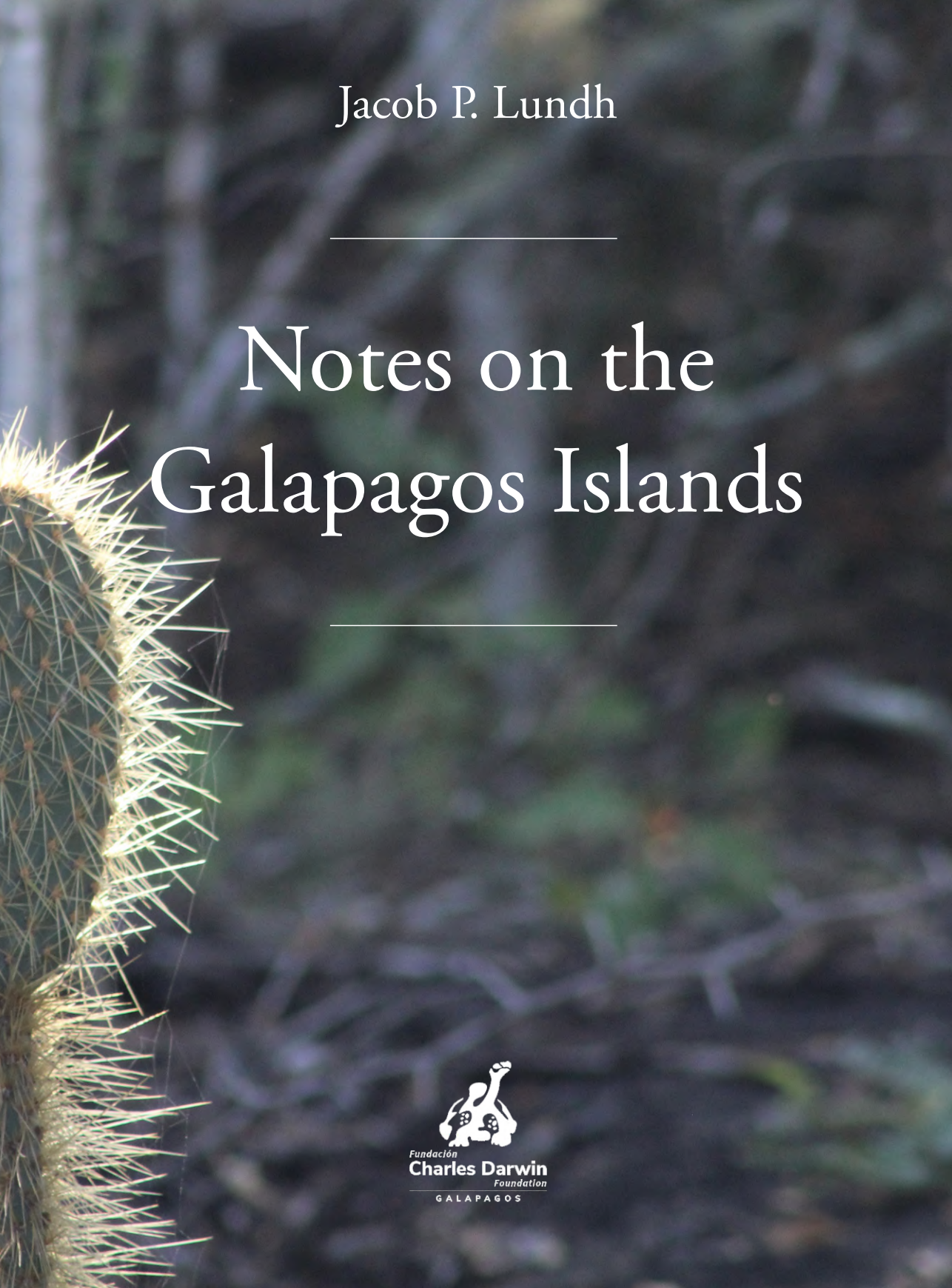

Jacob P. Lundh

Notes on the Galapagos Islands

Fundación Charles Darwin Foundation
GALAPAGOS

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Lundh, Jacob P.

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Santa Cruz, Galapagos Islands, Ecuador

Jacob P. Lundh

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Edited by Edgardo Civallero

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Charles Darwin Foundation
Library, Archive & Museum
Puerto Ayora - Santa Cruz
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INTRODUCTION

This book presents the transcription of an unpublished manuscript recently found in the special bibliographic collections of the Library, Archive and Museum of the Charles Darwin Foundation (CDF). The text, produced by Jacob Lundh, a Norwegian colonist in the Galapagos Islands, is devoted to the geography, history, biodiversity, and society of the archipelago. It has been lightly edited to correct a number of typos present in the original document, although scientific names were kept as written by the author.

The volume is published with permission of Mr. Lundh's daughter, Ms. Ingrid Lundh, and is part of a collection produced by the CDF Library, Archive and Museum, aimed at recovering Galapagos' social and scientific memory, and to make it visible through open-access, bilingual, digital editions.

Edgardo Civallero
CDF's Library, Archive & Museum
Puerto Ayora, Galapagos Islands, August 2023.

NOTES ON THE GALAPAGOS ISLANDS

by JACOBO P. LUNDH

PREFACE

The present work is an attempt at giving the general public, as well as those interested in the natural history of the Galápagos, an overall picture of these fascinating islands, without dwelling in too much detail. I hope this has been accomplished with a fair degree of success.

While the total of this work may be considered as an introduction to the study of the Archipelago, its first part serves as such to the second, since it briefly describes the climate, flora, fauna, agriculture, fishing, history, etc. The second part is a short description of each island, taken separately, with some details of local history where this is believed to be of interest or of some importance. This latter part has been divided into several chapters, one to each of the six largest islands. The minor islands are briefly described under the heading corresponding to their nearest large neighbor, with the exception of that group of minor islands north of the Line, known locally as *Las Islas del Norte*, which is dealt with separately.

The names used for the various islands are those in general usage among the inhabitants of Galápagos. A table of names will be

found facing the map that precedes the text, as an aid to those unfamiliar with some of these names or interested in knowing the synonymy of each island.

The suggestions made regarding the conservation of the flora and fauna of the Islands are almost identical with those put forward by Dr. Irenäus Eibl-Eibesfeldt in his excellent "Survey of the Galápagos Islands" (UNESCO Missions Report No. 8, Paris, 1959). This is only natural, for the measures suggested are the only ones that are reasonable under the circumstances known to both of us. However, I readily admit that I have been influenced by many of Dr. Eibl-Eibesfeldt's ideas; but this has been only because these ideas are based on facts with which I am thoroughly familiar after a lifetime's contact with Galápagos. Thus, I here bear him witness.

My purpose is to present facts, but it may be at times necessary to interpret these in the light of my past experience with the Islands. Occasionally, some of my facts and comments may seem like criticism. They are not intended as such, and to avoid this misinterpretation I would have gladly withheld them, had it not been because they are essential to give a complete picture. Erroneous attitudes or regulations that are mentioned here and there are not the result of general incompetence of this or that official. They are caused simply by a lack of available advice on the subject of conservation to officials whose profession and past experience have not prepared them for this side-activity so foreign

to them. It is to the credit of many of them that they have tried as best they knew to protect the fauna of the Islands with the limited means at their disposal.

The presence of the Charles Darwin Foundation's Research Station on Santa Cruz will be of enormous aid to those Ecuadorian officials responsible for the conservation of the Galápagos fauna, since it provides them with the scientific information and advice so wanting in the past.

As for the development of the Islands, it is remarkable how often the Ecuadorian Government has been criticized, both on the Islands and on the Mainland, for not doing more for the Galápagos. This is, in most cases, very unfair. There is much to be done on the Mainland, in regions far more important to the Nation's economy than are the Galápagos, notably in the way of road building. Road construction programs have been going on for a number of years in continental Ecuador, but there is still much to be done in this respect. Unfortunately, Ecuador is far from being a rich country where public funds are concerned, so it is quite surprising how much has been actually done for the Galápagos, a province that is only a heavy burden on the country's budget.

Galápagos is the province that receives the largest per capita budget in Ecuador. The Government has removed the last penal colony

from the Islands, it has given them the status of province (which means a number of extra officials), it has established schools on all the islands and at each center of population, dispensaries and radio communications exist on each inhabited island, and there is a small but modern hospital at Santa Cruz. All this causes the Nation considerable expense, if we take into account the limited number of inhabitants. But, I suppose, complaining is a weakness all we humans are more or less prone to at times.

As for my historical information, I owe much of it to early inhabitants such as Don Manuel Augusto Cobos, son of the controversial founder of Progreso, the loss of whose diary during the 1924 uprising, when the plantation house burnt, has been a source of regret to both the junior Cobos and myself, since it is probably the only document giving details of the life of those anonymous men, the archil collectors and tortoise hunters of the later part of the past century and the early years of the present (the elder Cobos was murdered in 1904). In this unique document one might also have found a key to the personality of this remarkable colonizer, Don Manuel Julián Cobos, who has been presented to posterity as a ruthless tyrant by writers who never knew him, or at best obtained their information from his enemies.

There are many other early settlers, who, unlike the junior Cobos, were not born here, but came here in their youth, whom I owe much information. Among these is the ancient Irene Bernabé, sole

survivor of Don Antonio Gil's original workers, those who helped him settle Isabela in the late 1890's. There is also Maestro José Vallejo, former boilermaker of the Cobos sugar refinery, who in his youth collected archil for the founder of Progreso. There are Manuel Gutiérrez and Damián Quimí, who were half-grown boys when the elder Cobos was assassinated. Other early settlers whom I owe much information are the late César Moncayo, who had lived many years on San Cristóbal before he moved over to Santa Cruz, and Gordon Wold, who is the earliest living settler on the latter island, where he helped found Puerto Ayora in the 1920's. One of his companions, a fellow member in the Norwegian settlement at Academy Bay, the late Kristian Stampa, was the man who initiated me in the arts of fishing and taught me to know the Islands.

But not all of my acquaintance with Galápagos history stems from people. There are also books to be credited, notably Carlos Manuel Larrea's fine work, "El Archipiélago de Colón" (Casa de la Cultura Ecuatoriana. 2nd edition in Quito, 1960), and the equally interesting book by the late Joseph R. Slevin, "The Galápagos Islands: A History of their Exploration" (Occasional Papers of the California Academy of Sciences. No. 25. San Francisco, 1959).

I wish to thank Miguel Castro and Alf Kastdalen, both boyhood friends, living on Santa Cruz, for our frequent and fruitful exchanges of information through our many years of close friendship. A similar exchange of data was sometimes held with the

four successive directors of the Charles Darwin Foundation's Research Station, Mr. Raymond Lévêque, Dr. André Brosset, Dr. David Snow, and Mr. Roger Perry, all of whom have been quite generous in sharing whatever information I asked.

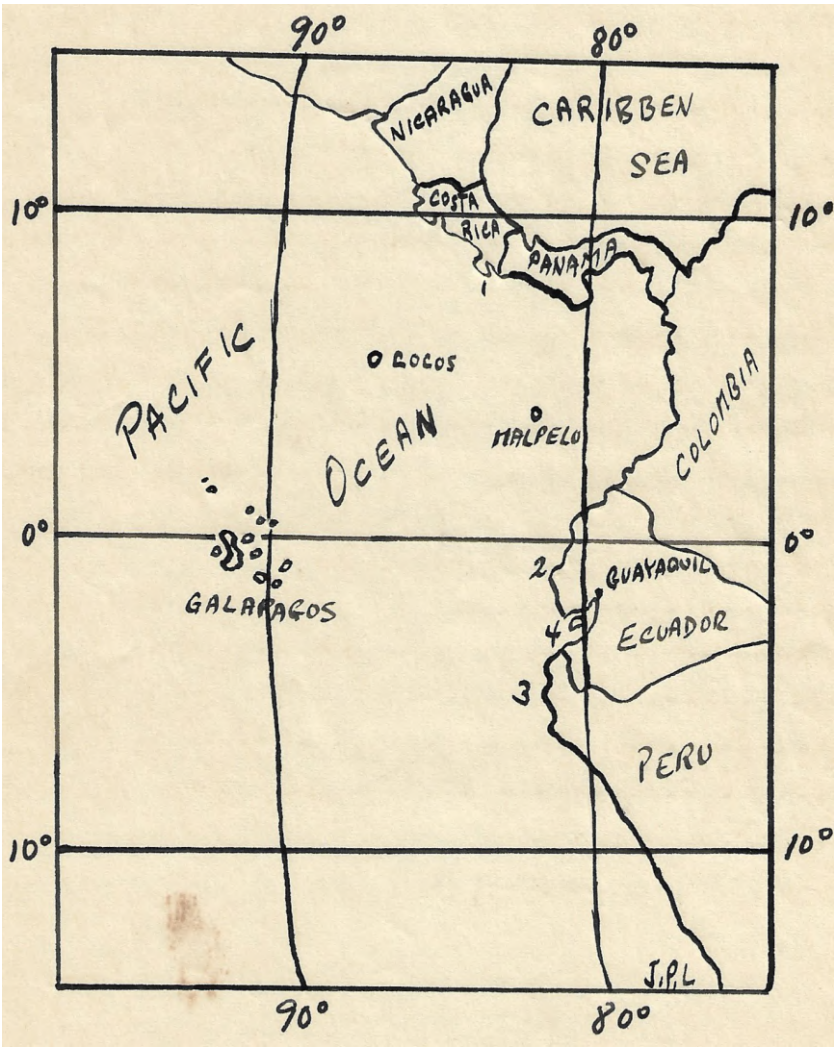
Among the many persons I recall with gratitude, who had something to do with the present work, Mrs. Cazenove Lee, of Washington, D. C., stands out as a notable example of generosity, having found time to obtain and send me several papers that I had difficulty getting, and which were most useful to complete the present description. Another such person is the distinguished Guayaquilian lawyer and intellectual, Dr. Alfredo Vera, who gave unstintingly of his time to read and make many useful remarks on the still unpublished Spanish manuscript, of which the present is a translation.

Dr. Juan E. Foerster, German entomologist of Buenos Aires, gave me the idea from which this description grew and developed, while the late Folke Anderson, President of Fruit Trading Corporation, and his former representative in Guayaquil, then manager of Compañía Ecuatoriana de Turismo Galápagos S.A., made it possible for me to return and remain on the Islands for five years, by making me their representative there. This latter made it possible for me to finish this work and engage in several other activities related with the study of Galápagos.

Probably, I owe the greatest gratitude to the late Helga B. Lundh, my mother, who taught me to love plants and animals, and stimulated me to learn as much as possible about these and other subjects that have helped build up this description. She also prodded me along whenever I showed a tendency to procrastinate while writing the Spanish version, which was almost finished while I still had the pleasure of her company on San Cristóbal.

Since first written, this work has undergone a few changes, there being considerable differences in some of its parts as presented here, if we compare it with that early MS that I gave Dr. Snow and which was filed away for reference at the Charles Darwin Research Station, some years ago. (I hope it has been useful to those consulting it). One reason for this is that some parts were no longer up to date; another, that certain parts have been extended to include additional information, as suggested by several people who had the kindness to go through the MS, and make comments on it, most of which, I am happy to say, have been very favorable.

Guayaquil, September, 1969.

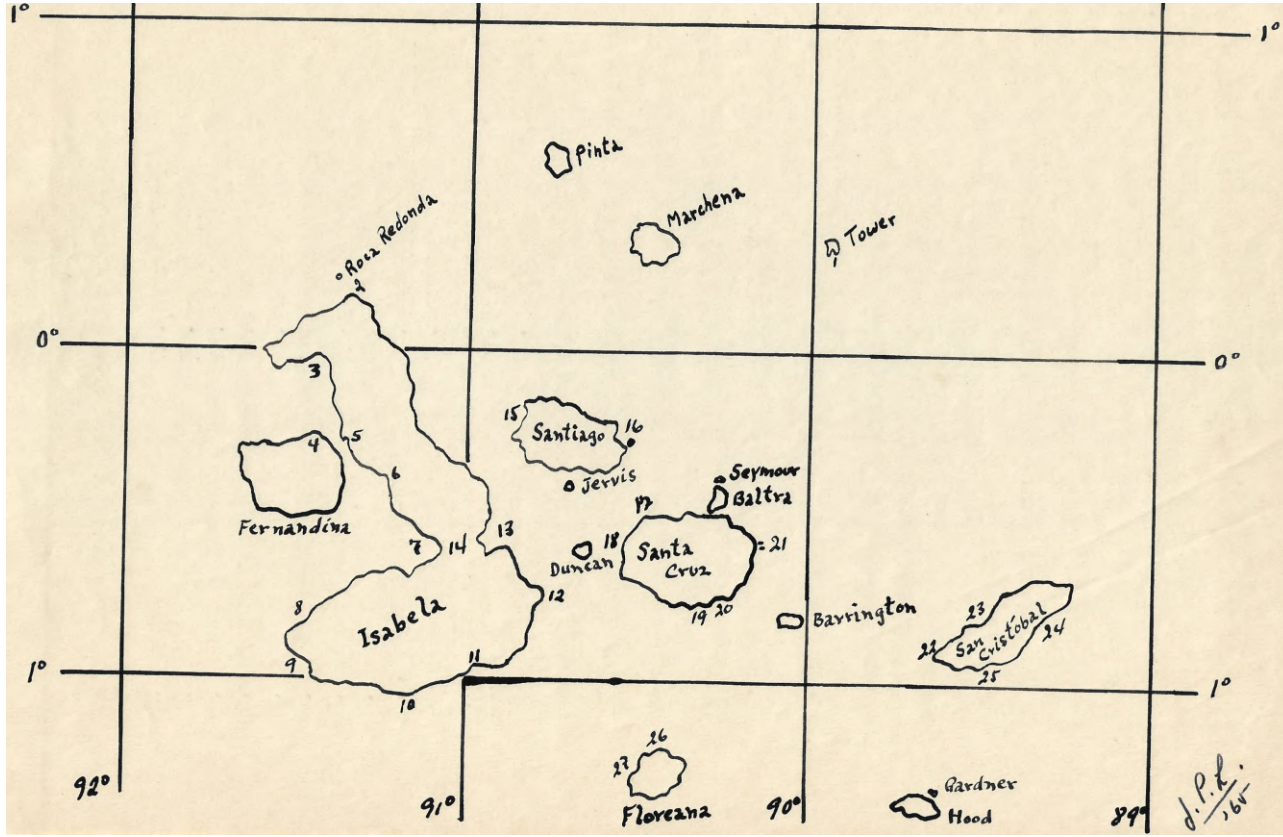


1.- Punta Sal Si Puedes, Costa Rica, nearest place in Central America.

2.- Cabo San Lorenzo, Ecuador, nearest place on the South American Mainland.

3.- Cabo Blanco, Peru, where the greater part of the Humboldt Current is deflected towards the Islands.

4.- Gulf of Guayaquil.


1°
0°
1°
92°
91°
90°
89°
Pinta
Marchena
Tower
Roca Redonda
Fernandina
Isabela
Santiago
Jervis
Seymour
Baltra
Santa Cruz
Duncan
Barrington
San Cristobal
Floreana
Gardner
Hood
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1. Darwin Bay
2. Point Albemarle
3. Banks Bay
4. Point Espinoza
5. Tagus Cove
6. Urbina Bay
7. Elizabeth Bay
8. Webb Cove
9. Iguana Cove
10. Cape Rose
11. *Puerto Villamil*
12. Cape Woodford
13. Cartago Bay
14. Perry Isthmus
15. *James Bay*
16. Sulivan Bay
17. Conway Bay
18. Whale Bay
19. Tortuga Bay
20. *Puerto Ayora*
21. Islas Plaza
22. *Puerto Baquerizo Moreno*
23. Puerto Grande
24. Rosa Blanca Bay
25. Fresh Water Bay
26. Post Office Bay
27. *Black Beach*

Note: Names in italics are those of inhabited places.

NAMES OF THE GALAPAGOS ISLANDS

LOCAL	OFFICIAL	OTHER NAMES
Culpepper	Darwin	Guerra, Los Dos Hermanos
Duncan	Pinzón	*Dean*, Camperdon
Fernandina	Fernandina	*Narborough*, Plata
Floreana	Santa María	*Charles*, Sta. María de la Aguada, Isle de Saute, Tejada
Hood	Española	Mascarin
Isabela	Isabela	*Albemarle*, Sta. Gertrudis, Sta, Isabel
Jervis	Rábida	*Nuestra Señora de la Esperanza*
Marchena	Marchena	*Bindloe*, Torres
Pinta	Pinta	*Abingdon*, Geraldina
San Cristóbal	San Cristóbal	*Dassigney*, Chatham, Grande, Mercedes, Solano
Santa Cruz	Santa Cruz	*Norfolk*, Indefatigable, Bolivia, Chávez, Porter, Valdez
Santiago	San Salvador	*James*, Gil, Olmedo, Isle du Tabac, York
Seymour	Baltra	

Seymour Norte	Seymour	
Tower	Genovesa	*Ewres*, Carenero
Wenman	Wolf	Núñez

The names in italics are those earliest in use for the respective islands.

FIRST PART

A GENERAL DESCRIPTION

I

POSITION AND FORMATION

The Galápagos Islands, known officially as the Archipiélago de Colón, extend from 156 kms. south of the Equator to 185 kms. north of it (1), at a distance of about 950 kms. to the west of Cape San Lorenzo (Ecuador), nearest point on the West Coast of South America, and about 1,150 kms. to the southwest of Punta Sal Si Puedes (Costa Rica), nearest place in Central America (2, 3). Scattered within a rectangle of 92,000 square kms. of ocean (1), their land surface, more than half of which is comprised by Isabela, reaches 7,844 sq. kms. (4). The insular group is formed by six major and nine minor islands, plus a number of islets and rocks.

Mainly of volcanic origin, the Galápagos are formed mostly of basaltic lava, tuff, ashes and scoria, except at places in the moist regions, where vegetable mold and decomposed volcanic rocks are found, and a very few locations where sedimentary formations occur. Darwin claims that there are some two thousand craters on the Archipelago, of which we know several to be still active, mostly in the western part of the group.

In many places there are clear signs of a rising of the seashore. Besides the somewhat recent and rapid rising of the bottom of Urbina Bay (Isabela), there are numerous, though less spectacular, evidences elsewhere such as the sea shells and pieces of coral scattered well above the spring tide mark on the south coast of Santa Cruz, and large pieces of the latter material in several parts of Hood.

A remarkable result of this phenomenon is the lime-stone formations on which nearly all of the Puerto Baquerizo Moreno village has been built. This soft rock seems to have formed under very little pressure, as the shell fragments that form most of it are rather loosely united.

(1) H. O. Chart No. 1798. Washington, 1946.
(2) Chart No. 549. Reichs Marine Amt. Berlin, 1914.
(3) H. O. Chart No. 823a, Washington, 1923.
(4) Francisco Terán: Geografía del Ecuador. Imprenta del Ministerio de Educación. Quito, 1955. Pg. 216.

II

CLIMATE AND SEASONS

The main body of the Humboldt Current, after leaving Cabo Blanco (Peru), turns towards the Galápagos, dividing itself into two great branches, one of which passes south and the other north of the Islands. Joining these two currents is a series of strong secondary ones that run between the various islands with a northerly and northwesterly set, at speeds that may reach, in certain areas, up to 5 km/h. Their different volumes of cold water may cause a variation of one to two degrees centigrade in the mean temperature from one place to another among the islands.

The cold currents and the prevailing winds give the Islands a climate that is relatively cool, if we consider the latitude of the insular group.

The lower regions and the high areas to the leeward of the larger volcanoes are all more or less arid, while the high windward areas, on the islands of greatest altitude, moistened by the mists borne on

the trade winds (in the second half of the year), remain green all year, except when occasional droughts occur.

During this season of mists and drizzles, the cold months, the weather is surprisingly cool for the tropics. Temperatures as low as 14°C have been recorded in the moist regions, while the lowest daytime temperature I experienced during the periods of 1946-49 and 1950-54 was of 18°C by the seashore. The first of these temperatures was observed just prior to sun-up, while the latter one was taken during mid-morning.

Daytime temperatures by the sea may fluctuate from about 22°C to 26°C, except for a few sunny days, when they may rise somewhat higher, at noon.

I have not had the opportunity to keep regular records, so all temperatures herein mentioned must be taken as approximate, being based on scattered data obtained from settlers in various places, and frequent though not continuous personal observations.

When the warm counter-current that comes from the Gulf of Panamá, the Corriente del Niño, begins to be felt along the west coast of South America, the cold waters from the south, already partly warmed by the southern hemisphere's summer sun, turn warmer, and the climate changes. In most years, the rainfall is increased, sometimes considerably, though this has been the

exception rather than the rule during the last few years. These changes also affect the Galápagos, though the rainfall here seldom increases as much as it does on the Mainland.

With the first rains, no matter how scanty these may be, the rocky cactus wastes begin to turn a tender green — grasses, creeping annuals, climbing annuals, and the foliage of the different deciduous trees like the palosanto (*Bursera*), make their appearance.

This is the season of rebirth, when the gray and black of the lowlands are covered with a new beauty. Sunshine is everywhere, interrupted only by an occasional shower of short duration, and the thermometer may climb as far up as 36°C in the shade, at noon. However, the heat is far from being as oppressive as it is in some parts of the Mainland during this same season.

In 1925, as much as 39°C were registered in parts of the Galápagos. The Niño Current had been stronger than usual, and its influence was felt as far south as northern Chile. This phenomenon, bringing with it strong precipitation, is repeated with various degrees of intensity every seven years. However, this cycle must be a component of a larger one, one we have been unaware of before, through lack of data from a sufficiently long period of years, since these seven-year cycles have failed lately.

There are indications that this might also have happened in the past.

Though there are no records for the Galápagos over this total extent of time, it seems to me that the yearly averages of rainfall, especially the ones corresponding to the warm seasons, have decreased slowly but steadily in the last thirty years.

The increase of the sea water temperature experienced in the most extreme cases of these seventh year warm seasons has serious effects on the marine biota of the regions affected, completely unbalancing the food chain that normally exists, beginning at its very base, the lowly plankton, and following up through the fishes and the sea birds. Large flocks of the latter are seen flying even up rivers (on the Mainland), far from their normal habitats, in a desperate search for food. Hundreds or even thousands die of starvation, their emaciated bodies being thrown up on the beaches by the waves. However, as has been stated in regard to the seasonal changes, the Galápagos are not affected by this phenomenon to such an extent as the Mainland. In fact, I cannot recall any unusual mortality of birds along the insular coasts, while I have seen a great quantity of emaciated cormorants migrating from Peru to Ecuador during extremely hot warm seasons. They seem to find more food here, at the mouths of the larger rivers, and inland.

While agriculture is at its peak during the cold season, when most planting is done and vegetables, maize and potatoes are planted and harvested, the warm season is the time when most fruits ripen — water melons, papayas, guavas, oranges, pineapples and bananas.

It must be remarked, though, that during the transition from one season to the next the products of the ending season become scarce, while those of the coming one are unobtainable.

The last few years have been unusually dry and the coming and going of seasons have been rather irregular, badly affecting agriculture of the Islands. During the 1964-65 warm season, the rainfall showed an increase in many parts of the Archipelago, but the same season was almost totally dry in 1967-68.

Rains are very localized during this part of the year, it often happening that one farm may receive a shower, while the one next to it remains dry and sunny. The winds also are unreliable and shifting, frequent periods of calm being usual. Occasionally, a ground swell will come in from the north, probably caused by the Tehuantepec northerns and the northeasterly winds of Central America, the Papagayos.

There are often strong winds in the afternoons, as the season wears on and the weather turns drier. These windy periods are usually

preceded by sweltering windless mornings. At such times the sun shines all day, and the winds come as a relief, freshening the air and causing a beautiful white capped sea.

Many authors have called this season "rainy" and the other one "dry." I prefer calling the former “warm" and the latter "cold," since the former is the driest season in any dry year, while the latter is invariably wet in the highlands. However, the so-called "rainy" season, no matter how dry or wet, will always be warm, while the so-called "dry" season is always cool, whether the year be a dry one or not.

Locally, the term "invierno" (winter) is used for the warm season, and "verano" (summer) for the cold one. These two terms are used in the same manner along the coast of Ecuador, where the two seasons occur at the same time of the year, and have similar effects on the semi-desertic coastal areas. Probably the Spaniards that settled in places like Guayas and Manabí provinces, where the heavy rains of the warm season coincide more or less with the winter of their own country, were the first to call the seasons by these names. On the Islands, "la garúa" (the drizzle) is also used for the cold season, mainly among the farming population, whose prosperity depends entirely on the fogs and drizzle prevailing at that time of the year.

