
Article

Castanopsis cuspidata dominated coppices in southern Miyazaki Prefecture

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Abstract

The *Castanopsis cuspidata* dominated coppices in southern Miyazaki Prefecture were investigated from the phytosociological viewpoint, in order to clarify the species composition, layering structure and species diversity. The frequent species, except *Castanopsis cuspidata*, are *Quercus glauca*, *Camellia japonica*, *Eurya japonica*, *Ligustrum japonicum*, *Trachelospermum asiaticum* and so. The number of species expected in 100 m² of the coppices are approximately 35-40 species and 25-30 species for all occurring species and component species of lucidophyllous forest, respectively. The coppices have characteristic species composition and life form spectra different from those of the published secondary forest associations which are mainly distributed in *Castanopsis* forest zone.

Key Words: *Castanopsis cuspidata* dominated coppice, layering structure, life form spectra, species composition, species diversity, Miyazaki Prefecture

Introduction

The secondary forests in the warm-temperate zone of Japan are mainly classified into four types by physiognomy: pine dominated secondary forests, summergreen secondary forests, sclerophyllous secondary forests and lucidophyllous secondary forests (Hattori et al., 1995). These secondary forests, except lucidophyllous, are dominated by species different from dominants of natural forests which are lucidophyllous forests. On the other hand, the lucidophyllous secondary forests have the same dominant species as natural forests, such as *Castanopsis cuspidata*, *Quercus glauca*, *Pasania glabra*, *Quercus salicina*, *Pasania edulis*, etc. (Itow, 1983). This type of secondary forest is mainly distributed in the Pacific coastal areas from Kyushu to Boso Peninsula, particularly well developed in southern and western Kyushu (Itow and Kawasato, 1978).

In southern Miyazaki Prefecture, *Castanopsis cuspidata* dominated coppices, which were used to get fuel and charcoal in the past, are widely distributed. We investigated the coppices as part of phytosociological and

ecological studies on lucidophyllous secondary forests. In the present paper, we describe the species composition, layering structure and species diversity of the coppices, and examine the characteristics of species composition and life form spectra of the coppices by comparing with the published secondary forest associations which are mainly distributed in *Castanopsis* forest zone.

We will discuss the position of the coppices in phytosociological systems or the difference between the coppices and the lucidophyllous natural forests more fully in a separate paper.

Study area

Castanopsis cuspidata dominated coppices were investigated in southern Miyazaki Prefecture (Fig. 1). They are distributed in the lowland areas (80-225m above sea level). The area is built of deposits composed mainly of sandstone and mudstone. The meteorological data (Meteorological Agency, 1958, 1959) at the nearest weather station from the area, which is in Takaoka (19m above sea level), show that the annual precipitation is 2435 mm and

the mean air temperature of the coldest month is 7.1°C. As the area is situated at a distance of more than 22 km from the nearest coastline, it is not influenced by sea wind.

Methods

The field survey was carried out in 53 stands during 1996-1997, following the phytosociological method (Braun-Blanquet, 1964). In each stand, a 100m² quadrat was set and the coverage(%) of all the plants appearing in each layer were measured. In addition, the altitude, inclination and exposure were also recorded.

Results

Species composition and layering structure

Appendix 1 shows the vegetation table of the *Castanopsis cuspidata* dominated coppices investigated. In the table, species are arranged in order of frequency of occurrence and the coverage of species is indicated by converting percentage into the Braun-Blanquet's cover abundance scale.

