EXPLORATION FOR RUBUS GERMPLASM IN GUIZHOU PROVINCE, PEOPLE'S REPUBLIC OF CHINA (1992)

A CHINA-USA COLLABORATIVE PROJECT

WITH

NANJING BOTANICAL GARDEN
MEM. SUN YAT SEN
NANJING, JIANGSU PROVINCE, PRC

GUIZHOU BOTANICAL GARDEN
GUIZHOU ACADEMY OF SCIENCES
GUIYANG, GUIZHOU PROVINCE, PRC

USDA-ARS
NATIONAL CLONAL GERMPLASM REPOSITORY
CORVALLIS, OR, USA

Report prepared by: Maxine M. Thompson

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of wild fruits, and other plants, in Guizhou Province, has a valuable fund of information about local plants and their location which he quite willingly shared with us. His quiet sense of humor provided many chuckles to the team. His demonstration of Chinese opera singing was a new cultural delight for us.

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Mr. Zhu De Hong, skillful driver, observant plant collector, and talented musician. His final contribution, the composition and singing of a "Team Song", was a touching finale to a grand trip. We tape-recorded his singing of this song which will serve as a happy momento. This song is presented in Appendix 1.

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ADDRESSES OF PRINCIPAL PARTICIPANTS

Prof. He Shan An, Director
Prof. Gu Ying, Research Professor
Nanjing Botanical Garden
Mem. Sun Yat-Sen
Nanjing, 21004
Jiangsu, PRC
Phone 011-86-25-432033
FAX 011-86-25-432074

Mr. Gong Deshen, Director
Mr. Shi Shengde, Vice-Director
Guizhou Botanical Garden
Liuchongguan
Guiyang, 550001
Guizhou, PRC
Phone 623112 or 622403

Dr. Maxine M. Thompson
Research Horticulturist
USDA-ARS
National Clonal Germplasm Repository
33447 Peoria Rd.
Corvallis, OR, 97333, USA
Phone 503-750-8712
FAX 503-750-8717

Ms. Judith Young
Inkstone Book Services
2821 29th Ave. West
Seattle, WA 98199, USA
Phone 206-284-4120

INTRODUCTION

Southwest China has long been considered to be a major center of diversity for the sub-genus Idaeobatus of the genus Rubus because of the large number of species there. It is also the major center for the sub -genus Malachobatus. This proposal targeted for exploration Guizhou Province. Flora Guizouensis describes 62 species and II varieties in 4 Subgenera--Idaeobatus (26), Malachobatus, (34) Dalibardastrum (1), and Chamaebatus (1). One new species, R. qianglongensis has recently been discovered and will be described soon. We found an additional 6 species not previously recorded in this Province. Therefore, there is at least 69, and most likely more, Rubus species there (Appendix 2). Rubus plants can be found throughout the Province, with some species being widespread and common, whereas others are very rare.

Our objectives were to locate as many of these species as possible, to collect seeds, herbarium specimens, flower buds for meiotic chromosome studies, and to make notes on their location, habitat, plant characteristics, and to make photographic records of their vegetative and reproductive phases.

GEOGRAPHY AND CLIMATE

Guizhou Province lies in the southwest part of China between Sichuan on the north, Hunan in the east, Guanxi in the south, and Yunnan to the west. The latitude ranges from 24° 40' N to 29° 15' N and the longitude ranges from 104° 38' E to 109° 30' E. The Province occupies 176,000 km^2 and, administratively, is divided into 87 small counties. The elevation ranges from about 300 m to 2,900 m on the highest peak.

Virtually all of the Province is mountainous with over 70 % of karst origin. The landscape with its precipitous cliffs, ridges, river valleys, underground rivers and caves, and interesting peaks, altogether creates a magnificent park-like scenery. In spite of the inhospitable terrain for agriculture, the slopes are intensively farmed. However, even with the intense land use and high population, there still remain many wild plant species because of the relatively mild climate (warm sub-tropical to temperate) and favorable moisture conditions. The weather is influenced by the southeast monsoon which, overall, creates a relatively warm, humid climate. Because of the elevation, summers are not excessively hot and yet winters are not severely cold. Most of the rain falls during the

growing season (spring and summer) which makes a favorable situation for natural plant growth.

ORGANIZATIONAL ASPECTS

This expedition was a cooperative venture involving two Chinese Institutions, the Nanjing Botanical Garden in Nanjing, Jiangsu Province, and the Guizhou Botanical Garden in Guiyang, Guizhou Province, and the U.S.D.A., National Clonal Germplasm Repository, Corvallis, OR. The initial concept was provided by Dr. Gu Ying and Dr. He Shan An, and the proposal was developed by these scientists in cooperation with Dr. Maxine Thompson, NCGR, Corvallis.

Dr. He Shan An, Director, Nanjing Botanical Garden, facilitated our entry to China, first, by obtaining the necessary official letters and permits for cooperative botanical research in China. His liason role was critical for the identification of our cooperators in Guizhou. After welcoming us to China when we arrived in Shanghai, he accompanied us to Guiyang to introduce us to the Guizhou botanists and then spent a few days to assist in our orientation and organizational plans.

Mr. Gong De Shen, Director of the Guizhou Botanical Garden, and his staff planned the schedule and itinerary and made all the arrangements for travel, including providing the vehicles and drivers, making reservations at hotels or hostels, and locating restaurants.

The exploration grant was handled as follows. A contract was prepared for the entire amount between the U.S. National Plant Germplasm System and Dr. He Shan An. Dr. He retained a portion of the funds for his costs in making initial arrangements and for costs incurred by his staff members who accompanied us to Guizhou, and the remainder was transferred to Mr. Gong, who then, at his discretion, provided for the entire team's costs throughout the expedition in Guizhou.

The team consisted of 10-13 persons at varying times; 2 scientists from Nanjing Botanical Garden, 4 scientists, 2 staff persons involved with supplies, arrangements, etc., and 3 drivers from Guizhou Botanical Garden, and 2 scientists representing the U.S. National Clonal Germplasm Repository. The large size of the team (10-13 persons) had the distinct advantage of our being able to make more extensive plant sightings and to achieve a greater number of collections. On the other hand, with so many people collecting, sometimes in different locations, it was not possible to make systematic, detailed notes on all the species because some of these I, personally, did not collect nor see growing in their natural habitat.

Sometimes a large number of species were collected by different persons on the same day and then assembled together and numbered at the end of the day. In these cases there was insufficient time to make complete notes. Finally, the language barrier also restricted my access to much discussion that transpired about the plants.

The itinerary of the first trip (the one in which we Americans participated), which is described in detail in another section of this report, involved travel by minibus, jeep, and automobile (during the first 2 weeks). We explored the northeast, southeast and southwest, but did not have time for the northwestern region. Much of the time we were in autonomous tribal regions, and much of the itinerary was in regions closed to foreigners (except with special permit), primarily because there are no tourist facilities developed as yet. Therefore, the usual plan was to drive to a destination where our hosts knew there were government hostels for traveling Chinese on official business, such as the Ecological Station, army reserve training hostels, seed distribution center, truck stops, etc. Then we made single-day excursions in different directions in the vicinity of these headquarters, collecting at stops along the roadside as well as on hikes into the mountains.

Overall, we were very satisfied with all organizational aspects of the expedition. Our hosts could not have been more considerate for our needs. The trip was planned very efficiently, and there was no waste of time or energy. Our only suggestion for future trips is that one person should be engaged specifically to provide language interpretation for the foreign visitors. Too many times, we felt confused about what was happening, and I'm sure we missed a great deal of discussion about the plants. Although our colleagues were very kind to interpret for us, we felt that it was a burden to the scientists who were also busy collecting, making notes, and photographing plants.

PLANT COLLECTIONS

The most productive collecting, that is, the greatest number of species were found, as might be expected, in the protected areas, e.g. Fanjing Shan Nature Preserve, Leigong Mt. Nature Preserve, and various other Forestry Department preserves. Although most of the Province consists of rocky mountains, the land is intensively cultivated, with every conceivable spot of soil planted, thus greatly limiting the number of wild species in the inhabited areas.

During 6 weeks of traveling over 4500 km in May-June in Guizhou,

we located and collected a total of 213 samples, which consisted of herbarium specimens only, seeds only, flower buds only, or combinations of these items. Herbarium specimens included about 60 Rubus species, one Fragaria, and one Juglans species. These are presented in the master list of collections, which includes samples from both trips--those collected in May-June as well as those collected later, in September -October (Appendix 3). With the combined expertise of the Guizhou Botanical Garden Staff and Dr. Gu Ying and Mr. Zhao Chang Min, who have previously collected and studied Chinese Rubus species, 51 of these 60 Rubus specimens were, I believe, accurately identified to species and, in a few cases, to varieties. The remaining unidentified 9 specimens may be unique species, or there may be some duplicates among them. Unfortunately, because fruits mature between May and November among the different species, on this first trip we were able to collect seeds of only about19 species and flower buds of 21 other species (Appendix 5) during the period we were there. An additional 2 seed samples of Chinese Rubus species which had been collected elsewhere were obtained from the Nanjing Botanical Garden.

The species that we saw appeared to be quite distinct, i.e., not intergrading as would be expected if there were extensive hybridization. Only in one case did we suspect interspecific hybridization. This was at a site where R. parvifolius and R. niveus were growing together. Here, there were a few plants which our Chinese colleagues could not identify to species and which appeared to be intermediate between the above species. However, their true identity needs further verification.

Our Chinese colleagues made a second expedition in September -October to collect seeds of later maturing species. They sent us an additional 22 seed samples, representing 16 species (collection numbers 92221 to 92248). Overall, including collections from both trips, we obtained 86 seed samples, representing 26 known species and 7 not yet identified. All seed samples collected, including those from both trips, are listed in Appendix 4 with both field collection numbers and National Clonal Germplasm Repository accesssion numbers.

The numbers assigned to plants in the section on itinerary are the field collection numbers. These numbers were applied to seeds and their corresponding voucher herbarium specimens, to seeds only, to herbarium specimens only, and to bud collections only. Numbers assigned to plants are not always in numerical sequence as they were collected because, sometimes, part of the team was collecting in one place and part in another, and numbers were applied later, after the time of collection.

Also, collection numbers for some seeds and buds (where herbarium specimens were not collected) are out of sequence because they were assigned at the end of the trip, although they are described on the day of collection in the itinerary. Gaps in the entire sequence of numbers occur because non-target plants, which were of interest only to the Chinese botanists, were collected, numbered, and retained by our hosts.

Seeds were satisfactorily extracted with a hand-held household blender, purchased in the U.S. and used with a 110/220 power converter in China. Herbarium specimens were collected in large plastic bags and pressed at the end of each day.

All herbarium specimens and seeds (except Juglans) collected were distributed equally to the Guizhou Botanical Garden, the Nanjing Botanical Garden, and to the U.S. National Clonal Germplasm Repository in Corvallis, OR. Juglans seeds were sent to the walnut breeder, Dr. Gale McGanahan, to share with the National Clonal Germplasm Repository in Davis, California. Flower buds for meiotic studies were distributed equally to the Nanjing Botanical Garden for analysis by Zhao Chang Min and to the NCGR in Corvallis for studies by Maxine Thompson.

POTENTIAL VALUE OF THE SPECIES

Although described botanically, very little information is available about the horticultural or cytological attributes of the 194 wild Rubus species of China.

Although none of the 69 Rubus species in Guizhou are cultivated, most of them have edible fruit and several of them have high enough fruit quality to be harvested from wild plants and sold in local markets, e.g. Rubus biflorus, Rubus corchorifolius, R. niveus, R. alcaefolius, R. peltatus, R. parvifolius, R. ellipticus, R. ichangensis, R. coreanus, R. innominatus, R. chingii, and several others. Only a few, e.g. Rubus swinhoei which has bitter fruit, and Rubus tephrodes whose fruit is small and distasteful, are not considered edible. Among these species, the range of diversity for all plant and fruit characteristics is very great.

Many interesting characteristics that we observed could be useful in breeding, e.g. upright, branching growth habit with relatively few suckers, thornlessness or relatively insignificant thorns, a wide range in plant vigor and growth habit, low chilling requirement, a very wide seasonal span of blooming and fruit maturity, very large inflorescences, large fruit size with small seeds, variation in fruit color (yellow, orange,

apricot, red, purple and black), high fruit flavor, high productivity, tolerance to high summer temperatures and humidity, and potential disease resistance.

Among the few species that have been evaluated (e.g. R. coreanus, R. parviflorus, R. ellipticus, and R. rosifolius) disease resistance and heat tolerance have been demonstrated, as may be expected in plants originating in a warm humid climate. R. innominatus (=R. kuntzeanus) is notable for having a very large flower cluster. In China, fruit of R. lambertianus is valued for use in juice, wine, and jelly because of the high content of highly stable anthocyanins (Gu Ying et al, 1989). Rubus peltatus has very large fruit (3.5 to 4.5 cm in length). Rubus corchorifolius is prized for its high quality fruit. Rubus ichangensis has small, but delicious fruit. Zhao et al (1992) evaluated a small sample of Rubus chingii seedlings and found significant variation in plant growth habit, flowering, fruit and bearing traits. For example, among only 11 seedlings, the percentage of fertile flowers ranged from 0 to 100%, fruit weight ranged from 1.99 gm to 5.30 gm, and yield ranged from 0.0 to 2408 gm. This small study indicates that there is enormous potential for selection, especially among the most promising species. Many of the species in this region need to be systematically evaluated for horticultural traits and considered for incorporation into breeding programs. The potential identification of new and valuable genetic traits for berry breeding is very great among these species.

As the chromosome numbers of most of the species collected have not been reported, the potential discovery of different ploidy levels among the species could open up the possibility of making new and different interspecific combinations.

ITINERARIES--LOCATIONS AND DESCRIPTIONS OF PLANTS

The itineraries of both trips are indicated on a map of Guizhou Province (Appendix 6).

First Collecting Trip (May 14-July 7)

MAY 14 Arrived in Shanghai and stayed overnight there.

May 15 Flew to Guiyang, Guizhou Province. Our local collaborators met us at the airport and invited us to a welcome dinner to get acquainted with them and with Chinese food (at least 15 different dishes of numerous, unidentifiable exotic items).

May 16 a.m. The entire group met together to make detailed plans for the itinerary and organization of the trip. Mr. Gong presented us with general information about the province and our collecting areas.

p.m. We visited the Academy of Sciences and had discussions with Mr. Zhu Yi-Qing, president, Mr. Xiang Ying-Hai, vice-president and Director of the Ecology Station in Fanjingshan Nature Preserve, and Mr. Fang Hou, vice-president and Director of the Provincial Commission of Science and Technology. These men exhibited much interest in establishing more contacts with U.S. scientists and welcomed further cooperative ventures. Then, an evening banquet provided by these gentlemen.

May 17 A Sunday tourist excursion to Huangguoshu Falls and to Tian Xing Qiao Bridge, a fascinating rock forest sculptured out of limestone by the abundant rainfall and rivers.

