<Original article>

INVESTIGATION REPORT ON PLANT COMMUNITIES ON YONGZONG ISLAND

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洪元植：永宗島의 植物群落硏究

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SUMMARY

1. The author investigated on the flora of Yongzong island especially on the point of view of the sociological studies.

2. The author could distinguish kinds of the plant formation in this island (1). Seaside plant formation (2). Mountain plant formation.

3. The seaside plant formation could be subdivided as follows:

(1). Association of *Triglochin maritimum* LINNE.
(2). Association of *Suaeda japonica* MAKINO.
(3). Association of *Scirpus triqueter* LINNE.
(4). Association of *Phragmites prosturatus* MAKINO.
(5). Association of *Zoysia japonica* STEUDEL.
(6). Association of *Zoysia sinica* HANCE var. *tenuis* NAKAI ex YAMAMOTO.
(7). Association of *Carex pumila* THUNBERG.
(8). Association of *Rosa rugosa* THUNBERG.
(9). Association of *Pinus Thunbergii* PARLATORE.

(1), (2), (3), (4), (5) associations can grow under the high tide. so when the high tide comes they soaked in the sea water.

4. The mountain plant formation can be subdivided as follows:

(1). Association of *Quercus aliena* BLUME and *Platycarya strobilacea* SIEBOLD & ZUCCARINI.
(2). Association of *Quercus aculissima* CARRUTHERS and *Platycarya strobilacea* SIEBOLD & ZUCCARINI.
(3). Association of *Robinia Pseudoeacia* LINNE and *Platycarya strobilacea* SIEBOLD & ZUCCARINI.

5. The plants at the abandoned mine regions are replacing by the association of *Robinia Pseudacacia* LINNE and *Platycarya strobilacea* SIEBOLD & ZUCCARINI.

6. Generally I can find that soil which is developed by the seaside plant formation under sea water (when high tide comes, they soaked in the sea water) is over the pH 8.0, so it shows strong alkaline.

But the sandy soil behind the tide line shows near the neutral in spite of the same seaside plant formation.

In the case of mountain plant formation the soil where they developed show near the pH 6.0, so it is acidity.

INTRODUCTION

Yongzong island is situated in the south-east of Inchon city and is about 58.8 Kilomters round.

Mt. Baekun (255.5m above the sea level) is the most highest mountain in this island and it has many branches. They run sloply into the sea from the top of Mt. Baekun. The geological structure of this island consists of metamorphosed aqueous rock of Pre-cambrian period mostly.

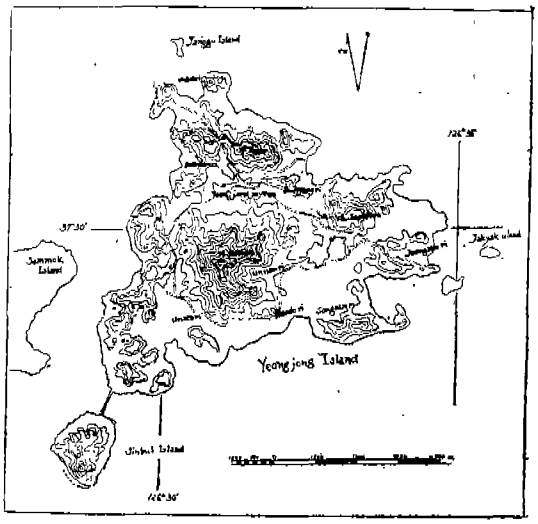

Fig. 1 Yongzong island

Nobody has not been made to attempt the investigation of the flora in this island. But I had make my mind to survey plant of this island, especially on the point of view of ecological botany. I visited to this island more than seven times for four years (1955, 1956, 1957, 1958), and surveyed the structure of vegetable group by the method of statistics. I was indebted to father, K.S.Yang, Prof. D.S. Yun and Prof. M.K. Pak for advicing and cmmenting upon this manuscript.

METHODS AND RESULTS

When I surveyed the seaside plant formation I used the quadrat methood (1m×1m) along the seaside and repeated 10 times in every association except the association of *Scirpus triqueter* Linne (I investigated this association 16 times).

