	S	T	L	M	S	T
Quercus spp.	20	32	59	111	14	16	32	65	16	17	75	108	19	26	100	145
	34	17	4	55	28	9	3	40	26	9	3	28	32	14	5	51
Castanopsis cuspidata	20	14	26	60	15	23	26	64	17	9	6	38	20	11	6	37
	40	8	1	49	31	14	1	46	36	6	1	32	46	6	1	53
Distylium racemosum	28	28	260	316	37	28	76	151	48	82	54	184	10	16	198	224
	51	51	11	77	67	21	3	91	80	41	3	124	20	8	11	39
Machilus Thunbergii	14	20	80	114	7	8	20	25	5	5	62	72	37	19	62	118
	27	11	7	45	16	16	1	23	12	27	2	41	82	11	2	95

Remarks. Areas of each sample plot are 0.25 ha. and in each column figures are shown which were converted to 1 ha. In the lateral columns the upper figures indicate the number of individuals and the lower figures indicate the volumes in m^3.

In diameter classes L, M and S indicate respectively large (more than 42 cm. in diameter), medium (from 22 cm. to 40 cm.) and small (smaller than 20 cm.).

Quercus spp. possibly include *Quercus stenophylla* and *Quercus acuta*, of which the former occupies the greater part.

Table VI.

Table showing the number of individuals and volumes (in m^3) per ha. of main tree species belonging to the first stratum in sample plots Aa1-Aa11 laid down in the laurisilvae at southern Ohsumi Peninsula (after K. Arakawa).

Sample plots / Species	Aa1	Aa2	Aa3	Aa4	Aa5	Aa6	Aa7	Aa8	Aa9	Aa10	Aa11
Machilus Thunbergii	66	26	67	27	35	22		39	45	9	8
	170.2	164.0	188.5	26.1	37.8	59.9		18.7	55.7	6.7	2.7
Distylium racemosum	19	164	358	161	340	121	**144**	**194**	**310**	**232**	**175**
	0.3	14.6	167.7	18.3	51.5	52.0	**38.2**	**63.3**	**198.0**	**246.8**	**80.1**
Quercus stenophylla	64	80	231	32	163	75	94	93	133	103	113
	26.0	9.7	21.3	7.2	53.9	21.1	40.3	32.7	41.0	13.7	27.5
Quercus acuta	1		1	23	9	5	15	44	7	8	20
	0.02		1.4	11.5	0.1	3.3	7.3	25.0	5.7	1.2	33.5

Remarks. Aa1. Compartment 13, Kanoya district forestry area.
Aa2. 〃 17, 〃
Aa3. 〃 53, 〃
Aa4. 〃 73, Uchinoura district forestry area.
Aa5. 〃 16, 〃
Aa6. 〃 55, 〃
Aa7. 〃 64, 〃
Aa8. 〃 22, Ôhneshime district forestry area.
Aa9. 〃 32, 〃
Aa10. 〃 77, Uchinoura district forestry area.
Aa11. 〃 101, Ôhneshime district forestry area.

In the lateral columns the upper figures indicate the number of individuals and those of the lower indicate the volumes in m^3.

Stratum 1. This stratum consists of essentially evergreen trees from 20–25 m. high of very complex floristic composition comprising some twenty to thirty species. The individuals form an extremely dense

Table VII.

Table showing the percentage annual cut of main tree species for 1949 at three working areas.

Species \ Working areas	Hutamata	Kisira	Uchinomaki
Distylium racemosum	25	50	25
*Quercus spp.**	30	12–30	12
Castanopsis cuspidata	10	12–30	15
Machilus Thunbergii	—	10	—
Other miscellaneous trees**	10	—	—

* *Quercus spp.* include *Quercus stenophylla* and *Q. acuta.*

** Other miscellaneous trees involve *Actinodaphne lanceolata, Actinodaphne longifolia, Podocarpus Nagi, Podocarpus macrophylla, Prunus serrulata, Ehretia ovalifolia, Torreya nucifera* and *Abies firma.*

Table VIII.

Table showing the number of individuals and volumes in m^3 per ha. of main tree species in *Distylium racemosum* forests on different expositions (after S. Amano).

Places	Kunimihira national forest		Maki national forest		Yamazoe national forest		Yamazoe national forest	
Compartments, sub-compartments and expositions	17 い, S		65 い, N		76 ほ, N		83 へ, S	
Areas (in ha.) of sample plots	113.40		103.13		16.43		17.49	
Species \ No. of individuals and volumes	No.	V	No.	V	No.	V	No.	V
Distylium racemosum	**187**	**75**	**128**	**144**	**199**	**177**	**339**	**124**
Quercus stenophylla	82	34	27	14				
Castanopsis cuspidata	23	27	17	21				
Machilus Thunbergii	23	27	7	9				
Machilus japonica	138	12	34	3				
Quercus acuta	24	12	10	6				
Actinodaphne longifolia	32	5	81	13				
Actinodaphne lancifolia	12	3	5	2				
Ternstroemia gymnanthera	3	1	6	3				
Podocarpus Nagai			121	17				
Camellia Sasanqua	312	5	56	2				
Camellia japonica var. *spontanea*	27	3	73	4				
Other miscellaceous trees	549	28	288	42	1024	163	1353	251
Total	1341	283	853	280	1223	340	1692	375
Percentage No. and volumes of *Distylium racemosum*	13%	26%	15%	51%	16%	52%	20%	49%