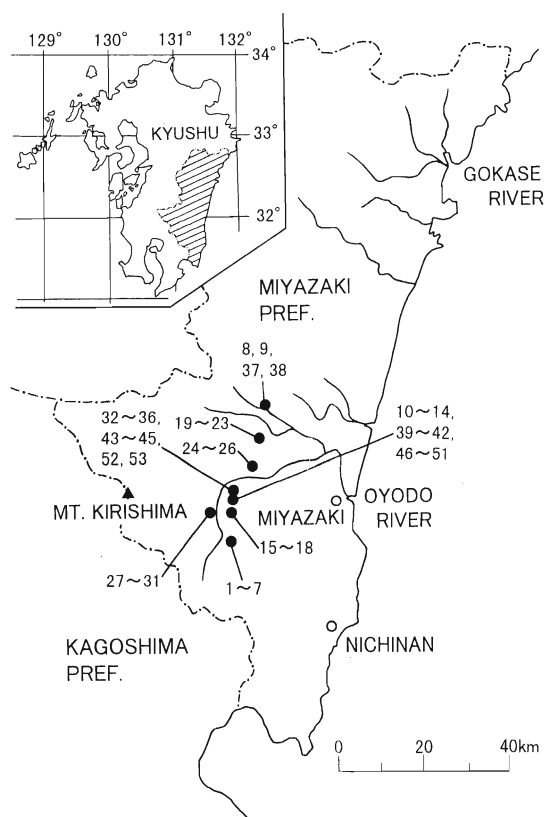


Fig.1. Location of study area. Numerals (1 ~ 53) correspond to the stand numbers in Appendix 1.

Species occurring frequently in the coppices are *Castanopsis cuspidata*, *Quercus glauca*, *Camellia japonica*, *Neolitsea aciculata*, *Meliosma rigida*, *Cinnamomum japonicum*, *Persea thunbergii*, *Neolitsea sericea*, *Distylium racemosum*, *Eurya japonica*, *Ligustrum japonicum*, *Aucuba japonica*, *Ficus erecta*, *Callicarpa mollis*, *Ardisia pusilla*, *Rubus buergeri*, *Illicium religiosum*, *Trachelospermum asiaticum*, *Wisteria floribunda* and *Kadsura japonica*.

The coppices have four or five layers. The height of trees which compose the tree layer are even for each stand and are approximately 15-18m. The tree layer reaches about 85 % or more in coverage and is nearly closed. In this layer, *Castanopsis cuspidata* with 2-5 trunks resulting from sprouting is dominant. There is also some mingling with climbers (*Berchemia racemosa*, *Celastrus orbiculatus*, *Akebia trifoliata*) and summergreen trees (*Prunus jamasakura*, *Albizia julibrissin*, *Cornus controversa*, *Mallotus japonicus*). The first shrub layer consist of plants that are 5-8 m high, with coverage between 12 and 75%. Species seen in this layer are *Eurya japonica*, *Distylium racemosum*, *Camellia japonica*, *Ligustrum japonicum*, *Meliosma rigida* and others. In the second shrub layer, plants are 2-4 m high, with a coverage of 10-30%. *Aucuba japonica*, *Callicarpa mollis*, *Neolitsea aciculata*, *Cinnamomum japonicum*, *Illicium religiosum*, *Cleyera japonica*, *Symplocos lucida* and *Neolitsea sericea* occur frequently. The herb layer (height 0.3-0.7m) has saplings and seedlings of species mentioned above, and there are also some species such as *Ardisia pusilla*, *Rubus buergeri*, *Alpinia japonica*, *Arachniodes sporadosora*, *Oplismenus undulatifolius*, *Kadsura japonica*, *Dumasia truncata*, *Liriope platyphylla* and so.

Species diversity

Various diversity indices (e.g. Fisher's α , Shannon's H' , Simpson's β) have been proposed as measures of species diversity (Itow and Miyata, 1977). Of these indices, the number of species per unit area is the best indicator of species richness and is the easiest to understand the meaning of its value. In this paper, we describe the number of species per unit area (100m²) of the *Castanopsis cuspidata* dominated coppices.

Fig.2 shows the relationships between the number of species per 100m² and the number of quadrats for all species and component species of lucidophyllous forest. The judgement of component species of lucidophyllous forest was based on Hattori (1985) and Miyawaki et al.(1994).

Although the number of all occurring species per 100m² are widely scattered between 20 and 55 species,

the mode is in the range from 35 to 40 species. On the other hand, the number of component species of lucidophyllous forest per 100m² is concentrated between 25 and 30 species. From these results, the number of species expected in 100m² of the *Castanopsis cuspidata* dominated coppices seems to be 35-40 species and 25-30 species for all occurring species and component species of lucidophyllous forest, respectively.

