

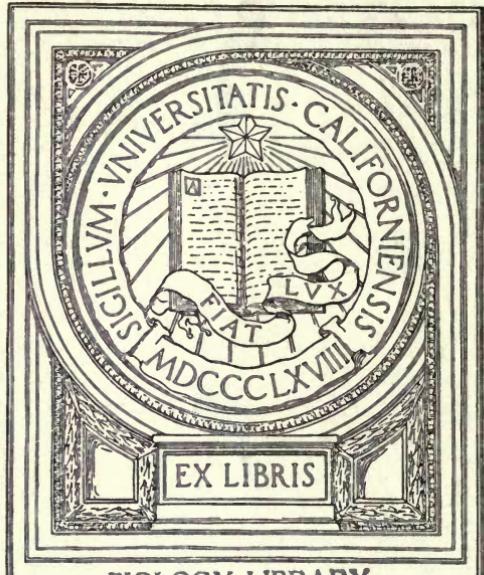
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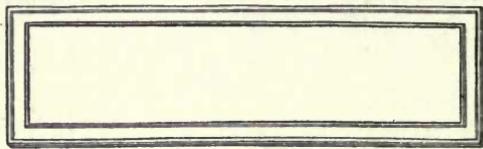


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VOL. 36, No. 1,
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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF
HARVARD UNIVERSITY. NEW SERIES.—No. LXII.

SABLE ISLAND, WITH A CATALOGUE OF ITS VASCULAR PLANTS.

BY HAROLD ST. JOHN.

BOSTON:
PRINTED FOR THE SOCIETY,
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INTRODUCTION.

In the summer of 1913, the writer made a botanical collecting trip to Sable Island, Nova Scotia. The journey was taken at the suggestion of Prof. Merritt L. Fernald, without whose continued inspiration and practical assistance, its results could scarcely have been brought together in the present report. There are many other acknowledgments to make, especially to Dr. B. L. Robinson, who arranged to have the writer go as a collector from the Gray Herbarium, and who has forwarded in every way the completion of the work. Miss Mary A. Day, Librarian of the Gray Herbarium, has frequently been of great assistance, especially in bibliographical matters. The writer wishes particularly to express his thanks to the responsible Canadian Government officials because of their constant readiness to make the expedition possible and pleasant. Unless a shipwrecked waif, one may not land on Sable Island without a permit from the Government. Mr. A. Johnston, Deputy Minister of Marine and Fisheries, of Ottawa, and Mr. C. H. Harvey, Agent of Marine and Fisheries, at Halifax, gave permission to visit the island and arranged for transportation on Government steamers. The Superintendent of Sable Island, Capt. J. U. Blakeney, both officially and personally, was helpful in every way possible, as were the members of the staff of the Life Saving Stations, the Lighthouses, and the Marconi Station. In Halifax by good fortune it was possible to meet Mr. Robert J. Bouteillier, former Superintendent of Sable Island. His unusual intelligence and keen powers of observation had given him during his long period of residence 28 years, an unrivalled knowledge of Sable Island and its phenomena. This knowledge he has frequently shared. To the late Mr. J. M. Macoun of the Canadian Geological Survey and to Dr. H. T. Güssow of the Central Experimental Farm, Ottawa, thanks are extended for the loan of specimens. Mr. Edwin R. Jump has kindly read part of the manuscript and checked it with his intensive knowledge of the history of Sable Island. The accompanying plates were drawn by Mr. F. Schuyler Mathews.

PRESENT STATUS OF SABLE ISLAND.

Stretching between Cape Cod and Newfoundland is a series of shoals or banks, Nantucket Shoals, Georges Bank, Brown's Bank, La Have Bank, Sandbro Bank, Emerald Bank, Sable Island Bank, Middle Ground, Canso Bank, Misaine Bank, Artimon Bank, Banquereau, St. Pierre Bank, Green Banks, and the Grand Banks of Newfoundland. In all this stretch there is but one spot above high-tide level, Sable Island, a long crescent of sand dunes, twenty miles in length and less than one mile broad.

The visitor to Sable Island will start from Halifax, Nova Scotia, and steam eastward 150 miles. If the weather is calm and there have been no northerly winds for two or three days, the steamer will approach the northerly, that is to say, the inner side of the crescent-shaped island, and anchor a mile or more from land. Surf-boats put out from the beach and soon the landing of the few passengers and the very important supplies is begun. On the way to the beach there are three troublesome bars that must be crossed on the crest of a big wave, so the trip is exciting enough for the most venturesome, and all the passengers are glad to have the boat's nose ground in the soft sand of the beach, above which rises a steep sand dune. If he climbs the tall look-out mast crowning it, he will see that this dune is continued as a ridge or range of dunes skirting the top of the North Beach throughout the whole length of the island, and that this ridge, called the North Ridge, forms the backbone of the island. Near the east end of the island the dunes attain their greatest height, and at one place between Life Saving Stations Nos. 3 and 4, the North Ridge rises to a peak called Rigging Hill, nearly 100 feet in height. From the North Ridge the dunes run inland diminishing in height and separated by dry or wet dune hollows. In some places there are definite cross-ridges of dunes. In every case these have their western faces bare, a condition caused by the constant erosion of the prevailing westerly winds. From the west end of the island, for a distance of twelve miles, the central strip is occupied by a large salt lake, Wallace Lake. The drifting sand has recently filled up a section of the lake a mile long and divided it into two unequal parts. The farther shore of Wallace Lake is formed by a narrow strip of sand, the South Beach. Near the eastern end of Wallace Lake there are a few dunes on the South Beach, the only remnants of the protecting ridge of dunes that

used to run the whole length of that beach. In the larger dune hollows are fresh-water ponds, and near the shores, and especially at the eastern end of Wallace Lake, are series of brackish ponds. The dunes, especially those near the sea, and the pond shores are well covered with vegetation. The beach grass forms a thin covering over all but the most recent dunes and flats, but there are great stretches, especially near the East End, where the blown sand is beyond control, drifting over everything and forming a barren desert of shifting white sand. This is a bird's-eye view of Sable Island as it was in 1913, but we know from trustworthy records that many changes had taken place and that previously it was very different, at least in size.

EARLY HISTORY OF SABLE ISLAND.

Who was the first of the European voyagers to sight Sable Island, we cannot now say. It is certain, though, that at the beginning of the 16th century, the fishermen of western Europe were acquainted with it.¹ "This is shown by maps of the period. One preserved in the royal library at Munich, marked as made by Pedro Reinel, who is described by Herrera as 'a portuguese pilot of much fame,' and supposed to be of about the year 1505, has it under the name of Santa Cruz.

"On the 13th March, 1521, the King of Portugal granted to Joan Alvarez Fagundez a large territory embracing Nova Scotia and adjacencies, together with various islands lying off it, which he is said to have discovered on a previous voyage, and among them is Santa Cruz."

"Gastaldi, a distinguished Italian cartographer, in a map of 1548, represents it under the name Isolla del Arena, and he is followed by his countryman, Zaltieri in 1566. But as early as 1546 Joannes Freire, a Portuguese mapmaker, calls it I. de Sable, * * * and by the end of that period it seems to have been commonly known by that name."

This is no place to give a detailed history of Sable Island; consequently only the more important facts, especially those bearing on its physiography or natural history, will be mentioned.

¹ Much of this historical data has been freely drawn from Patterson, Rev. George: Sable Island: Its History and Phenomena. Trans. Roy. Soc. Can. xii. §2. 3-49 (1894).

Many of the early voyagers refer to the herds of cattle to be found on the island, and there is a great deal of conflicting evidence as to how and when they got there. According to Champlain, they were left there about the year 1552 by the Portuguese. "Not only does Champlain mention the fact, but we find the same asserted by the historian of Sir Humphrey Gilbert's expedition. That intrepid mariner sailed from Newfoundland in 1583 for the American coast intending, after making Cape Breton, to go to Sable Island, as the writer says, 'upon intelligence we had of a Portugal who was himself present when the Portugals, above thirty years past,' consequently before 1553, 'did put into the same island neat and swine to breed, which were since exceedingly multiplied.' Eight days after sailing from Newfoundland, or early in the morning of the 29th of August the largest ship of the three in the fleet, the 'Admiral' of 120 tons, with Maurice Browne, captain, and Richard Clarke, master, first ran among shoals, then stroke aground and had soone after her sterne and hinder partes beaten in peeces'."¹ It has been generally interpreted as by Brymner² that this happened on Sable Island. There are two accounts of the event, one by Clarke, a relation of Richard Clarke, the master of the *Admiral*, the other by Hayes, captain and owner of the *Golden Hinde*. These contradictory accounts are both given by Hakluyt. All of the evidence has been reviewed by Patterson³ who concludes that the wreck of the *Admiral* could not have taken place upon Sable Island and that it probably occurred upon Cape Breton, near Louisbourg.

"The island¹ and the cattle upon it next come into notice by the expedition of Troilus du Mesgouez, Marquis de la Roche. He was a Catholic nobleman of Brittany, who had from his youth been connected with the French court. He agreed with the King to found a colony in America, and for that purpose received from him a commission in which he was named lieutenant-general of Canada, Hochelaga, Newfoundland, Labrador, and the countries adjacent, with sovereign power over this vast domain. This commission was first

¹ Patterson, *l. c.* 8.

² Brymner, Douglas: Rept. on Canadian Archives, pp. xxv–xxvii (1895).

³ Patterson, Rev. George: Termination of Sir Humphrey Gilbert's Expedition. Trans. Roy. Soc. Can. 2nd ser. iii. part 2, 113–27, 2 illustr. and 1 chart (1897).

issued in 1578." Biggar tells us¹ that "he did not set sail until 1584. Unfortunately his largest vessel with over one hundred colonists on board was wrecked near Brouague and the voyage had to be abandoned."

"In that year [1598] he set out with one small vessel, under Chef d'hôtel, a distinguished Norman pilot. * * * His expedition was so modest, not to say cheap, in its proportion and equipment as to seem quite unworthy of its ambitious mission, or the vice-regal rank of its commander. One vessel constituted the fleet, and it is so small, that, according to a contemporary chronicle, you could wash your hands in the water without leaving the deck, while forty out of the sixty men comprising the marquis' army of occupation and evangelization, were convicts chosen from the royal prisons."²

Biggar, who has investigated many of the old archives, gives us a somewhat different account. He quotes the contract made in March, 1597, between la Roche and Chefdostel, master of the *La Catherine* of 170 tons. Chefdostel was to transport a company of soldiers to Sable Island on condition that la Roche should pay for half the cargo of salt, half the wages of the crew, and the whole of the provisions. A year later la Roche, failing to attract *bona fide* colonists, was allowed to take convicts from the jails of Brittany and Normandy. On the 16th of March, 1598, la Roche made a new contract with Chefdostel who for 600 crowns was to transport the convicts to Sable Island. Two days later a similar contract was made with Jehan Girot, master of the *Françoise*, who having a smaller vessel was to receive 100 crowns.

The Marquis de la Roche obtained 200 or 250 convicts, male and female, from the prisons, but it appears that he allowed many of these to purchase their freedom before sailing. He set sail in 1598 and on reaching Sable Island landed 40, 50, or 60 of the convicts,³ leaving with them a small supply of provisions and goods; then he sailed away to

¹ Biggar, H. P.: *The Early Trading Companies of New France*, 39 (1901).

² Oxley, J. M.: *Mag. of Amer. Hist.* xv. 166 (1886).

³ Charlevoix, P. F. X.: *Histoire et Description de la Nouvelle France*, i. 109 (1744), says 40 convicts were landed; Gosselin, E.: *Early French Voyages to Newfoundland*, *Mag. Am. Hist.* viii. 288 (1882), says that the colonists "with the exception of fifty, refused to disembark, and compelled de la Roche to bring them back to France"; Biggar, H. P.: *The Early Trading Companies of New France*, 40 (1901), says that only sixty persons were actually landed on the island.

explore the neighboring coast of Acadia. He intended "to select a site for settlement, to which he proposed afterwards to remove them. On his return he was caught by a tempest, which drove him eastward. His frail bark was obliged to run before the storm, and at last he reached France, intending soon to return. But misfortune attended him. The Duc de Moncoeur is said to have cast him into prison. At all events five years elapsed before anything could be done for the relief of the unfortunate creatures he had left behind."¹

"At first it would seem as if on being thus released from all restraint they fought with one another like entrapped rats, for Les-carbot tells that 'ces gens se mutinèrent, et se coupèrent la gorge l'un à l'autre'. Then as the horror of their situation fully dawned upon them, and they realized that only by harmonious co-operation could any life be preserved, better counsels prevailed, and systematic efforts were put forth to secure a maintenance. From the wreck of a Spanish ship they built themselves huts, the ocean furnished them with fire-wood, the wild cattle with meat, the seals with clothing, and with some seeds and farming implements happily included among the '*bagage*' mentioned by Les-carbot, they carried on agricultural operations in a sheltered valley by the lake-side whose tradition remains to this day by the locality being known as the French Gardens.

"Despite these alleviations in the rigor of their fate, however, the utter absence of the most necessary comforts, and their own evil deeds so reduced their numbers that when, in 1603, the King sent a vessel [under Chef d'hôtel, the same pilot] to bring them back, only eleven out of the original forty were found alive, clad in their self-made seal-skin garments, broken, haggard, and unkempt, they were presented before Henry IV., and their harrowing tale so touched the royal heart that they each received a full pardon for their crimes, and a *solatium* of fifty golden crowns. The strangest part of the story remains yet to be told. Undeterred by an experience that was surely sufficient to appall the stoutest hearted, these Rip Van Winkles of the sea, whose names may still be found in record in the *Registres d'Audience du Parliament de Rouen*, returned to their place of exile, and drove a thriving trade in furs and ivory with their mother country for many years, until one by one they passed away."²

¹ Patterson, *l. c.* 8.

² Oxley, *l. c.* 167.

From Governor John Winthrop's Journal¹ we learn that "Mr. John Rose, being cast ashore there in the [Mary and Jane] two years since [1633], and making a small pinnace of the wreck of his ship, sailed thence to the French upon the main, being thirty leagues off, by whom he was detained prisoner, and forced to pilot them to the island, where they had great store of sea-horse and cattle, and black foxes; and they left seventeen men upon the island to inhabit it. The island is thirty miles long, two miles broad in most places, a mere sand, yet full of fresh water in ponds, etc. He saw about eight hundred cattle, small and great, all red, and the largest he ever saw, and many foxes whereof some perfect black. There is no wood upon it, but store of wild peas and flags by the ponds, and grass. In the middle of it is a pond of salt water, ten miles long, full of plaice etc."

"In 1634 the island was granted, along with Port Royal and La Heve, by the Company of the Hundred Associates, to Claude de Razilli, brother of Isaac de Razilli, who had been appointed commander or governor-in-chief of Acadia, and who had commenced a settlement at La Heve."²

In the following year, 1635, according to Governor John Winthrop¹, "Mr. Graves, in the James, and Mr. Hodges, in the Rebecka, set sail for the Isle of Sable for sea horse (which are there in great number) and wild cows. * * * The company which went now, carried twelve landmen, two mastiffs, a house and a shallop.

"[August 26.] They returned from their voyage. They found there upon the island sixteen Frenchmen, who had wintered there, and built a little fort, and killed some black foxes. They had killed also many of the cattle, so as they found not above one hundred and forty, and but two or three calves. They could kill but few sea-horse, by reason they were forced to travel so far in the sand as they were too weak to stick them, and they came away at such time as they [the sea-horse or walrus] use to go up highest to eat green peas. The winter there is very cold, and the snow above knee deep."

Commander de Razilli died that year or the next, and his brother transferred the rights of both to Charnisay, and the French seem to have abandoned the island.

¹ Winthrop, John: The History of New England from 1630 to 1649, edited by James Savage, i. 162 (1825).

² Patterson, George: Supplementary Notes on Sable Island. Trans. Roy. Soc. Can. 2nd series, iii. § 2, 133 (1897).

Governor Winthrop also records¹ that in the summer of 1642 "the merchants of Boston sent out a vessel again to the isle of Sable, with 12 men, to stay there a year. They sent again in the 8th month, and in three weeks the vessel returned and brought home 400 pair of sea horse teeth, which were esteemed worth £300, and left all the men well and 12 tons of oil and many skins, which they could not bring away, being put from the island in a storm."

In the 4th month of 1642, "the adventurers to the Isle of Sable fetched off their men and goods all safe. The oil, teeth seal and horse hides, and some black fox skins came near to £1500."²

As we learn from a letter by Bishop Saint Vallier, written in 1686, the Acadians caught and shipped large numbers of the wild cattle to their homes on the mainland, where they domesticated them. We do not find the wild cattle mentioned after this time.

During the early part of the 18th century we hear very little of Sable Island. It was next brought into prominence by the Rev. Andrew Le Mercier, a graduate of Geneva and of old Huguenot stock, who, in 1719, became pastor of the French Protestant Church in Boston. In 1729, on the arrival of Governor Phillips in Nova Scotia, Le Mercier proposed to him to plant a colony of French Protestants in Nova Scotia. The Governor recommended a grant of 5,000 acres, but nothing came of it. On the 6th of March, 1738, we find Le Mercier petitioning³ Governor Armstrong for a grant of Sable Island, but after approval of his petition, he was unwilling to pay the penny an acre quit-rent. At this time, Le Mercier sent stock to the island preparatory to moving his family there. In 1740, he again applied for a grant of the island arguing⁴ that as the land is "low, boggy and sandy scil, with large ponds or settling of water occasioned by the overflowings of the tides, he thinks the penny an acre too much for what can not be improved."

At the instance of Le Mercier, the Governor of Nova Scotia issued two proclamations forbidding any molestation of Le Mercier's establishment on Sable Island. Nevertheless, he suffered losses and advertised in a Boston paper⁵, in 1744, a reward of £40 for the detection

¹ Winthrop, *l. c.* ii. 34.

² Winthrop, *l. c.* 67.

³ Murdoch, Beamish: *Hist. of Nova Scotia*, i. 523 (1865).

⁴ *Ibid.*, ii. 6 (1866).

⁵ *Boston Evening-Post*, Jan. 30 (1744).

of the plunderers, saying, "Notwithstanding those two Proclamations, the *love of Money*, which is the *Root of all Evil*, is so deeply rooted in the Hearts of some Fishermen, that they have sundry Times Stole our Cattle and our Goods, regarding neither the Laws of God or of Man, neither Justice to me, or Humanity to Shipwreck'd Men, which by their Wickedness they endeavor to Starve, and minding neither natural or revealed Religion and their eternal Damnation, nor even their own temporal Interest, which is certainly not to hinder but to promote the abovesaid Settlement, since it may be their Case one Time or other to be cast away upon the Island *Sables*, and to want there those Things which they have carried off."

In the year 1746, the Duc d' Anville, in his expedition against the British colonies, was overtaken by a severe storm near this island and lost a transport and a fire-ship.

In 1753, Le Mercier published a detailed notice of Sable Island.¹ It is really an advertisement, by means of which he hoped to sell the island, so we must understand and discount the very rosy light in which it is portrayed. As the article is of very considerable interest, and as it is not readily available to all readers, it seems worth while to quote it here in its entirety.

"TO BE SOLD by me the Subscriber

"(Andrew Le Mercier, Pastor of the French Church)

"THE ISLAND *Sables*.

"*The Publick hath here a short description of it for nothing.*

"SAID Island is situated at the Distance of about 40 Leagues from *Halifax*, thirty from *Cape Breton*, and 50 from *Newfoundland*; a good Market for the Produce of the Island, Cattle & Roots of all sorts. It is about 28 Miles long, one Mile over, and contains about 10,000 Acres of Land, 500 of which are quite barren, all the rest produces or may bear something. Their are neither River or Brooks or fresh Water, but everywhere even upon the Beach you may come to fresh clear Water by digging about 3 feet, by which means the root of the Grass is always kept cool and alive, so that it cannot be much subject to a Drought, as it was experienced three Years ago. The Climate may be called temperate, for as in Winter the Snow hardly lies above three

¹ Le Mercier, Andrew: The Island *Sables*. Boston Weekly News Letter, February 8 (1753).

Days on the Ground, so it is never extream hot in Summer, and it is a rare thing to be frightened by any Thunder. It bears no venomous Creatures of any sort, and hardly any Flies.—The high Winds clear the air, which makes it healthy; and nature hath furnished it with medicinal Plants and Shrubs:—It produces naturally near 20 sorts of Berries, out of which some People suppose very good Liquors and Wines might be expressed— It looks all green in Winter with the Juniper Bushes and red in Summer with the large Strawberries and other wild Fruits which it bears.—It hath abundance of wild or Beach Pease, which fatten the Cattle very well:—By several Pieces of petrified Wood found there it is supposed that the Sand hath a Property of petrifying Wood.—Within these seven or eight Years Providence hath opened a Communication between the great Pond (fifteen Miles long) and the Sea, which hath made a safe and large Harbour, but the Entrance is barred so that large and sharp Vessels cannot get into it; but as there is about 8 Feet of Water over the Bar at high Water there is sufficient Passage (as we know by Experience) for Vessels of 30 Tuns or more, if not built Sharp.—The Ponds abound with Flounders and Eels; the Beech itself with Clams and Sand Eels; the Air with Fowls, and especially with black Ducks, so as to make money with their Feathers. The Soil is so natural for all sorts of Roots, especially Turnipe, that they are not only uncommonly sweet there but also uncommonly large, some weighing 7 Pounds a piece:—Rye grows there very naturally and also Wheat at the Rate of 13 Bushels per acre. It is supposed that Flax would grow there very well; it would also produce Indian Corn well enough if the high Winds in the Fall did not break it:—There is neither Trees (but many Bushes) nor Stones.—The Grass is tall, thick and hath a very sweet taste and nourishing Property; there is some English Grass, but the other is more profitable, and there is enough to feed some thousand Heads of Cattle:—Horses breed and grow there without Care or Trouble; there is all Winter long Grass enough or near enough for them, so that they eat but little of the Hay which is made for them in the Summer or the Fall.—The raising of Sheep, Horn-Cattle, and especially of Horses is the most Advantagious (as for the Grain there are not above 400 Acres where it may be raised). The Care of Gardens and Cattle take up our People's Time in Summer, in Winter they go to kill Seils and boil their Fat into Oyl, as well as that of Whales, which now and then are cast away dead upon the Beach. The Island finds them in

Turf and the Sea brings them Wood; so they are not deprived of the Necessaries of Life, nor without Profits of several Sorts; besides their having the pleasure of saving many Men's Lives, according to the motto of the Island, viz—*Destruo & Salvo*. When I took Possession of the Island there was no four-footed Creatures upon it, but a few foxes some red and some black (some of which remain to this Day) now there are I suppose about 90 Sheep, between 20 or 30 Horses including Colts, Stallions and breeding Mares, about 30 or 40 Cows tame and Wild, and 40 Hogs. There are all sorts of Utensils for Farming and trying Fat, several Boats and six or seven small Houses and Warehouses. The advantages which do accrue or may accrue from the Improvement of that Place are so great that I would not easily part with it if I was so skilful in Navigation and Shipping as is necessary: That Ignorance of mine induces me (not any Defect in the Island itself) to part with it. If any Person desires to purchase it, and to know further about it, they may see at my House a Map and Plan of it, or if they live at a Distance by letters sent (Postage free) they may enquire about any Thing, they want to be satisfied in, and I will endeavor to give them all the Light they desire. I must know their Mind within 2 or 3 Months, that the Crew now upon the Island, may be disposed of accordingly."

"Boston, the 5th Day of

Andrew Le Mercier,

"February, 1753

Pastor of the French Church."

It does not appear that Le Mercier found a purchaser. He died on March 31st, 1764, and his will, drawn on the 7th of November, 1761, does not mention Sable Island. At least in 1760, the island was uninhabited and a certain Boston merchant, Thomas Hancock¹, desiring to relieve the sufferings of those shipwrecked, fitted out a schooner with "Horses, Cows, Sheep, Goats, Hogs and Animals likely to live on the Island. They were landed there and generally answered very well."

In 1760, a vessel with a part of the 43d regiment returning from the capture of Quebec, was wrecked on the island. The evidence of this was found long afterward. "In the year 1842, during a severe gale, an old landmark in the form of a pyramid, said to be one hundred feet high, was completely blown away, exposing some small huts built of the timbers and planks of a vessel. On examination they were found to contain quite a number of articles of furniture, stores

¹ Rept. on Canadian Archives, 86 (1895).

put in boxes, bales of blankets, a quantity of military shoes, and, among other articles, a dog-collar of brass, on which was engraved the name of Major Elliott, 43rd regiment. On referring to the records of the regiment, however, it was found that the party had been taken off the island. The site of the encampment is now under at least five fathoms of water.”¹

In 1774, permission was granted by Governor Legge, and approved by the King, to Michael Flannigan and his associates to reside on the island.² We know nothing of their intentions or the length of their stay.

During the War of the American Revolution, American privateers frequently visited Sable Island and made great inroads on all its resources. By the close of the hostilities none of the animals remained, except a few of the horses.

Moses Gerrish, a Newburyport skipper, was shipwrecked on Sable Island on a homeward voyage from the Banks, November 9, 1787. The provisions which he and his crew saved, and a number of young seal lasted them about 60 days when they “had recourse to the horses

* * * * we killed and eat 13 of them. * * * Being without ammunition, we were obliged to dig pits to betray horses, it being impossible to get them in any other way.”³ He was rescued on the 18th of April by Capt. Nathaniel Preble of the schooner *Betsy*.

In the year 1789, a certain Jesse Lawrence, “who lived on the isle of Sable, to receive wrecked people, and to carry on the seal fishery, was attacked by people from Massachusetts, who landed there and wantonly pillaged and destroyed his house and effects, and then compelled him to leave the island. He received some compensation from Governor Hancock [of Massachusetts] and his council, which still left him a sufferer.”⁴

During the last few years of the 18th century, Sable Island was the scene of many disastrous shipwrecks, and at this time objects of great value and foreign origin, laces, jewelry, etc., were seen in the cabins of certain Nova-Scotian fishermen, and ugly tales were told about wreck-

¹ Patterson, George: Sable Island. Trans. Roy. Soc. Can. xii. § 2, 11-12 (1894).

² Murdoch, Beamish: Hist. of Nova-Scotia, ii. 526 (1866).

³ Essex Journal and New Hampshire Packet (1788); and Boston Herald and Journal, December 28 (1917).

⁴ Murdoch, l. c. iii. 78 (1867); and Nova Scotia Gazette, February 10 (1789).

ers and pirates preying on any unfortunates cast upon the island. So notorious was this condition, that at the instance of Sir John Wentworth an act was passed in 1801 for the protection of shipwrecked property; and unauthorized persons were forbidden to dwell on Sable Island, and were forcibly removed.

The captain and the crew of one of the vessels cast away at this time were forced to stay on Sable Island through the winter. It became the Captain's custom after each storm to examine the part of the island most affected by it. In doing this he counted over 40 wrecks, which had been uncovered, not one of which was visible before.

FIRST HUMANE ESTABLISHMENT, 1801.

On the 25th of June, 1801, the House of Assembly of Nova Scotia authorized the settling of three families on Sable Island and voted £600 to defray the expenses. James Morris was appointed the first Superintendent, and on the 13th of October, he with his family and assistants was landed on the island. The object was to save the lives and the property of people shipwrecked on the island. Three years later, by an official report, we learn that from five wrecks, Supt. Morris and his staff were responsible for saving the lives of 41 persons and £2,300 worth of property.

Between 1801 and 1913, there have been 176 known wrecks on the Island, and it is estimated from bits of wreckage that at least as many "missing ships" have struck and gone down with all hands on the more distant parts of the bars. The Northwest Bar extends 11 miles beyond the West End of the island and the Northeast Bar 16 miles beyond the East End, so that in time of storms the island and its bars form a line of breakers and shoals nearly 50 miles long that bodes ill for any mariner who attempts to cross.

During the War of 1812, President Madison issued strict orders that "the public and private armed vessels of the United States are not to interrupt any British unarmed vessels bound to Sable Island, and laden with supplies for the humane establishment at that place."¹

The establishment has continued to the present day, supported at first by the government of Nova Scotia, then by Nova Scotia and Great Britain jointly, and now by Canada and Great Britain. In 1913, it consisted of five Life Saving Stations and two lighthouses, with a staff of twenty-one men, and a Marconi Station with five men, the

¹ Niles' Weekly Register, iii. 191 (1812).

total population including the families being about sixty persons. In the records of this establishment we have continuous detailed information as to the conditions on Sable Island.

