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イチイ群落の植物社会学的研究

Mizuo MIZUNO, Toshihiro TANAKA, Hiroko FUKUHARA, Toshihiko KOYA* and Kenji YAMAZOE** : *Phytosociological Studies on the Communities of *Taxus cuspidata* SIEB. et ZUCC.*

1. Introduction.

Taxus cuspidata SIEB. et ZUCC. is a evergreen and dioecious tree, 15-20 m tall, 0.5-0.8 m in diameter, being characterized by its crown in shape oblongly rounded and the leaves growing spirally arranged around the branch almost in a stand of two lines in parallel. This tree species occurs in mountainous areas or subalpine zones among the districts, Saghalien, Chishima (south from Ketí-Island), Hokkaidō, Honshū, Shikoku and Kyūshū. This is also found expandly as from Cheju Island toward Korean Peninsula, the northeastern district of China, the Heilungkian district and the Okhotsk district in the Asian Continent. It is said on the reports made by Furuhashi¹⁾ and Tatewaki²⁾ which are the only issues on record at present regarding the community of *Taxus cuspidata*, that this tree species in many cases grow separately in individual within the mixed forests of broad-leaved deciduous trees, *Abies sachalinensis* FR. SCHM. and *Picea jezoensis* CARR., sometimes develops in a form of community in a region of Hokkaidō. Owing to the reasons that this tree is a very important to be used as a timber product and also that the tree has been designated as a representative tree of Gifu Prefecture, the indigenous habitat of the tree in Gifu Pref. was investigated this time and studied from a phytosociological view point, being compared relatively with the other vegetational conditions of the indigenous tree of this species growing in Hokkaidō.

2. Study sites and natural conditions.

It was considered in the past that the places in which *Taxus cuspidata* grew in a large population were the primeval forest on Mt. Kuraiyama in Gifu Pref.. However, there is not any community of this tree on the mountain at present.

It is now just at the neighbouring forests under private ownership or

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around the top of Mt. Funayama of near Mt. Kuraiyama, that the community is found to exist on sparse subsistence level. All the reports mentioned above and the other relevant reports regarding to the community of this tree species say that Hokkaidō is the only place where large communities of the tree are formed. Nevertheless there happens to be found this tree species forming the communities as they are naturally within Gifu Pref., which motivated us to investigate these sites, namely the Ichinomori-Hachiman Shrine* (1,200 m above sea level), Hiwada and Morikoshi-Hachiman Shrine (1,300 m above sea level), Kohiwada, Takane-mura Village, Ōno-Gun, Gifu Pref..

Takane V. is located at the part of the eastern end in the south of Ōno-Gun, in lat. 36.2°N. and long. 127.3°E., and is a upland between 800–3,000m above sea level being adjacent to Mt. Ontake in the south and Mt. Norikuradake in the north. (Fig. 1)

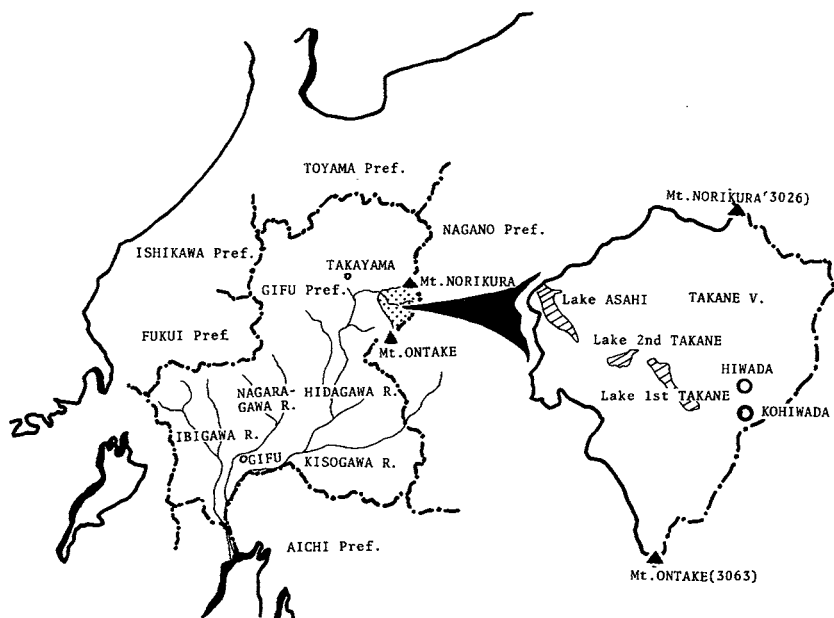


Fig. 1. General geographic map of study sites.

