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BEACH GRASS

SAND DUNES IN WINTER

BEACH GRASS

BY

CHARLES WENDELL TOWNSEND

Author of "Sand Dunes and Salt Marshes," "A Labrador Spring," "In Audubon's Labrador," etc.

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PREFACE

IN "Sand Dunes and Salt Marshes" I made note of intimate studies of such regions in my sojourns at Ipswich, of the varied forms and movements of the sand, of the growth and origin of the salt marsh and of the life in the dunes and the marshes both animal and vegetable. In the following pages I have endeavored to set forth additional studies in these same regions.

Chapters VII and XI appeared first in the pages of the Auk, Chapter IX and part of Chapter X in the Bulletin of the Essex County Ornithological Club, to both of which publications I am indebted for permission to print here.

As in my other books, the Index will be found to contain the scientific names of the plants and animals mentioned. The illustrations are from my own photographs.

I have called the present volume by the title of

"Beach Grass", partly because this grass is so characteristic of the region and partly because of the meaning of its scientific name—*Ammophila arenaria*—the sandy sand-lover.

BEACH GRASS

BEACH GRASS

CHAPTER I

Days and Nights in the Dunes

"There is a rapture on the lonely shore,
There is society, where none intrudes,
By the deep Sea, and music in its roar."
—Byron

THE DUNES are constantly changing and always present scenes of interest and beauty. The surface ripple-marks formed in the bed of the wind and athwart its course like the ripple marks in the sandy bed of a stream, move with the current. The grains of sand hurry up the gradually sloping side to windward, drop over the steeper leeward side and eddy in the trough. These rippling, corded markings are to be found wherever the sand is bare of vegetation, and record the direction of the present or latest strong wind. Like snowdrifts, the sand

collects behind tufts of grass or bits of driftwood and builds up into dunes. The dunes devoid of binding grass or bushes—the desert dunes—move in the direction of the strongest winds, those of the winter months which blow from the north towards the south. Like magnified ripple-marks, the windward side is hard packed and slopes upward at a gentle angle of about nine degrees, while the leeward side rests at the steeper angle of repose of the sand, an angle of thirty-two degrees. On this side each foot of the traveller sinks deeply into the soft sand and starts it rolling downward.

The two most striking examples of this desert type of dune at Ipswich, described in my former volume, still continue their devastating career. The "glacier" dune has buried still more of the living pitch pine grove and has uncovered more of the dead one. In its uncovering process, the bleached skeleton of a horse has ben exposed today, and its bones lie about among the relics of trees where the animal laid itself down to die, many years before. The other great desert dune, the one near the mouth of the Essex River, has

THE VENDOME DUNE OVERWHELMED BY SAND IN 1915

THE VENDOME DUNE IN 1918

THE CAMP GROVE IN 1913

THE CAMP GROVE IN 1921

swept on with greater rapidity, as a larger area is now devoid of binding vegetation and is open to all the winds of heaven. Little remains of the birch grove, and the camp therein will shortly be overwhelmed. The sand has doubtless advanced at times at a faster rate than five feet a month in winter, a rate formerly determined by measurement and markings of individual trees.

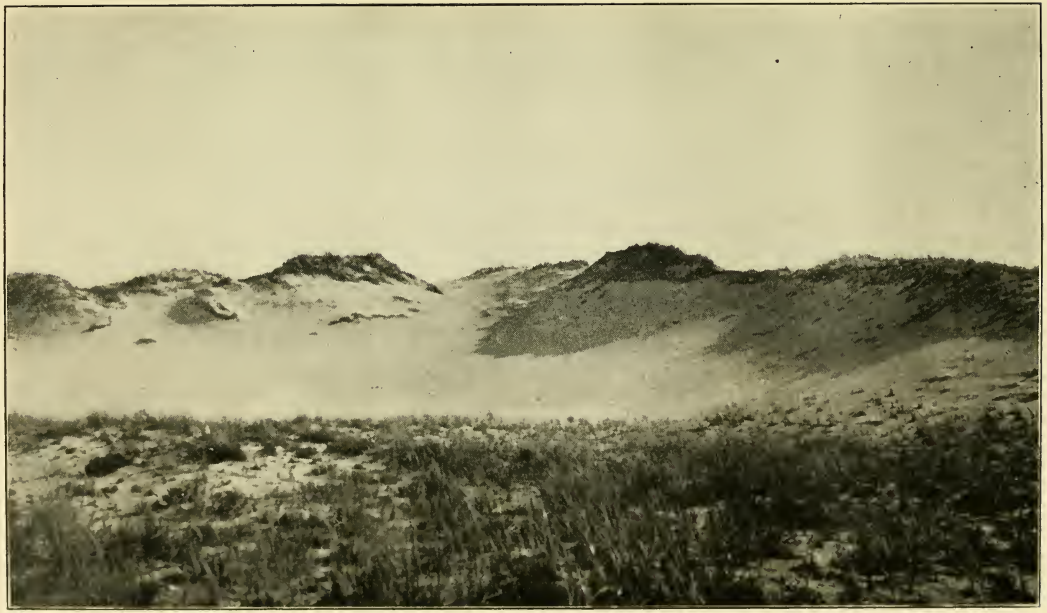
Between these two, a dune has overwhelmed a fisherman's shanty which formerly bore a weather-beaten sign,—"The Vendome." Higher and higher crept the sand until nothing was left exposed but the ridgepole, and this finally disappeared. By a further shift and advance of the sand, a bit of the ruins is now revealed on this Vendome dune.

The reverse waves of sand, with their steeper undercut surfaces to windward, held in place by the binding roots and buried stalks of the beach grass, have continued to cut backwards. These I formerly called amphitheatre dunes, as they take the shape of large or small amphitheatres. A similar name, that of cirque dunes, might well be adopted, for, like the glacial cirques cut out of

the rocks of mountains, their progress is partly determined by undercutting and by "plucking," —not by ice, however, but by the wind. Some of these cirque dunes are changing to the desert type as larger areas of sand, free from vegetation on their windward sides, give freer scope to the wind.

Irregular dunes, looking like snow-covered mountain tops, pyramidal dunes cut on all sides, and peaks well protected by the binding beach grass are all to be found. Some of the latter stand up like nunataks above the surface of a glacier, or monadnocks on a worn down plain. Eagle dune has constantly changed in outline, disappearing like snow in the hot sunshine on the windward northern side, to be built up to leeward.

The outline of the beach itself is undergoing many changes. The building of a stone and cement breakwater opposite Little Neck at the mouth of the Ipswich River has caused many changes in its wake. The cove below, where one of the Christmas wrecks occurred in 1909, has lost an indention of at least a hundred yards and the



CIRQUE DUNE CHANGING TO THE DESERT FORM

A NUNATAK IN THE DUNES

DESERT DUNE OF THE CAMP GROVE FROM THE NORTH

shore has become almost straight. Farther to the south, the rebound from this building out has carried away fifty or sixty feet of the end of a driveway to the shore, and exposed a cross section of dunes in a low cliff. In 1911, I found the distance from the northern corner of the lighthouse lot was a thousand and ninety feet from high water mark. In December, 1920, it was only six hundred and thirty feet. Warning trespass signs, like King Canute's commands, have been of no avail. They have been washed away by the advancing sea.

In winter this cliff of sand, solidified by frost, is undercut by the waves, cracks a foot or two from the edge and long sections sink down. In this way the recession is rapid. The pathway from the lighthouse, after traversing the dunes, formerly passed through a broad stretch of low-lying upper beach. Now that the beach is cut back, the path over the dunes is shown in section like a U-shaped hanging valley.

Still farther to the south the beach has built out on a shore line of about half a mile, and successive waves of dunes mark the old beach lines.

A great plane of wind-swept sand awaits the growth of beach grass and the building up of dunes, but may succumb to the waves before this occurs. Again the swing of the shore line beyond this plane has cut into the older dune-covered beaches and has revealed in section timbers of old wrecks, once on the shore, and the remains of a fisherman's dory long buried by the sand. Beyond this the beach line is nearly straight, for the outlying Ipswich bar comes to an end, the swing of the river no longer exerts itself, its meanders have ceased and it has escaped to sea. It is dangerous to interfere with the course of a river. The consequences are far reaching.

Although many bushes and trees are overwhelmed by the sand every year, the total amount of vegetation in the Ipswich dunes, described in the former volume, appears to be increasing. In the last ten years the groves of pitch pines have augmented very much in area, extending towards the south whither the pine seeds are carried by the strong northerly winds. Many of the cranberry bogs—natural ones, not man-made—have grown up to bushes, and here

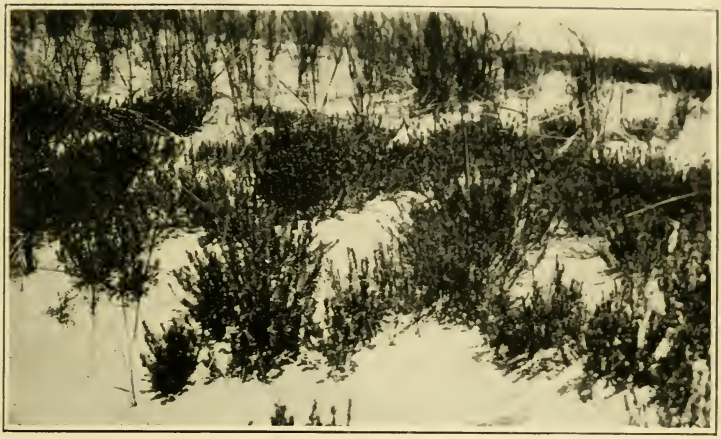
I have added a new bush and a new tree to the list—the buttonbush and the red oak. The dusty miller, a naturalized emigrant to these shores, has increased and multiplied. The Hudsonia is as beautiful at all seasons as ever. The two clumps of red birches and of rhodora still keep their station, but the few square feet of bearberry have disappeared from my ken, whether overwhelmed by the sand, or merely lost, I know not.

It is devoutly to be hoped that no enthusiast will ever introduce foreign trees or shrubs to disturb the natural flora of these dunes. Such an event would be viewed by a naturalist almost in the nature of a calamity.

Growing near the edge of the dunes at the foot of Castle Hill is a willow of great age, a veteran, with split and hollow bole, unable longer to hold up its great branches which rest on the ground. In touching the ground it has renewed its life like Antæus of old or like the banyan tree, and has taken root and sent up fresh and vigorous willow saplings. It is related of the early colonists that they brought

over from England willow wands which they stuck in the ground to grow, and I like to think that Winthrop the younger, who owned all this region, may have planted this tree. There are three other willows of the same great age and decrepitude but with the same vigor of renewed youth, two side by side higher up on Castle Hill, the other on the side of Sagamore Hill. The pair on Castle Hill are much broken with age. The trunk of one is fourteen feet, seven inches in circumference, the other seventeen feet nine inches in circumference—almost six feet in diameter.

A mirage of the distant coast and of vessels on the sea is a common phenomenon at Ipswich beach as in all seashore regions. Cape Ann is often distorted by mirage and the low shores and houses of the New Hampshire coast are elevated so that they appear like lofty cliffs, interrupted with numerous water-falls. The distant Isles of Shoals, visible only on clear days, are raised up so as to look like a city, dominated by the lofty lighthouse column. Mt. Agamentacus in Maine resembles a huge and flattened inverted bowl.



HUDSONIA IN BLOSSOM

DUSTY MILLER

Sometimes it seems suspended between sky and sea. On days when the sea is dark blue and the sky pale blue, fading to white at the horizon, distant shores and hulls of vessels often appear lifted up, and a narrow ribbon of white sky stretches beneath.

All are familiar with the classical tale of mirage in the desert, which simulates a lake of water to the thirsty traveller. Several times I have seen a similar mirage at Ipswich beach. One was so perfect that I was completely deceived, and wondered how this lake of calm, unruffled water could have sprung up over night in the expanse of sand. The illusion was intensified by some gulls who appeared to be wading and swimming in the water. As I approached, the lake receded and finally vanished.

At night there is a gentle mystery and a sense of primeval grandeur in the sand dunes that surpasses the mystery and the grandeur of the day. It is good for the soul to escape from the conventionalities of life and lose itself in darkness in this waste of sand. Like a wolf, turning and shaping his form in the grass before he lies down,

so the dune-lover shapes his form in the sand, hollowing places for his shoulders and hips. Lying thus in his mold, securely wrapt in his blanket, on the crest of a dune wave, he sees the sun set, the blue eclipse of the sky by the earth rise in the East, and the pink glow overhead and in the West gradually fade. Swallows in straggling bands and in great multitudes, hastening to their night roost, skim close by, sometimes within a hair's breadth of his face. The dark, ungraceful forms of night herons pass over with slow wing-flaps and discordant croaks, and the stars come out until the whole vault of heaven is aglow. Those who dwell in caves, in deep canyons or in rooms in city streets, know not the brilliancy of the heavens as revealed to those who lie out under the stars. They know not:

"The silence that is in the starry sky,
The sleep that is among the lonely hills."

The laughing cry of the loon comes to his ears from the sea and the noisy clamor of a great company of herring gulls, gossiping with each other as they settle down for a night on the

shore. Sandpipers and plovers whistle as they fly over, and the lisping notes of warblers, migrating from the sterile cold of the North, drop from above. Forming a continuous background to these voices is the boom and the crash of the waves on the sea beach.

All too soon he sinks into a gentle slumber, to awake perchance in the night and hear the passing birds still calling to each other, and the surf still booming, and to watch the flickering rays of the aurora waving its ghostly arms overhead, or a meteor as it streaks across the sky. At dawn he arouses himself and finds everything about him soaked in dew. The radiation into the clear cloudless sky has reduced the temperature many degrees with the consequent condensation of moisture. Beads of dew stand out over his blanket, the grass blades drip with it and pit the sand below, and his frying-pan, beside the cold, sand-quenched fire, is dotted with drops of water. He has covered his binoculars, note-book case and knife with his hat and has saved them from a soaking.

The air is crisp and cold. Tree swallows and,

later, barn swallows rise up in clouds from the dune thicket near at hand and salute the sun which, although still invisible from the sand, lights up their plumage on high. The red glow in the East begins to pale. It loses its brilliant carmine hue, fades to rose and to yellow and to cold straw color, and the great globe of the sun appears above the horizon.

It is time for him to arise if he would take advantage of the oblique rays of the sun to study the story of the night in the tracks in the sand. The sand is moist with dew and holds every faintest impression like molders' wax. The wind has not yet arisen to mar these impressions by drying and crumbling them, or by filling them with blowing sand. The oblique rays of the sun, casting shadows in the faintest indentations, bring out with startling clearness tracks that are all but invisible when the sun is overhead.

Near at hand are tracks of small birds that have paused for a moment, but have departed in haste alarmed by the attributes of man. An unsuspecting white-footed mouse has jumped along, leaving the tracks of a miniature rabbit.

A plodding toad, patiently pursuing its direct course, has traced its footsteps near the head of the sleeper. A skunk, that knight of the night *sans peur*, on account of his armor of scent, and, in this case, at least, *sans reproche*, has ambled leisurely by. One may be sure that no fox or deer tracks will be found near, except perhaps on the windward side. The sense of smell in these animals is too keen to permit them to run any risks.

At the time of the full moon the fascination of the sand dunes is increased to a superlative degree. The whiteness of the sand augments the brilliancy of the moonlight, just as is the case when the landscape is white with snow. Such a night was that of September 25 and 26, 1920. It was calm and warm, 68° Farenheit by the cricket thermometer.[1] As I wandered alone about the dunes, listening to the voices of the birds passing overhead, and of those on the shore and sea, I was alert for a glimpse of night-wandering animals whose tracks were clearly visible by moonlight. Exposing a photographic

[1] See page 201.

plate for twenty minutes to the mysterious scene, I patiently waited and watched during this interval but saw no track-maker. The sky on the sandy horizon—on the crest of a sand wave—looked black in comparison with the white sand, but this starless darkness soon merged into the vault of the heavens with its suggestion of blue, studded sparsely with stars. Only those of greater magnitude showed in the brilliant light of the moon; the light of the lesser ones was quenched. We pay for the light of the full moon by loss of starlight just as we pay for sunshine by loss of moonlight. About five in the morning the moon set large and red, and the lesser as well as the greater stars blazed out, and the path of the Milky Way appeared across the heavens.

After a period of unfavorable wind or weather, a perfect night may come when the floodgates of bird migration are opened, and the pent-up multitudes, waiting for this chance, pour along the aërial channels. Such a night followed September 9, 1916, and it was my good fortune to spend it in the dunes and on the beach. The air,

THE DUNES BY MOONLIGHT (*twenty minute exposure*)

BEACH GRASS

blown as clear as crystal by a sparkling northwest wind, and illuminated by the full moon, and its reflection from the sea and white sand, made the night almost as light as day. There was a brilliancy and ethereal quality suggestive of fairyland. Such nights as these fill one with rapture at the marvelous beauty and mystery of the sand dunes.

During the evening it was evident that a large migration of small birds was taking place along this highway by the seashore as the air was filled with bird calls that showered down from the sky, but, peer as I would, the birds themselves remained invisible, notwithstanding the apparent brilliancy of the air. Only as they cross the face of the moon are such small bodies to be discerned.

The tide was at its lowest ebb and, on the hard, broad floor of wet sand scattered shore birds were feeding. The short sharp note of the sanderling, the rasping *ai-ah* of the turnstone and the double whistle of the ring-necked plover sounded from time to time above the roar of the waves. No need for these birds to migrate by night as they are well able to feed at that period.

I made a salty, springy bed of dried eel grass, thatch and Irish moss on the soft upper beach, on which I spread my sleeping bag. Although at evening and at morning the sea was separated from my bed by nearly a quarter of mile of beach, about midnight I was dimly aware that the waves were pounding and roaring ominously not far from my feet. At this uncertain time of night the bird calls above still proclaimed the passing hosts.

When I awoke for the day I watched the sun rise over the sea, and I realized in the absence of bird calls that the flight for the night was over, and that the birds had settled for the day for rest and food.

My steps were first directed to the nearest thicket, for it was evident that most of the birds would seek the shelter of trees and bushes. On the way I came upon some pipits that had arrived during the night, very probably from Labrador, and had found congenial surroundings on the bare sand amid tufts of beach grass. In a thicket less than half an acre in extent of alder and gray birch, with an undergrowth of bayberry,

wild rose, staghorn sumach and poison ivy, surrounded by a threatening mass of bare dunes, was an assembly of birds that made the day a red-letter one for me, and still thrills me with pleasure when I think of it. The trees and bushes and the bare white patches of sand beneath seemed filled with birds—not a flock of one kind but of many different kinds. For several hours I wandered enchanted through this diminutive grove, retracing and crossing my steps again and again, led on by the sight and calls of the birds. At times I looked down on the tops of the trees from the encoaching dunes, and at times I sat on the sand under the trees and watched the birds come and go about me.

The interesting group of warblers took first rank in this assembly. Myrtle warblers and black-polls, both in their simple winter plumages, were abundant. One myrtle warbler was, however, in the full regalia of the spring. It is not surprising that the black-poll in the fall was at first unrecognized by Audubon and called the autumnal warbler. In the autumn the country is often flooded with them and their characteris-

tic call notes are to be heard on every hand. Their plumage at this time is entirely unlike that of the spring. A redstart, a Maryland yellow-throat, a Nashville and a parula warbler were of this company, and magnolia warblers, spreading their tails and showing the white median bands, were common. In a dark thicket, a splendid male black-throated blue warbler revealed himself to me by the white spots on his wings. Presently he hopped into the light where I could admire his trig figure, black throat and blue back. The commoner black-throated green warbler in winter plumage with his black throat entirely concealed by white feather tips was represented by several individuals.

I have left to the end three rarer species of warblers, any one of which is worth a long trip to see. One of these, the Tennessee warbler, is, in the adult stage, one of the most obscurely marked of all warblers, a plain gray and white bird, but the two individuals in this favored grove were young of the year, and so yellow that an observer, unfamiliar with this phase, would be sorely puzzled. The first time I saw this ju-

venile plumage was on a steamer bound back from Labrador, where, during a fog, a couple of young and very yellow Tennessee warblers flitted about the deck almost within arm's reach.

The two other warblers are both strikingly marked birds in full adult male plumage, but are both difficult to recognize in their juvenile dress. One, the bay-breasted, in this phase resembles strikingly the black-poll warbler in its autumnal phase, but the individual who displayed itself to my delighted gaze and turned with great accommodation first one side and then the other to me, showed a faint streak of reddish brown or bay on each side.

The last of this group, a Cape May warbler, I saw at four different times and places in the grove, and I am still in doubt whether it was always the same bird or four different ones. It is perhaps safe to say that there were at least two individuals. The Cape May warbler in juvenile plumage has but the faintest traces of the tiger-like markings on its face, and, with its spotted sides and yellow rump, it resembles rather closely the magnolia warbler in the same stage. The

black spots are less black and the yellow of the breast less vivid than in the magnolia warbler, and, instead of having a subterminal band of white on its tail, the Cape May has white on the outside feathers only.

Warblers are fascinating birds and form an interesting and clearly marked group. They are abundant not only in number of individuals but in number of species. In the full nuptial plumage of spring and early summer many of them are as striking in the brilliancy of their coloring and markings as some of the tropical orchids. One would suppose they would be well known by those who live in or visit the country, but it is an astonishing fact that they are rarely seen except by those who look for them and have cultivated habits of observation. I am confident that many people would have walked through this grove of mine, filled with birds as it was, and seen none there, or have noticed a few "sparrows." Sometimes a brilliantly arrayed warbler, perhaps a redstart or a magnolia warbler, species which pour through our groves in thousands, suddenly pops out within a few feet of

such a person, directly in their field of vision so that they actually see it and can not help themselves, and they report they have seen "a most extraordinary bird, doubtless a waif blown from the tropics." As to the call notes and song of warblers, they are as if they did not exist to such a person. Even if he is silent and does not drown out the bird voices by his own, his auditory apparatus appears to be insensible to the notes of warblers and of nearly all other birds. However, he does not realize his loss.

In the group of thrushes, four representatives were present in this oasis, namely the robin and veery and olive-backed and gray-cheeked thrushes. The last named bird looked so small I am inclined to think it was a Bicknell's rather than an Alice's thrush. These two birds are alike in plumage with gray cheeks, but the Bicknell's is a little bit smaller.

A solitary vireo with his dark, slate-blue head and his white eye-rings appeared at close range. In the sparrow family, juncos with their twittering notes and flashing white tail feathers were most in evidence. The whistling call of the

white-throated sparrow came out of the thicket and it was apparent they were present in considerable numbers. Although both of these birds have on rare occasions bred as far south as Essex County, it is unusual to find them in numbers at such an early date in the fall. A few Savannah sparrows and goldfinches completed the list of twenty-two different species in this circumscribed area. A half a dozen more species are, however, to be added as they were seen or heard as they flew over: namely, purple finch, tree and barn swallow, herring gull, pipit, and duck hawk. The hawk struck terror to all the birds in the grove as he skimmed low over the trees, but my presence, probably, prevented a catastrophe.

Nearly all the twenty-eight species enumerated were birds that are not found in summer in this sand dune region and it is probable that even the Maryland yellow-throat, robin, song and Savannah sparrows, purple finches, and goldfinches, tree and barn swallows were also migrants from the North.

Let it not be supposed that all my nights spent

in the sand dunes have been as poetical as the foregoing. Two stand out in my memory that were far from it. On one of these, in a summer of plentiful rains, I fashioned my mold in the lee of a clump of beach grass on the top of a dune and composed myself to sleep. But, alas, mosquitoes in great multitudes gathered about my devoted head. Oil of citronella, plentifully applied, failed to deter them—I could hear them splashing in it on my face. Their actions reminded me of Labrador. A move to the breezy side of the grass in a seal-like manner, by squirming and flopping in my sleeping-bag was equally unsuccessful. I then took up my bed and walked to what I considered the most windswept spot on the side of the dune. But, as grains of sand driven by the wind come to rest behind any obstruction, so the mosquitoes gathered in my lee and proceeded to the slaughter. I tried several equally unsuccessful moves during the night which was also enlivened by several showers.

On another occasion when the wind was a gentle and a warm one from the southwest, I went

to sleep on the northerly side of a dune, very comfortably wrapt in a thin blanket. In a few hours I was awakened, chilled to the marrow of my bones by a strong wind from the cold northwest. Several times that night I moved, chased around the dune by the searching and changeable wind, and always cold. To complete my discomfiture, my mug of hot coffee at breakfast, which I had tasted only in anticipation, overturned and the delectable fluid sank into the illimitable sand. I must, however, have had considerable sleep on both of these nights as I felt fresh and rested the next day, and I suffered no ill effects in this germless air from being, on the second occasion, so thoroughly chilled. I was certainly cold but caught no cold.

It has been said with truth that adventures are generally due to insufficient preparation. If I had brought a head-net on the first night and more bed clothing on the second, I should have had no adventures to relate.

The most inspiring and exciting sound made by migrating birds is that which comes from a flock of Canada geese. In the distance a faint

sound is heard, it comes nearer and nearer—the sound of many voices—of hounds in the chase, of brazen instruments, the honking of geese, a multitude talking at once. The sound grows louder and louder. I rush out of a bushy thicket, where the trees obscure the sky, and climb to the peak of the nearest dune. Here come the birds, a hundred or more of them, now in a long line abreast, now in perfect V-shape, now massing together in a loose flock. They sweep on in glorious strength of wing and pass overhead and the babel of tongues is almost a deafening clangor, and the sight of the great birds, each with his long neck stretched eagerly towards his home in the northland, becomes an inspiration. The voices grow less loud, become faint and occasional and then cease. All is quiet again but the sight and the sound of this migrating flock are long to be treasured in the memory.

"How oft against the sunset sky or moon
I watched that moving zig-zag of spread wings
In unforgotten autumns gone too soon,
In unforgotten springs!

"Creatures of desolation! Far they fly
Above all lands bound by the curling foam,
In misty fens, wild moors and trackless sky
These wild things have their home.

. . . . . .

"Dark flying rune against the western glow
It tells the sweep and loneliness of things,
Symbol of autumns vanished long ago,
Symbol of coming springs."

The work of the Audubon Societies is bearing fruit. No longer are the plumes torn from the nesting egret. The bird is increasing again in numbers and, after the breeding season in the South, occasionally wanders to the North. In the last dozen years there have been several incursions of this great bird from the South. On an October day in 1919 I was so fortunate as to flush one of these splendid birds from a bog in the dunes. Pure white with the exception of black legs and yellow bill, as large as the great blue heron, it was an impressive sight as it rose, slowly doubled up its long neck, extended behind its black legs, and flew out over the marshes. An hour later, from my house, I discovered it wad-

ing about in the tide on the marshes. Fifteen years ago this bird, if discovered by a gunner, would have been shot and taken to a taxidermist to be stuffed. Now-a-days these birds give joy to an increasing class of nature lovers, and they are able to repeat their visits. In the summer of 1921, no less than six of these beautiful birds were to be seen in the salt marshes.

An interesting migration day in the dunes fell to my lot in mid-March. Some six short-eared owls were tarrying on their way North. Never before had I seen more than two in a day's travel in the dunes. The seaside grasshopper and toad, the Ipswich sparrow and piping plover are well adapted to concealment in the sand, but the short-eared owl surpasses them all. Like them it is somewhat sandy colored, but it bears at times a most striking resemblance to a lichen-crusted stump or a snow-flecked bit of driftwood. An ornithological friend was enjoying with me the sight of these birds and commented on their close resemblance to stumps as they sat on the dunes amid tufts of beach grass. One of them we had watched and seen fly away, and, after we had re-

marked that an obvious stump near, with patches of snow on it, closely resembled a sitting owl, the stump opened its wings and flew away!

That great owl from the white North, the snowy owl, I have been privileged to see a number of times in the dunes, and have described some of these encounters in "Sand Dunes and Salt Marshes." On a January day in 1913 I saw one of these great birds, a rather dark individual, sitting on a dune top near Eagle Dune. I stalked him within fifty yards, when he arose, and, in the strong wind, poised motionless like a kite. His great wings and tail were spread to the full extent and the tips of the larger feathers of the wings were bent up with the air pressure. Alternately gliding and flapping, he skimmed low over the beach grass, occasionally stretching his neck and lifting his great round head above the level of the back and looking about. Twice he alighted on the dunes, sitting not erect as this bird is usually depicted, but with body inclined at the angle of about forty-five degrees. The next December I watched another snowy owl in

YOUNG LONG-EARED OWL

ANCIENT WILLOW

the dunes mobbed by a large flock of snow buntings that swirled about him and darted down toward him as he sat serene on a dune top. The only time I have seen this bird alight in a tree was on a December day in 1918 when one flew over the marshes within plain sight of my house, and perched on the tallest tree on a marsh island.

In June, 1917, a pair of long-eared owls nested in the pitch pine grove to the northeast of Wigwam Hill. They occupied an old crow's nest in a pine about twenty feet from the ground, and brought up three solemn looking young that were at first clad in white down. Their faces were dark and their downy ear tufts were plainly visible even at this early age. One of the old birds flew anxiously about among the trees, uttering low, complaining notes which suggested the barking of a puppy.

The interesting fact about this family of owls was their diet, and of this they made a very good record in the numerous pellets of undigested food that they cast up and were found around the foot of the tree. Their habits were not hygienic, for the nest itself was covered, several layers deep,

like stratifications, with the fur, feathers, and bones of their victims. All of these I collected with care after the birds had left the nest, and sent them to the Biological Survey in Washington for identification. The result was most surprising and is interesting to record here. This family of owls had been fed on two red-winged blackbirds, one each of the following kinds of sparrows—the sharp-tailed, Savannah, vesper and chipping—on two song sparrows, one chewink, one pine warbler, one Maryland yellowthroat and two other unidentified warblers, two thrushes, a brown thrasher and four other small birds not identified; also on three short-tailed shrews, one white-footed mouse, eleven jumping mice, and eleven meadow mice. In other words, the refuse from the owl table showed that over thirteen different kinds of birds had been eaten and twenty-three individuals; also four species of mammals and twenty-five individuals.

Fisher in his classic on the "Hawks and Owls of the United States" says: "The Long-eared Owl is one of our most beneficial species, destroying vast numbers of injurious rodents and seldom

touching insectivorous birds." This dune family belongs in another category, and Mr. E. W. Nelson of the Biological Survey, commenting on these findings, wrote me that "It is very unusual to find the long-eared owl feeding upon birds to such an extent. In a large number of pellets examined from winter roosts of these birds, we have found the bird remains making up considerably less than ten per cent. of the total animal contents. The owls in question must have had exceptional opportunities to secure birds, and the breeding season may also have had some effect in producing this habit." The Ipswich dunes are, as I have always maintained, particularly good regions for birds, and these owls seem to have had the instincts of collectors.

There are several heronries near Ipswich, one at Plum Island, one at Hamilton, one at North Beverly, but an interesting and, I believe, the largest is one I have watched from its beginning in a grove in the Ipswich dunes. This grove is composed almost entirely of pitch pines, but there are a few white birches and white maples among them. The fishing is good in the neigh-

boring creeks and estuaries, and night herons from distant heronries have been in the habit of taking their noonday siestas in these trees for many years. In the summer of 1916, I found several pairs had nested there, and counted twenty-five nests. In 1917, I counted one hundred and sixty-seven nests, and, as the number of birds was rapidly increasing, I determined, in 1918, to make a careful census of nests after the birds had flown. With the help of two boys, I began one cold December day to count the nests in each tree, and, that we might not count the same tree twice, we tied a white string around the trunk of each counted tree. This proved slow work and very cold for the fingers. As there was a light snow on the ground, we found that by stamping the snow at the foot of the trunk, we could quickly and effectually mark the tree. In this way the count was accurate as far as it went, but we probably overlooked a few trees on the periphery of the roost. Here are the results: 492 nesting trees containing one to eight nests each, and a total of 761 nests. The nests varied in size from thin, flimsy affairs to

NIGHT HERONS' NESTS

NIGHT HERONS' NEST WITH EGGS

thick bulky masses of twigs so completely interwoven as to stand a good deal of rough handling without coming to pieces.

The point of vantage from which to view the heronry at the height of the season is from the top of Wigwam Hill. Below stretch the green tops of the pines, dotted, as with splendid white blossoms, by the beautiful birds that stand on the tree-tops near their nests and brooding mates. When one enters the heronry on foot, the scene is not so enchanting, and one's ears are assailed by strange and discordant sounds, one's nostrils by odors ancient and fishlike. Everything is whitewashed here and one must be wary. By watching the actions of the nearly naked young birds that climb about the branches, one becomes convinced of their recent reptilian ancestry. Tragedies among the young are common as shown in the mummified corpses, caught by the neck in the crotch of branches and swinging as though from gibbets. Foxes get good hunting in this region.

The inception and growth of this heronry has been most interesting and well illustrates the ad-

vantages of protection. A still more striking change has taken place in this region in the case of terns, the swallows of the sea. Fifty years ago terns of various species laid their eggs on the sand of Ipswich beach above the tides. Common, arctic and least terns formed an interesting colony which was described in 1870 in his "Naturalist's Guide" by Charles J. Maynard, the discoverer of the Ipswich sparrow. Wanton persecution by gunners, the shooting of the birds in sport and the taking of the eggs for food and as curiosities, and, above all, the systematic slaughter for millinery purposes extirpated these birds here, and brought them to the verge of extinction along the whole Atlantic coast.

As regards the subject of bird protection, it is interesting and encouraging to compare the state of mind and moral sense of people in general at that time and today. The sportsman, with a long autumn, winter and spring season, as a rule respected the close season for game birds, but for birds, whose value today is admitted to be largely æsthetic, he thought nothing. If he exterminated them, there was no regret. They

were of no use, and, if they afforded good flying marks, as did the terns, he had no scruples about shooting them and leaving their beautiful bodies, mangled and blood-stained, where they fell. He did not even take the trouble to kill wounded birds that had thus served as his target. If he had feminine friends or relatives who would appreciate the graceful wings for their hats, he felt even virtuous in destroying the birds for these trophies and the women thought no ill of the practice. The fact that it was the fashion to wear these wings in the hats dulled all thought on the subject. The men who went into the business of supplying the greedy millinery trade felt that the cruelty involved, if they thought of it at all, and the possible total destruction of the birds, was fully justified by the dollars received. If the adult terns were more easily shot when their nests were invaded or their young put in danger, then it was laudable to take advantage of these circumstances. Any one having scruples on this point was an unreasonable sentimentalist and did not deserve the rewards of business.

