PLANT GERMPLASM COLLECTION REPORT

USDA-ARS
FORAGE AND RANGE RESEARCH LABORATORY
LOGAN, UTAH

Foreign Travel to:
China
July 12-August 20, 1983

Title: Exploration for Forages in Central and Northwestern China

U.S. Participants

Douglas R. Dewey - Research Geneticist (contact Doug Johnson)
USDA-Agricultural Research Service
Logan, Utah U.S.A.

Non U.S. Participants

William Tai (Brassica Cytogenetics)
University of Manitoba
Winnipeg, Manitoba, CANADA

GERMPLASM COLLECTIONS

Sponsoring Agency: China Program
Office of International Cooperation and Development
U.S. Department of Agriculture
Washington, D. C. U.S.A.

In Cooperation With: Department of Foreign Affairs
Ministry of Agriculture
Animal Husbandry & Fishery (MAAF)
Beijing, PEOPLE'S REPUBLIC OF CHINA

ACTUAL ITINERARY

The requested itinerary was granted by the Chinese MAAF with a few minor exceptions. The primary differences from the requested itinerary concerned means of travel from one province to another. We had hoped to travel from Sichuan to Gansu by van and to collect seeds en route. Instead, we traveled by train, with virtually no opportunity to collect even at the train stops. The Chinese MAAF originally scheduled travel by train from Lanzhou, Gansu to Urumqi, Xinjiang

(3-day trip). Instead we flew (3 ½ hours). The extra 2 days saved by flying vs. train travel was added to the stay at Beijing at the end of the trip.

ACTIVITIES IN EACH PROVINCE

BEIJING: 14-16 July

We were met at the Beijing Airport by Mr. Huang Yong-Ning (Deputy Division Chief, Dept.of Foreign Affairs, MAAF) and Mr. Liu Cong-Meng (a MAAF employee who handled the day-to-day details). Mr. Huang stayed with us during our stay in Beijing and also traveled with us to Chengdu, Sichuan. The apparent reason for Mr. Huang's attention to our needs was his previous acquaintance and contacts with Dr. Tai. This was Dr. Tai's seventh visit to China and he has the attention of the highest level agricultural officials in China.

Those attending the banquet given for us on the evening of July 15 is further evidence of Dr. Tai's standing in the eyes of the MAAF officials. Banquet attendees included:

Xiang Tsong-Yang
Director, Foreign Affairs, MAAF
Beijing

Huang Yong-Ning
Deputy Division Chief
Foreign Affairs, MAAF
Beijing

Qu Ning-Kang
Deputy Division Chief
Division of Science & Technology Exchange
Bureau of Science and Technology, MAAF

Shao Qi-Quan
Deputy Director, Institute of Genetics
Academia Sinica, Beijing

We were pleased that the itinerary we had suggested was approved more or less intact. There was some question whether Qinghai was open to foreigners, but it (at least parts of it) had been opened 2 months previously. We were disappointed that we would be unable to drive from Chengdu, Sichuan to Lanzhou, Gansu; however, the roads and logistics made that plan impractical. Some rescheduling of travel arrangements for Dr. Tai had to be made to

accommodate his return to Beijing several days ahead of Dewey's return. The MAAF had not been informed by OICD of Dr. Tai's early departure from China, but they readily agreed to make the necessary change in plans.

On 15 July we checked in with Mr. Norman Kallemeyn, Agricultural counselor at the U.S. Embassy. We decided that it would be best if we would give all seed obtained during the trip to Mr. Kallemeyn, who would then ship it to the Plant Quarantine Center at Beltsville, MD. A copy of our itinerary was left with Mr. Kallemeyn so that he would know of our general whereabouts during the next five weeks.

In a meeting of 16 July with Dong Yu-Shen-Director of the CAAS's Crop Germplasm Resources Institute (CGRI), a serious matter was raised that threatened to destroy the trip. She said that a recent regulation prevented foreigners from collecting seeds of any kind in the wild. She suggested that we continue with the trip and prepare a list of what we wanted and they would have someone collect it for us at a later date. This arrangement is grossly inefficient and is not really practical. After further consultation with Mr. Huang Yong-Ning, we came to the following agreement. We would make seed collections ourselves and turn the seed over to our Chinese escort, Mrs. Gung Hwa-Tzu, who would deliver the seed at the end of the trip to the CGRI. The CGRI would then send the seed to the Plant Quarantine Center in Beltsville. This is a rather indirect procedure of getting the seed to the U.S., but it was our only viable alternative. In situations where seed was immature at the time of our visit, we would leave seed envelopes and instructions with our local hosts, asking them to collect seed later in the year and send it to the CGRI, who would then forward it to the U.S.

The rule of no collecting in the wild by foreigners has serious implications concerning the future of plant collecting expeditions to China. Although we were able to work out some kind of compromise for forages, it is doubtful that such arrangements can be made for collecting seeds of other crops.

It was agreed that all seed exchanges between the U.S. and the P.R.C. should be channeled through the Plant Introduction Office at Beltsville, MD and the CGRI at Beijing. This, of course, is the best procedure, which will make for an orderly flow of germplasm and also meet quarantine requirements. Dewey had brought 75 collections of grasses, 21 collections of legumes, and 8 collections of shrubs to given to certain individuals in China. These were left with the CGRI for distribution. Eight collections of Atriplex were hand-carried to Xinjiang where they had been specifically requested by a particular organization. A complete list of seeds brought by the U.S. team to China is given in Appendix I.

