

Chapter VII

No other islands of the Galapagos group present the foreboding aspect of Fernandina. This island volcano has erupted ~~in/great~~/~~volu~~/ more frequently and with greater violence during the few centuries of human ^{presence} ~~observation~~ than any of ~~the/other~~ its neighbors. It stands scared and devastated by the outpourings ~~of~~from its remote summit. Flows of lava and fields of ash have isolated Fernandina's crater ~~against~~ ^{from} the casual visitor so that only the most determined explorers have seen its ~~mysterious~~ ^{fabled} interior. Eruptions have indeed ^{within historical times} occurred on other island, most recently on Isabela from the side of _____ volcano which is still smoking from the event of two years ago. Lava from this eruption split into ~~two~~ streams as it reached Perry Isthmus, one turning ~~into~~ east into Cartago Bay where it burned ~~out/the~~ through the mangrove belt, and the other west to ~~Urvina~~ ^{Elvina} Bay. Perhaps not more than one hundred years ago, judging by the appearance of iridescent freshness of some of the flows around Sullivan Bay, lava poured from the flanks of ^{Isla} Santiago (James Island) blackening its slopes and coast lines on three sides but leaving the peaks green with life. Awesome as ~~this~~ ^{it} event, or series of events, must have been ~~it/did~~ ^{it} they did not leave the island with the same atmosphere of impending doom that one senses on Fernandina. (A less contemporary eruption on Volcan Alcedo has left ^{its} ~~as a reminder~~ on ~~the~~ rim as a reminder a row of hot springs and geysers.)

Volcanism on all the other major islands appears to have been associated with a more remote past. They are clothed ⁱⁿ ~~with~~ vegetation, sparse and xerophilic ^{here} on these of low ^{profile} ~~contour~~ but lush and tropical peaks and ^{the} on the/higher altitudes of/ancient, quiescent volcanoes. Above two thousand feet the vegetation is watered by the moisture from clouds, occasional thunderstorms, and drizzly rains during the summer garua or foggy season. Under this ^{continued} ~~constant~~ application of

the
small quantities of water, combined with ~~an incredible~~ mineral richness of ~~the~~ volcanic soil, the various plants have developed a jungle density of giant forms. Some like the Scalesia or sunflower trees are ~~unique~~ ^{endemic} (evolved) ^{that evolved on} types (unique to) the Galapagos Islands, whereas others of hardwood varieties ^{actually related to} such as metazarea and ^{guayavillo,} ~~guayavillo~~ are counterparts of mainland species. These forests grow ~~on~~ ^{at} Santa Cruz ~~at~~ ^{at} medium altitudes on the south side of the island and higher on the north facing slopes, but the peaks themselves and much of uplands around their bases are covered with grasses and bracken. The latter ~~which grows~~ in favorable locations ~~grows~~ head high. What determines this distribution of the vegetation is not fully understood is not necessarily related to available under ground water. but ~~must be related to the water content of the ground.~~ The ~~peaks~~ which have escaped the lava flows and green mountain tops of Santiago, ~~which are not as high as those of~~ ~~Santa Cruz,~~ appear to be covered with this same kind of forest.

The islands of San Cristobal and Floreana at one time also supported ~~for~~ a dense vegetative cover, but this has been so greatly modified by human occupation and farming ~~that~~ as well as by the introduction of exotic species that its original character is no longer evident. Much of the largest island, Isabela, is still in its primordial state. All of its seven volcanoes, where volcanism in the past several centuries has not ~~sered~~ or buried them, are ~~still~~ covered with vegetation to their rims. On this island even the introduced burrows have produced little effect.

According to geologists the whole Galapagos area is volcanically ^{they} unstable and so far as ~~can~~ ^{they} predict ~~eruptions~~ and uplifts could take place anywhere within it, even though the most recent disturbances have occurred along its western boundary. And so the islands which appear to be the most stable, quiescent, and mature may be the next to ~~explode~~ into eruption. One of them may become the awesome Fernandina of the future, while Fernandina mellowing

in temporary old age clothes itself with a mantle of green to await some far future ~~flame~~ fiery rejuvenation.

