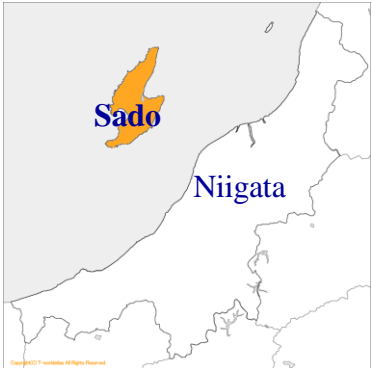


**Template for GIAHS proposal**  
**Globally Important Agricultural Heritage Systems (GIAHS) Initiative**

**SUMMARY INFORMATION**

Name/Title of the Agricultural Heritage System	
<b>Sado's satoyama in harmony with Japanese crested ibis</b>	
Requesting Agency/Organization: Sado City	
Cooperating Organizations:	
<ol style="list-style-type: none"> <li>(1) Ministry of Agriculture, Forestry, and Fisheries (MAFF),</li> <li>(2) United Nations University Institute for Sustainability and Peace (UNU-ISP), United Nations University-Institute of Advanced Studies, Operating Unit Ishikawa/Kanazawa (UNU-IAS OUIK),</li> <li>(3) Niigata Prefecture,</li> <li>(4) Niigata University (Framework Agreement with Sado City),</li> <li>(5) Tokyo University of Agriculture(Framework Agreement with Sado City),</li> <li>(6) Sado Agricultural Cooperative,</li> <li>(7) Hamochi Agricultural Cooperative</li> </ol>	
Country/location/site (please annex maps and descriptions of location):	
<p>Sado City, Niigata, Japan  Sado Island, one island, one city,  located 40km northwest off the coast of Niigata,  located on the Sea of Japan side, Japan</p>	
Accessibility of the site	
<p>2 hours from Tokyo to Niigata by bullet train  65 minutes from Niigata to Sado by high-speed boat, 2.5 hours by car ferry</p>	
Approximate Surface Area: 855km <sup>2</sup>	
Agro-Ecological Zone/s: Paddy field zone in temperate area	
Topographic features: Island	
Climate Type: Temperate	
Approximate Population: 64,000 (28,000 farmers)	
Main Source of Livelihoods: Agriculture, tourism	
Ethnicity/Indigenous population: N/A	

Traversed by two mountain ranges with a broad plain in the middle, the Sado Island located off the shore of Niigata Prefecture is characterized by a variety of landforms and altitudes, which have been ingeniously harnessed to create the *satoyama* landscape, a dynamic mosaic of various socio-ecological systems comprising secondary woodlands, plantations, grasslands, paddy fields, wetlands, irrigation ponds and canals. These exist in close proximity and interdependence with the marine-coastal ecosystems of *satoumi* landscapes, comprised of seashore, rocky shore, tidal flats and seaweed/eelgrass beds<sup>1</sup>.

With their ecosystem complexity, the *satoyama* and the *satoumi* landscapes in Sado Island harbor a variety of agricultural biodiversity, such as rice, beans, vegetables, potatoes, soba, fruit, grown in paddy fields and other fields, livestock, wild plants and mushrooms in forests, and many seafood in the coastal areas. Rice, beef and persimmon from the Sado are among the best in Japan. The *satoyama* in Sado was also the last habitat of the wild Japanese crested ibis, a culturally valued bird in Japan that feeds on paddy fields and roost on the tall trees. The history of rice cultivation and other agricultural practices in Sado can be traced back to the Yayoi period, 1700 years ago. Over the centuries, a diversified landscape has been produced and maintained by the communities inhabiting the island, that have developed locally adapted practices for resource use and management. For example, ingenious water management practices with over 1000 irrigation ponds to cope with a scarcity of water resources coupled with rapid drainage of rainwater into the sea, while creating a rich local culture of rice farming, such as Kuruma Rice Planting listed as national important intangible cultural heritage. Pressures on food production during the gold rush of the Edo period (1603-1868) led to the development of rice terraces on hill slopes, which contribute to the landscape's aesthetic appeal as well as to the feeding ground of Japanese crested ibis.

After a period of systematic promotion of conventional agriculture in Sado similar to the rest of Japan, the island is witnessing a revival of traditional practices, catalyzed by its efforts to reintroduce the crested ibis to the wild. Traditional ecological knowledge associated with *satoyama* is being combined with applications of modern technology and governmental policy to restore the mosaic of ecosystems on which the ibis depends for its survival while promoting environmentally-sound agricultural practices. Communities on the island are collaborating with researchers and governments in exploring further measures towards a more sustainable agriculture.

## DESCRIPTION OF THE AGRICULTURE HERITAGE SYSTEM

### I. Characteristics of the proposed GIAHS

#### Global (or national) importance

Traversed by two mountain ranges with a broad plain in the middle, the Sado Island located 40km off the shore of Niigata Prefecture is characterized by a variety of landforms and altitudes, which have been ingeniously harnessed to create the *satoyama* landscape, a dynamic mosaic of various socio-ecological systems comprising secondary woodlands, plantations, grasslands, paddy and upland fields, wetlands, irrigation ponds and canals. These exist in close proximity and interdependence with the marine-coastal ecosystems of *satoumi* landscapes, comprised of seashore, rocky shore, tidal flats and seaweed/eelgrass beds<sup>2</sup>. In general, the woodlands, grasslands as well as upland fields are distributed on the sloping areas while the paddy fields, wetlands, streams and ponds are located in the valley bottoms or flat areas. The village settlements are concentrated at the foot of the hills and mountains or in the transition areas between paddy fields and mixed forests.

*Satoyama* provide a variety of ecosystem services to meet the rural livelihoods and needs. In the past, woodlands provided villagers with the forest litters as fertilizer to the paddy fields, the wild plants and mushroom as food, the timber for buildings and the firewood for cooking and heating. Grasslands feed horses and

<sup>1</sup> As defined by the Japan Satoyama Satoumi Assessment (JSSA, October 2010)

<sup>2</sup> *ibid.*

cattle, which provided main draft power for farming while grass was also harvested for roof thatching. Streams and ponds were managed to irrigate the paddy fields and to produce fish. The paddy fields and upland fields produce rice and vegetables to ensure food security. Rice cultivation over centuries has also created rich culture, including Kuruma Rice Planting listed as national important intangible cultural heritage, and Shinto ritual for rice planting and harvesting. On the other hand, the *Satoyama* landscapes offer mosaics of varied biotope for high biodiversity, both domestic (crops and livestock) and wild species. Among its diversity of agricultural crops and livestock, rice, beef and persimmon of Sado are well known for their quality in Japan.

Distinguishably, Sado's *satoyama* offered the ideal habitat combination for the endangered Japanese crested ibis, which depends on varied landscape for its survival. The ibis culturally valued in Japan feeds on small fish like loaches, insects like grasshoppers, worms, small river crabs and frogs that are easily available in paddy fields and nearby creeks (Photo 1). Furthermore, it always feeds in places where trees are present so that it can have an extensive view of the area and take a rest. It prefers tall trees like pines and *quercus serrata* that can command a good view for resting, roosting, and nesting. Only *satoyama* with paddy fields and woodlands meet these conditions of the ibis habitat in Japan. Unfortunately, the ibis was brought to the verge of extinction by excessive hunting and degradation of its habitat—the traditional *satoyama*, including loss of food due to wetland conversion as a result of land improvement measures, and due to agricultural chemicals, loss of resting and roosting places due to under-use and under-management of the forests and rice terraces in the *satoyama* landscapes.



Photo 1. Ibis feeds on paddy fields harvested

Being the last habitat of the wild Japanese crested ibis, various efforts of the public and private sectors have been made to bring the ibis back in the wild in Sado Island<sup>3</sup>. Traditional and new agricultural practices that conserve and enhance biodiversity, including minimal inputs of agricultural chemicals and fertilizer and holistic management of ecosystems at the landscape level are being adopted to rebuild the *satoyama* landscape that the ibis can depend on for its survival. The ibis friendly agriculture helps add value to agricultural products through certification and payment for environmental services, enhancement of tourism attractions, and revitalization of local economy.

As the ibis is on the near top of the ecosystem food web (Figure 1), the ibis stands as a symbol for biodiversity conservation in Sado, but also for the predicament of Japanese and global biodiversity as a whole in the face of conventional agriculture. Sado upholds the aims of the *Satoyama* Initiative, which was established under the overarching goal of “harmonious coexistence between humans and nature” under Japan’s 21st Century Environmental Nation Strategy (2007). In 1994, when the Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF) initiated its national committee for promoting environmentally sound agricultural practices, Sado Island gained recognition as a pioneer of changing agricultural practices towards agriculture that is more sustainable. Thus, it can be considered representative of *satoyama* sites in Japan that draw on traditional knowledge while adopting innovation in response to changing physical and socio-economic contexts.

At the global level, Sado is important for more than just its endemic and endangered species and its unique socio-cultural traditions. In the context of a shift from a conservation paradigm that fences off protected areas to approaches that integrate development goals with community participation, and a closer focus on biodiversity conservation and sustainable use in human-influenced landscapes, Sado offers a model for human activity that has the potential to sustain and even enhance biodiversity by integrating agriculture with biodiversity management. It also demonstrates that locally adapted practices can play an important role in maintaining and enhancing habitats that are the product of centuries-long selective human intervention and modification. Finally, in the face of rapid decline in habitat loss and species diversity, the experience of Sado offers both a promise

<sup>3</sup> In fact, the last 7 birds of the crested ibis living in the wild in the world were found in remote forest valleys of Yang County, China where traditional farming continued without use of machinery and agrochemicals, and the ibis was believed to be auspicious and protected by local people.

that with commitment and participation from a variety of stakeholders these negative trends can be reversed, and a lesson that powerful, cultural, emotional symbols can be used to catalyze change in the way we conceive our relationships with nature. The implementation of the Sado GIAHS initiative will offer an excellent model through which many of the post-2010 period targets of CBD can be achieved.



