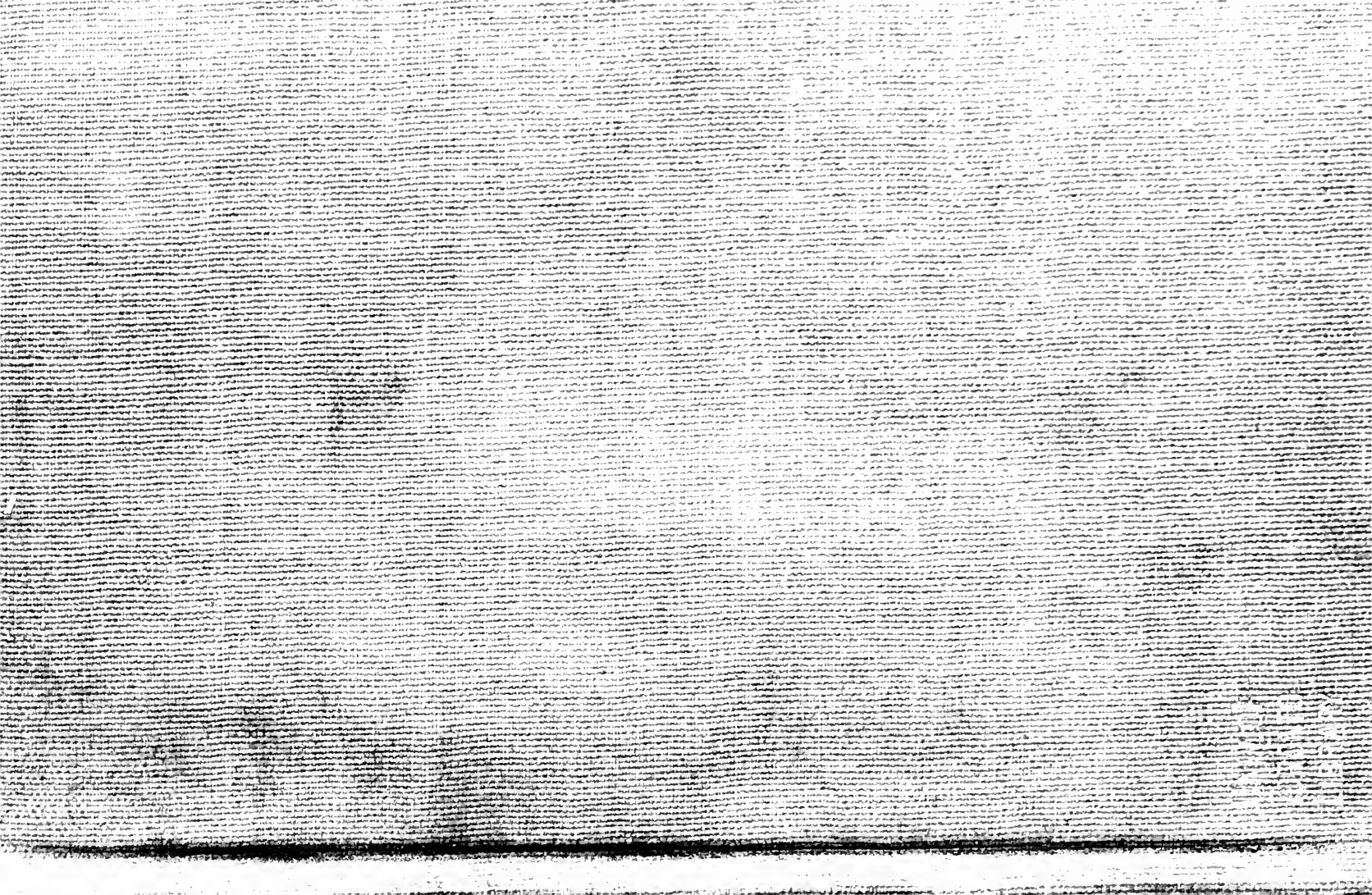

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SABLE ISLAND, WITH A CATALOGUE OF ITS VASCULAR PLANTS.

By Harold St. John.

BOSTON:
PRINTED FOR THE SOCIETY.
March, 1921.

CONTENTS.

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, Sambro 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.

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[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 Brymner[2] 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 Patterson[3] who concludes that the wreck of the *Admiral* could not have taken place upon Sable Island and that it probably occured upon Cape Breton, near Louisbourg.

"The island[1] 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

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[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 us[1] 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]

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[1] Patterson, *l. c.* 8.

[2] Oxley, *l. c.* 167.

From Governor John Winthrop's Journal[1] 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 Winthrop[1], "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.

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[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 records[1] 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 petitioning[3] 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 arguing[4] that as the land is "low, boggy and sandy soil, with large ponds or settlings 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 paper[5], 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 Hancock[1], 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, published[1] 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 30⅔ 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. Gilpin[2], and following him by Prof. John Macoun[3], 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 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. Bayfield[1] made another survey of Sable Island and the bank about it. He determined the position of the East and West Ends as 59° 45′ 59″ W. long., and 60°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.

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[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 southeast 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 account[1] 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 macouni* Mac Kay[1] 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 Ridgway[1] 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 Merriam[2] 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 throve, 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 Gilpin[1] 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, for[2] "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 settlings 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 Mercier[1] 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 depredations 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 experiments[1] 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 mentions[2] 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, meretur)." 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 Journal[1] 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 published[2] 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 reported[2] 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 reported[1], "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 writer[2] 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 published[3] 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 dwarft 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 1885[1], 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, says[2], "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 writer[3] 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 article[4] 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. "It[5] 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-Barnabé, 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 says[1] "my specimens show that not less than forty species occur." "I[2] 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 words[3]: "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 1851[1] 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 year[2] 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 inclined[3] 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 bufonius* L., var. *halophilus* Buchenau & Fernald, *Chenopodium rubrum* L., *Spergularia leiosperma* (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 pennsylvanicum* 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 Warming[1] 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 Hollows—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. Dawson[2] 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. *psilostachyum* 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., *Nymphozanthus 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 Newfoundland[1], 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. *villosus* 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. *parvifolia* (Raf.) Fernald & Long, *P. tridentata* Ait., *Empetrum nigrum* L., *Hippuris vulgaris* L., *Ligusticum scothicum* L., *Coeloplcurum 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 hispidus* 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. *ovatus* 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 laeera* (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 Raii* 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. Saunders[1] 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 ¾ 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
'Lime	.062
'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
	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
	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
	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
'Fat	.81
'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
December	.....	.....	.....	.....	.....	.....	.....	.....
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 report[1] 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 census[1] 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.

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[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 overtopped 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 fructubus 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 génévrier 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 3⅝ and 3⅜ 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 Ashe. 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. **villosus** 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 turfy 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 freshwater 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 turfy 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 turfy 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. hydropiperoïdem* simulans sed differt ocreolis glabris ciliolatis, 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 ciliolate 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. *psilostachyum,* 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 ARVENSIS 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.) Cyrill., 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.) Cyrill., 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.

PORTULACACEAE.

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

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

NYMPHAEACEAE.

Nymphozanthus 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 *Nymphozanthus 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 turfy 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 hispidus 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 quinquefoliolatis vel subquinquefoliolatis; foliolis obovatis 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 obovatis grosse dupliciterque serratis 2.5–8 cm. longis, 1.5–7 cm. latis, costis subter pilosis; inflorescentia racemosa vel compositi-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-foliolate, but sometimes 5-foliolate 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.

Rydberg cites with some doubt the Macoun nos. 21,183 and 21,193 from Sable Island as *Rubus nigricans* × *recurvans,* Bull. Torr. Bot. Cl. xlii. 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 hispidus* × *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. tardatus* 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. hispidus* 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. hispidus* 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 *Guaphalium* 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., subpilosus, 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-pilosis, pilis adpressis incurvatis; capsulis cinereo-pilosis valde glandulosis.

"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. *mesophilum* * * * 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 scothicum 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 ½ 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. Bouteillier, 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 pennsylvanicum 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. Oxycoccus 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 *Centaurium 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, bluntish 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]

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

[2]As *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 Manual[2] 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.

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

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

[3]As *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 turfy 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. bifida (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 turfy 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 Wettst. 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.) Dene. 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 dwarft 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. PALUSTRE 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 Lighthouse. 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 pulchellus (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					

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EXPLANATION OF PLATES.

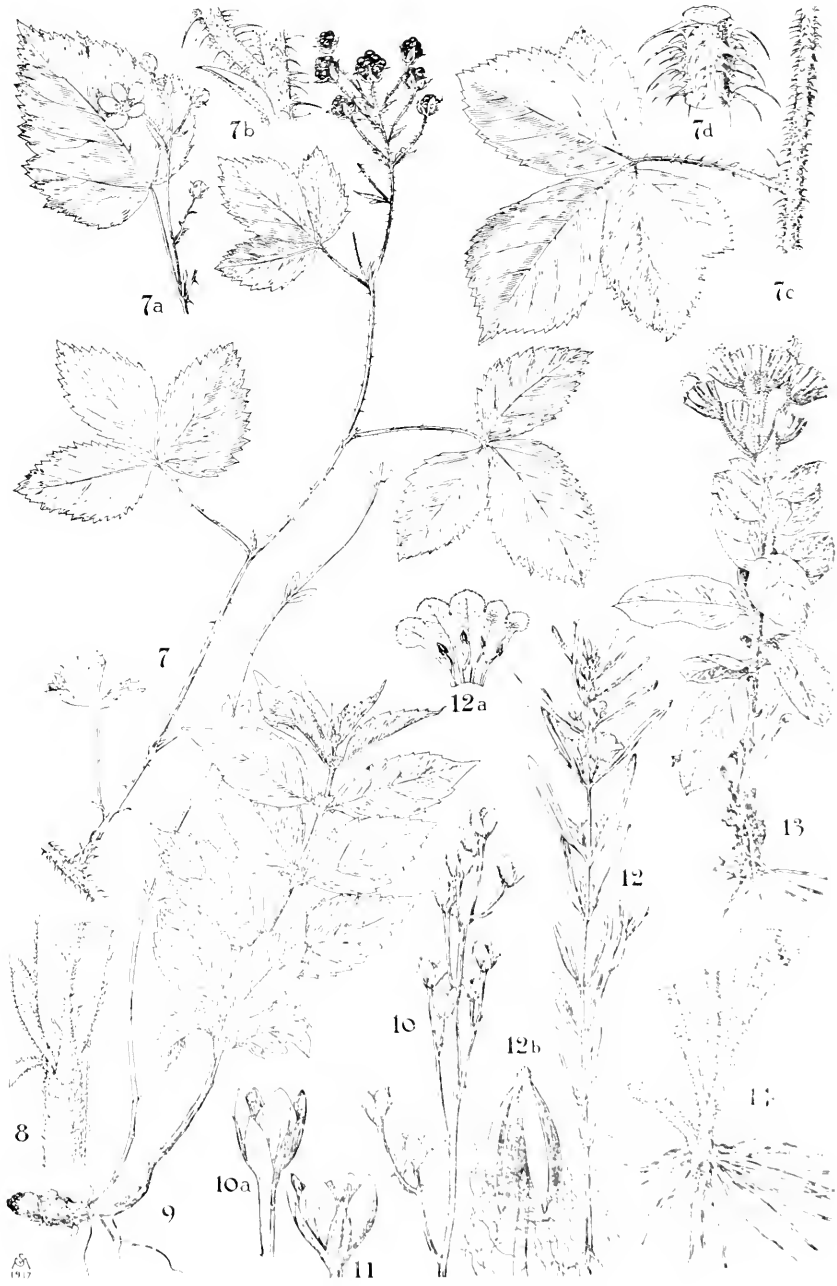
PLATE 1.