stand with foliage so intermingled that recognition of species from the ground is rendered difficult. The foliage density of this stratum is increased by the presence of woody lianes. Full list of species and their number of individuals and volumes (in m^3) per ha. in five qurdrats are shown in Table IV. From the figures of Table IV it may be obvious that *Distylium racemosum* is the most abundant in both number of individuals and volumes (in m^3) per ha. and apparently a dominant of the forest. The most frequent co-dominant is *Quercus stenophylla*. This relation is also supported by the figures of the following tables (Table V, VI, VII, VIII).

Although we have no chance to estimate the variation in number of individuals and volumes in m^3 of *Distylium racemosum* and its associates according to the expositions and elevations, but according to the figures of Amano which are reproduced in the following tables (Table

Table IX.

Table showing the number of individuals and volumes in m^3 of main tree species according to the expositions and elevations (after S. Amano).

Places	Exposition	Habitats	Ravine		Mountain side		Top of ridge	
		Areas of sample plots	50 m. × 100 m.		50 m. × 100 m.		50 m. × 100 m.	
Sub-compartment ヽ Compartment 17, Kunimihira national forest	South	*Distylium racemosum*	1.65 13	33 260	2.42 23	48 460	6.86 26	137 520
		Machilus Thunbergii	0.04 7	1 140	2.55 3	51 60		
		Castanopsis cuspidata	6.65 9	133 180	3.68 21	74 420		
		Quercus stenophylla	7.08 10	142 200	3.38 32	68 640	5.95 6	119 120
		Other miscellaneous trees	2.43 23	59 1180	2.97 105	59 2100	1.59 24	32 480
		Total	17.85 98	358 1960	15.00 184	300 3680	14.40 56	288 1120
Sub-compartment ヽ Compartment 17, Maki national forest	North	*Distylium rasemosum*	0.01 1	1 20	1.45 4	29 80	9.55 11	191 220
		Machilus Thunbergii						
		Castanopsis cuspidata					21.4 1	43 20
		Quercus stenophylla and *Q. gilva*	5.24 (3.37) 4 (3)	105 (67) 80	0.01 1	0.2 20	2.16 3	43 60
		Other miscellaneous trees	7.57 69	151 1380	13.01 78	260 1560	1.89 54	38 1080
		Total	16.19 77	324 1540	14.47 83	289 1660	15.74 69	315 1380

Remarks. In the lateral columns the upper figures indicate the volumes in m^3 and those of the lower indicate the No. of individuals. In the vertical columns the right figures indicate the value converted to a ha. Figures in parenthesis are referred to *Quercus stenophylla*.

VIII, IX) and those of our research (Fig. 3) it may appear that as increase the altitudes it increases in both number of individuals and volumes (in m³.), and as to the expositions it seems occur abundantly on northern slope which is cooler and wetter than the south.

Distylium racemosum, a dominant of the forest, is a dark foliaged tree with reddish brown bark exfoliating in scales. The average height of this tree is about 20 m. Short, stout boles reach often up to 1 m. in diameter at breast height branching 10–15 m. with whorls of leaves densely crowded at the end of ultimate branchlets. Capsules 2-lobed at apex include shining rice sized seeds which possibly dispersed by birds.

The common co-dominant are *Quercus stenophylla* and *Castanopsis cuspidata* (in other districts often *Castanopsis Thunbergii*). The latter is a large tree seldom attaining up to 2 m. in diameter and occurs as a common dominant at lower altitudes down to sea level. *Quercus stenophylla* is a common species to be found in southern Japan and its most luxurinant development is seen in forests of Ohsumi Peninsula, at where large trees with clean boles up to 20 m. and a dimension up to 1 m. are not rare, though it is said that wood quality is inferior to those from Kirishima range.

In forest, especially along the ravines at lower altitudes *Machilus Thunbergii* occurs often as a frequent co-dominant and in some places even as a dominant. *Quercus acuta*, an evergreen oak with dark brown bark exfoliating in scales, occurs especially at higher elevations as a frequent co-dominant, although it is essentially a dominant of the *Quercus acuta* association which represents a warm temperate "mist belt forest" at southern Kyusyu.