Although the collecting trip was originally intended only for the acquisition of forages, Dr. Tai also wished to collect Brassica (rapeseed). During the course of the trip, a few Brassica collections were made whenever it was convenient.

While in Beijing, we visited the Forage Crops Laboratory of the Animal Husbandry Institute of the CAAS. This laboratory is responsible for coordinating the overall breeding effort in forages throughout China for the CAAS. The Forage Crops Laboratory is located in poor facilities and they are simply doing survey-type work and strain testing. Nothing significant from a breeding standpoint will come from this laboratory in the foreseeable future. I suggested that they should: (1) quickly decide on which species should be emphasized in the various parts of China, (2) choose the best cultivars that have been bred in other parts of the world, (3) develop the capability of large-scale seed increase of those cultivars, and (4) get on as soon as possible with the use of these cultivars especially on the bast and deteriorated rangeland. In the meantime start developing a plant-breeding capability of their own so that in 10-15 years they may be ale to supplant foreign-bred cultivars with their own. I repeated this same theme throughout the trip, but with little apparent success.

I gave my first seminar at the Forage Crops Laboratory on the topic of "Cytotaxonomy of the Perennial Grasses of the Tribe Triticeae." I repeated this seminar at every location we visited. Dr. Tai served as the interpreter on each occasion and did a splendid job because of his complete fluency in Chinese and English and his knowledge in the field of cytogenetics.

At each location, we were expected to give seminars and participate in discussion sessions in which we were to give advice and guidance on plant-breeding techniques etc. This kind of activity took at least a day at each location and diverted us from our primary purpose of collecting seed. Some of this type of interchange is necessary, but is was excessive. The Chinese benefitted somewhat from these discussion and our experience, but we gained little or nothing other than an appreciation of some of their problems, which are legion.

Before leaving Beijing for Sichuan, we were told that our escort would be Mrs. Gung Hwa-Tzu, an alfalfa breeder from the Forage Crops Laboratory, CAAS. She would, however, not join us until we arrived in Lanzhou, Gansu because Mr. Huang Yong-Ning of the MAAF would accompany in Sichuan.

<u>Key Individuals Encountered in Beijing Include:</u>

Xiang, Tzong-yang
Director of Foreign Affairs
MAAF

Huang Yong-Ning
Deputy Division Chief
Department of Foreign Affairs
MAAF

Qu Ning-Kang
Deputy Division Chief
Science & Technology Exchange, MAAF

Liu Cong-Meng
(a subordinate of Huang Yong-Ning)
Department of Foreign Affairs
MAAF

Prof. (Mrs.) Dong Yu-Shen, Director
Crop Germplasm Resources Institute
CAAS

Prof. Shi Xiao-Shi
Deputy Director
Crop Germplasm Resources Institute
CAAS

Prof. Hu Han
Director
Institute of Genetics, Academia Sinica

Prof. Shao Qi-Quan
Deputy Director
Genetics Institute, Academia Sinica

Xung-De Xiao
Director
Laboratory of Forage Crops
Animal Husbandry Institute
CAAS

Su Jia-Kai
Deputy Director
Laboratory of Forage Crops
Animal Husbandry Institute
CAAS

(Mrs.) Gung Hwa-Tzu
Research Associate
Laboratory of Forage Crops
Animal Husbandry Institute
CAAS
(She served as our escort in Gansu, Qinghai and Xinjiang).

Zhang Ya-Fa
Research Associate
Laboratory of Forage Crops
Animal Husbandry Institute

CAAS
(He wants to come to Logan for a research-training experience.)

SICHUAN: 16-22 JULY

We were met by several provincial agricultural and foreign affairs officials when we arrived by air at Chengdu at 4:00 p.m. on Saturday, 16 July. We were presented an itinerary for the next six days, which involved 2 days of briefings, lectures, and discussions, 2 days of sight-seeing, and 2 days at the Ya-an Agricultural College. There was little that could be done to make the itinerary more useful. A primary purpose in visiting Sichuan was to meet Prof. Yen Chi and his wife Assoc. Prof. Yang Jun-Liang, who are working on the breeding and taxonomy of annual and perennial Triticeae species.

Chengdu and Ya-an are toward the southern limits of distribution of the Triticeae grasses in Sichuan. The only Triticeae group of much consequence in the area is Elymus (=Agropyron and Roegneria) tsukushiensis (=kamoji). This species is already is already in our collection at Logan, Utah. It is of some cytogenetic and taxonomic interest, but of no economic value. During our week in Sichuan, we made only 2 collections; both were E. tsukushiensis (kamoji). From the standpoint of plant collecting, the week in Sichuan was virtually useless. During our visit to Sichuan, Dewey gave two lectures (both on cytotaxonomy of perennial Triticeae). The first lecture was given at Chengdu to an audience of about 20 forage workers form various parts of Sichuan. The second lecture was given at the Ya-an Agricultural College to an audience of about 100. Tai lectured to the same group at Ya-an on general concepts and applications of cytogenetics. The various briefings and discussions were intended to obtain advice and information from us, and we gained little form the discussions.

