

Collection and Conservation of Wild Leguminous Crop Relatives on Ishigaki, Iriomote, Miyako, Kurima, Irabu and Ikema islands, Okinawa, Japan, 2012

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Summary

A field survey was conducted on Ishigaki, Iriomote, Miyako, Kurima, Irabu and Ikema islands, Okinawa prefecture, Japan, from 11th to 15th June, 2012. As a result, 28 accessions of leguminous plants consist of 2 accessions of *Vigna luteola*, 22 of *Vigna marina*, 1 of *Vigna reflexo-pilosa*, 3 of *Vigna riukiensis* were recorded and seed samples were collected if available. All the seed materials collected were conserved at NIAS genebank, Japan. These accessions will be grown and evaluated in 2013 and will become available for research, breeding and educational purposes.

KEY WORDS: wild legumes, *Vigna*, Okinawa islands

Introduction

In order to conserve genetic diversity of wild relatives of leguminous crops, the genebank of National Institute of Agrobiological Sciences (NIAS genebank), has been conducting domestic and overseas exploration (Vaughan *et al.*, 2011, Tomooka *et al.* 2011). The previous exploration reports are available from the NIAS genebank web page indicated below.

<http://www.gene.affrc.go.jp/publications.php?section=plant>. (some articles are written in English). In Okinawa prefecture, which is located in the southernmost sub-tropical region of Japan, several important legume crops wild relatives are distributed. *Vigna luteola* and *V. marina* are belonging to the same subgenus (subgenus *Vigna* in the genus *Vigna*) as cowpea (*V. unguiculata*), and is considered to be a possible gene(s) sources for cowpea. In addition, *V. luteola* has resistance to flooding and *V. marina* has resistance to salt, and these two species are cross compatible. This makes these species as interesting genetic materials to study stress resistance mechanisms. *Vigna reflexo-pilosa* is an only tetraploid species in the genus *Vigna*. There is a domesticated form of this species (*V. reflexo-pilosa* var. *glabra* = *V. glabrescens*) which shows high yield potential. Therefore, wild *V. reflexo-pilosa*, cross compatible with domesticated form, can be considered to be a gene(s) source for the domesticated form. *V. riukiensis* is

Table 1. Itinerary of the field survey in Okinawa (Ishigaki, Iriomote, Miyako, Irabu, Kurima, Ikema islands).

日程表 沖縄 (石垣島・西表島・宮古島・伊良部島・来間島・池間島)

Date	Itinerary	Stay
2012/6/11	Tsukuba -- (Tsukuba Express train / JR) -- Haneda Airport 08 : 40 -- (ANA 127) -- 11:15 Naha Airport 12:40 -- (ANA1771) -- 13:40 Ishigaki Airport (Ishigaki Island) (Ishigaki Island EXPLORATION))	Ishigaki Island
2012/6/12	Ishigaki Port (Ishigaki Island) 08:00 -- (Jet Boat) -- 08:40 Ohara Port (Iriomote Island) (Iriomote Island EXPLORATION)) Uehara Port (Iriomote Island) 17:00 -- (Jet Boat) -- 17:40 Ishigaki Island	Ishigaki Island
2012/6/13	((Ishigaki Island EXPLORATION)) Ishigaki Airport 14:30 -- (RAC834) -- 15:05 Miyako Airport (Miyako Island) ((Kurima and Miyako Islands EXPLORATION))	Miyako Island
2012/6/14	Taira Port (Miyako Island) 07:40 -- (Ferryboat) -- 08:00 Sarahama Port (Irabu Island) (Irabu Island EXPLORATION)) Sarahama Port (Irabu Island) 11:00 -- (Ferryboat) -- 11:15 Taira Port (Miyako Island) ((Miyako and Ikema Islands EXPLORATION))	Miyako Island
2012/6/15	((Miyako Island EXPLORATION)) Miyako Airport (Miyako Island) 13:25 -- (ANA1724) -- 14:15 Naha Airport 14:35 (ANA128) -- Haneda Airport 16:55 -- (Tsukuba Express train / JR) -- Tsukuba	

distributed only in Okinawa, Japan and Taiwan, China. It shows higher levels of heat tolerance and salt resistance compared with cross compatible leguminous crop, azuki bean. It is also cross compatible with rice bean (*V. umbellata*).