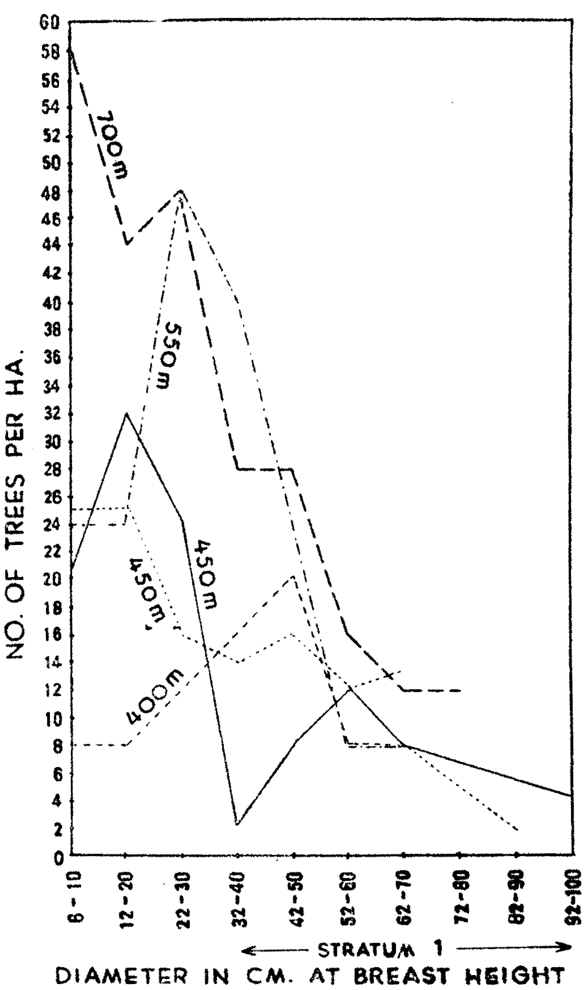

Fig. 3. Frequency distribution curves for tree diameter at breast height on *Distylium racemosum* in five quadrats laid down at different elevations.

The common sub-dominants are *Actinodaphne lancifolia* and *Actinodaphne longifolia*, of which the former seldom attaining up to 90 cm. in diameter is characterized by its white spotted bark.

Other less frequent associate canopy trees are *Lithocarpus edulis*, *Ternstroemia gymnanthera*, *Cinnamomum japonicum*, *Daphniphyllum macropodum*, *Machilus japonica*, *Michelia compressa*, *Elaeocarpus japonica*, *Symplocos prunifolia*, *Meliosma rigida*, and the deciduous species are very rare, viz., *Prunus serrulata* and *Diospylos japonica* occur rarely and the more rare species are *Phellodendron sachalinense* and *Nauclea racemosa* occurring in forests along the ravines.

Stratum 2. This stratum consists of mesophanerophytes from 8 to 15 m. high of fairly complex floristic composition comprising some thirty to forty species. The dominant species of this stratum somewhat varying in places are following species: *Cleyera japonica*, *Illicium japonicum*, *Camellia japonica* var. *spontanea*, *Machilus japonica*, and *Camellia Sasanqua*. Of these species the first is a medium sized tree up to 15 m. in height and 50 m. in diameter at breast height and seldom reaches to the first stratum, although generally it occurs as a small tree up to 10 m. in height. This is a most common dominant to be found in inland forest with high atmospheric humidity and best developed in wetter forests along the ravines. *Illicium japonicum* resembling to the preceding species in its appearance and size occurs as a most frequent codominant of this second stratum, but in altitudes it ascends the higher elevations than the former possibly owing to its less demand for soil moisture, and, therefore, it occurs abundantly even in forests on or near the tops of ridge.

Two species of camellia mentioned above are also frequent species of the second stratum, although usually they are more abundant in the third stratum. *Camellia Sasanqua*, a small tree usually attaining down to 10 m. in height and 10 cm. in diameter, is found most abundantly on mountain sides where the soil is well drained, therefore it is rare in forests along the ravines. *Camellia japonica* var. *spontanea* with grayish smooth bark and showy red flowers is a commonest species to be found in warm temperate forests of Japan. It is a small tree seldom attaining up to 15 m. in height and 50 cm. in diameter, and best developed in forests nearer the coast where the warm and humid sea wind blows, although it often invades *Abies firma* association as stunted. *Machilus japonica* is a medium sized tree rarely attaining 20 m. in height and 70 cm. in diameter and seldom reaches to the first stratum, but in even climax forest individuals with such dimension are rare. Generally it occurs as a second stratum tree and best developed in wetter forests along the ravine where the atmospheric humidity is always high. Other frequent species is *Cinnamomum japonicum*, a medium sized tree attaining 20 m. in height and 40 cm. in diameter at its best. Less frequent are *Symplocos prunifolia* and *Meliosma rigida* which sometimes developing into trees sufficiently large to reach the first stratum. *Neolitzea aciculosa* seldom reaches to this stratum, although essentially it belongs to the third stratum. The full list of species occurring in sample plots I-V, and their number of individuals and volumes in m³ are shown in Table XI, and the data of Arakawa also indicate the similar tendency to our result (Table X).

Table X.

Table showing the number of individuals and volumes (in m³) per ha. of main tree species belonging to the second stratum in sample plots Aa1-Aa11 laid down in the laurisilvae on southern Ohsumi Peninsula (after K. Arakawa).