May 18 Visit to the Biological Institute of Guizhou. Visit with Mr. Li Zhi Fa, the director, Mr. Liu Guang Qian, vice-director, and Mr. Chen Qian Hai, the director of the Taxonomy Department. Mr. Chen has studied Rubus species in Guizhou Province and most of the herbarium specimens of this genus are housed here. He presented an overview of Rubus sp. in Guizhou.

May 19 Drive 16 hours, from Guiyang to Jiangkuo in Jiangkuo County.

92030 Rubus parkeri Hance (Collected along this road but numbered later; therefore, out-of-sequence.) Plants relatively low vigor, semi -trailing. Beside road, near He Ba town, in Shi Qian County, at 650 m.

Rolling, low mountains. Herbarium specimen only.

Rubus species seen at a stop along the road, near Jung Yang village, at 1354 m, but not collected:

R. trianthus	R. setchuensis
R. coreanus	R. lambertianus
R. innominatus	R. corchorifolius

May 20-22 Stayed in Jiangkuo at Institute of Biology's Ecology Station Hostel

May 20 Day of rest, and planning meetings.

May 21 Collecting in the vicinity (within 1 km) of the Ecological Station in Fanjing Shan Nature Preserve, about 27 km NW of Jiangkuo, Jiangkuo County, elevation about 650 m, (27° 49' N and 108° 45' E). Very steep mountains, heavily vegetated, near Hei Wan river

92001 Rubus eustephanus Focke ex Diels Plants to 1.2 m, upright; large red fruit with many, small drupelets, and large, hollow center, edible. Leaves badly diseased so herbarium specimen not collected. Several plants seen, primarily in this region. Fruits mature now. Seeds only.

92002 Rubus setchuenensis Bureau et Franch. Plants to 1.75 m, an upright, spreading shrub with woody stems, growing along riverbank. Canes virtually thornless. Common plant, many plants seen during trip. Too early for flower buds. Herbarium specimen, vegetative only.

92003 Rubus corchorifolius L. Plants to 2+ m, upright. Fruit medium small, orange, with good taste, mature now. Drupelets adhere to receptacle. Relatively few primocanes on each plant. Common plant, many plants seen during trip. Seeds, and herbarium specimen with fruit.

92004 Rubus innominatus S. Moore Plants to 1 m, upright -spreading. Too early for flower buds. Common plant. Herbarium specimen with very young flower buds.

92005 Rubus inopertus (Diels) Focke Plants with arching, vigorous canes. Many plants seen throughout trip. Herbarium specimen, vegetative only.

92007 Rubus amphidasys Focke ex Diels Low plant, to 0.5 m. Flowers with long, frilly sepals covered with glandular (sticky) hairs. Relatively few plants seen during trip. Herbarium specimen, vegetative only.

92008 Rubus tephrodes Hance Very vigorous shrub, to 2-3 m, with many, semi-arching canes. Young leaves often with red in center. Too early for flowers buds. Common plant with wide distribution. Herbarium specimen, vegetative only.

92009 Rubus lambertianus Ser. Moderately vigorous plant with many arching canes. Common plant, with wide distribution. Too early for flower buds. Herbarium specimen, vegetative only.

92011 Rubus reflexus Ker. Small plant, semi-trailing, to 0.5 m. Not common, but several plants seen during trip. Herbarium specimen, vegetative only.

92013 Rubus eustephanus Focke ex Diels Plants upright, to 2 m, with relatively few primocanes. Mature, large, red fruit with large hollow center and many, small drupelets, edible. Several plants seen, primarily in this region. Seeds collected, and herbarium specimens with fruit.

92014 Rubus coreanus Miq. Plants vigorous (over 2.5 m), with arching canes. Now, with old flowers and young fruit. Very small, dark pink, upright petals and reflexed calyx. Herbarium specimen with old flowers.

92016 Rubus ichangensis Hemsl. et Ktze. Plants trailing. Herbarium specimen, vegetative only.

92021 Rubus corchorifolius L. Plants upright, very vigorous, to 2.5+ m, with very few primocanes. Fruit orange, medium-small, good taste; drupelets adhere to receptacle. Fruits mature now. Common plant, many plants seen during trip. Seeds, and herbarium specimens with mature fruit.

92022 Rubus eustephanus Focke ex Diels Plants upright, to 2 m, with relatively few primocanes. Several plants seen, particularly in this

region. Fruit large, red, with large hollow center and many, small drupelets, edible. Seeds from few plants, and herbarium specimens with fruit.

92023 Rubus parvifolius L. Herbarium specimen only, with flowers.

92024 Rubus amphidasys Focke ex Diels. Herbarium specimen, vegetative only.

92025 Rubus swinhoei Hance Plants climbing up through, and hanging down, from trees and shrubs in dense shade. Long, 3-4 m, trailing canes with clusters of immature fruit. Herbarium specimens, with immature fruit.

92026 Rubus swinhoei Hance Plants as above, collected near No. 92025. Herbarium specimens, with immature fruit.

May 22

Site I Collecting in the Zhang Tuan River valley, about 25-40 km south and east of Jiangkuo, Jiangkuo County. Exploration in a few creek valley sites within a 2 km area, elevation 350-500 m. (27° 36' N and 108° 54' E).

92028 Rubus tephrodes Hance. Plants very vigorous, semi-arching canes to 2.5 m. Many canes together form large colonies. One of the most common species. Too early for flower buds. Herbarium specimen, vegetative only

92029 Rubus eustephanus Focke ex Diels. Plants upright, to 2m, with relatively few primocanes. Fruit red, large, with hollow center and many, small drupelets, edible. Several plants seen in this region. Herbarium specimen, with fruit.

92031 Rubus alcaefolius Poir. Low plant, to 0.6 m, with many canes forming a large colony, growing along steam bank. Palmately lobed, simple leaves with white undersides and dull, bullate upper surfaces. Plants fairly common, seen several times. Too early for flower buds. Herbarium specimen, vegetative only.

92032 Rubus swinhoei Hance. Long canes (3-4m) hanging down side of bank under small trees and shrubs Seen occasionally as single plants. Fruit almost mature, but not enough to collect seeds. Herbarium specimen, with immature fruits.

92033 Rubus pinfaensis Levl. et Vant. Small plants, 0.25 m, above the trail, in full sun. Only a few plants seen. Herbarium specimen, vegetative only.

92035 Rubus bambusarum Focke Plant growing near road, along a stream bank. Herbarium specimen, vegetative only.

Site 2 Explore around Xing Zhuan village and nearby Gao Qian village, 12-14 km east of Jiangkuo, Jiangkuo County, at 350-520 m (about 27° 45' N and 108° 55' E)

92036 Rubus eustephanus Focke ex Diels. Plants upright, to 2+ m, with relatively few primocanes. Canes angled in cross-section, pinnately compond leaves. No fruit. Several plants seen in this region. Herbarium specimen, vegetative only

92037 Rubus innominatus S. Moore Plants with semi-upright canes, 1.5 to 2 m, growing in colonies. Common plant during our trip. Herbarium specimen, with young flower buds.

92038 Rubus lambertianus Ser. Plants semi-upright, to 1+ m, growing in colonies. Common plant during our trip. Herbarium specimen, vegetative only.

92039 Rubus tephrodes Hance. Plants with vigorous, upright -arching canes growing in large colonies, to 2+ m. No flower buds yet. Herbarium specimen, vegetative only.

May 23 (Drive from Jiangkuo to Yinjiang)

Site I Near Miao Wang Po village, northeast of Jiangkuo, on a mountain slope, at 800 m elevation.

92040 Rubus innominatus S. Moore Plant semi-upright, about 1 m tall. Only one plant seen here, but this is one of the more common species during our trip. Herbarium specimen, vegetative only. Buds killed for

cytological studies.

Site 2 About 1 km north of De Wang town (52 km NE of Jiangkuo), in Yinjiang County, at 1206 m elevation, (27° 49' N and 108° 33' E).

92041 Rubus setchuenensis Bureau et Franch. Plants 0.75 to1.0+ m tall, growing in colonies of arching canes. Stems woody, so it appears to be a perennial shrub. Almost thornless, with tiny thorns on young primocanes only. Too early for flower buds. Herbarium specimen, vegetative only.

92042 Rubus faberi Focke Plants are long, trailing canes (1.5 to 2 m) with simple, slightly lobed leaves. With flower buds, almost blooming. Petals white. Herbarium specimens, with flower buds.

Site 3 (Plants were collected by Zhao and Wei on a 2-day hike (May 22-23) over Fanjingshan Mt. (i.e., trail from the Ecology Station to Yinjiang), at elevations ranging from 660 m to 2190 m. Although the elevations of each accesion were given to the author, only a few notes on plant traits are available. Collection Numbers **92043** to **92072** were collected between 27° 49' N, 108° 45' E and 27° 57' N, 108° 36' E but the precise latitude and longitude of each accession is not known. Although local collection site names are given, these places are not on the map.

92043 Rubus adenophorus Rolfe Near Yang Jia Chang village, which is near Zhang Jia Ba town, Yinjiang County, 800 m. Herbarium specimen, with buds and flowers.

92045 Rubus rufus Focke var. pinnatifidus Card. Along the trail, at Jiangkuo Junzi Yian, Jiangkuo County, 660 m. Herbarium specimen, with flower buds.

92046 Rubus rufus Focke.
Along the trail, at Jiangkuo Junzi Yian, Jiangkuo County, 660 m. Herbarium specimen, vegetative only.

92047 Rubus lambertianus Ser. var. paykouangensis. Along the trail, at Jiangkuo Junzi Yian, Jiangkuo County, 660 m. Herbarium specimen, vegetative only.

92048 Rubus rufus Focke Along the trail, at Xiao Hei Wan, Jiangkuo County, 710 m. Herbarium specimen, vegetative only.

92049 Rubus swinhoei Hance Along the trail at Qishu Ping, Jiangkuo County, 880 m. Herbarium specimen, with flower buds..

92050 Rubus sp. Along the trail, at Yu Ao, Jiangkuo County, 910 m. Herbarium specimen only.

92051 Rubus malifolius Focke Along the trail, at Yu Ao, Jiangkuo County, 910 m. Herbarium specimen, vegetative only.

92052 Rubus hunanensis Hand-Mazz. Along the trail, at Yu Ao, Jiangkuo County, 910 m. Herbarium specimen, vegetative only.

92053 Rubus malifolius Focke Along the trail, at Yu Ao, Jiangkuo County, 950 m. Herbarium specimen, vegetative only.

92054 Rubus xanthoneurus Focke Along the trail, at Yu Ao, Jiangkuo County, 950 m. Herbarium specimen, vegetative only.

92055 Rubus reflexus Ker. var. orogenes Hand-Mazz. Along the trail, at Yu Ao, Jiangkuo County, 1,070 m. Herbarium specimen, vegetative only.

92056 Rubus inopertus (Diels) Focke Along the trail, at Yu Ao, Jiangkuo County, 1,250 m. Herbarium specimen, vegetative only.

92058 Rubus inopertus (Diels) Focke Along the trail, at Yu Ao, Jiangkuo County, 1,350 m. Herbarium specimen, vegetative only.

92059 Rubus irenaeus Focke Along the trail, at Chang Ban Pou, Jiangkuo County, 1,580 m. Herbarium specime, vegetative only.

92060 Rubus caudifolius Wuzhi Along the trail, at Chang Ban Pou, Jiangkuo County, 1,620 m. Herbarium specimen, vegetative only.

92061 Rubus xanthoneurus Focke Along the trail, at Chang Ban Pou, Jiangkuo County, 1,640 m. Herbarium specimen, vegetative only.

92062 Rubus caudifolius Wuzhi On Fanjingshan Mt., Jiangkuo

County, 1,710 m. Herbarium specimen, with flower buds.

92063 Rubus caudifolius Wuzhi Along the trail, at Hui Xang Ping, Jiangkuo County, 1,760 m. Herbarium specimen, vegetative only.

92064 Rubus pinnatisepalus Hemsl. Along the trail, at Guan Dou Yan, Jiangkuo County, 2,050 m. Herbarium specimen, vegetative only.

92065 Rubus trianthus Focke Along the trail, at Jin Ding, Jiangkuo County, 2,100 m. Herbarium specimen, with flowers.

92066 Rubus caudifolius Wuzhi Along the trail, at Jin Ding, Jiangkuo County, 2,100 m. Herbarium specimen, with flower buds.

92067 Rubus mesogaeus Focke Along the trail, at Hu Gue Shi, Yinjiang County, 2,050 m. Herbarium specimen, vegetative only.

92068 Rubus henryi Hemsl. et Ktze. Aong the trail, at Hu Gue Shi, Yinjiang County, 1,750 m. Herbarium specimen, vegetative only.

92070 Rubus tsangorum Hand-Mazz. Along the trail, at Zhang Jia Ba, Yinjiang County, 820 m. Herbarium specimen, with flower buds.

92071 Rubus reflexus Ker. Along the trail, at Zhang Jia Ba, Yinjiang County, 820 m. Herbarium specimen, vegetative only.

92072 Rubus lambertianus Ser. var. glaber Hemsl. Along the trail, at Jun Zi Yan region, Jiangkuo County, 660 m. Herbarium specimens, vegetative only.

May 24 In Yinjiang. Collection within few km of this town.

92073 Rubus parkeri Hance. Plants less than 1 m. Blooming now, with large inflorescences. Said by farmer to have small, black fruit which is edible, but not as good as R. corchorifolius. Collected on a small farm, on a steep slope, near Long Chang town, Yinjiang County, at 540 m. (28° 02' N and 108° 24' E. Herbarium specimens, with flower buds and flowers.

May 25 Drive from Yinjiang to Songtau. Collection was done on a short

walk along the road leading south from Mu Huan and towards the Furongba branch of the Ecology Station of the Fanjingshan Nature Preserve, near Jiang Jai Ao village, on the north side of the mountain, at about 28° 03' N and 108° 41' E. Yinjiang County.

92074 Rubus xanthoneurus Focke Plants vigorous, canes trailing, cascading down bank below road. Elevation 1,107 m. Herbarium specimens include inflorescences with young flower buds. Buds killed for cytological studies.

92075 Rubus amphidasys Focke ex Diels Plants small, 30 to 40 cm tall, growing beside road, elevation 1,107 m. Herbarium specimens include inflorescences with young flower buds. Buds killed for cytological study.

92076 Rubus ireneaus Focke Few plants, small, 25-30 cm tall, growing beside road, elevation 1,107 m. Herbarium specimens, with buds and flowers. Buds killed for cytological studies.

92077 Rubus corchorifolius L. Several plants very upright, to 2 m, with very few primocanes. The few main canes branch high and are woody below. Fruit mature now, very sweet and good. Growing beside the road, elevation 1,107 m. Seeds only, collected from many plants.