Figure 1. Food web of Sado, ibis on the top level

## 1. Food and livelihood security

Sado is an island in the Sea of Japan, north off to Niigata Prefecture. It has over 1,000m-mountains, a hilly mountainous area, and an agricultural plain, where a variety of food can be produced. Rice, beans, vegetables, potatoes, soba, fruit, harvested from paddy fields and other fields, dairy products, wild plants and mushrooms from forests, and a variety of seafood, support the food supply and economy on Sado (Table 1). The agricultural output of rice is about 8 billion yen, that of fruit is 1.5 billion yen, and that of the livestock products is 0.6 billion yen. Sado exports a variety of farm products such as rice, persimmon, and seafood. Over one third of its citizens is engaged in agriculture to practice “locally produce locally consume”. This makes the self-sufficiency rate quite high at 187% (Table 2).

Table 1. Planted acreage (ha)

ranking	1995	2005
1	Paddy rice, 7917	Paddy rice, 6700
2	Persimmon, 589	Persimmon, 548
3	Feed, 325	Soy bean, 254
4	Soy bean, 248	Soba, 249
5	Japanese radish, 112	Feed, 246
6	Adzuki bean, 105	Japanese radish, 99
7	Soba, 89	Potato, 77
8	Potato, 84	Adzuki bean, 62
9	Eggplant, 38	Eggplant, 35
10	Sweet potato, 37	Sweet potato, 28
		Watermelon, 28

Tabel 2. Self sufficiency rate per capita (% , weight-based)

Rice	754
Fruits	335
Fish	337
Mushrooms	92
Vegetables	109
Milk	115

Note: Self-sufficiency rate on Sado, 187% (calorie-based)

## 2. Biodiversity and ecosystem function

### *Biodiversity*

Sado has a unique terrain of 1,000 m-mountains and 400 to 600 m-hilly areas, with the plain in between, and a marine climate due to the location in a cool-temperate zone in the Sea of Japan (Figure 2). The characteristic of a warm-temperate zone with a warm ocean current has generated the diversity of agriculture systems and food production. Due to the geographical and climatic conditions, southern strains and northern strains of plants are distributed in a complex way. What makes Sado distinguished from mainland Japan is its perpendicular distribution of plants. At a place of lower altitude, alpine flora or subalpine flora of the mainland can be observed. The cause is not yet known. 37 critically endangered species of plants have been registered. In particular, as endemic species seen only on Sado, *R. cirrhosa* is protected.

Sado is home to mammals like the Sado Mole (*Mogera tokudae*) and the Sado Hare, which are sub-endemic species to Sado. The Sado Hare is on the verge of extinction because of the influence of nonnative martens. Among birds living on Sado, the Japanese crested ibis is the most famous. Sado is used as a passageway for migratory birds, and cranes, white-fronted geese, and mallards, as well as storks have been identified in recent years.

### *Agrodiversity*

On Sado, a variety of agricultural products suited to a complicated climate have been produced. Agriculture is a key source of livelihoods, centered on rice cultivation in stretching from terraced to plain paddy fields. Vegetables, fruit, and flowers are also produced in small quantities, harnessing the environments suitable for a variety of products.

Local brand products include “Sado Rice” among the most expensive rice varieties in Japan, “Okesa Persimmon”, “Sado Beef,” mainly grown on the island. A variety of horticulture products are also produced such as apples, pears, figs, and strawberries, and flowers and bulbs mainly in the dune land. The farm stand “Fureai” which sells products direct and food such as “Ampo Persimmon” processed by women are also well known. Due to impacts of climate change on agricultural production, apples and mandarin oranges characterized as cold climate crops and warm climate crops respectively, can now be produced on Sado while the production of mandarin oranges had not been possible until 10 years ago.



Figure 2. Sado geographical sketch

### 3. Knowledge systems and adapted technologies

As paddy fields are the main feeding grounds for the Japanese crested ibis, environmentally friendly agriculture has been practiced throughout the island in order to bring back the bird into the wild. Sado City has been studying the technologies, based on traditional knowledge, that nurture small living creatures, such as loaches and worms, to be fed by the ibis and live and propagate in and around rice paddies. These technologies help enrich small animals and fish for the Japanese crested ibis to feed on. The rice cultivation technology practiced in the past in some areas has been reintroduced into the entire island. Three technologies are highlighted as follows:

#### “E” technology

In the hilly and mountainous areas, a ditch called “E” was created around the paddy fields when irrigation channels were made in the past. In “E,” water always remained as a safe haven for aquatic organisms and biotopes, as well as a perfect feeding ground for the crested ibis. At present, paddy fields are drained for about a week in summer, a production technique called “nakaboshi”, to improve the quality of rice. During this period, “E” becomes a shelter for aquatic creatures as a food source for ibis. Also, the Japanese crested ibis does not like paddy fields covered by tall rice plants in summer. As a result, “E” was important as a feeding ground for the bird. Restoring “E” which is dug 20-30cm around paddy fields is being promoted. Especially, “E” on the side of water outlet would be effective to provide a habitat for loaches and tadpoles and ultimately enhance biodiversity conservation. “E” in winter can serve as a spawning ground for montane brown frogs.



Photo 2. E

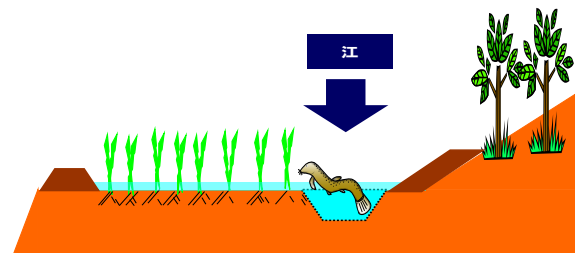


Figure 3. Cross-section of E

#### Winter flooding

Due to the agricultural water shortage in the past, soil puddling was conducted from autumn to winter, and paddy fields were filled with water during winter to save water for rice planting in spring. This is called as winter flooding (Photo 3). Flooded paddy fields can function as a habitat for aquatic creatures to survive through winter and as a feeding ground for the Japanese crested ibis during the snowy season. Winter flooding can dramatically increase midge larvae (*tubifex*) which helps make soil ooze, so that seeds of weeds will sink into the soil and kill weed seeds, resulting in herbicidal effect. Midge larvae can also be food of aquatic organisms supporting biodiversity.



Photo 3. Winter flooding

### *Reduction of agricultural chemicals*

Because of the development of gold and silver mining<sup>4</sup>, there was a time when the demand of agricultural products was not met, so importance has been attached to the development of terraced fields and preservation of farmlands. The reduction of agricultural chemicals, as well as the custom of not spraying herbicide on the ridges between rice fields in order to preserve farmlands has been passed down from generation to generation. It is very unusual that in 99% of the farmlands, herbicide is not used on the ridges and agricultural roads.

At a certain point during the post-war period, the use of agricultural chemicals increased on Sado. However, the awareness of sustainable agriculture was raised through the preservation activities for the Japanese crested ibis. The rise in awareness of food safety among consumers has led to rice cultivation with low use of agricultural chemicals throughout the area.

## **4. Cultures, value systems and social organizations (Agri-Culture)**

### *Agricultural production organizations*

Many of Sado farmers are small-scale. Agriculture has been practiced collectively in villages and cooperatives were established in each village to manage agricultural water and agricultural roads. This cooperative agricultural management has been passed down. On the other hand, farmers of paddy fields which underwent a large scale improvement project are formulating a large-scale cooperative system, including “The Measures to Conserve and Improve Land, Water, and Environment” for the management of agricultural facilities. The cooperation system, in accordance with the community, size, and modality, is the driving force of maintaining agriculture on the island.

### *Traditional culture developed from agriculture*

The history of Sado is closely related to the history of gold mining. During the height of gold mining in the Edo period, one hundred thousand people lived in Aikawa Village. With the increased population, rice was distributed at a price three times higher than that on the mainland. This resulted in the development of terraced rice paddies in the hilly and mountainous areas of the island. The terraced fields developed in those days have provided a feeding ground for the Japanese crested ibis and ensured a rich village life, creating various cultural customs through shrine rituals concerning agriculture. At present, the succession of traditional culture is at stake due to the decreasing and aging population, and the preservation of culture is required as part of biodiversity preservation activities.

### *Traditional farming method and customs*

#### *Kuruma Rice Planting*

Kuruma Rice Planting is a traditional way of rice planting in which rice is planted in a circle around a seedling in the center.

It is the custom practiced at the end of rice planting in the largest paddy field of an old-established family. It is a very important example of an old agricultural customs and designated as National important intangible cultural heritage (Photo 4).



Photo 4. Kuruma Rice Planting

#### *Ritual Shinto performance at the Hakusan Shrine*

This is a ritual Shinto performance to wish for (pre-celebrate) a good harvest practiced at the Hakusan Shrine. The agricultural work from making a bed for rice seedlings to planting is enacted at the outer shrine.

#### *Ritual Shinto performance of rice planting at the Goshō Shrine*

This is a ritual Shinto performance to pray for a successful rice harvest in the coming year practiced at the Goshō Shrine by enacting rice planting at the shrine. This ritual is passed down exclusively to the eldest son of the selected shrine parishioner by succession and kept secret from other families. It is held annually at 3 p.m. on the sixth of February, and practiced in seven separate ceremonies. Women are prohibited from entering the precinct in the afternoon on this occasion.