Today all this is changed. Thanks to broader views and the teachings of ornithologists in general and of the Audubon Societies in particular, and by reason of laws enacted through their efforts, people are beginning to realize the justice and importance of preserving these birds. Their sense of moral fitness has been aroused, they begin to feel the value of the birds from a purely æsthetic point of view as adding beauty and interest to the landscape, although few realize the importance of preserving them as a sacred trust for future generations.

In 1921, by the middle of May, terns had become common at Ipswich beach, arriving from the South. On June 12 there were over three hundred there, mostly the common species but a few roseate terns were to be seen. This latter species is easily distinguished from the common tern by its longer, slimmer shape, by its bill which is wholly black, instead of being red with a black tip, and by its voice, for it emits at frequent intervals a rather sweet double plover-like note—*tu-wit*—and a loud harsh scream that closely resembles that made by tearing cloth.

On this June day I sat on the sand within sixty yards of a flock of over a hundred terns that had alighted on the water's edge. It was at once apparent that the birds were preparing to breed, as many of them were engaged in active courtship. As the sexes are alike in plumage one could distinguish the males from the females only by their actions, but these actions were distinctive. With short mincing steps a male would strut before a demure female. His puffed out neck and his head were stretched up to the full extent, and his open bill was continually vibrating as he uttered rasping *crrrs*. His long tail was cocked up between the wings which were extended from the body so that the shoulders stuck out nearly horizontally. At times he sidestepped, at times he pirouetted. Sometimes two or more males were acting thus in a group by themselves, as if each were trying to outvy the others. Sometimes two would fly at each other on the beach like game-cocks and rise and continue the fight in the air. Again a male would return from fishing with a sand-lance drooped from his bill, and, after eluding rivals who

sought to take the fish from him, he would alight close to his beloved one and present her with the choice morsel, following up his gift with courtship antics. She, meanwhile, calmly and apparently without the least concern for him, swallowed the tidbit.

I fully expected to find the terns laying their eggs above the beach after such actions, but, no, they left for other regions. I feel, however, that it is only a question of a short time before the terns return to their own. and again nest at Ipswich beach.

For many years I had enjoyed squatters' rights in the dunes in the possession of a camp. This was situated in the grove just described which had furnished such a wealth of migrating birds. It is near the southern end of the dunes, equidistant from the sea beach on the outside and the beach of the estuary on the inside. In this camp, and in tents near at hand, my family, some young friends, a poll-parrot, a canary bird and I spent August in 1912. We lived to a certain extent off the land and water. Fish, the common clams and the larger sea clams, furnished much

of our food, and blackberries were abundant. A pump in the camp brought us sweet, cold water from a driven well of thirty feet, in which the water level was just below the surface of the sand. Dead wood in the grove and driftwood on the beach furnished our fire. Our bathtub was the Atlantic ocean. We generally slept in our tents and in the camp in the grove, but at times, as the mood seized us, around our camp fire on the top of a dune, or on the edge of the sea beach. The gulls and terns and sandpipers were our constant companions. We lived a free and open-air existence on the sand and in the water, and we were well sunned, sanded, and salted.

Many changes have taken place since that day. The squatters are banished and their camps are no more. Some of the shanties have been removed bodily or in pieces by water, others like "The Vendome," have been covered by the blowing sand. A longer lease of life was granted to my camp, but, in its isolation, it had been battered and looted by wandering clammers, and the dunes are rapidly advancing to its destruction.

The greater part of the grove of trees has disappeared—their dead tops may still be seen in places nearly a hundred yards off in the sterile dune. Already the sand is creeping close to the house, and it is doomed.

But it is better so. There are all too few seashore regions that are unspoiled by the hand of man and those few are rapidly disappearing. The electric car and the automobile bring people in crowds to the seashore. A region of sand dunes is covered with summer houses, tin cans and Sunday newspapers, detestable to birds and bird-lovers alike. Fortunate indeed are the birds and bird-lovers who can wander in a region unmarred and "unimproved," and grateful are they to any one who can order such a state of affairs. May it always remain so!

CHAPTER II

Tracks in the Sand

"In the sand of the hillocks by the loud sounding ocean
He followed their tracks at the break of the day."
—Anon.

IN "Sand Dunes and Salt Marshes" I had something to say of tracks and tracking in the dunes, illustrated by photographs. Since this book was published I have continued with ever increasing interest to track the deer and the fox, the skunk and the mouse, the gull and the crow, the toad and the grasshopper and others of their ilk in the dunes, and shall here record some of my findings. One never knows where one may come on an interesting story in the sand or one requiring some ingenuity to unravel.

Deer tracks are common in the dunes. In 1913, I wrote that this animal "thanks to the well enforced protective laws, is more abundant in densely settled eastern Massachusetts than it has

been for over a hundred years, and it is possible that in some localities it is even more abundant than has ever been the case. For not only has white man ceased to persecute the deer, but he has eliminated its natural enemies, such as wolves, lynxes and panthers, as well as Indians." Since 1912, there has been an open season every fall of six days and the slaughter of deer at first was so great that they were all but exterminated from this region. In nine years two hundred and twenty deer were shot in Essex County.

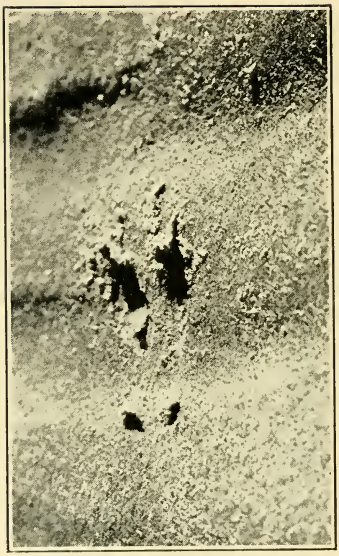
Of late years the deer have increased again, and, although rarely seen, give evidence by their tracks of much night wandering in the dunes. Sometimes the tracks go straight, as if the animal had his objective point clearly in mind. As he walks his split hoof—his third and fourth toes—curve together so that they nearly meet. Each hind foot falls so exactly into the track of the fore foot that a duplication of marks is rarely seen. When he runs and bounds, the split hoof spreads with the harder impact of the jumps, and the third and fourth toes make almost parallel or even diverging, instead of converging marks. At

TRACKS OF DEER WALKING IN HARD SAND

TRACKS OF SAME DEER RUNNING IN SOFT SAND

DEER TRACKS IN HARD SAND

DEER TRACKS IN HARD SAND



DEER TRACKS IN SOFT SAND

TRACKS OF DOE AND FAWN ABOUT WATER-HOLE

these times, especially if the sand be soft, the marks of the dew-claws, rudiments of hoofs on the second and fifth toes, reach the sand and leave their imprint, a reminder of the ancestral four-toed condition.

The tracks of fawns show that they commonly run beside the doe but in a less sedate manner, taking side trips and returning, and occasionally, in the exuberance of their childish spirits, bounding up into the air, perhaps sideways, and coming down with all four feet near together.

The study of the tracks of these creatures is interesting, even if one does not catch a sight of the makers. One July day I noticed the fresh tracks of a large stag near the lighthouse, and picked them up again two miles or more down the beach where the animal was trotting from the dunes towards the water. It was then nine o'clock in the morning and dead low tide. The tracks showed that the stag stopped at about six o'clock at the edge of the half ebbed tide. Turning about he forded a little inlet, dry at low tide, but at six o'clock full of water as shown by the absence of tracks in its bed, and by the splash

and drop marks on the sand where he stepped out on the beach. I followed his tracks, which were as clear-cut as if in clay, in the damp sand, but merely shallow cup-shaped depressions without form in the hot dry sand. Instead of going inland he had skirted the edge of the dunes at the beach for nearly a mile, only once going back a few rods into the dunes. Passing the high peak of Eagle Dune, he turned abruptly down towards the water, and, at about half tide, his tracks disappeared in the wash of the waves. I searched farther down the beach for his return tracks but, seeing none, I retraced my steps and found he must have walked back about fifty yards up the beach in the water, and had then trotted straight away from the beach, over the side of Eagle Dune and into the bogs and thickets of the interior. He had probably got the wind of some campers farther down the beach.

Doubtless many times deer are passed unseen in bushy cranberry bogs. These afford good cover for restful days after nights of wandering, of play and of feeding. One June day I fol-

lowed the tracks of a moderate-sized deer in the dunes. It is a pleasant and harmless way to hunt deer and good sport. Over sand hills and through hollows they led me. The deer had appeared especially to enjoy splashing through pools of water. At last I started a doe from a clump of bushes in a cranberry bog, she threw up her white tail-flag and bounded off. Stopping on the side of a dune, a picture of exceeding beauty in a setting of glistening sand, she watched me calmly and unafraid, for she had lowered her flag. Suddenly her flag went up and away she sped. The white tail-flag is a sure indication of fear. In this case the sound of my approach may have frightened the doe. Later she paused to look at me, and, with her imperfect sight, did not recognize her arch-enemy man. A passing breeze brought the scent and she at once displayed her warning. If any other deer saw it they would have understood and flashed the same signal. Further observation and thought on this subject had more fully confirmed the views previously expressed that the white flag is a danger signal, and that it al-

ways advertises and never conceals its owner.

On a February day, with wind in my favor, I watched a couple of deer trotting together through the dunes towards the beach. Looking over the last wave of sand towards the beach, they were evidently alarmed, perhaps by a fancied or real scent from a human being, to me invisible, threw up their flags, turned inland but changing their minds, trotted in my direction just inside the beach. I ran down to head them off but they passed me within eighty yards, bounding prettily over the beach grass. One of their leaps measured twelve feet.

Such lovely pictures of wild life remain long in the memory. A few more are worth mentioning. One afternoon in mid-summer while sailing at high tide down the Castleneck estuary we saw a beautiful doe, very red and large, walking slowly along the edge of the water by the Vendome dune. Soon she turned inland and disappeared beyond the dune. We landed and crept to the top of the ridge and looked over. There she stood, not over seventy yards away on the white expanse of sand with her tail to-

wards us and her head turned to look at us—a beautiful sight. She then trotted and bounded off but her tail was down; she was not frightened; she did not have our wind and she had not really seen us,—or did she recognize us as friends?

I discovered another doe on a September day, wandering about the marsh near the dunes to the windward of me and about three hundred yards away. She occasionally fed in the grass but kept looking up, once directly at me. From time to time she shook her tail nervously but never spread the alarm. Gracefully jumping a creek she startled a pheasant and watched it flying away. At last she disappeared in the thickets of the dunes.

On a bright October day a doe emerged from a dune bog and stood within fifty yards of me to windward. As she slowly trotted off, two fawns followed her, walking most charmingly side by side. I said twins, but immediately afterwards appeared a third fawn. Could they have been triplets or were they merely friends, the children of two or three parents?

On a winter's day in a sunny nook of a pine

thicket in the dunes I was listening to the sizzling of bacon in my frying-pan. Suddenly I was aroused from my pleasant anticipations by the sound of crashing among the bushes, and, looking up, I saw the white tails of two deer vanishing in the gloom of the timber. Whether I saw the forms of the deer themselves or merely imagined I did, can not be set down here with certitude, but I doubt very much if I should have seen the deer at all, had it not been for their conspicuous alarm signals.

On a cold February day I followed the tracks of a deer that ascended the narrow ridge of a dune. The other side of the dune went down steeply and was covered with glare ice, except in one place where hard snow gave my snowshoes a foot-hold. The deer, however, had kept on his course and had descended over the ice. There were deep and long furrows in the snows at the foot of the slide, scratches on the ice and an abundance of rubbed-off deer's hairs. It was plain he had fallen and slid on his side. Deer are not so very wise after all, I reflected; they are very human.

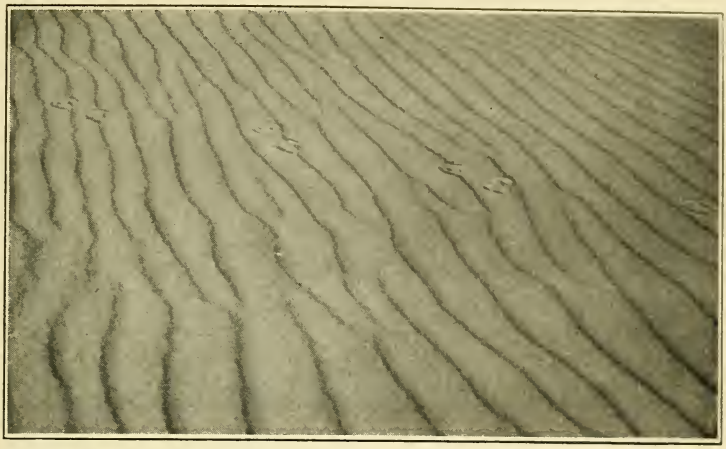
Foxes continue to be common in the Ipswich dunes and furnish food for thought in their tracks and actions. Their clean-cut footmarks with the two long pointed toes extending out in front are generally characteristic. In soft sand, however, where the imprint is not clearly marked, this feature is often lost and the print appears as round as that of an ordinary dog. In deep sand rarely, more often in deep snow, the fox occasionally leaves a mark made by the slight dragging of a foot. This mark is not made by the tail, which, as far as my observation goes, is always held tidily above the surface of the ground. His beautiful brush would be sadly worn if he allowed it to drag in the sand.

With two of the habits of the fox, not before referred to by me, I have become familiar in the last few years. One of these is their habit of digging for water. The water level in the dunes varies. In wet years all the deeper depression ponds, and the water is stained brown from vegetation. In the depressions free from vegetation the water is clear and green. As the spring and summer advances the level of the water sinks, and

successive terraces of small rushes or other vegetation mark the receding shore line. In dry seasons there is no water to be found in the dunes, but one needs to dig but a few inches in these hollows, and clean, sweet water seeps into the pit. The fox has also learned this trick and it is not uncommon to find small water-holes, dug by foxes as shown by their scratch-marks and tracks. These water-holes are taken advantage of by other creatures and deer tracks and crow tracks are often found near them.

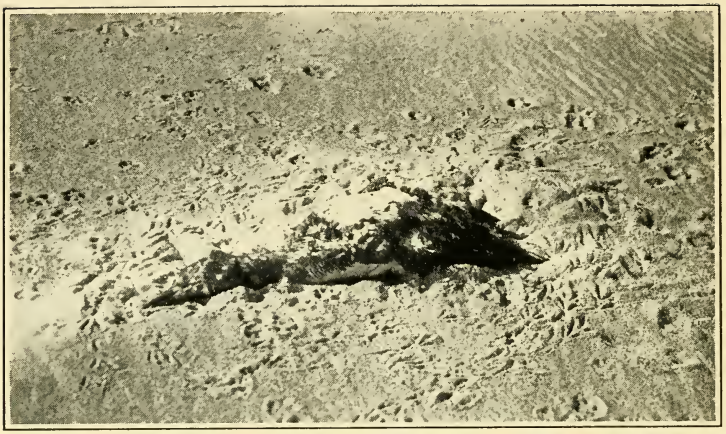
Another habit of the fox in the dunes is digging for grubs and cutworms at the roots of the grass. While the skunk makes a shallow, roundish hole, the fox is likely to make a deeper, narrow hole. I have seen a number of these holes together and plenty of fox tracks, showing clearly their origin. The habit does not seem to be as common as with the skunk that pits the dunes for this purpose much more extensively.

All is game to the fox as my studies of the droppings previously related showed. One February day I noticed many fox tracks near a curling snow drift, a drop of blood, a tuft of rabbit's



FOX TRACKS AND RIPPLE-MARKS

FOX DIGGINGS FOR GRUBS



DEAD LOON WITH TRACKS OF CROW, SKUNK AND FOX

CATERPILLAR TRACKS ON STEEP SIDE OF DUNE

fur and part of the entrails of that animal. A fox caught in a muskrat runway had his stomach full of muskrat fur. On one occasion I was following the tracks of a white-footed mouse. These were joined by those of a fox. There were some irregular jumps on the part of the fox and the mouse tracks vanished. Again I found the body of a herring gull on the beach with head torn off and much of the flesh gone. It was surrounded by tracks of both fox and crow, but I venture to affirm that these two were not companions at the feast.

A dead creature on the beach always attracts the scavengers. A big loon thrown up at the top of the tide was surrounded by tracks in which those of crow, fox and skunk could easily be recognized. The skunk had ambled up in the night from low water and was making for the dunes twenty feet to leeward of the loon; suddenly he stopped, "skidding" a little, turned at right angles and trotted directly to the loon. The loon was recenty dead, a wounded bird, no doubt, that had escaped the clutches of the gunner. It showed no mark of tooth or claw, but had been inspected

only, and left until it was more tender eating. The fox had kicked up sand over it and there was the mark of his foot in the sand on the loon's back.

As one follows fox tracks through the dunes one can sometimes notice the strong foxy odor resembling closely that of a skunk. It is not a pleasant odor, but, in recognizing it, one feels a primitive sort of satisfaction in the keenness of his perceptions. On a still cold day in the woods of Castle Hill I smelt the foxy odor very plainly, and noticed the fresh tracks of a fox in the light dry snow. It was a perfect day for tracking and I set out to follow. The chase led me up and down hill, through woods and thickets and open fields in the course of which I learned several things. The tracks were clear-cut and slender, pointed in front and showing the knob of a hind toe behind. The back feet were so exactly placed in the marks of the forefeet that the prints appeared to be of only one foot. There was no dragging nor scuffing. The signs at stumps on one side or the other of the trail showed that it was a male or dog fox that I was following. At

these places the foxy odor was particularly strong.

His course was generally direct but he had turned aside to investigate every hole. He had examined both ends of a small culvert underneath the wood-road and he had paused to drink at a brook. Arrived at a wire fence for sheep he had, without hesitation and very deftly, jumped through one of the small square openings between the wires. On emerging from the enclosure he had run up over the hill to the tracks of another fox. In these he stepped so carefully that the tracks appeared to be those of only one fox. After thirty yards of this Indian file, the tracks separated, one going to the left, the other to the right. I followed the latter, and from indications that were found later, it is evident that I had unwittingly abandoned the chase of the dog fox and was on the trail of a female fox or vixen.

The lady soon turned aside and scratched away the snow and pine needles at the foot of a tree, and, if one were to judge from the feathers, she had discovered a crow and a dead one, for there were no crow tracks near. Immediately

on leaving this find, the tracks showed a groove at intervals on the left side, as if the booty had dragged at times in the snow. Turning aside from the path, she had started up the hill in the open field. A disturbed place in the snow, numerous and irregular marks of foxes' feet and a multitude of crow's feathers scattered about, suggested that the fox had laid down the crow, and had partially or wholly devoured it. As there seemed to be something under the snow at this point, I dug down, and there in a smooth cup-shaped depression was—not the remains of a crow as I had expected—but the half of a freshly killed cottontail rabbit. The head and foreshoulders were gone, but the skin was as neatly rounded over the stump of the body, and the fur was as smooth as if an expert furrier had sewed up the gaping wound.

After carefully covering up the half rabbit, the fox had trotted a few yards further, climbed a boulder in the field and sat down to survey her cache. From the rock she had jumped three or four feet to the ground, ambled across the field and entered the woods. There were now no

side marks to distinguish her tracks which were soon lost in the maze of others among the trees.

That the fox himself depends on his nose much more than on his eyes, I have often demonstrated but never so clearly as on a midwinter day when, walking along the beach at low tide, I made out a fox half a mile ahead of me, ambling about on the upper beach. Once he layed down in the sand and bit at his back as a dog does when hunting fleas. Soon he ran over the hard wet beach to the edge of the water, scanning every bit of seaweed or driftwood on his way. The wind was blowing from the sea to the dunes so that it would have been impossible to stalk him from the dunes. I therefore decided to test his eyesight and walked straight towards him along the beach where he would not get my wind. I was in plain sight, but, although he apparently looked at me as I approached, it was not until I was within a hundred yards of him that he sprang forward, ran up the beach like the wind and disappeared in the dunes. No tracks were to be seen on the hard surface of the sand until his initial spring.

It may be said that this fox really saw me and was playing with me as foxes sometimes do, and thus allowed me to approach as I did. I hardly think this was the case, for, until the final spring and straightaway run, he showed no evidence of realizing what I was, and did not run along the beach ahead of me as would have been the case if he were trying to decoy me on in play.

The beach is a good feeding ground for the fox, but his visits to this region at low tide—broad as it is and lacking in any shelter—are generally made at night and are unseen in the darkness. If the tide is low in the night the tracks of foxes coming up from the beach are common the next morning. At ten o'clock one November morning, when the tide had been low at three and was then an hour in ebb, I came upon the tracks of four foxes that had trotted down from the dunes and were lost in the narrow strip of beach swept clean by the tide. Three of these had trotted down together, the fourth, some fifty yards further off. All four foxes returned to the dunes two or three hundred yards down the beach,

two of them side by side. It was probably a family party, and the young were full grown, as all the tracks were about the same size.

I once had an opportunity to measure the speed of a fox. As I was motoring along the road one evening at Ipswich, with searchlights burning, a splendid red fox bounded ahead of the automobile, his white tail-tip glistening like a target. He was evidently confused by the lights and darted first to one side and then to the other side of the road, but finally, after a run of about two hundred yards, he turned in to the bushes on the left. In following the chase I had speeded up to thirty miles an hour, but did not gain on him. I have found, by measuring the tracks of another bounding fox, that his feet spread out in a line to a distance of three feet, and that the distance between the jumps was five to seven feet.

On a June day I came across a fox's track in the dunes with a deep groove running along close beside it. I followed it for two or three hundred yards till it entered a thicket of poplars not more than thirty or forty yards in circumfer-

ence in a deep hollow. Before tracing the tracks and groove into the thicket I convinced myself that the groove did not emerge, although there were plenty of out-going fox tracks. On entering the thicket I found a freshly killed night heron, much mangled. The entrails and breast had been eaten. Holding the heron by the body and carrying it five and six inches from the sand, I discovered that its heavy bill made a groove exactly like the one I had been following.

The cause of the groove accompanying the fox tracks was evident, but it seemed worth while to discover all I could about this matter. Retracing my steps and the steps of the fox, I finally lost them in the middle of the grove of pitch pines, the seat of the great night heronry. In all, the heron had been carried forty-two hundred paces or fully three quarters of a mile. Now the heron showed by its plumage that it was an immature bird, hatched the year before. It perhaps did not have the cunning of the adults nor their advantageous position in the rookery and it may have been roosting on the ground and was sprung upon and killed by the fox.

Another very interesting fact developed. I noticed that there were the tracks of two foxes, one a little larger than the other, associated with the groove. As the tracks came out of the heronry on to the clear sand, it was the larger fox that was carrying the bird, while the smaller tracks ran first on one side then on the other. After about a hundred yards of this, the smaller fox took up the burden and carried it the rest of the way, although the larger fox ran along beside, generally very near but occasionally running a little wide. If we assume that the larger fox was the male or dog fox and the smaller one the female or vixen, then the male must have made the killing and, in true savage fashion, have given the booty to his squaw to carry home.

It was very easy to follow the tracks with the groove, for although they went nearly directly towards their goal, they avoided all bushy and grassy places, and the groove was plainly visible on the sand. It would have been difficult to carry the body of a heron through bushes or even through grass. At one place the body had been

dropped on the sand and taken up again in such a way that the groove, which had been on the right side, was now on the left. Within a hundred yards of the hollow in which I found the heron, there were numerous tracks of young foxes some of which had come to meet the old ones, and followed them back to the hollow. At the verge of the hollow the heron had been placed on the sand before it was taken into the clump of trees.

The whole story was as clear as if I had been present at the parents' return from the chase with the welcome booty, although I did not see hide or hair of this fox family. It was probable that their hole or earth was near by, but I failed to find it. Two young foxes were seen in the dunes a few weeks later by several of my family who had slept on the top of a dune. They awoke in the early morning to see these little creatures rolling over in play within a few yards of them. Suddenly the foxes perceived the human beings, and, with hair on end, they stamped their little feet and barked savagely at the intruders.

On one occasion, I am inclined to think, I saved a pheasant from death by a fox. I was walking on snowshoes just below the brow of Castle Hill when I heard a sharp croak—it was almost a shriek and expressive of great fear—and a hen pheasant flew out of a low, bushy thicket directly towards me. Immediately afterwards a fox ran out of the other side and disappeared over the hill. My explanation of the episode is this: the pheasant was feeding or dozing in the thicket, unmindful of a fox who was creeping to spring at her. The noise of my snowshoes aroused her and, looking up, she caught sight of the fox almost upon her. With a shriek she made off away from the fox, disregarding any other danger. Thus it happened that the pheasant flew towards me, and the fox, debarred of his prize, departed in the other direction. I imagined he looked very disgruntled and that he had the air of one swearing inwardly.

Muskrat tracks, easily distinguished by the central groove made by the tail and by the webbed footprints, may occasionally be seen in the dry sand, when the *wanderlust* seizes these amphibi-

ous creatures and they travel from one bog to another. I have found their spectacular and decorative tracks even on the edge of the sea, an undesirable pond of muskrats.

Woodchuck tracks are not often seen in the dunes. The animal prefers to dig his hole in stiff glacial gravel and not in soft, shifting sand. The best tracks of his I ever saw in the dunes were in wet sand in a dune hollow—each claw, each wrinkle on the sole of the foot was distinct—but alas! I had no photographic film left with which to secure it. In walking leisurely the footprints of a woodchuck are near together and the toes are frequently dragged. When in a hurry the animal jumps like a rabbit, although less actively, and the tracks are in fours, the larger hind feet side by side in advance, the smaller ones back of these and one foot diagonally behind the other. Not only are the front feet smaller than the hind feet, but they show the marks of only four toes, while the larger back feet have five toes. One of these large tracks I measured was two and a half inches long and one and a half inches broad. The distance be-

MUSKRAT TRACKS

MUSKRAT TRACKS

TRACKS OF WOODCHUCK AND PHEASANT ON FEBRUARY 6, 1921

tween the jumps I found in one case to be two feet, four inches.

Woodchucks hibernate in their holes during the winter, and are more consistent about it than skunks whose tracks are often to be seen in the snow on mild winter days. The only time I ever saw a woodchuck walking on snow was on March 14, 1920. There was still much snow on the ground and great icy drifts after a hard winter. On this day I saw a large woodchuck running over the snow near my house. He hid in some bushes but, on my approach, ran on the snow to the middle of the garden, sat still a moment on the drift and then disappeared into it. A round tunnel in the icy snow thirteen inches deep was continued in his hole in the frozen ground. How did he know, sealed up as he was, that it was time to bore through the icy snow and come out?

The mild winter of 1920, 1921 was a favorable one to test the saying that if the woodchuck or ground hog comes out of his hole on Candlemas Day—February 2—and sees his shadow he goes back to his hole to escape the six weeks of cold and storms to follow—

"If Candlemas day be dry and fair,
The half o' winter's to come and mair;
If Candlemas day be wet and foul,
The half o' winter's gane at Yule."

Four days after Candlemas, which had been mild and pleasant, I was at Ipswich and discovered in a smooth patch of sand on Wigwam Hill the tracks of a woodchuck shown in the photograph. He had undoubtedly seen his shadow for the tracks were subsequent to a shower that had occurred in the morning just before the sun shone. The haste of his progress—rabbit fashion—suggested that he was anxious to return to his hole for six weeks more sleep.

The same day the weather grew colder and the following day it snowed, and it snowed occasionally afterwards, but on the whole, during the next six weeks, the weather was very mild and there were many days when the ground hog could venture abroad in comfort, if he were not bound to abide by the prophesy of his shadow at the Candlemas season. March 6 was an exceptionally mild day, the glass reaching 60°, and the fresh

tracks of the ground hog were plainly to be seen. Here then was full proof that the ground hog and his shadow are not to be relied on! Thus are our cherished beliefs overthrown, our idols shattered!

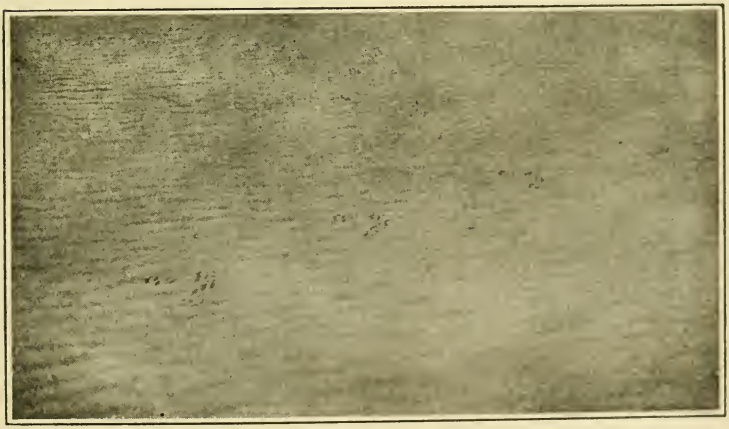
Tracks of cottontail rabbits are also uncommon in the dunes, but they are all too common in the snow in pastures and orchards of the upland. They are easily distinguished from those of other animals. The rabbit hops along and lands on his soft feet so disposed that the powerful hind ones are in front and the smaller fore paws between his thighs behind. The marks of the hind feet are side by side in front, those of the forefeet are in a line one behind the other. This pattern always distinguishes the tracks of a cottontail from those of a grey squirrel for in the latter case the forefeet like the hind feet are in pairs side by side. Besides this, in the case of the squirrel, the tracks often begin or end at a tree trunk. Rabbits do not climb trees.

Like the deer, the cottontail flashes his white tail in fear. They are timid creatures and are always attacked with panic at the sight of man.

When at ease the tail is down, the white patch does not show. A rabbit on a cart path two hundred yards away trotted about at ease, although he apparently looked at me at times, but I doubt if he saw me for his tail was down. Later I came upon him suddenly, the tail went up and all the white hairs there and on his stern seemed to stand on end as in the case of the deer, and flashed out a most prominent signal.

It was maintained by the late Abbott Thayer that this white signal, instead of advertising served to obliterate the rabbit by matching the white sky, as seen by the pursuing animal with his eyes close to the ground. One April day, as I was lying on the ground in an orchard, I heard the yapping of some dogs, and a rabbit ran across the field within fifty yards, prominent by reason of his white tail. I could not for a moment imagine this to be obliterative, although I had a dog's view of him. A minute later two terriers came along, following the trail by nose as is their wont and not by eye. There have been other occasions when the tail of the rabbit has been at the height of my eye, as on a side hill, but never did it ap-

RABBIT TRACKS



GRAY SQUIRREL TRACKS

DEAD WHITE-FOOTED MOUSE AND TRACKS

SEASIDE GOLDENROD AND SKUNK TRACKS

pear in the least obliterative. The cottontail often depends on his concealingly colored coat to escape detection, and we may pass him within a few feet and fail to see his motionless body among the dry leaves. The northern varying hare has no rear white signal and when he lopes off, he looks, to one used to a cottontail, like a cowed animal with tail between the legs.

At the lower end of the sand dunes one may find the tracks of that world-wide traveler and pest of mankind, the Norway rat. I have no doubt he voyaged to these shores on sand schooners and left by the convenient gangway. His tracks are in form like a squirrel and his naked feet make clean marks and show well the details. His naked tail grooves the sand at times. His canny nature was well shown one night when I had set traps for small native mice and had laid paths of cornmeal along the sand. The next morning showed the tracks of rats all about, but never nearer than eight or ten inches from the traps. A week later I visited the same locality and no rat tracks were to be found. They had deserted the dangerous region.

The white-footed mouse also makes tracks like a rabbit and he is apt to have runways or paths where many tracks are to be seen. In going up a slope, the tracks become linear, two together in each print, as if the pretty little creature were trotting. One midwinter day I noticed many tracks about an old ship's timber in the dunes. Beneath it was a nest of dry grass, the size of two fists, from which peeped a very sleepy, white-footed mouse.

Tracks of the jumping-mouse are similar but smaller, and often show the tail, switched sometimes to one side and sometimes to the other. I measured the tracks of one that had galloped at speed across the sand and made jumps at seventeen or eighteen inches, and one at nineteen inches.

Fortunately for the nesting birds, cats are rarely found in the dunes. One is generally kept at the lighthouse, and she has been so obliging as to make tracks in damp sand for me to photograph. About the size of a skunk's tracks, they are easily distinguished from those of any other animal to be met with in these regions by the ab-

CAT TRACKS

SKUNK TRACKS AND HOLE DUG FOR GRUBS

sence of claw marks. The pads show distinctly, but the feline race keeps the claws concealed in sheathes until they are needed for execution.

After a rain, the sand may be so hard packed that the tracks of lighter animals or birds do not show or show only at intervals, so that their interpretation becomes difficult. I have seen the characteristic tracks of a skunk arranged in close linear fashion as he ambled slowly along, or in diagonal lines of fours, as he quickened his pace, change to a single foot mark every two or three feet where the sand was so hard that it only occasionally showed an impression. Such a sand surface is well pitted by the rain, a condition shown in several photographs.

On the beach sand, hard-packed by the waves, this state of things is not uncommon and a fox may trot along and leave no trace on the hard surface until he springs away in haste. The tracks of sanderlings are often invisible, but their recent presence is plainly shown by the series of curving lines of probings, which are sometimes nearly continuous furrows. A flock of plovers may leave nothing to mark their presence on the

hard beach but their occasional dabs or probings, irregularly scattered in the sand. Sandpipers keep their heads down and probe the sand systematically; plovers run about with their heads up and dab here and there. Yellow-legs in the marsh keep their heads up and dab like plovers. In the case of the black-bellied plover, these dabs often show a partly opened bill.

I have found the tracks of seals on Ipswich bar, —great grooves and depressions and flipper-marks. The seal still flourishes here, and as recently as December, 1919, I counted on the bar seventy-five of these great animals taking their siestas. It is always a delight to watch these wild creatures, and their presence and numbers when pointed out to the stranger is always the occasion for surprise. Thoreau in his "Cape Cod" says: "The Boston papers had never told me that there were seals in the harbor. I had always associated these with the Esquimaux and other outlandish people. Yet from the parlor windows all along the coast you may see families of them sporting on the flats. They were as strange to me as mermen would be."