1. *Juncus pelocarpus* E. Mey., var. *sabulonensis* St. John, n. var. Habit sketch from the type, × 2.
1a. Detail of fruit of the type, × 5.
1b. Seed of the type, × 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. *psilostachyum* St. John. Habit sketch from the type, × ½.
3a. Detail of inflorescence showing the eciliate ocreolae, from the type, × 2.
4. *Calopogon pulchellus* (Sw.) R. Br., forma *latifolius* St. John. Habit sketch of the type, × ½.
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, × ½.
5a. Detail of a spike, × 2.
5b. A single fruit showing the raised anchor-like nerves on the two outer sepals, from the above, × 5.
5c. A mature achene, from the above, × 5.
6. *Lathyrus palustris* L., var. *retusus* Fernald & St. John. Habit view of several median leaves of the type, × ½.


1a
1b
2
1
3a
4
3
5
5c
5b
6
5a

PLATE 2.

7. *Rubus arcuans* Fernald & St. John. Habit sketch of fruiting branchlet of the type, × ½.
7a. Flowering spray drawn from the specimen *St. John*, no. 1,259 from Sable Island, Nova Scotia, × ½.
7b. Detail of the base of a fruiting pedicel of the type, × 4.
7c. Sketch of a segment of a first-year cane and a single leaf from the type, × ½.
7d. Enlarged view of a portion of a first-year cane of the type, × 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, × 4.
9. *Lycopus uniflorus* Michx., var. *ovatus* Fernald & St. John. Habit sketch of the type, × ½.
10. *Bartonia iodandra* Robinson, var. *sabulonensis* Fernald. Habit sketch of the upper half of a plant, from the type, × 1.
10a. Enlarged view of a single flower, from the type, × 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, × 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, × ½.
12a. Corolla seen from within, drawn from *St. John*, no. 1,318, × 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, × 10.
13. *Hieracium scabrum* Michx., var. *leucocaule* Fernald & St. John. Habit sketch of a plant on the type sheet, × ½.
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, × ½.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No. 2. — THE DISTRIBUTION OF NEW ENGLAND ODONATA [1]

BY R. HEBER HOWE, JR.

Introduction

SOMEONE has well said that the distribution of animals and plants depends on the distribution of biological collectors. By way of example the author has collected during five years of intensive field work in the small township of Concord, Massachusetts (200 ft. elevation), eighty-eight of the one hundred and sixty-four species of Odonata, or more than one half of those known from all New England. Zoögeography is a fascinating and important subject of study, but attempts to define too closely the zones and their boundaries is an unprofitable task, as a distributional relation to pure topography hardly exists. The effects of temperature control as modified by northern and southern slopes, interior and littoral stations, geologic surface exposure, and chemical (halophile) conditions, and many other factors, far more subtle, all lend their perplexing elements. It is actually true that every collector sooner or later finds that he lives at a transition station: species extend down to his home from the north, and up to his very dooryard from the south. It is because of this fact that the Transition as a definite zone seems to be illogical. It should be dispensed with as such, and is by many zoögeographists today.

Nature after all recognizes no Boreal nor Austral regions, but only species each a little different in environmental requirement, that together occupy as a whole regions where life may within its own subtle laws exist. Zones are man's invention, and must if truthful, be wide and elastic, and without purely mechanical boundaries. No matter how monotonous a geographical area is, diverse will be its life; and almost no matter how geographically varied, certain similar forms will range over it all.

The Odonata as a group of insects do not depend for their distribution to an appreciable extent on flora (Calvert, Proc. Acad.

[1] Contribution from the Entomological Laboratory of the Bussey Institution, Harvard University. — No. 186.

Nat. Sci., Phila., **60**: 487, 1908), and though they live from nine months to three years as aquatic larvae, flying for only a few weeks, their presence in a given region is more the result of their imaginal life (flight wanderings or migrations of females) than of their larval existence. At least recent changes would seem to depend on the imaginal states.

The present paper is an attempt to trace, and to some extent to explain, the New England distribution of the Odonata. In this study, it has been necessary to examine the continental distribution of species. The local elements that have been investigated have included topography, geological influence including glacial phenomena, temperature, moisture, and halophilous control, water temperatures, variability in seasonal occurrence, migration, and wind carriage. These will be discussed in their turn.

Dr. C. H. Kennedy in his very kind and generous review (Ent. News, **31** : 206–208, 1920) of the author's Manual of New England Odonata (Mem. Thoreau Mus. Nat. Hist., **2** : 1–102, 1917–20) suggested that the tables "showing the New England states from which each species has been recorded . . . have little value as these are political regions while it is the physiographic and climatic areas that control distribution." The reason for the tables was not that the writer was ignorant of such a fact, — but because, first as stated, he wanted the Manual to conform in plan to Dr. Calvert's List of Odonata (1905), one of the Occasional Papers on the Fauna of New England published by the Boston Society of Natural History; and secondly, because until many "political" stations are listed it is quite impossible to discuss the distributional characteristics of species intelligently. Even now there are many corners of these much investigated States where collecting is needed. Dr. Kennedy will agree[1] that only when it is possible to piece together township- into state-, and state- into continental-lists, can zoögeography be properly understood and studied. As a proof of the value of the publication of these tables two state-lists have been suggested, which when published, will be the result of intensive field work, valuable in the extreme, as units in a patchwork zoögeographical whole.

[1] For he later says, "All odonate records in New England [are] of great value, for which reason Dr. Howe's Manual is especially opportune."

Since the publication of Part VI of the author's Manual he has accumulated nearly a thousand additional records, and eight additional species have been recorded from the area.[1] This paper on distribution, it is hoped, will for the time being, prove adequate as a basis for the further study of New England Odonata.

Topography

The topography of New England is so well known, and has been so fully set forth from a faunal point of view that it is quite unnecessary to discuss it here at length (Scudder, Butterflies of East. U. S. & Can., **1** : 75–86, 1889). That the area abounds in every variety of inland water, from the small pond to the extensive lake, and from the little stream to the large river; that it has an extended and diversified seacoast; that it rises from tide-washed lowlands through hill country to bare mountain-tops, is common knowledge. It is therefore not surprising that of the 494 species and subspecies listed in Dr. Muttkowski's Catalogue of the Odonata of North America (1910), which comprises only 19 per cent of those known to science for the whole world, 164 have been recorded from New England, or practically 33 per cent of those attributed to the continent. This is an admittedly large proportion if we consider that these States occupy about $\frac{1}{133}$ of the total continental area. From Massachusetts alone have been recorded 139 species, 28 per cent, and its area is only about one-eighth that of New England. In Indiana where intensive collecting has been carried on over a long period of years (1895–1921), 26 per cent have been recorded from an area approximately one half that of New England.

Faunal Areas

In the explanation of odonate distribution Dr. C. H. Merriam's paper on Life Zones of the United States (1898) has been generally used, and according to his divisions four life zones are represented in New England: the Hudsonian and Canadian of the Boreal, and the Transition and Upper Austral of the Austral regions. As all New England lies in the humid eastern belt, the Transition Zone is

[1] Supplement, Manual New England Odonata. Mem. Thoreau Mus. Nat. Hist., **2**, 1–14, March, 1921.

there referred to as the Alleghanian area, the Upper Austral as the Carolinian area. Though these faunal areas are easily recognized, a more detailed study in this group of insects shows at least one other and exceedingly interesting element: the presence of an isolated and quite distinct maritime district (Howe & Allen, Birds of Mass., 11–12, 1901) neither Boreal nor Austral, but both curiously intermingled (Scudder, *loc. cit.*, 89–95).

Dr. Kennedy, in his review of the author's Manual, has attempted to state the origin of three of these faunas "though obviously of necessity [in a] very broad way," and he evidently did not distinguish between the Hudsonian and Canadian, but added the Lower Austral in which he included one half of the Austral portion of the maritime district mentioned.

The oldest fauna he calls the Transition, — "possibly a relic of the pre-Pliocene times, whose species manage to hang on by living in special habitats that as yet are not seriously invaded by more modern faunas." "These genera occupy rough country and rapid gravelly streams or boggy land." "They are characteristic of the central Appalachian system and among them are many rare and odd species." Twenty-five species are included here. He states that the Canadian species were "probably the first to appear in New England after the retreat of the ice," and that the genera to which they belong "are holarctic and probably Eurasian . . . perhaps having spread into North America during recent interglacial epochs." Forty-four of our species are assigned to this fauna.

The Upper Austral fauna is the largest, comprising sixty-eight species. This he calls "the great Mississippi Valley fauna of ponds and muddy streams, a very modern fauna of close species, which is at present overflowing into the warmer parts of New England." The Lower Austral, of nineteen species, comprises the "odds and ends, the pioneers of a very modern fauna . . . which have slipped up the narrow, warm coast from the semitropical gulf strip." "This fauna must be increasing at present."

Geologic and Land Control

No one doubts that a fundamental relation exists between the distribution of life, geologic phenomena, and later physiographic changes. To interpret these relations correctly is a problem as

difficult as it is interesting. Erosion, the elevation and submergence of coastal lands, soil conditions, and glacial invasion are explanatory of change, though in the last case the discovery of forests supported by glacial waste on the surface of the Malaspina Glacier in Alaska complicates the hypothesis even more. Mr. R. J. Tillyard in his distributional studies of Odonata in Australia has advanced some interesting geologic explanations. The extensions of lowland faunas to uplands by base-leveling, and valley segregations are very illustrative of physiographic influence (Walker, Can. Ent., **40** : 171, 1917). The proximity of the ocean and ocean currents exert definite controls that must not be ignored. Man's influence also through irrigation and land-making is, and will be, of very considerable consequence.