92078 Rubus hastifolius Levl. et Vant. Few plants, low, trailing through Pyracantha shrub, canes about 0.75 m to 1.0 m long. Leaves hastate, with very rusty hairs on undersides. Collected along road, elevation 1,145 m. Herbarium specimens, with old flowers and very young fruits.

92079 Rubus adenophorous Rolfe Single plant about 1 m long, growing out a west-facing rock, beside road, at elevation 1,138 m. Herbarium specimens, with flower buds and flowers.

92308 Rubus adenophorus Rolfe (Collected here but numbered later; therefore, out of sequence). Single, stunted planted near No. 92079. Buds only, for cytological studies.

May 26 In Songtau. Trip to Forest Farm with Director of Forest Farm, located 19 km east of Songtau, in Songtau County.

Site 1 Stop beside road a few km east of Songtau, at elevation 529 m. (28°11' N and 109°13' E)

92080 Rubus innominatus S. Moore. Plants growing on dry, well -drained bank above road in sunny exposure, less vigorous than usual. Herbarium specimens, with flower buds and flowers. Buds killed for cytologial studies.

Site 2 Walk around the Forest Farm at Si Chang (28°10'N and 109°16' E)

92081 Rubus adenophorus Rolfe Collected at Diao Bian village, at 803 m. Herbarium specimens, with flower buds. Buds killed for cytological studies.

92082 Rubus lambertianus Ser. var. glandulosus Card. Atypical, very weak plant, 25-28 cm tall, with glandular hairs. Collected at Diao Bian village, at 803 m. Herbarium specimen, vegetative only.

92310 Rubus parvifolius L. Collected near Diao Bian village, at 677 m elevation. Buds only, killed for cytological studies.

92083 Rubus innominatus S. Moore Collected at Diao Bian village, along the road near the Forest Farm Headquarters, at 818 m. Herbarium specimen, with very young flower buds..

92084 Rubus coreanus Miq. Collected at Diao Bian village, near No. 92083, at 818 m. Herbarium specimen, vegetative only.

92085 Rubus flagelliflorus Focke ex Diels Plant trailing, canes climbing up into tree, about 1 m long. Collected at Pan Shi village, at 760 m. Herbarium specimen, vegetative only.

May 27 Drive from Songtau to Tongren. Through rolling mountains, almost all cultivated with the usual crops, rice, corn, rapeseed, wheat, cabbage, beans. Relatively few wild plants, therefore poor collecting region.

92086 Rubus xanthoneurus Focke Plants trailing, growing on a wet

bank beside the road. Canes 0.75 to 1.0 m long. Collected near Yi Wan Shui, about 20 km south and east of Songtau, Songtau County, at 828 m elevation (28°05' N and 109°12' E.) Herbarium specimens, vegetative only.

May 28 Drive from Tongren to Zhen Yuan, Zhen Yuan County, through rolling mountains, mostly cultivated, therefore no stops made for collecting. After visiting the old monastery in Zhen Yuan, we drove up the river gorge and made one collection.

92087 Rubus chiliadenus Focke Few plants growing on the slope above the Hong Qi Power Station, about 8 km from Zhen Yuan, at 520 m elevation and about 27°03' N and 108°24' E Herbarium specimens, with buds and a few flowers.

May 29 Drive from Zhen Yuan to Leishan, Leishan County. The topography consisted of a jumble of moutain ridges (estimated to range from about 450 m to 1250 m) and valleys, most of which is intensively cultivated. There was practically no natural vegetation except a few shrubs along the roadside. Many large clumps of Rubus tephrodes seen along the way, but it is too early for flower buds so nothing collected.

May 30 Drive from Leishan to top of Leigong Mt. Nature Preserve, walk a few km down the road for collection, and then drive back to Leishan. Collecting at about 26°23' N and 108°11' E in Leishan County.

92088 Rubus caudifolius Wuzhi. Trailing plant. Collected at 1785 m. Herbarium specimen, with old flowers.

92089 Rubus columellaris Tutcher. Upright clump, about 1m tall. Collected at 1,730 m. Herbarium specimen, with buds and flowers. Few buds killed for cytological studies.

92090 Rubus hunanensis Hand-Mazz. Collected at 1,730 m elevation. Herbarium specimen, vegetative only.

92091 Rubus crassifolius Yu and Lu Extensive colony of low plants, about 25-30 cm tall. Leaves roundish with deep sinus, thick, reticulate, raised veins on undersides. Common plant here at higher elevations (above 1850 m), where there is much fog and cool temperatures. Nearby is a Rhododendron community. Collected at 2,172 m elevation. Herbarium

specimens with flowers. Buds killed for cytological specimens.

92092 Rubus grayanus Maxim. Collected on Leigong Mt. at 1,990 m. Herbarium specimen, with immature fruit.

92093 Rubus caudifolius Wuzhi Trailing plant with low-moderate vigor, often seen hanging down a bank or rock wall. Collected at 1,950 m. Herbarium specimen, with flower buds and flowers. Buds killed for cytological studies.

92094 Rubus columellaris Tutcher. Plants blooming, at 1,954 m. Herbarium specimen, with flowers.

92095 Rubus grayanus Maxim. Shrub to 2 m tall. Fruits not quite ripe enough for seed collection. Collected at 1,570 m. Herbarium specimen, with immature fruits.

92096 Rubus columellaris Tutcher Collected at 1,570 m. Herbarium specimens, with flower buds and flowers.

92097 Rubus reflexus Ker. Collected at 1,500 m. Herbarium specimens, with flower buds.

92098 Rubus xanthoneurus Focke Collected at 1,500 m. Herbarium specimen, with very young flower buds. Buds killed for cytological studies.

92099 Rubus grayanus Maxim. Leaves and fruits look different from previous collections of this species. Collected at 1,470 m. Herbarium specimen, vegetative only.

92100 Rubus panduratus Hand.-Mazz. Collected at 1,460 m. Herbarium specimen, vegetative only.

92101 Rubus malifolius Focke. Collected at 1,430 m. Plant had immature flowers, but my herbarium specimen is vegetative only.

92102 Rubus peltatus Maxim. Collected at 1,440 m. Herbarium specimen, vegetative only.

92103 Rubus multibracteatus Levl. et Vant. Collected at 1,400 m. Plant had flower buds but my herbarium specimen is vegetative only.

92104 Rubus ireneaus Focke Plants low, about 25 cm tall, in colonies, usually in shade. Collected at 1,500 m. Herbarium specimen, with flower buds and flowers. Buds killed for cytological studies.

92105 Rubus multibracteatus Levl. et Vant. Collected at 1,450 m. Herbarium specimen, with immature flower buds.

92106 Fragaria nilgerrensis Schlecht. ex Gay. Plants seen from1,730 to 2,170 m. Plants at higher elevations with flowers and at lower elevations, some with ripe fruit, and many more with immature fruit. Fruit is white, sweet, and soft. Herbarium specimens with flowers and fruits. Seeds collected from many plants scattered along the road.

92108 Rubus corchorifolius L. Selected because fruit is red, rather than the usual orange color, and possibly larger than usual. Seeds only collected, from several plants, at est. 1,400 to 1,500 m.

May 31 Drive 35 km SE from Leishan to Mao Ping, another part of Leigong Mt. Nature Preserve, Leishan County. This region has cool subtropical, mountainous vegetation which is mostly shrubby with scattered large trees. Species seen included Pinus massoniana, several Prunus sp., Cornus sp., Acer sp., and Salix sp. General vicinity is approximately 26°20' N and 108°15' E.

Site 1 Walk along a road near Mao Ping between 1,720 m and 1,785 m elevation.

92109 Rubus peltatus Maxim. Plants growing on shale scree, on north slope. Plants 1.0 to 1.3 m, arching, with partly developed fruit. Fruit is very large. The immature fruit is already 3 cm long and 1.5 cm wide. Collected at 1,740 m. Herbarium specimen with immature fruit.

Site 2 We drove a few km. to a lower site (1,260 m) and stopped to explore this area.

92110 Rubus corchorifolius L. Plant was exceptionally vigorous. Cane diameter at base was 2.65 cm and height was about 3 m. Floricane

consisted of a single cane that had branches over1 m long, which began at about 1.2 m from base of trunk. There was only one new primocane, over 2 m tall, and still growing. Fruit was mature, sweet, and possibly larger and more reddish than usual. Fruit was 14-19 mm long and 12-13 mm wide. Collected at 1,280 m elevation. Seeds only collected, from this single plant.

92112 Rubus xanthoneurus Focke Plants low, shrubby, to about 1 m tall, with long, narrow leaves. Collected at 1,338 m elevation Herbarium specimens with very young flower buds. Buds killed for cytological studies.

92113 Rubus panduratus Hand.-Mazz. Trailing plant, growing up into another shrub. Canes about 0.6 m to 0.75 m. Collected at 1,548 m elevation. Plant had flower buds but my herbarium specimen is vegetative only.

92114 Rubus inopertus (Diels) Focke Canes arching, vigorous, to 2+ m. Plants with unusually small buds. Collected at 1,660 m elevation. Herbarium specimens with flower buds and flowers. Buds killed for cytological studies.

92115 Rubus inopertus (Diels) Focke Canes arching, vigorous, to 2+ m. Collected at 1,660 m elevation. Herbarium specimens with young flower buds. Buds killed for cytological studies.

92116 Rubus corchorifolius L. Plants very upright, vigorous, to 2+ m, with few canes per plant. Fruits appeared smaller than usual, orange, sweet and good taste. Drupelets adhere to receptacle. Collected from many plants, from 1,400 to est. 2,000 m elevation. Seeds only.

June I Drive 43 km northeast from Leishan and collect in the vicinity of Xijiang town, another region in the Leigong Nature Preserve, Leishan County, at about 26° 30' N and 18O° 10'E.

92117 Rubus parvifolius L. Few mature fruits. Collected at 840 m elevation. Seeds and herbarium specimens, with fruit.

92118 Rubus tephrodes Hance var. ampliflorus (Levl. et Vant.) Hand -Mazz. Canes vigorous, upright-arching. Bristles on stems are shorter

than 5 mm. Growing beside a small creek, near Gan Rong village at 800 m elevation. Herbarium specimens, vegetative only.

92119 Rubus tephrodes Hance var. setosissimus Hand.-Mazz. Canes vigorous, upright-arching. Bristles on stems are longer than 5 mm. Growing near No. 92118, at 800 m elevation. Herbarium specimens, vegetative only.

92120 Rubus tsangorum Hand.-Mazz. Collected at 880 m elevation. Plants had flowers but my herbarium specimen is vegetative only.

Also seen along this creek, but not collected because too early for flower buds, were R. setchuensis and R. buergeri.

June 2 Drive 130 km from Leishan to Rongjiang, Rongjiang County. Steep, mountainous country, mostly cultivated wherever possible, and some areas planted to Pinus massoniana, some to Cunninghamia lanceolata, some to tung trees, and some to Castanea mollissima. Rongjiang is at a lower elevation, 304 m, and consequently has a warmer subtropical climate than our previous collecting sites.

No stops for collecting this day.

June 3 Drive 30 km northeast of Rongjiang to Zai Ma town to locate a local guide in a government office. The region is so extensively cultivated, or too steep for access, that we needed help to find some regions where we could get off the road for collecting. Locations at about 26° 04' N and 108° 42' E in Rongjiang County.

Site I Near Lu Si Zui village, a few km from Zai Ma.

92220 Rubus parvifolius L. (Collected here, but numbered later; therefore out of sequence.) Elevation 584 m. Seeds only, collected from several typical plants with mature, red fruit.

92121 Rubus rosifolius Smith Plants low vigor, 0.3 to 0.5 m tall, trailing amony the dense ferns and other vegetation. Appears weedy. Collected at 584 m elevation. A few seeds collected, and herbarium specimens, with old flowers.

92122 Rubus sumatranus Miq. Plants low vigor, to 0.5 m tall, growing among dense, mixed herbaceous and shrubby vegetation, including

ferns. Collected at 603 m elevation. Herbarium specimens with buds, flowers and young fruit was collected, but later misplaced. Buds killed for cytological studies.

92123 Rubus reflexus Ker. Plant trailing, about 0.5 m long, hanging out of dense vegetation on bank above trail. Collected at 624 m elevation. Herbarium specimen with buds, flowers, and young fruits. Buds killed for cytological studies.

92124 Rubus swinhoei Hance Long canes, one plant 2.0 to 2.5 m and another to 5.5 m, hanging down a bank under the shade of other shrubs. Plants grow as individuals, i.e., not in colonies. Plants with mature and immature fruit now. Fruit small, 13-14 mm wide and 8-9 mm long, black, very astringent/bitter, inedible. Drupelets adhere together and detach from receptacle. Also, thorns have a toxic substance which, where skin was scratched, caused inflamed spots which persisted for a week. Collected at 584 m elevation. Seeds collected from 3 plants, and herbarium specimens, vegetative only.

Other Rubus species seen in this region, but not collected were:

1) R. alcaefolius, which was said to bloom in July and mature fruit in November. Fruit was said to be large, red, sweet, and very good to eat

2) R. corchorifolius, which has orange, very good, sweet/sour tasting fruit which matures earlier and is finished now.

3) R. buergeri, which blooms later

4) R. lambertianus, which blooms later and matures fruit in November. Fruit is said to be sour and that only children eat them.

5) R. tephrodes, which also blooms and matures fruit much later. Fruit is small and black, edible but not particularly good

6) R. ichangensis, which also blooms and matures fruit later. Said to have small but sweet and delicious fruit

Site 2 Drive a few km from Lu Si Zui village and collect along a trail up a creek valley in vicinity of Feng Deng Zai village. Dense vegetation of mostly low shrubs and herbs, including many ferns, with occasional small trees.

92125 Rubus pinfaensis Levl. et Vant. Plants trailing off a bank, 2.0 to 2.5 m long. Fruit mature now, small (7.5-9 mm wide x 7-8 mm

long), yellow, and drupelets adhere to each other and detach from receptacle. Collected at 677 m elevation. Seeds collected, and herbarium specimens with fruit.

92126 Rubus amphidasys Focke ex Diels Plant with low vigor, about 0.4 m tall, growing above trail, among low brush on a sunny slope, facing west. Collected at 708 m elevation. Herbarium specimens, with flower buds and flowers.

92127 Rubus sumatranus Miq. Plants with low vigor, about 0.4 m tall, growing among dense vegetation, on same bank as 92126 (R. amphidasys) at 723 m elevation. Few yellow-orange mature fruits. Drupelets adhere together and separate from receptacle. Many, small drupelets and large hollow center. Seeds collected, and herbarium specimens, with fruit.

92128 Rubus glabricarpus Cheng Plants growing on same bank as 92126 and 92127, below the trail. Canes about 1.25 m long, winding among ferns. Mature fruit orange, roundish, small. Collected at 735 m elevation. Seeds collected, and herbarium specimens with immature fruit.

