

## General Feature of Coniferous Forests in Japan.

By

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1) Regions. For the object of this information, it is necessary to divide the Japanese Empire to the following eleven regions, that is, Karafuto (K), Hokkaido (H), Northern Honshiu (N. Ho), Central Honshiu (C. Ho), Western Honshiu (W. Ho), Shikoku (Sh), Kiushiu (Ki), Taiwan (T), Chosen (Ch), Ogasawarajima (O), and Riu:kiu (R), but the last two regions are not significant to this present title.

2) Species. In Japan there are numerous indigenous species of Coniferae, and the distributions of the species are also very complex. The names of species recognized as relatively important trees for forestry are as follows:

Species	Distributions										
	K	H	N.Ho	C.Ho	W.Ho	Sh	Ki	T	Ch	O	R
<i>Abies firma</i> Sieb. et Zucc.	—	—	—	×	×	×	×	—	—	—	—
<i>A. holophylla</i> Maxim.	—	—	—	—	—	—	—	—	×	—	—
<i>A. homolepis</i> Sieb. et Zucc.	—	—	—	×	—	×	—	—	—	—	—
<i>A. homolepis</i> var. <i>umbellata</i> Wils.	—	—	—	×	—	—	—	—	—	—	—
<i>A. Kawakamii</i> Ito	—	—	—	—	—	—	—	×	—	—	—
<i>A. Mariessii</i> Mast.	—	—	×	×	—	—	—	—	—	—	—
<i>A. Mayriana</i> Miyabe et Kudo	—	×	—	—	—	—	—	—	—	—	—
<i>A. nephrolepis</i> Maxim.	—	—	—	—	—	—	—	—	×	—	—
<i>A. sachalinensis</i> Mast.	×	×	—	—	—	—	—	—	—	—	—
<i>A. shikokiana</i> Nakai	—	—	—	—	—	×	—	—	—	—	—
<i>A. Veitchii</i> Lindl.	—	—	—	×	—	—	—	—	—	—	—
<i>A. Veitchii</i> var. <i>olivacea</i> Shirasawa	—	—	—	×	—	—	—	—	—	—	—
<i>A. Wilsonii</i> Miyabe et Kudo	×	—	—	—	—	—	—	—	—	—	—
<i>Chamaecyparis formosensis</i> Matsum.	—	—	—	—	—	—	—	×	—	—	—
<i>Ch. obtusa</i> Sieb. et Zucc.	—	—	—	×	×	×	×	×	—	—	—
<i>Ch. obtusa</i> f. <i>formosana</i> Hayata	—	—	—	—	—	—	—	×	—	—	—
<i>Ch. pisifera</i> Sieb. et Zucc.	—	—	—	×	—	—	—	—	—	—	—
<i>Cryptomeria japonica</i> D. Don.	—	—	×	×	×	×	×	—	—	—	—
<i>Cunninghamia Kawakamii</i> Hayata	—	—	—	—	—	—	—	×	—	—	—
<i>C. Konishii</i> Hayata	—	—	—	—	—	—	—	×	—	—	—
<i>C. sinensis</i> R. Br.	—	—	—	—	—	—	—	×	—	—	—
<i>Juniperus chinensis</i> L.	—	—	—	×	—	—	×	—	×	—	—
<i>J. chinensis</i> var. <i>sargentii</i> Henry	×	×	×	—	—	—	—	—	—	—	—
<i>J. communis</i> L.	×	—	—	—	—	—	—	—	—	—	—
<i>J. communis</i> var. <i>montana</i> Ait.	×	—	—	—	—	—	—	—	—	—	—
<i>J. communis</i> var. <i>nipponica</i> Wils.	—	—	×	×	—	—	—	—	—	—	—
<i>J. conferta</i> Parl.	×	×	×	×	—	—	—	—	—	—	—

(Continued)