Why the vegetative associations differ so much from mountain to mountain top, except where human intervention has been a factor, is one of those as yet unsolved mysteries. ~~remains a recorded~~ mystery. When accumulated knowledge finds the answer the mystery, ~~a~~ ^{the} mystery is our ignorance.

mean you square
It is there
 The solution is contained within the situation, and ~~it~~ ^{is} of the objects that compose it ^{to see} as clearly written ^{in the} as their very existence, to be read by anyone with eyes to see for nothing in the natural world is truly mysterious; everything that happens and exists is the consequence of a perfect logic - the perfect logic of nature.

The most recent botanical studies list 41% of Galapageian species endemic. Shortly after Darwin's visit the percentage of endemic species was considered higher but was been reduced by the discovery of Galapagos species on the coasts ~~of~~ ^{1/} of Ecuador intensive studies which have discovered many Galapagos species and Peru. Nevertheless the number of plants found only in the Archipelago remains impressively large. After the giant opuntias, the tree cacti of the arid coastal zones, the most impressive ~~genus~~ ^{general} endemic genus is Scalesia of the composite family. Of the 18 species 14 occur on Santa Cruz and 4 on Santiago whereas other islands on which the genus is found have only one species each. This distribution is explained by the assumption that the original colonization took place on Santa Cruz followed by divergent evolution and secondary migration to other islands. But there are several other possibilities including introductions of related species from the mainland multiple colonization by the parental stock, colonization of new by the parental stock habitats/combined with isolation and evolutionary change, and hybridization between species developed on different islands.

Because Santa Cruz is so richly represented contains such rich representation ⁱⁿ of Galapagos flora, not only ⁱⁿ of the many species
 65

of Scalesia but in a great variety of other plants, several varieties of finches, and a protected colony of Galapagos tortoises its interior higher altitudes should be visited by anyone hoping to gain even the most rudimentary understanding of Galapagos life.

Behind the ^{about} ~~dry~~ coastal plain on the south side of Santa Cruz, which extends back from the shore around the settlement at Academy Bay and is covered by a tangled thorny forest of croton bushes, ^{here} and giant opuntias, the land rises steadily to a second sloping plateau at ^{one} ~~two~~ thousand feet. The intermediate zone between the coast and the plateau is broken by several sharp escarpments ^{of the} ~~of~~ croton and cactus ^{and here} ~~and~~ formed by ancient flows of lava. As one ascends ~~the~~ ^{to be} cactus and croton are left behind ~~and are~~ replaced ~~by~~ gradually by other kinds of trees. The temperature drops but the humidity increases until the atmosphere ^{of the} ~~of the~~ feels almost stifling. The first/new types of tree-like plants to ^{if are} ~~appear~~ ~~are~~ a spindly ~~species~~ ^{They are readily} of Scalesias. ~~These are seen joined by~~ recognized by their lack of sturdy lower branches and ^{by} ~~the way~~ the foliage grows in tuft-like masses at the top ~~of~~ the stem. As they increase in ^{number} ~~density~~ and become dominant one feels as though he had shrunk in size ~~by~~ through the working of some undetected "Alice in Wonderland" magic and were walking through a field of weeds. Near the beginning of the plateau a further change in the vegetation takes place. ~~3~~ Tropical

hardwoods, matazarna and light-barked guayavillo, make their ^{along with the} ~~appearance~~ ^{sunflower trees} ~~but the~~ Scalesia do not completely disappear. ~~The forest~~ ^{thickens} becomes denser, the undergrowth ~~of~~ ^{becomes denser}, grasses grow ~~in~~ ^{are} wherever an opening occurs ~~open grasses~~, and the taller trees become festooned with lichens and other epiphytes. ^{fern + moss}

It should not be understood that this progression takes place everywhere on the island in this precise order. ^{except} ~~There are places~~ ^{where the} ~~where the~~ hardwoods are found near the coast ^{and places occur where the} or where species of Scalesia are ^{are much reduced} ~~absent~~. The cactus associations extend higher up ~~on the~~ from

