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長崎県対馬におけるマメ科植物遺伝資源の探索収集，２００９年

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Collection and conservation of Wild Leguminous Crop Relatives on Tsushima Island, Nagasaki, Japan, 2009

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Summary

A field survey was conducted on Tsushima island, Nagasaki prefecture, Japan, from 20th to 23rd October, 2009. As a result, 32 accessions of leguminous plants consist of 7 accessions of *Amphicarpaea bracteata*, 3 of *Glycine soja*, 14 of *Vigna angularis* var. *nipponensis,* 2 of *Vigna unguiculata* and 6 of *Vigna vexillata* were recorded and seed samples were collected. All the seed materials collected were deposited at NIAS Genebank, Japan.

Introduction

In order to conserve genetic diversity of wild relatives of leguminous crops, the Genebank of National Institute of Agrobiological Sciences, Japan has been conducting domestic exploration. This is a report of a field survey on leguminous plants on Tsushima island, Nagasaki prefecture, Japan. The Tsushima island is located between Korea (ca. 50km to Pusan city, Korea) and Kyushu island of Japan (ca. 150km to Fukuoka city, Japan, Fig. 1).

Methods

We surveyed Tsushima island by car from 20th to 23rd October, 2009 (Table 1, Fig. 1). Seeds, herbarium specimens and root nodules (if available) were collected. Information on collection sites including village name, altitude, latitude, longitude, habitat sketch map and other ecological data was recorded on passport data sheets as summarized in Tables 2 & 3.

Results and Discussion

A total of 32 accessions of leguminous plants consist of 7 accessions of *Amphicarpaea bracteata*, 3 of *Glycine soja*, 14 of *Vigna angularis* var. *nipponensis,* 2 of *Vigna unguiculata* and 6 of *Vigna vexillata* were recorded and seed samples were collected (Tables 2 & 3). Collected seed samples are conserved at NIAS Genebank, Tsukuba, Japan and will be multiplied and evaluated in 2010.

Amphicarpaea bracteata (Hog peanut, Yabu-mame in Japanese)

This plant was commonly found growing in the surveyed area (Fig. 1). *Amphicarpaea* plants were sometimes sympatric with other wild legumes especially with *Vigna angularis* var. *nipponensis* plants. Variation in seed size was observed among populations (Photo 1 and 2).

As is indicated by its genus name, *Amphicarpaea bracteata* has two types of pods (http://www.pfaf.org/user/plant.aspx?latinname=Amphicarpaea+bracteata). Flowers near the soil surface produced under-ground pods like groundnut. The under-ground pod contains a single seed with larger size compared with that produced in above-ground pods. Seeds in under-ground pods are edible in raw. They are sweet and delicious with a taste more like shelled garden beans than peanuts. North American natives also used above-ground seeds after cooked. Above-ground pod contains 4 to 5 seeds with smaller size and lentil like morphology. They also ate roots after peeled and boiled although roots are small and stringy.

Glycine soja (Wild soybean, Tsuru-mame in Japanese)

The NIAS Genebank has been conducting comprehensive collecting survey of wild soybean throughout Japan, and genetic structure of wild soybean has been clarified (Kuroda *et al*, 2006, 2008). However, this is the first survey by NIAS Genebank for collecting wild soybean in Tsushima. The previous exploration reports are available from the NIAS Genebank web page. (http://www.gene.affrc.go.jp/publications.php?section=plant : This page is written in Japanese.

Table 1. Itinerary　日程表　（長崎県対馬）

Day	Date	Itinerary	Activities	Stay
1	2009/10/20(Tue)	Tsukuba (NIAS) -- Haneda airport (Tokyo) 12:30 -- (ANA 253) -- 14:15 Fukuoka airport (Kyushu) 15:35 -- (ANA4937) -- 16:10 Tsushima airport (Nagasaki) -- car (rent) --Izuhara town	Transportation	Izuhara town
2	2009/10/21(Wed)	Izuhara -- Mizushima (Kechi) -- Toyotama (Nii) -- Mine (Ohkubo) -- Kami-Agata (Nita, Sago) -- Kami-Tsushima (Toyo)	Exploration	Kami-Tsushima town (Hitakatsu)
3	2009/10/22(Thu)	Kami-Tsushima (Shushi) -- Mine (Kushi) -- Toyotama -- Mizushima --Izuhara (Uchiyama, Kunehama, Tsutsu)	Exploration	Izuhara town
4	2009/10/23(Fri)	Izuhara (Kuta, Koura) -- Mizushima (One, Kechi) -- Izuhara (Are) --Mizushima (Kashi, Sumo) --Tsushima airport 16:45 -- (ANA4938) -- 17:15 Fukuoka airport 18:40 -- (ANA266) -- 20:15 Haneda airport (Tokyo) -- Tsukuba (NIAS)	Exploration / Transportation	

