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Original Paper

Field Survey and Collection of Leguminous Genetic Resources in Kagoshima and Kumamoto Prefectures of Japan in 2017

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Summary

We conducted a field survey to collect leguminous genetic resources and to investigate their distribution in Kagoshima and Kumamoto prefectures, in the southern part of Japan, from October 16th to 20th, 2017. In total, 55 accessions were collected, including 32 wild soybean (Japanese name, Tsuru-mame) accessions, 15 wild adzuki bean (Japanese name, Yabutsuru-azuki) accessions, one cultivated adzuki bean (Japanese name, Azuki) accession, five wild tuber cowpea (Japanese name, Aka-sasage) accessions and two cowpea (Japanese name, Sasage) accessions. We successfully identified the southernmost wild adzuki bean of Japan, the 'KK-10' accession, and collected its seeds in the Osumi Peninsula. All collected seeds are conserved at the National Agriculture and Food Research Organization (NARO) Genebank of Japan. We plan to multiply seeds of the collected accessions and to evaluate their growth traits at our experimental field in Tsukuba in 2018. Multiplied seeds will become available upon request for research, breeding and educational purposes.

KEY WORDS: leguminous genetic resources, Kagoshima, Kumamoto, Japan

Introduction

The genera *Glycine* and *Vigna* belong to the legume family (Leguminosae) and include a variety of crops, such as soybean (*Glycine max* [L.] Merr., Japanese name, Daizu), adzuki bean (*Vigna angularis* [Willd.] Ohwi & H. Ohashi, Azuki), and cowpea (*Vigna unguiculata* [L.] Walp., Sasage). The National Agriculture and Food Research Organization (NARO) Genebank has been conducting field surveys for the collection and conservation of *Glycine* and *Vigna* germplasm distributed in Japan (see Annual Report

on Exploration and Introduction of Plant Genetic Resources, https://www.gene.affrc.go.jp/publications.php#plant_report).

In last year's survey of Tanegashima and Yakushima islands, we aimed to determine the southernmost habitat of wild soybeans (*Glycine soja* Sieb. & Zucc.) and wild adzuki bean (*Vigna angularis* [Willd.] Ohwi & H. Ohashi var. *nipponensis* (Ohwi) Ohwi & H. Ohashi) in Japan. We identified that the southernmost habitat of wild soybeans lies in the vicinity of Rokumei river at Nishino, Minamitanecho, Kumage-gun, Kagoshima (Baba-Kasai *et al.* 2017). However, we were unable to identify any wild adzuki bean growing there (Baba-Kasai *et al.* 2017). A survey on the state of vegetation in the Osumi Peninsula, Kagoshima prefectural Museum reported that the southernmost habitat of wild adzuki bean would lie around Mount Inao in this Peninsula (Kawagoshi 1997). Thus, we decided to search the Osumi Peninsula in 2017 and collect the southernmost accession of wild adzuki bean. Furthermore, we attempted to identify the southern habitats of wild soybeans and *Vigna marina* (Burm.) Merr. (Japanese name, Hama-sasage) in the Kyushu part of Kagoshima prefecture, especially in the Satsuma and the Osumi Peninsulas.

Additionally, when carrying out this survey, we investigated the geographical distribution of wild tuber cowpea (*Vigna vexillata* [L.] A. Rich.) in Kumamoto prefecture. We previously investigated the habitat of wild tuber cowpea in Oita and Miyazaki prefectures (Takahashi *et al.* 2017). During that survey, we hypothesized that wild tuber cowpea could spread their habitats around Mount Aso to disperse their seeds, e.g., by streams running through the mountains and/or by birds. Internet reports of wild tuber cowpea in Kumamoto prefecture by citizens provide its geographical distribution to support the hypothesis. Thus, the present survey was performed in Kumamoto prefecture to evaluate the hypothesis.

Methods

A field survey of Kagoshima and Kumamoto prefectures, Japan, was conducted by car from October 16th to 20th, 2017. The survey began at Kagoshima airport and ended at Kumamoto airport (the itinerary is shown in Table 1; the survey routes are shown in Fig. 1). When naturally growing leguminous wild plants were observed, or when we came across a habitat with conditions suitable for finding these legumes, we stopped our car and searched the area for natural populations.

Bulk seed samples were generally collected from each population. When a population contained plants with different traits, the seeds of each morphotype were collected separately.

Passport data recorded included the location of collection sites, i.e., latitude, longitude and altitude; we sketched maps of the habitat and noted any special characteristics of sampled plants, as shown in Table 3. This information is stored in our gene bank database when the sampled plants are registered as accessions. Latitude and longitude were measured using the WGS84 world geodetic system and a Garmin GPSMAP 60sc handheld GPS device.

Results and Discussion

In total, 55 accessions, including 32 of *G. soja*, 16 of *V. angularis*, five of *V. vexillata*, and two of *V. unguiculata* were recorded, and seed samples of each were collected (Table 2, Fig. 1). The collection consists of two cultivated accessions, one escaped accession and 52 wild-type accessions. Passport information for each accession is shown in Table 3 and seed photographs of each accession are presented at the end of this report.

Table 1. Itinerary of the field survey in Kagoshima and Kumamoto prefectures, Japan (October 16–20, 2017)

Date	Itinerary	Stay
2017/10/16	Tsukuba -- (Tsukuba Express train / JR) -- Haneda Airport 11:45 -- (JAL647) -- Kagoshima Airport -- (car) -- Minamikyushu-shi -- Ibusuki-shi	Ibusuki-shi
2017/10/17	Exploration on the west to center part of Osumi peninsula in Kagoshima prefecture	Kanoya-shi
2017/10/18	Exploration on the east part of Osumi peninsula and Kirishima-shi in Kagoshima prefecture, moved to Hitoyoshi-shi, in Kumamoto prefecture	Hitoyoshi-shi
2017/10/19	Exploration on Kuma-gun and Uki-shi in Kumamoto prefecture	Kumamoto-shi
2017/10/20	Exploration on Kumamoto-shi and Kamimashiki-gun in Kumamoto prefecture; Kumamoto Airport 14:05 -- (JAL630) -- Haneda Airport 15:40 -- (JR / Tsukuba Express train) -- Tsukuba	