But when I surveyed the mountain plant formation I used the quadrat method (2×2m) at random and repeated 10 times in every association.

Generally island's vegetation consist of plant formation in the sea water, plant formation of the seaside, plant formation in the damp place and plant formation of the mountain, but in the case of Yongzong island, there is no plant formation in the sea water, for it is due to the tide zone mostly which consist of muddy soil (no sand), and differnce of ebb and flow is too severe. So I could not find the algal plant formation in the sea water except some kinds of green algae. Also there was not plant formation of the damp place except behind of the primary school at Unbukri.

I could distinguish the seaside plant formation and the mountain plant formation about the plant communities in this island. The plant formation of the seaside was well developed and I could distinguish largely 2 groups as followow:

(1) Plant groups were soaked in the sea water when the high tide comes.

(2) Plant groups were grow at the sandy soil place far from the tide line.

I. SEASIDE PLANT FORMATION

(1). Association of *Triglochin maritimum* Linne

This association was well developed at the south part of the seaside in Zungsanri, and especially grew at the high place where the humus material deposited and showed acidity (some cases they show below p H 6.0 because exudation of organic acid from the decayed matter).

Table 1. Association of *Triglochin maritimum* LINNE

Name of plants	Cover degree	Frepuency degree(%)
	pH 8.2	
Triglochin maritimum LINNE	4.2	100
Limonium tetragonum (THUNBERG) BULFOCK	+	20
Scirpus triqueter LINNE	+	20
Suaeda japonica MAKINO	+	10

When we see the table *Triglochin maritimum* exhibits high cover degree, it is due to compactely grow together.

Sometimes *Limonium tetragonium*, *Scirpus triqueter* and *Suaeda japnica* grow mixedly.

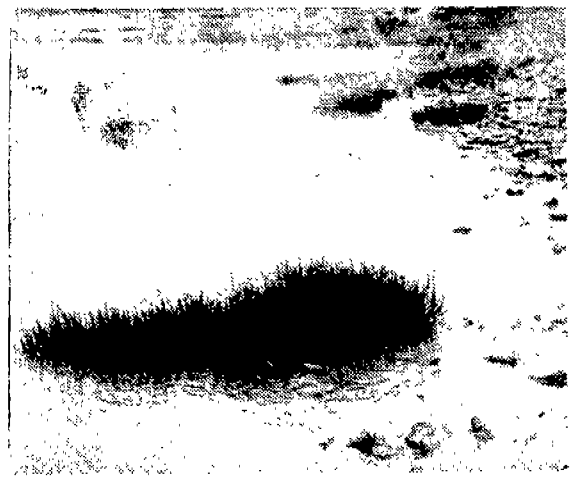

Fig. 2 Association of *Triglochin maritimum*

(2). Association of *Suaeda japonica* MAKINO

This sasociation was well develped at the north part of the seaside in Zungsangri. This association is the most popular type of the yellow sea. It is very wonderful scene that the vast area is covered with this association, and it looks like to be painted with blood.

Fig. 3 Association of *Suaeda japonica*

Table 2. Association of *Suaeda japonica* MAKINO

Name of Plants	Cover degree	Frequency degree(%)
	pH 8.0~8.2	
Suaeda japonica MAKINO	2.5	100
Salicornia hebacea LINNE	+	10
Limonium tetragonium(THUNBERG) BULLOK	+	10

We can also see *Salicornia herbacea* and *Limonium tetragonum* which appears mixedly with this *Suaeda japonica*, but its frequency degree is very low.

(3). Association of *Scirpus triqueter* LINNE

The association of *Scirpus triqueter* grows every where in this island like *Suaeda japonica* and *Triglochin maritimum*.

When the high tide comes, they are soaked in the sea wate, but they can fully maintain their life in the sea water. It is due to the these plant's tolerance of salt.

Table 3. Association of *Scirpus triqueter* LINNE

Name of plants	Cover degree	Frequency degree(%)
	pH 8.0	
Scirpus triqueter LINNE	1.4	100
Phragmites prosluratus MAKINO	+	62
Suaeda japonica MAKNO	+	43
Triglochin maritimum LINNE	0.1	24

Scirpus triqueter well gorw mixedly with the *Phragmites* because the cover degree of the latter is low, so the former can fully appropriate the sun light.