DIMINISHING SIZE OF SABLE ISLAND.

We find Sable Island represented on the early charts of the coast of North America such as that by Reinel, in 1505, by Rotz in 1542, by Joannes Freire in 1546, by Vaz Dourado in 1573, and by that of Hakluyt in 1598-1600. It also appears on the small-scale maps by Philippe Buache in 1736, and that by Bellin in 1757.

In 1766 and 1767, Joseph Frederick Wallet Des Barres made a survey of Sable Island, published¹ in 1777 and 1779. It is drawn on two different scales, the larger about one-half a mile to the inch. He gives several hundred soundings near the island and locates it between 60° 01' and 60° 32' W. Long. The island itself is shown as a long flat crescent, in shape much as it is to-day, and 30 miles long by 2 miles broad. The second highest hill is 146 feet above sea level. The center of the island is shown with an inland lake 12 feet in depth, with an opening to the sea on the north side. Almost continuous ridges of dunes shelter this lake on both the north and the south sides. Des Barres says, "The whole island is composed of fine white sand, much coarser than any of the soundings about it, and inter-mixed with small transparent stones. Its face is very broken, and hove up in little hills, knobs and cliffs, wildly heaped together, within which are hollows and ponds of fresh water, * * *. The *Ram's Head* is the highest hill on this island; it has a steep cliff on the north west and falls gently to the south east. The *Naked Sand Hills* are one hundred and forty-six feet of perpendicular height above the level of high-water mark, * * * * Gratia Hill is a knob at the top of a cliff the height of which is one hundred and twenty-six feet * * *."²

Of this same period is a chart by Capt. John Montresor: Map of Nova Scotia or Acadia; with the Islands of Cape Breton and St. John's, from Actual Surveys, by Capt. Montresor, 1768. The scale is about 6 miles to the inch. Sable Island is shown as $30\frac{2}{3}$ miles in length by 2 miles in breadth. The salt lake has an opening at its western end through the South Beach. The dunes extend half-way

¹ Atlantic Neptune, i (1777 and 1779).

² Des Barres, l. c. 68.

down the South Beach, but the remainder is shown as a mere sand flat. There is no detail as to the fresh-water ponds or the individual dunes.

Another British Admiralty chart of Sable Island, dated 1770, appeared as Chart 8 in Robert Sayer's North American Pilot of 1779. These charts were drawn from original surveys by James Cook, Michael Lane, Surveyors, Joseph Gilbert, and other officers in the King's Service, and they were engraved by Thomas Jeffreys, and printed by R. Sayer and J. Bennett. Although this Sayer chart was, like the Des Barres chart, an official British Admiralty chart and was published in a volume of the same year as the second issue of the Des Barres chart, and although there is no indication of the identity of the surveyor of the Sayer chart, yet the two charts were undoubtedly based on two distinct and independent surveys. The Sayer chart is on the scale about 3 miles to the inch. The outline of the island is the same flat crescent, like that shown by Des Barres, and the length is "about 30 Miles, in Breadth across the Pond, Meadow and upland a Mile;" but the details are quite different. There is no indication of the height of the sand dunes, and the local place-names differ. The opening from the salt lake through the North Ridge has been drifted over and appears as a sand flat, marked, "The Place to Dig for a Harbour." Instead there is an opening through the South Beach at the western end of the salt lake. The South Beach is shown with a line of dunes running for six miles from the east end, then for the rest of its length it is shown as a mere sand flat with a few remnants of dunes. This chart lacks the detail of the location of the fresh-water ponds and the numerous ridges of dunes such as appears on the Des Barres chart.

Superintendent James Morris, in 1801, estimated one hill at the east end to be 200 feet high and others to be 150 feet high.

Lieut. Burton, in 1808, made a survey of the island when it was proposed to place a lighthouse there. He reported the island to be 30 miles in length and 2 miles in breadth, with hills from 150 to 200 feet, beginning at the west end, and attaining their greatest elevation at Mount Knight, its eastern extremity.

When, in 1802, the position for the main station was chosen, it was one remarkably sheltered among the sand hills, 5 miles from the West End.

"In 1814 the Superintendent, Mr. Hudson, wrote the Government, that owing to the rapid manner in which the island was being washed

away it would be necessary for him to remove the establishment to a more secure position; that within 4 years previous, 4 miles had gone entirely from the west end, leaving but a mile between him and the sea which was advancing steadily. On the north side an area equal to 4,0 ft. wide and 3 miles long had gone bodily from the island during a single night. He intended to move the buildings to a place called 'Middle Houses', 3 miles further east.

"In 1820 the Superintendent again wrote the Government, that not only had the old site of the main station gone seaward; but the sea was again encroaching to such an alarming extent that he would be obliged to once more remove the station, and had selected a place known as the 'Haul over,' 4 miles further east. Here it enjoyed a short respite when again the sea threatened its foundation. * * * again the sea advanced, the two following winters were noted for the frequency of storms, and the havoc made along the sand cliffs, every gale sensibly diminishing the western portion of the island, toppling great masses of sand hills into the surf below as well as changing the surface of the interior. One instance * * * when thousands of tons of sand were carried from the beach and strewn over the island, smothering vegetation, so that hundreds of horses died for want of food."¹

It has been argued by J. B. Gilpin², and following him by Prof. John Macoun³, that the action of the wind is here always constructive, that it takes the sand from the dry upper beach, moves it inland and builds it up into the dunes, but that it does not act as a waster. It does build up, of course, but on the lee side it is also picking up the sand grains and carrying them out over the sea, where at the slightest lull they drop into the water, and are lost, as far as Sable Island is concerned. That the wind is constantly shifting the sand in whatever direction the wind happens to blow, is forcibly brought to the attention of anyone who ventures out of doors in a strong wind. If the wind is blowing 20 miles an hour or more, it picks up so much sand that it acts like a veritable sand-blast. In consequence all the lights of glass in the windows become quickly dulled and soon so abraded that they are no longer transparent but only translucent. Any traveller feels it and is forced to shield his eyes, face, and hands from its severe action.

¹ Macdonald, S. D.: Trans. N. S. Inst. Nat. Sci. vi. part 2, 113 (1884).

² Gilpin, J. B.: Sable Island, 19 (1858).

³ Ann. Rep. Geol. Surv. Can. n. s. xii. 213A (1899).

As stated, this shifting of the sand often completely buries the vegetation of considerable areas. This is indicated by the layers of dark peat usually less than an inch in thickness that may be seen in vertical sections of the dunes such as are often exposed when the wind opens a new gulch. In 1913, two of the Life Saving Stations, no. 2 and no. 4, were seriously threatened with being buried by the shifting sand. Both were situated near and in the lee of the North Ridge, the high and nearly continuous line of grass-covered dunes that skirts the crest of the North Beach. In each case the wind had made a break and opened a gulch in the North Ridge opposite the stations. Every north wind enlarged the two gulches and piled the sand, tons of it, around the two stations. The necessity of moving these stations was seriously being considered.

The old main station-house was again moved, two miles farther east. When the sea later undermined the new foundation, it took the old house too.

A chart of Sable Island by Capt. Joseph Darby was published in 1824 and revised in 1829. It is on the scale of 3 miles to the inch. The island is shown as $25 \frac{1}{3}$ miles long, and the South Beach is shown with an almost continuous line of dunes. Wallace Lake appears 15 miles in length, and with the dunes extending 2 miles beyond its western end.

Capt. Darby reports in Blunt's Coast Pilot of 1832, "I have known this island for 28 years, during which time the west end has decreased in length 7 miles, although the outer breakers of the N. W. bar have the same bearings from the west end of the Island as they formerly had, demonstrating that the whole bank and bar are travelling eastward."

Mr. Miller, in 1833, selected a site for a lighthouse, but in 1837, on revisiting it, he found that it had undergone a complete change and he was forced to recommend a temporary site and a lighthouse such as could be easily removed.

A severe gale in 1842, completely demolished an old landmark, a pyramidal hill near the west-end station said to be 100 feet in height. Under this were found relics left by Maj. Elliott and men of the 43d Regiment, wrecked here in 1761.

The Hon. Joseph Howe visited the island as Commissioner in 1851. In his report is the startling statement that during 30 years, 11 miles by actual measurement of the western end had been washed away.

At this time, 1851, Capt. H. W. Bayfield¹ made another survey of Sable Island and the bank about it. He determined the position of the East and West Ends as $59^{\circ} 45' 59''$ W. long., and $60^{\circ} 8' 57''$ W. long. "The east extreme of the sand hills alone remains unchanged for comparison with the observations of Admiral Ogle's officers [in 1828], and it is satisfactory to find, that there was not only no reason to find fault with their determination, but that their latitude and also the meridian distance from Halifax is the same as ours, within two or three seconds of space. About two miles of the west end of the Island have been washed away since they observed in 1828, and this reduction of the Island, and consequent addition to the western bar is reported to have been in operation at least since 1811, and seems almost certain to continue. A comparison some years hence with the present survey, can alone show precisely the amount of waste in any given time, the correctness or otherwise of the reported shifting of the bars, and of the opinion that the Island is insensibly becoming narrower, &c. All agree that there has been no material change in the east end of the Island within the memory of anyone acquainted with it, * * *."

For the next twenty years the island enjoyed a period of comparative stability and calm.

The winter of 1881-82, was marked by a succession of severe gales in which great erosion took place. The winds wasted from the surface of the dunes and the waves chopped off whole sections from the end of the island. During one gale an area of 70 feet by one-quarter mile vanished, as a month later in a few hours did 33 feet of the whole breadth of the island. Early in February occurred another violent gale, this time coincident with a high run of tides. The sea had worn away the embankment of dunes to within forty feet of a bluff on which stood the light-keeper's barn. All hands stood by. The cattle were removed to the porch of the lighthouse. As the staff were watching the force of the waves that were undermining the embankment, suddenly they saw a depression in the margin of the cliff, and the next instant an area equal to 48 feet wide and one-quarter mile long vanished into the breakers on the north side. During the night the forty feet in front of the barn vanished, and the next morning the barn itself went crashing down into the waves.

¹ Bayfield, Capt. H. W.: Append. to Journ. of House of Assembly, Prov. of N. S. no. 24, 167-168 (1851).

The sea was now within 12 feet of the West Lighthouse, a splendid tower built in 1873 at a cost of \$40,000. During two days of unusually quiet weather, a heavy ground-swell set in from the south-east undermining the embankment till the lighthouse canted over dangerously. Before the crash the apparatus was removed. Later it was installed about a mile further east. The sea continued to advance and in 1888 the light was again removed, two miles farther east.

From this time, another period of comparative stability started. It will be seen that such has been the regular course of events: during a few years every storm causes violent destruction of a part of the island, then follows a period of 10, 20, or 40 years of quiet. This is probably to be explained by the protecting action of the sand washed from the island and deposited on the surrounding bars during the years of active erosion. The building-up of these bars makes a protecting ring upon which the waves break their fury before reaching the island. When these bars have been worn down the waves can again vigorously attack the island, and another period of destruction ensues.

We have no more recent survey, but only the observations of those stationed on the island, which tell us that it is now twenty miles long, less than one mile broad, and its highest point, Rigging Hill, nearly 100 feet high.

CHANGES IN WALLACE LAKE.

The physical changes in Sable Island are also evidenced in Wallace Lake, the great salt-water pond that occupies the center of the island for over half its length.

Le Mercier gives us our first good account¹ of this lake, in the year 1753. "Within these seven or eight Years, Providence hath opened a Communication between the great Pond (fifteen Miles long) and the Sea, which hath made a safe and large Harbour; but the Entrance is barred so that large and sharp Vessels cannot get into it; but as there is about 8 Feet of Water over the Bar at high Water there is sufficient Passage (as we know by Experience) for Vessels of 30 Tuns or more, if not built Sharp."

On Des Barres' chart from the survey of 1766 and 1767 the lake is shown very much as at present, but with a broad opening to the sea through the dunes on the north side, with soundings in its center of

¹ Boston Weekly News Letter, February 8 (1753).

12 feet, and with a total length of 12 miles. Beyond its western end the sand dunes stretched continuously for about 5 miles. The South Beach was half a mile in width and had an almost continuous line of dunes 50 feet in height. In 1808, Superintendent James Morris writes of this channel, "It is completely shut, and it is difficult to trace where it has been." In 1828, Superintendent Edward Hodgson refers to this obliterated channel, urging that it be reopened. Some years afterward a terrific storm made a breach in the South Beach, again opening the salt pond to the sea, and making it available as a harbor for small vessels. In 1836, during a severe storm two American fishermen ran into this protected harbor for shelter, but the storm completely blocked up the channel, imprisoning the vessels, whose weathered timbers now lie on the shores of Wallace Lake. One of the gales in the winter of 1881 opened a gulch toward the eastern end, which so drained the lake as to reduce it to 8 miles in length, and rendered it so shallow as to be no longer useful in transporting materials from one Life Saving Station to another. This gulch is now closed, and all the dunes beyond the western end of the lake have been washed away, only a narrow beach now separating the lake at this point from the sea. The waves have eaten off almost all of the South Beach, all of the line of dunes is gone except a small remnant near the eastern end, and the beach itself is so narrow now, that waves break over it in heavy weather. It is no longer possible to maintain a Life Saving Station on this South Beach. There is usually an opening, now through one or another part of the narrow South Beach. The wind has drifted sand across and filled up a strip, a mile wide in 1913, dividing Wallace Lake into two unequal parts.

If we look back over this evidence and draw a contrast, it is a very striking one, for from various surveys of 1766-67, 1768, 1770, and 1801, the island was about 30 miles long, 1 to 2 miles broad, with hills 150 to 200 feet high; whereas now it is but 20 miles long, hardly 1 mile broad, and the highest hill does not even attain 100 feet.

If the determination of the location of the island in the earlier surveys was correct, the whole island has been moving slowly eastward. The prevailing winds are westerly; the western end of the island is the lower and has suffered all of the severe erosion by wind and storm; and the eastern end is broader, with higher hills, and more drifting unanchored sand. As the bare undercut western side of the cross-ridges of dunes testifies the prevailing westerly winds are the dom-

inant eroding factor on the surface of the island, so that it is quite possible that the whole island is, under the compulsion of these westerly winds, slowly creeping eastward along the summit of the Sable Island Bank.

In any case, the island is rapidly wasting away. Three hundred years from now Sable Island, in all probability, will have vanished, and then there will be no lighthouse to warn the mariners of those times from the treacherous bars on the summit of the Sable Island Bank. The study of its fauna and flora will then be ancient history, only to be pursued by consulting the few specimens in the larger museums and herbaria.

THE ENDEMIC FRESH-WATER SPONGE.

An endemic species of fresh-water sponge, *Heteromeyenia macounii* Mac Kay¹ has been described from Sable Island. "This sponge was collected in considerable abundance on the 18th of August, 1899, by Professor John Macoun, Botanist of the Geological Survey of Canada, in the fresh water pond found in the center of that great sand-shoal in the Atlantic Ocean, well known as Sable Island, nearly one hundred miles from Nova Scotia, the nearest part of the continent. It was growing around the submerged portion of the slender stems of *Myriophyllum tenellum*, Bigelow, in green, compact, lobular masses, showing, where broken, numerous orange yellow gemmules.

"It appears to approach most nearly to the following fresh water sponges described by Potts: *Heteromeyenia ryderi v. baleni*, found from Florida to New Jersey, in its spiculation; and *Heteromeyenia ryderi v. walshii*, from Gilder Pond, Massachusetts, in the fasciculation of its skeleton spicules." Gilder Pond is at 1,800 feet altitude on the side of Mt. Everett, Mount Washington, Berkshire County, Massachusetts.²

IPSWICH SPARROW.

The Ipswich Sparrow, first discovered in 1868 by C. J. Maynard among the sand dunes at Ipswich, has constantly been a source of interest to ornithologists. Repeated observations along the Atlantic seacoast proved it to be a regular migrant starting south from Nova Scotia in September, stopping at the bleak wind-swept areas of sand dunes on its journey to Maine, Virginia or sometimes to Georgia.

¹ Mac Kay, A. H.: Fresh Water Sponge from Sable Island. Trans. N. S. Inst. Sci. x. 319-322 (1900).

² Proc. Acad. Nat. Sci. Philadelphia, 231 (1887).

In the early spring this shy, quiet bird follows the coast northward to its nesting grounds. In 1884, Robert Ridgway¹ suggested that a series of eggs from Sable Island, collected by J. P. Dodd in July, 1862, might in reality be those of the Ipswich Sparrow.

Immediately Dr. C. Hart Merriam² wrote to Rev. W. A. Des Brisay, a resident missionary at Sable Island, and obtained a specimen of the common "Gray Bird" of the Island. The fact that this proved to be an Ipswich Sparrow added another link to the chain of accumulating evidence. It remained for Dr. Jonathan Dwight, Jr., however, actually to determine the breeding-haunts of this large pale-colored sparrow. In 1894, Dr. Dwight visited Sable Island, remaining there from the 28th of May till the 14th of June. During that time he found the Ipswich Sparrow breeding there; he studied its song, its habits; he collected sets of eggs and the cleverly hidden nests; and he learned that some of these "Gray Birds" as they are called by the Life Savers on Sable Island, are all the year residents, though most of them migrate southward in the fall.

Persistent search on the mainland of Nova Scotia, on Cape Breton, on Prince Edward Island, and among the sand hills of the Magdalen Islands has failed to reveal or even hint that the Ipswich Sparrow ever breeds anywhere except on Sable Island.

The bird is so small and so retiring that it has never attracted the notice of the fishermen, hunters, and desperadoes, who for centuries, just how many no one can say, have frequented the island and brought persecution or destruction to one or another kind of animal life. Although neither man nor other living enemies disturb the bird, it does seem seriously threatened by other factors.

Since all of the individuals of this species breed on Sable Island, is there a definite maximum of breeding pairs that can be supported? Of course this must be answered in the affirmative, and on a bleak, sterile island of about fifteen square miles in area, this maximum number cannot be very large and it must now be smaller than in the past when Sable Island was much larger in size. But what of the future, when more and more of the island disappears in the waves, till finally it ceases to exist? Will the Ipswich Sparrow seek a new breeding-ground, or is it a species grown so conservative that it cannot make the change, and will vanish with its island home? The writer makes

¹ Auk, i. 292 (1884).

² Auk, i. 390 (1884).

no attempt to answer these questions that he has posed, but leaves them for the reader, or to the observers of future generations.

NATIVE AND INTRODUCED ANIMALS.

Most of the early voyagers were drawn to Sable Island because of the animal life, natural or introduced, that existed there. The Portuguese fishermen, about 1520, placed cattle on the island, where they persisted and multiplied greatly.

Johannes de Laet, in 1633, mentions the cattle and swine, as well as seals and black foxes.

The convicts abandoned by Marquis de la Roche in 1598, lived on the cattle and clothed themselves in the skins of the seals.

John Rose of Boston, when shipwrecked on Sable Island in 1633, saw, "about 800 cattle, small and great all red, and the largest he ever saw, and many foxes whereof some perfect black." In the years that followed many parties sailed from Boston to the island to hunt the wild cattle, black fox, and the walrus.

The cattle must have been killed off in the mean time for Andrew Le Mercier says, "When I took Possession of the Island [1738] there was no four-footed creatures upon it, but a few foxes some red and some black (some of which remain to this day) [1753]." From his time on there are frequent mentions of wild horses or ponies on the island, but these we consider elsewhere.

In 1801, with the outfit of the Humane Establishment, there were introduced on the island 1 three-year old bull, 2 young cows in calf, 1 young boar, 2 young sows, 1 male and 1 female goat, 2 rams, 8 ewes, and 1 horse. Superintendent Morris, in 1802, referred to the wild horses, "the only animals found on the island, if we except the rats and mice, which at one time became very troublesome." Of the animals introduced, it was found that the sheep did not thrive, all dying except two pet lambs brought up in the house. Several later attempts were made to maintain them on the island, but though done with care, all were unsuccessful. "The animals seemed to thrive, but one after another would be found dead, though quite fat. The officers in charge of the admiralty survey reported that they found a plant which was fatal to sheep."¹ It has not been possible to determine who made this report, nor to what species it alludes.

The hogs ran wild and soon became quite fierce. They were all destroyed in 1814 because of their ghoulish tastes when shipwrecks occurred.

¹ Patterson, George: Trans. Roy. Soc. Can. xii. § 2, 20 (1894).

English rabbits were introduced, and they multiplied so that they formed an abundant source of food. Then rats escaping from wrecked vessels reached the island and became so numerous as to be a plague, eating up so much of the stores that Superintendent Morris and his men were seriously threatened with starvation. Then the rats by killing the young, nearly annihilated the stock of rabbits. The government sent out a number of cats, which killed the rats, and then finished the rabbits. The cats soon became very wild and so numerous as to be troublesome. Dogs were then imported, and they, helped by men with shot-guns, finished the cats. Rabbits were again introduced and thrived, until they were discovered by a snowy owl. The owls soon came in numbers to this happy hunting-ground, and they finished the rabbits. In 1882, rabbits were again introduced, and the story is almost parallel with the foregoing. They multiplied and became such a nuisance that in 1889, seven cats were brought from Halifax, and in 1890, thirty more. While the cats were wintering and fattening on the rabbits, seven red foxes were brought from the mainland and in a single season they made an end of all the rabbits and cats. These records show in a very graphic way what happens when an additional species of animal is introduced on a small island, what a severe struggle for existence takes place between it and the species already there.

SABLE ISLAND PONIES.

From nearly every recent voyager to Sable Island, we get accounts of more or less fullness about the wild ponies, but we must turn to J. Bernard Gilpin¹ for the best record. He assumes that the present gangs of Sable Island ponies are the descendants of a few horses of ordinary New England stock landed there by the Rev. Andrew Le Mercier about one hundred and fifty years before [1714]. This approximate date is earlier than Le Mercier's actual connection with the island, for² "on the 6th of March, 1738, he wrote to Governor Armstrong [of Nova Scotia], inclosing a petition for a grant of it, on behalf of himself and his associates. His design was stated as being to stock it with such domestic animals as might be useful in preserving the lives of mariners who might escape from shipwrecks; though,

¹ Gilpin, J. Bernard: On Introduced Species of Nova Scotia. *Trans N. S. Inst. Nat. Sci.* i. part 2. 60 (1864).

² Patterson, George: Sable Island: Its History and Phenomena. *Trans. Roy. Soc. Can.* xii. § 2. 11 (1894).

from the suitableness of much of the soil for grazing and the opportunities afforded for seal hunting, they no doubt hoped to combine profit with benevolence. The petition was approved, but the grant does not seem to have actually passed. He was unwilling to pay the penny an acre quit rent demanded by the instructions of his majesty's government. * * * in the mean time Mr. M. sent a stock of cattle to the island, preparatory to removing his family thither.

"In 1740 he again applies for a grant of the island, but represents that as the land is, 'low, boggy and sandy soil, with large ponds or settling of water occasioned by the overflowing of the tides, he thinks the penny an acre, too much for what cannot be improved.' On the 16th August Governor Mascarene writes to the board of trade that it would be to the advantage of the public to encourage the settlement, by affording relief to the ship-wrecked, and profitable to the proprietors by grazing, fishing, and killing seals for their oil skins. Le Mercier does not even then seem to have received his grant, but he continued to have cattle on the island for some years, and also some settlers, and through his efforts many lives were saved. But he complains that evil-disposed fishermen stole his cattle and goods, and in 1744 we find him advertising in Boston papers a reward of £40 for the discovery of the depredators."

In 1753, Le Mercier¹ writes, "When I took Possession of the Island there was no four-footed Creatures upon it, but a few foxes some red and some black (some of which remain to this Day) now there are I suppose about 90 Sheep, between 20 or 30 Horses including Colts, Stallions and breeding Mares, about 30 or 40 Cows tame and Wild, and 40 Hogs."

It is said that about this time Le Mercier, failing to find a purchaser, abandoned his interests on Sable Island. Even though we cannot substantiate this, we can demonstrate that horses were placed on Sable Island by Thomas Hancock.

About 1760, according to Lieutenant-Governor Sir John Wentworth,² Thomas Hancock, a Boston merchant, desiring to relieve the suffering of those that chanced to be shipwrecked on Sable Island, fitted out a schooner and upon her embarked "Horses, Cows, Sheep, Goats, Hogs and Animals likely to live on the Island. These were landed there and generally answered very well. No great deprivations were made on them till the commencement of the American

¹ Boston Weekly News-Letter, February 8 (1753).

² Rept. on Canadian Archives, 86 (1895).

War, during the course of which, privateersmen, and lawless persons of every description frequently landed on the island, and by the close of the War none of the Animals remained except a number of Horses. These Horses have been the means of affording food to many unfortunate persons who have since been thrown on the Island. * * * Many of them have been wantonly shot by persons wintering on the island for the purpose of wrecking. By such means as these, the greater part of the horses have been destroyed, and unless some remedy is found, this last hope of the unfortunate Mariner, will be entirely cut off."

Thus it is certain that horses of New England stock were left on Sable Island in 1753, or at least in 1760, and that Gilpin's assumption that these were the parent stock of the present-day Sable Island ponies is quite justified.

Gilpin describes them as he found them, "about four hundred in number, divided into about six herds, or gangs (so called), each gang headed by an old male, who was sufficiently conspicuous by his masses of mane and tail. Each herd had its separate feeding ground, to which the individuals composing it seemed to be equally attached, as to their leader. On driving over the Island, and mixing all herds, promiscuously, as we once did, by the next morning they had returned to their separate feeding grounds, some of them travelling ten or twelve miles during the night. On riding towards them the herd was seen grazing at the distance of a mile, with several outlying parties. The leader was observed repeatedly to drive these outlying mares and young horses into the general herd, who all now began a general retreat at a slow trot, with the exception of the old stallion, who faced the approaching party, passing backwards and forwards, frequently stopping and tossing back the mane from his eyes. The resemblance to a convoy crowding all sail to leeward, and a frigate in stays awaiting the enemy, was perfect. On pressing him, however, with our riding horses, he joined his herd now in a gallop, but keeping always in the rear. His instinct taught him the unequal match with man, but the air of leadership was unmistakable. They often fight among themselves, one stallion visiting the herd of a second. I saw a horse nearly disabled in one of these encounters. The young horses, between two and three years old, are driven out of the herd by the leader. I watched one, hour after hour, driving a young grey colt with the most furious bites, to a distance. The young horses live in small bands on the outskirts of the herd, and sometimes an old or disabled

mare, unable to keep up, drops behind; she is an object of the greatest attraction to them, soon produces foals, and thus a nucleus of a new herd is formed.

"I never saw one lying down to rest. They seem to sleep standing. They persistingly refuse the shelter of a stable, or the society of man, always moving from him. In the roughest weather escaping from the stable they would put a mile or two between them and it, before they stopped to graze; in this respect differing widely from the semi-wild cattle, which besieged the barn doors with their lowing during the winter. * * *

"To sum up then what we read from this narrow page in natural history, opened to our view, and in which my sole assumption is their origin from two or three individuals, we find that, left to themselves, following the laws of natural selection, their descendants in one hundred and fifty years, have returned to the habits and manners of the tarpany, or only stock of wild horses now existing in the world. That, in regard to their form they differ in some respects from the tarpany, though agreeing with them in size, hairy head, and thick coat: but, although differing from these, they have wonderfully reproduced forms, of whose existence we only know from the sculptures of Nineveh and the friezes of the Parthenon, where we find the low stature contrasted by the tall rider, the abundant tail and mane either cropped or tied and plaited, to prevent its encumbering the rider, the hairy jowl and horizontal head, and the short and cock-thrappled neck, and in some figures the short croup and low tail. * * *

"As regards colour we find that the original stock carried with them the germ of all colours known from ages, not only the bays and browns which we consider the natural colours, but the more startling varieties of pure white, and piebald,—piebalds known from ages, on old China coin, upon the ancient Thracian hills, from whose back Attila ravished worlds, and the mark of whose foot, it was his boast, that neither nature nor man could efface. We find, too, the chestnuts prevailing with their extremities coloured like their bodies, their tails and manes growing ever lighter, and a tendency to a dark streak on the back and withers; lastly, the blue greys or mouse or tans, with the same dark streak. Here, too, there is nothing new; the ancient Assyrian dun, and the Phrygian cerulean breeds of the time of Homer, are all prototypes, though the latter is scarcely known among our domestic breeds."