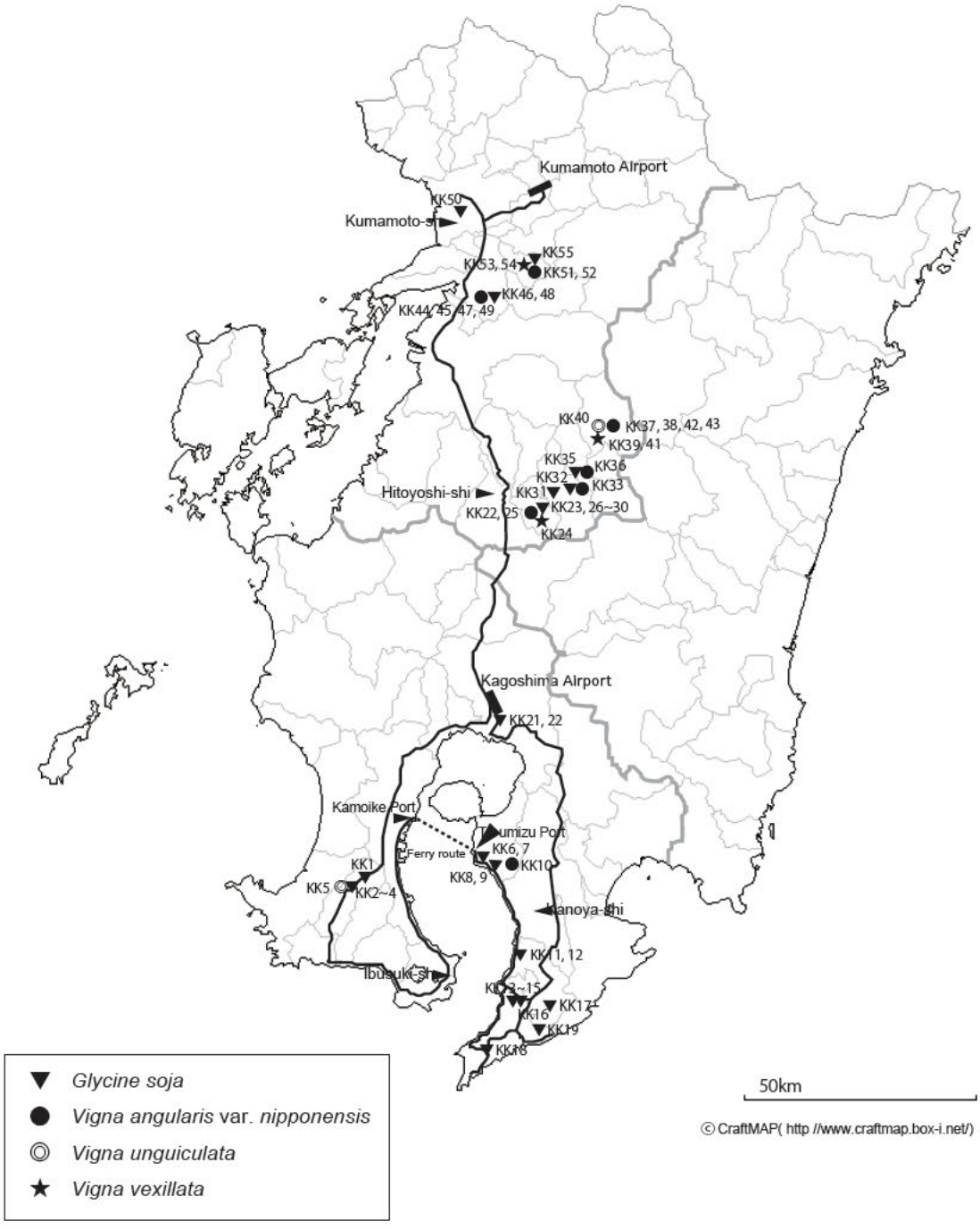

Fig. 1. Survey routes and the collection and search sites in Kagoshima and Kumamoto prefectures.

Table 2. A summary of materials collected in Kagoshima and Kumamoto prefectures

Species	Wild	Escaped	Cultivated	Total
Vigna angularis	15		1	16
Glycine soja	32			32
Vigna unguiculata		1	1	2
Vigna vexillata	5			5
Total	52	1	2	55

Wild-type soybeans (*G. soja*, Japanese, Tsuru-mame)

Although the southernmost habitat of wild soybeans in Japan lies in the vicinity of Rokumei river at Minamitanecho of Tanegashima island (Baba-Kasai *et al.* 2017), the southern habitats in the Kyushu part of Kagoshima prefecture were not clear. Thus, these habitats were searched, especially in the Satsuma and Osumi Peninsulas of Kagoshima prefecture.

Due to the short survey period in the Satsuma Peninsula (4 h, see Table 1), only four accessions of wild soybean were found in the central area of this Peninsula. All our accessions were found in their typical habitats (shown at Photos 2 and 3), including a paddy field ridge, vacant land beside a river, and a fallow field. Among these four accessions, KK-3 has the largest leaves (Photo 4). We suggest that wild soybeans may have more southern habitats in the Satsuma Peninsula as there are large paddy fields and many rivers running through plains.

In the Osumi Peninsula, we found 13 accessions of wild soybean (Photos 6 and 10–16). Due to the geographical environment, it was increasingly difficult to identify plants towards the southern part of the Osumi Peninsula. This area is quite mountainous compared with the Satsuma Peninsula. The southernmost habitat of wild soybean in the Osumi Peninsula lies in a fallow field, Iwashita Satakori, Minamiosumi-cho, Kimotsuki-gun. We found one accession 'KK-18' in that areas, growing together *Persicaria thunbergii* (Sieb. et Zucc.) H. Gross ex Nakai (Japanese name, Mizosoba), and *Miscanthus sinensis* Andersson. (Japanese name, Susuki) (Photo 15). As the latitude of the KK-18 habitat (N31°04′11.2″) is lower than the southernmost point of Satsuma Peninsula, KK-18 is the southernmost accession of wild soybean in the Kyushu part of Kagoshima prefecture.

