DECIDUOUS FRUITS IN CENTRAL AMERICA, COLOMBIA AND ECUADOR[1]

GEORGE M. DARROW [2]

IN ALL COUNTRIES to a great extent, and especially where transportation facilities are limited, fruits and other foods used are raised very near the population centers. In central and northern South American countries most people live in the highlands which have a temperate climate. There are few temperate-climate fruits native to the highlands which have been improved, the chief being the capulín cherry, used very extensively as food in Ecuador. For this reason, as well as because of the demand by those accustomed to their use, temperate-climate fruits have been introduced from Europe and United States. These temperate-climate fruits form a considerable industry and source of food but could be greatly improved by better selection of varieties and better culture. It is the purpose of this paper to make suggestions as to the best varieties for trial in these highlands. It should be remembered, however, that not far distant in all of these countries are the tropics, where several fruits of high quality and of high food value such as banana, plantain, orange, avocado, and pineapple are produced cheaply in immense quantities and where many other fruits are grown to some extent and could be grown still more.

TEMPERATE-CLIMATE AREAS

Temperate-climate areas occur at various altitudes depending on their latitude, as would be expected. Thus the farther north from the equator one goes the lower the elevation of temperate climate areas is. The altitudes where

1. Many scientists of the countries visited were most cordial in their help in showing me the fruit industries and giving generously of their observations and experience. To these I express my appreciation.

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temperate climates are found depend also on such local influences as air drainage and source direction of winds, for in the highlands there are areas with great differences in elevations within a few miles. In Guatemala frosts may occur at about 1,800 meters while in Ecuador they do not occur until the elevation is about 2,600 meters. There is little change of seasons in Ecuador at the equator but in Guatemala at 15° north latitude the days are shorter and cooler in the winter season than in the summer. Thus apples, pears, and other fruits succeed as well at 1,800 to 2,100 meters in Guatemala as at 2,600 to 2,900 meters in Ecuador.

In Colombia strawberries and grapes are grown commercially at as low an elevation as 900 meters, where citrus, bananas, and avocados thrive. The flavor of the strawberries is good, but hardly equal to that of the same varieties at a higher elevation (1,500 to 1,800 meters). The flavor of the Isabella grape is excellent at 900 meters. To map the approximate lower contour boundaries of the real temperate climate of each country, one should start at about 1,400 meters in Guatemala and rise to about 2,300 meters in Ecuador. Though these elevations are below the frost line, a few varieties having very short chilling requirements grow fairly well there. Under the short daylight periods such varieties seem to get enough temperatures below the critical ones necessary for breaking the rest period (45° F. or about 7° C. for some fruits) to make fruit buds and to develop good fruit even though no frosts occur. The upper limit of extensive fruit production is not far above the frost line but is variable because of air drainage and air currents. Where there is good air drainage away from the fruit planting, good sites for fruit often may be found in the highlands at elevations much above the usual frost line. If frosts occur often throughout the year the flowers and fruit may be killed and no crop obtained.

TEMPERATURE REQUIREMENTS OF FRUIT VARIETIES

Growers and research workers through the years have learned that different varieties of temperate-climate fruits respond differently to both high and low temperatures. The responses must be learned for different countries where the

latitudes with their effects on alternation of seasons and temperatures differ.

In general, varieties said to have low chilling or cold requirements are the ones that succeed best in all Central and northern South American countries. Most temperate-climate fruits were originated and developed in the temperate climates of the United States, Canada, Europe and Asia. All of them grow better after a period of low temperatures, and varieties of each fruit differ in the length of the cold period required to start them into good growth. The temperature usually considered critical is 45° F. Below that temperature, the changes that cause temperate-climate fruits to grow vigorously occur. In all these countries varieties known to have short cold or chilling requirements and adapted to southern areas of the United States, Europe and Asia should be selected for trial. Those now raised and known to succeed are such varieties. New varieties to be tested should be selected on this basis.

