

CHAPTER IV

The Man-O'-War Birds of Tower

pt
The thousand-fathom line of ocean depths lies close to the western side of Fernandina and Isabela and marks the western terminus of the Galapagos Platform. Beyond this point the ocean floor continues to decline steeply to abyssal depths of two miles. The awesome height and majesty of these submarine cliffs that outline the Platform can only be imagined, but some idea of their size is obtained by considering a comparison with the most imposing cliffs on land, the walls of the Grand Canyon, which would be dwarfed beside them. They differ, however, in that they have been formed not by erosion but by massive outpourings of molten basalt from the earth's mantle ^{which rose up to} ~~and~~ overlie the original ocean bottom. A narrow submarine trench cuts into this flow from the northwest dividing the platform into a large southern section, on which the major islands rest, and a smaller part that has given rise to the group of islands lying north of the Equator which include Pinta, Marchena, and Genovesa or Tower ^{Island}.

?
Tower, except for the tiny, sheer peaks of Darwin and Wolf to the northwest, ^{is} the smallest, most easterly, and most remote of the group. ^{It} is a round, flat island not three miles in diameter. ^{whose} Its periphery consists of fifty foot vertical cliffs, ^{These cliffs are} broken only at a point where the sea has entered one side of its principal crater to produce a nearly land-locked harbor called Darwin Bay. The water within the crater is over one hundred fathoms deep, but on the north side where its walls have collapsed

^{formed}
~~seems~~
a shoal ~~makes out~~ which affords a good anchorage for small boats.
? { ~~The only good landing on the island is at this place~~ On the shore
on which ^{here} a white beach of coarse calcareous fragments of shells,
coral, and coralline algae has been heaped up by wave action. A
pool behind the beach that fills and empties with the tide through
underground connections with the ocean is a feeding place for
herons and shore birds; and here we saw the Dusky Lava Gull come

The largest colonies of oceanic birds in the Galapagos
nest on Tower Island. Among nearly two hundred thousand
red-footed boobies and swallow-tailed gulls ^{are} some two hundred
man-o'-war or frigate birds. Both varieties of frigates occur,
the great frigate bird in preponderant numbers with a small
percentage of the magnificent frigate bird intermixed. They nest
in the cryptocarpus shrubs fringing the tidal pools that lie
behind the ridges of the collapsed crater.

more widely distributed on the whole than the frigates, nest far

^{l.c.} inland in the Palo Santo forest which covers a large part of the
island, ^(this forest the frigate birds.) and in which the latter because of their requirement for
more open flying space, are much less common. The Swallow-tailed ^{l.c.}

^{also}
Gulls ^{l.c.} avoid the dense vegetation, nesting on the beach and lava
cliffs.

On the eastern cliffs of Tower are found its greatest
congregations of birds. Many thousands of Swallow-tailed Gulls ^{l.c.}
breed here, but their numbers are dwarfed by those of another
^{l.c.} order, the Storm Petrels, a million of which by some estimates
nest in the crevices and hollows of the cliffs. Two species of
these pelagic birds nest here: one kind feeds during the day, the

P other at night. Along in the afternoon those that have been out foraging begin to return and those that have stayed on their nests leave for their night-time feeding grounds. These petrels, however do not depart immediately on emerging from their nesting holes, nor do they enter them as soon as they return from the sea. Like swarming insects they flutter in and out from the cliff, along and over it, at home in the spray of breaking waves. So great are their numbers that from a distance one sees them above the cliff top as a dark pulsating cloud of dancing gnats. With P the approach of night the cloud thins out to only a few birds, and by sunset they have all gone - one kind to their nests in the cliff, and the other kind away to feed at sea.