The warm period of the year is the one when the Islands are at their most beautiful, and their appearance, with their diaphanous lagoons, lofty somber lava cliffs, deep blue sea, strange and weird cactus wastes, and naked lava fields resembling the moon's surface, may be best appreciated.

III

NATURAL REGIONS AND INSULAR FLORA

Of the 682 forms of vascular plants reported by Stewart from the Galápagos Islands, 40.9% are endemic (5). Though a number of new species and subspecies have been described since, numerous introduced plants have also made their appearance in later years, so, roughly, we probably still have about the same proportion of endemism in the known vascular flora.

On account of the variety of conditions found at the different altitudes, and mainly owing to the moisture carried by the prevailing winds during the cooler part of the year, the latter affecting the higher windward zones of the major islands, there are various regions we must consider when studying the flora of this insular group. I follow Stewart's excellent definition of these (6), adding only one name to his list — the "shore region," to include those scattered areas where mangroves and other strand vegetation occur.

Thus, we have, from sea level to the zones of greatest elevation, five more or less definite botanical regions on the higher islands — a) the shore (including the mangrove swamps, salt and brackish ponds, beaches and other parts of the shoreline); b) the dry region, which covers the greater part of the Archipelago's surface; c) the intermediate region or transition region; d) the moist region, where practically all farming takes place; e) the grasslands, or open areas that extend above the forests of the latter.

A) **The Shore Region**.- In the sheltered bays, salt lagoons and coastal marshes, the greenness of the halophytic vegetation contrasts markedly with the surrounding barrenness of the dry region, during the cooler part of the year. The glossy green foliage of the red mangrove (*Rhizophora mangle*) and another species that, with it, forms the greater part of the insular mangrove swamps, the white mangrove (*Laguncularia racemosa*), are a welcome sight after the monotony and somberness of color found in other parts of the lowlands. In the salt marshes and behind the mangroves, as well as on pebbly beaches or on sandy stretches, generally isolated, or forming very small groups, one finds the black mangrove (*Avicennia officinalis*) as bushes or trees.

A coarse grass (*Sporobolus virginicus*) is very common on the margins of marshes and lagoons or forming dense carpeting on the upper parts of sandy beaches. Under similar conditions is also found an aizoaceous herb with succulent stems and leaves

(*Sesuvium portulacastrum*), a plant that also occurs on rocks and promontories near the sea. There is a red endemic species (*S. edmondstonei*) which is widely distributed throughout the Archipelago.

A creeper, the strand morning glory (*Ipomoea pes-caprae*), is an important element in the rather sparse vegetation of the dunes and sand flats, reaching a length of more than thirty meters. Other species of this genus are found at various altitudes, even as far up as the moist region, where they climb into the trees and bushes.

The following trees are often found as strand plants: the manchineel tree (*Hippomane mancinella*), a small endemic celastraceous tree (*Maytenus obovata*), and the Jerusalem thorn (*Parkinsonia aculeata*), the latter a spreading tree with showy yellow flowers. *Hippomane* is common as far up as the lower moist region, where its thick branches support a profusion of epiphytic ferns, mosses and bromeliads. *M. obovata*, frequent around salt lagoons and such places, may extend up to the higher limits of the dry region, while *P. aculeata*, found in similar locations as the former, may be considered as typical of the lower dry region, where it is often very abundant (as around Post Office Bay, Floreana).

This coastal zone reaches its greatest development in the region that extends from Puerto Villamil to the westward, to Cape Rose

(south coast of Isabela), and in the Perry Isthmus and its neighborhood, on the same island.

B) **The Dry Region**.- Taking Santa Cruz as an example, for it is one of the islands where the differences from one zone to the next are best developed, we shall gradually ascend to the upper regions.

This zone of dry and gray appearance, the majority of whose perennials have grayish trunks covered with lichens of similar coloration, extends on this island (on its windward side) up to 106 meters above sea level; on the southeastern side it reaches up to 122 meters; on the northwestern to 137 meters, and on the leeward side (note the great difference), it extends to an altitude of 457 meters above sea level.

Ferns are scarce in this part, the first ones being found somewhat inland (*Trachypteris pinnata* and *Notholaena sulphurea*). These turn more abundant as one proceeds to the upper parts of this zone and the lower intermediate region, where they have already been joined by *Cheilanthes microphylla*, a less drought-resistant species.

The plants one thinks of first in association with the lower regions are the Cactaceae, though these are not dominant in all parts. Here, I shall limit myself to two striking arborescent cacti — *Jasminocereus howellii* and *Opuntia echios gigantea*, the latter reaching a height of about ten meters under favorable conditions.

These trees are to be found throughout the dry region in the islands where they occur, *J. howellii* on the edges of escarpments and similarly exposed places, and *O. echios* under more or less the same, as well as under more favorable conditions, where, as in the south of Santa Cruz, it may form groves and forests of considerable extent. The latter species extends into the lower parts of the intermediate region, where it has already turned by degrees smaller and more scattered, as the shade from the increasingly larger and stronger trees and bushes becomes denser. There are three species of *Jasminocereus* and seven of *Opuntia* known from the Islands, all of them endemic. There is still much to be done concerning the Galápagos cacti, for they are as yet imperfectly known, though Howell (7) did much to clear up the confusion surrounding the Opuntiae, while Dawson (8) has added considerably to our knowledge of these, besides giving a more realistic classification of the Jasminocerei, which were dealt with in a superficial manner by Howell.

Among the trees of the dry region, the most common is the palosanto (*Bursera graveolens*), its short pale gray trunk crowned by long flexible branches that often reach up to a height of six meters above the ground. Much infested by lichens, it is a favorite home of the once valuable archil (*Roccella*), from which was produced a violet dye. Its habitat extends to the lower parts of the intermediate region, and during the warm season, when its leaves come forth,

the tender green characteristic of these gives a delicate color to the landscape of the lowlands.

Other common forest trees in the dry region are the matazarno (*Piscidia erythrina*) and the porotillo (*Erythrina velutina*), the latter being the largest tree of the lower altitudes on the islands where it occurs.

In all parts of this region one meets with thorny trees, shrubs and thickets, and species of *Castela*, *Acacia* and *Prosopis* are common, as well as a member of the buckthorn family (*Discaria pauciflora*) that forms impenetrable barriers in the bottoms of gullies and similar places. Adding to the grayness of the landscape are the small trees and bushes of the several varieties of chala (*Croton scouleri*), with their whitish gray trunks and grayish green foliage.

During the warm months, several annuals come to life in the form of creepers, climbers and herbs. The West Indian cotton (*Gossypium barbadense*) and the endemic *G. klotzschianum* also develop in this season (as small bushes), extending into the lower reaches of the intermediate region. An amaranthaceous shrub (*Alternanthera echinocephala*) is common, as well as nettles such as *Fleurya aestuans*, the latter being found all year round in the moist region, where it may grow as tall as one meter.

Grasses are abundant after the first rains of the warm season, especially in the open spaces where the terrain is too porous to support larger vegetation. The most common of these plants are *Aristida subspicata* and several species of millet (*Panicum*).

C) **The Intermediate Region**.- As one ascends towards the intermediate region, new species appear, other have disappeared or turn gradually scarcer, while many grow stronger and in greater numbers. Ferns become more abundant, fruticose lichens are common through all this zone, and numerous herbaceous species, both creeping and climbing, found only during the warm months in the dry region, are met with here throughout the year, on account of the greater humidity. Small bushes of *Croton scouleri brevifolius* take the place of the more xerophytic varieties, turning into small trees farther inland; an endemic velvetweed (*Abutilon depauperatum*) is increasingly common, the guayabillo (*Psidium galapageium*), a bush in the upper dry zone, increases in size, transforming itself gradually into a large forest tree once it reaches the moist region. The thorny uñagato (*Zanthoxylum fagara*), at the most a shrub in the arid regions, is here a forest tree of up to twelve meters in height, being met with in this condition through all this region and the next.

Vines such as *Cissampelos pareira* are abundant in this zone, from where they continue to be so well into the moist region. Some species of *Scalesia*, in the form of shrubs, nearly always small,

gradually disappear, while the largest in this genus, the lechoso (*Scalesia pedunculata*) makes its first appearance, increasing in size and numbers as one ascends, until it forms forests in many parts of the moist region, where it may grow to a height of about twenty meters.

The air is cooler in the intermediate region, the soil is more abundant, and the vegetation remains more or less green throughout the year. The ground in its upper reaches is usually covered by herbs. This region ends, to the windward, at an altitude of 156 meters above sea level, while it reaches an elevation of 610 meters to the leeward. (The total altitude of Santa Cruz is 864 meters).

D) **The Moist Region**.- Extensive forests of lechoso (*Scalesia pedunculata*) exist in this region, and the pegapega (*Pisonia floribunda*), a tree with spreading branches and thick bark, found also in the dry region, is abundant, as are also the guayabillo (*Psidium galapageium*) and the uñagato (*Zanthoxylum fagara*). All these serve as the home to numerous epiphytes — *Tillandsia insularis*, a very common endemic bromeliad, orchids such as *Epidendrum spicatum*, and various ferns (*Nephrolepis pectinata* and *Polypodium*). Other ferns are also met with, especially in the upper parts of this region — several species of maidenhair (*Adiantum*) are common, various species of the genus *Asplenium* are abundant, and the common brake (*Pteris aquilina*) reaches considerable size.

Several club mosses, occurring mostly as epiphytes, are found, one such being *Lycopodium dichotomum*, which is very common on the branches of the guayabillo tree or on the ground of the grassy region.

Herbs, grasses and sedges are abundant, especially in the glades and other open stretches. Of the nettles, besides the *Fleurya* already mentioned, there are several species of *Pilea* and the bushes of *Urera alceifolia*, the contact of which is most painful.

In general, the vegetation of the moist region is reminiscent of that found in the humid tropical regions, except that the trees are much smaller here. The soil is fertile, and it is here that nearly all cultivation is done, since the prevailing winds of the cool months bring enough moisture to allow farming. Though well wooded, this region has very little lumber suitable for construction work.

In the upper reaches of the moist region the trees turn gradually smaller. Its highest limit is marked by a belt of low, small trees and bushes, the dominant species being the cacaotillo (*Miconia robinsoniana*), associated here and there with a few uñagatos and bushes of *Tournefortia*, mosses and ferns growing profusely in their shade, and the former hanging together with lichens from their branches. On the windward side, the moist region ends at 457 meters above sea level.

E) **The Grassy Region**.- After this altitude, an open windy region begins, mostly covered by grasses, apart from which one finds only a few scattered bunches of ferns, some club mosses and mosses, the latter mostly on rocks and the branches of the few stunted shrubs of *Zanthoxylum* and *Miconia* that may be found to the leeward of the many small scattered hills, or inside the extinct craters. In such locations one may also meet with small fern-covered expanses,

In some of the sheltered places there are groups of *Hemitelia multiflora*, the only arborescent fern known from the Islands. This species may reach a height of over three meters, sometimes falling to the ground by the weight of its palm-like crown, continuing there its growth. The total length of such fallen trunks, counting the upward-curving part close to the crown, may exceed five meters.

The grasslands reach their greatest development on Isabela, where they cover extensive areas on the slopes of the Santo Tomás and Cerro Azul volcanoes, while on Santa Cruz and San Cristóbal this zone includes only the highest plateaux and the hills rising above these. On the other islands, the grassy region is absent or is too small to be of any importance.

Remarks.- The various natural regions, as far as climate is concerned, are more or less the same from one island to another, except in such places as Fernandina and the mountains north of

the Perry Isthmus (Isabela), where the presence of high mountainous formations to the windward hinders the moistening effects of the cold season winds. However, in most cases, the proportions among the different botanical species from one place to another varies so much, regardless of similarity in climate and terrain, that it often changes completely the appearance of the landscape. Thus, we find the cacti a dominant feature of the Santa Cruz lowlands, while on San Cristóbal they are very scarce, the dominant tree being here the palosanto, which, though abundant on Santa Cruz also, serves there as a mere background to the striking *Opuntia* forests.

On Duncan, we have the curious case of the palosanto's total absence, though it is abundant on all the surrounding islands and conditions on Duncan seem favorable to its growth. On the other hand, Baltra has its own species of palosanto (*Bursera malacophylla*), though Santa Cruz, with its common palosanto (*B. graveolens*), a species widely distributed through the Archipelago, is separated from it only by a narrow channel, a couple of cables wide.

The matazarno (*Piscidia erythrina*) is abundant in the dry regions of Santa Cruz and San Cristóbal, but it apparently does not exist elsewhere on the Islands.

It would doubtlessly be interesting to describe each of the major islands with their natural regions, but this would be outside the scope of a general description such as the present one. However, some additional information is given in this respect in Part Two, where the individual islands are described.

(5) Alban Stewart: A Botanical Survey of the Galápagos Is. Proc. Calif. Ac. Sc. 4th Ser. Vol. I. No. 2. San Francisco, 1911. Pg. 245.
(6) Op. cit. Pgs. 206-211.
(7) John T. Howell: The Cactaeceae of the Galápagos Is. Proc. Calif. Ac. Sc. 4th Ser. Vol. XXI. No. 5. San Francisco, 1933. Pgs. 41-54.
(8) E. Yale Dawson: Cacti of the Galápagos Is. and of Coastal Ecuador. Reprint from Cactus and Succulent Journal of America. Vol. XXXIV. Nos. 3 and 4. 1962.

IV

AGRICULTURE ON THE GALÁPAGOS

The insular farmers, especially those on Santa Cruz, where the soil is exceptionally good, are in the position of producing almost any kind of vegetable and a great variety of fruits, the former during the colder months, the latter mostly in the warm season.

Aside from where his own needs are concerned, this advantage is of little help to the Galápagos agriculturist, for his only market is very limited, consisting chiefly of the fishing population, which is smaller than the agricultural one.

Occasionally, in the past, potatoes were exported to Guayaquil, but these have an advantageous price only when the harvest fails in the Andean Region, from where most of the national production comes. It being impossible, of course, to predict in which years the price will be good, and such years being unusual, the raising of this crop has declined, becoming almost as unimportant as the production of other vegetables, which were an important source of

income to the settlers during the last part of World War II, when an active trade had been established with the U.S. Base at Baltra.

It must always be held in mind that the Galápagos have two great disadvantages — 1) the Islands do not produce, nor can they produce, anything that is not already produced, or may be produced on the Mainland, much nearer to the markets to which the Islands must per force take their products; 2) there are about one thousand kilometers of water between Galápagos and its nearest market, Guayaquil.

With such conditions, it is only natural that coffee should have become the main cash crop of the Islands' farmers. It is a product that grows easily under local conditions, its price is relatively good on the Mainland, and it may be stored for an indefinite amount of time, thus making a delay in shipment unimportant.

Though there are no available statistics, it is obvious that the coffee production on the Galápagos is low, considering the number of existing farms and their extent. This is easily explained — coffee is harvested by hand, and, as it ripens unevenly through most of the season, it has to be picked berry by berry. For a larger production, it would be necessary to have a considerable number of workers, and labor is both too scarce and too expensive for this kind of operation, especially since the coffee harvest and the fishing season coincide, and most workmen prefer fishing. Thus, the coffee

harvest is done mostly by the farmer and his family, except in a few cases such as the plantation at San Cristóbal.

Considering the uncertain future of coffee, a product that is suffering from great competition both on the national market as well as on the international one, the prospects of the Galápagos farmer look rather dim, unless he discovers some new and profitable activity.

Little has been done to introduce new exportable products. The trials made by settlers and agronomists have been more in the nature of curiosity, rather than of any practical value, if one is to judge by the results. Most of the agronomists have shown a marked interest in the raising of vegetables, which the settlers had already grown successfully for many years when the first experimental station was established,

Purely agricultural production, not taking into account animal husbandry, offers few possibilities to the islander, and none of these are economically attractive. If he does not run into the problem of competition from areas better located in relation to the existing markets and the distance to the latter (as in the case of fruits and vegetables), he runs into the lack of capital to make a given activity profitable (as in the case of sugar cane). Other products require experimentation that may involve investments in

time and money beyond the settler's resources. Besides that, their results may lead nowhere, proving unprofitable or utterly negative.

V

ISLAND FAUNA

The fauna of the Galápagos Islands was found remarkable by the earliest visitors. Fray Tomás de Berlanga, in his letter to Charles V informing him of their discovery, mentions the giant tortoises, the seals, the turtles, and the iguanas, wondering at the tameness of all these and the birds, a tameness that has contributed greatly towards the partial or total extinction of several species.

Two facts worthy of mention, besides the high proportion of endemic species, are the total absence of amphibians and the limited number of land mammals. Of the latter, we meet with only a small brown rat (*Oryzomys*) of which five species are known from the Islands, and an insectivorous bat (*Lasiurus brachyotis*). The former tends to become extinct wherever the black rat is introduced, being apparently unable to compete with the latter rodent.

Other mammals found on the Islands are the Galápagos fur seal (*Arctocephalus galapagoensis*), which was almost exterminated

during the 19th century, and the more abundant sea lion (*Zalophus wollebaeki*). These are endemic, while the other marine mammals found here are not, such as the sperm whale (*Physeter catodon*).

Of the 89 species of birds nesting on the Islands, 77 are endemic (9). Among these, the most remarkable are the finches of the subfamily Geospizinae, whose drab gray or black color and relatively reduced size make them of only casual interest to the uninformed visitor. However, these insignificant birds played an important role in the formation of Darwin's theories, for, obviously descended from a common fringilline ancestor, it can be clearly seen how they have evolved into several closely related groups.

Five genera, totaling thirteen species, are recognized by a recent investigator (Dr. Robert I. Bowman), who has made an exhaustive study of this remarkable group (10). There is a fourteenth species inhabiting Cocos Island, Costa Rica, and forming the monotypic genus *Pinaroloxias*.

In the Galápagos finches, it is possible to observe how one hypothetic ancestral species may spread into different ecologic niches, adapting itself gradually to each. This is dramatically shown by the comparison of the heavy-beaked *Geospiza magnirostris*, whose bill is obviously designed for crushing seeds, with the small warbler-like *Certhidea olivacea*, whose fine bill looks like that of

any insectivorous bird. In between, there are many stages and many diets.

Certhidea, the smallest of the group, though largely insectivorous, also eats some other foods, such as green buds and flower parts. This is also the case with the larger and more finch-like *Camarhynchus parvulus* and *C. psittacula*, the former feeding mainly on insects, the latter on insect larvae, but both supplementing this diet with fruit pulp, small seeds, and other plant material.

Another such insectivorous bird is the remarkable "woodpecker finch" (*Cactospiza pallida*), which uses a cactus spine or a small twig to pry larvae and insects out of holes and cracks in the trees and cacti. Though it has not been reported to eat seeds, like most Galápagos finches, it is quite fond of fruit.

Among the most vegetarian members of the group, we find *Platyspiza crassirostris*, the largest bird among the Galápagos finches, which has a diet that includes flowers, fruit pulp and some seeds. This species rarely eats insects. The genus *Geospiza* is also largely vegetarian, notably *G. magnirostris*, which is a seed-eater by preference, though it also feeds on flowers and even nectar from these. *G. fortis*, which supplements the same diet with an occasional caterpillar or insect, seems like a link between the former and the more or less omnivorous members of the genus.

It is obvious that many of the species and races of the Geospizinae are the results of mutations favorable to their occupying definite ecological niches; but very few of them actually occupy the ones they seem best suited for, the group as a whole being more or less omnivorous. Such exceptions as *Certhidea olivacea*, with a predominantly insectivorous diet, and *Geospiza magnirostris*, a seed-eater, seem to be cases where the adaptive radiation in the group has reached its fulfillment, while the group in general is still undergoing adaptation.

A fact that strikes any student of this group of birds is the large number of intermediate individuals, individuals which could be placed in either of two related species or races. This grading of one species' characteristics into those of another makes it difficult to draw the line between some of them, and also explains the taxonomic differences that exist among authors who have dealt with these finches' classification. Some cases, of course, may be attributed to hybridity; but this explanation, more often than not is unsatisfactory for a number of reasons that are beyond the scope of the present work to explain.

While the finches are probably the most remarkable birds as far as speciation is concerned, they are not at all unique in this respect, there being a number of similar, though perhaps slightly less striking, cases in both the flora and fauna of the Islands. Another interesting bird is the mocking-thrush (*Nesomimus*) of which there

are four distinct species, one of them (*N. parvulus*) subdivided into seven subspecies (11), each island having its own form. There is no overlapping of their ranges, and the genus itself is endemic to the Galápagos, though very closely related to the Mainland mocking birds.

The Galápagos species and subspecies are distinguished from one another by such features as differences in average size of body and/or bill, absence, presence or difference in coloration of certain body markings, slight variations in overall color, etc. However, as far as I can tell, there is no variation between the different forms in habits or diet, all being omnivorous, though showing a great preference for insects and larvae. In this too are they quite similar to their Mainland relatives.

The mocking-thrush is curious, inquisitive and bold, which may explain in part why it tends to become scarce around inhabited areas. On Floreana the local form (*N. trifasciatus*) has long since disappeared, being found only on the adjacent islets such as Champion. This has been attributed to the early introduction of cats on that island, which was the first to be colonized (1832). This is likely to be true, though rats must also have contributed considerably to its disappearance by eating both eggs and nestlings.

On San Cristóbal, where feral animals have existed from almost as early a date as on Floreana, the bird is still relatively common. This

may be explained by the fact that the former island is much larger, and may, for this reason, have had a much larger bird population.

Among the other endemic birds, we find also an albatross (*Diomedea irrorata*), which nests only in the Punta Cevallos region, on the eastern side of Hood Island, though it has been reported from as far away as the coast of Peru. Another remarkable bird is the Galápagos penguin (*Spheniscus mendiculus*), the only penguin that is found north of the Equator. It nests in the western part of the Archipelago, from Iguana Cove in the SW of Isabela to NW Isabela, including Fernandina Island. Penguins range far from their nesting grounds, having been reported from Floreana, Santa Cruz, and Baltra. I have never seen them around San Cristóbal, but they were frequent visitors at Puerto Villamil (Isabela), and I recall seeing one at Academy Bay in 1948.

The flightless cormorant (*Nannopterum harrisi*) has a habitat that coincides very closely with the breeding area of the penguins, except in the north, where it extends farther east, to include NE Isabela. I found them quite common around Point Albemarle in May, 1950. The flightless cormorant has, as far as I know, never been reported outside its habitat.

High exposed cliffs are the favorite habitat of many different sea birds. Among these are the three species of boobies (*Sula*) found on the Islands. These noisy birds are very good divers, shooting into

the water from considerable height. When they fish in groups, which is frequent, their continuous diving churns the water as if it were being machine-gunned.

Another cliff-dweller is the large-winged, black frigate bird (*Fregata*), which glides gracefully over the sea, swooping down to the surface to make a fast catch as it skims over the water, barely touching it. Often it will attack other sea birds in flight, pecking their heads until they disgorge their food, which the frigate bird will rapidly catch in midair. This piratical acrobat has such a large wing-span that it has to take off from a cliff or a tree. On the ground it is quite helpless with its short legs.

The fork-tailed gull (*Creagrus furcatus*) is perhaps the most beautiful of the cliff-dwelling sea birds. It lives only in places where the sea beats furiously against the base of the cliffs, and the breeze brings in the salty moisture of the open ocean. It is quite unlike the lava gull (*Larus fuliginosus*), its slaty-colored relative, a scavenger that is found on sand beaches, low-lying seaside lava fields, and other more or less sheltered locations. Besides these two endemic gulls, there is a Mainland species (*Larus pipixcan*), which is occasionally met with during the warm season. I have observed groups of up to eight or ten individuals at Wreck Bay (San Cristóbal). Considering the season, it is possible that these are visitors from the north, seeking milder weather, as part of our warm season coincides with the winter of the northern hemisphere.

Among the birds inhabiting the salt marshes and ponds, the Galápagos pintail (*Anas bahamensis galapagensis*) stands out as the most common. It is never found in very large groups, but it is exceptional to visit a pond in the mangrove swamps and not see at least two or three of these small and rather tame birds. They are also frequently found in the grasslands, where freshwater ponds and marshes form during the cold months. I have seen them at every one of my frequent visits to El Junco Lake (San Cristóbal), and I recall seeing some ducklings in a marsh in the western part of the Santa Cruz grasslands during the cold season of 1946. These small ducks seem to breed both in the warm and in the cold seasons. In the San Cristóbal grasslands I have often seen them associated with the rather wild blue-winged teal (*Querguedula discors*), which is probably a Mainland visitor.

A marsh inhabitant that is always heard and rarely seen is the gallinule (*Gallinula chloropus cachinnans*), an exceedingly shy bird. Its call is frequently heard among the low branches of the white mangroves (*Laguncularia*) surrounding the salt lagoons in the south of Isabela, where I have got an occasional glimpse of this most wary of birds. I recall seeing it in the San Cristóbal grasslands and at James Bay (Santiago) where it frequents the salt lagoons in the northern part of the bay, as well as the crater lake just south of the lava flow that divides the bay into two regions.

The most beautiful of the marsh birds is doubtlessly the flamingo (*Phoenicopterus ruber*). This species is found on the Atlantic coast of tropical and subtropical America, the only place on the Pacific coast where it lives being the Galápagos Islands. It is nowhere abundant, but is relatively common on the south coast of Isabela, where it can find numerous salt lagoons, surrounded by mangroves. These lagoons are not directly connected to the sea, and, quite often, have a very high concentration of salt.

The flamingoes move about very much, frequently abandoning even such areas as James Bay, in the northern part of which they are known to nest. However, I cannot remember visiting the area to the west of Puerto Villamil without seeing at least some of them in one of the numerous lagoons, this being one of the few places where one can count on finding them at all times.

As is the case with other groups of Galápagos animals, there are several species of birds that are in danger of disappearing. Of these, there are two which I distinctly remember since childhood, as they were abundant, very tame, and striking enough to impress themselves upon my memory at an earlier date than most other birds of the Islands. These two species are the Galápagos pigeon (*Nesopelia galapagensis*) and the insular hawk (*Buteo galapagensis*). The former lived on all the islands, but became extinct many years ago on San Cristóbal and Floreana, as well as on southern Isabela.

In fact, I cannot recall seeing any on this last island, though they are likely to be found in the more remote areas.

I saw a Galápagos pigeon near the settlement of Wreck Bay, San Cristóbal, on July 14, 1964, but I doubt if it was native to the island. It was probably a specimen brought over from some other island, and kept as a pet. It was exceedingly nervous, a behavior unusual in this species. Fishermen often bring salted doves by the sackful, as well as a few live ones to keep as pets, when they return from islands such as Hood, Santiago, Barrington, etc. where the species still survives.

Nesopelia used to be abundant on Santa Cruz until the 1930's, when it began to disappear. Though I have lived on that island and visited many of its more remote areas, I cannot recall seeing any doves there later than 1938, when they were already rare around Academy Bay. When I returned in 1946, they were considered extinct on that island. They were also extinct on Baltra, where they were wiped out during World War II.

Even visiting naval vessels will stock up on Galápagos pigeons when calling at places such as James Bay. Once, the superintendent of the salt mine there told me that he had had trouble with some crew members of a naval transport ship, who were collecting doves by the sackful. When he told them the doves were protected by the law, they laughed at him, and informed him that they had orders

from their commanding officer to supply the officers' table with doves. The fact that James Bay was private property did not seem to impress them at all. This is one of the many cases that illustrate the need of giving naval personnel conservation training, so they can help save what is left of the Galápagos fauna rather than destroy it. In fact, the naval personnel are in a privileged position to help with this chore, having the means of transportation necessary, as well as a great number of enlisted men and officers, who have little to do while stationed on the Islands.

The northern form of this species (*N. galapagensis exsul*), living in relative isolation on Culpepper and Wenman, has doubtlessly a better opportunity of surviving.

The beautiful and relatively harmless Galápagos hawk has been reported from all the islands except Tower, Culpepper and Wenman in the north, and Floreana in the south. It used to be very abundant at Academy Bay (Santa Cruz) as late as the 1930's, when its numbers started a rapid decline due to constant killing by the settlers. Except for a few stray specimens, flying in from the remotest parts of the island, they were very rare in the 1940's. I have not seen any on Santa Cruz since 1947. They appeared to be extinct on San Cristóbal at an even earlier date.

There is much of interest to be said about the reptiles, including the giant tortoises, from which the Islands received their name.