This semi-plateau region on the scalesia zone is the most fertile part of the island and has come under limited cultivation. Above the farm ~~zone~~ ^{lands} the forest continues into a brown zone named for the color of the epiphytes, in particular for a variety of liverwort, that encrust the trees. Beyond the forest a band of Miconia bushes and ferns ~~which~~ ^{grassland} forms a nearly impenetrable barrier between it and the upland ~~moor~~ ^{sides}. Here at the top of the island a moor-like condition prevails with grasses and bracken covering the ~~slopes~~ ^{sides} of the volcanic old cones ~~and craters~~. Reedy ponds and sphagnum bogs occupy the hollows and ancient filled-in craters, and on the surrounding ~~well-drained~~ ^{have become ponds or reedy marsh} slopes ~~one~~ is astonished to find here ~~on the equator~~ patches of gray raindeer lichens, a miniature tundra on the equator. ~~No~~ ^{rise} ~~add to~~ the temperate or northern aspect ⁵ of the grassy highland of Santa Cruz, when I was there in April, ^{migrating} purple martins ~~were~~ ^{ed} circling ~~over~~ the ponds and darted low along the hillsides in their swift search for insects.

The zonation of vegetation on the island does not follow everywhere this exact order. Here and there the guayavillos grow down into the cactus ^{margins} ~~and croton desert~~ lowlands, and in other places ~~the~~ desert types extend ^{up the slopes} higher than ~~normal~~ ^{usual}. are found mixed with scalesia zone trees at altitudes higher than usual. These non-conforming ^{disturbances} ~~dispersions~~ seem to be ^{the result of local} ~~caused by local~~ climatic conditions ^{locally influenced} ~~caused by local~~ variations ^{by wind of} ~~in the ocean~~ currents, and ^{relativ} ~~prevailing winds~~ which effect the moisture over the adjacent land. The Miconia belt ^{is also a non-uniform occurrence} and on a few of the other larger islands, it is a peculiar occurrence even on Santa Cruz where ^{it is not continuous} around the whole perimeter of the central/highlands. The Miconia belt, ^{to a} ~~a~~ peculiar occurrence ^{abundant but} on a few of the larger islands, is also non-uniformly distributed even on Santa Cruz where it is not continuous around the whole perimeter of the central grassy highlands.

And of our gold on Andromeda in
complexion with other things. Continued
August

in the past few decades

The greatest changes that have been wrought/on the distribution of vegetation on Santa Cruz were man produced. In the period between the two world wars people came from Europe to settle in the Galapagos Islands. Among them were seekers of fortune and misinformed ^{were to} adventurers, and people, ~~miserable~~ about the conditions they ~~would~~ encounter, who hoped to find the easy life of a South Seas island paradise. These latter were disappointed and soon left; others putting the best face they could on a bad situation tried to adapt to the grim austerity of the islands and to extract from them a living. Many failed and departed, ^{in discouragement} but a small number of ^{incurably romantic,} ~~determined,~~ hardworking individuals, whose determination could not be beaten down, fell in love with the Galapagos, and with its unrelenting, intractable qualities and succeeded. They were the nucleus that attracted later immigrants from the American continents until today several score Ecuadorians and North Americans have staked out homesteads and cleared land for farming in the intermediate forested zone between the high grasslands and the dry coastal plains.

This small group of settlers introduced to the islands many economically valuable plants and trees - exotics in the language of ecology. They brought sugarcane, coffee, taro, pineapples, papayas, sweetpotatoes, and many other ^{common} vegetables; and they planted banana, avocado, and citrus trees. Much of the land of the Scalesia zone ^{with them} was pre-empted for these crops. They also brought domestic animals - pigs and chickens, cows and goats. Goats introduced earlier ~~than~~ many of the islands by whalers, to serve as a store of food, ran wild destroying ~~many of~~ the endemic ~~plants~~ vegetation and upsetting the delicate ecological balance. Pigs soon escaped to establish a feral population of extreme predaceousness/ ^{against which the native fauna is defenseless.} They decimated the young tortoises and land iguanas, and rooted out the nests of the green sea turtles on their breeding beaches.

