

Report on Plant Exploration in CHILE, ECUADOR, and COLOMBIA
for Strawberries and Other Small Fruits^{1/}

November 20, 1956 to January 27, 1957

George M. Darrow^{2/}

The chief objective was to obtain additional germ plasm for use by strawberry breeders in the United States.

The background: (1) Cultivated strawberries trace back to the importation of the "Chilean" [*F. chiloensis*] strawberry from Chile into France in 1714, the "Chilean" being described as growing to the size of a hen's egg. In Europe it was crossed with the small-fruited, soft, high-flavored *Fragaria virginiana* already introduced from eastern North America. The modern cultivated strawberry evolved from the hybrids. (2) The "Chilean" red and white varieties, apparently the same or similar to those under cultivation when the Spanish came to Chile in the early 1500's, are still the principal varieties in Chile even though European and American varieties have been tried through the years. (3) The "Chilean" are all perfect-flowered, yet no perfect-flowered selections have been made in North America in any of the 3 octoploid native species: *F. chiloensis*, *F. ovalis*, and *F. virginiana* [with the possible exception of a selection of *F. chiloensis* by Bringham, of California, in 1956]. (4) Selections of *F. chiloensis* from the coast of Oregon by Waldo have been highly resistant to red stele-root rot; a selection by Wilhelm from the California Coast has been highly resistant to verticillium wilt; many or most selections of *F. chiloensis* have been highly tolerant of virus. (5) The "Chilean" has given large fruit size and hybrid vigor in crosses. (6) No survey had been made in Chile to obtain superior germ plasm for breeders.

The Report

I left Washington November 26, 7:05 P.M., via Panagra and arrived at Santiago November 27 at 4:20 P.M., being met by Mr. Nickerson, Assistant Agricultural Attaché to Chile, and Prof. B. Sparre, Systematic Botanist of the University of Chile. From Wednesday through to Saturday, I made contacts in Santiago--with Dr. Carlos Munoz, Director of the Department of Agricultural Research, University of Chile, with whom I looked over the herbarium material of *Fragaria* in the Agronomy (University of Chile) Herbarium. I also looked over the herbarium material in the College of Pharmacy [University of Chile]. Several tours were made of the fresh fruit markets in Santiago to survey strawberries. At this time, November 28 to December 1 [which would be our May 29 to June 1], about 90 percent of the berries in the Santiago markets were the Red Chilean, about 8 percent cultivated varieties from the United States or Europe, and 2 lots were the White Chilean. There were also a few *F. vesca alpina* in small containers. Four weeks later, on December 24, the largest lots of strawberries were still the Red Chilean but there were several lots of the White Chilean, of cultivated foreign varieties, and of *F. vesca*.

On December 3 Dr. Munoz furnished a car and driver to go to Quilloto, near Valparaiso, where strawberries were said to be formerly extensively, but now slightly, grown. With Leopoldo Caltagirone, an entomologist stationed there, I visited 2 farms, 1 of foreign varieties and 1 of a Red Chilean. I was told that "root weevil" [correctly white fringed beetle], *Pantomorus leucoloma*, was the most serious insect and that it had wiped out most of the industry here as in other places in Chile. I found the strawberry aphid here and later in nearly all cultivated fields in Chile, and in many places in the wild also, far from cultivated fields, and on *Rosa canina* [? the sweet-brier rose] which was naturalized widely, especially in South Chile.

^{1/} The work covered in this report was undertaken in cooperation with the Plant Introduction Section and financed as part of their plant procurement investigations.

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On December 4 Nickerson and I left Santiago for South Chile in the Embassy carryall, reaching Chillan the first night. Nickerson drove that and the following week and then returned to Santiago on December 14. Prof. Sparre [assigned by Dr. Munoz as my interpreter] could not leave Santiago on December 4, so came on the train on December 5, joining us at Chillan. He continued with me until December 20, when he returned to Santiago.

All strawberries in the market at Chillan were very fine White Chilean, said to be raised near the coast around Cobquecura about 50 miles north of Concepcion but only reachable by a road from Chillan. Seed of 1 Kilo of fruit was cleaned and sent to Washington; only about 5 percent seemed to be good and was saved.

In the afternoon of December 5 we drove to region of Termas Chillan in the Andes range, collecting plants and seed of the mountain F. chiloensis along the Digullin [2,000'] and the Renegado [3,200'] Rivers in the sand and gravel banks. The first berries were ripening. Dr. Lee Winters, in charge of the Rockefeller Experiment Station at Chillan, was most helpful.

On December 6 we drove to Concepcion and met Prof. Mario Ricardi, Assistant Head of Botany, and Miss Torres, his assistant at the University of Concepcion. All herbarium material [40 collections] of Fragaria of the University had been sent to Dr. S. C. Harland, University of Manchester, England. Also, 25 grams of seed of wild chiloensis collected at, or near, Aysen a year ago had been sent to Germany. Three different Fragaria were in the University gardens--1 of which was from the Aysen [farthest south] area. In the afternoon we collected in the wild 2 miles south. On December 7 Prof. Ricardi went with us to Rocoto, about 10 miles distant between the ocean and the mouth of the Bio Bio River, where we collected plants and fruit on bluffs about 1,000' high. All cultivated and most wild strawberries in this area were said to have been killed out by a disease years ago [probably the white fringed beetle]. Also, I was told that a large Red Chilean strawberry area at Copiopo, Huasco, and Freirimal, 950 K north of Santiago [latitude 28°-30°] had been killed out about 50 years ago by some trouble.

On December 8 we drove to Angol by the coast route [a difficult all-day drive] and stayed over Sunday, December 9, with E. E. Reed, at El Vergel. Mr. Reed, a fruit specialist [M. A., Oregon State], manages a 3,600-acre farm with 1,000 acres of forest planting, a herd of 60 to 80 cows, over 150 acres in orchard, and a nursery of 80 to 90 acres. He formerly collected strawberries for what is now our Plant Introduction Section [about 1924] and is probably the best informed horticulturist in Chile. He has done a fine plant introduction job and has greatly helped all plant industries in Chile by keeping the varieties reasonably up to date and propagating the best varieties. He was growing 3 cultivated strawberry varieties of Oregon origin, named Ancud, Maullin, and Quillan. He gave us many useful references to people and collecting areas.

On December 10 we drove to Temuco and with Prof. Gilberto Montero [Claro Solar 1134, Temuco], a good botanist who teaches science there, collected F. chiloensis in the recreation park of the City--these were male and female clones. In the market only the White Chilean were seen, about 300 pesos [50 cents] per Kilo. They were from the Carahua area and have been the only ones grown in that area for 50 years.