We identified two accessions in Kirishima-shi, the central area of Kagoshima prefecture, on the way to Kumamoto prefecture, and 12 accessions in Kumamoto prefecture (Photos 19–21, 23, 30, 31 and 36). All were found in their typical habitats and six Kumamoto accessions were growing beside wild adzuki beans (Photos 18, 19 and 22).

Wild adzuki bean (*V. angularis,* Japanese, Yabutsuru-azuki)

According to the previous report (Kawagoshi 1997), the southern limit for wild adzuki bean to thrive would lie around Mount Inao. Thus, we aimed to identify wild adzuki bean plants in the Osumi Peninsula in this field survey and successfully collected one accession, 'KK-10' (Photos 7–9) from Urakawauchikami, Shinjo, Tarumizu-shi in the peninsula (N31°26′58.7″, E130°44′42.9″).

Although we continued to survey wild adzuki beans towards Mount Inao after collecting KK-10, we were only able to find *Dunbaria villosa* (Thunb.) Makino (Japanese name, Noazuki) and *Amphicarpaea bracteata* (Japanese name, Yabu-mame) in the northern area beside Mount Inao. A curator of the Kagoshima Prefectural Museum, who was consulted on the habitat of wild adzuki bean in the Osumi Peninsula, was

suspicious the results of the previous report relating to the southern limit of this species (Kawagoshi 1997); no specimen of wild adzuki bean from around Mount Inao is kept in either the Kagoshima Prefectural Museum or Kagoshima University. Based on the results of this and the previous year's survey (Baba-Kasai *et al.* 2017), we conclude that the accession at Urakawauchikami is the southernmost wild adzuki bean of Japan at the present time; however, it is possible that this species may be identified in a more southern area in the Satsuma Peninsula.

All other wild adzuki bean accessions (Photos 18, 22, 24, 28, 29, 32 and 33) were observed in Kumamoto prefecture. In the present survey, it was easier to identify wild adzuki beans in Kumamoto prefecture than in the Osumi Peninsula of Kagoshima. We concentrated the survey around paddy fields in Kumamoto prefecture, whilst paddy fields were rare in the Osumi Peninsula because of its mountainous environment. All of the Kumamoto accessions were found in novel places and in their typical habitats near paddy fields.

Wild tuber cowpea (*V. vexillata,* Japanese name, Aka-sasage)

In our previous survey in Oita and Miyazaki prefectures in 2016 (Takahashi *et al.* 2017), we collected nine accessions of *V. vexillata* in the cities of Bungotakada and Hita in Oita prefecture, and in Takachiho of Miyazaki. During that survey, we hypothesized that *V. vexillata* could spread its habitat around Mount Aso to disperse its seeds, e.g., by streams of water running through the mountain. Thus, we aimed to verify this hypothesis in the present survey.

We identified three accessions (KK-24, KK-39 and KK-41; Photos 17, 25 and 27, respectively) in Kuma-gun where a large basin named Kuma Basin spreads at the foot of the southernmost rim of the Kyushu Mountains. The Kyushu Mountains include Takachiho Basin, where we collected four accessions of *V. vexillata* in 2016. In addition, the Kuma Basin is located opposite to Hita Basin, where we collected three accessions of *V. vexillata* in 2016, across Mount Aso.

To trace the dispersion of *V. vexillata*, we planned a survey route starting from Minakami-mura, where we collected KK-39 and KK-41, through Shiiba-son to Yamato-cho across the Kyushu Mountains; however, we were unable to follow this route due to a road closure. Therefore, we travelled to Uki-shi and Kosa-machi using the Kyushu Expressway. Finally, we identified 'KK-53' and 'KK-54' (Photos 34 and 35) in Kosa-machi of Kamimashiki-gun, opposite to Kuma Basin, where KK-24, KK-39 and KK-41, were collected, across Mount Kunimi of the Kyushu Mountains. The geographical distribution of the five accessions suggests that seeds are dispersed by streams of water running through Mount Kunimi.

As the morphological features of these five accessions are similar to those of nine accessions collected in 2016, they were considered to be *V. vexillata* var. *tsusimensis*. Since all five accessions grew near the habitat of *V. angularis* var. *nipponensis*, *V. vexillata* var. *tsusimensis* plants inhabit artificially disturbed wet environments, consistent with *V. angularis* var. *nipponensis*. However, *V. vexillata* var. *tsusimensis* seems to prefer moderately abandoned environments (Photos 34 and 35), compared with *V. angularis* var. *nipponensis*.

***V. marina* (Japanese, Hama-sasage)**

V. marina is a pan tropical species and its geographical distribution in the Ryukyu islands is well documented (Tomooka *et al.* 2000, 2012, 2013; Takahashi *et al.* 2014). Conversely, its distribution in the northern region from the Ryukyu islands has not been sufficiently surveyed. Kawagoshi (1997) reported

that the northern limit of the species is around Sata Headland of the Osumi Peninsula, Kagoshima prefecture. Thus, we aimed to identify *V. marina* around Sata Headland in this survey.

The coast around this region is rocky, although *V. marina* prefers to grow on sandy beaches. In addition, a few sandy beaches surveyed appeared to be unsuitable for *V. marina* due to human disturbance. Consequently, we were unable to identify *V. marina* around Sata Headland in this survey.

Cowpea (*V. unguiculata*, Japanese name, Sasage)

One cowpea accession 'KK-5', which produces large black seeds, was collected from a cultivated field near a fallow field where a wild soybean 'KK-4' was collected. KK-5 cultivation was complete and KK-5 cowpea plants were almost harvested (Photo 5). We identified a naturally growing cowpea accession, 'KK-40', which has small yellow-brown seeds beside V. vexillata accession 'KK-41' (Photos 26 and 27).