Temperature and Moisture

That temperature and moisture play a very important part in distribution is clearly evident. Temperature, however, as governed by latitude or elevation from the point of view of zoögeography is a misleading factor for the question of exposure is the more important. Our planet for example reaches perihelion in July, but it is nevertheless our hottest month. The stability of temperature perhaps not only explains the overlapping of boreal and austral species in our so-called "cold-bog islands," but along the seacoast as well. A nice correlation in temperature is to be noted in the fact that typically boreal species, or restricted boreal species occupying middle elevations, *e.g.*, *Williamsonia lintneri*, *Agrion amatum*, when inhabiting stations near or beyond the general southern limits of their range during their imaginal life appear in the cool months of April, May, and early June, and that the most widely distributed species have the longest flight season, *e.g.*, *Anax junius*. Moisture seems not to govern distribution as directly as it does size in development and pigmentation (Scudder, *loc. cit.*, 86–89, 1889).

Halophile Control

It seems to have been fairly well ascertained that no species of Odonata are halophile. The marine littoral distribution of several species is probably more accurately explained by the necessity of a stable temperature condition for both larval and imaginal states,

and a salinity up to 1.003 is endured rather than sought. A marked decrease after the severe winter of 1919–20 in *Erythrodiplax berenice* on Cape Cod supports this explanation. No one species has been found to be exclusively confined to brackish ponds, since all the supposed halophile species inhabit both fresh and brackish ponds. This is true of the salt lakes of the interior as well (Schwartz, Can. Ent., **23**: 235–241, 1891, and Osburn, Amer. Nat., **40** : 395–399, 1906). The proximity of the ocean is a stabilizing temperature influence.

The very evident congeniality or attraction of maritime conditions for species of plants and animals has long been noted, and as yet has met with no very satisfactory explanation. There are probably many unexplained links in the chain, which only a most intensive ecological study can solve.

Seasonal Occurrence

The very evident variability in the abundance of Odonata from season to season has been the common observation of field naturalists (Walker, Can. Ent., **17** : 171–178, 1917). A warm, sunny, dry season always shows, so far as the author has observed, a decided local increase not only of individuals, but also of species in comparison with numbers noted in a cold, sunless, wet season, provided the ponds and streams are not low. This would seem to be due not only to wider flight activity, but also to unsuccessful transformations during wet weather. Another factor that may have a local influence is that some species remain in their larval state over a period of more than one year, and therefore in certain years more species are emerging than in others (Psyche, **27**: 155, 1920).

Water Temperatures

The primitive cedar swamps and cold-bog ponds have long been termed "boreal islands" where northern species far south of their usual range find congenial habitats. In connection with the Odonata the cold-bog ponds might better be termed "extralimital islands" for they are not only southern stations for boreal species, but northern stations for austral species. The presence of *Leucorrhinia frigida* and *L. glacialis* south of their normal ranges,

and of *Tramea carolina* north of its normal range, all three flying together over a small bog pond where they breed and transform, needed investigation. The taking of a series of water temperatures from the bottom of this bog pond, and a comparison of those temperatures with others taken in a glacial pond in the same township (Lat. 42° 25′, elevation 200 ft.) has given some interesting data. The cold springs that evidently feed this bog pond keep the bottom temperature at 51° F. in summer, while in winter the pond hardly freezes over, and its bottom temperature falls only to 36° F., or a range of 15° F. At the other pond the winter and summer bottom temperatures ranged through 33° F., or from 36° to 69° F. It would seem therefore quite natural that the larvae of the *Leucorrhinias* would find a summer temperature not too warm, — and those of *Tramea carolina*, a winter one not too low. As both imagoes enjoy warm sunlight their imaginal lives are also satisfied.

Migration

The migration of insects is an established fact, and that of the Odonata has been frequently observed and recorded. Whether or not it is a relic of glacial invasion and retreat, and follows ancestral routes, as does that of birds, is unknown. A swarming, similar to that of swallows preceding the migration movement, has been noted by the author and others, and a definite southward trend of migration along the beaches of our coast is observable every autumn. Northward spring migrations have also been recorded. The migrations are confined to the larger species of strong flight, and it would seem that distributional extension must at times result. *Anax junius*, a regular migrant, is for example, the species of widest North American range, and *Libellula pulchella* and *L. semifasciata*, *Tramea carolina* and *T. lacerata*, and many *Aeshna* species which have been commonly recorded on migrations, have extensive ranges (Shannon, Harper's Month. Mag., **131**: Sept., 609–618, 1915; Shannon, Sci. Monthly, **3** : 227–240, 1916; Osburn, Journ. N. Y. Ent. Soc., **24** : 90–92, 1916; Walker, Can. Ent., **17** : 172, 1917; Torrey, Amer. Nat., **14** : 132–133, 1880, and 594, 1881).

Wind Carriage

That besides the migratory movements Odonata are at times carried many miles by high winds seems very probable. Although the arrival of a tattered specimen in a locality far beyond its normal range may be due to the migratory instinct, nevertheless, in several cases of this kind that have been noted by the author high winds have preceded such arrivals. These in the author's experience, have so far, save for one instance, been confined to the migratory month of September. The recording of such occurrences if made in July and August would be of much interest. The instances above referred to were: *Somatochlora walshii* at Concord, Mass., *Aeshna interrupta* at Wenham, Mass., and *Agrion maculatum* at Chatham, Mass.

Distribution of Species

No matter what disagreement exists in regard to the acceptance of the life zones of the north-temperate regions, all zoögeographers admit at least the presence of a Boreal or northern fauna, and an Austral or southern one. All arguments arise in dealing with the proper assignment of northern species that overlap and southern species that underlap in the intermediate regions. The author believes that as in the recognition of subspecies, the aim of all biological study should be to present only important distinctions for general use, acknowledging of course the interest of individual cases, and individual specialized investigation.

In the following lists the term "eastern" refers to species which inhabit the regions east of the Mississippi-Missouri Rivers, and the Prairie Provinces of Canada; the term "east-central" to those that cross to the western limits of the eastern humid belt, or far more rarely into the arid eastern slope of the Rocky Mountains as well. "Transcontinental" refers to species that cross the Rocky Mountains to the Pacific Coast States or Provinces. The typically boreal species are represented by more than double the number of transcontinental species probably largely owing to the lack of high north and south mountain barriers in the region, and because of their holarctic origin.

It is to be noted that species having a short flight season or imaginal life, flying in either spring, summer, or autumn, generally the first or the last, are boreal in origin, while austral species, on

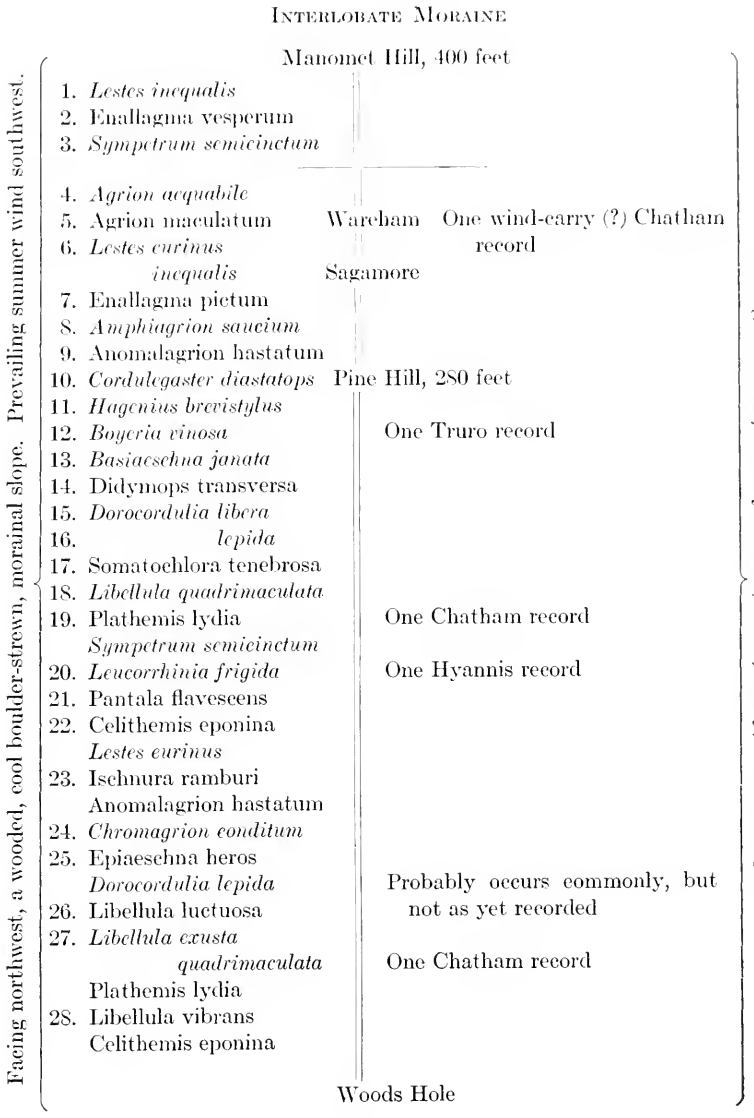
the other hand, have as a rule a long flight season extending from June to September, or through two seasons. The three periods are not co-extensive throughout New England, for in interior Maine and in high elevations spring extends from early June to early July; summer from early July until mid-August; and autumn from mid-August until mid-September. Along the southern coast of New England, on the other hand, spring extends from late April until mid-June; summer from mid-June until late August, and autumn from late August even to mid-November [1] (Banks, Ann. Ent. Soc. Amer., **8** : 133–134, 1915).

Studies in botanical ecology have progressed farther than those in zoölogical ecology, and no ecological study of the Odonata as a whole has been seriously attempted (see Calvert, Proc. Acad. Nat. Sci. Phila., **60**: 460–491, 1908). Dr. Needham in his Aquatic Insects of New York (Bull. 68, N. Y. State Mus., 275, 1903) listed the larval habitats "of some New York Odonata," and Dr. Riley has published a paper (Ann. Ent. Soc. Amer., **5** : 273–292, 1912) on the Ecology of Odonate Nymphs, and various other writers, including the author, have stated the imaginal habitats of the species listed. That in a study of the distribution of species a great deal of investigation might well be spent on ecological areas is perfectly evident. An explanation of the distribution of certain puzzling species may be solved by an understanding and recognition of the so-called "lakes." *Williamsonia lintneri* for example, known from the semi-boreal prairie Provinces of Ontario and Manitoba, again occurs not uncommonly in eastern Massachusetts in what has been considered as the Transition Zone, with additional records from Center, N. Y., and Paterson, N. J., stations on the boundary of the so-called Upper Austral. It is without doubt a boreal species, and flies in eastern Massachusetts in April and May. Here it has been taken about cold boggy ponds and quarry pools. Thus are represented two widely separated distributional "lakes."