Geography and geology.

The Mashida river takes its sources from the hills of Mt. Norikuradake,

* (Where was designated by Japanese Government as a precious natural product on 26 th June, 1975).

being fed by many tributaries streaming through Takane V., is flowing down to the south to develop into the river as a name of the Hida and finally empties into the Kiso river. Many of the mountains at Takane V. have steep side because all over the mountainous area of Takane V. had been dissected at the stage of their maturity.

There are flat topped mountains which are the peneplain remnants made at the previous stage of the mountainous cycle activities.

It can be also seen at the lower areas of Mt. Norikuradake or Mt. Ontake that vast gently rolling plateaus such as the name of Shirakaba, Nenohara, Sengendaru and Takane-Kōgen spread out which were all formed through the volcanic activities.

Geographical composition at the area is generally characterized by the sorts of andesite which belong to the fourth diluvial epoch. Other type of geological formation, however, comprising conglomerate, sandstone, slate chert and diabase tuff, which belong to the Permian period of the Plaeozoic era runs at the length of about 13 km to the west with the width between the Nomugi Pass (1,672 m) and the upper course of the Makuwa river lying almost from south to north.

Climate.³⁾

The climate of the area was studied by preparing a climatic-diagram from the meteorological data of Takane V. which was available. For the comparative study, the data at Gifu City and also the data Takayama City were prepared as well. Mean annual temperature at Takane V. is 8.7°C. (1902-1950) and 9°C. (1975) and is, comparing with the mean annual temperature of 10.6°C. at Takayama City and 14.8°C. at Gifu City, lower than the both cities' temperature. The maximum temperature of the year at Takane V. is 21.6°C. in August, whereas it is only for two months, in July and August, for the temperature to stand over 20°C. throughout the year. The climate at the area is, therefore, understood to be cool in general over the year. A period of the time that the temperature keeps over the 5°C., which is limited temperature for the suitable growth of plant, is for eight months of the year from April to November, still the lowest temperature during the period is 5.1°C. of the November.

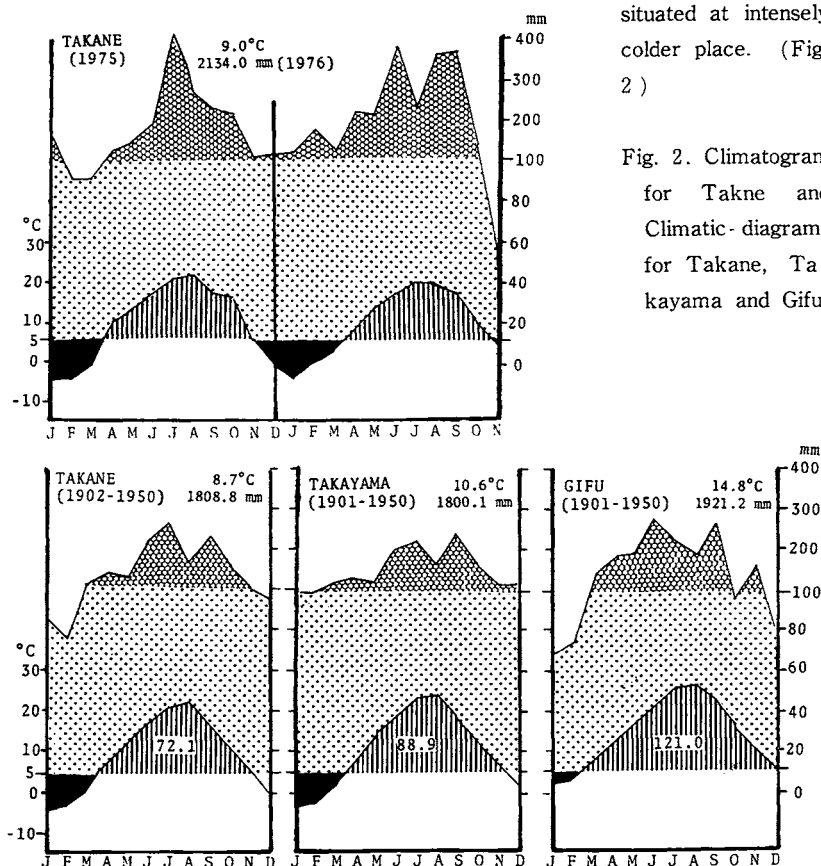
The warmth index on the area is 72.1 (1902-1950) and 75.7 (1975) and also lower in comparison with that of 88.9 at Takayama City and that of 121.0 at Gifu City. The coldness index on the area is -27.3, Takayama City -21.3, and Gifu City -2.6. The figures of the above show that Takane V. is