Fig. 4 Association of *Scirpus triqueer*

(4). Association of *Phragmites prosturatus* MAKINO

This association was developed at the tide zone in Zungsanri and Unbukri. The rhizome of *Phragmites prosturatus* developed in the muddy soil, and the length of the rhizome is very long.

The rhizome of *Phragmites prosturatus* have the branch stem or hair root at the every node.

This plant completely soaked in the sea water when a high tide appeared, but can grow well at the hollow place where the sea water remained when the low tide appeared.

When the autumn has come upper parts of these plants die. In the spring we could hardly distinguish *Phragmites prosturatus* and *Scirpus triqueter*, because both are like each other.

Cattle can graze this plant. So when I visited the grazing place in Autumn I could find only lower stalk of the plant. It seems that cattle like to eat *Phragites* than *Scirpus*.

Fig. 5 Association of *Phragmites prosturatus*

Table 4. Association of *Phragmites prosturatus* MAKINO

Name of plants	Cover degree	Frequency degree(%)
	pH 8.0~8.2	
Phragmites prosturatus MAKINO	4.2	100
Scirpus triqueter LINNE	1.2	80
Linonium tetragonium(THUNBERG) BULLOCK	+	30
Triglochin maritmum LINNE	+	20
Aster Tripolium LINNE	+	20
Suaeda japonica MAKINO	+	10
Atriplex tatarica LINNE	+	10

(5). Association of *Zoysia japonica* STEUDEL

Generally the association of *Zoysia japonica* was well developed at the muddy soil unlike *Zoysia sinica*. When high tide appeared, these plants also soaked in the sea water. These plants grow everywhere in the island but especially they was well developed at the seaside in Unbukri. These plants are not so stronger to the tolerance of salt than *Suaeda japonica* and *Triglochin maritimum*.

Table 5. Association of *Zoysia japonica* STEUDEL

Name of plants	Cover degree	Frequency degree(%)
	pH 8.1~8.3	
Zoysia japonica STEUDEL	4.1	100
Limonium tetragonium(THUNBERG) BULLOCK	+	40
Suaeda japonica MAKINO	0.3	40
Atriplex tatarica LINNE	0.2	40
Triglochin maritimum LINNE	+	10
Phramites prosturatus MAKINO	+	10

Above mentioned (1), (2), (3), (4), (5) associatons are developed under the high tide line, so when the high tide comes they are soaked fully in the sea water.

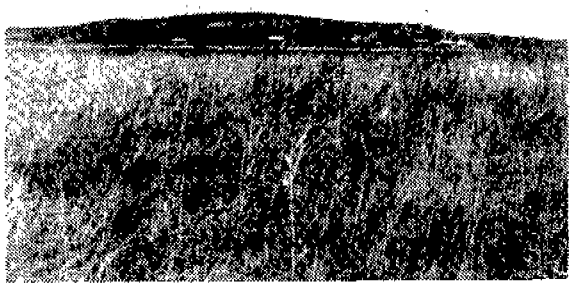

Fig. 6 Association of *Zoysia japonica*

(6). Association of *Zoysia sinica* HANCE ver. *tenuis* NAKAI *Zoysia sinica* well grow in the soil unlike *Zoysia japonica*.

These plants grow mixedly with *Ischaemum anthephoroides*, *Carex pumila*, and *Pennisetum japonica*.

Generally *Zoysia sinica* are well developed at everywhere near the sea in the island.