Of equal importance to selecting varieties with short cold requirements is consideration of the effects of the constant low temperatures at high elevations throughout the year, especially near the equator. Continued low temperatures slow down fruit development and maturity, affect flavor and texture, and hinder the development of heavy crops at certain seasons which is necessary for low production costs. Varieties must be selected not only because they have low cold or chilling requirements but also because they produce well and develop good flavor and good texture where the temperatures are never high in the daytime. Many varieties do not develop good flavor at continuous low temperatures, but some varieties do. So it is especially important to select the latter for planting at high elevations.

BEST ADAPTED TEMPERATE-CLIMATE FRUITS

The deciduous fruits produced commercially in the highlands, in order of importance, are capulín cherries, plums, apples, pears, peaches, grapes, strawberries, quinces and hawthorns. Blackberries are common and blueberries are occasionally found in the markets but both are harvested from the wild. One planting of red raspberries in Gua-

temala was producing some fruit; otherwise the raspberry was not succeeding. No sweet or sour cherries, apricots, currants or gooseberries succeed. So far as observed, apples and pears were the only ones of the fruits listed that were exported from one country to another and the principal shipments were from Ecuador to Colombia. Large quantities of fruit, especially apples, were imported from Chile into Ecuador and apples and grapes from California were seen in the markets of most of these countries.

KINDS AND VARIETIES THAT MAY SUCCEED BEST

Suggestions are given below on the kinds and varieties that may succeed best. It is to be hoped that the list given can be revised from time to time as more information becomes available and comparative trials of new varieties are made. For example Santa Rosa is generally the best plum variety in this entire area. Further observation and tests should show more specific limits of its adaptability — that is, between what elevations it grows best and for what season and uses it is best adapted. Other varieties should be better at different elevations and for earlier or later ripening. Thus Methley, a newer variety of plum, is considered best in a few places and after more extensive trials may be found best in other places for certain elevations and seasons. There are many other varieties to be tried, some of which may be still better.

The lists that follow are made up as the result of my own limited observations, together with the observations of many other scientists and growers.

Fruit Varieties And Species For Trial In
Central America, Colombia, and Ecuador

Cherries—Commercial in Ecuador, 1,500 to 3,500 meters.

* Capulín, *Prunus serotina* var. *salicifolia* (selections of early, midseason, late, and very late season). Sour and sweet cherries none—have too long chilling requirement for any part of Central American or northern South American countries.

Plums—1,800 to 2,800 meters—best fruit of all for commercial and home gardens.

Japanese varieties for 1,800 to 2,700 meters.

* Santa Rosa (most grown in all countries) ("Late Santa Rosa" matures a month later).

* Most promising or best known.

* Chabot (Bailey) (abundant in Ecuador).
* Satsuma (red) (in many countries) (requires most cold).
* Methley (purple) (best in some places) (requires least cold except for "P. Pissardi").
* Beauty (early) (common) (requires next to least cold).
* Mariposa (season of Santa Rosa, blood red flesh).

Ogden (early, follows Beauty, small, yellow, very productive).
Wickson (follows Santa Rosa).
Becky Smith (not very productive).
Kelsey (blossoms early, follows Wickson, low chilling requirement).

Other varieties and species of plums.

* Excelsior (Japanese-American Hybrid, 1,800 to 2,600 meters).

P. cerasifera f. *atropurpurea,* commonly called *P. Pissardi* (excellent cooked, least cold requirement, 1,800 m. and up). (Hollywood is the best named variety of this type of plum).

Mirabelle (yellow preserve variety) (seedlings used as stocks for plums, 2,400 to 2,700 meters).
Terrell (cling) (seedling of Excelsior, 1,800 m. and up).
Reine Claude (only European) (requires more cold than most).

Apples—1,800 to 3,000 meters (except Helm), commercial and home garden.

Selections of Spanisn cider type as low as 1,200 m. in Honduras.

* Helm (1,500 m. but better 1,800 to 2,700 m.)

Beverly Hills (1,800 to 2,700 m.) (mealy).

* Gravenstein (most widely grown).
* Winter Banana (widely grown).

Valmore.
White Winter Pearmain (high quality).
Pettingill.
Yellow Bellflower.

* San Jacinto (highly colored).
* Blenheim Orange (sometimes known as Emilia and Pennsylvania).