Table 1

Plants	PLOT NO.						
	1	2	3	4	5	6	7
<u>Tree layer</u>							
<i>Tamus cuspidata</i>	31	31	51	51	21		21
<i>Chamaecyparis obtusa</i>	21	21	11	+			+
<i>Schisaphragma hydrangeoides</i>							
<i>Acer mono</i>					11	31	+
<i>Fraxus grayana</i>					+	+	11
<i>Ilex micrococca</i>					+		+
<u>Subtree layer</u>							
<i>Tamus cuspidata</i>	11	+	11	+	11	21	
<i>Chamaecyparis obtusa</i>	11	11	11	+			+
<i>Ruymyus coryphilla</i>							
<u>Shrub layer</u>							
<i>Chamaecyparis obtusa</i>	11	11	+		+		
<i>Abies homolepis</i>				+	+	+	+
<i>Tamus cuspidata</i>				+	+	22	+
<i>Chamaecyparis pisifera</i>				+	+		
<i>Ilex macrospora</i>				+	+		
<i>Tsuga sieboldii</i>				+			+
<i>Acanthopanax sciadophylloides</i>					11	11	
<i>Acer palmatum</i> var. <i>matsumurae</i>					11	11	
<i>Helwingia japonica</i>					+	11	
<i>Rhus trilobocarpa</i>					11	+	
<u>Herb layer</u>							
<i>Tamus cuspidata</i>	+	+	+	+	+	+	+
<i>Diaporum amilacinum</i>	22	12	12	22	12	+2	22
<i>Dryopteris crassirrhoma</i>	+	+	+	+2	22	44	
<i>Quercus crispula</i>				+	+	+	+
<i>Ilex aenata</i>				+	+	+	+2
<i>Viburnum urticifolium</i>				+	+	+	+
<i>Schisaphragma hydrangeoides</i>				+	+	+	+
<i>Thujopsis dolabrata</i>	22	11	+	+	+	+	+
<i>Chamaecyparis obtusa</i>	+	11	+	+			
<i>Adenocaulon bicolor</i> var. <i>adhaerens</i>	22	+	+	+			
<i>Trachelospermum asiaticum</i>	+	+	12	12			
<i>Ampelopsis brevipedunculata</i>	12	+	12	+			
<i>Artasema serratum</i> forma <i>thunbergii</i>	+	+	+	+			
<i>Acanthopanax sciadophylloides</i>	+	22	+	+	+		+
<i>Ilex macrospora</i>	+	+	+	+			
<i>Rumex standishii</i>	+	+	+	+			
<i>Metastellenium dilatatum</i>		12	+	+	+		
<i>Trillium eschscholii</i>		+	+	+			
<i>Viburnum furcatum</i>		+	+	+	+		
<i>Galium aparine</i>		+	+	+	+		
<i>Ligustrum obtusifolium</i>		+	+	+	+		+
<i>Tripterospermum japonicum</i>		+	+	+			
<i>Acer palmatum</i> var. <i>matsumurae</i>	11	+	+	+			
<i>Akebia quinata</i>	+	+	+	+			
<i>Smitas china</i>	+	+	+	+			
<i>Actinidia arguta</i>	+	+	+	+			
<i>Urtica thunbergiana</i>	+	+	+	+			
<i>Rhus trilobocarpa</i>	+	+	+	+			
<i>Phytolacca eschscholii</i>	+	+	+	12	+		
<i>Solidago virga-aurea</i>	+	+	+	+			
<i>Clinlonia uddenste</i>	+	+	+	+			
<i>Abies homolepis</i>	11	+	+	+2			
<i>Agrostis eupatori</i>	+	+	+	+			
<i>Polygonum amphibium</i>	+	+	+	+			
<i>Hydrangea petiolata</i>	+	+	+	+			
<i>Viola eschscholii</i>	+	+	+	+			
<i>Xanthoxylum piperitum</i>	+	+	+	+			
<i>Galium brachyspermum</i>	+	+	+	+			
<i>Vaccinium vitis-idaea</i>	+	+	+	+			
<i>Lycopodium serratum</i> var. <i>serratum</i>	+	+	+	+			