~~28~~
The Galapagos tortoises can be seen in ~~two~~ two concentrations

7 8

or soaks into the brown clay soil but is renewed by the winter rains in December and January. This is the area of the last stand of the Galapagos tortoises on Santa Cruz. Here ^{upwards to} 1,500 have been counted and many unrecorded individuals may be present.

from
The Darwin Station maintains a casita in the reserve area on the fringe of the Scalesia-Guayavillo forest ^{near one of the concentrations of} for the convenience of official visitors ~~to the reserve~~. The casita is an ^{extremely} simple rough shelter built of boards and poles, ^{and roofed with corrugated} ~~the principal~~ ^{roofed} structure is a small dark room with a corrugated iron roof, a fireplace on one side for cooking, a low table in the middle, and a dirt floor. ^{Complete the opportunity of the single mud room} Beside giving protection from rain, the roof serves the more important function of a water ~~catching~~ ^{for} collecting surface, and ~~to this end~~ is connected by gutters and a down spout to a rain barrel at the corner of the building. A platform extending from the casita on one side supports a very ragged tent to provide sleeping accommodations for two, or with uncomfortable crowding, for three people. (When I visited the place we brought our own tents and slept on the ground nearby.) Next to the tent a rustic table and benches of poles had been constructed under a canopy of sticks. ^{Here} ^{this} In partial shade visitors ate their meals.

page 13
From Bella Vista the village center of the farming community nearest to ~~the end above~~ and directly above Academy Bay it is a ten mile walk west to the casita. The trail first passes a grove

The Galapagos tortoises can be seen in two ~~areas~~ concentrations in the reserve area. From Bella Vista the farming community ~~directly~~^{west} nearest to and directly above Academy Bay it is a ten mile walk to a casita, a rough shelter built of boards and poles, for the convenience of official visitors on the fringe of the Scalesia-Guayavillo forest. Nearby is a marshy pond always frequented by the tortoises. The casita is an extremely simple structure; a small dark ^{with corrugated iron} roofed ~~over~~ ^{room} room with a fireplace on one side for cooking, a low table in the middle, and a dirt floor. The roof gives shelter in bad weather ~~but~~ ^{AND} serves the more important function of a water catching surface being connected by gutters and a down spout to a rain barrel at the corner of the building. ~~On~~ A platform ~~connected~~ extending from the casita on one side supports a very ragged tent to provide sleeping ^{accommodations} accommodations for two, or with uncomfortable crowding, three people. (When I visited the place we brought our own tents and slept on the ground nearby.) Beside the tent a rustic table of poles had been constructed under a roof of sticks to provide shade. Here visitors ate their meals.

page 9
~~The horse trail to the casita first passes through a grove~~ of balsa trees brought over as seedlings several years ago from the mainland. They have already ^{grown} ~~attained~~ to considerable size with smooth gray trunks up to 2 feet in diameter, and a crown of broad, ^{glowy} ~~rich~~ green leaves fifty feet overhead. They grow with ~~the~~ ^{long} weed-like luxuriance and look very tropical. Some had been cut down and ^{logs} ~~their~~ pithy ~~trunks~~ were lying around, one of which my son Steve picked up with ease and ~~stood~~ posed for a photograph ^{like} ~~like Hercules holding an enormous tree.~~ After the balsa grove, farms ~~are~~ alternate with uncleared forest. One ~~pass~~ comes on stands of sugar cane, fields of pineapples, and

plantations of banana ^{the} trees crowded together, shedding their torn plumed ~~ragged~~ enormous ~~lower~~ leaves, with ~~seemingly~~ profligate carelessness. ~~They~~

The rough trail, at present used only by foot, horse, and pack train traffic, had been cleared to a width so generous as to suggest a plan to accommodate more modern transportation at some not distant future time.