In spite of the failure to make significant collections in Sichuan, the visit was not without some potential benefits. The contacts with Prof. Yen Chi and Prof. Yang Jun-Liang were beneficial and could lead to the acquisition of germplasm of substantial scientific, if not practical, interest. Profs. Yen and Yang claim to have located diploid strains of Elymus (-Roegneria) ciliaris and Elymus (=Roegneria) tsukushiensis (=kamoji). If so, this represents a significant finding relating to Triticeae phylogeny and taxonomy. Dewey has identified a genome (designated "Y") of unknown origin that occurs in many East Asian Triticeae grasses. He has speculated that if the diploid contributor of the Y genome may still exist in China. Profs. Yen and Yang may have located the Y-genome diploid; however, their findings need to be reconfirmed cytologically. They have promised to send the diploid E. ciliaris to Dewey for verification. They do not have the diploid E. tsukushiensis currently in their possession, but they think it occurs naturally in the Ya-an area, and they will collect extensively in that area until they relocate it.

Profs. Yen and Yang have developed a good herbarium of Triticeae grasses (from may parts of China) at Ya-an. Dewey took photographs of many of the specimens. Profs. Yan and Yang make annual collecting trips to various parts of China, particularly int eh Northwest (Gansu, Qinghai, and Xinjiang) and they have acquired many species of value to Dewey's cytogenetic program. Working through Profs. Yen and Yang may be the most effective means of getting seed of Chinese Triticeae grasses.

Key people encountered in Sichuan:

Yen Chi
Professor (Wheat Breeding)
Agronomy Department
Sichuan Agricultural College, Ya-an

Yang Jun-Liang
Associate Professor (Botany and Taxonomy)
Agronomy Department
Sichuan Agricultural College, Ya-an

Zhou Sou-Rong
Associate Professor (Forages)
Agronomy Department
Sichuan Agricultural College, Ya-an

Lo Peng
Head Biology Department
(Rapeseed Genetics)
Sichaun University, Chengdu
GANSU: JULY 23-30

Because of the MAAF's confidence in Dr. Tai, we traveled unescorted form Chengdu to Lanzhou. A 34-hour train ride beginning at 5:30 p.m. on Friday, 22 July an ending on Sunday, 24 July at 3:30 a.m. took us from Chengdu, Sichuan to Lanzhou, Gansu. The train takes a circuitous route that leads NE to Baoji (near Xian) and then NW to Lanzhou. By the morning of 23 July we were out of the rice growing area of Sichuan and were in the Qin Ling Mountains at elevations near 800 meters. These mountains look similar to those at the Great Wall north of Beijing. Triticeae grasses increased in frequency after we got above 1,000 meters. We had no opportunity to get off the train and do any collecting during the numerous stops, except at the summit at the city of Qin Ling (elevation 1, 380 m). At this stop we collected
Elymus dahuricus and an unidentified Elymus (=Roegneria). The mountains around Qin Ling appear to be a reasonably good collecting areas for Elymus.

After the summit at Qin Ling, the railroad drops sharply to 620 m, where warm season grasses (especially Bothriochloa) prevail. The elevation then gradually increased as we traveled toward Lanzhou, which is about 1, 500 m. During the course of the trip from Chengdu to Lanzhou, we passed through more than 200 tunnels, which are indicative of the mountainous nature of much of terrain.

We were met at our 3:30 a.m. arrival at Lanzhou on Sunday, 24 July by Prof. Wu Ren Run (a previous acquaintance of Dewey's) and several other officials. That afternoon, we were briefed and presented an itinerary to Prof. Ren Jiz-Hou (an acquaintance of Dewey's), or principal contact in Gansu. The schedules called for two days at the Huangchen Sheep Commune about 440 km W of Lanzhou, a day at Prof. Ren's Grassland Station at Ungfeng, and day of lectures

and discussions. The remaining time was spent in travel. This appeared to be a good itinerary, on that would lend itself to considerable plant collecting. We were accompanied to the Sheep Commune and the Grassland Station by Prof. Wu Ren Run, Prof. Keng Bao Jai, and Prof. Zhang Peng-Yuin. Prof. Wu is a senior scientists with the Animal Husbandry Institute of the CAAS at Lanzhou. He has broad knowledge of the vegetation in the area, and he prepared an extensive checklist of all the vegetation growing at or near the Huangchen Sheep Commune. Prof. Keng is a well known botanist form the University of Nanjing. (His father, Keng Yi-Li, edited the Grass Flora of China.) Keng Bao-Jai had been visiting in Lanzhou and delayed his departure from Lanzhou so that he could accompany us. Prof. Zhang (a previous acquaintance of Dewey's) is a member of the Biology Department at the University of Lanzhou. He is very knowledgeable botanist and is well acquainted with the flora of Gansu.

Unfortunately, we were able to do very little plant collecting in Gansu because our two primary collection sites -- The Huangchen Sheep Commune and the Yungfeng Grassland Station-- were at elevations of about 2,600 meters and the grasses were mostly at the pollen shedding stage. Collecting in areas above 2, 000 meters should be done in late August or early September.

he Huangchen Sheep Commune is in a prime grassland area of the Qilian Mountains, which separate Gansu and Qinghai Provinces. Much of the grassland area is between 2,600 and 3,000 meters. The terrain then turns into forested mountains that reach to 4,700 meters. Some of the prominent forage species in the area include: Leymus dasystachys, Elymus nutans, Agropyron cristatum, Achnatherum splendens, Stipa spp., Hedysarum multijugam, Medicago sativa, M. falcata, M. media, and Trigonella ruthenica.