On December 11, with Prof. Mario Rubio, agronomist at Temuco, who speaks some English, we drove to Carahua. About 50 percent of the berries of the area were said to be canned by Bozzoto Brothers [of Quillota]. Their cannery was quite modern and was said to can 200,000 Kilos annually. My understanding was that 1956 was too dry, 1955 was too wet, but 1953 and 1954 just right for good production. 100 pesos per K was said to be the price paid but 140 pesos was the price on December 11. We drove to Trovolhue, the largest center, where there were 3 buyers and the berries were coming in by oxcart in 10- and 20-Kilo boxes. They were said to pick every 4 days. All cultivated fields seen had volunteer potatoes in among the berry plants. Nearly all were on very steep hillsides in small areas, about 14" between rows and 6" between plants; some fields were bearing their sixth crop. There was evidence of different varieties of the "White" and seed was obtained of the "Moreno" White Chilean, said to be better flavored, as well as of the common White Chilean. The White Chilean is a late variety with a normal season there 3 to 4 weeks long.

On December 12, Prof. Gilberto Montero went with us east to the Volcan Llaima area. Near the hotel near Llaima [1,450 meters elevation] the plants were not in blossom; at

about 1,400 meters elevation there was bloom and at 1,250 meters there was lots of bloom, both male and female but no hermaphrodites.

On December 13 we drove from Temuco past Cunco 18 kilometers to the Fundo Perez. They grew a cultivated foreign variety and some White Chilean in the garden but nearby in the orchard were wild strawberries and about 1 K beyond at Fundo El Salto we found our first hermaphrodite in the wild in a pasture. It was very similar to the cultivated Red and White Chilean in plant.

On December 14 we drove north to Collipulli, where Nickerson left us to return to Santiago, and then E. E. Reed drove us to Puren. A Mr. Reyes [a storekeeper there] told us where to find the cultivated strawberries--all White Chilean. This is a rather extensive new strawberry area only 6 to 7 years old. The field by the grower's house we visited was about 400' elevation and the upper one 900', on a very steep slope. Berries were being picked in both the upper and lower fields.

On December 15 we took the train south to Osorno. On the 16th we drove out south of Osorno to Riachuelo but the large "wild" turned out to be a poor cultivated variety. On December 17 we drove east to Puyehue and beyond to about 6 miles of the Argentine border but again the "large wild" turned out to be a cultivated variety and we saw no wild strawberries.

On December 18 we went by plane to Castro on the Island of Chiloé and on December 19 collected on the plateau rim near Piruquina. Mr. John Bucher, Castilla 77, Castro, an Alliance Missionary, furnished us a boy as a guide and promised to obtain seed from far south on the Island for us.

On December 20 Prof. Sparre went back to Santiago and I went to Ancud by narrow gauge railroad. Agronomist Carlos Riffart met me. He spoke a little English and took me to the beaches where we collected plants and seed. Here we found several clones of hermaphrodite as well as pistillate and male clones. About 2 kilos of wild F. chiloensis were purchased in the market and the seed extracted. Riffart also promised to send fruit of the very red Chilean by plane to me on the following Saturday when it would come into the market [not yet received].

On December 21 I left Ancud by plane to P. Montt and by train on December 22 to Santiago, arriving at 11:00 December 23.

In Santiago I met Raimundo Cabrera, strawberry specialist of the Departamento de Extension Agricola. Castilla 3727, Santiago; also Jorge Bolton, extension editor of the same office, and Mario Otto, an extension man for part of the Santiago area. On December 28 I went with them to 3 strawberry growers north of Santiago--the first of 2½ acres, all Red Chilean; the second of about 25 acres, all Red Chilean; and a third of ½-acre, of which ½ was a foreign variety, "freson," and ½ was Red Chilean. Fields were weedy, alkali was serious, and the plants not vigorous. Leaf diseases were absent or rare. Fungus and honeydew said to come from aphids was observed. The strawberry aphid was present but not abundant then. The yields were said to be ¼ of those of 15 years ago. In 1 field corn 3' apart in rows about 6' apart was used as a shade crop. The Red Chilean was said to require a rich soil. Sulfate of ammonia was said to be impossible to obtain and sulfur [exported from Chile] + nitrate was being tried.

On December 31 I went with Bolton and Cabrera to Casablanca, about 65 miles toward the coast. A young Englishman, Leslie Philips Jones, technician for the Kendrick Fundo, had about 1 acre of a foreign variety, freson, and a small patch of mixed Red Chilean and some hybrid. The berries were going to a jam factory in Casablanca. Irrigation was from a deep well. The beds were very good, the yield fair [2 tons this year], the variety rough and poor. He plans to expand. He took me to a planting of Mr. Morrison, Fundo Loma Larga, who share-cropped 1 acre of strawberries--foreign variety--the field had very bad bindweed and some virus like yellows but had well-water irrigation.

On January 3, with Bolton and Cabrera, we went to Pennafior, 33 K from Santiago down the river. In this intensive fruit-growing area a variety called "Luis XIII" was grown. Three growers were visited, one with 2 acres, one with 3 acres, and one with 20 acres. The 20-acre grower, William Hombitzer, Fundo Nogal, had besides the Luis XIII, plants of an Oregon variety from Reed of El Vergel, Angol. They were the only fully normal looking plants seen in Chile and were extremely vigorous. Thirty-seven boxes, of about

5 K each, of fruit were picked that day, Jan. 3. There were aphids and damage by white fringed beetle.

On January 4, Sparre and I flew from Santiago to Victoria and were driven to Curacautin by the Victoria agronomist. We then were given a ride by lumber truck by Forester Ivan Larraquibel, of Temuco, to Malaleshuello where we stayed over night with the local forest administrator. January 5, with a boy to guide us, we climbed Mt. Los Raices by the old road to Lonquimay, collecting all the way to the top--1,600 M. Hermaphrodite clones were found. No aphids were seen but mealy bugs [identified as *Aleyrodes* sp.] were noted on the wild strawberry here as well as in many other places. A little later, January 15-30, might have been better collecting.

We got a jeep ride back to Curacautin in the evening and on January 6 took the bus to Termas Tolhuaca [4,000']. In the afternoon we collected around the hotel, and in a valley nearby. Strawberries were very abundant and the season just right. Hot water bottles were furnished at night, it was so cold.

January 7 we hired a jeep to drive to Lake Malleco, where we collected several hermaphrodites back of the Forest Administrator Luis Schindler's home; at about 3,000'. January 8 we climbed the mountain back of the hotel to 5,000' and went along the Argentine trail. There were few strawberries in this area and we made only 1 collection.

On January 9 we took the bus from Termas Tolhuaco to Curacautin and the train to Temuco. The plane from Temuco to P. Montt on January 10 was about 6 hours late. January 11, the agronomist furnished a car and driver to go to Maullin and to the beaches about 4 K. west, collecting in the sand dunes where strawberries were abundant.