~~grassland~~ ^{strips} divided by ~~bands~~ ^{covered} of grassland and ~~at~~ ^{wide} areas ^{of} with a low vine called mora. Resembling northern hemisphere smilax more closely than any other vegetation though far more generously equipped with the features that make smilax one of the most unpleasant plants to encounter in temperate forests, mora is a tangled ~~vine~~ mass of stems armed with long sharp, curving thorns that grows to a depth of three feet. It forms the most ^{impervious} ~~impenetrable~~ barrier of any known vegetation. One could not penetrate ~~it~~ ^{mora} a dozen steps without becoming hopelessly entangled, ~~one's~~ clothing would soon be in shreds, and ~~one's~~ lacerated body ~~a~~ ^a bleeding mess. My first and last experience with mora resulted in/deeply scratched and bleeding arms when I carelessly brushed against a stragling ~~stem~~ branch. ~~It~~ The only way to get through a field of mora is by cautiously and laboriously, stem by stem, cutting a ~~way~~ path. The trail to the casita had been cut through to provide a wide safe passage.

The casita faces ~~on~~ a grassy glade surrounded by guayavillo ~~trees draped with lichen~~ trees draped with lichen. A short-eared Galapagos owl perched on a high branch stared impassively down, watching us as we explored the area. Not ^{only} ~~only~~ nocturnal in habits like the Galapagos Barn owl, this bird hunts during the day and so is often seen. Two kinds of fly-catchers ~~are~~ also common in the wooded regions and are found in such different habitats as the coastal bursera and cactus zone and the scalesia forests of the central ^{mountain} ~~grater~~ chain on Santa Cruz. They both occurred around the casita. One is ~~the~~ ^{small} a species of ~~Myiarchus~~ ^{the genus} Myiarchus

related to the ash-throated flycatcher of Arizona, a pretty little
the ish
birds with/yellow/underparts but ~~not~~ the strikingly rufous tail
others of the Myiarchus group,
of its northern relatives. Like ~~so many of the Galapagos~~
and so many of the Galapagos birds, it is fearless, and inquisitive
and easily approached. The other is the Vermilion flycatcher, the male
adult
of which in full ~~climax~~ plumage sports a scarlet breast and crown.
This bright feature, however, is not universal to the Galapagos race
and is apparently disappearing in a genetic drift towards drabness,
a ~~definite~~ trend observed in other isolated insular species. No one knows,
but it has been suggested that the somber plumage of the Darwin finches
may have been a consequence of a similar tendency.

In ^a the marshy pond near the ~~casita~~ bordered with ^{a dense thicket of} manzanillo
of manzanillo trees near the casita, which I visited with several
members of the expedition, ^{a half} ~~ten or a~~ dozen tortoises were resting in the
shallow water. ^{Several of them} They were drawn into their shells, heads completely
^{elyphantine feet} concealed behind ~~scaly~~ front ^{feet} legs. What they were doing was something
keeping cool maybe ^{or heating} ~~but~~ ^{more said while they} from time to time they
only "known" to the sluggish tortoise mind, ^{but} ~~but~~ ^{from time to time they} would
come out, ^{a reptile's} peer about extend their ancient wrinkled necks to
peer around with ~~the~~ inscrutable gaze of the reptile that by its
unfathomable impassivity communicates nothing. ^{an} gaze about with ~~the~~
~~that~~ inscrutable reptilian impassivity that communicated nothing ^{to us}.
They jack themselves along a few steps, crop a mouthful of two of grass,
and subside again. Once in a while manifesting unusual purpose a
tortoise marched straight out of the marsh into the woods ^{pushing} ~~disappearing~~
^{that had these} ~~tank-like~~ through the thickest part of undergrowth.