Species	Distributions										
	K	H	N.Ho	C.Ho	W.Ho	Sh	Ki	T	Ch	O	R
<i>J. conferta</i> var. <i>maritima</i> Wils.	—	—	—	×	—	—	—	—	—	—	—
<i>J. formosana</i> Hayata	—	—	—	—	—	—	—	×	—	—	—
<i>J. formosana</i> var. <i>concolor</i> Hayata	—	—	—	—	—	—	—	×	—	—	—
<i>J. luchuensis</i> Koidz.	—	—	—	—	—	—	—	—	—	—	×
<i>J. procumbens</i> Sieb.	—	—	—	—	—	—	×	—	—	—	×
<i>J. rigida</i> Sieb. et Zucc.	—	×	—	×	×	—	—	—	—	—	—
<i>J. squamata</i> Ham.	—	—	—	—	—	—	—	×	—	—	—
<i>J. taxifolia</i> Hook. et Arn.	—	—	—	×	—	—	—	—	—	×	×
<i>Keteleeria Davidiana</i> Beissn.	—	—	—	—	—	—	—	×	—	—	—
<i>Larix dahurica</i> var. <i>japonica</i> Maxim.	×	×	—	—	—	—	—	—	—	—	—
<i>L. dahurica</i> f. <i>ochrocarpa</i> Wils.	×	—	—	—	—	—	—	—	—	—	—
<i>L. dahurica</i> var. <i>coreana</i> Nakai	—	—	—	—	—	—	—	—	×	—	—
<i>L. Kaempferi</i> Sarg.	—	—	—	×	—	—	—	—	—	—	—
<i>Libocedrus macrolepis</i> Benth. et Hook.	—	—	—	—	—	—	—	×	—	—	—
<i>Picea bicolor</i> Mayr	—	—	—	×	—	—	—	—	—	—	—
<i>P. bicolor</i> var. <i>acicularis</i> Shirasawa et Koyama	—	—	—	×	—	—	—	—	—	—	—
<i>P. bicolor</i> var. <i>resera</i> Shirasawa et Koyama	—	—	—	×	—	—	—	—	—	—	—
<i>P. Glehnii</i> Mast.	×	×	—	×	—	—	—	—	—	—	—
<i>P. Glehnii</i> f. <i>chlorocarpa</i> Miyabe et Kudo	—	×	—	—	—	—	—	—	—	—	—
<i>P. Glehnii</i> var. <i>Tei</i> Makino	—	—	—	×	—	—	—	—	—	—	—
<i>P. jezoensis</i> Carr.	×	×	—	—	—	—	—	—	—	—	—
<i>P. jezoensis</i> var. <i>hondoensis</i> Rehd.	—	—	—	×	—	—	—	—	×	—	—
<i>P. koraiensis</i> Nakai	—	—	—	—	—	—	—	—	×	—	—
<i>P. Koyamai</i> Shirasawa	—	—	—	×	—	—	—	—	—	—	—
<i>P. Maximowiczii</i> Regel.	—	—	—	×	—	—	—	—	—	—	—
<i>P. morrisonicola</i> Hayata	—	—	—	—	—	—	—	×	—	—	—
<i>P. polita</i> Carr.	—	—	—	×	—	×	×	—	—	—	—
<i>Pinus amamiana</i> Koidz.	—	—	—	—	—	—	×	—	—	—	—
<i>P. Armandii</i> Franch.	—	—	—	—	—	—	—	×	—	—	—
<i>P. cembra</i> var. <i>manchurica</i> Mast.	—	×	—	—	—	—	—	—	—	—	—
<i>P. densiflora</i> Sieb. et Zucc.	—	—	×	×	×	×	×	—	×	—	—
<i>P. densiflora</i> f. <i>umbraculifera</i> Miyoshi	—	—	—	×	—	—	—	—	—	—	—
<i>P. formosana</i> Hayata	—	—	—	—	—	—	—	×	—	—	—
<i>P. hakkodensis</i> Makino	—	—	×	—	—	—	—	—	—	—	—
<i>P. koraiensis</i> Sieb. et Zucc.	—	—	×	×	—	—	—	—	×	—	—
<i>P. leucosperma</i> Maxim.	—	—	—	—	—	—	—	—	×	—	—
<i>P. luchuensis</i> Mayr	—	—	—	—	—	—	—	—	—	—	×
<i>P. Massoniana</i> Don.	—	—	—	—	—	—	—	×	—	—	—
<i>P. parviflora</i> Sieb. et Zucc.	—	×	×	×	×	×	×	—	—	—	—
<i>P. pentaphylla</i> Mayr	—	×	×	×	—	—	—	—	—	—	—
<i>P. pumila</i> Regel.	×	×	×	×	—	—	—	—	—	—	—
<i>P. taiwanensis</i> Hayata	—	—	—	—	—	—	—	×	—	—	—
<i>P. Thunbergii</i> Parl.	—	—	×	×	×	×	×	—	×	—	—

(Continued)

Species	Distributions											
	K	H	N.Ho	C.Ho	W.Ho	Sh	Ki	T	Ch	O	R	
<i>P. Uyematsui</i> Hayata	—	—	—	—	—	—	—	×	—	—	—	
<i>Pseudotsuga japonica</i> Beissn.	—	—	—	—	×	×	—	—	—	—	—	
<i>P. Wilsoniana</i> Hayata	—	—	—	—	—	—	—	×	—	—	—	
<i>Sciadopitys verticillata</i> Sieb. et Zucc.	—	—	—	×	×	×	×	—	—	—	—	
<i>Taiwania cryptomerioides</i> Hayata	—	—	—	—	—	—	—	×	—	—	—	
<i>Thuja Standishii</i> Carr.	—	—	×	×	—	—	—	—	—	—	—	
<i>Thujopsis dolabrata</i> Sieb. et Zucc.	—	—	—	×	×	—	—	—	—	—	—	
<i>T. dolabrata</i> var. <i>Hondai</i> Makino	—	×	×	—	—	—	—	—	—	—	—	
<i>Tsuga diversifolia</i> Mast.	—	—	×	×	×	×	×	—	—	—	—	
<i>T. formosana</i> Hayata	—	—	—	—	—	—	—	×	—	—	—	
<i>T. Sieboldii</i> Carr.	—	—	—	×	×	×	×	—	—	—	—	
<i>Cephalotaxus argotaenia</i> Pilg.	—	—	—	—	—	—	—	×	—	—	—	
<i>C. drupacea</i> Sieb. et Zucc.	—	—	×	×	×	×	×	—	—	—	—	
<i>C. drupacea</i> var. <i>nana</i> Rehd.	—	×	×	×	×	—	—	—	—	—	—	
<i>C. drupacea</i> var. <i>nana</i> f. <i>astringens</i> Nakai	—	—	—	×	—	—	—	—	—	—	—	
<i>C. Wilsoniana</i> Hayata	—	—	—	—	—	—	—	×	—	—	—	
<i>Podocarpus costalis</i> Presl.	—	—	—	—	—	—	—	×	—	—	—	
<i>P. formosanus</i> Dumm.	—	—	—	—	—	—	—	×	—	—	—	
<i>P. macrophyllus</i> D. Don.	—	—	—	×	×	×	×	—	—	—	×	
<i>P. nagi</i> Pilg.	—	—	—	—	×	×	×	×	—	—	×	
<i>P. nagi</i> var. <i>angustifolia</i> Makino	—	—	—	—	—	—	—	×	—	—	—	
<i>P. Nakaii</i> Hayata	—	—	—	—	—	—	—	×	—	—	—	
<i>P. nankoensis</i> Hayata	—	—	—	—	—	—	—	×	—	—	—	
<i>P. neriifolius</i> D. Don.	—	—	—	—	—	—	—	×	—	—	—	
<i>P. philippinensis</i> Foxw.	—	—	—	—	—	—	—	×	—	—	—	
<i>Taxus chinensis</i> Rehd.	—	—	—	—	—	—	—	×	—	—	—	
<i>T. cuspidata</i> Sieb. et Zucc.	×	×	×	×	×	×	—	×	×	—	—	
<i>T. cuspidata</i> var. <i>ambraculifera</i> Makino	—	—	—	×	—	—	—	—	—	—	—	
<i>T. cuspidata</i> var. <i>chinensis</i> Rehd. et Wils.	—	—	—	—	—	—	—	×	—	—	—	
<i>Torreya nucifera</i> Sieb. et Zucc.	—	—	—	×	×	×	×	—	×	—	—	
<i>T. nucifera</i> var. <i>articulata</i> Miyoshi	—	—	—	×	—	—	—	—	—	—	—	
<i>T. nucifera</i> var. <i>radicans</i> Nakai	—	—	—	×	—	—	—	—	—	—	—	
<i>T. nuda</i> Miyoshi	—	—	—	×	—	—	—	—	—	—	—	