On June 11, 1922, twelve years to the day after my delightful but remote observation of the new-born seal and its mother on a bar off Ipswich beach, related in "Sand Dunes and Salt Marshes," I found a young seal basking in the sun twenty feet above the tide on the beach itself. We saw each other about the same time, but, by quick action on my part, I was able to head him off from the water, and had, for the first time, a chance to study this interesting animal in a wild state at close range.

He was a beautiful little creature, sleek and velvety, handsomely marked in black and grey, and "speckled like a macreil" as were the mermaids of the ancient arctic explorers. His eyes were large and lustrous, and he "looked earnestly" on me. Young as he was, his full upper lip carried a more than man-sized moustache of long, stout and curving bristles. He was thirty inches long and may have weighed twenty pounds. He growled gently when barred from the water, but made no attempt to bite, and allowed himself to be stroked.

When I stood aside he made straight for the

water, arching his back as he lifted himself up on his front flippers which were bent so that his claws dug deep in the sand as he dragged his body along. His hind flippers were as useless for progression as was his short tail. This three-in-one part of his anatomy swayed gently from side to side with his efforts at walking on his hands. The record of a leisurely walk from the water was shown by little flipper-marks in the sand that were only three inches apart, but in his hasty return his front steps, so to speak, were ten inches apart. A marvelous change came over the method of his departure when he entered the water of an incoming wave. The awkward caterpillar humping ceased, and the back flippers came into action so that the body was driven forward with great speed as by a screw propeller, and the seal at once disappeared under the surface. Later his small dark head bobbed up, but at once plunged like an expert swimmer's under a curling wave that was about to overwhelm him.

It was a most interesting experience but I have two regrets. I pray for another opportunity to

wipe these out, and I trust I may not be obliged to wait for the passage of another twelve years. The first regret is that I did not observe whether the seal used or did not use his front flippers in swimming, when his back ones came into such powerful play, and the second regret is that, alas! I had left my camera at home.

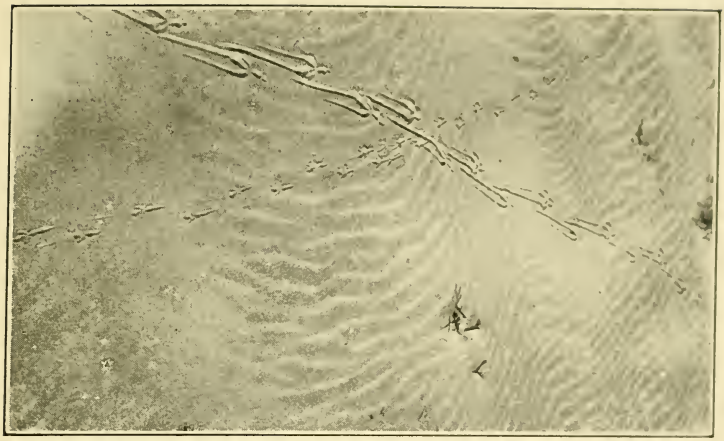
Bird tracks in the dunes are most abundant in fall and winter when great flocks of snow buntings and horned larks spread their traceries over the sand. The horned lark always walks or runs and takes long strides, while the snow bunting takes shorter steps and may sometimes hop. The horned lark picks at the pointed stalks of grass from the sand while the snow bunting frequently perches on them. In both, as in the case of the Lapland longspur, the mark made by the hind toe and claw is long and well incised.

The tracks of a flock of swallows that has rested on a dune top during the fall migrations are puzzling to the uninitiated. The birds do not wander far, as their short legs and long wings interfere with much pedestrian exercise. In fact, their method of locomotion on the ground

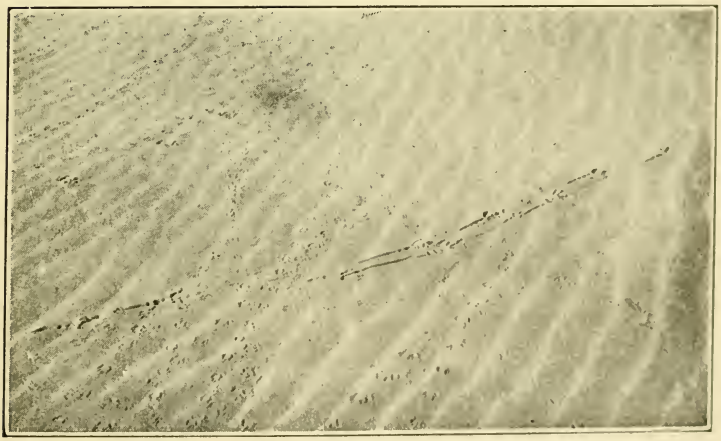
is largely by flutterings, a combined action of wings and feet, although they occasionally walk a few inches without the help of their wings. The feet are held well apart as they shuffle along. As the flocks are made up chiefly of tree swallows, the droppings on the sand generally contain a few bayberry seeds. The swallows often take sun baths, opening and shutting their wings in the early morning on the side of the dune, just as do barn swallows on the sunny side of a roof.

Although tracks of shore birds and gulls are more common on the beach, flocks often settle in the dunes and spread their tracks over the sand. One may find in a short compass the tracks of ring-necked plover and herring gull, of skunk and fox, of crow and toad.

Savannah sparrow tracks are common at all seasons but winter, while those of its cousin, the Ipswich sparrow are most common in spring and fall, and rare in winter. One would need to be a keen diagnostician to distinguish between the tracks of these two birds, but the Ipswich sparrow is slightly larger and is more of a walker than the



TRACKS OF A HORNED LARK AND OF A LAZY CROW



TRACKS OF CROW AND OF YOUNG TOADS

TRACKS OF RING-NECKED PLOVER, OF TOAD, AND OF CROW ALIGHTING

TRACKS OF NIGHT HERONS

Savannah and, unlike that bird, it very rarely hops.

Crows' tracks are common at all seasons of the year and always characteristic. The "gouty" toe joints, the lazy habit of dragging one or more toes, the very rare hop, have all been mentioned in my previous publication. In alighting, the feet come down together and the hind toe and even the tarsus may cut the sand. In springing away, the feet together sometimes sink in deeply. In both acts the marks of the wing feathers are often plainly imprinted on the sand. While the adult crow rarely hops, the young do so frequently. Hopping is probably the primitive form of locomotion in arboreal birds that jump or hop from limb to limb, while the art of walking is acquired later if the bird frequents the ground. I have watched an adult crow and four full grown young on the beach. The young frequently called for food and whenever this was found by the parent, the young, although generally walking, would, at these times, hurry to her with long hops, aiding themselves by spreading their wings. This spreading of the wings to

glide when a bird hops must have been the primitive form of aviation in birds, just as it was the primitive form in man. The early gliding experiments of Lillienthal are historical.

Near the heronry, the footprints of multitudes of night herons are in evidence, and rarely one comes across the much larger prints of the great blue heron. One of these birds, a sportive individual, took three broad jumps with feet together before taking flight. The tracks of this heron are more commonly seen on the beach or in the wet places in the dunes, but I retain the picture in my mind of one of these great birds standing like a Japanese bronze on a dune-top silhouetted against the sunset.

Toad tracks are sometimes abundant in the dunes, but their numbers are dependent on the amount of water in the bogs in the tadpole season. In August and September one may find multitudes of their curious tracks, most of them of small individuals. Their usual gait is by short jumps only two or three inches long or less, but I have measured the jumps of larger toads that were evidently in a hurry, and had cleared

eighteen and even twenty inches. They steer a surprisingly straight course, often over the highest part of a dune wave. Where they hide themselves by day is always a problem, as it is the rarest thing to discover them in daylight. Even then, they are difficult to see, as they assimilate their color to the sand and are very grey and sandy. They may be found under a log or piece of a wreck, or buried in the sand. One may find in the morning a disturbance in the smooth surface of the sand and tracks of a toad leaving it. The toad must have buried himself in the sand in the early morning before, but his tracks leading up to his hiding place were effaced by the wind of the day. That evening he made his exit for his night wandering and pursuit of insects, and his tracks of exit were still plainly to be seen in the morning, before the sun had dried the sand and the wind had blotted out the record.

Insects weave a delicate tracery over the sand. The seaside locust or grasshopper, colored like the sand so as to be almost invisible when at rest, whirs a long distance away as one walks over the dunes in summer. The multiple footprints

of his six feet, the groove made by his body and the deep marks in the sand made by his powerful hind feet as he hops away are all characteristic.

The tracks of caterpillars on the sand are curious and at times very striking features. They are seen to best advantage when the surface of the sand is pit-marked by rain, for the passage of the caterpillar's body smoothes or planes the surface and the track shows well by contrast. A large woolly-bear caterpillar that I encountered in the dunes one August day was making a straight course with considerable speed over the dry but rain-marked sand. Its track was half an inch wide and perfectly smooth, for his rough hairs brushed off the irregularities in the sand he traversed. At times a narrow central ridge showed, made by the interval between his pairs of false legs. Where he struggled up an incline, cross lines appeared made by the digging in of his vigorous true legs in front. When I attempted to examine him and put him through his paces on the sand, he curled up in a ball and played possum.

It is evident that woolly-bear caterpillars de-

TRACKS OF HERRING GULL

GRASSHOPPER AND ITS TRACKS AND TRACKS OF SAVANNAH SPARROW

pend on their *chevaux-de-frise* to protect them from attack, but this does not always avail. During the fall migrations at Ipswich I once watched within a few feet a hermit thrush picking at a woolly-bear caterpillar on the ground. I soon saw that the thrush's efforts were effectively directed, for the hairs were fast disappearing from the victim. At last a black, naked worm, entirely devoid of the thick coat of hairs, remained. The hermit thrush then picked his victim up in his bill, swallowed it, flew to a low branch, wagged his tail up and down in his characteristic manner, chucked a few times with satisfaction, and was off.

On the steep side of a dune a caterpillar had made repeated efforts to ascend, but losing its foothold in the loose sand had rolled down. Yet, like Bruce's spider, it tried, tried, tried again. The picture in the sand suggested the outline of a jagged mountain range or a temperature chart.

CHAPTER III

The Beach in Winter

"The wind blew east; we heard the roar
Of ocean on his wintry shore."

—Emerson

THE winter of the great frost, so vividly described in Lorna Doone was a memorable one. The country people in the Doone Valley, depressed by the snow and cold, heard a hollow moaning sound which they attributed to a witch "cursing all the country from the caverns by the sea" and believed that the snow would last until they could catch and down her. "But the land being thoroughly blocked with snow, and the inshore parts of the sea with ice (floating in great fields along) Mother Willdrum (if she it were) had the caverns all to herself, for there was no getting at her."

Severe winters are sure to recur either singly or in a series and they are apt to shake the faith,

temporarily at least, of those who say the climate is changing and is much milder than when they were young. Then, according to these wise ones, snow came regularly at Thanksgiving and there was sleighing until the end of March. Meteorological records kept for many years show that mild winters and severe winters occurred a generation ago as they do today, and that the snowfall has varied irregularly. The average snowfall in Boston for the winter is 44 inches, but in the winter of 1873–4 it was more than twice this, or 96.4 inches, a little over eight feet. Two years later it was 5.3 inches, the least on record. The winters of 1886–7, of 1903–4 and of 1919–20 were severe winters with a snowfall of 73 inches each year, while in 1888–9, 1900–1, 1908–9 and 1912–13 it was only 20 inches or less. That the arrival of snow did not average earlier a generation or more ago is shown by the fact that the average amount of snowfall up to December in twenty-one years from 1871 to 1892 was 1.8 inches, while in the twenty-two succeeding winters up to 1913, it was 1.9 inches. In the same way if we delve into more ancient

records we find accounts of mild winters and severe winters, but in the long run, the cold and warm, the dry and wet balance each other, and the general average is the same. Meteorologists believe that there has been no material change in the climate within historical times.

Yet it is a common idea that the climate of New England is growing milder, and when we have much cold and snow, the older people speak of it as an "old-fashioned winter." The human mind is prone to remember vividly and even to magnify unusual events and seasons, while ordinary seasons of snowfall are forgotten. Then, too, a snowdrift three feet high, struggled through by a child, assumes gigantic proportions in the memory when the child has reached mature age and size.

In our cities a generation ago, the snowfall was not managed as efficiently as it is now, when powerful snow ploughs and gangs of men clear the streets within a few hours of the storm. In former days the snow was allowed to accumulate and remained longer in the way of traffic. An-

other cause for self-deception exists with those who have spent their earlier years in inland towns or country where the snowfall is greater and comes earlier than it does in coastal regions. A very few miles often makes a considerable difference.

The winters of 1903–4 of 1917–18 and 1919–20 were unusually severe and afforded many interesting phenomena. That of 1917–18, occurring during the Great War, will long be remembered. Captain Howard, the keeper of the light in the Ipswich dunes, was startled at night by loud boomings which shook the plates on his pantry shelves. Visions of German raiders bombing the coast naturally came to his mind, but it was discovered later that the disturbance arose from great frost cracks forming in the sand of the dunes and extending for many yards. In this way miniature earthquakes are caused by the frost.

The beach and the sea are of great interest in severe winter weather. Those who know these regions only in the summer have little idea of the changes wrought by the cold. As the tide

falls, the beach becomes coated with ice of fantastic design. Each receding wave is marked by an arc of frozen foam. In continued cold weather, the coating on the beach gradually builds up, augmented by the icy slush and cakes left by the ebbing tide. All is so solidly frozen to the sand that it remains a bottom ice at flood tide. A shelf of ice may extend a little way out over the water forming, what is called in arctic regions, an ice foot.

At times great cakes of ice break away from their anchors and, buoyed up by the water, bring up sand, pebbles, and boulders. After the severe winter of 1917–18 the beach at Ipswich to a distance of two miles below the pebbly and boulder-strewn shore at the foot of Castle Hill, was dotted in places with pebbles and boulders. These must have been carried by the ground ice with the falling tide and dropped later on the sand. One unfamiliar with this winter phenomenon might be at a loss to explain the presence of a boulder four feet long and about three feet thick that I found on the smooth sand beach, some two miles from the nearest boulder region

at the foot of Castle Hill. Two other boulders, nearly as large, were to be found on the beach in this two-mile stretch. How many disappeared in deep water can not be told. One is apt to think that all boulders have been brought to their present position by glaciers or icebergs which are of glacial origin, but it is evident that they must have sometimes been carried in the past, as these examples show that they are in the present, by ice not of glacial origin.

On the upper edge of the beach is to be found in severe winters the most interesting and striking ice formation, the ice-wall. This is formed partly of small ice cakes and slush ice left at the top of the tide, and partly of snow. It is solidified by the sea-water thrown up by the waves, which, in freezing, cements together the component parts, and builds up the wall higher and higher as the spray and ice is thrown on top. At times the soft slush ice, newly formed on the surface of the ocean, is thrown on top of the wall and fills the hollows with a snow-white mantle which contrasts strongly with the old ice, often dark with sand. This mantle, at first as soft as

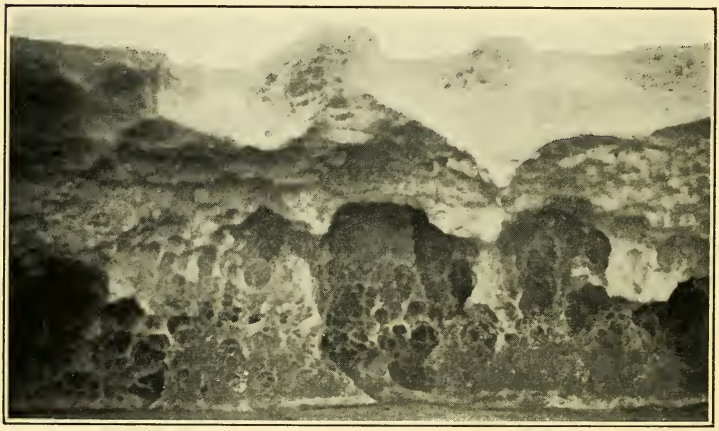
snow, later becomes solidified into a hard frozen mass by the percolating water.

The steep side of the ice-wall faces the sea, while the land side slopes off gradually. In storms, and at unusually high tides the sea breaks over and forms a second or even a third ice-wall higher up the beach, but the lower wall is always the sharpest defined and most spectacular. Its height varies from a foot or two to ten or twelve feet, dependent on the length and severity of the frost. Against this solid barrier, the waves break at high tide as on a rocky shore, and, as in the latter case, they carve turrets and columns, overhanging shelves, chasms and grottos. Many of the grottos in the ice-wall are extremely beautiful, the walls irregularly honeycombed and studded with crystals and knobs of ice, and the roof hung with icicles. In places, pure white or delicately green or blue, the ice is apt to become soiled with sand thrown up by the waves. A brief thaw may remove the icy coating which holds the sand on the beach, and the waves soon change the color of the ice-wall from white to gray. The contrast between the sand beach,

INCIPIENT ICE-WALL AT THE BEACH, JANUARY, 1922

THE ICE-WALL AT THE BEACH, JANUARY 6, 1918

ICE-WALL UNDERCUT



ICE-WALL HONEYCOMBED AND DARKENED WITH SAND

smooth and as free from snow and ice as in midsummer, and the ice-wall at its upper edge makes a surprising picture, but the wall is most beautiful when the beach is sealed by an icy coating, and the waves build up the wall undefiled by sand.

On one memorable day in midwinter I was at the beach alone and had taken off my snowshoes in order to climb down the wall on to the beach. I found the snowshoes, which are four feet long, useful in the photographs I was taking to give an idea of the height of the wall. Without some measure of comparison, a photograph of a wall a foot high may appear ten times that height, and in the same way a wall of ten feet may appear in a photograph to be only a foot high. I have seen a photograph taken of a small cake of floe-ice from the distance of a few feet produce the impression on the beholder of an iceberg half a mile away. I was so busy photographing the ice-wall that I had not noticed the rising tide whose waves were almost stilled by their coating of slob ice. With each throb of the sea the

water was creeping nearer to me over the icy beach, but hidden from view under the soft slush floating on top, and I suddenly found my moccasined feet in the freezing mixture. The ice-wall, smooth and undercut, was unclimable except with ice axe and creepers, but a dash of a hundred yards brought me to a broken place in the wall where I easily ascended to safety.

At times the upper edge of the beach is covered thick with flattened ovoids and spheres of ice from a few inches to a foot or two in diameter. Cobblestone ice is an appropriate name for this formation, as it is brought about by the rubbing together of ice cakes thrown around and rolled up and down the beach by the surf. The process is the same as in the much slower formation of cobblestones out of broken fragments of rock. On one occasion I found part of the sea-wall built up of these round pebbles of ice, some small, some large, all tightly cemented together with frozen sea-spray. It was a perfect conglomerate or puddingstone, similar in formation to the conglomerate made of beach pebbles in former ages.

ICE-WALL, FEBRUARY 8, 1920

ICE-WALL, FEBRUARY 29, 1920

" PUDDINGSTONE " ICE-WALL

" COBBLESTONE " ICE ON THE BEACH

At the foot of the gravelly cliffs of Castle Hill, where it has been cut away by the sea, the beach is strewn with boulders. On these, in severe weather, ice caps build up still higher until the waves can reach no farther. The waves are arrested at their highest point and turned into pinnacles of ice.

The sea itself is wonderfully changed under the influence of the intense cold. Long after the small fresh water ponds are fast bound up with ice, the sea keeps open. The restless waves prevent freezing and the larger body of sea water takes a long period of frost to cool it down to the freezing point, which is 28° Fahrenheit, not 32° as is the case with fresh water. Instead of forming a thin skim of ice as in quiet regions, the surface of the sea, churned by the ceaseless throb of the waves, becomes milky and suggests sago gruel. The surface ripples vanish, as if quieted by oil, and the waves throb and break with a muffled and sullen roar on the icy beach. Their force is spent under the thick covering of snowy ice. If one scoops up a handful of this he discovers that it is not formed of

rounded grains as he might imagine but of thin flakes and crystals broken up into small pieces. It is this icy mixture that is left by the receding waves in snowy windrows on the beach, and that serves to build up the ice-wall and fill its hollows. One may unexpectedly sink up to the hips in crevasses in the ice-wall filled with the snowy white mass before it is congealed by the cement of freezing water.

As the cold continues, the flakes freeze together on the water and form ice cakes of all sizes from an inch to several feet and later many yards in diameter, forming veritable floes. The constant heave of the sea prevents, at first, the formation of an extensive sheet, but these cakes, rubbing against one another, take on a more or less circular outline with elevated edges. This is the well-known pancake ice of Scoresby and other arctic explorers,—the lolly or slob ice of the Labrador Coast.

On February 3, 1918, the ocean, as far as one could see from the beach, was covered with pancake ice with here and there a larger piece of solid floe. On some of these, seals were lying, adding

to the arctic character of the scene. On one piece of the floe were two seals and one splendid great black-backed gull. Lanes of steel-blue water intersected the snowy surface, and in these, red-breasted mergansers sported, pushing the smaller ice cakes out of their way as they swam. As I was watching a flock of seventy-five of these ducks, with their iridescent green heads and coral red bills, all adult males,—for nearly all the the brown-headed females and young winter in the South,—they laboriously rose from the water, leaving behind them an oblong patch of dark water. There was no wind and the ground swell was so nearly flattened by the ice that but tiny waves broke on the beach. In bits of open water close to shore one could see the ice coating of the beach extending out, beautifully green as seen through the clear sea water.

But perhaps the most interesting arctic phenomenon of intensely cold weather at the seashore is the mist that arises from the sea water —the frost-rime of the older arctic explorers. Captain William Scoresby in his "Journal of a voyage to the Northern Whale-Fishery" pub-

lished in 1823 defines frost-rime as "a sort of fog that appears on the surface of the sea, in severe frosts, produced by the condensation of the vapor arising from the water in consequence of its being much warmer than the air." "The sea," he says, "on occasions of frost-rime is generally about 20 degrees or 30 degrees warmer than the air." He goes on to say, "I was long in doubt whether the freezing of the sprays and froth of the waves, or the evaporation of the sea, was the cause of the meteor. Having, however, taken a large shallow vessel of water into the open air, and placed it in a situation sheltered from the wind, at a time when the frost-rime was particularly dense, the thermometer being at zero, I observed that this water, though perfectly still and unruffled, soon began to discharge a thin vapor, resembling the frost-rime, which it continued to give out, until the surface was covered with ice. This experiment convinced me that the cause must be simply evaporation."

The sea looks like the scene of a terrible conflagration. Great smoke-like masses of dark vapor boil up, and lashed by the icy wind, roll in

ICE-WALL AND PINNACLED ROCKS

ICE-WALL BATTERED BY THE SURF AT HIGH TIDE

FROST-RIME AT THE BEACH

ICE GROTTO

on to the shore. Here and there spirts of white vapor, resembling puffs of steam, rise up from the water against the background of dark clouds, spin around like water spouts and rapidly drift down wind. As they gradually fade away, they are often renewed by fresh bursts from below.

The frost-rime is densest in the night and in the morning and evening hours when the cold is most intense. At midday, under the rays of the sun, except in below zero weather, the cloud disappears. At night, the frost-rime looks from a distance like a dark and sullen mountain range, but it is snow-capped and beautiful to behold when the tops of the range are touched by the rays of the full moon.

As one watches from the shore the cloud blow in over the land, it seems to dissipate into thin air, but in reality it is transformed or congealed into countless crystals that sparkle and glow on every blade of dead grass, every dried spray of goldenrod, every branch of brush. On the ice-covered sand the crystals take advantage of every knob and every roughness to begin their growth. They are few and far between where

the surface of the ice is smooth, but they thickly beset the rough ice. As they build up they form rosettes, if the air is calm, shuttlecocks if there be a wind. The apex of the shuttlecock points down wind, the feathery crystals extending fan-shaped towards it. These rosettes and shuttlecocks of feathery crystals of ice are of great beauty and scintillate in the bright sunlight. They are winter flowers, lovely in form and coloration. The icicles hanging from the stranded ice cakes and from the roofs of the grottos carved in the sea-wall are furred around with these delicate snowy crystals. The sea beach is interesting and beautiful at all seasons, and not least in winter.

CHAPTER IV

Ice and Snow in the Sand Dunes

"Come and see the north-wind's masonry."
—Emerson

IT is very unusual for the dunes to be held down by such an unbroken coating of snow and ice, that the blowing of the sand ceases and dune growth and change are stilled. This state of affairs occurred, however, in the winter of 1919–20. The earlier snowstorms of the winter were heavy and wet; the snow fell quietly, coating the sand thickly and freezing into a solid sheet. Later storms added to the accumulation and the dry surface snow blew about and formed drifts that were, for the most part, spotless white and free from contamination with the darker sand which was held prisoner below. Winter is generally the season of greatest movement in the dunes,

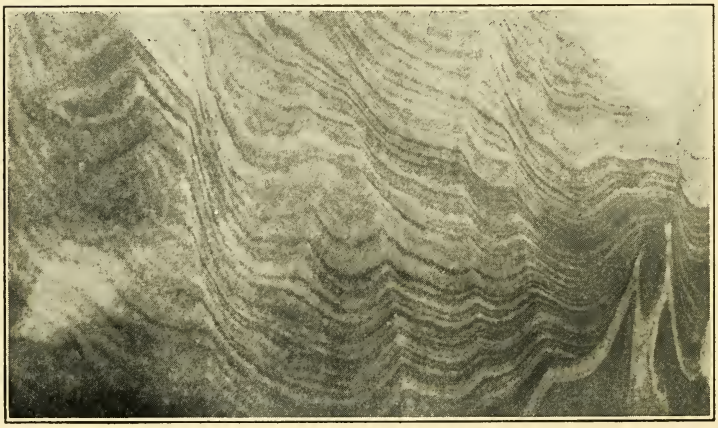
for the winds are then the strongest and, as a rule, the snow and sand blow about together, forming gray drifts of mingled sand and snow. In the northern blasts, the conical dunes smoke at the top like wigwams, the cirque dunes are rapidly undercut and build up to leeward and the desert dunes deposit their load of snow and sand on the steep southern side. Often the snow and sand are segregated and form alternate layers, wavy lines and concentric circles, alternately gray and white, sometimes in patterns of considerable beauty.

On the leeward side of a dune, the southern side in winter, where the sweep from the north is unobstructed by vegetation, masses of snow sometimes accumulate and are buried in successive layers of sand. One of these, which I called glacier dune, I described in "Sand Dunes and Salt Marshes" and told of finding snow there throughout the month of May. One may easily recognize these caches of snow as the spring comes on by the dampness and therefore darkness of the sand over them, but especially by the cracks in the sand. As the snow melts below, the sand

DUNES IN WINTER

DUNES AFTER ICE-STORM

SNOWDRIFT IN DUNES



STRATIFIED DRIFT OF SAND AND SNOW

is kept moist and so compacted that in sinking to take the place of the snow, the layer of sand cracks. In walking over the dunes in cold weather one may be startled by suddenly sinking through an inch or two of sand up to one's waist in clear snow.

The wind plays strange pranks with the sand in winter. One formation, not uncommon, is that of an icy slab supported on numerous short columns of sand a few inches to a foot or more high. These structures look at times like miniature Grecian temples. Again there are columns devoid of a roof and toadstool-like structures. [1] The explanation of their formation is probably as follows: snow in melting has frozen into a surface coating of ice and has also percolated into the sand in spots and frozen there. The cutting wind has blown away the loose sand not cemented by the ice and has rounded off into small pillars the harder combination of ice and sand. Occasionally one will find a large mushroom-like

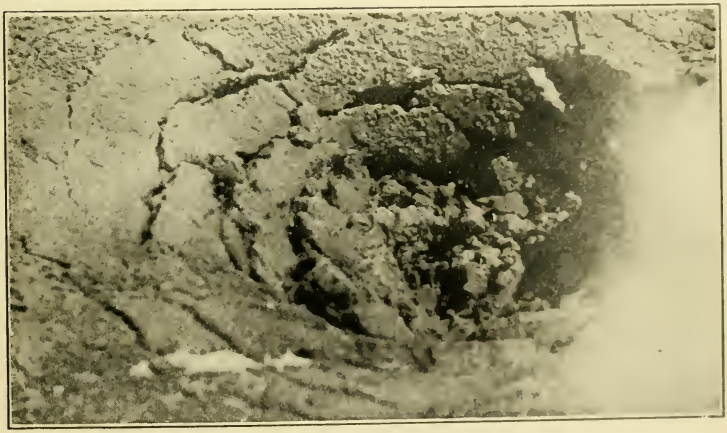
[1] The similarity in formation of these miniature wind-carved columns and those made by the sea waves in horizontal strata of limestone is striking. Compare this illustration with the one on page 60 of "A Labrador Spring."

structure with a covering thatch of grass and weed stalks. This pale yellow covering has not attracted the sun's rays but has protected the underlying ice-infiltrated sand, while the sun has melted the icy sand all about. The loose sand is carried off by the wind leaving a small tableland or butte of hard sand which is generally undercut to the mushroom shape.

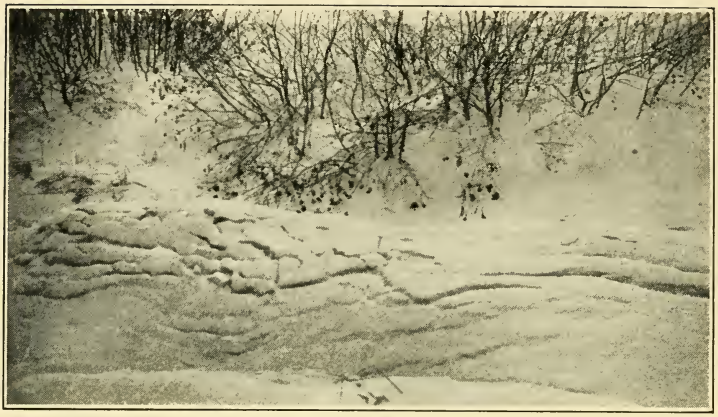
It is not always so easy to discover an explanation for sand formations in freezing or thawing weather. One of the most curious is one that I have several times found at the end of a severe winter in shallow pools of water in the dunes, where mounds a foot or two across with rounded and irregularly curved slopes appear to have risen up above the water. The cracks in some of them early in the season point to underlying snow. They look like geological models. As the water of the pools sink, these mounds appear stranger still, surrounded as they are by irregular ridges and grooves of sand, that look as if a monster king-crab had been ploughing his way through the wet sand.

Later in the season some of the pools are

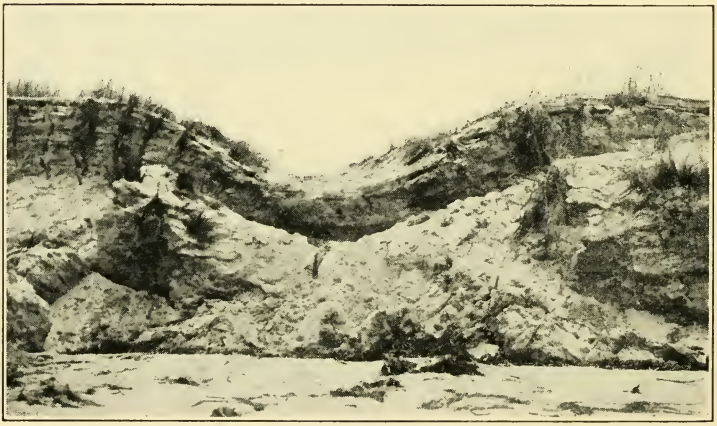
FROZEN SAND COLUMNS, "TOADSTOOLS"



SAND KETTLE-HOLE



CRACKS IN SAND OVER SNOW



FROST CRACK AND RETREAT OF DUNES BEFORE THE SEA

bordered by zones of small crater-like pits with as ragged edges as the craters on the moon. The cause and method of formation, at first obscure, was solved by digging in the soft sand of this zone. Then it was found that bubbles of gas from imprisoned and decaying vegetation formed, on bursting at the surface of the soft and watery sand, these miniature craters.

In the spring one may find in hollows in the dunes circular depressions about a foot across and three or four inches deep, marked with concentric and radial cracks in the sand. These are to be found singly or grouped in such numbers that they also suggest the craters on the moon. It is probable they are formed in the same manner as glacial kettle-holes and I have therefore called them miniature glacial kettles.

Glacial kettle-holes occur commonly in the glacial drift or gravel throughout New England as well as in other parts of the glacier-visited world. They are pits a few feet to a hundred feet deep, and as many yards across and more or less circular in form. Their surrounding banks are as steep as the gravel will

lie, and often grown up to bushes and trees. Generally dry in summer, they contain small ponds in the spring. A good example is not far from my house at Ipswich. They are believed to have been formed at the end of the last glacial period by the slow melting of detached masses of ice buried in the moraine.

I had always some difficulty in picturing in my mind the formation of these familiar features in glacial landscapes until I came across a description by John Muir of a kettle-hole in process of formation in Alaska. "I found a pit," he says, "eight or ten feet deep with raw shifting sides countersunk abruptly in the rough moraine material and at the bottom, on sliding down by the aid of a lithe spruce tree that was being undermined, I discovered, after digging down a foot or two, that the bottom was resting on a block of solid blue ice which had been buried in the moraine perhaps a century or more, judging by the age of the tree that had grown above it. Probably more than another century will be required to complete the formation of this kettle by the slow melting of the buried ice-block. The

moraine material of course was falling in as the ice melted, and the sides maintained an angle as steep as the material would lie."

The "miniature kettles" in the dunes are damp and cracked, indicating melting snow beneath. The truth of this surmise is easily proved by digging through the two or three inches of sand. Detached nodules of snow covered with sand in melting reproduce on a small scale the kettle-holes of the glacial period. When the snow is all melted the sand dries up, the cracks disappear, the dry sand slips down and blows into the hole and this interesting reminder of the great glacial period is obliterated.

CHAPTER V

Ice Formations in the Salt Marshes

"or to reside
In thrilling region of thick-ribbed ice"
—Shakespeare

THE salt marshes, intersected by winding creeks and cut by larger estuaries, are always scenes of beauty and interest in winter. Usually there are pools and veins of blue water which relieve the universal whiteness, but, in severe seasons, all alike is icebound. As far as the eye can see, all is glistening ice. At dead low tide, the smallest creeks are roofed over at the level of the marsh and the tide rushes and gurgles back and forth unseen below. Creeks a little larger are choked with huge cakes of ice that balance on their edges, fill their depths or form ice bridges at various parts of their courses. In the still larger creeks, the banks are capped, coated, pillared and buttressed in ice, while the body of the creek is covered with a

A CREEK IN WINTER AT LOW TIDE

VENDOME DUNE FROM THE FROZEN ESTUARY

thick sheet that rests on the flats at low tide and bridges the deeper channel, and at high tide floats at the level of the marsh.