Species \ Sample plots	Aa1	Aa2	Aa3	Aa4	Aa5	Aa6	Aa7	Aa8	Ar9	Aa10	Aa11
Cleyera japonica			307 11.16	480 13.66	384 18.24	100 2.76	210 12.99	234 8.81	286 9.52	236 8.36	99 2.04
Illicium japonicum	5 0.08		67 2.50	98 11.64	52 2.25	57 1.23	94 1.76	137 6.59	15 0.93	4 0.10	360 13.18
Camellia japonica v. *spontanea*	222 3.60		59 2.74	71 1.56	95 4.29	30 0.87	32 1.42	67 2.20	151 9.86	68 2.94	31 1.41
Camellia Sasanqua	2 0.02	170 4.81	347 10.64	174 5.49	100 2.36	225 3.96	301 11.56	308 3.90	27 0.40	91 2.27	419 10.46
Eurya japonica	80 0.99	51 0.28	291 13.31	206 1.84	137 1.11	78 0.47	182 2.09	50 0.47	47 0.42	143 1.53	63 1.34
Neolitsea aciculosa	7 0.76	36 0.88	89 6.78	74 2.86	2 0.01	2 0.04	67 0.67	72 3.32	15 0.26	29 2.35	114 6.35
Cinnamomum japonicum	65 1.77	79 6.04	106 8.20	32 0.61	84 3.31	12 0.54	28 1.03	43 9.87	32 0.84	7 0.35	46 3.48

Remarks. Above species were picked up from the data of Arakawa, in which no divisions of strata are shown. Therefore, the figures for each species indicate the sum of the main tree species belonging to the second and third stratum, although the weight of the third stratum in volumes is very slight.

In each column the upper figures indicate the number of individuals and those of the lower indicate the volumes, in m³.

Sample plots are the same as in Table VI.

Stratum 3. Lower part of the second stratum is formed by small trees and saplings from 3 to 8 m. in height. The floristic composition is not so different from those of the second stratum — especially in the seral stage —, but it may be distinguished from it by the presence of particular species normally belonging to this stratum. Such species are *Eurya japonica*, *Ligustrum japonicum*, *Symplocos myrtacea*, *Camellia Sasanqua*, *Viburnum Awabucki*, *Neolitsea aciculosa*, *Symplocos glauca*, *Premna japonica, Euscaphis japonica,* etc. The most frequent species of this stratum are *Neolitsea aciculosa, Camellia Sasanqua, Eurya japonica* and some of the saplings of species belonging to the higher strata, such as *Cleyera japonica, Machilus japonica, Illicium japonicum, Distylium racemosum,* etc. The full list of species and their number of individuals and volumes (in m^3) per ha. are shown in Table XII.

Eurya japonica, a small tree or shrub up to 5 m. in height, occurs in both wet and dry sites, but it prefers the forests near or on the tops of ridge. *Camellia Sasanqua* and *Neolitsea aciculosa* are small tree seldom reach the second stratum as mentioned above. *Symplocos myrtacea* is a small tree up to 5 m., though generally it occurs as a shrub about 1–2 m. high. This is a characteristic dominant shrub of the *Abies firma* association of the higher regions, and, therefore, usually it occurs at upper part of this community.

The lower part of this stratum is characterized by the occurrence of the few species normally belong to this part, but it may be unwise to divide this lower part of the third stratum as a separate stratum. The average cover grades and the percentage frequencies of species ranging from 1.5 m. to 3 m. in height which belong to the lower part of the third stratum are shown in Table XIII.

Stratum 4. Nanophanerophytes and herbaceous plants.

The climate which prevails under this stratum is remarkably uniform. Sunflecks are rarely to be seen on the forest floor, the light intensity is very low, and the stillness of the air is undisturbed by the wind which may often be heard rustling the leaves in the top strata of the forest. Although no records are available it is evident that both temperature and humidity change very slowly from day to day. The dominant species being evergreen ferns, such as *Rumohra aristata* and *Dryopteris subtripinnata,* of which the latter species is a common dominant in wetter sites along the ravines, while the former predominates in somewhat drier forests on the mountain slopes. In some places *Damnacanthus indicus* which forms small flat-toped bush about 50 cm. high occurs abundantly. *Maesa japonica* which forms bush about 1 m. high is also frequent in forest along the ravines. Less frequent are *Ardisia lentiginosa, Ardisia crispa, Ardisia pusilla, Skimmia japonica*—especially at higher altitudes—and *Chloranthus glaber* which are characteristic shrubs of this stratum in the district. Herbaceous species are very rare. *Dryopteris erythrosora*—at low and medium altitudes—, *Plagiogyria japonica*—especially at high altitudes—, *Lycopodium serratum, Diplazium lanceum, Calanthe Matsumurana, Goodyera velutina, Cymbidium virescens, Alpinia japonica, Ainsliaea apiculata*—especially at high

Table XI.