<i>Echinopanax japonicum</i>	+	+	+	+			
<i>Viola pumilio</i>	+2	+	+	+			
<i>Ruymyus alata</i> forma <i>striata</i>	+	+	+	+			
<i>Rumex crispus</i>	+	+	+	+			
<i>Helwingia japonica</i>	+	+	+	+			
<i>Cryptotaenia canadensis</i>	+	+	+	+			
<i>Fraxus pentaphylla</i> var. <i>himekumatei</i>	+	+	+	12	+		
Plants of One Appearance							
<u>Tree layer</u> (<i>Thujopsis dolabrata</i> , <i>Ampelopsis brevipedunculata</i> , <i>Acer palmatum</i> , <i>Castanea crenata</i> .)							
<u>Subtree layer</u> (<i>Thujopsis dolabrata</i> , <i>Abies homolepis</i> , <i>Akebia quinata</i> , <i>Acer palmatum</i> var. <i>matsumurae</i> .)							
<u>Shrub layer</u> (<i>Thujopsis dolabrata</i> , <i>Fraxus grayana</i> , <i>Castanea crenata</i> , <i>Kaopanax septemlobus</i> , <i>Corylus sieboldiana</i> , <i>Kadsura japonica</i> , <i>Clethra barbinervis</i> , <i>Ampelopsis brevipedunculata</i> , <i>Smitas china</i> , <i>Ligustrum obtusifolium</i> , <i>Sorbus commixta</i> , <i>Quercus crispula</i> , <i>Ilex micrococca</i> , <i>Ruymyus alata</i> forma <i>striata</i> , <i>Viburnum urticifolium</i> .)							
<u>Herb layer</u> (<i>Smitas china</i> , <i>Desmodium racemosum</i> , <i>Rubus cernuus</i> var. <i>tilleobrous</i> , <i>Aruncus sylvestris</i> , <i>Acer rufinerve</i> , <i>Cardamine hirsuta</i> , <i>Fraxus eschscholii</i> var. <i>japonicum</i> , <i>Ranunculus acris</i> var. <i>japonicus</i> , <i>Chamaecyparis pisifera</i> , <i>Fraxus grayana</i> , <i>Maackia reevesii</i> , <i>Bostia undulata</i> var. <i>erronema</i> , <i>Santala elata</i> var. <i>chinensis</i> , <i>Aconitum japonicum</i> , <i>Viola virginica</i> , <i>Kadsura japonica</i> , <i>Chrysosplenium fauriei</i> var. <i>kiotense</i> , <i>Athyrium yokosense</i> , <i>Asplenium trichomanes</i> , <i>Placopeltis thunbergiana</i> , <i>Lycopodium alatum</i> var. <i>nipponicum</i> , <i>Silene japonica</i> var. <i>repens</i> , <i>Lindera umbellata</i> subsp. <i>membranacea</i> .)							

situated at intensely colder place. (Fig. 2)

Fig. 2. Climatogram for Takne and Climatic diagrams for Takane, Takayama and Gifu.



3. Method.

In this vegetational study, 15 m by 15 m and 20 m by 20 m of each quadrat were established by means of Br.-Blanquet's method. The investigation on the sites were made on 30 th, 31 st August 1976 and 31 st October 1976 and 17 th July 1977. According to the investigations made on the sites, we prepared a community table in a common method with which further detailed study was made in a phytosociological aspect.