At various times the government authorities concerned with Sable Island have tried to improve the breed of the ponies. "A few unsuccessful experiments¹ have been tried, and the tame horses being let loose, have been killed by the wild ones." Howe recommends, in conclusion, the introduction of blooded stallions. This, too, has been tried, without results. To one familiar with the history of the Sable Island ponies, this failure is not surprising, for the newly introduced horses are set loose and allowed to breed freely with the wild ponies. No artificial selection is exercised, and as these new horses and their offspring exist under the same living conditions that wrought the horses from New England into Sable Island ponies, they, or rather their offspring, become Sable Island ponies, and no "improvement in the breed" is realized.

EARLY BOTANICAL RECORDS.

The botanical history of Sable Island is not very extensive but it begins with a record of extraordinary interest.

Johannes de Laet in the third, which is a Latin edition of his work mentions² in his account of Sable Island, or Insula de Sable as he calls it, "fruticeta multa, paucissimae arbores, humus fere nuda aut leviter herbida;" When translated this is; "there are many thickets of shrubs, very few trees, the soil is almost bare or lightly clothed with vegetation." To the present state of the island these statements are all applicable, the sand dunes are bare, or lightly clothed with vegetation, there are thickets of shrubs formed mostly of *Rosa virginiana* Mill., but also of *Myrica carolinensis* Mill., *Ilex verticillata* (L.) Gray, *Viburnum cassinoides* L., and *Rubus arcuans* Fernald & St. John, but at present there are no native trees of any sort. This clause which is quoted and translated from de Laet does not occur in the first and second editions of his work, which are in Dutch. It is added to the end of the paragraph devoted to Sable Island in the third or Latin edition, and it appears with similar wording in the fourth or French edition. Johannes de Laet was born in Antwerp in 1585 and died in Amsterdam in 1649. He had direct connections with the new world, being a "patroon" of Rensselaerswyck (now Albany, N. Y.) where his daughter and son-in-law had settled, and he was also a director of the Dutch West India Company. This official connection would

¹ Howe, Joseph: Append. to Journ. of House of Assembly Prov. N. S. 162 (1851).

² Laet, Johannes de: *Novus Orbis seu Descript. Indiae Occ.* ed. 3, 37 (1633).

give him access to the records of the Company and it is probably in this way that de Laet gained his information about Sable Island.

He relates the early history of the island, the attempt to found a colony there by Baron de Lery, of the stocking of the island with cattle and pigs, the incident of Marquis de la Roche and the convicts whom he abandoned on the island, describes the series of deeps and shallows, that is the bars which surround the island, and the consequent difficulty in making a landing, and he cautions, "nor in my opinion is it reasonably worth while (neque sane, ut opinor, mereatur)." The absolute accuracy of these other statements about Sable Island by de Laet confirms the value of his statement that at 1633, the time of his writing, or a few years before, there were a very few trees on the island. The botanists of his time were still classifying plants on the basis of their habit, whether herbaceous, shrubby, or arborescent, so there is no reason for thinking that he did not know a tree from a shrub. Comparable regions on the mainland, such as Cape Cod or Plum Island, Massachusetts, have even in many exposed parts, clumps of trees in the hollows between the dunes. Of course, as far back as 1633, Sable Island was much larger than it is at present, and its sand hills much higher, so there would have been more sheltered spots in which trees could grow. Taken all in all, every bit of evidence seems to indicate that de Laet's statement can be accepted at face value, that in 1633, or shortly before then, there were a few native trees growing on Sable Island.

From Gov. John Winthrop's Journal¹ we learn that, in 1633, a certain John Rose was wrecked in the *Mary and Jane* on Sable Island. From the timbers of his wrecked vessel he managed to construct a small pinnace in which he made his way to Acadia. There he was detained a prisoner by the French, and forced to pilot them back to Sable Island in their search for walrus and cattle. Finally, being set free, Rose returned to Boston. He reported great numbers of cattle and foxes and, "There is no wood upon it, but store of wild peas and flags by the ponds, and grass."

In 1753, Andrew Le Mercier published² the next notice of Sable Island that contains any reference to its natural history. "It produces naturally near 20 sorts of Berries, out of which some People suppose very good Liquors and Wines might be expressed—It looks

¹ Winthrop, John: The History of New England from 1630 to 1649, edited by James Savage, i. 162 (1825).

² Boston Weekly News Letter, Feb. 8 (1753.)

all green in Winter with the Juniper Bushes and red in Summer with the large Strawberries and other wild Fruits which it bears.—It hath abundance of wild or Beach Pease, which fatten the Cattle very well.

* * * There is neither Trees (but many Bushes) nor Stones.—The Grass is tall, thick and hath a very sweet taste and nourishing Property; there is some English Grass, but the other is more profitable, and there is enough to feed some thousand Heads of Cattle."

All of the native plants mentioned by Le Mercier, juniper bushes, strawberries (though they hardly color the ground red), and beach pease, grow there to-day.

With reference to the quotation from de Laet given above, it will be noticed that Le Mercier says, "There is neither Trees (but many Bushes) nor Stones" and that John Rose reported "no wood upon it" in 1633, so by the year 1753 any trees which had formerly existed on Sable Island had, in all probability disappeared.

Joseph Frederick Wallet Des Barres made a survey of Sable Island in 1766 and 1767 in compliance with orders from the British Admiralty. In his page and a half of "Remarks on the Isle of Sable,"¹ we find, "The whole island is composed of fine white sand, much coarser than any of the soundings about it, and intermixed with small transparent stones. Its face is very broken, and hove up in little hills, knobs and cliffs, wildly heaped together, within which are hollows and ponds of fresh water, the skirts of which abound with cranberries the whole year, and with blueberries &c. in their season, as also with ducks, snipes, and other birds. This sandy island affords a great plenty of beach grass, wild pease, and other herbages, for the support of the horses, cows, hogs, &c. which are running wild upon it. It grows no trees but abundance of wreck and drift wood may be picked up along shore for fuel."

Seth Coleman reported² to Lieutenant-Governor Sir John Wentworth on conditions at Sable Island as he found them June 24th, 1801, saying, "The soil in general is nearly the same excepting upon the upland, which is principally of a nature to produce Beach Grass intermixed with the wild Pea, and round the Edge of the Pond, there is a finer kind of grass, but much of the same quality, and I discovered some small spots of English Grass, and on the boarders of the Pond Vegetables might be raised, if enclosed for Gardens, * * * and

¹ Des Barres, Joseph Frederick Wallet: *The Isle of Sable, Survey'd in 1766 and 1767. Atlantic Neptune, i. 68 (1777).*

² Rept. on Canadian Archives, 91 (1895).

I have no doubt but Indian Corn might be produced, but not in large quantities."

In 1850, Joseph Howe visited Sable Island, and reported¹, "I was agreeably surprised to find it covered, for nearly its whole length of five and twenty miles, with natural grass and wild peas, and sustaining by its spontaneous production, five hundred head of wild horses, and ten or twelve head of cattle.

"Cranberries of large size, and fine flavour, grow in abundance on Sable Island. A few barrels of these are generally picked in the autumn, but the cranberry, as a source of income, or a means of employment, has scarcely ever been thought of by our people."

An anonymous writer² says, "It was in the year 1851, when employed as one of the assistants in the Admiralty Survey of the Gulf of St. Lawrence, that orders were unexpectedly received to proceed to Sable Island, and report upon the erection of a lighthouse. * * * The amount and variety of vegetation on this gigantic sand bar is extraordinary. Besides several kinds of grass, there are wild peas, and other plants, affording subsistence to between 400 and 500 wild horses, and an innumerable colony of rats and rabbits, as well as the domestic cattle kept for the use of the establishment. * * * In the neighbourhood of the chief residence, where white clover and other grasses have been sown, so luxuriant is the yield that over 100 tons of hay are made annually. There are several edible berries, the strawberry in the richest profusion covering the ground upon which we rode, with none to gather them. Cranberries abound."

In 1858, J. B. Gilpin published³ a charming little book on Sable Island in which he devotes one paragraph to its botanical features:

"A Botanist would give a scientific list of thirty or forty varieties of shrubs and plants. Trees there are none, and the usual shrubs are dwarfed to a few inches; a little ground juniper and low with-wood would not afford a riding-cane. Tall coarse grasses cover the surface of the ground, alternating with sandy barrens and snowy peaks of blown sand. The wild rose, blue lily, and wild pea enamel the valleys. Strawberries, blueberries and cranberries are in abundance. They are measured by bucket-fulls; and as Autumn heats yellow the

¹ Howe, Joseph: Appendix to Journ. of House of Assembly, Prov. of N. S. no. 24, 161-164 (1851).

² The Leisure Hour, xxx. 432-433 (1881).

³ Gilpin, J. Bernard: Sable Island, Its Past History, Present Appearance, Natural History etc. 18-19 (1858).

luxuriant green, the tall, mallow, gay golden rods and wild China-asters are swept by the heaving gales."

Joseph Charles Taché, in 1885¹, published a book which in so far as it refers to Sable Island is very little but a free translation of J. B. Gilpin's "Sable Island." In a different form he reproduces Gilpin's paragraph on the botanical productions of the island. For some reason he feels that Gilpin's estimate of the size of the flora was not adequate, and he, Taché, says², "On a dit qu'un botaniste pourrait y observer trente à quarante espèces ou variétés; mais il est certain qu'un catalogue complet des plantes de l'île et de ses rivages, qui comprendrait les mousses, les algues et les plantes d'occasion, aurait beaucoup plus d'étendue que cela."

In 1890, an anonymous writer³ makes the first mention of the occurrence of blackberries on the island: "On the shores of the lake, which extends for about eight miles, may be gathered in their season the wild pea, wild roses, lilies, asters, strawberries, blackberries, and cranberries. From these wild fruits a small revenue is derived by the men of the life-saving station, who gather and ship them to Nova Scotia."

The Rev. George Patterson in his article⁴ devotes one sentence to the flowers and fruits. All of the species mentioned occur in Gilpin's "Sable Island" with almost the identical wording, and Patterson refers to him in a footnote on the following page.

The first naturalist to visit Sable Island was Dr. Jonathan Dwight, Jr. From the 28th of May until the 14th of June, 1894, he was on the island with the special object of ascertaining the breeding-home and habits of the Ipswich Sparrow, which were at that time quite unknown. This he accomplished very successfully.

Although it was quite early in the season, Dr. Dwight gave considerable attention to the flora. "It⁵ was impossible to study satisfactorily the flora of Sable Island, for at the time of my visit few of the plants had more than just opened their earliest buds, and of

¹ Tache, Joseph Charles: *Les Sablons (L'Ile de Sable) et L'Ile Saint-Bar-nabé*, 1-154 (1885).

² *l. c.* 29.

³ Anonymous: *The Graveyard of the Atlantic. All the Year Round*, lxvi. 517-522 (1890).

⁴ Patterson, Rev. George: *Sable Island, Its History and Phenomena*. *Trans. Roy. Soc. Can.* xii. § 2. 5 (1894).

⁵ Dwight, Jonathan, Jr.: *The Ipswich Sparrow*. *Mem. Nuttall Ornith. Club*, ii. 12-13 (1895).

the species collected, many could not be positively identified even by so able a botanist as Dr. N. L. Britton of Columbia College, who was kind enough to make the attempt for me and to furnish the scientific names. * * * The blueberry bushes were blossoming the second week in June, many of the tiny sprigs trailing in the sand, partly covered by it, and the leaf buds of the rose bushes were little more than half unfolded." This short quotation will give a hint of the condition of the vegetation and Dr. Dwight's interest in it. He says¹ "my specimens show that not less than forty species occur." "I² make no pretense to a complete enumeration of the plants of Sable Island, for reasons given, but those that I have mentioned are among the most conspicuous and characteristic of its flora, which resembles in many respects that of the adjacent mainland."

He mentions several species that have been cultivated, and also some that were presumably introduced, but to him appeared so thoroughly naturalized that they were hard to distinguish from the native ones. To quote his own words³: "Timothy (*Phleum pratense* L.) and Red-top Grass (*Agrostis alba vulgaris* With.), as well as Red Clover (*Trifolium pratense* L.), have been cultivated near the stations, and White Clover (*T. repens* L.) is frequently met with, but man's influence has been at work on the island for so many centuries that it is almost impossible to draw the line between indigenous species, if such there be, and those artificially introduced. * * * Before my departure nearly the whole surface had acquired a visibly greener tinge with here and there the ruddy glow of blossoming Sorrel (*Rumex acetosella* L.) while such weeds as the Beach Pea (*Lathyrus maritimus* (L.)), Everlasting (*Gnaphalium* sp.?), and Meadow-rue (*Thalictrum* sp.?) were becoming conspicuous."

It is quite true as Dr. Dwight says, that some of the introduced species have made themselves thoroughly at home on the island, but the writer in no case had any difficulty in deciding whether or not a plant was a native. *Trifolium repens* is frequent on the island, particularly on the dry sands near the Life Saving Stations and along the shores of the adjacent ponds where the cattle and the domesticated ponies browse continually. It does not occur in the remoter parts of

¹ Dwight, l. c. 13.

² Dwight, l. c. 14.

³ Dwight, l. c. 12.

the island, and does not seem to the writer to be a native plant. *Rumex Acetosella* is obviously an introduced species.

Observations in 1851¹ confirm that the white clover is an introduced species here: "In the neighbourhood of the chief residence, where white clover and other grasses have been sown, so luxuriant is the yield that over 100 tons of hay are made annually."

Why Dr. Dwight called *Lathyrus maritimus* and the *Thalictrum* weeds, is not made clear, and the writer cannot imagine any explanation of it. They are both characteristic of and generally distributed on the dry sand dunes, which are surely a habitat on which native plants would be expected.

Dr. Dwight mentions in his paper by generic or specific names twenty-seven plants. The remaining thirteen are presumably immature and at that time almost indeterminable specimens. The plants are all in the Herbarium of the New York Botanical Garden, but no list of them was kept.

Dwight's admirable scholarly report contains as well as his data and remarks upon the Ipswich Sparrow, chapters on various features of Sable Island: the History of Sable Island, its Physical Aspect, its Climate, its Flora, its resident Mammals, and Birds.

The first botanist to visit Sable Island was the Botanist of the Canadian Geological Survey, John Macoun, who landed on the island July 20, 1899, and remained there for five weeks. In his Report for that year² he gives a general account of the island and some mention of its flora. On the mooted question whether the island was ever wooded he brings some evidence. "I am inclined³ to believe that trees have never grown upon the island. On one occasion I saw roots protruding from under a sand-hill over thirty feet high, and on digging them out found that they represented part of the remains of a specimen of *Juniperus Sabina procumbens* (creeping juniper). It was rooted in a layer of black soil and when taken out showed that it had lain flat on the ground. Two of the roots, including the bark, measured $3\frac{5}{8}$ and $3\frac{3}{8}$ inches in diameter respectively, while the crown, where the branches began to spread was over seventeen inches in circumference or nearly six inches in diameter. This growth and others observed under sand-hills indicate long periods of vegetation without encroachment of sand, so that when these shrubs lived, the lagoon was

¹ The Leisure Hour, xxx. 432 (1881).

² Ann. Rep. Can. Geol. Surv. xii. n. s. 212-219 A (1899).

³ Macoun, l. c., 217 A.

a quiet lake and the north side of the island was miles removed, as no sand reached these localities for many years.

"Though there are no trees on the island and shrubs never attain more than a foot in height, these, if sheltered from the sea air and winter gales attain a considerable size. About fourteen years ago, Mr. Boutellier planted a willow and an elm, both of which are now about five feet high. Every summer they make a fine growth, but during the winter are killed back to the point at which they are protected by an adjoining fence. Even in summer, as I learned from my own observations, the leaves above the shelter of the fence are small and badly formed, and after a strong gale or heavy fog the tender ones become blackened or shrivelled at the edges, while those that were protected were very large and well formed." The two planted trees mentioned by John Macoun, were still living in 1913, that is twenty-eight years after their planting. They had good sturdy trunks for about two feet, then bushed out into broom-like heads of innumerable fine shoots that stretched up above the protecting board fence. As John Macoun stated, each year all of these upright shoots are killed back to the level of the top of the fence.

He makes the generalization that "all the shrubs are natives of Newfoundland and Nova Scotia."¹ This seems to be the case, with the exception of *Rubus arcuans* which is not known from Newfoundland, and at that time was not known to Professor Macoun.

PLANT HABITATS.

On an island consisting of a 20-mile stretch of sand dunes there can be little diversity of plant habitats. Nevertheless, a variety of these is found on Sable Island, and they may be distinguished as follows:

SEA BEACHES.—These are of pure white sand. This is true, except for one bit of the South Beach, east of the Life Saving Station No. 3, where magnetite, as iron sand, is so abundant as to alter the color. The vegetation of this strip, however, is not perceptibly different from that on other parts of the beach. Because of the encroachment of the waves, the beach is very steep, the loose dry sand rising abruptly to the base of a dune. At the very top of the beach in the soft, wind-blown sand are a few clumps of *Arenaria peploides* L., var. *robusta* Fernald, all of them with their young shoots gone, eaten off by the gangs of wild ponies. Here and there are small single plants of *Cakile edentula* (Bigel.) Hook.; otherwise the beach is bare of vegetation.

¹ Macoun, *l. c.* 218 A.

SAND FLATS and SAND SPITS.—Not long ago the salt lake, Wallace Lake, was sheltered by rows of dunes on both its north and its south shores, but now from most of the south side the dunes have been swept away, and between the southern shore of Wallace Lake and the South Beach of the Island, there is nothing but a great sand flat over which the waves break during all heavy storms. Sand spits and dry bars quite similar in character extend out for some distance from either end of the island. On all of these the *Arenaria* thrives, and here also it is despoiled by the ponies, so much so that it is almost impossible to find fruiting specimens. The bareness of these stretches is also broken by occasional mats of *Limosella subulata* Ives.

WALLACE LAKE and the BRACKISH PONDS.—Wallace Lake, though often for short periods shut off from the sea, is quite as salt as is the sea itself. In the lake is an abundant growth of *Zostera marina* L., which is not met with elsewhere.

Especially at the eastern end of Wallace Lake, near Life Saving Station No. 3, and near the Wireless Station are series of ponds reached by the salt water only during the heaviest fall and winter storms. These ponds form a perfect series from the outer ones which are quite brackish to the inner which are fresh. These brackish ponds have a much more abundant vegetation than does Wallace Lake. In them are great masses of Pondweeds, *Potamogeton bupleuroides* Fernald, *P. pectinatus* L., and *P. pusillus* L., var. *capitatus* Benn., as well as *Ruppia maritima* L., var. *longipes* Hagström. Around the borders of these ponds will be found *Carex Oederi* Retz., var. *pumila* (Coss. & Germain) Fernald, and great clumps of *Spartina Michauxiana* Hitchc., *Aster novi-belgii* L., var. *litoreus* Gray, and *Scirpus acutus* Muhl.

LAKE BEACH.—As the tides in Wallace Lake are very small or none at all, and as the waves during storms cannot become large and destructive, the Lake Beach has an abundant vegetation on its broad expanse. Over great stretches it is covered with a smooth green carpet made up of numerous species, among which are *Juncus bуfoniаs* L., var. *halophilus* Buchenau & Fernald, *Chenopodium rubrum* L., *Spergularia leiisperma* (Kindb.) F. Schmidt, *Ranunculus Cymbalaria* Pursh, *Potentilla pacifica* Howell, *Plantago major* L., var. *intermedia* (Gilibert) Dene., and *P. decipiens* Barneoud. Out of the sward formed by these lowly plants grow the less numerous taller ones, such as *Rumex maritimus* L., var. *fueginus* (Phil.) Dusén, and *Atriplex patula* L., var. *hastata* (L.) Gray.

SAND DUNES.—If one may be allowed to generalize, the whole island is only a series of undulating sand dunes. All of them are in a continuous state of flux, but at any one time they can all be placed into one of several categories. A strong sea breeze blowing at low tide will pick up grain after grain of sand from the dry upper half of the beach, and transfer it inland. A storm wind, while doing the same thing, will often make a breach in the outer side of the most exposed dune, whirl away the sand from the roots of the protecting vegetation, and soon form a deep gully from which the sand is swirled inland without obstruction. Coming from either of these sources, the sand is blown inland, then dumped in a quiet place. Whatever happens to be beneath, pond, cranberry-bog, or Life Saving Station, is buried by the new dune. These most recently formed dunes are to be met with all over the island, and are, of course, without vegetation. During the growing season the plants near by will tend to colonize them and, unless the boisterous winds keep them in constant motion, young plants will come up on them and tend to hold them in place. The first to appear in such situations is the Beach Grass, *Ammophila breviligulata* Fernald. Soon after, *Lathyrus maritimus* (L.) Bigel. and *Solidago sempervirens* L. appear. If other storms do not interfere by shifting the dune to still another place, these plants will spread, and before long the dune will be fairly covered with vegetation and anchored by roots. Other species will creep in and join these three dominant ones, and soon the dune has on it many species such as *Deschampsia flexuosa* (L.) Trin., *Festuca rubra* L., *Smilacina stellata* (L.) Desf., *Fragaria virginiana* Duchesne, var. *terrae-novae* (Rydb.) Fernald & Wiegand, *Rosa virginiana* Mill., *Convolvulus sepium* L., and *Anaphalis margaritacea* (L.) B. & H., var. *subalpina* Gray. On the protected slopes of the more permanent dunes these species, especially the Rose, the Beach Pea, and the Morning Glory, form a tangle that is waist-high and very difficult to penetrate.

EMPETRUM HEATHS.—These are in reality the ultimate stage in the evolution of the sand dune. They are found in the middle of the broadest part of the island, the place most protected from the eroding elements. The dunes themselves are low and undulating, and covering them is a low vegetation, composed especially of the trailing branches of *Empetrum nigrum* L., *Juniperus communis* L., var. *megistocarpa* Fernald & St. John, and *Juniperus horizontalis* Moench. Together they form a green, springy carpet nearly a foot in thickness. Mixed with the dominant species are of course others, such

as *Ammophila breviligulata* Fernald, *Lathyrus maritimus* (L.) Bigel., *Solidago sempervirens* L., and *Aster novi-belgii* L., which are ubiquitous on all the drier parts of the island; there are also such species as *Coptis trifolia* (L.) Salisb., *Pyrus arbutifolia* (L.) L. f., var. *atropurpurea* (Britton) Robinson, *Vaccinium pensylvanicum* Lam., *Trientalis borealis* Raf., *Mitchella repens* L., *Lonicera caerulea* L., var. *calvescens* Fernald & Wiegand, *Linnaea borealis* L., var. *americana* (Forbes) Rehder, and *Viburnum cassinoides* L. These stretches here called Empetrum Heaths are what J. Macoun in his article called the "old land." In this area he found *Polypodium vulgare* L., a surprising plant to find on a sand-dune island. Yet we learn from Warming¹ that in northern Europe it occurs on the gray sand dunes, and Fernald & Long found it in 1919 on sheltered wooded slopes of sand hills at Provincetown on Cape Cod.

DUNE HOLLOWES—The shallow hollows between the dunes are often dry and destitute of vegetation, but if the hollows are deep, they approach the water table which is relatively high.

This water table has frequently been commented upon; for it is well known that clear fresh water can be obtained by digging a few inches or feet in any of the dune hollows. The level of this water table has, of course, a relation to the height of the water in the fresh-water ponds. But through all this is a fundamental factor which we cannot yet explain. There is no evidence to show that there is any hard or impervious stratum underlying Sable Island. If such a layer existed near the surface it would surely be known, and it would have to be near the surface to govern the relative position of the water table as observed. To the best of the writer's knowledge, no deep borings have ever been made on the island. In discussing this obscure feature of Sable Island, Sir J. W. Dawson² says, "Pools of fresh water, however, appear in places, which would seem to imply that there is an impervious subsoil. This may, however, be caused by the floating of rain water on water-soaked sand, an appearance which may sometimes be observed on ordinary sand beaches, where, in consequence of their resting on the surface of the sea-water, these pools or springs sometimes rise and fall with the tide. I am not aware, however, that this occurs at Sable Island." Any such tidal variation in the level of the fresh-water ponds would be very conspicuous, but no such feature has ever been observed on the island. We must

¹ Warming, Eugene: Oecology of Plants. English ed. 267 (1909).

² Dawson, Sir John William: Acadian Geology, ed. 3, 37 (1878).

leave this problem, then, having advanced no farther than the stating of the difficulty. These wet dune hollows support the most abundant vegetation of any part of the island. The first plant to appear and the quickest to spread is *Vaccinium macrocarpon* Ait., and it forms a thick carpet in all of the wet hollows, though it is sometimes obscured by taller-growing plants. Conspicuous among its companions in such places are *Lycopodium inundatum* L., *Carex canescens* L., var. *disjuncta* Fernald, *Juncus balticus* Willd., var. *littoralis* Engelm., *J. articulatus* L., var. *obtusatus* Engelm., *Sisyrinchium gramineum* Curtis, *Calopogon pulchellus* (Sw.) R. Br., *Hypericum virginicum* L., *Viola lanceolata* L., *Lysimachia terrestris* (L.) BSP., *Lycopus uniflorus* Michx., var. *ovatus* Fernald & St. John, and *Agalinis paupercula* (Gray) Britton, var. *neoscotica* (Greene) Pennell & St. John.

FRESH-WATER PONDS.—A mere stage beyond the wet dune hollows are the fresh-water ponds which occupy all of the deepest dune hollows. Some are only seasonal and disappear during any dry spell, but a considerable number are permanently maintained by the rain water.

Most of these ponds have a pure sand bottom, but a few of the deeper and more permanent have accumulated a layer of black muck over the bottom. Around their shores they have the cranberries and most of the other plants characteristic of the wet dune hollows, but they have many additional species, as *Eleocharis palustris* (L.) R. & S., *Juncus bulbosus* L., *Iris versicolor* L., *Rumex Britannica* L., *Polygonum hydropiperoides* Michx., var. *psilotachyum* St. John, *Tillaea aquatica* L., *Potentilla monspeliensis* L., var. *norvegica* (L.) Rydb., *P. palustris* (L.) Scop., *Lathyrus palustris* L., vars. *macranthus* (T. G. White) Fernald, and *retusus* Fernald & St. John, *Epilobium molle* Torr., var. *sabulonense* Fernald, *Centaurium umbellatum* Gilib., *Menyanthes trifoliata* L., and *Teucrium canadense* L., var. *littorale* (Bicknell) Fernald.

In one area, that part of the "old land" bordering the fresh-water ponds near the Marconi Station, conditions have been stable enough, and the vegetation vigorous enough, to form a deposit of loamy soil. It does not exceed a few acres in extent and nowhere is it more than a foot and a half in thickness. It lies directly on the white sand that forms the rest of the island. The vegetation on this loamy area is more vigorous, but not different in character from that around the borders of other fresh-water ponds. In the shallow borders of the ponds is another series of species, not to be found in the wet dune hol-

lows. Among these are *Typha latifolia* L., *Potamogeton polygonifolius* Pourret, *P. epihydrus* Raf., *Eriocaulon septangulare* With., *Nymphaeanthus variegatus* (Engelm.) Fernald, *Myriophyllum tenellum* Bigel., *Hippuris vulgaris* L., and *Lobelia Dortmanna* L.

PHYTOGEOGRAPHY.

In studying the geographic affinities of the flora of Sable Island, it was realized that this problem was but a small part of the much larger one of the relations and sources of the floras of Newfoundland, Prince Edward Island, and adjacent regions. It was, in fact, in the hope of throwing some light on this larger question that the trip to Sable Island was planned. And now, in this discussion of the flora, the general scheme used by Prof. M. L. Fernald in his analysis of the geographic relationships of the flora of Newfoundland¹, has been followed as far as it is applicable to this smaller flora.

There is an element of definitely adventive plants, 51 in number. These are in most cases confined to the immediate neighborhood of the Life Saving Stations or the lighthouses, in the cultivated fields, along the paths, or near the stables. A few species such as *Anthoxanthum odoratum* L., *Rumex crispus* L., *Rumex Acetosella* L., *Cerastium vulgatum* L., *Trifolium repens* L., and *Cirsium arvense* (L.) Scop. have spread to the shores of the fresh-water ponds or to the dry dunes, and made themselves very much at home. In every case, however, they can be demonstrated as a foreign element in the flora. As a result of the very extensive tree planting on the island there are a few species or individual trees that have survived and must be considered now as a part of the flora. These planted species total 15 in number. Together with the 51 adventives they give us a total of 66 plants, which will be excluded from the further discussion of the phytogeography of the island.

The native flora consists of 147 species, varieties, and forms. They fall into the primary classes:

Class I. Boreal types.

Class II. Southwestern types.