This animal was to be found in fifteen different subspecies, one to each island where it occurred, except for Isabela, where five forms, one to each of the great volcanoes, are known (12). At present, most of these subspecies still survive in the remotest parts of their former habitats; but it is doubtful if they can be saved, unless something effective is done in the near future, for, in most places, they are subject to the destructive activities of humans, wild hogs, feral dogs and rats, all of which continue their labor of extermination of this and other insular species that, once lost, can never be replaced due to their uniqueness. Due to their importance in the history of the islands, particularly of Isabela, more is told about the Galápagos tortoise in the chapter devoted to Isabela.

There are several sea turtles, also found along the coast of Ecuador, such as the green turtle (*Chelone virgata*), a species that often gets caught inside the trawl nets of the shrimpers along the shores of Esmeraldas (NW Ecuador) and in the waters of the Gulf of Guayaquil. *Chelone virgata* was the main source of turtle oil, an important item of the islanders' diet until the 1950's, particularly on Santa Cruz.

The marine iguanas (*Amblyrhynchus cristatus*), only sea lizards in the world, were at one time abundant everywhere along the shores, and are still common in many parts. These unusual reptiles are excellent divers, feeding mostly underwater, where they seek the algae that form the bulk of their diet. They readily supplement

their generally vegetarian fare with an occasional piece of carrion found along the shore. Less abundant by far are their terrestrial relatives, the so-called yellow iguanas (*Conolophus subcristatus*) and the Barrington iguana (*C. pallidus*), both feeding on herbs, grasses, leaves, and fruit from the cacti, braving the spines of the latter's branch joints when food gets scarce in their dry habitats.

The smaller insular reptiles are the seven species of snakes (*Dromicus*) (13), harmless and timid creatures; the seven species of lava lizards (*Tropidurus*) (14), and the six species of geckos (*Phyllodactylus*) (15).

The Tropiduri show a marked preference for the rocky areas in the dry regions, where hiding is easy, among the crevices and under the stones, but when surprised by predators while on sandy ground they dig in with such speed that one often doubts if the missing lizard was there at all. This is accomplished by sticking the nose into the usually coarse, lose sand and making rapid swimming motions with the four extremities, pushing upwards and backwards, while the body is pressed forwards and down. When the body and extremities have disappeared, a few wiggles take care of the tail.

I had never noticed this means of escape before, until I placed two lizards in a cage with sand on its bottom. There were two snakes in it also, so it did not surprise me when the Tropiduri disappeared;

but the snakes were unusually active for recently fed snakes, and there were no suspicious bulges on their middles. The cage was escape-proof. There was only one possible explanation, so I dug in the sand and found the lizards, which dug in again as soon as I let them go. I have repeated the same experiment with geckos, but these never tried to hide in the sand at all. It is interesting to note that the Tropiduri used the several times I have repeated this experience were all caught on high lava ground, far from any sandy area.

Among the lesser reptiles, especially such small lizards as the geckos, there are probably several undescribed species. There is the case of a gecko named *Gonatodes collaris* by Garman, who described it from four specimens secured by Dr. Georg Baur, and labeled "Wreck Bay" (San Cristóbal Island). No other collectors seem to have found any other specimens, so Van Denburgh concludes, quite logically, that the Baur specimens might have been collected in Guayaquil and somehow got mislabeled (16). It is also possible that these specimens reached San Cristóbal in some cargo, this island being a place of some activity due to the sugar refinery which was at the height of its production by the time of Baur's visit (1891).

About seven years ago (1962), also at Wreck Bay, I collected a small nocturnal lizard I had never seen before, giving it to Dr. Andre Brosset, then Director of the Charles Darwin Research

Station at Santa Cruz. He could not identify it and sent it to a German herpetologist. Until Dr. Brosset left the Islands, the lizard had not been identified.

My first opinion about this lizard was that it might have belonged to an undescribed Mainland species, having arrived in some freight. However, this seems doubtful now, unless it is a recently introduced species that has reproduced successfully, for I saw another lizard of the same kind a year later, in the same general area where I captured the first specimen. Unfortunately, I was unable to collect it. The same happened with two other smaller lizards, which appeared to belong to a darker allied form, or were two cases of melanism, unless this species has the ability to change color in order to blend with the surroundings, in the last case the dark brown trunk of a tree.

Sharks are abundant around the Galápagos. Fortunately, almost all the ones found close to shore belong to such relatively harmless species as the blue shark (*Prionace glauca*) and the bay shark (*Carcharhinus galapagensis*). The greatly feared white shark (*Carcharodon carcharias*), which may exceed ten meters in length, occurs usually offshore. The hammerhead (*Sphyrna zygaena*) is rare in this area, the tiger shark (*Galeocerdo tigrinus*) being somewhat commoner.

Of the numerous rays found among the Islands, the most remarkable, on account of its enormous size, is the devil fish (*Manta birostris*), quite common in the northern waters of the Archipelago. I had the opportunity to get a close view of one while visiting the Punta Albemarle area (northern end of Isabela), in 1950. This ray measured about eight meters from the tip of one pectoral fin to that of the opposite. Numerous Mantae were seen in these waters during the month of May, some probably larger than the one mentioned.

A number of fishes of commercial value are to be found in the insular waters, though not in the incredible quantities that some claim, nor all of them in exploitable amounts. Of the Thunnidae there are several valuable species, as the bluefin tuna (*Thunnus thynnus*), the albacore (*T. germo*), the yellowfin tuna (*Neothunnus macropterus*), and the bigeye tuna (*Parathunnus mebachi*). The skipjack (*Katsuwonus pelamis*), of the family Katsuwonidae, a fish of considerable importance to the Mainland canning industry, is quite common. The Spanish mackerel (*Scomberomorus sierra*) is abundant, as well as the wahoo (*Acanthocybium solandri*), both of the Cybiidae. The latter is found mostly in the northern waters of the Archipelago.

Sailfish (*Istiophorus grayi*) has been reported from Galápagos and I know of at least one that was caught here, having also seen fish at sea that most likely belonged to this species. Another member of

this family (Istiophoridae), a marlin, forms part of the catches of the Japanese long-line fishermen operating in this area, but there are no available statistics to give us any idea of whether this fish, presumably *Makaira mitsukurii*, the striped marlin, is abundant or not, since the Japanese work at present under a permit that covers a number of species, including the swordfish (*Xiphias gladius*), which is said to be very common in these waters.

Apart from some minor species such as the gray mullet (*Mugil thoburni*) and a few others that are used as food and bait locally, the groupers (Serranidae) are the most important species as far as the settlers are concerned, as they form the bulk of their annual catches, which are shipped, salted and dried, to the Mainland, under the name of *bacalao* ("codfish"). The more common species are the golden grouper (*Mycteroperca pardalis*), the gray grouper (*M. xenarcha*), the spotted grouper (*Epinephelus analogus*), the brown grouper (*E. labriformis*), and the sea bass (*Promicrops guttatus*). Quite often, ocean white-fish (*Caulolatilus princeps*) is thrown in with the groupers, though it belongs to a quite different family, the Branchiostegidae.

The only crustacean of value, under commercial exploitation since 1960, is the spiny lobster (*Panulirus*), of which there seems to be at least two different species. The various crabs (*Grapsus*, *Eriphides*, etc.) are of no economic value.

Mollusks are not very important around the Islands, though there are numerous individual species, mostly small. The most common of the edible ones seems to be a chiton known locally as *canchalagua*. This one is hunted among the rocks of the foreshore at full moon by the settlers, many of whom have a high regard for its rubbery flesh.

The echinoderms are widely represented by such animals as the sea stars, sea urchins (such as the formidably armed *Cidaris thouarsii*), sand dollars, and sea cucumbers. There is also a quantity of coral of different kinds, none making up any large formations, the water temperature being probably too low to favor any considerable development of corals.

(9) Irenäus Eibl-Eibesfeldt: Survey on the Galápagos Islands. UNESCO Mission Reports 8. Paris, 1959. Pg. 7.
(10) Robert I. Bowman: Morphological Differentiation and Adaptation in the Galápagos Finches. Univ. of Calif. Pubs. in Zoology. Vol. 58. Univ. of Calif. Press. Berkeley and Los Angeles, 1961.
(11) Harry S. Swarth: The Avifauna of the Galápagos Islands. Occ. Papers Calif. Ac. Sc. XVIII. San Francisco, 1931. Pgs. 104-131.
(12) John Van Denburgh: The Giant Land Tortoises of the Galápagos Archipelago. Proc. Calif. Ac. Sc. 4th Ser. Vol. II. Pt. I. No. 10. San Francisco, 1914.
(13) John Van Denburgh: The Snakes of the Galápagos Islands. Proc. Calif. Ac. Sc. 4th Ser. Vol. I. No. 4. San Francisco, 1912.

(14) John Van Denburgh and Joseph R. Slevin: The Galapagoan Lizards of the Genus Tropidurus; with Notes on the Iguanas of the Genera Conolophus and Amblyrhynchus. Proc. Calif. Ac. Sc. 4th Ser. Vol. II. Pt. I. No. 9. San Francisco, 1913.
(15) John Van Denburgh: The Geckos of the Galápagos Archipelago. Proc. Calif. Ac. Sc. 4th Ser. Vol. I. No. 6. San Francisco, 1912.
(16) Op. cit. Pgs. 410-411.

VI
THE FISHERIES

The ichthyic fauna of the Galápagos is not as varied as that of the Mainland waters, where the greater variety of conditions allows a greater variety of species. Thus, a large number of the species known from the Islands or those closely related to them are also found along the coast of continental Ecuador, besides a great quantity of fishes that could never survive under the conditions offered by the Galápagos waters.

From a commercial point of view, the fisheries resources of the Archipelago have been greatly exaggerated, being much inferior to those of Manabí and the Santa Elena Peninsula, on the continental coast. This does not mean, however, that the insular fisheries are commercially worthless. Quite the contrary — if properly managed, they can become an important source of income to many people, and a good source of revenue to the Ecuadorian Government.

As has been mentioned, the various groupers are of commercial importance to the local fishermen, who start their season around

October and end it shortly before Easter. The fishing is done with hand lines and cut bait.

Since the demand for salt fish, a traditional Easter food, drops almost completely once the holidays are over, the fishermen living close to the populous areas of the Mainland devote themselves to the fresh fish business, an activity beyond the reach of the islander, who would have to transport his fish all the way to the Mainland and lacks both the refrigerated storage and transportation facilities to do it. The investment necessary to solve this problem is, of course, considerable and, to the islander, impossible. Aside from this, fish is abundant in the Mainland waters and its price low, there being thus nothing to attract a possible outside investor.

The result of this is that the insular fishermen are forced to remain inactive during a considerable part of the year and, what is worse, fish during the months when the groupers are spawning.

This kind of fishing has not taken long to show its effects, for if we could still fish commercially with oars and sail a little over twenty years ago despite the limitations imposed on us by the strong currents, today, with power boats, it is not only necessary to travel to the most remote corners of the Archipelago, but the production decreases from year to year.

Unfortunately, the solution to this problem is not simple. If the Government should create a closed season at spawning time, the Islands' economy would suffer a collapse; if it does not protect the fish, the greatest source of outside money will slowly dwindle to nothing.

The suggestion that fishing be done outside the present season and the fish kept until the market on the Mainland is favorable (shortly before Easter) is not practicable. The so-called "bacalao" has a high oil content which, despite the salt used, gradually decomposes through the action of light, heat and oxygen, turning rapidly rancid and giving the flesh of the salted fish a brown coloration that turns increasingly darker, until the product starts crumbling off in minute pieces. Grouper that has been salted for some time, even before losing its commercial value, has often an unpleasant flavor and an ugly coloration. This effect could be considerably retarded by refrigeration and better processing methods, the fact that the fish would have to be dried again being a minor problem. But, as stated above, refrigeration is beyond the means of the local fishermen, and, of course, its use would increase operational costs.

For want of capital, the islander has been unable to do anything with such species as the tunas and skipjack. These have no market to speak of when salted and dried, their commercial exploitation requiring refrigeration; but, up to a few years ago, these were a good source of revenue to the Government, which collected a fair

amount of money from the U.S. tuna clippers that came to fish in Galápagos waters. Some, it is true, fished illegally, but the number of these lawbreakers was much smaller than has been claimed by some. For a number of reasons, tuna fishing declined around the Islands; but the American fishing vessels seem to be gradually returning.

Japanese long-line fishermen have been operating among the Islands for the last two or three years. They have large diesel-powered vessels, with great refrigerated holds, and the necessary space for fuel and supplies to give them a tremendous operational range. These modern ships catch and process a number of sharks, the Thunnidae, swordfish and marlins. There was also a Japanese company interested in obtaining a concession to fish for sperm whales among the Islands. A freezer plant was also planned. However, the project was abandoned, as it was found that there were not enough whales in the area to justify the great investment needed.

Since the beginning of 1960, a new line of commercial fishing has been launched in the Galápagos, providing an all year income to many of the local fishermen. The spiny lobster has up till now brought out several outfits, of which only two are still in operation. Should more freezer vessels of this kind enter the lobster business, it is very likely that the species will become too scarce for profitable exploitation. Considering the large investment and the cost of

operation, one realizes easily that a good and continued production over a relatively long period is necessary to make this activity worthwhile. If this industry is to survive through the years, depletion must be soon prevented by protecting fertile females, controlling the sizes that are caught, and taking other protective measures prescribed by Ecuadorian fishery laws. After eight years of uncontrolled fishing, it is quite possible that it is too late for the species to recover entirely from the damage done to it.

The Government has taken a step in the right direction by naming an Inspector of Fisheries for the Islands. However, it is obvious that this can only be a beginning, for what is needed is a group of properly trained men with the necessary facilities for moving rapidly from place to place, making it possible to patrol the Islands' waters at any time, surprising vessels without a permit to operate in the area and enforcing the existing as well as any future protective measures that may be created to save the natural resources, both those of commercial value, such as fish and lobster, as well as those of interest to science and tourism, such as the plants and animals peculiar to the Archipelago.

At present, the one Fisheries Inspector must cover the whole insular territory and is dependent on the very people he must control, the fishermen, for transportation, his voyages being entirely subject to their convenience. Another solution to the patrolling problem would be to train a part of the Ecuadorian

Navy's personnel in subjects related to conservation, providing them with more transportation facilities for inter-island travel: in this case, small, fast shallow-draft vessels with the necessary comforts and capacity so that four or five men could spend a fortnight aboard without undue want of comfort. I believe the Ecuadorian Navy, with the organization and manpower it has on hand, given the special facilities and the necessary training, could do a wonderful job in helping protect the resources and the fauna of the Islands. Without suitable training, however, they would not be competent to do much — as would be the case with anybody else.

During my years of experience in the various fishing activities on the Mainland coast as well as around the Galápagos, I have come to realize that, though Ecuadorian fish and game laws are excellent in many ways, there is too little trained personnel available to enforce them, and not sufficient facilities for the existing personnel to work efficiently.

I have long maintained that some of the existing laws and regulations need revision. However, such revision needs that stock be taken of existing resources, as we must know for sure what we really have, before we can decide what to do with it and how to make efficient use of it without causing its depletion.

A thorough survey of the kind suggested above requires considerable expense and much work, but it would be the best investment the country could make both in the Islands and the Mainland. The National Fisheries Institute (Instituto Nacional de Pesca) and FAO have carried out an extensive research program during the last few years, a program that is being continued by the Institute. Though it has naturally favored the Mainland coast, the program has also included the Islands. However, much remains to be done yet, and I have not found out anything to indicate that it has modified existing legislation. Perhaps it is too early for the latter remark to be made...

VII

THE INTRODUCED FAUNA

The origin of the various species that have been introduced to the Islands varies not only from one species to another, but also from one island to another. If General José Villamil brought the ancestors of today's wild cattle to Floreana, Don Antonio Gil introduced sixty heads of Manabí cattle and let them lose on Isabela; if Captain David Porter, U.S.N. had four goats escape on Santiago, the wild goats on Santa Cruz were introduced by the first Norwegian settlers, about four decades ago. But, whether introduced with good intentions, by accident or through carelessness, the feral descendants of domestic animals have been and still are a tremendous problem to the survival of the insular flora and fauna.

Not counting insect pests, plants detrimental to agriculture and to the life of some of the native flora, diseases and parasites, which are all included in the list of evils inherited from the ignorance and carelessness of the first settlers, and of not few of the present-day colonists, we shall limit ourselves here to a brief look at such

mammals as the goats and pigs, whose destructive powers surpass those of other species introduced by man.

Dogs.- It is said that the dog is man's best friend. Under certain circumstances —domesticity and a good leash— I readily admit that this may be so, though any dog, no matter how attached to its master, if running on its own, is always a potential menace to the wild and domesticated fauna, as has been proved an infinity of times.

On some of the Galápagos, dogs are found in their worst possible form — wild. On Isabela, Floreana, and San Cristóbal there are numerous packs, and if nothing is done about tame dogs hunting on their own, there will soon be a wild canine population on Santa Cruz also. The carelessness of dog owners is widespread enough to make this possible at any time.

If it is true that these animals help maintain a certain balance between such species as cattle, goats and pigs and the local flora on which they feed, it is also a fact that they cause enormous destruction among the tortoises, eating their young and their eggs, and feeding on land and marine iguanas.

Some officials have made sporadic efforts to reduce the wild dog population, this being something that merits all our approval, though we must not lose sight of the fact that the dogs are a

balancing factor. One such effort was made by Dr. Arturo Farfán, Director of Sanitation for Galápagos, who, in 1960, sent out all his inspectors to poison wild dogs on Isabela, there having been a supposed case of rabies on that island. A considerable number of wild dogs were killed.

The following year, Governor Enrique Vallejo, worried about the destruction of wild cattle on Isabela, launched a campaign to promote the killing of wild dogs, but was unable to secure the necessary governmental backing. After this, the matter has been dropped completely.

Cats.- On Isabela, Santa Cruz, San Cristóbal and Floreana there are large quantities of wild cats, but their effect on the local fauna is little known, though it can be easily imagined that these animals feed on both birds and small reptiles. However, to attempt their destruction would very likely be the exchange of one evil for another one of worse nature, for it is quite possible that the cats keep these islands from being overrun by rats and mice, as is the case of Baltra, where there are no cats and a small mouse was introduced during World War II. This mouse is now a major factor in the destruction of the local vegetation, including even such relatively large plants as the arborescent cacti, through which they gnaw tunnels and holes, eventually killing the tree.

Rats and mice.- Of these there are several introduced species, one or more being present on most of the Islands. A nuisance on the islands where cats exist, they constitute a major problem on those where they have no natural enemies. Their great fertility, their omnivorous habits, the absence of diseases, and the paucity of enemies give these rodents a destructive power far beyond their size. Eggs of birds and reptiles, small animals, plants, seeds, crops and supplies — nothing is safe from these diligent vermin. In fact, rodents have prevented the successful reproduction of the Duncan tortoises for a considerable number of years, by raiding their nests every breeding season.

Horses and asses.- The former are no problem, since they are found in relative abundance only in the grassy region and the upper woodlands of San Cristóbal, where most of the fauna with which they would have competed for survival has long since disappeared. The other island where wild horses occur is Isabela, where they are far from numerous.

The case of the wild asses is another matter. These show a marked preference for the dry regions, where food is scarce during great part of the year, thus making it necessary for them to gnaw the bark of trees and resort to cacti for food and moisture. I have, on different islands, come across great numbers of fallen palosanto trees and arborescent cacti, which had been felled by gnawing and then eaten on. When donkeys were not present or near, they had

left enough evidence to point them out as the source of destruction. Their powers of doing damage have been greatly underestimated by those interested in our conservation problems.

The wild asses are seldom bothered by the settlers, and are thus left to multiply freely, this explaining their abundance on Isabela, Santa Cruz, Santiago, San Cristóbal and Floreana.

Pigs.- These animals are found in considerable numbers on Isabela, Santa Cruz, Santiago and San Cristóbal, as well as on Floreana. To leave pigs free on the Islands is one of the greatest errors so far committed in the Galápagos, for their great fertility, the absence of diseases and, in many places, the lack of natural enemies (where dogs are not present), have caused their speedy multiplication.

The wild pig is one of the worst enemies of the Archipelago's fauna, since it feeds on the eggs of reptiles and those birds that nest on the ground, it eats small animals, and has contributed much to the near extinction of tortoises in certain areas, destroying their eggs and young. Apart from this, the wild pigs do considerable damage to the minor vegetation that serves as food and shelter to many of the endemic species we wish to protect from extinction, notably the tortoises. From time to time, the pigs turn into a serious problem to the local farmers, invading their plantings. One fact that has been generally overlooked is that the feral pigs also

contaminate the rain water pools from which other wild animals drink, and to which the farming population on Santa Cruz and Isabela resort in times of drought.

Goats.- Upon returning to the Galápagos after an absence of five years, in 1954, I could hardly credit what I heard, when informed that it was necessary to have permission from certain local officials to hunt goats. It was remembered that, years ago, though no such restriction was enforced or existed, goats were abundant enough to constitute a problem and a menace to the vegetation on the islands where they are found, their increase in numbers from year to year having always been far above their death rate, even including those killed by hunters.

Though it was almost impossible to enforce this surprising regulation, and those fond of goat meat continued to hunt as before, I found whole botanical associations completely or almost destroyed even in places where goats had not existed a few years before. It is reported that goats even roam the grasslands of Santa Cruz, a region very far above what used to be their highest habitat a few years earlier.

These most active destroyers of vegetation were quite numerous on Isabela, Santa Cruz, Santiago, Floreana, Hood and Barrington, having been almost eliminated on the last island, and to a great extent on Hood. They are relatively abundant on San Cristóbal

and Pinta, and some exist on Duncan, I have been told. They were nearly extinct on Baltra, but their number has increased considerably during the last few years.

There are more than enough examples of what goats can do when left to go wild, even in places where their hunting is not restricted. The case of Guadalupe Island, off the coast of Lower California, is a sufficient example. This place, remarkably like the Galápagos for the endemism of its flora, had abundant vegetation. Today, it is a waste of bare rocks, the goats having destroyed most of the vegetation, allowing the rains to carry away most of the soil. All this was done in less than a century, though three parties were granted and made use of concessions to hunt the goats for their skins during parts of this period (17).

Cattle.- The problem of the wild cattle is a lesser one than that of the feral goats, for, being large animals, they are easier to keep track of, making it possible to establish a better population control, keeping their numbers within reasonable limits. Their size also limits them to certain areas where food is abundant, while the goats roam all regions, preferring the dry one, where the terrain is usually worse than anywhere else, making it difficult to keep track of them. On the other hand, while the cows gestation period lasts a little over nine months, and while it usually produces only one calf per year, the female goat has a gestation period slightly under five

months, producing an average of two young per birth, with almost 2.5 births per year.

On Santa Cruz, the wild cattle have been known to cause serious damage to the farms in the remotest areas, especially in time of drought. On Isabela, the herds are poorly nourished during dry years, and most of the cattle one sees are rather scrawny-looking and relatively small. Obviously there is too much cattle per acre of natural pasture land. Besides overgrazing, there seems also to be excessive inbreeding.

There is very little wild cattle on San Cristóbal and Floreana. On the former, man has long since reduced their numbers, while years of drought and hunting have affected greatly the once abundant populations of the latter. These two factors also seem to have been reducing the Santa Cruz herds considerably during the last decade.

Solution of the problem.- The problem of conservation created by the presence of species alien to the Archipelago is not beyond solution. What is really serious is the manner in which we are letting time slip by without taking more effective steps, for there is little time left to waste.

A constant war must be waged on rats, mice and dogs. It is unlikely that we shall ever exterminate any of these species; but periodic campaigns against them, if frequent enough and properly

organized, should keep their numbers sufficiently low to discard them as serious destructive factors.

The existing restrictions hindering the exploitation of wild cattle must be lifted considerably, allowing the settlers to capture and tame a reasonable number of animals. This would greatly stimulate cattle raising and help solve in a considerable part the precarious economical situation of many Galápagos farmers, besides keeping the amount of wild cattle within reasonable limits.

The intensive hunting of goats, donkeys and pigs should be encouraged as much as possible, giving facilities for the marketing of skins. If enough settlers could be interested in this activity, these animals could be reduced to a reasonable number, making them useful species instead of a continuous source of damage to nature. This kind of hunting could go on for some time before it would no longer pay to do it. Then, there would still be enough animals left to provide game for the settlers and even begin a new cycle of increase in all three species.

It is very doubtful if a thorough study of the problems created by the introduced fauna on the Galápagos will lead to any other conclusions than those suggested, save, perhaps, more drastic measures, such as the introduction of certain diseases like anthrax, in the case of wild goats. In my opinion such measures would be both dangerous and impractical, as well as unnecessary, for it

would imperil the livestock of the settlers, as well as destroy any commercial value the dead feral animals might have.

The Charles Darwin Research Station has carried out a control program in some areas, reducing considerably the goat and pig populations of their reserve in the western part of Santa Cruz, and, as was noted above, the goat populations of Hood and Barrington, especially the latter, which has been almost wiped out. Unfortunately, little if anything has been done about the wild donkeys. A more extensive program has been prevented by lack of funds and personnel.

(17) Julio Berdegué A.: La Isla de Guadalupe, México. Contribución al Conocimiento de sus Recursos Naturales Renovables. Secretaría de Marina. Dirección General de Pesca e Industrias Conexas. México, 1957. Pgs. 21-26.

Volcanic formations at James Bay, on the west coast of Santiago. To the left, an old lava formation which has been surrounded by a recent on (to the right). In the background, Sugar Loaf Mountain, a tuff volcano in the south of the bay. The vegetation in the foreground is poor — two specimens of *Jasminocereus howellii delicatus* (to the left), and *Asclepias angustissima* (below), the latter, a creeper that is well adapted to the very barren environment where it lives. Like the cactus, this plant lacks leaves, its stems having taken over all photosynthetic activity.

The coastal region — mangrove formations. This photograph was taken at a salt lagoon in the south of Isabela. In the foreground and background, red mangroves (*Rhizophora mangle*).

The dry region. *Brachycereus nesioticus*, a cactus that develops only on recent lava fields and under conditions so unfavorable to growth that hardly any other vegetation will be found near it. Compare size of plant with cap at left. This is the smallest cactus of the Galápagos, where most species of this family are arborescent or, at least, bush-like.

Opuntia echios inermis, a cactus of SE Isabela. The different varieties of *O. echios* form a very interesting group, which includes all the Opuntiae of the south-central Galápagos. The author thinks that the *inermis* variety may form an evolutionary link between *O. echios* and *O. galapagensis*, the latter the most widespread *Opuntia* of the north-central part of the Archipelago and Pinta.

The author's daughter with a live, recently caught snake. The Galápagos snakes (*Dromicus spp.*) are completely harmless. They live only in the dry regions.

Galápagos fur seal (*Arctocephalus galapagoensis*), Punta Baquerizo area, on the west coast of Santiago. This species was almost wiped out, during the past century, by the sealers and whalers. It seems to be recovering from its near extinction.

VIII

HISTORY

According to the conclusions drawn by Thor Heyerdahl and Arne Skjölsvold from the material collected by the Norwegian Archaeological Expedition in 1953, the Islands were visited by Mainland aborigines in remote pre-Columbian times (18). Considering that most of the rather scanty evidence found by Heyerdahl and his companions was located at the campsite of a 1684 buccaneering expedition and was almost lost among the far more abundant shards of much more recent pottery (colonial Indian), makes it quite obvious that a few old pieces of pottery had found their way aboard Spanish ships together with the larger number of contemporary pieces, all of which, when the vessels were seized by the buccaneers, were brought by the latter to the Galápagos, where they had sailed to make repairs and rest.

Much of this relatively recent pottery may possibly also be traced to the tortoise hunters, for even as late as our own century has it been common for the poorer classes to cook in this type of containers, the designs and shapes of which have not varied

perceptibly since colonial times. It is only during the last 15-20 years that cheap aluminum has come into general use. It is significant that two other sites where potshards abound are Black Beach (Floreana), close to the earliest historical settlement of the Galápagos, and Whale Bay, a favorite camping site of the tortoise hunters visiting Santa Cruz. Broken earthenware pots are also found elsewhere on the Islands, always close to the shore and mostly, if not invariably, where the hinterland was, or appears to have been, good tortoise and/or archil country. Much more archaeological evidence is needed before we may accept such conclusions completely.