4. Results and discussion.

On the vegetational study at the sites, a total of 7 plots from the both study sites were selected. The result of the field data on the botanical composition through the investigation was presented in the community table (Table 1). It is estimated by the further intensive study on the prepared

community table that the potential natural vegetation at this locality is composed by *Taxus cuspidata*, *Chamaecyparis obtusa* SIEB. et ZUCC., *C. pisifera* SIEB. et ZUCC., *Thuopsis dolabrata* SIEB. et ZUCC., *Schizophragma hydrangeoides* SIEB. et ZUCC., *Acer mono* MAXIM., *Prunus grayana* MAXIM., *Phellodendron amurense* RUPR., *Abies homolepis* SIEB. et ZUCC., *Kalopanax septemlobus* KOIDZ., *Quercus crispula* BLUME, *Disporum smilacinum* A. GRAY, *Dryopteris crassirhizoma* NAKAI, *Maianthemum dilatatum* NELS. et MACBR., *Trillium smallii* MAXIM., *Viburnum furcatum* BLUME, *Rumohra mutica* CHING, *Cimicifuga simplex* WORMSK, *Clintonia undensis* TRAUTV. et MEY., *Macroclinidium rigidulum* MAKINO and the categories of *Quercus Fagetea crenatae* Miyawaki, Ohba et al, and also *Pinetalia pentaphyllae* Suz. - Tok. as the edaphic climax.

In the present report, this vegetation is dealt with as a unit of the community of *Taxus cuspidata* for the reasons that the botanical composition of this vegetation is too uncertain to be regarded as an association unit and also very hard to be identified with what the association is defined so far although this vegetation appears to form a climax pattern of vegetation. The plants which have a distribution limit between the categories of *Quercus Fagetea crenatae* Miyawaki, Ohba et al and the categories of *Vaccinio-Piceetea japonica* Br. - Bl. are *Disporum smilacinum*, *Maianthemum dilatatum*, *Rumohra mutica*, *Clintonia undensis*, *Cimicifuga simplex*, *Schizophragma hydrangeoides*, *Abies homolepis* and *Chamaecyparis pisifera* among the plants occurring in this community.

Further detailed study on this community of *Taxus cuspidata* indicates that the Ichiinomori-Hachiman Shrine has the vegetation type that *Taxus cuspidata* and *Chamaecyparis obtusa* dominate in both the tree layer and the subtree layer, being nearly like a pure forest, the herbaceous layer being covered by *Thuopsis dolabrata* and by a few number of *Taxus cuspidata*, and that on the other hand the Morikoshi-Hachiman Shrine has the vegetation type that the tree layer is prevailed by a small population of needle-leaved trees such as *Chamaecyparis obtusa* and *Abies homolepis* and by a large population of deciduous broad-leaves trees such as *Acer palmatum* THUNB., *A. mono*, *Prunus grayana*, and *Phellodendron amurense* the subtree layer being occurred by *Taxus cuspidata*, the understorey with less species being covered only by vascular cryptogam such as *Dryopteris crassirhizoma*. (Fig. 3)

The report on the *Taxus cuspidata* forest at Akkeshi area in Hokkaido shows that the overstorey on the area is dominated by the species of *Abies sachalinensis* and that there are strangely found a many of the broad-leaved



Fig. 3 (A) The Community of *Taxus cuspidata* at the Iciinomori-Hachiman Shrine is nearly like a pure forest as a large population. View of Shrine forest (upper) In the forest (under)