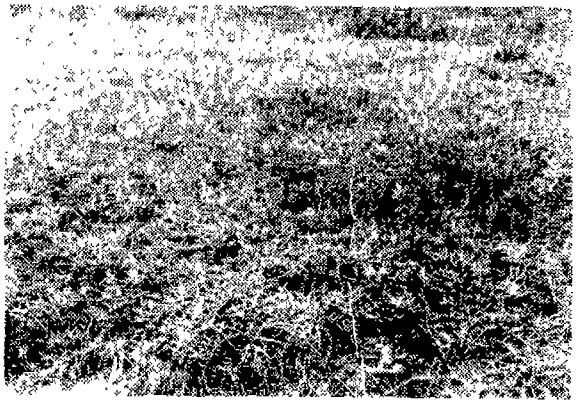

Fig. 7 Association of *Zoysia sinica* var. *tenuis*

Table 6. Association of *Zoysia sinica* HANCE var. *tenuis* NAKAI ex YAMAMOTO

Name of plants	Cover degree	pH 6.9~7.0 Frequency degree(%)
Zoysia sinica HANCE var. *tenuis* NAKAI ex YAMAMOTO	4.1	100
Limonium tetragonum(FIIUBERG) BULLOCK	1.2	90
Cnidium japonicum MIZUEL	0.3	40
Suaeda japonica MAKINO	+	10
Sonchus oleaceus LINNE	+	10

(7). Association of *Carex pumila* THUNBERG

Association of *Carex pumila* can only grow at the sandy soil place and are very strong to the tolerance of sand cover.

We can find this association at everywhere and it developed at the sandy soil place far from the seaside.

Table 7. Association of *Carex pumila* THUNBERG

Name of plants	Cover degree	pH 7.0 Frqucuccy degree(%)
Carex pumila THUNBERG	3.6	100
Lathyrus maritimus BIGELOW	+	40
Phragmites prosturatus MAKINO	+	40
Zoysia japonica STEUDEL	+	20
Artemisia scoparia WALDSTEIN et KITAIBEL	+	10
Suaeda maritima DUMORTIER	+	10

(8). Association of *Rosa rugosa* THUNBERG

Association of *Rosa rugosa* symbolyes the nothern part seaside and grow well mixedly with *Festuca ovina* and *Zoysia sinica*. The plants which grow at this place are like the dry land. There are not so tall plant because man digging the plant for ornament.

Fig. 8 Association of *Rosa rugosa*

Table 8. Association of *Roas rugosa* Thunberg

Name of plants	Cover degree	pH 6.8~6.9 Frequency degree(%)
4th layer (0.3~1m)		
Rosa rugosa THUNBERG	4.3	100
Artemisia capillaris THUNBERG	+	20
Lespedeza cuneata G. DON	+	10
Gypsophila oldhamiana MIQUEL	+	10
Lespedeza Maximowiczii C.K. SCHNEIDER	+	10
Cephalonoplos segetum(BUNGE) KITAMURA	+	10
Rosa ployantha SIEBOLD & ZUCCARINI var. *genuina* (FRAONCHET & SAVATIER) NAKAI ex KAWAMOTO	+	10
5th layer (below 0.3m)		
Festuca ovina LINNE var. *vulgaris* KOCH	+	90
Zoysia sinica HANCE var. *tenuis* NAKAI ex YAMANTO	0.5	60
Potentilla fragarioides LINNE var. *Sprengeliana*(LEHMANN) MAXIMOWICZ	+	60
Rosa rugosa THUNBERG	1.2	40
Pulsatilla koreana(YABE)NAKAI ex MORI	+	40
Equisetum ramossimum DISFONTAINES var. *japonicum* MIRDE	+	40
Luzula capitata(MIQUEL) NAKAI	+	20
Viola mandshurica BECKER var. *ciliata* NAKAI	+	10

(9). Association of *Pinus Thunbergii* PARLOTORE

I could find the association of *Pinus Thunbergii* everywhere in the seaside. There are evidence that

artificial disturbance added and herb lay ers of these plants were undeveloped.