<sup>4</sup> On Sado, silver was also produced in large quantities. Therefore, it is sometimes referred to as “gold and silver mines.” In this document, it is referred to as “gold mine.” Sado City is promoting agriculture that pays full attention to “food production” and “preservation of biodiversity,” by combining the above mentioned knowledge and technologies.

## 5. Remarkable landscapes, land and water resources management features

### *Remarkable landscapes*

Sado preserves its natural environment and many *satoyama* where people and nature live in harmony. It preserves secondary natural areas managed through human activities such as terraced fields developed to increase food production (Photo 5), It also preserves beautiful pristine landscapes (Photo 7) such as beautiful primeval forests preserved in a harsh natural environment (Photo 6). In recent years, because of the ongoing depopulation and aging population, maintenance and management of agricultural land and forests are getting difficult. Efforts, however, are being made toward the creation of a beautiful island in cooperation with biodiversity preservation activities that nurture the Japanese crested ibis.

Photo5.

Terraced fields that have sustained Gold Mines and ibis



Photo 6. Primeval forest preserved by people and culture



Photo 7. Gregarious sweetroots

### *Land and water control*

Sado is an island with a small basin and no big rivers. In ancient times it suffered water shortages. Therefore, over 1,000 irrigation ponds of various sizes were made throughout the island, (Photo 8). Even in the Showa period, water shortage continued. At the same time, the Kuninaka Plain was frequently flooded whenever there was intense rainfall. Because of these, large scale dams such as the Ogura Dam (Photo 9) were constructed as part of the National Land Development Project to secure water, while drainage pumping stations were built in areas downstream to prevent flooding. The farmland was developed as well, resulting in great improvement in agricultural production infrastructure and efficient agriculture.

It is imperative to continue efficient and sustainable agriculture to preserve irrigation ponds, creeks, and rice fields which serve as feeding grounds for the Japanese crested ibis. “The Measures to Conserve and Improve Land, Water, and Environment,” to manage and maintain agricultural facilities such as irrigation canals, and to create and develop biotope, are being taken in 75 districts of 5,000 ha, by farmers as well as whole communities.



Photo 8. Scattered irrigation ponds



Photo 9. Ogura Dam

## II. Other social and cultural characteristics pertinent to the management of the agricultural system (optional)

Many traditional cultural customs were developed from agricultural rituals, supported by the local economy which was prospering from gold and silver mining and these rituals have been passed down to the present. These traditional customs were declining, due to depopulation, a dwindling birthrate and the aging population, but in recent years their value has been seen in the limelight again, and they are being restored through exchanges between people in cities. The efforts in releasing the Japanese crested ibis back into the wild have brought about the high-valued added agricultural products and the revitalization of settlement communities, and they are also very effective in conserving traditions.

### *Noh play*

Noh plays started not as entertainment for ordinary people, but as prayers for safety in the gold mines. Because of this, it has been conserved by farmers as an agricultural custom, such as prayers for a good harvest. At present one-third of the Noh theaters in Japan remain on Sado. The conservation activities have become very active and the Noh culture, including a torchlight performance (Photo 10), has been restored. Zeami, the famous Sarugaku artist who in the early Muromachi period perfected Sarugaku (present Noh play) with his father, Kanami, was banished to Sado. However, Noh became very popular in the Edo period, with the development of gold mining, and it came to be performed in various parts of the island.

### *Oni-daiko (Oni Drum)*

This started in the Edo period, and over 100 conservation groups are still active on Sado (Photo 11). It is performed at festivals held in various parts of Sado, and is used for praying for a good harvest, a good catch, the safety of one's family, and for driving evil spirits away. A spring festival is held before rice planting to pray for a good harvest. An autumn festival is held to thank the gods for the harvest.

### *Hanagasa Dance*

The dance is offered at the annual celebration of Kuji Hachimangu to console holy spirits and to pray for a good harvest. Dancers are exclusively made up of 14 or 15 girls or boys.



Photo 10. Noh play



Photo 11. Oni-daiko

## III. Historic relevance

### *Paddy agriculture passed down as agricultural assets*

On Sado, the remains of agriculture and rice cultivation are found in the Chigusa Remains. During the Ritsuryo era (the eighth century) Jyori paddy fields, or compartment paddy fields (about 1,350 ha), were developed.

In the Edo period (1603-1868), Sado was under direct control of the Tokugawa Shogunate. But during the next 100 years, the area of paddy fields increased about 1.6 times from about 5,000 ha to about 8,000 ha, due to the population explosion. With the development of gold mining, over one hundred thousand people came to the island, and the demand for rice increased, resulting in the expansion of new paddy fields. Ogura Senmaida (meaning thousands) terraced fields (Photo 12) were developed in this era, and as many as 1,165 irrigation ponds were made as a water source for the newly developed paddy fields. These agricultural assets centering on paddy fields have been passed down through history to the present day. These terraced fields and irrigation

ponds not only formed unique landscapes, but also played a role in preserving biodiversity. They became the habitat of Japan's last remaining Japanese crested ibis, and through their release back into the wild, it aims to formulate the Japanese method of restoring species, environment, and biodiversity.



Photo 12. Ogura Senmaida  
terraced fields

#### *History of gold mining and technology of draining agricultural water*

In the the Edo period, gold was mined underground below sea level, and ground water posed a big problem. “Suishorin” technologies (Figure 4) were adopted to pump up and drain groundwater. These technologies are the Archimedes pump called the “Ryubisha” in China, and which was later introduced to Japan via China. They were utilized in transporting water from rivers and irrigation ponds to paddy fields developed in hilly and mountainous areas.

In the Kuninaka Plain, the drainage measures for the Kono River started to be taken, and the “Waju (circle levee)” was formed to develop farmlands. Even in the modern era, the creation of irrigation ponds has continued, and land was reclaimed in Nakaoki Plateau, Yoshii, and Shukunegi. Because of the small drainage basin, the shortage of water sources was a great problem on the island. In the Showa period, various projects for water source development and drainage measures were introduced, and modern agriculture was realized.

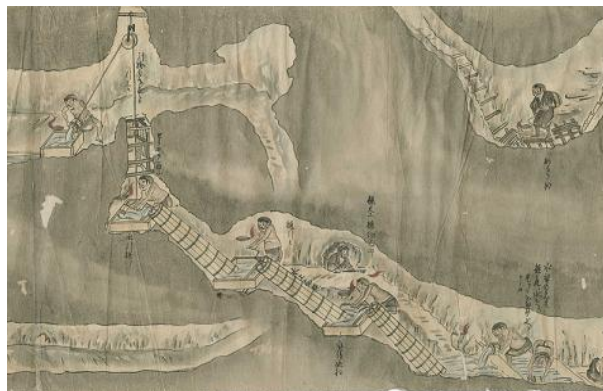


Figure 4. Suishorin of Sado gold mining

#### **IV. Contemporary relevance**

Toward the end of 2010 International Year of Biodiversity, we have witnessed the momentum that a new era of living in harmony arose and new global alliance to protect life on earth was established.

*Satoyama* gained international recognition at the 10th meeting of the Conference of the Parties to the Convention on Biological Diversity (COP10 Nagoya) when the “the International Partnership for the Satoyama Initiative (IPSI)”, jointly developed and proposed by the Ministry of the Environment of Japan and UNU-IAS, was adopted in a decision on the Sustainable Use of Biodiversity at COP10 Nagoya and globally recognized “as a potentially useful tool to better understand and support human-influenced natural environments for the benefit of biodiversity and human well-being”. Under the Satoyama Initiative, Japan is reaching across borders to communities around the globe to work together to enhance understanding and raise awareness of the impor-

tance of socio-ecological production landscapes for livelihoods and to support the cultural heritage and diversity of socio-ecological production landscapes globally.

Aichi Target is another important outcome of the COP10 Nagoya. The Strategic Plan of the Convention on Biological Diversity or the “Aichi Target” is organized under five strategic goals that address the underlying causes of biodiversity loss, reduce the pressures on biodiversity, safeguard biodiversity at all levels, enhance the benefits provided by biodiversity, and provide for capacity-building, with consensus of a substantial increase in the level of financial resources. The “Aichi Target” will be the overarching framework on biodiversity not only for such biodiversity-related conventions, but for the entire United Nations system. Parties agreed to translate this overarching international framework into national biodiversity strategy and action plans within two years.

These aforementioned global efforts will get more linked with policy at national and local levels. These international efforts to promote Aichi Target and IPSI will support national policy such as Japan’s 21st Century Environmental Nation Strategy (2007). Sado upholds the aims of the IPSI, which was established under the overarching goal of “harmonious coexistence between humans and nature” under the Strategy, including the design of physical and social infrastructure for the conservation and sustainable use of socio-ecological landscapes and their biodiversity.

Securing and preserving biodiversity is called for nationwide in agriculture. “The Protection and Propagation Project for the Japanese Crested Ibis (Ministry of Environment, Ministry of Agriculture, Forestry and Fisheries, and Ministry of Land, Infrastructure and Transport)” in 2002 also called for the improvement of habitat environment, including preservation of feeding grounds in paddy fields and agricultural ditches. It is noted that, Sado Island gained recognition as a pioneer of changing agricultural practices towards agriculture that is more sustainable in 1994 when the Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF) initiated its national committee for promoting environmentally sound agricultural practices.

As a pioneer to practice sustainable agriculture, it is hoped to develop “Sado model”, as an environmentally friendly island, in cooperation with the government and prefecture. It is highly expected that Sado model by integrating the agricultural biodiversity preservation system with the ibis-friendly farming system is driven, with GIAHS recognition, to be established and disseminated from the island to be applied to other regions and beyond the country.