No collections were made at the Sheep Commune. However we left some seed envelopes with the manger of the Commune and asked him to collect for us later and send the seed to Prof. Wu Ren-Run or Prof. Ren Jiz-Hou, who would send it to the CGRI at Beijing for shipment to us. Chances of getting seed through these channels are not too good. The Sheep Commune is really in a remote area (they never had foreign visitors prior to our visit) and their contacts with institutions in Lanzhou are very infrequent.

The Yungfeng Grassland Experiment Station is part of Prof. Ren Jiz-Hou's Grassland Ecology Institute. The Experiment Station is located about 170 km NW of Lanzhou on the road toward Wuwei. This is another excellent collecting site, but we were 3-4 weeks too early to get seed. Some of the forage species that grow in this area are: Elymus nutans and its close relatives, Elymus dahuricus and its close relative, several single spikelet Elymus (=Roegneria), Agropyron cristatum, Leymus dasystachys and its close relatives, Astragalus spp., and Oxytropis spp.

Between kilometer markers 193 and 194 on the Lanzhou to Wuwei highway, we located an Elymus with 2 spikelets per node and the spikelets were on short pedicels, somewhat like the pedicels seen in Brachypodium. The species is not Elymus nutans nor is it Brachypodium. It may be a connecting species between Elymus and Brachypodium. We received assurances from Prof. Ren Jiz-Hou as a grass specialist and interpreter) that they would collect for us in the area in and around the Experiment Station early in September. Seed envelopes were left with Prof. Zhang, Prof. Wu, and Mrs. Wang. We have every reason to believe that we will get seed from these people.

The last full day (29 July) in Gansu was spent in lectures and discussions. Dewey gave his usual lecture on grass cytotaxonomy. During the discussions, we again raised the issue of the Grassland Institute and the University of Lanzhou in collecting for us later in the year. They agreed to do this and they will forward the seed to the CGRI at Beijing.

On Saturday, 30 July, we made a dozen collections on the grounds of the University of Lanzhou and in the southern suburbs of the city. Inasmuch as Dewey had collected in these areas in 1980, it is doubtful that anything new was obtained. After more than 2 weeks in China, we had made only 16 collections. At this point we were of course rather discouraged.

Key people in Gansu include:

Ren Jiz-Hou
Professor of Range Science
Director of the Grassland Ecology Institute
(Prof. Ren is influential politically as well as scientifically.)

We Ren-Run
Professor (Forages)
Animal Husbandry Institute
CAAS

Zhang Peng-Yuin
Professor (Botany)
University of Lanzhou
(He will collect for us. He has a student that he would like to send to Logan.)

Mrs. Wang Yan-Rong
Interpreter and forage specialist in Prof. Ren's
Grassland Ecology Institute
(She will do most of the subsequent collecting for us. She has and interest in coming to Logan for further training and study.)

QINGHAI: 31 July - 4 August

We traveled by train (5 hours) from Lanzhou, Gansu to Xining, Qinghai on the afternoon of 30 July and were met at the train station by Prof. Guo Pen-Chao, Head of the Botany Department of the Northwest Plateau Institute of Biology. The next morning, we were welcomed by the Director of the Institute. The Institute, which is part of Academia Sinica, has five departments--Zoology, Ecology, Botany, Agronomy, and Information. Although the Ansated has has foreign visitors in the past, we were the first to visit the Botany Department.

Prof. Guo is a nationally recognized botanist, being one of the joint authors of Keng Yi-Li's 1959 Grass Flora of China. Prof. Guo is one the two authors of the Triticeae treatment in the forthcoming 80-volume Flora of China. The other co-author of the Triticeae in the new flora is Yang Xi-Ling form the Inner Mongolia College of Agriculture.

Our itinerary in Qinghai called for two days in the vicinity of Qinghai Lake, about 150 km West of Xining. Another day was to be spend in Dunghe County at a sand desert site. Qinghai is a plateau province, and Xining (its capital) is about 2,000 meters elevation. Our intended collecting sites around Qinghai Lake and in Dunghe County are at elevations near 3,000 meters. As in Gansu, most grasses at these elevations were just shedding pollen by 1 August. Consequently, we were unable to make significant collections in Qinghai. Nevertheless, Prof. Gou promised to collect seed for us later in the year. We left 75 seed envelopes with him for this purpose.

Because of our inability to make collections at high elevations, we cut our visit to the Qinghai Lake and Dunghe County area to only 2 days. During this time we observed the following forage species that are quite common in the area: Agropyron cristatum, Elymus nutans, and its close relatives, Elymus dahuricus and its close relatives, Leymus dasystachys and its close relatives, several single-spikelet Elymus (=Redgneria), Pennisetum sp., Achnatherum sp., Stipa sp., Astragalus sp., Oxytropis sp., Iris sp., and Hedysarum multijugam.

As we returned to Xining on 1 August, we made 6-8 collections along the roadside at elevations below 2, 500 meters. On subsequent days, we made additional collections in the experimental plots of the Biological Institute at Xining and in the suburbs of Xining. Our 5-day say in Qinghai netted a meager 20 collections, making a grand total of 36 collections after 3 weeks in China. At this point, the trip looked like certain disaster from a collecting standpoint.