To collect these wild leguminous species, we conducted an exploration in Ishigaki island in 2004 (Tomooka *et al.*, 2005). In 2011, some of the habitats of *Vigna luteola*, *V. marina*, *V. reflexo-pilosa* and *V. riukiensis* found in 2004 were re-visited and re-surveyed. In addition to Ishigaki island, we have surveyed Iriomote and Kuro islands in 2011 exploration (Tomooka *et al.*, 2012). In the present survey in 2012, collection sites in Ishigaki and Iriomote islands were re-visited to monitor the change of population size and site and to re-collect seed samples. In addition, Kurima, Miyako, Irabu and Ikema islands, Okinawa prefecture were newly surveyed.

Methods

We surveyed 5 islands by car from 11th to 15th June, 2012 (Table 1, Fig. 1). Seed samples, 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 were recorded on passport data sheets as summarized in Tables 2 and 3. Latitude and longitude were measured using WGS84 world geodetic system.

Results and Discussion

A total of 28 accessions of leguminous plants consist of 2 accessions of *Vigna luteola*, 22 of *Vigna marina*, 1 of *Vigna reflexo-pilosa*, 3 of *Vigna riukiensis* were recorded and seed samples were collected (Table 2). Collected seed samples are conserved at NIAS genebank, Tsukuba, Japan and will be multiplied and evaluated in 2013. Multiplied seed samples will

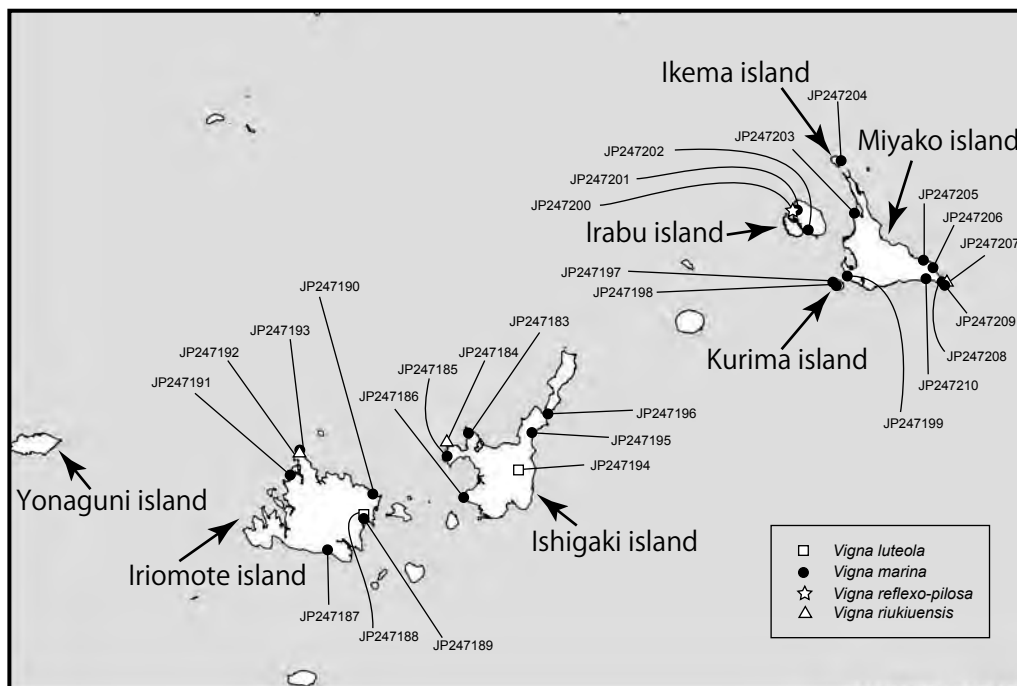


Fig.1. A map of the collected materials in Okinawa, 2012

become available for research, breeding and educational purposes upon request. Searching (http://www.gene.affrc.go.jp/databases-plant_search_en.php) and requesting accessions (http://www.gene.affrc.go.jp/distribution_en.php?section=plant) can be done through NIAS genebank web site.

