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北海道におけるマメ科植物遺伝資源の探索収集，２００８年

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Collection and Conservation of Wild Leguminous Crop Relatives in Hokkaido, Japan, 2008

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Summary

Based on the Memorandum of Understanding between the National Institute of Agrobiological Sciences, Japan and the Tamil Nadu Agricultural University, India, a field survey was conducted in southwestern part of Hokkaido island, Japan from 29th September to 3rd October, 2008. As a result, 31 accessions of leguminous plants consist of the genus *Amphicarpaea*, *Glycine* and *Lotus* were recorded and seed samples were collected. All the seed materials collected were deposited at NIAS genebank, Japan.

Introduction

In order to facilitate the collaborative research activities on plant genetic resources, the National Institute of Agrobiological Sciences, Japan and the Tamil Nadu Agricultural University, India agreed to establish the Memorandum of Understanding (MOU) on Joint Research of Genetic Resources in April, 2007. This is a report of the collaborative field survey on leguminous plants in Hokkaido, Japan under this MOU. The main target taxa in this trip is *Glycine soja* (wild soybean).

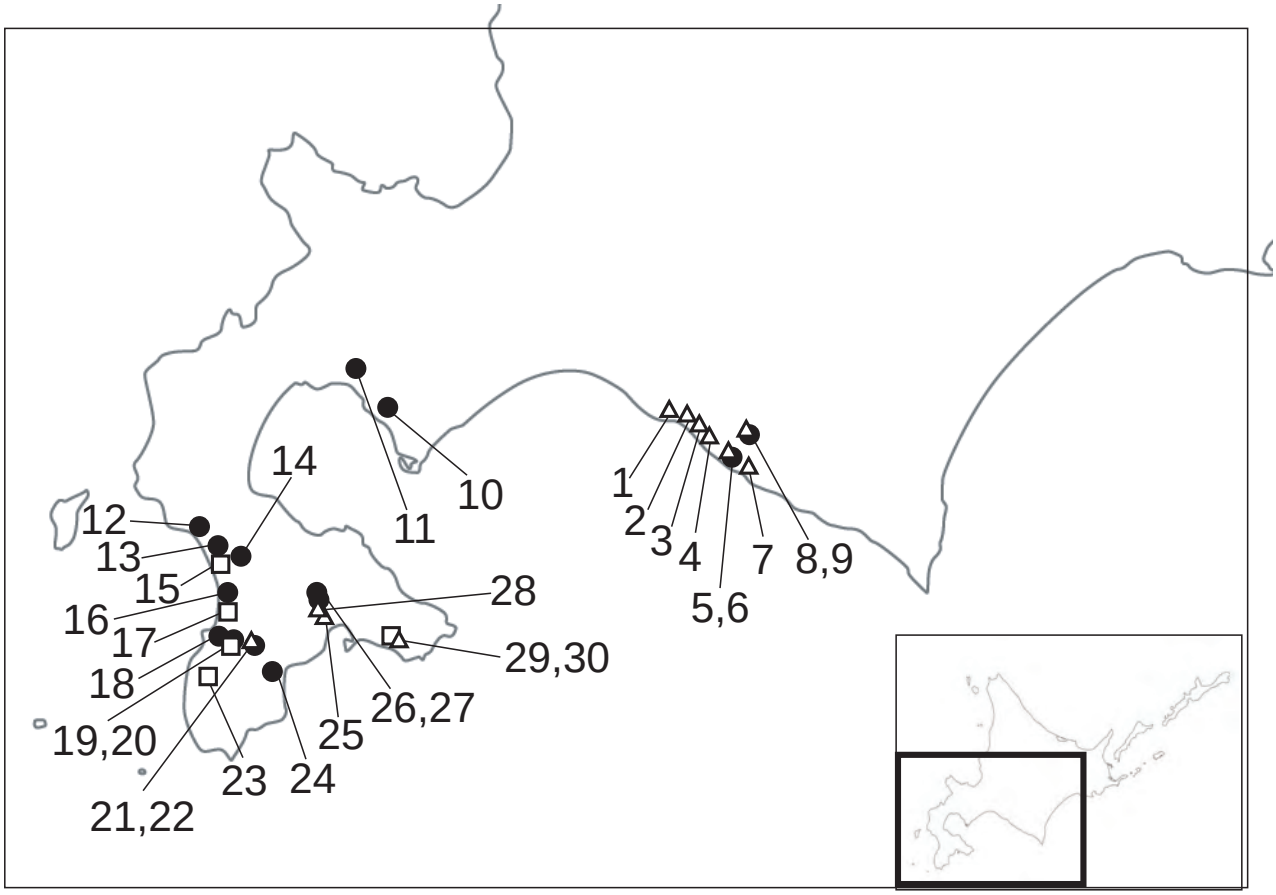

Fig.1. Collection sites of *Amphicarpaea bracteata*(●), *Grycine soja*(△) and *Lotus* sp.(□). Collection No. is indicated for each site.

Table 1. Itinerary 日程表 （北海道）

Day	Date		Itinerary	Activities	Stay
1	2008.9.29	Mon	Tsukuba -- Haneda (Tokyo) 11:00 -- (ANA 061) -- 12:35 Chitose (Hokkaido) -- car -- Hidaka town	Transportation and Exploration	Hidaka town
2	2008.9.30	Tue	Hidaka -- Mukawa -- Niikappu -- Shizunai -- Noboribetsu -- Toyako	Exploration	Toyako town
3	2008.10.1	Wed	Toyako -- Date -- Yakumo -- Otobe -- Assabu -- Esashi	Exploration	Esashi town
4	2008.10.2	Thu	Esashi -- Kaminokuchi -- Matsumae -- Kikonai -- Hakodate	Exploration	Hakodate
5	2008.10.3	Fri	Hakodate -- Hokuto -- Hakodate 15:25 -- (JAL1168) -- 16:50 Haneda (Tokyo) -- Tsukuba	Exploration and Transportation	