Considerable benefit was gained by our visit to Qinghai in spite of the meager collecting. The Institute of Biology has a good herbarium and parts of two days were spend in the herbarium. Dewey photographed about 75 specimens of Triticeae grasses. These will give a better understanding of the Triticeae germplasm that is found in Qinghai and surrounding provinces.

While Dewey was involved in herbarium study, Tai demonstrated the use of new microscope equipment recently acquired by the Institute. The Chinese seem to be intent on obtaining quite expensive and sophisticated equipment, but they often do not have the training and expertise to use that equipment to its best advantage.

As at other locations, Dewey gave his lecture on cytotaxonomy of Triticeae grasses. The main message of that lecture is that the Chinese should consolidate the genus Roegneria with Elymus. Chinese taxonomists are the only group worldwide that still recognize Roegneria as a valid genus. It is important that they give full consideration to this matter before their new flora is prepared. The cytogenetic facts strongly support the absorption of Roegneria into Elymus. Prof. Gou was very receptive to this concept and he intends to use his influence in making that consolidation. Botanists and agronomists at all other locations that we visited likewise seemed predisposed to accept Dewey's recommendations to consolidate Roegneria with Elymus. If this one point can be made and accepted, then the many lectures will not have been without some tangible benefits.

It was necessary to return to Lanzhou to catch a plane to Urumqi, Xinjiang rather than flying directly from Xining. We asked, and were given permission, to return to Lanzhou by van so that we could collect seed en route. Unfortunately, it rained very hard on the return trip and we were unable to do any collecting. What else could go wrong? About half way between Xining and Lanzhou we go caught in an active rock slide (caused by the heavy rain) that blocked the road ahead. We were able to get turned around and went back to a small town where we were able to catch a very slow train to Lanzhou, arriving at 9:00 p.m.

Key people at Xining, Qinghai include:

Gou Pen-Chao
Professor (Botany)
Head, Botany Department
Northwest Plateau Institute of Biology
Academia Sinica

Wang Shi-Jin
Research Associate (grass cytogenetics?)
(This man will probably be the person who made subsequent collections for us.)

XINJIANG: 5-12 August

Our original itinerary called for train travel (3 days) from Lanzhou, Gansu to Urumqi, Xinjiang. Thank goodness we were able to fly, which took 3 ½ hours. The plans was propeller driven and traveled about 250 mph, but that sure beats the train. We were met at the Urumqi Airport by Prof. Xu Peng (a previous acquaintance of Dewey's) of the August 1st Agricultural College, Mr. Chen Xiang-Jiao (another acquaintance of Dewey's) form the Grassland Institute of the Xinjiang Bureau of Animal Husbandry, and by several other officials.

The itinerary called for 2 days of seminars and discussions (one day at the beginning and one day at the end). Five days were scheduled for field work in Fukang County (60 kn N of Urumqi, Tian Lake (90 km N of Urumqi), and south Mountain (60 km SW of Urumqi). The elevation at Urumqi is about 900 meters and the areas we were schedules to visit were less that 2,000 meters, so we would be in areas where seed is mature.

On 6 August we visited the August 1st Agricultural College and were briefed on the grassland vegetation in Xinjiang. Prof. Xu described the following types of grazing lands with the most common vegetation.

1. Sand Dune Areas: Calligonum, Aristida, Artemesia, Ephedra, Salsola, Tamarisk
2. Desert Grassland: Achnatherum, Stipa, Festuca, Caragana, Artemesia, Eurotia.
3. Semiarid Grassland: Agropyron, Festuca, Stipa, Leymus, Vicia, Astragalus, Artemesia, Medicago.
4. Sub-alpine Meadow Grassland: Elymus, Roegneria, Elytrigia, Bromus, Koeleria, Agropyron, Astragalus, Medicago.

We asked to be take to the semiarid and subalpine grassland during our visit. With one exception, they accommodated our request. Dewey gave his cytotaxonomy lecture to an audience of about 75. No one seemed opposed to the idea of combining Roegneria with Elymus.

On Sunday, 7 August we left of Fukang County. Mr. Chen Xiang-Jao served as the escort during our entire stay in Xinjiang. In spite of our earlier request not to visit desert and sand dune sites, they is exactly where we went first. We wasted a half day without seeing anything of interest to us. With some persuasion from Dr. Tai, they agreed to take us into some nearby mountains during the afternoon. Although it rained quite hard during the afternoon, we made 14 collections. This was our best day yet.

The visit to Tian Lake on 8 August was unusually successful thanks largely to the efforts to a Fukang County local agricultural official (a Kazakh) who got us into ungrazed areas on the far side (east) of Tian Lake. Through his influence, we were taken by boat across Tian Lake and set off for 2 ½ hours to do collecting. The only problem was that it started raining and kept it up for most of the 2 ½ hours. We got thoroughly wet because we couldn't let this collecting opportunity pass. The ungrazed area is extremely rich in grasses and legumes. We finally saw what the native undisturbed vegetation of the Tian Shan Mountains is like, and we were greatly impressed. The problem lies in getting access to areas of this nature.

During the day, we made 46 collections (elevations ranging from 900-1,900 meters) of various species of Elymus (including Roegneria), Leymus, Elytrigia, Psathyrostachys, Festuca, Poa, Bromus, Phleum, Stipa, Vicia, Astragalus, Medicago, Trifolium, and Brassica.