***Vigna luteola* (Hairy pod cowpea, Nagaba Hama Sasage in Japanese)**

Vigna luteola is a pan tropical species distributed mainly in a wet habitat, which is used as a fodder crop in Australia and USA (Tomooka *et al.*, 2010). *V. luteola* has hollow seeds which can float on the water to disseminate their seeds. Therefore, it is considered to be an interesting material to study genetic and physiological mechanism of flood tolerance. Two accessions were collected. One accession (JP247188) was found growing in a fallow paddy field beside the junction of “Iriomote Yasei Center (Iriomote Wild Life Conservation Center)” (Fig. 1, Photos 1 & 2). Many plants were growing widely on a fallow paddy field. Plants were still too young and only a few seeds could be collected. Another accession (JP247194) was collected from river side population near Bunatabaru Kobashi on Ishigaki island (monitoring site Ishi-1). Seed length of JP247194 was longer than those of JP247188.

***Vigna marina* (Beach cowpea, Hama Sasage in Japanese)**

Vigna marina is a pan tropical species distributed on sandy beach (Tomooka *et al.*, 2010).

Table 2. A summary of collected samples in Okinawa, 2012. 沖縄（石垣島・西表島・宮古島・伊良部島・来間島・池間島）における収集品の内訳

Species	seeds	root nodules
<i>Vigna luteola</i>	2	0
<i>Vigna marina</i>	22	6
<i>Vigna reflexo-pilosa</i>	1	0
<i>Vigna riukuensis</i>	3	0
Total	28	6

It has a high level of salt resistance, and therefore is a good material to understand genetic and physiological bases of salt resistance. Twenty two accessions of *V. marina* were collected (Table 2). Among them, 5 accessions were collected in Ishigaki island, 5 in Iriomote, 2 in Kurima, 7 in Miyako, 2 in Irabu and 1 in Ikema island (Fig. 1).

In Ishigaki island, 5 sites (beaches) were visited. Among them 4 sites are monitoring sites found in previous surveys. A new habitat (Ishi-11) was found in Osaki beach (Photo 3). Population (JP247185) showed good pod set with less insect damage and therefore many seeds (403 seeds) could be collected.

In Iriomote island, 5 sites were visited. Among them 4 sites are monitoring sites found in previous surveys. A new site (Irio-8, JP247189) was found on road side near the junction of "Iriomote Yasei Center". At this site, 271 seeds were collected. At Irio-3 monitoring site (Hoshidate), 694 seeds could be collected mainly from plants growing on stone wall on the beach (Photo 4). It is a commonly observed phenomenon that *V. marina* plants growing on stone wall showed better pod set with less insect damage.

Two new habitats were found on Kurima island and JP247197 (Nagama hama) and JP247198 (Nagasaki hama) were collected (Fig. 1). At Nagama hama beach, *V. marina* plants were growing along beach and showed very good pod set with few insect damage (Photo 5). There are wilted *V. marina* plants found sporadically on the beach (Photo 6). These wilted plants were considered to be damaged by sea water blown up by a recent typhoon.

Two new habitats were found on Irabu island (Fig. 1). At Sawada beach, we could not find any *V. marina* plants. However, we found *V. marina* plants (JP247201) growing in disturbed open grassland near from sea side beside Hotel "Inau-no-Sato". Only a few plants were found at this site and only 11 seeds could be collected. A population (JP247202) was found in Toguchi no hama located in the southern part of Irabu island (Fig. 1, Photo 7). At this site, many *V. marina* plants were growing with very good pod set and less insect damage. A total of 1,716 seeds could be collected. Many nodules were formed on the roots emerged from the long crawling stems (Photos 8 & 9).