In what regards the Galápagos Islands, I have always viewed with great doubt the legendary voyage of Tupac Yupanqui, who is supposed to have visited the Archipelago at the close of the 15th century. Such a trip was possible, as we have seen from Thor Heyerdahl's spectacular Kon-Tiki Expedition. But if we are to accept that this South American ruler did reach the Islands, we might as well also accept the fact that he brought with him some of the inhabitants of the far-off lands he visited. Since Galápagos had no inhabitants, the Inca must have been somewhere else. In 1953, while talking with Heyerdahl about the unlikeliness of such a visit to the Galápagos, I learned with pleasure that he also had discarded this story for the same reasons. But Heyerdahl, with his extensive knowledge of Polynesian history and traditions, had been able to go further, locating Tupac Yupanqui's visit somewhere in Eastern

Polynesia, where a tradition exists concerning the visit of some powerful foreign ruler at the approximate time of the Inca's legendary voyage. Unfortunately, I do not recall the name of the island mentioned by Heyerdahl.

The first European that arrived to the Island, and the first documented visitor to the group, was the Bishop of Castilla del Oro, Fray Tomás de Berlanga, who arrived by accident on March 10 of the year 1535. In his report to Charles V, Holy Roman Emperor, King of Spain as Charles I, the Bishop shows how impressed he was by the desolate and arid landscape, as well as by the tameness of the strange animals he found (19).

After Fray Tomás followed Captain Diego de Rivadeneira, who, like the distinguished Dominican, was carried to the Archipelago (in 1546) by an unfavorable current and a lack of winds. Neither he nor the Bishop named or explored what to them must have appeared as a forbidding land.

Though the buccaneer Sir Richard Hawkins, before the end of the 16th century, seems to have been the first person to appreciate the strategic value of the Islands, it is not until the end of the following century that ships, nearly all of them buccaneering vessels, visit the Galápagos in any numbers.

The Islands had many advantages apart from their strategic position as a base for buccaneering fleets, these same advantages being well appreciated by the whalers of later years. There were no inhabitants, and Spanish galleons seldom ventured into these waters; good careening beaches and anchorages were available; there were several watering places known to the buccaneers, and fish, sea turtles, doves, pintail ducks, giant tortoises, and land iguanas were then very abundant. (The giant land tortoises were much in demand for their excellent oil and good meat, besides the fact that these reptiles could survive on shipboard during a considerable time without food and water, making them a most desirable source of fresh food aboard the sailing vessels of those days, when refrigeration and canning were unknown).

It may be said that the descriptive literature and the exploration of the Archipelago really began with the arrival of Captains Eaton and Cook, on the "Nicholas" and the "Bachelor's Delight," in the year 1684, for among the officers of these buccaneers were such observers as William Dampier, Ambrose Cowley, and Edward Davis, who have left us their impressions and observations. The second of these seafarers made a chart of the Islands that remained the best of its kind until Captain Colnett's was published over a century later.

Davis returned with William Knight in 1685, and again in 1687. Another buccaneer who left much interesting information was

Captain Woodes Rogers, who came in 1709 aboard the "Duke," accompanied by Stephen Courtney on the "Duchess." Another Englishman, Clipperton, a former mate of William Dampier, and discoverer of the island named after him off the West Coast of Mexico, came to the Galápagos in 1720.

As early as 1787, the first whaler entered the Pacific, and soon many followed, once word got around that the sperm whale was abundant. This activity became so important, that the British Government and the great whaling firm of Samuel Enderby and Sons organized a research expedition to the South Seas, under the command of Captain James Colnett R.N.

Colnett visited the Galápagos briefly in 1793, returning again in March of the following year. During the two months that he stayed in the waters of the Archipelago, he gathered much data of interest and made his chart on the area, which was in use among the whalers during a great part of the period these were operating in the Pacific.

On April 17 of 1813 begins one of the most interesting chapters in the insular history, with the arrival of the U.S. Frigate "Essex," under the command of Captain David Porter. This distinguished seaman found here the same advantages so much appreciated by the buccaneers and whalers, and made James Bay, on the western

side of Santiago, his favorite anchorage, as Davis, Dampier and Cowley had done before him.

Porter caused serious damage to the British whalers operating in the Pacific, and he had the English worried for some time, until March of 1814, when Sir James Hillyer, commander of H.M.S. "Phoebe," captured the "Essex" at Valparaiso, Chile.

Though the English and American whalers, as well as the British war vessels, called on the Islands frequently, no nation seems to have had interest in taking possession of the Archipelago, but it is likely that some power would have claimed the Galápagos as their own before the end of the first half of the 19th Century, for interest in the Islands increased as time went by. It is only due to General José Villamil, a Louisiana Spaniard who had settled in Guayaquil, that Ecuador came to possess the Galápagos.

General Villamil, who had distinguished himself during the struggle for independence, as well as in public life during the early years of the Republic, made every effort to interest the Ecuadorian Government in the Galápagos. He succeeded in the later part of 1831, and, in 1832, Colonel Ignacio Hernández was sent out to take possession in the name of Ecuador, the act taking place on Floreana, on February 12. General Villamil sent out some settlers and brought a group of eighty with him when he left for the Islands some months later.

Five years after the settlement was founded, it had about three hundred inhabitants. An active trade was going on with the whalers, who bought and bartered tortoise oil, meat, vegetables and fruit from the settlers. But the colony was by then also on its way to disintegration, the Government having made the terrible mistake of deporting all sorts of criminals and prostitutes to the island, thus introducing an element of unrest and disorder among the original colonists, who had been mostly political deportees with a background of honesty.

While Villamil's colonization project was still under way, in 1835, H.M.S. "Beagle" visited the Islands. Aboard was a young naturalist, Charles Darwin, who found here some of the evidence that led him to his conclusions concerning the evolution of species.

The "Beagle" was under the command of Robert FitzRoy, a distinguished officer of the Royal Navy, an excellent cartographer and navigator. He made a new chart of the Islands, which, with very few changes, was in use until 1942, when the U.S.S. "Bowditch" made a new survey. It is surprising how little FitzRoy's chart differs from the modern one, if we compare the means and conditions with which he worked to the modern instruments and methods available to the cartographers on the "Bowditch."

Though several naturalists had visited the Galápagos before him, it was not until Darwin's writings became widely known that the

Islands attracted the attention of naturalists the world over. This interest has remained unabated until our own days, and was the reason behind the several costly expeditions organized at the close of the past century and the beginning of the present.

Distinguished naturalists such as Simeon Habel, who spent six months in the Galápagos during 1868, Louis Agassiz (1872) and Theodor Wolf (1875) were fascinated by the Archipelago. In 1897, Lord Rothschild financed the Webster-Harris Expedition, and was so satisfied with the results that he sent another one in 1901, under Rollo H. Beck, distinguished member of the former. Snodgrass and Heller remained six months in the Archipelago, collecting, from 1898 to 1899.

Neither before nor afterwards has anyone surpassed the work of the California Academy of Sciences Expedition (1905-06), led by Rollo H. Beck. This group of naturalists remained on the Islands for a whole year, returning with the most extensive collections ever made of plants, insects, reptiles, birds, and mammals of the Archipelago.

Other expeditions that produced interesting results were the Norwegian Zoological Expedition led by Alf Wollebaek (1925), the two by William Beebe (1923 and 1925), the several of Captain Allan Hancock (1928 and 1931 to 1935), those of Vincent Astor

(1930 to 1938), and the Templeton Crocker Expedition of the California Academy of Sciences, in 1932.

Individual scientists or small groups have been coming and going after World War II, especially since the Charles Darwin Research Station was set up. In connection with its official inauguration, a scientific congress was held at the beginning of 1964. Numerous field trips were made by specialists to the various islands, and a few unexplored and inaccessible areas were visited in helicopter. I am looking forward to the publication of the various papers which should be coming out in the near future.

While the scientific world grew more and more interested in the Islands, their colonization progressed slowly. General Villamil's colony on Floreana had disintegrated, and an unsuccessful attempt to re-establish it on San Cristóbal had failed. The Galápagos remained again more or less uninhabited, except for transitory settlers such as tortoise hunters and archil collectors.

Around 1869, there were a few settlers on San Cristóbal, left there by Manuel Julián Cobos and José Monroy, two of the owners of the Compañía Orchillera. These worked mainly to supply the archil collectors with food. The next year, 1870, José Valdizán bought the concession for exploiting archil from the Ecuadorian Government, and established a colony on Floreana. Valdizán was murdered in 1878, the year Cobos gave the colonization of

Galápagos a decisive turn by deciding to live permanently on the Islands and begin a sugar plantation on San Cristóbal. This he did the following year, adding a hundred of Valdizán's men to the little over fifty he already had on his farm.

Cobos had been in the archil business, and this continued being one of his sources of income while he mounted his refinery, developed cattle raising, planted coffee, and experimented with a number of other products. His project of planting cotton in the intermediate region of San Cristóbal and that of settling Santa Cruz were cut short by his assassination, in 1904.

In 1893, Don Antonio Gil became interested in the old Villamil concession and attempted to settle Floreana. Not finding the island satisfactory, he soon moved over to Isabela, where he founded Puerto Villamil, on the south-southeast coast, and Santo Tomás some 18 kilometers inland, near the site of a farm he later bought from David Mora. In time, he got a concession from the Government extending from Cape Woodford to Iguana Cove, bounded to the south by the Pacific Ocean and to the north by an imaginary line following the highest ridges of the mountains that comprise the Southern Range of Isabela. This grant has been recognized as property by the Ecuadorian Government on several occasions, though it includes all the settled land on this island, and practically all that is inhabitable. The Gil family seems to worry

little about the presence of settlers, considering them as a potential labor source if they should ever make use of their grant again.

Between the years of 1924 and 1927 several Norwegian groups tried to establish themselves, very few of their members remaining. The lack of first-hand knowledge of the Islands, the disunity of the members and poor organization were the sources of inevitable failure. All this has been the lot of every such project attempted on the Islands, whether Ecuadorian or foreign. It can be said that the great majority of present day settlers were people who came entirely on their own, without any connection whatsoever with colonization groups.

During World War II, the United States had a base on the Island of Baltra and several radar stations at various locations elsewhere in the Archipelago. In 1946, all military installations were dismantled and the buildings turned over to the Ecuadorian Government.

The following year, the administration of the Islands was entrusted to the Ecuadorian Navy, and the Territorial Chief, an officer of the Ecuadorian Army, was replaced by the Maritime Governor, a Navy officer.

In the beginning of 1959, the Galápagos came under civilian administration, having a Governor like the other provinces of the Republic, responsible to the Minister of Government. Due to the

small population of the Islands, certain differences exist, such as the judicial system being subject to the Superior Court of the Guayas Province, at Guayaquil. Though the jurisdiction of the Ecuadorian Navy normally extends over civilians only in matters concerning shores, harbors and navigation, in Galápagos it keeps records of the ownership of livestock and regulates travel, extending permits to those who wish to travel to or from the Galápagos. The former is highly irregular, as such records are kept by civilian officials elsewhere in the country. The second is against the constitution, which guarantees freedom of travel throughout the territory of the Republic both to Ecuadorian citizens and foreigners who have entered the country legally. In any case, it has no practical purpose, as settlers are still streaming in to occupy lands that are supposed to belong to the National Park, often travelling on Navy ships. I also know of several cases where people with a bad police record were allowed to visit the Islands and stay, including one person who had been sent to the Mainland by the Maritime Governor (before civilian administration was established) after being caught in an act of homosexuality. After serving a term in jail he had no difficulty in returning, though the Navy was still administrating the Islands and they were as strict as usual in demanding that one get a permit to travel to Galápagos.

The above makes me believe that these are merely formalities that have survived since the days when one had to ask for permission to carry one's freight and book passage on Navy ships, which were,

for some years, our only means of communication. However, the Navy has been reluctant to change the situation, though it only means trouble to them and much annoyance and loss of time to travelers. I have had much complaint from tourists on this matter.

Shortly after the appointment off the first civilian governor, the last penal colony of the Islands (at Isabela) was removed.

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(19). Fray Tomás de Berlanga: Carta del Emperador Carlos V dando cuenta del Descubrimiento de las Islas. Colección de Documentos Inéditos de Indias. Vol. 41. Madrid, 1883. Pgs. 538-544.

IX

COMMUNICATIONS

During most of their history, communications between Galápagos and the Mainland have been quite irregular, and no sailing dates could ever be trusted as reliable, as postponements were the rule rather than the exception. However, when the late Folke Anderson, president of Fruit Trading Corporation, became interested in establishing a cattle ranch, in 1958, at Iguana Cove (Isabela), he started to send out one of his ships on a regular monthly schedule. Later, improvements were made in this service, though the project at Iguana Cove was abandoned.

The service of the "Cristóbal Carrier" went through a series of ups and downs, until it was taken over by Agencia Marítima Ricaurte of Guayaquil, in 1965. It is still the best ship to have served the Islands, though it is far from a luxury liner. Conditions aboard are tolerable, the personnel is friendly, and the food edible. The passage, round trip, in the best cabins, is about US$ 140.00. This includes transportation in the ship's boats to shore on the various

islands visited. At present the ship calls at San Cristóbal, Santa Cruz, Isabela, Floreana, and, occasionally, Baltra.

"Tame," the Government airline, makes irregular flights to the Islands, and may start again on a regular schedule if tourism picks up some. The planes land on Baltra, and the passengers have to travel to the other islands in local fishing vessels, unless other arrangements have been made. This may be solved in the near future, I have been told. A one-way passage to Baltra costs about US$ 24.00.

Any Ecuadorian citizen or resident alien wishing to travel to the Islands must obtain a permit from the First Naval Zone in Guayaquil, at the Palacio de Gobierno. This is also the case with foreign visitors such as tourists, if they are leaving the islands on the same ship that brought them out. Should these last wish to remain for any extent of time longer than the visit of their ship, a special permit must be secured from the Ministry of Defense in Quito. I understand that these requirements are not enforced by the Air Force, which runs the Government airline.

The postal service to the Islands is done by way of Guayaquil, and is dependent on both the ships and the Government airline for transportation. There are postal employees who travel with the mail, and there is a postal clerk on each of the inhabited islands. At

one time there were special stamps with Galápagos motifs sold at the local post offices, but these are no longer available.

The Ecuadorian Navy maintains garrisons on all the inhabited islands. All these have wireless stations and accept transmitting messages for civilians at the regular rates. On San Cristóbal and Santa Cruz there are also civilian stations maintained by the Ministry of Public Works and Communications.

Travelers visiting the Islands may find to their surprise that the most populated island in the group (San Cristóbal) has no hotel, while at the least populated one, Floreana, one may obtain food and board at the Wittmer home, at Black Beach Anchorage, at a reasonable rate.

On Santa Cruz, Forrest Nelson's Hotel Eden offers individual cabins with private bathrooms at US$ 12.50 per day, including food. The cabins are scattered in a most beautiful setting, just outside the Academy Bay settlement. In the village itself is a modest hotel belonging to one of the local merchants. The rates here are about two dollars a day for food and board. This hotel had not been built when I last visited the Islands.

Boats may be chartered at all the inhabited islands, especially outside the fishing season. The three largest ones available at San Cristóbal are those of the Serrano, Gutiérrez and Ayala families.

These vessels are designed for fishing and offer no comforts at all. Rates run around US$ 20-30 a day for vessel and crew, the owner providing the fuel. Food is usually provided by the charterer.

There are two vessels available at Academy Bay, besides the usual fishing boats. One is a 40-foot yacht belonging to Karl Angermeyer, the other is a somewhat smaller vessel belonging to his brother Fritz. I understand that they charge US$ 30.00 per day per person, including food. The Wittmer family also has a vessel available for charter, on Floreana. The situation on Isabela is similar to that of San Cristóbal, rates being perhaps somewhat lower, as the boats are smaller.

X

EDUCATION

Galápagos is the province of Ecuador with the greatest number of schools and teachers per inhabitant. On San Cristóbal, the most populated island, there are five primary schools (Puerto Baquerizo, Progreso, Socavón, Tres Palos and El Chino), and a convent school for girls, the Instituto San Francisco. The last and the Puerto Baquerizo school also have the first grades of high school and teach sewing, homemaking and other useful subjects.

The founder of the Instituto San Francisco, Monseñor Juan de Dios Campusano, former Apostolic Prefect of Galápagos, intended to expand this school until it had a full high school. He also had plans for a boy school offering the regular subjects plus carpentry and mechanics. Knowing the Reverend Hugolino Cerusuolo, who replaced him in 1966, I have no doubts that this project will be completed.

The Instituto, having boarding facilities, has made it possible for the girls from other islands to continue their education. The

tuition at the boarding school is low enough to make it available to most insular girls.

On Isabela there are two primary schools, one at Puerto Villamil, the other at Santo Tomás. On Santa Cruz there are four (Puerto Ayora, Bellavista, Occidente, and Santa Rosa), and there is one at Black Beach, Floreana.

The Peace Corps has been engaged in school construction programs on the Islands recently, and so have the Franciscans.

XI

HEALTH CONDITIONS

Though the insular climate is healthy, it is far from possessing the almost miraculous healing qualities that some have claimed for it. Here, as elsewhere in the world, we have our maladies, though, it is true, in a lesser number due, no doubt, to the relative isolation in which we live. This is proved by the fact that the more frequent our contact with the Mainland and the greater the number of settlers, the greater the number and frequency of diseases. In the "old days" there were very few of us living on Santa Cruz, and our diseases were boils, wound infections, amoebic dysentery, rheumatism, and, after a ship had called, colds. On San Cristóbal, where the contact with the Mainland was more regular and the population greater, they had already been through a number of diseases we had no first-hand knowledge of, including an epidemic of what seems to have been Asiatic cholera, this latter happening some years before Santa Cruz was settled.

The most common evil on all the islands are intestinal parasites, mostly amoebas. I cannot recall ever hearing of someone having

tapeworm on the Islands, but hookworms, trichinae and other nematodes are quite common. This and the unbalanced diet of the islanders, the latter due to the lack of an all-year supply of vegetables and other such foods, probably explains the anemic condition so widely found among the settlers.

Various infectious conditions are frequent during the warm season, when boils, wound infections, and infectious gastroenteritis are common. The last is now considered as a part of the normal warm season discomforts affecting small children on San Cristóbal, and the fact that few actually die of it is only due to medical care and antibiotics, two advantages unknown to the early settlers. Whooping cough is another common warm season disease.

Rheumatism is common among the local fishermen, and even more widespread among the farmers, who, at least on San Cristóbal, are also much afflicted by asthma, a malady that the climate of Galápagos is reputed to cure.

There are several dermatophytes, such as ringworms and a certain fungus causing severe itching. The latter is widespread in the moist regions of all the higher islands, occurring mostly in humid, shady places where an abundance of rotten vegetation exists, such as in banana plantings. During the colder months, when the almost constant drizzle moistens the highlands, the farmers often suffer

from this fungus, which is frequently cured by soaking the affected parts in strong brine.

Tuberculosis of the lungs is not unknown, but it is not widespread enough to be considered a social problem. Venereal diseases are also known to occur, but it is hard to tell how widely, for very few cases are reported to the local physicians, some have been treated on the Mainland, and it is suspected that not few go without any treatment at all. Personally, I am under the impression that these diseases are quite uncommon in the Archipelago, since one would otherwise see more consequences of so many supposedly untreated cases.

Diseases usually associated with the tropics, such as malaria, yellow fever, elephantiasis, leprosy, etc. are not of the Islands. The several cases of malaria known to me were contracted elsewhere, the local mosquito (*Culex taeniorhynchus*) being a non-carrier. There was a case of leprosy here many years ago, but the man was sent to the Mainland as soon as his malady was discovered by an official who was familiar with the symptoms of leprosy from cases he had seen elsewhere in Ecuador.

All the inhabited islands have dispensaries with nurses who give free attention to the public. The Navy has a physician and a dentist at San Cristóbal, both whom give attention to civilians.

The small hospital which was planned by Monseñor Campusano, and for which he obtained the instrumental while he visited Europe, has been finished by Monseñor Cerusuolo and is now in operation. The equipment was donated by the Catholic bishops of Germany.

The hospital built by the Government on Santa Cruz (because of its central location) has been in operation for two or three years now, offering medical and dental service to the islanders. I understand that new dispensaries are being built on the Islands.

Most of the stores around the Islands sell medicines, which have a very limited market, since the dispensaries often carry a fairly complete stock. However, they occasionally run out.

The Archipelago is remarkable for its healthy conditions as far as animals are concerned. This is surprising if we consider the total absence of quarantine. Should any contagious disease be introduced, it would probably wipe out all the susceptible species on the island where it was brought, for the manner in which domestic animals are raised is completely primitive, vaccines and other preventive measures being unknown. To this must be added that the absence of the more dangerous livestock diseases has lowered the resistance of the local breeds, since they have never had the need or the opportunity to produce any antibodies to protect themselves.

A certain amount of ticks exists, but these do not seem to carry any diseases at present. The greatest problem is a kind of infectious diarrhea, that is not very contagious, and some intestinal parasites.

XII

ECONOMIC REVIEW

Much has been said and written about the great economic possibilities of Galápagos — the great quantities of fish found in its waters, the fertility of its soil and its bright agricultural future, the enormous guano reserves (a complete fallacy), its cattle resources. We shall examine these briefly.

Agriculture.- We have seen in Chapter IV the need for experimenting with the introduction of plants that offer good economical possibilities to the insular farmers, who now depend mainly on coffee as a source of uncertain income. I believe that, at present, the best chances of the Galápagos are in cattle raising, should the restrictions on capturing and taming wild cattle be lifted somewhat. There is more than enough cattle to give all the settlers a good start, and we already know by experience of several good pasture grasses that grow well on the Islands. Thus, it is not necessary in this case, as it would be in that of the introduction of new crops, to spend time and money in experimenting with something of uncertain results.

Much better land, with deep topsoil (on Galápagos the soil is, as a rule, shallow) is found on the Mainland, in many places where roads to the populated areas will soon be built or are in the process of construction. Some of these regions have a healthy climate and are far nearer to markets, thus making it possible, when roads are finished, to compete favorably with producers elsewhere on the Mainland. Much of this land is free or costs very little, it is far enough away from international boundaries and the seashore to make it possible for alien residents to gain a title to it, something impossible on the Galápagos.

There is also another restriction to land ownership on the Islands, and this applies to Ecuadorian citizens as well as to foreigners. No land may be owned nor claimed legally if not under possession previous to 1959, when all unoccupied land on Galápagos was declared a national park.

Cattle raising.- As has been previously mentioned, the lifting of the restrictions on the capture and taming of wild cattle would save the Islands' farming population from their precarious economical situation and greatly benefit the settlers in general.

The present regulations concerning wild cattle make no sense at all. Most of them die without being of use to anyone. Wild cattle die mainly in three ways — old age, killed by feral dogs, or killed by poachers who only make use of the hides and very little of the

meat. The latter are causing serious destruction to the cattle of Santa Cruz, sometimes killing a head of cattle to get a few pounds of meat. The best opportunity to help the settlers is being squandered, while the cattle are rapidly dying out...

To raise cattle, more widespread cultivation of better grasses is necessary, and the cattle must be kept under fence, where they can be controlled and taken care of. This has been done on Santa Cruz, but it is exceptional to find cattle under these conditions on the other islands,

The fisheries and marine fauna.- In Chapter VI, a review of the Islands' fisheries was made. Here it must be stressed that more research is necessary and new legislation based on this. We do not know how much exploitation each available commercial species can support without total destruction of its economic value, causing serious loss to both investors and the workers involved.

Besides the fishes mentioned under the corresponding heading, there are three other marine species of possible economic importance — the sperm whale, the sea lion and the fur seal. The last was almost completely wiped out by the whalers and sealers of the past century, which has not prevented some people of our own time to continue killing it. This species is now protected by law, and, though this is far from being a complete solution to the problem of its survival, the fur seal seems to be recovering. If the

three or four existing colonies are properly taken care of, they may become a source of income to the local fishermen, who could eventually exploit them under strictly enforced regulations and control.

The sea lions, also protected by law, are far more abundant and more widely distributed than the seals, though their numbers have decreased greatly during the last few years. Their skin is less valuable than that of the seals, but they might also be exploited commercially under adequate control.

As stated elsewhere, it was found that the sperm whale (*Physeter catodon*) is not as abundant among the Islands as was generally assumed. At least this is the conclusion reached by a Japanese group that looked into the matter. However, their number could be sufficient for a plant already engaged in other fishing activities. The possibilities should be examined from this point of view also, before discarding it completely.

Tourism.- The insular group has the enormous advantages of its unusual landscapes, its excellent climate, its exceptional fauna, and the fact that it is an entirely new place open to the traveler. Another decided advantage is that its climate is mostly sunny when the colder countries of the Northern Hemisphere have their worst weather. But two things are basic to make tourism to the Galápagos a success — the judicious investment of considerable

capital, and the effective protection of the natural beauty of the Archipelago, as well as of its flora and fauna.

The destruction of landscape by the unnecessary felling of trees, bushes and cacti should be severely punished. The taking of sand from beaches should be regulated in such a manner as to avoid their destruction. We had a case like this happen on Santa Cruz, a few years ago. There was a small white beach near the Port Captain's house. All its sand was carried away to fill a road that was being built to the interior of the island, this having first been roughly paved with rocks. The rains carried away the sand, most of which disappeared among the paving rocks. Now there is very little sand on the road, and none on the beach.

The disfigurement of the landscape with paint, as has been practiced at Tagus Cove (Isabela), where the imposing cliffs may no longer be appreciated because of the promiscuous scribbling of yacht and fishing vessel names all over their sides, should be punished by law. This objectionable practice has been started on the stately lava cliffs that constitute a major attraction at Academy Bay, Santa Cruz. Here, the damage may still be prevented.

We have already seen how necessary it is to protect the natural flora and fauna of the Islands from the effects of the various introduced species. This is of vital importance not only to save the insular species from destruction, but also to save the Archipelago

from becoming an extensive and uninhabitable waste, a land destroyed by erosion and dried out through the absence of moisture-condensing vegetation.

All visiting vessels such as yachts and fishermen, as well as those tourists staying over from one ship to the next, should be given a list of the protected species and existing regulations, so that they may know what should not be done. The introduction of firearms should be discouraged where possible, for their indiscriminate use is all too frequent, even among those who should know better.

One measure that would be of incalculable aid in carrying out the existing conservation laws, and those that may later be created, is the education of the local inhabitants, and the officials sent to the Islands, in the problems of conservation, so that they may grasp the reasons behind such laws. A more severe legislation and more effective patrolling are necessary, but it is impossible to control the whole insular area completely. Hence, the great need for educating the local people in understanding conservation. The Charles Darwin Research Station has already such a program for the school children of Santa Cruz — a praiseworthy step in the right direction.

Also, the Government should refrain from being too generous in extending permits for collecting the various protected species. I fully realize that no harm is meant by those officials granting these,

but they are far removed from the Galápagos and have no idea of which species are on the verge of extinction and which are still reasonably abundant. Unfortunately, many so-called naturalists place their personal ambitions and the collections of their museums or zoological gardens above their love of nature, thus not refraining from making the most out of their permits, regardless of the harm they may be doing to the survival of this or that species. I am sure that if officials realized that this attitude exists among many people, they would be quite wary in granting permits.

There is already an agreement between the Government and the Charles Darwin Foundation whereby permits must receive the approval of the Research Station before they are valid. This is a wise measure as the Station has personnel that is well informed about existing conditions on the Islands, as regards both flora and fauna, while the officials in the capital have no such information. However, I have heard that both officials at San Cristóbal and various officials in Quito have granted permits to capture or kill local animals, though neither were authorized or competent to do so. This shows that many officials have a rather hazy idea about how far their jurisdiction goes, especially concerning matters related to Galápagos.

In the light of what has happened in the immediate past, it is easy to understand the argument presented by some of the local lawbreakers, who say that "the tortoises and other such animals are

protected so that they may be carried away by foreigners and other outsiders." This is one of the most reasonable excuses ever found for selling small tortoises as souvenirs and killing the larger ones for food. Especially if one sees Navy officers wearing shoes made of sea lion skin and their crews buying small tortoises to take back as gifts for their family and friends.

Colonization.- To stimulate the colonization of the Islands and to attempt keeping their nature intact at the same time is something bordering on the impossible. It is enough to take a look at the destruction wrought during the last thirty years only, and compare it to the limited number of inhabitants, to realize what a considerable increase of population would mean. Not that the settlers are wholly responsible for what has happened, nor are all of them involved at all, for we know of numerous visitors, both Ecuadorian and foreign, some coming as campers or tourists and staying at various islands, others arriving as yachtsmen, who would kill many of the protected species either for food or their skin or, what is unconceivable but, unfortunately, frequent, just to show off their marksmanship. It is all too often that iguanas, sea lions, sea birds of different species, and other animals have died to satisfy the stupidity of such people, who find an outlet to their destructive nature in the killing of helpless animals.