In the distribution of Odonata in New England there is only one striking and seemingly very definite line that separates two New England regions for both Boreal and Austral species. This is the glacial contact line or interlobate moraine stretching from Manomet to Falmouth, — a barrier in other words to Cape Cod.

[1] These terms are applicable only to New England, — spring species are frequently summer species in Canada.

The twenty-eight species whose ranges are abruptly terminated at this line, of which sixteen are northern, are indicated in the diagram below, and in the following lists (boreal species in italics).



The line is marked by a well-wooded, morainal, boulder-strewn slope facing northwest toward Buzzard's Bay to an elevation of 200 feet in an average distance inland of three miles. From the crest to southeast stretches the gentle slope of the sparingly wooded, sandy, outwash plain. The angle of insolation on these two slopes, plus the prevailing summer southwest wind, and forest shade, make the temperature on the latter slope decidedly higher. Whether this change in all its elements is sufficient to explain this separation barrier, or whether it is due to glacial advance and retreat of the past it is, I suppose, impossible to say. Present topographic control would seem to be far the more likely cause. Further collecting in the townships to the southeast of this line may prove that it is not as definite as it would now appear with the records at hand, but at all events the faunas of the base and lower Cape, are distinct in many species.

To the east of this interlobate morainal boundary which really is, perhaps, the most natural one by which to set apart the Cape fauna, the following fifty-nine species have been taken of which nineteen are northern (indicated by italics) and forty southern.

1. Agrion maculatum, one record — Chatham
2. Hetaerina americana, one record — Provincetown
3. *Lestes congener*
4. *disjunctus*
5. forcipatus
6. rectangularis
7. *unguiculatus*
8. vigilax
9. Argia moesta
10. violacea
11. Enallagma civile
12. *cyathigerum*
13. doubledayi
14. durum
15. exsulans
16. *minusculum*
17. signatum
18. *Nehalennia irene*
19. Ischnura posita
20. verticalis
21. Progomphus obscurus
22. *Gomphus abbreviatus*, one record — Provincetown
23. *Gomphus exilis*
24. *spicatus*
25. Dromogomphus spinosus
26. *Boyeria vinosa*
27. Anax junius
28. *Aeshna canadensis*
29. clepsydra
30. tuberculifera
31. *umbrosa*
32. verticalis
33. Macromia illinoiensis
34. Epicordulia princeps
35. Tetragoneuria cynosura
36. cynosura simulans
37. Libellula auripennis
38. cyanea
39. *crusta*, one record—Chatham
40. incesta
41. pulchella

42. Libellula semifasciata
43. Plathemis lydia, one record — Chatham
44. Perithemis domitia tenera
45. *Nannothemis bella*
46. Erythrodiplax berenice
47. Erythemis simplicicollis
48. Pachydiplax longipennis
49. Sympetrum corruptum
50. *costiferum*
51. *Sympetrum obtrusum*
52. *rubicundulum*
53. *ricinum*
54. *Leucorrhinia frigida*, one record — Hyannis
55. intacta
56. Celithemis elisa
57. monomelaena
58. ornata
59. Tramea carolina

On the Cape itself another interesting control is to be noted. A few species that inhabit the deeper, ice-block kettles are absent from the shallower outwash ponds, and *vice versa*. Here again the mud of the former as compared with the sand of the latter probably explains the larval distribution of the different species.

One other factor of interest, already noted, is that the most boreal forms, if appearing in unusually southern stations, are always of early spring or autumn occurrence. *Williamsonia lintneri*, *Enallagma calverti*, and others at the southern limit of their ranges appear in April, May, or early June. This would suggest the importance of temperature as the most potent distributional control.

There is in New England at least, however, one interesting instance of distribution that seems most probably explained by geologic, rather than by topographic or climatic influence. Prof. M. L. Fernald has pointed out that "the Tertiary continental shelf . . . is now depressed as a shallow bench off the east Atlantic coast of America; and from the botanical and zoölogical evidence, as well as from recently published geological evidence, it now seems perfectly settled that the continental shelf formed in the late Pleistocene and even later a nearly continuous although somewhat interrupted floor from New Jersey and southern New England, by way of Sable Island and the Grand Banks, to southern and eastern Newfoundland" (Amer. Journ. Bot., **5** : 238, 1918). Without citing the botanical and zoölogical evidence to which he refers, and which seems steadily accumulating, the Odonata supply another seemingly definite instance. The two holarctic species, *Enallagma calverti* and *E. cyathigerum*, bridging a wide hiatus in southern New England from the boreal regions, occur again on the coast from Provincetown to Point Judith, R. I., and on Nantucket. Both species have been recorded from Newfoundland as

well, while one has been taken as far south as New Jersey. In this case, contrary to the usual evidence, the migration was of northern species southward, rather than of southern species northward.

Though fifty years as a unit of time in geologic history is infinitesimal, yet there seems to be evidence accumulating to prove that species are extending their ranges westward, *e.g.*, *Enallagma ebrium* (see Hagen and Elrod, Bull. No. 10, Univ. Mont., 151, 1902), and others eastward, *e.g.*, *Sympetrum corruptum* (see Calvert, Trans. Amer. Ent. Soc., Phila., 264, 269, 1893), and that Lower Austral species are pushing slowly northward along the Atlantic coastal strip, *e.g.*, *Prionidus cristatus* and *Murgantia histrionica* (Heteroptera) (see Kennedy, Ent. News, **31** : 208, 1920). There are several instances among the birds where perfectly definite changes and extensions of range have been recorded since the study of ornithology began in the United States. Besides these instances and though little definite evidence is available there seem also to be indications that the east and west belt of so-called Transition and even Upper Austral species that were Boreal, and which were pushed southward by the ice advance, are now regaining lost territory, and are withdrawing their southern outposts (see Scudder, Amer. Journ. Sci., ser. 3, **48** : 178–187, 1894). Not only is this suggested by the failure in recent years to reëstablish records of certain northern species made fifty years ago in the southern States, and of recent recording of "farthest north" records for the same and other species, *e.g.*, *Nehalennia irene*, but, as has been said, by the season (early spring) and duration (brief) of the imaginal-life period of these species, and of their probable holarctic origin.

Northern or Boreal Species

The boreal species common to New England, of which thirty-two are transcontinental, number ninety-one. The Odonata as an order inhabit largely the Austral and Tropical regions, and are represented less commonly in the Boreal. On the other hand, if we consider the so-called Transition Zone as belonging more naturally to the Boreal than to the Austral, these States should be occupied by a large proportion of northern species, particularly in view of the fact that their southern borders are still occupied by species the presence of which is explained by a former land connection with Newfoundland. The following sixteen species are the most typi-

cally boreal in range, and are either transcontinental or nearly so. They inhabit elevations between 600 and 4000 feet, and are also to be found away from the coast, in Maine north of the 44.5 parallel, or in "extra-limital" island or migration-point stations farther south. New England stations are listed in the author's Manual, and there are undoubtedly stations outside New England that through oversight have not been included here.

1. **Aeshna caerulea septentrionalis,** transcontinental and circumpolar. It has never been taken elsewhere in the United States, but ranges northward to Labrador and probably to Alaska.
2. **Somatochlora cingulata,** east-central. Dr. Muttkowski's Massachusetts record cannot be traced. It has not been recorded from elsewhere in the United States but ranges northward to Labrador. Dr. Tillyard (Proc. Linn. Soc. N. S. Wales, **34** : 41, 1914) states that Maine is the zoöcenter of the genus Somatochlora as shown by specific contours, but since the publication of Mr. F. C. Whitehouse's Alberta lists this would seem to be refuted.
3. **Ophiogomphus colubrinus,** east-central. It has been recorded doubtfully from only one other station in the United States: Yellowstone (7,000 ft.), Wyoming. It ranges northward to Newfoundland, Manitoba, and Northwest Territory.
4. **Somatochlora albicincta,** transcontinental, summer. It has been recorded also in the United States from Mt. Rainier (14,363 ft.), Washington, and ranges northward to Labrador and Alaska.
5. **Somatochlora franklinii,** east-central, spring. The only other United States station is Pt. Abbaye, Pequaming, Michigan (600 ft., Lat. 47° N.). It ranges northward to Labrador, Alberta, and Northwest Territory.
6. **Aeshna juncea,** transcontinental and holarctic. There are but two other stations for it in the United States: Shell Creek (8,000–10,000 ft.), Big Horn Mts., Wyo., and southern Colorado at an elevation of from 10,000–11,000 ft. It ranges northward to Labrador and Alaska.
7. **Somatochlora forcipata,** transcontinental, spring and summer. It has been taken at only one other United States station: Whitefish Pt., Chippewa Co., Michigan (600 ft., Lat. 46.5° N.). It ranges northward to Labrador and Northwest Territory.
8. **Leucorrhinia hudsonica,** transcontinental, spring. The Winchendon, Mass., record is from an "extra-limital" island. It has been taken at two other stations in the United States: Pequaming (600 ft., Lat. 47° N.), Michigan, and Divide (1,500 ft., Lat. 46° N.), Wisconsin. It ranges northward to Labrador and Alaska.
9. **Cordulia shurtleffi,** transcontinental, spring and summer. The Massachusetts and Connecticut stations are "extra-limital" islands. It has been taken at four other stations in the eastern United States south of New England: Tunis Lake (3,500 ft.) and Saranac Inn (1622 ft.), New York; Dawkill Pond (900 ft.), North Mt. (2,000 ft.), and Perdix (348 ft.),

Pennsylvania; and at Pequaming, Michigan (600 ft., Lat. 47° N.), and is known also from Washington (1,000 ft.), Oregon (4,000 ft.) and Nevada (7,000 ft.). It ranges northward to Newfoundland, Labrador, Northwest Territory, and Alaska.