Table2. A summary of collected materials
収集品の内訳

Species	No.
Amphicarpaea bracteata	15
Glycine soja	12
Lotus sp.	4
Total	31

Methods

We surveyed southwestern part of Hokkaido island by car from 29th September to 3rd October, 2008 (Table 1, Fig. 1). Seeds, herbarium specimens and root nodules (if available) were collected (Photos1-4, Table 2). Information on collection sites including village name, altitude, latitude, longitude, habitat and other ecological data were recorded as passport data (Table 3).

Results and Discussion

A total of 31 wild legume accessions consist of 15 accessions of *Amphicarpaea bracteata*, 12 of *Glycine soja* and 4 of *Lotus* sp. was recorded and collected (Table 2 & 3). Collected seed samples are conserved at NIAS genebank, Tsukuba, Japan.

Amphicarpaea bracteata (Hog peanut, Yabu-mame: Japanese, Aha: Ainu)

This plant was commonly found growing in the surveyed area of Hokkaido (Fig.1). *Amphicarpaea* plants were sometimes sympatric with *Glycine soja* (wild soybean) plants. Variation in seed size was observed among populations (Photo 5 and 6).

As is indicated by its genus name, *Amphicarpaea bracteata* has two types of pods. 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 or cooked. The native tribe “Ainu” in Hokkaido collected and ate underground seeds.

(http://www.frpac.or.jp/kodomo/html/bunka/tabemono2/tabemono_02_yabumame.html)

It is called “Aha” in the Ainu language. They usually collected under-ground pods in spring after snow disappeared from the ground surface. Seeds were peeled and kept in a room temperature after sun-dried. They were boiled sometimes together with seeds of *Trapa japonica* (called “Pekampe”) and/or dried fruits of *Phellodendron amurense* (“Shikelepe”) and eaten.

The North American natives also ate under-ground seeds as raw or cooked.

(http://www.ibiblio.org/pfaf/cgi-bin/arr_html?Amphicarpaea+bracteata)

According to this “Plants For A Future Database,” they are sweet and delicious raw 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 (Photos 5 and 6). They also ate roots after peeling and boiled although roots are small and stringy.