The Ecuadorian Government has taken a most enlightened step in declaring the Galápagos a national park; but nothing has yet been

done to prevent settlers from coming and establishing themselves on land that has been set aside for this park. It is true that they will be denied titles to it, perhaps; but this is of little use, since they have been allowed to clear much of it, destroying beyond repair many botanical associations.

In my opinion, certain areas should be set aside for the natural growth of the local populations, while the rest should remain as a reserve for the insular flora and fauna, and the hunting ground of those settlers engaged in exploiting the introduced feral species. San Cristóbal and Floreana, as far as the upper regions are concerned, have lost their value and may be left for agriculture. The same is the case of some parts near the inhabited areas of Isabela and Santa Cruz, it being urgent on these two islands to define once and for all which are the places open for settlement and which are to be left as natural reserves.

Also, there should be some control of the use being given to land that has already been taken by settlers, as there are many people who have held for years (and still hold) more land than they make use of, in violation of the Ecuadorian land and colonization laws, and preventing other people who need the land from using it.

I believe that immigration to the Galápagos must cease if the Islands are to remain as a sanctuary for wildlife. The natural growth of the already existing population will soon take care of

whatever land may be set aside for agriculture and expansion of the settlements.

Should the Government find it convenient to modify the 1959 law and leave only the remotest areas of the Archipelago and its uninhabitable islands as a national park (as had been done earlier), allowing the rest of the Galápagos to be settled, it is suggested that means be provided so that the existing officials may be in a position to efficiently patrol the Islands. To this must be added the educational program mentioned earlier. It is important that not only the officials, but also old and new settlers realize alike the valuable treasure-house of natural history that has been entrusted by Ecuador to every man sent out here by its Government and to every settler allowed to live here. Every good Ecuadorian should feel the proud possessor of this unique little world we know as the Galápagos, and strive to keep it from being utterly destroyed.

Another step of vital importance, if colonization is allowed to continue, is to permit entry only to settlers provided with sufficient means to begin an industry or some other activity that may require labor, thus helping solve the present precarious situation in which most islanders live, subject as they are to a purely seasonal source of income. To allow more fundless settlers on the Islands is only a way of making things worse for those already there.

Once the existing economical situation has been improved could it be considered possible to remove the above restrictions, making it possible to come for those that are certain to obtain work here, or have the necessary means to live independently while getting started either in fishing or farming.

These suggestions are, I admit, somewhat undemocratic, but their importance is obvious to anyone acquainted with conditions on the Islands.

It is not the same to travel to Galápagos as it is to go from one province to another on the Mainland. The distances are greater, of course, but there is also the fact that the Islands are a land of limited opportunity. One may say, when on the Mainland, that if one project fails there is always something else to do; on Galápagos there are only two things, farming or fishing, and both are subject to seasons and the need of at least a little capital with which to start or at least to help one wait for the time when production begins.

However, as stated above, even under the restrictions that have been suggested, is colonization compatible with the idea of a national park and conservation, and without conservation we shall not only lose one of the most valuable areas of biological research in the world, but the real economical future of Galápagos, international tourism, will be utterly lost. The result would be a group of inhospitable islands, inhabited by a population of

impoverished settlers, struggling for mere survival, with no other prospects in sight.

SECOND PART

THE ISLANDS

XIII

ISABELA

Known in English as Albemarle (for George Monk, first Duke of Albemarle), this is the largest of the Galápagos, having an area of 4,275 sq. kms., that is, more than half of the total surface of the Archipelago (7,844 sq. kms.). It is formed by five great volcanoes, whose bases are united by lava flows and other eruptive matter. Besides these five major volcanoes, there are a great number of minor ones and hundreds of secondary craters and spatter cones. There are also several active volcanoes. One of the major mountains is the highest on the Galápagos, Cerro Azul, located at the southwestern end of the island. This one reaches an altitude of 1,688 meters above sea level, and its central crater has a diameter of about eight kilometers.

At least four fifths of Isabela's surface is useless, consisting as it does of barren lava fields and wastes of volcanic scoria. Some of these fields are of quite recent formation, as the one produced by the eruption of March, 1963, on the northeastern side of the island. Another new field of recent lava is the one in the vicinity of

Cape Rose, in the south-southwest, formed during the middle of 1959. A terrific eruption took place at midnight on April 13, 1963, five new secondary craters having formed on the leeward slopes of Santo Tomás Volcano, whose windward side is the inhabited part of this island. Though no danger existed for the settlers, there was great tension among them, the eruption being uncomfortably close. Southwest of Elizabeth Bay, the lava covered up a small cove, after running the long distance between one of the craters and the shore. The easternmost of the craters was still pouring lava two months later.

This extensive island has only two settled areas — the Santo Tomás region and Puerto Villamil, their joint populations being less than 300 persons.

Puerto Villamil.- This picturesque place is located on the south-southeastern side of Isabela, and is the only usable anchorage on the southern coast of this island. Its approach is somewhat difficult for the navigator who makes his first visit, the neighboring waters and the bay itself being full of shoals. The only landing is at the dock or the adjacent part of the beach, both sheltered by some small reefs.

Situated on a sand flat between the sea and extensive lava flats, the settlement consists of wooden houses with corrugated steel roofs, a type of construction common to all the Islands. There is a school

and the beginnings of a Franciscan monastery, both made out of hewn lava.

The lava field behind the village is formed of pahoehoe, corded and undulant masses that have cracked in many places, when the field contracted as it cooled. In many parts of this enormous flow, where depressions reaching the base occur, one meets with telluric waters of a somewhat sulphurous taste. From such places, the settlers obtain their drinking water. Usable water has been found in several places to the west of Puerto Villamil, but landing in this part of the coast is, in the best of cases, very difficult, and there are no good anchorages.

There are numerous salt water lagoons in all this region, where the Galápagos pintail duck (*Anas bahamensis galapagensis*), egrets (*Casmerodius albus egretta*), pink flamingoes (*Phoenicopterus ruber*), blue herons (*Ardea herodias cognata*), and other such birds find their home. In the warm season of 1960, Mr. Reymond Lévêque, at that time director of the Research Station at Santa Cruz, and I went hiking from Puerto Villamil to the west. On the way to Puerto Barahona, we saw a number and variety of limicoline birds along the beach, while the mangrove swamps rewarded us with a quantity of waders which showed very little worry about our presence. At Puerto Barahona itself, Mr. Lévêque spotted an osprey (*Pandion haliaetus carolinensis*) circling over a salty lagoon. We watched it for some time, since this species had been reported from

Galápagos only once or twice before. Though this area would be of great interest to ornithologists, few of these have visited the region.

At present, most of the men in Puerto Villamil occupy themselves with grouper fishing, but, when the settlement was founded by Don Antonio Gil, at the end of the past century, this was only the port to his Hacienda Santo Tomás, located about eighteen kilometers inland. Villamil was the loading place for such products as tortoise oil, archil (the latter collected in the dry region), cowhides, cattle and sulphur from the crater of Mt. Santo Tomás.

Santo Tomás.- In the days of Don Antonio, it was a small village where his workmen lived. Today, it consists of only two houses and a school, the farming population of the island being scattered around and below the site of the former village. Santo Tomás proper is about 390 meters above sea level, somewhat lower than the grasslands, which begin at 460 meters, extending to the rim of the huge main crater of the 1,490-meter high Santo Tomás Volcano.

The grassy region is the favorite habitat of the wild cattle, large herds roaming it when the weather is mild. Its green appearance contrasts markedly with that of the interior of the 9½ km. wide main crater, which, after descending a little ways on the inside, soon turns barren, and serves as the home of such xerophytic plants as cacti and other species one expects only in the lowlands. Lava

lizards (*Tropidurus albemarlensis*), reptiles of the dry regions, whose habitat is always below the middle of the intermediate region, are abundant inside this crater.

The present day inhabitants of Santo Tomás and its vicinity grow vegetables, fruit and coffee, besides raising some cattle. The last two products are their main sources of income. This was not always so, for, in its beginnings, Santo Tomás was a center of tortoise hunters, who left from here to camp at the pools where the rain water accumulates, providing drinking places for the tortoises and other wild animals. Here, these reptiles would come and wallow in the mud, rest, and refresh themselves. The distinguished scientist and explorer, Rollo Howard Beck, who visited the Islands several times at the close of the past and the beginning of the present century, has left us an interesting account of the big chelonians, telling of their life and how they were hunted (20).

The tortoise hunter's working equipment was simple, consisting of a pot or tin for rendering the oil, a donkey, a short machete or a hatchet, and a pair of sacks sewn together to form a kind of double saddle-bag. Once the camp was made, the oilers killed off all the large tortoises within easy reach, cooking their fat to produce oil, in the same manner lard is rendered. When no more worth-while tortoises were left, each man would take his machete, saddle-bags and donkey, and go out to search for more.

When a hunter found a tortoise of convenient size, he would turn it over, and proceed to hack away at the suture joining the plastron to the carapace, accomplishing this with a few strokes of the machete. At once, he would cut off the two thick fatty bodies along the lower sides of the carapace, throw these into his saddle-bag, and be ready for the next. Should he be in doubt about the fatness of a reptile, he would make a deep incision in the skin-covered part of its rear end, letting the animal go if not worth killing. As is to be expected, many of the tortoises thus treated would die from wound infection.

As may be seen, the day's work of only one hunter could mean the death of a considerable number of tortoises; but the worst part of it is that the females, being fatter than the males, were killed in much greater numbers, thus reducing much more the possibilities of recovery for this interesting species, represented in this region by *Testudo elephantopus guentheri*.

Long before those times, the tortoise oil trade had grown to such proportions that there were those who made sizeable expeditions with the purpose of bringing oil to Colombia, Ecuador and Peru, the countries from which most of the tortoise hunters hailed. One such case is that of Don Miguel Andrade Fuentefría, who requested and obtained from the Congress of Ecuador, in the year 1839, a concession to exploit the oils of both sea lions and tortoises. Quite often, oiling and archil gathering were worked in

combination, since archil had a good price among dyers before synthetic colorants were available.

The great chelonians were also actively hunted by the whalers and the early settlers, the latter established on Floreana since 1832. On that island, the tortoise population was soon exterminated, it being necessary for the colonists to organize hunting parties to the neighboring islands, and even to Santiago, where Darwin found one such group as early as in 1835, which shows that tortoises were extremely scarce on Floreana when the settlement there was only three years old. Evidently, the known habitats on such nearby islands as Hood, San Cristóbal, and Santa Cruz had been cleaned out, since the settlers found it necessary to go as far as Santiago; but tortoise hunting took place on these other islands on a considerable scale at several periods after this, as new hunting grounds were discovered on them.

Tortoises were an important factor in the diet of the first settlers, who depended on them as a supply of both grease and meat, though, according to Darwin, pigs and goats already roamed wild on Floreana at the time of his visit. Doubtlessly, tortoise oil must also have been one of the chief sources of income of these early colonists.

The scarcity of tortoises in certain areas at such an early date as 1835 cannot be blamed so much on the colonists as on the

whalers. The places of easiest access to the settlers, such as Floreana itself, San Cristóbal and Hood, had been subject to intensive exploitation by visiting ships since almost half a century before. Some of the whalers loaded from three to four hundred tortoises each for food. In 1855, the schooner "Tarlton" arrived at San Francisco with not less than 580 of these reptiles aboard, not counting those that must have been butchered for food on the Islands and during the trip (21). This last case is mentioned as an extreme example of what went on.

If one remembers that only from 1832 to 1833 Floreana alone was visited by thirty-one whalers, and one averages only two hundred tortoises to each (a very low average), this would account for the end of 6,200 of these reptiles. Probably all or nearly all whalers visited Floreana, on account of the barrel at Post Office Bay, where they sought mail and information from their fellow fishermen, so one may assume that these thirty-one vessels were all that came during this first year the Islands were under the Ecuadorian flag. Still, from year to year, tortoise hunting on this vast scale makes one wonder that there are any left at all.

Then, we have the tortoise hunters and early settlers, whose destructive work must have rivaled that of the whalers, since their oil business would otherwise have been unprofitable. A good tortoise produces but three gallons of oil, thus making a relatively great number necessary to fill a barrel. Beck wrote, in 1902, that he

saw about 1,200 gallons ready for shipment at Puerto Villamil, upon a visit to that place (20) — one single shipment, 400 to 500 dead tortoises...

However, we cannot condemn such a destructive labor, for it was carried out at a time when little was thought of conservation of natural resources, to say nothing of nature in general. The destruction of flora and fauna was widespread, the most wasteful practices being common where natural resources were concerned. It is therefore not surprising that men of the intelligence and vision of General Villamil, Don Manuel Cobos and Don Antonio Gil, not only were indifferent to the extermination of the tortoises, but found in their hunting a desirable means of increasing their incomes, so that they could further their respective colonization schemes. In fact, such attitudes are not uncommon today (when we have considerable knowledge about the problems of conservation), even among people of vast culture, not to speak of less educated persons.

A most deplorable fact is that, in our own days, when tortoise hunting should no longer be a necessity, there being an abundance of introduced animals that could serve as a source of meat, there are still those who hunt these reptiles for food and, what is worse, sell their young, either dead or alive, for souvenirs. And this when so many of us have seen these animals disappear from one place after another.

The chances for survival of most of the remaining forms of the Galápagos tortoise are very uncertain, especially in such places as southern Isabela, where wild dogs and feral pigs are numerous. These destructive mammals, as has been stated elsewhere, eat the eggs and the young of the tortoise. Beck writes, commenting about the period of incubation and the time before the carapace of the young tortoise hardens enough to give it protection, that "...it is doubtful if more than one out of 10,000 escapes" (20).

Iguana Cove.- Following the southern coast of Isabela from Villamil to the west, one sees white beaches of coral and shell sand, crowned with a deceptive greenness, that gives this coast the appearance of great fertility. This vegetation is halophytic in nature and, this being a country of salt lagoons and ponds, it flourishes well. There is an abundance of red mangrove (*Rhizophora mangle*), white mangrove (*Laguncularia racemosa*), black mangrove (*Avicennia officinalis*) and, in many places, yana or mangle jelí (*Conocarpus erectus*), a beautiful tree that is found forming thickets around Puerto Villamil, where most of the arborescent specimens have fallen to the ax or the machete of those gathering firewood. The poisonous manchineel (*Hippomane mancinella*) is very common in this region, its abundant foliage often increased by that of the woody vine known locally as bejuco salado (*Cryptocarpus pyriformis*). Under its shade, where some of the sun's rays may still penetrate, one finds a few amaranthaceous plants of elegant shape.

Along the margins of the salt lagoons and in the depressions where some moisture may be found, there is an abundance of a coarse grass mentioned earlier (*Sporobolus virginicus*), and, on the beaches, as well as along parts of the shores of the lagoons, grow the two strand purslanes (*Sesuvium portulacastrum* and *S. edmondstonei*). Also other aizoaceous plants are common, such as some of the genus *Mollugo*. These botanical associations are found throughout the Archipelago, wherever salt marshes and lagoons are located, reaching their greatest development along this low coast and the Perry Isthmus, with its two bays, Cartago and Elizabeth, on this same island,

The greenery seen when one passes along this shore of unsafe anchorages and beaches swept by thundering breakers, forms a relatively narrow strip, hiding from sight the barren lava fields beyond it.

As one leaves behind Cape Rose, named after the buccaneer Jean Rose, companion of Davis, the appearance of the coast changes, the shore turning somber with its naked lava fields and steep cliffs. It is a coast of savage beauty, rough, with a certain fascinating attraction that, though strong, does not bid the traveler to tarry.

As one approaches Point Essex, named by Captain Porter after his famous frigate, the abrupt coast and the equally steep slopes of Cerro Azul turn green, a green one normally finds only in the

highlands elsewhere among the Islands. This stretch, extending from here to the middle of Iguana Cove, is the only part of the insular coast where one meets with a decidedly mesophytic vegetation.

Iguana Cove is an exposed anchorage with a most rugged landscape, abrupt rocky shores, and deep, cold waters, located to the north-northwest of Point Essex, the latter being the southwestern tip of Isabela. Uninhabited on account of its poor anchorage, unsafe landing and isolation, this is an attractive place, though somewhat somber. There is a moderate quantity of wild cattle here, as well as wild dogs and a limited number of tortoises (*Testudo elephantopus vicina*). On my three protracted visits to the area, in 1959, no signs were seen of wild pigs, goats or asses, all of which are quite common on the slopes of the Santo Tomás Volcano, farther east. As far as I know, none of these three species has been introduced to this area.

Fruit Trading Corporation, of which Compañía Ecuatoriana de Turismo Galápagos S.A. (CETUGA) was a subsidiary, had a camp here, there being a project of taming local wild cattle in order to breed it to high quality stock and produce beef suitable for marketing on the Mainland. The scheme was abandoned for various reasons, among them the lack of a good harbor and the scarcity of fresh water.

The northern half of Iguana Cove is the first part of a region of naked lava fields of a most desolate appearance, which, upon passing Christopher Point, is covered by numerous small craters and broken lava bubbles, giving the landscape an unreal touch. This coast is, in most places, lower than that around Iguana Cove, but the waters are deep up to the very shore. The United States Armed Forces had a radar station, during the last war, at Webb Cove (after Lt. G.R.C. Webb, R.N.), one of a system set up for the defense of Galápagos. The other stations were located at Cerro de la Orchilla (near Puerto Villamil), Point Albemarle (northern end of Isabela), the eastern side of Hood Island, and Baltra, the last also the location of their main base.

From Iguana Cove, begins the nesting area of the Galápagos penguin (*Spheniscus mendiculus*), and the habitat of the flightless cormorant (*Nannopterum harrisi*), the latter the largest and only flightless member of its family, its wings being in the process of becoming flippers, as has happened to those of the penguin.

The Perry Isthmus.- This low area of terrain separates the southern range of Isabela (which runs about ENE to WSW) from the northern range, running more or less southeast to northwest. The former includes Cerro Santo Tomás and Cerro Azul; the latter, the three great northern volcanoes. The Isthmus extends from the foot of the Santo Tomás, separating it from the 1,112-meter high Cowley Mountain. At its narrowest part, it is about

nine kilometers wide, with Cartago Bay to the east and Elizabeth Bay to the west of it.

Cartago Bay is quite extensive, and affords good anchorage at several places, for vessels of any size. Its shores, like the south coast of the island, have a green and inviting appearance, but once the narrow strip of halophytic vegetation has been crossed, a desolate and arid landscape extends as far as the eye can see, the ground being covered with scoria and vast lava fields of such jaggedness and dark brittleness as to make walking both dangerous and almost impossible.

The slopes of the Santo Tomás and the other mountains of the southern are barren to a considerable altitude on this side, for they do not benefit from the drizzles of the cold months. However, there are many places where rain accumulates, forming ponds, when the warm months are rainy, and there are signs that there might be fresh or brackish water in this region, due to filtrations from the southern mountains.

Salt water lagoons are common in Cartago Bay, and there is an abundance of pintail ducks and other marsh birds. It also appears as if the waters of the bay itself provide a favorable environment for certain mollusks, for a small species of oyster is quite common. There is also an abundance of a bivalve (*Pinna*), found everywhere,

its fan-shaped shells stuck in the mud or among the rocks by their pointed ends.

About north-northwest of the Isthmus rises Mount Cowley (Alcedo), its eastern slopes a vast field of pumice, almost barren of vegetation. This side slopes moderately for nine or ten kilometers from an altitude of about six hundred meters. Above this altitude, the terrain is steep, covered with a dense tall grass, with scattered lichen-covered bushes and stunted trees, the latter mostly palosanto (*Bursera*), covered, from this altitude up, with a great profusion of a lichen (*Usnea*). To judge by the vegetation, one is inclined to believe that this area is subject to drought during a great part of the year.

Wild asses, originally introduced by the tortoise hunters at some time during the past century, are very abundant. This cannot be said of the local race of tortoise (*Testudo elephantopus vandenburghi*), which was almost exterminated before the turn of the century, and, despite relative isolation, has not been able to recover much from such ruthless hunting.

Around one thousand meters above sea level, a fairly level terrain is found, extending to the rim of the crater. This expanse, some two and a half kilometers wide, is covered by a very tall species of grass, which forms an almost impenetrable barrier, about two meters in height.

At the bottom of Mount Cowley's crater is a geyser, and sulphur of very good quality has been discovered in the same location. The sulphur, however, is somewhat scattered and the amount available is not exactly known.

Elizabeth Bay, to the west, is much larger than Cartago. To the southwest, south and southeast, it is sheltered by the southern mountain range, while Cowley Mountain protects it in the northeast. Fernandina Island affords some protection to the northwest. In this excellent bay a considerable fleet could find good anchorage.

Towards the inner part of Elizabeth Bay, there are two islets on which penguin colonies exist, and, farther towards the Isthmus, one finds a maze of channels and mangrove swamps, where turbid greenish waters are populated by an abundance of mullet (*Mugil*), snook (*Centropomus*) and sea turtles (*Chelone*).

Tagus Cove.- About northwest from Mount Cowley, rises great steep-sided Mount Tagus (Darwin) to an altitude of approximately 1,300 meters. Its lower parts are barren, sparsely clad with a scattering of totally xerophytic vegetation. To the west of this great volcano extends Canal Bolívar, appearing like a wide fjord, where it separates Isabela from Fernandina. On the northeastern shore of this channel, on the Isabela side, is located Tagus Cove, named

after H.M.S. "Tagus," which visited the Islands together with the "Briton," in 1814.

Tagus Cove is surrounded by steep tuff hills, being a small, deep and quite safe anchorage, probably the remains of an ancient crater. The whalers called here often, establishing the custom of engraving their names in the soft surface of the steep slopes and cliffs, where many of them may still be read. This practice has been continued by modern vessels, only that the latter have made it a point to spoil the beauty of the landscape by using white paint.

The landing is at the mouth of a dry gulch, somewhat to the right of the head of the cove. Along this, one may reach the higher parts of the hills surrounding the cove, and thus enjoy the stupendous view that extends in every direction. From here one sees also the extensive river of solidified lava that separates Tagus Mountain from the tuff hills.

In the northern part of the cove, and separated from it by a ridge of some sixty meters in height, there is an almost circular salt water lake, about 350 meters in diameter. This extinct crater has very steep inner slopes that plunge directly into the lake's waters, going from seven to eleven meters below its surface, before reaching the bottom.

Tagus Cove was originally named Banks Cove by Captain Colnett, in honor of his contemporary, the famous botanist, Sir Joseph Banks (1743-1820), whose name is now given to the great bay farther north. Captain FitzRoy, the master of the "Beagle," made an excellent survey of this cove, in 1835.

In 1801, Captain Amasa Delano of the "Perseverance" discovered fresh water in a depression in the porous tuff bed of a dry gulch, about half a mile south of Tagus Cove. This is very good water, but the source is not quite reliable, for it sometimes dries out completely. According to Slevin (22), the schooner "Academy" was able to collect from forty to fifty gallons per day at this place.

To the north of Tagus Mountain rises another volcano of greater altitude, but of similar formation, Mount Banks (Wolf), which forms the northern extreme of Isabela. Its western slopes run down to Banks Bay, which is protected to the north by the rugged peninsula formed by Cape Berkeley. This harbor has very deep waters, soundings of four hundred or more fathoms being found less than half a mile from shore. It is protected to the south by Fernandina.

This great bay and Tagus Cove are constantly mentioned in the narratives and log books of the whalers and other contemporary seafarers. The neighboring waters, mostly to the north, were the best whaling grounds in Galápagos, and both the bay and the cove

to the south of it were important sources of tortoises and land iguanas.

The marine iguanas (*Amblyrhynchus cristatus*), the penguins, cormorants, sea lions and other animals endemic to the Islands are still abundant in this region; but tortoises are rather scarce on the slopes of Mount Tagus (*Testudo elephantopus microphyes*), unless one searches in the more remote and inaccessible parts of the region. Tortoises were still abundant as late as in 1875, when Commander Cookson of the "Peterel" sent 24 of his men ashore, a ways south of the cove, and these located thirty in a few hours' search (23). Upon landing, they found a trail leading inland, along which were remains of campfires, carapaces and tortoise bones — the campsites of oilers and whalers that had been this way in search of tortoises. In the following years, the area continued to be visited by tortoise hunters, and Slevin, in Van Denburgh's interesting work on the great chelonians, states that the females were rare in this region, having been hunted more than the males, as they were fatter than these (24).

The "Hassler" called at Tagus Cove in 1872, and its crew found the land iguanas (*Conolophus subcristatus*) numerous (25). In 1906, they were already scarce and very wild (26).

Slevin found, at Banks Bay, a great number of the burrows land iguanas make, indicating that there had been a large colony here,

in the past. The reptiles themselves were, however, on the verge of extinction, so small was their number (27). As far as I can recall, I have never seen any at either place.

The slopes of the 1,670-meter high Mount Banks, Banks Bay and Cape Berkeley form the habitat of *Testudo elephantopus becki*, the tortoise with the greatest chances of survival. The terrain here is so broken and the area so remote, that it discourages most human predators, and, as far as we know, neither dogs nor pigs exist in the area. There are no introduced animals that compete with these reptiles for food, which is indeed fortunate, since food is relatively scarce.

The Equator crosses Cape Berkeley and the southeastern part of Mount Banks main crater, this being the only place in Galápagos where the Line crosses land,

(20) R. H. Beck, in Van Denburgh: The Gigantic Land Tortoises of the Galápagos Archipelago. Proc. Calif. Ac. Sc. 4th Ser. Vol. II. Pt. I. San Francisco, 1914. Pgs. 238-241.
(21) Joseph R. Slevin: The Galápagos Islands. A History of their Exploration. Calif. Ac. Sc. Occ. Papers XXV. San Francisco, 1959. Pg. 130.
(22) Slevin, op. cit. Pg. 6
(23) Commander Cookson R.N., in Van Denburgh, op. cit. Pg. 227.
(24) Slevin's field notes in Van Denburgh, op. cit. Pg 332.
(25) Blake, in Slevin, op. cit. Pg. 118.

(26) Van Denburgh and Slevin: The Galapagoan Lizards of the Genus Tropidurus; with Notes on the Iguanas of the Genera Conolophus and Amblyrhynchus. Proc. Calif. Ac. Sc. 4th Ser. Vol. II. Pt. I. San Francisco, 1913. Pg. 189.
(27) Van Denburgh and Slevin, op. cit. Pg. 190.

XIV

SANTA CRUZ

Also known as Indefatigable, Porter and Chávez, among other names, this is the second largest island in the group, being 1,020 sq. kms. At its highest point, Mount Crocker, it reaches an altitude of 864 meters above sea level. This mountain, the remains of an ancient crater, was ascended on August 10 of 1932 by members of the Templeton Crocker Expedition of the California Academy of Sciences.

This is the island where most of the Archipelago's foreign population lives, making up about five per cent of Santa Cruz's total of nearly one thousand.

Puerto Ayora.- This village is located on the southern side of the island, at Academy Bay, which was named after the California Academy of Sciences' schooner, which spent a little over a year among the Islands (1905-1906).

The coast in this part of Santa Cruz is very rocky, and the northeastern, southwestern and western shores of the bay are formed by tall cliffs, dark and abrupt, crowned by enormous arborescent cacti (*Opuntia echios gigantea* and *Jasminocereus howellii howellii*), all of which gives a unique and strange character to the landscape. The anchorage close to the southwestern shore of the bay, close to the cliff, is good. This may also be said of the landing left by the Norwegians, who had a cannery here in 1926. This stone jetty was repaired and extended by a local port captain and a group of conscripts, a few years ago.

This bay was known and frequented by the archil gatherers and tortoise hunters of the past century, who called it la Aguada de Chávez (Chávez's watering place), this name being applied chiefly to what is now called Pelican Bay, where the best brackish water of Academy Bay was found, and the present village still gets part of its drinking water. Here was also the old landing place, an almost hidden beach of powdery white sand, above which is located the water hole. Of the luxuriant manchineel trees that shaded it, only two remain, standing between the water hole and the beach.

Pelican Bay is a poor landing, the low tide uncovering the mud and rocks below the beach, making it difficult to get ashore. Its anchorage, not sheltered by the southwestern cliffs, is equally bad. For this reason, the Norwegians chose what is now the western part of the settlement to build their houses, though the water here

is not as good as at Pelican Bay. With explosives and their hands, they dug a shallow channel into the lagoon where they built the stone jetty. This place provides a snug little harbor for small boats, and is closer to the best ship anchorage in the bay. A trail was cut from the new landing, to join it with the old path going from Pelican Bay to the interior. Part of the former and all of the latter are still in use.

Excellent water has been found inland from the western part of the village, and has been piped into various parts of the settlement, as well as to the end of the jetty.