The Japanese crested ibis is a symbolic creature of nature restoration. Most large avian species including the Japanese crested ibis are umbrella species and constitute a part of the food chain system (Figure 1). Rice paddies play an important role in biodiversity conservation as they and marsh areas serve as feeding grounds of various living organisms. Accordingly, it is needed to secure the continuity of agricultural production activities and entail farming entails feeding environment of the ibis as well as biodiversity. In addition, the understanding of the relation between biodiversity of paddy fields and rice cultivation should be commonly shared among consumers and farmers. To this end, Sado City has actively disseminated the concept, the significance of paddy fields and agriculture through the preservation and restoration activities for prized species, in cooperation with other areas beyond prefecture level: Toyooka City in Hyogo prefecture to preserve storks, and Osaki City in Miyagi prefecture, to preserve white-fronted geese.

This Sado’s experience is expected to ultimately contribute to Japan’s 21st Century Environmental Nation Strategy by overcoming sustainable development challenges such as water, land and biodiversity conservation as well as food security. Realization of a low-carbon society by Sado imitative is also expected to make a contribution to the national strategy. In fact, Sado City laid down the Environment Basic Ordinance in 2005 and plans to formulate the Sado Biodiversity Economic Strategy and the Sado Biodiversity Local Strategy in 2011. These efforts of the City can be widely disseminated as a successful model of “the Economics of Ecosystems & Biodiversity (TEEB)” and international platform.

## V. Threats and challenges

Sado faces challenges at crossroads. The aging and decreasing the population in agriculture has resulted in the abandonment of terraced fields (because of difficult arable conditions), the loss of marshes connected to forests and irrigation ponds, as well as the deterioration in biodiversity and inhabiting environment for large avian species.

It is concerned that at operational level, the decrease of farming population will lead to a decline in collective agrarian functions to support sustainable agricultural system as well as a loss of diversity. The decrease of farming population has also generated part-time farmers those who cannot spare enough time and labor on farm work. This has also invited the situation that such farmers depend on agricultural chemicals and fertilizers in

producing agricultural products within manageable labor. As a result, the management of paddy fields that serve as feeding grounds for the crested ibis is becoming more challenging. Not only that, another challenge is falling market price due to overproduction and sluggish tourism, which is not economically sustainable. Accordingly, the population of the island has decreased by about 1,000 people per year.

In order to overcome such challenges, Sado City has made efforts to revitalize local agriculture and tourism through promotion of the ibis-friendly farming based on traditional *satoyama*. This ibis-friendly farming has been successful in adding value to agriculture products through certificate such as the ibis rice as well as promoting tourism in linkage with ibis restoration. As ibis near top of food web, restoration of ibis is needed to promote biodiversity conservation on the whole island. A series of collaborative efforts of public and private sectors have been made to support this ibis friendly farming and restoration of the bird.

## **VI. Practical considerations**

### *Ongoing efforts to promote GIAHS*

With support of national government, MOE, and MAFF, the city has launched ibis friendly farming to rebuild *satoyama* for revitalization of local economy through the value addition and for restoration of ibis which is cherished for generations in Japan. Certification of the ibis friendly farming has been expanding, with significant reduction of chemical inputs in agriculture and restoration of traditional technology such as “E” technology today, several ibis has been released to wild since 2008. Marketing of the brand rice named “ibis rice” has been quite successful in increasing farmers’ income.

### *Potentials and opportunities for sustainability and management of GIAHS*

Governments at local and national levels have committed to restore ibis and restore *satoyama* and they recognize the potentials to work with GIAHS in the direction of the restoration. One example is that Sado City plans to formulate the Sado Biodiversity Economic Strategy and the Sado Biodiversity Local Strategy in 2011, building on the Environment Basic Ordinance in 2005. As a national strategy, Japan’s 21st Century Environmental Nation Strategy was established in 2007 and the GIAHS objectives are very much in line with overarching goal of “harmonious coexistence between humans and nature” of this strategy.

### *Expected impact of GIAHS on society and ecology*

This GIAHS initiative will further strengthen local identity and pride as well as improve local livelihoods through adding values to products of GIAHS and enhance biodiversity. With success of the ibis farming certificate, it is expected that GIAHS recognition will further boost the branding of ibis-satoyama rice and other agriculture products from Sado. In terms of livelihoods, GIAHS designation is expected to raise the branding of ibis rice and other products and tourism of Sado in the face of depopulation. This will help revitalize local economy. In terms of ecology, the GIAHS initiative will be built on on-going efforts of ibis restoration to further expand the coverage of land where ibis friendly farming is practiced. It will also enhance biodiversity and ecosystem services on the whole island. Outcomes of GIAHS initiative with all relevant stakeholders will develop a Sado model, as a good practice, to promote living in harmony with nature including the Japanese crested ibis.

### *Motivation of the local community, the local/national authorities and other relevant stakeholders*

Local communities expect GIAHS to help raise branding and market price of agriculture products in Sado and it is expected to contribute to local economy. Local/national governments aim to contribute to achieve Aichi Target and CBD. In this regard, GIAHS is taken as an important means to reach the goal. Local governments also take it a way to revitalize the island economy. Japanese and local stakeholders are interested in exchanges of approaches and viewpoints to adaptive management of agriculture heritage systems with international partners.

Furthermore, cooperation with CSR activities of companies is expected and cooperation among universities and local communities is enhanced for field work of academic research. It will help development of payment for environmental services, revitalization of relationship between people, economy and environment as common keywords. Other stakeholders and local people love ibis and desire to support the ibis restoration, and they recognize through exchanges and collaboration between urban and rural societies.

## VII. DYNAMIC CONSERVATION PLAN FOR GIAHS SELECTED SITE

Sado City has started “the ibis-friendly farming method” and a certification system for creation of the homeland of the Japanese crested ibis to rebuild the *satoyama* for local economy and biodiversity. These measures are well familiarized in the area. The efforts are being made to promulgate the understanding of the branding of Sado rice, expansion of the feeding grounds of the Japanese crested ibis, and an integration of biodiversity preservation and agricultural production. For ibis friendly agriculture, Sado City aims to reduce agricultural chemicals and chemical fertilizers throughout the island. A 30% reduction was realized in 2010, and it is expected that a 50 % reduction will be realized in 2012. Sado aims to settle 60 Japanese crested ibises in the eastern part of the Kosado area by 2015.

### *Certification for the homeland to live with the Japanese crested ibis*

It is one of important certification programs ibis-friendly farming. All of the following conditions should be met in order to be certified as an ibis-friendly farming method in the following points:

- (1) The ibis-friendly farming method should be practiced to secure marsh areas in paddy fields and to also secure a habitat for other living creatures
  - (a) Creation of “E” and conventional technologies like winter flooding (see page 6, Photo 2, Figure 3)
  - (b) Creation of fish passes<sup>5</sup> (Photo 13)
  - (c) Creation of biotope<sup>6</sup> and connections with paddy fields (Photo 14)
- (2) Certification of an eco-farmer
- (3) Reduction of agricultural chemicals and chemical fertilizers by over 50% from the local standards
- (4) Implementation of “bio-assessment” twice a year



Photo 13. Fish passes



Photo 14. Biotope

It is important to inform public about safety and security of agricultural products through the preservation of the Japanese crested ibis, and the value of revitalization of ecosystem such as frogs and loaches that paddy fields nurture. Sado rice has come to well recognized nationwide, since 2008, to establish a local brand. The model of agriculture that preserves sustainable agriculture and biodiversity throughout the entire area, as well as the promotion and branding of agricultural produce are being disseminated nationwide in order to establish payment system for the environment accompanying consumers’ purchase of agricultural products.

The rice grown with the “ibis-friendly” farming is sold as certified rice and a high value is added as brand rice (Photo 15). The rice was sold at a price 140-200 yen per kg higher than regular price, supporting a good sale. Linkage between consumers’ support of rice cultivation and biodiversity conservation is clarified and shared through the donation scheme, namely one yen per 1kg sale is donated to the Crested Ibis Preservation Fund in Sado City. This system supports the sales of high



Photo 15. Ibis-friendly” farming certified rice

<sup>5</sup> Fish passes in paddy fields (Photo 13): In areas where a large-scale paddy development was conducted, a fish pass is made to preserve the condition in which loaches and other creatures can move from a creek to paddy fields.

<sup>6</sup> Biotope (Photo 14): By connecting a biotope and paddy fields with a creek or fish pass, a habitat for creatures is secured when paddy fields are drained.

price rice and also helps people understand widely the relationship between “eating” and “food production and environment preservation” as a key message from Sado. The sale of rice at a higher price has motivated farmers to practice the ‘ibis-friendly farming method, and has increased affection for the Japanese crested. As a result, the ibis-friendly farming has spread rapidly throughout the area as 20 % of the rice planted area on Sado has been practiced by the farming. The acreage of farmland under the certification system rose from 460 ha (2008) to 1,200 ha (2010), supporting good sales of rice, and at the same time, feeding grounds for the Japanese crested ibis are steadily increasing through the expansion of the ibis-friendly farming method, as a cycle process of sustainable environment restoration and agricultural production. It brings Sado to ranks first in Japan in terms of the acreage of winter flooding, the acreage of “E”, and the extent of bio-assessment.

This has helped to change farmers’ awareness. The preservation of the environment does not mean sacrifice or volunteer work, but the environment can be preserved through the new system of agriculture with payment for environmental service. This compatibility of environmental and economic activities is one feature of the symbiosis between people and the Japanese crested ibis, which was created on Sado.