As one walks at low tide in the icy depths of these creeks, careful to avoid stepping on a loose cake that may conceal a deep hole in the channel below, one might be in the arctic regions, miles and ages removed from the veneer of civilization. No sign of human handwork is to be seen; no smoke curling from chimneys; no bushes or trees or other evidences of the temperate zone. Each turn of the creek opens up new and strange visions of icy grandeur and beauty; overhead, the blue vault of the sky; underfoot, and all about, ice, ice—nothing but ice. Like a primitive man, one is dependent on wits and vigor. The illusion is strengthened if one wears Eskimo clothing, sealskin boots, sealskin mittens and fur koolatuk. Dressed in these, one may defy the cold and sit in comfort on an ice cake with the thermometer 10° F., below zero. My koolatuk is of caribou fur and was made by Labrador Eskimos. It goes on over the head like a jumper and is provided with a hood. As

the fashion is in Labrador, the hood has a point behind. In Greenland, the same article of apparel is called a koolatah and is rounded behind, lacking the point. Although it weighs but four and a half pounds it is warmer than many a modern fur coat weighing more than twice that amount. The reason is a simple one. Imagine two bags filled with hot air. One of the bags is slit down the front and buttoned up, the other is intact; the hot air is constantly escaping from the first, which represents the modern fur coat, and is held in the second, which represents the koolatuk. With hood fastened securely around the face, the thick fur is a bar to the escape of air above. The hot air is less likely to escape below, but, in very cold weather, one ties a rope around the waist over the koolatuk, and the warmth of the garment is sensibly increased. This trick I learned from Donald G. McMillan, the arctic explorer. Deep-sea fishermen in severe weather tie a rope around their jumpers for the same purpose and call it their "soul and body lashing," as it helps to keep soul and body together. A day taken from our modern steam-heated life

and spent in playing Eskimo is refreshing to soul and body alike and helps to keep them together!

The ice floor of the creeks and estuaries is pushed up by the mighty hydraulic power of the tides for eight or nine feet twice in twenty-four hours, and twice it sinks back again. Long cracks parallel with the banks, through which at times the green sea water escapes, only to be frozen in solid lakelets, permits this up and down motion. In very cold weather, the solid ice rises and falls with surprisingly little disturbance. In places, pressure ridges form and the ice is sometimes forced up from all sides into hummocks. In the times of the full moon when there is an unusually high course of tides, especially if the tide is urged farther landward by an easterly gale, the water breaks loose over the marshes and great cakes of ice are strewn about in wild confusion. Woe to the summer constructions of boat-landings and houses! Everything must give way before the mighty hydraulic pressure. The water freezing between the cakes later cements the whole into one solid mass.

At night when the moon is full, the ice-strewn marshes have a strange and unearthly beauty. One may wander over them as in a dream. The sparkling ice, which almost obliterates the shadows by its brilliant diffused light, makes an excursion at that time one long to be remembered. Although everything seems as bright as day, the brilliancy is deceptive and distances and objects are difficult to judge and recognize. One may suddenly step down several feet where all seemed on the same plane. The brilliancy of the scene at the full of the moon is so great that a photograph may be taken which differs in no respect from that of a daylight photograph. The exposure needed, although longer, is surprisingly short owing to the brilliant reflections from the snow and ice. The accompanying plate is from a seven minutes exposure taken at nine in the evening.

The large cakes of ice, stranded on the marsh assume at times curious forms. At first of nearly uniform thickness and rectangular on their broken sides, they become rounded, cavernous or arched and often take on strange and bizarre

THE MARSH IN WINTER

THE MARSH BY MOONLIGHT (*seven minute exposure*)

THE ICE ANT-EATER

THE ICE BEAR

shapes. With a little imagination, I have been able to distinguish a polar bear and a lamb amiably and incongruously roaming the ice-fields together. These suggest the curious shapes and cavernous structure seen in icebergs due to the undercutting and wash of the waves. It is evident that undercutting by high tides is to some extent responsible for the formations, but some of them have not been reached by the salt-water since the time they were stranded. The melting of the lower, more salty layers of the ice cake while the upper fresh-water and snow-ice remain, are probable factors in their formation. The thin ice arch shown in the illustration suggests the bending of the plastic ice, but this form would require lateral pressure at the two ends. If bending took place from gravity, a reversed arch would result, as the supports are at the two ends. It is probable, therefore, that the arch form is due, not to bending, but to undercutting and melting of the lower salty ice. The arch is apparently a later stage of the cavern.

As the ice melts from the marsh the large cakes endure the longest, and of these the ones that are

covered with thatch and marsh grass are slowest in melting. The pale yellow marsh grass shields the ice from the sun's rays, while the cakes that have ploughed up mud on the surface, attract the sun's rays and melt quickly.

In the severe winter of 1919–20 the salt marshes were early covered thick with ice frozen to the marsh, and the smaller creeks were all so securely roofed that the ice there remained at the level of the marsh even at low tide. A warm week in March, followed by a southwest rain, served to diminish this ice coating to a large extent, and the ice disappeared from the marsh without the usual forcible disruption of storm tides and broken ice cakes. On March 14 only the larger creeks below Castle Island were open and showed dark water,—the broad marsh and the smaller creeks were still one universal whiteness. It was a cold day with a bitter northwest wind. All the surface water pools were smoothly frozen and walking over the marsh was unimpeded by ice cakes but had an element of danger. The roofs of the smaller creeks were generally intact, but had been so thinned by the sun and

rain above, and by the gradually warming waters below, that in places they were of paper thinness. One took chances in crossing them. Alpine roping would have been desirable. In other places, the icy roof was eaten away into a delicate fretwork of lace, and, through the larger holes, one could see the swirling tide below. As a rule, however, with a little preliminary testing and good selection, the creeks could be crossed on safe bridges.

When the marshes are free from ice, a snowstorm late in the spring may whiten them temporarily, but an unusually high tide transforms them to a dark plane in a white setting of upland. The marshes look particularly black at these times. The reverse or negative of this scene appears in cold weather when there is no snow. The marshes are white with ice, while the setting of hills and fields is brown and bare.

A heavy snowstorm in winter renders a crossing of the marshes an uncertain performance. One may meet some surprises. This happened to me in a February storm in 1916. I was taking a short cut across the marshes on snowshoes,

and, on account of the blinding gusts of fine powdered snow, did not notice that the tide had filled one of the creeks in my path. The coating of slush ice and snow concealed the water and, before I was aware of it, I was floundering in the mixture, but by kicking off my snowshoes, I managed speedily to reach shore. Two other surprises on this cross-marsh walk were more pleasing. Twice I flushed from a few inches in front of the tip of my snowshoe meadowlarks that had been hiding in well protected nooks in the snow-covered grass. Their bowers were drifted over by the light snow, through which they burst like bombs in flight.

CHAPTER VI

The Uplands in Winter

"Around the glistening wonder bent
The blue walls of the firmament.
No cloud above, no earth below,—
A universe of sky and snow!"

—Whittier

"Hast thou entered into the treasures of the snow?"
Job, xxxvii, 22

WHETHER careful statistics would confirm my observation or not I do not know, but it has often seemed to me to be a fact that weather has a habit of repeating itself at intervals of a week. This was certainly the case in the early months of the year 1920. Every Saturday for eight or nine times in succession, there was a snow-storm, and as that was the day I went to Ipswich for the week-end, my friends offered me sympathy. Inwardly I rejoiced in great measure, for not only were my

week-ends made the more interesting, but I always secretly hoped that the storm would block the trains for my return and thereby prolong my stay.

With snowshoes I was always able to walk to and from my house and the station, but trains are more easily blocked. In the early days of the snow, I had not prepared for this emergency and had left the shoes in the Ipswich house. Consequently late one Saturday afternoon in January, I found myself with a friend at the Ipswich railroad station, separated by three miles and a half of snow-blocked road from our destination and suitable foot gear, a distance that could not be traversed by either horse or motor.

It had snowed intermittently for a week and two feet of snow on a level had fallen. For the last twenty-four hours it had blown a gale from the northeast and the air was filled with driving snow. The walk through the village streets, banked up with snow and embowered in great overarching elms, their branches snow-covered, glistening in the street lights, was pleasant and easy. In the lee of Heart-break Hill the snow

was falling softly and evenly, and was unbroken by any recent track of sleigh or man. Beyond we began to feel the great sweep of the wind from the north across the marshes, and its biting breath and sharp snow crystals made us pull our caps over our faces. At the farther side of Burnham's Hill the road became impassable; it was packed with drifts from side to side. I knew from old experience that this condition must extend as far as the North-Gate Road, and that the only escape was to take to the fields to the north on the edge of the salt marsh. In the darkness and whirling snow, we had blundered into the drifts without seeing them, and only by slowly and painfully walking on our knees we were enabled to escape. Attempts to walk on our feet resulted in our sinking into the drift above our waists when progress was necessarily very slow. In the fields all recent snow had been instantly stripped off by the winds which went roaring by to deposit its burden in the road in the lee of the stone wall and bushes, and a glossy crust, not strong enough to support us, and breaking at each step, here made our progress slow. It was a wild

night, but with a companion on whom I could depend and with assured shelter at the end, although there was none on the way, I had no need to worry about my ability to accomplish the task. We did not hurry and we stopped about halfway in the lee of some spruces to rest and ingest a few calories in the form of sweet chocolate. As we neared the end of our journey, the roar of the surf on the shore added to the tumult made by the wind. After our two hours struggle, the house looked inviting although it was dark and cold. As we entered the shed, a pheasant, sheltered in its lee, went whirring off into the darkness and the storm. We soon had a hot fire and a hot supper and bid defiance to the storm, which shook the house and roared about us like a baffled beast.

The Indian chieftain Rain-in-the-Face probably understood the pleasure and stimulation derived from the pelting of rain, and the still more pleasureable sensation of driving snow in the face:

"Give me to struggle with weather and wind
Give me to stride through the snow;

Give me the feel of the chill on my cheeks
And the glow and the glory within!"

The Eskimos would call my hill-top on the sea-shore *anoatok*—the wind-loved spot. The sound of the winds hurrying by, the tone constantly changing is one of the pleasures of life, too little appreciated. In fact, most people complain of it and say they are wearied and all unstrung by it. It may be that this is a habit of mind that goes back to the time when our savage ancestors, poorly clad and housed, feeling the dire effects of the wind and of the struggle against it, endowed it with fierce and diabolical characteristics. An opposite habit of mind, one of joy, of pleasure and of appreciation of the varied sounds of the wind is worth cultivation.

"Long ago was I friends with the wind; I am friends with it yet."

My usual route from the town to my house in winter is by an old road which leads north of Heart-break Hill and crosses Labor-in-vain Creek near its junction with the Ipswich River. I have

often pictured the early settlers coming back to town in their boats from a day's fishing, painfully pulling at the clumsy oars against a head wind or tide, and mistaking the wide outlet of this creek for the main river. In a few rods more, the rapidly narrowing creek would show them that their labor had been in vain. An English oak with small leaves and long peduncled acorns stands near here, a descendent perhaps of one planted by the early settlers.

The rough and very little-travelled road beyond the bridge through the salt marshes is overflowed by the tide at the full of the moon, and I have occasionally been obliged to wade through icy waters. In winter when all is tight frozen my usual route is across the marshes and smaller creeks to the foot of Sagamore Pond, the upper end of which is within a third of a mile of my house. Towards night in severe weather, the expansion of the ice in freezing, cracks it with loud, booming explosions which travel over the pond in all directions. It is an enjoyable sound, one of the interesting sounds of Nature. Aside from its associations with the broad expanse of frozen

ponds and with clear cold weather, its deep mellow sound is pleasing.

Short cuts are not always the shortest way, for the longest way round is often the shortest way home. I remember on a dark rainy night in February, when pools of water stood in every depression in the ice, I followed the old road for most of the way, but took a short cut across a bit of salt marsh. As I was striding along with my ruck-sack on my back, I struck just below the knee the single wire of a fence. The upper part of my body kept on its way until it landed face downward in an icy pool of water. But the worst is yet to come! Before I could recover from my discomfiture, my ruck-sack, which had also kept on traveling, but was held within limits by the straps, came down hard on my head. The situation was so comical that it saved the day. In future, however, I carefully avoided that wire.

Another short cut was taken on a January day in 1907, an unusually mild day for midwinter. Frequent torrential rains had scoured the country clean of snow except in the deep woods and in the shelter of stone walls, where a few dwindling

drifts still lingered. I had been prevented from taking the only Sunday morning train for Ipswich, but I managed to catch a later train for Manchester. From there I walked the twelve miles to my farm at Ipswich. The day was perfect. Hardly a breath of wind stirred, and the warmth of the sun rendered a hat and coat unnecessary. The Essex Woods road, so often traversed in summer by noisy automobiles and chattering driving parties, was silent except for the notes of winter birds that greeted me from time to time. Chickadees, golden-crowned kinglets and red-breasted nuthatches—three fast friends were all there. While I was watching these birds close to the ground at the foot of some lofty hemlocks, I noticed a few scales of cones dropping from above. Looking up I soon discovered the cause of the disturbance, in the form of white-winged crossbills who were busy at their feast. Traversing the broad salt marshes, I arrived on the shore of Birch Island opposite my house, from which, however, a creek forty yards wide separated me. The tide was at the flood, and was rushing in with so much force that the water

was turbid with sand and its depth could not be seen. I had made an erroneous calculation as to the time of the flood. There was no time to lose. Hastily removing my clothes, I tied them up in a bundle and holding them on top of my head I started to ford the creek. I was familiar with the lay of the bottom, and hoped to be able to cross without difficulty. It was necessary to feel the way carefully to avoid stepping suddenly into a deep hole. The water rapidly rose from waist high to my shoulders, and, in one particularly deep spot, I felt the tide laving my beard. Should I turn back or push on? Fortunately I took the latter course and soon came to shallower water and reached the further bank. I then had a run of several hundred yards to find a spot where I could jump and splash across a smaller creek. The run in bare feet on partly frozen marsh served to warm me up. I hastily rubbed myself down with a pocket-handkerchief and put on my clothes. Arrived at the house, where I hoped to surprise the family and find a warm fire and good dinner, I discovered that the door was locked and that the family were away dining somewhere

in the dunes. A cheese sandwich, however, tasted good to the last crumb and a sunny corner on the south side of the house was pleasantly warm.

It is uncommon on this wind-swept coast for the snow to fall gently on the trees and bushes, and build up fairy palaces of beauty, or, if it does, it is soon blown away by a rising wind. Often, however, in sheltered nooks in the lea of higher ground, the trees and bushes are loaded with snow. Every branch, every twig bears its burden, and the evergreens are glorious in their white coating. If the snow is light and feathery, it does but little damage, for an overload bends down the branch and the snow falls off in a powdery spray. The slighest touch or a puff of wind causes a miniature snowstorm.

If, however, rain and sleet have coated the trees with ice great damage may result from the tightly fastened load. But one may almost forgive the damage for the surpassing beauty of these ice-storms. I was therefore most fortunate in arriving in Ipswich at a week-end in February, 1920, just as one of these storms was clearing

away. Blown along by a cold northwest wind filled with icy particles I made rapid progress on snowshoes over the hard crust. As I reached the foot of Sagamore Pond, the sun burst from the dark clouds just before setting and illumined all the icy trees with a flame-colored glow, which made everything glisten and sparkle like a scene in fairy land. The drifts on Sagamore Hill were brilliantly prominent, each snow-wave burning in old gold, shading off to a salmon hue, while the sky above was rippled over with marvelous pink and golden bars.

From my bed that night I could look over the white marshes, dimly lighted by the stars, to the ghostly waves of the sand dunes, the dark sea beyond and Cape Ann with its twinkling lights dominated by the steady red gleam from the lighthouse at Annisquam.

The next morning I awoke at dawn. All the landscape was in shadow, all was as blue as the blue coverlid on my bed. I compared them carefully—the hue of the snow and the coverlid exactly matched. Hog Island loomed up a round dark blue drumlin and the level marsh, all

ice covered, was equally blue—a deep indigo blue—everything was painted with it. As the sun rose over the rim of the earth, gleams of gold and flame shot out and at last illumined the whole scene. Every weed-stalk, every twig, every branch of bush and tree sparkled and glistened in the morning rays.

I had intended to do some wood-chopping, but the fascination of the scene prevented all work. Its attraction was so great that I spent the entire day wandering from place to place, finding everywhere new scenes of beauty. From the top of Sagamore Hill the great sparkling ice-fields of marsh were spread below me. The trees of the wooded islands did not look dark against the ice as they do when bare, nor white as when loaded with snow, but they were of a delicate blue-gray and thickly beset with sparkling brilliants.

Everywhere one turned, familiar trees and bushes were transformed as if by miracle. Twigs no larger than a lead pencil were covered with clear ice until they were three and even four inches in circumference. The long spikes of

BIRCH BENT BY ICE-STORM

EDGE OF "FOREST" AFTER ICE-STORM

beach grass looked like curving crystal saws with with narrow dark centers and long icicle teeth below. The last years' fruiting stalks of the sea-side golden-rod were thickly coated with ice. Every hip and berry had its natural color enhanced through a covering of transparent ice, just as beach pebbles are made to glow by wetting or varnishing. Glacé fruit adorned the trees and bushes. Each little knob on the pendant balls of the buttonwood trees could be seen through the ice. The clusters of barberries, the catkins of the birches and the great red torches of the staghorn sumachs were all encased in clear, transparent ice.

The ice was thickest on the north and east sides whence the storm had come. Indeed the west and south sides of the tree trunks lacked the icy armor, but the berries and fruit as well as the smaller branches and twigs were for the most part completely encased. Careful scrutiny, however, showed that the sumach torches and even some of the smaller fruits and seeds were vulnerable on the southwest side, the lea side, so that here the birds might get at their contents. Yet

the birds must have suffered greatly from the general sealing up of their food.

Evergreen trees were but little changed in color, for the transparent ice, unless it caught the sun's rays, was almost invisible over the dark green needles, yet the trees were so changed in shape as to lose their proper outline. White pines were so heavily loaded that their branches slanted downward, and the trees resembled aged spruces in the northern wilds. The transformation was remarkable. A balsam fir tree near my house, instead of holding its branches diagonally upwards towards the sky, pointed them down, and the tree looked as if it had been trimmed to a pointed cone.

Gray branches everywhere bent over in graceful curves till their tips touched the snow. In open places like the dunes they were all prostrate to the south, frozen where the icy north wind had left them. They looked like Samaritans at their devotions on the summit of Mount Genzim. Their innumerable small branches and fine divisions held such a load of silvery ice that they could no longer stand erect under it. In

sheltered places, clumps of birch trees had prostrated themselves radially from the central point. United they stood, divided they fell. Rarely was a branch or twig broken, all had been pliant and yielding to the load. Not so in the case of the canoe birches, the white birch of the north. This tree, here at least, is less yielding, and broken and partly broken branches and stems were common.

The tree that suffered most from this ice-storm was the white maple. Its soft and brittle wood was unable to bear the heavy load of ice, and the snow underneath was covered with branches and great limbs torn and splintered as if the trees had been through a German barrage. Poplars were also sadly broken and scarred as were to a less degree the elms and the lindens. The icy armor held the branches in a vise and they became as brittle as the ice under the strain. All the willows had become of the weeping variety. The sturdy oak and apple and cherry hardly bent to their burdens, much less broke, while native evergreens as a rule were unharmed. Hickories, walnuts, ashes and sumach—all with great com-

pound leaves—have no need for the fine branchlets, and sprays such as the elm and birch need for the support of their little leaves. The midrib of the compound leaf is itself the branchlet, and, as this falls with the leaf at the beginning of winter, only the coarse, stubby branches are left. These trees, therefore, carry comparatively little ice and the damage among them was slight.

The suggestion of Christmas trees, hung about with sparkling brilliants, is considerably increased in ice-storms like this by the presence of spots of red or blue or green light. I have seen these spots on various occasions glowing as clear as the lights of electric bulbs. They are due to the splitting up of the white rays of light in prism shaped icicles. By gradually moving one's position, the light is made to change from red to orange, to green, blue and violet, while the reverse order of the spectrum can be brought out by slowly returning to the first position. I have seen such an icicle hanging from the branch of a tree, that changed in color as the branch swayed back and forth in the breeze.

In a wind the musical tinkling of many ice-covered branches, and the jingle of falling pieces of ice is a pleasant sound, but one grieves at the breaking of twigs and the sharp reports and crashing of branches that snap without bending in their icy armor. The snow becomes covered with broken twigs and branches and with splinters of ice and molds of the branches an inch or more thick, all sparkling in the sunlight. Progress by walking through a field of tall grass and weeds, thus bedecked with ice, is attended with much crashing and musical jingling as the ice is broken from the stems and flung on the icy crust. The ice-storm of December 1921, which did such grievous injury to trees a few miles inland, was innocuous at Ipswich.

In the severe winter of 1919–20 the meadow-mice and cottontail rabbits were hard put to it for food and played havoc with young trees. The devastation in young orchards was particularly severe and many thousands of apple, pear and other fruit trees were ruined. It is customary to protect the lower foot or two of young orchard trees with wire netting or roofing paper,

as meadow-mice, working under the snow, are fond of tender bark. In this winter when seven feet of snow on a level fell during the season, and when drifts sometimes buried trees ten and fifteen years old to their tops, the work that went on under the snow was extensive and not revealed until the snow melted. Then it was discovered that many trees were completely girdled by the mice whose delicate teeth markings could be seen covering all the wood from which the bark had been removed. Many of the lower limbs were girdled in the same manner and stood out white and bare. The limbs showed also the larger tooth markings of the rabbits, and the leaf and flower buds were removed by their incisors as if they had been cut with a sharp knife. One ignorant of these matters, might be led to think that some enemy had, in spite, pruned off all the buds on the lower branches of his fruit-trees. Indeed when one stands under an apple-tree in spring and finds the buds cut off as high as the arm can reach, a human enemy rather than a diminutive cottontail is suggested. When the snow is gone it is difficult to realize the condition

BUSHES AND TREES IN ICE-STORM. A GLACIAL KETTLE-HOLE

APPLE-TREE GNAWED BY RABBITS AND MEADOW-MICE

in midwinter. I took pains at that time to walk on snowshoes over the tops of some of my low spreading apple-trees of twenty years growth that were engulfed in a great drift in the lea of a bushy stone wall, but I found that when I stated this fact the following summer I was looked on with incredulity. There are some observations made with exactitude that it is better not to repeat if one wishes to preserve one's reputation for veracity! The snow under these apple-trees was covered with rabbit droppings, and, as it melted, tunnels of field-mice crossing each other and branching in all directions were spread out like a map. Not only were cultivated fruit-trees girdled but many of the native wild trees: wild black cherries, gray birch, sumachs and even evergreens. Many of these leaved out and blossomed as usual the next summer but the summer after that they were dead!

Another result of the severe winters is shown in the creatures that have succumbed to cold and starvation. Dead crows and black ducks I have found, and twice I have picked up the frozen bodies of myrtle warblers. These birds are un-

doubtedly able to survive much cold if they have plenty of food, but, in a dearth of calories they go to the wall. I have measured all the crows I have found dead and although there are not yet numbers enough from which to draw conclusions, it would seem as if it were the small and weakly that fall first. Doubtless many creep into holes and die and are never found, or are eaten by prowling animals. As the bird population remains nearly constant and many young are reared each year it is evident that a large number must perish annually—but how few of their bodies are ever seen!

It has been reported that in severely cold weather birds are found with their eyes frozen. I had always supposed that this took place only when the bird was much weakened from lack of food and was dying, or that it occurred after death, for northern birds, with their active circulation and high temperature, can stand much cold provided they have sufficient food. On May 31, 1920, after the severe winter, Mr. F. A. Saunders and I were walking along the inner beach of the dunes when we noticed a crow flying

towards us. It passed within thirty yards without swerving from its direct flight, and both of us noticed that the eye turned towards us was white. It is most unusual for a crow to fly within gunshot of a man at Ipswich, and it is probable that the crow was blind in one or both eyes. Had they been touched by the frost or was it cataract?

After a severe winter, drifts of snow on bare hills remain longest on the south side, sometimes in a series of girdling zones. One would expect the snow to melt quicker on the southern exposures, but, in the northerly storms of winter, the snow collects in drifts to great depths on the lea or southern side of the hills, while it is blown off on the windward side. Although the sun is more powerful on the southern sides, it takes longer to melt the snow there on account of the far greater accumulation.

Although the aurora borealis is not limited to the winter season, it is displayed to greatest perfection at that time. One of the most beautiful auroras I have ever seen occurred one cold clear night in March, 1918, during the Great War, and the superstitious might well have read omens in

its display. A series of white streamers radiated from the zenith, constantly waving and changing their places. Whole sections of the sky glowed a blood red, as if it reflected a mighty conflagration or a mighty slaughter, and the snow was tinged with the crimson flood. When this crimson sky was crossed with bars of white with here and there patches of dark blue, it needed little imagination to picture a draping of the sky with Old Glory.

On another occasion the whole sky was marked by waving, curving sheets of light, concentrated in spots or radiating from the zenith. The colors were varied and delicate, suggestive at times of the rainbow, at times of the lovely greens and yellows of the lunar moth. These rays and folds of color moved about with great speed and resembled the waving of soft silken draperies—a skirt dance of the skies. The Cree Indians call the aurora "the dance of the spirits."

The climate in this part of the country varies irregularly not only from year to year, but also from day to day. A sunny, balmy day in winter, may be suddenly interrupted by a blizzard of

great severity, a warm rain may change to an icy snowstorm, or the coldest weather be succeeded by the greatest thaw.

"First it blew and then it snew,
Then it friz and then it thew,
Then there came a shower of rain,
Then it friz and thew again."

Variety is the spice of life, and these changes are interesting and even enjoyable—to one in the mood.

The uplands are not always white with snow in winter. The variation is a wide one. The winter before this one of great snow was nearly snowless, and the winter following was mild and lacking in snowfall. On January 26, 1916, the Fahrenheit thermometer stood at 66° at 2 P. M. and 58° at midnight. On January 26, 1913 the temperature at noon was 58°, there was no snow or ice to be found and there was no frost in the ground. The fields and marshes were brown and bare. Pheasants were crowing and meadowlarks singing.

The persistency of winter and the variability

in the advent of spring in New England is well known. On April 17, 1910, I gathered a small mess of asparagus in my garden, the rhubarb was up eight or ten inches, and violets, houstonias and wild strawberries were in blossom. The larches were clothed in green and the beach plum blossoms were nearly out. On May 7, 1918 the temperature was 89°, all the trees had leafed out and the lilacs were in full blossom. On May 6, 1917 there was a snowstorm at Ipswich the glass stood at 39° at noon, and not a leaf was to be seen except those of the wild currant. Not until May 20 did the maples and lindens begin to leaf out.

Sunday, March 26, 1922, was a balmy day; the ground was free from snow and almost free from frost, and the glass reached 80°. The Sunday following, a fierce northeaster had covered the ground nearly a foot deep with snow, and the temperature had fallen to 30°. Variety is the spice of life. Therefore New England weather is of the best!

CHAPTER VII

A Winter Crow Roost

"At break of day I crossed the wooded vale;
And while the morning made
A trembling light among the tree-tops pale,
I saw the sable birds on every limb,
Clinging together closely in the shade,
And croaking placidly their surly hymn."

—Van Dyke

PRIOR to the winter of 1916–17, most of the crows of the eastern parts of Essex County, Massachusetts, spent the nights in roosts in the pine thickets at Annisquam and West Gloucester. Hither from all directions in winter afternoons these birds could be seen wending their way. The general course of flight over the Ipswich dunes was from north to south. There were, however, several small roosts in the Ipswich region. One was in a grove of white pines and cedars on the south side of Heart-break

Hill; another, which lodged about five hundred birds, was in one of the pitch pine thickets of the Ipswich dunes. In November, 1916, I discovered that the ground under and near the large thickets of evergreens and hard woods on the southerly side of Castle Hill close to Ipswich beach was covered thickly with crow pellets and droppings. I was not surprised, therefore, to find that the afternoon flight of crows was directed towards these thickets, and that the birds were passing over the dunes in an opposite direction to that taken in former years. Whether the great roosts at Annisquam and West Gloucester have been deserted or not I cannot say, but it is evident that the larger number of birds have transferred their winter nights' lodgings to Castle Hill.

Twenty-five years ago the whole southerly side of Castle and High Hills was pasture and mowing land. The owner at that time began planting trees on a large scale.[1] At first barely visible in the grass these have grown to a height of thirty or forty feet, and there is now a respectable forest over twenty or thirty acres of

[1] This was in 1892, and the owner was the late John B. Brown. The estate is now owned by Richard T. Crane Jr.

land. The evergreen trees are largely European species—Scotch and Austrian pines with spruces and firs. There is a large grove of European larches, and there are patches of willows, maples, ashes, buttonwoods, and other deciduous trees.

In the short winter afternoons the crows begin their flight to the roost long before sunset. By three o'clock or even as early as one o'clock, especially in dark weather and in the short December days, this bed-time journey begins, while in the latter part of February the flight is postponed until half past four or a quarter of five. From every direction but the seaward side the crows direct their course towards the roost. Three main streams of flight can be distinguished: one from the north, from the region of the Ipswich and Rowley "hundreds"—the great stretches of salt marsh that extend to the Merrimac River—a second from the west and a third—apparently the largest of all, broad and deep and highly concentrated—from the south.

It was the last of these rivers that on a cold December afternoon with a biting wind from the northwest I first studied in company with Mr.

Francis H. Allen. It was an impressive sight. About three o'clock the crows began to appear, singly and in small groups, beating their way in the teeth of the wind towards the north. In flying over the estuary of the Castle Neck River they kept close to the water as if to take advantage of the lee behind the waves; over the land they clung to the contour of the dunes. As we walked among these waves of sand, the crows often appeared suddenly and unexpectedly over the crest of a dune within a few feet of us. Silently for the most part, except for the silken rustle of their wings, they flew over in increasing numbers until it was evident that they were to be counted, not by hundreds, but by thousands. Many of them alighted on the dunes to the south of the roosting place; sand, bushes and stunted bare trees were alike black with them. Others assembled on the bare hillside to the east. About sunset a great tumult of corvine voices issued from the multitude—a loud cawing with occasional wailing notes—and a black cloud rose into the air and settled in the branches of the bare trees to the west of the roost. From here

as it was growing dusk they glided into the evergreens for the night.

The last day of the year 1916, I spent with Dr. W. M. Tyler in the dunes. The wind was fresh from the northwest—the temperature was 5° Fahr. at 6.30 A. M., 18° at noon and 20° at 6 P. M. As early as one o'clock in the afternoon a few crows were seen struggling north over and close to the surface of the dunes. Others were noticed flying high and towards the south. This southerly flight came from over Castle Hill to the north, passed the roost and continued on over the dunes. At half-past three some of these birds, which were apparently turning their backs on their usual night's lodging place, met with a large company coming from the south and all settled together in the dunes about two miles south of the roost. Some of the birds coming from the north, however, settled on the bare fields by the roost, and their numbers here were augmented by a stream from the west. This concourse on the hillside set up a great tumult of cawings just before four o'clock. At five minutes after four, the united multitude of north-

erners and southerners rose from their meeting place in the dunes and flew low to join their noisy brethren on the hillside. This river of black wings from the south was a continuous one and it was joined just before its debouch on the hillside by the stream from the west. The river from the north had split into two layers: the lower flying birds came to rest on the hill—the higher flying ones favored by the strong northwest wind, continued on their way south, notwithstanding the great current of crows that was sweeping north below them. They joined their comrades in the dunes and retraced their steps. No signs of starvation and impaired vigor in these unnecessary flights, or in the games of tag in which two or more of the birds would at times indulge!

The pace is now fast and furious. The birds are anxious to get within touch of the roost before it is dark but none have yet entered it. At 4.15 P. M., 135 birds pass in a minute from the south on their way to join the concourse on the hillside. A little later this southern river becomes so choked with birds that it is impossible

to count them. From our point of vantage in a spruce thicket on the hill we can see that this flock stretches for two miles into the dunes and it takes four minutes to pass. The speed of flight, therefore, must be roughly about thirty miles an hour. At 4.15 P. M. the sun sets, but in the yellow glow of the cloudless sky the birds can be seen pouring by from the west and south. The bulk of the stream from the north now comes to rest on the hillside for only occasionally can a crow be seen flying to the south over the heads of the southern stream.

At 4.35 P. M., Dr. Tyler and I again counted the southern stream for a minute as they flew silently between us and the lighthouse. One of us counted 160 the other 157 birds, so it is probable that our counts were fairly accurate. This constant watching of the black stream from the south against the white lighthouse produced in both of us a curious optical illusion. The lighthouse and dunes seemed to be moving smoothly and swiftly from north to south!

At 4.37 P.M., a great cawing arose from the hillside and a black cloud of birds rose up, some

to enter the roost, others to subside on the hillside. It was evident that the birds from time to time had been diving into the roost. At 4.40 P. M. it was rapidly growing dark and the tributary streams were evidently dwindling. Only 50 went by the lighthouse in a minute. Five minutes later it was nearly dark and only a few belated stragglers were hurrying to the concourse on the hill.

At 4.45 P. M., Dr. Tyler and I walked around to the north of the roost, and, although we could see nothing in the darkness, we could hear the silken rustle of wings and feathers as the crows were composing themselves for the night's rest among the branches of the trees. The babble of low conversational notes that went up from the company suggested the sounds of a night heronry, although *cawings* and *carrings* were interspersed with the *kis* and *uks* and *ahhs*. The odor was that of a hen-yard. The temperature in the grove, with its hundreds of corvine furnaces breathing out air heated to 105° or thereabouts was probably distinctly higher than in the open. We refrained from entering the

thicket, for any attempt to do so aroused the birds to flight.

In the dim light we could make out that the hillside field between the roost and the sea was still blackened with birds that were continually rising up and entering the trees. Some of them perched temporarily on the bare tops of the hard woods where they were visible against the sky. The noise and confusion were great. It would seem as if the roost was so crowded that the birds had to wait their time for a chance to get in, and that a constant shifting of places and crowding was necessary before the crows could settle in peace for the night. Hence the prolonged and varied conversation; hence the profanity.