10. **Leucorrhinia glacialis,** transcontinental, spring and summer. Outside New England, and south of Canada where it is known from Nova Scotia to British Columbia, it has been taken in New York at Saranac Inn (1,622 ft.); in Michigan at Pequaming (600 ft., Lat. 47° N.); in Wisconsin at Divide (1,500 ft., Lat. 46° N.); and in the west in California (8,000 ft.), and Nevada (6,000 ft.).
11. **Leucorrhinia proxima,** transcontinental, spring and summer. Outside New England, and south of Canada where it is known from Nova Scotia to British Columbia, it has been taken only in Minnesota in Lat. 44.5° N., at elevations between 700 and 800 feet.
12. **Somatochlora minor,** east-central, spring. Sheep Creek (7,000 ft.), Wyoming, is the only other reported United States station. It ranges northward to Quebec and Alberta.
13. **Somatochlora walshii,** eastern, spring, summer, and autumn. The Massachusetts record is evidently a migratory one. It has been taken south of New England only in the Keene Valley (3,000 ft.), New York. It ranges northward to Nova Scotia, Ontario, Quebec, Manitoba, and Alberta.
14. **Somatochlora elongata,** east-central, summer. The Schoodic, Me., record would appear to be a migratory one. It has been taken outside New England in the United States at the following stations: Saranac Inn (1,622 ft.) and Ithaca (814 ft.), New York; upper Wisconsin River (1,600 ft., Lat. 46° N.), Wisconsin. It ranges northward to Nova Scotia, New Brunswick, and Quebec.
15. **Aeshna interrupta,** transcontinental, summer and autumn. The three coast records are evidently migratory ones. It has been taken outside New England in the Catskill Mts. (4,025 ft.), Lake St. Regis (2,000 ft.), New York; Isle Royale (Lat. 48° N.), Topinabee (8,000 ft., Lat. 45.5° N.), Minnehaha Falls, Emmet Co. (Lat. 45.5° N.), and North Hudson (Lat. 46° N.), Wisconsin. It ranges northward to Newfoundland, Quebec, the Prairie Provinces, and Northwest Territory.
16. **Aeshna eremita,** transcontinental, summer and autumn. The eastern Massachusetts stations are migratory ones. It has been taken elsewhere in the United States at Lake St. Regis (2,000 ft.), New York; at Marquette (600 ft., Lat. 46.5° N.), Oden (606 ft., Lat. 45.5° N.), Minnehaha Falls, Emmet Co. (800 ft., Lat. 45.5° N.), Isle Royale (Lat. 48° N.), at St. Croix Dam (Lat. 46° N.), Chippewa Falls (Lat. 45.5° N.), Wisconsin; and at Shell Creek (8,000–10,000 ft.), Big Horn Mts., Wyoming. In Canada it ranges from Newfoundland and Labrador through the Prairie Provinces, to Northwest Territory and Alaska.

The following ten eastern species rarely inhabit in New England elevations above 1500 feet, nor descend except rarely below 500

feet. Here are listed many of those species which have been commonly considered as belonging to the Transition Zone. They are, the author contends, restricted boreal species confined to "special habitats." It seems likely from their present homes that they are, as has been said, relics of an earlier fauna. An interesting parallel example is found in the Diptera where the species *Bittacomorphella jonesi* Johnson was first described from an elevation of 3000 feet in North Carolina, and afterwards was found to be a boreal species extending northward to Machias, Orono, and Mt. Desert, Me. One of the misleading results of recognizing a Transition Zone is that truly boreal species are thus inadvertently placed in the Austral, because the Transition Zone of Merriam is but a subdivision of it, though many more odonate (3–1) typical boreal species, than austral, overlap into it. If included in either region it is far more logical to consider it a part of the Boreal. Even Scudder's intermediate boundary is too far north for an approximate division between boreal and austral species. Of course all boundaries are purely arbitrary, and those recognized are the result of a purely arbitrary selection. Dr. Merriam said, in fact, and his words have been frequently overlooked: "The zone as a whole is characterized by comparatively few distinctive animals and plants, but rather by the occurrence together of southern species which here find their northern limit, and northern species which here find their southern limit." In other words it is not a zone at all, but simply as he calls it, an "overlap" area. The following species are of the boreal type to which he refers, and inhabit for the most part cold streams of wooded country.

17. **Agrion aequabile,** eastern, spring. Its varieties make the species' range transcontinental. Outside New England and south of Canada where it has been taken in Nova Scotia, Quebec, and Ontario, it has been taken in New York at Axton (2,000 ft.), Keeseville (2,000 ft.), and at Bronx Park and Long Island at sea level; in New Jersey at Newfoundland (770 ft.) and Great Notch (411 ft.); in central Ohio (744 ft., Lat. 40° N.); in central and northern Indiana (750 ft., Lat. 39.5°–41.5° N.); Waterloo (841 ft.), Iowa; Milwaukee Co. (600 ft.), at Divide (1,500 ft.), and in Washington Co. (900 ft.), Wisconsin; and in Minnesota at Lake Amelia (905 ft.). The Virginia record has been expunged, and the old Georgia record is very doubtful.

18. **Agrion amatum,** eastern, spring. South of New England this species has been taken in New York, Axton (2,000 ft.), Keene Valley (3,000 ft.); in Pennsylvania, Charter Oak (1,000 ft.); in Maryland, near Cranesville,

W. Va. (2,000 ft.); in North Carolina, Magnetic City, (3,000 ft.). The only Canadian station is St. David's, Quebec. The increased elevations in stations southward are interesting, and to be expected.

19. **Ophiogomphus anomalus,** eastern, spring. This species has only been taken elsewhere in Canada in Quebec and Ontario.
20. **Ophiogomphus carolus,** eastern, spring. Only one station south of New England is known for this species, — Ithaca (814 ft.), New York. In Canada it has been taken in Ontario.
21. **Ophiogomphus mainensis,** eastern. This species has not been recorded from outside New England. Dr. Muttkowski's Massachusetts record cannot be traced. The elevation of the New Hampshire station is 1,600 feet.
22. **Gomphus borealis,** eastern, spring. South of New England it has been taken at Saranac Inn (1,622 ft.), New York; and at Magnetic City (3,000 ft.), North Carolina. The Ontario, Canada, record was an error.
23. **Gomphus scudderi,** eastern, summer. Outside New England it has been recorded from Saranac Inn (1,622 ft.), New York, and Oden (606 ft., Lat. 45.5° N.), Michigan. It has also been taken in Ontario.
24. **Boyeria grafiana,** eastern, summer. North of New England known from Quebec and Ontario in Canada, it has been recorded in the United States outside New England from Old Forge (1,500 ft.), New York; from Ohio Pyle (1,224 ft.), Pennsylvania; from Orwell (800 ft.), Ohio; and doubtfully from Cave Branch (650 ft.), Kentucky.
25. **Somatochlora kennedyi,** eastern, spring. Outside New England it is known only from Quebec and Ontario in Canada, and from the Ministiqua River (750 ft., Lat. 46.5° N.), Michigan.
26. **Somatochlora williamsoni,** eastern, spring. Outside New England, and south of Canada where it is known from Quebec and Ontario, it has been taken at Saranac Inn (1,622 ft.), New York, and at Oden (606 ft., Lat. 45.5° N.) Michigan.

The following eleven eastern species which rarely inhabit elevations over 1500 to 1900 feet, have a more extended range than the last over the low country even to sea level. Not infrequently these species reach the cranberry bogs of the pine-barren region (Lat. 40° N.) of New Jersey. This region is one characterized apparently by several unquestionably boreal species, *e.g.*, *Libellula quadrimaculata*. Many of them reach Maryland and stations away from the coast in Virginia, North Carolina, and to Kentucky and Tennessee. Like the last, though boreal in habitat, they have been called transitional. Though it may be entirely erroneous to consider these and the following species (Nos. 27–55) as boreal, a mere arbitrary division at best, yet environmentally and physiographically, they are distinctly boreal rather than austral, though altitudinally and latitudinally, not typically so. None has ever been

taken across the interlobate morainal barrier on Cape Cod. They inhabit the spring runs, cold streams, or (primitive) ponds, and are on the wing in early spring.

27. **Chromagrion conditum,** eastern, spring. South of New England it is recorded from New York: Ithaca (381–814 ft.), Hamburg (796 ft.), McLean (1,119 ft.), Saranac Inn (1,622 ft.); New Jersey: Brown's Mills (71 ft.), Hewitt (413 ft.), Lakehurst (50 ft.); Pennsylvania: Idlewild (1,200 ft.), Pine Creek (808 ft.); Maryland: Lakeland (56 ft.), Hyattsville (46 ft.), Great Falls (167 ft.); Virginia: Great Falls (167 ft.); North Carolina: Raleigh (300 ft.); Tennessee: Ashland City (408 ft.); westward it is found in northern Ohio, Indiana, and Illinois northward to Wisconsin: Chippewa Falls (866 ft., Lat. 45° N.). In Canada it is known from Quebec and Ontario.
28. **Ophiogomphus rupinsulensis,** east-central, spring and early summer. South of Canada, where it is known from Quebec to Alberta, and outside New England, it has been recorded on the Atlantic coast from New Jersey, Dover (510 ft.), Halifax; from Pennsylvania: Allegheny Co. (750 ft.); New York: Ithaca (814 ft.); Maryland: Glen Echo (100 ft.); Tennessee: Stone River (700 ft.); central Ohio (750 ft., Lat. 40° N.); northern Indiana (750 ft., Lat. 41° N.); northern Illinois (560 ft., Lat. 42° N.); northern Wisconsin (1,500 ft.); and from North Dakota, Caledonia (800 ft.).
29. **Cordulegaster diastatops,** eastern, spring. South of New England it is recorded from New York: Ithaca (814 ft.), McLean (1,119 ft.): New Jersey: Hewitt (413 ft.), Lake Hopatcong (914 ft.), Lakehurst (50 ft.); Maryland: Hyattsville (46 ft.); West Virginia: Cranesville (2,000 ft.); North Carolina: Raleigh (300 ft.); and from northern Indiana. In Canada it is known from Nova Scotia, New Brunswick, Quebec, and Ontario.
30. **Cordulegaster maculatus,** eastern, spring. South of New England it is reported from New York: Saranac Inn (1,622 ft.), to sea level; New Jersey: Newfoundland (770 ft.), Greenwood Lake (618 ft.), Lakehurst (50 ft.), Staten Island, Lacey (25 ft.); Pennsylvania: Ohio Pyle (1,224 ft.); Maryland: Plummers Is. (sea level), Bladenburg (25 ft.); District of Columbia (25 ft.); Virginia: Great Falls (500 ft.), Enola (500 ft.), Arlington (420 ft.); North Carolina: Raleigh (300 ft.); and Georgia (an old record with exact locality doubtful, — Screven Co. ?). It is also known from northern Indiana, and in Canada from the same Provinces as the last species.
31. **Cordulegaster obliquus,** eastern, spring. South of New England it is recorded from New York: Pine Island (408 ft.), New York City (50 ft.); New Jersey: Lake Hopatcong (914 ft.), Palisades (100 ft.); Pennsylvania: Squaw Run (1,000 ft.); District of Columbia (sea level); Virginia: Enola (500 ft.); and from Kentucky and Georgia (old and indefinite records). Westward it is recorded from Ohio, Indiana, Illinois, (Texas?), Kansas (800 ft.). In Canada it is known from Quebec and Ontario.