Jonwin.
Etters Gold.
Alaska.
Pink Pearl (red-fleshed).

* Balsosa (local name in Ecuador).

Caville San Sanvuer (good cooking, tart, large, short chilling requirement).

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* Most promising or best known.

Pears—1,800 to 3,000 m. (except Hood, Pineapple and Baldwin) commercial and home garden.

* Hood (1,200 to 2,400 m.)
* Orient (large, fine canned, probably best 2,100 to 2,400 m.)
Baldwin (Kieffer type) (1,500 to 2,400 m.)
* Kieffer (probably best) (2,100 to 2,700 m.)
Pineapple (poor quality) (1,200 to 2,400 m.)
* Packham Triumph (vigorous, irregular fruit, probably best 2,400 to 2,700 meters).
Winter Nelis
Winter Bartlett
Bartlett (Williams) * A sport with low cold requirement is known in Israel.
Bosc
Ciruela (an Ambato variety).
Morado (an Ambato variety).
Delia (an Ambato variety).
Mame (an Ambato variety).
Botella (an Ambato variety; very vigorous).
Fertility
Coscia (low chilling requirement).

Peaches—1,500 to 2,700 meters.

Yellow flesh

* Bonita (free stone, good quality).
* Meadow Lark (early, low chilling requirement, almost free).
Ventura (sixth earliest, free, firm).
Dorothy N.
Early Elberta or Socala (good quality, fifth earliest).

White flesh

* Angel (early).
Robin (second earliest, free).
* Jewel (1,500 m. to frost line).
* Waldo (1,500 m. to frost line).
Redwing (third earliest, free).
Rosy (late, soft side).
Altair (flowering and fruiting).
C. O. Smith.
Hermosa (free, aromatic).
Wildrose.

Strawberries—900 to 2,900 meters. Commercially grown.

* Missionary (best at all lower elevations) (900 to 2,100 m.)

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* Most promising or best known.

Parramos (of Guatemala) (1,800 to 2,400 m.) similar to Perle de Prague.

Ambato *(Fragaria chiloensis)* (of Ecuador) (2,600 to 2,900 m.) (pale reddish, drought resistant).

Grapes—Use adapted rootstocks, if possible, commercially grown.

* Isabella (has succeeded on own roots but is especially fine on Colombian rootstock) (900 to 2,800 m.) Wine, table, and jam. Worth trying down to elevation of 300 m.

Pierre (a tetraploid of Isabella with double sized berries) (900 to 1,800 m.)

Niagara (best white, use adapted rootstocks) (probably 1,700 to 3,000 m.)

Quinces—1,200 to 2,700 m., well adapted to Honduras, Guatemala at 1,200 to 2,400 m. and in Ecuador at 2,300 to 2,700 m.

Varieties: Pineapple, orange.

Hawthorns—1,800 to 2,700 m., well adapted to these elevations in Guatemala.

Blackberries—rarely commercially grown, large quantities from wild species.

* Andes, *Rubus glaucus* (Mora de Castilla) (1,200 to 3,000 m.)

Boysen (from California) (2,300 to 2,700 m.)

Florida Marvel (use root cuttings only from Florida) (2,300 to 2,700 m.)

Rogers, or Advance (from Texas) (2,300 to 2,700 m.)

Shank's blackberry (from Honduras) (1,800 m.)

Selections 1, 2, and 3 at Chimaltenango, Guatemala (1,800 m.)

Selections of *R. breviglandulifer* (from Honduras) (1,200 to 2,400 m.)

Olallie (from Oregon) (2,300 to 2,700 m.)

Earliness (from Texas) (trailing) (2,300 to 2,700 m.)

Regalness (from Texas) (trailing) (2,300 to 2,700 m.)

Lateness (from Texas) (trailing) (2,300 to 2,700 m.)

Blueberries—2,700 to 3,000 m.—acid soil, for testing only.

Callaway (rabbit-eye variety from Georgia).

Coastal (rabbit-eye variety from Georgia).

Raspberries—rarely commercial, for testing only.

* September (from New York) (1,800 to 2,700 m.) (red fruit).