Class III. Endemic plants or species unknown on the American continent.

Class I. Boreal Types.—This class includes all of the plants that occur to the north of Newfoundland in Labrador proper, south-western Greenland, or the Arctic regions. A few of the species could

¹ Fernald, M. L.: *Rhodora*, xiii. 136 (1911).

be classed as Arctic, but the great majority are Hudsonian or Canadian types, and it does not, in considering this region, seem worth while to try to distinguish between them. The boreal types total 45 plants, = 30 per cent. of the Sable Island flora.

A few examples will indicate the make-up of this class: *Elymus arenarius* L., var. *villosum* E. Mey., *Spiranthes Romanzoffiana* Cham., *Arenaria lateriflora* L., var. *typica* (Regel) St. John, *Drosera rotundifolia* L., *Fragaria virginiana* Duchesne, var. *terrae-novae* (Rydb.) Fernald & Wiegand, *Potentilla palustris* (L.) Scop., var. *parrifolia* (Raf.) Fernald & Long, *P. tridentata* Ait., *Empetrum nigrum* L., *Hippuris vulgaris* L., *Ligusticum scoticum* L., *Coelopleurum lucidum* (L.) Fernald, *Cornus canadensis* L., *Menyanthes trifoliata* L., *Euphrasia purpurea* Reeks, var. *Randii* (Robinson) Fernald & Wiegand, *Plantago decipiens* Barneoud, *Linnaea borealis* L., var. *americana* (Forbes) Rehder, *Anaphalis margaritacea* (L.) B. & H., var. *subalpina* Gray, and *Senecio Pseudo-Arnica* Less.

Class II.¹ Southwestern Types.—This class consists of plants found chiefly in regions to the southwest of Newfoundland. It totals 83 plants = 55 per cent. of the flora. It falls into three subdivisions.

Subclass A. Canadian and Alleghanian plants mostly common to Newfoundland, Nova Scotia, New Brunswick and coastal New England, but unknown in eastern Saguenay County, Quebec, or Labrador. These total 36 plants = 24 per cent. of the flora.

As typical of this subclass may be listed: *Polypodium vulgare* L., *Osmunda cinnamomea* L., *Scirpus acutus* Muhl., *Spartina Michauxiana* Hitchc., *Habenaria bracteata* (Willd.) R. Br. (does not reach Newfoundland), *Rubus hispida* Michx., *Hypericum virginicum* L., *Galium Claytoni* Michx., *Mitchella repens* L. (does not reach Newfoundland), and *Viburnum cassinoides* L.

Subclass B. Species having affinities with the Southern Coastal Plain, usually belonging to genera or having nearly related species

¹ Class II of Prof. Fernald's discussion (*l. c. p. 138*), the Western types, is represented on Sable Island by only two plants, *Polygonum hydropiperoides* Michx., var. *psilostachyum* St. John, occurring on Sable Island and along the Columbia River in Washington, and *Lycopus uniflorus* Michx., var. *ovalus* Fernald & St. John, occurring on Sable Island, at Canso, Nova Scotia, and at Sullivan's Gulch, Portland, Oregon. If Sable Island contained a greater diversity of soils it is probable that more of these western plants would occur there. Many of them are calcicoles, so it is not surprising that they are not to be found on Sable Island, which presents nothing but sand, wet or dry.

characteristic of the southern Coastal Plain, but themselves extending beyond its geological limits, following the sandy or acid-peaty soils northward and inland. These total 24 species = 16 per cent. of the flora.

To typify this subclass we can cite: *Panicum huachucae* Ashe, *Eriocaulon septangulare* With., *Juncus canadensis* J. Gay, *Sisyrinchium gramineum* Curtis, *Calopogon pulchellus* (Sw.) R. Br., *Pyrus arbutifolia* (L.) L. f., var. *atropurpurea* (Britton) Robinson, *Ilex verticillata* (L.) Gray, *Myriophyllum tenellum* Bigel., *Utricularia cornuta* Michx., *Lobelia Dortmanna* L.

Subclass C. Southern Coastal Plain species ranging from Texas, Florida, the Carolinas, or New Jersey northward along the sandy coastal strip, Long Island, Nantucket, Cape Cod, to Sable Island, to Newfoundland, or Prince Edward Island, uncommon or unknown inland in continental eastern Canada. These total 23 plants = 15 per cent. of the flora. It is noteworthy that the endemic fresh-water sponge, *Heteromeyenia macouni* Mac Kay, has as its nearest relatives *H. ryderi*, var. *baleni*, ranging from Florida to New Jersey, and *H. ryderi*, var. *walshii* from Gilder Pond, Mount Washington, Massachusetts.

This subclass contains *Ammophila breviligulata* Fernald, *Agropyron repens* (L.) Beauv., var. *pilosum* Scribn., *Carex silicea* Olney, *Carex hormathodes* Fernald, *Juncus articulatus* L., var. *obtusatus* Engelm., *Habenaria lacera* (Michx.) R. Br., *Myrica carolinensis* Mill., *Tillaea aquatica* L., *Rosa virginiana* Mill., *Viola primulifolia* L., *Centunculus minimus* L., *Teucrium canadense* L., var. *littorale* (Bicknell) Fernald, *Limosella subulata* Ives, and *Plantago major* L., var. *intermedia* (Gilibert) Dene.

Class III. Endemic Plants or Species unknown on the American Continent.—This includes 10 plants = 7 per cent. of the flora.

Subclass A. Endemic Plants.—This includes 6 plants = 4 per cent. of the flora. It is notable that in no case were the characters of the endemic plants strong enough to be considered specific; in every case they had to be treated as of formal or varietal rank. The six endemic plants are: *Juncus pelocarpus* Mey., var. *sabulonensis* St. John, *Calopogon pulchellus* (Sw.) R. Br., f. *latifolius* St. John, *Lathyrus palustris* L., var. *retusus* Fernald & St. John, *Epilobium molle* Torr., var. *sabulonense* Fernald, *Bartonia iodandra* Robinson, var. *sabulonensis* Fernald, *Hieracium scabrum* Michx., var. *leucocaule* Fernald & St. John.

Subclass B. Species characteristic of western Europe, not known in Iceland, Greenland, or Labrador, but occurring on Sable Island, and usually on St. Pierre, Miquelon, and the Avalon Peninsula of Newfoundland. This includes 4 plants = 3 per cent. of the flora. They are: *Potamogeton polygonifolius* Pourret, *Juncus bulbosus* L., *Polygonum Raitii* Bab., and *Centaurium umbellatum* Gilib.

The 8 plants which are not included in any of these classes are either members of critical groups now under revision, or recently described species whose ranges are as yet imperfectly known.

FORESTRY EXPERIMENTS.

Since 1801, the government of Nova Scotia, and later that of Canada have maintained one or more Life Saving Stations on Sable Island. The buildings of these establishments have been constantly threatened with destruction, either by burial in the drifting sand, or by being engulfed in the waves of a severe storm that might wash away the very site on which the buildings stand. Under these circumstances it is not strange that an attempt was made to hold in place the drifting sand hills that compose the island.

In 1900, Sir Louis Davies, Minister of Marine and Fisheries, requested William Saunders, Director of the Dominion Experimental Farms, "to consider the subject of a somewhat extensive experiment in tree planting on Sable Island." That same year Dr. Saunders¹ in company with Lieut.-Col. F. F. Gourdeau visited the seacoast of Brittany, "to see the results of the planting of pine forests there on the drifting sands on the ocean shores, to gain information as to the methods adopted in planting and the varieties of trees which have been successfully grown. * * *

"On returning to Ottawa a list of such sorts as were likely to be suitable was prepared with quantities desired. The trees and shrubs chosen included a large number of those which have succeeded well in drifting sands in France to which were added a number of other varieties which from Canadian experience were likely to prove useful for that purpose. Small lots of many other species were added to lend interest to the collection and to test their hardiness and adaptability to the climate of Sable Island. This list included in all

¹ Saunders, Wm.: Experiments in Tree Planting on Sable Island, Dominion Experimental Farms, Report, 63-77 (1901).

68,755 evergreens of 25 varieties, and 12,590 deciduous sorts of 79 varieties,"—as well as 50 pounds of the seed of the Maritime Pine, *Pinus maritima*. This large shipment reached Sable Island the middle of May, 1901, and under the direction of Lieut.-Col. Gourdeau and Mr. Saunders, planting was started at once. The crates were unpacked and the young trees, almost all of which arrived in good condition, were placed in trenches in the moist sand with their roots well covered. The work of planting the thousands of trees was pushed forward vigorously and completed on the 17th of June. Of the trees about 300 were planted near the East End Lighthouse, about 1000 at No. 2 Life Saving Station, about 5,000 at No. 3 L. S. S., about 3,000 at No. 4 L. S. S., and the remainder at Gourdeau Park, a section near the Wireless Station formed of low rolling dunes covered with a thick mat of trailing *Juniperus* and *Empetrum*. This area is one of those called *Empetrum* Heaths, where a thin layer of dark humus has been formed above the white sand.

An accurate statement of the nature and conditions of the soil and the climate of Sable Island where these young trees were planted is given by Mr. Saunders.¹

"I brought with me a sample of the almost pure sand forming the soil on the top of the sandy bluff on which the first plantation was made in which the sand binding grass was growing, also two samples of the black peaty layer which covers the sand to a depth of 3 to 4 inches over a large portion of the central part of the island, probably to the extent of 1,800 to 2,000 acres. One of these was taken from the large area chosen for the plantation to be known as Gourdeau Park, and the other was from similar soil some miles further east. I also brought a sample of similar material picked up on the beach on the south shore where it was being washed by the sea. A fifth sample consisted of a bunch of the sand-binding grass *Ammophila arenaria* [= *A. breviligulata* Fernald]. These were submitted to the Chemist of the Experimental Farms, Mr. F. T. Shutt, for analysis, who reports on them as follows:

'Analysis and Report on Samples From Sable Island.

'By Frank T. Shutt, Chemist, Dominion Experimental Farms.

'No. 1. Sample of the sand from field on top of the bluff, northeast of the look-out, where first forest clump was planted. It contains roots of grass *Ammophila arenaria* [*A. breviligulata*]. Weight of sand 2 pounds 13 ounces, containing $\frac{3}{4}$ ounces of grass roots.

¹ Saunders, Wm., *l. c.*

'Analysis of this sand after separation of the greater part of the fibre showed .0018 per cent of nitrogen.

'Digestion of this sand with hydrochloric acid (sp. gr. 1.115) at the temperature of boiling water for 5 hours, showed that .412 per cent had passed into solution.

'The examination of this acid solution gave the following data:

'Oxide of iron and alumina.....	.328
'Lime062
'Phosphoric acid.....	.012

'Potash:—By the spectroscope, traces of potash were plainly discernable. With the usual reagent (platinic chloride) only a very faint precipitation was obtained when working on an acid solution from 10 grams of the sand.

'No. 2. Sample of peaty soil from surface underlaid by sand in central part of island 1½ miles east of residence of Superintendent where a large block of trees has been planted, locality known as Gourdeau Park, layer 3 to 4 inches thick.

'Analysis of (air-dried) peaty soil:—

	p. c.
'Moisture	4.87
'Organic matter.....	22.22
'Mineral matter practically sand.....	72.91
<hr/>	
	100

'Nitrogen in organic matter..... .878

'No. 3. Representative sample of peaty soil covering a large area some distance east of where No. 2 was taken, from 3 to 4 inches deep, and underlaid by sand. Weight soil, air-dried, 3 pounds 12½ ounces, containing 5½ ounces fibre.

'Analysis of (air-dried) peaty soil:—

	p. c.
'Moisture	1.48
'Organic matter.....	8.63
'Mineral matter practically sand.....	89.89
<hr/>	
	100

'Nitrogen in organic matter..... .271

'No. 4. Sample from a large lump of peaty soil found on the beach on the south shore, being washed by the sea. It contains a considerable amount of semi-decayed eel grass *Zostera maritima*. Weight of soil, air-dried, 1 pound 5 ounces, containing 2½ ounces fibre, principally eel grass.

'Analysis of (air-dried) peaty soil:—

	p. c.
'Moisture	3.00
'Organic matter.....	9.50
'Mineral matter practically sand.....	87.50
<hr/>	
	100

'Nitrogen in organic matter..... 267

'The above three samples are similar in character, and no doubt also as to origin. They may be considered as semi-decayed vegetable matter (largely fibrous) and sand, and practically the only point of difference between them lies in the varying proportions of these two constituents. In the air-dried condition the sand can be very easily separated from the organic matter by shaking and sifting, showing that there is no intimate incorporation of these constituents as in the case of true soils.

'The plant food they contain other than nitrogen is present in very small amounts, and we must suppose exists in such a condition that it is only slowly set free for plant use.

'No. 5. Analysis of the (air-dried) grass or hay *Ammophila arenaria* [*A. breviligulata*] from Sable Island, chiefly barren stems:

	p. c.
'Moisture	12.42
'Protein	13.81
'Fat81
'Fibre	41.00
'Carbo-hydrates	26.71
'Ash	5.25

100

'In protein or albuminoids this grass makes a very good showing, being quite equal in respect to these important nutrients to many of our highly esteemed cultivated grasses.

'The percentage of fibre is above the average, and this together with the somewhat high protein, necessarily makes the carbo-hydrates (starch, sugar, &c.) much lower than usual. This hay contains 5.25 per cent ash or mineral matter, which on further examination is found to include 1.37 per cent of sand. This sand had remained attached to the grass in spite of all care being taken to separate it.

'The indications are that though probably somewhat less digestible than the best hays made from grass cut before seeding, this Sable Island grass has a distinct and even moderately high feeding value due to its comparatively speaking large protein content.'

"The results obtained by Mr. Shutt are very interesting and valuable. The ponies, of which there are four bands numbering about 120 in all running wild on the island, feed almost entirely on this grass which looks tough and hard and does not impress one as likely to be very nutritious. The ponies, however, do well on it, and even the domestic cattle use it considerably, although they are said to prefer timothy and clover. The fact that this grass has a decided nutritive character is now demonstrated.

"Arrangements for the use of artificial fertilizers.

"Realizing at the outset that it was probable that the soil of some of the sites which might be chosen for tree planting on the island would be deficient in the elements of fertility needed for the healthy growth of trees, a sufficient quantity of artificial fertilizers was taken to Sable Island with the trees. These included nitrate of soda, muriate of potash, superphosphate of lime with a few barrels of quick lime. Instructions were left with the Superintendent as to the use of these after the trees were planted, and the proportions in which they should be mixed. That after mixing they should be diluted with an equal bulk of sand and scattered in small proportion over the ground once a month for three months, leaving a small portion of each plantation untreated for comparison. This would probably give the trees at the start sufficient plant food for healthy growth.

"A natural source of plant food.

"There is one source of plant food on Sable Island which should not be overlooked. Sea birds are most abundant there. After travelling over the greater part of the island and seeing the immense number of terns everywhere, from a rough computation of the number per acre and the acreage of the island we estimated that these birds alone did not fall far short of a million on the island. They feed on small fish, and they are so incessantly active that they consume large quantities and their droppings are seen on every hand. This perennial source of fertility must have its effect. Like the guano on the sea-girt islands in parts of South America this material is very rich in plant food, which is in readily soluble forms and the quantity deposited every year would probably be sufficient to supply a considerable part of the small proportion of these elements needed for healthy tree growth. Traces only of these useful elements are found in the clear, pure sand which covers so large a part of the surface of the island, probably for the reason that this fertilizing material if not promptly taken up by plant roots is so soluble that it is soon washed through the porous sand by frequent rains and its accumulation is thus prevented.

"Conditions of climate—strong winds.

"The climate is a very singular one, and one of the chief difficulties in the way of rapid success in tree planting is the force and constancy

of the winds, and the frequency of the gales. From the meteorological tables here given, prepared by Mr. W. T. Ellis from material kindly furnished by Mr. R. F. Stupart, Director of the Meteorological Service of Canada, covering nearly four years, it appears that the average hourly velocity of the wind during the whole of that period has been more than 18 miles, while the gales have averaged over 10 each month when the winds have ranged mostly from 40 to 65 miles an hour. A study of the temperatures will show that there are no extremes of heat or cold on the island; that the highest temperature during the past four years has been 78, and the lowest point reached by the thermometer during the same period was 5 above zero.

Months.	Maximum.	Minimum.	Total Precipitation.	Average hourly velocity of wind.	Maximum velocity.	Number of gales.	Fair.	Fog.
1898.	°	°	Inches.	Miles.		Days.	Days.	Days.
January.....	48.5	6.0	5.65	21.5	48	18	15	2
February.....	43.0	17.0	1.54	18.7	64	14	20	2
March.....	46.5	23.5	3.20	17.8	46	17	20	9
April.....	53.0	27.0	4.90	19.8	38	18	16	10
May.....	60.5	33.0	2.90	15.7	41	7	24	8
June.....	66.0	39.0	3.12	15.9	39	9	20	14
July.....	75.0	45.5	4.55	11.8	25	1	17	10
August.....	77.0	58.0	4.44	12.0	27	2	18	17
September.....	73.5	46.0	5.89	16.6	42	9	19	7
October.....	61.5	39.5	3.85	18.6	36	13	20	6
November.....	63.0	30.0	8.68	19.6	49	18	16	9
December.....	52.0	18.0	6.64	23.7	59	20	16	6
Averages.....	59.95	31.87	4.61	17.6	42.8	12	18	8
1899.								
January.....	48.5	7.5	2.17	24.4	53	21	19	3
February.....	39.0	9.0	2.78	26.0	65	19	17	6
March.....	47.5	17.0	4.96	22.6	46	20	22	13
April.....	48.0	29.0	1.65	19.5	56	13	22	12
May.....	59.0	28.0	2.62	18.2	39	10	21	7
June.....	64.5	41.0	4.97	12.8	27	3	16	11
July.....	71.0	52.0	2.30	14.9	31	5	22	21
August.....	74.5	56.0	3.76	12.6	32	2	20	2
September.....	72.0	48.0	3.52	16.0	40	7	20	8
October.....	69.0	44.0	5.71	16.8	46	9	22	6
November.....	59.5	32.0	2.66	20.0	56	12	18	8
December.....	53.0	24.0	4.31	18.8	49	18	17	6
Averages.....	58.79	32.29	3.45	18.5	45	12	19	8

Months.	Maximum.	Minimum.	Total Precipitation.	Average hourly velocity of wind.	Maximum velocity.	Number of gales.	Fair.	Fog.
1900.	°	°	Inches.	Miles.		Days.	Days.	Days.
January.....	52.5	17.0	5.76	23.7	56	20	14	5
February.....	52.0	7.0	3.59	26.5	56	20	17	3
March.....	48.5	15.5	6.15	22.2	52	19	16	8
April.....	52.5	32.5	5.55	19.4	46	16	14	6
May.....	57.8	34.0	3.04	16.2	37	6	19	7
June.....	69.0	40.0	2.84	14.2	27	6	21	14
July.....	75.0	49.0	2.25	13.4	32	3	23	18
August.....	73.0	51.0	6.16	13.6	40	4	17	6
September.....	70.0	47.0	5.66	16.2	49	7	17	8
October.....	66.0	37.0	2.31	17.4	51	11	21	5
November.....	60.5	27.0	2.94	22.7	46	24	11	8
December.....	49.0	20.0	2.94	21.8	52	15	14	3
Averages.....	60.48	31.41	4.09	18.9	45	12	17	7
1901.								
January.....	47.0	5.0	3.24	22.7	58	14	19	9
February.....	45.5	19.0	3.21	21.9	45	9	12	4
March.....	47.0	19.0	4.04	20.2	56	12	23	11
April.....	54.0	34.0	2.36	19.4	60	4	24	17
May.....	57.0	34.0	4.97	13.3	34	1	18	10
June.....	63.0	44.0	2.38	14.8	36	1	24	15
July.....	77.0	53.0	2.90	12.9	36	0	28	19
August.....	78.0	60.0	3.36	11.3	34	1	26	13
September.....	76.5	48.0	1.65	17.4	42	5	26	7
October.....	68.0	41.0	4.52	18.4	48	4	25	9
November.....	57.5	30.0	2.10	18.2	62	7	23	0
Averages.....	60.95	35.18	3.17	17.3	46	5	22	10

"The plantations started very well, all of the young trees taking root and the seed of the Maritime Pine germinated and came up 'as thick as it can stand, and * * * very fine and strong'."

This brief statement of the planting of the trees on Sable Island should impress the reader with the great care with which the plan was devised and the diligence with which the laborious planting was executed.

The Superintendent of Sable Island, R. J. Bouteillier, took a keen interest in the whole project and did all that a man could to insure its success. From his reports we learn that the trees began almost immediately to succumb to the severity of the climate. In his first

report he had to mention a discouraging loss. "I may say that almost everything planted seems to have taken root, those you first put in are budding freely, although I regret to say that on Friday last we had a moderate gale which lasted about 24 hours when the wind at times exceeded 40 miles an hour. I find that on the trees with soft leaves which had just opened, they were burned off as if from frost. The pines and spruces were not affected as far as could be observed."

In the fall of 1901, November 5th, Supt. Bouteillier wrote, "With regard to the condition of the trees the latter part of the summer was very dry, so much so that our vegetables are less than a half crop, so that you can see it must have been trying for the trees.

"*Rainfall*—

June, 2.38 inches; spread well over the whole month; fogs as well.

July, 2.90 inches; spread well over the whole month; fair; warmer.

August 1 to 13, 3.36 inches; no fogs; very warm.

September 8 to 30, 1.65 inches; no fogs; very warm; dry gales.

October 3 to 24, 3.60 inches; no fogs; warm; some high winds.

"You will see from this that the trying time was from August 13 to October 3, with only 1.65 of rain, no fogs and very warm weather for Sable Island. The thermometer averaged high all summer.

"This drought killed most of the weaklings, and the high winds burned the leaves off the deciduous trees between September 21 and 26, during which time it blew a continuous gale from S. W. around to north. After the gale subsided, the leaves were as though a fire had run close to the trees and scorched them. It was not cold, and we have had no frost yet.

"Many of these trees were very promising, and some of them are budding again since we have had rains. * * *

"Now, as I think I have shown you the worst side, I will show the other. All the evergreens looked dull during the drought, but after we had a few rains they improved wonderfully. All the pines, except the white pine *P. strobus* are looking splendidly and have made growth. The plants from the pine seed also grew well, but lately I noticed that many were turning a bluish cast. Some spruces survive, but few look promising. Arbor-vitae suffered much from drought, but there are many promising specimens in various localities.

"This general statement of the conditions of the trees applies to all planted in the various localities, but I think Gourdeau Park, 1½

miles east of main station, is most promising, and next is 4th station plot. In all plots planted the weeds and grass has grown freely, and I am satisfied now that this is best for the trees; it gives shelter. If the ground had been kept clear the drifting sand would abrade the bark, and it is very noticeable that trees do best where sheltered by grass or wild plants. In 'Gourdeau Park' there is shelter owing to the conformation of the ground, and the slopes have different exposures. I find where the slopes are exposed to the south-west and west winds (our prevailing winds) the trees are least promising."

In the following year, Dr. Saunders in an additional report¹ gave the latest news concerning the plantation on Sable Island. The first letter received in 1902 was written May 26. In this Mr. Bouteillier says, "I will give you the latest news of the trees. Our winter has been very mild; not much snow and not much frost. When a cold snap occurred it was followed by enough mild weather to take all the frost out of the ground. March was very mild; April was cold and windy, and that has continued up to a week ago. Many pines that seemed to stand the winter went red in March and April, and many that turned color have recovered and are putting out new buds. Survivors of Austrian, Mountain and Maritime pines are the most promising, and those that are not doing well are the small specimens; nearly all the larger ones planted are killed. A few spruces of all kinds survive, but they are not promising. Of the arbor vitae only a few are living. Juniper of both kinds nearly all dead; perhaps four or five survivors.

"Of the Maritime pines raised from the seed you brought, these were killed wherever they were scattered on the bare ground, but where they came up among the grass they are growing finely in this shelter, and there are thousands now green and putting out new buds. When sowing these I put them in thick, and after they came up I thought that in spots they were too thick; but this was their salvation, as the winds subsequently killed those on the outside, while those in the middle of these bunches were protected and have remained green.

"The deciduous trees were killed down from the top, some to the ground, others killed outright, but they are no exceptions, all are killed at least half way down. Included in these are *Pyrus prunifolia*, *P. baccata*, *Caragana arborescens* and Silver Poplar. All these deciduous sorts put out leaves a month ago, but lately we have had

¹ Saunders, Wm.: Reports from Sable Island in 1902, l. c. 56-58 (1902).

very high winds and all the leaves are more or less blighted, and some of the gooseberry and currant bushes are stripped. As I have mentioned before shelter is necessary here to success."

Supt. Bouteillier in the succeeding years continued to report on the condition of the young trees. Each year his report was more and more like a list of casualties due to the wind or the drought. In 1910, he made a careful census¹ of the survivors, finding 72 live.

During my visit to Sable Island in 1913, I was naturally much interested in the result of the tree planting, and carefully inspected each of the sites. I found 77 individuals. In all cases Supt. Bouteillier and I did not identify the trees as the same, but this is easy to understand as all of them are little dwarfed, blasted sprigs which never flower or fruit and which have very abnormal foliage. In all the important details we do agree, that out of the original planting in 1901 of 81,345 trees, as well as 50 pounds of seed of *Pinus maritima* there are now but 75 or so individuals alive, none of these exceeding the height of the sheltering Beach Grass. The attempt to forest these sand dunes was an absolute failure.

After a review of all the circumstances connected with this tree planting, no error in planning, no omission, no carelessness or accident in the planting is apparent. Large numbers of the trees that have successfully reclaimed similar areas were used, as well as a great variety of other possible trees and shrubs. It would seem that, although a few trees probably did grow on the island as late as 1633 the decreased size and height of the island since then had so reduced the amount of shelter from the fierce winds and storms that at present no trees could be made to stand the extreme climatic conditions. This remains, however, a distinct challenge to the foresters. It is hoped that sometime they may be able to meet it successfully.

CATALOGUE OF THE VASCULAR PLANTS.

In the following catalogue different fonts of type are used to distinguish the different elements of the flora.

Native plants are indicated by full-faced type.

Adventive plants are indicated by large and small capitals.

Discredited records are enclosed in brackets.

¹ Dominion Experimental Farms, Report of the Director, Results of Experiments in Tree Planting on Sable Island, 54-55 (1910).

POLYPODIACEAE.

[*ASPIDIUM SPINULOSUM* Sw., var. *DILATATUM* (Hoffm.) Hook. The record of this fern for Sable Island is based on a communication from *H. T. Güssow*, but he writes that the plant was in "too fragmentary a condition to be placed in the Herbarium." The determination of this plant cannot now be verified.]

Polypodium vulgare L. Known only from one collection, on the old land at Island Pond, very rare, *J. Macoun* (C. no. 22,695).

Spores mature,—late July.

OSMUNDACEAE.

Osmunda cinnamomea L. Local, but abundant by the marshy shores of the fresh ponds at the eastern end of Wallace Lake, near Life Saving Station No. 3. Collected by *J. Macoun*; *H. T. Güssow*; *H. St. John*, no. 1,108 (H).

LYCOPODIACEAE.

Lycopodium inundatum L. Somewhat general in the wet dune hollows. *J. Macoun*; *H. T. Güssow*; *H. St. John*, nos. 1,109 and 1,110 (H).

Spores mature,—September.

PINACEAE.

PINUS MONTANA Mill. Six trees planted near Life Saving Station No. 3, in a grassy dune hollow have survived from the five thousand set out in 1901, but they are not over two feet in height, and are hidden by a luxuriant growth of *Ammophila*. *H. St. John*, no. 1,111 (H).

P. SYLVESTRIS L. A few trees out of the ten thousand planted in 1901 near Life Saving Station No. 4, are still living but they are overtapped by the *Ammophila*. *H. St. John*, no. 1,112 (H).

PICEA CANADENSIS (Mill.) B. S. P. One tree surviving at Life Saving Station, No. 4, from the planting in 1901 of 2,500 young trees. *H. St. John*, no. 1,113 (H).

[*JUNIPERUS COMMUNIS* recorded by *J. Macoun* (M. p. 216A) is probably of the var. *megistocarpa*.]

Juniperus communis L., var. **megistocarpa** Fernald & St. John, n. var., *J. communem*, var. *montanam* ramis prostratis foliis latis brevibus incurvantibus similans sed differt fructibus majoribus, 9–13 mm. diametro; seminibus majoribus, 5–7 mm. longis.