The most lively members of the marsh community were the
the adult generations of aquatic
vermilion flycatchers attracted by many kinds of insects
insects. ^{that had these} They darted over the surface from lookout points on the
surrounding trees, ^{to snap up the more} ~~but~~ finding these ^{winged forms} ~~remote from the best feeding~~
spots than the backs of the tortoises, they used their backs as

In a ~~marshy~~ pond bordered with dense thickets of manzanillo trees near the casita, which ~~we~~ ^{on the first day of our trip to} visited with several members of the ~~the~~ ^{Carter} expedition, a half dozen tortoises were resting in the shallow water. Drawn into their shells, ~~several of~~ the heads of several of them were completely concealed behind elephantine front feet. From time to time they would extend their ancient wrinkled necks to gaze about with an inscrutable reptilian impassivity that communicated nothing to us. They jacked themselves along a few steps, cropped a mouthful or two of grass, and subsided into inactivity. Once, manifesting unusual purpose a tortoise marched straight out of the marsh into the woods pushing through the thickest ~~part of~~ undergrowth.

Slow motion is the way of life of these giant tortoises. They move with the deliberation of a sloth and the irresistibility of a tank. One front foot at a time is extended, to the right and to the left, pressed down and backwards with a ~~jerky~~ sweeping oar-like motion that propells the creature forward in a jerky course. The hind feet, not so easily observed, do their share of pushing under the concealment of the over-hanging carapace. In wet grass and boggy places the tortoises slide themselves ~~along~~ over the well lubricated surface without attempting in the absence of compelling motivation to rise up on their four legs, which in other situations they are perfectly capable of doing. In fact the larger members of the species are famous for their ability to carry at once two grown men on their backs.

What motivates a tortoise is a matter not entirely of conjecture. To some extent observers have been able to fathom the working of the ~~more scientifically~~ sluggish tortoise mind; or ~~perhaps~~ I should say interpret their behavior. When one lumbers into a shallow slough for a dozen yards or ~~and~~ more and subsides ~~into~~, except for slow rhythmic breathing, into inanimate immobility, he may be replenishing dehydrated tissues, or

page B
not

Then the
Expedition
page 13

following exertion ~~it may be~~ to facilitate breathing ~~in such a~~
~~hoyed up in such a half-submerged position.~~ Whatever goes on in his
 primitive retilian brain, if indeed anything at all approaching
 consciousness does go on, he is not deflected with ease from his
 fixed preoccupation with internal matters, for when during one of these
 introspective sessions the animal is disturbed he simply reaffirms
 his concentration by tightening his withdrawal ^{under} his armour.

Sometimes they seem to seek deeper seclusion for their reveries by
^{sinking} ~~burying~~ themselves in mud. ^{without} When they return eventually to the
 external world of tortoises ^{to} senses ~~and~~ resume their methodical
 wandering they appear smeared with ~~sienna-colored~~ ^{the} volcanic clays and
 clods ~~clinging to their shells.~~ ^{of the muddy slant.}

wondering, ~~clouds clinging to their shells and coated with the burnt~~ smeared sienna colored
 volcanic ~~sienna clays of volcanic origin.~~ with
 and clouds clinging to their shells.

The Galapagos tortoise~~s~~ has evolved in a tortoise
 with the exception of ~~comparable~~
 paradise free, except for the ~~only other~~ large herbivorous animal
 from but
 in the Galapagos Islands, of all ~~except~~ intra-specific competition.

- the land iguana - His food supply was plentiful and he multiplied,
 apparently unrestrained by ~~adversity~~ ^{biological} ~~in his world, until his individuals~~ ^{confined}
 to a which of
 in his population/numbered in the hundreds of thousands. He had no
 enemies; no predatory animals large or small ever attacked him; danger
 and fear were to him unknown until several centuries ago MAN walked
 over his horizon. Then his troubles began and have continued to
 increase to the point ~~where~~ ^{his} of extinction on many of the islands.

Not only was he attacked by men who butchered him and carried off
 thousands ~~off~~ alive, ^{his young were} he was ruthlessly ~~run down~~ ^{attacked} by the domestic animals
 that men released into his ~~paradise~~ ^{dominion} & wild pigs and dogs and cats &;
 and his young ^{were} ~~ferreted out~~ ^{not to mention} by that worst of man's social parasites

Races of the Norway rat accidentally introduced from ~~ships~~ the ships of men.
 The tortoise now survives in ~~any~~ ^{viable} numbers on only two island, Santa Cruz
 and Isabela, ^{on the islands} and there in a handful of thousands where a ~~hundred~~ ^{thousand} times that
 that number once were common. It is told that when men first came to the