Indian Summer (from New York) (1,800 to 2,700 m.) (red fruit).

Rubus albescens (in El Salvador) (750 to 1,500 m.) (black fruit).

Rubus ellipticus (in Costa Rica) (750 to 1,500 m.) (yellow fruit).

Apricots—None, have too high chilling and heat requirements.

Currants and *gooseberries*—None, have too long chilling requirements.

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* Most promising or best known.

DISCUSSION

The lists of kinds and varieties of fruits are of necessity very general and comments may well be made on some of them. The capulín cherry, *Prunus serotina* var. *salicifolia,* grown slightly in the other countries, is by far the most important fruit, both in commerce and in the home garden at 2,400 to 2,700 meters in the Ambato section of Ecuador. According to Wilson Popenoe (Jour. Heredity 13: 51-62. 1922) it probably originated in Mexico, where it is common in the markets, and was taken by Indians in ancient times through the highlands to Ecuador. In that country the trees are immensely productive and the fruit large, up to an inch in diameter and with a slight to marked bitterness. Selections producing fruit with superior flavor and only a trace of bitterness have been propagated on capulín seedlings and their fruit maturity periods cover a long season from December to March and April. These selections should be distributed extensively so that they will be available in the highlands of all the countries. Seedlings of superior trees should be tested to see whether they too produce fruits of good or superior quality, for it would be far simpler to grow seedlings than to propagate the selections by budding or grafting. Though very extensively raised in Ecuador and to some extent in Guatemala and Colombia, the capulín is a relatively minor fruit in the other countries. It could well become important in all of them. Sour and sweet cherries require such long rest periods that they have not succeeded in any part of this area.

The Missionary strawberry is clearly the best for most highland areas up to about 2,100 m. A variety seen at Parramos, Guatemala, at about 2,100 m. and referred to in the lists as "Parramos" was highly productive and high in flavor. Like the Missionary it fruited throughout the year. In the Ambato section of Ecuador several hundred acres of the "Ambato" strawberry (Jour. Heredity 22: 457-466. 1921; Ceiba 3: 179-185. 1953), a selection of the native wild beach strawberry of Chile, are grown. In this region of low rainfall it is probably the only variety that will succeed but with irrigation other varieties such as the "Parra-

mos" and Missionary should succeed and produce far higher yields of high flavored fruit.

The Andes blackberry (Jour. Heredity 12: 387-393. 1921; Ceiba 3: 97-101. 1952), the *Mora de Castilla,* is native to high elevations in all these countries, usually at 1,800 to 3,000 m. The fruit is high in dessert quality and is often the most common blackberry in the markets. Though found in many gardens, the Andes blackberry was not seen in commercial plantings. Because of the large size and high flavor of its fruit, its continuous fruiting habit, its vigor and freedom from disease, the Andes blackberry is a desirable fruit for home gardens throughout the areas and should be tested for growing commercially.

Blackberry varieties from the United States have not been very promising so far. The erect-growing Shank's blackberry (*Rubus Shankii*) at Tegucigalpa, Honduras, produces fine fruit somewhat like that of the erect blackberries of the United States and is worth testing in gardens and commercial fields. Selected plants of *R. sapidus* seen in a garden in Guatemala are very similar to those of *R. Shankii* and are well worth using in gardens. Selected plants of *R. breviglandulifer* and *R. hondurensis* seen in Honduras and plants of a closely related species in Guatemala and of *R. adenotrichus* in Ecuador are extremely productive of large tart fruit. The plants of the last species are very vigorous and grow somewhat like the Himalaya in the United States though the canes are stronger and not so long. Productive plants of related species with a similar growth habit were seen in Costa Rica and Colombia and should also be tested in home gardens and for the commercial market. Because of the few serious diseases and insects affecting the blackberries they seem promising for improvement.