3) Kinds of forest vegetations with conifers. From the stand point of synecology the forest vegetations with conifers in Japan may be classified into the following six types:

- A. Northern xerophytic coniferous forest.
- B. High mountain xerophytic coniferous forest.
- C. Mesophytic forest mixed with conifers and deciduous broad-leaved trees.
- D. Mesophytic forest mixed with conifers and evergreen broad-leaved trees.
- E. Temperate rain-forest with broad-leaved conifers belong to *Taxaceae*.
- F. Strand pine forest.

A) Northern xerophytic coniferous Forest. The forest vegetations belong to this type mainly occur in the Karafuto and Hokkaido. Usually, this type of forest touches with the Japanese creeping pine (*Pinus pumila*) at the upper limit. The dominant species of this forest vegetation are *Abies Mayriana*,

*A. sachalinensis*, *A. Wilsonii*, *Larix dahurica* var. *japonica*, *L. dahurica* f. *chrocarpa*, *Picea Glehnii* f. *chlorocarpa* and *P. jezoensis*.

The forests, which occur covering over the huge area of northern Chosen and the upper part of the main mountain ranges of the peninsula, including the following dominant species, *Abies holophylla*, *A. nephrolepis*, *Larix dahurica* var. *coreana*, *Picea jezoensis* var. *hondoensis*, *P. koraiensis*, *Pinus koraiensis*, and *P. leucosperma*, have very similar physiognomy to that of this forest vegetation.

As an example of this forest vegetation a forest situating in Karafuto is selected, and the brief floristic composition is listed as follows:

(Life forms)	Species	Exclusiveness
Notes: The numbers of exclusiveness represent the characteristicity of the species to the vegetation, that is confined to the vegetation (5), seldom met with outside it (4), rather more oftenly found in it (3), found equally in and outside it (2), rather more oftenly found outside it (1).		
(Dominant trees)		
	<i>Abies Mayriana</i> Miyabe. et Kudo	
	<i>Picea jezoensis</i> Carr.	
(Ground herbs)		
	<i>Dryopteris Amurensis</i> Takeda	4.
	<i>D. dilatata</i> A. Gray var. <i>oblonga</i> Takeda	4.
	<i>D. Linnaeana</i> C. Chr.	3.
	<i>D. phegopteris</i> C. Chr.	2.
	<i>Equisetum sylvaticum</i> L.	5.
	<i>Lycopodium obscurum</i> L. f. <i>fabellatum</i> Takeda	2.
	<i>Stellaria jezoensis</i> Maxim.	4.
	<i>Aconitum pseudolaevae</i> Nakai f. <i>genuinum</i> Nakai	3.
	<i>Anemone debilis</i> Fisch.	2.
	<i>Corydalis gigantea</i> Trautv. et May. var. <i>amurensis</i> Regel.	5.
	<i>Waldsteinia sibirica</i> Tratt.	4.
	<i>Oxalis Acetosella</i> L.	3.
	<i>Circaea alpina</i> L.	2.
	<i>Angelica Maximowiczii</i> Benth.	5.
	<i>Cornus canadensis</i> L.	4.
	<i>Pirola renifolia</i> Maxim.	4.
	<i>Trientalis europea</i> L.	4.
	<i>Galium kamschaticum</i> Stell. var. <i>hirsutum</i> Takeda	5.
	<i>Saussurea acuminata</i> Turcz.	5.
	<i>Ephippianthus Schmidtii</i> Reichb.	3.
	<i>Goodyera Schlechtendaliana</i> Reichb. f.	2.

(From the report of forest vegetation survey of the training forest of Imperial University of Kyoto in Karafuto.)