92311 Rubus reflexus Ker. (Collected here but numbered later; therefore, out of sequence). Plants 0.5 m, growing among dense, herbaceous/low shrubby vegetation beside trail, near the previous 4 accessions. Elevation 740 m. Buds only, killed for cytological studies.

92129 Rubus xanthoneurus Focke Plants trailing, with moderate vigor, growing near roadside. Simple, elliptical leaves, with large panicle (est.17 cm long and 14 cm wide at base). Collected at 620 m elevation. Herbarium specimens, with flower buds.

June 4 Drive from Rongjiang to Congjiang, Congjiang County. Collecting done within 10 km west of Conjiang, about 25° 42' N and 108° 48' E. In Congjiang County.

92130 Rubus columellaris Tutcher Plants were hanging off of a dry bank beside road. Canes about I m long, leaves badly diseased. Plants appear productive, fruits in large clusters, mostly immature now. Mature fruit yellow, medium-large (14-15 mm long and 12-14 mm wide), with large hollow center. Collected at 315 m elevation near Dukou village.

Seeds collected, and herbarium specimens with fruit.

92300 Rubus parvifolius L. (Collected about 8 km west of Congjiang, but numbered later; therefore, out-of-sequence.) Plants hanging down a bank in shade, beside road. Fruit red, and mature now. Collected at 410 m elevation. Seeds only.

92131 Rubus parvifolius L. Plants hanging down a shady bank, near the previous collection (No. 92221). Fruit dark-purple, and mature now. Collected at 410 m elevation. Seeds collected, and herbarium specimens, with immature fruit.

92132 Rubus columellaris Tutcher Common in this region. Plants grow singly or in small colonies. Plants 1.0 to 1.5 m tall, arching. Very productive with fruit in large clusters. Uneven ripening, from very small, green fruit to mature. Fruit yellow, with hollow center, the largest fruit 18 mm x 18mm, edible. Collected at 708 m elevation, 7 km west of Congjiang. Seeds collected from 2 plants, and herbarium specimens, with fruit.

92133 Rubus coreanus Miq. Canes arching, vigorous, 2-2.5 m long, growing singly or in small colonies. Common in this region. Plants appear very productive. Fruit bright yellow, medium firmness, 14-16 mm x 8-9 mm, very good taste, unique flavor, 11° Brix. Looks like good breeding potential. Collected at 708 m elevation, about 7 km west of Congjiang. Seeds collected from one plant, and herbarium specimens, with fruit.

92134 Rubus sumatranus Miq. Plants from 0.3 to 1 m tall, the larger one with much fruit. Fruit medium-large, 15-19mm x 13-16 mm, yellow-orange with red seeds, and with hollow center. Many, small drupelets. Collected between 690 m and 708 m elevation about 6-7 km west of Congjiang in the vicinity of Shi Re Pan village. Seeds collected from 3 plants, and herbarium specimens, with fruit.

June 5 Drive 29 km southeast of Congjiang to Xi Shan town to find a local guide to accompany us. Then drove another 10 km south into a forest, where we got out and walked. In Congjiang County.

Site I Collected along the road between Congjiang and Xi Shan between 300 m and 430 m elevation at about 25° 38' N and 108° 57' E.

92135 Rubus columellaris Tutcher Plants common, scattered along the road as single plants or small colonies. Canes upright-arching, productive. Fruit born in clusters of several fruits. Fruit large, (the largest was 21 mm x 22 mm and weighed 2 gm and the smallest was 17 mm x 18mm and weighed 1.6 gm). Seeds only collected.

Site 2 About 10 km south of Xi Shan, in a moist, subtropical forest, at about 25° 38' N and 108° 58' E.

92136 Rubus parvifolius L. Single plant beside road with mature, orange fruit. Near Bei Meng village, at 492 m elevation. Seeds collected, and herbarium specimens, with old flowers and immature fruit.

92137 Rubus xanthoneurus Focke Canes trailing on ground under shrub, about 1.75 to 1.0 m long, with simple, long, narrow leaves. Near Bei Meng village, at 584 m elevation. Herbarium specimen, vegetative only.

92138 Rubus swinhoei Hance Trailing canes, 2-3 m long, hanging down bank, in shade of other shrubs/trees, near a creek. Near Bei Meng village, at 581 m elevation. Seeds only collected

92139 Rubus xanthoneurus Focke var. glandulosus Yu and Lu. Trailing canes among shrubs. Plants with flower buds. Near Bei Meng village, at 581 m elevation. Herbarium specimens with flower buds and flowers. Buds killed for cytological studies.

92140 Rubus parvifolius L. Plants of moderate-low vigor, hanging off the roadbank. Mature fruits red. Seeds collected from 3-4 plants. Near Bei Meng village, at 554 m elevation. Seeds only collected.

92141 Rubus parvifolius L. Plants of moderate-low vigor, hanging off roadbank. Mature fruits orange. Seeds collected from one plant. Near Bei Meng village, at 555 m elevation. Seeds only collected.

Site 3 Near Xi Shan, beside road, at 560 m elevation, 24° 40' N and 108° 58' E.

92142 Rubus lambertianus Ser. var. paykouangensis (Levl.) Hand. -Mazz. Collected beside the road because it appeared to be different from

previous plants seen. This species is very common in this vicinity. Very late blooming, no flower buds yet. Collected at 560 m. Herbarium specimens, vegetative only.

Several plants of Rubus corchorifolius were seen in this region but the fruit is all finished by now so we did not collect. Very early maturing fruit.

June 6 Drive 104 km from Congjiang to Liping, Liping County. Our vehicle made no stops along the way for collecting, but I noticed Rubus lambertianus (very abundant, with no flower buds yet), R. columellaris (few with some mature fruit), R. coreanus (several plants, with mature, orange-yellow fruit), and R. tephrodes (beginning about half way to Liping) which was still vegetative only.

June 7 Collection at 2 sites in vicinity of Liping, Liping County, with guides from the Forest Bureau--Mr. Zhou Gau Yuan and Mr. Yang Zu Hua

Site I In Shi Jin Shan Forest Farm, about 20 km south west of Liping, where there had been extensive reforestation with Cunninghamia lanceolata. Trees were fast-growing; at 3 years old, they were 2.75 to 3.5 m tall. About 26° 08' N and 109° 05' E

92144 Rubus hastifolius Levl. et Vant. Plants trailing, canes to 2 m long, growing as single plants. Leaves small, with rusty tomentum on underside. Elevation 692 and 741 m. Herbarium specimens mixed from 2 plants, vegetative only.

92145 Rubus sumatranus Miq. Plants from 0.3 to 2.0 m tall, growing under or among other shrubs. Elevation 740 m and 692 m. Seeds only, collected from 6 plants at 2 nearby locations.

92309 Rubus amphidasys Focke ex Diels (Collected here but numbered later; therefore, out of sequence) Plants low vigor, to 0.5 m tall. Elevation 740 m. Buds only, killed for cytological studies.

92146 Rubus multibracteatus Levl. et Vant. Plants upright-arching, 1.5 to 2 m tall, growing in small colonies on bank above road. Elevation 676 m. Herbarium specimen, with flower buds. Buds killed for cytological studies.

92147 Rubus swinhoei Hance Plant trailing, canes 2-3 m long, hanging off bank in shade of other shrubs/trees. Tends to grow singly, or occasionally, a few plants nearby. Mature fruits black, small, bitter/astringent and inedible. Elevation 677 m. Collected seeds only, from one plant.

92148 Rubus irenaeus Focke Plants in low colonies, to 0.3 m tall. Elevation 690 m. Herbarium specimen, with flowers. Buds killed for cytological studies.

92149 Rubus rosifolius Smith Plants 0.5 to 0.75 m tall, growing in spreading colonies, appears to be weedy. Several plants seen along trail with only a few fruits. Fruit mature now. Elevation 707 m. No herbarium specimen. Collected seeds only.

92150 Rubus ichangensis Hemsl. et Ktze. Plants trailing, climbing up into other shrubs; with simple, elongate leaves, and flower buds now. Elevation 677 m. Herbarium specimens with flower buds. Buds killed for cytological studies.

92312 Rubus sumatranus Miq. (Collected here but numbered later; therefore out of sequence) Small plants. 0.5 to 1 m tall. Elevation 677 m. Buds only, killed for cytological studies.

Other Rubus species seen here but not collected:

R. corchorifolius L. Fruit very early, finished by now.
R. innominatus S. Moore Plants with flower buds
R. tephrodes Hance Flower buds have not yet appeared.

Site 2 Visit the Dong Fang Forest Farm, 25 km northeast of Liping. Tour Arboretum and walk around Forest Farm experimental plantings including a genebank of grafted Cunninghamia trees from various regions in China, Liriodendron chinensis seedling trees from seeds obtained on Fanjing, Mt., Taiwania, and other species. At 26° 23' N and 109° 09' E.

92151 Rubus parvifolius L. Many small (0.4 -0.8 m) plants growing among the grass and weeds in open, exposed areas in the arboretum. Fruit red, mature now. Elevation 461 m. Seeds collected from many plants, and herbarium specimens, vegetative only.

92152 Rubus coreanus Miq. Vigorous, arching canes to 2+ m. Plants common in this general region. Plants look productive, with many multiple-fruit clusters. Fruit small (the largest is 12 x 7.5 mm), orange, good taste, mature now. Elevation 431 m. Seeds only collected, from about 6 plants in one site and from several plants in another, nearby site.

92153 Rubus coreanus Miq. Vigorous, arching canes to 2+ m. Plants common in this region, with black or orange fruit. This plant with black fruit. Elevation 461 m. Seeds only collected, from one plant.

June 8 Drive about 12 hours from Liping to Kaili. No stops for collecting.

June 9 Drive from Kaili to Guiyang, with 3 stops along the way, in Kaili and Guiding Counties.

Site 1 Xiang Lushan region, a few km northwest of Kaili, elevation 700 m, 26° 36' N and 107° 56' E . Kaili County.

92154 Rubus chroosepalus Focke (?) Still some uncertainty about identity. Trailing plant, 0.3 to 0.7 m long canes hanging off bank above a creek. Herbarium specimen with old flowers. Buds killed for cytological studies.

Site 2 Near Longli, about 36 km southeast of Guiyang. Elevation 1,188 m, 26° 33' N and 106° 58' E . Guiding County.

92155 Rubus xanthoneurus Focke Canes trailing through shrubs, about 1.25 m long. Growing in shade. Herbarium specimens with flower buds and flowers. Buds killed for cytological studies.

92156 Rubus innominatus S. Moore. Collected near # 92155. Just beginning to flower. Herbarium specimens, with flowers.

Site 3 Near Guiding, about 95 km east of Guiyang, elevation 1,150 m, 26° 35' N and 107° 25' E

92157 Rubus lambertianus Ser. Collected because plants looked somewhat different from usual. Herbarium specimens, vegetative only.

June 10 to June 15 In Guiyang.

June 10 Clean seeds, laundry, letter-writing, rest, etc.

June 11 Preparation of lectures to be presented at the Academy of Sciences, and shopping. Purchased one walnut sample in market.

92307 Juglans regia L. (Collection number out-of-sequence because number not assigned until end of trip.) Nuts purchased in market in Guiyang and designated "Guiyang" because of where they were acquired. Said to have come from the northwest region of Guizhou which is the major walnut-growing region of this province. However, Mr. Gong disputed this origin because the nuts were not good enough quality.

June 12 Tour of the Guizhou Botanical Garden in Guiyang with Botanical Garden staff. Some of our observations are presented below.

1. Endangered species, with Mr. Zhang. Includes Cathaya, Taiwania, Davidia involucrata, Annomocarya sinensis, Pterostyrax psilophylla, Emmenopterus henryi, and a yellow-flowered Camellia sp.

2. Magnoliaceae--young trees just getting started

3. Rosa sp. collection with Mr. Shi Sheng De. Mr. Shi has an active program for collection, propagation, selection, and breeding of native Rosa sp. Of particular importance is the large collection of Rosa roxburghii selections showing a wide range in flowering as well as in hip size, shape, color, juice content. Mr. Shi has published a paper on this variability. Hips are exceptionally high in vitamin C, and commercial juices are being produced.

4. Native fruit tree collection of Mr. Shi Shengde. Mr. Shi has collected wild fruits, but most of emphasis recently is on Rosa and Actinidia.

5. Actinidia sp. collection. Mr. Shi has collected 21 of the 30 species in Guizhou Province. When collecting, he selects for good edible types. A. chinenesis has the largest fruit and is the most productive. The largest fruit he has collected weighs 110 gms. He has one cultivar, 'Lushan', which was selected by an Agricultural Institute in Guanxi, which has fruit up to 200 gms He has not found any plant with perfect flowers.

6. Rose garden, including mostly foreign cultivars. An interesting rose native to Guizhou Province is Rosa chinensis, called 'Yueyuehung', which means "every month red", because of its everblooming habit.

7. Ornamental plants, with Mr. Li Yong. His work includes many potted species collected from the wild, e.g. orchids, a bonsai collection, and he is an expert on Rhododendron sp. There are 80 species reported in Guizhou Province, and over 600 species in China overall.

8. Fern collection with Mr. Wang Yung Ping, Director of Medicinal Plants and fern curator. He has a collection of over 200 fern species from Guizhou Province.

June 13 I presented 2 lectures at the Guizhou Academy of Sciences in Guiyang, one on "The U.S. National Plant Germplasm System" and the other on "Exploration for Temperate Fruits and Nuts in No. Pakistan", with Prof. Gu Ying as interpreter.

June 14 Day of leisure, shopping, sight-seeing, and dinner at Mr. Gong's home.

June 16 Drive 15 hours from Guiyang to Xingyi, Xingyi County. Travel was very slow due to poor conditions of road, especially from recent flooding.

92158 Rubus multibracteatus Levl. et Vant. Plants growing out of a moist bank above road, canes 1-2 m long. in small to medium-sized colonies. Calyx surrounds young fruit and flares back at maturity. Fruit mostly immature but a few are mature, red, large, and taste acceptable except for the long, objectionable, persistent styles. Fruit in clusters of 2-8 fruits. Elevation 769 m. Near Duan Qiao village, about 10 km southeast of Guanling, in Zheng Ning County. 25° 53' N and 105° 39' E. Seeds collected, and herbarium specimens with flowers to mature fruit.

92159 Rubus niveus Thunb. Canes arching, 1 m+ long, growing on roadbank, about 24 km south of Huajan, in Guan Ling County. Fruit black with bloom, small, mature now. Elevation 1,260 m, at 25° 39' N and 105° 39' E. Seeds collected from several plants, and herbarium specimens, with fruit.

92160 Rubus ellipticus Smith. Small plants, less than I m tall, growing on poor, rocky soil, and may have been grazed. Fruit is very early maturing and is finished now. About 24 km south of Huajan, in Guan Ling County. Elevation 1,260 m., at 25° 39' N and 105° 39' E. Herbarium specimens, vegetative only.