Dr. Tai had to return to Urumqi on 9 August and then to Beijing in the afternoon of the same day. He left China on 12 August to meet other commitments he had in Washington D. C. On 19-20 August.

On 9 August, Dewey and the other collected in a side canyon off the road to Tian Lake. Altitudes ranged form 1,750 downward to 1,100 meters. Much of the same species seen at Tian lake were found in the side canyon, known as the "Groove". It had rained heavily during the night, so we were unable to get into the mountains until about noon. Nevertheless, 40 collections were made during the half day.

After 3 days in Fukang County and at Tian Lake, we returned to Urumqi in preparation for spending the final two days in the South Mountain area. During those two days, 10 and 11 August, another 42 collections were made at elevations ranging from 1,500 to 2,000 meters. Nothing especially new was collected at South Mountain except for one species of Elymus

(=Roegneria) that we hadn't seen before and a Vicia species with large pubescent pods and seeds almost as large as peas.

In addition to the collections made in the mountains on both sides of Urumqi, we made a number of collections inside the guest house compound where we stayed at Urumqi. The compound is a large (40-50 acres) wooded area (artificially planted) with considerable grass, legume, and forb understory. Dewey stayed in the compound in 1980 and made some of the same collections. We tried not to duplicated those collections in 1983.

Were it not for the week in Xinjiang, our trip would have been very disappointing. However, Xinjiang made it worthwhile. Of the 202 collections made in Chain, 166 came from Xinjiang. As at other locations, we left seed envelopes with key people, Xu Peng and Chen Xiang-Jiao, asking them to collect additional accessions for us as the opportunity arises.

In the evening of 11 August, Prof. Xu Peng and a colleague came to the guest house to discuss the possibility of sending trainees to Logan for experience in range improvement and plant breeding and cytogentics. I expressed my willingness to accept someone in our laboratory at Logan. I am to contact the Range Science Department at Logan to see if they would be interested in developing a cooperative relationship with the August 1 Agricultural College with respect to range science maters. I also promised to put the U.S. Bureau of Land Management in contact with the August 1st Agricultural college. The BLM could supply some badly needed experts in the revegetation of China's abused and deteriorated rangeland.

The next morning (12 August) I met with Chen Xiang-Jiao and eight others form the Bureau of Animal Husbandry and the August 1st Agricultural College concerning matters of future cooperation. The Forage and Range Research Unit at Logan, Utah, will establish further ties at least through correspondence. As promised the previous evening to Prof. Xu, I will try to initiate contacts between the Chinese forage and range people in Xinjiang and Utah State University as well as the BLM. Because much of Xinjiang is climatically similar to Utah, the connections between the two groups is very logical.

BEIJING: August 13-18

Original plans called for spending 3 days in Beijing at the end of the trip. The 2-3 days saved by taking the plane instead of the train to Urumqi, Xinjiang was added to the stay at Beijing. The logical thing to do would be to extend the stay in Xinjiang and do more collecting. However, our hosts in Xinjiang were unprepared to do this. On returning to Beijing, I contacted the Pan Am office to get my ticket changed to depart on 16 August rather than 19 August. Because of the nature of the ticket, it could not be changed, so I had three extra days in Beijing. These days were used in report writing and visits to the Institute of Genetics and the Institute of Botany, and sight-seeing.

All seed collections were delivered to the CGRI on Monday, 15 August. Prof. Dong Yu-Shen (Director of the Institute) was on a field trip to Xinjiang, so I met with the Deputy Director, Zhi Ziao-Zhi. I explained the necessity of sending the seed to the U.S. Plant Quarantine Station at Beltsville as soon as possible and by air-mail. Mr. Zhi seemed most cooperative and assured me

that it would be sent expeditiously. Apparently, they will ask the Institute of Botany to identify the collections that I could not apply a species name to. This may take a few weeks.

In a subsequent discussion (18 August) with Norman Kallemeyn (Agricultural counselor, U. S. Embassy) we decided that it would be best if the CGRI were to give the seed to our Embassy, who in turn would ship it to Beltsville via pouch mail. Before leaving Beijing on 19 August, I asked Mr. Liu Cong-Meng (MAAF host) to relay the seed shipping instructions to Mr. Zhi Xiao-Shi at the CGRI. As a follow-up, I wrote a letter to Prof. Dong Yu-Shen as soon as I got back to Logan reiterating the request to give the seed to the U.S. Embassy in Beijing.

By invitation from the Institute of Botany, I presented the lecture on cytotaxonomy of the Triticeae grasses to a group of about 25 scientists on 15 August. This made seven times I had given the same lecture, but to different audiences. This is getting a lot of mileage out of one lecture. Fortunately I had anticipated being asked to give lectures, so I prepared slides that could be used to illustrate the lecture. Although the lecturing took considerable time, I felt that it was worthwhile in that it promoted a new and better taxonomic philosophy. Any scientist visiting China should be prepared to give lectures and seminars.

In the afternoon of 17 August, I was visited in the hotel by Liu Zhi-Wu (CGRI), Gung Hwa-Tzu (our trip escort), and Zhang Ya-Fa (Forage Crop Laboratory, Animal Husbandry Institute, CAAS). Mr. Liu had spend 2 years in the U.S. working with Tai at Michigan State and with me at Utah State. The purpose of the visit was to see if I would accept Mr. Zhang in our laboratory at Logan for a 2-year training-study period. I agreed to this if Mr. Zhang could obtain the necessary financial support from China. He apparently has this support and only had to pass an English competency test. He will take the test on the 25 August.