Discussion

Comparison between the *Castanopsis cuspidata* dominated coppices and the published secondary forest associations

1. Species composition

Yamanaka (1969), who investigated secondary forests in southern Shikoku (*Pinus densiflora* community, *Quercus serrata*—*Castanea crenata* community, *Quercus glauca* community and *Castanopsis cuspidata* community), reported that the *Castanopsis cuspidata* community

has many species common to the other secondary forest communities, such as *Rhus succedanea*, *Callicarpa mollis*, *Rhus trichocarpa*, *Viburnum erosum*, *Clethra barbinervis* and so. Also, Itow et al. (1976) pointed out that the *Castanopsis cuspidata* dominated coppices in Tsushima Islands, western Kyushu include some species occurring characteristically in secondary forests, such as *Callicarpa mollis*, *Styrax japonicus*, *Fraxinus sieboldiana*, *Viburnum erosum*, *Clethra barbinervis*, *Rhus trichocarpa* and others. These reports suggest that *Castanopsis cuspidata* dominated secondary forests are more or less similar to other types of secondary forest floristically. Therefore, in order to clarify the similarity or difference of species composition between the *Castanopsis cuspidata* dominated coppices investigated and other types of secondary forest, the species composition of the coppices were compared with those of *Daphno pseudomezerei*-*Quercetum serratae* in Zushi, Tokyo Pref. (Miyawaki et al., 1971), *Quercetum variabili-serratae* in Takehara, Hiroshima Pref. (Kobayashi et al., 1976), *Platycaryo-Quercetum serratae* in Tsushima Islands (Itow, 1981), *Rhododendro weyrichii*-*Pinetum densiflorae* in southern Shikoku (Yamanaka, 1969), *Rhododendro macrosepali*-*Pinetum densiflorae* in Kobe, Hyogo Pref. (Nakanishi et al., 1982) and *Rhododendro reticulati*-*Pinetum densiflorae* in Takehara, Hiroshima Pref. (Kobayashi et al., 1976), which are mainly distributed in *Castanopsis* forest zone. Appendix 2 gives a summary of their species compositions.

As shown in Appendix 2, the coppices have some species common to all the published associations, such as *Callicarpa mollis*, *Rhus trichocarpa*, *Prunus jamasakura*, *Viburnum erosum*, *Ligustrum japonicum*, *Eurya japonica*, *Cinnamomum japonicum*, *Camellia japonica* and so.

However, the coppices are clearly distinguished from the published associations by the presence of *Castanopsis cuspidata*, *Actinodaphne lancifolia*, *Neolitsea aciculata*, *Illicium religiosum*, *Distylium racemosum*, *Persea japonica*, *Prunus spinulosa*, *Arachniodes sporadosora*, *Alpinia japonica*, etc. Also, the coppices are characterized by the absence of differential species of *Daphno pseudomezerei*-*Quercetum serratae* (*Daphne pseudomezereum*, *Pleioblastus chino*, *Stachyurus praecox*, *Ligustrum obtusifolium*, *Stephanandra incisa*, *Cornus controversa*, *Lonicera gracilipes* var. *glabra*, etc.), *Quercetum variabili-serratae* (*Quercus variabilis*), *Platycaryo-Quercetum serratae* (*Platycarya strobilacea*, *Scutellaria indica* var. *tsusimensis*, *Melampyrum roseum*, *Rhododendron mucronulatum*, *Spodiopogon sibiricus*, etc.), *Rhododendro weyrichii*-*Pinetum densiflorae* (*Rhododendron weyrichii*, *Symplocos prunifolia*, *Oplismenus*