Table showing the number of individuals (No.) and volumes in m^3 (V) per ha. of tree species which belong to the second stratum in sample plots I-V.

Sample plots / Species	I		II		III		IV		V		VI	
	No.	V	No.	V	No.	V	No.	V	No.	V	C	%F
Cleyera japonica	71	11.0	16	7.6	68	13.7	76	14.3	64	12.5	2.2	87
Illicium japonicum	24	4.7	4	1.5	44	13.3	60	11.8	24	3.2	1.5	68
Camellia Sasanqua	19	2.7			20	2.1	44	3.8	40	4.8	0.3	28
Eurya japonica	5	0.5					4	0.2			0.6	55
Quercus stenophylla	13	2.5			12	4.3	4	0.2	8	4.9	+	4
Neolitsea aciculosa	15	2.5			4	0.6					+	4
Distylium racemosum	37	8.3	16	5.1	48	9.6	80	26.0	64	17.8	+	28
Camellia japonica var. *spontanea*	16	2.5	8	1.7	44	6.5	56	9.8	32	10.3	0.8	59
Actinodaphne longifolia	8	1.5	4	1.5	4	1.5	4	2.1	8	4.3		
Symplocos prunifolia	6	1.5										
Podocarpus macrophylla	4	0.9			4	1.3					+	9
Castanopsis cuspidata	5	0.8	4	1.3	4	2.5					+	9
Machilus Thunbergii	3	1.4			4	1.3					+	4
Quercus acuta					20	8.8	12	3.0				
Cornus controversa	9	2.1										
Lindera Thunbergii	5	0.7										
Machilus japonica	2	1.1	12	4.9			4	9.2				
Daphniphyllum macropodum							8	1.7			+	9
Fagara ailanthoides	8	2.4										
Euscaphis japonica	2	0.2										
Cinnamomum japonicum	1	0.3	4	1.3	12	5.5	4	1.3			+	9
Lithocarpus edulis	3	1.0	4	1.5	20	6.4	8	2.9				
Mallotus japonica	5	1.1										
Abies firma											+	4
Actinodaphne lancifollia	3	1.4			12	3.4						
Symplocos myrtacea											+	12
Syzigium buxifolium	2	0.2										
Phellodendron sachalinense	1	0.1										
Viburnum Awabuki	1	0.4										
Neolitsea sericea					4	0.6	4	0.2				
Meliosma rigida			8	2.7	1	0.5			8	0.5		
Broussonetia kazinoki							4	0.2				
Ternstroemia gymnanthera			4	0.5								
Total	268	51.8	84	29.6	325	81.9	372	86.7	248	58.3		

Remark. In sample plots VI the average cover grades (C) and the percentage frequencies (%F) are shown.

Table XII.

Table showing the number of individuals and volumes (in m³) per ha. of tree species belonging to the third stratum in sample plots I-V.

Sample plots / Species	I		II		III		IV		V	
	No.	V	No.	V	No.	V	No.	V	No.	V
Cleyera japonica	**121**	**1.60**	28	0.24	56	0.83	72	1.19	80	1.26
Illicium japonicum	50	0.81	36	0.55	**80**	**0.86**	**104**	**1.48**	8	0.10
Camellia Sasanqua	48	0.75	4	0.03	20	0.12	104	1.28	**200**	**2.18**
Eurya japonica	48	0.60	**92**	**0.76**	72	0.83	124	0.84	88	0.65
Quercus stenophylla	17	0.29	12	0.11	16	0.37			16	0.42
Neolitsea aciculosa	15	0.17	20	0.21	4	0.03	8	0.08	32	0.11
Distylium racemosum	25	0.51	8	0.08	20	0.14	60	1.40	32	0.42
Camellia japonica v. *spontanea*	23	0.36	8	0.06	**60**	**0.98**	48	1.05	96	0.80
Actinodaphne longifolia	14	0.25	4	0.10	20	0.16	4	0.05	24	0.22
Symplocos prunifolia	7	0.06	4	0.03						
Podocarpus macrophyllus	6	0.13	4	0.03	4	0.03				
Castanopsis cuspidata	4	0.04	20	0.14	4	0.03	4	0.03	24	0.11
Machilus Thunbergii	5	0.35					4	0.03		
Quercus acuta	7	0.11	4	0.03	32	0.42	4	0.03		
Cornus controversa	1	0.01								
Lindera Thunbergii	2	0.05								
Machilus japonica	6	0.08	120	1.11			32	0.26		
Daphniphyllum macropodum			4	0.03			4	0.05		
Euscaphis japonica	2	0.05								
Cinnamomum japonicum	3	0.08	12	0.08	20	0.16	28	0.24		
Lithocarpus edulis			12	0.34	16	0.18	12	0.24	8	0.06
Mallotus japonica	1	0.01								
Abies firma							4	0.05		
Actinodaphne lancifolia	1	0.01	4	0.03	8	0.08				
Symplocos myrtacea	2	0.01			16	0.29	28	0.22		
Ligustrum japonicum					8	0.08				
Symplocos lancifolica	2	0.05								
Elaeocarpus japonicus			4	0.03						
Symplocos japonia	2	0.01								
Cephalotaxus drupacea	1	0.01					4	0.03		
Ilex Hanceana	1	0.04								
Symplocos glauca			8	0.06	4	0.05				
Neolitsea sericea			24	0.32	12	0.13	16	0.14	16	0.42
Meliosma rigida					4	0.03				
Broussonetia Kazinoki			10	0.14			12	0.47		
Premna japonica	3	0.06	4	0.05			4	0.05		
Ficus erecta							4	0.05		
Total	417	6.53	497	4.56	460	5.83	688	9.07	424	6.64

Table XIII.