B) High mountain xerophytic coniferous forest. The forests belong to this type occur mainly at the slope of the high mountain ranges of central Honshu, and the summits of mountain ranges of Kiushu and Shikoku. The dominant species of conifers occurring very commonly in the forests are *Abies homolepis*, *A. Mariesii*, *A. Shikokiana*, *A. Veitchii*, *A. Veitchii* var. *olivacea*, *Larix Kaempferi*, *Picea bicolor*, *P. bicolor* var. *acicularis*, *P. bicolor* var. *reflexa*, *P. jezoensis* var. *hondoensis*, *P. Koyamai*, *P. Maximowiczii*, *Pinus koraiensis*, *P. parviflora*, *P. pentaphylla*, *Thuja Standishii* and *Tsuga diversifolia*. Generally, this forest vegetation is lined the upper limit by the scrub of creeping pine as same as the case of preceding forest vegetation. The marked characteristics of this forest vegetation is the fact that the number of species of dominant conifers is relatively numerous. In comparison of the northern xerophytic coniferous forest and this forest vegetation, it is very remarkable that the species of

dominant conifers are almostly quite different.

The forests occurring at the upper parts of the main mountain ranges of Taiwan, including the following dominant species *Abies Kawakamii*, *Picea morrisonicola*, *Pinus taiwanensis* etc. seem to be classified into this forest vegetation.

As an example of this forest vegetation, a forest situating at central Honshiu is selected, and its brief floristic composition is listed as follows :

(Life forms)	Species	Exclusiveness
(Dominant trees)		
	<i>Abies Mariesii</i> Mast.	
	<i>A. Veitchii</i> Lindl.	
	<i>Larix Kaempferi</i> Sarg.	
	<i>Picea jezoensis</i> Carr. var. <i>hondoensis</i> Rehd.	
	<i>Pinus koraiensis</i> Sieb. et Zucc.	
	<i>Tsuga diversifolia</i> Mast.	
(Subordinate trees)		
	<i>Betula Ermannii</i> Cham. var. <i>communis</i> Koidz.	3.
	<i>Sorbus Aucuparia</i> L.	2.
	<i>Acer palmatum</i> Thunb. subsp. <i>Matsumuræ</i> Koidz.	2.
	<i>A. Tschonoskii</i> Maxim.	4.
(Ground herbs)		
	<i>Dryopteris dilatata</i> A. Gray var. <i>delloidea</i> Takeda	2.
	<i>D. nutica</i> C. Chr.	2.
	<i>D. phegopteris</i> C. Chr.	2.
	<i>Pasonia japonica</i> Miyabe et Takeda	3.
	<i>Pteridophyllum ranceosum</i> Sieb. et Zucc.	4.
	<i>Oxalis Acetosella</i> L. var. <i>japonica</i> Makino	3.
	<i>Viola bitoria</i> L.	3.
	<i>Echinopanax japonicum</i> Nakai	4.
	<i>Cryptotaeniopsis Tanakæ</i> Boiss.	2.
	<i>Cornus canadensis</i> L.	4.
	<i>Shortia soldanelloides</i> Makino var. <i>genuina</i> Makino f. <i>typica</i> Makino	2.
	<i>Pirola renifolia</i> Makino	4.
	<i>Vaccinium Vitis-Idææ</i> L.	2.
	<i>Primula japonica</i> A. Gray	4.
	<i>Trientalis europæa</i> L.	3.
	<i>Thymus Przewalskii</i> Nakai var. <i>laxa</i> Nakai	4.
	<i>Galium gracile</i> Bunge.	2.
	<i>Patrinia palmata</i> Maxim. var. <i>typica</i> Makino	2.
	<i>Cacalia adenostyloides</i> Franch. et Sav.	3.
	<i>Leontopodium japonicum</i> Miq.	2.
	<i>Deschampsia flexuosa</i> Trin.	2.
	<i>Clintonia udensis</i> Trautv. et Mey.	4.
	<i>Maianthemum bifolium</i> DC.	2.
	<i>Metanarthecium luteo viride</i> Maxim.	2.
	<i>Paris quadri-lobia</i> L. var. <i>obovata</i> Regel. et Til.	3.
	<i>Streptopus japonicus</i> Ohwi.	4.
	<i>Dactyloctenium maculosum</i> Miyaba et Kudo	3.
	<i>Listea cordata</i> R. Br.	4.
	<i>Platanthera Takedai</i> Makino	4.

C) Mesophytic forest mixed with conifers and deciduous broad-leaved trees. This forest vegetation

mainly includes the forests, which occur from the northern Honshiu to central Honshiu occupying the lower slopes of high mountains and the foot-mountain regions. In this forest the conifers associating normally with Japanese beech (*Fagus crenata* Blume) and Japanese oak (*Quercus crispula* Blume).

This forest vegetation plays the most important part for forestry in Japan. In the northern Honshiu *Cryptomeria japonica* and *Thujaopsis dolabrata* var. *Hondai* are the two dominant species, and in the central Honshiu, *Cryptomeria japonica*, *Chamaecyparis obtusa*, *Ch. pisifera*, and *Abies firma* are the principal species. In the former part the centres of forest vegetations of *Cryptomeria* and *Thujaopsis* quite separate and there can be found frequently the consociations of each species, but in the latter the forests are mostly mixed. *Sciadopitys verticillata*, *Thuja Standishii*, and *Thujaopsis dolabrata* occur also in rather small number in the latter part. At the Japan sea side *Cryptomeria* often associates with *Thujaopsis dolabrata* var. *hondai* or *Thuja Standishii*, but at the Pacific ocean side it associates with *Chamaecyparis obtusa* or *Abies firma*. In this forest vegetation *Abies firma* scarcely associates with *Tsuga Sieboldii*, while in the mesophytic forest mixed with conifers and evergreen broad-leaved trees, which is described in next paragraph, associates mostly with *Tsuga Sieboldii*.