From Pelican Bay begins the path that leads to the Research Station of the Charles Darwin Foundation. The Station, located on the northern shore of the bay, consists of a laboratory, the director's residence, a mess hall, a workshop, a small warehouse (by the landing), and two guest houses, the last on an elevation behind the Station. There is a path leading inland a ways, to a high cliff, above which there is a seismograph. The station has been carrying on meteorological observations for some years, and will be installing a tide gauge and facilities for marine biology in the near future. Also, natural reserves will be provided for animal species on the verge of extinction, such as the one existing in the western part of the island. This Research Station is vital in helping save what is left of the original flora and fauna of the Islands. It is to be hoped that the local officials make the most of this opportunity of

receiving valuable advice and cooperation in the creation and enforcement of the various conservation laws needed.

Bellavista and the interior.- Bellavista is located about seven kilometers inland from Puerto Ayora, and is the oldest of the existing agricultural settlements on this island. Its name, meaning "beautiful view," is quite misleading, for it is located on a large flat, from which no view is possible, surrounded as it is by a forest of lechoso (*Scalesia pedunculata*), pega-pega (*Pisonia floribunda*) and other indigenous species, as well as such introduced trees as the avocado (*Persea*) and the balsa wood (*Ochroma lagopus*), all of which hide the mountains on one side, and what little might be seen of the ocean on the other.

On this plain rose the dwellings of Mr. Amador-Baquerizo's workmen. This gentleman had bought several heads of cattle from Hacienda Progreso (San Cristóbal), with the purpose of starting a cattle ranch on Santa Cruz. This was around the year 1925, when the island had no permanent population.

When the Norwegians who established the cannery arrived, they found the Pelican Bay trail open as far as this plain, above which they started a small farm, part of it being now within the lands of Gordon Wold, one of the members of that group. His farm is called Hacienda Fortuna, which is the old name of the Bellavista plain. The now numerous wild cattle that roam the highlands of

Santa Cruz descend in part from Mr. Amador-Baquerizo's abandoned herd, two or three cows having also been brought over from San Cristóbal by Mrs. Anna Horneman, the wife of a Norwegian geologist, shortly after the birth of one of their sons, in the late 1920's. These cows were let lose when the Hornemans went on one of their trips to Norway.

The interior of Santa Cruz has undoubtedly the best soil in the Archipelago, and the variety of crops that may be raised here during the different seasons is surprising. During the cold months, this area may produce a great number of vegetables — cabbage, lettuce, endive, carrots, cucumbers, squash, potatoes, cassava, yams, taro, radishes, celery, parsley, eggplant, etc. During the warm months, one may harvest melons, avocadoes, grapefruit, pineapples, plantains, etc. However, during the transition from one season to the next, one seldom gets the products of one or the other, and in years of drought, though the cold season drizzle has never been known to fail completely, one gets little of anything.

There having been more interest in experimenting with new products on this island, one finds balsa wood, several kinds of bamboo, Cuban cedar (*Cedrela odorata*), cashew (*Anacardium occidentale*) and many other plants not usually found on the other settled islands of the group. But here, as elsewhere on the Galápagos, coffee and cattle remain the main cash crops, as far as the farmers are concerned.

On Santa Cruz, there is an abundance of feral pigs, goats, asses and cattle. Such is the quantity of these introduced animals, that they are already a problem to many of the farmers, and the destruction caused by them to the local flora is such, that they greatly endanger the survival of many botanical species, and compete strongly against such protected fauna as the local tortoise (*Testudo elephantopus porteri*), the last surviving now only in the more remote areas of its formerly extensive habitat.

The Santa Cruz farmers are dependent on the rainfall for their fresh water supply, and when the rains fail, must bring their water from the pools that are formed by the heavy rains, where the wild animals drink and wallow.

Tortuga Bay and Cerro Gallina.- Not far from Puerto Ayora and somewhat to the west of it, is Tortuga Bay, one of the most beautiful places in the Archipelago. It is a small cove, the eastern side of which is formed by a salt water lagoon, separated from the sea by a long and narrow rocky point. Its waters are of a transparent green, its beach of fine white sand framed by the luxuriant green of the mangroves. Behind this beach rise the high sand dunes, at the southern side of which lies another, much more extensive white beach, stretching from the base of the rocky point towards the east-northeast, its fine sands exposed to the trade winds and the ceaseless pounding of the pale surf, which envelopes it in a soft haze.

Inland rise extensive forests of gigantic and grotesquely shaped cacti, while, farther west, lies a salt marsh frequented by pink flamingoes, pintails, gallinules and other birds of the mangrove swamps. In the lagoon, mostly at night, one sees sea turtles, after which the first Norwegians settlers named the cove, where they came to supply themselves with the oil and meat of these marine reptiles, so tame and numerous in those days. Now, they are exceedingly shy, due in great part to the intensive hunting they were subject to in the years between World War II and the early 1950's, when the island's population was increasing and turtle oil still was an important item in the local diet.

Tortuga Bay was the site proposed by Dy. Irenäus Eibl-Eibesfeldt for the Research Station of the Charles Darwin Foundation, but this fine suggestion met with the difficulty of access to the area, for there is no road nor a good trail to the place and, when coming by sea, one must use a shallow draft boat and enter at high tide, in order to negotiate the reefs and shoals that obstaculize the entrance to the shallow lagoon, the latter being the only safe anchorage and landing area in the region. When the sea gets rough, the whole entrance is covered by foaming breakers.

On the inland side of the dunes, and at both ends of them, one may find brackish water. At the western end it is quite drinkable, but, under the manchineel trees at the other end, at the small hole where the wild goats often drink, the water is too bitter and salty

for humans. Inland, there are several places where one may find drinkable brackish water, down in the bottom of deep fissures. To the west, between Tortuga Bay and Cerro Gallina, there are two fresh water springs, close to the shore, one of them located between the latter hill and a place called La Fe. This spring is at the bottom of a small rocky-sided canyon. It is said that there is another spring somewhere inland from this same coast.

During a recent visit to the area inland from Tortuga Bay, I was appalled by the great destruction caused to the vegetation by the wild goats. A few years before, I had visited this region on many a hunting trip, and had found the vegetation, in most places, quite impenetrable. These same places are now bare rock, except for the sorry remains of woody vines and shrubs that have been utterly stripped of bark and leaves, standing in the barren nakedness of their death as a mute warning of what will happen to all the vegetation of the goat-infested islands, unless something drastic is done in the very nearest future.

Having noticed that both local people and visitors find Tortuga Bay a most attractive place, and considering its relative closeness to the inhabited part of the island, I should suggest that it be set aside for a recreational area, with the necessary regulations to protect its natural beauty, flora and fauna. I am sure funds could be obtained from the Government and other sources to make a trail suitable for hiking and riding to the lagoon. This could not cost too much.

Tortuga Bay is indeed most beautiful, and it is a pity that so few people have the opportunity of enjoying a visit to this place.

Cerro Gallina is located at the southwestern end of the island, being remarkable for its summit, which is formed by several jagged peaks, as well as for its isolated position, the latter making it a landmark visible from a considerable distance. Long ago, this hill was known as Cerro Colorado, a name given now to a sedimentary formation on the east side of Santa Cruz, while the original Cerro Gallina was one located on the northwest side of the island.

These confusions in the geographical names of Galápagos are not uncommon, there being also a bay, just north of the present Cerro Gallina, called incorrectly Tortuga Bay on the newer charts of the Archipelago.

Cerro Gallina has a poor anchorage, and landing is difficult most of the year, for this shore is open to the prevailing winds. The place is very interesting, though, and well worth a visit, not only on account of its pristine beauty, but also because it is the only part of the coastal region where one may still find the giant tortoises in any numbers. Cerro Gallina is within the restricted western part of Santa Cruz, which is a tortoise refuge, and special permission must be obtained to visit it from the Charles Darwin Research Station and the port captain of Puerto Ayora. This is the case of all parts from here to Conway Bay.

Puerto de las Chacras and Santa Rosa.- About three miles to the south of Conway Bay, the beautiful anchorage on the northwest side of Santa Cruz, and across from Duncan Island, there is a quiet little harbor, with a landscape that is pleasant to the eye, though rather arid, especially during the cold months, when the palosanto (*Bursera*), the dominant tree in this region, has shed its foliage. This place is known today as Whale Bay, one of the few geographical names that have survived from the Norwegian settling venture of 1926. In the old days, it was known as Puerto de las Chacras ("Harbor of the Farms"), for it was here that the trail started, leading to the plantings at Santa Rosa and Salasaca, the so called "pirate farms." This trail was still more or less open during the early years of this century. It started from the little landing beach, at the foot of Whale Hill, whose steep peak serves to identify this cove from a distance. Whale Hill, Cerro Ballena, was the Cerro Gallina of the archil gatherers and tortoise hunters.

The little beach, at the head of this anchorage, is not white as those in Conway Bay and elsewhere in this region, its sands being mostly golden green crystals, diminutive gems of chrysolite, a magnesium iron silicate.

It was at Whale Bay that the first botanical specimens from Santa Cruz were collected by Nils Johann Andersson, botanist on the Swedish frigate "Eugenie." Though the ship only stayed for a few hours, Andersson found several new species of plants, and left us a

very good description of the place, mentioning among other things an abandoned hut at the foot of the jagged Whale Hill (28). This was in May, 1852.

As early as 1846, there were inhabitants at Puerto de las Chacras. Captain De Gueydon, who visited the place in September of that year, mentions two or three huts at the foot of Whale Hill. From these dwellings, a path led to the fresh water spring some ten miles to the interior. The latter could be none other than the little spring at Santa Rosa. De Gueydon, then commandant of "Le Genie," in his very interesting report to his superiors in the French Navy, does not mention any plantings near the spring or elsewhere, nor does he tell what was the occupation of the inhabitants; but we may safely assume that they were archil collectors and tortoise hunters, most likely the workmen of Villamil and Mena, from Floreana.

Constructions such as those mentioned by De Gueydon and Andersson must have been maintained by the archil collectors and tortoise hunters in later years at this place, as there were two abandoned and quite dilapidated huts at the foot of Whale Hill, as late as the end of the past century, according to Maestro José Vallejo, former boilermaker of the sugar plantation at Progreso (San Cristóbal), who saw them when, in his youth, he gathered archil for Cobos. The plantings left at Santa Rosa and Salasaca by the archil collectors and the oilers survived, in great part, up to the first years of World War II, more or less, when the wild pigs,

introduced by the Norwegian settlers in 1926 to the southern part of the island, discovered this region of Santa Cruz, destroying everything except the orange trees, lemon bushes and the "cabuya" (*Furcraea cubensis*), the latter forming extensive thickets that extend below this region. This sisal-like plant was probably introduced to serve as a fence to keep out the wild donkeys.

Manuel Cobos, owner of the sugar plantation at San Cristóbal, is credited with starting the plantings at Santa Rosa and Salasaca, in order that his men, while working around the Canal de San Salvador, Canal de Isabela and Canal de Pinzón areas, would have a handy supply of fresh food. This story, told by some of the oldest early settlers of San Cristóbal, sounds very reasonable, since it was in the same manner that Cobos started his plantation at San Cristóbal, which was later to grow far beyond its original size and purpose, becoming one of the largest sugar plantations in Ecuador.

After the penal colony was established at San Cristóbal, much against Manuel Cobos' will, he would at times deport people to Santa Cruz, having them work at Santa Rosa as punishment for bad behavior. Such was the case of one Camilo Casanova, often mentioned as an example of Cobos' cruelty. This man was sent to Santa Cruz for his rebellious and undisciplined character, at a time when no human being lived on the island. His version of a precarious existence in constant thirst and hunger is quite unbelievable when one knows that there was plenty of meat to be

had on the island (iguanas and tortoises), and that there was an abundance of cassava, taro, plantains, oranges, lemons and other edible products at both Salasaca and Santa Rosa, the spring at the latter place flowing cool and clear throughout the year. The trail from Puerto de las Chacras was open and well-known among the settlers and convicts of San Cristóbal, there being even a rough shelter at Santa Rosa. However, it must have been with a feeling of despair that the rebellious Casanova watched the boat that brought him, as it sailed out of Whale Bay, while he stood on the golden-green sands, at the foot of the jagged hill, enveloped by the whispering silence of the vast and lonely island,

It was in this same region, between Puerto de las Chacras and Conway Bay, that the unlucky crew of the Norwegian bark "Alexandra," under Captain Emil Petersen, landed. This vessel was carrying coal from Newcastle to Panamá, in 1906. Caught by the equatorial calms, it lay adrift between its goal and the Galápagos Islands. The days came and went, water and food became scarce, and the crew turned restless. Seeing them on the verge of mutiny, Captain Petersen agreed to their request of abandoning ship, which was done on May 8.

On the third day of travel in the lifeboats, with a course for the Galápagos, the men from the "Alexandra" saw some mountains which were believed to be part of Isabela, reckoned as 25 miles distant. During the night, the current carried them away from the

Islands, so that the next morning they could no longer see land. Only on May 20 did they sight the Archipelago again, this time making a successful landing close to Conway Bay. It is told that Captain Petersen landed with a money belt containing 800 pounds sterling.

During one of their many unsuccessful searches for fresh water, the castaways discovered the remains of a fire, footprints, an empty tin and several overturned rocks, all recent signs of the presence of the members of the California Academy of Sciences Expedition, which, unluckily for the crew of the "Alexandra," were, on May 20, drifting south of Nameless Island, some distance to the south of where the seamen landed, trying in vain to make their way to the north. Had they succeeded, it would have meant the prompt rescue of Petersen and his men.

The castaways had to drink the blood of sea lions and iguanas, and try the soapy acrid juice of the cacti, in order to survive thirst. After a difficult journey over broken lava, they arrived, months later, at Aguada de Chávez, recently renamed Academy Bay.

Exhaustion, the difficult terrain, the sun and the constant thirst had soon caused Captain Petersen to feel the weight of his 800 pieces of gold, which he finally hid somewhere along the west coast of Santa Cruz, where they are still supposed to be, if nobody has found them.

Puerto Ayora, at Academy Bay, is the only inhabited part of the coast of Santa Cruz, and nobody has attempted to settle permanently at Puerto de las Chacras, but there is a small group of settlers that has claimed land at Santa Rosa, since 1959.

The North Coast, Baltra and Seymour.- The north coast of Santa Cruz is one of the most attractive places in the Canal de San Salvador region. There are numerous small, blindingly white beaches, the water is clear and transparent, while good anchorages are found almost everywhere. There is an extensive and fine bay on the north side of the island, formerly known as Bahía Baquedano, now called Borrero Bay.

Baltra is better known as Seymour, the name of the tiny island to the north of it. With fifteen square kilometers of surface, it is the seventh in size of the minor islands. It is formed principally by two small plateaux, the largest one in the south. Its northern, eastern and most of its southern shores are formed by steep cliffs rising abruptly out of the surrounding waters. The terrain slopes from east to west, and there are several landings on the latter side, where the shore is low and rocky, interrupted here and there by shell sand beaches. From this coast, access to the interior is easy.

The best anchorage is Aeolean Cove, where there is still a dock, left by the U.S. Armed Forces, which had their main Galápagos base on this island. From the dock, an asphalt road leads to the interior

of Baltra, where, on the southern plateau, there is a landing strip, now used by the Ecuadorian Air Force and their passenger service to the Islands. This airstrip was extended and repaired in November, 1965.

During some remote past, this and the small island to the north of it must have formed part of Santa Cruz, from which Baltra is separated by a channel about a quarter of a mile wide, the Canal de Itabaca. The western end of Canal de Itabaca has been closed by a causeway leading over its shallowest part to the north side of Santa Cruz. A trail has been cut across the latter island to join the one going down from Bellavista to Puerto Ayora. A survey has been made to decide where the road joining Puerto Ayora to the Baltra airstrip will go. This was all done in early 1966, but nothing has been done about building the road. (This is a rather old project, which was first mentioned to me in 1958 by Senator Manuel Pareja, who was then sponsoring it in Congress, where he then represented the Islands).

Baltra is barren, its vegetation consisting mainly of cacti, palosantos, and several annuals such as grasses and small vines that grow during the warm season, if it rains. Along the lower shores, one finds some halophytic vegetation — mangroves and *Sesuvium*. In rainy years, water melons are abundant on this island, for, during the war, these fruits were imported in large quantities from

the inhabited islands, their seeds having been scattered around the barracks and along the roads.

Years ago, land iguanas were abundant on Baltra, but they were exterminated together with the goats, the only difference being that the former were completely wiped out, while enough of the latter remained to recover. The wild goats and a small proliferous mouse that was introduced during the last war constitute a serious danger to the scanty vegetation of Baltra.

In North Channel, which separates Baltra from Seymour, there is a small islet, where is found one of the few remaining colonies of Galápagos fur seals (*Arctocephalus galapagoensis*). It appears as if their number is increasing beyond the capacity of the islet, for a new colony seems to be establishing itself on the southwestern end of Baltra, most likely animals that have migrated from the Canal del Norte.

At various places on Baltra, deposits of fossil marine shells have been found. According to Ochsner and Dall these are from the Pliocene (29).

Seymour is the smallest of the minor islands, with a surface of only four square kilometers. Its formation is similar to that of Baltra, but it is remarkable for the endemism shown by its flora. Though

very close to Baltra, it has a different species of cactus all its own, *Opuntia zacana*.

To the northwest of Aeolean Cove, on Baltra, are located two islands, Greater and Lesser Daphne, the former an extinct volcano with a circular crater, the bottom of which is covered by white sand. Here numerous sea birds nest.

Puerto Núñez and the Plaza Islands.- To the east of Puerto Ayora, Punta Núñez reaches into the sea, its vicinity the former location of a large colony of land iguanas, as can be seen by the numerous abandoned burrows excavated long ago by these reptiles. Close to the point itself is a tiny lagoon, where a small boat may enter at high tide. Here, the inhabitants of the island used to catch sea turtles.

Beyond Punta Núñez, on the southeastern coast of Santa Cruz, is the small and calm harbor that bears the same name, its entrance difficult on account of the great number of reefs and the shallowness of the neighboring waters. This pleasant place was also a favorite turtle hunting area, as well as a campsite of the Santa Cruz fishermen. There are numerous indications that fresh water might be found inland from Puerto Núñez, not very far from the shore.

The coast beyond Puerto Núñez has an abundance of shoals, but there are also many places where a small vessel may take refuge, such as the anchorage at Punta Rocafuerte.

Only when one reaches Cerro Colorado, on the east side of the island, does the coast again turn high and abrupt, as at Academy Bay. From Cerro Colorado, the tall cliffs continue uninterrupted until one is half-way through the Canal de Itabaca.

Across from Cerro Colorado, and separated from Santa Cruz by a narrow but deep channel, are the Islas Plaza, two islets, the southernmost of which has a land iguana colony and, on its southern cliffs, a large colony of swallow-tailed gulls (*Creagrus furcatus*). This one, as well as the other islet, has a great number of sea lions living on it. The waters in this area are clean and transparent, but sharks are abundant.

Duncan and Barrington.- The former of these islands, known also as Pinzón, is separated from the west coast of Santa Cruz by the Canal de Pinzón, a ten-kilometer wide body of water. This small island shares the fifth place in size among the lesser Galápagos with Tower, being 17 square kilometers. Its height of 458 meters makes its terrain rather steep.

The tiny cove on its northeast side, protected by a little islet, was a favorite camping site of the Santa Cruz fishermen, some of whom

supplied themselves with meat from the local tortoise population (*Testudo elephantopus ephippium*), mainly at the great extinct crater in the north-northwestern part of the island's interior. It seems that this part of Duncan was much frequented by the great chelonians, even in the days of their abundance. The crater is somewhat greater than one kilometer in diameter and its inner walls reach an elevation of about 80 meters above the level of the reddish soil of its flat bottom. The floor of this huge natural amphitheater is about 140 meters above sea level, and its center is covered with annual vegetation, mostly grasses, during the rainy months, while in the dry ones it is a flat of red dust. Towards the periphery, the vegetation consists of spiny shrubs, their density increasing as one moves away from the crater's center.

During rainy years, the water accumulates in the center of the crater, forming a great pool, where the tortoises used to drink and wallow in the mud. At such times, the grass grows tall and strong along the edges of the pool. In drier years, the tortoises supplied themselves with water from the holes and depressions in the rocks, which fill with the slightest rain.

Tortoises were also plentiful in the western and the southern sides of Duncan, and it is possible to find a few at these places and at the crater, though they have been repeatedly reported as extinct. The broken terrain, abrupt and covered in great part by veritable barriers of spiny shrubbery, has saved many tortoises from

detection and capture. However, it was a long time since the Duncan tortoises had been able to produce young, due to the numerous rats on this island, which ate their eggs. However, the Charles Darwin Research Station has been sending people over to dig up their nests, to take the eggs to their station at Academy Bay, where they are hatched, and the young are raised until their shells are hard enough to discourage most predators. They will then be taken back to Duncan and released in their natural habitat. I had the pleasure of seeing the first specimens that were hatched in this manner, when I visited Santa Cruz briefly in November, 1965.

The insular hawk (*Buteo galapagoensis*), at one time very abundant on the south coast of Santa Cruz, an island from which it has almost disappeared, is still quite common on Duncan, as are several species of finches, and one of the mockingbirds (*Nesomimus parvulus*). There is a colony of sea lions in the northeastern cove.

It is reputed that two Americans found a treasure on this island in the 1920's.

Barrington or Santa Fe, some 17 kilometers from Punta Núñez, in the south east of Santa Cruz, is the fourth in size of the minor islands, with a surface of 25 square kilometers and an altitude of 260 meters. Like Duncan, it is barren, and the wild goats that live there often die of thirst and starvation during the more or less dry years.

The great abundance of arborescent cacti (*Opuntia echios barringtonensis*) found on Barrington makes it reminiscent of the southern lowlands of Santa Cruz; but here there is a most remarkable absence of cereoid cacti, though conditions seem ideal for the development of these. This island has also its own species of land iguana (*Conolophus pallidus*), which is still abundant in the upper areas of the island, where several rather large colonies survive.

Though the goats have caused tremendous destruction in the Barrington flora, the native vegetarian fauna still holds its own to a surprising degree. Besides the aforesaid iguanas, there are numerous ground doves (*Nesopelia galapagensis*) and the local species of rats (*Oryzomys bauri*) is still abundant. The young iguanas must have a hard time surviving, though, for the goats keep the ground clean of cactus fruit, an evidence of which is the remarkable scarcity of young cacti, which points to the fact that these interesting plants are hindered from reproducing and may become extinct in time. The young iguanas are not so apt to climb into higher trees as are the older, so they are more dependent on fallen fruit and such low vegetation as the goats prefer. It is also obvious that the goats are to blame for the disappearance of the genus *Scalesia* from this island. Dr. David Snow, former Director of the Research Station at Santa Cruz, showed me a photograph of what may be the only surviving plant of this helianthoid genus on Barrington. It was a small tree growing in an inaccessible place.

At present, the Charles Darwin Research Station is sending people periodically to shoot goats on Barrington, in order to keep down the numbers of these most destructive animals.

Hawks, marine iguanas, snakes, lizards and sea lions are still very common on this island, and the last are numerous at the small cove on the northeast side, where the boats traveling from Santa Cruz to San Cristóbal often overnight.

According to Van Denburgh (30), there were tortoises on this island, a fact that nobody else seems to have recorded. The California Academy of Sciences Expedition found a number of bones, belonging to fourteen tortoises, and two almost petrified eggs, the latter on the northern part of the island. Van Denburgh further tells that Captain Thomas Levick of Wreck Bay informed that tortoises were common on Barrington around the 1870's.

(28) N. J. Andersson: Om Galápagos-Öarnas Vegetation. Kgl. Svenska Vetenskaps-Akademien. Stockholm, 1858. Pg. 12.
(29) W. H. Dall and W. H. Ochsner: Tertiary and Pleistocene Mollusca from the Galápagos Islands. Proc. Calif. Ac. Sc. 4th Ser. Vol. XVII. No. IV. San Francisco, 1928. Pp. 94-96.
(30) Van Denburgh: The Gigantic Land Tortoises of the Galápagos Archipelago. Proc. Calif. Ac. Sc. 4th Ser. Vol. II. Pt. I. No. X. San Franciseo, 1914. Pgs. 365-366.

XV

FERNANDINA

This island, known as Narborough in English (after Sir John Narborough, an English naval commander), is the westernmost of the group, being separated from Isabela by the deep and narrow Canal Bolívar (4½ kms. wide). Its 750 square kilometers of surface makes it the third in size of the Galápagos. Its highest point is the rim of the main crater, 1,494 meters above sea level. Largely formed by recent lava, it still has several active craters, and its appearance is most uninviting to the visitor approaching its rocky, barren shores. It is the only major island not having an introduced fauna, therefore remaining more or less in its primitive condition.

The first person to ascend to the main crater of Fernandina was Rollo Howard Beck, the head of the California Academy of Sciences' Expedition. As he tells himself (31), he left the shore at daybreak, on April 3, 1906, starting out from Mangrove Point, in the southeastern part of the island. At noon, he came upon a lava field of greater age than the one he had so far followed. He estimated that he was half way up the mountain by then.

Following the older field, which had a few scattered cacti and some sparse vegetation, he found tortoise droppings. These were dry and contained remains of *Jasminocereus*, a cactus seldom eaten by tortoises, the spines on its trunk being large and rigid. Thinking that further up, where conditions would be better for more vegetation to thrive, he had better chances of locating tortoises, Beck kept on towards the summit of the volcano. On his way, he found lava that was older than that of the second flow, there being also some soil and a great abundance of land iguanas, which, as has been found out later, are numerous at all altitudes wherever there is a little vegetation to feed on. (Dr. Eibl-Eibesfeldt found them even at the bottom of the main crater (32)).

About evening, Beck arrived at the base of the main crater, where he camped until morning, when he continued up to the rim, which, on this side, is formed by an 800 meter wide flat. Though this stretch of ground showed more favorable conditions for the tortoises, there being a fair amount of cacti and grass, no signs of them were found.

Returning by way of his camp, Beck went to the place where he had found the tortoise droppings. He arrived there in the later part of the afternoon and searched along the old lava field. Soon, he came upon some older lava on which there was soil. Marked in this was a tortoise trail with the prints of one of these animals, which had traveled it not more than a day before. Following the tracks,

Beck discovered an old male, noticeably different from any of the known tortoises, though somewhat similar to the *Testudo elephantopus becki* of northern Isabela, which had been named after Beck some years before by Lord Rothschild, in recognition for his work in furthering the knowledge on these animals. This, the only specimen of tortoise even collected on Fernandina, was described and named *T. elephantopus phantastica* by Van Denburgh in his outstanding paper on the Galápagos Testudinae. As far as is known, this is the only tortoise ever seen on Fernandina.

In 1957, the main crater of Fernandina was ascended again and the shores of the sulphurous lake were visited for the first time by Drs. Eibl-Eibesfeldt and Bowman (33) with their companions. The group started from the northwestern side of the island, making a difficult journey over recent lava fields. Upon reaching the rim of the main crater, they went around to its eastern side, from where they descended to the bottom, reaching the shore of the lake with some difficulty. Here, they came upon a variety of animal life — land iguanas, lizards, snakes, mocking birds, finches, and the little Galápagos rats (*Oryzomys narboroughi*). In the lake swam pintail ducks, insect larvae and small fish. A small stream of warm water flowed into the lake from one of its shores.

Two members of the expedition improvised a raft with the empty water cans and visited the islet in the lake, a small volcano with its own little crater serving as the bed of a miniature lake. One of

them, Karl Angermeyer, of Santa Cruz, has painted several landscapes of the interior of the two-mile wide Fernandina crater lake.

The expedition returned by the northeastern slope, reaching California Cove, the anchorage at Punta Espinoza, the northeastern end of the island, where a boat was waiting.

In 1958, Dr. Roy Sudbury ascended the crater with the intention of settling by the shore of the lake. With him went two or three men from Isabela, engaged as porters. Sudbury returned very disappointed, settling at Point Essex, the southwestern end of Isabela, where he died in 1961. The lake had disappeared, its bed being dry and fissured. Through the cracks rose sulphurous fumes, while the small volcano on the rim of the main crater belched thick clouds of steam. Thus ended Galápagos largest body of fresh water. However, later visitors have reported that there is some water in the crater again, covering a small area of the bottom.