Table 9. Associatifn of *Pinus Thunbergii* PARLATORE

pH 6.8~7.0

Name of plants	Cover degree	Frequency degree(%)
2nd layer (3—10m)		
Pinus Thunbergii PARLATORE	2.6	100
3rd layer (1—3m)		
Platycarya strobilacea SIEBOLD & ZUCCARINI	1.2	80
Lespedeza Maximowiczii C.K. SCHNEIDER	+	10
4th layer		
Indigofera kirilowii MAXIMOWICZ ex PALIBIN	+	50
Lysimachia barystachys BUNGE	+	30
Pteridium aquilinum (LINNE) KUHN var. *japonicum* NAKAI	+	30
Gypsophila oldhamiana MIQUEL	+	10
Amethystanthus inflexus NAKAI	+	10
Chrysanthemum lavandulaefolium MAKINO	+	10
Poa acroleuca STEUDEL	+	10
Platycodon glaucum(THUNBERG) NAKAI	+	10
Pycnostelma paniculatum(BUNGE) K. SCHUMANN	+	10
Patrinia villosa (THUNBERG) JUSSIEU	+	10
Cirsium Maackii MAXIMOWICZ var. *koraiensis* NAKAI	+	10
Artemisia japoeica THUNBERG	+	10
Clematis mandshurica MAXIMOWICZ	+	10
5th layer		
Festuca ovina LINNE var. *vulgaris* KOCH	—	40
Pulsatilla koreana(YABE) NAKAI ex MORI	—	30
Prunella asiatica NAKAI	—	20
Potentilla fragarioides LINNE var. *Sprengliana*(LEHMANN) MAXIMOWICZ	—	20
Leibnitzia Anandria (LINNE) NAKAI	—	10
Lotus corniculatus LINNE ver. *japonicus* REGEL f. *tpicus* NAKAI	—	10
Zoysia sinica HANCE var. *tenuis* NAKAI ex YAMAMOTO	—	10

Fig. 9 Association of *Pinus Tunbergii*

It is also interesting fast that *Pinus Thunbergii* grow mixedly with *Platycarya strobilacea.*

II. MOUNTAIN PLANT FORMATON

As above mentioned, the topogrophy of this is simple, for the mountain range is very low, the slope is not so steep, and basal rocks are unappeared.

The vegetation of the island were completely disturbed, it is due to cutting the tree for woods, so we can not find the natural forest's Physiognomy in this island. When we subjected to the secondary forest, instead of natural forest, we distinguish 3 different kinds of association.

(1). Association of *Quercus aliena* and *Platycarya strobilacea*

This association is the most popular in this island.

The association is well developed on the roadside or near the village which protected from the disturbance. The consisting plants of the 2nd layer are very few. When we see the table 2. We notice the low cover degree of *Quercus aliena.* It apparently shows the poor forest of this island.

Table 10. Association of *Quercus aliena* and *Platycarya strobilacea*

pH 6.4

Name of plants	Cover degree	Frequency degree(%)
2nd layer		
Quercus aliena BLUME	2.1	100
Platycarya strobilacea SIEBOLD & ZUCCARINI	0.5	90
Pinus Thunbergii PARLATORE	0.7	70
3rd layer		
Quercus aliena BLUME	0.8	40
Alnus sibirica FISCHER	0.2	40
Platycarya strobilacea SIEBOLD & ZUCCARINI	0.2	30

Quercus acutissima CARRUTHERS	0.4	30
Aster scaber THUNBERG	0.1	20
Robinia pseudacacia LINNE	+	10
Celastrus orbiculatus THUNBERG	+	10
Lespedeza Maximowiczii C.K. SCHNEIDER	+	10
Arundinella hirta TANAKA var. *ciliare* KOIDZUMI	+	10
4th layer		
Indiofera kirilowii MAXIMOWICZ ex PALIBIN	+	60
Amethystanthus inflexus NAKAI	+	60
Artemisia japonica THUNBERG	+	50
Poa acroleuca STEUDEL	+	50
Cirsium Maackii MAXIMOWICZ var. *koraiensis* NAKAI	+	20
Atractylis lyraa SIEBOLD & ZUCCARNI	+	20
Thalictrum Thunbergii DC. var. *hypoleucum* NAKAI	+	20
Pteridium aquilinum (LINNE) KUHN var. *japonicum* NAKAI	+	10
Sanguisorba officinalis LINNE	+	10
Chrysanthemum lavandulaefolium MAKINO	+	10
Peucedanum deltoideum MAKINO	+	10
5th layer		
Festuca ovina LINNE. var *vulgaris* KOCH	+	50