The forests of Japanese red pine (*Pinus densiflora*) are distributed from the northern Honshiu to southern Kiushiu, therefore, at a glance there can be found no characteristics of environment of this forests, but the greaterpart of forests of red pine showing very excellent physiognomy are included in the region of this forest vegetation.

As an example of this forest vegetation, a forest situating in northern Honshiu is selected, and its brief floristic composition is listed as follows:

(Life forms)	Species	Exclusiveness
(Dominant trees)		
	<i>Cryptomeria japonica</i> D. Don.	
	<i>Fagus crenata</i> Blume.	
	<i>Quercus crispula</i> Blume.	
(Subordinate trees)		
	<i>Cephalotaxus drupacea</i> Sieb. et Zucc. var. <i>nana</i> Rehd.	4.
	<i>Thuja Standishii</i> Carr.	4.
	<i>Carpinus laxiflora</i> Blume.	2.
	<i>Cercidiphyllum japonicum</i> Sieb. et Zucc.	2.
	<i>Magnolia obovata</i> Thunb.	2.
	<i>Micromela alnifolia</i> Koehne.	2.
	<i>Prunus Grayana</i> Maxim.	3.
	<i>P. serrulata</i> Lindl. var. <i>sachalinensis</i> Makino	4.
	<i>Acer distylum</i> Sieb. et Zucc.	2.
	<i>A. micranthum</i> Sieb. et Zucc.	2.
	<i>A. palmatum</i> Thunb.	4.
	<i>Aesculus turbinata</i> Blume.	4.
	<i>Meliosma myriantha</i> Sieb. et Zucc.	2.
	<i>Kalopanax innovans</i> Miq.	2.
	<i>K. ricinifolium</i> Miq. var. <i>typicum</i> Nakai	2.
	<i>Syrax japonicum</i> Sieb. et Zucc.	2.
	<i>S. Obassia</i> Sieb. et Zucc.	2.
	<i>Fraxinus Sieboldiana</i> Blume. var. <i>serrata</i> Nakai	2.
(Shrubs)		
	<i>Corylus rostrata</i> Ait. var. <i>Sieboldiana</i> Maxim.	2.
	<i>Lindera umbellata</i> Thunb.	2.
	<i>Hydrangea paniculata</i> Sieb. var. <i>floritunda</i> Regel.	2.
	<i>Hamamelis japonica</i> Sieb. et Zucc.	2.
	<i>Skimmia japonica</i> Thunb.	2.
	<i>Daphniphyllum humile</i> Maxim.	4.

(Continued)

(Life forms)

Species	Exclusiveness
<i>Ilex macropoda</i> Miq.	2.
<i>I. Sugeroki</i> Maxim. subsp. <i>brevipedunculata</i> Makino	4.
<i>Stachyurus praecox</i> Sieb. et Zucc.	2.
<i>Daphne Miyabeana</i> Makino	4.
<i>Aucuba japonica</i> Thunb. var. <i>borealis</i> Miyabe	4.
<i>Clethra barbinervis</i> Sieb. et Zucc.	2.
<i>Rhododendron Albrechtii</i> Maxim.	4.
<i>Callicarpa japonica</i> Thunb.	2.
<i>Clerodendron trichotomum</i> Thunb.	2.
<i>Diervilla hortensis</i> Sieb. et Zucc.	3.
<i>Viburnum dilatatum</i> Thunb. f. <i>pilosulum</i> Nakai	2.
<i>Sasa senanensis</i> Rehd.	3.
(Ground herbs)	
<i>Adiantum pedatum</i> L.	3.
<i>Athyrium acrostichoides</i> Diels.	2.
<i>A. Vidalii</i> Nakai	2.
<i>Blechnum nipponicum</i> Makino	4.
<i>Diplazium squamigerum</i> Christ.	2.
<i>Dryopteris africana</i> C. Chr.	2.
<i>D. crassirhizoma</i> Nakai	3.
<i>D. mutica</i> C. Chr.	2.
<i>D. remotissima</i> Koidz.	4.
<i>D. viridescens</i> O. Kuntze.	2.
<i>Matteuccia orientalis</i> Trev.	2.
<i>Phyllitis scolopendrium</i> Newm.	4.
<i>Plagiogyria Matsumuraeana</i> Makino	4.
<i>Polystichum aculeatum</i> Schott. var. <i>ovato-paleaceum</i> Kodama	1.
<i>Chloranthus japonicus</i> Sieb.	2.
<i>Ch. serratus</i> Roem. et Sch.	2.
<i>Flatostema umbellatum</i> Blume var. <i>involutum</i> Makino	2.
<i>Laportea bulbifera</i> Wedd.	2.
<i>Sceptrocnide macrostachya</i> Maxim.	4.
<i>Asarum Sieboldii</i> Miq.	2.
<i>Polygonum Thunbergii</i> Sieb. et Zucc. var. <i>typicum</i> Franch. et Sav.	2.
<i>Stellaria diversiflora</i> Maxim.	2.
<i>Hydrangea macrophylla</i> DC. f. <i>acuminata</i> Wils.	2.
<i>Rodgeria poliochylla</i> A. Gray	4.
<i>Filipendula kamtschatica</i> Maxim.	4.
<i>Oxalis Acetosella</i> L. var. <i>japonica</i> Makino	4.
<i>Impatiens Noli-tangere</i> L.	2.
<i>I. Textori</i> Miq.	2.
<i>Panax japonicum</i> C. A. Mey. f. <i>typicum</i> Nakai	2.
<i>Angelica polyclada</i> Franch.	3.
<i>Heracleum lanatum</i> Michx.	2.
<i>Salvia nipponica</i> Miq.	2.
<i>Phryma leptostachya</i> L.	2.
<i>Golium trifloriforme</i> Kom.	2.
<i>Cacalia bulbiphora</i> Maxim.	2.
<i>C. delphinifolia</i> Sieb. et Zucc.	2.
<i>C. fimbriata</i> Sieb. et Zucc.	4.