The giant Colombian blackberry, *Rubus macrocarpus,* described by Popenoe (Jour. Heredity 11: 195-202. 1921) was seen in Colombia and Ecuador and it or a related species is known as far north as Costa Rica and south to Peru. Well-grown fruits are said to be as large or larger than hen's eggs and are scarlet red or wine red. The fruit, occasionally sold in the markets, is considered fairly good in flavor. The plants seen did not seem very productive but

the immense size of the fruit might make the Colombian blackberry useful in gardens. The plants and fruit seemed so extremely variable that it might well be possible to select plants that would be productive under cultivation.

Raspberry varieties from Europe and United States were mostly failures. However, red raspberries which fruit on the young shoots should be tried especially the varieties September and Indian Summer. Because of their vigor and freedom from disease in Central America, *Rubus albescens* and *R. ellipticus* should be used in breeding. Their fruits are only fair in flavor.

Though grapes produced locally are in the markets of most of these countries, really good grapes were seen only near Palmira, Colombia. There the Isabella on the native rootstock *Vitis tiliaefolia* is raised by scores of growers and the fruit is of excellent quality. It is probably the best variety for most of this area from Guatemala to Ecuador. Its tetraploid, Pierce, with berries of twice the size, raised extensively in California, should be tested with the Isabella.

The native blueberry *Vaccinium floribundum* is related to *V. ovatum* of California, Oregon, and Washington. It was not under cultivation. The fruit is sold in the markets in limited quantities. None of the highbush blueberries from the United States were growing well. The varieties Callaway and Coastal of the rabbit-eye type native to southern Georgia and northern Florida are suggested for trial.

The Japanese type of plum represented by the Santa Rosa variety is grown more widely than any other temperate-climate fruit. Many other varieties are raised commercially, especially in Guatemala, Costa Rica, Colombia and Ecuador. Though the Santa Rosa is usually the chief variety the Methley is well liked also, especially at the lower elevations. Excelsior, a Japanese-American hybrid plum of southeastern United States, is well liked and worth testing at the lower elevations, 1,800 to 2,100 m. Terrell, a seedling of Excelsior, may be better. European-type plums require more cold than most others and do not generally succeed. Reine Claude, often called Green Gage, is the most extensively grown of the European type and does fairly well in the Ambato, Ecuador, area. Two selections of Mirabelle,

propagated by cuttings in California as stocks for plums, may be worth testing as stocks in Ecuador and other countries. These are Myrobalan 29C and Marianna 2624.

Though peaches are perhaps as widely grown as plums, their quality is relatively poor. Usually seedlings are grown and the fruits are small and white-fleshed. Many of the newer white and yellow-fleshed varieties of southern California and of the southeastern United States are immensely superior and should be tested in place of the seedlings now grown. Some of the newer varieties with low chilling requirements observed in Honduras were superior to those encountered in other parts of Central America. Possibly proper cultural care may indicate that some of these named varieties can be grown commercially.

Apricots have not succeeded anywhere in these countries.

Apples are grown most extensively in Ecuador and are even exported from that country. Considerable quantities are grown also in Colombia, Guatemala, Honduras, and Costa Rica. Large quantities of fruit from what seem to be selections of seedlings of French crabs are still produced. These are probably Spanish crab types. The fruits are used for sauce, jelly, and similar products. They are small-fruited, are propagated by sucker sprouts and cuttings, and have very short cold requirements. Some of them were being raised commercially in the same orchard with coffee, citrus, bananas, and mangos at about 1,200 m. in Honduras.

Some of these apples may be found well adapted to areas of a little cold below 45° F. and as stocks for other varieties in warm climates. In Costa Rica ordinary varieties were seen at about 2,800 m. being propagated by cutting off shoots and placing them in the ground in the shade on the north side of the parent trees at the outer reach of the branches. No fire blight, cedar rust, apple scab or codling moth was seen; apparently apples have far fewer pests than in most other countries. Mildew was sometimes serious.

The most extensively grown apple variety was the Blenheim Orange, an English variety known in Ecuador as Emilia and in Colombia as Pennsylvania but was not ob-

served in other countries. (Identified by J. M. Potter of the Royal Horticultural Society, England). It is a leading variety also in Kenya, Africa in the same latitude as Ecuador. It is a triploid variety that requires cross pollination if it is to set fruit. In northern Europe it is among the finest-flavored and largest commercial apples, but because it is less productive than other varieties, few plantings are being made there now.