92161 Rubus niveus Thunb. Canes arching, 1+ m long. Fruit mature now, small, black. Very common plant from here southward. Near Ping Zai village in Xing Ren County. Elevation 1,415 m. At 25° 40' N and 105° 20' E. Seeds only collected, from few plants.

92162 Rubus lambertianus Ser. paykouangensis (Levl.) Hand.-Mazz. Plants collected about 10 km south of Ping Zai village in Xing Ren County. Elevation 1338 m. Herbarium specimens, vegetative only.

92163 Rubus niveus Thunb. Collected very near #92161, near Ping Zai village in Xing Ren County. Elevation 1,415 m. At 25° 40' N and 105° 20' E. Herbarium specimen, with immature fruit.

June 17 and June 18 In and around Xingyi, Xingyi County.

June 17

a.m. Met Mr. Deng Chao Yi, a taxonomist with the Forest Research Institute of Qian-Xi-Nan (S.W.) region of Guizhou, who is studying the flora of this region. He has very kindly agreed to guide us for 4 days to Rubus collecting sites. He has recently made an intensive study of variation in wild Carya species which will be published in Acta Phytotaxonomica Yunnanica. Now he is beginning a study of variation in the wild Juglans species.

p.m. Visit to Minorities Cultural Museum in Xingyi, and walk through the town. Purchased a walnut sample from market.

920305 Juglans regia L. (Collection number out-of-sequence because number not assigned until end of trip.) Nuts said to have come from Qishe, about 60 km SW of Xingyi, at one of the highest elevations (est. 2,000 m) in this region. Sample designated "Xing-Yi-1" because it was the first nut sample acquired in this town.

June 18 Drive to trailhead of Ma Li River Gorge trail about 8 km northeast of Xingyi, with Mr. Deng, and walk down into canyon and along a trail on the face of the cliff. 25° 08' N and 104° 57' E, in Xingyi County

92164 Rubus echinoides Metc. Canes 1 to 2+ m long, winding in among the shrubs, near the trailhead, elevation 1,342 m. Plants in more open situations have an arching growth habit. Several plants seen along this trail. Herbarium specimens, with flower buds and flowers. Buds

killed for cytological studies.

92165 Rubus parvifolius L. Plant is more vigorous than usual and has 5 leaflets, rather than the usual 3. We saw plants with 3, 5, or 7 leaflets in this region. Collected very near #92164, at 1,342 m elevation, near trailhead. Herbarium specimen, with flowers and immature fruit. (Fruit is mature now, but there were too few on this plant to collect)

92301 Rubus parvifolius L. (Seeds collected here but numbered at end of trip; therefore, out of sequence) Plant small, canes 0.5 m long, with 3 leaflets. Very near collection # 92165, at 1,342 m elevation, near trailhead. Seeds only collected.

92166 Rubus sp. This was one of the species where identity was questionable (possibly ichangensis (?). Plants were trailing through the dense shrubbery as we walked down the trail on the cliffside. Simple leaves. Elevation 920 m. Herbarium specimens, vegetative only.

92167 Rubus sp. This was another species that we could not identify. Old canes trailing along the ground and sending up short laterals 0.3 to 0.8 m long. Growing among the bamboo shrubs. Leaves very variable. Elevation 923 m. Herbarium specimens, vegetative only.

92168 Rubus mallotifolius Wu ex Yu and Lu. Plants upright -arching, to 2 m tall. Local woman said that fruit of this species is not edible. Growing along trail at 1,012 m. Herbarium specimen with flower buds and few flowers. Buds killed for cytological studies.

Rubus species seen but not collected at this location included:

R. niveus	R. lambertianus (vegetative only)
R. pinfaensis	R. ellipticus (fruit finished)

June 19 Drive from Xingyi to Anlong, Anlong county.

Site 1 Open, rocky slope beside road with scattered shrubs, near Wen Jia Po village, about 6 km west of Anlong, Anlong County. Elevation 1,268 m. Located at 25° 02' N and 105° 23' E

92169 Rubus sp. Plants with arching canes, to 2 m. Plants were growing among Rubus niveus and Rubus parvifolius and, although not critically examined, they appeared to be intermediate in both leaves and

fruit traits between these 2 species, and our Chinese collaborators could not identify the species. Therefore, we suspected that these may be interspecific hybrids, but this needs verification. Mature fruits medium -small (12 mm x 9.5 mm), purple-red with bloom, drupelets adhere to each other and detach from receptacle. Acceptable taste. Seeds collected from few plant, and herbarium specimens with flowers.

92170 Rubus niveus Thunb. Plants 1.2 m to 1.5 m high, with arching canes, to 2.0 to 2.5 m long. Mature fruits purple-black, with bloom, drupelets adhere to each other and detach from receptacle. Good taste. collected and eaten by local people. Seeds only, collected from several nearby plants.

92171 Rubus parvifolius L. Plants more or less trailing to semi -arching. These plants had the largest, multiple-fruit clusters that we have seen so far. Excellent large clusters with larger-than-usual fruits. Seeds collected from several nearby plants.

Other species seen at this site but not collected include:
Rubus echinoides - with flower buds.
Rubus lambertianus - vegetative only

Site 2 Zao Ti Park in Anlong, Anlong County. Plants growing by an irrigation channel in partial shade. Elevation 1,357 m. Located at 25° 02' N and 105° 27' E.

92172 Rubus niveus Thunb. Very luxuriant, very productive plant due to favorable growing conditions. Laterals on floricanes 0.5 to 0.7 m long. Fruit is produced in terminal clusters and also in clusters in axils of leaves. On 3 laterals there were 57, 73, and 104 fruits per cluster respectively. Fruit was mostly immature but the few mature fruits were black, with a bloom, and good tasting. Seeds collected from one plant, and herbarium specimens with flowers and immature fruit.

June 20 Drive from Anlong to Longshan Mt., hike a few km on mountain and return to Anlong. Mr. Qing Ling, the Assistant director of the Forest Bureau of Anlong Co. accompanied us.

The road up the mountain had been built in 1991 on a highly unstable slope, and after the heavy recent rains there were several places where sections of the road had slipped down the slope, or where the loose rubble

had slid down onto the road from above. This unpaved road was very slippery and hazardous, so much so that, finally the vehicle drivers could no longer proceed up the mountain. This region is the most over-used, and abused landscape that we have seen, with widespread destruction, or elimination, of plants on steep slopes consisting of very loose soil and rocks. Severe erosion problems existed here before the road was put in, and the road cuts seriously exacerbated this problem, as evidenced by the long, bare, loose slides of earth below the cuts, and the landslides falling from above the cuts.

The team split up into 3 groups for collecting so I do not have the exact collections sites. However, all were collected on Longshan Mt. at various elevations. Longshan Mt. is about 35 km north of Anlong, located at 25°19' N and 105° 27' E.

92173 Rubus rufus Focke Growing in a shady site, in the forest in Longtoudashan region on the mountain. Elevation 1,500 m. Herbarium specimens, vegetative only.

92174 Rubus ichangensis Hemsl. et Ktze. Very small plants, no flower buds or fruit. In the Longtoudashan region on the mountain. Elevation 1,500 m. Herbarium specimens, vegetative only.

92175 Rubus malifolius Focke Very small plant, growing near No. 92174, in the Longtoudashan region on the mountain, at 1,500 m elevation. Herbarium specimen, vegetative only.

92176 Rubus sp. Unidentified species, found in the Longtoudashan region on the mountain, at 1,490 m elevation. Herbarium specimen, vegetative only.

92178 Rubus idaeopsis Focke Plant with purple flowers, and with flower buds. Collected in the Longtoudashan region of the mountain, at 1,500 m. Herbarium specimens with flowers. Buds killed for cytological studies.

92179 Rubus assamensis Focke Collected in the Longtoudashan region of the mountain, at 1,500 m. Herbarium specimens, with flower buds. Buds killed for cytological studies.

92180 Rubus dolichophyllus Hand-Mazz. Collected in the

Longtoudashan region of the mountain, at 1,580 m. White flowers. Herbarium specimens, with flower buds. Buds killed for cytological studies.

92181 Rubus sp. Collected by Gong and Wei in a different location on the mountain, at 1,770 m. Herbarium specimen, with flowers.

92182 Rubus sp. Collected by Gong and Wei in a different location on the mountain, at 1,800 m. Herbarium specimen, vegetative only.

92183 Rubus rufus Focke Collected by Gong and Wei in a different lcation on the mountain, at 1,620 m. Herbarium specimen, with flowers.

92302 Rubus parvifolius L. (This accession collected here but numbered at end of trip; therefore, out of sequence) Fruit collected from 3 exceptionally productive small plants, by Gong and Wei on the mountain, at 1,700 m. Seeds only.

92303 Rubus parvifolius L. (This accession collected lower down on the mountain, but numbered at end of trip; therefore, out of sequence.) Collected by Wang, on the edge of bunds supporting corn patch, on a cliff above road, at1,108 m and 1,237 m. Plants of this species in this region appear to have particularly large clusters of fruit on relatively small plants (0.3 to 1.0 m long). On one plant, which was 0.5 m, I estimated about 50 fruits in one cluster. Fruit counts of clusters of another plant were 14, 20, and 40. Flowers/fruits always occur in three's, in axils of leaves. Fruit red, 11-12 mm x 9-10 mm, very good taste and appearance. Seeds only, collected from several plants at 2 sites.

Other Rubus species seen today but not collected:
R. ellipticus --many plants, fruit finished
R. multibracteatus --with flowers

June 21 Drive 28 km southeast from Anlong to Shi Pan village, hike around Xian He Ping Mt., and return to Anlong, Anlong County. The mountain is located about 25° 00' N and 105° 38' E. The team split into 2 groups with one walking around the mountain and the other climbing to the top of the mountain.

This karst terrain consisted of very rough, rocky limestone outcroppings and scattered peaks with small valleys among them. The

entire walk around the mountain was up and down on stepped stone paths winding among the valleys, connecting the frequent small clusters of farm houses. Corn was planted everywhere there was a small handful of soil among the rocks, and among the corn plants were pole beans, squash, cabbage, etc. Although the landscape was stikingly beautiful, the farming conditions were extremely harsh, and people obviously struggling to survive.

Because of the abundant rainfall and favorable climate here, and in spite of the intensive farming, there still appeared to be an amazing abundance and diversity of wild plants growing on the bunds and among the rocks wherever corn could not be planted, and on the cliff faces, so that the general aspect was that of a rock garden.

Collections of Group # 1 (Around the mountain)

92184 Rubus xanthoneurus Focke Canes 2 m long, growing up through another shrub. Few good flowers and few old flowers. Elevation 1,338 m. Herbarium specimens, with old flowers.

92185 Rubus idaeopsis Focke Plants 1.5 m tall, with old flowers. Elevation 1,354 m. Herbarium specimens, with old flowers and immature fruit..

92186 Rubus sp. Plants appear similar to No. 91169 but identity needs to be verified. (Both R. niveus and R. parvifolius, putative parents of No. 92169, are also growing in this vicinity). Canes 0.5 to 0.8 m. Small fruit clusters, some fruit with few drupelets. Fruit black. Elevation 1,308 m. Seeds collected and herbarium specimens, with old flowers.

92219 Rubus niveus Thunb. (Collected at this location but numbered at the end of trip; therefore, out of sequence) Beside the trail, about 0.2 km beyond No. 92186. Elevation 1,348 m. Typical plants and fruits. Most fruit immature but a few were ripe. This species is common in the southwest part of Guizhou. Seeds only.

92191 Rubus ellipticus Smith (Collected at this location but numbered 2 days later; therefore out of sequence) Selected by Gu Ying because it was an exceptionally large plant, about 3 m tall and 6 m wide. Elevation 1,308 m. Herbarium specimen, vegetative only.

92192 Rubus sp. (Collected at this location but numbered 2 days later; therefore, out of sequence) Appears similar to No. 92181, but a better specimen. Elevation 1308 m. Herbarium specimens, vegetative only.

Other Rubus species seen but not collected:

R. lambertianus--not even flower buds yet
R. parvifolius --with flowers, but no fruit

Collections of Group #2 (Higher on Xian He Ping Mt. mountain)

92187 Rubus malifolius Focke Collected on the mountain at 1,650 m. Herbarium specimens, with immature fruit.

92188 Rubus flagelliflorus Focke ex Diels (?) Identity not certain. Two types of fruit were collected from this plant--small, mature black fruit with normal seeds and larger, immature red fruit with greatly enlarged seeds which later proved to be devoid of embryos. Closer examination revealed a larva of some insect in them whose identity needs to be established. Elevation 1,660 m. Seeds collected, and herbarium specimens, with calyces and receptacles where fruit was removed.

92189 Rubus inopertus (Diels) Focke Collected on the mountain at 1,670 m. Herbarium specimens, with young fruit.

92313 Juglans cathayensis Dode. Branches with leaves and immature fruits were collected from the top of the mountain where there were several trees growing. Mr. Deng told us that they are common at higher elevations in this region. Trees were scattered among other wild vegetation in the higher slopes which are unsuitable for farming, at 1,500 to 1,600 m elevation. Nuts were immature, borne in clusters of 10-15 nuts. Up to 21 leaflets per leaf. Nuts are collected and eaten by local people. Photographs taken. Herbarium specimens made, vegetative only.

June 22 Drive 30 km south from Anlong to Pojiao, in Anlong County, and return to Anlong. Pojiao is near the Nanpanjiang river which is the Provincial border with Guanxi Province. Here it is lower elevation (450 m), hotter and drier (900 mm rainfall). Here the slopes are all planted to sugar cane, bananas and corn. Much overuse of land, and still

people are clearing off more land on steep slopes for planting crops. Only a few trees on south slopes, but patches of planted trees occur on north slopes.

92190 Rubus multibracteatus Levl. et Vant. Shrubs with woody stems, very vigorous, canes 3+ m, growing on roadbank and in draw below road near Sha Chang Ping village. Plants grow in small colonies, and are productive. Fruit in clusters of 2-8 fruit per cluster. The larger cluster is terminal and smaller ones are at the next 2 nodes below. Fruit bright red, large (largest 22mm x 19mm and smallest 17mm x 13mm), with long persistent, unappealing styles, but with good taste, and 19° Brix. People do collect and eat fruit from these wild plants which are very common in this region. Elevation 985 m, at about 25° 00' N and 105° 27' E. Herbarium specimens, and seeds collected from several plants.

92193 Rubus echinoides Metc. Collected along the road between Anlong and Pojiao, at 1,200 m elevation, near 25° 02' and 105° 27'. Several plants seen in this region. Fruits swelling but still enclosed in prickly calyx. Herbarium specimens, with very immature fruits.

92194 Rubus malifolius Focke Collected along the road between Anlong and Pojiao, at 1,200 m elevation, near 25° 02' N and 105° 27' E. Herbarium specimens, vegetative only.