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

Southwestern part of Hokkaido is the northern limit of *Glycine soja* distribution in Japan. The NIAS genebank has been conducting comprehensive collecting survey of wild soybean throughout Japan except Hokkaido, and genetic structure of wild soybean has been clarified (Kuroda *et al*, 2006 and 2008). This is the first survey by NIAS genebank for collecting wild soybean in this region. The former exploration reports are available from the NIAS genebank web page. Most of the reports were written in Japanese with English summary.

http://www.gene.affrc.go.jp/publications.php?section=plant. (e.g. Tomooka *et al*., 2008)

Compared with *Amphicarpaea bracteata*, *G. soja* was less common. Habitat of *G. soja* seems to be limited to more open, more disturbed and drier sites compared to *Amphicarpaea*. All the populations were found on the river bank with sandy soil not far from the sea. Seed size variation was observed in 2008Hok25 population (Photo 7 and Photo 8). Seeds of 2008Hok25B population were much smaller than those of 2008Hok25A population and other *G. soja* populations. Populations 2008Hok25A and 25B were growing in the same site, Tokirichi river side, and were located only ca. 20 m distance.

Lotus sp.

In Japan, *Lotus corniculatus* var. *japonicus* (=*Lotus japonicus*) and *L. australis* are distributed. In addition, *L. corniculatus* var. *corniculatus*, *L. tenuis* and *L. ulgiginosus* were introduced and became native relatively recently in Japan. In the present survey, we have collected 4 accessions of *Lotus* sp. All the accessions were found in southwestern part of Oshima peninsula.

References

Kuroda, Y., A. Kaga, N. Tomooka & D.A. Vaughan. 2006. Population genetic structure of Japanese wild soybean (*Glycine soja*) based on microsatellite variation. ***Molecular Ecology***. 15: 959-974.

Kuroda Y, Kaga A, Tomooka N and Vaughan D.A. 2008. Gene Flow and Genetic Structure of Wild Soybean (*Glycine soja*) in Japan. ***Crop Science*** 48: 1071-1079.

Tomooka N, Kaga A, Isemura T, Kuroda Y, Tamang A, Matsushima K, Nemoto K and Vaughan D.A. 2008. Collection and conservation of leguminous crops and their wild relatives in Japan, 2007. ***Annual Report on Exploration and Introduction of Plant Genetic Resources*** (NIAS, Tsukuba, Japan) Vol. 24: 9-19.

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とインド，タミルナドゥ農業大学の間で 2007 年 4 月に締結した協同研究協定（MOU）に基づいて招聘した M. Pandiyan 博士をメンバーに加えて行った北海道南西部におけるマメ科植物遺伝資源の調査報告である．調査は，2008 年 9 月 29 日～ 10 月 3 日にかけて行った．調査の結果，野生ダイズであるツルマメ（*Glycine soja*）12 点，かつてアイヌ民族による利用がみられたヤブマメ（*Amphicarpaea bracteata*）15 点，ミヤコグサ属植物 4 点，合計 31 点の遺伝資源を収集保存した．これらの遺伝資源は，2009 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予定である．