On 18 August I submitted a short written "critique" of our trip to Mr. Kallemeyn at the U.S. Embassy. It briefly summarized the activities of the trip and included some general observations and recommendations. Some version of this critique will be cabled to appropriate officials in Washington, D. C.,

I departed Beijing on the morning of 19 August, spent the night at Narita, Japan, and returned home on 20 August. It was good to get back home!!

SUMMARY

Thirty-five days (15 July-18 August) were spent in China (Beijing, Sichuan, Gansu, Qinghai, and Xinjiang) by D. R. Dewey (Logan, Utah) and William Tai (Winnipeg, Manitoba) with the express purpose of collecting forages in the wild. The general itinerary suggested by the U.S. side was granted by the Chinese MAAF with a few exceptions regarding mod of travel from province to province. While still in Beijing, the trip was threatened by a statement from Prof. Dong Yu-Shen (Director of CGRI, CAAS) that China had adapted a policy that prohibited foreigners form collecting any germplasm in the wild. Prof. Dong's suggestion was to continue with the trip and simply survey the vegetation, and CAAS scientists would collect for us at a later date. Such a plan was unacceptable to us. It was finally agreed after consultation with Huang Yong-Ning (Deputy Director of Foreign Affairs, MAAF) that we would be allowed to

collect the seed ourselves but then turn it over to the CGRI. The CGRI would subsequently send the seed to the U.S. Although this appeared to be an unnecessary procedure, we agreed to it rather than to discontinue the trip.

The 7-day visit to the Sichuan Province was almost useless from the standpoint of plant collecting (only two collections were made). We had originally intended to collect as we traveled by van from Chengdu, Sichuan to Lanzhou, Gansu. However, we had to travel by train, which almost preempted plant collecting en route (two collections were made at one train stop). In spite of the failure to make significant plant collections, the stay in Sichuan was not without value. Contacts established with Profs. Yen Chi and Yang Jin-Liang (Sichuan Agricultural College) and Prof. Lo Peng (Sichuan University) should be useful for germplasm exchanges in the future.

The 8-day visit to the Gansu Province was not much more effective than the visit to Sichaun (12 collections were made in Gansu). We visited two excellent grassland sites (Huangchen Sheep Commune and Yungfeng Grassland Station) several hundred kilometers west of Lanzhou. However, both sites were at elevations above 2,600 meters, and seed was not yet formed. Although we were unable to collect ourselves, we were given strong assurances from Prof. Ren Jiz-Hou (Director of the Gansu Grassland Ecology Institute) that collections would be made for us in late August or early September.

The 5-day visit to Qinghai was almost a repeat of the visit to Gansu. We made only 20 collections in Qinghai. Excellent grassland sites were visited int eh area of Qinghai Lake and in Dunghe County, about 150 km west of Xining (the capital of Qinghai). However, these sites were all above 3,000 meters and seed was not yet formed. Examination of an excellent herbarium at the Northwest Plateau Institute of Biology (Xining) showed that many Triticeae grasses occur in Qinghai. Prof. Guo Pen-Chao (a Triticeae taxonomist and our host in Qinghai) promised to have collections made for us later in the season.

The most successful part of the trip was the 8-day stay in Xinjiang. Of the 202 collections made in China, 166 came from Xinjiang. Most collections were made in the Tian Shan Mountains about 90 km NE of Urumqi (capital of Xinjiang) and at another area (South Mountain) about 60 km SW of Urumqi. Xinjiang offers great potential for forage collecting, however, we were able to collect in a small part in the immediate vicinity of Urumqi. Prof. Xu Peng (August 1st Agricultural College) and Mr. Chen Xiang-Jiao (Bureau of Animal Husbandry) indicated that they would collect for us in a wilder area of Xinjiang.

The following list summarizes our collections during the 35-day trip:

Genus	No. of Collections
Agropyron cristatum	4
Astragalus sp.	8
Brassica juncea	3
Brassica sp.	18
Bromus inermis	7

Dactylis glomerata	2
Elymus (Roegneria) ciliaris	3
Elymus (Roegneria) multiculmis	1
Elymus nutans	2
Elymus sibiricus	9
Elymus submuticus	2
Elymus (Roegneria) tsukushiensis)	5
Elymus (Roegneria) ugamicus	1
Elymus spp.	32
Elytrigia aegilopoides	8
Elytrigia repens	11
Festuca arundinacea	1
Festuca ovina	1
Hedysarum multijugam	2
Hordeum bogdanii	4
Hordeum brevisubulatum	3
Leymus angustus	5
Leymus dasystachus	5
Leymus multicaulis	2
Leymus ramosus	2
Leymus sp.	1
Medicago falcata	7
Medicago sativa	4
Medicago sp. (annual)	1
Phleum sp.	2
Poa sp.	2
Psathyrostachys juncea	6
Stipa spp.	7
Trifolium fragiferum	1
Trifolium repens	5
Vicia spp.	7
Shrubby legume	2
TOTAL	206*
*Included 4 collections from Japan DT-3001 *Elymus tsukushiensis* DT-3002 *Festuca arundinacea* DT-3003 *Elymus tsuushiensis*	

DT-3004 *Brassica sp.*

In a letter to Dewey dated 20 September 1983, Dong Yu-Shen stated, "I have turned (16 September) the 184 accessions of forage seed you collected this summer in China to the Agricultural Counselor, Mr. Norman Kallemeyn at the U.S. Embassy via our Ministry of Agriculture. All accessions have been turned to the U.S. Embassy except the few ones which are not allowed to be sent according to our country's regulation."