Other species seen along the road, but not collected:
R. niveus--primocanes only, fruit is finished here
R. ellipticus--primocanes only, fruit is long gone
R. parvifolius--with ripe fruit

June 23 Drive 132 km west from Anlong, through Ceheng, to Wangmo, Wangmo County. Between Ceheng and Wangmo, there was much tung, tobacco, bananas and Cunninghamia planted.

a.m. --Collections along the road between Anlong and Ceheng

92195 Rubus parvifolius L. Collected because of its atypical trait of no glandular hairs. About 1 km west of Ceheng, at 969 m, and about 25° 00' N and 105° 48'E, in Ceheng County. Herbarium specimens, with flowers and immature fruit.

92196 Rubus sp. Arching canes 2+ m long. Canes glabrous and reddish, 5-leaflets. Leaves somewhat resemble R. parvifolius, but more glossy. Fruit purple-black with bloom, with few drupelets. Few fruits and much sterility. Need to compare with No. 92169. Collected I km west of Ceheng, at 969 m elevation, and about 25° 00' N and 105° 48' E, in Ceheng County. A few seeds collected, and herbarium specimens, with flowers.

92197 Rubus parvifolius L. Collected because plant has glandular hairs, in contrast to No. 92195. Collected I km west of Ceheng, at 969 m elevation, and about 25°00' N and 105° 48' E, in Ceheng County. Herbarium specimens, with immature fruit.

92198 Rubus multibracteatus Levl. et Vant. Plants appear very productive. A few mature fruits on each of several plants. A few km west of Ceheng (just past Ceyang) at 861 m, and about 25°00' N and 105° 46' E. This species common in this region. Seeds only.

p.m --Lunch with Mr. Wang De Gao, Director of Ceheng County and then a drive to an experimental litchi planting. Researchers from the Horticultural Institute of the Agricultural Institute in Guiyang are assisting in the horticultural development here e.g. oranges, mandarins, and litchi.

A few kms from the litchi planting we were shown a wild longan tree, with mature fruits.

Then we proceded towards Wangmo.

92199 Rubus multibracteatus Levl. et Vant. Plants occur in small colonies and are very common in this region. Large shrubs, growing among other dense shrubs/trees. About 20 km southwest of Wangmo, at 800 m elevation, and about 25° 08 N and 106° 02' E, in Wangmo County. Productive, fruit red, mostly mature. Seeds only collected, from several plants.

Rubus species seen today but not collected:

R. lambertianus--still no flower buds
R. parvifolius--mature fruit
R. ellipticus--fruit long gone
R. niveus--mature fruit
R. sp. (No. 92196)--few mature fruit

Arrived in Wangmo and were welcomed by Mr. Wu, the County Director, who very kindly treated us to a banquet with other local officials.

June 24 Drive 130 km east and north from Wangmo to Luodian, Luodian County.

Site 1 Before heading east, we drove back, southwest, and turned off the main highway and took a dirt road south, through a mixed forest, and stopped near An Mao Ao village, 25 km SW of Wangmo, Wangmo County. Walked a short distance into the woods, and then back down the road. Elevation 861 m, at about 25° 07' N and 106°01' E

92200 Rubus parvifolius L. Many plants of this species along the roadside. Plants rather small, but fruit seems to be larger than usual (3 typical fruits measured 14 x12.5 mm, 15 x 12 mm, and 13.5 x 12.5 mm). Seeds only, from several plants.

92201 Rubus multibracteatus Levl. et Vant. Very vigorous, woody -stemmed shrub to 4+ m tall and 4+ m wide, with arching canes est. 6 m long. This species sends up many shoots, scattered over a fairly large area from a central group of canes. Mature fruit apricot-colored, SS =11 -12° Brix. Herbarium specimens and seeds collected from a few nearby plants (could be same clone).

92218 Rubus multibracteatus Levl. et Vant. (Collected from plants near No. 92201, but numbered later; therefore, out of sequence) Fruit mature, red. Plants beside the road. Seeds only

As we proceded towards Luodian, R. multibracteatus was very common on the slopes, almost the dominant species among the low shrub and herbaceaous community.

Site 2 Just east of Gou Ting, and before Luodian, Luodian County. Elevation 443 m.

92202 Rubus feddei Levl. et Vant Very vigorous, trailing canes, to 4+ m long, winding among shrubs. Large flower clusters with buds now. Herbarium specimens with flower buds and flowers. Buds killed for

cytological studies.

Site 3 Near Luo Kun town, west of Luodian, Luodian County. Elevation 500 m.

92203 Rubus sumatranus Miq. Herbarium specimens, with immature and mature fruit.

June 25 Drive 35 km southeast from Luodian to Luo Yang and Lang Li Po, near the Hong Shui He River (338 m elevation) with a guide from the Forestry Bureau of Luodian County, and then back to Luodian. We drove through a mixed conifer and broadleaved subtropical forest. Then walked along a trail up the river a half km. without sighting any Rubus. So, back up the road to Luodian. Collections made at Yang Li Po, 373 m elevation, 25°15' N and 106° 38' E, in Luodian County.

92204 Rubus feddei Levl. et Vant. Very vigorous canes, 5 + m long, winding through the dense shrubbery. Inflorescences very large, with many buds, and a few open flowers now. Fruit said to be medium-size and black at maturity, and is not good enough to be eaten by local people. Herbarium specimens with flower buds and flowers. Buds killed for cytological studies.

92210 Rubus parvifolius L. Collected because it was growing at the southernmost region of Guizhou Province, at Yang Li Po. Herbarium specimens, vegetative only.

June 26 Drive from Luodian to Guiyang, much of the way through beautiful karst landscape with fascinating rounded peaks and valleys. Between Luodian and Site I, Rubus niveus, R. multibracteatus and R. ellipticus , which had been very common in the south, were no longer seen.

Site 1 About 60 km north of Luodian, near the border of Hui Shui and Luodian Counties, elevation 1,061 m and at 25° 49' N and 106° 34' E, Luodian County.

92212 Rubus coreanus Miq. Canes arching, 2-3 m long. Fruit black, mature and much fallen now. Small, and good tasting. Plants growing on slopes beside road, mixed with other herbs and shrubs. Seeds collected from one plant, and herbarium specimens, with mature fruit.

92213 Rubus coreanus Miq. Canes arching, 2-3 m long. Fruit purple, small, and good tasting, some mature fruit on plant and much already dropped. Growing on slopes above road, intertwined with canes having orange fruit. Seeds collected from few plants, and herbarium specimens, with mature fruit.

92214 Rubus coreanus Miq. Canes arching, 2-3 m long. Fruit small, orange, and good tasting. Some mature fruit still on plant, much already dropped. Growing on slopes above road among other herbs and shrubs, and intertwined with plants with purple fruit. Seeds collected from few plants, and herbarium specimens, with mature fruit.

92215 Rubus innominatus S. Moore Plants with young, immature fruits. Growing at same site as the previous R. coreanus plants. Herbarium specimens, with old flowers and very immature fruits.

Site 2 About 42 km south of Guiyang, just north of Chi Tu village, beside road. Elevation 1046 m, and at 26° 20' N and 106° 40' E.

92216 Rubus coreanus Miq. Arching canes. Mature fruit now, orange, small, and good tasting. Seeds only, from few adjacent plants which are possibly the same clone.

June 27 to 30 In Guiyang for final discussions, sum-up, and potential future collaboration.

June 27

a.m. Cleaned seeds, prepared herbarium specimens.

p.m. Visited the Guizhou Academy of Sciences, with Mr. Xiang Ying-Hai, Vice-Director. Mr. Xiang expressed strong interest in future collaboration with Americans for further plant exploration and collaborative research. The scientists there realize that their native flora contains valuable horticultural genetic resources which could be developed if sufficient resources were directed towards such efforts. The scientists, especially Mr. Shi, have already collected and studied some wild fruit species but much remains to be done in further collection, selection of superior clones, and breeding. Some of the possible species to address are mentionned in the section of this report on "Further

Collaboration with Chinese Scientists".

June 28

a.m. Touristic visit to Hua Xi Park, on outskirts of Guiyang.

p.m Sorted out herbarium specimens for the 3 Institutions involved-Guizhou Botanical Garden, Nanjing Botanical Garden, and USDA -ARS-NCGR. Also, sorted seeds into triplicate samples for the 3 groups.

June 29 Group discussions to evaluate the expedition, to sum-up the accomplishments, and to consider suggestions for improvements for future collaborative projects with Americans. A summary of these conclusions are given in the section of this report on "Further Collaboration with Chinese Scientists".

92306 Juglans regia L. (Collection number out-of-sequence because number applied at end of trip) Nut sample given to me by Mr. Gong, who said that his friend had sent them from Xing-Yi. Sample designated "Xing -Yi-2" because it was the second sample acquired from that town.

June 30 Departed from Guiyang at 9:40 a.m. and flew to Shanghai, and then on to Nanjing, arriving at 9:40 p.m.

July 1 to July 6 In Nanjing. (Officially, on leave)

July 1 Day of rest, and banquet in the evening with Dr. He Shan An, Dr. Gu Ying, and several other members of the Nanjing Botanical Garden staff.

July 2 Visit to the Nanjing Botanical Garden, and discussions on follow-up activites and future collaboration. See section of this report on "Further Collaboration with Chinese Scientists".

July 3 Visit the Nanjing Botanical Garden. Observed the Rubus species collection which had been established from earlier collections in other provinces, and general tour of the Garden. Very attractive, well -organized and well-maintained.

92217 Rubus chingi Hu Upright canes, 2-3 m, with relatively few new primocanes. Fruit red, good tasting, size varies much, drupelets

adhere to receptacle. Collected and sold in local markets. Fruit matures very early, end of May-early June in Nanjing. Seeds were given to us by Mr. Zhao Chang Min of the Nanjing Botanical Garden, but had been collected from wild plants. Herbarium specimen, vegetative only.

92304 Rubus tsangorum Hand.-Mazz. Collected from plants growing in the Nanjing Botanical Garden. There were very few fruits on this plant, and a few shoots with flower buds. These plants were grown from seeds collected from wild populations in Fujian or Hunan Province. It is possible that our seeds, or part of them, are interspecific hybrids because of the proximity of other Rubus species. Seeds collected. Buds killed for cytological studies.

Invitation to dinner at Zhao Chang Min's home.

July 4 Travel by vehicle to observe field trial plots of American blackberries and blueberries, several km from Nanjing. Rabbiteye blueberries and blackberry cultivars, Hull Thornless and Chester appear to be promising new crops for this region. Then, visit to a natural wooded area which is protected. Lunch with County officials

Invitation to dinner at Drs. He and Gu Ying's home.

July 5 a.m.--Shopping in Nanjing

p.m.--Invitation to dinner at Mr. Chen Yue Kun's home.

July 6 Visit the Nanjing Botanical Garden Display Room where the various activites of the Garden are described and illustrated with posters, with Mr. Chen Yue Kun, Foreign Affairs Office, as guide.

Farewell banquet in evening with Dr. He and Botanical Garden Staff.

July 7 Train to Shanghai, stay overnight.

July 8 Flew from Shanghai to Seattle, to Portland, then to Corvallis by limosine.

Second Collecting Trip (Sept.7-Oct.6)

Two scientists from the Nanjing Botanical Garden, Zhao Chang Min and Wang Chuan Yong, joined Gong De Shen and Shi Sheng De from the Guizhou Botanical Garden for this second trip to collect seeds of later maturing Rubus species. They surveyed primarily the northwestern part of

the Province, and made one repeat trip to Leigong Mt. in Leishan County. Samples of seeds collected were subsequently sent to the National Clonal Germplasm Repository in Corvallis, OR.

Sept 14

92221 Rubus setchuenensis Bureau et Franch. Collected in Zunyi County, Guizhou Province, at 1255 m elevation. Fruit black.

Sept 15

92222 Rubus setchuenensis Bureau et Franch. Collected in Tongzi County, Guizhou Province, at 1420 m elevation. Fruit black.

92223 Rubus ireneaus Focke Collected in Xishui County, Guizhou Province, at 1440 m elevation. Fruit red.

92224 Rubus innominatus S. Moore Collected in Xishui County, Guizhou Province, at 1510 m elevation. Fruit orange-red.

92225 Rubus sp. Collected in Xishui County, Guizhou Province, at 1500 m elevation. Fruit black.

Sept 17

92234 Rubus sp. Collected in Xishui County, Guizhou Province, at 970 m elevation. Fruit black.

Sept 19

92248 Rubus assamensis Focke Collected in Chishui County, Guizhou Province, at 300 m elevation. Fruit black.

92249 Rubus sp. Collected in Xuyong County, Sichuan Province, at 1100 m elevation. Fruit black.

92250 Rubus sp. Collected in Xuyong County, Sichuan Province, at 1150 m elevation. Fruit black.

Sept 20

92251 Rubus setchuenensis Bureau et Franch. Collected in Bijie County, Guizhou Province, at 1590 m elevation. Fruit black

Sept 22

92259 Rubus ireneaus Focke Collected in Bijie County, Guizhou Province, at 1810 m elevation. Fruit red.

92260 Rubus columellaris Tutcher Collected in Bijie County, Guizhou Province, at 1770 m elevation. Fruit orange-red.

Sept 26

92271 Rubus parvifolius L. Collected in Weining County, Guizhou Province, at 2100 m elevation. Fruit red.

92274 Rubus niveus Thunb. Collected in Shuicheng County, Guizhou Province, at 1750 m elevation. Fruit black.

92275 Rubus niveus Thunb. Collected in Shuicheng County, Guizhou Province, at 1730 m elevation. Fruit black.

Sept 27

92279 Rubus lambertianus Ser. Collected in Shuicheng County, Guizhou Province, at 1820 m elevation. Fruit orange.

92280 Rubus setchuenensis Bureau et Franch. Collected in Shuicheng County, at 1820 m elevation. Fruit black.

Sept 28

92286 Rubus lambertianus Ser. Collected in Nayong County, Guizhou Province, at 1350 m elevation. Fruit orange.

Oct 2

92287 Rubus tephrodes Hance Collected in Fuquan County, Guizhou Province. Fruit black.

Oct 3

92288 Rubus amphidasys Focke ex Diels Collected in Leishan County, Guizhou Province, at 1350 m elevation. Fruit red.

92289 Rubus hunanensis Hand.-Mazz. Collected in Leishan County, Guizhou Province, at 1350 m elevation. Fruit orange-red.

92291 Rubus multibracteatus Levl. et Vant Collected in Leishan County, Guizhou Province, at 1350 m elevation. Fruit red.

FURTHER POTENTIAL COLLABORATION WITH CHINESE SCIENTISTS

Guizhou Botanical Garden

The staff of the Guizhou Botanical Garden, who have the concurrence of the administrators of the Guizhou Academy of Sciences, are interested in participating and collaborating in additional plant explorations with American scientists. Our experience was that this group is exceptionally fine to work with. They exhibited the ultimate in hospitality, their enthusiasism for locating and collecting plants in the native flora was outstanding, and they had an enjoyable sense of humor. I would highly recommend them as cooperators. Some plants that they have a special interest in further collecting and developing are the following:

1) Actinidia sp., especially A. chinensis, widespread native plants, ranging from 400 to 2170 m elevation, and growing in every county in the Province. Some collections have been made and some breeding has been done, but more intensive work is needed. Altogether 30 species kare recorded in Guizhou.