Seven new habitats were found on Miyako island (Fig. 1). Most of the habitats were sandy beach on the sea shore. At Sunayama beach, JP247203 grew at higher elevation site (ca.10 m a.s.l.) before going down to the seashore (Photo 10). At this site, very large root nodules were formed. At Yoshino beach, small populations were sporadically distributed along seashore. Most of the pods were severely damaged by insects. Seed coat color collected at this site is greenish (Photo 11). At Agarihennazaki, *V. marina* population (JP247208) grew on the cape (not on a sandy beach). Some plants showed seeds germination within a pod (Photo 12). At Horagawa beach, *V. marina* population (JP247210) grew on a rocky habitat (not on a sandy beach) (Photo 13).

One new habitat was found in Ikema island. Population (JP247204) grew on a sandy beach (Uhama) beside Ikema Ohashi (a bridge connecting Miyako and Ikema islands) (Photo 14). Plants showed good pod set with few insect damage and 1,120 seeds could be collected. However, parasitic plants (Sunazuru = *Cassytha filiformis* L.), which sometimes totally killed *V. marina* plants, were found (Photo 15).

***Vigna reflexo-pilosa* (Ohyabutsuru Azuki in Japanese)**

V. reflexo-pilosa is an only one tetraploid (2n=44) species in the genus *Vigna* (Tomooka *et al.*, 2002). There is a cross-compatible domesticated taxa (*V. reflexo-pilosa* var. *glabra* = *V. glabrescens*). Therefore, wild *V. reflexo-pilosa* is considered to be an useful genetic resources for improving domesticated taxa. A new habitat of *V. reflexo-pilosa* was found at open grassland near Sawada beach (Fig. 1).

***Vigna riukiensis* (Hina Azuki in Japanese)**

Vigna riukiensis is a wild relative which is cross compatible with both azuki bean (*V. angularis*) and rice bean (*V. umbellata*) (Tomooka *et al.*, 2002). Three accessions of *V. riukiensis* were collected, 1 from Ishigaki island, 1 from Iriomote island and 1 from Miyako island (Table 2, Fig. 1). A new site was found where *V. riukiensis* was growing in a pineapple field near Hoshizuna beach (JP247192). A population (JP247207) was found growing near the edge of Agarihennazaki cape on Miyako island (Photo 16).

References

- Tomooka N., Vaughan D. A., Maxted N. and Moss H. 2002. The Asian *Vigna*. Genus *Vigna* subgenus *Ceratotropis* genetic resources. 270 pages. Kluwer Academic Press.
- Tomooka N, Kaga A, Isemura T, Vaughan DA, Srinives P, Somta P, Thadavong S, Bounphanousay C, Kanyavong K, Inthapanya P, Pandiyan M, Senthil N, Ramamoorthi N, Jaiwal PK, Jing T, Umezawa K, and Yokoyama T. 2011. *Vigna* Genetic Resources. In Proceedings of the 14th NIAS International Workshop on Genetic Resources “Genetics and Comparative Genomics of Legumes (*Glycine* and *Vigna*).” pp. 11-22.
(http://www.gene.affrc.go.jp/pdf/misc/international-WS_14_11.pdf)
- Tomooka N, Kaga A, Isemura T, Vaughan DA. 2011. *Vigna*. In (Chittaranjan Kole ed.) Wild Crop Relatives: Genomic and Breeding Resources. Legume Crops and Forages. Chapter 15, 291-311. Springer.
- Tomooka N, Kuroda Y, Yokoyama T, Kashiwaba K, Kaga A, Isemura T and . Vaughan DA 2005. Ecological Survey and Conservation of Legumes - symbiotic Rhizobia Genetic Diversity from Ishigaki Island, Okinawa, Japan, 2004. Annual Report on Exploration and Introduction of Plant Genetic Resources (NIAS, Tsukuba, Japan). Vol. 21: 97-103.
(http://www.gene.affrc.go.jp/plant/pdf/report/parts/2004_1-10.pdf)
- Tomooka N, Yoshida Y, Naito K, Akatsu T and Yokoyama T. 2012. Collection and Conservation of Wild Leguminous Crop Relatives on Ishigaki-jima, Iriomote-jima and Kuro-shima Islands, Okinawa, Japan, 2011. Annual Report on Exploration and Introduction of Plant Genetic Resources (NIAS, Tsukuba, Japan). Vol. 28: 27-41.
([http://www.gene.affrc.go.jp/pdf/publications/plant-exp_2011\(28\)_p27.pdf](http://www.gene.affrc.go.jp/pdf/publications/plant-exp_2011(28)_p27.pdf))
- Vaughan D, Tomooka N, Kaga A, Isemura T and Kuroda Y. 2011. *Glycine* Genetic Resources. In Proceedings of the 14th NIAS International Workshop on Genetic Resources “Genetics and Comparative Genomics of Legumes (*Glycine* and *Vigna*).” pp.1-10.
(http://www.gene.affrc.go.jp/pdf/misc/international-WS_14_1.pdf)