### *Environmental education*

The city is also committed to environmental education in the communities, farmland and water preservation activities, as well as human resource development. Regular bio-assessment day is organized to raise public awareness of biodiversity. “The Sado Kids Bio-Assessment Team” is formed by elementary school students and “The Environment Citizen’s College” is held for citizens to learn about agriculture, and the environment that nurtures the Japanese crested ibis (Photo 16).



Photo 16. Exchange program with city people (left), bio assessment & rice planting (right)

### *Technology development and human resource development*

In cooperation with the government (Ministry of Agriculture, Forestry and Fisheries, and Ministry of Education), the prefecture and the university, the ibis-friendly farming method is being monitored with the GIS system in order to evaluate its effects and examine future environment restoration methods. In collaboration with the Sado Nature Restoration Research Center at Niigata University, human resources that support and spread the practice of the ibis-friendly farming method are being developed.

### *Multi-stakeholder participation*

The creation of an island where people can cohabitate along with the Japanese crested ibis has led to the revitalization of the area. Through the acceptance of the corporate social responsibility (CSR) activities from companies that support these activities, and further expansion of exchange with urban dwellers, Sado City will disseminate the value of multifaceted functions of agriculture, and the need for a reservation system.

In order to protect feeding grounds, the activities for protecting abandoned fields and terraced fields were started, and many biotopes were created with the participation of city people and students. The terraced field ownership system was started in cooperation between local residents and urban dwellers, resulting in the development of activities for re-developing abandoned fields and protecting local landscapes. Notably, the Ogura Senmaida, terraced rice paddies which are falling into a state of disrepair, are restored through the ownership-system and an ongoing exchange of activities with city dwellers (Photo 17). The participation of young people like urban dwellers and students in the activities has contributed to maintaining the formation of the settlement.



Photo 17. Ownership system by non-farmers

In some cases, endangered species have been found in the course of spreading and maintaining biotopes in the hilly and mountainous area through the activities for protecting the Japanese crested ibis. A Red Data Book for Sado (field guide to animals) is planned to be published in the future in order to research biodiversity and to secure preservation.

#### *Promotion of agriculture on Sado*

In the future the method of restoring ecosystems that attaches importance to the relations among paddy fields, forests and rivers should be clarified on Sado. The agricultural production system that operates with *satoyama* and biodiversity preservation is planned. The environmental economy will be urged to be revitalized by branding agricultural and marine products through the cooperative system between forest restoration (tree thinning and the production of chips from thinned wood) and mushroom production, as well as a cooperative system between grassland conservation and the stock-raising industry (branding dairy products like milk, cheese, and butter). These efforts intend to revitalize the agricultural system that attaches importance to the preservation of biodiversity on Sado.

#### Reference:

##### The declaration of bio-assessment day

Sado City specifies the second Sunday in June and the first Sunday in August as a “Bio-Assessment Day,” a day set aside to practice it.

#### The declaration of bio-assessment day

We have promoted the development of the island where people and the Japanese crested ibis can live together, in cooperation with the government, industry and academia under the national project of releasing the Japanese crested ibis back into the wild. The attempts to restore the environment where the once extinct Japanese crested ibis can live again, is an endeavor to face squarely with the crisis of biodiversity, and to restore the Japanese crested ibis, the large avian species, by nurturing small creatures, leading to the restoration of biodiversity, which is drawing global attention.

This also means to restore the natural environment through human efforts, which was lost due to the human desire to seek affluence at any cost. The mission of Sado, which the wild Japanese crested ibis chose as last habitat, is to develop a rich island where people live in harmony with nature.

We hereby declare that we set the second Sunday in June and the first Sunday in August as “Bio-Assessment Day,” and that we accomplish the settlement of the Japanese crested ibis in the wild, and bring to fruition the realization of a society where people can live in harmony with nature.

June 13, 2010

Koichiro Takano, Mayor of Sado City

● lists of agricultural biodiversity and associated  
List of agricultural biodiversity

分類 class	品目 items	品種名 variety name	学名 scientific name	備考 remarks
米 Rice	うるち米 Rice  醸造用米 Rice for Brew  もち米 glutinous Rice	コシヒカリ こしいぶき ゆきの精 ひとめぼれ 越路早生 あきたこまち トドロキワセ 五百万石 越淡麗 たかね錦 こがねもち わたぼうし	<i>Oryza sativa</i> <i>Oryza sativa</i> <i>Oryza sativa</i> <i>Oryza sativa</i> <i>Oryza sativa</i> <i>Oryza sativa</i> <i>Oryza sativa</i> <i>Oryza sativa</i> <i>Oryza sativa</i> <i>Oryza sativa</i> <i>Oryza sativa</i> <i>Oryza sativa</i>	
穀物類 grain	小麦 Wheat 六条大麦 Barley そば buckweat とうもろこし corn	信濃1号 ゴールド	<i>Triticum</i> <i>Hordeum vulgare</i> <i>Fagopyrum esculentum</i> <i>Zea mays</i>	
豆類 leguminous	大豆 soybean, Soya bean 小豆 azuki bean, adzuki bean 落花生 peanut えだまめ green soy beans  青さやいんげん snow pea, pea さやえんどう Pea そらまめ broad bean	サヤムスメ 茶マメ	<i>Glycine max</i> <i>Vigna angularis</i> <i>Arachis hypogaea</i> <i>Glycine max</i> <i>Glycine max</i> Phaseolus vulgaris L. <i>Pisum sativum</i> <i>Vicia faba</i>	
お茶 Tea plant	茶	ヤブキタ茶	<i>Camellia sinensis</i> (L.) Kuntze	
果実的野菜 Fruits and Vegetables	いちご strawberry すいか Watermelon  メロン Muskmelon	越後姫 祭ばやし スリーセブン アールスメイト、 アンデス5号、 グランドール4号	<i>Fragaria</i> <i>Citrullus lanatu</i> <i>Citrullus lanatu</i> <i>Cucumis melo</i> <i>Cucumis melo</i> <i>Cucumis melo</i>	
果菜類 Fruits and Vegetables	きゅうり Cucumber  トマト tomato  なす Eggplant  ピーマン bell pepper  かぼちゃ Pumpkin	シヤーブ フリーダム 桃太郎 あいこ ミニキャロル レッドオーレ 千両2号 中長ナス 水ナス 京みどり 京波 えびす ぼっちゃん 小菊	<i>Cucumis sativus</i> <i>Cucumis sativus</i> <i>Solanum lycopersicum</i> <i>Solanum lycopersicum</i> <i>Solanum lycopersicum</i> <i>Solanum lycopersicum</i> <i>Solanum melongena</i> <i>Solanum melongena</i> <i>Solanum melongena</i> <i>Solanum melongena</i> <i>Capsicum annuum</i> <i>Capsicum annuum</i> <i>Cucurbita moschata</i> <i>Cucurbita moschata</i> <i>Cucurbita moschata</i>	

分類 class	品目 items	品種名 variety name	学名 scientific name	備考 remarks
	しろうり Oriental pickling melon オクラ Okra ゴーヤ Bitter melon	栗坊 在来種 グリーンソード ふしなり あばし	<i>Cucurbita moschata</i> <i>Cucumis melo</i> L. var. <i>utilissimus</i> <i>Abelmoschus esculentus</i> <i>Momordica charantia</i> <i>Momordica charantia</i>	
茎菜類 stalk vegetable	ねぎ Welsh onion  たまねぎ Onion  アスパラガス asparagus ニンニク Garlic たけのこ bamboo shoot	長宝、 東京冬黒 夏扇 OL黄 もみじ 七宝 グリーンタワー ホワイト六辺 孟宗竹 真竹 淡竹	<i>Allium fistulosum</i> <i>Allium fistulosum</i> <i>Allium fistulosum</i> <i>Allium cepa</i> <i>Allium cepa</i> <i>Allium cepa</i> <i>Asparagus</i> <i>Allium sativum</i> <i>Phyllostachys heterocycla</i> f. <i>pubescens</i> <i>Phyllostachys bambusoides</i> <i>Phyllostachys nigra</i> var. <i>henonis</i>	
葉菜類 green vegetables	キャベツ Cabbage  はくさい Chinese cabbage  ほうれんそう Spinach  レタス Lettuce シソ Red Shiso	弥彦 越の里 湖水 むそう ストロング 黄丸 サラダほうれん草 クローネ アトラス 在来種	<i>Brassica oleracea</i> L. var. <i>capitata</i> <i>Brassica oleracea</i> L. var. <i>capitata</i> <i>Brassica oleracea</i> L. var. <i>capitata</i> <i>Brassica rapa</i> L. var. <i>glabra</i> Regel <i>Brassica rapa</i> L. var. <i>glabra</i> Regel <i>Brassica rapa</i> L. var. <i>glabra</i> Regel <i>Spinacia oleracea</i> L. <i>Spinacia oleracea</i> L. <i>Spinacia oleracea</i> L. <i>Lactuca sativa</i> <i>Perilla frutescens</i>	
葉茎類 Stem type vegetables	オータムボエム Chinese colza 赤泊菜(べんり菜) Rakkyo シュンギク crown daisy セリ Japanese parsley ニラ Garlic chives, Chinese chives	オータムボエム 赤泊菜 佐藤ゆたか 在来種	<i>Brassica rapa</i> L. var. <i>nippo-oleifera</i> <i>Allium chinense</i> <i>Glebionis coronaria</i> (L.) Cass. ex Spach <i>Oenanthe javanica</i> <i>Allium tuberosum</i> Rottler	
花菜類 Flower vegetable	カリフラワー Cauliflower ブロッコリー Broccoli 食用菊 chrysanthemum	しらぎく ごくいき もつてのほか かきのもと	<i>Brassica oleracea</i> var. <i>botrytis</i> <i>Brassica oleracea</i> var. <i>italica</i> <i>Chrysanthemum</i> × <i>morifolium</i> Ramat <i>Chrysanthemum</i> × <i>morifolium</i> Ramat	
根菜類 root crops	みょうが Myoga かぶ Turnip  ごぼう edible burdock  こんにやく devil's tongue だいこん Daikon  にんじん Carrot	在来種 スワン ひかり 白駒 滝野川 サラダごぼう  春風 耐病総太り YR鉄人 高揚 ひとみ	<i>Zingiber mioga</i> <i>Brassica rapa</i> <i>Brassica rapa</i> <i>Brassica rapa</i> <i>Arctium lappa</i> <i>Arctium lappa</i>  <i>Amorphophallus konjac</i> <i>Raphanus sativus</i> <i>Raphanus sativus</i> <i>Raphanus sativus</i> <i>Daucus carota</i> <i>Daucus carota</i>	