were
P The breeding cycle of frigate birds lasts more than a year and it begins on Tower Island in January. The start is marked by a period of courtship and display that includes very complex and dramatic behavior on the part of the male. I was very eager to witness this display, and since we ^{were} ~~are~~ now well into March, I proposed that our next trip be to Tower Island for a stay of several days. Moreover I suggested that on our return from Tower we make another attempt to land on the flamingo crater among the Bainbridge Rocks. These plans were happily agreed to and then discussed with ^{the} Angemeyer brothers. It was decided to start on ^{March} ~~the~~ ^{the} twentieth, which would give them time to restock and refuel the Nixe and the Charybdis. Tower Island lies 50 nautical miles north-north-east of Baltra across an ocean stretch of variable and unpredictable currents. Fritz said we should try to make this crossing in one day by leaving Baltra harbor very early in

the morning. The first day of this cruise, therefore, would be to Baltra where we would pass the night and start for Tower at four in the morning on the twenty-first. So for the third time we sailed around the east ^eshort of Santa Cruz past the Plaza Islands and through South Channel. That first night we turned in early, knowing we would be underway again long before sunrise.

The erratic, hollow thumping of the Nixe's diesel motor as it warmed up woke me. Fritz was up first to start the engine which always took several minutes to settle into its normal rhythm. In no time I was out of my bed on deck and dressed, ready to help with the anchor. After a few minutes when the sound of the motor had become more regular, Fritz called out to haul away, and Steve, Fiddie, ^{Fritz's} ~~his~~ young son, and I heaved it up. The chain all glowing with phosphorescence came rattling onto the dark deck between our bare feet, splashing our legs with fiery sparks, and as the anchor cleared the bottom the Nixe picked up speed. We stood for a moment watching the lights of the Charybdis, which was just getting under way behind. Then all my attention was directed towards a wonderful phenomenon of the sea, accentuated by the blackness of the night under an overcast sky. Flowing away in our wake was a milky stream of greenish light, spinning and pulsing as it spread out and faded to a ghostly glow fifty yards astern. Where this shining trail began in the churning of the propeller close under the stern, incandescent points of light flashed on, ^{like} ~~unwinking~~ beacons to line our course. This was a sea rich with plankton, small organisms - biota of the surface waters, both plant and animal, and the eggs and larvae of larger kinds - ^{which they are} ~~that~~ when disturbed respond by igniting their cold chemical

lamps. The curling bow waves were studded with these jewels of phosphorescence from which bright zig-zag lines streaked away to mark the paths of frightened squid and shrimps. For long we stood watching the display. Big pelagic fish outlined in pale fire appeared from time to time moving swiftly on secret missions to vanish into unfathomed depths.

The blackness of night was slowly replaced by a gray dawn. An overcast sky and a bank of sea fog on the eastern horizon obscured the rising sun. Not until it had attained an altitude of several degrees was it able to dissipate the mists sufficiently to break through at last and light a small patch of sea near the horizon. The distant oil-smooth waves reflecting yellow rays from the low sun blinked and glittered in the foreboding gloom of persistent fog. But it was an augury of clearing, and before an hour had passed the clouds had all evaporated and the sun was shining on a sparkling sea.

The rapid improvement of the weather was most propitious to our witnessing for the first time an astronomical event which was to occur that day. March 21st marks the Vernal Equinox when the sun crosses the Equator on its trip north and then the Earth's axis is at right angles to the direction of the sun. At the Equinox on the Equator the sun will stand in the zenith at noon. It so happened that on this cruise on the 21st of March we crossed the Equator at approximately midday when all objects cast their least shadows, and a straight vertical pole casts no shadow at all. With navigational instruments the sun's highest altitude could have been measured and would have been found to be very close to 90 degrees. Without them we could not make this measurement but

amused ourselves instead by examining the shadows on our rolling deck, not a very convincing substitute.