January 12 we flew from P. Montt to Coyhaique [650' elevation], a cattle and sheep city of 10,000 [about 300 miles south]. In the afternoon we collected on the mountain slopes at about 1,500'. This is the area farthest south and of greatest abundance of wild strawberries that we saw in Chile, and we met this afternoon about 30 pickers having up to about 10 K. each of strawberries. A notable character of these berries was that all were without caps, most of the caps being left on the plants. Nearly all *F. chilensis* in Chile have this characteristic of easy capping.

We found several hermaphrodite clones. Again on January 13, we collected in another direction, and January 14 drove about 20 K. toward Coyhaique Alta, collecting on a hill between Bull and Hidden Lakes, where strawberries were especially abundant.

The Coyhaique area of tens or hundreds of thousands of acres has the most wild strawberries of any area ever seen, though in Northern United States and Canada there have probably been similar areas at times. Where sheep are pastured the plants are very small and generally it is not good prospecting area. Where cattle are pastured usually the strawberry plants are larger and the collecting good. We were told that in some years picking begins in November, usually in early December with heavy picking till the end of January. Some berries are even sold in March, coming from very high elevations. They are said to be large. In Coyhaique winter temperatures go to -13° F. with snow for 2 months. The mountains are snowcapped in all directions. The veterinarian, Alberto Saini, furnished a pickup truck and driver. Saini speaks a little English but will go to an English school in Santiago in preparation for a trip to Australia and New Zealand. Coyhaique may well be the largest wild strawberry market in the World at present. Manuel Andrade, of the Agronomy Department, has bought wild strawberries for canning in former years but did not have funds to operate this year. He has been an agronomist at Ancud.

On January 15 we rode in the veterinarian's car from Coyhaique to Balmacedo [59 K.], collecting on the way, and took the plane at 12:00 for Santiago, arriving at the airport at 5:45. Five sacks of plants were sent January 17 to Washington in the Embassy pouch and the seed cleaned.

Summary

Dr. Munoz, Director of Agricultural Research, through "agronomists" [county agents], furnished cars and guides in many parts of Chile and these agronomists can usually be contacted for help. Many speak a little English. The Forest and Extension Services also were often helpful and many could speak some English.

In general, collections of wild F. chiloensis were made along the coast and in the Andes--along the beaches at 3 locations--near Concepcion [latitude 36°-50"], Maullin [41°-40"], and Ancud [41°-50"]. The collections near Castro on Chiloe were 10 to 15 miles inland but were in a similar climate. Rarely does the temperature go lower than about 27° F. in this coastal area. The Andes mountain collections were made on the way up to Termas Chillan [36°-50"], around Termas Tolhuaca [38°-10"], on the Los Raices range [38°-25"], on the way up to Hotel Llama [38°-40"], near Cunco [38°-50"], and around Coyhaique [45°-35"]. These were from about 1,650' at Coyhaique, 1,300' near Cunco, to 5,300' on Los Raices. The timber line was just at the highest point where we collected strawberries on Los Raices. At Coyhaique the snow line was estimated at 3,000' but seemed to me higher. Frosts had occurred in December and January where we collected flowers, buds, and seed. However, we could not obtain evidence on the frost resistance of flowers. Certainly the fruit must often be frozen in the green and ripe stages. Lowest winter temperatures of which we could be sure were about -13° F. However, near Coyhaique the strawberry probably grew up to about the snow line where the temperatures would be much lower.

One interior valley collection was made in a recreation park at Temuco, in an area comparable with the Medford, Oregon, area. As the plants were male or female, they were probably native, not introduced.

Characters in F. chiloensis of value in breeding are: (1) The very large size of the White and Red Chilean varieties. (2) Their remarkable firmness. (3) The easy capping of most of the wild chiloensis. (4) Their possible resistance to red stele and verticillium. (5) Their drought resistance. The Andes Mountain selections may have much greater hardness than the coastal selections. In both areas and in nearly all locations hermaphrodite plants were found. Though large-fruited plants were found in both areas, possibly larger ones may be found in the coastal areas. Nearly white-fruited wild selections [note Darrow #100] were found in both areas. The wild fruit lacked flavor and aroma as compared with F. virginiana.

About 5 cultivated varieties of the Chilean were seen, 2 of White Chilean and 3 of the Red Chilean. Around Santiago nearly all were of the Red Chilean and southward nearly all were of the White Chilean. In general, the White Chilean was very large, smooth, firm, and a straw-yellowish white-tinged, often with a dull red, the variant "Morena" seen in one field being said to be better flavored and darker [plants died]. Volunteer potatoes were growing in all White Chilean fields seen and in many Red Chilean, so both may be resistant to verticillium wilt. Two forms of the Red Chilean seemed to be grown, the longer larger-berried being the common Red Chilean and similar to the White but smoother. The other was called "Freson" [generally applied to a foreign variety] at one place and was said to be smaller, not so long, better flavored, and more resistant to the white fringed beetle. A few plants of the third Red Chilean was seen in a field of the White at Trolvohue but there was little chance to determine its value.

At least the great part of the cultivated F. chiloensis in Chile are of 3 kinds--White Chilean, Red Chilean, and Small Red Chilean. In Ecuador is a fourth variety, the Ambato, adapted to a strictly 12-hour day length. In southern Peru and in Bolivia there may be still another variety of F. chiloensis. In Mexico the "Fino" seems to be pure F. chiloensis but has smaller berries and has a virus lethal to F. vesca.

Recommendations regarding collections

1. Seedlings of many collections should be grown to be made available to breeders.
2. All seed of some collections should be sent to George F. Waldo in Oregon.
3. All seed of some collections should be planted by Don Scott at Beltsville.
4. Seed of large collections should be offered to Waldo, Bringham, and others.
5. Plants sent in should be propagated and if free of virus offered to breeders.
6. Attempts should be made through J. Becerra, of Lima, Peru, to obtain their cultivated form of F. chiloensis for comparison and breeding.

7. Plants of the Giant blackberry should be discarded after the University of Maryland has finished with them unless someone has equipment to control day length and temperature.

PART II

Enroute Santiago to Quito, I had Saturday in Lima, Peru, and there at the U. S. Embassy, through H. Allard [USDA] and Rigney [N. Car.], I met J. Becerra, who is doing some work [with Long] on strawberry varieties. He stated that he had selected out good plants of a variety that bore well in the short days of 10° South [he has sent plants to me]. Also, he would get plants of F. chilensis grown in South Peru. It may be the Red Chilean or a separate variety. He will be at Beltsville in about April. He works with Long.

Arrived in Quito, Ecuador, January 20 at 12:30, being met by Chable, of the Agricultural Mission. With Chable driving, we went via Ambato to Banos on the east slope of the Andes, at the foot of Vol. Tungurahua about 150 miles distant. Along the way near Ambato we saw some picking of Capulin cherries, though the fruit of most trees was not ripe. In the market at Ambato about 30 were selling Capulin cherries--the largest being as large as any sweet cherries. There were more Capulin cherry trees in the area than I had seen previously--in an area 50 to 75 miles long perhaps 500,000 to 1,000,000 trees. Some strawberries were in the market; all were Ambato. Because of landslides we had to take the road via Huairapata to Banos. One K. beyond the village at 9,400' and 28 K. before Banos we found 1 form of the giant blackberry--medium in plant size but with very large flower and fruit clusters--on both sides of the road, especially the upper side in rather open pastures.