Resembling *J. communis* L., var. *montana* Ait. in its prostrate branches and short broad incurved leaves, but differing from it by its larger fruit, 9–13 mm. in diameter, and by its larger seeds, 5–7 mm. long.

NEWFOUNDLAND: serpentine and magnesian limestone barrens, northeastern base and slopes of Blomidon ("Blow-me-down") Mountains, Bay of Islands, August 21, 1910, *M. L. Fernald* and *K. M. Wiegand*, no. 2,422 (H).

QUEBEC, MAGDALEN ISLANDS: sand ridges back of the Narrows, Alright Island, August 21, 1912, *M. L. Fernald*, *Bayard Long*, and *Harold St. John*, no. 6,729 (TYPE in Gray Herb.); sand hills between East Cape and East Point, Coffin Island, *M. L. Fernald*, *Bayard Long*, and *Harold St. John*, no. 6,728 (H); sand dunes, Brion Island, Aug. 6, 1914, *Harold St. John*, no. 2,040 (H).

NOVA SCOTIA: Empetrum heaths near Gourdeau park, Sable Island, Aug. 23, 1913, *Harold St. John*, no. 1,114 (H); sprawling on sand dunes, Empetrum heaths, Whalepost, Sable Island, Aug. 30, 1913, *Harold St. John*, no. 1,115 (H).

Common on Sable Island on the dry slopes of the fixed dunes. This variety is probably the only one on the Island. In 1753 *Andrew Le Mercier* (L) described the Island as looking "all green in winter with the Juniper bushes."

In 1766 and 1767, *J. F. W. Des Barres* observed "juniper &c., in their season" (Atlantic Neptune, i. 68, 1777).

"A little ground juniper," is referred to by *J. B. Gilpin* (G. p. 18); "On y trouve, en fait de fruits, les baies du générvier rampant" (T. p. 29).

Fr.—August and September.

[*J. COMMUNIS* L., var. *DEPRESSA* Pursh. Collected by *J. Macoun* and *H. T. Güssow*, and probably to be referred to the preceding variety.]

[*J. NANA* Willd. The plant mentioned by *Jonathan Dwight, Jr.*, (D. pp. 9 and 12) is probably *J. communis*, var. *megistocarpa*.]

J. horizontalis Moench. Dry sheltered slopes of the more permanent dunes. *J. Macoun* writes (M. p. 217A), "On one occasion I saw roots protruding from under a sand-hill over thirty feet high, and on digging them out found that they represented part of the remains

of a specimen of *Juniperus Sabina procumbens* (creeping juniper). It was rooted in a layer of black soil and when taken out showed that it had lain flat on the ground. Two of the roots, including the bark, measured $3\frac{5}{8}$ and $3\frac{3}{8}$ inches in diameter respectively, while the crown, where the branches began to spread was over seventeen inches in circumference or nearly six inches in diameter." Quite common on the old land, *J. Macoun* (C. no. 22,607); trailing on the sand dunes, Whalepost, *H. St. John*, nos. 1,116 and 1,117 (H).

Fl., Fr.—August and September.

[*J. PROCUMBENS* recorded by *J. Macoun* (M. p. 218A) is probably *J. horizontalis*.]

[*J. SABINA PROCUMBENS* recorded by *J. Macoun* (M. p. 217A) is *J. horizontalis*.]

TYPHACEAE.

Typha latifolia L. Local, growing only by the border of the fresh ponds at the east end of Wallace Lake, *J. Macoun*; and swampy edge of fresh-water pond near Life Saving Station No. 3, *H. St. John*, no. 1,118 (H).

Fr.—September.

SPARGANIACEAE.

Sparganium angustifolium Michx. Common in the permanent fresh-water ponds. *J. Macoun* (C. nos. 22,637 and 22,637a); *H. St. John*, nos. 1,119 and 1,120 (H).

Fl.—July and August. *Fr.*—August and September.

[*S. SIMPLEX* Huds. of *J. Macoun* is *S. angustifolium*.]

POTAMOGETONACEAE.

Potamogeton polygonifolius Pourret. Abundant in the fresh-water ponds. It will grow even in ponds that dry up for a part of the summer, but it probably does not fruit in these except in a wet season. In such exsiccated ponds the plant appears as a tight prostrate rosette of apparently sessile leaves. *J. Macoun* (C. no. 22,095)—for the first notice of this, see A. Bennett, Journal of Botany, xxx. 198 (1901). *H. St. John*, nos. 1,121 and 1,122 (H).

Fr.—August and September.

P. epihydrus Raf. Very common in the fresh ponds. *J. Macoun* (C. no. 22,073); *H. St. John*, no. 1,123 (H).

Fl.—July and August. *Fr.*—August and September.

P. bupleuroides Fernald. Common in brackish ponds. *J. Macoun* (C. no. 22,081); *H. T. Güssow* (E); *H. St. John*, no. 1,124 (H).
Fr.—August and September.

[*P. PERFOLIATUS* L. The specimens from Sable Island interpreted as this prove to be the American *P. bupleuroides*.]

[*P. FRIESII* Rupr. *J. Macoun's* collection (C. no. 22,097) proves to be *P. pusillus*, var. *capitatus*.]

P. pusillus L., var. **capitatus** Benn. Abundant in the brackish ponds. The type collection was made in pools, July 27, 1899, *J. Macoun* (C. no. 22,096 and 22,097); *H. St. John*, no. 1,125 (H).

Fl., Fr.—July and August.

[*P. STURROCKII* Benn. In Fryer's Potamogetons of the British Isles, 85 (1915) Arthur Bennett records this plant from Sable Island.]

P. pectinatus L. Common in the brackish pools. *J. Macoun* (C. nos. 22,071 and 22,072); *H. St. John*, no. 1,126 (H).

Fl., Fr.—August.

[*P. PECTINATUS* L., f. *PSEUDOMARINUS* Benn. In the Journal of Botany, xxxix. 199 (1901) Bennett makes the combination and credits the plant to Sable Island.]

[*P. FILIFORMIS* Pers. The collection by *J. Macoun* called this, is *P. pectinatus*.]

[*RUPPIA MARITIMA* L. *J. Macoun's* collection so named proves to be var. *longipes*.]

Ruppia maritima L., var. **longipes** Hagström. Abundant in Wallace Lake and the brackish ponds. *J. Macoun* (C. no. 22,635); *H. St. John*, no. 1,127 (H).

Fl., Fr.—August.

Zostera marina L. Common in Wallace Lake and washed up on the sea beaches. *J. Dwight, Jr.*, (D. pp. 13 & 40) mentions that it "abounds in the lagoon, and occurs as drift along its shores" and that the nest of the Ipswich Sparrow may be partly made of "eel-grass." Listed by *J. Macoun*; and *H. T. Güssow*. *H. St. John*, no. 1,128 (H).

GRAMINEAE.

Panicum huachucae Asbe. Occasional in the drier spots. *J. Macoun* (C. no. 22,708), labeled *P. implicatum*; *H. St. John*, nos. 1,129 and 1,130 (H).

Fr.—July and August.

[**PANICUM IMPLICATUM** Scribn. *J. Macoun's* collection was so labeled by Hitchcock and Chase, but the size of the spikelets and the character of the pubescence indicate that this plant should rather be treated as *P. huachucae*.]

ECHINOCHLOA CRUSGALLI (L.) Beauv. A garden weed at the Main Life Saving Station. *H. St. John*, no. 1,131 (H).

Fr.—September.

ANTHOXANTHUM ODORATUM L. Established on the drier, more stable parts of the island. *J. Macoun* (M. p. 218A) comments on the abundance of this species on the old land and argues that it appears native there, or at least is "a resident of such long standing that it has made itself at home in all suitable places." *H. St. John*, no. 1,132 (H).

Fr.—August.

PHLEUM PRATENSE L. Planted and well established near the Life Saving Stations. Observed by *J. Dwight, Jr.* (D. p. 12); collected by *J. Macoun*; *H. St. John*, no. 1,133 (H).

Fl., Fr.—August.

AGROSTIS ALBA L., var. **VULGARIS** (With.) Thurb. Cultivated near the stations, according to *J. Dwight, Jr.* (D. p. 12).

A. alba L., var. **maritima** (Lam.) G. F. W. Mey. Abundant in the dune hollows and at the margins of the fresh-water ponds. Collected by *J. Macoun*; *H. T. Güssow* (E); *H. St. John*, nos. 1,134 and 1,135 (H).

Fr.—August.

A.—[A collection by *J. Macoun* (C. no. 73,060) obviously belongs to the *alba* series, but I have been unable to place it to my satisfaction.]

[**A. HIEMALIS** (Walt.) B. S. P. Both *Macoun* and *Güssow* list this species, but the plants are probably to be interpreted as of the var. *geminata*.]

A. hiemalis (Walt.) B. S. P., var. **geminata** (Trin.) Hitchc. A common plant, sprawling on the sand in the wet or the dry dune hollows. A. S. Hitchcock in his monograph of the North American Species of *Agrostis*, Bull. Bur. Plant Industry, lxviii. 43 (1905), cites one sheet with awnless spikelets, but this phase is apparently common. *H. St. John*, nos. 1,136 and 1,365 (H).

Fl., Fr.—August.

Ammophila breviligulata Fernald. (*A. arenaria* of Am. authors, not Link.) Abundant on all the drier parts of the island. Without doubt this is the most important plant on the island, for without it nothing would stay the erosive action of the wind, the storms, and the sea, and in a very short time the whole island would be reduced to a treacherous submerged bar, such as now extend out from either end of the island for more than fifteen miles. The Beach Grass does what none of the hundred odd species planted for this purpose succeeded in doing, for in most parts of the island it actually does anchor the sand and prevent the dunes from being dissipated by the winds. Even the earlier explorers such as *Des Barres*, mention "a great plenty of beach grass" (Atlantic Neptune, i. 68, 1777); in 1801, *Seth Coleman* found the soil of Sable Island, "of a nature to produce Beach Grass" (Rept. on Canadian Archives, 91, 1895). *John Macoun* (M. p. 215A): "All the sandhills are covered with sandgrass (*Ammophila*) and the wonderful vigour of this grass is well shown everywhere, but more particularly where the sand has just been deposited, or is in a raw state. I found one underground stem or stolon over twelve feet long which had sixty-four series of roots and no less than forty-seven tufts of leaves. The growing point was so hard and sharp that it might almost penetrate wood."

Another equally important use of the Beach Grass is that of providing the fodder that supports the gangs of wild and semi-domesticated ponies, as well as the cattle. To one familiar with it in other places the Beach Grass would seem like very poor fodder. On the sheltered slopes of many of the dunes, it grows here shoulder high, deep green, and juicy and succulent, so much so that I used to pull young shoots and chew them as I plodded over the soft sand and forced my way through the tangle of Beach Pea. It seemed to me that two factors might jointly or singly explain the unusually tender and succulent condition of the Beach Grass here: the cool, very moist climate; the regular cutting and harvesting of it as a hay crop over

large areas. During my stay at the Main Life Saving Station over sixty tons of this crop were stored away within the huge barns. Such a conspicuous plant was naturally observed by *J. Dwight, Jr.*; *J. Macoun*; *H. T. Güssow*; *H. St. John*, no. 1,137 (H).

Fl.—Late August and September.

[*A. ARENARIA* (L.) Link. All records belong to the American *A. breviligulata*.]

Deschampsia flexuosa (L.) Trin. On the drier parts of the island. *J. Macoun*; *H. T. Güssow* (E); *H. St. John*, no. 1,138 (H).

Fr.—July.

[*D. ALBA* R. & S. *Güssow's* specimen so named is *D. flexuosa*.]

AVENA SATIVA L. A weed at the Main Life Saving Station. *H. St. John*, no. 1,139 (H).

A. SATIVA L., var. **ORIENTALIS** (Schreb.) Richter. A weed at the Main Life Saving Station. *H. St. John*, no. 1,140 (H).

Danthonia spicata (L.) Beauv. On the old land, not rare. Found only by *J. Macoun* (C. no. 22,688).

Fr.—July.

Spartina Michauxiana Hitchc. Occasional at the borders of the brackish ponds. Found by *J. Macoun*; *H. T. Güssow*; *H. St. John*, nos. 1,141 and 1,142 (H).

Fl.—August.

POA ANNUA L. A weed near the stations. Collected by *J. Macoun* (C. no. 22,682).

Fl.—July.

P. PALUSTRIS L. (*P. triflora* Gilib.) Planted in a field near the Main Life Saving Station. *J. Macoun* (C. no. 22,681).

Fl.—July.

P. pratensis L. Generally distributed and frequent on the dry dunes. In 1753, *Andrew Le Mercier* (L) remarked, "there is some English Grass"; and in 1801, *Seth Coleman* found "some small spots of English Grass" (Rept. on Canadian Archives, 91, 1895).

Listed by *J. Macoun*; *H. T. Güssow*; *H. St. John*, no. 1,143 (H).

Fr.—August.

Glyceria Fernaldii (Hitchc.) St. John. (*G. pallida*, var. *Fernaldii* Hitchc.) In marshy spots, East End, *J. Macoun* (C. no. 22,684).

Fr.—Early August.

Festuca rubra L. Common on the drier parts of the island. Collected by *J. Macoun* (C. no. 22,686); *H. T. Güssow*; *H. St. John*, no. 1,144 (H).

Fl.—July. *Fr.*—August.

F. rubra L., var. **glaucescens** (Hegetschw. & Heer) Richter. Common on the nearly bare dunes where the coarse glaucous leaves form great tufts. *H. St. John*, nos. 1,145, 1,146, and 1,147 (H).

Fr.—August.

BROMUS SECALINUS L. A fugitive weed. In meadow grass, rare. *J. Macoun* (C. no. 22,671).

Fr.—July.

AGROPYRON REPENS L. Established near the Life Saving Stations. Recorded by *J. Macoun*; *H. St. John*, no. 1,148 (H).

Fr.—August.

A. repens L., var. **pilosum** Scribn. On sand dunes remote from the Life Saving Stations and apparently native. *H. St. John*, no. 1,149 (H).

Fl.—August.

HORDEUM JUBATUM L. A weed at the Main Life Saving Station. Reported by *J. Macoun*; *H. St. John*, no. 1,150 (H).

Fr.—August and September.

Elymus arenarius L., var. **villosum** E. Mey. (*E. arenarius* of Am. authors; *E. mollis* Trin.) Very rare on the island, occurring, as far as known, only along the top of a narrow ridge of dunes extending a short distance from the eastern end of Wallace Lake along the South Beach. This line of dunes has been rapidly washing away and the remnants are still exposed to the action of the storms. This grass luxuriates here, sending its culms up to a height of six feet or more, but the station is in great danger of being destroyed. *H. St. John*, no. 1,151 (H).

Fr.—September.

CYPERACEAE.

Eleocharis palustris (L.) R. & S. Abundantly fringing the borders of the permanent and semi-permanent fresh-water ponds.

J. Macoun (C. nos. 77,185, 77,186, 77,163, 22,648); *H. T. Güssow*; *H. St. John*, no. 1,152 (H).

Fl.—August.

E. palustris (L.) R. & S., var. *glaucescens* (Willd.) Gray. Even more common than the preceding, but found sprawling on the drier sand flats or in nearly bare dune hollows. *J. Macoun* (C. nos. 22,640, 22,647, and 77,187); *H. St. John*, nos. 1,153, 1,154, and 1,155 (H).

Fl.—August. *Fr.*—August and September.

Scirpus nanus Spreng. Found only by the brackish margins of Wallace Lake. *J. Macoun* (C. no. 22,649); *H. T. Güssow*; *H. St. John*, no. 1,156 (H).

Fl., *Fr.*—September.

S. americanus Pers. Common in the dune hollows. *J. Macoun* (C. no. 22,632); *H. T. Güssow*; *H. St. John*, no. 1,157 (H).

Fl.—August.

S. acutus Muhl. (*S. occidentalis* (Wats.) Chase.) Brackish and nearly fresh ponds near Wallace Lake. Some of the specimens have been named *S. validus* but none seems to belong in that species. *J. Macoun* (C. no. 22,633) is very young material. *H. T. Güssow's* collection has well developed achenes only 2 mm. long, but the spikelets are borne for the most part in glomerules, so the plant is treated as of this species. *H. St. John*, nos. 1,158 and 1,159 (H) do not have long spikelets, but the achenes are large, 2.5 mm. long, and the scales are long and overlapping. These specimens with a mingling of characters of *S. validus* and of *S. acutus* raise the question as to the distinctness of these two species.

Fr.—September.

[*S. OCCIDENTALIS* (Wats.) Chase is *S. acutus*.]

[*S. VALIDUS* Vahl. The specimens from Sable Island that have been called this seem better treated as *S. acutus*.]

S. campestris Britton, var. *paludosus* (A. Nelson) Fernald. Brackish ponds near Wallace Lake. *J. Macoun* (C. no. 22,634); *H. St. John*, no. 1,160 (H).

Fr.—September

Carex hormathodes Fernald. Wet margins of the fresh ponds. common. *J. Macoun*; *H. St. John*, nos. 1,161, 1,162, and 1,163 (H).

Fr.—August and September.

[*C. STRAMINEA* Willd. The specimen so labeled by *J. Macoun* is *C. hormathodes*.]

C. silicea Olney. Uniformly distributed on the dunes and drier sand flats. *J. Macoun*; *H. St. John*, no. 1,164 (H).

Fl., Fr.—August.

C. echinata Murr. (*C. stellulata* Good.) Borders of ponds and wet dune hollows. *J. Macoun* (C. no. 23,037); *H. St. John*, no. 1,165 (H).

Fr.—July and August.

C. echinata Murr., var. **cephalantha** Bailey. Found at the East End, *J. Macoun* (C. no. 77,162 and 22,065).

Fr.—July.

C. canescens L., var. **disjuncta** Fernald. Common along the pond margins and in the wet dune hollows. *J. Macoun* (C. nos. 23,070 and 23,071); *H. St. John*, no. 1,166 (H).

Fr.—July to September.

C. deflexa Hornem. Found only by *J. Macoun* (C. no. 23,089).

Fr.—July.

C. Oederi Retz., var. **pumila** (Coss. & Germain) Fernald. Wet usually turfey borders of brackish ponds. *J. Macoun* (C. no. 23,088); *H. St. John*, no. 1,167 (H).

Fr.—July and August.

ERIOCAULACEAE.

Eriocaulon septangulare With. (*E. articulatum* (Huds.) Morong.) Very abundant at the wet margins of the fresh-water ponds. *J. Macoun*; *H. St. John*, no. 1,168 (H).

Fr.—August.

JUNCACEAE.

Juncus bufonius L. Wet sand near Wallace Lake. Collected by *J. Macoun*; *H. T. Güssow*; *H. St. John*, no. 1,169 (H).

Fl., Fr.—August.

J. bufonius L., var. **halophilus** Buchenau & Fernald. Brackish beach of Wallace Lake, *H. St. John*, no. 1,170 (H).

Fl., Fr.—August.

J. tenuis Willd. Common on the sand dunes. Collected by *J. Macoun; H. T. Güssow; H. St. John*, nos. 1,171 and 1,172 (H).
Fl., Fr.—August and September.

[*J. BALTIC* recorded by *J. Macoun* (M. p. 218A) is *J. balticus*, var. *littoralis*.]

J. balticus Willd., var. *littoralis* Engelm. Very common in the wet or dry dune hollows. Collected by *J. Dwight, Jr.* (D. p. 12); *J. Macoun; H. T. Güssow; H. St. John*, no. 1,173 (H).

Fl., Fr.—August.

J. canadensis J. Gay. Common in the dune hollows. *J. Macoun; H. T. Güssow; H. St. John*, nos. 1,174 and 1,175 (H).

Fl.—August. *Fr.*—August and September.

J. pelocarpus Mey., var. *sabulonensis*, n. var., prostratus omnibus partibus forma typica multo minor; foliis teretibus, septis vix visibilibus; floribus in cymam contractam aggregatis; capsulo 2.5–3.5 mm. longo, 1–1.5 mm. diametro igitur crassitudine dimidium longitudinis subaequante.

Prostrate, very much reduced in all parts: the septa scarcely showing on the terete leaf blades: flowers more nearly approximate in the reduced cyme: capsule 2.5–3.5 mm. long, 1–1.5 mm. wide, averaging nearly one half as wide as long, while in *J. pelocarpus* the capsules are 3–4 mm. long, and 1–1.5 mm. wide, averaging one third as wide as long. The bulbiferous form is not known to occur in the var. *sabulonensis*.

NOVA SCOTIA: shallow ponds, Sable Island, Aug. 16, 1899, *J. Macoun* (C. no. 22,631); sprawling in wet dune hollow, Sable Island, Aug. 30, 1913, *H. St. John*, no. 1,176 (TYPE in Gray Herb.).

J. bulbosus L. Common along the marshy borders of fresh-water ponds. *J. Macoun* (C. no. 22,623) see *J. M. Macoun, Ottawa Nat. xv. (Contributions to Canadian Bot. xiv.) 79 (1901); H. St. John*, no. 1,177 (H).

Fl., Fr.—August.

[*J. ARTICULATUS* L. of *J. Macoun* is *J. pelocarpus*, var. *sabulonensis*.]

J. articulatus L., var. *obtusatus* Engelm. Very common in the wet dune hollows. *H. T. Güssow* (E); *H. St. John*, nos. 1,178, 1,179, and 1,180 (H).

Fr.—August and September.

Luzula campestris (L.) DC., var. *acadiensis* Fernald. See *Rhodora*, xix. 38 (1917). Common on the dry dunes that are fixed

by semi-abundant vegetation. *H. St. John*, nos. 1,181 and 1,182 (H). All records for the var. *multiflora* should probably go here.

Fr.—August.

[*JUNCOIDES CAMPESTRE* (L.) recorded by *J. Dwight, Jr.*, (D. p. 12) is treated as *Luzula campestris*, var. *acadiensis*.]

LILIACEAE.

Smilacina stellata (L.) Desf. Found throughout, on the drier dunes that are anchored by a covering of larger vegetation. *J. Dwight, Jr.*; *J. Macoun*; *H. T. Güssow*; *H. St. John*, no. 1,183 (H).

Fr.—August, uncommon.

IRIDACEAE.

Iris versicolor L. Common by the wet pond margins. *John Rose*, in 1633, saw "flags by the ponds" (Winthrop, John: Hist. of N. E., ed. James Savage, i. 162 (1825)). *J. B. Gilpin* records (G. p. 18), "The wild rose, blue lily and wild pea enamel the valleys." It has seemed evident to me that Gilpin's "blue lily" must be *Iris versicolor*. *J. Dwight, Jr.* (D. p. 14) refers to the "blue lilies," "that are said to bloom later in the season, I failed to obtain any specimens." *J. Macoun*; *H. T. Güssow*; *H. St. John*, nos. 1,184 and 1,185 (H).

Fl., Fr.—August and September.

Sisyrinchium gramineum Curtis. Abundant in the wet dune hollows all over the island. Recorded as *S. graminoides* Bicknell by Bicknell, Bull. Torr. Bot. Club, xxvii. 239 (1900). *J. Macoun* (C. nos. 76,855, 76,856, and 76,857); *H. St. John*, no. 1,186 (H).

Fl., Fr.—July and August.

[*S. ANGUSTIFOLIUM* Mill. All records of this from Sable Island should be interpreted as *S. gramineum*.]

ORCHIDACEAE.

Habenaria bracteata (Willd.) R. Br. In boggy spots near Island Pond. Found only by *J. Macoun* (C. no. 22,614). This specimen has been recorded by Ames as *H. viridis* R. Br., var. *bracteata* Gray, in his Orchidaceae, iv. 24 (1910).

Fr.—July.

[*H. VIRIDIS* R. Br., var. *BRACTEATA* Gray recorded by Ames is *H. bracteata*.]

H. clavellata (Michx.) Spreng. Occasional on turf banks near the fresh-water ponds. *J. Macoun; H. T. Güssow* (E); *H. St. John*, nos. 1,187 and 1,188 (H).

Fl.—*Fr.*—September.

H. lacera (Michx.) R. Br. Occasional on turf banks and in the wet dune hollows. *J. Macoun; H. T. Güssow* (E); *H. St. John*, nos. 1,189, 1,190, 1,191, and 1,192 (H).

Fl.—August. *Fr.*—September.

Calopogon pulchellus (Sw.) R. Br. Frequent in the wet dune hollows. *J. Macoun; H. T. Güssow; H. St. John*, nos. 1,193 and 1,194 (H).

Fl.—August.

C. pulchellus (Sw.) R. Br., forma **latifolius** n. f., foliis oblongo-vel elliptici-lanceolatis, 7–11 cm. longis, 1.3–2.8 cm. latis.

Leaves oblong- or elliptic-lanceolate, 7–11 cm. long, 1.3–2.8 cm. wide.

Nova Scotia: wet dune hollow, Sable Island, Aug. 27, 1913, *H. St. John*, no. 1,195 (TYPE in Gray Herb.).

Spiranthes Romanzoffiana Cham. In damp boggy spots. Found only by *J. Macoun* (C. no. 22,603).

Fl.—July.

SALICACEAE.

SALIX VIMINALIS L. A planted specimen has survived at Life Saving Station No. 3, and attained a height of six feet. It showed no signs of having fruited. *H. St. John*, no. 1,196 (H).

MYRICACEAE.

Myrica carolinensis Mill. Scattered clumps on the dry dunes. *J. Macoun; H. T. Güssow; H. St. John*, no. 1,197 (H).

Fr.—August.

M. CERIFERA L. Recorded by *J. Dwight, Jr.* (D. pp. 13 & 42) and by *J. Macoun* (M. p. 218A), but the specimens are undoubtedly *M. carolinensis*.

BETULACEAE.

BETULA PENDULA Roth. Planted in 1901, and one tree surviving near Life Saving Station No. 4, although not equalling the Sand Grass (*Ammophila*) in height. *H. St. John*, no. 1,198 (H).

B. ALBA L. (**B. PUBESCENS** Ehrh.) Two thousand trees were planted in 1901 in Gourdeau Park and a few are still growing there, but are not over two feet in height. *H. St. John*, no. 1,199 (H).

POLYGONACEAE.

Rumex Britannica L. Occurring only along the swampy margins of the fresh-water ponds extending beyond the eastern end of Wallace Lake, near Life Saving Station No. 3. *J. Macoun* (C. no. 22,595); *H. St. John*, no. 1,200 (H).

Fl.—August. *Fr.*—September.

[**R. OCCIDENTALIS** Wats. The plant so listed by *J. Macoun* is *R. Britannica*.]

R. CRISPUS L. Introduced and common near the Life Saving Stations, rare elsewhere. *J. Macoun*; *H. St. John*, nos. 1,201, 1,202, and 1,203 (H).

Fr.—August and September.

R. maritimus L., var. **fueginus** (Phil.) Dusén. See St. John Rhodora, xvii. 81 (1915). Abundant on the brackish beaches of Wallace Lake, and appearing as a weed in the gardens through the use as a fertilizer of sea-weed collected on the beach of the lake. *J. Macoun* (C. no. 22,549); *H. St. John*, nos. 1,204, 1,205, 1,206, 1,207, and 1,208 (H).

Fl.—August. *Fr.*—September.

R. ACETOSELLA L. Thoroughly established on the drier parts of the island, especially near the Life Saving Stations. Mentioned by *J. Dwight, Jr.* (D. pp. 13 & 42). Listed by *J. Macoun*; and *H. T. Güssow*; *H. St. John*, no. 1,209 (H).

Fl.—August.

Polygonum Raii Bab. Wet dune hollow, possibly brackish. Known only from the collection, *H. St. John*, no. 1,210 (H).

Fl.—August.

[**P. FOWLERI** Robinson. The plant so listed by *J. Macoun* is *P. aviculare*.]

P. AVICULARE L. Well established near the Life Saving Stations. *J. Macoun* (C. no. 22,599, also as door-weed M. p. 218A); *H. St. John*, nos. 1,211, and 1,212 (H).

Fl., *Fr.*—August and September.

P. LAPATHIFOLIUM L. In a potato field, East End Post, *J. Macoun* (C. no. 22,590).

Fl., Fr.—July.

P. LAPATHIFOLIUM L., var. *PROSTRATUM* Wimmer. Brackish beach of Wallace Lake near the Main Life Saving Station. *H. St. John*, no. 1,361 (H). Material of this number was distributed under an unpublished manuscript name.

Fl., Fr.—September.

P. SCABRUM Moench (*P. TOMENTOSUM* Schrank). A weed at the Main Life Saving Station. *H. St. John*, no. 1,213 (H).

Fl., Fr.—August.