During the course of the day we were visited by a school of porpoises, more correctly called dolphins. (Porpoises are strictly the much smaller members of the same family, the Delphinidae, confined to coastal waters. The Galapagos species is the Pacific Bottlenosed Dolphin. There is some confusion about the term dolphin which also is applied to the brilliantly colored pelagis fish, Coryphaena hippurus, which I previously described.) Dolphins are very entertaining mammals, ^{and they seem to be equally} ~~a point of view which~~
 ✓ ~~entertained by us.~~
 ✓ ~~is apparently mutually shared.~~ They are attracted to a boat, probably by the sound of its motor, from a considerable distance. From out of nowhere they come at high speed, leaping clear of the water and creating a great commotion. As they get near they slow down and range along side since their top speed greatly exceeds that of most small power boats and certainly of all boats under sail. They gather around the bow on either side swimming more ^{leisurely}, breaking water only just enough to breath. They seem particularly to enjoy taking positions directly under the forefoot of the boat where they effortlessly keep pace with it, weaving from side to side for moments at a time, changing places with other members of the herd, and darting ahead to rise and blow. The best place for an observer is the farthest forward point on the deck, where, ^{while} holding to the forestay, it is possible to lean out and look down under the bow. From this place of vantage the dolphins on both sides can be seen as well as those under and ahead of the boat. Sometimes they lose interest after a few minutes and swim off, but on most occasions they stay with you for as long as half an hour, when it seems to be a game they

are playing among themselves as well as with you that holds them. Probably anthropomorphic prejudice partly influences our judgment of dolphin behavior, but nevertheless they do often seem to be concerned to entertain us as well as to derive entertainment from us. It is easy to feel they are showing off with their effortless swimming, ~~which no movement of their tails we could detect seemed sufficient to account for.~~ From time to time a dolphin moving along close beside the bow will turn on his side to look up at you as though to make sure you are still there watching him. The impression is very strong that he is clowning. At other times one will roll completely over in a graceful, fluid maneuver as smooth as a soaring bird. When one comes up for air close by the boat it is possible to see the mechanism of the blow hole. A tight fitting flap opens instantly the dolphin's head emerges, a blast of air carries with it spray from the water still flowing off his back, then, immediately following a sucking inhalation, the valve snaps shut as the animal submerges. It is all accomplished in a few seconds, timed perfectly to the curve of the dolphin's roll.

That dolphins play together is an impression strengthened by the whistles and squeaks they utter, heard from the deck but even more clearly through the hull in the forward part of the boat. The sounds have been assigned a communicative purpose and probably are constantly made by the members of a school, wherefore they do not, when considered alone, simply indicate playful behavior. But when coupled with the way the animals dispose themselves in relation to a boat, weaving about and alternating positions,

the feeling that the sounds are something more than an automatic reaction is too strong to be ignored. The more we learn about dolphins and the closer our relations with them become, the greater is our estimate of their intelligence and/capacity for learning ~~things~~ ^{things}. Along with these highest attributes of the nervous system always seems to go a capacity for conscious enjoyment and play, and in this respect dolphins do not lag behind the other most intelligent animals.

Several groups of dolphins appeared before the day was over, or the same school returned again and again, giving us ample opportunity for observing them. One thing we noticed right away was the criss-cross of white scratches they all bore on their gray backs and flanks. It seemed that part of their interest in a boat was the opportunity it gave them to remove parasites by running themselves against the keel, which could account for the scratches, but we were never able to verify this suspicion. One female dolphin was accompanied by her cub who followed her closely wherever she went, maintaining its position under and to one side of her tail and never straying more than a foot or two away. Together they gave a beautiful exhibition of perfectly synchronized, close formation swimming. Between members of the school we saw no collisions regardless of how closely they gathered under the stem. They swam about under and over one another without interference, and even rose to breathe in tandem or side by side with never a bump. And all the time they watched us, and almost comically seemed to pose for a camera.