On January 22 we drove 20 K. from Banos [5,950'] around the side of Vol. Tungurahua toward Riobamba. We climbed in second growth and pastures from 9,000' to 10,000' but found only a little of the Giant blackberry at the higher elevations. The best collecting was along the road itself. At 15 K. from Banos we collected the best plant of all on the lower side of the road, having 1 cluster of 42 flower buds and fruits as well as other clusters. We also found a sterile hybrid near a shed at about 14 to 16 K. from Banos--a cross with the common rich pink-flowered, very glandular, hairy blackberry of bogotensis type. Other hybrids of similar type were seen.

On the return to Quito, we again collected the large-cluster type at Huairapata just at the top of the climb out of the Riobamba valley and then drove to Huachi to the Ambato strawberry fields. The season had been very dry and there were few blossoms and fruits. We purchased 10 plants with buds from a lady who said she was 40 years old and had inherited the field from her father. We saw many more fields than in 1952. There may be 1,000 acres around Huachi on the unirrigated volcanic soils 9,000' to 10,000' above sea level.

On January 24, with Chable we drove up Mt. Pichinchu, back of Quito. At 10,800' and 18 K. from Quito just over the brow at the first gully, we collected a plant with 42 fruits, flowers, and buds on 1 cluster, with fruit deep wine-colored long before it was ripe. Each gully seemed to have plants on the lower side of the road.

In the afternoon I took the plane to Bogota and was met by Roberto Alveres, the auto driver for E. E. Reichard, Acting Chief, Agricultural and Natural Resources Division, American Operations Mission, who was away. On January 25 I visited the various agencies and the University of Colombia. In the afternoon Roberto drove me to the edge of the plateau beyond San Miguel, 44 K. from the hotel. The Giant blackberry, Rubus macrocarpus, was abundant at the drop into the Magdalene Valley. Two other species of the Giant group were in the same area--both smaller growing, one entirely glabrous, the other nearly glabrous.

On January 26, in the morning, I rode with Dr. Orlando Fals Borda, a sociologist, north to a small test of the Klonmore and Blakemore strawberries at Choconta in the Sancio Valley at 9,000'. Being set in July, neither were growing very well and were making no runners, and Missionary and Florida Ninety were suggested for trial. Frost had occurred a week earlier and 8 or 9 frosts were expected yearly. We collected Vaccinium meridiense 12 K. beyond the place with the strawberry test in Sancio Valley. This blueberry was very productive and grew to 12', much like V. ovatum in Oregon, but the

good-sized berries had little flavor. Its seeds were minute and only 1 or 2 to a berry.

In the afternoon, with Dr. Jesus M. Idrobo we drove to the mountains back of Bogota on the Chipaque Road. At 10,500', 15 K. from Bogota we found the Giant blackberry, Rubus gacheterisis, abundant on both sides of the road; also a small species of the Giant group, Rubus choachensis. This small species grew to 3' high and had 1 to 4 blossoms and fruit, but the fruit was quite large. Dr. Idrobo has just started a study of the Rubus of Colombia and has furnished E. G. Freeman, Whitley City, Ky., and Kenneth Werniment, Foreign Service, USA, with pollen of R. gacheterisis.

It is notable that in each location visited a different form of the Giant blackberry was found. Three represent different species and only a careful comparison by growing under the same conditions will indicate which may be the best. It is uncertain whether R. macrocarpus of Mt. Pichincha, of Ecuador, and of the San Miguel area of Colombia are identical or if a fourth species of the Giant type was seen. As a guess, R. roseus and R. macrocarpus are equally large and promising for breeding and gacheterisis slightly smaller but still up to 2" across--however, it was found in a dryer location. The Ecuadorian species across the Rio Bomba Valley from Vol. Tungurahua was in a fairly dry location but had the largest fruit clusters of all and may well be worth breeding also. The 3 other species, 1 on the mountain back of Bogota and the 2 more slender species beyond San Miguel seem less promising but might be promising in breeding if their chromosome number was known. No hybrids of the Giant group were found in the Bogota area but finding hybrids on Vol. Tungurahua indicated that they could be made.

The blueberry V. meridiensis seemed worth testing in breeding in the Northwest with V. ovatum because of its small seed size, the few seed per berry, its good fruit size, and the possibility of hybrid vigor resulting from crosses.

F. chiloensis collections by Darrow in CHILE, Dec. 5, 1956 to Jan. 15, 1957

Darrow numbers 1 to 132 have been given Plant Introduction numbers. The complete list is in Darrow's office--see Mrs. Neumann. They include plants and seeds. The plants are at the P. I. Station at Glendale, Md., and 359 were living [Feb. 12] of the 99 different lots. Of these, plants of varieties are living as follows:

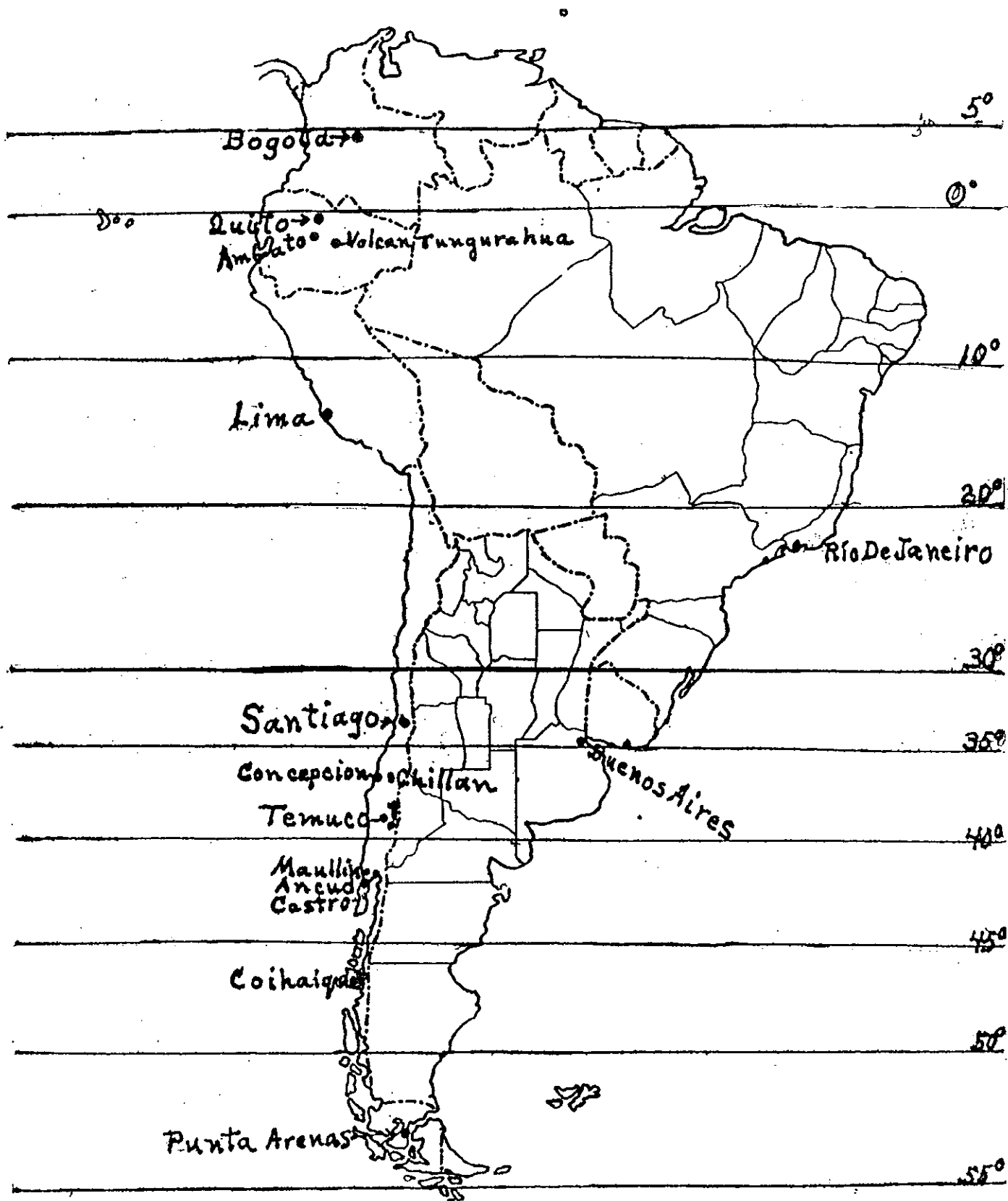
Darrow 11 -- Common "White Chilean"--2 plants and 50 seedlings.
 " 12 -- "Morena White Chilean"--1 plant [weak] and 15 seedlings.
 " 13 -- "Pink Chilean" - - - - -0 plants and 1 seedling.
 " 72 -- "Round Red Chilean"- - -4 plants.

Larger quantities of seed [part of which was planted] were obtained of the following:

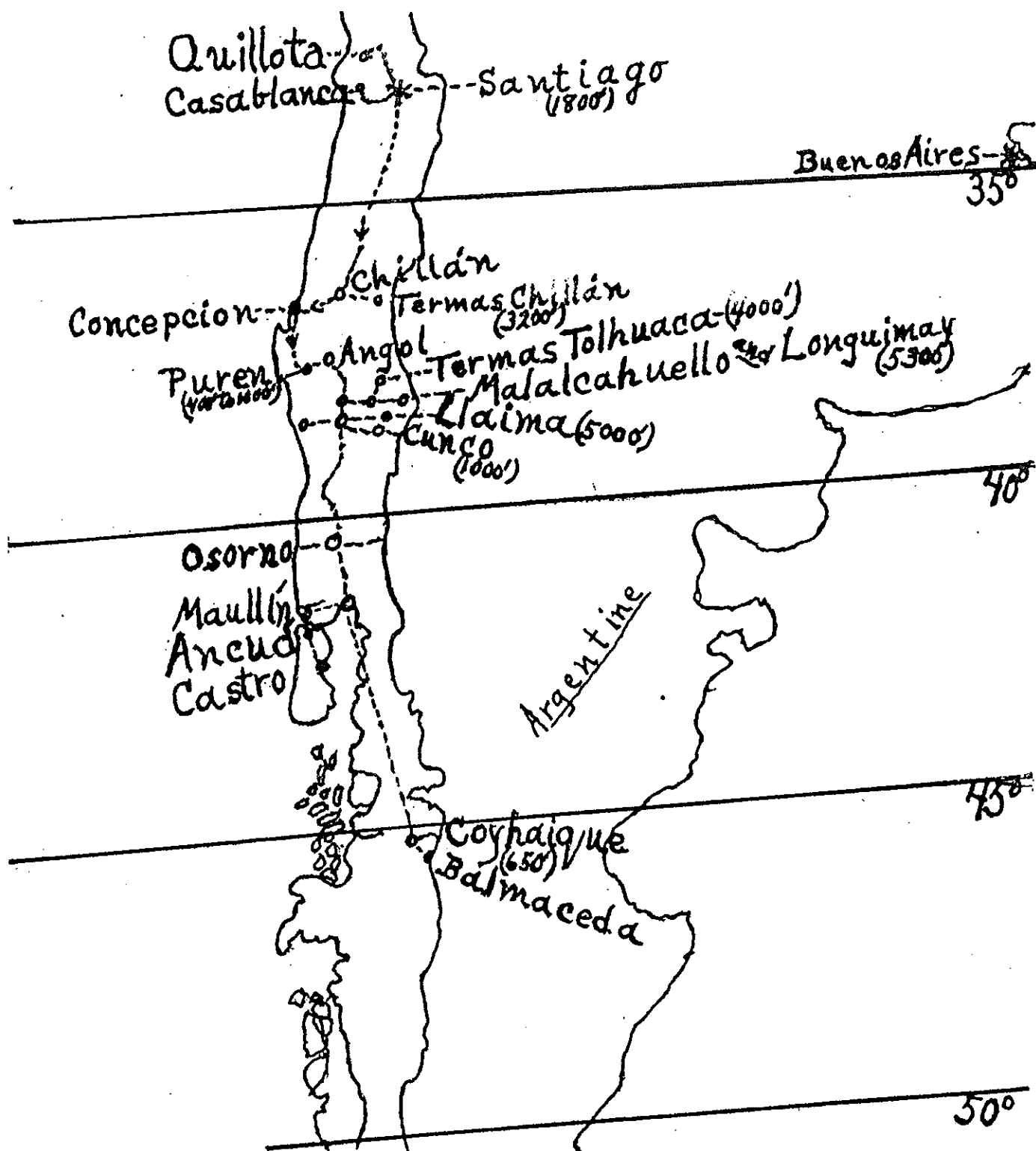
Darrow 1	- "White Chilean" variety	- - - - -	2,000 seed	- 50 seedlings
26	- " " " "	- - - - -	5,000 "	0 "
31	- Wild beach <u>F. chiloensis</u> , Ancud	- - - - -	30,000 "	2,000 "
42	- "Red Chilean" variety	- - - - -	4,000 "	500 "
43	- " " " "	- - - - -	4,000 "	---
92	- Wild mountain <u>F. chiloensis</u> , Coyhaique	- - - - -	40,000 "	---
96	- " " " "	- - - - -	30,000 "	---

In addition, we have a small amount of 25 to 2,000 seed of about 50 collections, mostly of wild F. chiloensis clones, as follows:

Darrow #	# seed	Darrow #	# seed	Darrow #	# seed	Darrow #	# seed	D-#	# seed
D-43	2,000	D-83	75	D-96	20,000	D-111	100	D-123	25
D-46	80	D-84	40	D-99	900	D-112	100	D-124	20
D-47	200	D-85	50	D-100	75	D-114	800	D-125	400
D-48	600	D-88	700	D-102	40	D-116	30	D-126	25
D-50	200	D-88-a	200	D-103	280	D-117	50	D-127	25
D-52	50	D-89	700	D-104	250	D-118	40	D-128	75
D-57	150	D-89-a	175	D-105	125	D-119	125	D-129	25
D-60	1,000	D-90	30	D-106	50	D-120	50	D-130	100
D-81	25	D-91	25	D-108	30	D-121	100	D-131	25
D-82	25	D-93	900	D-109	50	D-122	90	D-132	600



Map--South Chile with places where strawberries were collected



Collections by George M. Darrow in CHILE, ECUADOR, and COLOMBIA

December 5, 1956 to January 25, 1957

[Indian name of wild strawberry = "Leguene"]

[For strawberries P = pistillate, H = hermaphrodite, M = male]

Darrow number	P. I. number			Plants or seedlings living <u>2/5/57</u>
1	235880	<u>F. chiloensis</u>	12/5/56, 2,000 seed of White Chilean variety from market, grown at Cobquecura, Chile	50 s
2	235881	"	12/5/56, 400 seed of wild collected 1600' to 3200' near Termas Chillan, Chile	110 s
3	235878	"	12/5/56, 4 plants (P) collected 1800' along Rio Diguillin 25 K from Termas Chillan, Chile	4 pl
4	235879	"	12/5/56, 9 plants (P) collected 3200' 8 K from Termas, Chillan	3 pl
5	-	"	12/6/56, 10 plants (P) collected on coast at Rocoto 16 K from Concepcion	-
6	-	"	12/7/56, 10 plants (P) collected on coast at Rocoto 16 K from Concepcion	-
7	-	"	12/7/56, 6 plants (H) collected on coast at Rocoto 16 K from Concepcion	3 pl
8	236103	"	12/7/56, 8 seed of #7	1 s
9	236107	"	12/10/56, 6 plants (P), Recreation Park in Temuco	20 s
10	236008	"	12/10/56, 5 " " " "	2 pl
11	235995	"	12/11/56, 10 " (H), common "White Chilean," var. Santa Celia, Trovolhue	0 s, 2 pl
12	235996	"	12/11/56, 2 plants (H) "Morena White Chilean" var. Santa Celia, Trovolhue (more flavor than common)	21 s, 1 pl
13	235997	"	12/11/56, 1 plant (H) "Pink Chilean," var. Santa Celia, Trovolhue	1 s, 1 pl
14	235998	"	12/12/56, 5 plants (P), large fruit, early, 3000', 4 K below Hotel Llaimea near Vol. Llaimea	5 pl
15	235999	"	12/12/56, 2 plants (M), location same as #14	2 pl
16	235600	"	12/12/56, several clones, 17 plants (P), " "	10 pl
17	"	"	12/12/56, seed of #14 and #16	20 s
18	235600	"	12/12/56, 11 plants not in flower, back of Hotel Llaimea, 4500', near Llaimea	9 s
19	236009	<u>R. geoides</u>	Only native rubus of Chile, trailing 2" to 4" high, not ripe, 16 plants collected for E. M. Meader, Durham, N. H.	-
20	236002	<u>F. chiloensis</u>	12/12/56, 2 plants each of 8 clones, 3750', 1 K from Hotel Llaimea	4 pl
21	236003	"	12/12/56, 9 plants (P) at 3000', 4K below Hotel Llaimea	5 pl
22	236004	"	12/12/56, 17 plants at 3000' near #21	6 pl
23	236005	"	12/13/56, 6 plants (P) 1200' Fundo Entre Rios, 18 K from Cunco	3 pl
24	236006	"	12/13/56, 6 plants (H) of first wild H in pasture Fundo El Salto, Cunco, 1200'	6 pl
25	-	"	12/13/56, (P) 56 seed of several P, location as #24	10 s
26	236104	"	12/14/56, (H) 5,000 seed of 100 berries of "White Chilean" var. from Ernesto Furro, Puren, Chile	-
27	236090	"	Some just germinating 12/19/56, 13 plants (P), 2 ea. of 6 clones, 1 of 7th (a M) with 1 berry, 13 K inland from Castro, Chiloé, 180'	10 pl
28	236091	"	12/10/56, 3 plants (P) from 2 clones near #27, 350'	3 pl
29	236092	"	12/19/56, 2 plants (P) ea. of 2 clones along railroad near Pid Pid, 11 K from Castro, Chiloé, 100'	3 pl
30	236102	<u>R. geoides</u>	12/19/56, 1 clump from near #29	-
31	236105	<u>F. chiloensis</u>	12/20/56, 30,000 seed of 1 K of wild from market, Ancud, Chiloé	2000 s
32	236093	"	12/20/56, 1 plant (H) from beach nr Rio Pudeto, Ancud	0
32-a	236114	"	12/20/56, (H) seed of #32	23 s
33	236094	"	12/20/56, 4 plants (H), location as #32	3 s
33-a	236106	"	12/20/56, (H) seed of #33	100 s