Fig. 10 Association of *Quercus aliena* and *Platycarya stoblacea*

Luzula capitata (MIOUEL) NAKAI	+	40
Pulsatilla koreana(YABE) NAKAI ex MORI	+	30
Portentilla fragarioides LINNE var. *Sprengliana* (LEHMANN) MAXIMOWICZ	+	20
Polytrichum sp.	+	20
Solidago virgaurea LINNE var. *leiocarpa* (BENTHAM) A. GRAY	+	10
Senecio campestris A.P.D.C CANDOLLE	+	10
Thesium chinense TURCZANINOW	+	10

A layer of herbs consist of mainly *Amethystanthus inflexus, Artemisia japonica Poa acroleuca, Festuca ovina* and *Luzula capitata.*

(2). Association of *Quercus acutissima* CARRUTHERS and *Platycarya strobilacea* SIEBOLD & ZUCCARINI.

This association also well developed at the roadside or near the village which protected from the distubance as like as association of *Quercus aliena* and *Platycarya strobilacea.*

Table 11. Association of *Quercus acutissima* and *Platycarya strobilacea*

Name of plants	pH 6.6~6.8 Cover degree	Frepency degree(%)
2nd layer		
Quercus acutissima CARRUTHERS	3.7	100
Platycarya strobilacea SIEBOLD & ZUCCARNI	0.7	70
Pinus Thunberegii PALATORE	0.2	50
3rd layer		
Quercus acutissima CARRUTHERS	1.2	60
Platcarya strobilacea SIEBOLD & ZUCCARINI	0.4	50
Betula Schnidtii REGEL	0.1	50
Smilax china LINNE	+	50
Lespedeza Maximowiczii C.K. SCHNEIDER	+	30
Stephandra incisa(THUNBEG) ZABEL	+	30

Fig. 11 Association of *Qercus acutissima* and *Platycarya stobilacea*

Pinus Thunbergii PARLATORE	+	30
Quercus serrata THUNBERG	+	20
Sorbus alnifolia K.C. SCHNEIDRE var. *typica*(C.K. SCHNEIDER) NAKAI	+	20

Acer Ginnala MAXIMOWICZ	+	20
Eccoilopus cotulifer A, CAMUS	+	10
4th layer		
Aster scaber THUNBERG	+	50
Rhododendron mucronulatum TURCZANINOW	+	40
Poa acroleuca STEUDEL	+	40
Sanguisorba officinalis LINNE	+	20
Amethystanthus inflexus NAKAI	+	20
Artemisia japonica THUNBERG	+	20
Solidago virgaurea LINNE var. *leiocarpa* A. GRAY	+	10
Atractylis lyrata SIEBOLD & ZUCCARINI	+	10
Platycodon glaucum(THUNBERG) NAKAI	+	10
Gypsophila oldhamiana MIQUEL	+	10
5th layer		
Festuca ovina LINNE var. *vulgaris* KOCH	0.1	80
Luzula capitata(MIQUEL) NAKAI	+	50
Polygala japonica HOUTTUYN	+	20
Athyrium Yokoscense(FRANCHET & SAVATIER) CHRISTENSE	+	10
Zoysia japonica STEUDEL	+	10
Leibnitzia Anandria(LINNE) NAKAI	+	10
Polytrichum sp.	+	10
Prunella asiatica NAKAI	+	10

A layer or herbs consist of mainly *Aster scaper*, *Poa acroeuca*, *Festuca ovina* and *Luzula capitata*.

(3). Association of *Robinia Pseudacacia* LINNE and *Platycarya strobilacea* SIEBOID & ZUCCARINI.

This association well developed at the place of abandoned mine in the Unbukri.

There are many scattered hollow place where digging gold in the past time (about 15 year ago). *Robinia Pseudacacia* and *Platycarya strobilacea* can grow well on such hollow places.