As we approached Tower Island in the afternoon we were visited by a delegation of another kind. Frigate birds came

flying out to investigate us, expecting the handouts they so often received from fishing boats. They followed us closely, gliding along beside the rail barely out of reach and landing on our mast heads and rigging. Not to disappoint them we tossed out scraps of meat which immediately attracted larger numbers until they became so bold as to pluck the food from our hands. They ^{were} ~~are~~ very skillful in retrieving morsels from the sea in their long hooked bills by a perfectly coordinated dip of the head as they flew over, seldom missing even tiny pieces. And to snatch in mid-air a piece of meat thrown out was no trick for them. If the food sank quickly, however, they were unable to recover it because they do not dive and rarely alight on the water. But boobies who were also circling the boats beyond the zone of frigates plunged after the scraps they missed without hesitation. Boobies and their near relations the gannets are the most fearless diving birds, ^{and with} They drop into the sea after fish from a great height - a hundred feet or even more. [A squadron of boobies circling above a shoal of mullet dive into them over and over like a rain of arrows or a flight of kamikazes, only they survive. When vulnerable fish are sighted, away they go without hesitation, aiming for the target regardless of its position. They strike the water at whatever angle the quarry is seen, straight down or on a long glide, so little time do they allow between sighting and execution of the attack.]

Salute

The sun was near setting when we anchored in Darwin Bay, but with an hour still remaining before dark we all went ashore. On the beach a shrill group of Swallow-tailed Gulls cried out

against our landing. Despite their protestations we crossed the coarse coral beach, avoiding their eggs and downy young, to the tidal pool beyond, which was full of water because the tide was high. A family of Yellow-crowned Night Herons was feeding knee deep on the shallow side. The border across the pool was fringed with low green vegetation packed with birds. ~~At first it seemed that more than the two kinds actually present were represented, but this illusion was owing to the difference in plumage between the frigate bird sexes and between the adults and juveniles.~~ ^{Frigate birds} ~~They~~ perched on every bush: All black males with red, inflated, gular pouches; white-throated, black-headed females: and white-headed immature birds. Interspersed among them in as great or greater numbers were the smaller, less conspicuous Red-footed Boobies. Obviously the frigate birds were still displaying, a cheering discovery. ⁹ On the right of the beach the broken lava cliff that surrounds the eastern side of Darwin Bay to its entrance rises forty to fifty feet. It is draped with hanging opuntia cacti, a plant decended from the same ancestral stock that gave rise to the arborial forms on other islands and that occur to a limited extent in the interior of Tower itself. No reptiles that feed on the cactus were ever present on Tower, which some plant ecologists interpret as the reason for the survival of the prostrate type, or the failure of the giant tree cacti to evolve. In the absence of ancestral tortoises mutual evolution of the present giant tortoise and the tree cactus could not take place; the theory being that the tree was an adaptation to the ravages of the tortoise, and that the evolution of a large tortoise was in turn a response

to the increasing inaccessibilness of cactus pads. Without environmental pressure favoring the tree form it failed to evolve, at least to the size it attained on those islands where tortoises existed.

The left side of the beach ends against low lava ridges, the tilted edges of the collapsed crater rim, behind which a line of tidal pools have been partly filled with sand. Inland from these pools several acres of low ground is covered with the *Cryptocarpus* shrubs in which a dense colony of some two hundred frigate birds nest. These shore areas where the limit of our exploration during the short time available on this first exciting day, and we returned to our boats as the sun was setting.

Knowledge of the behavior of Man-O'-War birds was greatly augmented by the work of Bryon Nelson who spent seven months on Tower Island studying them. But in spite of his intensive observations several puzzling features of their behavior still remain unexplained. Young birds are slow to mature and long remain dependent on their parents, continuing to be fed by them for months after they have learned to fly, even up to the beginning of and past the following breeding season. Since the breeding cycle starts on Tower about the same time each year, this long post-fledging dependence of juveniles indicates that two groups of frigates may nest here on alternate years. I saw a fully grown frigate in juvenile plumage feed from the gullet of an adult female, while a few feet away another female was incubating her egg and not much farther off on the other side a pair were engaged in mutual display. Except for what they pirate from other species of birds, especially the boobies, frigates snatch most of their