沖縄県石垣島，西表島，来間島，伊良部島，宮古島， 池間島におけるマメ科ササゲ属植物遺伝資源の探索収集， 2012年

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和文摘要

本報告は，沖縄県石垣島，西表島，来間島，伊良部島，宮古島，池間島におけるマメ科ササゲ属植物遺伝資源の調査報告である。調査は，2012年6月11日～15日にかけて行った。調査の結果，ナガバハマササゲ (*Vigna luteola*) 2点，ハマササゲ (*Vigna marina*) 22点，オオヤブツルアズキ (*Vigna reflexo-pilosa*) 1点，ヒナアズキ (*Vigna riukuensis*) 3点，合計28点の植物遺伝資源を収集保存した。これらの遺伝資源は，2013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，種子増殖を行い配布可能なアクティブコレクションとして生物研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 収集品のパスポートデータ

JP No.	Coll. No. (2012-)	Coll. Date (2012)	Species name	Status	Collection Site		Latitude	Longitude	Altitude (m)	Soil	Seed	Herbarium	Nodule	Remarks
247183	shi-5	11 Jun.	<i>Vigna marina</i>	wild	Sukuji beach, Kabira, Ishigaki, Okinawa	沖縄県 石垣市 川平 底地ビーチ	N24-28-10	E124-7-32	1	sand	bulk	no	no	growing on sandy beach, collected at the site near Sea Side Hotel, same location as JP235812 (2009Ishi-5)
247184	Ishi-9	11 Jun.	<i>Vigna riukiensis</i>	wild	Uganzaki, Ishigaki, Okinawa	沖縄県 石垣市 御神崎 (うがんざき)	N24-27-08.25	E124-4-43.27	33	silt	bulk	no	no	growing on a turf grassland, only a few plants found this time
247185	Ishi-11	11 Jun.	<i>Vigna marina</i>	wild	Osaki, Ishigaki, Okinawa	沖縄県 石垣市 大崎	N24-25-32.59	E124-4-39.48	0	sand	bulk	no	no	growing on coastal dike, good pod set
247186	Ishi-10	11 Jun.	<i>Vigna marina</i>	wild	Toujinbaka, Ishigaki, Okinawa	沖縄県 石垣市 唐人墓	N24-21-55.6	E124-6-45.4	6	sand	bulk	no	no	climbing on trees, opposite side of a road to Tojinbaka park
247187	Irio-1	12 Jun.	<i>Vigna marina</i>	wild	Haemida no Hama beach, Toyobaru, Taketomi, (Iriomote island), Yaeyama, Okinawa	沖縄県 八重山郡 竹富町 (西表島) 豊原 南風見田 (はえみだ) の浜	N24-16-20	E123-50-03	5	sand	bulk	no	no	growing on sandy beach
247188	Irio-7	12 Jun.	<i>Vigna luteola</i>	wild	beside the junction of "YASEI-Center", Taketomi, (Iriomote island), Yaeyama, Okinawa	沖縄県 八重山郡 竹富町 (西表島) 古見, 野生生 物保護センター入り口 横の放棄水田	N24-19-36.69	E123-54-38.94	8	sand	bulk	no	no	growing in an abandoned paddy field, large population
247189	Irio-8	12 Jun.	<i>Vigna marina</i>	wild	near the junction of "YASEI-Center", Taketomi, (Iriomote island), Yaeyama, Okinawa	沖縄県 八重山郡 竹富町 (西表島) 古見, 野生生 物保護センター入り口 近くの海岸側道路脇	N24-19-31.83	E123-54-40.30	8	sand	bulk	no	no	beside road side facing to the sea
247190	Irio-6	12 Jun.	<i>Vigna marina</i>	wild	Funarabashi, Taketomi, (Iriomote island), Yaeyama, Okinawa	沖縄県 八重山郡 竹富町 (西表島) 船良橋	N24-22-00.5	E123-55-20.0	8	sand	bulk	no	no	growing on stone coastal dike, population size decreased compared with 2011 (last year), several plants showed symptom like virus infected leaves
247191	Irio-3	12 Jun.	<i>Vigna marina</i>	wild	Hoshitate no Hama beach, Hoshidate, Taketomi, (Iriomote island), Yaeyama, Okinawa	沖縄県 八重山郡 竹富町 (西表島) 干立 星立の浜	N24-23-42.0	E123-45-14.8	3	sand	bulk	no	no	sandy beach, seeds collected form plants growing on stone wall on the beach
247192	Irio-9	12 Jun.	<i>Vigna riukiensis</i>	wild	near Hoshizuna beach, Uehara, Taketomi, (Iriomote island), Yaeyama, Okinawa	沖縄県 八重山郡 竹富町 (西表島) 上原 星砂海 岸横のパイナップル畑 内	N24-26-06.2	E123-46-40.9	24	clay	bulk	no	no	many <i>V. riukiensis</i> plants flowering in a pine apple field