32. **Gomphus abbreviatus,** eastern, spring. South of New England it has been doubtfully reported from New York and Pennsylvania; and is recorded from Greenwood Lake (618 ft.), New Jersey, and Lumberton (150 ft.), North Carolina. Westward it is reported only from Ohio, Loudonville (973 ft.) (a doubtful record). There is one Provincetown record for this species.
33. **Gomphus albistylus,** eastern, spring and early summer. South of New England it has been recorded from New Jersey: Lucaston (133 ft.), Ramapo Mt. (475 ft.); Pennsylvania: York and Bucks Co. (350 ft.), Castle Rock (100 ft.), Ohio Pyle (1,224 ft.), Rockwood (1,813 ft.), Idlewild (1,200 ft.), Lehigh Gap (389 ft.); Maryland: Great Falls (167 ft.); Virginia: Great Falls (500 ft.); Kentucky: Gregson's Spring (? ft.); Tennessee: Sycamore Creek (500 ft.?); North Carolina: no locality given. It is known also from Loudonville (973 ft.), Ohio, and Ontario.
34. **Gomphus parvulus,** eastern, spring. Other United States stations to the south are: Ithaca (814 ft.), New York; Alleghany River (750 ft.), Pennsylvania; Ramapo (500 ft.), Hewitt (413 ft.), Schooley Mt. (1,208 ft.), Raritan River (100 ft.), New Jersey; Lumberton (120 ft.), North Carolina; and Rocky Creek (650 ft.), Kentucky. It is known in Canada from Nova Scotia.
35. **Gomphus spicatus,** eastern, spring. South of New England this species is recorded from Ithaca (814 ft.), Saranac Inn (1,622 ft.), Clarence (709 ft.), Black Rock Harbor (596 ft.), New York; New Jersey: Newfoundland (770 ft.), Caldwell (411 ft.); westward it is reported from northern Ohio, Indiana, and Illinois, and northward to Canada where it is known from Quebec and Ontario.
36. **Dorocordulia libera,** eastern, spring and early summer. Outside New England it has been recorded from New York: Catskill (2,140 ft.), Saranac Inn (1,622 ft.), Bronxville (109 ft.); New Jersey: Normanock (1,000 ft.), Beaver Lake (1,030 ft.), Newfoundland (770 ft.), Paterson (193 ft.); from northern Indiana (700 ft., Lat. 41° N.); Michigan: Pt. Abbaye, Pequaming (600 ft., Lat. 47° N.); northern Wisconsin (860 ft., Lat. 43° N.); and Minnesota: Stillwater (688 ft.). It is known also from Ontario, Canada.
37. **Helocordulia uhleri,** eastern, spring. South of New England it is recorded from New York: Saranac Inn (1,622 ft.); New Jersey: Brown's Mills (71 ft.), Florence (52 ft.), Iona (105 ft.), Manumuskin (17 ft.), Newfoundland (770 ft.), Lakehurst (50 ft.); and Pennsylvania: Rockwood (1,813 ft.). In Canada it has been taken in Quebec and Ontario.

The following twenty-one species are like the last group in range, but rarely inhabit elevations over 1000 feet.

38. **Tetragoneuria canis,** eastern, spring. Outside New England it is recorded from (as *spinosa*) New York: Saranac Inn (1,622 ft.), Ithaca (814 ft.); New Jersey: Great Notch (411 ft.), Old Bridge (16 ft.); Maryland; Wisconsin: Divide (1,500 ft.); and a doubtful record of a female from Georgia. In Canada it is known from Nova Scotia, Quebec, and Ontario.

39. **Dorocordulia lepida,** eastern, spring and early summer. Outside New England it has been recorded from New York: Albany (30 ft.), Burntlhills Pond (1,288 ft.), Amber Lake (506 ft.), Mud Pond (1,589 ft.); New Jersey: Brown's Mills (71 ft.), Iona (105 ft.), Jamesburg (78 ft.), Atco (148 ft.), Lakehurst (50 ft.); and is attributed as well to Maryland.
40. **Neurocordulia yamaskanensis,** eastern, spring. South of New England recorded from Pennsylvania: Perdix (348 ft.)?, and Ohio, Rattlesnake Island (597 ft.). In Canada it is known from Quebec and Ontario.
41. **Williamsonia lintneri,** east-central, early spring. Outside New England it has been recorded from New York: Center (30 ft.); New Jersey: Paterson (193 ft.). In Canada it is known from Ontario and Manitoba.
42. **Lestes eurinus,** eastern, spring. This species has been considered Carolinian, but it is a cold-pond species, and is frequently found associated with *Cordulia shurtleffi* in the latter's extra-limital stations. Outside New England it is reported from New York: Saranac Inn (1,622 ft.), Dobb's Ferry and Staten Island (sea level); Ohio: Sandusky (597 ft.), Portage Co. (1,068 ft.); northern Indiana (800 ft., Lat. 41° N.); Illinois: Lake Forest (704 ft., Lat. 42° N.); Wisconsin (593 ft., Lat. 43° N.); and Iowa, Lake Okobiji (1,500 ft.). It is known also from Ontario, Canada.
43. **Ophiogomphus aspersus,** eastern, spring and early summer. Outside New England known only from Saranac Inn (1,622 ft.).
44. **Ophiogomphus johannus,** eastern, spring. Outside New England recorded from Wilmurt (1,393 ft.), New York; Rockwood (1,813 ft.), Pennsylvania; Rockwood (1,813 ft.) and Hewitt (413 ft.), New Jersey.
45. **Gomphus adelphus,** eastern, spring. This little-known species has been taken outside New England only at Bethlehem (100 ft.), and Kenwood (492 ft.), New York.
46. **Gomphus brevis,** eastern, spring. Other United States stations are: Scoharie (600 ft.), Saranac Inn (1,622 ft.), New York; Rockwood (1,813 ft.), Ohio Pyle (1,224 ft.), Confluence (1,355 ft.), Pennsylvania; Brown's Mills (71 ft., May 21), New Jersey; and Divide (1,500 ft.), Wisconsin. In Canada it is recorded from Quebec and Ontario.
47. **Gomphus furcifer,** eastern, spring and early summer. Outside New England it is known from New York: Ithaca (414 ft.); New Jersey: Hewitt (413 ft.); Ohio: Kent (1,030 ft.), Licking Reservoir (912 ft.); and northern Indiana (750 ft., Lat. 41° N.). Known also from Ontario.
48. **Gomphus amnicola,** eastern, spring. South of New England it has been recorded from New York, Bethlehem (100 ft.); from Pennsylvania, Inglenook (over 360 ft.), Marysville (500 ft.), Harrisburg (317 ft.); from North Carolina, Lumberton (150 ft.). To the west it is reported from Ohio, northern Illinois at various elevations about 600 ft.; from Iowa, Des Moines (805 ft.); from Kansas, Douglas (1,196 ft.), and northward to Wisconsin and Minnesota.
49. **Gomphus lividus,** eastern, spring. South of New England it has been recorded from New York: Ithaca (814 ft.), Pine Island (408 ft.), and Bronxville (109 ft.); New Jersey: near Blackwood (25 ft.), Newfoundland (770 ft.), Raritan River (100 ft.); Pennsylvania: Idlewild (1,200

ft.), New Brighton (750 ft.); District of Columbia (sea level); Virginia: Great Falls (167 ft.); North Carolina: Raleigh (300 ft.), Havelock (23 ft.), Hobton (100 ft.); and there are old records for South Carolina and Georgia. Westward in central Ohio, northern Indiana, Arkansas, and Wisconsin. In Canada it is known from Ontario.

50. **Gomphus notatus,** eastern, spring and early summer. South of New England it has been taken in Maryland: Lakeland (56 ft.); West Virginia: Harper's Ferry (287 ft.); Kentucky: Great Falls (500 ft.); Tennessee: Nashville (450 ft.); Alabama: Riverton (418 ft.); westward it is recorded from Illinois, Michigan, Wisconsin, and in Canada from Quebec, Ontario, and Manitoba.

51. **Gomphus quadricolor,** eastern. South of New England it is recorded from New York: Ithaca (814 ft.); Pennsylvania: Heckton Mills (500 ft.); and Tennessee: Sycamore (1,000 ft.). Westward it is known from central Ohio, Indiana, and northern Illinois, Bloomington (781 ft.), northward to Michigan and Wisconsin. In Canada it is known from Quebec (?).

52. **Gomphus fraternus,** eastern. This species of doubtful occurrence in New England would appear from its range outside our area to belong here.

53. **Gomphus spiniceps,** eastern. South of New England it is recorded from New York: Adirondacks (1,622 ft.); Pennsylvania: Allegheny Co. (750 ft.); Maryland: Hyattsville (46 ft.), Fairmount Park (sea level); West Virginia: Harper's Ferry (287 ft.); Kentucky: Greasy Creek (500 ft.); Tennessee: Clinch River (1,004 ft.), Horton's Ford (500 ft.). Westward it is reported from northern Ohio, Indiana, and Illinois, to Michigan and Wisconsin. In Canada it is reported from Quebec.

54. **Gomphus vastus,** eastern, spring and early summer. South of New England it is recorded from New York: (?); Pennsylvania: Allegheny Co. (750 ft.), Philadelphia (sea level), Pittsburgh (587 ft.); Maryland: Cabin John (sea level); Virginia: Great Falls (167 ft.); West Virginia; Kentucky: Great Falls (500 ft.); Tennessee: Nashville (450 ft.). Westward it is reported from northern Ohio, Indiana, Illinois, Hannibal (473 ft.), Kansas, Montgomery Co. (837 ft., this like the record from the same county for *C. obliquus* is an extreme-limital one); Iowa: LeClaire (580 ft.), Lansing (630 ft.). Northward it ranges to Michigan, Wisconsin, Minnesota to Quebec and Ontario in Canada.

55. **Gomphus ventricosus,** eastern, spring. South of New England it is recorded from New York: Pine Island (408 ft.); Pennsylvania: Inglenook (over 360 ft.), York (370 ft.); District of Columbia (sea level); Virginia: Great Falls (167 ft.). Westward it is known from northern Indiana, and Illinois (563 ft.).

56. **Gomphus villosipes,** eastern, spring. Outside New England it is recorded from New York: Ithaca (814 ft.), Grand Island (572 ft.), Staten Island; New Jersey: Great Peace Meadow (100 ft.), Ramsey (347 ft.); Pennsylvania: Primrose (1,019 ft.), Tinicum (500 ft.), Folsom (97 ft.); Ohio: Columbus (744 ft.), Mahoning Co. (1,000 ft.); Indiana: central and northern (800 ft., Lat. 40° N.); Illinois: Swan Pond (403 ft., Lat. 38° N.); Minnesota: Phelan Lake (859 ft.). In Canada it is known from Ontario.