Table 3. A passport data of collected materials　収集品のパスポートデータ

Coll. Date	Coll. No.	JP No.	Species name	Status	Collection Site	Vill., City, Pref.	Latitude	Longitude
29-Sep-08	2008Hok 1	235044	*Glycine soja*	wild	北海道 沙流郡 日高町 富川東 2, 沙流川	Sarugawa (river name), Tomikawa higashi 2, Hidakacho, Saru-gun, Hokkaido	N42-30-56.5	E142-02-14.5
30-Sep-08	2008Hok 2	235045	*Glycine soja*	wild	北海道 沙流郡 日高町 清畠 慶能舞川	Kenomaigawa (river name), Kiyohata, Hidakacho, Saru-gun, Hokkaido	N42-28-10.0	E142-10-39.6
30-Sep-08	2008Hok 3	235046	*Glycine soja*	wild	北海道 沙流郡 日高町 厚賀町 加張川	Gabarigawa (river name), Atsugacho, Hidakacho, Saru-gun, Hokkaido	N42-26-59.1	E142-11-46.4
30-Sep-08	2008Hok 4	235047	*Glycine soja*	wild	北海道 沙流郡 日高町 厚賀町 厚別川	Atsubetsugawa (river name), Atsugacho, Hidakacho, Saru-gun, Hokkaido	N42-25-34.3	E142-13-58.0
30-Sep-08	2008Hok 5	235048	*Glycine soja*	wild	北海道 新冠郡 新冠町 新冠川	Niikappugawa (river name), Niikappu-cho, Niikappu-gun, Hokkaido	N42-22-14.2	E142-18-37.3
30-Sep-08	2008Hok 6	235049	*Amphicarpaea bracteata*	wild	北海道 新冠郡 新冠町 新冠川	Niikappugawa (river name), Niikappu-cho, Niikappu-gun, Hokkaido	N42-22-14.2	E142-18-37.3
30-Sep-08	2008Hok 7	235050	*Glycine soja*	wild	北海道 日高郡 新ひだか町 静内 うぐいすの森公園	beside Shizunaigawa (river name) in Uguisunomori Park, Shizunai, Shin-hidakacho, Hidaka-gun, Hokkaido	N42-20-07.0	E142-22-42.2
30-Sep-08	2008Hok 8	235051	*Glycine soja*	wild	北海道 新冠郡 新冠町 明和	Meiwa, Niikappu-cho, Niikappu-gun, Hokkaido	N42-26-01.1	E142-24-22.9
30-Sep-08	2008Hok 9	235052	*Amphicarpaea bracteata*	wild	北海道 新冠郡 新冠町 明和	Meiwa, Niikappu-cho, Niikappu-gun, Hokkaido	N42-26-01.1	E142-24-22.9
1-Oct-08	2008Hok 10	235053	*Amphicarpaea bracteata*	wild	北海道 伊達市 館山下町 長流川	Osarugawa (river name), Tateyamashitacho, Date-shi, Hokkaido	N42-29-21.5	E140-50-49.7
1-Oct-08	2008Hok 11	235054	*Amphicarpaea bracteata*	wild	北海道 虻田郡 豊浦町 インディアン水車公園 , 貫気別川水辺	Indian Water Mill Park, Toyoura-cho, Abuta-gun, Hokkaido	N42-35-59.2	E140-42-05.5
1-Oct-08	2008Hok 12	235055	*Amphicarpaea bracteata*	wild	北海道 二海郡 八雲町 熊石折戸町 相沼内川 河原	Ainumanaigawa (river name), Kumaishi-Orito-cho, Yakumocho, Futami-gun, Hokkaido	N42-04-16.7	E140-04-12.9
1-Oct-08	2008Hok 13	235056	*Amphicarpaea bracteata*	wild	北海道 爾志郡 乙部町 姫川 河原 堤防	Himegawa (river name), Otobe-cho, Nishi-gun, Hokkaido	N41-58-22.4	E140-08-26.7
1-Oct-08	2008Hok 14	235057	*Amphicarpaea bracteata*	wild	北海道 檜山郡 江差町 厚沢部川	Assabugawa (river name), Esashi-cho, Hiyama-gun, Hokkaido	N41-55-36.4	E140-09-37.8
1-Oct-08	2008Hok 14B	235058	*Amphicarpaea bracteata*	wild	北海道　檜山郡 江差町 厚沢部川	Assabugawa (river name), Esashi-cho, Hiyama-gun, Hokkaido	N41-55-36.4	E140-09-37.8
1-Oct-08	2008Hok 15	235059	*Lotus* sp.	wild	北海道 檜山郡 江差町 厚沢部川	Assabugawa (river name), Esashi-cho, Hiyama-gun, Hokkaido	N41-55-30.4	E140-08-46.8
2-Oct-08	2008Hok 16	235060	*Amphicarpaea bracteata*	wild	北海道 檜山郡 江差町 尾山町 田沢川	Tazawagawa (river name), Oyama-cho, Esashi-cho, Hiyama-gun, Hokkaido	N41-53-52.3	E140-08-27.5
2-Oct-08	2008Hok 17	235061	*Lotus* sp.	wild	北海道 檜山郡 江差町 椴川町 椴川横	beside Todogawa (river name), Todogawa-cho, Esashi-cho, Hiyama-gun, Hokkaido	N41-49-35.8	E140-07-32.6
2-Oct-08	2008Hok 18	235062	*Amphicarpaea bracteata*	wild	北海道 檜山郡 上ノ国町 新村 天の川橋上流 300m	300 m from Amanogawa-bridge, Shinmura, Kaminokuni-cho, Hiyama-gun, Hokkaido	N41-47-55.0	E140-07-08.6
2-Oct-08	2008Hok 19	235063	*Lotus* sp.	wild	北海道 檜山郡 上ノ国町 小森大橋	Komori-bridge, Kaminokuni-cho, Hiyama-gun, Hokkaido	N41-46-32.3	E140-08-49.8