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鹿児島県および熊本県におけるマメ科植物遺伝資源の探索収集，2017 年 10 月 16 日～ 20 日

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和文摘要

2017 年 10 月 16 日～ 20 日に鹿児島県および熊本県でのマメ科植物遺伝資源探索を行い，野生ダイズ（*Glycine soja*，ツルマメ）32 点，野生アズキ（*V. angularis* var. *nipponensis*，ヤブツルアズキ）15 点，栽培アズキ（*V. angularis*，アズキ）1 点，野生アカササゲ（*V. vexillata*）5 点，ササゲ（*V. unguiculata*）2 点，合計 55 点のマメ科植物遺伝資源を収集した．また，鹿児島県大隅半島において野生アズキ生息域の南限を調査，日本最南端の野生アズキ 1 点（KK-10）を収集したことは特筆に値する．収集したすべてのマメ科植物遺伝資源は，つくば市にある農業・食品産業技術総合研究機構 遺伝資源センター圃場で栽培し，特性評価と種子増殖を行う計画である．増殖種子は，農業・食品産業技術総合研究機構のジーンバンクで保存するとともに，研究や教育に利用するための配布可能な遺伝資源とする．

Table 3. Passport information of collected materials

Col No / Map ID	JP No	Scientific name	Col Date	Status	Collection Site (Address)	Latitude	Longitude	Altitude (m)	Soil	Seed	Herbarium	Nodule	Remarks	100 seed weight (g)
KK-1	259458	*Glycine soja*	16 Oct, 2017	Wild	Kiyomizu, Kawabe-cho, Minamikyushu-shi, Kagoshima 鹿児島県 南九州市　川辺町　清水	N31°24'58 1"	E130°26'18 5"	84	clay loam	bulk	no	no	Beside a paddy field near R225	1 52
KK-2	259459	*Glycine soja*	16 Oct, 2017	Wild	Hirayama, Kawabe-cho, Minamikyushu-shi, Kagoshima 鹿児島県 南九州市　川辺町　平山	N31°23'20 7"	E130°23'52 5"	42	sandy loam	bulk	no	no	At a vacant land beside the Mannose river	1 76
KK-3	259460	*Glycine soja*	16 Oct, 2017	Wild	Hirayama, Kawabe-cho, Minamikyushu-shi, Kagoshima 鹿児島県 南九州市　川辺町　平山	N31°23'21 0"	E130°23'52 4"	42	sandy loam	bulk	no	no	At a vacant land beside the Mannose river, has larger leave than KK-2	2 04
KK-4	259461	*Glycine soja*	16 Oct, 2017	Wild	Hirayama, Kawabe-cho, Minamikyushu-shi, Kagoshima 鹿児島県 南九州市　川辺町　平山	N31°23'18 4"	E130°23'48 4"	45	clay loam	bulk	no	no	In a fallow field	1 60
KK-5	259462	*Vigna unguiculata*	16 Oct, 2017	cultivated	Hirayama, Kawabe-cho, Minamikyushu-shi, Kagoshima 鹿児島県 南九州市　川辺町　平山	N31°23'19 5"	E130°23'46 9"	42	clay loam	bulk	no	no	In a field near KK-4	16 20
KK-6	259463	*Glycine soja*	17 Oct, 2017	Wild	Shinjo, Tarumizu-shi, Kagoshima 鹿児島県　垂水市　新城	N31°27'16 1"	E130°43'52 8"	11	gravel	bulk	no	no	Beside an irrigation ditch near R220	0 79
KK-7	259464	*Glycine soja*	17 Oct, 2017	Wild	Shinjo, Tarumizu-shi, Kagoshima 鹿児島県　垂水市　新城	N31°27'17 7"	E130°43'55 8"	15	sandy loam	bulk	no	no	At a slope beside an abandoned field near the irrigation ditch	0 94
KK-8	259465	*Glycine soja*	17 Oct, 2017	Wild	Shinjo, Tarumizu-shi, Kagoshima 鹿児島県　垂水市　新城	N31°26'35 6"	E130°44'27 3"	2	clay loam	bulk	no	no	Beside a fallow paddy field near Matsuzaki river	1 24
KK-9	259466	*Glycine soja*	17 Oct, 2017	Wild	Shinjo, Tarumizu-shi, Kagoshima 鹿児島県　垂水市　新城	N31°26'37 7"	E130°44'27 8"	4	gravel	bulk	no	no	Beside a green house site on the opposite side of Matsuzaki river from KK-8	1 22