Table 2. A summary of collected materials in Tsushima

対馬における収集品の内訳

Species	No.
Amphicarpaea bracteata	7
Glycine soja	3
Vigna angularis var. *nipponensis*	14
Vigna unguiculata	2
Vigna vexillata var. *tsushimensis*	6
Total	32

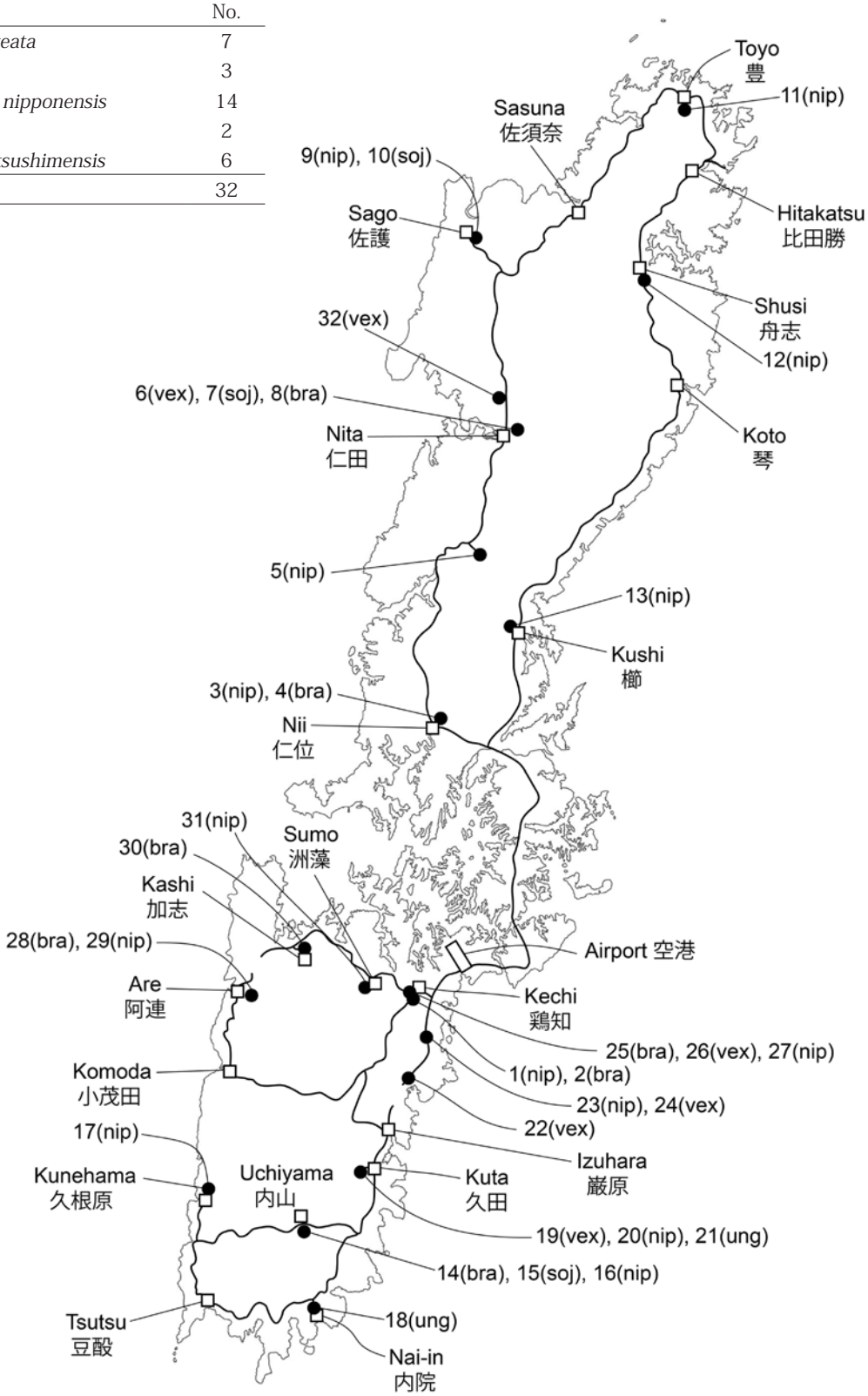

Fig. 1. A map of Tsushima island, Nagasaki, Japan. Main cities or locations are indicated by a rectangle and their names are indicated. Collection sites are indicated by black circle. For each collection site, collection number of each accession is listed with species name abbreviations in a parenthesis.