(Continued)

(Life forms)	Species	Exclusiveness
	<i>C. hastata</i> L. var. <i>glabra</i> Ledeb.	3.
	<i>Arisaema amplissimum</i> Blume.	3.
	<i>Lysichiton camtschatense</i> Schott.	4.
	<i>Symplocarpus foetidus</i> Salisb.	4.
	<i>Cardiocrinum Glehni</i> Makino	4.
	<i>Disporum sessile</i> D. Don.	2.
	<i>Hosta japonica</i> Asch. et Graebn. var. <i>coerulea</i> Makino	2.
	<i>Lilium auratum</i> Lindl.	3.
	<i>L. medeoloides</i> A. Gray	4.
	<i>Paris tetraphylla</i> A. Gray	2.
	<i>Trillium apetalon</i> Makino	2.

(From the report of forest vegetation survey of Akita District Forest Office).

D) Mesophytic forest mixed with conifers and evergreen broad-leaved trees. This forest vegetation develops covering the western Honshiu, Shikoku, and Kiushiu. Although, the flora of principal species of conifers are very similar to those of mesophytic forest mixed with conifers and deciduous broad-leaved trees, it is very naturally to think quite different environment between these two forest vegetations, from the view point of the following two facts that the physiognomy of this forest is ultimately characteristic caused by associating the evergreen broad-leaved trees, and *Tsuga Sieboldii*, which occurs very scarcely in the forest mixed with conifers and deciduous broad-leaved trees, associates as an important member of this forest vegetation. Moreover, the fact also makes remarkable contrast that there is some tendency of occurrence of consociation in the former vegetation, for instances, the pure stands of *Cryptomeria japonica*, *Thujaopsis dolabrata* in northern Honshiu, *Chamaecyparis obtusa* in central Honshiu, but in this vegetation the forests are mostly mixed, for instances, the forest mixed with *Cryptomeria japonica*, *Chamaecyparis obtusa*, *Abies firma*, *Tsuga Sieboldii*, *Sciadopitys verticillata*, and *Pseudotsuga japonica* in Shikoku, and the forest mixed with *Abies firma*, *Tsuga Sieboldii*, *Pinus densiflora* and *Picea polita* in Kiushiu.

In Yakusima island, which situates in the sea near southern Kiushiu, occurs a wonderful forest mixed with very old trees of *Cryptomeria japonica*, *Chamaecyparis obtusa*, *Abies firma*, and *Tsuga Sieboldii*. Especially, it is very interesting and priceless facts for forest ecology in Japan, that there are standing scattered many gigantic trees of *Cryptomeria*, which are more than one thousand years old.

Probably, the forest mixed with *Chamaecyparis formosensis*, *Ch. obtusa*, *Libocedrus macrolepis*, *Pseudotsuga Wilsoniana*, and *Taiwania cryptomerioides* etc. occurs in Taiwan occupying the lower part or middle slopes of high mountain regions, may be classified in this forest vegetation.

As an example of this forest vegetation, a forest situating in central Kiushiu is selected, and its brief floristic composition is listed as follows:

(Life forms)	Species	Exclusiveness
(Dominant trees)		
	<i>Abies firma</i> Sieb. et Zucc.	
	<i>Picea polita</i> Carr.	
	<i>Pinus densiflora</i> Sieb. et Zucc.	
	<i>Tsuga Sieboldii</i> Carr.	
	<i>Shiia Sieboldii</i> Makino	
(Subordinate trees)		
	<i>Torreya nucifera</i> Sieb. et Zucc.	4.
	<i>Carpinus laxiflora</i> Blume.	2.