Altitude	Habitat	Shading	Disturb-ance	Population size	Growth stage	Soil	Seed	Herba-rium	Nodule	Re:
4m	grassland	open	med	sporadically	mature	sand	yes	yes	no	in grassland beside Sarugawa (river name). past maturity. no flower seen. narrow leaf, long pod.
15m	grassland	open	med	many plants	past maturity	sand	yes	yes	no	Kenomaigawa (river name) river bank beside Tsukimi bridge. narrow leaf, long pod.
1m	grassland	light	med	several plants	mature	sand	yes	yes	yes	Gabarigawa (river name) river bank. fine black sand. late maturity compared with Col. No.2.
1m	grassland	open	high	many plants	mature	sand	yes	yes	yes	Atsubetsugawa (river name) river bank near Atsubetsu bridge. fine sand. late maturity compared with Col. No.2
1m	grassland	open	med	several plants	mature	sand	yes	yes	no	Niikappugawa (river name) river side. fine sand. narrow leaf.
1m	grassland	open	med	several plants	mature	sand	yes	yes	no	Niikappugawa (river name) river side. fine sand.
1m	grassland	open	med	a few plants	pre-mature	sand	yes	no	no	beside Shizunaigawa (river name) in Uguisunomori Park. single plant matured.
30m	grassland	light	med	several plants	past maturity	muddy	yes	yes	no	near the river. Muddy soil. late maturity
30m	grassland	light	med	plenty	pre-mature	muddy	yes	no	no	*Amphicarpaea* grow more than *Glycine*.
10m	grassland	light	med	several plants	mature	sand	yes	yes	no	Osarugawa (river name) river side
26m	grassland	open	high	several plants	pre-mature	sand	yes	yes	no	beside Nukibetsugawa (river name). A little too early to collect mature pods.
1m	grassland	light	med	several plants	pre-mature	sand	yes	no	no	Ainumanaigawa (river name) river side. most plants immature
5m	grassland	light	high	several plants	pre-mature	sand	yes	no	no	Himekawagawa (river name) river bank
5m	grassland	light	med	several plants	mature	sand	yes	no	no	Assabugawa (river name) bank
5m	grassland	light	med	several plants	mature	sand	yes	no	no	Assabugawa (river name) bank
5m	grassland	light	med	several plants	mature	muddy	yes	no	no	beside athletic park near Assabugawa (river name)
5m	grassland	open	med	several plants	pre-mature	sand	yes	no	no	beside Tazawagawa (river name)
3m	grassland	open	high	several plants	mature	sand	yes	yes	no	beside Todogawa (river name) near the sea
3m	grassland	light	med	several plants	pre-mature	sand	yes	yes	no	Amanogawa (river name) river bank
3m	grassland	light	med	several plants	pre-mature	sand	yes	yes	no	Amanogawa (river name) river bank near Komori Ohashi

Table 3(continued).