Species abbreviations: bra : *Amphicarpaea bracteata*, nip : *Vigna angularis* var. *nipponensis*, soj : *Glycine soja*, ung : *Vigna unguiculata*, vex : *Vigna vexillata*

However, some trip reports are written in English, others are written in Japanese with English summary. You can read and download pdf file of trip reports of each year by clicking green title under ISSN 0915-602X index.)
(e.g. Tomooka *et al*., 2008, http://www.gene.affrc.go.jp/pdf/report/parts/2007_1-2.pdf).

Compared with *Amphicarpaea bracteata* and *Vigna angularis* var. *nipponensis*, *G. soja* was less common in Tsushima. Habitat of *G. soja* seems to be limited to more open, disturbed and drier sites compared to *Amphicarpaea bracteata* and *Vigna angularis* (Photo 3 and 4).

***Vigna angularis* var. *nipponensis* (Wild azuki bean, Yabutsuru-azuki in Japanese)**

Natural population of azuki bean was commonly found near paddy field or in an abandoned farmer's field in Tsushima (Photo 5). Among 14 populations found, 2 populations consisted of individuals with different seed coat color (Photo 6, 7 and 8). In addition, 12 populations consisted of individuals with green stem color. The stem color of typical wild azuki bean is purple and that of typical cultivated azuki bean is green. These facts (seed and stem color variation) indicate that most of the naturally growing azuki bean populations in Tsushima consist of individuals which had experienced outcrossing with cultivated azuki bean in the past.

***Vigna unguiculata* (Cowpea, Sasage in Japanese)**

Two populations of naturally growing cowpea were found in southern part of Tsushima island (Fig. 1). Both populations were growing in the abandoned farmer's field. Seed color of individuals in both populations was purplish brown (Photo 9). These indicate that these individuals were escaped from cultivation in the past. These plants showed strong pod shattering which is considered to be an adaptation to natural habitat (Photo 10).

***Vigna vexillata* var. *tsushimensis* (Tuber cowpea, Aka-sasage in Japanese)**

V. vexillata is a pan-tropical species found throughout the world with considerable morphological variations. Hence, several botanical varieties were described (Maréchal *et al*., 1978). Recently, a domesticated form was found cultivated mainly for its tuberous roots in Bali and Timor, Indonesia (Karuniawan *et al*. 2006). Wild germplasm can therefore be used as gene sources for the crop improvement.

One variety, var. *tsushimensis*, is found only from China, Taiwan (China), Korean peninsula and Kyushu, Japan. In Japan, V. vexillata was registered as an endangered species ranked at the highest risk (IA) in the Red Book published by the Ministry of Environment. Six populations of *V. vexillata* var. *tsushimensis* were found in Tsushima (Table 2, Fig. 1). At a site near Nita, *V. vexillata* (Col. No. 6) was growing sympatric with *Amphicarpa bracteata* and *Glycine soja* (Photo 11). The soil is sandy at this site. Four populations were found near Izuhara city (e.g. Photo 12). Plants were at the past-maturity stage and no flowers were observed. A large population was found near Kechi, Mitsushima town (Col. No. 26, Fig. 1). The habitat was a newly developed land in the Kechi river basin where paddy fields were predominant. This land was totally covered by *V. vexillata* and *Mischansus sinensis* (Photo 13). Plants of *V. vexillata* in this place developed thick roots (Photo 14). Seed morphology of *V. vexillata* collected from Nita and near Izuhara was shown (Photo 15 and 16).