(Continued)

(Life forms)

Species	Exclusiveness
<i>Quercus acuta</i> Thunb.	4.
<i>Q. stenophylla</i> Makino	4.
<i>Magnolia obovata</i> Thunb.	2.
<i>Prunus Maximowiczii</i> Rupr.	2.
<i>P. serrulata</i> Lindl. var. <i>spontanea</i> Makino	2.
<i>Daphniphyllum macropodum</i> Miq.	4.
<i>Acer micranthum</i> Sieb. et Zucc.	3.
<i>A. Sieboldianum</i> Miq. var. <i>typicum</i> Maxim. subvar. <i>microphyllum</i> Koidz.	2.
<i>Camellia japonica</i> L. var. <i>spontanea</i> Makino	4.
<i>Eurya ochracea</i> Szysz.	4.
<i>Stewartia monodelpha</i> Sieb. et Zucc.	4.
<i>Acanthopanax sciadophylloides</i> Franch. et Sav.	2.
<i>Cornus controversa</i> Hemsl.	2.
<i>Styrax japonicum</i> Sieb. et Zucc.	3.
(Shrubs)	
<i>Illicium religiosum</i> Sieb. et Zucc.	4.
<i>Lindela Thunbergii</i> Makino	4.
<i>Tetradenia foliosa</i> Nees.	4.
<i>T. glauca</i> Matsum.	4.
<i>Hydrangea virens</i> Sieb.	4.
<i>Skimmia japonica</i> Thunb.	2.
<i>Rhus trichocarpa</i> Miq.	2.
<i>Ilex crenata</i> Thunb. var. <i>typica</i> Loes. f. <i>genuina</i> Loes.	2.
<i>I. macrofoda</i> Miq.	2.
<i>I. pedunculosa</i> Miq.	4.
<i>Evonymus oxyphyllus</i> Miq.	2.
<i>E. striata</i> Loes.	2.
<i>Eurya japonica</i> Thunb.	3.
<i>Xolisma elliptica</i> Nakai	3.
<i>Ardisia japonica</i> Blume.	2.
<i>Symplocos myrtacea</i> Sieb. et Zucc.	4.
<i>Ligustrum japonicum</i> Thunb.	4.
<i>Callicarpa mollis</i> Sieb. et Zucc.	4.
<i>Michella repens</i> L. var. <i>undulata</i> Makino	1.
<i>Viburnum dilatatum</i> Thunb. f. <i>pilosulum</i> Nakai	2.
(Ground herbs)	
<i>Dryopteris acuminata</i> Nakai	4.
<i>Viola Selkirkii</i> Pursh.	1.
<i>Lysimachia japonica</i> Thunb.	2.
<i>Crawfordia japonica</i> Sieb. et Zucc.	2.
<i>Gentiana scabra</i> Bunge var. <i>Buergeri</i> Maxim.	3.
<i>Ainsliaea apiculata</i> Sch. Bip.	3.
<i>Disporum sessile</i> D. Don.	2.
<i>Smilax China</i> L.	2.
<i>Calanthe discolor</i> Lindl.	2.
<i>C. tricarinata</i> Lindl.	2.
<i>Cymbidium virescens</i> Lindl.	2.
<i>Goodyera Schlechtendaliana</i> Reichb. f.	2.
<i>Peristylus viridis</i> Lindl.	1.
(Lianas)	

(Continued)

(Life forms)	Species	Exclusiveness
	<i>Cocculus trilobus</i> DC.	2.
	<i>Schizandra nigra</i> Maxim.	2.
	<i>Schizophragma hydrangeoides</i> Sieb. et Zucc.	2.
	<i>Rhus Toxicodendron</i> L. var. <i>vulgaris</i> Pursch. f. <i>radicans</i> Engl.	2.
	<i>Evoymus radicans</i> Sieb.	4.
	<i>Vitis amurensis</i> Rupr. var. <i>Coignetii</i> Nakai	2.
	<i>Actinidia callosa</i> Lindl. var. <i>arguta</i> Makino	2.
	<i>Hedera japonica</i> Tabler.	3.
	<i>Trachelospermum asiaticum</i> Nakai var. <i>intermedium</i> Nakai	3.
(Epiphytes)		
	<i>Hymenophyllum barbatum</i> Miq.	4.
	<i>H. Wrightii</i> Bosch.	3.
	<i>Davallia Mariesii</i> Moore.	3.
	<i>Polypodium lineare</i> Thunb.	3.
	<i>P. Oluoi</i> Yatabe	4.
	<i>Lycopodium serratum</i> Thunb. var. <i>javanicum</i> Makino	3.

E) Temperate rain forest with broad-leaved conifers belong to *Taxaceae*. This forest vegetation occurs mainly in southern Kiushiu and the foot mountain region of northern Taiwan. The principal species dominating in this forest vegetation mostly belong to evergreen broad-leaved trees, and as conifers *Podocarpus macrophyllus* and *P. nagi* are principal species but these are standing scattered in the forest.

As an example of this forest vegetation, a forest situated in southern Kiushiu is selected, and its brief floristic composition is listed as follows:

(Life forms)	Species	Exclusiveness
(Dominant trees)		
	<i>Podocarpus macrophyllus</i> D. Don.	
	<i>P. nagi</i> Pilg.	
	<i>Quercus gilva</i> Blume.	
	<i>Q. stenophylla</i> Makino	
	<i>Shiia Sieboldii</i> Makino	
	<i>Machilus Thunbergii</i> Sieb. et Zucc.	
	<i>Distylium racemosum</i> Sieb. et Zucc.	
	<i>Nauclea racemosa</i> Sieb. et Zucc.	
(Subordinate trees)		
	<i>Actinodaphne longi'olia</i> Nakai	4.
	<i>Cinnamomum japonicum</i> Sieb.	3.
	<i>Camellia japonica</i> L. var. <i>spontanea</i> Makino	3.
	<i>C. Sasanqua</i> Thunb.	5.
	<i>Turpinia ternata</i> Nakai	4.
	<i>Eurya ochracea</i> Szysz.	4.
	<i>Ternstroemia japonica</i> Thunb.	4.
	<i>Heptapleurum octophyllum</i> Forbes. et Hemsl.	4.
(Shrubs)		
	<i>Debregeasia edulis</i> Wedd.	4.
	<i>Villebrunea fruticosa</i> Nakai	4.
	<i>Fatsia japonica</i> Decne. et Planch.	4.