Galapagos Islands the tortoises in the upland grazing meadows were so
^{abundant} ~~abundant~~ that it was possible to walk ^{for long distances} ~~over their heads~~ on their backs
 one to another without
 back to back never once touching the ground. The tortoises on Santa

Cruz are begin^{ning} to learn fear and to withdraw into their shells
 at the sight of people. But whether this new response would in the
 end save them from extinction is today not a ^{pertinent} ~~significant~~ question
 because man, their greatest enemy, has decided that the Galapagos
 giant tortoises must not ^{be exterminated} ~~perish from this earth~~, and ^{he} ~~he~~ is taking
 measures at long last to assure their survival. Wisdom and conscience,
 the highest human attributes, have at last in this distant corner of
 the planet and in this particular relationship triumphed over
 the predaceous impulse.

not here

The most lively members of the marsh community are the vermilion flycatchers attracted by the aquatic insects that breed there. They dart over the surface from lookout points on the surrounding trees to snap up the winged forms, but use also the backs of the tortoises as closer stations from which to launch foraging flights. It is not unusual to see several tortoises at one time serving as lookouts for these flycatchers.

page 8

page 11a

Southwest of the casita, several miles away, another area of ponds and grazing near a hill called El Chato is the watering center ~~of~~ ^{an even} larger population of tortoises. ~~They~~ ^{They} spend their days feeding with catholic indiscriminateness on the ~~grass and other~~ ^{surrounding} vegetation in the parklands or on marsh weeds ~~in shallow water~~ ^{in shallow water}. At night it is said they retreat to shallow ~~water~~ ^{the ponds} or to mud wallows ~~of their own creation~~ ^{into} which they have created by churning up the soil ~~to~~ ^{into} a soupy consistency ~~in damp~~ ^{liquid} places. ~~They rest in these situations all night half submerged, and~~ ^{which fulfills a need beyond that} bouyed up by the water. A need is being fulfilled, beyond the need for replenishment ~~from body weight pressure~~ ^{from body weight pressure} liquid, involving relief of pressure on their plastrons ~~from their~~ ^{permit and deeper} weight ~~to allow~~ ^{weight} freer breathing. The breathing process of tortoises is a ~~cycle~~ ^{cycle} prolonged cycle of slow intake of air culminating in a rapid hissing exhalation. They probably are able to ~~build up~~ ^{build up} a considerable oxygen deficite during the exertions required for walking around ~~while~~ ^{and} grazing. At night, bouyed up by water, the ~~pressure of body weight on the tortoise's plastron~~ ^{pressure of body weight on the tortoise's plastron} is relieved and ~~they~~ ^{the} can breath more freely to reduce ~~his~~ ^{the} oxygen deficiency, ~~thus~~ ^{thus} the periods spent in water fulfill a need beyond that for the replenishment of body fluids.

Female tortoises do not lay ~~their~~ ^{their} eggs in the same ~~where~~ ^{cool highlands} where they live most of the year ~~in the moist uplands~~ ^{in the moist uplands}. They migrate down to the hot ~~dry~~ ^{desert brush} lowlands where the conditions for incubation are more favorable, and there in the sun-baked soil of ~~the local residents~~ ^{ashy the pieces of local flat open areas} called "campos" they dig their nests and ~~lay~~ ^{deposit} their eggs. Campos are level open ~~areas~~ ^{surfaces} of washed down Volcanic soil washed down from higher slopes into ~~depressions~~ ^{the} becomes ~~very hard~~ ^{soonest the hard dry}. In order to dig her nest

the female tortoise must soften the ground which she does by urinating on it. After laying her eggs she presses the damp soil back over the eggs with her plastron. As it dries out the ground becomes exceedingly hard and dense and unless it is again softened by rain / at the time of hatching the young tortoises are unable to dig their way out and perish. Many have been found trapped in ~~these~~ these because rain did not come at the right time ^{however} represents a subterranean nests/in all stages of disintegration. This ~~is a~~ ^{long} natural loss ~~normal hazard~~ to which the tortoises ^{during} in their/evolution~~n~~ have accommodated and can survive, but ~~when~~ add to ~~this~~ it the hazard of that man and the predators he has introduced - pigs ~~to~~ dig out the nest, and rats, ferral cats and dogs ~~that~~ that prey on the ~~young/tortoises~~ hatchlings and young and the survival of the totoises is in jeopardy.