分類 class	品目 items	品種名 variety name	学名 scientific name	備考 remarks
	れんこん East Indian Lotus ユリ根 Lily ラッキョウ Rakkyo	五寸にんじん    在来種	<i>Daucus carota</i> <i>Nelumbo nucifera</i> <i>Lilium maculatum</i> Thunb <i>Allium chinense</i>	
いも類 potatoes	かんしょ sweet potato  やまいも Japanese yam, glutinous yam	ベニアズマ  紅赤  じねんじよ	<i>Ipomoea batatas</i>  <i>Ipomoea batatas</i>  <i>Dioscorea japonica</i>	
果樹 fruit tree.	びわ (Japanese) Loquat おうとう(さくらんぼ) Wild Cherry or Sweet Cherry  もも Peach  ネクタリン <i>Amygdalus persica</i> var. <i>nectarina</i>  すもも Pulm  うめ Ume  くり Japanese Chestnut 日本なし Nashi Pear, Sand Pear  西洋なし Pear (European Pear) りんご Apple  柿 Kaki Persimmon いちじく fig tree  ぶどう Grape  キウイフルーツ kiwifruit	田中びわ  佐藤錦  高砂  ナボレオン  白風  川中島  黄金桃  黎明  秀峰  大石早生  ソルダム  藤五郎  越のうめ  丹沢  二十世紀  幸水  豊水  新高  新興  ル・レクチエ  つがる  ふじ  陽光  秋映  おけさ柿(平核無)  在来種  ビオレ・ソリエス  甲州  巨砲  デラウエア  ネオマスカット  ヘイワード	<i>Eriobotrya japonica</i>  <i>Prunus avium</i>  <i>Prunus avium</i>  <i>Prunus avium</i>  <i>Amygdalus persica</i>  <i>Amygdalus persica</i>  <i>Amygdalus persica</i>  <i>Nectarine</i>  <i>Nectarine</i>  <i>Prunus salicina</i>  <i>Prunus salicina</i>  <i>Prunus mume</i>  <i>Prunus mume</i>  <i>Castanea crenata</i>  <i>Pyrus pyrifolia</i>  <i>Pyrus pyrifolia</i>  <i>Pyrus pyrifolia</i>  <i>Pyrus pyrifolia</i>  <i>Pyrus pyrifolia</i>  <i>Pyrus communis</i>  <i>Malus pumila</i>  <i>Malus pumila</i>  <i>Malus pumila</i>  <i>Malus pumila</i>  <i>Diospyros kaki</i>  <i>Ficus carica</i>  <i>Vitis spp</i>  <i>Vitis spp</i>  <i>Vitis spp</i>  <i>Vitis spp</i>  <i>Actinidia deliciosa</i>	
柑橘類 citrus fruits	みかん mikan  ゆず yuzu	いしずわせ  ゆら早生  在来種	<i>Citrus unshiu</i> Marc  <i>Citrus unshiu</i> Marc  <i>Citrus junos</i>	
菌茸類 mushroom	まつたけ Tricholoma matsutake エリンギ Pleurotus eryngii (De Cand.)Gillet 1874 シイタケ Shiitake mushroom ナメコ predaceous diving beetle	在来種	<i>Tricholoma matsutake</i>  <i>king trumpet mushroom</i>  <i>Lentinula edodes</i>  <i>Pholiota nameko</i>	
山菜類 edible wild plants	フキ Giant Butterbur ウド udo	在来種  在来種	<i>Petasites japonicus</i>  <i>Aralia cordata</i>	

分類 class	品目 items	品種名 variety name	学名 scientific name	備考 remarks
	ぜんまい hairspring	在来種	<i>Osmunda japonica</i>	
	クワイ water chestnut	在来種	<i>Sagittaria trifolia</i>	
	わらび western bracken fern	在来種	<i>Pteridium aquilinum</i>	
	ふきのとう Giant Butterbur	在来種	<i>Petasites japonicus</i>	

## List of biodiversity

生物多様性のリスト

EX:絶滅 EW:野生絶滅 CR:絶滅危惧ⅠA類 EN:絶滅危惧ⅠB類 VU:絶滅危惧Ⅱ類 NT:準絶滅危惧 DD:情報不足 LP:地域個体群  
 EX:EXTINCT EW:EXTINCT IN THE WILD CR:CRITICALLY ENDANGERED EN:ENDANGERED VU:VULNERABLE NT:NEAR THREATENED DD:DATA DEFICIENT  
 LP:THREATENED LOCAL POPULATION

分類 class	科名または小分類 family	学名 scientific name	カテゴリー category		備考 remarks		
			新潟県 Niigata	国 Japan			
鳥類 Aves	ウ科 サギ科	Phalacrocoracidae	<i>Phalacrocorax capillatus</i>	NT			
		Ardeidae	<i>Gorsachius goisagi</i> <i>Egretta intermedia intermedia</i>	VU NT	NT		
	トキ科 カモ科	Threskiornithidae	<i>Nipponia nippon</i>	EW	EW		
		Anatidae	<i>Branta bernicla orientalis</i>	NT	VU		
			<i>Anser albifrons frontalis</i>	NT	NT		
			<i>Anser fabalis serratirostris</i>	NT	VU		
			<i>Anser fabalis middendorffii</i>	NT	NT		
			<i>Anser caerulescens caerulescens</i>	VU	DD		
			<i>Anser cygnoides</i>	VU	DD		
			<i>Anas Formosa</i>	NT	VU		
			<i>Anas falcata</i>	NT			
			<i>Histrionicus histrionicus pacificus</i>	NT			
			<i>Bucephala clangula clangula</i>	NT			
			Misago科	Pandionidae	<i>Pandion haliaetus haliaetus</i>	NT	NT
			タカ科	Accipitridae	<i>Pernis apivorus orientalis</i>	NT	NT
	<i>Haliaeetus albicilla albicilla</i>	EN			EN		
	<i>Haliaeetus elagicus pelaricus</i>	EN			VU		
	<i>Accipiter gentilis fujiyamae</i>	VU			VU		
	<i>Accipiter gularis gularis</i>	NT					
	<i>Accipiter nisus nisosimilis</i>	NT			NT		
	<i>Spizaetus nipalensis orientalis</i>	EN			EN		
	<i>Circus spilonotus spilonotus</i>	NT			VU		
	<i>Falco peregrinus japonensis</i>	NT			VU		
	クイナ科	Rallidae			<i>Porzana fusca erythrothorax</i>	VU	
	シギ科	Scolopacidae			<i>Eurynorhynchus pygmeus</i>	NT	EN
			<i>Tringa totanus ussuriensis</i> <i>Numenius madagascariensis</i>	NT NT	VU VU		
	セイタカシギ科 ツバメチドリ科 カモメ科 フクロウ科	Recurvirostridae	<i>Himantopus himantopus himantopus</i>	NT	EN		
		Glareolidae	<i>Glareola maldivarum</i>	NT	VU		
		Laridae	<i>Sterna albifrons sinensis</i>	NT	VU		
		Strigidae	<i>Otus scops japonicus</i>	NT			
			<i>Otus lempiji semitorques</i>	NT			
			<i>Ninox scutulata japonica</i>	NT			
		ヨタカ科	Caprimulgidae	<i>Caprimulgus indicus jotaka</i>	NT		
		ヤマセミ科	Cerylidae	<i>Megaceryle lugubris lugubris</i>	NT		
		ブッポウソウ科	Coraciidae	<i>Eurystomus orientalis calonyx</i>	VU	VU	
		サンショウクイ科	Campephagidae	<i>Pericrocotus divaricatus divaricatus</i>	NT	VU	
	モズ科	Laniidae	<i>Lanius cristatus superciliosus</i>	VU	NT		
	ヒタキ科	Muscicapidae	<i>Muscicapa dauurica dauurica</i>	NT			
	カササギヒタキ科	Monarchidae	<i>Terpsiphone atrocaudata atrocaudata</i>	NT			
	ホオジロ科	Emberizidae	<i>Emberiza yessoensis yessoensis</i>	NT	VU		
	カラス科	Corvidae	<i>Garrulus glandarius tokugawae</i>	LP			
						Subspecies-specific	
	昆虫類 Insect	サナエトンボ科	Gomphidae	<i>Gomphus postocularis</i>	VU		
ヤンマ科		Aeshnidae	<i>Gynacantha japonica</i>	VU			
エゾトンボ科		Ephthalmiinae	<i>Epithea marginata</i>	NT			
ツチカメムシ科			<i>Canthophorus niveimarginatus</i>	NT	NT		
ハナカメムシ科			<i>Lyctocoris beneficus</i>	VU	EN		
コオイムシ科		Belostomatidae	<i>Appasus japonicus</i>	NT	NT		
タイコウチ科		Nepidae	<i>Laccotrepes japonensis</i>	EN			
セミ科		Cicadidae	<i>Tibicen flammatus</i>	NT			
ヤママユガ科		Saturniidae	<i>Samia cynthia pryeri</i>	LP			
ヤガ科		Noctuidae	<i>Amphipyra subrigua</i>	NT			
シジミチョウ科		Lycaenidae	<i>Artopoetes pryer</i>	NT			
タテハチョウ科		Nymphalidae	<i>Sasakia charonda</i> <i>Mycalesis francisca</i> <i>Lethe sicelis</i>	NT NT VU	NT		
ハンミョウ科		Cicindelidae	<i>Cicindela sumatrensis niponensis</i> <i>Cicindela laetescripta</i>	NT NT	VU VU		
ゲンゴロウ科		Dytiscidae	<i>Dytiscus sharpi</i>	VU	VU		
ゴミムシダマシ科		Tenebrionidae	<i>Misolampidius rugipennis</i>	LP			
ハムシ科		Chrysomelidae	<i>Chrysolina virgata</i>	NT	DD		
クワガタムシ科		Lucanidae	<i>Dorcus hopei binodulosus</i>	NT	NT		
コガネムシ科		Scarabaeidae	<i>Copris ochus</i> <i>Onthophagus oshimanus</i>	NT EN	NT DD		
オサムシ科		Carabidae	<i>Carabus arboreus exilis</i>	EX	EX		
			<i>Carabus vanvolxemi ssp. noesskei</i>				
			<i>Damaster blaptoides capito</i>				
			<i>Oroblemus katorum</i> <i>Colpodes sylphis sadoensis</i>				
ハネカクシ科		Staphylinidae					
コメツキモドキ科			<i>Languriomorpha yamamotoi</i>				
カミキリムシ科		Cerambycidae	<i>Glaphyra nitida</i>	NT			