57. **Enallagma laterale,** eastern, spring.
58. **Nehalennia gracilis,** eastern, spring. These last two little-known species also probably belong here.

The four following eastern species have similar ranges, and though reaching stations at 1000 to 1400 feet, occur (except No. 62) sparingly on Cape Cod.

59. **Gomphus exilis,** eastern, spring. South of New England it is recorded from New York: Reeseville (2,000 ft.), Ithaca (814 ft.), Saranac Inn (1,622 ft.), to sea level; New Jersey: Newfoundland (770 ft.), to elevations of 50 ft.; Pennsylvania: Ohio Pyle (1,224 ft.), Confluence (1,335 ft.), to sea level; Maryland: Lakeland (56 ft.), Hyattsville (46 ft.), Laurel (156 ft.); Virginia: Great Falls (167 ft.); North Carolina: Lumberton (150 ft.); and an old record for Kentucky and Florida. Westward it is found throughout Ohio, northern Indiana, and Illinois: Crystal Lake (593 ft.), Kensington (596 ft.). In Canada it is known from Nova Scotia, Quebec, and Ontario.
60. **Nannothemis bella,** eastern, spring and early summer. South of New England it has been recorded from New York, Westchester Co. (250 ft.), Yaphank (51 ft.), Wyandaneh (?); New Jersey: Berlin (160 ft.), Clementon (58 ft.), Albion (141 ft.), Lucaston (133 ft.), Seaville (23 ft.), De Costa (86 ft.), Iona (165 ft.), Staten Island (sea level), Lakehurst (50 ft.), Beaver Lake (1,030 ft.); Pennsylvania: Philadelphia (sea level); Maryland: Beltsville (116 ft.), Hyattsville (46 ft.); North Carolina: Southern Pines (500 ft.); and old records from Georgia and Florida. Westward it is reported from northern Indiana, Michigan, and Ontario, Canada.
61. **Enallagma minusculum,** eastern, summer. This little-known species also probably belongs here.
62. **Somatochlora tenebrosa,** eastern, autumn. Outside New England it is recorded from New York: Clarence (709 ft.), Oswego Co. (over 300 ft.), Hauppaug (78 ft.); New Jersey: Jamesburg (78 ft.), Clementon (58 ft.), Lakehurst (50 ft.), Ramapo Mts. (310 ft.); Pennsylvania: Rausch's Gap (566 ft.), Goldmine (796 ft.), Inglenook (over 360 ft.); Maryland; Virginia?; North Carolina: Raleigh (300 ft.), Highland (3,800 ft.); Kentucky: Big South Fork, Parker's Lake (1,300 ft.); Indiana; and Illinois. In Canada it is known from Quebec, Nova Scotia, and Ontario.

The following twelve east-central and transcontinental species rarely inhabit elevations in New England over 1000 to 1500 feet, but have an extended range over the low country to sea level. South of these States they reach "extra-limital" stations near the seacoast in New Jersey, Pennsylvania, Maryland, Virginia, and in North Carolina are found at elevations as low as 300 feet. In the Mississippi Valley they are rarely found south of the Ohio and

Missouri Rivers. Species that are transcontinental always occupy in the Rocky Mountains relatively higher altitudes when in the same latitude in the Appalachians. These species are not found on Cape Cod beyond the morainal barrier, except for a straggling record for two species. The wide ranges of the remaining northern species, and the fact that the southern species following find New England the northern limit of their ranges, make it unnecessary to give stations and elevations outside New England in the present paper. No doubt for the foregoing species not all published stations have been listed, but those that are given are typical of the species.

63. **Lestes inequalis,** east-central, spring and summer.
64. **Lestes uncatus,** transcontinental, spring and summer.
65. **Enallagma carunculatum,** transcontinental, summer.
66. **Enallagma ebrium,** transcontinental, perhaps having only just recently extended its range across the Rocky Mountains into Washington, spring and summer.
67. **Enallagma hageni,** east-central, spring and early summer. The southern records for this species may refer to *C. recurvatum* Davis.
68. **Amphiagrion saucium,** transcontinental, spring. There exists one isolated Louisiana record.
69. **Hagenius brevistylus,** east-central, spring, summer, and early autumn.
70. **Boyeria vinosa,** east-central, summer, and autumn. One Truro record, on Cape Cod.
71. **Basiaeschna janata,** east-central, spring.
72. **Tetragoneuria spinigera,** transcontinental, spring.
73. **Libellula quadrimaculata,** transcontinental, and holarctic, spring and summer.
74. **Leucorrhinia frigida,** transcontinental, spring and early summer. There is one Cape Cod record (at Hyannis).

The following sixteen largely transcontinental species have similar ranges to the last, but are found on Cape Cod commonly, and also in most cases on the outlying islands, — Nantucket and Martha's Vineyard. They appear for many reasons to be boreal species which were pushed southward by glacial invasion.

75. **Nehalennia irene,** east-central, spring and summer. The one Florida record needs confirmation.
76. **Lestes congener,** transcontinental, summer and autumn.
77. **Lestes disjunctus,** transcontinental, spring, summer and autumn.
78. **Lestes unguiculatus,** transcontinental, spring, summer and autumn.
79. **Aeshna canadensis,** transcontinental, summer and autumn.
80. **Aeshna umbrosa,** transcontinental, summer and autumn.

81. **Libellula exusta,** transcontinental, spring and early summer. The Florida and Georgia records probably refer to the species rather than to the variety (the latter seeming to be more northern) though they need confirmation.
82. **Libellula exusta julia,** transcontinental, spring and early summer. This variety's range, because of its very recent definite recognition, is little understood.
83. **Sympetrum obtrusum,** transcontinental, summer and autumn.
84. **Sympetrum rubicundulum,** east-central. Possibly confused with the more northern *decisum* for it is recorded in the White Mountains from 4,000 feet. The examination of a very large series of New England specimens fails, however, to establish this fact. In no New England specimen examined does the yellow at the base of the wings reach the first antecubital, a characteristic supposedly typical of *rubicundulum,* and the bifurcation of the hamule always occupies one-third its length, and not one-fourth only as attributed to *decisum,* and as found in *obtrusum.*
85. **Sympetrum scoticum,** transcontinental, but one New England record.
86. **Sympetrum semicinctum,** transcontinental, summer and autumn.
87. **Sympetrum vicinum,** transcontinental, summer and autumn.
88. **Leucorrhinia intacta,** transcontinental, spring and early summer.
89. **Sympetrum costiferum,** transcontinental, summer and autumn.
90. **Sympetrum atripes.** Here also may belong this little-known species recorded only from Wyoming, Wisconsin, and New Hampshire (see Ent. News, **32** : 80–82, 1921).

The following two species inhabit mountain elevations 1000 to 3000 feet with occasionally lower interior Maine stations (200 ft.), and again occur after a wide hiatus, on Nantucket, and along the coast from Provincetown to Rhode Island. The second is also known from West Point (10 ft.), N. Y., and Ramsey (347 ft.), N. J. These now isolated stations are perhaps a relic of the early land connection with Newfoundland.

91. **Enallagma calverti,** transcontinental, spring.
92. **Enallagma cyathigerum,** transcontinental, and holarctic, spring.

Southern or Austral Species

The austral species common to New England, of which thirteen are transcontinental, number seventy-three. If the flight period does not occupy two seasons it is generally confined to the summer, — a natural austral correlation.

The following nine east-central or transcontinental species are found throughout New England save in elevations above 1000 to

1500 feet. Many of these species find their way north into the southern limits of the Boreal region. They are all species of extended latitudinal range, including Canada, and all have been taken on Cape Cod.

93. **Agrion maculatum,** east-central, spring, summer, and early autumn. One doubtful California record, and only one "wind-carry" (?) Cape Cod record.
94. **Lestes rectangularis,** east-central, spring, summer and autumn.
95. **Ischnura verticalis,** east-central, spring, summer and autumn.
96. **Anax junius,** transcontinental, and coastwise to Alaska, spring, summer and autumn.
97. **Aeshna clepsydra,** east-central, summer and autumn.
98. **Aeshna constricta,** transcontinental, summer and autumn.
99. **Libellula pulchella,** transcontinental, spring, summer and autumn.
100. **Plathemis lydia,** transcontinental, spring, summer and autumn.
101. **Sympetrum corruptum,** transcontinental, summer and autumn.

The following sixteen east-central or transcontinental species inhabit the low country to the foothills of the higher mountains up to 500 feet, and in Maine reach the latitude of 44.5°. They also are to be found on Cape Cod, and many have been recorded from the adjoining islands of Nantucket and Martha's Vineyard. All have been taken in the St. Lawrence Valley, Canada.

102. **Hetaerina americana,** transcontinental, summer and autumn.
103. **Lestes forcipatus,** transcontinental, spring, summer and autumn. Northern records for this species are frequently due to misdeterminations for *L. disjunctus*.
104. **Argia modesta,** transcontinental except Pacific Coast States, late spring and summer.
105. **Argia violacea,** east-central, and Arizona, spring, summer and autumn.
106. **Enallagma civile,** transcontinental, spring, summer and autumn.
107. **Enallagma exsulans,** east-central, spring and summer.
108. **Enallagma signatum,** east-central, summer.
109. **Ischnura posita,** east-central, spring, summer and autumn.
110. **Dromogomphus spinosus,** east-central, spring, summer and autumn.
111. **Aeshna tuberculifera,** transcontinental, summer and autumn.
112. **Macromia illinoiensis,** east-central, spring and summer.
113. **Epicordulia princeps,** east-central, spring and summer.
114. **Tetragoneuria cynosura,** east-central, spring.
115. **Libellula incesta,** east-central, spring, summer and autumn.
116. **Libellula semifasciata,** east-central, spring and summer.
117. **Celithemis elisa,** east-central, spring and summer. Cape Cod specimens for the most part lack the nodus spot, or it is very much reduced.

The following five species are like the last except that they are only eastern in range.

118. **Lestes vigilax,** eastern, spring, summer and autumn.
119. **Enallagma aspersum,** eastern, summer and autumn.
120. **Aeshna verticalis,** eastern, summer and autumn.
121. **Tetragoneuria cynosura simulans,** eastern, spring.
122. **Celithemis ornata,** eastern, — littoral, summer.

The following thirteen east-central or transcontinental species inhabit the low hill country up to 200 to 500 feet elevation, but do not cross the interlobate moraine on to Cape Cod. Several reach occasionally the St. Lawrence Valley in Canada, and all but the two noted are rare or absent in Maine.