✓ food from the surface of the sea. According to Nelson it consists largely of flying fish and squid. Probably the skill required to obtain this kind of a living is not quickly learned which accounts not only for the long period of dependence of the young but for the high mortality rate among juveniles, many of whom die of starvation. They have been found reduced to a third of the adult weight, ~~a condition probably caused by foraging failure rather than by lack of adult care.~~ ~~a likely result of foraging failure than lack~~ ^{a condition probably caused by foraging failure rather than by lack}

? Another factor, cited by Nelson, ^{which may be} contributing to the high mortality rate among frigates is egg loss, ^{in which this} amounting to over sixty percent of the eggs laid in one season. Fifty percent of the loss could be attributed to third party interference; the other half to eggs falling through ^{the} structure of too flimsy nests, or being rolled out by accident during the place-changing ceremony when the incubating partner is relieved by its mate. Flimsy nest construction is the consequence of an intense competition for sticks, the only material used for nest building, which is always in short supply. An unguarded nest, during the period of courting and egg laying, whether it contains an egg or not, is quickly torn to pieces by other frigates who seem constantly to be on the alert for such opportunities. They fly over, sometimes in a regular procession, snatching sticks one by one in the same manner they would snatch a fish from the sea, demolishing a nest in a very short time. An egg that the nest might contain would of course soon roll out, but it is unusual for nests containing eggs to be left unattended. A nest without an egg, however, where I had watched a prolonged courting display was, on desertion by both birds, quickly carried off by others to the last stick. Subsequently, on the return of presumably the original pair, they

P brought in several sticks in an attempt to reconstruct their nest. When an egg is lost during female incubation and the nest deserted, it is, Nelson says, usually reoccupied immediately by a displaying male who is soon joined by a female. The puzzle is: who is he? If he is the original male, what was he doing hanging around when he should have been away foraging in preparation for his stint on the nest? The female, on the other hand, was in many cases known to be a newcomer since the first female had been marked with dye to make her recognizable. Another consideration that makes this behavior unusual for a colonial nesting species is that it indicates a very low order of territorial aggressiveness. Most sea birds would defend their territories against interlopers even after losing their eggs.

The courtship display of Man-O'-War birds is a fascinating affair. The complicated behavior patterns that are tied in with bizarre physical developments in the male bird is a marvelous example of an evolutionary cul-de-sac. Off the main stem of evolution on a side branch of specialization the development of the gular sac, cape of iridescent scapular feathers, and small webless feet promises no lasting advantage to the species; rather it is a handicap that in terms of our perhaps inadequate understanding can only lead to extinction. A behavior pattern that seems to lead in the same disastrous direction is the specialized foraging habit of snatching food from the surface of the sea, which, because of the skill required, has lead to a long dependence of the juvenile on parental feeding with a concomitant high mortality rate. The effect of the foraging methods on the adult has also

been a trend away from generalization towards other highly specialized physical characteristics. Thus frigate birds have become adapted to a life on the wing permitting them to remain indefinitely aloft in a tropical climate. Their ratio of wing span to body weight is greater - their aerodynamic conformation more favorable - for soaring than in any other bird. They have lost a need to alight on the water and with this change their feet have lost, or never acquired, webs, and have shrunk to almost vestigial size, a further economy in body weight. Their feathers are not waterproof as with most pelagic birds, which confirms a limitation, imposed as well by the other features, to a life in the air and to restricted breeding grounds. If something should happen to reduce the availability of certain surface inhabitants of the sea they would face extinction. Perhaps this is already happening and they are responding in a way that may prolong their survival by adopting a piratical habit of "parasitizing" the boobies on whom they could become completely dependent.