2) Myrica rubra, and other Myrica sp. are wild plants which are collected by local people. Selection of superior clones needs to be done.

3) Rosa roxburghi This species is very common in certain regions. It is not only an attractive ornamental but valuable for the hips, from which a very high Vitimin C drink is prepared. More selection from the wild populations and breeding is needed to develop superior cultivars for commercial production.

4) Rubus sp. Many wild species have good, large, edible fruit that are widely collected from wild plants. However, none of these are cultivated as yet. Superior clones of the more promising species need to be identified and breeding work initiated .

5) Other wild fruits of interest are Juglans sp., Carya sp., Castanea mollisima, and several species of Prunus.

6) In addition, there are many very attractive shrubs and trees with potential value for ornamental use that could be developed.

Nanjing Botanical Garden

For several years, Dr. He Shan An, Director of the Nanjing Botanical Garden, has participated in several coooperative ventures with American

scientists. He and his staff seem committed to international cooperative scientific ventures. With his, and several of his staff's, excellent command of English and their international contacts with botanists, they have been very helpful to assist in developing liasons with other Chinese Botanical Institutions. It can expected that there will be continued joint scientific programs with American and Chinese scientists at the Nanjing Botanical Garden. The staff there has an appreciation for the mutual benefits gained from international cooperation.

1)Specific cooperative work that will proceed following this Rubus expedition are as follows:

a) Preparation of a paper, or booklet, summarizing the characteristics and locations of the species that we found in Guizhou.

b) A research paper on the chromosome numbers of the Chinese Rubus species.

c) Development of a uniform evaluation system for evaluating the species in different environments--Nanjing, China and Corvallis, OR

d) The Chinese botanists are interested in developing coooperative berry breeding work with an American Rubus breeder; i.e, to share information and breeding materials.

2) Other types of cooperation that are desired include:

a) Reciprocal exchange of scientists for short study periods.

The Chinese scientists are particularly interested in:

-learning about recent advances in biotechnology, especially new methods of evaluation such as DNA studies, and other new botanical research techniques

-more information about germplasm management, and storage

- developing uniform systems for evaluation so that results from different environments can be compared

The American scientists could benefit from:

-the knowledge of Chinese botanists about the flora

-access to Chinese herbaria to study the plants.
-sharing plant evaluation data from different environments
-the participation of Chinese botanists on joint plant exploration trips, a necessary component of any trip for making in-country arrangements for local travel, accomodations, access to local government officials, obtaining various permits, providing language interpretation, etc.
-assistance for liason with other Chinese botanists and Botanical Gardens for plant explorations

b) Post-graduate study for young Chinese scientists in American Universities. The Chinese will benefit from scientific training which might not be available in China. The Americans will benefit by developing the potential for having the best possible future collaborator in China.

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APPENDIX I

Team Song of the U.S.A./China Scientific Expedition

Zhu Te Hong, Composer/lyricist

Kim Ching, English Translation

Great nations of China and the U.S.A.

Are working together to explore the world of science

Scientists of the two nations, fearless of hazards and difficulties

Have friendship flowers blooming

Curving highways lead to cloudy heights

Under the hot sun we walk toward the mountain peaks

As we saunter the narrow hilly trails

Wishing the white cloud can be used to wipe off our sweat

Wearing morning mist as our hats

Troops of scientists around the mountain ranges will discover great many natural resources

Victorious songs will be echoed by streams and rivers

Troops of scientists around the mountain ranges will discover great many natural resources

Victorious songs will be echoed by streams and rivers.

中美联合科学考察队队歌

贵州植物园 朱德洪 词曲
吴德慎 魏德生 改词

B调 2/4

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撕 块 白 云 把 汗 擦

3 · 6 | 1 · 2 | 3 · 1 | 2 · 3 |

刚 拿 晨 雾 当 帽 戴

群 山 列 队 献 资 源

1 · 3 | 2 1 | 6 21 | 6 — |

又 把 彩 霞 脚 下 踏

江 河 齐 奏 凯 歌 还

3 · 6 | 1 · 2 | 3 · 1 | 2 · 3 |

群 山 列 队 献 资 源

1 · 3 | 5 3 | 6 35 | 6 0 ||

江 河 齐 奏 凯 歌 还

曲終

一九九二年六月二十九日

APPENDIX 2

Rubus species in Guizhou Province

1. Described in 'Flora Guizouensis'

Subgenus Chamaebatus

R. pectinellus

Subgenus Dalibardastrum

R. amphidasys

Subgenus Malachobatus

R. acuminatus puberulus
R. alcaefolius
R. assamensis
R. bambusarum
R. buergeri
R. caudifolius
R. chroosepalus
R. dolichophyllus
R. echinoides
R. feddei
R. hastifolius
R. flagelliflorus
R. henryi var. sozostylus
R. huangpingensis
R. hunanensis
R. ichangensis
R. irenaeus
R. lambertianus
R. lobophyllus
R. malifolius
R. multibracteatus
R. oblongus
R. panduratus
R. parkeri
R. pinnatisepalus
R. pirifolius
R. playfairianus
R. reflexus
R. refractus
R. rufus
R. setchuenensis
R. swinhoei
R. tephrodes
R. xanthoneurus

Subgenus Idaeobatus

R. adenophorus
R. aurantiacus var. obusifolius
R. biflorus
R. chiliadenus
R. columellaris
R. corchorifolius
R. coreanus
R. ellipticus var. obcordatus
R. eucalyptus
R. eustephanus
R. idaeopsis
R. innominatus
R. inopertus
R. leucanthus
R. mesogaeus
R. niveus

Appendix 2 (cont)

Subgenus Idaeobatus (cont)

R. parvifolius
R. peltatus
R. pentagonus var. modestus
R. pinfaensis
R. pungens var. oldhamii
R. quinquefoliatus
R. rosifolius
R. sumatranus
R. trianthus
R. tsangii

2. New sp. added by Chen Qian Hai (Taxonomist at the Biology Institute of the Guizhou Academy of Sciences)

R. qianglongensis

3. Additional species found by our Team, previously unreported from this province

R. crassifolius
R. faberi
R. glabricarpus
R. grayanus
R. mallotifolius
R. tsangorum

APPENDIX 3

Master List of Accessions

Coll No	NCGR No	Species	Seeds	Herb	Sp Buds
92106	FRA 1188	Fragaria nilgerrensis Schlect. ex Gay	X	X	
92305		Juglans regia L. (Guiyang)	X		
92306		Juglans regia L. (Xingyi-1)	X		
92307		Juglans regia L. (Xingyi-2)	X		
92313		Juglans cathayensis Dode		X	
92043		Rubus adenophorus Rolfe		X	
92079		Rubus adenophorus Rolfe		X	
92081		Rubus adenophorus Rolfe		X	X
92308		Rubus adenophorus Rolfe			X
92031		Rubus alceaefolius Poir.		X	
92007		Rubus amphidasys Focke ex Diels		X	
92024		Rubus amphidasys Focke ex Diels		X	
92075		Rubus amphidasys Focke ex Diels		X	X
92126		Rubus amphidasys Focke ex Diels		X	
92309		Rubus amphidasys Focke ex Diels			X
92288	RUB 1714	Rubus amphidasys Focke ex Diels	X		
92179		Rubus assamensis Focke		X	X
92248	RUB 1701	Rubus assamensis Focke	X		
92035		Rubus bambusarum Focke		X	
92060		Rubus caudifolius Wuzhi		X	
92062		Rubus caudifolius Wuzhi		X	
92063		Rubus caudifolius Wuzhi		X	
92066		Rubus caudifolius Wuzhi		X	
92088		Rubus caudifolius Wuzhi		X	
92093		Rubus caudifolius Wuzhi		X	X
92087		Rubus chiliadenus Focke		X	
92217	RUB 1620	Rubus chingii Hu	X		
92154		Rubus chroosepalus Focke		X	X
92089		Rubus columellaris Tutcher		X	X
92094		Rubus columellaris Tutcher		X	
92096		Rubus columellaris Tutcher		X	
92130	RUB 1621	Rubus columellaris Tutcher	X	X	
92132	RUB 1622	Rubus columellaris Tutcher	X	X	
92135	RUB 1623	Rubus columellaris Tutcher	X		
92260	RUB 1706	Rubus columellaris Tutcher	X		
92003	RUB 1624	Rubus corchorifolius L.	X	X	
92021	RUB 1625	Rubus corchorifolius L.	X	X	
92077	RUB1626	Rubus corchorifolius L.	X		
92108	RUB 1627	Rubus corchorifolius L.	X		
92110	RUB 1628	Rubus corchorifolius L.	X		
92116	RUB 1629	Rubus corchorifolius L.	X		
92014		Rubus coreanus Miq.		X	
92084		Rubus coreanus Miq.		X	
92133	RUB 1630	Rubus coreanus Miq.	X	X	
92152	RUB 1631	Rubus coreanus Miq.	X		
92153	RUB 1632	Rubus coreanus Miq.	X		
92212	RUB 1633	Rubus coreanus Miq.	X	X	
92213	RUB 1634	Rubus coreanus Miq.	X	X	
92214	RUB 1635	Rubus coreanus Miq.	X	X	
92216	RUB 1636	Rubus coreanus Miq.	X		
92091		Rubus crassifolius Yu et Lu		X	X
92180		Rubus dolichophyllus Hand.-Mazz.		X	X

APPENDIX 3 (cont)

92164		Rubus echinoides Metc.		X	X
92193		Rubus echinoides Metc.		X	
92160		Rubus ellipticus Smith		X	
92191		Rubus ellipticus Smith		X	
92001	RUB 1637	Rubus eustephanus Focke ex Diels	X		
92013	RUB 1638	Rubus eustephanus Focke ex Diels	X	X	
92022	RUB 1639	Rubus eustephanus Focke ex Diels	X	X	
92029		Rubus eustephanus Focke ex Diels		X	
92036		Rubus eustephanus Focke ex Diels		X	
92042		Rubus faberi Focke		X	
92202		Rubus feddei Levl. et Vant.		X	X
92204		Rubus feddei Levl. et Vant.		X	X
92085		Rubus flagelliflorus Focke ex Diels		X	
92188	RUB 1677	Rubus flagelliflorus Focke ex Diels	X	X	
92128	RUB 1640	Rubus glabricarpus Cheng	X	X	
92092		Rubus grayanus Maxim.		X	
92095		Rubus grayanus Maxim.		X	
92099		Rubus grayanus Maxim.		X	
92078		Rubus hastifolius Levl. et Vant.		X	
92144		Rubus hastifolius Levl. et Vant.		X	
92068		Rubus henryi Hemsl. et Ktze.		X	
92052		Rubus hunanensis hand.-Mazz.		X	
92090		Rubus hunanensis Hand.-Mazz.		X	
92289	RUB 1715	Rubus hunanensis Hand.-Mazz.	X		
92150		Rubus ichangensis Hemsl. et Ktze		X	X
92016		Rubus ichangensis Hemsl. et Ktze.		X	
92166		Rubus ichangensis Hemsl. et Ktze.		X	
92174		Rubus ichangensis Hemsl. et Ktze.		X	
92178		Rubus idaeopsis Focke		X	X
92185		Rubus idaeopsis Focke		X	
92004		Rubus innominatus S. Moore		X	
92037		Rubus innominatus S. Moore		X	
92040		Rubus innominatus S. Moore		X	
92080		Rubus innominatus S. Moore		X	X
92083		Rubus innominatus S. Moore		X	
92156		Rubus innominatus S. Moore		X	
92215		Rubus innominatus S. Moore		X	
92224	RUB 1698	Rubus innominatus (Diels) Focke	X		
92005		Rubus inopertus (Diels) Focke		X	
92056		Rubus inopertus (Diels) Focke		X	
92058		Rubus inopertus (Diels) Focke		X	
92114		Rubus inopertus (Diels) Focke		X	X
92115		Rubus inopertus (Diels) Focke		X	X
92189		Rubus inopertus (Diels) Focke		X	
92059		Rubus irenaeus Focke		X	
92076		Rubus irenaeus Focke		X	X
92104		Rubus irenaeus Focke		X	X
92148		Rubus irenaeus Focke		X	
92232		Rubus ireneaus Focke			X
92223	RUB 1697	Rubus ireneaus Focke	X		
92259	RUB 1705	Rubus ireneaus Focke	X		
92009		Rubus lambertianus Ser.		X	
92038		Rubus lambertianus Ser.		X	
92047		Rubus lambertianus Ser.		X	

APPENDIX 3 (cont)

92157		Rubus lambertianus Ser.		X	
92279	RUB 1710	Rubus lambertianus Ser.	X		
92286	RUB 1712	Rubus lambertianus Ser.	X		
92072		Rubus lambertianus Ser. glaber Hemsl.		X	
92082		Rubus lambertianus Ser. glandulosus Card.		X	
92142		Rubus lambertianus Ser. paykouangensis (Levl.)Hand-Mazz.		X	
92162		Rubus lambertianus Ser. paykouangensis (Levl.)Hand-Mazz		X	
92051		Rubus malifolius Focke		X	
92053		Rubus malifolius Focke		X	
92101		Rubus malifolius Focke		X	
92175		Rubus malifolius Focke		X	
92187		Rubus malifolius Focke		X	
92194		Rubus malifolius Focke		X	
92168		Rubus mallotifolius Wu ex Yu and Lu		X	X
92067		Rubus mesogaeus Focke		X	
92103		Rubus multibracteatus Levl. et Vant.		X	
92105		Rubus multibracteatus Levl. et Vant.		X	
92146		Rubus multibracteatus Levl. et Vant.		X	X
92158	RUB 1641	Rubus multibracteatus Levl. et Vant.	X	X	
92190	RUB 1642	Rubus multibracteatus Levl. et Vant.	X	X	
92198	RUB 1643	Rubus multibracteatus Levl. et Vant.	X		
92199	RUB 1644	Rubus multibracteatus Levl. et Vant.	X		
92201	RUB 1645	Rubus multibracteatus Levl. et Vant.	X	X	
92218	RUB 1646	Rubus multibracteatus Levl. et Vant.	X		
92291	RUB 1716	Rubus multibracteatus Levl. et Vant.	X		
92159	RUB 1647	Rubus niveus Thunb.	X	X	
92161	RUB 1648	Rubus niveus Thunb.	X		
92163		Rubus niveus Thunb.		X	
92170	RUB 1649	Rubus niveus Thunb.	X		
92172	RUB 1650	Rubus niveus Thunb.	X	X	
92219	RUB 1651	Rubus niveus Thunb.	X		
92274	RUB 1708	Rubus niveus Thunb.	X		
92275	RUB 1709	Rubus niveus Thunb.	X		
92100		Rubus panduratus Hand-Mazz.		X	
92113		Rubus panduratus Hand.-Mazz.		X	
92030		Rubus parkeri Hance		X	
92073		Rubus parkeri Hance		X	
92221	RUB 1661	Rubus parvifolius L.	X		
92023		Rubus parvifolius L.		X	
92117	RUB 1652	Rubus parvifolius L.	X	X	
92131	RUB 1653	Rubus parvifolius L.	X	X	
92136	RUB 1654	Rubus parvifolius L.	X	X	
92140	RUB 1655	Rubus parvifolius L.	X		
92141	RUB 1656	Rubus parvifolius L.	X		
92151	RUB 1657	Rubus parvifolius L.	X	X	
92165		Rubus parvifolius L.		X	
92171	RUB 1658	Rubus parvifolius L.	X		
92195		Rubus parvifolius L.		X	
92197		Rubus parvifolius L.		X	
92200	RUB 1659	Rubus parvifolius L.	X		
92210		Rubus parvifolius L.		X	
92220	RUB 1660	Rubus parvifolius L.	X		
92300	RUB 1661	Rubus parvifolius L.	X		
92301	RUB 1662	Rubus parvifolius L.	X		