KK-10	259467	*Vigna angularis* var *nipponensis*	17 Oct, 2017	Wild	Urakawauchikami, Shinjo, Tarumizu-shi, Kagoshima 鹿児島県　垂水市　新城　浦川内上	N31°26'58 7"	E130°44'42 9"	4	clay loam	bulk	no	no	The southernmost habitat of *V. angularis* var *nipponensis* that we could find out in Osumi Peninsula; At a slope beside a paddy field near R225	2 56
KK-11	259468	*Glycine soja*	17 Oct, 2017	Wild	Kamikawakami, Kamikawa, Kinko-cho, Kimotsuki-gun, Kagoshima 鹿児島県　肝属郡　錦江町　神川　神川上	N31°16'19 0"	E130°47'59 5"	1	gravel	bulk	no	no	At a vacant land beside the R561	1 44
KK-12	259469	*Glycine soja*	17 Oct, 2017	Wild	Kamikawakami, Kamikawa, Kinko-cho, Kimotsuki-gun, Kagoshima 鹿児島県　肝属郡　錦江町　神川　神川上	N31°16'18 2"	E130°48'07 3"	5	gravel	bulk	no	no	At a bank beside Kamikawa river near Kitazurubashi bridge	1 88
KK-13	259470	*Glycine soja*	17 Oct, 2017	Wild	Onakabai, Nejimeyokobeppu, Kinko-cho, Kimotsuki-gun, Kagoshima 鹿児島県　肝属郡　錦江町　根占横別府　大中原	N31°11'06 6"	E130°48'08 7"	225	clay loam	bulk	no	no	At a bank between pasture fields	1 08
KK-14	259471	*Glycine soja*	17 Oct, 2017	Wild	Onakabai, Nejimeyokobeppu, Kinko-cho, Kimotsuki-gun, Kagoshima 鹿児島県　肝属郡　錦江町　根占横別府　大中原	N31°11'05 4"	E130°48'05 3"	222	clay loam	bulk	no	no	At a bank beside a fallow field	0 96
KK-15	259472	*Glycine soja*	17 Oct, 2017	Wild	Onakabai, Nejimeyokobeppu, Kinko-cho, Kimotsuki-gun, Kagoshima 鹿児島県　肝属郡　錦江町　根占横別府　大中原	N31°11'09 6"	E130°48'16 7"	211	clay loam	bulk	no	no	At a bank beside a fallow field	2 04
KK-16	259473	*Glycine soja*	17 Oct, 2017	Wild	Ogarane, Nejimeyokobeppu, Kinko-cho, Kimotsuki-gun, Kagoshima 鹿児島県　肝属郡　錦江町　根占横別府　大柄根	N31°10'59 8"	E130°48'45 7"	185	clay loam	bulk	no	no	In a fallow field	1 04
KK-17	259474	*Glycine soja*	17 Oct, 2017	Wild	Tashirofumoto, Kinko-cho, Kimotsuki-gun, Kagoshima 鹿児島県　肝属郡　錦江町　田代麓	N31°10'19 8"	E130°53'10 0"	257	gravel	bulk	no	no	At a vacant land between a bush and a paddy field along the Ogawa river	2 20
KK-18	259475	*Glycine soja*	18 Oct, 2017	Wild	Iwashita Satakori, Minamiosumi-cho, Kimotsuki-gun, Kagoshima 鹿児島県　大隅郡　南大隅町　佐多郡　岩下	N31°04'11 2"	E130°43'33 5"	33	clay loam	bulk	no	no	The southernmost habitat of *G. soja* that we could find out in Osumi Peninsula; In a fallow field near T-junction of R564 and R68	0 84
KK-19	259476	*Glycine soja*	18 Oct, 2017	Wild	Kumanohoso Satahetsuka, Minamiosumi-cho, Kimotsuki-gun, Kagoshima 鹿児島県　大隅郡　南大隅町　佐多辺塚　熊之細	N31°05'54 4"	E130°50'18 5"	87	loam	bulk	no	no	At a bank beside a paddy field	1 25
KK-20	259477	*Glycine soja*	18 Oct, 2017	Wild	Togo, Hayato-cho, Kirishima-shi, Kagoshima 鹿児島県　霧島市　隼人町　東郷	N31°46'05 7"	E130°44'55 6"	8	loam	bulk	no	no	In a fallow field among paddy fields	2 56