It was an intensely interesting experience, this observation of the return of the crows to their night's lodgings, and one wished for eyes all about the head, well sharpened wits to interpret and a trained assistant to take down notes. How many birds spent the night in the roost? That is a difficult question to answer, but a rough estimate can be made. There were three streams en-

tering the roost beginning at one o'clock and continuing until a quarter of five. The largest of these was from the south, the next largest from the west and the smallest from the north. The greatest flight occurred in the hour before dark. From counts made in the stream from the south this flow averaged at least a hundred in a minute or 6000 in the hour. If we suppose that an equal number arrived in the combined western and northern streams there would be 12,000 occupants in the roost, a very moderate estimate, I believe.

Crows were not the only species that sought refuge for the night in these evergreens. At half-past four a starling was seen flying thither. But the great flight of starlings appeared shortly after four. There were about two hundred of them—a mere nothing compared with the enormous multitudes that are soon destined to inhabit these regions, for the European starling, introduced in some evil moment to these new lands of the Western Hemisphere, is increasing by leaps and bounds. This flock of two hundred starlings flew by with a whistling of wings

straight for the roost, but, on its arrival, at once began a series of aërial evolutions which lasted for half an hour by the watch, before the flock finally entered the roost for the night. At times the birds would spread out like a mist on the hillsides, at times they would combine to form a compact dark ball; again they would stream off like a whisp of smoke, and turn and twist and snap the whip in a most amazing manner. The exhibition of this troop of starlings was that of well trained performers executing difficult and intricate evolutions without hesitation and without fault. The rhythm and harmony of all their movements was perfect; the speed of action was so great that it was at times difficult to follow them with the eye. They opened or closed ranks, they deployed to the right or to the left, they descended or ascended as if impelled by a common mind or as if possessed of perfect telepathic intercommunication. One could hear no word of command and there appeared to be no leader. The spirit of play was in it all and the joy of untiring energy, of perfect mastery of the air and of consummate grace and skill.

It was a marvelous and mysterious exhibition.

I have often watched from my house the western stream of crows go by, bound for the roost. With a strong northwest wind the greater number fly in the lea of the hill close to the marsh. A smaller number push their way in the valley to the north partly sheltered from the wind by the trees. It exposes himself to the full sweep of the wind over the top of the hill. When the wind is in the east the crows fly close to the marsh and follow the windings of Castle Creek. With a westerly breeze, however, the birds fly high and, silhouetted against the sunset glow, the birds pass over the hill at great speed, alternately flapping and sailing. Those that fly over the marshes keep at the level of the top of the hill instead of skimming close to the ground as they do in unfavorable winds. I have counted eighty and at times as many as one hundred and twenty passing in a minute in this western tributary to the roost. Sometimes they tarry at Birch Island and blacken the bare trees with their numbers, and fill the air with the din of their afternoon conversation. Of a sudden they

are off for their night roost on Castle Hill.

In the early months of the year 1919 the roost was much disturbed by a great horned owl, and temporarily ceased to be, the crows going elsewhere. The feathers of dead crows and great outcrys among the living attested the crime. Early in April, however, the crows returned as usual to the roost; the owl had evidently taken his departure for his breeding grounds.

The afternoon of the twenty-second of February, 1917, was cold and clear with a wind from the northwest. I made my way to the top of Castle Hill in order to watch the stream of crows from the north. The first arrivals came at half-past four o'clock. They were flying over the ice-filled marshes of the Ipswich and Plum Island rivers, on the lookout perhaps for a last scanty portion of food before bedtime. On reaching Castle Hill they flew up over its crest and glided down into the hard woods to the east and west of the evergreen roost. Here they took part in the regular noisy evening crow reception of the three streams before retiring for the night.

At the full of the moon on the sixth of Janu-

ary I visited the roost at 9 P. M., a time when all well regulated crows should, I had supposed, be sound asleep. As I approached the roost, much to my surprise, I heard distant sleepy cries like those of young herons, and when I reached the edge of the roosting trees there was a tumultuous rush and bustle of crows flying from tree to tree and overhead. Strain my eyes as I would only occasionally could I catch sight of a black form, although the air was brilliant with the moonlight and the reflection from the snow. I turned back at once as I had no desire to disturb the birds' slumbers but it was evident that many, even at this later hour, had not settled down for the night.

The morning flight from the roost takes less time than the evening return. As I approached it in the semi-darkness at 6.25 A. M., on January 7, a distant cawing could be heard and a minute later nine crows were seen flying off to the south, and three minutes later, nine went off to the west. At half-past six, after a great uproar of *caws* and *uks*, occasional rattles and wailing *ahhhs*, a broad stream boiled up from the roosting

trees and spread off towards the west, obscurely seen in the dim light except when the birds stood out against the beginning red glow in the east or against the light of the setting moon in the west. As I stood concealed on the hillside among a grove of spruces, the crows passed over my head, noiselessly, except for the silken swish of their wings, fully a thousand strong. Then no more for over five minutes although the tumult in the roost continued in increasing volume. At 6.40 the roost boiled over again, but the birds, spreading in all directions, soon united into a black river that flowed over the dunes to the south. The settings for this black stream were the white sand dunes and the luminous glow in the east which had become a brilliant crimson, fading to orange and yellow and cut by a broad band of pink haze that streamed up to the zenith. The morning star glowed brightly until almost broad daylight. The sun rose at 7.14. At 7, I entered the roost and hurried away the few hundred remaining birds some of whom were in the bare tops of the hard woods ready to depart, while others were still dozing in the evergreens

below. The air was close and smelt like a hen-house. Pellets and droppings were everywhere.

On the last day of 1916, Dr. Tyler and I watched the crows leaving the roost. We arrived at 6.40, too late to see the first departures. From time to time we counted the birds going by in the stream to the south and as our counts showed a remarkable agreement they may be taken as substantially accurate. At 6.45, 105 passed in a minute; at 6.50, 125 passed, at 6.55, 58 passed, at 6.58, 121 passed and at 7.00, 63 passed.

The starlings left the roost at 7 o'clock and passed us with a chorus of shrill cries or perhaps it was the swish of their wings that we heard. They were intent on the day's hunt for food and did not waste time on setting-up evolutions. At 7.13 the sun rose and the roost was silent and deserted.

In the early part of the winter there is plenty of food for the crows. The bayberry and stag-horn sumach bushes, the poison ivy, cat briers and red cedars are laden with their fruit. The salt marshes and beaches furnish a bountiful

supply of food in the form of mollusks and crutaceans as well as in dead fish and other carrion brought up by the tides. In fact, it is these marshes and beaches that make such a great concourse of crows possible;—the inland country is able to support but a mere fraction of such a multitude. If the winter is a prolonged and severe one, the food problem becomes more and more difficult. All the bayberry bushes that are not covered with snow are stripped of their berries; the red flames of the sumach are battered and reduced to a spindling central stalk with but a few red furry seeds remaining. The upper beach, the source of so much food supply in dead fish, crabs and mollusks, is encased in ice and built up into a wall; the marshes with their wealth of small snails and mussels is sealed several feet deep in tumbled cakes of ice, and the tide rises and falls in the creeks and larger estuaries under an unbroken icy mantle. All the uplands are buried in snow. It is difficult to conceive how this multitude of red-blooded, active birds can glean enough food under these conditions. The number of food calories needed

by each crow must be large. But the crow, like the Indian and all creatures of nature, is well able to take care of himself and to utilize every possible source of food supply. Neither a feast nor a famine disturbs his equanimity, unless the latter is too prolonged.

Although most of the birds appeared to be endowed with plenty of strength and energy, one at least on February 22 seemed to be suffering from the hard times. This crow alighted in a feeble tottering manner on a post within forty yards of me, and balanced himself with difficulty. I walked to within thirty yards of him when he wearily took wing only to alight in a similar way on another post a couple of hundred yards away. When flushed from this he managed to fly a few rods to the roosting grove.

Two other crows previous to this incident were found dead near the roost. Both were normal in size as shown by measurements,[1] and neither

[1] In "The birds of Essex County," p. 243, I recorded the examination of a crow found dead early in March, 1904. "The body was greatly emaciated, the intestines nearly empty, and the stomach contained only a husk of oats and a piece of coal ashes. There was no evidence of disease. The bird

showed any signs of injury. One was very thin. The case of the other is worth recording in detail. It was on January first, 1917, that I discovered a crow in the topmost branch of a slender fifty-foot ash tree on the edge of the roost. A string had in some way become entangled about one foot and the branch of the tree. Struggle as he would he could not free himself and, although he could perch at ease on the branch, he often hung head downwards from it, exhausted by his fruitless efforts. While I watched him and searched my brain for some means for his release, another crow repeatedly swooped down and passed within a few feet or even inches of the poor captive. Both birds were cawing violently. As it was impossible to climb the slender tree I decided to go on to the beach, hoping that in my absence fortune would favor the bird, and that the string might become untangled. On my return an hour later the victim was still tied fast, while on the ground a few yards from the foot of the tree and directly in my path, was the body of a crow still warm. No other crow was

weighed only ten ounces and was small in every way,—a case of the small and unfit perishing."

in the neighborhood. The dead crow was a male of normal size, as shown by measurements, its plumage was in good condition and it showed every evidence of perfect health. No injury could be found anywhere—there was no sign of hemorrhage under the skin, in the abdominal cavity or in the skull. Fat was present in considerable amount, especially about the viscera.

In order to finish the story it may be recorded here that by the forcible bending down of the top of the slender ash so that the captive crow could be reached from another tree this unfortunate bird (of its sex I am ignorant) was released only to die on the following day. I shall not attempt to answer the question as to the cause of the death of the crow whose autopsy I have related, but one is tempted to say that he died of grief for the captive one.

On relating the case to the late Mr. William Brewster, he told me of a guinea fowl and an Egyptian goose that he had kept together from their hatching out. Having occasion to put them in separate enclosures, he found that they both refused to eat and were constantly butting

their heads against the wire mesh that separated them. United in the same enclosure again, they proved to be most devoted friends, always in each other's company. At last the guinea fowl fell ill and died and the goose was found dead on the following day. An examination showed disease and emaciation in the case of the guinea fowl, but no signs of either in the case of the goose.

In this connection the following incident is also pertinent. On a lawn near the sea at Marblehead, Mr. F. A. Saunders and I discovered the dead body of a Brunnich's murre, an arctic sea-bird of the auk family that occasionally wanders to our shores in winter. The bird had been dead at least a week. Within a stone's throw, just outside the breakers, swam a very live murre.

Curiously enough, a correspondent in Rockport related later a similar experience with a dead and living murre, and, on February 5, 1922, Mr. F. A. Saunders and I found a third instance. On the beach at Ipswich was a dead Brunnich's murre and not far away and close to the shore swam a live Brunnich's murre, a most

unusual bird on a sandy shore. There is certainly more than chance coincidence in these three instances, which, I believe point to the faithfulness of the survivor of a pair.

During the greater part of the day the roost is deserted, but there is much to be learned of the ways of the crow even under these conditions. Pellets and droppings are everywhere on the ground under the trees as well as in the surrounding fields, and they are especially obvious when the ground is covered with snow. The fact that the snow in the fields near the roost is well trodden by the crows and spotted with droppings and pellets might lead one to think that the birds had spent the night there, but these studies have shown that the field was merely a reception room where the birds met before retiring for the night.

The pellets which are ejected from the mouths of the birds after a meal and are composed of the useless and indigestible portions of the meal, are cylindrical in shape, rounded at the ends and measure one or two inches in length and about half-an-inch or more in diameter. In warm or

TRACKS OF CROW TAKING FLIGHT

CROW PELLETS REGURGITATED

wet weather they speedily break up and mingle with the soil, but in cold weather they freeze and retain their form. A study of these pellets reveal the nature of the corvine dietary. In times of plenty, as in the early fall when berries are everywhere, the crows are extravagant and wasteful in their feeding habits. Much nourishment is thrown out in these pellets before it has had time to be digested in the stomach. Like the ancient Romans they empty their stomachs that they may feast the more. Crows take no interest in food conservation; the pellets at these times show much wasted food. Not so in severe winters when famine is close at hand. Then every bit of the waxy coat of myrtle berries is digested off and there are no intact cranberries, as in the bounteous autumn, but only the remnants of skin and seeds. At these times also some ashes are to be found in their pellets, as if the birds were trying to quiet the stomach craving by bulk, and hunger had made them bold in visiting the refuse piles near houses.

I collected at various times, from November to February, several hundred of these pellets.

amounting in bulk to 662 cubic centimeters of material after the pellets were broken up into their composite parts. This I sent on to the Biological Survey at Washington and received from Mr. Nelson, Chief of the Survey, the following report: "The examination of crow roost material sent in by you has been completed by Mr. Kalmbach. It proved to be a most interesting lot of pellets containing many more specifically different items than are to be found in similar material from roosts in this vicinity. I am appending herewith the result of this examination The numbers connected with the more abundant seeds are approximate, as they were secured by carefully counting the seeds in a portion of the material and then multiplying to get the total.

INSECTS

1 Sphæroderus lecontei (Ground beetle)
Trace of another carabid
Traces of two other unknown beetles
3 Hypera punctata (clover-leaf weevil)
1 Sphenophorus sp. (bill-bug)
1 Rhodobænus tridecimpunctatus (bill-bug)

1 Sitona hispidula (clover-root curculio)
17 acridids (shorthorned grasshoppers)
2 Gryllus (crickets)
1 hymenopteron
Trace of a fly
2 jaws of caterpillar
3 small Tineid cocoons

Other Invertebrates

Spider fragments and cocoon
Jaws of 3 Nereis sp. (marine worm)
100 Melampus sp. (Black-footed snail)
A few fragments and about 750 operculi of Littorina sp.? (periwinkle)
Mytilus sp. (Mussel)
Other mollusk fragments
Parts of a crab

Vertebrates

Bones of fish
Bones and scales of snake
Shell of hen's egg
4 Microtus pennsylvanicus (Meadow mouse)
1 Condylura cristata (Star-nosed mole)

2 Blarina brevicauda (Short-tailed shrew)
Several larger bone fragments (carrion)

PLANTS

10,000 seeds of Myrica carolinensis (Bayberry)
1,200 " " Rhus radicans and R. vernix (Poison Ivy and Poison Sumach)
1,100 " " typhina and glabra (Staghorn and Smooth Sumach)
80 " " Berberis sp. (Barberry)
360 " " Oxycoccus sp. (Cranberry)
30 " " Juniperus sp. (Red Cedar and Low Juniper)
50 " " Smilax sp. (Cat-brier)
100 " " Ilex verticillata (Winter berry)
2 " " Vitus sp. (Grape)
2 " " Solanum sp. (Night-shade)
A few kernels of oats and hulls
A few kernels of wheat and hulls
A few kernels of barley and hulls
A few kernels of corn (fragmentary) and hulls
Trace of buckwheat
Fragments of seeds of pumpkin or squash

Seed and skin of apple
Pulp of pear (?)
Acorn
Meat of an unknown nut
A piece of rotten wood
A piece of cork

MISCELLANEOUS

A rubber band
Gravel

CHAPTER VIII

The Forest

"Besides the motives that have been assigned for these plantations, it may be added that the Grand Khan is the more disposed to make them, from the circumstance of his dreamers and astrologers having declared that those who plant trees are rewarded with long life."

—Marco Polo

ONE does not associate a forest with sand dunes and salt marshes but *The Forest* has become such an intimate part of my life in these regions, I would fain record here its history and charms. All naturalists love a forest for its varied collection of trees, for the vegetation of its floor, for the birds and animals it shelters within its borders, and for its general charms of darkness and quiet as well as for its sweet odors and its varied voices To create such a region within the limits of a twelve acre lot of grass land on the side of a glacial gravel hill, bordered by

THE "FOREST" IN 1906, APPEARING ABOVE THE GRASS

THE "FOREST" IN 1921 (*from the same point*)

salt marshes seemed an ambitious undertaking, but, with the enthusiasm of youth, although some would have said I was old enough to know better, I dedicated in the summer of 1900 an acre of my grass land to what I fondly named my "Forest." My objects were two fold: *first*, to make a collection of New England trees so that I might become familiar with them in all stages of growth.

"No distant tree but by his shape was known
Or, near at hand, by leaf or bark alone."

Foreign emigrants were not desired. European trees, so commonly planted about houses, were to be rigidly excluded. *Second*, to make an attractive place for birds. On the latter account I intended to plant the trees thickly, and, although I might later thin them out to some extent, I did not propose to prune off the lower branches in the picnic grove style, nor did I wish to avoid the crowding common to real forests, and attractive to the birds, but not considered desirable by arboriculturists. Not that I loved trees less, but birds more.

The first spring I transplanted pitch pines and shad bushes, red cedars and gray birches by canoe, or laboriously in bags on my back from the sand dunes and the surrounding pastures and planted them at random in the grass. It was a hot and dry summer and nearly all of these died. Nothing daunted I devised the following winter a more active campaign, read all I could find on the forestation of waste lands, obtained catalogues of tree nurseries, drew elaborate plans for planting, with irregular openings and vistas among the trees, which in my mind's eye I could see spreading out over my head. My forest occupied much of my thoughts.

By intensive work on occasional week-ends and holidays that spring I managed to plant 1400 spindling trees, not over one or two feet high, in the forest, and about a thousand similar trees in rows by an old hawthorn hedge. The latter constituted my nursery from which I was to draw later. Nearly all the work I did myself, but I had a little help at times from an ancient gardener from the village, whose knowledge in these matters and flow of words was limitless. With

a heavy mattock I would chop a hole through the tough turf and loosen the soil sufficiently to insert the roots of the little tree, pressing the earth firmly around it. It was hard work but my prophetic vision of the forest lured me on and I labored hopefully.

Of the trees bought at the nurseries, there were seven hundred tiny white pines, five hundred each of white maples, elms and red oaks and a nearly equal number of ashes. Many of these I intended as nurses during the growing period in this wind-swept region, as trees do much better under these circumstances when they are planted thickly. In these early years I rarely went to any place in the country that I did not come back with specimens of the trees of the region, sometimes wrapt in paper in my pocket, or in my traveling bag or—if a more extensive collection—packed in a box. With critical, greedy eye I scanned my friends' fields and woods for new seedlings. I brought red pines and balsam firs from Shelburne, New Hampshire, witch hazel from Arlington, hemlocks from Brookline, scrub oaks from West Roxbury and cedars from Brain-

tree. William Brewster sent me some white pines from Concord and other friends remembered me from time to time, but most of all I scoured the neighboring woods and fields of Ipswich and especially the sand dunes for new and interesting additions to my forest area. Old Captain Ellsworth had saved for me a fine beach plum near the lighthouse. As my time in the spring and fall—the proper transplanting season—was very limited I had need to transplant in midsummer during my vacation. Fortunately evergreens could safely be transplanted at this season but my broad-leaf ventures were only occasionally successful.

There had been no preliminary work, no ploughing nor harrowing and no subsequent cultivation—I had neither time nor means for these—and I was convinced from what I had read that, although these were of course desirable, they could be dispensed with. I was prepared to lose many of my trees in the struggle, but I felt sure I should triumph in the end. Nothing venture, nothing have is often a good motto.

Many of my wise friends, looking down on

my little forest, shook their heads and said they feared the trees would be root-bound by the grass and remain poor stunted things even if they managed to live. My brother thoughtfully suggested I should put up a sign, "Do not tread on the forest in the grass." Partly that I might see the trees and thus gain courage, and partly to aid their growth, I used laboriously to cut the grass about them with a sickle, and mulch them. Occasionally by a miss-stroke, a forest tree was laid low. I had great need to be philosophical.

In those discouraging days the Myopia Club of Hamilton held their annual fox-hunt or, rather, anise-seed bag chase in our neighborhood. One autumn morning, to my dismay, the rider, with his anise-seed bag trailing behind, rode straight through my forest. I arranged saw-horses and stretched strings as temporary fences to keep off the hunters and confine them to a path below the forest, but in the afternoon the red-coated riders jumped the saw-horses and lived up to their names by riding over the forest without seeing it. I suppose they thought I had arranged

the obstructions as hurdles for their pleasure.

After the chase had swept by and the red coats, dotting the field, were lost to sight in the distance, the whole family anxiously inspected the poor neglected forest. Although there were hoof prints close to some of the forest trees, not a single one had been injured. They had had many narrow escapes and I felt there was a future for them.

At first my forest made but a pitiable appearance. It vanished when the grass was tall and green in early summer, but, with each returning fall when the grass was brown and prostrate, I was cheered by the reappearance of the little trees on the hillside, and, after three years, some of the trees were plainly noticeable above the grass at all times.

At the end of the third year I took a census of the trees by a method which I imagine is new to foresters. I prepared two strings, each the length of the forest, and tied rags to them at intervals of ten feet. I stretched the first string along the upper edge of the forest, the second ten feet within the sacred precincts. In this way I laid

out squares measuring ten feet on each side and containing a hundred square feet, and I identified, counted and recorded all the trees and bushes in each of these squares. Then I took the outside string and lifted it over the forest trees and over the second string. Again I counted the trees in the squares and repeated the process with the second string. By alternately passing the strings over each other and over the loftiest forest trees I was able to make a most intimate and accurate census of my forest, and all it contained and I plotted an elaborate chart of the same. The result indicated about fifty-five different kinds of New England trees and some twelve hundred individuals. At the end of this chapter I have made a list of the different trees. Nearly all the species are in the forest, but some are now to be found in other places in my twelve acre lot.

Time went by and it was evident that the trees had won over the grass, which grew scantier and scantier in the shade. Even the wild strawberries, that had at first increased with the killing out of the grass, were disappearing, and I began

to introduce shade-loving forest plants—hepaticas, dog's-tooth violets, bloodroot and ferns. Under the pines was a smooth brown carpet of needles where a few years before had been a mowing field. One could sit or even stand in seclusion, hidden in the forest. I was filled with pride and happiness.

It is an interesting and surprising thing that so many different kinds of trees should grow so well, or even grow at all in the same locality. Specimens of nearly all the different kinds grew fairly well. Of the evergreens the white spruce grew better than the black or red spruce. It is interesting to be able to watch and study these tree species side by side. The pitch pine was the most difficult pine to transplant on account of its tap-root. The magnificent red pine with its splendid long needles, two in a bunch, grew luxuriantly. The American larch, frequenter of bogs, grew vigorously on my dry hillside. The only trees that did distinctly poorly were the beech and the chestnut. Of the former only one survives and that, after twenty years, is only four feet high, but it is vigorous and promises

better growth. The chestnut is handicapped by the blight yet two or three still live.

When the forest was in its fourteenth year and some of the trees had reached the respectable height of twenty feet, I planned a shelter in its precincts. With the help of the light-keeper, a lean-to was built in a clump of white pines in the heart of the forest. The pines were some of those Mr. William Brewster had sent me from his farm in Concord, dug not far from his log cabin on the Concord River. Theirs was a pleasant association. They had reached a height of twelve or fifteen feet and in one of them a crow had built her nest. We dug four holes through the brown carpet of needles and the black loam to white glacial clay, and planted four stout cedar posts. A slanting roof above of spruce boards covered with shingles and a flat floor eight feet square beneath completed the structure, with the exception of wire netting on three sides and cotton netting curtains in front. The crow's nest, which had been deserted, made a convenient shelf for our tools during the building. Inside the lean-to there was room for two cot beds, and

a man could stand erect at the entrance. A post planted in front with a few short boards on top made a convenient writing table. Here I like to sleep at night surrounded by my friends the trees and from their branches come the songs of many birds.

The birds early discovered the forest's attractions. During the spring and fall it becomes a nesting and feeding place for many migrants. It is an oasis in a desert of salt marshes to north and south. Delicate warblers flying across the marshes seek rest in its protecting arms. My list of migrants is large, and, as time goes on, I am inclined to believe, I shall find that many will tarry there regularly. Birds, like most of us, are creatures of habit, and, if they find a convenient stopping place—a good inn—on their twice yearly journeys, they will come back to it. For example, on three Memorial Days at intervals of several years I have found a yellow-bellied flycatcher singing in my forest. Doubtless he stopped there on other years, but, if the day were neither a Sunday nor a holiday, his presence was not noted. Although the spring and fall migra-

THE LEAN-TO IN THE "FOREST," APRIL 4, 1915

ICE ARCH IN MARSH

tions of birds are surprisingly regular, they are not always on calendar dates, as is the popular belief, but are much influenced by the weather.

When the forest was still in its early childhood, song sparrows, yellow warblers and Maryland yellow-throats enjoyed nesting in its bushy precincts. A pair of tree swallows nested in a box on a spindling ash tree, and another pair in a hollow tree trunk brought from the dunes. As the forest grew, these nesting sites became too shaded and hidden for the swallows, and, to my great joy a pair of chickadees occupied the box.

The history of the chickadees' adoption of the forest as a home is worth relating. Chickadees have been occasional winter visitors to my farm but, with the summer, they disappeared to more congenial regions. They do not care for grass fields and gardens, but need woods for their domestic life. I therefore set deliberately to work to make my place attractive to them all the year. In winter I put food on a feeding shelf and provided an automatic feeder to act in my absence. As a consequence, several chickadees were always to be seen about the place that

winter. A further and more interesting consequence resulted. The summer before there had been for the first time a considerable invasion of gypsy caterpillars into my forest, although I had creosoted as many of the egg clusters as could be found the previous winter. At every week-end of the first winter that the little band of chickadees remained continually at the farm, they were to be seen not only at my feeding shelf but also in the forest, and the egg clusters seemed to be disappearing. No creosote was used and at the end of the winter the egg clusters were gone. I have seen chickadees eating these eggs, and I believe my riddance of these pests was due to them, for, although the forest has never been sprayed and the gypsy eggs have only once been creosoted, the forest has been practically free from this destructive worm. I regard this as an object lesson in the value of birds in keeping down insect pests. To obtain the best results it may be necessary to spray the fruit-trees and sometimes other trees to save them, but, in so doing, one loses to a large extent the beneficial work of the birds. Moreover, there is strong evidence

that the poisonous sprays used result in a considerable destruction of our birds. They drink of the poison drops on leaves, just as they drink from the same cups after a shower or a heavy dew.

A pair of chickadees nested in a box in my forest that spring and nearly every spring since, and their clear whistling "pee wee" and their familiar and attractive ways added much to the charm of life. On one occasion, in late fall, a chickadee had entered through the open door the screened open-air dining-room of my house. He was considerably alarmed and fluttered against the wire netting. Finally, escaping by the door, he flew around the corner of the house, passing me with the speed of a winged arrow, crossed the driveway and popped into a bird box by the stone wall. He immediately turned and thrust his head out and sang his clear whistling song as if in triumph at his escape.

Birds in moments of intense excitement, even when this excitement is not due to courtship, sometimes burst into song. An extraordinary example of this once occurred in the forest in

late May. I awoke in the morning to find a Maryland yellow-throat in the plumage of the female flying distractedly about the lean-to trying to get out, fanning my face at times with its wings, and at times alighting on my pillow. It had come in through the opening between the two netting curtains at the entrance. As it could not find its way out I reached over and pulled the curtains apart, with the result of causing it still greater fright but allowing it to escape. It flew a few yards to a perch and at once, to my great surprise, poured forth a song which could be recognized as the "witchery" song of the male, but much abbreviated and inferior in tone and volume. It is possible that the bird was a young male of the previous year, that, through some retardation in development, had not yet assumed the full nuptial dress of the adult male, nor the full courtship voice, or it may have been, as it appeared, a female, and, under the intense stress of captivity and escape, had been wrought up to the pitch of song.

One day in winter I found a handsome cock pheasant safely sheltered in the lean-to. As

there were no mosquito curtains in front at this season, his escape was an easy one.

In the lower part of the forest, just above the salt marsh, is a springy place and fairly open. An alder brought from the dunes grew vigorously. It was perfect woodcock country in miniature, but I never expected to find woodcock there. However, early one morning as I was hurrying from my lean-to for a bath in the salt creek, I nearly stepped on two young woodcocks that fluttered off into the bushes. After this on several occasions I started an adult woodcock that rose like a whistling meteor through the forest. I have watched and listened every spring since for the courtship song and flight of this interesting bird, but as yet the pair have not returned.

To awaken on a spring morning and listen to the morning chorus of birds is one of the greatest pleasures that comes from my occupation of the lean-to in the forest. Bird songs are also to be heard there at night. The chipping sparrow sings occasionally at this season, the song sparrow much more commonly. The black-billed cuckoo sometimes pours forth his curious song not only

from a perch but from the wing as he slowly flies about the darkness. First he clears his throat most vigorously; then he calls *cow* a number of times at regular intervals but soon changes to *cow-cow*, *cow-cow* or *cow-cow-cow*. His doublets and triplets distinguish him from his yellow-billed cousin, whose *cows* are as woodeny as if knocked out by a mallet.

The cuckoo is called the "rain-crow" because it is thought he sings before a rain. Many a farmer has been cheered in a dry "spell" by hearing the voice of this bird. I am afraid his song is as of little value for meteorological predictions as is the call of the bob-white, who is sometimes thought to say "more wet." The value of the cuckoo to the farmer is based on more substantial foundation, however, for he is one of the few birds fond of hairy caterpillars. The nests of tent caterpillars may be seen full of punctures, and cuckoos' stomachs are often fury with caterpillar hairs.

The "stake-driving" of the bittern may often be heard from my cot in the darkness before

dawn, less commonly the "pumping." Both of these terms accurately describe the nuptial "song" of this bird. When near at hand the bittern's song resembles the sound of an old farmyard pump in action—*ker-chunk, ker-chunk.* One can even hear a preliminary gurgling. At a distance, only one of the notes is heard which sounds for all the world like the blow of a mallet on a post —like stake-driving in the marsh.

Occasionally a Maryland yellow-throat sings in the night or a kingbird indulges in his peculiar song and dance which he is also prone to do in the late evening when the light is so poor that he is hardly visible. It is a zig-zag and erratic dance, a dart this way and then that, high up in the air, with an accompaniment of double screams, harsh to our ear, but pleasing, doubtless, to his mate.

In the dusk of spring evenings the song of the greater yellow-legs, comes up from the salt marshes, and one may get a glimpse through the trees of the long-legged birds stalking about in the sloughs or flashing out their strikingly white

rumps as they fly. Their song has an appealing tone and a romantic fervor and appears to ask, *will-yer*, *will-yer*, *will-yer?*

A true bird of the night is the screech owl and his mournful serenade may often be heard in my forest. The term screech owl is a misnomer for he does not screech but utters a quavering, mournful whistle which ends,—if one is near enough to hear it,—with two or three guttural, woodeny notes. Two other birds of the night frequently announce their presence from the marshes, the night heron by varied quawks and the black duck by harsh quacks.

During the migrations, especially in the fall, one can hear the birds calling to each other as they fly over in the night. These calls, so evident to a bird student, are unheard by the ordinary man. To him they are non-existent and he can be brought to hear them only with considerable difficulty. He hears the noises of the street or of the countryside, the distant sound of voices, bells ringing or the barking of a dog, but he seems unable to concentrate his attention on the lisping notes and distinctive calls, so fa-

miliar to the ornithologist, that comes showering down from the sky.

As is well known, most of the smaller birds migrate by night. The reason of this is that they are unable to find their insect or vegetable food in the dark, and they must needs devote the day to that important function, snatching a few winks of sleep when they can. Birds that can feed as they fly, like swallows and night hawks, and also strong flying birds like the crow and robin and, I believe, the hummingbird migrate by day and sleep at night as usual. Many of the ducks and shore birds migrate by day as they are able to feed at night and all of them are strong fliers. The delicate warblers, wrens, sparrows and flycatchers make the long journeys at night, and on favorable nights the air is filled with their calls as they cheer each other on their travels.

I am inclined to think, as a result of many observations, that the first regular morning awakening and song of our summer residents is that of the tree swallow. It is a simple song a couple of notes frequently repeated, but, dropping down

from the sky just before dawn from a multitude of throats, it is a pleasing forerunner of the day. The robin is a close second as an early riser, and next the song sparrow. A robin gives a challenge call, there is a rustle among the hundreds of robins that roost in the forest, a bird carols forth and soon the whole robin chorus bursts on the ear, a glorious morning hymn of praise for the sun, clear, rich pure and holy. A catbird sings from the roof close to my head, a yellow warbler and a Maryland yellow-throat from a birch near-by, bobolinks and meadowlarks sing from and over the fields, a kingfisher rattles as he flies over the forest on his way to the creek to fish, and crows, rather lazy about awakening, caw from the big nut tree, or utter their crackling song.

Among the winter birds that visit the forest the northern shrike is always worth seeing. On rare occasions with us he sings, and he has performed from a tree-top in the forest. To an optimist his song is well worth hearing so abounding is it in sweet musical sounds—full-throated robin-like warbles, clear notes like the bell-tones of a blue jay, and pretty trills. These he in-

tersperses with notes far from pleasing—harsh and rasping ones—and a pessimist, having these uppermost in his mind, would put down the song as a very undesirable one. It is well to pass lightly over the unpleasant things of life and lay stress on the pleasing.

Audubon believed that these discordant cries of the shrike were imitations of birds in distress and that they served to beguile small birds within its reach. This idea comes down from the Middle Ages, for one Dame Juliana Berners denounced for the same reason the European gray shrike and stigmatized it as "an ungratefull subtell fowle."

The redpolls and siskins, the crossbills both red and white-winged and the pine grosbeak have all visited my forest from the north, and, on one occasion, I was so fortunate as to find several evening grosbeaks, that splendid yellow and black bird of the northwest, feasting on the seeds of the box elder. Of late years this accidental winter visitor has become almost a regular visitor, and he is particularly fond of the seeds of the box elder or ash-leaved maple. This tree

has been planted extensively in the Great Plains and, it is believed that, beguiled by its seeds, the evening grosbeak has been led even to our Eastern Coast.

Not only are bird songs interesting and delightful, but even the faintest calls and notes may be the source of great pleasure. The whistling call of the white-throated sparrow, the lisp of the fox sparrow, the distinctive calls of the myrtle and the magnolia warblers for example, heard in the spring and autumn migrations, arouse emotions which help to carry a man through a busy and trying day. There is an intellectual pleasure and a feeling of mastery that springs from it, in being able to recognize a faint call and to picture the exact appearance of the bird, from which it comes, and to recall its home environment in the north. One can smell the balsam fir and the fragrant Linnea, and feel the cool breath of northern air. The ornithologist in particular or the naturalist in general, the greater part of whose life is spent in the busy haunts of men, leads a double life of which his acquaintances know nothing, which is indeed a

sealed book even to his intimate friends, if they are destitute of similar tastes and knowledge. To their ears he speaks a strange language, he describes what is before them that they do not see, what is audible to all, that they do not hear. As a rule the naturalist is silent on these subjects when he is among the Philistines, but enthusiastic and even loquacious when with the elect and the sympathetic.