The grassland and moore on the top of the island above the miconia zone are quite a different ^{association} ~~habitat~~ from the parklands of the tortoises. For one thing they are drier on the well drained slopes where the volcanic foundation of lava, cinders and ash is only thinly covered with soil. Nevertheless, nurished by fogs, the ground is almost completely covered with low vegetation: a tundra-like mixture of short grass, impoverished brachen, small ferns, mosses and lichens. As the dry^{er} season of April and May comes to an end, before the onset of the summer ~~garua~~ ^{streaked} ~~the~~ the brachen and grass turn yellow and brown/with ~~streaks of~~ yellow, the mosses darken and shrivel, and the raindeer lichens become crisp and brittle; life seems to be going out of everything. The ~~as~~ general aspect is very like autumn in the northern United States but lacks the accents ~~of~~ provided by flaming ~~red~~ blueberry leaves. Counterpart to the dryness of the slopes is the persistance in old craters and in the hollows and depressions between cones of ~~ponds and reed filled bogs~~ reed bordered ponds and sphagnum bogs where ^{a measureless depth of muck} ~~one is fearful of walking~~ ^{irregularly} makes one afraid to ^{wade} ~~walk~~. I probed one ~~of these~~ of these bogs with the longest pole I

an authenticity

To add/to the temperate character of the grassy highlands of Santa Cruz, but ~~at once~~ simultaneously to subtract from their anachronistic autumnal appearance, when I was there in April, migrating purple martins circled the ponds and darted low along the hillsides in ^u~~their~~ swift search for insects. Their presence was an undeniable sign of spring, but spring many thousand miles away.

could cut and found no firm bottom. *15a H*

The cones and craters of Santa Cruz are mostly so old that they have been smoothed ^{and} ~~into~~ rounded ^{action} ~~down~~ by the ~~erosion~~ of weather and plant growth erosion. Old lava flows and rivulets of lava, the outlines of which are still visible, are crumbling under these ~~indirect~~ influences; their sharpness and abrasive properties that are such a ^{more recent} ~~detering~~ feature of the ~~newer~~ flows on Fernandina and Santiago have been obliterated. It is now possible to walk over them anywhere with relative ease. One exception, the ~~most recent~~ latest crater, a peak called El _____, though ^{about 200} ~~ancient~~ by historical measure, is a steep-sided cone that rises ^{about 200} ~~two~~ hundred feet ~~at~~ from the center of an even older crater to a small vent not more than fifty feet in diameter. Its rim is ~~still dark~~ bare dark rock still, and on its sides the tracery of lava rivulets is clearly seen. One in particular, a tube four feet in diameter, extends in a long S curve to the base of the cone.

On the north side of the central chain of peaks the grass land ~~gives way rapidly and~~ abruptly at a wall of scalesia forest composed of the tallest species of Scalesia found in the Galapagos Islands. Fingers of this forest reach up ~~on~~ the sides of some of the craters ~~to~~ nearly to their summits. The growth of all the vegetation ^{more} at this altitude on the north facing slope is ~~very~~ luxuriant ^{with} ~~which~~ a situation ~~than on the opposite side~~ which must have some relation to a differential ~~of~~ precipitation or cloud formation on the two sides. Marching along the sky-line of the peaks on ^{on} the east-west axis a row of agaves marks a trail across the island from Whale Bay on the west shore to Cerro Colorado ^{opposite} ~~at~~ the Plazas Islands on the east. Agaves are ~~not~~ ^{new} ~~not~~ endemic to the Galapagos ~~islands~~ and were planted, so the legend goes, by whalers or buccaneers who had established a land route between these ~~the~~ bases.