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分類 class	科名または小分類 family		学名 scientific name	カテゴリー category		備考 remarks
				新潟県 Niigata	国 Japan	
	ネズミ科	Muridae	<i>Microtus montebelli brevicorpus</i> <i>Apodemus speciosus sadoensis</i> <i>Apodemus argenteus</i> <i>Rattus norvegicus</i> <i>Rattus rattus</i> <i>Mus musculus</i>			Subspecies-specific Subspecies-specific
	ウサギ科	Leporidae	<i>Lepus brachyurus lyoni</i>	NT		Subspecies-specific
爬虫類 Reptilia	イシガメ科	Geoemydidae	<i>Mauremys japonica</i> <i>Chinemys reevesii</i>	NT		
	カナヘビ科	Lacertidae	<i>Takydromus tachydromoides</i>			
	トカゲ科	Scincidae	<i>Plestiodon japonicus</i>			
	ナミヘビ科	Colubridae	<i>Elaphe climacophora</i> <i>Elaphe quadrivirgata</i> <i>Dinodon orientalis</i> <i>Amphiesma vibakari</i> <i>Rhabdophis tigrinus</i> <i>Gloydus blomhoffii</i>	LP		
	クサリヘビ科	Viperidae				
貝類 shellfish	ヤマキサゴ科	Helicinidae	<i>Hemipoma hakodadiense</i>	NT	NT	Niigataprefecture only Sado
	ヤマダニシ科	Cyclophoridae	<i>Japonia sadoensis</i>	NT	DD	type locality, Niigataprefecture only Sado
	ムシオイガイ科	Alycaeiidae	<i>Chamalycaeus japonicus sadoensis</i>	VU	VU	Subspecies-specific・type locality
	イツマデガイ科	Pomatiopsidae	<i>Blanfordia japonica japonica</i> <i>Oncomelania minima</i>	NT	NT	type locality, Niigataprefecture only Sado
	カワザンショウ科	Assimineidae	<i>Paludinella tanegashimae</i>	EN	VU	Niigataprefecture only Sado
	ヤマボタルガイ科	Cochlicopidae	<i>Cionella lubrica</i>	NT	LP	Niigataprefecture only Sado
	キバサナギガイ科	Vertiginidae	<i>Vertigo eogea eogea</i>	LP	LP	
	キセルガイモドキ科	Buliminidae	<i>Mirus japonicus</i> <i>Mirus reinianus</i> <i>Mirus andersonianus</i>	VU	VU	
	キセルガイ科	Clausiliidae	<i>paganizaptyx stimpsoni sadoensis</i> <i>Mundiphaedusa</i>	NT	NT	Subspecies-specific・type locality
	ベッコウマイマイ科	Helicariionidae	<i>Parakaliella sadoensis</i>	LP	VU	
	オナジマイマイ科	Bradybaenidae	<i>Euhadra sadoensis</i>	NT	DD	endemic species・type locality
	アマオブネガイ科	Neritidae	<i>Clithon retropictus</i>	EN	VU	endemic species・type locality
	タニシ科	Viviparidae	<i>Cipangopaludina chinensis laeta</i>	NT	NT	
	モノアラガイ科	Lymnaeidae	<i>Radix auricularia japonica</i>	NT	NT	
	オカモノアラガイ科	Succineidae	<i>Oxyloma hirasei</i>	NT	NT	
	イシガイ科	Unionidae	<i>Cristaria plicata plicata</i>	NT	NT	
	シジミ科	Cyrenidae	<i>Corbicula leana</i>	NT	NT	
	マメシジミ科	Pisidiidae	<i>Pisidium nipponense</i>	NT	NT	
植物 plant	ミズニラ科	Isoetaceae	<i>Isoetes japonica</i> <i>Isoetes asiatica</i> <i>Isoetes sinensis</i>	EN	VU	
	シノブ科	Davalliaceae	<i>Davallia mariesii</i>	EN	VU	
	シシラン科	Vittariaceae	<i>Antrophyum obovatum</i>	EN	EN	
	アカウキクサ科	Azollaceae	<i>Azolla japonica</i>	EN	VU	
	ナデシコ科	Caryophyllaceae	<i>Dianthus japonicus</i> <i>Honkenya peploides</i>	EN	VU	
	キンボウゲ科	Ranunculaceae	<i>Pulsatilla cernua</i> <i>Hepatica nobilis var. japonica</i> <i>Adonis amurensis</i> <i>Anemone debilis</i> <i>Thalictrum rochebrunianum</i>	EN	VU	
	ベンケイソウ科	Crassulaceae	<i>Orostachys iwawange</i> <i>Orostachys japonicus</i> <i>Sedum uniflorum subsp. japonicum var. sena</i>	LP	EN	
	アカバナ科	Onagraceae	<i>Epilobium hirsutum var. villosum</i>	EN	VU	
	ボタン科	Paeonaceae	<i>Paeonia obovata</i> <i>Paeonia japonica</i>	EN	EN	
	ムラサキ科	Boraginaceae	<i>Mertensia maritima ssp. asiatica</i> <i>Lithospermum zollingeri</i> <i>Cynoglossum asperrimum</i> <i>Messerschmidia sibirica</i>	EN	VU	
	ゴマノハグサ科	Scrophulariaceae	<i>Deinostema adenocaulum</i> <i>Dopatrium junceum</i> <i>Veronica didyma var. lilacina</i> <i>Veronica melissaefolia</i> <i>Euphrasia maximowiczii</i> <i>Pseudolysimachion kiusianum subsp. maritim</i> <i>Scrophularia grayana</i> <i>Euphrasia insignia subsp. insignis var. insignis</i>	EN	EN	
	オミナエシ科	Valerianaceae	<i>Patrinia scabiosifolia</i>	NT	NT	
	キキョウ科	Campanulaceae	<i>Platycodon grandiflorus</i>	EN	VU	
	キク科	Asteraceae	<i>Atractylodes japonica</i> <i>Gnaphalium hypoleucum</i> <i>Achillea ptarmica subsp. macrocephala</i> <i>Erigeron thunbergii</i>	EN	EN	