Table showing the average cover grades (C) and percentage frequencies (%F) of species belonging to the lower part of the third stratum in belt transects I-V.

No. of belt transects.	I		II		III		IV		V	
Average cover grades and percentage frequencies / Speies	C	%F	C	%F	C	%F	C	%F	C	%F
Cleyera joponica	1.0	36	+	20	+	4	–	–	0.6	37
Eurya japonica	**1.0**	**50**	0.9	33	+	32	0.7	36	**1.1**	**44**
Quercus stenophylla	0.7	40	+	14	+	32	+	4	+	9
Castanopsis cuspidata	0.7	38	–	–	–	–	+	9	+	19
Neolitsea aciculosa	0.5	31	0.8	54	**1.0**	**59**	**1.0**	**88**	0.6	39
Distylium racemosum	0.5	52	+	12	+	13	0.5	36	+	12
Camellia Sasanqua	0.3	29	+	16	0.5	41	0.8	45	0.6	31
Cinnamomum japonicum	+	24	+	16	+	18	+	9	+	19
Symplocos myrtacea	+	14	+	4	+	9	+	4	0.5	43
Camellia japonica var. *spontanea*	+	14	+	20	0.6	50	–	–	+	25
Maesa japonica	+	14	–	–	+	4	–	–	–	–
Ligustrum japonicum	+	17	–	–	+	4	–	–	+	16
Machilus japonica	+	7	**1.2**	**40**	+	18	0.8	36	+	5
Symplocos japonica	+	5	+	4	+	4	–	–	+	7
Machilus Thunbergii	+	5	–	–	+	4	–	–	+	17
Neolitsea sericea	+	5	–	–	+	4	+	27	+	17
Ternstroemia gymnanthera	+	5	+	4	0.4	32	–	–	+	7
Elaeocarpus japonicus	+	2	+	4	+	4	–	–	–	–
Dendropanax trifidum	+	5	–	–	+	9	–	–	+	1
Cephalotaxus drupacea	+	2	+	4	–	–	–	–	+	1
Illicium japonicum	+	17	0.7	54	+	26	1.0	54	0.6	37
Meliosma rigida	+	2	+	8	–	–	–	–	–	–
Daphniphyllum macropodum	+	2	–	–	–	–	–	–	+	5
Actinodaphne longifolia	+	2	+	4	+	9	–	–	–	–
Ilex rotunda	+	2	–	–	–	–	–	–	–	–
Symplocos prunifolia	+	12	+	2	–	–	–	–	+	1
Abies firma	–	–	–	–	–	–	–	–	+	16
Michelia compressa	–	–	–	–	–	–	–	–	+	3
Daphne kiusiana	–	–	+	4	–	–	–	–	+	1
Rhododendron Kaempheri	–	–	–	–	–	–	–	–	+	13
Wikstroemia trichotoma	–	–	–	–	–	–	–	–	+	5
Berchemia fagifolia	–	–	–	–	–	–	–	–	+	3
Actinodaphne lancifolia	–	–	–	–	–	–	–	–	+	3
Quercus acuta	–	–	–	–	+	4	–	–	+	3
Pieris japonica	–	–	–	–	–	–	–	–	+	8
Hydrangea luteo-venosa	–	–	–	–	–	–	–	–	+	1
Ilex crenata	–	–	–	–	–	–	–	–	+	1
Podocarpus macrophyllus	–	–	–	–	–	–	–	–	+	1
Rhododendron vististylum	–	–	+	12	+	26	+	4	–	–
Cornus controversa	–	–	+	4	–	–	–	–	–	–
Meliosa rigida	–	–	+	4	–	–	–	–	–	–
Elaeagnus maritima	–	–	+	12	–	–	–	–	–	–
Clerodendron trichotomum	–	–	+	4	–	–	–	–	–	–
Lithocarpus edulis	–	–	+	4	+	9	–	–	–	–
Ardisia lentiginosa	–	–	+	8	–	–	–	–	–	–
Ilex Hanceana	–	–	+	4	–	–	+	8	–	–

altitudes — and *Arisaema serratum* are scattered through the forest. Seedlings and young trees of tree strata are of course abundant. As the upper limit of the *Distylium racemosum* association is approached *Ainsliaea apiculata, Scutellaria violacea, Goodyera velutina* and *Asarum hexaloba* which originally belong to the *Quercus acuta* association or to the *Abies firma* association gradually increase the number of individuals. The full list of species and their percentage frequencies and cover grades in each sample plot are shown in Table XIV.