Coll. Date	Coll. No.	JP No.	Species name		Collection Site	Vill., City, Pref.	Latitude	Longitude
2-Oct-08	2008Hok 20	235064	*Amphicarpaea bracteata*	wild	北海道 檜山郡 上ノ国町 小森大橋	Komori-bridge, Kaminokuni-cho, Hiyama-gun, Hokkaido	N41-46-32.3	E140-08-49.8
2-Oct-08	2008Hok 21	235065	*Glycine soja*	wild	北海道 檜山郡 上ノ国町 宮越 天の川 (宮越駅横)	near Miyakoshi-station, Amanoawagawa (river name), Miyakoshi, Kaminokuni-cho, Hiyama-gun, Hokkaido	N41-45-41.4	E140-10-59.0
2-Oct-08	2008Hok 22	235066	*Amphicarpaea bracteata*	wild	北海道 檜山郡 上ノ国町 宮越 天の川 (宮越駅横)	near Miyakoshi-station, Amanoawagawa (river name), Miyakoshi, Kaminokuni-cho, Hiyama-gun, Hokkaido	N41-45-41.4	E140-10-59.0
2-Oct-08	2008Hok 23	235067	*Lotus* sp.	wild	北海道 檜山郡 上ノ国町 早川 石崎川　採石場	Gravel digging place beside Ishizakigawa (river name), Hayakawa, Kaminokuni-cho, Hiyama-gun, Hokkaido	N41-41-30.8	E140-02-37.7
2-Oct-08	2008Hok 24	235068	*Amphicarpaea bracteata*	wild	北海道 上磯郡 木古内町 吉堀 木古内川	Kikonaigawa (river name), Yoshibori, Kikonai-cho, Kamiiso-gun, Hokkaido	N41-41-10.3	E140-22-50.2
3-Oct-08	2008Hok 25A	235069	*Glycine soja*	wild	北海道 北斗市 大工川 戸切地川 大工川橋横	beside Daikugawa-bridge, Hekirichigawa (river name), Daikugawa, Hokuto-shi, Hokkaido	N41-49-58.1	E140-38-37.5
3-Oct-08	2008Hok 25B	235070	*Glycine soja*	wild	北海道 北斗市 大工川 戸切地川 大工川橋横	beside Daikugawa-bridge, Hekirichigawa (river name), Daikugawa, Hokuto-shi, Hokkaido	N41-49-58.1	E140-38-37.5
3-Oct-08	2008Hok 26	235071	*Amphicarpaea bracteata*	wild	北海道 北斗市 大工川 戸切地川 大工川橋横	beside Daikugawa-bridge, Hekirichigawa (river name), Daikugawa, Hokuto-shi, Hokkaido	N41-49-58.1	E140-38-37.5
3-Oct-08	2008Hok 27	235072	*Amphicarpaea bracteata*	wild	北海道 北斗市 大野川上流 護岸横の草むら	Ohnogawa (river name), Hokuto-shi, Hokkaido	N41-52-12.8	E140-38-21.5
3-Oct-08	2008Hok 28	235073	*Glycine soja*	wild	北海道 北斗市 千代田 大野川 千代田橋横	beside Chiyoda-bridge, Ohnogawa (river name), Chiyoda, Hokuto-shi, Hokkaido	N41-51-05.8	E140-39-10.0
3-Oct-08	2008Hok 29	235074	*Lotus* sp.	wild	北海道 函館市 汐泊川 豊倉橋横	beside Toyokura-bridge, Shiodomarigawa (river name), Hakodate-shi, Hokkaido	N41-46-07.0	E140-51-31.6
3-Oct-08	2008Hok 30	235075	*Glycine soja*	wild	北海道 函館市 汐泊川 豊倉橋横	beside Toyokura-bridge, Shiodomarigawa (river name), Hakodate-shi, Hokkaido	N41-46-07.0	E140-51-31.6

Altitude	Habitat	Shading	Disturb-ance	Population size	Growth stage	Soil	Seed	Harba-rium	Nodule	Re:
3m	grassland	light	med	several plants	pre-mature	sand	yes	yes	no	Amanogawa (river name) river bank near Komori Ohashi
23m	grassland	open	high	a few plants	mature	sand	yes	yes	no	Amanogawa (river name) river side near Miyakoshi Station. a few plants.
23m	grassland	open	high	plenty	mature	sand	yes	yes	no	river side. plenty
29m	grassland	open	high	a few plants	mature	gravel	yes	no	no	Gravel quarry beside Ishizakigawa (river name).
27m	grassland	light	med	plenty	mature	sand	yes	no	no	Kikonaigawa (river name) river bank near Yoshihori bridge
14m	grassland	open	med	several plants	mature	mad	yes	yes	no	Hekirichigawa (river name) river side near Daikugawa bridge
14m	grassland	open	med	several plants	mature	mad	yes	yes	no	Hekirichigawa (river name) river side near Daikugawa bridge
14m	grassland	open	med	several plants	mature	mad	yes	yes	no	Hekirichigawa (river name) river side near Daikugawa bridge
?	grassland	light	med	several plants	mature	sand	yes	no	no	grassland beside Ohnogawa (river name)
8m	grassland	light	med	several plants	mature	sand	yes	yes	no	Ohnogawa (river name) river bank near Chiyoda bridge
2m	grassland	light	high	several plants	mature	sand	yes	yes	no	Shiodomarigawa (river name) river bank near Toyokura bridge. fine sand. large pod & leaf size.
2m	grassland	light	high	several plants	mature	sand	yes	yes	no	Shiodomarigawa (river name) river bank near Toyokura bridge. fine sand. large pod & leaf size.