The list of birds I have heard from my cot in the forest is a long one and I shall not burden the reader with it. I have observed as many as one hundred and fifty different kinds of birds on or from my farm, many of these are birds of passage or at least nest elsewhere. In 1915 I made a census for the United States department of agriculture of birds that nest on my farm and the list totaled twenty-eight species. All of these I have heard from my cot in the forest. They are as follows: ring-necked pheasant, black-billed cuckoo, flicker, phœbe, kingbird, crow, bobolink, red-winged blackbird, meadow-lark, Baltimore oriole, bronzed grackle, purple finch, goldfinch, vesper, Savannah, chipping and song

sparrows, barn and tree swallows, cedar waxwing, red-eyed vireo, yellow warbler, Maryland yellow-throat, redstart, catbird, brown thrasher, robin and bluebird. There is an advantage in dwelling in a small forest: one can also hear the birds of the fields and meadows outside.

The catbird is handicapped by his name and is not appreciated as he should be. It is true that he mews like a cat, but his song although varying much, is always interesting and often sweet and musical. It is interesting because the catbird is a mimic—not nearly as good a one as his cousin the mocking bird—but well worth listening to for the surprises he affords. I was once paddling on the Ipswich River when a catbird suddenly swooped down across my bow uttering a rattle that almost deceived me into thinking him to be a kingfisher. A gifted individual that has sung in my forest has imitated some of the delightful strains of the rose-breasted grosbeak as well as those of the red-eyed vireo, and has varied his performance by scolding like a blue jay. Other bird notes that I have heard mimicked by catbirds are the chewink, the robin, whose alarm

note, *dick dick*, he often imitates perfectly, more rarely his song, the wood thrush, veery, brown thrasher, goldfinch, flicker, bob-white and greater yellow-legs. The call of this large wader, the grand chevalier with the legs yellow, as the French Canadians say, was so perfectly imitated that I was not undeceived until I saw the catbird, who changed his note on my intrusion to mews.

The catbird appears to be constantly improvising and practicing new combinations in the process of which he frequently strikes a false or harsh note. While the brown thrasher avoids these mistakes and regularly repeats each note or phrase, the catbird indulges in repetition only when a phrase happens to tickle his fancy. Thus a bird heard from my cot sang a pleasing and musical phrase that sounded like *Péter-boro*, and repeated it five or six times. After this he mewed to show that he was not too idealistic nor stuck up, and then tried another musical combination. Do not disdain to listen to the catbird on account of his name in the same foolish way that people decline to eat dogfish on account of its name. There is unfortunately a great deal

in a name after all, and even a rose called by some vulgar name would not smell as sweet to the multitude.

Another bird whose reputation as a singer is not of the best, suffers unjustly, I believe, from the imputation of being prosy, monotonous and long drawn out in his singing. He is even called a preacher in an uncomplimentary sense. I refer to the red-eyed vireo whom I am glad to be able to include in my forest orchestra, for to me his song is one of quiet content, of a happy individual, philosophically and joyfully going about his day's tasks with unhurried steps, of a sweet-faced woman contentedly knitting, of a bird leisurely gleaning his daily food and pouring out his soul in thankfulness. One is not excited by his song and does not hang on each phrase, but one may enjoy it as a delightful background to the more individual and detached efforts of other birds.

One of the birds that occasionally makes flying visits to my forest, but sings not in the ordinary meaning of the word, is the hummingbird. Chiefly for his benefit I planted trumpet-creepers about my house. It is probable that the long bill

of the hummingbird was evolved in order to reach the nectar in these long-throated flowers, and that the flower was evolved so that the hummingbird or insect in feeding on these nectaries should bear pollen from one flower to another and thus cross-fertilize them. Each species works for its own good. It is not altruistic.

The hummingbirds at Ipswich have, however, taken an unfair advantage of my hospitality in planting these vines and a still more unfair advantage of the vines. Instead of drinking the nectar through their slender bills inserted into the long tubes of the flowers, they have grievously punctured and slit the tubes and thus made a short cut to their food. Sometimes I am unable to find a perfect flower—all are damaged. Such actions are, as far as I know, most unusual.[1] Is it possible that an over efficient hummingbird has discovered and perhaps taught others this reprehensible practice at my farm? This opens up a wide field of conjecture. Let us suppose

[1] I have recently read that the flowers of the tree-daturas in Ecuador are cross-fertilized by a hummingbird with a long bill, but that shorter-billed species rupture the corolla tubes from without.

that in a region like Central America, where long-necked flowers and hummingbirds abound, the latter had universally adopted this short cut to the food supply. The result would be disaster not only for the flowers but for the birds. It is evident that the flowers so pierced would not form any more honey for future meals and would ultimately die. They would not be crossed-fertilized, and even if they matured seed these might prove infertile. It is conceivable that in this way not only individuals but whole species of flowers might perish, as well as the hummingbird life dependent upon them.

The forest as a robin roost is worthy of a few words. I had been hunting for a name for my farm and, when the scientific name of the robin was changed from *Turdus migratorius* to *Merula migratoria*, I welcomed the euphonious title and called my farm Merula Farm. I have kept the name although the powers that be have seen fit to change the name of the robin to *Planesticus*. As if in acknowledgment of my choice, the robin has been so good as to select my forest for its roosting place at night. Hither they have come

in numbers ever since the forest had reached a sapling height, and have spent the nights from June to October. There may at times be several hundreds, but I have never counted them. When the female robin is brooding the young, the male and his bachelor friends resort to this club-house at night. Later they are joined by the juvenals and, when all the broods have flown the nest, doubtless by the females also. Before dusk the robins come from all sides, frequently alighting first in a field from which they dive from below into the forest. Some of them alight on tall outlying trees and from there enter the forest from above. Sometimes, especially on rainy days, the birds drop down from the air without preliminary preparation.

On a pleasant evening in September I concealed myself in the lean-to in the forest to watch from the inside the coming of the robins to the roost. At a quarter after five, by true time, came the first arrivals, and soon the ground and lower branches of the trees were alive with them. After a little preening, a few conversational notes and an occasional fight with sharp cries and

snapping of bills, these birds ascended to the leafy tree-tops where there was much shifting of positions and animated conversation. Occasionally a pair in active fight would come to the ground, but for the most part all the birds after the first, including the newcomers who were arriving in numbers, remained in the tree-tops. The din began to diminish at half-past six and at a quarter of seven, the birds were sleeping so soundly that they did not arouse when I left the forest.

Early in the season the morning chorus from this assembly of robins is full-throated and glorious. After the end of July or the first of August the morning awakening is destitute, or nearly destitute, of song. Occasionally a single robin makes a feeble attempt to sing. Song is replaced, however, by many conversational notes and a general shifting and fluttering about through the trees as if a gossipy reception was being held before the birds leave for the day.

The morning awakening, early in September, begins about half-past four and the birds are nearly all gone by five o'clock. Very different

is the behavior of a small flock of starlings who also roost in the forest. Not a sound is heard from them until fifteen or twenty minutes after the departure of the robins, when, with a preliminary chirp—although I do not always hear this—they are off with a silken swish of wings.

At night, in walking in the darkness to my cot, I am careful not to hit the tree trunks, for, if I do, I am apt to awaken one or more of the slumbering robins, and the commotion caused by their alarm notes and fluttering of wings often spreads in all directions like ripples on a pond. On clear moonlight nights occasional conversational notes and a shifting of positions are not uncommon among the birds.

One June morning at daybreak, I was aroused from my sleep in the forest by a great outcry among the robins who were flying about in a nervous, alarmed manner. A few grackles, redwings, yellow warblers and chickadees added to the tumult. Later I discovered a short distance from my bed the feathers of a robin that had been eaten by a hawk. The offender in this case was a marsh hawk, who had varied his

usual diet of field-mice. He was certainly a criminal among his race for I have evidence that he has devoured in my forest not only several robins but a grackle and a green heron. I have seen him harrying the forest in the day time pursued by most of its inhabitants.

At times barn swallows to the number of fifty or more have roosted in the forest and have caused me infinite joy by their early song of thanksgiving. Few birds sing so charmingly in chorus as does the barn swallow.

The distant calls of the crow and its varied conversational notes, some of which have a very human quality, and its rattling, crackling "song" already referred to, are pleasing rural sounds. But I have determined never again to allow this bird to nest in my forest, not only on account of the danger to other birds' eggs and tender nestlings, but also because the sound of the constant calling of the young for food, a repeated *car car car*, is most disturbing to one who is alert for bird songs. Nor is this all, for, when the parent inserts its bill and head into the capacious maw of the youngster in order to feed it, this same

youngster makes a still more disagreeable gurgling or gargling sound which is but the prelude to more *cars*. Young crows are always calling for more.

The year following this determination to exclude nesting crows, I found the evidence of a crow tragedy in numerous scattered feathers of that bird. It was plain that a hawk or perhaps a great horned owl had relieved me of the job for no nesting crow intruded that year. I trust that the tradition of the dangers of the forest to crows will persist.

Another bird I do not care to have nest in my forest is that enterprising and intelligent bird, the bronzed grackle. My reasons are the same as in the case of the crow. He is destructive to other birds' eggs and young, and peace-disturbing not only when his own young are calling for food, but even when he himself is singing in his best manner.

Of late years the grackle has shown his enterprise and intelligence by taking to nesting in cities and towns and about houses. Prior to 1900 he was rarely to be seen in the Public Gar-

den in Boston, but since that date they have nested there commonly. Not until 1907 did they begin to build nests in the vines of my house, and it soon became a matter of choice between the delightful robin or the obnoxious grackle as a housemate. I naturally preferred the former. A nest of a grackle over a back porch that I tore down every week-end for five in succession, was rebuilt and an egg generally laid therein by the next week-end. I then found that if the eggs were taken and the nest left, the birds became suspicious and deserted. Possibly they thought the destruction of the nest was due to the elements while the purloining of the eggs was due to an enemy who would return for more! The last method of inducing the grackles to change their abode was approved of by my neighbors and, by the aid of a boy, thirty-two fresh grackles' eggs were secured from the vines of several houses. They made an excellent omelet.

In the last chapter of "Sand Dunes and Salt Marshes" I had something to say of the interesting habit acquired by these birds of picking a bit of food from the surface of water like a

gull, sometimes immersing part of the body in the act, and I mentioned that I had seen one carry off what appeared to be a small silvery fish. Since that time I have seen grackles accomplish this feat many times in the Back-Bay Basin of the Charles River, and, with the help of a policeman, I have secured the living fish that they had brought to land. The fish were three-spined sticklebacks. I am sure that an island community of grackles would have nothing to fear from the shrinking of their terrestrial food supply.

One spring I tied pieces of white rag to a string and stretched it across my garden to protect the sprouting corn from the crows and it was effectual. The grackles, however, not only refused to be scared by this device, but one individual actually pulled the string hither and thither over the ground until he succeeded in detaching a piece of rag. With this, croaking hoarsely in triumph, he flew to his nest. Rather than lose the company of this interesting bird I would let him nest on my house and in my forest, but I prefer to have him nest elsewhere.

Not only do I hear birds in my morning waking hours but I see them from my cot. Looking up through the trees early one spring morning I noticed a small bird fluttering among the leaves of the topmost branches of an oak. With my glasses I saw that it was a female Maryland yellow-throat. Presently she hopped out to a bare branch, shook herself as birds do after a bath, puffing out all her feathers which were wet, and I realized that she had been taking a dew-bath in the tree-tops.

It is possible that this is a common habit among birds, although I have never seen it described. The rustling and fluttering of the awakening robins already mentioned may be the accompanying sounds of dew-baths, but robins are such early risers that there is too little light to spy out their matutinal ways.

Inquisitive chickadees are apt to fly about from branch to branch close at hand, peering at me with their black shining eyes. Catbirds chase insects over the dry leaves, twitching the leaves back of them with their bills, and making the noise of a larger animal. Robins start

fighting in the tree-tops out of my sight and drop to the ground within my vision. Song sparrows, Maryland yellow-throats and yellow warblers often sing to me within sight but upon my ears I am chiefly dependent for these *clinical* observations.

The shy mammal rarely reveals himself in my waking hours in the forest. I have heard foxes barking in the distance and have seen their tracks in the snow sometimes close to the lean-to, and once, from the house I saw a fox trot across the field in early morning and enter the forest. Gray squirrels chase each other from tree to tree and scamper over the dry leaves, cottontail rabbits often play within scope of my vision, I have glimpses of white-footed mice and I have sometimes been conscious of the presence of a skunk.

On awakening one lovely May morning, I was surprised to see a cottontail rabbit bounding into the air as if it were intent on climbing a tree. Then I discovered there were two and that they were playing. One would run at full speed directly at the other, who, as if discharged by

springs, bounced straight up into the air a couple of feet or so and his playmate passed underneath. The merry pair continued to practice this cottontail form of leap-frog for several minutes.

I once saw a deer run out of the forest in the day time. Deer have done grievous injury to the bark of a locust tree, and in the early days of the forest I had to tie rags to a couple of white cedars to prevent their entire consumption by deer. I have not caught a weasel asleep, neither have I seen one from my cot, but on one occasion on the outskirts of the forest I came across a weasel that sat up on end with its little forepaws hanging down, and impudently watched me from a distance of fifteen feet. At times it stood erect on its hind feet, at times it squatted on its haunches. It was a long drawn out animal, brown above, white below, tinged with creamy yellow; the end of its tail was black; its ears were large and its black beedy eyes were fixed upon me. I stood motionless and whistled to it softly. After a few minutes scrutiny it dropped to all fours and bounded off like a dachshund hobby-horse, but returned in a mo-

ment to again watch the strange whistling creature.

There are many other sounds than those already detailed that are interesting to one "who is quick to read the voices of the night," such as the wide range of insect sounds. After the middle of August the snowy tree-cricket sings by rubbing his wing-covers together every night until his activities are stilled by the cold of autumn. This point is reached when the thermometer sinks to about fifty degrees. It is a regular pulsing, throbbing song in which two or more insects may unite in unison. Thoreau refers to it as "the slumbrous breathing of crickets throughout the night." The hotter the night, the quicker the repetition of the notes, the colder, the slower. By counting the notes in a quarter of a minute and adding thirty-nine, one obtains the number of degrees of temperature Fahrenheit, with surprising accuracy. This may be called a cricket thermometer.

The snowy tree-cricket, whose song I have just described, is a very different looking insect from the well-known field-cricket, a first cousin of the

European species, the familiar "cricket on the hearth." The field-cricket is dark brown or black, stout and robust in appearance and easily discovered. The snowy tree-cricket is pale greenish white in color, slender and delicately formed. It is practically never seen except by those who make diligent search, as it secretes itself in bushes and vines, and is apt to cease singing if one intrudes too closely on its haunts.

On a November night the wind switched around from the south to the northeast, blew hard and brought rain. I was awakened by the rain in my face and the groaning of a tree trunk rubbing against the roof of the lean-to. The sound was so human that I reached out in the darkness to discover if by any chance some one had come to the other bed beside me.

The soft soughing of the wind in the pines, the rustling of the leaves of the hard woods as their branches sway in the breeze, or the roaring of a gale through the forest are all sounds that give pleasure. Especially do I enjoy the sound of the surf breaking on the beach when an easterly wind

brings it to my ears, or when it roars loudly in a calm night after a storm.

Even in the absence of beasts or birds, the view from my cot in the lean-to is most satisfying:—the brown forest floor, the clustering tree trunks, the green canopy above and all around dotted here and there with glimpses of sky—a very pleasant and well arranged bed chamber. In front of the lean-to, the ground slopes rapidly down, and here is left a space with trees on either side. Through this vista I used to be able to look out on the broad marshes and winding creeks, the wooded islands and the distant pine-covered hills. Gradually the tree growth narrowed the view and, although I lopped off branches from time to time, the jungle conquered in the end and now my view, even in this direction, is bounded by waving foliage.

Partly to avoid disturbing the beasts and birds and partly for the sake of the mild adventure, I take no light at night to guide me to the lean-to. The forest path is a sinuous one, some seventy paces long, and winds about among the trees. On moonlight nights the way is clear, but there

are many nights when I am engulfed in Stygian darkness the moment I enter the forest. Partly by the feel of the well trodden path on the fallen leaves and pine needles, and partly by my familiarity with the individual trees and knowledge of all the twists and turns of the path, I can generally reach my goal. Sometimes I stray and am temporarily lost. My attitude on the walk is that of a suppliant, with hands extended and clasped lest any sapling steal through my guard and smite me in the face. For the time being I am a blind man and it matters not whether my eyes are shut or open.

A rain continues in the forest for several hours after the storm has ceased outside. The leaves and branches drip steadily in the calm that follows a storm, and the rain pours down in showers when gusts of wind shake the trees. Just as snow is conserved in the forest and slowly melts and enriches the ground, so is the volume of the rain spread over a longer period and does not rush down the hillsides in a career of waste and destruction. In winter, when the fields are here bare of snow, there piled in great drifts, depend-

ent on the vargaries of the wind and the irregularities of the shelter, my forest is evenly carpeted and built up with snow. When the spring warmth and showers leave the fields a patchwork of sodden and gullied earth and snowdrifts, and finally remove all traces of whiteness, the forest still retains its slowly melting blanket. This at last sinks into the ground without a trace.

One of the pleasurable sounds in Nature is that of falling rain. In a house one may be disturbed lest it rain in the windows and injure the ceilings, and, in the city, the prospect outside is far from inspiring. If, however, one associates with the sound of falling rain the smell of the earth and the crops greedy for the refreshing draught, the associated cooling of the air in heated days, and all the glorious and awe-inspiring manifestations of a storm, the sound becomes one of the pleasurable sounds of nature. To lie out in a lean-to and listen to the wind singing in the branches, to hear the rain on the roof and in the trees, to feel now and then a spray of moisture on the cheek is always an interesting experience.

What pleasant memories does not the smell of salt marshes bring to mind! It is a characteristic odor, a good salty, marshy smell, and it is concentrated in all its agreeable qualities in a rick of damp salt hay. A summer's rain bring it up from the marshes to my lean-to in the forest with especial force. Why this should be so I do not know. Its full flavor is to be found on the borders of the creeks, where one walks in the thatch grass with loud crackling sounds at each tread as the great grass stalks snap under foot. The smell of the flats at low tide is good but it lacks the flavor of salt hay. Flats have an evil reputation, as they are associated in the mind with the flats about the harbors of great cities, contaminated with sewage and with the waste of gas factories. Flats in primitive regions, washed clean twice in twenty-four hours by the clear green sea water are as different from these as white is from black.

The sweet odors that float through the four open sides of my lean-to in the forest are always a delight. The delicate and subtle odors of early spring, the smell of the freshly turned

soil wafted from yonder field, the perfume of the apple blossom, which sometimes pervades the whole country-side, the odors of the old hawthorne hedge and of the wild cherries at the boundary stone walls, the superlatively sweet odor of the wild grape, of the wild rose and of the new-mown hay, the aromatic smell of pine and spruce and fir, as well as the good smell of the salt marsh, all contribute to the pleasures of sense and contemplation of one who makes this forest his bed chamber. One often strains his nose and his memory to differentiate these odors.

On the floor of a natural forest an interesting assembly of wild flowers is to be found. These forest-loving species are of course absent where a forest is rudely thrust by man into a mowing-field, although, in time, by the agency of wind and birds and beasts, it would undoubtedly spring up. I have already alluded to my introduction of dog's-tooth violets, bloodroot, ferns and other plants, and it is my ambition, as opportunity favors, to make here a collection of forest-loving species that will add greatly

to the beauty and interest of my forest, which will be as an open book. What better way to learn the ferns, for example, than by collecting and introducing as many different kinds as possible and watching them as they become established. Fortunately the character of the ground varies from dry gravel to clay subsoil, and to springy ground at the foot of the hill near the salt marsh. I already have a few lady's slippers and rattlesnake plantains in my forest. The possibility of a considerable collection of wild flowers there as well as of ferns is an inspiring thought.

An unexpected source of profit and pleasure ensued from the forest. When I planted and tenderly brooded over the delicate seedlings on the hillside, the use of an axe on them was far from my thoughts. Yet a time came when an axe was very necessary. I had planted them near together for protection from the rough winds. Many of them were nurses, and it is well to eliminate nurses when the child outgrows the apron-strings. Elms and ashes had been sprinkled in liberally, but, although I was glad to grow a thicket for birds, I found these nurses were push-

ing and shading some of my rarer trees and that they would eventually kill them. Hence the need of the axe, although it required a steeling of the heart to destroy what I had nurtured from their infancy. I could still keep a thicket for birds even with liberal cutting and my thicket would contain a greater variety of trees.

The wielding of the axe as an exercise has many advantages. Personally I prefer it to the wielding of a golf club. It is at its best in mid-winter when golf is often impossible. It requires much skill and quickness of eye. My first stumps looked like beaver stumps. The felling of the tree in the desired direction, the loping off of the limbs, the cutting up of the large part of the trunk into fireplace wood, and of the small part into stove wood, the pushing of the load in a wheelbarrow up to the house or the dragging it on a sled on the snow, the gathering and burning of the brush—all of these in the cold sparkling days of autumn and winter are joys that make life worth living and keep a man in good physical condition. There is no better exercise.

There were no towering forest trees to be cut down in my youthful forest, and, with the exception of a few old wild cherry trees on my boundary walls that I cut down to make room for other trees, I guarded my old trees most zealously. Wind and storm, however, played havoc with a few of these veterans and gave me opportunities to cut up the large boles with the help of a friend and a two handled saw, and to split the pieces with iron wedges and a sledge hammer. Sawing is monotonous work, and unless the trunk or limb is too large the axe is to be preferred even if it take longer and be more wasteful. The saw requires no skill in its use, each drawing back and forth is the same as the one preceding. Each stroke of the axe, on the other hand, must be intelligently placed to get the best results. Two in succession are rarely the same. One stroke cuts diagonally, another cuts straight across the grain; the fragrant white chips fly the steel rings out. Swinging a heavy sledge hammer is also splendid exercise. A splitting and tearing of the wood occurs, clean fresh surfaces open up and a sweet smell issues forth. During the Great

War when it was a patriotic duty to conserve coal for our allies, I was able to keep the house supplied with wood.

Every farm should have a wood-lot, and if it does not possess one, let not the owner delay to plant it. Rightly used it is a source of much pleasure and profit.

> "*When ye hae naething else to do,*
> *ye may be aye sticking in a tree. It will*
> *be growing when ye're sleeping.*"

List of Trees in Forest and Adjoining Land

Larch	Arbor vitæ
White Pine	White Cedar
Pitch Pine	Red Cedar
Banksian Pine	Aspen poplar
Red Pine	White Willow
Black Spruce	Butternut
Red Spruce	Black Walnut
White Spruce	Bitternut Hickory
Hemlock	Hop Hornbeam
Balsam Fir	Hornbeam

Sweet Birch
Yellow Birch
White or Gray Birch
Canoe Birch
Beech
Chestnut
White Oak
Bur Oak
Swamp White Oak
Chestnut Oak
Red Oak
Scarlet Oak
American Elm
Hackberry
Tulip Tree
Sassafras
Buttonwood
Mountain Ash
Wild Red Cherry
Chokecherry
Wild Black Cherry
Locust
Clammy Locust
Red Maple
White Maple
Sugar Maple
Mountain Maple
Striped Maple
Ash-leaved Maple
Linden
Flowering Dogwood
Tupelo
Red Ash
White Ash
Green Ash

Bushes and Vines

Shadbush
Thorn
Staghorn Sumach
Smooth Sumach
Red Osier
Hobble-bush
Arrow-wood Viburnum
Maple-leaf Viburnum

Sweet Viburnum
Wythe-rod Viburnum
Hazel
Barberry
Beach Plum
Bayberry
Winterberry
Alder
Witch Hazel
Elder
Rhodora
Meadowsweet
Hardhack
High Blackberry
Wild Rose
Wild Gooseberry
Low Juniper
Yew
Poison Ivy
Fox Grape
Frost Grape
Bitter-Sweet
Groundnut
Trumpet Creeper
Woodbine

CHAPTER IX

Swallows at Work and Play

"Who but the swallow triumphs now alone?
The canopy of heav'n is all her own
Her youthful offspring to their haunts repair,
And glide along in glades and skim the air,
And dip for insects in the purling springs,
And stoop on rivers to refresh their wings."

—Dryden

BOTH the tree swallow and barn swallow have modified their nesting habits since the arrival of the white man in America. The tree swallow formerly built its nest in trees hollowed by decay or in woodpeckers' nesting holes. This habit is still continued wherever suitable holes are to be found, even in such a thickly populated region as Essex County, but the majority of the nests that come to our attention are built in boxes or houses of various designs that are erected for their especial convenience.

On my twelve acre farm at Ipswich I have had fifteen pairs building in boxes in one season. One of these boxes, which has been occupied each year for over twenty years, violates most of the rules laid down in modern books for the building of bird-houses. It is advised, and with good reason, that paint should not be used, that the opening should be no larger than the bird's body, that it should be circular, several inches above the bottom of the box and that the nesting material be removed at the end of every season. Now this favored house of mine is painted red with black windows and green blinds, has a large rectangular opening on a level with the floor, and, being on the top of a pole, is never cleaned out. This only goes to show that the tree swallow is an adaptive bird. My experience demonstrates that square wooden boxes are just as popular as the most carefully made and expensive von Berlepsch boxes, which may be heresy.

The barn swallow formerly built its mud and straw nests in rocky caves. Swallow Cave at Nahant is an instance, but as far as I know no barn swallow has been found within fifty years

building in a natural cave in Essex County. It nests in artificial caves made by the white man, in out-buildings and, above all, in barns.

What is more charming than an ancient barn filled with the sweet scent of hay and the song of the barn swallows! The doors stand open, the windows have many gaps in their frames. Through these inviting openings the swallows are constantly gliding. I have known many such barns but of one that I know intimately at Ipswich I would speak here. Not only did barn swallows nest in large numbers in its cavernous interior but a large colony of eave swallows built their retort-shaped nests under its liberal eaves. I once counted on the beams and rafters of this barn fifty-five barn swallows' nests. These are made of globules of gray mud brought by the birds in their bills, firmly plastered together and mixed with straw. They are lined with hay and feathers. In late June and in July one may lie in the fragrant hay and listen to a concert of great beauty and watch a scene constantly changing and full of interest. The old birds are ever flying in and out, skimming close to the floor or

just missing the top of the door or window frame, skillfully dodging any human being that may be standing in the doorway and never pausing for an instant in the swiftness of their flight. They cling to the old beams or to the edge of the nest where they are opposed by a row of four or five pinkish yellow mouths which form conspicuous targets for the discharge of mouthfuls of insects. All the young twitter excitedly, but all those which are unfed as well as the lucky one or two that are fed, quickly subside as soon as the parent goes, and the yellow commisures of their mouths alone are seen in the twilight of the rafters. Sometimes both parents arrive with food at the nest at the same time and the consequent excitement is doubled.

The song of the barn swallow is rarely mentioned in the books. One reads of their twittering calls from the air or the barn roof. To my mind the barn swallow is one of our most delightful singers. His song is always full of charm, soft and lovely, devoid of all roughness. Besides delivering an individual song, he delights in singing in chorus. It is a sweet and cheerful

song full of little trills and joyful bubbles of music, at times clear and sparkling, at times oozing and rubbery. Like the music of a brook it flows on indefinitely. At times the old barn is permeated with its melody. Swallows on every rafter and in every cranny and coursing through the air seem filled with the most intense joy of the music. Then all is silent except for the twittering of the young; anon the song bursts forth again and swells into a louder chorus and dwindles into a soft, low air as if a master leader were swinging his baton.

Not only do the swallows sing thus in the barns, but as they course the fields or skim the ponds, and perhaps best of all when a group of them welcome the morning sun from a roofside. Our barn swallow is an accomplished singer, and, as a proof that he delights in his own song, he does not limit it to the courtship season but continues it through the arduous time of the rearing of the young and even after the young have left the nest and are abroad. From the first day of his arrival in late April till the end of August and even into September this charming bird sings.

Very few birds have such a long and continuous song season.

The tree swallow is far inferior in voice to his cousin the barn swallow. In fact, it is the common belief that he has no song, and there would be full excuse for the belief. Such, however, is not the fact. He is our earliest bird to regularly welcome the dawn by song, even anticipating the robin. The tree swallows' song, for such it must be called, is a rather monotonous and rather labored repetition of rolling or warbling notes. Every third or fourth is sharper and shorter, and at times the notes may possibly be called melodious. Its association, however, makes it a pleasing song especially when the notes shower down from a multitude of throats in the dim light of dawn.

This last season a pair of tree swallows reared a brood of young in a nesting box on the outside of a porch on my Ipswich house, and a pair of barn swallows nested and successfully reared five young on top of a pillar under the same porch, so that I was able to observe and compare the habits of these two species. I have no intention

of giving statistics as to the number of times the young were fed per hour, or to calculate the number of insects devoured—indeed I made no notes of these important but rather dull facts—but I would call attention to two very fundamental differences in the nesting habits of two such similar birds.

When the broods were young, the parents of both species diligently removed the white sacs of dejecta and dropped them at a distance, as is the common habit of passerine birds. The habit was continued during the entire residence of the young tree swallows in their nest, but only while the barn swallows were small. When the latter had attained nearly adult stature and for several days before they flew, they discharged their dejecta over the edge of the nest, whitening the piazza floor below, but leaving the nest unsoiled. In both cases the nest sanitation was perfect.

The second difference in habit between the two species is of considerable interest. The tree swallow brood once launched into the world was lost. As far as I know it did not again occupy its birthplace that season. Not so the barn

swallow. For several days before they left the nest the five young birds seemed fully grown and fully feathered. The chief difference between them and their parents was the fact that they lacked the long outer feathers of the tail. The five heads and necks with their neat brown throat-bibs presented a charming appearance, extending in a row over the edge of the nest. Their shining black eyes looked at me unafraid. When a parent appeared, all their yellow mouths flew open in eager expectancy and all twittered beseechingly. Usually only one, sometimes two, were rewarded by a mouthful of insect food. A day arrived when the parents flew under the porch back and forth close to the nest as if to entice the young birds, but not feeding them. Several of their friends joined them, for at times there were four or even five birds flying before the gallery of the young.

The next day there were only three birds in the nest after the early morning, but the two wanderers returned at sunset. On the following day all five flew off at eight in the morning. At times they rested in trees and were fed by the parents.

sometimes they were fed in mid-air, but doubtless they did some insect catching on their own hook. At six o'clock they were all back in the nest and being fed by the parents. For four days more this was repeated. The young left in the morning but returned to the nest at night, generally going and coming together. On the fifth night only two returned and after that they occupied the nest no more. I imagined I saw the family party several times, however, as a group of six or seven barn swallows flew past, and occasionally they would fly around under the porch, the adults pouring forth their souls in song. This use of the nest by the young as a sleeping place is interesting. Most birds when they fly the nest do not return.

In "Sand Dunes and Salt Marshes" I described in some detail the roosting and migration habits of our swallows. Here I will say something of their play. Swallows are social birds. Not only does each associate with its own species, but all four species, the barn, tree, eave, and bank swallows are often found in the same assembly, gathered together for roosting, migrating, feeding

or play. Their enjoyment in their perfect mastery of the air is very evident. They fly not only for the purpose of getting food but for the pleasure of flying, chasing each other back and forth, skimming trees and buildings and even human beings by hairs' breaths. One of the best places to watch this social sport of flying is at a pond. By far the majority of the birds with us are tree swallows but a moderate number of barn swallows and a few eave and bank swallows may be seen. One September day at sunset a flock of many hundreds if not thousands of these birds were alighted on the bushes, fence rails and wires near the waters of Sagamore Pond. They arose with the roar of many wings, and, turning first their dark then their white surfaces to the observer, swirled about in irregular groups. Then they all flew close to the water, and every now and then hurled themselves at it so that the quiet surface of the pond was pitted with splashes as from a bombardment. Their heads, backs and wings were soused in the water, which they shook off in showers as they arose. At times they would dip lightly several times in succession. At last they

all rose high in the air and turned in the direction of their night roost, but the temptation to stay up a little longer and renew their play and the fun of the bath was too great and they returned and again bombarded the water. Finally, when the whole sky was suffused with an orange glow, deepening to crimson, they tore themselves away from their sport, rose to a great height and in open ranks made off directly for their roost in the dunes.

On a dull May day with an easterly gale bringing in sea mist, Sagamore Pond was covered with swallows—all four species, tree, barn, eave and bank in order of abundance. As one stood on the shore and looked out on the bewildering throng, one could recognize the calls of all the species. They were all flying within a foot of the water into the teeth of the gale, occasionally setting their wings and soaring and occasionally dipping in the water below. Arrived at the easterly shore of the pond, they ascended a few yards, turned and glided down wind with great rapidity, only to turn again and begin their slow progress back. It reminded one of a lot of chil-

dren sliding down hill and laboriously dragging their sleds back again.

On a June morning I came upon a flock of fifty barn swallows sitting on a wire fence, each singing his song of gladness. In an instant all were fluttering head to the wind over the buttercups and daisies; then all alighted in the grass and dabbed at insects. The morning was so cold that the insects were not on the wing, but quiet and dormant.

On another cold morning in September I entered a meadow white with Queen Anne's lace and spotted with fluttering, twittering tree swallows, a half thousand of them at a moderate estimate. They were flying down to leeward and slowly flying back through the grass picking up insects as they went. Occasionally they became entangled in the grass and flowers and struggled to extricate themselves. The gentle snap, snap of their bills could be heard as they flew within a few feet or even inches of me.

Tree swallows and barn swallows are both very fearless of man, or perhaps one should say trustful and confiding. On a rainy or cold day

when insects are sluggish, if one walks through a meadow these delightful birds will circle close by to seize the insects put up from the grass.

It is probable that both the spirit of play and the pursuit of insects are combined in these displays of swallow activity, but at times it seems as if play were the over-ruling factor.