D-#	PI-#				2. Pl/s living
34	236095	<u>F. chiloensis</u>	12/20/56, 2 plants, location as #32		2 s
35	236096	"	12/20/56, 2 plants (P), " " #32		1 s
35-a	236107	"	12/20/56, seed (P) of #35		400+ s
36	236097	"	12/20/56, 7 plants (P), " " #32		3 pl
36-a	236108	"	12/20/56, seed (P) of #36 (50 germinating)		200 s
37	236098	"	12/20/56, 5 plants (H), location as #32		4 pl
37-a	236109	"	12/20/56, seed of #37 (12 germinating)		120 s
38	236110	"	12/20/56, seed of (H) clones, location as #32 (40 germinating)		100 s
39	236099	"	12/20/56, 2 plants (P), location as #32		1 pl
39-a	236111	"	12/20/56, seed (P) of #39 (100 + germinating)		30 s
40	236100	"	12/20/56, 2 plants (P), location as #32		2 pl
41	236101	"	12/20/56, 3 plants (P), very productive, large berry, location as #32		1 pl
41-a	236112	"	12/20/56, seed of #41		300 s
42	236113	"	12/24/56, 4,000 seed from 1 K of Red Chilean var., Market Santiago		520 s
43	237002	"	12/28/56, 4,000 seed from 1/2 K of Red Chilean var., from Fundo Las Mercedes 12 K north Santiago		-
43-a	236550	"	1/5/57, 5 plants (P), 4000' on Mt. Los Raices, east of Victoria		3 pl
44	236551	"	1/5/57, 5 plants (P), 4000', location as 43-a		2 pl
45	236552	"	1/5/57, 5 " (P), " " "		3 pl
46	236553	"	1/5/57, 5 " (P), " " "		4 pl
47	236554	"	1/5/57, 6 " (P), large fruit, " " "		4 pl
48	236555	"	1/5/57, 5 " (P), 5000', " " "		4 pl
49	236556	"	1/5/57, 5 " (P), late, " " "		4 pl
50	236557	"	1/5/57, 5 " (P), 4500', " " "		2 pl
51	236558	"	1/5/57, 5 " (P), 4600', " " "		2 pl
52	236559	"	1/5/57, 2 " (P), 4600', " " "		5 pl
53	236560	"	1/5/57, 7 " (P), 4600', " " "		1 pl
54	236561	"	1/5/57, 5 " (P), 5000', late, " " "		5 pl
55	236562	"	1/5/57, 6 " (P), 5000', " " "		5 pl
56	236563	"	1/5/57, 5 " (P), 5000', " " "		3 pl
57	236564	"	1/5/57, 5 " (P), 5000', " " "		2 pl
58	236565	"	1/5/57, 5 " (P), 5000', " " "		3 pl
59	236566	"	1/5/57, 5 " (P), 5000', " " "		2 pl
60	236567	"	1/6/57, 5 " (P), 4000' near hotel Termas de Tolhuaca		0 (?)
61	236568	"	1/6/57, 6 " (P), late, location as #60, east of Victoria		5 pl
62	236569	"	1/6/57, 7 plants (P), very vigorous, location as #60		5 pl
63	236570	"	1/6/57, 3 " (P), " " " "		3 pl
64	236571	"	1/6/57, 6 " (P), late, " " "		6 pl
65	236572	"	1/6/57, 6 " (P), early, " " "		3 pl
66	236573	"	1/6/57, 7 " (P), large berries, " " "		6 pl
67	236574	"	1/6/57, 6 " (H), part H, in valley beyond hotel, as in #60		5 pl
68	236575	"	1/6/57, 6 plants (P), location as #67		6 pl
69	236576	"	1/6/57, 6 " (P), large fruit, location as #67		5 pl
70	236577	"	1/6/57, 6 " (H), weakly H, in mat with <u>R. geoides</u> , location as #67		6 pl
71	236578	"	1/5/57, 12 plants (P), very vigorous, very large berry as #43-a, at 4600'		1 pl
72	236579	"	1/7/57, 6 plants (H), "Round Red Chilean" var. in gar- den of Luis Schindler, Nat. Park of Tolhuaca, nr Lake Malleco, very vigorous, 3000'		6 pl
73	236593	<u>Hippoastrum</u> sp.	1/7/57, 1 bulb red flowered--wild, nr location #72		-
74	236580	<u>F. chiloensis</u>	1/7/57, 6 plants (P)		6 pl
75	236581	"	1/7/57, 5 plants (H) weakly H, " " "		3 pl
76	236582	"	1/7/57, 6 " (H) " " " "		4 pl
77	236583	"	1/7/57, 6 " (P), large-fruited, " wild " "		4 pl
78	236584	"	1/7/57, 7 " (P) " " " "		3 pl
79	236585	"	1/7/57, 7 " " " " "		2 pl
80	236586	"	1/7/57, 7 " (P) " " " "		6 pl

D-#	PI-#			3. Pl/s living
81	236587	<u>F. chiloensis</u>	1/7/57, 3 plants (P), very large fruit, wild, near location #72	3 pl
82	236588	"	1/7/57, 6 plants (P), 1 K from Lake Malleco toward Termas Tolhuaca, Chile	5 pl
82-a	237011	"	1/7/57, seed (P) of #82	
83	236589	"	1/7/57, 6 plants (P), 2 K back toward T. Tolhuaca	5 pl
83-a	237012	"	1/7/57, Seed of 83	
84	236590	"	1/7/57, 7 plants (P) 3 K back toward T. Tolhuaca	7 pl
84-a	237013	"	1/7/57, Seed (P) of #84	
85	236591	"	1/7/57, 8 plants (P), location as #84	3 pl
85-a	237014	"	1/7/57, seed (P) of #85	
86	236592	"	1/7/57, 6 plants (P) 4 K back toward T. Tolhuaca	6 pl
87	236625	"	1/8/57, 6 " (M) 5000' nr Argentine trail above T. Tolhuaca	4 pl
88	237015 & 237051	"	1/5/57, seed of plants collected on Los Raices, Chile	
89	236626	"	1/11/57, 40 plants (P), 1 pl per clone, beaches near Mauillin, Chile	20 pl
89-a	237017	"	1/11/57, seed (P) of #89	
89-b	237016	"	1/6 & 7/57, seed of berries collected nr T. Tolhuaca	
90	236627	"	1/11/57, 4 plants (H) location as #89	?
90-a	237018	"	1/11/57, seed (H) of #90	
91	236628	"	1/11/57, 6 plants (H) location as #89	3 pl
91-a	237019	"	1/11/57, seed (H) of #91	
92	236994	"	1/12/57, 50,000 seed from 6 pounds wild from hill- sides 5 K from Coyhaique 1200' to 1500'	-
93	237020	"	1/13/57, 1,000 seed from 20 K toward C. Alta from Coyhaique, many H in area, 1600' to 2000'	-
94	236993	<u>Berberis</u>		
		<u>heterophylla</u>		
95	237122	<u>Ribes</u> sp.	1/11/57, seed of fruit bought in market P. Montt 1/12/57, on slopes 1700' above Coyhaique, Chile, very long clusters, ? <u>R. magdalenensis</u>	-
96	237021	<u>F. chiloensis</u>	1/14/57, 30,000 seed from 3 lbs., 20 K from Coyhaique toward C. Alta from hill between Bull and Hidden Lakes---many H in area	-
99	236629	"	1/13/57, 34 plants (H), best partly H, berries 1", 2000', location as #92	18 pl
99-a	237022	"	1/13/57, seed of #99, 43 berries, 121 seed on 1 berry	-
100	236630	"	1/13/57, 7 plants (H), white wild H, 1450', near Coyhaique	7 pl
100-a	237023	"	1/13/57, seed of #100	-
101	236631	"	1/13/57, 2 plants (H) at about 1600', as #100	?
102	236632	"	1/13/57, 6 " (H), productive H 1600', as #100	4 pl
102-a	237024	"	1/13/57, seed of 7 berries of #102	-
103	236633	"	1/13/57, 5 plants partly H, near #102	3 pl
103-a	237025	"	1/13/57, seed of 103, 16 large berries	-
104	236634	"	1/13/57, 8 plants (P), large-fruited, near #100	7 pl
104-a	237026	"	1/13/57, seed of #104	-
105	236635	"	1/13/57, 9 plants (H) with large fruit, as #100	7 pl
105-a	237027	"	1/13/57, seed of 105	-
106	236636	"	1/14/57, 6 plants (H), with 1 large berry per plant, as #96	4 pl
106-a	237028	"	1/14/57, seed of #106	-
107	236637	"	1/14/57, 6 plants (P) extremely vigorous & late, as #96	4 pl
108	236638	"	1/14/57, 5 " (H), location as #96	4 pl
108-a	237029	"	1/14/57, seed of #108	-
109	236639	"	1/14/57, 5 plants (P), location as #96	2 pl
109-a	237030	"	1/14/57, seed of #109	-
110	236640	"	1/14/57, 5 plants (H), location as #96	2 pl
111	236641	"	1/14/57, 8 " (P), " " "	5 pl
111-a	237031	"	1/14/57, seed of #111	-
112	236642	"	1/14/57, 5 plants (P), location as #96	2 pl
112-a	237032	"	1/14/57, seed of #112	-
113	236643	"	1/14/57, 5 plants (H), location as #96	5 pl