(Continued)

(Life forms)

Species	Exclusiveness
<i>Maesa japonica</i> Mor. et Zoll.	4.
<i>Rapanea nerifolia</i> Mez.	4.
<i>Premna japonica</i> Miq.	4.
(Ground herbs)	
<i>Angiopteris suboppositifolia</i> de Vris.	5.
<i>Cyathea boninsimensis</i> Copel.	5.
<i>Asplenium unilaterale</i> Lam.	4.
<i>A. Wrightii</i> Eat.	4.
<i>Cheiropleuria bicuspidis</i> Presl. var. <i>integrifolia</i> Eat.	4.
<i>Cyclophorus adnascens</i> Desv.	4.
<i>Diplazium lanczum</i> Presl.	4.
<i>D. Wichurae</i> Diels.	4.
<i>Dryopteris africana</i> C. Chr.	2.
<i>D. lepigera</i> O. Kuntze.	4.
<i>D. ochthodes</i> C. Chr.	4.
<i>Microlepia marginata</i> C. Chr.	4.
<i>Polypodium ellipticum</i> Thunb. var. <i>pothifolium</i> Makino	4.
<i>P. ensatum</i> Thunb.	4.
<i>P. Wrightii</i> Mett.	5.
<i>Polystichum amabile</i> J. Sm.	4.
<i>Pteris cretica</i> L. var. <i>albolineata</i> Hook.	4.
<i>P. hachijoensis</i> Nakai	4.
<i>P. quadriaurita</i> Retz.	4.
<i>P. Wallichiana</i> Ag.	4.
<i>Woodwardia orientalis</i> Sw.	4.
<i>Osmunda bromeliaefolia</i> Copel.	4.
<i>Balanophora japonica</i> Makino	4.
<i>Polygonum chinense</i> L. var. <i>Thunbergianum</i> Meisn.	3.
<i>Mitrostemon Yamamotoi</i> Makino	5.
<i>Swertia Tashiroi</i> Makino	5.
<i>Ophiorrhiza japonica</i> Blume.	4.
<i>Ligularia tussilaginea</i> Makino	4.
<i>Pinellia tripartita</i> Schott.	4.
<i>Alpinia japonica</i> Miq.	4.
<i>Phajus maculatus</i> Lindl.	5.
<i>P. maculatus</i> Lindl. var. <i>minor</i> Franch.	5.
(Lianas)	
<i>Piper Futokadsura</i> Sieb.	4.
<i>Ficus pumila</i> L.	4.
<i>Stephania japonica</i> Miers.	4.
<i>Anodendron laeve</i> Makino	4.
<i>Marsdenia tomentosa</i> Morr. et Decne.	4.
<i>Psychortia serpens</i> L.	4.
<i>Uncaria rhynchophylla</i> Miq.	4.
<i>Lonicera affinis</i> Hook. et Arn.	4.
(Epiphytes)	
<i>Trichomanes auriculatum</i> Blume.	4.
<i>T. cuppressoides</i> Desv.	4.

(Continued)

(Life form)	Species	Exclusiveness
	<i>Asplenium Nidus</i> L.	4.
	<i>Drymoglossum microphyllum</i> C. Chr.	3.
	<i>Polyozium Busserianum</i> Miq. var. <i>stipitatum</i> Takeda	4.
	<i>P. Makinoi</i> C. Chr.	4.
	<i>Vittaria japonica</i> Miq.	4.
	<i>Lycopodium Criotomerianum</i> Maxim.	3.
	<i>L. Sieboldii</i> Miq.	5.
	<i>Selaginella caulescens</i> Spring.	4.
	<i>Psilotum nudum</i> Beauv.	4.
	<i>Lysionotus pauciflora</i> Maxim.	5.
	<i>Aerides japonicum</i> Reichb.	4.
	<i>Angraecum falcatum</i> Benth. et Hook. f.	4.
	<i>Bulbophyllum inconspicuum</i> Maxim.	4.
	<i>Dendrobium monile</i> Kraenzl.	3.
	<i>Eria reptans</i> Makino	4.
	<i>Oberonia japonica</i> Makino	3.

F) Strand pine forest. In Japan, which has very very long coast line, everywhere there are many cases concerned with the problems to establish or to protect strand forests, which are indispensably necessary for defence of sea wind, wind-blown sand, and the invasion of sand dunes.

It is a very interesting fact that four main types of this forest vegetation can be seen. The first type, which occurs in southern Kyushu, is dominated by *Pinus Thunbergii* associating with numerous evergreen broad-leaved trees and shrubs, the second type, which occurs covering over the great part of strand regions of Japan, is dominated by *Pinus Thunbergii* and *P. densiflora* associating with both evergreen and deciduous broad-leaved trees and shrubs, the third type, which continuously occurs touching to the north of the second type, is dominated by *Pinus densiflora* associating with numerous species of deciduous broad-leaved trees and shrubs, and the last type, which occurs in the most northern Honshu, is dominated, at present, by *Pinus Thunbergii* associating with species of deciduous broad-leaved trees such as *Quercus*, *Acer*, and *Castanea*, but it is a very remarkable fact that the *Pinus Thunbergii* dominating actually in this type of strand forest are mostly planted long time ago or the descendants of the planted one.