Table 3. (Continued).

Col No / Map ID	JP No	Scientific name	Col Date	Status	Collection Site (Address)	Latitude	Longitude	Altitude (m)	Soil	Seed	Herbarium	Nodule	Remarks	100 seed weight (g)
KK-21	259478	*Glycine soja*	18 Oct, 2017	Wild	Togo, Hayato-cho, Kirishima-shi, Kagoshima 鹿児島県　霧島市　隼人町　東郷	N31°46'03 9"	E130°44'55 3"	8	loam	bulk	no	no	In a fallow field among paddy fields	1 92
KK-22	259479	*Vigna angularis* var *nipponensis*	19 Oct, 2017	Wild	Ichibu, Nishiki-machi, Kuma-gun, Kumamoto 熊本県　球磨郡　錦町　一武	N32°11'37 9"	E130°50'43 8"	180	loam	bulk	no	no	At a bank beside a field	2 68
KK-23	259480	*Glycine soja*	19 Oct, 2017	Wild	Ichibu, Nishiki-machi, Kuma-gun, Kumamoto 熊本県　球磨郡　錦町　一武	N32°11'37 3"	E130°50'46 3"	180	loam	bulk	no	no	At a bank beside a field	2 44
KK-24	259481	*Vigna vexillata*	19 Oct, 2017	Wild	Ichibu, Nishiki-machi, Kuma-gun, Kumamoto 熊本県　球磨郡　錦町　一武	N32°11'32 4"	E130°50'58 8"	189	clay loam	bulk	no	no	Beside an irrigation ditch beside a paddy field	4 12
KK-25	259482	*Vigna angularis* var *nipponensis*	19 Oct, 2017	Wild	Ichibu, Nishiki-machi, Kuma-gun, Kumamoto 熊本県　球磨郡　錦町　一武	N32°11'37 3"	E130°50'54 7"	192	loam	bulk	no	no	Beside a pasture field	2 88
KK-26	259483	*Glycine soja*	19 Oct, 2017	Wild	Ichibu, Nishiki-machi, Kuma-gun, Kumamoto 熊本県　球磨郡　錦町　一武	N32°11'37 2"	E130°50'54 7"	183	loam	bulk	no	no	Beside a pasture field	2 44
KK-27	259484	*Glycine soja*	19 Oct, 2017	Wild	Ichibu, Nishiki-machi, Kuma-gun, Kumamoto 熊本県　球磨郡　錦町　一武	N32°11'45 5"	E130°51'09 7"	179	gravel	bulk	no	no	Near a large abandon field	2 72
KK-28	259485	*Glycine soja*	19 Oct, 2017	Wild	Ichibu, Nishiki-machi, Kuma-gun, Kumamoto 熊本県　球磨郡　錦町　一武	N32°11'49 0"	E130°51'10 0"	175	gravel	bulk	no	no	Beside the large abandon field	2 04
KK-29	259486	*Glycine soja*	19 Oct, 2017	Wild	Ichibu, Nishiki-machi, Kuma-gun, Kumamoto 熊本県　球磨郡　錦町　一武	N32°11'48 3"	E130°51'08 6"	176	gravel	bulk	no	no	Inside a large abandon field	3 24
KK-30	259487	*Glycine soja*	19 Oct, 2017	Wild	Higashiharu, Ichibu, Nishiki-machi, Kuma-gun, Kumamoto 熊本県　球磨郡　錦町　一武　東原	N32°12'23 0"	E130°51'22 3"	152	clay loam	bulk	no	no	Beside a paddy field near an irrigation ditch	2 24
KK-31	259488	*Glycine soja*	19 Oct, 2017	Wild	Uenishi, Asagiri-cho, Kuma-gun, Kumamoto 熊本県　球磨郡　あさぎり町　上西	N32°11'49 0"	E130°52'44 3"	209	gravel	bulk	no	no	At the front of a large solar panel field	2 04
KK-32	259489	*Glycine soja*	19 Oct, 2017	Wild	Okaharuminami, Asagiri-cho, Kuma-gun, Kumamoto 熊本県　球磨郡　あさぎり町 岡原南	N32°13'16 6"	E130°55'41 7"	191	gravel	bulk	no	no	Beside an irrigation ditch running through paddy fields	3 08
KK-33	259490	*Vigna angularis* var *angularis*	19 Oct, 2017	cultivated	Okaharuminami, Asagiri-cho, Kuma-gun, Kumamoto 熊本県　球磨郡　あさぎり町 岡原南	N32°13'20 6"	E130°55'39 7"	188	loam	bulk	no	no	In a field beside green houses	18 03
KK-34	259491	*Vigna angularis* var *nipponensis*	19 Oct, 2017	Wild	Okuno, Taragi-cho, Kuma-gun, Kumamoto 熊本県　球磨郡　多良木町　奥野	N32°14'40 2"	E130°56'36 1"	174	clay loam	bulk	no	no	Beside a paddy field near Tenshinbashi bridge of R48	2 76
KK-35	259492	*Glycine soja*	19 Oct, 2017	Wild	Okuno, Taragi-cho, Kuma-gun, Kumamoto 熊本県　球磨郡　多良木町　奥野	N32°14'40 0"	E130°56'35 9"	174	clay loam	bulk	no	no	Beside a paddy field near Tenshinbashi bridge of R48	2 60
KK-36	259493	*Vigna angularis* var *nipponensis*	19 Oct, 2017	Wild	Okuno, Taragi-cho, Kuma-gun, Kumamoto 熊本県　球磨郡　多良木町　奥野	N32°14'42 5"	E130°56'31 0"	171	loam	bulk	no	no	Beside a squash field near Tenshinbashi bridge	3 00
KK-37	259494	*Vigna angularis* var *nipponensis*	19 Oct, 2017	Wild	Iwano, Mizukami-mura, Kuma-gun, Kumamoto 熊本県　球磨郡　水上村 岩野	N32°17'52 2"	E130°59'33 0"	201	clay loam	bulk	no	no	Beside a sorghum field near Tenshinbashi bridge	2 80
KK-38	259495	*Vigna angularis* var *nipponensis*	19 Oct, 2017	Wild	Iwano, Mizukami-mura, Kuma-gun, Kumamoto 熊本県　球磨郡　水上村 岩野	N32°17'53 8"	E130°59'36 0"	198	clay loam	bulk	no	no	Beside a paddy field	3 16
KK-39	259496	*Vigna vexillata*	19 Oct, 2017	Wild	Iwano, Mizukami-mura, Kuma-gun, Kumamoto 熊本県　球磨郡　水上村 岩野	N32°17'53 7"	E130°59'36 0"	203	clay loam	bulk	no	no	Beside a paddy field	4 08
KK-40	259497	*Vigna unguiculata*	19 Oct, 2017	escaped	Iwano, Mizukami-mura, Kuma-gun, Kumamoto 熊本県　球磨郡　水上村 岩野	N32°17'54 5"	E130°59'36 7"	203	clay loam	bulk	no	no	Beside a paddy field	5 16
KK-41	259498	*Vigna vexillata*	19 Oct, 2017	Wild	Iwano, Mizukami-mura, Kuma-gun, Kumamoto 熊本県　球磨郡　水上村 岩野	N32°17'54 7"	E130°59'37 2"	203	clay loam	bulk	no	no	Beside a paddy field	4 52
KK-42	259499	*Vigna angularis* var *nipponensis*	19 Oct, 2017	Wild	Iwano, Mizukami-mura, Kuma-gun, Kumamoto 熊本県　球磨郡　水上村 岩野	N32°17'52 5"	E130°59'40 6"	203	gravel	bulk	no	no	Beside a garage along R388	3 00
KK-43	259500	*Vigna angularis* var *nipponensis*	19 Oct, 2017	Wild	Yuyama, Mizukami-mura, Kuma-gun, Kumamoto 熊本県　球磨郡　水上村 湯山	N32°19'14 8"	E131°02'46 5"	356	clay loam	bulk	no	no	At a bank beside a paddy field	2 64
KK-44	259501	*Vigna angularis* var *nipponensis*	19 Oct, 2017	Wild	Kajiyabayashi, Higashiogawa,　Ogawa-machi, Uki-shi, Kumamoto 熊本県　宇城市 小川町　東小川　楫屋林	N32°34'19 8"	E130°43'28 0"	29	clay	bulk	no	no	Beside a paddy field	2 04

Table 3. (Continued).