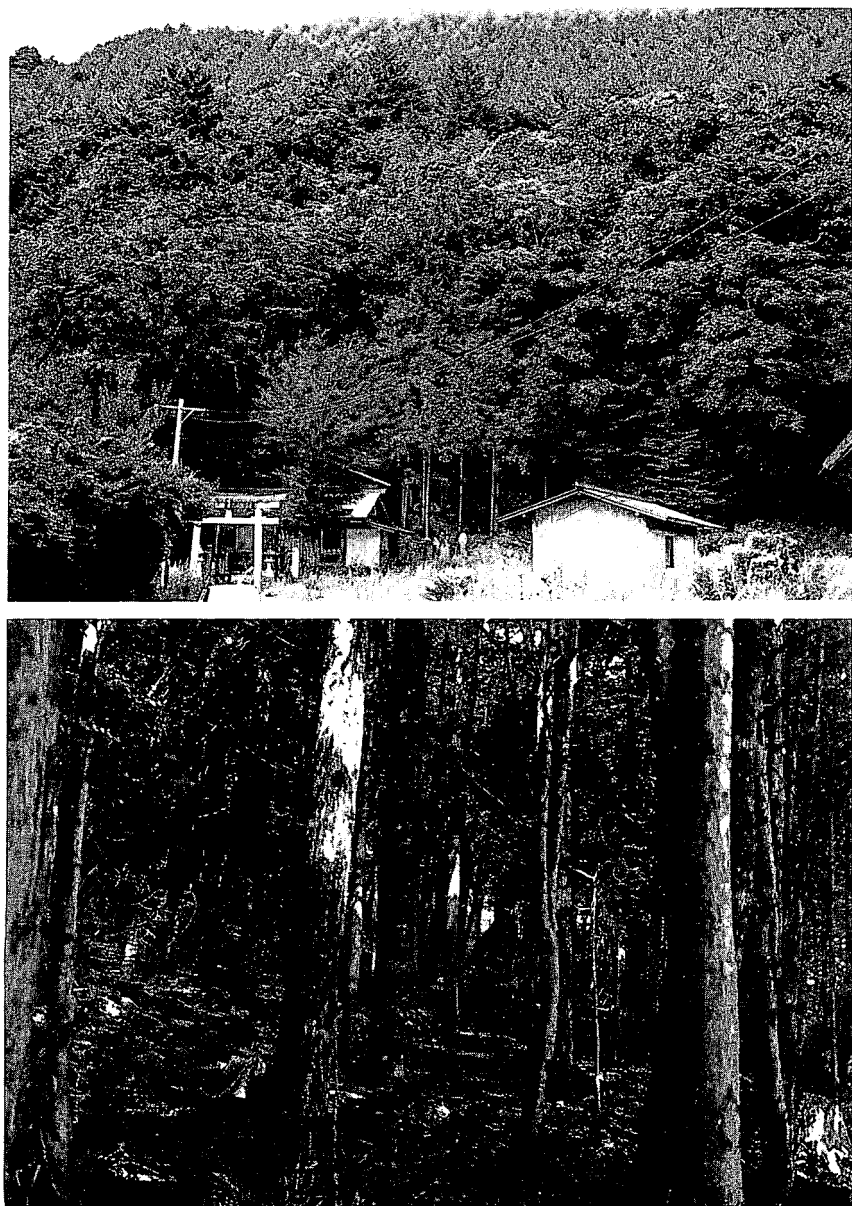


Fig. 3 (B) The Community of *Taxus cuspidata* at the Morikoshi-Hachiman Shrine is more natural in its formation an aspect of Phytosociology. View of Shrine forest (upper) In the forest (under)

trees within the pure forest of *Taxus cuspidata*, and that there exist *Fraxinus lanuginosa* KOIDZ., *Sorbus commixta* HEDL., *Kalopanax septemlobus*, *Alnus hirsuta* TURCZ. and *Betula ermanii* CHAM. of all 18–25 m tall, as the constant species within the area, where in many cases the species of *Taxus cuspidata* forms a growing pattern of the subtree layer tree of 8–12 m tall. In Takane V., however, the deciduous broad-leaved tree or *Chamaecyparis obtusa* is the dominant tree species, and there are *Chamaecyparis obtusa*, *Thujaopsis dolabrata*, *Acer palmatum*, *A. mono*, *Prunus grayana*, *Phellodendron amurense* and *Abies homolepis* as the tree species which are found in the area. As for the deciduous tree, *Phellodendron amurense* var. *sachalinense* FR. SCHM. which is seen in Hokkaidō appears as *Phellodendron amurense* at Takane V. of Gifu Pref., and *Acer mono* var. *glabrum* HARA as *A. mono*. The common tree species which occurs both in Hokkaidō and at Takane V. is *Sorbus commixta*.