The Gravenstein and Winter Banana are two other widely grown varieties that require less cold than most other temperate-climate varieties. The list of apple varieties given includes a number of others that require little chilling and make vigorous growth.

Pears also are raised extensively in about the same areas as are apples and for about the same markets. On the whole pears are known to have lower chilling requirements and seem to grow and produce better than do apples. No one pear variety is as prominent as is the Blenheim Orange apple. The quality of the pears is often very good. In Guatemala pears are usually grafted on hawthorn and commonly set fruit within a year from the time of grafting. Quince is often used as a stock for pear in Ecuador. Pears of Oriental blood commonly require less chilling than do those of pure European parentage and may be raised at the lower elevations.

Quinces grow and produce well in most of these countries. They seem to have short cold requirements and are free from fire blight and codling moth, which are very serious in the United States. No observations on varietal adaptation were obtained. The varieties Pineapple and Orange are suggested.

The Hawthorn, *Crataegus pubescens,* is extensively raised in Guatemala. The fruit is used for preserves, Christmas decorations, and medicine. The plant is used as a stock for pear and to a less extent for apple and quince. The trees and fruit seem remarkably uniform, suggesting that hawthorn may be apomictic and reproduce true from seed. It should be tested as a stock for pear in Ecuador and other countries.

LITERATURE

AMERICAN INDIANS IN THE PACIFIC. Thor Heyerdahl. i-xv + 821 pp. ill. 1952. George Allen & Unwin Ltd., Stockholm-London. — This is an impressive, profusely illustrated volume, difficult to review because the included data were drawn from such a wide range of special fields that no one individual can possibly evaluate all of it. The impressive bibliography contains roughly one thousand titles and it is evident that the cited works were actually studied, perhaps largely with the view of locating statements that would support the author's preconceived theory. Were the truth known it is probable that there were intrusions of men from both sides of the great ocean, but surely the American ones were very minor. As I am reasonably familiar with the botanical field I shall confine my remarks strictly to this area. If the archeologic, philologic and 'historic' (if we may use that term to cover legends), and other data presented are as weak as the botanical evidence, the only conclusion that I can draw is that it is most unfortunate that Mr. Heyerdahl felt that his theory must be "proved".

In 1951 and 1952 I had the opportunity of studying Solander's critically prepared but unpublished manuscript covering the flora of Tahiti, based on the Banks and Solander collections (Cook's first voyage, 1769), and checking the botanical publications of J. R. and G. Forster (Cook's second voyage). In 1951 I examined the specimens on which selected descriptions were based. These actual specimens are available at the British Museum (Natural History). These four active botanists spent approximately five months on the coastal plain at Matavai Bay, Tahiti, making a very thorough botanical survey. Unlike most modern botanists and collectors they did not neglect the cultivated plants and the weeds. To indicate this, note the large number and varieties of cultivated species indicated below. Thus we had the first botanical collections made in all of Polynesia, a comprehensive assemblage of material on which a reasonably complete descriptive flora of the low altitude parts of Tahiti could be based.

The results, in relation to Heyerdahl's claims are extraordinary. Among all of the cultivated economic and food

plants only one, the sweet potato, came from America; all of the others, Broussonetia, sugar cane, plantains and bananas (23 varieties), true yams (Dioscorea) of which there were three species, Curcuma, Alocasia, taro (16 varieties), Tacca, coconut, the gourd, candle nut, Spondias, Eugenia, breadfruit (21 varieties), and a few other genera were introduced from Malaysia as well as were their few domestic animals, — the pig, the dog and the common fowl.

The weeds, approximately thirty species, were also from Indo-Malaysia, some of which have not yet been found in America; — there is a mere possibility that two of these may have originated in America. The now dominant weeds of American origin all over Polynesia were wholly absent.