Col No / Map ID	JP No	Scientific name	Col Date	Status	Collection Site (Address)	Latitude	Longitude	Altitude (m)	Soil	Seed	Herbarium	Nodule	Remarks	100 seed weight (g)
KK-45	259502	*Vigna angularis* var *nipponensis*	19 Oct, 2017	Wild	Nozoe, Minamikaito, Ogawa-machi, Uki-shi, Kumamoto 熊本県　宇城市　小川町　南海東　野添	N32˚34'33 3"	E130˚44'08 4"	32	clay	bulk	no	no	Beside a paddy field	2 64
KK-46	259503	*Glycine soja*	19 Oct, 2017	Wild	Nozoe, Minamikaito, Ogawa-machi, Uki-shi, Kumamoto 熊本県　宇城市　小川町　南海東　野添	N32˚34'33 6"	E130˚44'07 7"	31	sandy loam	bulk	no	no	Beside a fallow field	1 68
KK-47	259504	*Vigna angularis* var *nipponensis*	19 Oct, 2017	Wild	Arikibara, Minamikaito, Ogawamachi, Uki-shi, Kumamoto 熊本県　宇城市　小川町　北海東　有木原	N32˚35'18 9"	E130˚44'42 6"	38	loam	bulk	no	no	At a riverbank of the Sunakawa river	2 00
KK-48	259505	*Glycine soja*	19 Oct, 2017	Wild	Arikibara, Minamikaito, Ogawa-machi, Uki-shi, Kumamoto 熊本県　宇城市　小川町　北海東　有木原	N32˚35'18 6"	E130˚44'42 2"	39	loam	bulk	no	no	At a riverbank of the Sunakawa river	2 56
KK-49	259506	*Vigna angularis* var *nipponensis*	19 Oct, 2017	Wild	Arikibara, Minamikaito, Ogawa-machi, Uki-shi, Kumamoto 熊本県　宇城市　小川町　北海東　有木原	N32˚35'21 3"	E130˚44'39 4"	47	silt	bulk	no	no	At a bank beside a paddy field	2 64
KK-50	259507	*Glycine soja*	20 Oct, 2017	Wild	Tatsuda, Kita-ku, Kumamoto-shi, Kumamoto 熊本県　熊本市　北区　龍田	N32˚49'52 0"	E130˚44'11 3"	62	clay	bulk	no	no	Beside the Tomboike pond in Tatsuda-yama park	2 24
KK-51	259508	*Vigna angularis* var *nipponensis*	20 Oct, 2017	Wild	Tashiro, Kamisogawa, Kosa-machi, Kamimashiki-gun, Kumamoto 熊本県　上益城郡　甲佐町　上早川 田代	N32˚41'12 7"	E130˚49'48 7"	73	clay loam	bulk	no	no	In a fallow field	3 32
KK-52	259509	*Vigna angularis* var *nipponensis*	20 Oct, 2017	Wild	Tashiro, Kamisogawa, Kosa-machi, Kamimashiki-gun, Kumamoto 熊本県　上益城郡　甲佐町　上早川 田代	N32˚41'20 1"	E130˚49'49 7"	69	sandy loam	bulk	no	no	Beside the Tastunogawa river	2 52
KK-53	259510	*Vigna vexillata*	20 Oct, 2017	Wild	Tashiro, Kamisogawa, Kosa-machi, Kamimashiki-gun, Kumamoto 熊本県　上益城郡　甲佐町　上早川 田代	N32˚41'26 1"	E130˚49'58 9"	88	loam	bulk	no	no	In an abandon glassy yard around a vacant house	3 64
KK-54	259511	*Vigna vexillata*	20 Oct, 2017	Wild	Tashiro, Kamisogawa, Kosa-machi, Kamimashiki-gun, Kumamoto 熊本県　上益城郡　甲佐町　上早川 田代	N32˚41'25 2"	E130˚49'58 5"	86	loam	bulk	no	no	In an abandon glassy yard around a vacant house	3 59
KK-55	259512	*Glycine soja*	20 Oct, 2017	Wild	Tashiro, Kamisogawa, Kosa-machi, Kamimashiki-gun, Kumamoto 熊本県　上益城郡　甲佐町　上早川 田代	N32˚41'27 3"	E130˚50'02 5"	97	gravel	bulk	no	no	In an abandon field	3 16

Photo 1. Plants of *G. soja* (KK-1) beside a paddy field near R225, Kiyomizu, Kawabe-cho, Minamikyushu-shi, Kagoshima

Photo 2. Habitat of *G. soja* (KK-1) beside a paddy field near R225, Kiyomizu, Kawabe-cho, Minamikyushu-shi, Kagoshima

Photo 3. Habitat of *G. soja* (KK-3) on vacant land beside the Mannose river, which has large leaves, Hirayama, Kawabe-cho, Minamikyushu-shi, Kagoshima

Photo 4. The leaves of 'KK-3' accession are larger than those of other *G. soja* accessions.

Photo 5. Plants of *V. unguiculata* (cultivated) found in a field near KK-4, Hirayama, Kawabe-cho, Minamikyushu-shi, Kagoshima

Photo 6. Plant of *G. soja* (KK-6) beside an irrigation ditch near R220, Shinjo, Tarumizu-shi, Kagoshima

Photo 7. The southernmost habitat of *V. angularis* var. *nipponensis* (KK-10) in Osumi Peninsula; a slope beside a paddy field near R225

Photo 8. Plants of *V. angularis* var. *nipponensis* (KK-10), Urakawauchikami, Shinjo, Tarumizu-shi, Kagoshima

Photo 9. A flower of *V. angularis* var. *nipponensis* (KK-10) Urakawauchikami, Shinjo, Tarumizu-shi, Kagoshima

Photo 10. Plants of *G. soja* (KK-12) on a bank beside the Kamikawa river near Kitazurubashi bridge

Photo 11. Habitat of *G. soja* (KK-12) Kamikawakami, Kamikawa, Kinko-cho, Kimotsuki-gun, Kagoshima

Photo 12. Habitat of *G. soja* (KK-14) on a bank beside a fallow field, Onakabai, Nejimeyokobeppu, Kinko-cho, Kimotsuki-gun, Kagoshima

Photo 13. Plants of *G. soja* (KK-16) in a fallow field, Ogarane, Nejimeyokobeppu, Kinko-cho, Kimotsuki-gun, Kagoshima

Photo 14. Plants of *G. soja* (KK-17) on vacant land along the Ogawa river, Tashirofumoto, Kinko-cho, Kimotsuki-gun, Kagoshima

Photo 15. The southernmost habitat of *G. soja* (KK-18) in Osumi Peninsula, in a fallow field, Iwashita Satakori, Minamiosumi-cho, Kimotsuki-gun, Kagoshima

Photo 16. *G. soja* (KK-19) plant on a bank beside a paddy field, Kumanohoso Satahetsuka, Minamiosumi-cho, Kimotsuki-gun, Kagoshima

Photo 17. Plants of *V. vexillata* (KK-24) beside an irrigation ditch running through paddy fields, Ichibu, Nishiki-machi, Kuma-gun, Kumamoto

Photo 18. Habitat of *V. angularis* var. *nipponensis* (KK-25) beside a pasture field, Ichibu, Nishiki-machi, Kuma-gun, Kumamoto

Photo 19. Plants of *G. soja* (KK-26) near KK-25, Ichibu, Nishiki-machi, Kuma-gun, Kumamoto

Photo 20. Plants of *G. soja* (KK-32) beside an irrigation ditch running through paddy fields, Okaharuminami, Asagiri-cho, Kuma-gun, Kumamoto

Photo 21. Habitat of *G. soja* (KK-32) beside an irrigation detch running through paddy fields, Okaharuminami, Asagiri-cho, Kuma-gun, Kumamoto