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和文摘要

本報告は，独立行政法人農業生物資源研究所ジーンバンクが行った長崎県対馬におけるマメ科植物遺伝資源の調査報告である．調査は，2009 年 10 月 21 日～ 10 月 23 日にかけて行った．調査の結果，かつてアイヌ民族による利用がみられたヤブマメ（*Amphicarpaea bracteata*）7 点，野生ダイズであるツルマメ（*Glycine soja*）3 点，野生アズキであるヤブツルアズキ（*Vigna angularis* var. *nipponensis*）14 点, ササゲ（*Vigna unguiculata*）逸出集団 2 点, アカササゲ（*Vigna vexillata* var. *tsushimensis*）6 点，合計 32 点の遺伝資源を収集保存した．これらの遺伝資源は，2010 年度につくば市の農業生物資源研究所において栽培し，特性評価，種子増殖を行った後，配布可能なアクティブコレクションとして農業生物研究所ジーンバンクにおいて保存する計画である．

Table 3. A passport data of collected materials in Tsushima　対馬における収集品のパスポートデータ

Col. No.	Date	Col. Name / JP No.	Species name	Status	Collection site (Japanese)	Collection Site (English)	Alt.	Latitude	Longitude	Seed	Herbarium	Nodule	Soil	Remarks
1	2009/10/21	2009Tsushima-01 JP No. 237042	*Vigna angularis* var. *nipponensis*	wild	美津島町雞知	Mitsushima machi, Kechi	31m	N34-15-45.1	E129-18-04.1	Yes	No	No	sandy	road side, past maturity, no flowers seen
2	2009/10/21	2009Tsushima-02 JP No. 237043	*Amphicarpaea bracteata*	wild	美津島町雞知	Mitsushima machi, Kechi	31m	N34-15-45.1	E129-18-04.1	Yes	No	No	sandy	road side, past maturity, no flowers seen
3	2009/10/21	2009Tsushima-03 JP No. 237044	*Vigna angularis* var. *nipponensis*	wild	豊玉町仁位	Toyotama machi, Nii	22m	N34-23-54.3	E129-19-43.7	Yes	No	No	clay	beside paddy
4	2009/10/21	2009Tsushima-04 JP No. 237045	*Amphicarpaea bracteata*	wild	豊玉町仁位	Toyotama machi, Nii	22m	N34-23-54.3	E129-19-43.7	Yes	No	No	clay	beside paddy, seems weedy (stem green), large pods
5	2009/10/21	2009Tsushima-05 JP No. 237046	*Vigna angularis* var. *nipponensis*	weedy	峰町大久保佐賀の内川沿い	Mine machi, Okubo, Sakanouchi kawa	15m	N34-28-12.5	E129-20-19.6	Yes	Yes	Yes	gravel	beside road, black and brown seeds mixed
6	2009/10/21	2009Tsushima-06 JP No. 237047	*Vigna vexillata* var. *tsushimensis*	wild	上県町仁田樫滝	Kamiagata machi, Nita, Kashitaki	5m	N34-32-00.4	E129-21-11.7	Yes	No	Yes	sand	long pods
7	2009/10/21	2009Tsushima-07 JP No. 237048	*Glycine soja*	wild	上県町仁田樫滝	Kamiagata machi, Nita, Kashitaki	5m	N34-32-00.4	E129-21-11.7	Yes	No	No	sand	
8	2009/10/21	2009Tsushima-08 JP No. 237049	*Amphicarpaea bracteata*	wild	上県町仁田樫滝	Kamiagata machi, Nita, Kashitaki	5m	N34-32-00.4	E129-21-11.7	Yes	No	No	sand	
9	2009/10/21	2009Tsushima-09 JP No. 237050	*Vigna angularis* var. *nipponensis*	wild	上県町佐護	Kamiagata machi, Sago	2m	N34-37-54.0	E129-20-10.1	Yes	No	No	clay	beside paddy
10	2009/10/21	2009Tsushima-10 JP No. 237051	*Glycine soja*	wild	上県町佐護	Kamiagata machi, Sago	2m	N34-37-54.0	E129-20-10.1	Yes	No	No	clay	beside paddy
11	2009/10/21	2009Tsushima-11 JP No. 237052	*Vigna angularis* var. *nipponensis*	weedy	上対馬町豊	Kamitsushima machi, Toyo	3m	N34-41-18.6	E129-27-30.3	Yes	No	No	clay	abandoned field edge, green stem
12	2009/10/22	2009Tsushima-12 JP No. 237053	*Vigna angularis* var. *nipponensis*	wild	上対馬町舟志	Kamitsushima machi, Shushi	3m	N34-36-15.0	E129-25-27.7	Yes	Yes	Yes	silt	abandoned paddy
13	2009/10/22	2009Tsushima-13 JP No. 237054	*Vigna angularis* var. *nipponensis*	wild	峰町櫛	Mine machi, Kushi	10m	N34-26-03.9	E129-21-39.2	Yes	No	No	silt	beside home garden, green thick stem
14	2009/10/22	2009Tsushima-14 JP No. 237055	*Amphicarpaea bracteata*	wild	厳原町内山	Izuhara machi, Uchi-yama	135m	N34-09-33.5	E129-14-11.2	Yes	No	No	silt	between mountain and terrace paddy, few pods matured