Table 3 (Continued).

JP No.	Coll. No. (2012-)	Coll. Date (2012)	Species name	Status	Collection Site	Latitude	Longitude	Altitude (m)	Soil	Seed	Herbarium	Nodule	Remarks	
247193	Irio-2	12 Jun.	<i>Vigna marina</i>	wild	Hoshizuna no Hama beach, Sumiyoshi, Uehara, Taketomi, (Iriomote island), Yaeyama, Okinawa	沖繩県 八重山郡 竹富町 (西表島) 上原 住吉 星砂の浜	N24-26-12	E123-46-40	1	sand	bulk	no	no	population of <i>V. marina</i> was found again while they could not be found in 2011
247194	Ishi-1	13 Jun.	<i>Vigna luteola</i>	wild	Bunatabaru-kobashi, Maezato-Omoto, Ishigaki, Okinawa	沖繩県 石垣市 真栄里 - 於茂登 (おもと) 武那田原小橋 (ぶなたばるこばし) 横	N24-24-41	E124-12-40	19	clay	bulk	no	no	river side population
247195	Ishi-3	13 Jun.	<i>Vigna marina</i>	wild	Inoda beach, Ishigaki, Okinawa	沖繩県 石垣市 伊野田 オートキャンプ場の砂浜	N24-28-2	E124-15-8	1	sand	bulk	no	no	sandy beach, there is a site (a small stream flows in a beach) where <i>V. marina</i> plants show good pod set with few insect damage
247196	Ishi-4	13 Jun.	<i>Vigna marina</i>	wild	Ibaruma beach, Ishigaki, Okinawa	沖繩県 石垣市 伊原間ビーチ	N24-30-31	E124-17-1	1	sand	bulk	no	no	sandy beach, pods severely attacked by larvae of batterfly
247197	Kurima-1	13 Jun.	<i>Vigna marina</i>	wild	Nagamahama beach, Kurima Island, Miyako, Okinawa	沖繩県 宮古島市 来間島 長間浜	N24-43-27.1	E125-14-24.5	3	sand	bulk	no	yes	sandy beach, good pod set and few insects damage, more than 1,000 seeds could be collected
247198	Kurima-2	13 Jun.	<i>Vigna marina</i>	wild	Nagasakihama, Kurima Island, Miyako, Okinawa	沖繩県 宮古島市 来間島 長崎浜	N24-42-51.4	E125-14-41.2	2	sand	bulk	no	yes	small sandy beach, growing beside parking space
247199	Miyako-1	13 Jun.	<i>Vigna marina</i>	wild	Maibama, Miyako, (Miyako-Island) Okinawa	沖繩県 宮古島市 (宮古島) 前浜	N24-44-05.1	E125-15-48.5		sand	bulk	no	yes	sandy beach beside Kurimaohashi bridge
247200	Irabu-1	14 Jun.	<i>Vigna reflexo-pilosa</i>	wild	Sawada beach, Irabu-Island, Myako, Okinawa	沖繩県 宮古島市 伊良部島 佐和田の浜 民宿 "いなうの郷" 横の荒地	N24-50-12.9	E125-09-28.9	6	clay	bulk	no	no	growing in disturbed open grass land beside Hotel "Inau-no-Sato", pods severely damaged by stink bugs
247201	Irabu-2	14 Jun.	<i>Vigna marina</i>	wild	Sawada beach, Irabu-Island, Myako, Okinawa	沖繩県 宮古島市 伊良部島 佐和田の浜 民宿 "いなうの郷" 横の荒地	N24-50-12.9	E125-09-28.9	6	clay	bulk	no	no	growing in disturbed open grass land beside Hotel "Inau-no-Sato", only a few <i>V. marina</i> plants growing