The botanical composition of species in the community at the Ichiinomori-Hachiman Shrine can be found, in many species, to be identified by the species composing the primeval community of *Taxus cuspidata* at Mt. Kuraiyama which is now out of existence, according to the Report on the Natural Forest of *Taxus cuspidata* at Mt. Kuraiyama as a National Presious Product in Gifu Pref.. It can be, therefore, estimated that the communities both at the Ichiinomori-Hachiman Shrine and the Morikoshi-Hachiman Shrine are very close to a natural vegetation type although they are growing each other at present in a isolated formation. Such standpoint should be supported that the occurrence of the community of *Taxus cuspidata* must be through a formation of subtree layer judging from its intensive nature of shadeness, as seen on the report regarding the forest of *Taxus cuspidata* in Hokkaidō. It is more natural for the community to be formed in such a way as the above. The community at the Morikoshi-Hachiman Shrine at Takane V. should be, therefore, more natural in its formation on an aspect of phytosociology. On the other hand, a pure forest as the community at the Ichiinomori-Hachiman Shrine can be said to be formed naturally as in fact having been recognized in its existence in Hokkaidō. However, this standpoint as a pure forest on the formation of the community might give a ground for reflection.

It is not possibly envisaged that such a type of the pure forest of this tree could be continuously maintained as a community in its existence, although it is possible to say that each number of the tree could continue to live on in a small population not as a community considering the fact that this tree is practically used as a tree for garden or hedge. For the reason

of such pure forest having been formed, it is conceived that the other tree species composing the overstory had been eliminated out by some factor of influence and as the result only this species of the tree had been remained as a fortuitous provision of nature.

A certain geographical similarity is, however, seen between the both of Hiwada hamlet in which the Ichiinomori-Hachiman Shrine is located and Kōhiwada hamlet in which the Morikoshi-Hachiman Shrine is located ; the both areas are fenced between mountains on two sides each other in the north and the south, developing in between as a flat land. The two Shrines stand on the points, where in question are locally sloped, of the flat land.

It would be, therefore, more proper considered that the communities of *Taxus cuspidata* had largely existed in the past over the whole flat land of each hamlet and eventually only the present communities of this tree growing just at the both Shrines have been survived. In this respect, it could be easier to understand why this type of the very pure forest is remained in isolation. It is also considered that the climatic conditions over the whole district of Hida would be suitable for the growth of *Taxus cuspidata*, judging from the fact that the species occurs dispersedly at many places such as Mt. Kuraiyama, Mt. Funayama, the Hirayu Pass and Sengendaru in the Hida district. The present communities of *Taxus cuspidata* are considered consequently, in our view, to have continued to live on in a present form which had existed in large population together with the other tree species such as broad-leaved trees, *Abies homolepis*, *Chamaecyparis obtusa* and etc. The above mentioned reasons including the geographical conditions should rather be indicated in the last analysis in respect to the occurrence of the present communities of *Taxus cuspidata*, not only the reason of the relatively particular climatic conditions for the occurrence of the community in Hokkaidō.

Literature

- 1) Furuhashi, Y. (1936) in Hokkaidō Ringyō Kaihō 34 : 463-470, 534-538
- 2) Tatewaki, M. & Tasita, E. (1937) in Ecological Review 3 : 279-293
- 3) Monthly Report of Gifu Meteorological Station (1975, 1976), Climate of Gifu Prefecture (1954)

摘 要

岐阜県にはイチイ自生地が現在2ヶ所（大野郡高根村日和田および小日和田）のみ見られる。それらについて植物社会学的に検討し、また北海道の自生地との比較をした。

植物社会学的な検討から、ブナ-ミズナラクラスおよび土地の極相のヒメコマツオールドに位置すると思われるが構成植物の性格が不明瞭のためイチイ群落とした。

イチイ群落を構成する植物は針葉樹（ヒノキ，ウラジロモミ）落葉広葉樹（キハダ，イタヤカエデ，ナナカマド）で混交した群落形成をしている。

イチイ群落構成種にはブナ＝ミズナラクラス域からトウヒ＝コケモモクラス域に分布域を有するチゴユリ，マイズルソウ，シノブカグマ，ツバメオモト，サラシナショウマ，ウラジロモミ，サワラなどを認めた。

イチイ群落の高木層を形成する針葉樹と落葉広葉樹は北海道のオンコ林と類似であり，構成樹種で，アカトドマツ→ウラジロモミ，ヒロハキハダ→キハダ，エゾイタヤ→イタヤカエデの変異が見られる。なお共通種はナナカマドである。