D-#	PI-#			4. Pl/s living
114	237033	<u>F. chiloensis</u>	1/14/57, seed of collected berries, location as 96	
115	236624	<u>Auracaria</u> sp.	1/8/57, 2 plants at 5000' east from outlook over Terma Tolhuaca	-
116	236645	<u>F. chiloensis</u>	1/12/57, 2 plants (H), productive 2000' above Coyhaique	2 pl
116-a	237034	"	1/12/57, 8 plants (P), location as #116	4 pl
117-a	237035	"	1/12/57, seed of #117	-
118	236646	"	1/12/57, 6 plants (H) of partly H very large fruit, as #116	3 pl
118-a	237036	"	1/12/57, seed of #118	-
119	236647	"	1/12/57, 4 plants (P) with large fruit, as #116	3 pl
119-a	237037	"	1/12/57, seed of #119	-
120	236648	"	1/12/57, 5 plants (P), large fruit, as #116	3 pl
120-a	237038	"	1/12/57, seed of #120	-
121	236649	"	1/12/57, 5 plants (P), large fruit, as #116	4 pl
121-a	237039	"	1/12/57, seed of #121	-
122	236650	"	1/12/57, 6 plants (H), at least 2 large berries per plant, location as #116	5 pl
122-a	237040	"	1/12/57, seed of #122	-
123	236651	"	1/12/57, 7 plants (H), location as #116	2 pl
123-a	237041	"	1/12/57, seed (H) of #123	-
124	236652	"	1/12/57, 5 plants (H) of a fine H, as #116	2 pl
124-a	237042	"	1/12/57, seed of #124	-
125	236653	"	1/12/57, (H) one of best H, 2 to 3 berries per plant, location as #116	4 pl
125-a	237043	"	1/12/57, seed of #125	-
126	236654	"	1/12/57, 5 plants (P), location as #116	5 pl
126-a	237044	"	1/12/57, seed of #126	-
127	236655	"	1/12/57, 5 plants (H), location as #116	4 pl
127-a	237045	"	1/12/57, seed of #127	-
128	236656	"	1/12/57, 5 plants, location as #116	4 pl
128-a	237046	"	1/12/57, seed of #128	-
129	236657	"	1/12/57, 6 plants (P), " " "	3 pl
129-a	237047	"	1/12/57, seed of #129	-
130	236658	"	1/12/57, 6 plants (H), but may be mixed with P, as 116	5 pl
130-a	237048	"	1/12/57, seed of #130	-
131	236659	"	1/12/57, 2 plants, location as #116	2 pl
131-a	237049	"	1/12/57, seed of #131	-
132	237050	"	1/15/57, (P) Coyhaique to Balmaceda, 1600', very dry location	-
133	237103	<u>Rubus</u> sp.	1/23/57, Cluster-fruited "Giant" type, 28 K from Banos toward Ambato, Ecuador, at 9300'--flowers and plant for University of Maryland	
134	237104	"	1/23/57, another plant, location of #133	
135	237096	<u>F. chilowensis</u>	1/23/57, 10 plants of Ambato var., 10,000' at Huachi, Ecuador--in flower to get pollen	
136	237097	<u>F. vesca</u>	1/23/57, for testing for indexing, location as #133	
137	237102	<u>Rubus roseus</u>	1/22/57, 18 K from Banos on Riobamba road on Vol. Tungurahua, 9220', largest plant, for University of Maryland for pollen. "Huhera Mora" = Giant blackberry	
138	"	"	1/22/57, a second plant, as #133	
139		<u>Rubus macro-</u> <u>carpus</u>	1/24/57, on Pichincha back of Quito, Ecuador, 10,000' just over the crest; for Univ. of Md. for pollen, plant of "Giant"	
140	237100	"	1/25/57, plant of "Giant" for pollen for Univ. of Md., 44 K from hotel in Bogota, Colombia, on Fusagasuga road beyond San Miguel	
141	237105	<u>Rubus</u> sp.	1/25/57, a medium-sized plant of "Giant" type, location as #140, for Univ. of Md.	
142	237106	"	1/25/57, smallest species of "Giant" type--for Univ. of Md., as #140	
143	237108	<u>V. meridionale</u>	1/26/57, very productive blueberry, "agraz," in clusters, of <u>V. ovatum</u> type; seeds, 8000', 10 K beyond Choconta, Colombia, to 12'	

<u>D-#</u>	<u>PI-#</u>		
144	237098	<u>Rubus choachensis</u>	1/26/57, small trilobate species of "Giant" type, large fruit, 3' high, 9600', 15 K east of Bogota, Col., for Univ. of Md.
145	237099	" <u>gacheterisis</u>	1/26/57, "Giant" globose-fruited, rounded tips to leaves, probably not so large as 140, 139, and 137; location as #144, for Univ. of Md.
146	237101	" <u>roseus</u>	1/22/57, as #137, for Univ. of Md.
147	237121	<u>Anemone multi-</u> <u>fida</u>	1/12/57, white-flowered, Coyhaique, 1650'

SUMMARY

(1) Plants of 99 collections Fragaria chiloensis living (on 2/12) at Glenndale.

(2) Large to fairly large quantity of seed still left:

Darrow 1	--	White Chilean variety, 1,000 seed, 50 seedlings
" 26	--	" " " 5,000 " , 0 "
" 31	--	Wild beach <u>F. chiloensis</u> , Ancud 30,000 " , 2,000 "
" 42	--	Red Chilean variety 3,000 " , 500 "
" 43	--	" " " 3,000 " , -
" 92	--	Wild mountain <u>F. chil-</u> <u>oensis</u> , Coyhaique 1500' 40,000 " , -
" 96	--	Wild mountain <u>F. chil-</u> <u>oensis</u> , Coyhaique, 2000' 30,000 " , -

(3) Small quantity [25 to 2,000] seed of 50 collections still not planted on 2/12/57.