CHAPTER X

Hawking

"True to the season, o'er our sea-boat shore,
The sailing osprey high is seen to soar,
With broad unmoving wing, and circling slow,
Marks each loose straggler in the deep below;
Sweeps down like lightning! plunges with a roar!
And bears his struggling victim to the shore."

—Alexander Wilson

LET no one suppose I am writing here of that most ancient of sports—falconry or hawking—in the sense that is usually intended, a sport that consists in the pursuit of game by trained and captive hawks. In the ruins of Ninevah a bas-relief has been found representing a falconer bearing a hawk on his wrist. In England hawking has been pursued from the earliest times, and, although its height of popularity was probably reached during the reign of Queen Elizabeth, yet it still exists, as a sport there today as is at-

tested by the numerous clubs devoted to its pursuit. The two hawks generally used in this sport in England are the peregrine falcon and the sparrow hawk. The former is the same as our duck hawk with only a slight subspecific difference, while the latter is an accipiter like our sharp-shinned and our Cooper's hawk and is midway in size between them. By our unscientific early colonists, our sparrow hawk was given the name it bears, although it is a falcon and not an accipiter like the British bird. It should have been called the kestrel.

Now it is one form of sport to train the captive hawk for killing, to blind it with a hood and to starve it so that it is keen to strike its chosen victim, and a very different sport to watch the wild bird enjoying its freedom, its glorious powers of flight and of soaring and gliding, with its marvelous mastery of air currents, and, at rare and most exciting intervals, to see it strike its prey. Another attribute of this form of hawking that I am here extolling is the intellectual pleasure to be obtained from the recognition of the hawk—the diagnosis of the species.

This intellectual pleasure deserves high rank. It is true that one's æsthetic sense may be gratified and one may receive great enjoyment from birds and flowers without knowledge of their structure or names. But on the other hand it is not true that a study of structure and the recognition of the species in the field is a detriment to the pure enjoyment of these wonderful creatures of nature. The musician who understands the musical composition of a symphony and whose ear is attuned to all its finer points, receives at a concert infinitely more pleasure than one who is ignorant of these matters. One who has studied flowers and birds and is able to distinguish the exact kind and the significance of form and markings, sees far more of their beauty than one not so trained and he obtains correspondingly more enjoyment. The untrained observer often fails to see the bird or flower at all, and if it is called to his attention, sees it but imperfectly. The enjoyment shown by naturalists—and I refer to the out-of-doors and not to the closet type—is evidenced in their writings. Wilson, Audubon, Darwin and Wallace, Gilbert

White and Hudson are conspicuous examples. I am sure, although it is heresy to say so, Thoreau would have had more pleasure from his studies of out-of-doors and would have given the world more pleasure, if he had been willing to study more closely and identify more carefully birds and flowers.

We are fortunate in having in this part of the world a number of different hawks that one may see from time to time—a good baker's dozen of them—and several are fairly common. In England hawks of all kinds, good and bad—and most of them are in reality good as they prey on mice and insects—are all looked upon as "vermin" and shot at sight. The noble sport of pheasant raising and pheasant slaughter must not be interfered with, or even its nerves offended. There is great danger that this dreadful contagion will spread to our shores by the introduction of the pheasant and the English game-keeper. It is impossible to change the fixed ideas on vermin of the latter species.

Hudson beautifully expressed the joy to be found in the contemplation of the soaring hawk

and his destestation of its extermination in England. He says: "For who that has ever looked at nature in other regions, where this perpetual hideous war of extermination against all noble feathered life is not carried on, does not miss the great soaring bird in the scene—eagle, or vulture, or buzzard, or kite, or harrier—floating at ease on broad vans, or rising heavenwards in vast and ever vaster circles? That is the one object in nature which has the effect of widening the prospect just as if the spectator had himself been miraculously raised to a greater altitude, while at the same time the blue dome of the sky appears to be lifted to an immeasurable height above him. The soaring figure reveals to sight and mind the immensity and glory of the visible world. Without it the blue sky can never seem sublime. But the great soaring bird is nowhere in our lonely sky, and missing it we remember the reason of its absence and realize what the modern craze for the artificially reared pheasant has cost us."

Far off in the distant sky a great bird is soaring on nearly motionless wings. Again he is

poised like a kite over the brow of yonder hill. Nearer at hand a lithe and graceful creature is flying close to the open ground, patiently quartering the whole field. Again one may see a hawk slinking along, alternately gliding and flapping by copse and hedge, fearlessly passing within a few yards of the human observer. Again a small hawk with pointed wings is hovering over a grassy pasture and drops at frequent intervals to the ground, or a larger bird, built on the same plan suddenly darts like a winged arrow and spreads devastation among a flock of terrified shore birds. It is rarely the case that one is able to make out the markings of these birds. In the distance they are dark objects silhouetted against the sky, and near at hand their velocity of flight and the excitement that their sudden apparition creates, not only in the birds but in the bird-watcher, makes the careful study of markings difficult. On these accounts many observers, keen and accurate enough in the case of other birds are often in despair with the identification of hawks, and their despair is increased by the fact that most artificial keys in the books dwell

chiefly on the markings that they fail to see. For example one of the best recent handbooks gives a key for *field identification* in which the presence or absence of cross-bars on the under parts are cardinal points!

With the exception of the marsh hawk, the bald eagle and the fish hawk or osprey—all of which are easily recognized—the hawks of this region in particular and of Northeastern America in general fall into three groups: *viz*, the falcons, the buteos and the accipiters. These groups are fundamental, easily identified, and, if once learned, the key to the hawks is within reach.

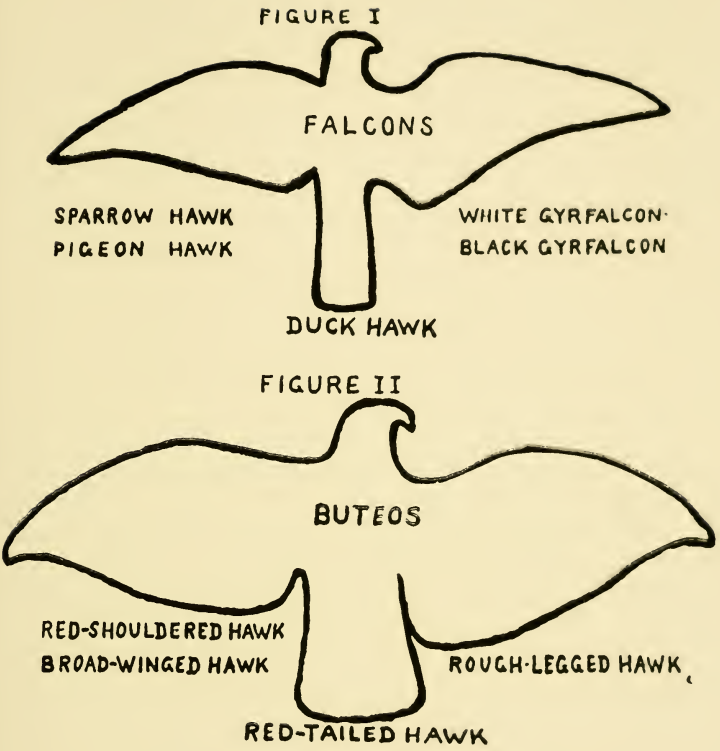
The falcons can be distinguished by their long, narrow, pointed wings that reach nearly to the end of their long tails when at rest, and by their swift and graceful flight. The buteos are distinguished by their broad wings, their short tails and their frequent habit of soaring in circles. The accipiters are distinguished by their short, broad wings which reach only to the base of their long tails, and by their habit of alternately sailing and flapping in flight.

In order to show at a glance the difference in

the shape of these three classes of hawks in the flight, as we most frequently see them silhouetted against the sky, I have drawn the outline of a freshly killed hawk from each class with wings extended. These outlines were then reduced to one eighth of life size, so that they could be used as an illustration. Under each figure is printed the name of the hawk chosen and beside each the names of the other hawks in the same group.

A study of the diagrams with the brief description already given should enable one to distinguish a falcon, a buteo or an accipiter. Of our falcons the smallest is the sparrow hawk, next the pigeon hawk while the largest is the duck hawk or peregrine falcon, while the rare gyrfalcons of the north are larger still.

The sparrow hawk is a confiding little bird, and often nests in holes in old apple-trees close to houses. He frequently alights on telegraph poles where he waves his tail up and down, and flies from pole to pole ahead of the wayfarer leading him on. Seen at close range, as is often the case, the striking face markings and the rich foxy brown back make his recognition easy. He



OUTLINE DRAWINGS OF HAWKS

has a habit of hovering a few feet above the grass and pouncing down at grasshoppers and crickets. The pigeon hawk is a little larger, has broader shoulders and is dark blue above, while the duck hawk is a much larger falcon and has markings like black mustachios. He has a dashing way with him. I was watching a flock of grass birds in the salt marsh when a duck hawk suddenly appeared, struck one of them dead within thirty yards of me, passed on in its impetuous flight, but, swinging about, seized the dead bird in its talons and was off. The whole thing was done in the twinkling of an eye so that it was difficult to realize what had happened. This is the habit of the duck hawk or the peregrine falcon, a quick rush or "stoop" in the language of the hawker, a strike in passing, which kills, and a return to bear off the prey. The strike is almost always on a bird awing. Ducks evince the greatest terror when this falcon dashes in amongst a flying flock. Not so when they are swimming on the water. One December day I saw a splendid duck hawk fly out from the dunes and scale over a flock of scoter ducks on the ocean. It then turned about

and disappeared among the dunes. The ducks appeared not a whit disturbed and paid no attention to their very transient visitor.

Of the buteos, the smallest is the broad-winged hawk, much larger is the red-shouldered hawk, next in grandeur the red-tailed hawk, while the rough-legged is the largest of all, nearly as large as an eagle. The broad-winged is about the size of a crow and usually very unsuspicious so that its recognition is an easy one. One may often hear its distinctive cry, a mournful double whistle suggestive of the call of the wood pewee.

A large buteo soaring in the distance should be examined carefully with the glasses. If it is an adult red-tailed hawk the foxy-red color of the tail seen from either above or below will flash at times, as the light strikes it, and will proclaim its identity. This species is a trifle larger than the red-shouldered hawk, but the difference in size without actual comparison is of little value for identification. If the tail is not red, it is either an immature red-tailed hawk or a red-shouldered hawk. In the latter bird the russet brown shoulders can be seen only under the most

favorable conditions. Its scream is a familiar one, as it is frequently imitated by the blue jay, while the red-tailed hawk's scream is strongly suggestive of the sound of escaping steam.

The rough-legged hawk comes to us in winter from Labrador. He is a magnificent bird, and, in his dark phase, is as black as a crow and as devoid of markings. In the light phase he has a white rump or base of the tail and often a black band across the lower chest. The flight of the rough-leg is graceful and indicative of skill and power. On motionless wings, if the wind be favorable, he often soars high in the blue vault of the sky, a picture long to be treasured. The wings and tail are extended to the full, the first half-dozen quills spread out separately and curved upwards at their tips from the air pressure.

Sometimes, when not too high, the bird may be seen to look down, to lower its long feathered legs from under the tail, where all hawks carry them in flight, to partially close its wings, and to drop like a plummet on the prey, which its keen vision has singled out. After one of these descents the bird I was watching flew off with a

large mouse, after another with a cottontail rabbit. It is one of our most beneficial hawks and, like all the buteos, which, alas, are ignorantly classed as "hen hawks," almost never touches a feather.

I shall never forget an incident which proved the beneficial character of one of this species to an English game-keeper who was imbued with the belief that all hawks are noxious vermin. It was at the heath hen reservation at Marthas Vineyard and the keeper in question had killed a rough-legged hawk which, from its size, he had deemed the arch enemy of his flock. The stomach of his victim was distended to its full capacity, and maintaining my expectation of mice, I opened it before him. Instead of finding, as the keeper had predicted, young heath hens within, we found the stomach stuffed with the fur and bones of field-mice: not a feather was to be found. My triumph was complete and the reputation of the hawk was saved, but I doubt if it disturbed the keeper's belief.

Of the accipitrine group, the smallest is the sharp-shinned hawk, next larger the Cooper's

hawk, while the largest of all is the goshawk. It is to be remembered that male hawks are smaller, sometimes a third smaller than the females, a fact that is brought out in the language of falconry where the male hawks are called *tiercels*, corrupted to *tercels* and *tassels*. A female sharp-shinned hawk may be nearly as large as a male Cooper's hawk. The shape of the ends of the tails in these two hawks is the important point; in the sharp-shinned it is square-cut, in the Cooper's it is rounded like a coop—an easy mnemonic.

The immature goshawk is larger than a Cooper's hawk but resembles it in form and coloration. The adult goshawk, however, is noticeable by reason of its slaty gray back, black top to the head and black cheek patch, and by the fine barring on the white under parts.

The accipiters soar at times but their usual and characteristic flight is a succession of flutters and sails, of wing flappings and glidings. They steal along by copse and hedge-row or boldly enter the chicken-yard and strike terror wherever they go. They are true chicken hawks and small

bird murderers. They are the farmer's enemy. Unlike the peregrine falcon, the accipiters do not strike their prey on the wing a killing stroke with the foot and then return to pick them up, but they pounce upon them as a rule on the ground or a perch, and, thrusting their talons deep, "truss" them in the language of falconry and crush out their life.

There are three other hawks that may be seen in northeastern America—the marsh hawk the bald eagle and the fish hawk or osprey.

The marsh hawk is our commonest hawk and is often to be seen flying over marsh or dune or upland pasture. He is a harrier like the English harrier and carefully quarters the ground, flying and sailing back and forth within a few yards of it in his search for mice and other small vermin. It must be confessed that he occasionally captures a bird and that some individuals are notorious offenders in that direction, but the species as a whole is one of the farmer's friends. His habit of flight, his long wings and tail and, most marked of all, his snow-white rump makes recognition easy. The only other hawk with a white rump

is the very much larger and heavier rough-legged hawk already described, a bird of a different build. The general coloration of the marsh hawk varies from a beautiful rufous brown in the female and immature to a light pearl blue in the adult male.

A huge bird with snow-white head and tail is none other than a bald eagle, but, as the immature birds lack the white and are uniform brown in color, one is obliged in their case to depend on the great size and general appearance. The fish hawk or osprey is easily recognized as it is the only large hawk that is dark above and white below. With glasses one can generally make out the white line over the eye. If it indulges in its usual spectacular occupation of hovering over the water, and dropping with a splash, a child of three may identify it. If the plunge is successful, the fish is born aloft and carried in the talons with head pointing forward.

All hawks may delight the eye by soaring in circles, sometimes to such a great height that they are mere specks in the sky. Sometimes they flap their wings at certain parts of the circle,

but at other times their wings appear motionless save for slight adjustments from time to time, yet in a mysterious way the great birds rise higher and higher. How can these things be? How can a bird defy gravity and sail upwards without muscular effort on its part other than the great strength needed to keep its wings extended?

Watch a hawk or a gull or a pigeon gliding on outstretched wings in its descent towards the ground. Is it not evident that if the wind, into which it generally glides should be deflected upwards, the glide could be continued in the same horizontal plane or turned even slightly upwards? Such indeed is often the case. Watch an aëroplane with engine shut off gliding against a wind to a landing. How slowly it approaches the earth! and we are told by aviators that if an inequality in the ground causes an upward deflection of the wind that the descent is even more gradual. One does not need to be an aviator to understand these things.[1]

[1] Since this was written there have been some remarkable instances of human gliding and soaring, dependent on the use of up-currents. These confirm the statement I have made that "there is no mystery about it."

It is evident that the soaring hawk, much more lightly build than the aëroplane in proportion to its wing surface, and with a marvelous instinctive knowledge of flight, takes advantage of air currents, and, when they are sufficiently strong in an upward degree, he is able, by gliding in circles, to mount higher and higher without a flap of his wings. Lacking the upward currents he would fail to rise or even to maintain the same level, for, after each downward glide, his ascending glide would fall short of his previous elevation. One can coast on a sled down one hill and up another but not to the same level. One must walk the rest of the way. If the up-currents are not sufficient, the hawk has to do a little hill-climbing by ordinary wing strokes and he then glides again and swings up as far as he can. The up-currents of the higher air, we now know from aviators and meteorologists, are sometimes very powerful, especially on days that are calm enough on the surface of the ground. That hawks are past-masters in taking advantage of these currents no one can doubt.

When a strong wind blows against a cliff or

a steep hill it is evident, even to the ground walker, that powerful up-currents are formed. If he stands on the edge of the cliff the loose ends of his garments are blown upwards. Hawks often take advantage of this state of affairs and, if the up-current is strong enough, are able to poise, like a boy's kite, motionless on outstretched wings. Here gravity takes the place of the string. Like a kite the hawk swings about if the wind is gusty. If the wind drops temporarily he must needs maintain his position by hovering. This demonstration of the use of up-currents should be plain to every one. There is no mystery about it. The rough-legged hawk is an adept in poising in up-currents. Many a time have I watched him in Labrador and Ipswich poised thus.

One of the most intimate studies I have ever made of the use of up-currents by birds, was in the case of gannets at the Bonaventure cliffs in the Gaspé Peninsula. Against these splendid cliffs some three hundred feet in height a strong sea-breeze was often blowing, and it was very evident even to my dull senses, as I stood on the

brow of the cliff that the air was deflected upwards. The great snowy birds were circling about on their outstretched pinions, which were held motionless except for the slight adjustments needed from time to time by the varying gusts. Many of them passed within fifteen feet of me, as I sat along the dwarfed spruces on the brink of the cliffs, so that I could study every movement. One bird that I kept within my vision soared in circles, perhaps three hundred feet in diameter, with never a flap of his wings except for a moment when he attempted to alight near his nest on a ledge. Ten times he essayed a landing, but it was not until the eleventh circuit that the conditions were entirely to his liking and the task was accomplished. On each of the last three rounds he executed an additional smaller circle, thus completing a perfect figure of eight. It was a beautiful demonstration of the use made by birds of ascending currents of air.

Near this same island at Percé is a rose-colored peak, the Montaigne Rouge or Pic d'Aurore which rises seven hundred feet sheer from the sea. About its precipitous sides herring gulls were al-

ways passing back and forth to their nests, and, taking advantage of the up-currents produced by the strong sea-breeze striking the cliffs, were floating upwards like white feathers. Occasionally a black feather was to be seen, as ravens visited the same cliffs intent on robbing the gulls' nests of eggs or young. One raven that I watched floated upwards the seven hundred feet with scarcely a wing stroke, born up by the gale.

While it is a common thing to see a pair of hawks of the same species mounting together in circles into the blue, it is not often that hawks of different species play together thus. On a beautiful May day I watched a large duck hawk and a marsh hawk apparently playing together, they circled about high up, the upper one frequently falling rapidly as if to strike the lower, who would then turn over to grapple, although, as far as I could see, they never actually touched each other. This was repeated again and again, sometimes one and sometimes the other the aggressor.

When that bird of Jove and of Washington, the bald eagle, soars into the vault of heaven—

a rare sight in these parts—one must needs hold his breath in wonder and admiration. The snowy-white head and tail flash out as they catch the sunlight on each successive turn of the circle. Each long feather of the wings stands out like fingers of a hand. Higher and higher he goes, soaring about in great circles with majestic grace. Suddenly he turns and launches his great aëroplane downward with amazing speed.

Hawking is indeed a sport of Kings!

CHAPTER XI

Courtship in Birds

"The blackbird hence selects her sooty spouse;
The nightingale, her musical compeer,
Lured by the well-known voice, the bird of night.
Smit with her dusky wings and greenish eyes,
Woos his dun paramour. The beauteous race
Speak the chaste love of their progenitors,
When, by the spring invited, they exult
In woods and fields, and to the sun unfold
Their plumes, that with paternal colours glow."

—Addison

THE difference between the mentality of birds and of man is enormous and we must be on our guard against imputing purely human motive to the lower animals. On the other hand the difference between man and the lower animals in many important matters is not one of kind, but one merely of degree.

A gull will drag a dried fish from the upper beach to the water to soften it before eating, a

grackle will dip a tough bit of biscuit in the water for the same purpose, and a man will soften a hard crust in his coffee. How much is sub-conscious instinct or reflex action in some or all of these cases and how much is self-conscious reasoning and forethought—it is not my purpose to discuss here. To call it instinct in all cases in the lower animals and reason in all cases in man may possibly savor of conceit.

The desire to live, to obtain food and to mate are primitive inborn instincts common to both the lower animals and to man. To gratify these instincts similar actions are resorted to by both the lower animals and man. The actions of a child desiring food from a table and those of a dog under the same circumstances are very much alike. Each appeals by voice and actions for the food, each is anxious to please the owner of the food, and each—unless the point has been reached in its experience of life when it fears the consequences of unlawful acts—will avail itself of an opportunity to surreptitiously snatch the food.

In the same way the desire of the male bird

to please the female more than its rivals please the same bird appeals to us as a very reasonable and very human point of view. This is what leads to courtship, and in this courtship rivalry it is natural to suppose that the best bird wins. Although it has been somewhat the fashion of late to decry Darwin's theory of sexual selection and to substitute others for it, its simplicity and common sense still appeal to many, and it is worth while occasionally to consult the original text.

Darwin published his "Origin or Species" in 1859. In Chapter IV he says he is led "to say a few words on what I have called Sexual Selection. This form of selection depends, not on a struggle for existence in relation to other organic beings or to external conditions, but on a struggle between the individuals of one sex, generally the males, for the possession of the other sex. The result is not death to the unsuccessful competitor, but few or no offspring. Sexual selection is, therefore, less rigorous than natural selection. Generally, the most vigorous males, those which are best fitted for their places in nature, will

leave most progeny. But in many cases, victory depends not so much on general vigor, as on having special weapons confined to the male sex. A hornless stag or spurless cock would have a poor chance of leaving numerous offspring.

"Amongst birds, the contest is often of a more peaceful character. All those who have attended to the subject, believe that there is the severest rivalry between the males of many species to attract, by singing, the females. The rock-thrush of Guiana, birds of paradise, and some others, congregate; and successive males display with the most elaborate care, and show off in the best manner their most gorgeous plumage; they likewise perform strange antics before the females, which, standing by as spectators, at last choose the most attractive partner.

"I cannot here enter on the necessary details; but if man can in a short time give beauty and an elegant carriage to his bantams, according to his standard of beauty, I can see no good reason to doubt that female birds, by selecting, during thousands of generations, the most melodious or beautiful males, according to their standard

of beauty, might produce a marked effect."

Eliot Howard,[1] on the other hand, believes that display and extravagant bodily antics are merely "reflex actions directly resulting from any excessive excitement, that they are not confined solely to courtship and do not in any way influence the female." The fact that the brilliantly arrayed male Argus pheasant and the dull-colored Savin's warbler both spread out and raise their wings and tails during courtship seem to Howard a strong argument against sexual selection.

Pycraft [2] says, "In these pages it is contended that neither brilliant coloration nor any form of ornamentation is to be ascribed to the direct action of 'sexual selection.' That is to say such conspicuous features have not been dependent on the action of formal choice for their survival and development, but are rather the 'expression points' of the internal, inherent growth variations, which, not being inimical to the welfare of the species, have been free to pursue their development in any direction which apparent chance

[1] The British Warblers.
[2] Courtship of Animals.

may dictate." In another place he says: "The frills and furbelows"—crests, vivid hues, etc., can—"be traced to the stimulating action of the 'hormones' which control both pigmentation and structure, as is shown by the fact that both are modified by any interference with the glands in question. Such ornamental features are then the concomitants, not the result, of sexual selection," and again "sexual selection, other things being equal, operates by according the greatest number of descendents to the most amorous and not necessarily to those of the highest hues." He is therefore willing to admit that amorous behavior by song and dance and display of plumage influence and attract the female but he objects to the bold statement that she selects the male. Such mental qualifications satisfy those who would cast aside Darwin's theory of sexual selection, but after all is said this theory, if not taken too literally, explains the facts better than any other. It is not necessary to assume that the female critically examines the display of color, dance or song of the rivals and balances them in her mind, but if we admit, as Pycraft is will-

ing to do, that she is attracted and influenced by these, even if only in a reflex or sub-conscious way, we have practically admitted the truth of Darwin's theory. The fittest male in any or all of these respects will be more likely to perpetuate the race.

The motives of dislay of color, dance and song are easily understood, for in one form or another they have all been used in human courtship. The likenesses are fundamental and extend from the lowest to the highest in the human species, but are most strikingly seen in the lowest, more primitive races.

Although at the present day and among the highest developed human races the display of bright colors is more marked among the females than the males, it must be remembered that this is a recent development. Only a few generations back the males, instead of wearing black or sombre clothing, were as brilliantly apparelled as the females, and among savages it is the male that is strikingly bedecked with feathers, tattoo markings and paint, while the female is quiet enough in her apparel or lack of apparel. The

tendency of the highly civilized male to revert to brilliant display of clothing is shown in his fondness for military finery and for striking colors when he is freed from the restraining hand of convention, as witness the cowboy and the sportsman.

In both bird and man the display of bright colors and attractive patterns, the dance and the song, even if of courtship origin and competitive in character, may lose the conscious, sexual side and be continued at other times for mere pleasure, in other words the original incentive for display, song and dance may be entirely lost, but that does not seem to me to be any argument against the theory of sexual selection.

The explanation of the brilliant colors of male birds on a mere physico-chemical basis due to exuberance of vitality, the maleness of the males, or the stimulation of the hormones in the courtship season fails to account for the fact that the brilliance of display in this season may occur without the growth of new feathers, but merely by the wearing down of old feathers and the unveiling of concealed patterns. This is true in

the case of the snow bunting, the junco and the chewink, and is strikingly shown in the case of the English sparrow, where the process goes on all unnoticed at our feet.

The ultra-concealing-colorationists say that the brilliant colors serve to conceal, but one who has watched eiders in the north, even though he admits that the green and white and black may match the iceberg and the sea and the rocks, is as sure that the colors are for display and for conspicuousness as he is that black is black and white is white. The speed with which the male discards his brilliant dress when the spring madness is over seems to bear him out in this opinion.

A recent writer [1] in "The Auk" states his opinion, that the brilliant colors and markings of the group of warblers "act as a uniform, faciliating the recognition by a bird of its own kind just as they facilitate its recognition by a bird student." How then does he account for the fact that the females and young, who need most to be identified, are most obscurely marked, and

[1] J. T. Nichols. Auk, 1912, XXXVI, 228.

who can doubt that birds can not only identify their own species with ease no matter how poorly marked, but can pick out even their own offspring from others? Does a Chinese woman have any difficulty in recognizing her own offspring in a group of hundreds, all similarly dressed and looking alike as peas to our untrained eyes? Or, to bring the matter nearer home, watch a mother enter a schoolyard in which a hundred small children all of the same age and dress are playing. She picks out her own child, brushes its dress and wipes its nose with a perfect certainty of conviction as to its identification, but if asked for the field marks, is unable to give them.

That the brilliant colors and markings of birds are of use in courtship and that many of them are the slow result of sexual selection seems to me to be a reasonable supposition because the male bird in courtship always displays these colors and markings to the best advantage. Where two or more males, as is often the case, are eagerly doing their best in display it would seem natural that the one who makes the most display is more

likely to excite and win the female. If this were not the case the display would fall into innocuous desuetude. Mr. William Brewster once told me the interesting case of a pair of summer tanagers in the south where he shot the male. In a short time the female appeared with another male. This one also he shot and so on until he had obtained three or four of this female's spouses. On careful examination of plumage it was seen that the most brilliant plumage was possessed by number one and that the brilliancy decreased successively in the others.

The fact that the brilliant plumage is assumed in many birds for the nuptial season only, seems to bear out the importance of display for courtship. The ducks go into the eclipse plumage immediately after the courtship season. The brilliantly marked male wood duck and the eider alike assume the modest and quiet dress of the female. This is true of many other birds. The bobolink and the scarlet tanager, the goldfinch and the myrtle warbler doff their striking dress in the fall and appear in the modest apparel of the female and immature.

Courtship means the act of wooing in love. Whatever theory we accept we must admit that the male *appears*[1] to endeavor to attract the female in one or all of three ways: first by a *display* of bright or striking colors, secondly by postures or movements which accentuate this display or call attention to his agility or skill—in other words by the *dance* in its broadest sense, —and thirdly by sounds either vocal or instrumental—*song* in its broadest sense.

The classical courtship of the peacock illustrates in an extreme form the display of color. It also includes two other factors of dance and song. It may well be sketched here as an exaggerated form and epitome of our subject.

In the presence of the hen and when in an amorous mood the peacock erects the stiff tail feathers which support the marvelous plumes that

[1] The fact that peacocks and turkey cocks delight in displaying their charms before people would seem to show that they are conscious of the beauty of their plumage and vain of their ability to show it off. When they are displaying before their hens, they must, in the same way, be conscious of their beauty. In other words, is there not as much reason in what they do as in the strutting of the painted and befeathered savage? Are their actions merely mechanical and instinctive? I do not think so.

arise from the back and form the upper tail coverts. He walks with mincing steps, turning this way and then that, so that his beauty may be seen from all points by the hen who walks carelessly by. Seen from in front, his blue-green head and neck with black and white face markings and tufted plumes stand out like a Chinese jade carving in the center of a concave sea-shell of shimmering green, embossed at regular intervals with eyes of marvelous beauty and detail. From behind, the stiff gray tail feathers supporting the shell are seen to be set off below by an abundance of black and white down. The wings of brown and blue frame the sides. Suddenly the peacock turns and flashes the full radiance of his beauty directly at the hen, he vibrates his downward stretched wings and quivers his stiff tail feathers so that they give forth a sound of rattling reeds. The green disk is thereby set all of a tremble in time with this instrumental music, the great bird bows towards the object of his affection, emits a raucous cry, and the green, quivering sea-shell curves beseechingly towards her. Who can resist such fascination?

But all birds are not so well fitted for display as the peacock who appears to have reached the very acme in this direction, but a study of some of the less brilliant birds bears out, perhaps more clearly, the efforts of the male in display. The male red-winged blackbird, when engaged in feeding on the ground, appears as a simple black bird. Sometimes not a trace of color is visible, although he may show a narrow yellow line or a somewhat broader line with red in it on his shoulders. When engaged in courtship these same shoulders blaze with scarlet color. Not only are the surrounding black feathers pushed back so that the epaulets are broad and conspicuous, but each individual scarlet feather is erected and the epaulets are thick and striking. Not only that, but he flies slowly and directly towards the female and the beauty spots are displayed to her eyes, if she will but bestow a glance at them, under the most favorable and dazzling circumstances.

The male eider swimming about and bowing to the female suddenly rises up on his tail in the water and flashes out the magnificent jet black

shield on his belly, a color that ought not to be there according to the concealing colorationists. In the same way the merganser drake displays his splendid white shirt-front with its delicate tinge of salmon pink.

The male bittern, as he strides about, extends the fluffy white feathers from under the wings in striking display. The male blue-headed vireo puffs out the yellow flank feathers till he seems nearly double the size of the slender female, and the myrtle warbler droops his wings to display his yellow rump and puffs out the yellow and black feathers on his sides.

The black guillemot as he curtesies to the female in the water opens wide his mouth and displays for her admiration the scarlet lining. The display of the inflated orange-colored neck-sake of the heath hen is but a small part of the remarkable courtship display of this bird.

The black duck and the domestic pigeon in the ardor of courtship take short flights by the females and the white lining of their wings become momentarily in evidence. The golden-eye drake displays from time to time his brilliant

orange-yellow tarsi and feet above the water as he performs his song and dance before the modest duck. Incidentally, and perhaps accidentally at first, he increases the display by the spurt of water caused by the movement of the foot. In the merganser this spurt of water has evidently become of primary importance and is a most conspicuous feature, but it is plain that it arose from an endeavor to display a colored foot. From a display of color it has become a form of a dance with an added mechanical feature. All three factors of courtship are so intricately mingled that is not always possible to treat of a single one alone.

Secondly the dance, using the word in the broadest sense, is frequently employed in avian courtship. In the simplest form the bird spreads its tail, slightly opens its wings and puffs out its feathers. This may be done rhythmically, and, with each motion, the song is emitted, for song and dance are almost always associated. The bronzed grackle illustrates this simple dance and at the same time very simple song. In slightly more elaborate form the bird may also bob its

head and with still more elaboration swing or sway its whole body or jump up and down. The blue-headed vireo, for example, bobs and bows in addition to puffing out its yellow flanks, the cowbird, besides puffing and spreading, bobs its head and swings its whole body, as if it were falling forward, the bluebird in the excitement of courtship jumps up and down on its perch and the flicker and bobs and curtesies in true cakewalk fashion.

That the dance does not necessarily mean leg movements is exemplified not only by birds but by various primitive human races, where posturing and movements of the head, arms and trunk may constitute a large part of the performance. Among the ducks the movements of the head and neck are sometimes very striking and bizarre. The golden-eye, besides performing with its feet in the way already described, has a remarkable head and neck dance and posturing in the courtship. The drake extends its head and neck straight forward like a bowsprit, then vertically upwards, then backwards so that the occiput rests on the rump, and lastly forward to the normal

position. Black ducks, baldpates, buffle-heads and others make short springs and flights from the water; mallards, scaups and pintails bob or bow and red-breasted mergansers courtesy with a swinging dip of the whole body. Bowing and courtesying are as common in avian as in human courtship.

Among our birds the gannet has perhaps the most elaborate dance, one that in completeness and in many of its features suggests the dance of the Layson albatross so well described by Professor W. K. Fisher. [1] It is worth while describing this dance of the gannets in detail, for, as far as I can discover, there is no description of it in any American ornithology and I have found no mention of it in the pages of the "Nuttall Bulletin" or "The Auk." Mr. P. A. Taverner [2] is the only one in this country who has referred to this dance as far as I know, and his description is very brief and omits many of the most interesting details. He appropriately calls it "a sort of conventionalized ritual." A fuller description is

[1] Auk, XXI, 1904, pp. 8–20.

[2] The Gannets of Bonaventure Island, Ottawa Naturalist, XXXII, 1918, p. 24.

given by Mr. J. H. Gurney [1] in his monograph on the gannet. He says: "This sort of thing can be seen with variations, any fine day in July, on the Bass Rock, but it cannot be the affection of courtship, because the courting season is passed." He ascribes it to the affection of the gannets for each other.