P. HYDROPIPER L. Introduced around buildings, Main Life Saving Station, *J. Macoun* (C. no. 22,582).

Fl., Fr.—August.

P. PERSICARIA L. A weed at the Main Life Saving Station. *H. St. John*, no. 1,214 (H).

Fl., Fr.—August.

P. hydropiperoides Michx., var. *psilostachyum*, n. var., *P. hydropiperoidem* simulans sed differt ocreolis glabris eciliolatis, marginibus pellucidis; foliis glabris vel glabratis brevioribus, 4–8 cm. longis, 0.8–2.4 cm. latis.

Differing from *P. hydropiperoides*, which has leaves pubescent at least on the midrib and near the margins and often throughout, in having glabrous eciliolate ocreolae which have scarious transparent margins, and in the glabrous or glabrate comparatively short leaves, 4–8 cm. long, 0.8–2.4 cm. wide.

NOVA SCOTIA: in muddy ponds and by their borders, Sable Island, Aug. 3, 1899, *J. Macoun* (C. no. 22,583); Sable Island, Sept., 1911, *H. T. Güssow* (E); shallow fresh-water pond, Sable Island, Aug. 16, 1913, *H. St. John*, no. 1,215 (H); swampy edge of fresh-water pond, Sable Island, Aug. 23, 1913, *H. St. John*, no. 1,216 (TYPE in Gray Herb.). *WASHINGTON*: White Salmon, Oct., 1880, *W. N. Suksdorf*, no. 483 (H); Columbia River Bottom, Klickitat Co., Oct. 12, 1881, *W. N. Suksdorf*, no. 56 (H & P).

To the last-cited specimen there is a reference in a letter from W. N. Suksdorf to Dr. Sereno Watson, dated Oct. 20, 1881. "It is an indigenous plant no doubt, very frequent on low bottom lands near the Columbia River; perennial, the prostrate stems rooting at the joints, the flowering portion mostly ascending." On the list is a note in Dr. Watson's handwriting, "but bracts not ciliate." So it

appears that Dr. Watson had noticed one of the characters of the var. *psilotachyum*, but he took no action.

P. CONVOLVULUS L. A weed at the Main Life Saving Station. *J. Macoun; H. St. John*, no. 1,217 (H).

Fl., Fr.—August.

CHENOPODIACEAE.

Chenopodium rubrum L. Common on the brackish beach of Wallace Lake. *J. Macoun; H. T. Güssow; H. St. John*, no. 1,218 (H).

Fr.—September.

C. ALBUM L. A weed at the Main Life Saving Station. *J. Macoun*; (also as "lamb's quarter" M. p. 218A); *H. St. John*, no. 1,219 (H).

Fl.—August.

A narrow-leaved form is also established at the Main Life Saving Station. *H. St. John*, no. 1,220 (H).

Fl.—September.

Atriplex patula L., var. **hastata** (L.) Gray. Common on the wet brackish beach of Wallace Lake. *J. Macoun; H. T. Güssow; H. St. John*, no. 1,221 (H).

Fr.—September.

CARYOPHYLLACEAE.

Spergularia leiosperma (Kindberg) F. Schmidt. See Fernald & Wiegand, Rhodora, xii. 162 (1910). Common on the brackish sandy beach of Wallace Lake. *J. Macoun* (C. no. 21,151); *H. T. Güssow* (E); *H. St. John*, nos. 1,222 and 1,223 (H).

Fl.—August. *Fr.*—August and September.

[*S. CANADENSIS* (Pers.) Don of *J. Macoun* and *H. T. Güssow* is *S. leiosperma*.]

SPERGULA ARVENTIS L. A weed at the Main Life Saving Station. *J. Macoun; H. St. John*, nos. 1,224 and 1,225 (H).

Fl.—August and September. *Fr.*—September.

Sagina procumbens L. Frequent in the wet dune hollows. *J. Macoun; H. St. John*, no. 1,226 (H); *H. S. Glazebrook* (H).

Fl.—June to August. *Fr.*—July to August.

Arenaria lateriflora L., var. **typica** (Regel) St. John. Turfy banks and grass-covered dunes. *J. Macoun; H. T. Güssow; H. St. John*, no. 1,227 (H).

Fr.—August.

[*A. GROENLANDICA* (Retz.) is recorded by *J. Dwight, Jr.* (D. p. 14). I searched for this specimen in the Herbarium of the New York Botanical Garden, but could not find it. I strongly suspect the plant is *A. lateriflora*, var. *typica*.]

[*A. PEPLOIDES* L. Recorded by *J. Dwight, Jr.* (D. p. 14) and by *J. Macoun* (M. p. 213A) is probably to be treated as of the var. *robusta*.]

A. peploides L., var. **robusta** Fernald. See *Rhodora*, xi. 114 (1909). Very abundant at the top of the beaches, on the dry bars and sand spits. As is the case with *Ammophila*, this plant plays an important part in the affairs of the island. The terns of three sorts which nest on the sand flats, almost invariably place their nests in a clump of the *Arenaria*. From a somewhat unusual cause, a botanist finds great difficulty in collecting good specimens of this abundant plant. For weeks he can inspect clump after clump of the *Arenaria* and find that in each case there has been an earlier visitor, and a very destructive one. This succulent, free-growing plant is the choicest fodder of the "gangs" of wild ponies that roam the island, and as these total anywhere from two to four hundred ponies, it is easy to see how they would make serious depredations on any plant growing only in a limited portion of an area of about fifteen square miles. Taking the hint from the ponies, I myself tried munching a sprig of the *Arenaria*, and found it of good texture, juicy and with a strong but not unpleasant taste resembling that of cabbage. *J. Dwight, Jr.* (D. p. 14); *J. Macoun; H. T. Güssow; H. St. John*, no. 1,228 (H).

Fr.—August.

STELLARIA GRAMINEA L. A weed, established at the Main Life Saving Station. *J. Macoun; H. St. John*, no. 1,229 (H).

Fl., Fr.—August.

S. MEDIA (L.) Cyrill. A weed, thoroughly established at the Main Life Saving Station. *J. Macoun* (C. no. 21,154); *H. St. John*, no. 1,230 (H).

Fl., Fr.—July and August.

[*S. MEDIA* (L.) Cyril., ssp. *NEGLECTA* Weihe. Theo. Holm, in the Ottawa Nat. xv. 37-41 (1901), records this from Sable Island, basing it on *J. Macoun's* collection (C. no. 21,154). I have examined this specimen and can see no justification for separating it from *S. media*.]

[*S. MEDIA* (L.) Cyril., var. *PROCERA* Klett & Richter. Recorded in Gray's Man. ed. 7, 382 (1908), is to be treated as *S. media*.]

CERASTIUM VULGATUM L. Established on the dry dunes near the Life Saving Stations. *J. Macoun*; *H. St. John*, no. 1,231 (H); *H. S. Glazebrook* (H).

Fl.—June to August. *Fr.*—August.

SILENE NOCTIFLORA L. A weed at Life Saving Station No. 3. *H. St. John*, no. 1,232 (H).

Fr.—September.

PONTULACACEAE.

[*MONTIA FONTANA* L. Listed by *J. Macoun*, but the specimen is *Tillaea aquatica*.]

PONTULACA OLERACEA L. A weed, observed in the garden of the Main Life Saving Station.

NYMPHAEACEAE.

Nymphaeanthus variegatus (Engelm.) Fernald. See *Rhodora*, xxi. 187 (1919). Abundant in the small ponds which at all times are absolutely isolated from the sea. *J. Macoun* (C. no. 21,142); *H. St. John*, no. 1,233 (H).

Fl.—July and August. *Fr.*—August.

[*NUPHAR ADVENA* Ait. All records from the island are to be considered as *Nymphaeanthus variegatus*.]

RANUNCULACEAE.

Ranunculus Cymbalaria Pursh. Common on the brackish beaches. *J. Macoun* (C. no. 21,130); *H. St. John*, no. 1,234 (H).

Fl., *Fr.*—July to September.

[*R. CYMBALARIA* Pursh, var. *ALPINUS* Hook. recorded by *J. Macoun*. The specimen is better treated as *R. Cymbalaria*.]

R. reptans L. (*R. Flammula*, var. *reptans* (L.) Meyer.) Very common in the wet dune hollows. *J. Macoun*; *H. T. Güssow*; *H. St. John*, no. 1,235 (H).

Fl., *Fr.*—August.

R. REPENS L. A rare introduction. Found only by *J. Macoun* (C. no. 21,132).

Fr.—August.

R. ACRIS L. A weed at the Main Life Saving Station. *J. Macoun*; *H. St. John*, no. 1,236 and 1,237 (H).

Fl.—August and September. *Fr.*—September.

[**THALICTRUM DIOICUM** L. Listed by *J. Macoun*, and *H. T. Güssow*, but the specimens are *T. polygamum*, var. *hebecarpum*.]

Thalictrum polygamum Muhl., var. **hebecarpum** Fernald. Common on the stable, well vegetated dunes. *J. Dwight, Jr.* (D. p. 13) mentions as one of the weeds "*Thalictrum sp.?*" As there is but one species of Meadow Rue growing on the island, and that very commonly, we can feel reasonably sure that *J. Dwight, Jr.*, found *T. polygamum*, var. *hebecarpum*. It is hard to understand, however, why he called it a weed. *J. Macoun* (C. no. 21,134); *H.T. Güssow* (E); *H. St. John*, no. 1,238 (H).

Fl.—July and August. *Fr.*—August and September.

[**T. ZIBELLINUM** Greene. In the Ottawa Naturalist, xxiv. 30 (1910) this new species was published, based upon the collection of *J. Macoun* (C. no. 21,134). I have examined the suite of specimens collected under this number and feel no hesitation about stating that the plant should be treated as *T. polygamum*, var. *hebecarpum*.]

Coptis trifolia (L.) Salisb. On the more permanent, grass-covered dunes. *J. Macoun*; *H. St. John*, no. 1,239 (H); *H. S. Glazebrook* (H).

Fl.—June.

CRUCIFERAE.

CAPSELLA BURSA-PASTORIS (L.) Medic. A weed at the Main Life Saving Station. *J. Macoun*; (also as "shepherd's purse" M. p. 218 A); *H. St. John*, no. 1,240 (H).

Fl., *Fr.*—August.

Cakile edentula (Bigel.) Hook. Common on the sea strands and along the brackish beach of Wallace Lake. *J. Macoun; H. T. Güssow* (E); *H. St. John*, no. 1,241 (H).

Fl., Fr.—August.

RAPHANUS SATIVUS L. Established at the Main Life Saving Station. *H. St. John*, no. 1,242 (H).

Fl.—August.

BRASSICA ARVENSIS (L.) Ktze. A weed near the Life Saving Stations. *J. Macoun; H. St. John*, no. 1,243 (H).

Fl.—August.

SISYMBRIUM OFFICINALE (L.) Scop. A weed near Life Saving Station, No. 3. *H. St. John*, no. 1,244 (H).

Fl., Fr.—September.

DROSERACEAE.

Drosera rotundifolia L. Common in the wet dune hollows and on the margins of the fresh-water ponds. *J. Macoun; H. T. Güssow; H. St. John*, no. 1,245 (H).

Fl., Fr.—August.

D. longifolia L. In wet sand and bogs, found only by *J. Macoun* (C. no. 21,187).

Fl.—August.

CRASSULACEAE.

Tillaea aquatica L. Forming pure mats at the wet borders of the fresh-water ponds. *J. Macoun* (C. no. 21,156); *H. St. John*, nos. 1,246 and 1,247 (H).

Fl., Fr.—July and August.

The three collections of this plant from Sable Island show, in the same clump, plants which have "nearly sessile" flowers and fruit, and other plants bearing nearly sessile flowers in the upper axils and peduncled ones in the lower axils. According to our present American treatments, we should have to recognize in these apparently pure clumps two species. An examination of the American material of *Tillaea Vaillantii* Willd. shows that in every known locality *T. aquatica* occurs and occurs more abundantly, that its characters are a matter of degree, not strictly definable. Consequently the author feels that *T. Vaillantii* of American authors should be treated as identical with *T. aquatica*. The inference must not be drawn that

the author is discounting *T. Vaillantii* Willd. of Europe, which is a valid and distinct species.

SAXIFRAGACEAE.

HYDRANGEA PANICULATA Sieb., var. **GRANDIFLORA** Sieb. From the twenty-five planted in 1901, one is still surviving at Life Saving Station, No 3. *H. St. John*, no. 1,248 (H).

ROSACEAE.

Pyrus arbutifolia (L.) L. f., var. **atropurpurea** (Britton) Robinson. Common on the more permanent, well vegetated parts of the island. *J. Macoun* (C. no. 21,174); *H. St. John*, nos. 1,249 and 1,250.

Fr.—August.

[*P. MELANOCARPA* (Michx.) Willd. Listed by *H. T. Güssow* on the basis of a field determination. It is doubtless to be considered as *P. arbutifolia*, var. *atropurpurea*.]

[*FRAGARIA VIRGINIANA* Duchesne. Listed by *H. T. Güssow* on the basis of a field determination. The plant was undoubtedly of the var. *terrae-novae*.]

Fragaria virginiana Duchesne, var. **terrae-novae** (Rydb.) Fernald & Wiegand. See *Rhodora*, xiii. 106 (1911). Common on the semi-permanent dunes, and in the turf hollows. *Andrew Le Mercier* in 1753 described the island as looking all "red in summer with the large Strawberries." We must remember, however, that by means of this article *Le Mercier* hoped to sell the island, which was then his private property. *J. B. Gilpin* in 1858 (G. p. 18) mentioned the "Strawberries." Similarly *J. C. Taché* speaks of "les fraises," (T. p. 29). *J. Dwight, Jr.*; *J. Macoun* (C. nos. 21,172 and 21,182); *H. T. Güssow*; *H. St. John*, no. 1,251 (H).

Fl.—June.

[*F. CANADENSIS* Michx. recorded by *J. Dwight, Jr.*, is *F. virginiana*, var. *terrae-novae*.]

[*POTENTILLA MONSPELIENSIS* L. The records of *J. Macoun*, and *H. T. Güssow* should be for var. *norvegica*.]

Potentilla monspeliensis L., var. **norvegica** (L.) Rydb. Common around the margins of the fresh-water ponds. *J. Macoun* (C. no. 21,176); *H. T. Güssow* (E); *H. St. John*, nos. 1,252 and 1,253 (H).

Fl., Fr.—August and September.

P. palustris (L.) Scop. Occasional on the wet pond margins. Listed by *J. Macoun*; *H. St. John*, nos. 1,254, 1,255, and 1,362 (H). *Fr.*—September.

P. palustris (L.) Scop. approaching var. **parvifolia** (Raf.) Fernald & Long. See *Rhodora*, xvi. 10 (1914). Swampy edge of a fresh pond, near the east end of Wallace Lake, growing in the same colony with *P. palustris*. *H. St. John*, no. 1,256 (H).

Fr.—September.

P. tridentata Ait. Occasional on the sand dunes. Listed by *J. Macoun*; and *H. T. Güssow*. *H. St. John*, no. 1,257 (H).

Fl.—August.

P. pacifica Howell. See *Rhodora* xi. 8 (1909). Abundant along the brackish beaches of Wallace Lake. *H. T. Güssow* (E); *H. St. John*, no. 1,258 (H).

Fl., Fr.—August.

[*P. ANSERINA* L. Listed by *J. Macoun*, but is probably *P. pacifica*.]

Rubus hispida L. Known from this area only by a small fragment collected by *J. Macoun* (C. no. 21,139 in part) (H).

Rubus arcuans Fernald & St. John, n. sp., arcuans deinde prostratus; turionibus aculeis 3–4.5 mm. longis robustis curvatis retrorsis valde armatis; foliis plerumque trifoliolatis aliquando quinquefoliatis vel subquinquefoliatis; foliolis obovatuis acutis vel suborbiculatis coriaceis supra nigri-viridibus subtus pallidi-viridibus grosse dupliciterque serratis, 3.5–8.5 cm. longis, 2–6.2 cm. latis, costa media subter aculeis raris instructa, costis minute pilosis: ramis floriferis prostratis; foliis trifoliolatis vel simplicibus; foliolis coriaceis obovatuis grosse dupliciterque serratis 2.5–8 cm. longis, 1.5–7 cm. latis, costis subter pilosis; inflorescentia racemosa vel composita racemosa foliosa interrupta, 0.6–3.2 dm. longa; pedicellis 1.5–4 cm. longis, densissime pilosis aculeis aliquando glandulis paucis stipitatis munitis; sepalis lanceolati-ovatis; petalis albis spatulatis, 7–11 mm. longis; fructibus globosis.

Arching and becoming prostrate: canes of the first year thickly beset with strong curved retrorse bristles, which are 3–4.5 mm. in length: the leaves normally 3-foliate, but sometimes 5-foliate or imperfectly so; the leaflets obovate with an acute tip or nearly orbicular, coriaceous, dark green above, light green beneath, coarsely doubly serrate, 3.5–8.5 cm. long, 2–6.2 cm. wide; the midrib armed beneath with scattered prickles; the veins finely pilose: fruiting canes prostrate, with trifoliolate or simple leaves; the coriaceous leaf-

lets obovate, pilose on the veins, coarsely and doubly serrate, 2.5–8 cm. long, 1.5–7 cm. wide: the inflorescence an interrupted leafy subcylindric simple or compound raceme, 0.6–3.2 dm. long; pedicels 1.5–4 cm. long, very densely pilose, armed with prickles and at times with a few stipitate glands; sepals lance-ovate; petals white, spatulate, 7–11 mm. long; fruit globose.

PRINCE EDWARD ISLAND: dry open soil, Dundee, Aug. 26, 1912, *M. L. Fernald*, *Bayard Long*, and *Harold St. John*, no. 7,652 (TYPE in Gray Herb.); railroad banks, Mt. Stewart, July 30, 1912, *M. L. Fernald*, *E. B. Bartram*, *Bayard Long*, and *Harold St. John*, nos. 7,655 and 7,654 (H); Miscouche, Sept. 12, 1909, *W. H. Blanchard*, no. 806 (H). NOVA SCOTIA: Pictou, July 22, 1907, *C. B. Robinson*, no. 574 (H). SABLE ISLAND: July 24, 1899, *J. Macoun* (C. no. 21,193 in part); sprawling among *Ammophila* on sand dunes, Aug. 26, 1913, *H. St. John*, no. 1,259 (H). MASSACHUSETTS: damp dune hollows east of Race Point Life Saving Station, Provincetown, August 2, 1919, *Fernald & Long*, no. 18,585.

Rydb erg cites with some doubt the Macoun nos. 21,183 and 21,193 from Sable Island as *Rubus nigricans* × *recurvans*, Bull. Torr. Bot. Cl. xlvi. 476 (1915); and on the following page he cites no. 21,193 as *Rubus nigricans* × *procumbens*. On p. 478 he cites the C. B. Robinson no. 574 as *Rubus hispida* × *nigricans*.

An anonymous writer reports "blackberries" on Sable Island (All the Year Round, lx. 521, 1890).

This species of the Maritime Provinces and Cape Cod differs from *R. stardatus* Blanchard by having broadly obovate more coriaceous leaflets, abundant strong prickles, densely villous and ordinarily glandless but bristly pedicels; instead of the broadly lanceolate leaflets tapering to each end, the less numerous weaker prickles, and the less pubescent and copiously glandular pedicels of that species; from *R. setosus* Bigel. by having strong prickles thickened at the base and broad obovate bluntly serrate dark green coriaceous leaflets, instead of fine setae and narrower oblanceolate sharply serrate paler leaflets, long-trailing tips of the branches and essentially glandless pedicels; from *R. hispida* L. by its much coarser habit, strong prickles, larger leaves, and its more elongate coarser inflorescence with larger corolla and larger seeds (averaging 3 mm. in length), the comparatively delicate *R. hispida* having fine weak prickles and more rounded smaller leaflets and small fruits with seeds averaging 2 mm. in length.

Fl., Fr.—August.

Rosa virginiana Mill. Very common on the more stable sand dunes throughout the island. "The wild rose" is mentioned by *J. B. Gilpin* (G. p. 18). *J. C. Taché* says, "La plus belle plante d'ornement est le rosier sauvage, qui vient à merveille, sur cette

terre si souvent enveloppée de brouillards et visitée par les orages" (T. p. 29). *J. Macoun; H. T. Güssow; H. St. John*, no. 1,260 (H).

Fr.—August and September.

[*R. NITIDA* Willd., is a tentative determination put on material in young leaf collected by *J. Dwight, Jr.* (D. p. 13). The plant is doubtless *R. virginiana*.]

LEGUMINOSAE.

CYTISUS SCOPARIUS (L.) Link. In 1901 there were planted 1,000 bushes of this species. In 1913 there was to be seen but one small clump which still survived in Gourdeau Park. *H. St. John*, no. 1,261 (H).

TRIFOLIUM PRATENSE L. A weed, well established around the Life Saving Stations. *J. Dwight, Jr.* (D. p. 12) states that this species has "been cultivated near the stations." *H. T. Güssow; H. St. John*, no. 1,262 (H).

Fl.—August and September.

T. REPENS L. Dry sand flats and pond shores. An anonymous writer who visited Sable Island in 1851 says, "In the neighbourhood of the chief residence, where white clover and other grasses have been sown, so luxuriant is the yield that over 100 tons of hay are made annually" (*Leisure Hour*, xxx. 433, 1881).

J. Dwight, Jr., (D. p. 12) in referring to this species says, "Man's influence has been at work on the island for so many centuries that it is almost impossible to draw the line between indigenous species, if such there be, and those artificially introduced." This species grows particularly on the dry sands near the Life Saving Stations and along the shores of the adjacent ponds where the cattle and the domesticated ponies browse continually, and because of this it seemed to the writer that the White Clover was one of the species that was obviously introduced. Listed by *J. Macoun* (also as "white clover," M. p. 218A); *H. St. John*, no. 1,263 (H).

Fl., Fr.—August.

T. HYBRIDUM L. A garden weed. Listed by *J. Macoun; H. St. John*, no. 1,264 (H).

Fl., Fr.—September.

Lathyrus maritimus (L.) Bigel. Very abundant all over the island, and an able ally of the Sand Grass in its perpetual defensive

against the eroding forces that threaten to destroy the island. In 1633 *John Rose* reported, "store of wild peas" (Winthrop, John: History of New England from 1630 to 1649, ed. James Savage i. 162, 1825). Writing in 1753 *Andrew Le Mercier* (L) says of the island, "It hath abundance of Wild or Beach Pease, which fatten the cattle very well." In 1766 and 1767 *Joseph Frederick Wallet Des Barres* found "wild pease" (Atlantic Neptune i. 68, 1777). *Seth Coleman* in 1801 found the "wild Pea" (Rept. on Canadian Archives 91, 1895). *Joseph Howe*, in 1851, "was agreeably surprised to find it covered, for nearly its whole length of five and twenty miles, with natural grass and wild peas" (Append. to Journ. of House of Assembly of N. S. 161, 1851). The "wild pea" is mentioned by *J. B. Gilpin*, 1858 (G. p. 18). *J. C. Taché* mentions the abundance of the "Lentille du Canada, qu'on nomme ici 'pois sauvages'" (T. p. 29). *J. Dwight, Jr.* (D. p. 13) lists this with *Gnaphalium* sp. and calls them both weeds! *Macoun* says (M. p. 215A), "This one species of grass [*Ammophila arenaria*] with the wild pea (*Lathyrus maritimus*) constitutes the bulk of the wild hay cut for winter fodder and the winter pasturage of the wild horses." Listed by *J. Macoun* and *H. T. Güssow*. *H. St. John*, nos. 1,265 and 1, 266 (H).

Fl., Fr.—August.

[*L. PALUSTRIS* L. of *J. Macoun's* and *H. T. Güssow's* list is of the var. *macranthus*.]

L. palustris L., var. **macranthus** (T. G. White) Fernald. See *Rhodora*, xiii. 50 (1911). Abundant at the swampy or sandy borders of the fresh-water ponds. *J. Macoun* (C. nos. 21,165 and 21,195); *H. T. Güssow* (E); *H. St. John*, nos. 1,267 and 1,268 (H).

Fl., Fr.—August and September.

[*L. PALUSTRIS* L., var. *MYRTIFOLIUS* (Muhl.) Gray of *J. Macoun's* list is of the var. *macranthus*.]

L. palustris L., var. **retusus** Fernald & St. John, n. var., sub-pilosus, caule tenue paulo alato, stipulis lanceolatis semisagittatis 8–18 mm. longis, foliolis 2–3-jugis spatulatis vel cuneato-ellipticis mucronatis retusis 2–4.5 cm. longis, 0.6–1.6 cm. latis, cirrhis 2–4-fidis, 4-floris, 1.2–1.6 cm. longis, legumine 4 cm. longo.

Somewhat pilose throughout: the stem slender, slightly winged: stipules lanceolate, semisagittate, 8–18 mm. long: leaflets of 2 or 3 pairs, spatulate or cuneate-elliptic, mucronate, retuse, 2–4.5 cm. long, 0.6–1.6 cm. wide: tendrils well developed, 2–4-parted: flowers 4 in number, 1.2–1.6 cm. in length: the pod 4 cm. long.

Nova Scotia: edge of fresh-water pond, Sable Island, Aug. 21, 1913, *Harold St. John*, no. 1,271 (TYPE in Gray Herb.).

This endemic variety differs from all the other known varieties of *Lathyrus palustris* in having the leaves broadest near the tip, and tapering gradually to a cuneate base.

Fl., Fr.—August.

EMPETRACEAE.

Empetrum nigrum L. Very abundant on the low undulating dunes and sheltered slopes in the more stable parts of the island. The juicy, attractively colored, but unpleasantly flavored berries form a part of the food of the birds that visit the island, especially the Curlews. They are sometimes used by the residents of the island in the manufacture of a slightly alcoholic drink. The berries are crushed, then after the addition of sugar or molasses the juice is put in a dark air-tight receptacle until the fermentation takes place. *J. Dwight, Jr.* (D. pp. 9 & 12) noticed that a large part of the island "is carpeted with the evergreen Crowberry (*Empetrum nigrum* L.)". *J. Macoun* also comments upon its abundance (M. p. 215A, 216A & 218A). It is listed by *H. T. Güssow. H. St. John*, nos. 1,269 and 1,270 (H).

Fr.—August and September.

AQUIFOLIACEAE.

Ilex verticillata (L.) Gray. Occasional on the dry slopes of shifting dunes. *H. St. John*, no. 2,041 (H).

Not observed in flower or fruit.

ACERACEAE.

ACER PLATANOIDES L. One sapling surviving at Life Saving Station, No. 3. In 1901 in the large planting there were 500 of these trees set out. *H. St. John*, no. 1,272 (H).

RHAMNACEAE.

RHAMNUS FRANGULA L. A few ragged shrubs still surviving at Gourdeau Park. None of them exceed 2 feet in height. In 1901 there were 100 bushes of this set out. *H. St. John*, no. 1,273 (H).

MALVACEAE.

[*J. B. Gilpin* (G. p. 18-9) in 1858 devotes a single paragraph to the flora, beginning with, "A Botanist would give a scientific list of

thirty or forty varieties of shrubs and plants." He mentions ten species, closing with the phrase, "and as Autumn heats yellow the luxuriant green, the tall, mallow, gay golden rods and wild China-asters are swept by the heaving gales." *J. C. Taché* (T. p. 28-9) in 1885 refers to eight of these ten species in a passage which is nothing but a free translation from Gilpin. For instance Taché begins with, "La Flore des Sablons n'a point été complètement cataloguée: on a dit qu'un botaniste pourrait y observer trente à quarante espèces ou variétés; * * * * Ces deux plantes fourragères, auxquelles s'adjoignent la verge d'or, la mauve et des autres espèces * * * " Taché, it will be seen has taken Gilpin's "tall, mallow," literally and records it definitely as, "la mauve." Gilpin's sentence, as it stands, is inconsistent, for if there were no comma after "tall," it would be clear that he wished to record some tall mallow. As it is, he seems to be setting off by commas a series of adjectives all qualifying "golden rods," and we may perhaps interpret "mallow" as a misprint for "mellow." No one of the four naturalists to visit Sable Island has found anything that could be called or mistaken for a "tall, mallow." Consequently, it seems better to drop this record as a probable error.]

GUTTIFERAE.

Hypericum boreale (Britton) Bicknell. Abundant in the wet dune hollows. *J. Macoun* (C. no. 21,158). Listed by *H. T. Güssow*. *H. St. John*, nos. 1,274 and 1,275 (H).