As saprophytic flowering plants *Burmannia nepalensis*—most abundant—, *Burmannia cryptopetala, Gastrodia shikokiana, Galeola septemtrionalis* and *Monotropastrum globosum* are rarely met with.

Owing to the high atmospheric humidity trunks of old trees which belong to the first stratum are densely covered with mosses and firm ferns and bear many epiphytes comprising some forty species. The common epiphytes occurring up to 2 m. from the ground—especially in forests along the ravines—are *Trichomanes auriculatum, Trichomanes orientale* and *Lemmatophyllum microphyllum.* As the first stratum is approached and light intensity is increased many epiphytes may be seen, chiefly on the lower branches of the mesophanerophytes. The common epiphytes of this stratum are orchids and pteridophytes as follows.

Orchidaceae	Pteridophytes
Dendrobium moniliforme	*Trichomanes parvulum*
Eria reptans	*Davallia Mariesii*
Bulbophyllum drymoglossum	*Pyrosia Lingua*
Bulbophyllum inconspicuum	*Vittalia japonica*
Aerides japonicum	*Phymatopsis Engleri*
Cirrhopetalum japonicum	*Asplenium Wilfordii*
Oberonia japonica	*Loxogramme salicifolia*
Neofinetia falcata	*Lycopodium Sieboldii*

Woody epiphytes are very rare. The only representative is *Lysionotus pauciflorus* (*Gesneriaceae*), a small shrub up to 20 cm. high bearing showy white flowers. As oblige epiphytes occurring on the forks of branches where the humus accumulate *Hosta sp.* and *Alpinia japonica* which originally grow on the forest floor are rarely met with. Such phenomenon is a characteristic feature of the district.

The lianes and creepers are also abundant especially in wet forests along the ravine. Some twenty-eight woody lianes and creepers have been known in this community in the Hutamata district. The most frequent are *Ficus foveolata, Trachelospermum asiaticum, Parthenocissus tricuspidata, Elaeagnus glabra, Elaeagnus maritima* and *Hedela Tobleri.*

Table XIV.

Table showing the average cover grades (C) and percentage frequencies (%F) of species belonging to the herbaceous layer in belt transect I-V.

Sample plots	I		II		III		IV		V	
Species	C	%F	C	%F	C	%F	C	%F	C	%F
Rumohra aristata	**1.2**	**57**	1.9	88	**2.7**	**91**	**2.5**	**100**	–	–
Damnacanths indicus	1.0	71	0.9	88	1.6	86	1.3	90	+	8
Quercus stenophylla	+	50	+	8	+	46	+	4	+	12
Trachelospermum asiaticum	+	52	+	58	0.5	77	+	81	+	47
Illicium japonicum	+	45	+	12	+	32	+	4	+	28
Camellia Sasanqua	+	40	+	28	+	36	+	63	+	24
Actinodaphne longifolia	+	26	–	–	+	4	+	4	+	1
Castanopsis cuspidata	+	17	+	4	+	32	+	4	+	40
Neolitsea aciculosa	+	26	+	8	+	13	+	4	+	16
Maesa japonica	+	14	+	54	+	36	–	–	–	–
Chloranthus glaber	+	17	+	12	+	4	+	4	–	–
Helicia cochinchinensis	+	10	–	–	+	4	–	–	–	–
Cymbidium virescens	+	17	–	–	–	–	+	9	–	–
Cinnamomum japonicum	+	12	+	8	+	18	+	4	+	4
Kadzura japonica	+	24	+	4	+	9	–	–	–	–
Quercus acuta	+	38	–	–	+	50	–	–	+	36
Hedela Tobleria	+	12	+	8	+	4	+	9	–	–
Symplocos prunifolia	+	10	–	–	–	–	–	–	+	5
Distylium racemosum	+	36	+	8	+	4	+	18	+	37
Ficus foveolata	+	7	+	4	+	4	–	–	–	–
Elaeagnus maritima	+	12	–	–	+	13	–	–	+	11
Actinodaphne lancifolia	+	14	–	–	+	13	+	4	–	–
Machilus Thunbergii	+	61	+	4	+	9	+	4	+	21
Parthenocissus tricuspidata	+	90	+	4	–	–	–	–	+	3
Neolitsea sericea	+	12	–	–	+	13	+	9	+	19
Dryopteris subtripinnata	+	10	**2.4**	**92**	+	9	+	9	–	–
Arisaema serrata	+	5	+	8	–	–	–	–	–	–
Stauntonia hexaphylla	+	12	–	–	+	4	+	4	+	3
Syzygium buxifolium	+	2	–	–	–	–	–	–	–	–
Lithocarpus edulis	+	–	–	–	–	–	+	13	–	–
Gardneria nutans	+	5	–	–	–	–	–	–	–	–
Dryopteris erythrosora	+	20	–	–	–	–	–	–	+	3
Lycopodium serratum	+	10	–	–	–	–	–	–	–	–
Ilex rotunda	+	2	–	–	–	–	–	–	–	–
Ligustrum japonicum	+	10	–	–	+	4	–	–	+	19
Abies firma	+	5	–	–	–	–	–	–	+	59
Vittalia japonica	+	2	–	–	–	–	–	–	–	–
Pyrosia lingua	+	2	–	–	–	–	–	–	+	1
Ardisia lentiginosa	+	2	–	–	–	–	–	–	+	1
Wistaria floribunda	+	12	–	–	–	–	–	–	–	–
Loxogramme salicifolia	+	2	–	–	–	–	–	–	–	–
Cleyera japonica	+	2	–	–	–	–	–	–	+	4
Symplocos myrtacea	+	2	–	–	+	4	+	4	+	37
Camellia japonica var. *spontanea*	+	7	–	–	+	26	–	–	+	19
Plagiogyria euphlebia	+	2	–	–	–	–	–	–	–	–
Diplazium lanceum	+	2	+	4	–	–	+	4	–	–
Machilus japonica	+	2	+	8	+	36	+	45	+	1
Eurya japonica	+	2	+	4	+	13	+	9	–	–
Daphniphyllum macropodum	+	2	–	–	+	13	–	–	+	17
Ternstroemia gymnanthera	+	2	–	–	+	18	–	–	+	19
Calanthe Matsumurana	+	2	–	–	–	–	–	–	–	–
Ardisia pusilla	+	2	–	–	–	–	–	–	–	–
Viburnum Awabucki	+	2	–	–	–	–	–	–	–	–
Ainsliaea apiculata	–	–	–	–	–	–	–	–	+	72
Scutellaria violacea	–	–	–	–	–	–	–	–	+	36
Goodyera velutina	–	–	+	4	+	4	–	–	+	36
Ilex crenata	–	–	–	–	–	–	–	–	+	3
Skimmia japonica	–	–	–	–	–	–	–	–	+	17
Rubus edulis	–	–	–	–	–	–	–	–	+	3