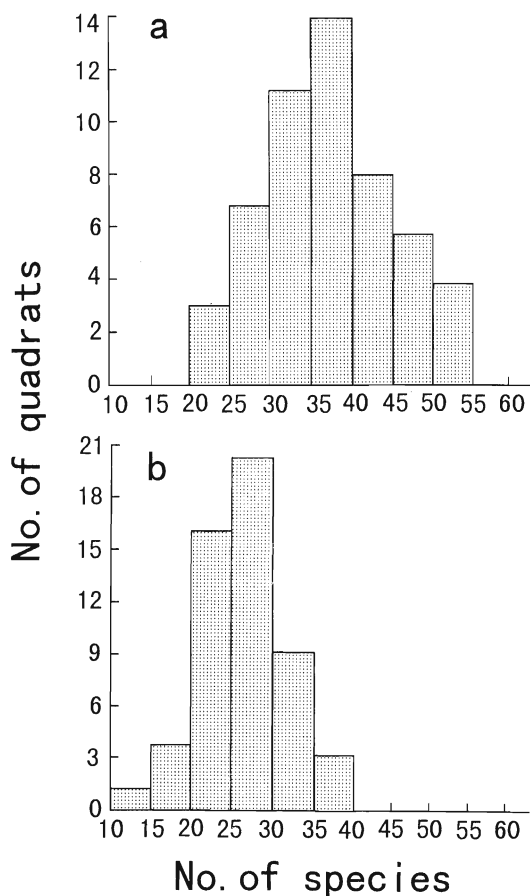


Fig.2. Relationships between the number of species per 100m² and the number of quadrats for all occurring species (a) and component species of lucidophyllous forest (b).

undulatifolius var. *japonicus*, *Ilex macropoda*, etc.) and *Rhododendro macrosepali*-*Pinetum densiflorae* (*Rhododendron macrosepalum*, *Vaccinium smallii* var. *glabrum*, *Rhamnus crenata*, *Vitis saccharifera*, *Acer crataegifolium*, etc.). Thus, the *Castanopsis cuspidata* dominated coppices have characteristic species composition different from those of the published secondary forest associations.

2. Life form spectra

The *Castanopsis cuspidata* dominated coppices and the published secondary forest associations mentioned above were compared with respect to life form spectra (Fig.3). Life forms were classified into nine types, based on Miyawaki et al.(1994) : ① evergreen trees (ET), ② evergreen shrubs (ES), ③ evergreen herbs (EH), ④ evergreen climbers (EC), ⑤ epiphytes (EP), ⑥ summergreen trees (ST), ⑦ summergreen shrubs (SS), ⑧ summergreen herbs (SH) and ⑨ summergreen climbers (SC). The value(%) of spectra was calculated by adopting the number of species of each life form.

In the *Castanopsis cuspidata* dominated coppices, the value of evergreen trees is very high, whereas the values of summergreen trees and summergreen shrubs are relatively low. And, evergreen plants (ET+ES+EH+EC+EP) occupy more than 70% of the whole value in the coppices, but they occupy less than 50% in the published associations. These results show that the *Castanopsis*

cuspidata dominated coppices are secondary forests characterized by a high value of evergreen plants, especially evergreen trees in life form spectra.

The climatic conditions in the area investigated are mainly related to the reason why the coppices maintain a high value of evergreen plants in the life form spectra in spite of repeated cutting to get fuel or charcoal. Itow (1983) reported that the lucidophyllous secondary forests in southwestern Japan are distributed in coastal areas with more than 5°C of the mean air temperature of the coldest month, and mentioned that evergreen trees have a good sprouting ability and high productivity due to the warm and humid maritime climate in these areas. As the area investigated has a very warm and humid climate, it seems to be easy for evergreen trees and shrubs to regenerate by sprouting, whereas difficult for summergreen plants to grow in the coppices due to the poor light condition resulting from the closed upper layers made by regenerated evergreen trees and shrubs.