15	2009/10/22	2009Tsushima-15 JP No. 237056	*Glycine soja*	wild	厳原町内山	Izuhara machi, Uchi-yama	135m	N34-09-33.5	E129-14-11.2	Yes	No	Yes	silt	between mountain and terrace paddy, past maturity
16	2009/10/22	2009Tsushima-16 JP No. 237057	*Vigna angularis* var. *nipponensis*	wild	厳原町内山	Izuhara machi, Uchi-yama	135m	N34-09-33.5	E129-14-11.2	Yes	No	Yes	silt	between mountain and terrace paddy
17	2009/10/22	2009Tsushima-17 JP No. 237058	*Vigna angularis* var. *nipponensis*	weedy	厳原町九根浜	Izuhara machi, Kune-hama	4m	N34-10-02.0	E129-10-52.1	Yes	No	Yes	silt	weedy, beside paddy field, thick green stem, pale brown seeds and black mottled seeds mixed in a population
18	2009/10/22	2009Tsushima-18 JP No. 237059	*Vigna unguiculata*	weedy	厳原町豆酘内院	Izuhara machi, Tsutsu Nai-in	7m	N34-07-14.5	E129-13-52.8	Yes	No	No	clay	weedy, between road and paddy, pale brown seeds, pod shattered
19	2009/10/23	2009Tsushima-19 JP No. 237060	*Vigna vexillata* var. *tsushimensis*	wild	厳原町久田総合運動公園横	Izuhara machi, Kuta	15m	N34-11-06.5	E129-16-36.5	Yes	No	No	silt	
20	2009/10/23	2009Tsushima-20 JP No. 237061	*Vigna angularis* var. *nipponensis*	wild	厳原町久田総合運動公園横	Izuhara machi, Kuta	15m	N34-11-06.5	E129-16-36.5	Yes	No	No	silt	
21	2009/10/23	2009Tsushima-21 JP No. 237062	*Vigna unguiculata*	weedy	厳原町久田総合運動公園横	Izuhara machi, Kuta	15m	N34-11-06.5	E129-16-36.5	Yes	No	No	silt	escaped from cultivation, with strong pod shattering habit
22	2009/10/23	2009Tsushima-22 JP No. 237063	*Vigna vexillata* var. *tsushimensis*	wild	厳原町小浦	Izuhara machi, Koura	10m	N34-13-42.2	E129-18-03.8	Yes	No	No	gravel	
23	2009/10/23	2009Tsushima-23 JP No. 237064	*Vigna angularis* var. *nipponensis*	wild	美津島町緒根坂トンネル北側すぐ左側空地	Mizushima machi, One	27m	N34-14-20.6	E129-18-34.3	Yes	No	No	gravel	
24	2009/10/23	2009Tsushima-24 JP No. 237065	*Vigna vexillata* var. *tsushimensis*	wild	美津島町緒根坂トンネル北側すぐ左側空地	Mizushima machi, One	27m	N34-14-20.6	E129-18-34.3	Yes	No	No	gravel	
25	2009/10/23	2009Tsushima-25 JP No. 237066	*Amphicarpaea bracteata*	wild	美津島町雞知	Mitsushima machi, Kechi	34m	N34-15-42.5	E129-17-58.5	Yes	Yes	No	sandy	
26	2009/10/23	2009Tsushima-26 JP No. 237067	*Vigna vexillata* var. *tsushimensis*	wild	美津島町雞知	Mitsushima machi, Kechi	34m	N34-15-42.5	E129-17-58.5	Yes	Yes	No	sandy	deep thick roots
27	2009/10/23	2009Tsushima-27 JP No. 237068	*Vigna angularis* var. *nipponensis*	wild	美津島町雞知	Mitsushima machi, Kechi	34m	N34-15-42.5	E129-17-58.5	Yes	Yes	No	sandy	
28	2009/10/23	2009Tsushima-28 JP No. 237069	*Amphicarpaea bracteata*	wild	厳原町阿連	Izuhara machi, Are	5m	N34-15-57.0	E129-12-15.7	Yes	No	No	silt	
29	2009/10/23	2009Tsushima-29 JP No. 237070	*Vigna angularis* var. *nipponensis*	wild	厳原町阿連	Izuhara machi, Are	5m	N34-15-57.0	E129-12-15.7	Yes	No	No	silt	
30	2009/10/23	2009Tsushima-30 JP No. 237071	*Amphicarpaea bracteata*	wild	美津島町加志	Mitsushima machi, Kashi	25m	N34-17-11.9	E129-14-02.2	Yes	No	No	silt	beside cultivated field
31	2009/10/23	2009Tsushima-31 JP No. 237072	*Vigna angularis* var. *nipponensis*	weedy	美津島町洲藻	Mitsushima machi, Sumo	7m	N34-16-23.4	E129-17-00.1	Yes	Yes	Yes	silt	weedy, abandoned paddy
32	2009/10/28	2009Tsushima-32 JP No. 237073	*Vigna vexillata* var. *tsushimensis*	wild	上県町仁田	Kamiagata machi, Nita	5m	—	—	Yes	No	No	—	