Fernandina seems to be the island of greatest volcanic activity in Galápagos, though more eruptions are actually recorded on Isabela. This is probably due to the isolation of the former island, where most minor eruptions must have passed unnoticed, especially on its western side, which is very seldom visited. Only a very large eruption would be noticed from the nearest permanent settlements (Puerto Villamil and Santo Tomás, on Isabela), as the one of June

11, 1968, which was seen from all the inhabited islands, and caused ashes to fall in many parts of Isabela. This recent eruption also caused the earth to shake as far away as Floreana, an unusual occurrence in Galápagos, where earthquakes are almost unknown.

A much greater outburst was the one described by Benjamin Morrell, master of the sailing vessel "Tartar" ("A Narrative of Four Voyages to the South Seas." New York, 1832). While anchored at Banks Bay, on February 14, 1825, at two in the morning, the "Tartar's" master and crew were awakened by a deafening noise, while incandescent ashes and flaming rocks exploded from Fernandina's center. At 4:30, the lava came forth, boiling over the rim of the crater like a cataract of fire, then forming a luminous river that wound its fiery path to the sea, where the water steamed furiously into dense clouds.

Gradually, the temperature of the water and air rose to such a point that the tar in the seams of the vessel turned soft and the crew felt suffocated by the heat. When a weak breeze came up, barely enough to move the "Tartar" on, sails were set and a course shaped for Elizabeth Bay, where anchorage was found at 11 p.m. of the 15th. The next day, at 8 a.m., the temperature here had also turned intolerable, so Captain Morrell was forced to abandon the area altogether.

On his return from Hawaii, on October 27 of the same year, seven months later, Morrell again called at Elizabeth Bay, from where he saw the volcano still belching lava.

On March 25 of the same year, Lord Byron, in command of H.M.S. "Blonde," on his way to Hawaii with the remains of King Kamehameha II and his Queen, who had died suddenly during a visit to London, witnessed the same terrible eruption from Tagus Cove, on Isabela.

The frequent, and often great, eruptions that must have taken place on Fernandina up to modern times explain the scarcity of tortoises, which must have been killed in great numbers by the flowing lava. At the same time, the lava has prevented the development of vegetation in any amount, making the environment unfavorable for a large tortoise population. However, it is very likely that the Fernandina tortoise is common in the upper parts, to the southwest and south of the main crater, where large patches of green may be seen from the shore. This is probably the rainiest area on this island, as it is less affected by the barrier that the Southern Mountains of Isabela form to the free passage of the trade winds and its moisture-laden mists towards Fernandina.

The best anchorage on Fernandina is California Cove, at Punta Espinoza. As elsewhere, the shore is formed mostly by sharp brittle clinkers. Among the upended broken slabs, in the midst of their

chaotic disarray, grow small groups of a low cereoid cactus (*Brachycereus nesioticus*), a plant found only under the most unfavorable conditions, where the lava has only recently solidified. Somewhat inland from the shore, are scattered shallow pools of salt water, whose groups of green mangroves stand here and there in the briny tepid water, accentuating the brownish somber desolation of the surrounding landscape.

At Punta Espinoza one still finds great colonies of marine iguanas, a sight common to all the insular shores years ago. There are also nesting sites of penguins and flightless cormorants. The region that includes the northern coast of this island, the northern part of Isabela and the neighboring waters was the favorite place in the Galápagos to the whalers that visited the Islands during the past century.

(31) Beck, in Van Denburgh: The Gigantic Land Tortoises of the Galápagos Archipelago. Proc. Calif. Ac. Sc. 4th Ser. Vol. II. Pt. I. No. X. San Francisco, 1914. Pgs. 301-302.
(32) Irenäus Eibl-Eibesfeldt: Galápagos, the Noah's Ark of the Pacific. Doubleday & Co., Inc. New York, 1961. Chapter VI.
(33) Eibl-Eibesfeldt, op. cit.

XVI

SANTIAGO

Known also as San Salvador and James Island, this, the fourth in size of the Galápagos with its 570 square kilometers, is located towards the center of the group, some 21 kilometers to the north-northwest of Conway Bay (Santa Cruz) and some 17 kilometers to the northeast of Punta Alfaro, on the east coast of Isabela. Its highest point is 907 meters above sea level.

The greater part of its lowlands is formed by enormous naked lava fields, except at James Bay. There is some good soil in parts of the moist region, a considerable distance from the shore.

In the higher parts of Santiago there are a number of rain water pools, around which one may still find tortoises, though these reptiles were much hunted on the island in the past century and their eggs and young are eaten by the wild pigs. The latter are abundant in the more wooded parts of the island. If nothing is done to protect the scanty remnants of the Santiago tortoise (*Testudo elephantopus darwini*), they will suffer the fate of the land

iguanas, which were very numerous in James Bay at the time of Darwin's visit. (At the beginning of this century there were no land iguanas left in the bay).

The wild pigs often come down to the northern part of James Bay, mostly when the guayabillo fruit (*Psidium galapageium*) ripen, in the later part of the warm season. James Bay is also a favorite place of wild goats and asses, which find an abundance of grazing here during the warm months. There are neither cattle nor wild dogs on this island. Of the native fauna, the ground doves, the snakes, the hawks and lizards are still fairly common. To the south of James Bay there is a colony of fur seals that is increasing in a promising manner, this species having been on the verge of extinction only a few years ago.

James Bay.- Named, like the island itself, in honor of King James II, this inviting and beautiful bay was the favorite refuge of buccaneers and whalers. A good anchorage on the western side of the island, it was used as a harbor by a buccaneer fleet in 1684, a camp being set up in its southern part, on a level stretch of ground above the tuff cliff that dominates the little landing beach. Still one may find a great quantity of terra cotta shards, where the great camp stood, and early visitors such as Captain Colnett, who called at James Bay during his second visit to the Islands (1794) found among the shards rusting daggers, needles and other metallic

objects that today form an unidentifiable part of the flat's reddish brown dust.

The site of the camp was well chosen, for there is always a breeze blowing, it dominates the approaches to the bay, is close to the best landing in the bay, and is not far removed from the spring at Sugar Loaf Mountain, which at that time of the year, if the rains are normal, flows clear and clean.

Among the buccaneers were Captain John Cook (their leader), Ambrose Cowley, Lionel Wafer, Edward Davis, John Eaton and William Dampier. Their long stay was due to Cook's illness, the camp having been erected mainly for his comfort, but the visit to James Bay was also used as an opportunity for dividing loot, resting and taking on supplies, for there was an abundance of fish, sea turtles, tortoises, land iguanas, water and salt. Several of these buccaneers left interesting observations on the conditions and the natural history of the places visited, notably Dampier. Ambrose Cowley made his chart of the Archipelago at this time, giving English names to the various islands, most of which are still in use.

When Cook's health improved, the expedition left the Galápagos. Soon after, Cook suffered a relapse and died, Davis being elected commander of his ship. The latter captain returned to the Islands at the end of the same year, in the company of Knight, to pick up some flour that had been cached in the bay.

The "Bachelor's Delight," under Captain Davis, returned in 1685, her surgeon, Lionel Wafer, leaving us an interesting description of the voyage and the visit to James Bay, a place that must have been a favorite one with Davis, who again returned in 1687, when he made two calls at this bay.

During his second visit to the Islands in that year, Davis organized the sharing of plunder in a most original manner. (It is said that this took place at Floreana). First, all the money was divided among the buccaneers. This done, all other valuables were auctioned off to the highest bidders. When the buccaneers ran out of cash, the money was again divided, so the auction could continue. This operation was repeated until all the plunder had been auctioned, the money being then divided again, for the last time.

In 1708, the "Duke" and the "Duchess" left England, under the command of Woodes Rogers, who was captain of the former vessel, on which the famous William Dampier sailed as an officer. The second ship was under Stephen Courtney, one of the financial backers of the expedition. On Juan Fernández they picked up Alexander Selkirk, the original Robinson Crusoe, who had been marooned there by Captain Stradling of the "Cinque Ports," some four years earlier.

During 1709, Woodes Rogers operated successfully in the Gulf of Guayaquil, being able to seize the city of that name, sacking it. Though exceedingly busy with the endless task of keeping discipline among his men, keeping in touch with his officers and seeing that his outfit worked smoothly, besides having to cope with the warm climate and the various tropical diseases, he still found time to study and describe the country, its political organization and its social life.

When disease broke out among his people, probably yellow fever, Rogers withdrew to Puná Island, at the mouths of the Guayas River, hoping that the fresh air of the Gulf would contribute towards the recovery of his sick. Later, he retired to the waters of the Gulf itself, from where he sailed to the Galápagos, as their drinking water was becoming scarce and he hoped to supply himself at Santa María de la Aguada (Floreana). Here, Alexander Selkirk proved useful, his years on the Juan Fernández having made him a fine woodsman.

In the meantime, a fleet of five ships, with 821 men, had sailed from Callao (Peru), under the command of Don Pablo Alzamora y Ursino, to search for Rogers in the Gulf of Guayaquil. Not finding him there, Alzamora also set course for the Galápagos, with no success.

Rogers arrived to England in 1711 and published his diary the next year. He was governor of the Bahamas from 1718 to 1721 and from 1729 to 1732, the last being the year of his death. Quite successful in fighting piracy in the Caribbean, he made a safe place out of the Bahamas.

The treaties signed at Utrecht from 1713 to 1714, and the more efficient escort provided to Spanish ships, made buccaneering illegal and difficult. On the other hand, there was now good profit in the increasing clandestine commerce with the settlers along the coasts of Spanish America, Thus, buccaneering passed into the realms of history.

In later years, after the whalers entered the Pacific and made Galápagos one of their haunts, James Bay became one of their favorite ports of call. It was in those days that Captain David Porter U.S.N. made his several visits to the bay, during the War of 1812 between his country and England. Porter reached the Islands on April 17 of 1813, commanding the U.S. Frigate "Essex," a vessel of 860 tons and 32 guns. Between that date and March 4 of the following year, when he was captured at Valparaiso (Chile) by the British, he sank and seized a considerable number of English whalers, causing great losses to that important industry.

Porter left interesting observations on the Islands, as well as on other places he visited, besides having the doubtful honor of

introducing the first domestic animals to the Galápagos. It must be said to his credit that this act was not intentional. Porter had four goats and some sheep on board and, the animals being very tame, he thought it safe to send them ashore without a watcher or tethers, so they could feed while the ship stayed there. This happened at James Bay, where they had arrived on August 4.

Every morning, one of the crew would water the animals at the landing. One day, the animals did not show up, nor were they found again, though a search was made. They had no doubt found the small spring up in the hills, for there is little if any water at the Sugar Loaf spring in August, and they would have been located there quite easily, as it is relatively close to the landing.

The goats proliferated, as may be seen today, no matter which side of the island one visits; but the sheep apparently did not, for nobody has seen them since shortly after Porter's visit.

On August 10, Porter lost one of his young officers, Lieutenant John S. Cowan, who had a disagreement with Lieutenant John M. Gamble of the Marines. There was a duel on the beach, the former officer losing his life. Cowan's remains still rest somewhere in James Bay. His grave is mentioned by Lieutenant Shillibeer of H.M.S. "Britton," who visited the bay almost one year later. This is the only known record of anyone seeing it after Porter left the

Islands. During World War II, the U.S. Armed Forces made an unsuccessful attempt at locating the grave.

According to Don Hugo Egas Zevallos, one of the sons of Don Darío Egas Sánchez (the first owner of the salt mine at James Bay), in his youth, when the mine was being exploited by his father, a partly mummified corpse was found, wearing the remains of a blue uniform that fell apart at the touch. The uniform had golden buttons and epaulettes, greatly tarnished by age. This surprising discovery must have taken place around 1926, and it was made somewhere in the neighborhood of Sugar Loaf Hill, not far from the spring, this being, incidentally, the closest place to the landing beach where there is enough lose soil to dig a grave, if one excepts the sand beaches along the shore, all of which are placed at the mouths of seasonal streams that run in the rainiest years — hardly a place to bury anyone or anything. It is not unlikely that the uniformed remains are those of the long dead Cowan.

The tortoise hunters made numerous visits to James Bay during the past century, and it was probably they who left the first ancestors of today's abundant wild asses. (Don Darío Weisson Egas, grandson of the salt mine's original owner, and I found some of their pens south of the bay, in 1964), The origin of the wild pigs on this island remains a mystery, the earliest record known to me of their presence being that made by J. Henry Blake, a member of the "Hassler" Expedition, who visited James Bay in 1872.

A wide and sinuous field of dark and bare lava descends down the middle of the bay, dividing it. North of the field the terrain is steep and wooded, while to the south it is formed by a rolling country of layered tuff and soil, covered in great part by annual grasses and herbs that dry out and turn into dust during the cold season. Over this vegetation stand the abundant palosantos, a few scattered acacias (*Acacia tortuosa*) and the ubiquitous *Castela galapageia*, the latter often attaining the size of a small tree in these parts. The southern part of the bay is dominated by the conically rounded steepness of Sugar Loaf Hill, which, seen from the west-northwest, resembles, more than a sugar loaf, the breast of a young woman.

To the north of Sugar Loaf Hill, hugging the lava field, about two kilometers from the shore, is a low and elongated volcano. Inside its extinct crater is a shallow salt lake, the bottom of which is formed by alternate strata of salt and mud. Its waters are much visited by pink flamingoes, gallinules and Galápagos pintails.

The salt strata of this crater lake are of unusual purity, some samples containing up to 99% sodium chloride. It was here that the islanders supplied themselves, when the salt pans on their home islands were flooded in rainy years. The lake and all the west coast of the island, from Buccaneer Cove (north of James Bay) all the way down to Cape Nepean, the southwestern tip of Santiago, is the private property of the heirs of Don Darío Egas Sánchez, who owned the salt mine from 1922.

Since salt was a state monopoly until recently. Don Darío was not able to exploit his mine until the salt pans at Salinas, on the Santa Elena Peninsula, were flooded and he could therefore sign a contract with the Ecuadorian Government. From December 1926 until the year 1928, when the Salinas pans were in production again, and the Government rescinded the contract, the Egas mine produced 32 thousand one-hundred-pound sacks of the mineral. Though exploitation had to be abandoned, the Egas family kept their rights on the property, awaiting the day when an opportunity for reopening the mine would appear.

After a long struggle to secure another contract with the Government, Don Darío's heirs, the Egas Zevallos, and some of his grandchildren, finally succeeded. Shortly before exploitation was started, however, the monopoly on salt was removed, casing a considerable fall in its sales price. This was the greatest blow received by the family since the annulment of the 1926 contract, and their company went into such a crisis that it had eventually to stop production.

It is most unfortunate that this should be the end of the mining project at James Bay, for considerable capital has been invested in equipment and roads, and the owners were about to begin marketing their main product, the first iodized table salt in Ecuador, a much needed product in a country with such a high percentage of thyroid disorders. While negotiations have dragged

on with the Government-owned Banco Nacional de Fomento for several years, and with no foreseeable results, other companies have developed salt production on the Mainland.

Sulivan Bay.- This harbor of remarkable beauty is located on the east side of Santiago. Most of its terrain being formed of burnt-looking lava, it has very little vegetation, the spatter-cones that adorn the landscape, the broken small craters and jagged rocks giving one the illusion of being on the moon.

The bay was named after one of the officers of the "Beagle," the ship on which Darwin visited the Islands, in that historical year of 1835, three centuries after the discovery of the Archipelago.

The southern shore of Sulivan Bay is formed by the volcanic Bartholomew Island, named in honor of Lieutenant David Ewen Bartholomew, R.N. It was on this islet that, walking among the volcanic scoria, we almost stepped on a land iguana, which, much alarmed, scurried into one of the fissures. This was a most unexpected incident, since these animals have long been considered extinct on Santiago and on this islet. Later, I found out that some iguanas had been landed there by one of the settlers from Santa Cruz, who had been fishing in the area. A land iguana was seen south of James Bay by one of the workers of the salt mine. This latter specimen may have been native to Santiago, as it was found in an isolated and rarely visited area.

Slevin (34) found only a few bones of land iguanas on Santiago, across from Bartholomew Island. However, it is not impossible that land iguanas are still to be found in small numbers inland.

According to Wollebaek, there was an eruption on Santiago, in the year 1897 (35).

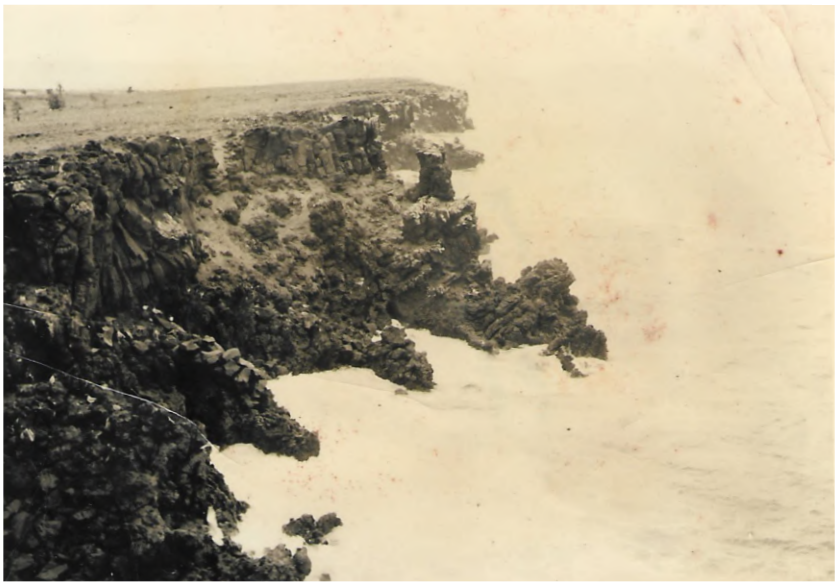
Jervis.- The eighth of the lesser islands, it is steep and barren, its surface reaching barely ten square kilometers. This island was much visited by the Santa Cruz fishermen, in the years following World War II. Officially known as Rábida, Jervis has an altitude of 367 meters and was the habitat of a tortoise, *Testudo elephantopus wallacei*, a form now most likely extinct, since recent visitors have been unable to find any specimens, despite the open vegetation, which allows little opportunity for concealment.

On the north side of Jervis is an extensive sand beach, crowned by a narrow strip of halophytic vegetation. Behind it is a shallow salt water lagoon much visited by flamingoes.

(34). Van Denburgh and Slevin: The Galapagoan Lizards of the Genus Tropidurus; with Notes on the Iguanas of the Genera Conolophus and Amblyrhynchus. Proc. Calif. Ac. Sc. 4th Ser. Vol. II. Pt. I No. IX. San Francisco, 1913. Pg. 189.
(35) Alf Wollebaek: De Forheksede Øer. J.W. Cappelens Forlag. Oslo, 1934. Pg. 30.

Detail of recent lava fields at James Bay, Santiago — pahoehoe formations.

Black Beach, on the west coast of Floreana. Rocky shores, small and few sand beaches. In the background, extinct volcanoes. The highest is Cerro de la Paja, a 640 meter high tuff formation, the highest on this island.



Basaltic cliff. Such formations are common in the Galápagos, especially in the south and the northeast of Santa Cruz.

A *Jasminocereus howellii delicatus* in fruit. This variety of *J. howellii* has been found so far only in Santiago.

“Ulva," the three-masted schooner that brought down the Norwegians who started a cannery on Santa Cruz and founded Puerto Ayora. The "Ulva" was sold to the Ecuadorian Navy, its name being changed to "Patria."

A male of Santa Cruz tortoise (*Testudo elephantopus porteri*).

The "Cristóbal Carrier" at James Bay. This bay was a favorite place with the English buccaneers. This picture was taken from the site of the main camp of a buccaneering expedition that spent some time here in 1684. In the background, the inland mountain range and a recent lava field. The low and flat-topped hill to the right has a crater at the bottom of which is the salt mine that was exploited by the "Dariegas" company.

XVII

SAN CRISTÓBAL

Known also as Chatham (after Lord Chatham), this island of 430 square kilometers is the fifth of the Archipelago, the closest to the Mainland and the most populated, the last due to the fact that it is the only of the Galápagos with an abundant supply of fresh water. San Cristóbal reaches its greatest altitude at Cerro San Joaquín, a 720-meter high hill in the southwestern part of the island, not far from the area where its approximately 1,500 inhabitants live.

Evidently, this island has a more impermeable subsoil than the others, for, when it rains abundantly, the water runs towards the lower parts in numerous small brooks, on the south, southeast and southwest sides, reaching in many places all the way down to the sea, instead of disappearing in the subsoil after a short run, as is almost invariably the case on other islands of the group. Aside from the purely seasonal brooks, which run only in very rainy years, there are several on the windward side of San Cristóbal that run all year, some reaching the shore, as do the two that form the

waterfall at Freshwater Bay, an exposed roadstead on the south coast.

The buccaneers mention little about San Cristóbal in their logs and diaries, but the island was much visited by the whalers and tortoise hunters of later times. The tortoise hunting parties left low stone pens, such as are found on the northwestern coast of this island. These were used to keep live tortoises, probably for future use as food or for trading with whalers.

Colnett called at San Cristóbal in 1793 and 1794. During his first visit, he looked in vain for fresh water, giving up his search when he had almost reached the brooks that run out to the sea on the windward coast. His lack of success in finding water caused him to sail back to the Mainland, from where he returned a second time, to continue his observations. Colnett's chart of the Islands was in general use among the whalers of later years.

Puerto Baquerizo Moreno.- While the first Floreana settlement existed, San Cristóbal was often visited by General Villamil and General Mena, who showed a marked preference for Wreck Bay, the old name of which Villamil changed to Puerto Cabello. Later, it was known as Puerto Chico, until Doctor Alfredo Baquerizo Moreno, the first Ecuadorian president to visit Galápagos, came here in 1916, and the inhabitants renamed the bay in his honor.

The first settlers preferred Wreck Bay to any of the windward anchorages, though some of the latter have fresh water, because it is the closest all-year harbor to the moist region, whereas all the windward anchorages are too rough in the cold season. Also, the terrain between the interior and Wreck Bay is less broken and of a more gradual slope, which makes the distance to the coast somewhat longer, but much easier to cover.

It is likely that a few whalers jumped ship here, as well as in Floreana. But none of these temporary settlers left any record of their passage, except for the legendary Watkins, who lived on the latter island. The first group of settlers was made up of some of the people from the Floreana settlement who moved over with General Mena in 1837, discouraged by the penal colony that the Government had established there, and disgusted with Governor Williams' despotic rule. (See next chapter). These settlers as well as those that came later, showed a marked preference for the highlands, where agriculture was possible.

At present, Puerto Baquerizo Moreno is the place of residence of the Governor, the Apostolic Prefect, and the Commandant of the Second Naval Zone — the three highest-ranking officials on the Galápagos. It is also the port of entry and clearance to the Islands, all vessels coming from the Mainland ports or from foreign countries being expected to call here first and last during their visits to the insular group.

The village consists of a small number of houses, mostly with wooden walls and corrugated iron roofs. On a high stretch of ground, on the inland side of it, stand the wooden church, the convent school and a building that the former Apostolic Prefect, Monseñor Juan de Dios Campuzano intended to use for a hospital, and which was finally finished and inaugurated by his successor, Fray Hugolino Cerusuolo, early in 1968.

Along the southern shore of the bay are the buildings of the Ecuadorian Navy's base, including a fine administration building made out of hewn lava rocks.

At the head of the bay, close to the beacon, is the dilapidated wooden pier, built during the past century by Don Manuel Julián Cobos for the loading of sugar from his Progreso refinery. A new dock was being built by the joint efforts of the Ecuadorian Navy and the Galápagos Public Works, in front of the Naval Zone's administration building. I hear that this project was abandoned as soon as its initiator, Lt. Commander Fausto Alvear ended his term as Naval Commandant at San Cristóbal.

On the north shore of the bay are a good dock and several buildings in various stages of destruction — the remains of what was one of the best freezer plants on the west coast of South America. Out of operation for a number of years, it belongs to the Sociedad Nacional de Galápagos, whose only remaining profitable

interest on the Islands is its coffee plantation, the latter all that remains of the original Cobos estate.

Progreso.- Following the old plantation road, which has been maintained by the Government and the settlers during the last few years, one ascends gradually to the interior, reaching Progreso after about seven kilometers. This, the oldest existing settlement on Galápagos, was the location of Cobos' sugar plantation.

Though the vegetation of the lower regions has suffered much destruction through the felling of trees for firewood and lumber, and the death of great quantity of plants such as palosantos and arborescent cacti, destroyed by wild and tame donkeys and goats, the flora of the dry region remains more or less unaffected by introduced botanical species. This is far from what can be said of the vegetation in the moist end of the upper intermediate regions. Here, the guava (*Psidium guajava*), in the form of bushes and small trees, has displaced almost completely the major forms of native flora and a large number of the smaller species. In some places it is associated with orange and lemon trees, and here and there interrupted by dense groves of the introduced rose apple (*Syzygium (Eugenia) jambos*). All these species originated in gardens and orchards.

On San Cristóbal, though to a lesser degree than on Floreana, we have an outstanding example of the deep changes that man may

unwittingly bring with his presence. Few of the large animals of the aboriginal fauna remain — only a few scattered sea lions on isolated beaches. This fauna is now mostly represented by some insects, arachnids, lizards and small birds. The island's tortoise (*Testudo elephantopus chathamensis*) is on the verge of extinction, though it seems to have bred as late as 1958 or thereabouts, according to data obtained by myself, in 1964, with the financial aid of Dr. David Snow, at the time Director of the Charles Darwin Research Station (36, 37).

Asses, goats, horses, dogs, pigs and cats, as well as a few heads of the once abundant wild cattle, are the present-day inhabitants of the remote areas of San Cristóbal. The last animals were almost wiped out by some of the more ignorant settlers, who hunted them for hides or to use the beef as food for their pigs and poultry.

Where before there were extensive cane fields, the result of Cobos' enterprise and effort, one views today great forests of guava, and small patches of cultivated ground, where a little coffee, cane, vegetables and cassava are raised by the local farmers. Here, as on the other islands, coffee, cattle (which runs loose all over the fertile parts of the island) and fish are the only cash crops of any importance. White rum, vegetables, pork, poultry and eggs are produced for the local market, and the fiber of a "century plant" (*Retreroya cubensis*), a wild-growing introduced species, is exported to the Mainland in limited quantities.

Ascending inland from Progreso, the terrain rises rapidly, the vegetation changes, the guava trees turning gradually into bushes and the cacaotillo (*Miconia robinsoniana*) becoming more common. In the days of the sugar plantation, this area above Progreso was open and covered with grass. Since the grasslands commenced at a lower altitude than on the other islands, one may suppose that annual burnings were made during dry periods, as is widely practiced on the Mainland, and that these destroyed the vegetation of the upper moist region, causing it to be replaced by grass. This supposition is partly confirmed by the observations of Stewart (1905-06), who mentions that the cacaotillo was then found only in ditches in the moist region (38). The favorite habitat of this species being the upper parts of the moist region, a somewhat exposed area, something must have destroyed it in its usual habitat. At present, the cacaotillo has not only invaded its usual habitat, but it has also extended over a great part of what we have come to consider the almost exclusive habitat of the grasses. At such altitudes, these small trees attain little height. Like the guavas around them, they seldom get to be more than stunted bushes. Generally, one finds these two species decorated by a profusion of hanging moss and liverworts, and great quantities of ferns covering the space between the bushes.

It is in the region above, that country of great open spaces carpeted with short grass, that the major brooks of the island are born. Two or three of these, joining into one stream, are cut by a small dam,

part of their flow being carried to Progreso and Puerto Baquerizo by a pipeline that follows in great part the ditch built by Cobos to carry water to his refinery, the little spring above Progreso being too small for his needs. From the latter settlement, the pipeline continues to a reservoir above Puerto Baquerizo.

This pipeline was laid by the Americans during World War II, with the purpose of supplying their base at Baltra with fresh water. The water was loaded at the end of the old pier, into cistern-barges, which were towed to Baltra by sea-going tugs. The availability of fresh water at Puerto Baquerizo made its growth possible, this taking place in a very short time, for not only did outsiders move in, but many of the islanders, who had until then preferred the highlands, moved to the bay and became fishermen.

In the highlands is also El Junco Lake, the only fresh water body of its kind on the Galápagos, since the disappearance of the lake at Fernandina. Like the latter, it is located at the bottom of a crater, but the volcano, as well as the lake, are small, the latter having a diameter of around two hundred meters.

The Leeward Coast.- Traveling from the southwest, going past Puerto Baquerizo, one may see a number of beautiful places, most of them easy to land on. On this coast it is possible to find anchorage and landing almost anywhere, save in a few instances, during the warm season, when a strong northerly is blowing. Just

before reaching Puerto Ochoa is a small beach of white sand, framed by a dark lava cliff on one side and an almost black shore of lava on the other, its sands bathed by the most transparent water.