APPENDIX 3 (cont)

92302	RUB 1663	Rubus parvifolius L.	X		
92303	RUB 1664	Rubus parvifolius L.	X		
92310		Rubus parvifolius L.			X
92271	RUB 1707	Rubus parvifolius L.	X		
92102		Rubus peltatus Maxim.		X	
92109		Rubus peltatus Maxim.		X	
92033		Rubus pinfaensis Levl. et Vant.		X	
92125	RUB 1665	Rubus pinfaensis Levl. et Vant.	X	X	
92064		Rubus pinnatisepalus Hemsl.		X	
92011		Rubus reflexus Ker.		X	
92071		Rubus reflexus Ker.		X	
92097		Rubus reflexus Ker.		X	
92123		Rubus reflexus Ker.		X	X
92311		Rubus reflexus Ker.			X
92055		Rubus reflexus Ker. orogenes Hand.-Mazz.		X	
92121	RUB 1666	Rubus rosifolius Smith	X	X	
92149	RUB 1667	Rubus rosifolius Smith	X		
92046		Rubus rufus Focke		X	
92048		Rubus rufus Focke		X	
92173		Rubus rufus Focke		X	
92183		Rubus rufus Focke		X	
92045		Rubus rufus Focke palmatifidus Card.		X	
92002		Rubus setchuenensis Bureau et Franch.		X	
92041		Rubus setchuenensis Bureau et Franch.		X	
92221	RUB 1695	Rubus setchuenensis Bureau et Franch.	X		
92222	RUB 1696	Rubus setchuenesis Bureau et Franch.	X		
92251	RUB 1704	Rubus setchuenensis Bureau et Franch.	X		
92280	RUB 1711	Rubus setchuenensis Bureau et Franch.	X		
92050		Rubus sp.		X	
92167		Rubus sp.		X	
92169	RUB 1675	Rubus sp.	X	X	
92176		Rubus sp.		X	
92181		Rubus sp.		X	
92182		Rubus sp.		X	
92186	RUB 1676	Rubus sp.	X	X	
92192		Rubus sp.		X	
92196	RUB 1678	Rubus sp.	X	X	
92225	RUB 1699	Rubus sp.	X		
92234	RUB 1700	Rubus sp.	X		
92249	RUB 1702	Rubus sp.	X		
92250	RUB 1703	Rubus sp.	X		
92122		Rubus sumatranus Miq.			X
92127	RUB 1668	Rubus sumatranus Miq.	X	X	
92134	RUB 1669	Rubus sumatranus Miq.	X	X	
92145	RUB 1670	Rubus sumatranus Miq.	X		
92203		Rubus sumatranus Miq.		X	
92312		Rubus sumatranus Miq.			X
92025		Rubus swinhoei Hance		X	
92026		Rubus swinhoei Hance		X	
92032		Rubus swinhoei Hance		X	
92049		Rubus swinhoei Hance		X	
92124	RUB 1671	Rubus swinhoei Hance	X	X	
92138	RUB 1672	Rubus swinhoei Hance	X		
92147	RUB 1673	Rubus swinhoei Hance	X		

APPENDIX 3 (cont)

92008		Rubus tephrodes Hance		X	
92028		Rubus tephrodes Hance		X	
92039		Rubus tephrodes Hance		X	
92287	RUB 1713	Rubus tephrodes Hance	X		
92118		Rubus tephrodes Hance ampliflorous (Levl. et Vant.) Hand-Mazz			X
92119		Rubus tephrodes Hance setosissimus (Levl. et Vant.) Hand-Mazz			X
92065		Rubus trianthus Focke		X	
92070		Rubus tsangorum Hand.-Mazz.		X	
92120		Rubus tsangorum Hand.-Mazz.		X	
92304	RUB 1674	Rubus tsangorum Hand.-Mazz.	X		
92054		Rubus xanthoneurus Focke		X	
92061		Rubus xanthoneurus Focke		X	
92074		Rubus xanthoneurus Focke		X	X
92086		Rubus xanthoneurus Focke		X	
92098		Rubus xanthoneurus Focke		X	X
92112		Rubus xanthoneurus Focke		X	X
92129		Rubus xanthoneurus Focke		X	
92155		Rubus xanthoneurus Focke		X	X
92184		Rubus xanthoneurus Focke		X	
92139		Rubus xanthoneurus Focke glandulosus Yu and Lu		X	X
92137		Rubus xanthoneurus Focke glandulosus Yu and Lu		X	

APPENDIX 4

List of Seeds Collected (including both trips)

Species	Collec. #	NCGR Acces. #
Fragaria nilgerrensis Schlect. ex Gay	92106	FRA 1188
Juglans regia L.	92305	
Juglans regia L.	92306	
Juglans regia L.	92307	
Rubus amphidasys Focke ex Diels	92288	RUB 1714
Rubus assamensis Focke	92248	RUB 1701
Rubus chingii Hu	92217	RUB 1620
Rubus columellaris Tutcher	92130	RUB 1621
Rubus columellaris Tutcher	92132	RUB 1622
Rubus columellaris Tutcher	92135	RUB 1623
Rubus columellaris Tutcher	92260	RUB 1706
Rubus corchorifolius L.	92003	RUB 1624
Rubus corchorifolius L.	92021	RUB 1625
Rubus corchorifolius L.	92077	RUB 1626
Rubus corchorifolius L.	92108	RUB 1627
Rubus corchorifolius L.	92110	RUB 1628
Rubus corchorifolius L.	92116	RUB 1629
Rubus coreanus Miq.	92133	RUB 1630
Rubus coreanus Miq.	92152	RUB 1631
Rubus coreanus Miq.	92153	RUB 1632
Rubus coreanus Miq.	92212	RUB 1633
Rubus coreanus Miq.	92213	RUB 1634
Rubus coreanus Miq.	92214	RUB 1635
Rubus coreanus Miq.	92216	RUB 1636
Rubus eustephanus Focke ex Diels	92001	RUB 1637
Rubus eustephanus Focke ex Diels	92013	RUB 1638
Rubus eustephanus Focke ex Diels	92022	RUB 1639
Rubus flagelliflorus Focke ex Diels	92188	RUB 1677
Rubus glabricarpus Cheng	92128	RUB 1640
Rubus hunanensis Hand-Mazz.	92289	RUB 1715
Rubus innominatus S. Moore	92224	RUB 1698
Rubus ireneaus Focke	92223	RUB 1697
Rubus ireneaus Focke	92259	RUB 1705

Appendix 4 (cont)

Rubus lambertianus Ser.	92279	RUB 1710
Rubus lambertianus Ser.	92286	RUB 1712
Rubus multibracteatus Levl. et Vant.	92158	RUB 1641
Rubus multibracteatus Levl. et Vant.	92190	RUB 1642
Rubus multibracteatus Levl. et Vant.	92198	RUB 1643
Rubus multibracteatus Levl. et Vant.	92199	RUB 1644
Rubus multibracteatus Levl. et Vant.	92201	RUB 1645
Rubus multibracteatus Levl. et Vant.	92218	RUB 1646
Rubus multibracteatus Levl. et Vant	92291	RUB 1716
Rubus niveus Thunb.	92159	RUB 1647
Rubus niveus Thunb.	92161	RUB 1648
Rubus niveus Thunb.	92170	RUB 1649
Rubus niveus Thunb.	92172	RUB 1650
Rubus niveus Thunb.	92219	RUB 1651
Rubus niveus Thunb.	92274	RUB 1708
Rubus niveus Thunb.	92275	RUB 1709
Rubus parvifolius L.	92117	RUB 1652
Rubus parvifolius L.	92131	RUB 1653
Rubus parvifolius L.	92136	RUB 1654
Rubus parvifolius L.	92140	RUB 1655
Rubus parvifolius L.	92141	RUB 1656
Rubus parvifolius L.	92151	RUB 1657
Rubus parvifolius L.	92171	RUB 1658
Rubus parvifolius L.	92200	RUB 1659
Rubus parvifolius L.	92220	RUB 1660
Rubus parvifolius L.	92300	RUB 1661
Rubus parvifolius L.	92301	RUB 1662
Rubus parvifolius L.	92302	RUB 1663
Rubus parvifolius L.	92303	RUB 1664
Rubus parvifolius L.	92271	RUB 1707
Rubus pinfaensis Levl. et Vant.	92125	RUB 1665
Rubus rosifolius Smith	92121	RUB 1666
Rubus rosifolius Smith	92149	RUB 1667
Rubus setchuenensis Bureau et Franch	92221	RUB 1695
Rubus setchuenensis Bureau et Franch	92222	RUB 1696
Rubus setchuenensis Bureau et Franch.	92251	RUB 1704
Rubus setchuenensis Bureau et Franch.	92280	RUB 1711
Rubus sumatranus Miq.	92127	RUB 1668
Rubus sumatranus Miq.	92134	RUB 1669

Appendix 4 (cont)

Rubus sumatranus Miq.	92145	RUB 1670
Rubus swinhoei Hance	92124	RUB 1671
Rubus swinhoei Hance	92138	RUB 1672
Rubus swinhoei Hance	92147	RUB 1673
Rubus tephrodes Hance	92287	RUB 1713
Rubus tsangorum Hand.-Mazz.	92304	RUB 1674
Rubus sp.	92169	RUB 1675
Rubus sp.	92186	RUB 1676
Rubus sp.	92196	RUB 1678
Rubus sp.	92225	RUB 1699
Rubus sp.	92234	RUB 1700
Rubus sp.	92249	RUB 1702
Rubus sp.	92250	RUB 1703

APPENDIX 5

Bud collections for chromosome studies

Species	Coll. No.
Rubus adenophorus Rolfe	92081
Rubus adenophorus Rolfe	92230
Rubus amphidasys Focke ex Diels	92075
Rubus amphidasys Focke ex Diels	92231
Rubus assamensis Focke	92179
Rubus caudifolius Wuzhi	92093
Rubus chroosepalus Focke	92154
Rubus columellaris Tutcher	92089
Rubus crassifolius Yu et Lu	92091
Rubus dolichophyllus Hand.-Mazz.	92180
Rubus echinoides Metc.	92164
Rubus feddei Levl. et Vant.	92202
Rubus feddei Levl. et Vant	92204
Rubus ichangensis Hemsl. et Ktze	92150
Rubus idaeopsis Focke	92178
Rubus innominatus S. Moore	92080
Rubus inopertus (Diels) Focke	92114
Rubus inopertus (Diels) Focke	92115
Rubus irenaeus Focke	92076
Rubus irenaeus Focke	92232
Rubus mallotifolius Wu ex Yu and Lu	92168
Rubus multibracteatus Levl. et Vant.	92146
Rubus parvifolius L.	92233
Rubus reflexus Ker.	92123
Rubus reflexus Ker.	92234
Rubus sumatranus Miq.	92122
Rubus sumatranus Miq.	92235
Rubus xanthoneurus Focke	92074
Rubus xanthoneurus Focke	92098
Rubus xanthoneurus Focke	92155
Rubus xanthoneurus Focke var. glandulosus Yu et Lu	92139
Rubus xanthoneurus Focke	92112

GUIZHOU SHENG
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GUIYANG
QIANDONGNAN MIAOZU DONGZU ZIZHIZHOU
QIANNAN BUYEIZU MIAOZU ZIZHIZHOU
LIUPANSHUI SHI
Luzhou
Yibin
Chengdu
Chongqing
Guangzhou
Nanning
Hanoi
Kunming
Lao Cai
Dien Bien Phu
Vientiane
Luang Prabang
Mekong
Red River
Yangtze
Pearl River
Tonkin
Gulf of Tonkin
Hainan Island
Xisha Qundao
Zhongsha Qundao
Nansha Qundao
Taiwan Dao
Taiwan Haixia
Taipei
Taichung
Tainan
Kaohsiung
Hong Kong
Macao
Hainan Dao
Leizhou Bandao
Guangdong Sheng
Guangxi Zhuang Zizhiqu
Yunnan Sheng
Sichuan Sheng
Hunan Sheng
Jiangxi Sheng
Fujian Sheng
Guizhou Sheng
Chongqing Shi
Sichuan Pendi
Yunnan Gaoyuan
Guangxi Pingyuan
Guangxi Shanqu
Guangdong Pingyuan
Guangdong Shanqu
Yunnan Shanqu
Guizhou Gaoyuan
Guizhou Shanqu
Sichuan Shanqu
Hunan Shanqu
Hunan Pingyuan
Jiangxi Shanqu
Jiangxi Pingyuan
Fujian Shanqu
Fujian Pingyuan
Taiwan Shanqu
Taiwan Pingyuan
Hainan Shanqu
Hainan Pingyuan
Xisha Qundao
Zhongsha Qundao
Nansha Qundao
Taiwan Dao
Taiwan Haixia
Taipei
Taichung
Tainan
Kaohsiung
Hong Kong
Macao
Hainan Dao
Leizhou Bandao
Guangdong Sheng
Guangxi Zhuang Zizhiqu
Yunnan Sheng
Sichuan Sheng
Hunan Sheng
Jiangxi Sheng
Fujian Sheng
Guizhou Sheng
Chongqing Shi
Sichuan Pendi
Yunnan Gaoyuan
Guangxi Pingyuan
Guangxi Shanqu
Guangdong Pingyuan
Guangdong Shanqu
Yunnan Shanqu
Guizhou Gaoyuan
Guizhou Shanqu
Sichuan Shanqu
Hunan Shanqu
Hunan Pingyuan
Jiangxi Shanqu
Jiangxi Pingyuan
Fujian Shanqu
Fujian Pingyuan
Taiwan Shanqu
Taiwan Pingyuan
Hainan Shanqu
Hainan Pingyuan