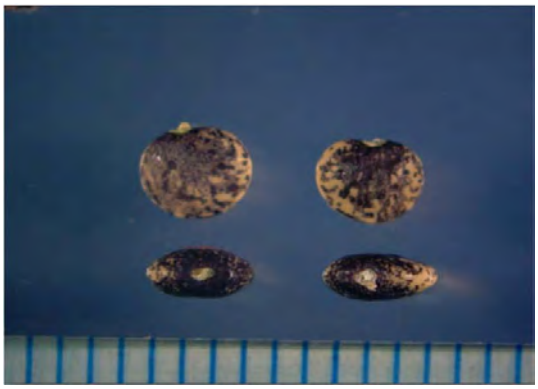

Photo 1. Seeds of *Amphicarpaea bracteata* population (2009Tsushima-28), Are, Izuhara town.

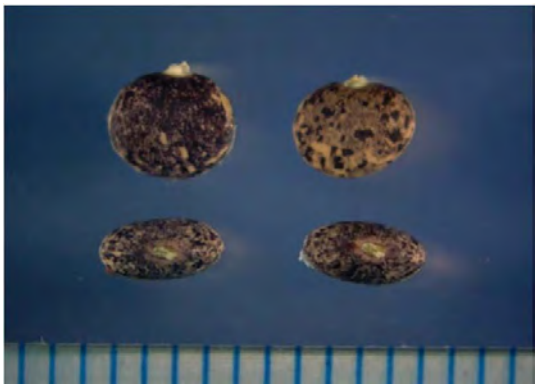

Photo 2. Seeds of *Amphicarpaea bracteata population* (2009Tsushima-30), Kashi, Mitsushima town.

Photo 3. Pods of *Glycine soja* population (2009Tsushima-10) growing between paddy field and cannal, near Sago river, Sago, Kamiagata town.

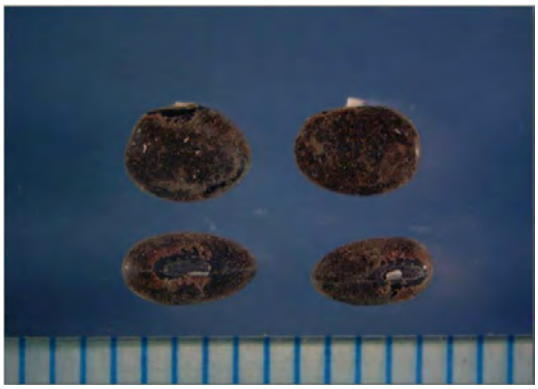

Photo 4. Seeds of *Glycine soja* (2009Tsushima-07), Kashitaki, Nita, Kamiagata town.

Photo 5. A weedy *Vigna angularis* var. *nipponensis* population (2009Tsushima-11) growing in an abandoned farmer's field, Toyo, Kamitsushima town.

Photo 6. *Vigna angularis* var. *nipponensis* population (2009Tsushima-04) growing along the road, Nii, Toyotama town. Black and brown seeds collected at this site (see also Photo 9).