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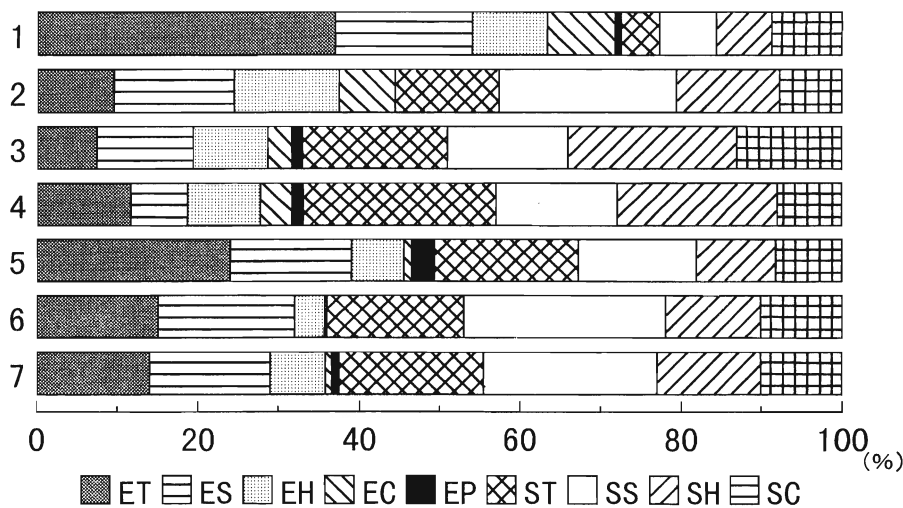


Fig.3. Life form spectrum of the *Castanopsis cuspidata* dominated coppices(1), *Daphno pseudomezerei*-*Quercetum serratae*(2), *Quercetum variabilis-serratae*(3), *Platycaryo-Quercetum serratae* (4), *Rhododendro weyrichii*-*Pinetum densiflorae*(5), *Rhododendro macrosepali*-*Pinetum densiflorae* (6) and *Rhododendro reticulati*-*Pinetum densiflorae*(7). ET: Evergreen trees, ES:Evergreen shrubs, EH: Evergreen herbs, EC: Evergreen climbers, EP: Epiphytes, ST: Summergreen trees, SS: Summergreen shrubs, SH:Summergreen herbs, SC: Summergreen climbers.

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Appendix 2. Summarized table of the *Castanopsis cuspidata* dominated coppices (1), *Daphno pseudomezerei-Quercetum serratae* (2), *Quercetum variabili-serratae* (3), *Platycaryo-Quercetum serratae* (4), *Rhododendro weyrichii-Pinetum densiflorae* (5), *Rhododendro macrosepali-Pinetum densiflorae* (6) and *Rhododendro reticulati-Pinetum densiflorae* (7).