However marginal their existence may seem, it has not yet reached the extremity of some other birds throughout the world, the flightless species, for instance, many of whom have already succumbed by their inability to cope with unexpected adverse conditions. The flightless cormorants of the Galapagos have taken an evolutionary direction which could probably not be reversed by environmental changes favoring flight, and are therefore in the long run doomed. But in the meantime their lives and those of the frigates are subjects of study from which much may be learned about evolutionary adaptation.

The most striking features of the male frigate's nuptialⁱ display is his huge throat pouch which he inflates with air to a taught^u balloon on which his head and bill seem to rest. The membrane is laced with a network of blood vessels which in the sun give the sac a brilliant scarlet translucence. When collapsed the sac becomes a narrow band of wrinkled red skin on the bird's neck. During courtship, between periods of active display, the male flies around with this wobbly ornament hanging from his throat. If he sees a male displaying on the ground he may alight nearby and join in the performance. Others may also be attracted until a considerable group has gathered all displaying at once. The stimulus^u for this behavior is of course the female. When^{one} flies overhead he extends his wings to their full eight-foot spread, tilted, according to Nelson, to reflect light from their silvery under surfaces, and directing his fully inflated pouch upwards he turns his head from side to side to attract her attention. His emotional excitement is accentuated by^a violent trembling of his wings, his long iridescent scapular feathers rise like a crest on his back, and he utters a frenzied warble as he rotates around to face her. All these actions are not necessarily performed simultaneously, although at the peak of display most of them occur as parts of what is probably an automatic reaction. When the female alights beside a male they engage in a sort of mutual admiration which has been described as an embrace; she stretches her head towards him and he enfolds her with his wings. At least they go through a long period of bill and head rubbing, vocalizations, and pecking at twigs as part of the

one
what?

a

female

one

H

ritual of pair formation. All this happens before the egg is laid during which time the nest is built, or an existing one strengthened by the addition of more sticks. Gradually the intensity of display by the male diminishes if the pair bonds are firmly established. But in the beginning of the process, it has been observed, the female may visit several males indicating that female choice plays an important part in pairing. Once mating has occurred and the egg is laid the stimulus for display dies down and the male no longer inflates his pouch. Nevertheless, I did observe a case of anomalous behavior where a male was incubating with his pouch partly inflated.

L.C. The Red-footed Boobies on Tower exhibit a plumage characteristic not manifest^{ed} by populations on other archipelago^as. This situation might be compared with the anomalous behavior of other non-endemic species of birds in the Galapagos. Thus the Little

L.C. Green Heron adapting its feeding habits to the special conditions prevalent in the islands has been known to dive in shallow water for its food, quite an unheron-like procedure. And the Yellow

L.C. Warblers on Hood Island have taken to foraging on the wet sand beaches below the high tide line for the small arthropods that inhabit this zone. They also, along with mockingbirds, have been seen hunting for insects or other small invertebrates around the carcasses of dead sealions. I was puzzled to see what appeared

L.C. to be Red-footed Boobies in immature plumage courting and engaging in prenesting behavior. They were not black and white as the adult birds are generally described, but had fawn-colored heads and brown wings and backs. At first I thought these might be another species of boobie unknown to me, but since no such other

birds exist as a separate species, the truth appeared that here
l.c. at least, on Tower, the Red-footed Boobies matured to a different
color phase than birds in other colonies, retaining a more juvenile-
like plumage. Confirmation of this phase situation I obtained
later, when back of the tidal pools away from the concentrations
l.c. of ~~Man-o'-War~~ birds, I discovered a boobie in pure white and black
plumage incubating its eggs in a nest built in a palo santa tree.
There was no mistaking its identity for it had the pale blue bill
and red feet of its fawn-colored relatives.