Photo 7. Black and brown seeds collected from *Vigna angularis* var. *nipponensis* population (2009Tsushima-05), Nii, Toyotama town.

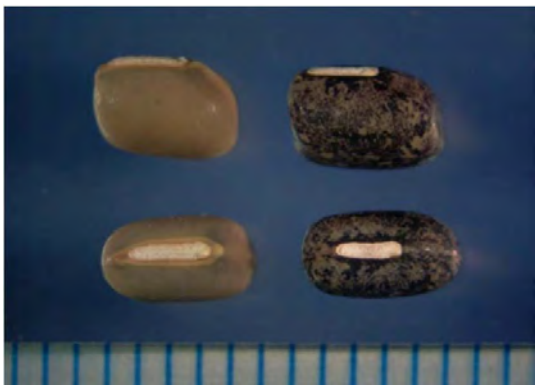

Photo 8. Pale brown and black seeds collected from *Vigna angularis* var. *nipponensis* population (2009Tsushima-17), Kunehama, Izuhara town.

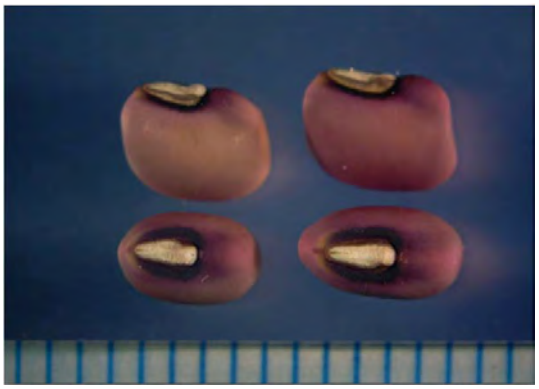

Photo 9. Seeds of *Vigna unguiculata* escaped population (2009Tsushima-18), Nai-in, Tsutsu, Izuhara town.

Photo 10. A shattered pod of escaped *Vigna unguiculata* population (2009Tsushima-18) growing in an abandoned farmer's field, Nai-in, Tsutsu, Izuhara town.

Photo 11. *Vigna vexillata* population (2009Tsushima-06) growing near the river, Kashitaki, Nita, Kamiatata town. Populations of *Glycine soja* and *Amphicarpaea bracteata* also found at this site.

Photo 12. *Vigna vexillata* population (2009Tsushima-24) growing beside road, north of Onesaka tunnel, Mitsushima town.

Photo 13. A large population of *Vigna vexillata* (2009Tsushima-26), Kechi, Mitsushima town.

Photo 14. Thick roots of *Vigna vexillata* (2009Tsushima-26).

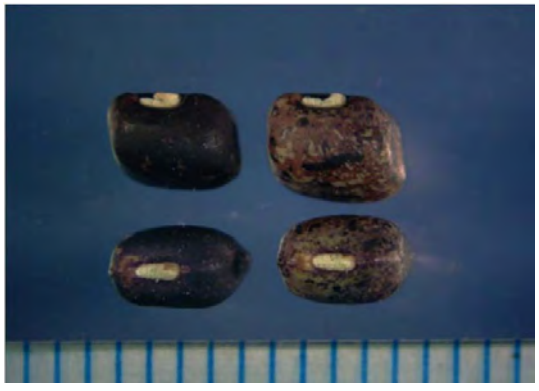

Photo 15. Seeds of *Vigna vexillata* population (2009Tsushima-06), Kashitaki, Nita, Kamiagata town.

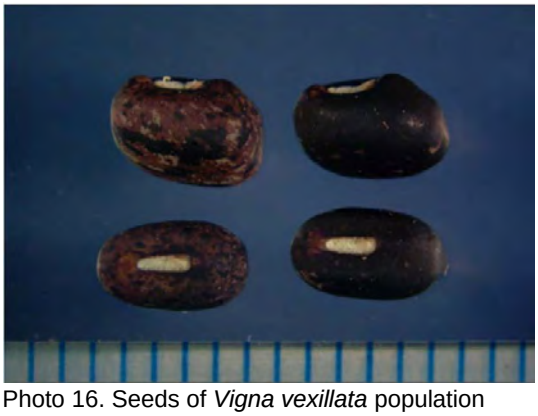

Photo 16. Seeds of *Vigna vexillata* population (2009Tsushima-22), Koura, Izuhara town.