Photo 22. Habitat of *V. angularis* var. *nipponensis* (KK-34) and *G. soja* (KK-35), beside a paddy field near Tenshinbashi bridge of R48 Okuno, Taragi-cho, Kuma-gun, Kumamoto

Photo 23. Plants of *G. soja* (KK-35) beside a paddy field near Tenshinbashi bridge of R48, Okuno, Taragi-cho, Kuma-gun, Kumamoto

Photo 24. Habitat of *V. angularis* var. *nipponensis* (KK-38) beside a paddy field, Iwano, Mizukami-mura, Kuma-gun, Kumamoto

Photo 25. Plants of *V. vexillata* (KK-39) beside a paddy field, Iwano, Mizumaki-mura, Kuma-gun, Kumamoto

Photo 26. Plants of *V. unguiculata* (KK-40) beside a paddy field, Iwano, Mizukami-mura, Kuma-gun, Kumamoto

Photo 27. A floral bud and pods of *V. vexillata* (KK-41) beside a paddy field, Iwano, Mizukami-mura, Kuma-gun, Kumamoto

Photo 28. Habitat of *V. angularis* var. *nipponensis* (KK-43) on the top of a bank beside a paddy field, Kumanohoso, Satahetsuka, Minamiosumi-cho, Kimotsuki-gun, Kagoshima

Photo 29. Habitat of *V. angularis* var. *nipponensis* (KK-49) on the top of a bank beside a paddy field, Arikibara, Minamikaito, Ogawa-machi, Uki-shi, Kumamoto

Photo 30. Plants of *G. soja* (KK-50) beside the Tomboike pond in Tatsuda-yama park, Tatsuda, Kita-ku, Kumamoto-shi, Kumamoto

Photo 31. Habita of *G. soja* (KK-50) beside the Tomboike pond in Tatsuda-yama park, Tatsuda, Kita-ku, Kumamoto-shi, Kumamoto

Photo 32. Plants of *V. angularis* var. *nipponensis* (KK-51) in a fallow field, Tashiro, Kamisogawa, Kosa-machi, Kamimashiki-gun, Kumamoto

Photo 33. Plants of *V. angularis* var. *nipponensis* (KK-52) beside the Tatsunogawa river, Tashiro, Kamisogawa, Kosa-machi, Kamimashiki-gun, Kumamoto

Photo 34. Plants of *V. vexillata* (KK-53) in an abandoned glassy yard around a vacant house, Tashiro, Kamisogawa, Kosa-machi, Kamimashiki-gun, Kumamoto

Photo 35. Habitat of *V. vexillata* (KK-54) in an abandoned glassy yard around a vacant house, Tashiro, Kamisogawa, Kosa-machi, Kamimashiki-gun, Kumamoto

Photo 36. Habitat of *G. soja* (KK-55) in an abandoned field, Tashiro, Kamisogawa, Kosa-machi, Kamimashiki-gun, Kumamoto

Seed photos

KK-1, JP259458, *Glycine soja*

KK-2, JP259459, *Glycine soja*

KK-3, JP259460, *Glycine soja*

KK-4, JP259461, *Glycine soja*

KK-5, JP259462, *Vigna unguiculata*

KK-6, JP259463, *Glycine soja*

KK-7, JP259464, *Glycine soja*

KK-8, JP259465, *Glycine soja*

KK-9, JP259466, *Glycine soja*

KK-10, JP259467, *Vigna angularis* var. *nipponensis*

KK-11, JP259468, *Glycine soja*

KK-12, JP259469, *Glycine soja*

KK-13, JP259470, *Glycine soja*

KK-14, JP259471, *Glycine soja*

KK-15, JP259472, *Glycine soja*

One scale on the ruler under the seeds indicates 1.0 mm.

KK-16, JP259473, *Glycine soja*

KK-17, JP259474, *Glycine soja*

KK-18, JP259475, *Glycine soja*

KK-19, JP259476, *Glycine soja*

KK-20, JP259477, *Glycine soja*

KK-21, JP259478, *Glycine soja*

KK-22, JP259479, *Vigna angularis* var. *nipponensis*

KK-23, JP259480, *Glycine soja*

KK-24, JP259481, *Vigna vexillata*

KK-25, JP259482, *Vigna angularis* var. *nipponensis*

KK-26, JP259483, *Glycine soja*

KK-27, JP259484, *Glycine soja*

KK-28, JP259485, *Glycine soja*

KK-29, JP259486, *Glycine soja*

KK-30, JP259487, *Glycine soja*

One scale on the ruler under the seeds indicates 1.0 mm.

KK-31, JP259488, *Glycine soja*

KK-32, JP259489, *Glycine soja*

KK-33, JP259490, *Vigna angularis* var. *angularis*

KK-34, JP259491, *Vigna angularis* var. *nipponensis*

KK-35, JP259492, *Glycine soja*

KK-36, JP259493, *Vigna angularis* var. *nipponensis*

KK-37, JP259494, *Vigna angularis* var. *nipponensis*

KK-38, JP259495, *Vigna angularis* var. *nipponensis*

KK-39, JP259496, *Vigna vexillata*

KK-40, JP259497, *Vigna unguiculata*

KK-41, JP259498, *Vigna vexillata*

KK-42, JP259499, *Vigna angularis* var. *nipponensis*

KK-43, JP259500, *Vigna angularis* var. *nipponensis*

KK-44, JP259501, *Vigna angularis* var. *nipponensis*

KK-45, JP259502, *Vigna angularis* var. *nipponensis*

One scale on the ruler under the seeds indicates 1.0 mm.

KK-46, JP259503, *Glycine soja*

KK-47, JP259504, *Vigna angularis* var. *nipponensis*

KK-48, JP259505, *Glycine soja*

KK-49, JP259506, *Vigna angularis* var. *nipponensis*

KK-50, JP259507, *Glycine soja*

KK-51, JP259508, *Vigna angularis* var. *nipponensis*

KK-52, JP259509, *Vigna angularis* var. *nipponensis*

KK-53, JP259510, *Vigna vexillata*

KK-54, JP259511, *Vigna vexillata*

KK-55, JP259512, *Glycine soja*

One scale on the ruler under the seeds indicates 1.0 mm.