Community No. of Rel.	1	2	3	4	5	6	7
	53	49	32	21	14	57	67
Differential species of the <i>Castanopsis cuspidata</i> dominated coppices							
<i>Castanopsis cuspidata</i>	V+5	*	r+	*	I 1-2	*	r+1
<i>Actinodaphne lancifolia</i>	III+2	*	r+	I+1	+1	I+	*
<i>Neolitsea aciculata</i>	V+2	*	*	r+	*	*	*
<i>Illicium religiosum</i>	III+1	*	*	*	*	+1	*
<i>Distylium racemosum</i>	III+4	*	*	*	*	*	*
<i>Persea japonica</i>	III+2	*	*	*	*	*	*
<i>Prunus spinulosa</i>	III+1	*	*	r+	I+	*	*
<i>Arachniodes sporadosora</i>	III+3	*	*	*	*	*	*
<i>Alpinia japonica</i>	III+	*	*	*	+1	*	*
<i>Rohdea japonica</i>	I+	*	*	r+	*	*	*
<i>Dumasia truncata</i>	III+1	r+	r1	*	*	r+	r+
<i>Aristolochia kaempferi</i>	III+1	+1	*	*	*	*	*
<i>Quercus myrsinaefolia</i>	II+2	*	*	*	*	r+	*
<i>Meliosma rigida</i>	IV+3	*	r+	*	r+	*	r+
<i>Daphniphyllum teijsmannii</i>	II+2	r+	*	*	+1	+1	r+
<i>Arachniodes aristata</i>	II+2	*	*	r+	*	*	*
<i>Microlepis marginata</i>	I+	r+	*	*	*	*	*
<i>Ilex rotunda</i>	II+2	*	*	r+	I+	+1	r+
<i>Elaeocarpus japonicus</i>	II+1	*	*	*	+1	*	*
<i>Celastrus orbiculatus</i>	II+1	+1	+1	*	*	r+	r+
<i>Ilex buergeri</i>	I+2	*	*	*	*	*	r+
<i>Quercus gilva</i>	II+3	*	*	*	*	*	r+
<i>Tylophora japonica</i>	I+	*	*	*	*	*	*
<i>Lonicera hypoglauca</i>	II+	*	*	*	*	*	*
<i>Dammacanthus indicus</i>	I+	*	*	*	*	*	*
<i>Michelia compressa</i>	I+1	*	*	*	*	*	*
<i>Pteris disper</i>	I+1	*	*	*	*	*	*
<i>Euchresta japonica</i>	I+	*	*	*	*	*	*
<i>Broussonetia kaempferi</i>	IV+3	*	*	*	*	*	*
<i>Anodendron affine</i>	I+	*	*	*	*	*	*
<i>Villebrunea pedunculata</i>	I+	*	*	*	*	*	*
<i>Broussonetia kaempferi</i>	I+	*	*	*	*	*	*
<i>Syzygium buxifolium</i>	I+	*	*	*	*	*	*
<i>Diospyros morrisiana</i>	I+1	*	*	*	*	*	*
<i>Actinidia arguta</i>	I+1	*	*	*	*	r+	*
<i>Ficus erecta</i> var. <i>sieboldii</i>	I+1	*	*	*	*	*	*
<i>Maesa japonica</i>	II+1	*	*	*	*	*	*
<i>Desmodium laxum</i>	II+1	*	*	*	*	*	*
Differential species of <i>Daphno pseudomezerei-Quercetum serratae</i>							
<i>Daphne pseudomezereum</i>	*	III+	*	*	*	*	*
<i>Pleioblastus chino</i>	*	IV+5	*	*	*	*	*
<i>Stachyurus praecox</i>	r+	IV+2	*	*	r+	*	r+
<i>Ligustrum obtusifolium</i>	*	IV+1	I+	I+	*	r+	r+
<i>Stephanandra incisa</i>	*	III+2	*	r+	*	*	*
<i>Cornus controversa</i>	I+2	III+4	*	r+	*	*	*
<i>Lonicera gracilipes</i> var. <i>glabra</i>	*	IV+2	r+	*	*	*	r+
<i>Viburnum dilatatum</i>	*	III+1	I+	*	r+	+1	r+
<i>Brachypodium sylvaticum</i>	*	I+	r+	*	*	*	*
<i>Carex floribunda</i>	*	II+1	*	r+	*	r+	r+
<i>Zelkova serrata</i>	*	II+3	r+	r+	*	*	*
<i>Acer mono</i> f. <i>dissectum</i>	*	I+2	*	*	*	*	*
<i>Aquilegia adoxoides</i>	*	I+1	*	*	*	*	*
<i>Carex pisiformis</i>	*	I+2	*	*	*	*	*
<i>Calanthe discolor</i>	*	III+	*	*	*	*	*
<i>Buglossoides zollingeri</i>	*	I+	*	*	*	*	*
<i>Scutellaria indica</i> var. <i>parvifolia</i>	*	I+	*	*	*	*	*
<i>Elaeagnus macrophylla</i>	*	I+	*	*	*	*	*
<i>Dryopteris varia</i> var. <i>hikonensis</i>	r+	I+	*	*	*	*	*
<i>Berberis thunbergii</i>	*	I+	*	*	*	*	*
<i>Polystichum polyblepharum</i>	*	I+3	*	*	*	*	*
<i>Carpinus tschonoskii</i>	*	II+3	*	+1	*	*	*
<i>Zanthoxylum ailanthoides</i>	*	II+2	*	*	*	*	*
<i>Reineckea carnea</i>	*	I+2	*	*	*	*	*
<i>Kalopanax pictus</i>	r+	II+2	*	r+	*	+1	*
<i>Lilium auratum</i>	*	I+	*	*	*	*	*
<i>Osmunda japonica</i>	*	II+	+1	*	r+	+1	r+
<i>Euonymus sieboldianus</i>	*	II+	r1	*	*	r+	*
<i>Zanthoxylum piperitum</i>	*	II+	*	r+	*	r+	r+
<i>Ophiopogon planiscapus</i>	*	II+1	r+	*	*	*	*
<i>Polygonatum falcatum</i>	*	I+	*	*	*	*	*