Also I found breeding pairs whose plumage was intermediate
between the brown and white phases. In these the back feathers
between the shoulders were white, often being rather prominently
displayed as scapular tufts, like the similar male frigate bird
display. A possible interpretation is that with increasing age
the brown phase boobies tend to become whiter beginning with the
scapular feathers. Not until I had returned to the United States,
l.c. on reading about ~~Red-footed Boobies~~ in Robert Cushman Murphy's
Oceanic Birds of South America, did I find a description of this
condition. He states specifically that on Tower Island in the
l.c. Galapagos the ~~Red-footed Boobies~~, quite unlike the birds in
Hawaiian Island colonies, breed in juvenile plumage, and that only
a very small percentage ever develop the more usual black and
white feathers. How well this fits the observations of naturalists
beginning with Darwin himself that insular types of birds, owing
to the reduced competition between fewer species, drift towards
drabness. ⁹¹ Brilliantly colored plumage is gradually given up
since the need for it has become less. Besides the Darwin finches,

Need to
break
up
this
91

which have all retained, or, since we have never known their
ancesters it may be correct to say, regressed to drabness, there
are two other species of land birds in the Galapagos that illustrate
this phenomenon. One is the ~~Yermilian~~ Flycatcher, the male of
which is losing its bright red color. Brilliant males still occur
and are very noticeable but many plainer males are seen in numbers
that cannot be accounted for on the basis of an expected proportion
of immature individuals. Another example is the Hood variant of
the ~~Yellow~~ Warbler whose anomalous feeding habits have already
been mentioned. This bird has lost most of the bright yellow
color of the male or the paler yellow of the female and become
quite dark and olive greenish, although still unmistakably the
same bird. And so we see that with the lessening of competitive
pressures and the changing of environmental conditions that favor
adaptive adjustments or the preservation of specialized characteristics,
the white plumage of the ~~Red-footed~~ Booby on Tower Island is
disappearing. A page of his genetic blueprint has been skipped
or has been torn out.

In among the lower branches of the ~~Cryptocarpus~~ shrubs
the pretty little Galapagos dove, a spotted brown bird with pink
iridescent neck feathers, creeps unobtrusively. When I saw ^{those} ~~them~~ doves
in this situation I wondered what they could be doing so furtively
in this lowest level in the frigate bird-booby colony. I thought
at first they were obtaining a symbiotic livelihood from the by-
products of the larger birds - from their insect-attracting refuse
or parasites. Then I saw a dove enter a small cave in the lava
and settle on three white eggs. Perched above her hardly more
than a foot away was a frigate bird with other frigates and boobies

P l.c. on all sides. They paid no heed to her - it was I who had unwittingly driven her from her nest. On searching further I found several other doves nesting in similar locations; perhaps they obtained some protection from their only enemy, the Galapagos Short-eared Owl, by the sheer numbers and propinquity of unrelated species. But later we found that they nested abundantly also in cavities on bare and crumbling old lava flows where no such protection was afforded.

to reach to reach
One day we walked inland to Tower's small secondary crater. It was only half a mile from Darwin Bay but took longer than one would expect, even allowing for the heavy cameras we carried, because the route crossed a series of ragged lava ridges over-grown with a forest of palo santa and cactus. All the way we encountered nesting boobies and from the raised rim we looked down several hundred feet onto a green-blue salt water lake surrounded by mangrove. A flock of boobies were floating on the surface and others were constantly flying around the rim, which like that of Darwin Bay had collapsed on one side following the quiescence of volcanic activity.

P.C. On the last day we crossed to the east side of Darwin Bay to see the petrel colony. We landed at the base of the crater wall at a place Carl Angemeyer called Prince Philip's Steps where HRH The Duke of Edinburgh went ashore during his visit to the Galapagos on the world voyage of the Royal Yacht Britannia. The eastern side of Darwin Bay is a narrow vertical-sided peninsula almost devoid of vegetation. The flat, bare top of the outer cliffs is the haunt of Galapagos Short-eared Owls that prey on the petrels. In the cracks and hollows on the face of the cliff hundreds of thousands of storm petrels and shearwaters nest.