Fl., *Fr.*—August.

[*H. MUTILUM* L. of *J. Macoun*'s list is *H. boreale*.]

H. virginicum L. Occasional in the wet dune hollows and cranberry bogs. *J. Macoun* (C. no. 21,157); listed by *H. T. Güssow*; *H. St. John*, no. 1,276 (H).

Fl.—July and August.

VIOLACEAE.

Viola septentrionalis Greene. Collected only by *H. S. Glazebrook*, the Station Master of Life Saving Station No. 3.

Fl.—June.

[*V. OBLIQUA* Hill (Blue Violets) is recorded by *J. Dwight, Jr.* (D. p. 13). A search in the Herbarium of the New York Botanical

Garden failed to reveal this specimen. It probably is to be regarded as *V. septentrionalis*.]

V. lanceolata L. Abundant in the wet dune hollows. [Recorded by *J. Dwight, Jr.* (D. p. 13), but the specimens on which this is based are *V. primulifolia*.] Listed by *H. T. Güssow*. *H. St. John*, no. 1,277 (H).

Fl.—June and July. *Fr.*—August.

V. primulifolia L. Rare, on dry sandy banks. Collected by *J. Dwight, Jr.*; *H. St. John*, no. 1,278 (H).

Fl.—June to August.

V. pallens (Banks) Brainerd. Common in the wet dune hollows, and along the swampy borders of the fresh-water ponds. *H. St. John*, nos. 1,279, 1,280, and 1,281 (H).

Fr.—August and September.

[*V. BLANDA* Willd. is listed by *H. T. Güssow*. The plant on which the record is based proves to be *V. incognita*, var. *Forbesii*.]

V. incognita Brainerd, var. **Forbesii** Brainerd. See *Bull. Torr. Bot. Cl.* xxxviii. 8 (1911). Found only by *H. T. Güssow* (E); and *H. S. Glazebrook* (H).

Fl.—June. *Fr.*—September.

ONAGRACEAE.

Epilobium molle Torr., var. **sabulonense** Fernald. Rhodora, xx. 31 (1918). Quoting from the original publication “habitu foliisque ut apud formam typicam; caulibus foliisque dense cinereo-pilosus, pilis adpressis incurvatis; capsulis cinereo-pilosus valde glandulosus.

“Habit and foliage as in the typical form: stems and leaves densely cinereous-pilose with appressed incurved hairs: capsules cinereous-pilose, copiously glandular.”

Nova Scotia: swampy edge of fresh-water pond at Life Saving Station No. 3, Sable Island, Sept. 9, 1913, *Harold St. John*, no. 1,282 (TYPE in Gray Herb.); rare, in a bog at No. 3 Station, Sable Island, (1899) *John Macoun* (C. no. 21,189).

Fl., *Fr.*—September.

“The only *Epilobium* known from Sable Island, 100 miles off the coast of Nova Scotia, is a plant collected in 1899 by Prof. John Macoun and in 1913 secured in quantity by Dr. Harold St. John; and from

the observations of both these explorers apparently the only member of the genus on the island. The plant in habit, outline of foliage, and large flowers, as well as in the characters of its calyx and seeds, exactly matches the common *E. molle* Torr. of the mainland, while the capsules have the peculiar glandular pubescence which is found upon the capsules of *E. molle*, but in the Sable Island plant much more highly developed than is common in mainland specimens. The stems and the leaves of the Sable Island plant, however, are densely cinereous with appressed and incurved hairs, exactly as in *E. densum* Raf.; *E. molle* having the stems, leaves, etc., densely covered with fine, straight conspicuously spreading pubescence.

"This Sable Island plant with the technical characters of calyx, petals, etc., and the glandular pubescence of the capsule, and the exact habit and leaf-outline of *E. molle*, but with the pubescence of the leaves and stems exactly as in *E. densum* would, if found upon the mainland, be promptly called a hybrid between those two species. But neither of the species has been detected on Sable Island, a region of sufficiently limited area to give assurance that the extended explorations of Macoun in 1899, of Güssow in 1911, and of St. John in 1913, when the latter explorer spent four weeks in an intensive study of the flora, would have brought to light any other existing member of the genus. Upon Sable Island, then, this plant, combining the characters of two ordinarily distinct species of the mainland, cannot be accepted as a hybrid, at least of modern origin. There is, moreover, reason to believe that the flora of Sable Island reached that area during the late Pleistocene and has been isolated from the mainland flora since that time. However long this period may have been, whether estimated by thousands or tens of thousands of years, it has certainly been a sufficient time for the Sable Island plant to have become thoroughly fixed in its characters, and even if, many thousands of years ago, it may have originated as a hybrid, it has upon Sable Island intensified its characters and become a thoroughly constant plant.

"The case of this plant is exactly comparable with that of *E. densum*, var. *nesophilum* * * * the peculiar variant of *E. densum* found upon Newfoundland and the Magdalen Islands, where no true *E. densum* is found, but in those areas suggesting that it might have originated in the long-distant past by the hybridization of *E. densum* of the South and *E. palustre* of the North. Whether these plants have had such an origin is entirely problematical and it may as confidently be argued

that they are local developments, which by insular isolation have become fixed entities, and are really the result of natural selection. Whatever the origin of these plants may be, they are now absolutely definite and consistent."¹

[E. MOLLE Torr., of Macoun's list is based on one of the plants cited above as *E. molle*, var. *sabulonense*.]

Oenothera cruciata Nutt. Occasional on the slopes of the dry dunes. *J. Macoun* (C. no. 21,193 in part); *H. St. John*, no. 1,283 (H).

Fl.—July and August. *Fr.*—August and September.

[O. OAKESIANA Robbins. The material so reported by *J. Macoun*, (C. no. 21,193) is in part *O. cruciata*, in part *O. muricata*.]

O. muricata L. Common on the slopes of the dry dunes. Collected by *J. Macoun* (C. nos. 78,527, and 21,193 in part); *H. St. John*, nos. 1,284 and 1,285 (H).

Fl., *Fr.*—August.

HALORAGIDACEAE.

Myriophyllum tenellum Bigel. Very abundant and forming solid bands submersed or emersed at the borders of the fresh-water ponds. *Dr. A. H. MacKay* in Trans. N. S. Inst. Sci. x. 320 (1900) mentions specimens found by *J. Macoun*. Listed by *J. Macoun*, and *H. T. Güssow*. *H. St. John*, nos. 1,287, and 1,288 (H).

Fl.—July and August. *Fr.*—September.

Hippuris vulgaris L. In the swampy margins of a few of the larger and more permanent fresh-water ponds. Listed by *J. Macoun*; and *H. T. Güssow*. *H. St. John*, no. 1,289 (H).

Fl., *Fr.*—August.

UMBELLIFERAE.

Ligusticum scoticum L. One single clump observed near the brackish margin of Wallace Lake. *H. St. John*, no. 1,290 (H).

Fl., *Fr.*—August.

Coelopleurum lucidum (L.) Fernald. (*C. actaeifolium* (Michx.) C. & R.) Infrequent on the slopes of the turf-covered dunes. Listed by *J. Macoun*; and *H. T. Güssow*. *H. St. John*, nos. 1,291, 1,292, and 1,293 (H).

Fl., *Fr.*—September.

¹ Fernald, l. c. 30-31.

PASTINACA SATIVA L. Planted in the garden of the East End Lighthouse. *H. St. John*, no. 1,294 (H).

Fr.—September.

DAUCUS CAROTA L. A weed in the garden at Life Saving Station No. 4. *H. St. John*, no. 1,295 (H).

Fl.—September.

CORNACEAE.

Cornus canadensis L. This species has been observed and collected only by *J. Dwight, Jr.* (D. pp. 13 and 42).

ERICACEAE.

CALLUNA VULGARIS (L.) Hull. Adventive but not well established, growing on the sheltered turf-covered slopes of the dunes. When *J. Macoun* visited Sable Island in 1899, he did not find *Calluna*. *H. T. Güssow* in 1911 collected it and noted, "found about $\frac{1}{2}$ mile west of Marconi Station, 3 solitary clumps and 1 solitary clump 10 miles East, close to No. 3 Station." In 1913, during my visit, only two clumps were observed, both being in Gourdeau Park, the locality near the Marconi Station mentioned by *Güssow*. It will be noticed that the first records of *Calluna* on the island come after the year 1901, when the large forestry planting was done. The trees were in greater part imported from a French nursery and Mr. R. J. Bouteiller, at that time Superintendent of the island, tells me that although *Calluna* was not included in the list of imported plants, it sprang up soon after near them, and was in all probability used for, or carried in, the protective packing around the trees. Collected by *H. T. Güssow* (E); and *H. St. John*, no. 1,296 (H).

Fl.—August and September.

Vaccinium pensylvanicum Lam. Very abundant on the low turf-covered dunes and undulating barrens. In 1766 and 1767, *J. F. W. Des Barres* observed "blueberries—&c., in their season" (*Atlantic Neptune*, i. 68, 1777). *J. B. Gilpin* writing in 1858 remarks that "blueberries * * * are in abundance" (G. p. 18). *J. C. Taché* mentions, "On y trouve, en fait des fruits, * * * les bluets" (T. p. 29). *J. Dwight* in 1895 reports this species in blossom the second week of June (D. pp. 13 and 42). Listed by *J. Macoun* (also M. p. 218A); and *H. T. Güssow*. *H. St. John*, no. 1,297 (H).

Fl.—June. *Fr.*—September.

V. macrocarpon Ait. Very abundant in most of the wet dune hollows. The cranberries form the only crop produced on the island that is of any importance. From 50 to 200 barrels are picked and exported every year. *J. F. W. Des Barres* reported that in 1766 and 1767 he found, "hollows and ponds of fresh-water, the skirts of which abound with cranberries the whole year" (*Atlantic Neptune*, i. 68, 1777). *Joseph Howe* in 1851 found that "Cranberries of Large size, and fine flavour, grow in abundance on Sable Island. A few barrels of these are generally picked in the autumn, but the cranberry, as a source of income, or a means of employment, has scarcely ever been thought of by our people" (Append. to *Journ. of House of Assembly, Prov. of N. S.* 161, 1851). *J. B. Gilpin* recorded in 1858 that "cranberries are in abundance (G. p. 18). *J. C. Taché* mentions that, "on y trouve, en fait des fruits, * * * les atocas." "Les atocas y abondent et constituent un objet d'exportation, dont la valeur annuelle s'élève à quelques centaines de piastres," (T. p. 29). *J. Dwight, Jr.* (D. p. 13) speaks of the abundance of "Cranberries (*Schollera macrocarpa* (Ait.))." They are also included in the lists of *J. Macoun* (also M. p. 215A & 216A); and *H. T. Güssow*. *H. St. John*, no 1,298 (H).

Fr.—August and September.

[**V. OXYCOCUS** L. The only record for this species is by Capt. *Fawson* in his report, October 15, 1801 (see *Murdoch, Beamish: Hist. of Nova-Scotia* ii. 6, 1866), where he refers to it by the common name, "bogberries." He mentions both "bogberries" and "cranberries," so he is apparently intending to distinguish between the two, but as there are no other records of the former from the island and no specimens, this record needs confirmation.]

PRIMULACEAE.

Lysimachia terrestris (L.) B. S. P. Occasional in the wet dune hollows. Listed by *J. Macoun*; and *H. T. Güssow*. *H. St. John*, nos. 1,299, and 1,300 (H).

Fl.—August.

Trientalis borealis Raf. (*T. americana* (Pers.) Pursh). Common on the turf-covered dunes and barrens. Listed by *J. Macoun*. *H. St. John*, nos. 1,301 and 1,302 (H); *H. S. Glazebrook* (H).

Fl.—June.

Centunculus minimus L. Locally found on bare sand flats which are occasionally flooded by the sea. *J. Macoun* (C. no. 22,544); *H. St. John*, no. 1,303 (H).

Fl., *Fr.*—August.

GENTIANACEAE.

[*SABBATIA CHLOROIDES* Pursh. “The chief annual is of southern extraction.” The material on which this record of *J. Macoun’s* (M. p. 218A) is based is *Centaureum umbellatum*.]

Bartonia iodandra Robinson, var. **sabulonensis** Fernald, n. var., a forma typica recedit floribus numerosis (4–30), ramibus saepe dichotomis, pedunculis valde clavatis, calyce valde fisso lobis plerumque distinctis.

Differing from the typical form in its more numerous (4–30) flowers; the branches often dichotomous; peduncles more clavate; calyx deeply cleft, the lobes mostly distinct.

Nova Scotia: swampy edges of fresh ponds, Sable Island, August 30 and September 12, 1913, *H. St. John*, nos. 1,306, 1,307 (TYPE in Gray Herb.).

Fl.—August and September. *Fr.*—September.

In typical *Bartonia iodandra* of Newfoundland and Cape Breton the 1–7-flowered plants have simple branches and the peduncles are more filiform. The calyx in all the Newfoundland and Cape Breton material (examined from eight regions) is cleft only $\frac{2}{3}$ to $\frac{3}{4}$ to the base, the tube being 1–2 mm. long and nerveless. The Sable Island plant with usually more numerous flowers on often forking branches rarely has a definite calyx-tube, most of the material showing the calyx with lobes distinct essentially to the base, the margins of the outer lobes decurrent down the peduncle. In this character the Sable Island plant approaches the more southern *B. virginica* (L.) B S P. and *B. paniculata* (Michx.) Robinson, in both of which the calyx-lobes are essentially distinct. In those more southern yellowish-stemmed plants, however, the yellowish-green calyx-lobes and the usually yellowish leaves are firm and subulate and the yellow corolla is at most 5 mm. long. The Sable Island plant has the leaves scattered or alternate as in *B. paniculata* but, like those of *B. iodandra*, they are ovate to oblong-lanceolate, bluish and purple. The stem likewise is purple, the calyx-lobes flat and thin, ovate to oblong-lanceolate, and the mature petaloid whitish corolla 5–6 mm. long, all characters of *B. iodandra*. The anthers of *B. iodandra* are generally

purple though sometimes becoming yellowish; those of var. *sabulonensis* at first purple, but in maturity, becoming yellow like those of the more southern species. On Newfoundland and Cape Breton *B. iodandra* is in flower through August, but the Sable Island plant is some weeks later, the material collected August 30, being only in bud.

Combining the color, foliage, and most of the flower-characters of *B. iodandra* with the habit and more deeply cleft calyx of *B. paniculata*, the Sable Island plant presents an interesting transition. *B. paniculata* is characteristic of the Coastal Plain from Louisiana to southeastern Massachusetts, rarely extending to southernmost Maine. *B. iodandra* in typical development is confined to Cape Breton and Newfoundland; and the transitional plant to the isolated Sable Island, one of the last remnants of the ancient continental shelf which extended from southern New England to the Newfoundland banks. It would thus seem probable that the widely distributed southern *B. paniculata* originally spread northward on the continental shelf, becoming modified toward the North, the Sable Island plant still retaining some distinctive *paniculata*-characters, which have disappeared from the more northern and further isolated *B. iodandra* of Cape Breton and Newfoundland.

Menyanthes trifoliata L. "Quite rare, in ponds at No. 3 station." Found only by J. Macoun (C. no. 22,541).

Centaurium umbellatum Gilib. Very common in the wet dune hollows, and by the wet sandy borders of the fresh-water ponds. Not near the Life Saving Stations or the Lighthouses and not giving any indication of being introduced. This species has been known in North America for a long time, but it has universally been treated in botanical manuals as an introduced plant. This seems to be the true explanation in the greater number of the cases, such as the record from Concord, Massachusetts,¹ A.W. Hosmer reporting it "found at Concord in 1890, not seen since." The species is occasional in the State of Michigan, but there it also seems to be an introduction.

There is, however, a station near Oswego, New York, which has been known for nearly a hundred years. In 1833 Beck reported,²

¹As *Erythraea Centaurium* Pers., Rhodora i. 224 (1899).

²As *Erythraea Centaurium* Pers., Beck, L. C.: Bot. of N. and Middle States, 242 (1833).

"I have specimens of this plant which were found near Oswego, N. Y., by the Rev. David Brown of Lockport. It is apparently indigenous." In 1865, J. A. Paine commented,¹ "Meadows and pastures, Oswego, two miles northward near the Lake shore; two or three miles south of the city and east of the river, borders of woods. Local." The evidence presented by the collectors and the field observers would certainly tend to indicate that in this case, at least, the plant was a native. In this connection the form of the successive records of the species from Sable Island is illuminating. The plant seems first to have been recorded from Sable Island (under the name E[RYTHRAEA] CENTAURIUM Pers.) in Macoun's Catalogue, ii. 342 (1890): "Sandy wastes on Sable Island off the coast of Nova Scotia. Collected July, 1870. (Mrs. Almond)." This record now appears in Gray's Manual² as "Waste grounds, N. S.;" in Britton and Brown's Illustrated Flora,³ "In waste places, Nova Scotia—Naturalized from Europe." Now "sandy wastes" on Sable Island are not "waste places;" they are in the strictest sense the sand dunes, and not a habitat in which the plants could be assumed to be introduced.

Collected by *J. Macoun* (C. no. 22,543); and by *H. T. Güssow* (E); *H. St. John*, nos. 1,304, and 1,305 (H).

Fl.—August and September. *Fr.*—September.

CONVOLVULACEAE.

Convolvulus sepium L. Abundant on the slopes of the dry dunes, where the stems intertwine for great distances between the culms of *Ammophila* and *Lathyrus maritimus*, helping in the formation of the dense tangles in the more sheltered places. Listed by *J. Macoun*. *H. St. John*, nos. 1,359 and 1,360 (H).

Fl., *Fr.*—September.

BORAGINACEAE.

Lappula echinata Gilib. A single adventive specimen found near the Main Life Saving Station. *H. St. John*, no. 1,308 (H).

Fl.—August.

¹As *Erythraea Centaurium* Pers. Paine, J. A.: Cat. of Pl. Found in Oneida Co., and Vicinity, 64 (116) (1865).

²Robinson, B. L., and Fernald, M. L.: Gray's Manual, ed. 7, 656 (1908).

³As *Centaurium Centaurium* (L.) W. F. Wight, Britton and Brown: Ill. Fl., ed. 2, iii. 2 (1913).

LABIATAE.

Teucrium canadense L., var. **littorale** (Bicknell) Fernald. Observed only on the turf-y shores of the fresh-water ponds near the eastern end of Wallace Lake. *H. St. John*, no. 1,309 (H).

Fl.—September.

GALEOPSIS TETRAHIT L., var. **BIFFIDA** (Boenn.) Lejeune & Courtois. A weed at the Main Life Saving Station. *H. St. John*, no. 1,310 (H).

Fl., Fr.—September.

[**LYCOPUS UNIFLORUS** Michx. Listed by *J. Macoun* and *H. T. Güssow*. These collections are undoubtedly of the following variety.]

Lycopus uniflorus Michx., var. **ovatus** Fernald & St. John, n. var., foliis sessilibus vel brevi-petiolatis ovato-lanceolatis vel deltoideo-ovatis grosse serratis, dentibus 4–6 acris prorsum vergentibus.

Leaves sessile or short petioled, ovate-lanceolate or deltoid-ovate, coarsely serrate with 4–6 sharp teeth which point directly forward.

NOVA SCOTIA: wet dune hollow, Sable Island, August 15, 1913, *H. St. John*, no. 1,311 (TYPE in Gray Herb.); Canso, August 17, 1900, *J. Fowler*, in part (H). **OREGON:** Sullivan's Gulch, Portland, July 14, 1902, *E. P. Sheldon*, no. 10,888 (H).

Mentha arvensis L. Observed only on turf-y knolls by the shore of the fresh-water ponds at the eastern end of Wallace Lake. *H. St. John*, nos. 1,312 and 1,313 (H).

Fl.—September.

[**M. CANADENSIS** L. of *J. Macoun*'s list is probably the preceding, *M. arvensis*.]

SOLANACEAE.

SOLANUM NIGRUM L. A weed thoroughly established in the gardens of the Main Life Saving Station. Listed by *J. Macoun*. *H. T. Güssow* (E); *H. St. John*, no. 1,314 (H).

Fl.—August and September. *Fr.*—September.

LYCIUM EUROPAEUM L. A few bushes planted and surviving in the garden at Life Saving Station No. 3. *H. St. John*, no. 1,315 (H).

SCROPHULARIACEAE.

Limosella subulata Ives. See Fernald, *Rhodora*, xx. 164 (1918). Abundant on the brackish beach of, and sand flats near Wallace Lake. Listed by *J. Macoun*. *H. St. John*, no. 1,316 (H).

Fl., Fr.—August.

Agalinis paupercula (Gray) Britton, var. **neoscotica** Pennell & St. John, n. comb., *Gerardia neoscotica* Greene, Leaflets of Bot. Observ. and Crit. ii. 106-7 (1910). Greene's type, collected by himself at Middleton, Nova Scotia, has been examined by Dr. Pennell and myself and we feel that it and the Sable Island plant belong in the same category. The var. *neoscotica* differs from *A. paupercula* in being only 1-2.5 dm. in height, in having the leaves broader, being broadly linear, 1-3 cm. long and 1.5-4.5 mm. wide; the lobes of the calyx are unusually long, 3-8 mm. and of unequal length; the corolla lobes are scarcely at all spreading; the anther sacs are glabrous.

Common in the wet dune hollows. *J. Macoun* (C. no. 22,576); *H. St. John*, nos. 1,317 and 1,318 (H).

Fl., *Fr.*—August.

[*GERARDIA PAUPERCULA* (Gray) Britton of *J. Macoun's* list is *Agalinis paupercula*, var. *neoscotica*.]

Euphrasia purpurea Reeks, var. **Randii** (Robinson) Fernald & Wiegand. Common in the boggy dune hollows. *H. St. John*, no. 1,319 (H).

Fl., *Fr.*—August.

Euphrasia americana Wetst. Listed by *H. T. Güssow*.

Rhinanthus Crista-galli L. Common on the drier, turf-covered dunes. Collected by *J. Macoun* (C. no. 22,577); *H. T. Güssow* (E); *H. St. John*, no. 1,320 (H).

Fl.—July. *Fr.*—July and August.

[*R. OBLONGIFOLIUS* Fernald of *J. Macoun's* list is *R. Crista-galli* L.]

LENTIBULARIACEAE

Utricularia cornuta Michx. Found only by *J. Macoun* (C. no. 22,574).

Fl.—July.

PLANTAGINACEAE.

PLANTAGO MAJOR L. Listed by *H. T. Güssow*.

P. major L., var. **intermedia** (Gilib.) Dcne. Brackish beaches of Wallace Lake. Listed by *J. Macoun*. *H. St. John*, no. 1,321 (H).

Fl., *Fr.*—August.

P. decipiens Barneoud. Common on the brackish beaches of Wallace Lake and the brackish ponds. Listed by *J. Macoun*; and *H. T. Güssow*. *H. St. John*, no. 1,322 (H).

Fl., Fr.—August.

RUBIACEAE.

Galium trifidum L. Very common in the wet dune hollows and along the swampy borders of the fresh-water ponds. *J. Macoun* (C. no. 81,150); *H. T. Güssow* (E); *H. St. John*, no. 1,324 (H).

Fl., Fr.—August and September.

[*G. TINCTORIUM* L., of *J. Macoun* and *H. T. Güssow* is *G. trifidum*.]

G. Claytoni Michx. In the wet dune hollows. *H. St. John*, no. 1,323 (H).

Fl., Fr.—August.

Mitchella repens L. Uncommon and local, on turf-covered dunes. *J. Dwight, Jr.*, records this (D. p. 13). Listed by *J. Macoun*; and *H. T. Güssow*. *H. St. John*, no. 1,325 (H).

Fr.—August.

CAPRIFOLIACEAE.

Lonicera caerulea L., var. **calvescens** Fernald & Wiegand, Rhodora, xii. 210 (1910). On the turf-covered dunes. Collected by *J. Dwight, Jr.*; and *J. Macoun* (C. no. 22,491).

Not observed in flower or fruit.

Linnaea borealis L., var. **americana** (Forbes) Rehder. Creeping between the stems of the prostrate Junipers and *Empetrum* where they form a thick turf on the low dunes. Listed by *J. Macoun*; and *H. T. Güssow*. *H. St. John*, no. 1,326 (H).

Not observed in flower or fruit.

Viburnum cassinoides L. Occasional on the turf-covered dunes. *J. B. Gilpin* wrote in 1858 (G. p. 18), "The usual shrubs are dwarfed to a few inches; * * * [the] low with-wood would not afford a riding cane." Listed by *J. Macoun*; and *H. T. Güssow*. *H. St. John*, nos. 1,327 and 1,328 (H).

Not observed in flower or fruit.

CAMPANULACEAE.

Lobelia Dortmanna L. Abundant along the wet margins of the fresh-water ponds. Listed by *J. Macoun*. *H. St. John*, no. 1,329 (H).

Fl., Fr.—August.

COMPOSITAE.

Solidago sempervirens L. Common in all of the drier parts of the island, especially so along the North, and the South Ridge, which are ranges of dunes close to and parallel with the sea beaches. *J. B. Gilpin* in 1858 (G. p. 19) remarked upon the "gay golden rods." *J. C. Taché* mentions "la verge d'or" (T. p. 29). Collected by *J. Macoun* (C. no. 22,535); and *H. T. Güssow* (E); *H. St. John*, nos. 1,330–1,334 (H).

Fl.—September.

Aster novi-belgii L. Very abundant on the dry dunes, or even at the swampy borders of the fresh-water ponds. *J. B. Gilpin* (G. pp. 18–9) in 1858 noted, "As autumn heats yellow the luxuriant green, the tall, mallow, gay golden rods and wild China-asters are swept by the heaving gales." Collected by *J. Macoun* (C. no. 22,502); *H. T. Güssow* (E); *H. St. John*, nos. 1,335–1,339 (H).

Fl.—Middle of August to September.

A. novi-belgii L., var. **litoreus** Gray. Occasional at the edge of the brackish ponds. *J. Macoun* (C. no. 22,502); *H. St. John*, no. 1,340 (H).

[*ANAPHALIS MARGARITACEA* (L.) B. & H. of *J. Macoun* and presumably of *H. T. Güssow* is the following var. *subalpina*.]

Anaphalis margaritacea (L.) B. & H., var. **subalpina** Gray. Very common on the dry dunes and barrens. *J. Macoun* (C. no. 22,515); *H. St. John*, no. 1,341 (H).

Fl.—August.

Gnaphalium obtusifolium L. (*G. polycephalum* Michx.) Abundant on the dry dunes and barrens. *J. Dwight's* mention (D. p. 13) of "*Gnaphalium* sp?" which he dubs a weed should probably be referred here. Listed by *J. Macoun*. *H. T. Güssow* (E); *H. St. John*, nos. 1,342 and 1,343 (H).

Fl., Fr.—August and September.

G. ULIGINOSUM L. A weed well established at the Main Life Saving Station. Listed by *J. Macoun*. *H. St. John*, no. 1,344 (H).
Fl., Fr.—August.

RUDBECKIA HIRTA L. A weed collected by *J. Macoun* (C. no. 23,439) in 1899 but not observed by the subsequent botanical collectors.

Fl.—August.

Bidens frondosa L. Listed by *J. Macoun*.

B. connata Muhl., var. **petiolata** (Nutt.) Farwell. See Fernald, Rhodora, x. 200 (1908). Infrequent, at the borders of fresh-water ponds. *H. T. Güssow* (E); *H. St. John*, no. 1,345 (H).

Fl., Fr.—September.

[*B. CERNUA* L. of *H. T. Güssow* is *B. connata*, var. *petiolata*.]

[*ACHILLEA MILLEFOLIUM* L. is listed by *J. Macoun*; and *H. T. Güssow*. The material is probably identical with that collected by the author and cited under the following, *A. lanulosa*.]

Achillea lanulosa Nutt. Very abundant on the dry dunes and barrens. *H. St. John*, no. 1,346 (H).

Fl.—August.

ANTHEMIS COTULA L. Thoroughly established at the Main Life Saving Station. Listed by *J. Macoun*; *H. T. Güssow*. *H. St. John*, no. 1,347 (H).

Fl., Fr.—August.

CHRYSANTHEMUM LEUCANTHEMUM L., var. **PINNATIFIDUM** Lecoq & Lamotte. A weed at the Main Life Saving Station. *H. St. John*, no. 1,348 (H).

Fl.—August.