Photo 1.*Glycine soja*(2008Hok2) population growing on the Kenomai river bank, Hidaka town. They have narrow leaflets and long pods.

Photo 2. *Glycine soja* (2008Hok3) population growing on the Gabari river side, Hidaka town. Soil type is fine black sand. They showed later maturity compared with Hok2 population.

Photo 3. *Lotus* sp. (2008Hok15) population growing near Assabu river, Esashi town.

Photo 4. *Glycine soja* (2008Hok30) population growing on the Shiodomari river bank, Hakodate city. Soil type is fine sand.

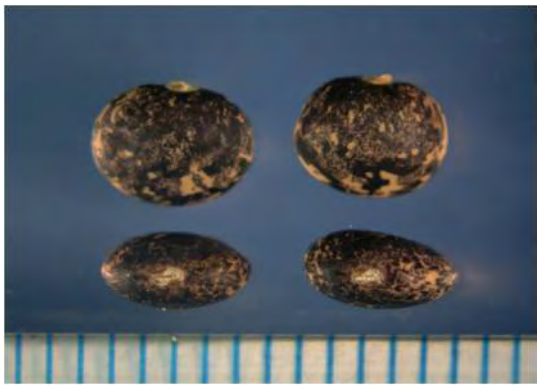

Photo 5. Seeds of *Amphicarpaea bracteata* (2008Hok9) population growing sympatric with *G. soja*, Niikappu town.

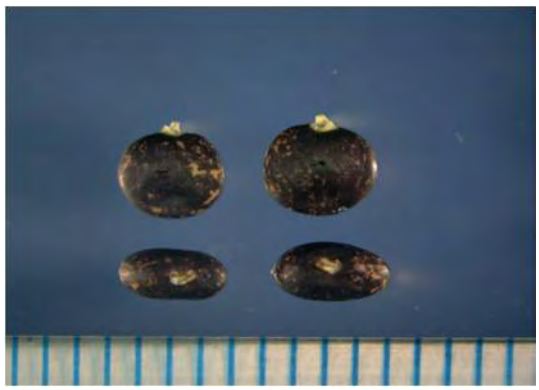

Photo 6. Smaller seeds of *Amphicarpaea bracteata* (2008Hok13) population growing on the Hime river bank, Otobe town. .

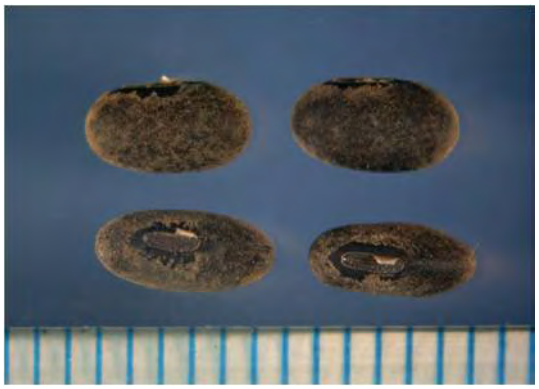

Photo 7. Seeds of *Glycine soja* (2008Hok25A) population growing on the Hekirichi river side bush, Hokuto city.

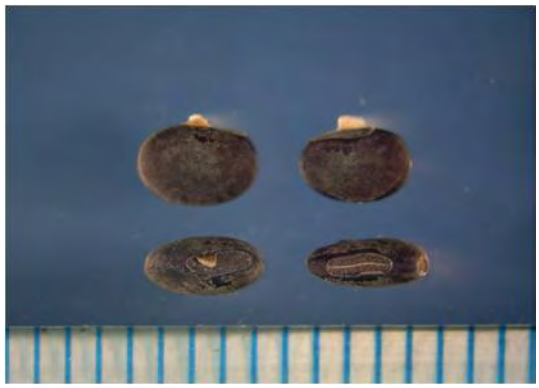

Photo 8. Smaller seeds of *Glycine soja* (2008Hok25B) population growing only 10 m apart from 2008HokA site, Hokuto city.