The two kinds of the little storm petrels that breed here are indistinguishable except in the hand or by their foraging habits.

Said before
The species that feeds by day

~~One species feeds at night and the other by day; the latter is~~

the one seen often in bays and coves fluttering over the waves as it feeds on surface plankton. It gets its name Little Peter, I am told, from St. Peter by the way it appears to walk on the

water. These petrels can be attracted to the side of a boat *by if one*

✓ scattering ^Sbits of oily material or powdered milk on the sea;

H and ~~these~~ ^{they} will fly close along side, giving a very pretty demonstra-

tion of their water-walking skill. Singly or by twos they flit past again and again as light as thistle down, tapping the water with their dangling webbed feet and dipping their bills for food. It is a dancing, butterfly flight, in which wings, long legs, and broad feet are used with precise coordination to keep the bird close to the surface yet safe from sudden wavelets and down gusts of air.

P On the way back to Academy Bay - as planned - we stopped again at the flamingo crater in the largest Bainbridge Rock, and this time we were able to land. The swell was so much less than before, we got ashore without even wetting our feet. The flamingoes were huddled on the far side of the lake; they seemed not greatly alarmed by our presence. As two of us took up positions with our cameras in the viridian saltwort that covered the steep bank, my son Steve walked slowly around the lake towards the flock. The strategy was to herd them around in front of us where we waited quietly. The plan worked remarkably well. As Steve approached the flamingoes they moved slowly away from him keeping in the shallow water below the bank, wading along in close formation, and stepping just high enough to clear the water with their feet. As

they circled towards us under the green bank pink reflections appeared in the rippled blue water - the colors of a little girl's birthday party. Approaching us, the birds became noticeably nervous and quickened their gait as though they planned to make a rush to get past, but they lost their nerve the last minute and took to the deep water where they swam by like pink caricatures of swans whose necks had become enormously attenuated and whose heads had changed into faces on which the dominating feature was a huge hooked nose. When they reached shallow water again, less than a foot deep, they stood up, demonstrating surprisingly that flamingoes swim with their legs doubled up under them and paddle with their feet. Several times we chased them around the pond and each time they seemed less fearful, at last running by in front of us with their wings raised for speed, showing to great advantage the black tipped primaries. It was a beautiful exhibition of light-footed grace and portrayed the flamingoes at their spectacular best.

We encountered flamingoes on subsequent cruises in other salt lagoons - at James Bay on San Salvador, on Jervis, and on Florena - but they were all wilder than those on Bainbridge where they are disturbed much less by fishermen. In these larger lagoons the birds retreat to the farthest side as soon as someone appears on the shore. They cannot be herded around and will spook if they are pressed too closely, flying off at once. Before leaving for a more secluded place they circle the lagoon displaying their exquisite ^{rose} color. They fly like cranes, their necks outstretched and their long legs trailing. With each beat of the black-tipped wings their bodies rise and fall while their heads

remain at a constant level, the body motion being absorbed in wave-like undulations of their long necks. ^H I cannot see flamingoes without recalling a childhood picture of a flamingo standing beside her nest, a tower of mud holding two great eggs in its saucered top. I must have returned to that picture often, fascinated by the strangeness of the bird. Somewhere in conjunction with the illustration I read that the heavy bill was used to crush oysters, a quite erroneous piece of information for it is adapted to a quite contrary use in a not well understood way, for straining small organisms from shallow muddy water.

^H In some hidden lagoon on the shore of one of the islands the Galapagos flamingoes have built their mud nests. Ever since childhood, when I first saw a color illustration of a flamingo standing beside her nest, a tower of mud holding two great eggs in its saucered top, I had hoped some day to see a colony of these birds. But because flamingoes do not tolerate even the slightest disturbance during their breeding period, and could easily be caused to desert their nests, we did not try to find the colony, and had we known its location we would not have visited it.