Table 3 (Continued).

JP No.	Coll. No. (2012-)	Coll. Date (2012)	Species name	Status	Collection Site	Latitude	Longitude	Altitude (m)	Soil	Seed	Herba- rium	Nodule	Remarks	
247202	Irabu-3	14 Jun.	<i>Vigna marina</i>	wild	Toguchinohama beach, Irabu-Island, Miyako, Okinawa	沖繩県 宮古島市 伊良部島 渡口の浜	N24-48-42.8	E125-10-42.3	3	sand	bulk	no	no	good pod set with few insect damage, about 1,700 seeds could be collected
247203	Miyako-2	14 Jun.	<i>Vigna marina</i>	wild	Sunayama beach, Miyako, (Miyako-Island) Okinawa	沖繩県 宮古島市 (宮古島) 砂山ビーチ	N24-50-20.6	E125-16-50.1	10	sand	bulk	no	yes	a population before going down to the beach
247204	Ikema-1	14 Jun.	<i>Vigna marina</i>	wild	Uhama, Ikema-Island, Miyako, Okinawa	沖繩県 宮古島市 池間島 ウハマ	N24-55-30.1	E125-15-19.2	3	sand	bulk	no	yes	growing on a beach down from a restaurant located on the north of Ikema bridge, good pod set with few insect damage, more than 1,000 seeds could be collected
247205	Miyako-3	14 Jun.	<i>Vigna marina</i>	wild	Aragusuku beach, Miyako, (Miyako-Island) Okinawa	沖繩県 宮古島市 (宮古島) 新城海岸	N24-45-39.3	E125-25-22.7	3	sand	bulk	no	yes	sandy beach, good pod set but severely damaged by insects
247206	Miyako-4	15 Jun.	<i>Vigna marina</i>	wild	Yoshino beach, Miyako, (Miyako-Island) Okinawa	沖繩県 宮古島市 (宮古島) 吉野海岸	N24-44-58.4	E125-26-31.6	3	sand	bulk	no	no	sandy beach, small population, pods severely damaged by insects, seed color greenish
247207	Miyako-5	15 Jun.	<i>Vigna riukuensis</i>	wild	Agarihennazaki, Miyako, (Miyako-Island) Okinawa	沖繩県 宮古島市 (宮古島) 東平安崎	N24-43-09.76	E125-28-07.84	10	silt	bulk	no	no	growing around small rock, near lighthouse of Agarihennazaki cliff, small leaves, short internode length
247208	Miyako-6	15 Jun.	<i>Vigna marina</i>	wild	Agarihennazaki, Miyako, (Miyako-Island) Okinawa	沖繩県 宮古島市 (宮古島) 東平安崎	N24-43-11.42	E125-28-05.56	8	silt	bulk	no	no	beside walk way of Agarihennazaki
247209	Miyako-7	15 Jun.	<i>Vigna marina</i>	wild	Agarihennazaki, Miyako, (Miyako-Island) Okinawa	沖繩県 宮古島市 (宮古島) 東平安崎	N24-43-09.42	E125-28-07.17	10	silt	bulk	no	no	beside parking area of Agarihennazaki, many germinated seeds observed in pods
247210	Miyako-8	15 Jun.	<i>Vigna marina</i>	wild	Boragawa beach, Miyako, (Miyako-Island) Okinawa	沖繩県 宮古島市 (宮古島) 保良川ビーチ	N24-43-48.12	E125-25-52.66	5	sand	bulk	no	no	growing on rocky place beside sandy beach