Senecio Pseudo-Arnica Less. Infrequent in the gulches near the sea and at the top of the beaches. Listed by *J. Macoun*; and *H. T. Güssow*. *H. St. John*, no. 1,349 (H).

Fl., Fr.—August.

CIRSIUM ARVENSE (L.) Scop. A weed thoroughly established near the Life Saving Stations and spreading. Listed by *J. Macoun*. *H. T. Güssow* (E); *H. St. John*, no. 1,350 (H).

Fl., Fr.—August and September.

CICHORIUM INTYBUS L. A weed at the Main Life Saving Station. Only one plant seen. *H. St. John*, no. 1,351 (H).

Fr.—September.

LEONTODON AUTUMNALIS L. Thoroughly established near the Life Saving Stations. Listed by *J. Macoun* (also mentioned, "fall dandelion" M. p. 218A); and *H. T. Güssow*. *H. St. John*, no. 1,352 (H).

Fl., Fr.—August.

TARAXACUM OFFICINALE Weber. A weed in the garden at the Main Life Saving Station. Listed by *J. Macoun*. *H. St. John*, no. 1,353 (H).

Fl., Fr.—August.

SONCHUS ASPER (L.) Hill. A weed at the Main Life Saving Station. *H. St. John*, no. 1,354 (H).

Fl., Fr.—August.

Prenanthes trifoliolata (Cass.) Fernald. Occasional on all the drier parts of the island. Collected by *J. Macoun* (C. no. 22,522); *H. T. Güssow* (E); and *H. St. John*, no. 1,355 (H).

Fl., Fr.—August and September.

P. nana (Bigel.) Torr. Infrequent on the turf-covered dunes. *H. St. John*, no. 1,356 (H).

Fl.—August.

Hieracium scabrum Michx., var. **leucocaule** Fernald & St. John. *Rhodora*, xvi. 182 (1914). To the present date this variety is still an endemic of Sable Island. It occurs scattered over the barrens between Life Saving Station No. 3 and the East End Light-house. Collected by *J. Macoun* (C. no. 22,525); *H. T. Güssow* (E); *H. St. John*, nos. 1,357 and 1,358 (H).

Fl., Fr.—September.

[*H. CANADENSE* Michx. of *J. Macoun's* list is *H. scabrum*, var. *leucocaule*.]

LIST OF ABBREVIATIONS.

- (C) = Herbarium of the Canadian Geological Survey.
 (D) = Dwight, Jonathan, Jr.: The Ipswich Sparrow. Mem. Nuttall Ornith. Club, ii. 1-56 (1895).
 (E) = Herbarium of the Central Experimental Farm, Ottawa, Canada.
 (G) = Gilpin, John Bernard: Sable Island. 1-24 (1858).
 (H) = Gray Herbarium of Harvard University.
 (L) = Le Mercier, Andrew: The Island Sables. Boston Weekly News Letter. February 8 (1753).
 (M) = Macoun, John: Sable Island. Ann. Rep. Can. Geol. Surv. n. s. xii. 212A-219A (1899).
 (P) = Herbarium of the Academy of Natural Sciences of Philadelphia, Pennsylvania.
 (T) = Taché, Jean Charles: Les Sablons, 1-154 (1885).

NEW SPECIES, VARIETIES, AND FORMS.

- Juniperus communis* L., var. **megistocarpa** Fernald & St. John
Juncus pelocarpus Mey., var. **sabulonensis** St. John
Calopogon pul.hellus (Sw.) R. Br. f., **latifolius** St. John
Polygonum hydropiperoides Michx., var. **psilostachyum** St. John
Rubus arcuans Fernald & St. John
Lathyrus palustris L., var. **retusus** Fernald & St. John
Bartonia iodandra Robinson, var. **sabulonensis** Fernald
Lycopus uniflorus Michx., var. **ovatus** Fernald & St. John
Agalinis paupercula (Gray) Britton, var. **neoscotica** (Greene) Pennell & St. John.

TABULAR STATEMENT OF FAMILIES, GENERA, SPECIES, VARIETIES,
AND FORMS OF THE NATIVE OR ADVENTIVE FLORA.

Families.	Genera.	Native Species.	Adventive Species.	Native Varieties.	Adventive Varieties.	Native Forms.
Polypodiaceae.....	1	1				
Osmundaceae.....	1	1				
Lycopodiaceae.....	1	1				
Pinaceae.....	1	1		1		
Typhaceae.....	1	1				
Sparganiaceae.....	1	1				
Potamogetonaceae.....	3	5		2		
Gramineae.....	17	8	9	5	2	
Cyperaceae.....	3	8		5		
Eriocaulaceae.....	1	1				
Juncaceae.....	2	3		5		
Liliaceae.....	1	1				
Iridaceae.....	2	2				
Orchidaceae.....	3	4		1		1
Myricaceae.....	1	1				
Polygonaceae.....	2	2	7	2	2	
Chenopodiaceae.....	2	1	1	1		
Caryophyllaceae.....	7	2	5	2		
Portulacaceae.....	1		1			
Nymphaeaceae.....	1	1				
Ranunculaceae.....	3	3	2	1		
Cruciferae.....	5	1	4			
Droseraceae.....	1	2				
Crassulaceae.....	1	1				
Rosaceae.....	7	6		4		
Leguminosae.....	2	1	3	2		
Empetraceae.....	1	1				
Aquifoliaceae.....	1	1				
Guttiferae.....	1	2				
Violaceae.....	1	4		1		

Families.	Genera.	Native Species.	Adventive Species.	Native Varieties.	Adventive Varieties.	Native Forms.
Onagraceae.....	2	2		1		
Haloragidaceae.....	2	2				
Umbelliferae.....	3	2	1			
Cornaceae.....	1	1				
Ericaceae.....	2	2	1			
Primulaceae.....	3	3				
Gentianaceae.....	3	2		1		
Convolvulaceae.....	1	1				
Boraginaceae.....	1		1			
Labiatae.....	4	1		2	1	
Solanaceae.....	1		1			
Scrophulariaceae.....	4	3		2		
Lentibulariaceae.....	1	1				
Plantaginaceae.....	1	1	1	1		
Rubiaceae.....	2	3				
Caprifoliaceae.....	3	1		2		
Campanulaceae.....	1	1				
Compositae.....	17	8	8	4	1	
Totals.....	127	101	45	45	6	1
Total of native and adventive species, varieties and forms	198					
Planted species not included in preceding table.....	15					
Total flora.....	213					

BIBLIOGRAPHY.

- Anonymous:** The Graveyard of the Atlantic. All the Year Round, lxvi. 517-522 (1890).
- Anonymous:** Sable Island. The Leisure Hour, xxx. 432-434 (1881). The author was one of the assistants in the Admiralty Survey of the Gulf of St. Lawrence, and visited Sable Island in 1851.
- Bayfield, Capt. H. W.:** Report to the Hydrographer of the Navy. Appendix to Journal of House of Assembly, Province of Nova Scotia, no. 24, 167-168 (1851), and no. 8, 78-79 (1852).
- Biggar, H. P.:** The Early Trading Companies of New France. 1-308 (1901).
- Brymner, Douglas:** Report on Canadian Archives, pp. xxv-xxvii (1895).
- Canadian Forestry Association, Officers of:** Tree Planting on Sable Island. Rod and Gun in Canada, v. 466-470 (1904).
- Charlevoix, Pierre Francois Xavier de:** Histoire et Description Générale de la Nouvelle France, 3 vols. (1744).
- Coleman, Seth:** Report to Sir John Wentworth, Lieutenant Governor of Nova Scotia. Report on Canadian Archives, 91-92 (1895).
- Darby, Joseph:** Chart of Sable Island. Published 8 April (1824), revised (1829).
- Dawson, John William:** Acadian Geology, 36-38 (1878).
- Des Barres, Joseph Frederick Wallet:** The Isle of Sable. Survey'd in 1766 and 1767 to Order of the Right Honourable the Lords Commissioners of the Admiralty. Atlantic Neptune, i. 68, 2 charts, 12 illustr. (1777 and 1779).
- Dwight, Jonathan, Jr.:** The Ipswich Sparrow and its Summer Home. Memoirs of the Nuttall Ornithological Club, no. 2. 1-56, 1 plate (1895).
- Gilpin, J[ohn] Bernard:** On Introduced Species of Nova Scotia. Transactions of the Nova Scotian Institute of Natural Science, i. (printed ii.) part 2, 60-68 (1864).
-
- Sable Island, Its Past History, Present Appearance, Natural History, &c., including Darby, Joseph: A Description of the Shipwreck of the American Schooner Arno, Lost on the Island, September 19, 1846, and including Howe, the Hon. Joseph: Sable Island, A Poem, and including Willis, J.: Mollusca of Sable Island, so far as ascertained up to 1858, 1-35, 3 illustr. (1858).
- Gosselin, E.:** Early French Voyages to Newfoundland. Translation. Mag. Am. Hist. viii. 286-290 (1882).
- Halleck, Charles:** The Secrets of Sable Island. Harper's Monthly, xxxiv. 4-19, 10 illustr. (1867).
- Howe, John:** A Letter to Robert Murray Esqr., Captain of H. M. Ship Asia. Report on Canadian Archives, 89-90 (1895).
- Howe, Joseph:** Condition and Past Management of the Humane Establishment at Sable Island, a Report to Lieut. genl. Sir John Harvey, dated October 21, 1850. Appendix to Journal of House of Assembly, Province of Nova Scotia, no. 24, 160-166 (1851), and no. 8, 70-76 (1852).

- Sable Island, a Poem. See Gilpin, J. B.: Sable Island, 31–34 (1858).
- Jaccombe, F. W. H.:** The Problem of Sable Island. Canadian Forestry Journal, ix. 91–92 (1913).
- de Laet, Johannes:** Novus Orbis seu Descriptionis Indiae Occidentalis. ed. 3, 1–690 (1633).
- Le Mercier, Rev. Andrew:** The Island Sables. To be sold by me the Subscriber. The Publick hath here a short description of it for nothing. Boston Weekly News Letter, February 8 (1753).
- Macdonald, Simon D.:** Geological Notes. Sable Island. Transactions of the Nova Scotian Institute of Natural Science, v. part 4, 337–338 (1882).
- Sable Island (continued). Transactions of the Nova Scotian Institute of Natural Science, vi. part 2, 110–119 (1884).
- Sable Island, No. 3.—Its Probable Origin and Submergence. Transactions of the Nova Scotian Institute of Natural Science, vi. part 4, 265–280 (1886).
- Macoun, John:** Sable Island. Annual Report of the Canadian Geological Survey, n. s. xii. 212A–219A (1899).
- Merriam, C. Hart:** Breeding of *Passerculus princeps* on Sable Island. Auk, i. 390 (1884).
- Montresor, Capt. John:** Map of Nova Scotia or Acadia; with the Islands of Cape Breton and St. John's from Actual Surveys (1768).
- Murdoch, Beamish:** History of Nova-Scotia, 3 vols. (1865–1867).
- Oxley, J. Macdonald:** An Ocean Grave-Yard. Scribner's Magazine, i. 603–610, 2 illustr., 1 map (1887).
- Historic Aspects of Sable Island. Magazine of American History, xv. 162–170 (1886).
- Patterson, Rev. George:** Sable Island: Its History and Phenomena. Transactions of the Royal Society of Canada, xii. section 2, 3–49, 1 map (1894).
- Supplementary notes on Sable Island. Transactions of the Royal Society of Canada, second series, iii. section 2, 131–138 (1897).
- Ridgway, Robert:** The Probable Breeding-place of *Passerculus princeps*. Auk, i. 292–293 (1884).
- Saunders, William:** Experiments in Tree Planting on Sable Island. Report of the Director of the Dominion Experimental Farms, 63–77 (1901).
- Reports from Sable Island in 1902. Report of the Director of the Dominion Experimental Farms, 56–58 (1902).
- Sayer, Robert:** The North American Pilot for Newfoundland, Labradore, the Gulf and River St. Lawrence: being a collection of Sixty Accurate Charts and Plans, drawn from original surveys: taken by James Cook and Michael Lane, Surveyors, and Joseph Gilbert, and other Officers in the King's Service (1779).
- Scambler, Lieut. Joseph:** A Letter to Lieut. Governor, Sir John Wentworth, written from, His Majesty's Tender Cutter Trepassey, at Sydney, 17th May, 1800. Report on Canadian Archives, 88–89 (1895).
- Scott, Marshall Owen:** Changing Aspects of Sable Island. Canadian Magazine, xviii. 341–349, 5 illustr., 2 charts (1901–1902).

Tache, Jean Charles: Les Sablons (L'Ile de Sable) et L'Ile Saint Barnabé, 1-154 (1885).

Uniacke, Richard John: The Address of the House of Representatives in General Assembly: To His Excellency Sir John Wentworth, Lieutenant Governor of Nova Scotia. 25 June, 1801. Report on Canadian Archives, 92-93 (1895).

Wentworth, Sir John: A Letter to Seth Coleman of Dartmouth in Nova Scotia, from Halifax, Nova Scotia, 11 June, 1801. Report on Canadian Archives, 90-91 (1895).

—Observations upon an Establishment proposed to be made on the Isle of Sable, for the relief of the distressed, and the Preservation of Property. Also, Statement of Facts relating to the Isle of Sable [1800]. Report on Canadian Archives, 84-88 (1895).

Willis, J.: Mollusca of Sable Island, so far as ascertained up to 1858. This is included in Gilpin, J. B.: Sable Island, 35 (1858).

Winsor, Justin: Narrative and Critical History of America. 8 vols. (1888-1889).

ST. JOHN—Sable Island.

EXPLANATION OF PLATES.

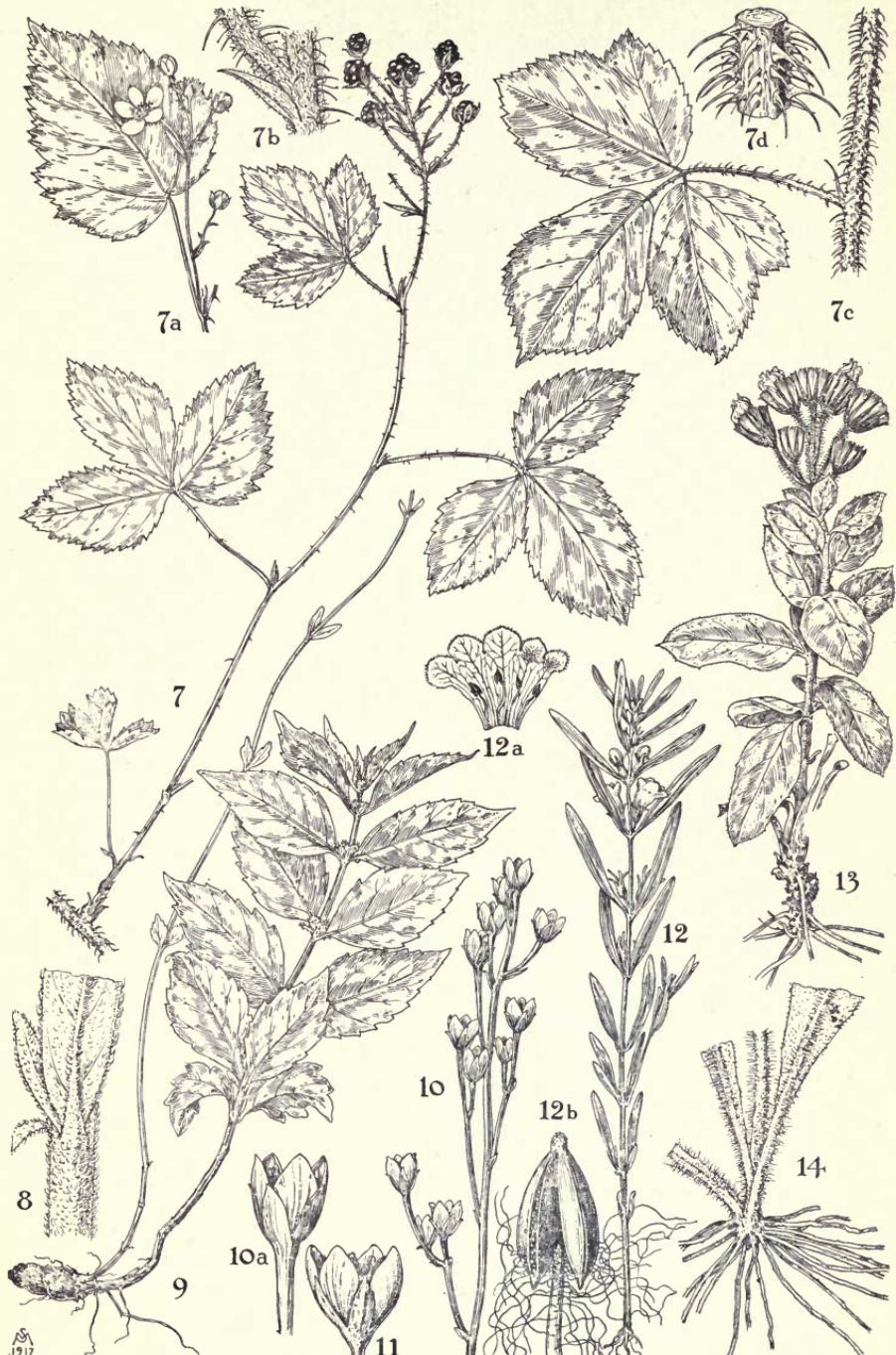
PLATE 1.

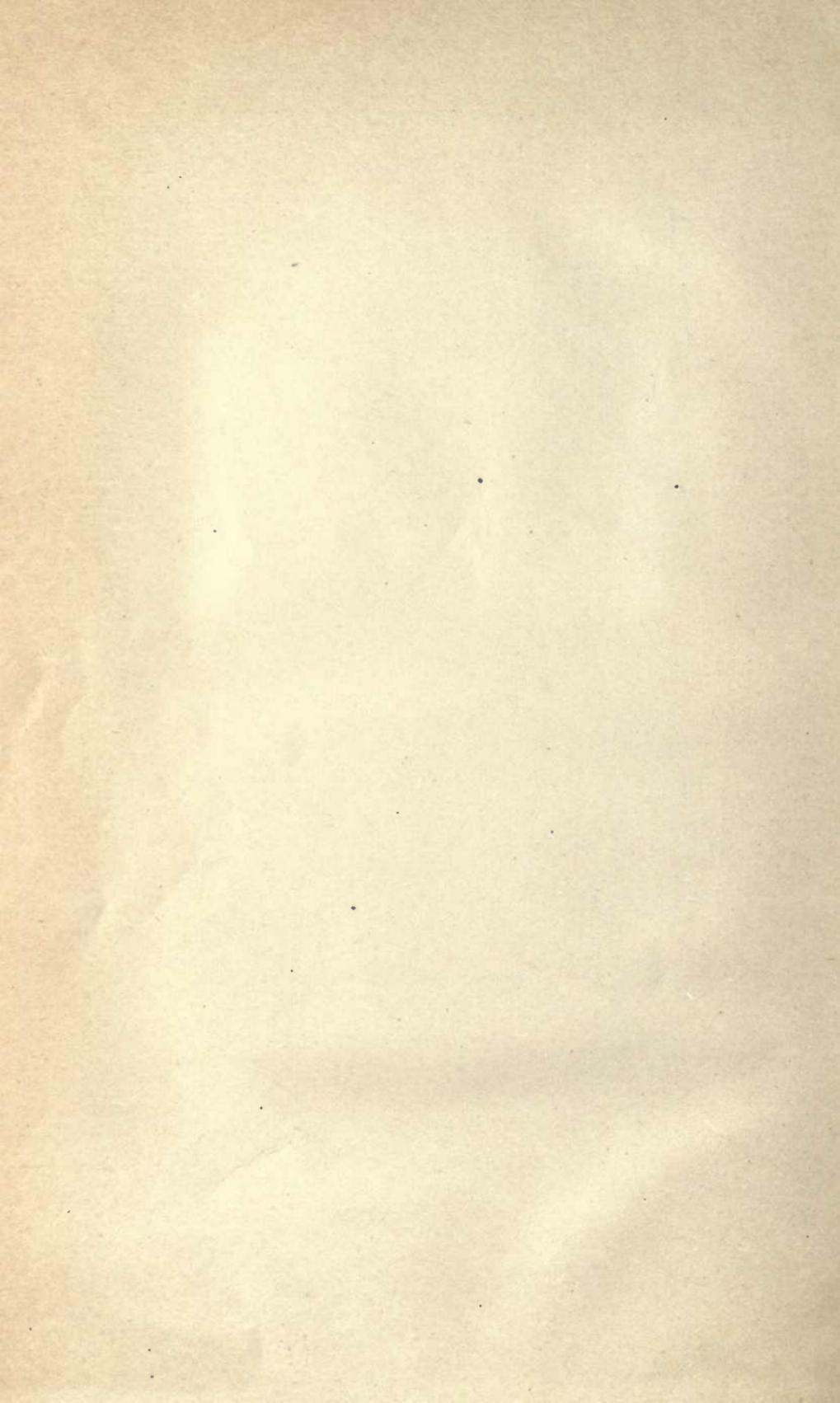
1. *Juncus pelocarpus* E. Mey., var. *sabulonensis* St. John, n. var. Habit sketch from the type, $\times 2$.
- 1a. Detail of fruit of the type, $\times 5$.
- 1b. Seed of the type, $\times 10$.
2. *Juncus pelocarpus* E. Mey. Detail of fruit after Buchenau, F.: Juncaceae. Pflanzenreich, iv. fam. 36, f. 84 E (1906).
3. *Polygonum hydropiperoides* Michx., var. *psilotachyum* St. John. Habit sketch from the type, $\times \frac{1}{2}$.
- 3a. Detail of inflorescence showing the eciliate ocreolae, from the type, $\times 2$.
4. *Calopogon pulchellus* (Sw.) R. Br., forma *latifolius* St. John. Habit sketch of the type, $\times \frac{1}{2}$.
5. *Polygonum lapathifolium* L., var. *prostratum* Wimmer. Habit sketch showing the tip half of one of the prostrate branches, from St. John, no. 1,361, Sable Island, Nova Scotia, September 4, 1913, $\times \frac{1}{2}$.
- 5a. Detail of a spike, $\times 2$.
- 5b. A single fruit showing the raised anchor-like nerves on the two outer sepals, from the above, $\times 5$.
- 5c. A mature achene, from the above, $\times 5$.
6. *Lathyrus palustris* L., var. *retusus* Fernald & St. John. Habit view of several median leaves of the type, $\times \frac{1}{2}$.

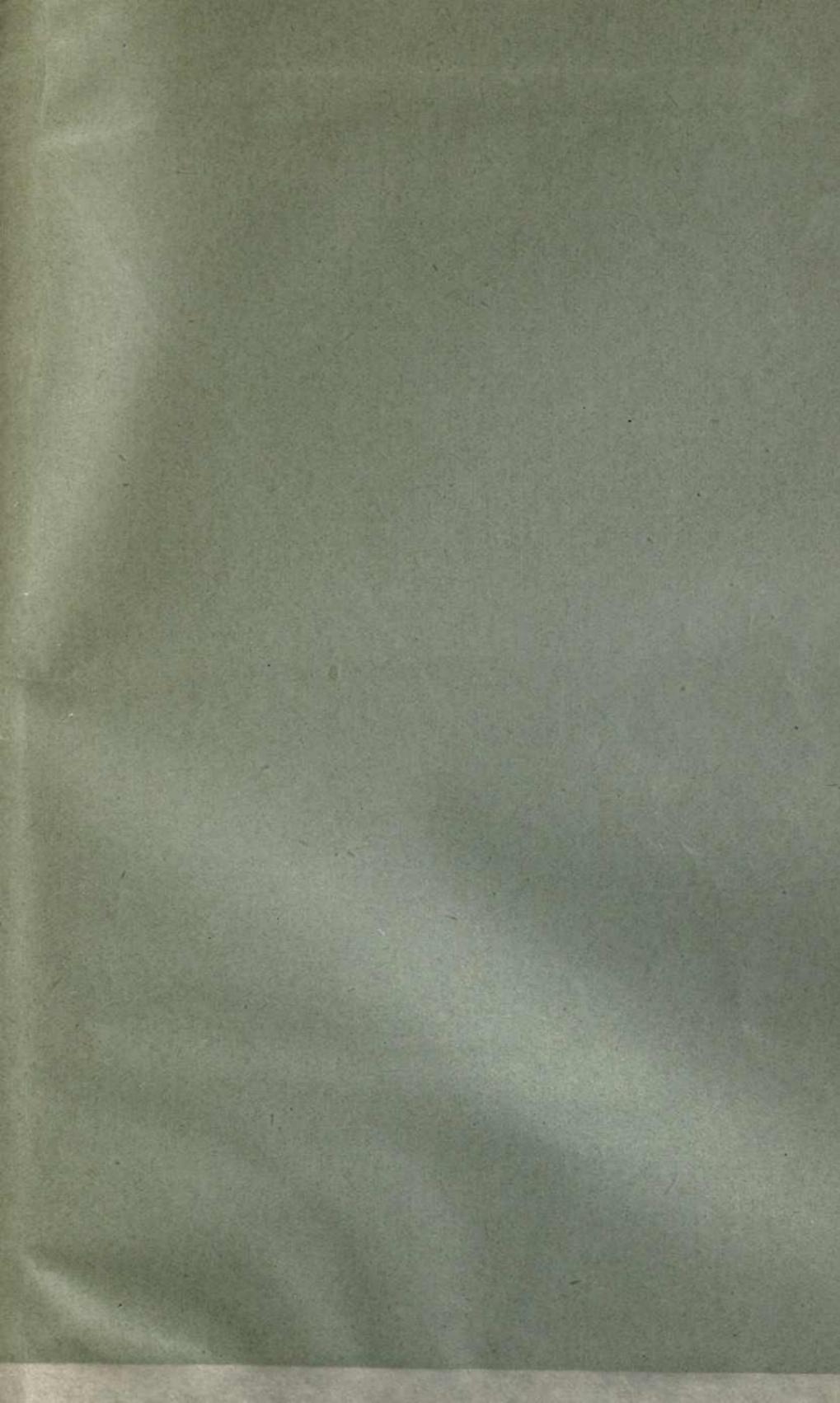


PLATE 2.

7. *Rubus arcuans* Fernald & St. John. Habit sketch of fruiting branchlet of the type, $\times \frac{1}{2}$.
- 7a. Flowering spray drawn from the specimen *St. John*, no. 1,259 from Sable Island, Nova Scotia, $\times \frac{1}{2}$.
- 7b. Detail of the base of a fruiting pedicel of the type, $\times 4$.
- 7c. Sketch of a segment of a first-year cane and a single leaf from the type, $\times \frac{1}{2}$.
- 7d. Enlarged view of a portion of a first-year cane of the type, $\times 2$.
8. *Epilobium molle* Torr., var. *sabulonense* Fernald. Detail of a portion of the stem and the base of a leaf showing the appressed pubescence, from the type, $\times 4$.
9. *Lycopus uniflorus* Michx., var. *ovatus* Fernald & St. John. Habit sketch of the type, $\times \frac{1}{2}$.
10. *Bartonia iodandra* Robinson, var. *sabulonensis* Fernald. Habit sketch of the upper half of a plant, from the type, $\times 1$.
- 10a. Enlarged view of a single flower, from the type, $\times 2$.
11. *Bartonia iodandra* Robinson. Enlarged view of a single flower, drawn from *M. L. Fernald & K. M. Wiegand*, no. 3,913, Birchy Cove, Newfoundland, Aug. 11, 1910, $\times 2$.
12. *Agalinis paupercula* (Gray) Britton, var. *neoscotica* (Greene) Pennell & St. John. Habit view drawn from *St. John*, no. 1,318, Sable Island, Nova Scotia, Aug. 18, 1913, $\times \frac{1}{2}$.
- 12a. Corolla seen from within, drawn from *St. John*, no. 1,318, $\times 1$.
- 12b. Enlarged view of an anther and part of its filament, showing the glabrous line of dehiscence of the anther sacs and the attachment of the hairs to the nearer side of the filament, drawn from *St. John*, no. 1,318, $\times 10$.
13. *Hieracium scabrum* Michx., var. *leucocaule* Fernald & St. John. Habit sketch of a plant on the type sheet, $\times \frac{1}{2}$.
14. *Hieracium scabrum* Michx. Base of plant showing characteristic villous pubescence of the petioles and the base of the stem, drawn from the specimen, *Ezra Brainerd*, Cobble Hill, New Haven, Vermont, Aug. 18, 1898, $\times \frac{1}{2}$.







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