Puerto Ochoa proper is between Lobos Islet and the shore of San Cristóbal, a fine anchorage even for large vessels, the latter finding suitable depths somewhat to the north of Lobos Islet.

Beyond Ochoa is Manglecito, a small anchorage for minor vessels, sheltered to the north-northeast by Manglecito Point, which marks the beginning of Puerto Grande (Stephens Bay). The famous Kicker Rock (León Dormido) stands at the entrance of this large bay, a 148-meter high landmark that can be seen from a great distance. Puerto Grande has a number of small white beaches and there are many places of great beauty here, but none is as fine as Sappho Cove, at the head of the bay. This little shallow anchorage is almost hidden by a small islet and a reef that extends from it towards the main island. The entrance is between the southeastern end of the islet and San Cristóbal. Sappho Cove being invariably calm, the Puerto Baquerizo fishermen use it to careen their boats, when the seas are too rough at their settlement. It is said that the crew of an American yacht dug up a treasure from the dunes above the beach at Sappho Cove, about three or four decades ago.

Puerto Grande ends at Finger Point (Cerro Brujo), an isolated hill that stands 224 meters above the waves that lap its foot. Its strangely shaped, jagged summit can be seen from afar.

On the land side of Cerro Brujo are some salt pans dug by Puerto Baquerizo fishermen, who come here for salt in the cold season, when the brine has evaporated enough for it to form. Inland from the salt pans, extends a most barren country of sharp clinkers, a strange and desolate landscape of volcanic debris scattered in jumbled heaps and mounds, nearly devoid of vegetation.

Continuing northeast, that is, following the coast from Puerto Grande on, one reaches Terrapin Road (Rada Tortuga), where the dark landscape is somewhat relieved by the green of the mangroves. In the vicinity of this anchorage are some of the stone pens mentioned earlier, where the tortoise hunters kept live tortoises.

At the northeastern tip of San Cristóbal is Hobbs Bay, a fine little bay known as El Calzoncillo, the Drawers, among the local fishermen, none of whom has been able to give me the reason for this odd name. This sheltered harbor and the small anchorage at Punta del Este, the latter at the foot of Mount Pitt, are the last havens of the leeward coast, for turning Punta del Este begins the exposed windward coast, where all the anchorages are made useless

by the prevailing winds and the seas that break along the coast, during the cold season.

The windward coast has many places of beauty, such as the extensive Rosa Blanca Bay and the somber Freshwater Bay, the latter with a nine-meter high waterfall leaping down a dark lava cliff.

Inland from Freshwater Bay, ascending into the moist region, is a wonderful country of steep green mountain sides, cut by deep canyons, in the bottom of which run clear little streams. From these slopes, on clear days, one has the illusion of being suspended over the immensity of the ocean.

Hood Island.- Known officially as Española, this, the southernmost of the Galápagos, has a surface of 103 square kilometers and an altitude of 198 meters above sea level. Much visited by the San Cristóbal fishermen, especially in the old days when fishing was done from rowboats, its tortoise population provided a welcome change in these hardy seafarers' diet. Needless to say, the local form of the giant tortoise, *Testudo elephantopus hoodensis*, is now almost extinct.

Sea lions are still very common along the coasts of Hood, and one frequently sees red-billed tropic birds (*Phaëthon aethereus*) flying

over the fifty kilometers of ocean that separate this island from San Cristóbal, its nearest neighbor.

On the east side of Hood, in the Punta Cevallos area, are the only known nesting grounds of the Galápagos albatross (*Diomedea irrorata*). In the same region, other sea birds also breed and nest — boobies (*Sula*) and frigate birds (*Fregata*). Above this area, a ways inland, are the remains of the radar station that the U.S. Armed Forces had here during the last war.

On the northeastern side of the island is Gardner Bay, with its rocks and islets, snowy white beaches and clear waters of slightly violaceous color. Here, as elsewhere on the island, the shore is backed by a tangled mass of thorny shrubs, forming an impenetrable barrier, beyond which is more open country. The feral goats have caused much destruction to the flora of Hood, and the once abundant arborescent cacti (*Opuntia megasperma megasperma*) are among the species that may be considered as almost extinct on this island.

(36) David W. Snow: The Giant Tortoises of the Galápagos Is.: their Present Status and Future Changes. Oryx. Vol VII. No. 6. Dec. 1964. Pgs. 288 and 290.
(37) Noticias de Galápagos. Publication of the Charles Darwin Foundation. No. 4. Brussels, Dec., 1964. Pg. 19.

(38) A. Stewart: A Botanical Survey of the Galápagos Islands. Proc. Calif. Ac. Sc. 4th Ser. Vol. I. No. II. San Francisco, 1911. Pg. 119.

XVIII

FLOREANA

Called also Santa María and Charles, this island is located some 68 kilometers to the west of Hood and about fifty to the south of Santa Cruz. It is the smallest and the lowest of the six major islands, having a surface of only 137 square kilometers and an elevation of 640 meters, at Cerro de la Paja. Its population of less than fifty makes a living from fishing and agriculture, as the people elsewhere on the Galápagos.

This island has an interesting history, being the first one settled. Its first inhabitant, assumed to be the very first settler of Galápagos, was one Patrick Watkins, who was left on the island around the year 1805 by a whaler — it is not certain whether at his own request or marooned. During the two years that he lived on Floreana, he devoted himself to raising vegetables that he bartered or sold to whalers, already numerous in these waters. Many stories circulate about this resourceful Irishman, but, having sampled the exaggeration with which most tales about these islands are so heavily spiced, I hesitate to take any of them at face value.

Watkins, though he probably did well with his business, must have grown tired of his solitude, for he ended it by stealing a boat belonging to a visiting whaler. It is reported that he was seen some time later in Paita, Peru.

It is possible that there were several other such lonely settlers on this and some of the other islands. When the act of possession by Ecuador was signed at Floreana, in 1832, one of the witnesses was one Juan Johnson, "old inhabitant of this island" (39).

The first organized colonization of the Islands was promoted by General José Villamil, a Spanish Creole from Louisiana, long time resident of Guayaquil, who had taken an active and important part in the independence of Ecuador. Shortly after Ecuador had seceded from the Republic of Great Colombia, in October of 1831, Villamil sent a commission to look into various possibilities offered by the Galápagos, especially in connection with the then valuable archil (*Roccella*), a lichen known to exist there.

On November 14 of the same year, in the name of the Sociedad Colonizadora del Archipiélago de Galápagos, he filed a claim on the lands he thought necessary for his project, having previously ascertained that the Government was about to follow his advice and take possession of the Islands.

By the end of the year the first President of the Republic, General Juan José Flores, had sent instructions to the Guayaquilean poet Don José Joaquin de Olmedo, Prefect of Guayas, that he organized an expedition. This was done, and it was placed under the command of Colonel Ignacio Hernández, who was appointed Justice of the Peace for the future settlement. The group sailed aboard the schooner "Mercedes," on January 20, 1832. Besides Colonel Hernández, two partners of General Villamil and a chaplain for the colony, there was a small group of settlers along. These were soldiers who had taken part in a coup against the Flores government and had been sentenced to death. Villamil, learning of their case, talked Flores into granting them a pardon on the condition that they left for the Islands as settlers.

On February 9, the schooner "Mercedes" arrived at Floreana. On the 12th, a ceremony took place whereby Colonel Hernández declared Galápagos Ecuadorian territory, in the presence of the passengers and crew of the "Mercedes," the island's lonely inhabitant, and the captains and crews of the American vessels "Levant" and "Richmond." He also changed the name of the insular group into "Archipiélago del Ecuador" and named Floreana in honor of General Flores.

The new colonists proceeded to search for a suitable place to settle, the area adjacent to the largest spring on the island being chosen, a place about three hundred meters above sea level. The site was

named Asilo de la Paz (Haven of Peace), a name that is still used for it, since the Wittmers, a German family that settled there a hundred years later, called their farm by that name, to honor the memory of these early settlers.

On February 19, Colonel Hernández and the chaplain started the distribution of land among the settlers, who are said to have proceeded to work with great enthusiasm. In April and June, more settlers of both sexes arrived, and, in October of the same year, General Villamil came out as Governor of the Galápagos, bringing with him a group of eighty people. From the very beginning, he took a keen interest in the welfare of the colonists, working actively to help them ahead.

Villamil introduced domestic animals such as cattle, goats and pigs, never guessing the consequences to the flora and indigenous fauna. In 1835, when Darwin visited Floreana, the goats and pigs had multiplied enough to provide wild game. The local subspecies of tortoise, however, had grown so scarce that a great part of the tortoise meat and oil used by the settlers came from other islands, as may be assumed from the fact that Darwin found some of the settlers engaged in tortoise hunting at Santiago. Apparently, *Testudo elephantopus elephantopus* was becoming extinct even at this early date.

Though the settlers had an income from their trade with the whalers, the shipping of archil and the tortoise oil, aside from producing much of their own food, Darwin writes that they complained of poverty. Without doubt, discontent was breeding in the settlement, for it is known that by then the first settlers had lost most of their enthusiasm, missing life on the Mainland, and longing for their native regions. Also, the colony was entering its phase of decadence. This was to be expected, since the Government had started to send political deportees as early as 1833, in order to increase the island's population. Though hardly the best manner to recruit settlers, this would not have been too bad; but soon the shipments included much less desirable settlers, such as criminals and prostitutes. For a short period, the Government succeeded in increasing the population to about three hundred souls.

General Villamil tried his best to keep the Mainland officials from making his settlement into a penal colony; but his efforts were in vain, as was his attempt at keeping the settlers united and maintaining order in the fast deteriorating community. He finally resigned and went to the Mainland, leaving General Mena in charge of his personal interests.

The Government appointed a new governor, one Colonel Williams. The latter promptly surrounded himself with deserters

from whaling ships and other adventurers, who helped him establish what amounted to a dictatorship.

It is true that a very hard hand was needed at this point to keep order in the colony; but Williams turned settlers and convicts alike into his slaves, making them work for his own profit and that of his accomplices. General Mena rose his voice of protest at once, but was impotent to act. In view of this, he and the more outspoken settlers moved to San Cristóbal, unwilling to live under the ignominious conditions existing on Floreana. At this point, Williams appeared as little less than invincible, favored as he was by the fear of most of the colony, the aid of his partners, the paucity and precariousness of communications and the indifference of a Government beset by problems on the Mainland. In fact, the Mainland officials favored Governor Williams with occasional shipments of political deportees (abundant at that time of political unrest), increasing unwittingly the number of his slaves. Finally, the fear of the colony turned into despair and, in 1841, the inhabitants of Floreana revolted against Colonel Williams, who had to flee for his life.

General Villamil came back in an attempt at saving what was left of his shattered dream. He found the greatest disorder among the eighty people still remaining on the island. After an effort at establishing order, he gave up and, with a handful of reliable settlers, he gathered some of his cattle and other former domestic

animals that roamed at large, moving over to San Cristóbal, to join General Mena. In 1845, barely thirteen years after the founding of the Floreana settlement, the only inhabitants remaining on the island were some twenty-five convicts.

Shortly after settling on San Cristóbal, General Villamil was recalled to active duty on the Mainland, where he was appointed Commandant General of the Guayas District. In the following years, he tried in vain to launch several ventures to Galápagos, some based on false rumors such as the discovery of coal on Floreana and extensive guano deposits in different parts of the Archipelago.

In 1852, the most spectacular escape in the history of the Galápagos penal colonies took place. A Floreana convict, one Briones, better known in Ecuadorian history as "el Pirata del Guayas" (the Pirate of the Guayas), somehow learned that former President Flores was launching an expedition from Peru to depose General Urbina's government, and regain power. Having decided to make the most of this situation, he got together some of his fellow convicts and planned to seize the first vessel that appeared at Floreana.

Soon, the American whaler "George Howland" anchored at one of the island's harbors and a boat was sent ashore. The sailors that landed were taken by surprise and made prisoners. A second boat

that came to investigate why it took the first one such a long time to return suffered the same fate.

Having most of the crew in their power, it was easy for the convicts to seize the ship itself, forcing her captain to sail with them to San Cristóbal, where they captured the Governor, General Mena. After helping themselves to the supplies and whatever else they thought useful, Briones and his men murdered General Mena and had the "George Howland" set course for the Gulf of Guayaquil.

The convicts' luck held, for, when they arrived at the Gulf, they came upon two sailing sloops that carried seventy of General Flores' men. One of these vessels was seized and its crew of twenty-nine butchered. The other sloop managed to make its escape into the maze of channels that cut through the mangrove swamps of the Guayas Delta.

After this, Briones and his gang headed confidently towards the port of Guayaquil, where they expected to be welcomed as heroes. They had a very rude awakening from their dream of glory, for, upon their arrival to the city, they were thrown in jail, prosecuted as murderers and executed, according to the law of that time.

After the time of General Villamil, there were many who became interested in the Islands and a number of colonization projects

were planned, most of them never going past the limits of thought. Sometime in the 1860's, the Compañía Orchillera was organized. This enterprise operated successfully, exploiting archil up to the year 1870, when José Valdizán bought the right to exploit this valuable lichen from the Ecuadorian Government. The same year, Valdizán started to resettle Floreana.

The Compañía Orchillera was dissolved, two of its owners, Manuel Julián Cobos and José Monroy, taking upon them to resettle San Cristóbal. They had kept ten people working there since 1869, extending the little farm originally intended as a source of fresh food for their archil gatherers. The difficulty of getting workmen from the Mainland to come out was probably their greatest hindrance, plus the lack of readily available capital, since it is doubtful that any banks dared risk investing in a venture of any kind in such a remote and little known place as were the Galápagos at that time.

While San Cristóbal progressed slowly, Valdizán seemed to be doing much better on Floreana, where he had gathered a considerable number of workmen. As his plans went ahead, he continued expanding, and as his need for workmen increased, he was forced to be less and less particular about whom he hired. Finally, as was bound to happen, trouble started to brew and, in 1878, there was an uprising. On July 13, Lucas Alvarado, one of Valdizán's workmen, approached him to request a day off, this

being only an excuse to get near his master. Valdizán kindly, but firmly, refused the request, pouring the man a drink. As he turned around to put away the bottle, Alvarado shoved a knife into Valdizán's left side. The master of the island managed to escape, being found, later, dead, some distance from his house.

After this, bedlam broke loose. The population on the island divided itself into Alvarado's supporters and those loyal to Valdizán. The civil war that ensued left only one survivor among the insurgents. It is said that an Englishman, Captain Thomas Levick, finally established order and attempted to keep the settlement from falling apart.

According to San Cristóbal tradition (I learned the story from an old man who had worked under Manuel J. Cobos), Levick was master of one of Cobos' two vessels, the sloop "Josefina Cobos" (the other was the schooner "Manuel J. Cobos," later renamed "San Cristóbal," a ship that served in the Islands as late as at the beginning of World War II). When the "Josefina" arrived at Floreana, the Lucas Alvarado faction had already been planning an uprising and were only waiting for a vessel they could seize, to provide them with transportation to the Mainland — standard procedure in Galápagos uprisings. As soon as a ship arrived, they would murder the master of the island, loot his house and stores, capture the visiting ship, and take off for the Mainland.

However, Captain Levick must have suspected something or, more likely, he was warned by someone, for it is obvious that the subversive group had miscalculated the number of those loyal to Valdizán. In any case, the Englishman is said to have gone up to warn the master of Floreana, arriving too late to save his life; but he managed to get his wife and daughter safely aboard the sloop.

There is another version of this story. It claims that Levick was not yet the master of the "Josefina" but was running another sloop that belonged to Valdizán. It also credits him with the destruction of Lucas Alvarado's band, claiming that he took direction of and organized the loyal faction.

Valdizán was buried close to his house, not far from the little spring in the upper dry region, above Black Beach. Many years later, his remains were removed from the little oasis and taken to Guayaquil.

At the time of all these happenings, the population of San Cristóbal had reached a little over fifty souls, and Cobos was not making much headway. But he had, however, decided on making a sugar plantation out of the upper part of the island and, seeing an opportunity of getting more labor without the tedious work of engaging people on the Mainland, he now engaged one hundred of the men who had worked for Valdizán on Floreana.

In 1879, Cobos came out to live on San Cristóbal, and give life to the sugar plantation he had planned, one that, unlike those on the Mainland, could be kept in production all year. It took him and his men ten years of hard labor to reach this goal. In 1889, the new refinery started to operate. Seven kilometers of rail had been laid through the cane fields, and a modern sugar plantation started to produce sugar at the rate of thirty thousand pounds per day. To commemorate the inauguration of the new refinery, Cobos renamed his plantation Hacienda Progreso.

In the meantime, Floreana slipped back to emptiness. Barely two years after Valdizán's murder, there were no people left on the island. In 1893, Don Antonio Gil established a settlement on Floreana, but abandoned the island in favor of Isabela, in 1897.

There may have been a few isolated attempts at settling Floreana, between 1897 and the 1920's, If there were, they were of short duration and of no importance, for they left no lasting effects or memory. The Norwegian group that came to Post Office Bay in 1926 found no inhabitants on the island, but they learned of a small group of settlers, organized by a Chilean, that had remained on the island for a short space of time, not long before their arrival.

When the Norwegian group disintegrated, the only inhabitants left were one Norwegian who had arrived with another group to San Cristóbal, a Dane and a new Norwegian settler, the three forming

a fishing partnership. This association ended when the third member of the group drowned at Cape Rose, Isabela, in 1931. By then, a vegetarian and nudist, Dr. Friedrich Ritter, and his partner, Dore Strauch, had been living on the island for about four years. This couple had made its home at Valdizán's oasis, naming it Friedo (for Friedrich and Dore).

In 1932, the Wittmers, a German family, settled close to the largest spring, at the site of the old Villamil settlement, in the southern part of the valley that forms most of the moist region of Floreana. Shortly after, the Baroness Wagner, her husband (one Philipson), and their partner, the German Rudolph Lorenz, arrived and made their home in the moist region. In 1934, this strange trio dissolved with the disappearance of the baroness and her husband. Lorenz died of thirst on Marchena, one of the arid Northern Islands, the same year, taking with him the secret surrounding the disappearance of his two associates.

The eccentric Dr. Ritter died, also in 1934, in a manner most ignominious for a sworn vegetarian — food poisoning caused by spoilt meat. Dore returned to Europe, and the year 1934 passed, leaving the Wittmers as the only inhabitants on Floreana for the next few years.

Black Beach Road.- Known in the days of the whalers as "Pat's Landing," it being at this place that they traded with Patrick

Watkins, who probably lived at Valdizán's oasis, this open anchorage is on the western side of Floreana. It is the harbor closest to the springs, and all the families on the island either live here or own a house in the tiny settlement.

From Black Beach begins the trail that leads to the highlands, passing through the Valdizán oasis, where a small spring forms a pool below some date palms. Near these, and under the coconut palms he planted in happier days, is Dr. Ritter's grave, a pile of lava rocks topped by a lopsided rough wooden cross. With the help of irrigation, this otherwise arid place produces some sugar cane, bananas, papaya and flowers, under the constant care of Mr. Eliecer Cruz and his numerous family, present owners of the oasis.

The trail continues inland, passing north of Cerro de la Paja, the highest hill on the island, crossing the fertile valley behind it and dividing itself into branches that end at the various farms. This upper region is covered with guava trees, orange and lemon trees and a few samples of the now almost displaced native vegetation.

Over thirty years ago, there was already an abundance of oranges and lemons on the island; but there was still a large amount of native vegetation and considerable extensions of grassland existed, where the wild cattle fed. These large open places have disappeared under the advancing guava, and it is this, as well as the unrestricted hunting on the part of hide traders, that has decimated the once

abundant cattle population of the island. Also, the frequent droughts of the last few years have contributed to destroy the cattle, for Floreana, being the lowest and the smallest of the major islands, is the first to suffer the consequences of drought. It is now difficult to visualize this island as supporting a population of three hundred people.

Floreana, having been intermittently inhabited over a long period of years, and being the first island to have a considerable number of introduced animals, has suffered the almost total destruction of its flora and fauna. The herds of sea lions, once so numerous on its shores, are reduced to small groups at the main rookeries. The tortoises disappeared from the island about a century and a quarter ago, snakes are found only on the adjacent islets, the *Tropidurus* lizards (abundant even on such a populated island as San Cristóbal) are rare, while marine iguanas, plentiful everywhere along the coast in the past, are now to be found only on the cliffs of the south shore, where they live in almost complete isolation. The only reptile that is still numerous on Floreana is the small endemic gecko (*Phyllodactylus bauri*), which owes its survival to the habit of sleeping during the daytime in tiny cracks in the lava or under rocks, in relative safety from predators.

Among the birds, several species have completely vanished, as is the case of the Galápagos dove, which was still occasionally seen about

forty years ago. The Floreana mocking bird (*Nesomimus trifasciatus*) has for many years been confined to the adjacent islets.

The vegetation of the upper regions, as is the case on San Cristóbal, has been almost completely displaced by a number of introduced species, while that of the lower areas, in a much greater degree than on the other island, has been much damaged by the introduced animals, notably the cacti, which here, as on Hood and San Cristóbal, are on the verge of extinction. In Floreana we have a terrible example of how the hand of man, his plants introduced without control, his domestic animals turned wild, and the vermin that accompany him wherever he settles (such as rats and mice) may destroy the other islands of Galápagos, turning this marvelous laboratory of nature into a barren waste, where little or nothing remains to help us solve the mystery of evolution and other riddles that may possibly have their answers hidden somewhere in this unique place.

Post Office Bay.- On the northwest coast of Floreana, this is a beautiful bay with a fine golden beach at its head, above which stand the post barrel and the few remains of the Norwegian settlement — the concrete posts of the prefabricated wooden houses, now used by visiting ships and yachts to write their names on, and a few rusty steel tanks that were used to collect rain water.

The name of the bay comes from the barrel. Nobody knows who set up the first one and, though he never mentions it in his writings, Colnett shows it on his chart of the Galápagos, dated 1793. It is likely that the first barrel was placed there by one of the early English whalers, for these had already entered the Pacific by 1787.

The whalers left their mail here when they passed through the Islands and it was picked up by home-bound ships. Once it had been brought to the home port, the mail was distributed to different destinations by means of traveling businessmen or by merchant ships.

As the years passed, the original barrel was replaced with wooden boxes and other barrels, conditioned and left there by various vessels that found the previous "mail-box" in bad condition. When the whalers disappeared from these waters and the barrel lost its former practical value, the British Navy's ships, passing the Islands on their way to their base at Esquimalt (British Columbia), maintained a barrel here, keeping this custom from dying out. Later, vessels of the most varied nationalities and types continued this. The present barrel was set up by the American brigantine "Yankee" while on its seventh voyage around the world. It was repainted by the crew of the "Albatross," shortly before she was lost in the Gulf of México.

The barrel, like the concrete posts left by the Norwegians, has been decorated with the names of people and vessels visiting the place, many of them leaving mail inside the former, often addressed to themselves. This mail is picked up by passing pleasure craft and fishing vessels, being mailed by them from such places as the Marquesas, Tahiti and Japan.

On the north coast of the island is Cormorant Bay, with its white sand beach. Between it and Puerto de las Salinas, which is more towards Post Office Bay, there is a large and shallow lagoon on whose northern shore the settlers have their salt pans. Flamingoes are quite numerous in this lagoon, but difficult to approach on account of the very soft mud on the bottom. All this area, from Post Office Bay east to Las Cuevas, is the most beautiful part of Floreana.

Farther to the east is the small cove of Las Cuevas, with its beach of brown sand, at the mouth of a deep canyon that cuts through between two steep hills. The hills form cliffs on their seaward faces, and, on these, visiting vessels have written their names.

There are numerous natural caves here, most of them mere holes or depressions in the sides of the canyon. In places, on these sides, one may also find engraved the names of ships, many dating back to the days of the whalers. Some are from the beginning of the past

century. If earlier inscriptions have existed, they are now long since erased by erosion of the relatively soft tufaceous surfaces.

XIX

THE NORTHERN ISLANDS

Surrounded by fast currents, arid and inhospitable, separated from the rest of Galápagos by the Equator, a small group of islands extends from the northeast to the northwest of the Archipelago — the formerly dreaded Northern Islands, now much visited by the insular fishermen.

These islands, though of small size, offer an interesting field for the naturalist; for they are still relatively little known, with the exception of Tower, whose great nesting grounds of marine birds have attracted many scientists. Their flora has been studied only superficially and their land birds and reptiles, as well as their insects and arachnids have received limited attention.

The northern island nearest the center of the Archipelago is **Marchena** (Bindloe), some 55 kilometers to the north-northeast of Santiago. It has a surface of 96 square kilometers and an altitude of 343 meters towards its center, where one still finds active fumaroles, over which columns of steam often rise.

This arid island was the scene of the German Lorenz's death and that of his Norwegian companion Nuggerud, owner of the ill-fated "Dinamita," the small launch in which they were traveling from Santa Cruz to San Cristóbal when their engine was damaged and the swift current carried them here. It seems that Lorenz and Nuggerud landed in the little dinghy found beside their desiccated corpses, after managing to anchor the launch near the shore. After the two Europeans landed, the anchor line must have parted, leaving the "Dinamita" adrift, for the launch was never found, nor the young fisherman, Chahuiz, who worked for Nuggerud.

Almost two years earlier, in 1932, we almost suffered a similar fate. We set sail from Sulivan Bay with the intention of reaching Santa Cruz, where we planned to replenish our water and stores. Out to sea, the wind quit and we drifted up to Marchena, reaching a steep coast where the chart marked no anchorage. When everything looked hopeless, we managed to anchor. Several days we lay there, drinking our evil-smelling rotten water on short rations, and eating vermin-filled rice with fried fish. One day, a California tuna clipper passed and her Norwegian captain towed us to the waters outside Puerto Ayora, Santa Cruz, where we entered by sail.

To the northwest, some 28 kilometers from Marchena, lies **Pinta**, known among the buccaneers as Abingdon, an abrupt island with a surface of fifty square kilometers, whose steep sides rise to 770 meters above the swift currents of the surrounding sea. Pinta is the

only minor island in the Archipelago having a moist region, which begins above a three hundred-meter altitude on the island's windward side. It also has an active volcano at its upper part.

Pinta is the only northern island where tortoises (*Testudo elephantopus abingdonensis*) have been found. It seems that this race was never plentiful, but it has been hunted from the earliest times until recently, when fishermen, on their way to Culpepper and Wenman, or camping on Pinta itself, would kill a tortoise or two to provide a change in their otherwise uniform diet of fish and rice. The end of the Pinta tortoises was brought about, however, by the introduction of goats to this island. The latter have multiplied greatly, displacing the tortoises from their old feeding grounds.

Miguel Castro, conservation officer of the Charles Darwin Research Station, tells me that the tortoises have been forced to migrate into a valley on the western side of the island, where the ground is cut by numerous fissures, most of which are hidden from view in the long grass. The tortoises fall in and die at the bottom of the fissures either by starvation or by the injuries caused by their fall. He tells further that one may find numerous remains of tortoises by inspecting the bottom of these great cracks. Mr. Castro believes the Pinta tortoise to be extinct, claiming that the last survivors found their end by falling into the numerous crevices of this semiarid valley.

The closest-living relative of the Pinta tortoise is *T. elephantopus becki* of northern Isabela, separated from it by at least eighty-five kilometers, mostly of ocean with a current of up to three knots' speed.

Pinta's best anchorage is at the foot of the cliffs on its southwestern side. The landing is somewhat to the north of the three hundred-meter high cliffs.

Over 46 kilometers to the east of Marchena, is **Tower** (Genovesa), a low island with an altitude of only 64 meters and a surface of 17 square kilometers. Completely barren, it is interesting mainly on account of its great number of sea birds, and its salt water lake, in the bottom of an extinct crater, towards the island's center. Darwin Bay, in the southwest, is the only bay in the Northern Islands and, like the lake, is formed by a huge crater, the southwestern side of which has collapsed into the ocean.

Some 139 kilometers to the northwest of Pinta, rises **Wenman** (Wolf), formed by three small and barren islets and a huge rock, the highest of the former reaching an altitude of 253 meters. It seems that this island must have been part of a great volcano whose western side disappeared into the sea.

About 32 kilometers to the northwest of Wenman, and of similar origin, is the northernmost of the Galápagos, **Culpepper**

(Darwin), a 167-meter high islet. On both of these northern islands, there is an abundance of sea birds, and fishing is fairly good along their steep shores. Induced by the poor catches at their usual fisheries, the San Cristóbal fishermen have been visiting Wenman and Culpepper during most of the last few years.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