Photo 1. *Vigna luteola*, JP247188 (Iriomote)



Photo 2. *Vigna luteola*, JP247188 (Iriomote)



Photo 3. *Vigna marina*, JP247185 (Osaki, Ishigaki)



Photo 4. *Vigna marina*, JP247191 (Hoshidate, Iriomote)



Photo 5. *Vigna marina*, JP247197 (Nagama hama, Kurima)



Photo 6. *Vigna marina*, JP247197 (Nagama hama, Kurima)



Photo 7. *Vigna marina*, JP247202 (Toguchi no hama, Iribu)



Photo 8. *Vigna marina*, JP247202 (Toguchi no hama, Iribu)



Photo 9. *Vigna marina*, JP247202 (Toguchi no hama, Irabu)



Photo 10. *Vigna marina*, JP247203 (Sunayama beach, Miyako)



Photo 11. *Vigna marina*, JP247206 (Yoshino beach, Miyako)



Photo 12. *Vigna marina*, JP247208 (Agarihennazaki, Miyako)



Photo 13. *Vigna marina*, JP247210 (Horagawa beach, Miyako)



Photo 14. *Vigna marina*, JP247204 (Ikema)



Photo 15. Parasitic plants of *Vigna marina*, JP247204 (Ikema)



Photo 16. *Vigna riukiensis*, JP247207 (Agarihennazaki, Miyako)



JP247183, 2012-Ishi-5
Vigna marina



JP247184, 2012-Ishi-9
Vigna riukiuens



JP247185, 2012-Ishi-11
Vigna marina



JP247186, 2012-Ishi-10
Vigna marina



JP247187, 2012-Irio-1
Vigna marina



JP247188, 2012-Irio-7
Vigna luteola



JP247189, 2012-Irio-8
Vigna marina



JP247190, 2012-Irio-6
Vigna marina



JP247191, 2012-Irio-3
Vigna marina



JP247192, 2012-Irio-9
Vigna riukiuens



JP247193, 2012-Irio-2
Vigna marina



JP247194, 2012-Ishi-1
Vigna luteola



JP247195, 2012-Ishi-3
Vigna marina



JP247196, 2012-Ishi-4
Vigna marina



JP247197, 2012-Kurima-1
Vigna marina



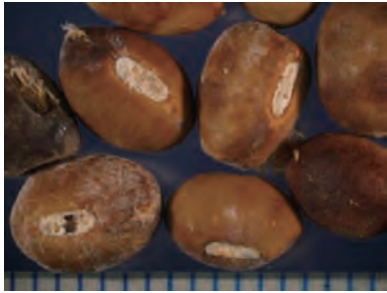
JP247198, 2012-Kurima-2
Vigna marina



JP247199, 2012-Miyako-1
Vigna marina



JP247200, 2012-Irabu-1
Vigna reflexo-pilosa



JP247201, 2012-Irabu-2
Vigna marina



JP247202, 2012-Irabu-3
Vigna marina



JP247203, 2012-Miyako-2
Vigna marina



JP247204, 2012-Ikema-1
Vigna marina



JP247205, 2012-Miyako-3
Vigna marina



JP247206, 2012-Miyako-4
Vigna marina



JP247207, 2012-Miyako-5
Vigna riukiuens



JP247208, 2012-Miyako-6
Vigna marina



JP247209, 2012-Miyako-7
Vigna marina



JP247210, 2012-Miyako-8
Vigna marina