Less frequent are *Lonicera affinis*, *Uncaria rhynchophylla*, *Berchemia magna*, *Berchemia fagifolia* — at high altitudes only—, *Actinidia rufa*, *Actinidia hypoleuca*, *Schizophragma hydrangeoides*, *Vitis flexuosa*, *Ampelopsis brevipedunculata* and *Celastrus orbiculatus*.

VII. Explanation of sample plots cited

No. of sample plots	Elevations in m.	Expositions	Slopes	Areas	Places
I	450	S	18°	100 m. × 100 m.	Subcompartment い, compartment 40, lower part of the Tatedani national forest.
II	400	S10 E	20°	50 m. × 50 m.	Subcompartment い, compartment 37, lower part of the Tatedani national forest.
III	450	S10 E	24°	50 m. × 50 m.	Ditto.
IV	550	S10 E	24°	50 m. × 50 m.	Ditto.
V	550	W	10°	50 m. × 25 m.	Subcompartment い, compartment 39, Uchinomaki national forest.
VI	700	W	25°	4 m. × 75 m.	Subcompartment い, compartment 41, upper part of the Tatedani national forest.

VIII. Summary

1. Brief description of the climate of the Hutamata district is given.

2. A brief description of the method employed in the field is given.

3. In the course of a survey on the basis of quadrats and belt transects various communities of forest vegetation were recognized.

4. Three main communities are recognized at the inland of Central Ohsumi: *Distylium racemosum* association, *Abies firma* association and *Quercus acuta* association, and their characteristic features and floristic compositions are shortly described.

5. As a first part of the studies on these communities the structure of *Distylium racemosum* association is described in detail.

6. This association generally ascends the altitudes up to approximately 800 m. above the sea level, at where it is gradually replaced by the *Quercus acuta* association, and decends the altitudes down to 300–600 m., at where it usually transfers to the *Castanopsietum*.

7. The dominant species of this community is *Distylium racemosum*, and the most frequent co-dominants are *Quercus stenophylla* and *Castanopsis cuspidata*. Less frequent is *Machilus Thunbergii* which occurs

sometimes as a dominant in wet forests along the ravine at lower altitudes.

8. In describing this association the vegetation is divided up into four strata: stratum 1, stratum 2, stratum 3, stratum 4.

9. Remark on the unusual lower limit of distribution of *Abies firma* and *Quercus acuta* is made, and as a possible cause of these inverse phenomenon high atmospheric humidity of this district is suggested.

10. From the statistical survey it became obvious that three main sociations—*Distylium racemosum-Cleyera japonica-Rumohra aristata* sociation, *Distylium racemosum-Machilus japonica-Dropteris subtripinnata* sociation and *Distylium racemosum-Camellia Sasanqua-Rumohra aristata* sociation—occur in this community.

11. Some remarks are made on the distribution of this community in southern Japan.

IX. References

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