All of the other plant species described by Solander in 1769 were mostly indigenous and largely endemic ones, a very few of natural pantropic distribution. The ample collections of the two Forsters, Cook's second voyage tell the same simple and demonstrable fact that all of the introduced and cultivated food and other economic plants were man-transmitted out of Malaysia (except the American sweet potato). Thus with one exception man's plant commensals (weeds and cultivated plants) having come through Malaysia does not conform to Heyerdahl's thesis, but very strongly supports the general belief among specialists in other fields that the Polynesians themselves travelled out of Asia through Malaysia and thence into the scattered Pacific islands.

From a purely botanical standpoint Heyerdahl, like one of his most frequently cited "authorities" (a man without botanical training or experience) had neither had any real knowledge of phytogeography, ecology, taxonomy, or even a knowledge of the simple elements of botany. Neither knew the difference between an endemic, indigenous, a natural "wide" or an introduced naturalized species. Neither properly considered the significance of the geologic aspects of plant history nor, within the historic period, the effects of early trade routes in relation to transmission of economic plants and weeds from America to the old world tropics. The latter include the Manila-Acapulco galleon line (1565-1815) and the old Portuguese route to

the Orient via Brazil (following the year 1500), and what actually happened between 1700 and 1850 in Pacific exploration and trade. The manifest fact is, except for the Manila-Acapulco route via Guam and the very few early voyages of exploration sponsored by the Spaniards south of the equator to the Solomon, New Hebrides and Santa Cruz Islands in the late sixteenth and early seventeenth centuries, the period of rapid introduction of exotic species into Polynesia commenced with Cook's first voyage. It still continues. It would have been infinitely better from the standpoint of what he wanted to prove, had the author eliminated all of the space that he devoted to the plant evidence. If what he included proves anything it is exactly the opposite of his basic thesis. After all, tangible evidence from the historical collections is very different from wishful thinking. — *Elmer D. Merrill.*

400 PLANTS OF SOUTH FLORIDA. Julia F. Morton and R. Bruce Ledin, 133 pp. with 28 full-page drawings. Text House, Coral Gables, Florida, 1952.

This book describes briefly but with botanical accuracy "the majority of the exotic and native plants cultivated in home gardens and parkways, as well as the more noteworthy of the wild plants seen by the wayside, on the beaches, and on the Florida Keys". The full-page drawings by Frank D. Venning Ph. D. are excellent — one could wish there were many more of them.

The 400 plants are described in alphabetical order, in accordance with their botanical names. Since one of the major purposes of the work is to assist the newcomer in recognizing the plants he sees about him in South Florida, and learning something about their origin, their ornamental or economic value, and the like, it might have helped if the authors had grouped the species under some such headings as "Ornamental Trees and Shrubs", "Palms and Cycads", "Plants bearing Edible Fruits" and so on. No keys are provided, nor do we think they would be appropriate in a work of this sort. The newcomer to South Florida, however, must know either the botanical name (and the botanical nomenclature and synonymy of the book are good) or he must be familiar with the common name of a

plant bei[illegible] which he is
searching. In[illegible] pro-
bably be all he [illegible]
these to guide him.

The authors, and the[illegible]
—the University of Miami—
having turned out a work botani[illegible]
sound, and presented in very attractive[illegible]
penoe.

BIRDS OF MEXICO. Emmet Reid Blake. The University of Chicago Press. 1953. List US$6.00.

There are 967 species of birds, with about 2000 geographical variations, in Mexico. A large number of these birds are resident in Central America and Mr. Blake's book, in addition to its intended range is perhaps the best field guide of the birds of northern Central America that exists.

The volume has quite adequate keys and descriptions. Those tried on the local birds seem to work without difficulty. There are a fine lot of illustrations, by Douglas Tibbitts, scattered through the book. These should help in the determination of the birds even though they were obviously made from museum specimens. My little orange-chinned parakeets, for example, are far more attractive than their portrait would indicate.

Ornithologists doubtless know the families of birds but occasionally people not so fortunate use bird books. A key to the families of Mexican birds (only about 90) should have been relatively easy to prepare and would have been welcome.

Distribution of the birds is given only for Mexico. Ranges outside of Mexico would have been most useful to those of us who live a little farther toward the equator. This, and the lack of Spanish common names we miss most in this fine volume.—*Louis O. Williams.*