Appendix 2. (continued)

Community No. of Rel.	1 53	2 49	3 32	4 21	5 14	6 57	7 67
<i>Disporum sessile</i>	.	II ⁺¹	.	.	.	.	.
<i>Clematis japonica</i>	.	II ⁺¹	r ⁺
<i>Cephalotaxus harringtonia</i>	I ⁺	III ⁺	.	I ⁺	.	+	.
Differential species of Quercetum variabili-serratae							
<i>Quercus variabilis</i>	.	.	V ⁺⁵	III ¹⁻⁴	.	I ⁻¹	III ⁻⁴
Differential species of Platycaryo-Quercetum serratae							
<i>Platycarya strobilacea</i>	.	.	+	III ⁺³	.	.	.
<i>Scutellaria indica</i> var. <i>tsusimensis</i>	.	.	.	II ⁺¹	.	.	.
<i>Melampyrum roseum</i>	.	.	.	II ⁺¹	.	.	.
<i>Rhododendron mucronulatum</i>	.	.	.	I ⁺	.	.	.
<i>Spodiopogon sibiricus</i>	.	.	.	IV ⁺¹	.	.	.
<i>Torreya nucifera</i>	.	+	+	II ⁻¹	.	.	.
<i>Sorbus commixta</i>	.	.	.	I ⁺²	.	.	.
<i>Abies firma</i>	.	.	.	I ⁺	.	+	+
<i>Cornus kousa</i>	.	.	+	II ⁺	.	+	.
<i>Hosta minor</i>	.	.	.	I ⁺	.	.	.
<i>Lespedeza cyrtobotrya</i>	.	.	r ⁺	II ⁺	.	+	r ⁺
<i>Pyrola japonica</i>	.	.	+	II ⁺	.	r ⁺	r ⁻¹
<i>Lindera obtusiloba</i>	.	.	.	II ⁺	.	.	r ⁺
<i>Diospyros kaki</i> var. <i>sylvestris</i>	.	.	.	I ⁺	.	.	.
<i>Symplocos tanakana</i>	.	.	.	I ⁺	.	.	.
Differential species of Rhododendro weyrichii-Pinetum densiflorae							
<i>Rhododendron weyrichii</i>	.	.	.	.	IV ⁺³	.	.
<i>Symplocos prunifolia</i>	r ⁺	.	.	.	V ⁺³	.	r ⁺
<i>Oplismenus undulatifolius</i> var. <i>japonicus</i>	.	.	.	.	IV ⁻¹	.	.
<i>Ilex macropoda</i>	.	.	r ₂	r ⁺	III ⁺³	I ⁺	r ⁺
<i>Gleichenia japonica</i>	+	+	.	.	III ⁺⁵	r ⁺	+
<i>Symplocos lancifolia</i>	.	.	.	.	I ⁺	.	.
<i>Symplocos glauca</i>	+	+	.	.	I ⁺	.	.
<i>Carpesium divaricatum</i>	.	.	.	.	II ⁺	+	.
Differential species of Rhododendro macrosepalii-Pinetum densiflorae							
<i>Rhododendron macrosepalum</i>	.	.	.	.	.	V ⁻²	.
<i>Vaccinium smallii</i> var. <i>glabrum</i>	.	.	+	.	I ⁺	IV ⁻¹	+
<i>Vitis saccharifera</i>	+	.	.	.	.	II ⁺¹	.