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			新潟県 Niigata	国 Japan	
		<i>Ixeris polycephala</i>	VU		
		<i>Prenanthes tanakae</i>	VU	VU	
		<i>Saussurea pulchella</i>	VU	VU	
		<i>Wedelia prostrata</i>	VU		
		<i>Farfugium japonicum</i>	NT		
		<i>Inula salicina</i> var. <i>asiatica</i>	NT		
		<i>Nemoseneo nikoensis</i>	NT		
		<i>Carpesium cernuum</i>	LP		
	ヒルムシロ科 Potamogetonaceae	<i>Potamogeton cristatus</i>	EN	EN	
		<i>Potamogeton malaiianus</i>	EN	CR	
		<i>Ruppia maritima</i>	EN	EN	
		<i>Potamogeton berchtoldii</i>	VU	VU	
	イバラモ科 Najadaceae	<i>Najas japonica</i>	EN	EN	
		<i>Najas minor</i>	EN		
	カヤツリグサ科 Cyperaceae	<i>Cladium chinense</i>	EN	EN	
		<i>Carex brownii</i>	VU		
		<i>Carex meurocarpa</i>	VU		
		<i>Carex rugulosa</i>	VU	VU	
		<i>Fimbristylis sericea</i>	VU		
		<i>Rhynchospora alba</i>	VU		
		<i>Bolboschoenus koshevnikovii</i>	VU		
		<i>Scleria parvula</i>	VU		
		<i>Carex gibba</i>	NT		
		<i>Carex otaruensis</i>	NT		
		<i>Carex planata</i>	NT		
		<i>Carex dickinsii</i>	LP		
		<i>Carex filipes</i> var. <i>rouyana</i>	LP		
		<i>Carex scabrifolia</i>	LP		
	ラン科 Orchidaceae	<i>Calanthe nipponica</i>	EN	EN	
		<i>Calanthe tricarinata</i>	EN	VU	
		<i>Cephalanthera erecta</i> var. <i>subaphylla</i>	EN	EN	
		<i>Cremastra unguiculata</i>	EN	VU	
		<i>Cypripedium debile</i>	EN	VU	
		<i>Cypripedium japonicum</i>	EN		
		<i>Dendrobium moniliforme</i>	EN		
		<i>Eleorchis japonica</i>	EN		
		<i>Goodyera macrantha</i>	EN		
		<i>Liparis makinoana</i>	EN	EN	
		<i>Galearis cyclochila</i>	EN	VU	
		<i>Orchis graminifolia</i>	EN	VU	
		<i>Pogonia japonica</i>	EN	EN	
		<i>Tulotis iinumae</i>	EN		
		<i>Amitostigma kinoshitae</i>	VU	VU	
		<i>Calanthe discolor</i>	VU	VU	
		<i>Calanthe reflexa</i>	VU	VU	
		<i>Cephalanthera falcata</i>	VU	VU	
		<i>Dactylostaix ringens</i>	VU		
		<i>Ephippianthus schmidtii</i>	VU		
		<i>Epipactis papillosa</i>	VU		
		<i>Habenaria sagittifera</i>	VU	VU	
		<i>Lecanorchis hokurikuensis</i>	VU		
		<i>Liparis auriculata</i>	VU		
		<i>Liparis japonica</i>	VU		
		<i>Listera japonica</i>	VU		
		<i>Listera makinoana</i>	VU		
		<i>Myrmechis japonica</i>	VU		
		<i>Platanthera hologlottis</i>	VU		
		<i>Platanthera japonica</i>	VU		
		<i>Pogonia minor</i>	VU		
		<i>Tipularia japonica</i>	VU		
		<i>Vexillabium nakaianum</i>	VU		
		<i>Galeola septentrionalis</i>	NT		
		<i>Platanthera ophrydioides</i> var. <i>monophylla</i>	NT		
		<i>Coeloglossum viride</i> var. <i>bracteatum</i>	LP		
		<i>Listera cordata</i> var. <i>japonica</i>	LP		
	イワヒバ科 Selaginellaceae	<i>Selaginella helvetica</i>	VU		
		<i>Selaginella shakotanensis</i>	VU		
		<i>Selaginella tamariscina</i>	VU		
	コケシノブ科 Hymenophyllaceae	<i>Crepidomanes insigne</i>	VU		
	イノモトソウ科 Pteridaceae	<i>Sphenomeris chinensis</i>	VU		
		<i>Pteris multifida</i>	VU		
		<i>Onychium japonicum</i>	VU		
		<i>Pteris excelsa</i>	NT		
	オシダ科 Dryopteridaceae	<i>Acystopteris japonica</i>	VU		
		<i>Arachniodes simplicior</i>	VU		
		<i>Dryopteris fuscipes</i>	VU		

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		<i>Arachniodes simplicior var. major</i>	VU		
		<i>Athyriumohra maximowiczii</i>	VU		
		<i>Christella acuminata</i>	VU		
		<i>Cyrtomium macrophyllum</i>	VU		
		<i>Deparia unifurcata</i>	VU		
		<i>Thelypteris glanduligera</i>	VU		
		<i>Diplaziopsis cavaleriana</i>	VU		
		<i>Ctenitis maximowicziana</i>	VU		
		<i>Polystichum pseudomakinoi</i>	VU		
		<i>Polystichum tagawanum</i>	VU		
		<i>Polystichum tsus-simense</i>	VU		
		<i>Polystichum tsussimense var. mayebarae</i>	VU		
		<i>Athyrium nikkoense</i>	LP		
		<i>Thelypteris nipponica</i>	NT		
		<i>Polystichum craspedosorum</i>	NT		
		<i>Athyrium rupestre</i>	LP		
		<i>Athyrium brevifrons</i>	LP		
		<i>Diplazium hachijoense</i>	LP		
		<i>Diplazium wichurae</i>	LP		
	チャセンシダ科	<i>Asplenium trichomanes</i>	VU		
	ウラボジ科	<i>Lemmaphyllum microphyllum</i>	VU		
		<i>Loxogramme grammitoides</i>	VU		
		<i>Pyrrosia hastata</i>	VU		
		<i>Pyrrosia linearifolia</i>	VU		
		<i>Lepisorus annuifrons</i>	NT		
	サンショウモ科	<i>Salvinia natans</i>	VU	VU	
	ヒノキ科	<i>Juniperus conferta</i>	VU		
		<i>Thujaopsis dolabrata var. hondae</i>	LP		
	ヤナギ科	<i>Salix chaenomeloides</i>	VU		
		<i>Salix eriocarpa</i>	LP		
	イラクサ科	<i>Pilea japonica</i>	VU		
		<i>Urtica laetevirens</i>	VU		
	ツチトリモチ科	<i>Balanophora nipponica</i>	VU	VU	
	タデ科	<i>Persicaria taquetii</i>	VU	VU	
		<i>Persicaria viscofera</i>	VU		
		<i>Rumex longifolius</i>	VU	VU	
	ツルナ科	<i>Tetragonia tetragonoides</i>	VU		
	マツブサ科	<i>Kadsura japonica</i>	VU		
		<i>Aquilegia buergeriana</i>	VU		
		<i>Caltha palustris var. enkoso</i>	VU		
		<i>Caltha palustris var. nipponica</i>	VU		
		<i>Clematis patens</i>	VU	VU	
		<i>Semiaquilegia adoxoides</i>	VU		
	スイレン科	<i>Brasenia schreberi</i>	VU		
		<i>Nymphaea tetragona</i>	VU		
	マツモ科	<i>Ceratophyllum demersum</i>	VU		
	ドクダミ科	<i>Saururus chinensis</i>	VU		
	オトギリソウ科	<i>Hypericum ascyron</i>	VU		
	ケシ科	<i>Pteridophyllum racemosum</i>	VU		
	ユキノシタ科	<i>Parnassia foliosa var. japonica</i>	VU		
		<i>Penthorum chinense</i>	VU	VU	
		<i>Astilbe microphylla</i>	NT		
		<i>Cardiandra alternifolia</i>	LP		
	バラ科	<i>Fragaria nipponica</i>	VU		
		<i>Geum aleppicum</i>	VU		
		<i>Potentilla chinensis</i>	VU		
		<i>Potentilla dickinsii</i>	VU		
		<i>Potentilla egedei var. grandis</i>	VU		
		<i>Rosa rugosa</i>	VU		
		<i>Rubus pungens var. oldhamii</i>	VU		
		<i>Spiraea nipponica</i>	VU		
		<i>Waldsteinia ternata</i>	VU		
		<i>Filipendula multijuga</i>	NT		
		<i>Kerria japonica</i>	NT		
		<i>Potentilla toyamensis</i>	NT		
		<i>Rhaphiolepis indica var. umbellata</i>	LP		
		<i>Rubus buergeri</i>	LP		
		<i>Rubus illecebrosus</i>	LP		
		<i>Rubus yabei</i>	LP		
	マメ科	<i>Caesalpinia decapetala var. japonica</i>	VU		
		<i>Desmodium oldhamii</i>	VU		
		<i>Lathyrus palustris subsp. pilosus</i>	VU		
		<i>Lespedeza tomentosa</i>	VU	VU	
		<i>Thermopsis lupinoides</i>	VU		
		<i>Lespedeza cyrtobotrya</i>	NT		
		<i>Dunbaria villosa</i>	LP		



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	アヤメ科	Iridaceae	<i>Iris gracilipes</i>	NT	NT	
			<i>Sparganium japonicum</i>	NT	NT	
			<i>Iris setosa</i>	LP		
	ハナヤスリ科	Ophioglossaceae	<i>Belamcanda chinensis</i>	LP		
			<i>Botrychium lanceolatum</i>	LP	CR	
			<i>Ophioglossum petiolatum</i>	LP		
	シシガシラ科	Blechnaceae	<i>Woodwardia orientalis</i>	LP		
	ウラボシ科	Polyodiaceae	<i>Neocheiropteris ensata</i>	LP		
	マツ科	Pinaceae	<i>Larix kaempferi</i>	LP		
			<i>Pinus koraiensis</i>	LP		
			<i>Castanopsis sieboldii</i>	LP		
	ブナ科	Fagaceae	<i>Quercus acuta</i>	LP		
			<i>Quercus salicina</i>	LP		
			<i>Ficus nipponica</i>	LP		
	クワ科	Moraceae	<i>Illicium anisatum</i>	LP		
	シキミ科	Illiciaceae	<i>Stauntonia hexaphylla</i>	LP		
	アケビ科	Lardizabalaceae	<i>Cayratia japonica</i>	LP		
	アブラナ科	Brassicaceae	<i>Draba nemorosa</i>	LP		
	トベラ科	Pittosporaceae	<i>Pittosporum tobira</i>	LP		
	モチノキ科	quifoliaceae	<i>Ilex integra</i>	LP		
			<i>Ilex pedunculosa</i>	LP		
			<i>Euscaphis japonica</i>	LP		
	ミツバウツギ科	Staphyleaceae	<i>Corchoropsis tomentosa</i>	LP		
	シナノキ科	Tiliaceae	<i>Viola violacea</i>	LP		
	グミ科	Elaeagnaceae	<i>Theligonum japonica</i>	LP		
	ヤマトグサ科	Theligonaceae	<i>Mitrasacme pygmaea</i>	LP		
	マチン科	Loganiaceae	<i>Galium gracilens</i>	LP		
	アカネ科	Rubiaceae	<i>Galium kikumugura</i>	LP		
			<i>Rubia jesoensis</i>	LP		
			<i>Lathraea japonica var. miqueliana</i>	LP		