The ultimate success (or failure) of this collecting trip depends largely on what happens in the future. If promises are kept to collect for us and that seed actually gets sent to the U.S. (In a reasonable length of time) the trip will have been quite successful. The germplasm that we collected ourselves probably will not justify the time and expense put into the trip. Other incidental benefits should accrue from the trip. Several Chinese scientists and students appear to be intent in pursuing training and academic work at Logan and Winnipeg. Professional contacts of this nature should facilitate germplasm exchange. Only time will answer the question of whether or not the present trip was worth the effort.

CONCLUSIONS AND RECOMMENDATIONS

Germplasm exchange between the U.S. and the P.R.C. continues to be a sensitive issue that must be approached with a great deal of discretion. Although the Chinese stand to gain more that the U.S. from free germplasm exchange, they seem to have the feeling that they might be exploited. The practice of sending U.S. collectors to collect germplasm in the wild is looked on with suspicion as evidenced by the recently announced policy prohibiting collecting by foreigners. Permission given to Dewey and Tai to collect forages may be a one-time exception to that policy. Another forage collecting expedition should be proposed in the near future to test the Chinese policy toward forages. Retention of the privilege to collect forages in the wild should make it easier to secure similar privileges in other crops at a later date.

Plant collecting in China is rather inefficient because: 1) large parts of China are not yet open to foreigners 2) itineraries are inflexible after they have been established, 3) access to some areas is difficult or impossible because of poor road network, 4) heavy "extracurricular" demands (seminars, discussions, sightseeing, etc.) are placed on a collector's time. There is little chance

that these impediments will change in the near future. If a scientists is not willing to accept these restrictions, he should not even consider a collecting trip to China.

Field collecting by U.S. scientists in China may in certain situations be less efficient than arranging for Chinese specialists to collect in our behalf. Before one can expect a Chinese colleague to collect for him, the following conditions must be satisfied. 1) A personal relationship involving a sense of mutual confidence and mutual benefit must be established. 2) Every effort should be made to fill the germplasm requests of cooperators. 3) All parties need to understand and work through the established germplasm channels in the two countries. These conditions seem to have been met with respect to cool-season forages. The success or failure of vicarious plant collecting for forages in China will be obvious in the nest few months after our Chinese hosts have had the opportunity to send the seed they promised to collect. If this procedure proves to be effective, the urgency of further U.S. forage collecting expeditions to China will be diminished but not eliminated.

After two rather extensive visits to China (1980 and 1983), it is apparent that East Asia is not as important as Central Asia as a source of forage germplasm for use on arid and semiarid sites in North America. Future collecting expeditions for arid cool-season forages should be concentrated in and around the Tian Shan and Altai mountain ranges in the Xinjiang Province.

APPENDIX I - FORAGE COLLECTIONS PRESENTED TO THE CGRI OR OTHER

ORGANIZATIONS IN CHINA

Species		Accession No.
		GRASSES
Agropyron cristatum	PI	172690
		180794
		203439
		203443
		225955
		222957
		229909
		234459

		297869
		297870
		311005
		314596
		314602
		325180
		330685
		439929
		439933
Agropyron desertorum	PI	284868
		314604
		340061
		345584
		406446
		429775
		439959
		439979
Agropyron sibiricum	PI	440090
		440093
Elymus caninus	PI	109012
(=Agropyron caninum)		314629
		439906
Elymus drobovii	PI	314201
(=Agropyron drobovii)		314203
Elymus fibrosus	PI	406448
(=Agropyron fibrosum)		439999
Elymus lanceolatus	PI	223663
(=Agropyron dasystachyum)		
Elymus transhyrcanus	PI	314202
(=Agropyron leptourum)		314206
		401255
		401262
		401266
Elymus longearistatus	PI	401278
(=Agropyron longearistatum)		401283

Elymus trachycaulus	PI	236699
(=Agropyron trachycaulum)		372643
		372645
		372648
		387887
Elytrigia elongatiformis	PI	229924
(=Agropyron elongatiforme)		380625
		383543
		401110
Elytrigia intermedia	PI	204384
(=Agropyron intermedium)		204854
		223668
		229918
		316122
		317406
		345586
		380632
Elytrigia intermedia-trichophora	PI	401208
(=Agropyron trichophorum)		401225
		440043
Thinopyrum ponticum	PI	109452
(=Agropyron elongatum)		142012
		179162
		401006
		401007
		LEGUMES
Cicer arietinum	PI	193767
		251027
		315806
		360433
Lens culinaris	PI	178947
		297790
		374116
		431900

Medicago sativa		Travois
		BC-79
		GP-52-111
		U-5660
		Deseret
Phaseolus vulgaris	PI	151029
		229771
		353545
		416513
Vicia faba	PI	195855
		284345
		358269
		430718
		SHRUBS
Atriplex canescens		B95-79
		U-92-79
		U-36-71
		B-127-79
		U-127-79
Atriplex cuneata		U-11-78
Atriplex confertifolia		U-23-78
Atriplex tridentata		U-5-79