The bowing and posturing and other strange antics of the Layson albatross is spoken of by Fisher as "a curious dance, or perhaps more appropriately a cakewalk," and he goes on to say: "This game or whatever one may wish to call it very likely originated in past time during the courting season, but it certainly has long since lost any such significance. I believe the birds now practise these antics for the pure fun they derive." These remarks I believe apply exactly to the dance of the gannets. I spent many hours one summer under most favorable conditions near the great gannet nesting ledges on the Cliffs of Bonaventure Island, P. Q., and I saw the dance repeated by hundreds of pairs many times, and I came to the same conclusion

[1] The Gannet, p. 377.

that Fisher did in the case of the Layson albatross, namely that it was originally a courtship dance and that it was continued from habit and from joy of it, in the same way that the song sparrow continues to sing long after the nuptial season.

Let me describe a typical performance: As the sexes are alike in plumage they cannot be distinguished apart. One of them, we will assume it is the male, is swinging around in great circles on rigidly outstretched and motionless wings. He passes within a few yards of me and swings towards a shelf crowded with birds brooding their downy, black-faced young. Alighting on the edge he elbows his way along the ledge, notwithstanding the angry looks, the black mouths suddenly opened and the vicious pecks of his neighbors. All of these he returns in kind. Arrived at his nest, he is enthusiastically greeted by his mate, who, disregarding the young bird beneath her, rises up to do her part in the dance. The birds stand face to face, the wings slightly raised and opened, the tails elevated and spread. They bow towards each other, then raise their heads

and wave their bills as if they were whetting these powerful instruments, or as if they were performing the polite preliminaries of a fencing bout. From time to time this process is interrupted as they bow to each other, and appear to caress each other as each dips its pale blue bill and cream-colored head first to one side and then to the other of its mate's snowy breast. With unbated enthusiasm and ardor, the various actions of this curious and loving dance are repeated again and again and often continue for several minutes. After the dance the pair preen themselves and each other, or the one first at the nest flies away and the new arrival waddles around so as to get back of the nestling, and the strange process of feeding takes place.

This dance is not only performed by pairs as just described, but not infrequently individuals perform a *pas seul*, it may be because he or she is wearied with waiting for its mate. The wings are slightly raised and opened, the tail elevated and spread, the bill pointed vertically upwards and waved aloft, then dipped to one side under the half open wing and then to the other, the bill

raised and waved again and so on over and over again. Owing to the great volume of sound from the ledges it is impossible to distinguish any individual performer, and I was unable to tell at what point in the dance and to what extent the song was important. The sound is like that of a thousand rattling looms in a great factory, a rough, vibrating, pulsing sound—*car-ra*, *car-ra*, *car-ra*.

The movements in the air that may or may not be accompanied with song may be classed in this division of the dance. The bobolink, rising in irregular circles, or progressing in a horizontal plane on rapidly vibrated down-curved wings, is expressing his amorous feelings by dance as well as by song. His flight often concludes by a rapid descent with wings pointing obliquely upward, forming a display by posture and motion—in themselves forms of dance. The ardor of courtship bears many a bird aloft, and he expresses his feelings with his wings as well as with his voice. One may name not only the oven-bird and the Maryland yellow-throat, the bobolink and the orchard oriole, the semipalmated sand-

piper and the upland plover, the horned lark and the pipit, but many other birds in this category, some of which like the song sparrow, sing chiefly from a perch. The horned lark mounts silently to a great height and pours forth his song in long periods, sometimes out of sight in the low-lying clouds. The pipit sings as he ascends nearly vertically and, arrived at the summit of his ambitions, descends quickly, still singing, to the earth.

All birds who indulge in flight song are apt to quiver their wings rapidly in their ecstasy. Sometimes this motion of wings becomes of primary importance and the bird flies with quivering wings but voiceless, or even vibrates his wings rapidly from a perch. This sometimes happens in birds that ordinarily sing at the same time. I have seen it, for example, in the song sparrow. The pheasant quivers his wings rapidly but nearly noiselessly, then emits his vocal crow to be followed by a loud clapping of the wings. The ptarmigan vibrates his wings rapidly in flight and calls at the same time; the spruce partridge flies from a tree stub to the ground with

audibly vibrating wings, while the ruffed grouse stands on a log and, by the rapid whirring of his wings, emits his characteristic "drumming." That this drumming is evolved from a flight song and that there was once a vocal part of the performance, I have little doubt. These examples show the stages in the evolution.

The loud clapping together of the wings behind the back in domestic pigeons during flight and their habit of soaring with wings obliquely upwards, although common at all times, are most marked in the courtship season and are probably of courtship origin. The V-shaped pose of the tail-feathers of the bronzed grackle is probably of the same nature, for it is discarded in midsummer.

Both the Savannah and vesper sparrow stand or walk on the ground and elevate and sometimes vibrate their wings rapidly above their backs. They also fly slowly a short distance above the ground with head and tail up and wings rapidly fluttering and deliver their song.

The rapid headlong plunges of the nighthawk may be classed as a display of motion, a form of

the dance. Incidentally, and perhaps accidentally at first, a loud booming sound is produced by the rush of air through the wing feathers. This instrumental music is now the important feature, although the dance is by no means a negligible one. The raven turns a rolling-over somersault in the air, and the marsh hawk plunges from a great height, loops the loop or turns a sidewise somersault. The chat with dangling legs dances crazily about in the air, and the kingbird executes a series of zig-zag and erratic flights, emitting at the same time a harsh double scream. This is a true courtship flight song but it is neither graceful to our eyes or pleasing to our ears. The taste of the kingbird in these matters appears to us to be poor.

The impossibility of treating in turn only one of the primary divisions—display, dance and song is well shown by these examples. The case of the courtship of the heath hen is still more difficult for all three factors are inextricably mingled. I have already alluded to the display of neck-sacks of this bird, orange in color and shape, a very striking and beautiful feature, but

secondary or incidental to the production of song to be described later. The erection of the neck-wings which ordinarily help cover the deflated neck-sacks, the spreading and erection of the tail, the vibration of the down-stretched wings, the pirouetting and turning of the body and the rapid stamping of the feet in this species are all forms of the dance.

Lastly, in this brief review and rough classification of the courtship actions of birds, the song is to be considered. By song I do not mean necessarily a melody or musical strain pleasing to human ears—although many of these produced by the higher species of birds are extremely pleasing—but any sound which is customarily connected with courtship. Courtship song, as thus understood, may be either vocal or instrumental. The rattling of the stiff tail feathers of the peacock and the rolling drum made by the wings of the ruffed grouse fall into the instrumental category. The rapid stamping of the feet by the heath hen produces a ratta-tat-tat like that made on a kettle drum. The tooting sound, similar to that made by blowing across

the top of a bottle, produced by the neck-sacks of this same bird, should, I suppose, be classed as instrumental song. The sounds made by the clapping together behind the back of the wings of the domestic pigeon, of the clapping on the sides of the pheasant are, of course, in the instrumental class.

The woodcock in his wonderful courtship flight, as he ascends straight up in the dim light of early morning or late evening, gives forth loud sounds that cease whenever the bird sets his wings and momentarily soars—instrumental sounds made apparently by his wings. During the last part of the ascent and during the descent he gives forth sweeter vocal notes or whistles. Before he is again on the wing he emits at intervals loud vocal *peents*, preceded by faint gulping sounds accompanied by a puffing out of the body and slight raising of the wings.

The Wilson snipe flies about in his ecstatic courtship when the light is so poor that it is difficult to observe his flight, and sounds arise—quavering or bleating in character—which are believed to be instrumental in their nature, due

to the passage of the air through the stiff primary feathers of the wings, or, as some believe, through the outer feathers of the tail. The loud booming or whirring sound made by the nighthawk in his spectacular plunges has already been mentioned, an instrumental music of curious character.

The drumming of the flicker on a hollow stub or on a roof or chimney-pot is clearly to be classed as instrumental music. I have heard this bird interrupt his spring song to drum and later continue with his vocal music.

The song of courtship produced by the vocal organs of the bird varies from the rasping, vibrating note of the golden-eye or the *aa-ou* of the eider, emitted at the height of the dance and display, the harsh scream of the kingbird or the *tis-ik* of the Henslow's sparrow to the clear, plaintive whistle of the white-throated sparrow, and the serene, spiritual hymn of the hermit thrush. While the simpler, more primitive songs are given forth only during courtship excitement, it is evident that many, especially the more complicated and æsthetic ones, although at their

best and sometimes elaborated or extended under courtship excitement, are often continued and repeated for the mere enjoyment of the performer in his own music. The autumnal recrudescence of the amatory instinct, often displayed in song, is well-known.

The subject of bird song is one apart by itself, and I have alluded to it in this brief manner merely to round out the classification, made in the beginning of this paper, of *display; dance* and *song*—the important features of bird courtship.

CHAPTER XII

On Certain Humanities

"The most of our kind are not naturalists but humanists"
—Shaler

"The proper study of mankind is man"
—Pope

A REGION of seashore, marsh and dune attracts certain forms of human activities, all, owing to the setting, more or less picturesque. The cutting of the salt hay and the life of the clammer which I have described in "Sand Dunes and Salt Marshes" are of this nature. The profession of eeler, of herring-torcher, of sander and of light-keeper belong peculiarly to this region, and of these and of their predecessors I would say a few words here.

Before the white man came, these dunes and marshes and the adjoining fertile land were frequented by the Indian. His was an interesting humanity. In the old histories of this region

much is said of the Indians, of their hunting and fishing, and of their cornfields planted on the hillsides, cleared by fire of the forest. Without recourse to historical documents one can still read the record of their activities here. In the dunes, in the marsh islands and on many a hillside close to the sea or to an estuary, deposits of clam shells are exposed by the blowing of the sand, the cutting of streams or the turn of the ploughshare.

The study of these deposits, or kitchen middens, is a long one and full of interest. I can imagine that an independent gold or diamond miner might be loath to stop work, thinking that the next turn of the pick would reveal a priceless nugget or gem. In the same way one who digs in a shell heap has always the vision before him of a prize. These prizes would appear very trivial to a gold miner, but may cause a great thrill of satisfaction to a naturalist. They consist largely in bones and fragments of bones, and even by a very small piece of bone one may reconstruct in imagination some most interesting creature. I have found, for example, in shell

heaps on the Maine coast, many bones, including those of the wild turkey and the great auk, and, here at Ipswich, the bones of deer and fox and seal, of wading birds and ducks and of many fishes. The larger bones had all been split up for the marrow, and the smaller bones had their spongy ends missing as if they had been eaten by dogs.

One discovery led to an amusing error. In a shell heap many years ago I unearthed or "unshelled," one might say, what apeared to be the upper section of a bird's bill, but it had an unusual polish, foreign to any of our birds' bills. In shape and size it most closely resembled that of a royal tern. I took it to several specialists at Harvard, and each repudiated it in turn. The ornithologist said it was not a bird's bill, the mammologist that it was no part of a four-legged creature, and the expert in crabs said it was no part of a crab. I therefore sent it to Washington, the fountain head of all knowledge, and word came back that it was the bill of a royal tern, certified to by several well-known ornithologists. Fortunately I did not rush into

print the interesting fact that a royal tern had been found so far north, for I was not satisfied. There was a peculiar polish in the enamel coating that "bill." A few years later I was looking at a dogfish thrown up by the waves on the beach, and, on examining the spur or tooth on the dorsal fin, I saw at once that it was my "royal tern's bill." Then I published "A case of mistaken diagnosis" but naturally did not disclose the names of the experts in Washington. I shall never be deceived by a dogfish's dorsal spur again.

Other prizes are the work of Indians. Bits of rude pottery—potsherds—are not uncommon, some of them ornamented by a pointed stick or by the impression of a twisted cord. Flint chips and stone implements are rare. I have found a few bone awls and needles, some of which resemble closely those made by the Eskimos at the present day. I have also found pieces of bone cut or notched. One had eight distinct notches, perhaps a record of enemies slain, or, may be, of wild geese captured.

At Treadwell's Island, near the mouth of the

Ipswich River, there are extensive shell heaps several feet thick, attesting the prolonged or numerous visits by bands of Indians to this region. Here many of the shells are those of the oyster, a mollusk long since extinct in this region.

One can picture the summer camp, the skin-covered wigwams, the bark canoes drawn up on the sandy beach of the estuary, the feasts of fish, clams and oysters and other products of the sea, of roasted ears of Indian corn, of sea-bird's eggs and of the flesh of birds and seals and other animals caught in snares and traps, or slain by stealth with stone-tipped spears and arrows. It is probable that many of the Indians in winter moved back into the more densely forested interior, partly for shelter from the gales which sweep the sand dunes and marshes of the coast and partly for the better hunting and trapping. This is the custom today of the Mountaineer Indians of Labrador.

It is evident that the Indians loved this region of dune and marsh, sea and estuary and made full use of the bounteous repast spread within

its borders. Would that white man had been as frugal at that table! Oysters would still abound, shad and salmon and trout and other fish would throng the estuaries and rivers, sea-birds in great multitudes would lay their eggs on the sandy shores, and great auks, Labrador ducks, Eskimo curlews, wild turkeys and wild pigeons would still be with us.

As one paddles up the creeks at low tide, following the winding channels, one is apt to see from time to time a swift moving shadow, darting in and out of the waving forest of eelgrass. Sometimes the shadow remains long enough to record itself on the retina as an eel. The flesh of the eel is firm and rich with fat, and is much sought after by those who have learned to like it and have no psychological objection to its snake-like form. In these waters it is caught by lines baited with great masses of worms, it is speared at low tide with barbed tridents, and is entrapped in eel-pots—cylindrical affairs with funnel-shaped openings into which the descent is easy but the return is impossible to creatures of the intelligence of the eel.

For many years an eel-catcher has spent his summers in the pursuit of his craft, living in a shanty in the dunes at Ipswich near Wigwam Hill, and later at Hog Island. He had followed the sea as cook, fisherman, and skipper. Eighteen of these were spent in the Gulf of St. Lawrence, but only once did he set foot on Labrador soil and that was at Little Meccatina Island, and he stayed there only five minutes, he said, because he was chilled by the barren aspect of the country and eaten up by mosquitoes. Born on January 10, 1828, Captain Thurlow had retired from the sea for many years and has lived in Newburyport, but every summer he gets restless and, in spite of his daughter's protests, would go to Ipswich and take up the life of an eel-catcher and clammer, living alone in his shanty.

Ordered to vacate his summer home in the dunes, where he was only a squatter, he procured a dozen casks, and, with the friendly help of some Italian workmen, moved his house to the beach and securely lashed it to the casks. Taking advantage of the flood tide he launched his ark, and, with the aid of a long hawser, a couple

of anchors and the ebb, he "swung her into the stream and across to Hog Island." Here he put skids and rollers under it and a hay-maker kindly hitched his team to the land and water craft and "in fifteen minutes hauled her up to a safe anchorage above the highest tides." "I was afraid I would make a mess of the job" he said, "but I didn't and it didn't cost me a cent, for the hay-maker wouldn't take anything for his help, and I think he was pleased by some eels I gave him." A strenuous job for even a young man to tackle single handed, and he almost ninety! But he put it through without a hitch and "didn't make a mess of it!" There is courage and vigor and sand, say I, born of life on the sea and in the dunes!

At the age of ninety-two he came as usual to his shanty on Hog Island. He had rowed and sailed alone in his dory from Newburyport going down the Merrimac River, through Plum Island River and Sound, up the Ipswich River and Fox Creek, and finally through the canal to Castle-neck River and so down to his beach at Hog Island. He told me he had a cough in the

THE EELER AT NINETY

THE SAND SCHOONER

spring that he could not get rid of, but in a few days at the beach the cough had left him. He was still erect and vigorous, a fine-looking man with clean-cut features, snowy hair and beard. He was digging a basket of clams before his door. Few men even twenty years younger could have straightened up as quickly or at all after assuming the position of the clammer! He visited his eel-pots in his old weather-beaten dory, using a spritsail whenever the wind was fair, his own sinewy arms pulling at the oars a short fisherman's stroke when the air fell calm. I trust the wind and tide are favorable with him now, and that he may long continue to come an eeling at Ipswich.

On a pleasant summer day when the wind and tide are fair, one may be so fortunate as to see an old high-floating schooner sailing up the mouth of the Ipswich River between the long bar and the beach, or a similar craft negotiating the more dangerous passage into the Essex River. The destination in the former case is the southern end of Plum Island facing the sound, in the latter the southern end of Ipswich beach and dunes on

the inner side. A week or so later the same schooners, taking advantage of the ebb tide, are departing, but now sunk almost to the level of their decks. With a fresh northwest wind they push a great wave before their broad bows and disappear from sight around the end of Cape Ann, south-bound for Boston. They are sand schooners and their captains and crew are spoken of as sanders.

Captain Charley commands the schooner *Edward S. Eveleth*, "built with copper fastenings," for the Gloucester fisheries forty years ago. The captain has been a sander for over fifty years—he began the year Lincoln was shot—and his father for fifty years had followed the same profession. His father said before he died that, in spite of all his labors, there was more sand at Ipswich beach than there was when he began, which confirms my own studies and observations that the beach is extending southward. The remains of an iron spindle on a rock now exposed on the beach at low tide, was, when Captain Charley began, separated from the beach by a good channel.

The sand schooner selects a steep part of a

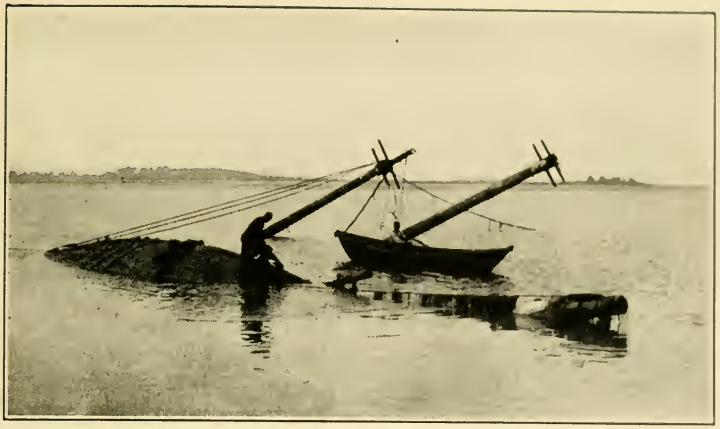
protected beach, comes up to it broadside at high tide and makes fast by means of hawsers and kedges both bow and stern. A long gangplank is run out and extended to the spot from which the sand is dug. Men fill broad and capacious wheelbarrows and run them up to the deck of the vessel, where they dump the loose sand into the hold. "It is the heaviest cargo there is," said Captain Charley, "and very dead; bricks are live in comparison."

Sanders ply their vocation in winter as well as summer. With a fair wind they can make Boston in seven hours. Captain Charley left Boston on Christmas in 1917 and did not get back until the middle of March. For most of the time he was frozen up. "Why anybody wants to visit the beach and sand hills I can't see," said the Captain. "If I didn't have to, I wouldn't stay there longer than one minute." [1]

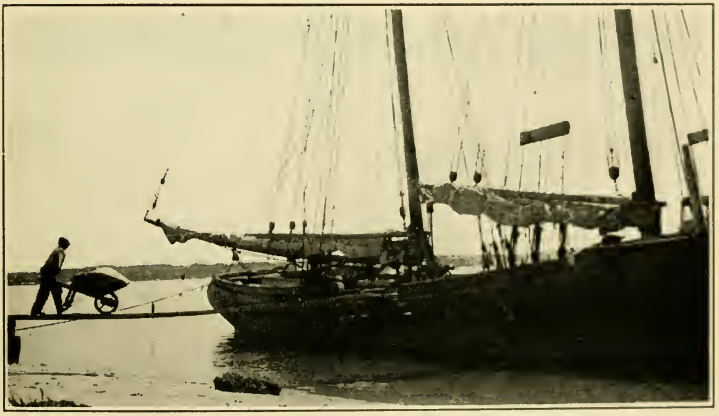
[1] Alas! the *Edward S. Eveleth* has found a grave in the sand and the flowing sea. On an October day in 1922, after she had been filled with sand, a heavy sea, rolling around the point of the dunes, rushed over her decks, and she turned on her beam ends at the edge of the beach. Each tide sucked her deeper into the sand. But it is far better that she ended her days thus than that she sank at sea with loss of life.

Herring torching is a picturesque pursuit. In the fall of the year young herring abound off the beaches and in the estuaries of this sandy region. Herring, like moths are fascinated by a flame, and crowd the waters near a torch carried on a boat. In the old days, the flaming knots of pitch pine, —candlewood as it was called—were used as a light. At the present day an iron basket is fixed over the bow of the boat and fed by hand with masses of cotton soaked in kerosene. A still greater improvement is a wire netting cylinder filled with asbestos, supplied with kerosene from a compressed air tank. Motor boats have taken the place of dories propelled by oars. On almost any favorable night in October and November one may see the mouths of the Ipswich and Essex rivers dotted with moving lights.

It is cold hard work but full of excitement and fisherman's luck. Some nights only a few fish are seen, on other nights the men are obliged to desist, for the boat can hold no more. The herring are piled high above the gunwales. The torch illuminates the water for a few feet around the bow of the boat—beyond is a wall of dark-



THE LAST OF THE "EDWARD S. EVELETH"



THE SANDER

ness. One can often see down several feet, to the sandy bottom through the clear water.

When fish are sighted, the watch calls to the skipper who at once slows down the engine. Sometimes a few herring are seen, sometimes immense numbers of them, all swimming forward towards the light. The dip-net, with a hoop about three feet in diameter, is quickly plunged just below the surface, as near the bow as may be, swept rapidly aft, and, with the help of the "turner" who seizes the hoop, it is pulled up and its contents emptied into the boat. Sometimes the net contains only two or three, sometimes it is filled with herring from a few inches in length—sardines—up to fishes a foot long. Fifteen barrels of herring is a heavy load to dip out in one night, but the fisherman is well repaid.

The life a light-keeper tends to independence and originality of character. Many of the keepers have followed the sea at one time or another and the sea exerts a broadening influence in life. In the old days at Ipswich, Captain Ellsworth held sway for nearly half a century, and his daughter tended the range light when the

journey over the sands was too much for the old man. His was a kindly and genial personality. The picture of his ruddy cheeks and twinkling blue eyes I shall always cherish. Since his death over twenty years ago there has been a succession of light-keepers at Ipswich, with all of whom I have made acqaintance. There is always a warm welcome in their cosy kitchen no matter how cold and blustering the day outside. The model housewife might well envy the housekeeping of a United States light-keeper. It mattered not how many children they had, nor the unexpectedness of the visit, one always found the house as neat as wax, the paint immaculate—not a speck of dirt or dust anywhere. The men who occupied this station in the last twenty years have all had interesting characteristics, and in my brief visits on cold winter's days I have learned many things. One of our best keepers was George Howard, an all round man, a jack-of-all-trades, constantly studying to improve himself, later the head light-keeper at the important station of Thatcher's Island off Cape Ann.

His father, Captain Alfred A. Howard, whose

stay at Ipswich was cut short by advancement to a better station, I greatly miss. He enjoyed his little joke and he also appreciated it in others. In the early days of the war I had dropped in to see him and happened to be wearing a pair of wristers I had brought from Labrador that were intended for the Indian trade. They were in stripes of vivid blue and red and yellow and white and I remarked that I called them my "camouflage wristers." "Oh," said Mrs. Howard, "do tell me what you mean by camouflage, I have seen that word in the papers lately." I explained that vessels were painted in alternate stripes of various colors, and, at a distance on the sea, it was difficult or impossible to see them, and that this was called *camouflage*. "And," I added "when I wear these wristers and get off about three hundred yards, you can't see me." Her face expressed great astonishment at this remarkable information, but the Captain's face was calm. He went at once to the pantry, soon to reappear with a large piece of cake on a plate. This he solemnly presented to me with the remark, "I am somewhat of a liar myself!"

Captain Howard was as good as a Joseph Lincoln story, and his supply of stories seemed unending. He had had an adventurous life and began young. He told me bits of it from time to time, sitting by the kitchen stove in his shirt-sleeves, his black eyes twinkling, while his wife, who must have heard the story many times, sat by with a smile on her face of full appreciation. I wish I could have taken down all the finer touches and expressions that he used, but I can give it from memory only as follows:

"My father, who was a sea-captain, took me on a trip to the West Indies when I was nine years old. The next year my mother died and the old man didn't take much of any notice of me and didn't care when I went out whether I came back or not. That was his way—so one day I never did come back and I never saw the old man again.

"It was this way: I lived in New York and used to play around the docks and look up at the big ships. They were mostly sailing-ships in those days with great high, painted sides and blunt rounded bows like the old battleship

Constitution. They would bunt into a wave and then give it up and go around. There were steam vessels too, but my eyes was always for the sailing vessels. On one of these of the old Swallow-tail line that plied between New York and London I see an officer in a shiny cap leaning over the rail and I speaks up bold and asks him if he don't want a cabin boy. 'A cabin boy,' says he, 'you ain't much more'n a baby in arms and we don't want none of those on this ship.' 'I'm not so young as I look,' says I, and I lied to him and says I was thirteen, when I was no more than ten, 'and besides,' says I, 'I am real smart and ready to do anything.' 'Go home to your mother,' says he, 'and don't bother me no more; we don't keep nus-girls here.' I ain't got no mother, and no father neither,' I says, for I had begun to lie and thought I might as well keep on, 'and no home nuther.' 'Where do you sleep?' says he, looking at me kind o' curious-like. 'Oh, any old place about the dock,' I says careless-like, 'sometimes in one place and sometimes in another.' 'Well,' he says, 'you can come aboard and wait till the old man comes, and tell

your story to him and perhaps he'll make an able seaman of you."

"So I shins up to the deck and the mate tells me to stay quiet till the captain came. To make a long story short the captain agreed to take me on my homeless story, and said that if I was a good boy he would pay me eight dollars a month and give me three suits of clothes.

"I was so small, the cook put a soap box for me to stand on in the galley so as I could reach up to wash the dishes. I liked it all right and soon got to feelin' at home aboard the old ship. The grub was pretty poor, but then we had sea-appetites and could eat anything. Sometimes we had old horse that had been killed in the Civil War. Yes, that's straight, we would get a bullet in our mouths every now and then! But the ship's biscuits, they was the liveliest things—why sometimes I would put one down by my mug of coffee and it would walk off—not far, but perhaps fourteen inches.

"Then the cockroaches—we don't never have any as big in these parts. They would come aboard when we were loading ship—big enough

and strong enough if properly harnessed to drag a dray of Herrick's safes. They was a great nuisance on board. The cook he had bean soup on Thursdays and the cockroaches got to know the day and would line up on the beams of the cabin when Thursdays came. The soup was in a big tureen and had what the cook called floating islands—hard tack. With the motion of the ship, the soup and its islands would sway back and forth and you could see them cockroaches cranin' their necks and their eyes poppin' out lookin' at it. Pretty soon they would begin droppin' down on the islands where they would sing in chorus 'A life on the ocean wave.'

"I ate the lively ship's bread but I preferred the biscuits the captain had on his table, and I rigged up a hook, line and sinker, and many a time I have fished up through the cabin lights one of them biscuits. I tried to fish up a piece of squash pie but it warn't no use.

"One day the cook had biled up a mess of fine potatoes for the captain's table and I wanted some of it bad. The cook he had to help carry the baskets of food to the captain's cabin, and,

when he was gone, I reached down through the hatch over the galley with a long ladle used for tar and scooped up quite a lot of mashed potato and eat it under one of the boats. After that I walks down to the galley innocent like and the cook had scraped off the dark part of the potatoes where I had tarred them, and put them in a plate and give them to me. So I had two helps of potatoes that day. One time when we was in at New York I skinned out just as I had seen the sailors do, and went to Brooklyn and stayed with my aunt. There were cousins there and I had a good time until I thought it was 'bout time for the *Cornelia* to sail, so I went back. The captain, he made a great blow out and took me by the ear and near pulled it off, as he asked me where I had been. I told him to my Aunt's, but he said I had held the ship from sailing, and he carried me off to the office, where they give me the first money I had ever earned. Seventy-five dollars! Talk about your Rockyfellers or this man up on the hill—they warn't in it with me.

"But I hated that mate, Mr. Green. He was the very devil in the way he abused the men. I

have seen him kick a green horn with his big sea-boots until he nearly put him out of commission. It was such actions as his that were common enough in those days that sickened me of going to sea. I saw him murder a man once. That's straight! It happened in this way. It was in the night watch and I was sittin' on the upper deck abaft the mainmast with a piece of tarpaulin over me to keep off the wet, for it was a thick night. We was rollin' along in good style, but the wind was refreshin', and the mate he called the men to go aloft forward and take in sail. There was an old feller aboard nigh on to seventy year who they had shanghaied. He was pretty feeble and the mate was always lookin' black daggers at him. He was on the watch that night, but the mate sung out to him to stay behind, because, he said to the men, the old hulk would probably fall off the riggin' and get killed.

"As soon as the men was gone he called the old tar, and, after lettin' out a half dozen broadsides of oaths and sweet names, he come to the root of the matter—I was all ears under the tarpaulin—unbeknownst to either of them—and he says,

'Goll dong you, didn't I tell you last time I see you that if ever our ways crost again I'd kill you.' The old fellow pleaded pittyful, but the mate he grabbed an iron belayin' pin and hit him a welt over the head—I had my eyes on 'em both by that time—and over the fellow went on to the lower deck strikin' his head on the way.

"I didn't know what I was doin', but I rushed out from my hidin' place and says 'Mr. Green you've killed him for sure!' He turned like a flash and grabbed me by the collar and the seat of my trousers and held me over the rail. For a moment I thought I was done for too, but, whatever made him do it, he changed his mind and pulled me back. There wasn't no one 'round to see what had happened and he pulled me into his cabin, which was on deck—the captain was down below and asleep—and he says to me, he says, puttin' his face within three inches of me and lookin' me straight in the eye: 'If you dare breathe one word of this, remember you're the next one.' Then he give me some terbaccer —I hadn't had none, but had chewed coffee

leaves and cinnamon—and we went on deck again.

"When the men came back from furlin' the sail, he points out the old fellow and says as how he had fallen off the upper deck with a lurch of the ship. 'Carry him into the passengers' galley' he says. We took passengers only on the v'age from London to New York, not the other way, and they had the use of the galley on the port side where they cooked their food. The ship's galley was on the starboard side. Well, the men toted the poor wreck to the galley as the mate said, and then stowed themselves as much out of the wet as they could for the rest of the watch.

"I stayed in the lea of the mainmast not knowing what else to do, and the mate he stomped up and down on the deck. Bymby he calls to me and tells me to go for'ward to the passengers' galley, and see how the old cuss was. Course I took the lantern out of the binacle and obeyed orders, but I was scared chilly—I could smell death in the air as I came to the galley, and there was the cook's cat—black as a coal—mewin' like

all get out. The old man was lyin' where the sailors had left him with his face down on his arms. I catched a hold of him and managed to turn him over, and his eyes was stickin' out of his head till you could see the white all round in the lantern light! They was glazed! I run back and says to the mate that he was gone, and he says: 'Re-mem-ber!'

"The next day they sewed him up in an old bit of sail and put some pieces of iron at his feet and laid him on a board. After the Capt'n had read the prayers, he up and asks if any one knew how this man come to his death. I wanted to speak out but I sees the sharp, cruel eyes of Mr. Green on me and I kep quiet. Then they heaved the end of the board up and the body slid down into the water, but it bobbed up astern three times before it sunk.

"When I was in London on that trip I went to see a policeman—a bobby they calls them over there—that I had made acquaintance with, and I says to him 'What would they do to a man who killed another man?' 'How do you know he did it?' says he kinder quick and he looks at me

sharp. 'I saw him,' says I. 'Where is the murderer?' says he, 'let me get at him.' 'He is on one of the ships in the river,' I says. He didn't say nothin' for a few minutes and then he said ''Tain't no use! you're only a boy and they'd never believe you in the world. You'd better say nothin' to nobody.' So I kep quiet, but, you'd better believe I didn't stay long on that ship.

"A good many years afterwards when I had give up deep-sea sailin', and was master of a fishin' boat from New York, we run in one night alongside of a clipper ship and she seemed kind o' familiar. Next mornin' I saw it must be the old *Cornelia* for I knew her from stem to stern and from keel to truck. I shinned up a rope and said good mornin' to the officer who was on deck, and told him I felt quite to home on the old craft as I had sailed many trips in her some years back. I asked who was the Capt'n and he says: Capt'n Green, 'Oho,' says I, 'I know him,' and asked when he was coming aboard. He says about ten o'clock. As it was then nine o'clock I waited around and there sure enough was the old devil, Mr. Green, comin' up the gang

plank. I says 'Good mornin' Capt'n Green,' civil as you please, but he didn't seem to remember me. I says 'You don't recolec me, Capt'n Green, but may be you will after I have refreshed your memory a little.' 'Go ahead,' says he, 'I don't like to talk of private affairs in public,' I says. So he takes me aft to his cabin and gives me a strong cigar and poured out some whisky, but I was not drinkin' any of that stuff. I looked him in the eye and says 'You don't remember me,' I says. I was a grown man then and only a shaver before so of course it was natr'l he shouldn't know me. 'I don't know you from the devil,' says he, speaking kinder peeved. 'Well,' says I, 'perhaps you can recall a night on the *Cornelia* when you held a boy by the slack of his trousers over the rail—you didn't drop him and I'm that boy.' He was struck all of a heap and began to talk about his family and five daughters and how much depended on him. 'Well,' I says, 'I haven't told nobody and don't believe I will but I wondered whether you had forgit me,' and I said good day and cleared out sudden.

"That fellow died a few years ago and a New

York paper put in a long notice as to how fine a man Captain Green was and how noble a life he had lead, follerin' the sea. I wanted to tell that editor a thing or two, for it made me mad, but I didn't."

These days of sea and shore tales at some of the lighthouses on our coast are gone, never to return. No longer is it possible to find refuge from the winter storm, from whirling snow and sand, by the cozy fireside of the light-keeper. The lighthouses still stand and shed their lights seaward, but the lights are impersonal, mechanical, automatic, cold and soulless. In the march of progress the government has found it possible, in some places, to do without the human light-keepers by using acetylene lamps which burn night and day without ceasing and without tending, except to be replenished at long intervals. A lonely lighthouse has an appealing, human quality, and hard it is to disassociate it from humanity. May this mechanical fate never fall on the light at Ipswich!

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