<i>Acer crataegifolium</i>	.	r ⁺	.	.	.	I ⁻¹	.
<i>Abelia serrata</i>	.	.	+	+	.	II ⁺¹	+
<i>Lindera umbellata</i>	.	r ⁺	r ⁺	.	.	III ⁻³	.
<i>Rhamnus crenata</i>	.	.	.	r ⁺	r ⁺	I ⁺	.
<i>Symplocos coreana</i>	.	.	.	r ⁺	.	II ⁺²	.
<i>Mitchella undulata</i>	.	.	.	.	.	I ⁺³	.
<i>Lonicera gracilipes</i>	.	.	.	.	.	I ⁻¹	r ⁺
Species common to all the communities							
<i>Callicarpa mollis</i>	IV ⁻¹	I ⁻¹	III ⁻²	II ⁺	IV ⁺	I ⁺	+
<i>Rhus trichocarpa</i>	+	+	IV ⁻¹	II ⁺	V ⁺¹	V ⁺²	IV ⁺³
<i>Prunus jamasakura</i>	II ¹⁻³	IV ⁺³	II ⁺²	+	II ⁺¹	II ⁺¹	I ⁻¹
<i>Viburnum erosum</i>	+	II ⁺¹	II ⁺	IV ⁺¹	IV ⁺¹	III ⁻¹	II ⁻¹
<i>Ligustrum japonicum</i>	V ⁺²	I ⁺	III ⁺¹	IV ⁺²	IV ⁺¹	III ⁻²	II ⁺³
<i>Eurya japonica</i>	V ⁻²	III ⁺¹	V ⁺⁴	III ⁺²	V ⁺²	V ⁺³	V ⁺⁴
<i>Cinnamomum japonicum</i>	IV ⁻¹	III ⁻¹	II ⁻¹	I ⁺	II ⁺	II ⁺	I ⁺
<i>Camellia japonica</i>	V ⁺²	I ⁺	II ⁺²	III ⁻³	II ⁺	II ⁻¹	I ⁺²
<i>Parthenocissus tricuspidata</i>	I ⁺	I ⁺	II ⁻¹	I ⁺	I ⁺	II ⁻¹	I ⁺¹
<i>Ficus erecta</i>	V ⁺³	III ⁺¹	II ⁺⁴	II ⁺	II ⁺	+	+
<i>Smilax china</i>	II ⁻¹	III ⁺¹	V ⁺²	IV ⁺	V ⁺¹	V ⁻²	V ⁺²
<i>Ardisia japonica</i>	II ⁻¹	V ⁺¹	III ⁺⁴	IV ⁺¹	+	III ⁻¹	II ⁺³
<i>Mallotus japonicus</i>	+	II ⁺¹	II ⁻²	I ⁺	II ⁺	+	+
<i>Dryopteris erythrosora</i>	I ⁺	IV ⁺²	III ⁺²	II ⁺	+	+	I ⁺³
<i>Cymbidium goeringii</i>	+	II ⁻¹	III ⁻¹	IV ⁺¹	II ⁺	II ⁺	II ⁻¹
Companions							
<i>Quercus serrata</i>	r ₁	V ⁺⁵	IV ⁺⁴	V ¹⁻⁴	III ⁺³	V ⁺²	IV ⁺³
<i>Ilex integra</i>	II ⁻¹	II ⁺¹	r ⁻¹	r ⁺	I ⁺	I ⁻¹	r ⁺
<i>Rubus buergeri</i>	III ⁻¹	r ⁺	+	r ⁺	II ⁺	r ⁺	r ⁺
<i>Cocculus orbiculatus</i>	II ⁺	+	I ⁺	r ⁺	I ⁺	I ⁺	+

Community 1: original, 2: Miyawaki et al. (1971), 3: Kobayashi et al. (1976), 4: Ito (1981), 5: Yamanaka (1969), 6: Nakanishi et al. (1982), 7: Kobayashi et al. (1976).



Photo. 1. A coppice dominated by *Castanopsis cuspidata*.



Photo. 2. Landscape of the *Castanopsis cuspidata* dominated coppices.