When we see the vigorous life of *Robinia Pseudacacia* in spite of 15 years passed since abandoned digging gold at the mine, we admire for the strong ability of growth of this plant,

Table 12. Association of *Robinia pseudaccia* and *Platycarya strobisacea*

Namf of plants	pH 6.2~6.4 Cover degree	Frequency degree(%)
3rd layer		
Robinia pseudacacia LINNE	3.8	100
Platycarya strobilacea SIEBOLD & ZUCCARINI	1.2	100
Pinus Thunbergii PARLATORE	0.5	60
Eccoilopus cotulifer A. CAMUS	+	30
Pinus rigida MILL	+	20
Quercus aliena BLUME	0.3	20
Arundinela hirta TANAKA var. *ciliare* KOIDZUMI	+	20
Quercus dentata THUNBERG	0.2	10
Styrax japonica SIEBOLD & ZUCCARINI	+	10
Palura chinensis(KER.) NAKAI var. *pliosa* NAKAI	+	10
Orixa japonica THUNBERG	+	10
Lespedeza Maximowiczii C.K. SCHNEIDER	+	10
Spiraea prunifolia SIEBOLD & ZUCCARINI var. *simpliciflora* NAKAI	+	10
4th layer		
Artemisia japonica THUNBERG	+	60
Platycarya strobilacea SIEBOLD & ZUCCARINI	0.2	50
Robinia pseudacacia LINNE	0.5	40
Indigofera kirilowii MAXIMOWICZ ex PALIBIN	0.3	40
Cirsium Maackii MAXIMOWICZ var. *koraiensis* NAKAI	+	30
Chrysanthemum lavandulaefolium MAKINO	+	30
Lysimachia barystachis BUNGE	+	30
Poa acroleuca STEUDEL	+	30
Asterscaber THUNBERG	+	30
Sanguisorba officinalis LINNE	+	30
Amethystanthus inflexus NAKAI	+	20
Patrinia villosa(THUNBERG) JUSSIEU	+	20
Artemisia capillaris THUNBERG	+	20

Fig. 12 Association of *Robinia pseudoacacia* and *Platycarya strobilacea*

Lespedeza cuneata G. DON	+	20
Pteridium aquilinum (LINNE) KUHN var. *japonicum* NAKAI	+	10
Rhododendron mucronulatum TURCZANINOW	+	10
5th layer		
Zoysia japonica STEUDEL	+	70
Pulsatilla koreana(YABE) NAKAI ex MORI	+	40
Kummerowia striata(THUNBERG) SCHINDLER	+	20
Synurus deltoides(AITON) NAKAI	+	20
Artemisia Feddei LEVEILLE et VANIOT	+	10
Lotus corniculatus LINNEvar. *japonicus* REGEL f. *typicus* NAKAI	+	10
Platycodon glaucum(THUNBERG) NAKAI	+	10
Ixeris dentata (THUNBERG) ROBINSON	+	10
Galargaeus Helioscopia LINNE	+	10
Equisetum arvense LINNE var. *boreale* (BONGARS) RUPRECHT	+	10
Gentiana Zollingeri FAWCETT	+	10

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摘 要

1. 筆者는 西海에 있는 京畿道富川郡永宗島의 植物群落의 構造를群落學의 統計的方法에 依해서 硏究했다.

2. 本島의 植物은 크게 海邊植物群系와 山地植物群系로 區分하며 海邊植物群系는 다시 高潮汀線과 低潮汀線사이에 發達하는것高潮汀線뒤에 發達하는것으로 나눌수가 있다.

3. 海邊植物群系를 9개의 群叢으로 나누워 각기 그 特徵과 分布를 記述했다.

4. 山地植物群系는 크게 「갈참나무」--「굴피나무」群叢, 「상수리나무」—「굴피나무」群叢, 「아까시아나무」—「굴피나무」群叢의 3개의 群叢으로 區別할수가 있다.

5. 二次遷移系列途中에 있는 廢坑地帶의 植物은 「아까시아나무」를 主로 한 群叢으로 置換되고 있다.

6. 各群叢이 發達해 있는 土壤의 水素ion 濃度調査에 있어서는 같은 海邊植物群叢이라도 高潮汀線과 低潮汀線사이의 것은 거이 pH 8.0을 超過하고 있지만 汀線뒤의 것은 거이 中性에 가깝다. 한편 山地植物의 境遇를 보면 pH 6.0을 中心으로 한 酸性을 보여주고 있다.