123. **Enallagma divagans,** east-central, spring(?).
124. **Enallagma geminatum,** east-central, spring, summer and autumn.
125. **Enallagma vesperum,** east-central, spring, summer and autumn.
126. **Ischnura kellicottii,** east-central, summer. The Block Island record would perhaps prove its relation with the species affected by the Buzzard's Bay lobe, if such a correlation in distribution exists at all.
127. **Anomalagrion hastatum,** east-central, spring.
128. **Tachyopteryx thoreyi,** east-central.
129. **Nasiaeschna pentacantha,** east-central, spring.
130. **Epiaeschna heros,** east-central, spring and early summer.
131. **Didymops transversa,** east-central, spring and early summer. These two species (130, 131) probably occur on Cape Cod and belong with last group. They are not uncommon in Maine.
132. **Neurocordulia obsoleta,** east-central, summer.
133. **Libellula luctuosa,** east-central, spring, summer and early autumn.
134. **Sympetrum ambiguum,** east-central, only one record.
135. **Pantala flavescens,** cosmopolitan, summer.

The following four species are like the last, but are only eastern in range.

136. **Gomphaeschna furcillata,** eastern, spring.
137. **Aeshna mutata,** eastern, one record only.
138. **Somatochlora linearis,** eastern, but two records.
139. **Tetragoneuria morio,** eastern, spring.

The following ten eastern or east-central species regularly inhabit southern New England, extending inland to the lower hill country (200 ft.), and some find the northern limit of their range in the cold-bog (primitive) ponds which present an even annual temperature. Only the last three species are known on Cape Cod.

140. **Agrion d. apicale,** eastern, spring.
141. **Argia translata,** east-central.
142. **Enallagma pictum,** eastern, summer(?).
143. **Enallagma traviatum,** east-central, summer.
144. **Cordulegaster erroneus,** eastern, only one record, — Connecticut.
145. **Gomphus pallidus,** east-central.
146. **Tetragoneuria semiquaea,** eastern, — one British Columbia record.
147. **Perithemis domitia tenera,** east-central, and Arizona, spring, summer and autumn.
148. **Celithemis eponina,** east-central, summer. Recorded from Ontario.
149. **Tramea carolina,** east-central, — northern stations cold bog-ponds, spring, summer and autumn. Recorded from Ontario.

The following thirteen typically southern species occur only along the coast as far north as Provincetown, and rarely to Cape Ann. *Erythrodiplax berenice* is reported also from Quebec.

150. **Enallagma doubledayi,** eastern, summer and autumn.
151. **Enallagma durum,** east-central, — littoral, summer.
152. **Ischnura ramburi,** east-central, — littoral, summer and autumn, largely confined to the brackish marshes.
153. **Progomphus obscurus,** transcontinental, summer, — largely confined to the outwash ponds of the Cape.
154. **Anax longipes,** eastern, summer.
155. **Libellula auripennis,** east-central, — littoral, summer and autumn.
156. **Libellula cyanea,** east-central, spring, summer and autumn.
157. **Libellula vibrans,** east-central, summer.
158. **Erythrodiplax berenice,** east-central — littoral, summer — largely confined to the brackish marshes.
159. **Erythemis simplicicollis,** transcontinental, summer and autumn.
160. **Pachydiplax longipennis,** transcontinental, spring and summer, and early autumn.
161. **Celithemis monomelaena,** eastern, summer.
162. **Tramea lacerata,** transcontinental, autumn.

The next species, and the only typically tropical one, which evidently reached Nantucket accidentally, probably by being blown up from the South by the prevailing summer winds, is

163. **Tramea abdominalis,** eastern, summer. After days of such winds the Portuguese-man-of-war not uncommonly is found along the southern beaches of Cape Cod carried north not alone by the ever present Gulf Stream.
164. **Tetragoneuria costalis,** for which there is one record, is at best a doubtful species.

Conclusions

It is clearly evident that the problem of distribution has two distinct aspects. First, that every species has a given interrelated latitudinal and altitudinal range; and secondly, that within this range species are to be found only at certain environmentally acceptable stations. Ranges are geographical, stations ecological To determine a species' distributional status, whether northern or southern, by its range alone, gives an inadequate impression. Only an ecological study of the station formation at which it is found can determine its proper classification. The ecological characteristics of Odonata species are at present little understood, and any definite placing of species is entirely provisional depending on further investigation. Species, of course, do not inhabit all acceptable ecological stations (the *places vides* of recent French investigators), within their range, any more than a certain oak-loving species can be expected to be found on all such trees within a forest or within its range. Species, in other words, are not spread out evenly over the entire area occupied by them. A species, therefore, it is plain, may inhabit one or more, often three, zones and even two regions, as defined by Merriam, and still belong to only one type of ecological station. In fact it is comparatively rare to find a species so elastic in its environmental requirement that it can inhabit more than one such (ovipositing) station. When a species is common to two types of ecological station they are at opposite latitudinal limits of their range, or, a normal range station and an extra-limital one.

To attempt to define therefore too closely and arbitrarily zone boundaries in verbal terms, *e.g.*, Upper Austral, is to confuse rather than to elucidate the problem. Only when a given species' distribution can be stated in both geographical and ecological terms, *e.g.*, "*Agrion amatum*, Lat. 35.15° (3000 ft.) to Lat. 45.3° (sea level), Long. 71° to 83° W., rapid, rocky, woodland streams" — can any degree of accuracy of expression be attained. Intensive collecting will then, frequently in a *moment*, and readjustments of Nature, over *long periods of time*, extend or vary the known geographical ranges. Far less often will Nature through survival necessity alter the ecological requirements. The latter it is clear become there-

fore not only the most stable and satisfactory, but decidedly the most worth while to investigate.[1]

The author will welcome any New England odonate records, and he wishes particularly to ask for ecological data especially where species are being observed to oviposit.

In closing this paper I wish to express my sincere thanks to Miss Bertha P. Currie of the Bureau of Entomology, Washington, for the compilation of many records, and to Drs. W. M. Wheeler, E. M. Walker, P. P. Calvert, R. A. Muttkowski, P. Garman, Messrs. C. T. Brues, N. Banks, C. W. Johnson, and E. B. Williamson, for material aid, and many others for much help in the preparation of this paper. For generous aid in defraying the cost of the publication grateful acknowledgment is due to Miss Mabel Lyman.

[1] See in this connection a paper just issued by Lutz (Amer. Mus. Novitates, 1921, no. 5, 7 pp.).

No. 3.—A REVIEW OF THE EVIDENCE FOR THE TACONIC REVOLUTION.

BY THOMAS H. CLARK.

CONTENTS.

INTRODUCTION.

THIS paper proposes to review the evidence for a long-accepted statement, first enunciated by Dana in 1863, and repeated in each subsequent edition of the Manual, that the close of the Ordovician was attended by uplift and folding in eastern North America, and to show how little evidence has been found in support of this view. This has necessitated an examination of the literature on this subject, the results of which are embodied in the following pages.

In the first edition of Dana's justly celebrated Manual of Geology, page 227, we find the following statement. "In British America, near Gaspé, on the Bay of St. Lawrence, according to Logan, the Lower Silurian lies in tilted strata beneath beds of the Upper Silurian, showing that an upturning had occurred before these superior beds were formed. Similar facts have been observed at the eastern base of the Green Mountains, where limestones of Upper Silurian and Devonian age rest un-

conformably on the altered strata of the Quebec group; and at Montreal, where the Lower Helderberg overlies unconformably the Hudson beds."

After thirty years, the accumulation of knowledge about the structure of eastern North America led Dana to elaborate the original ideas in the following words. "The strata of the Lower Silurian in eastern North America appear to have been laid down, one over the other, without intervening dislocations. . . . Mountain-making finally ensued, producing, among its effects, the Taconic Mountain Range along western and northwestern New England, and also the Cincinnati geanticline, besides uplifts in Nova Scotia and New Brunswick. Moreover, there is probable evidence that the Taconic Range at the north was but one of a series along the Atlantic border. . . . The Taconic upturning is known to have occurred not later than the close of the Lower Silurian era from the fact that Upper Silurian rocks are not present in the series, but actually overlie the Lower unconformably in some localities; . . . The probability that the upturning was continued southward through Virginia has been sustained by the discovery, in 1892, of Crinoids, by N. H. Darton, in the slate quarries of Arvon, Buckingham County, Va. . . . Walcott states that the species . . . are of either Trenton or Hudson age. . . . Unconformability between the Upper Silurian and the Lower Silurian rocks has been observed in Carleton County, N. B., just north of the boundary near Metapedia Lake, and also on Lake Temiscouata, and elsewhere (L. W. Bailey); and in Nova Scotia at Cape St. George, Arisaig, Lochaber, and from Kerrowgane down the East River of Pictou, and north of Sunderland Lake."[1]

It has long been granted that in the formative period of American geology no other book exerted as much influence upon the growth of the science as Dana's Manual. Since its last edition in 1895, its influence has naturally diminished, but could the same hand that wrote it now revise it in the light of modern knowledge and progress it is probable that its superiority would remain unchallenged. One cannot read an up-to-date text-book without recognizing its debt to the Manual, and this

[1]Dana, J. D. Manual of Geology. Fourth ed., p. 526, 1895.

debt many authors frankly admit. As examples of the particular influence of Dana's views on the problem at hand, I shall refer to a few of the modern text-books and other writings which are compilations of geological data, *viz.:*

Ulrich, E. O., and Schuchert, C. Paleozoic seas and barriers in eastern North America. Bull. N. Y. State Mus., no. 52, p. 646, 1902.

Chamberlin, T. C., and Salisbury, R. D. Geology. Second ed., vol. 2, p. 333-336, 1907.

Schuchert, C. Paleogeography of North America. Bull. Geol. Soc. Amer., 1910.

Chamberlin, R. T. Diastrophism, etc., VII, Periodicity of paleozoic orogenic movements. Journ. Geol., vol. 22, p. 318-321, 1914.

Blackwelder, Eliot. A summary of the orogenic epochs in the geologic history of North America. Journ. Geol., vol. 22, p. 639-643, 1914.

Scott, W. B. An introduction to geology. Second ed., p. 567, 1909.

Schuchert, C. Text-book of geology, part 2, p. 636, 1915.

Cleland, H. F. Geology, physical and historical, p. 422, 1916.

A study of these writings will show the existence of a concerted opinion among geologists to-day that there was a period of intense folding accompanying uplift at the close of Ordovician time. Direct evidence of such a condition is said to be seen at localities where Silurian rocks overlie unconformably folded rocks of Ordovician age. These localities may be arranged according to both geographical distribution and similarity of geological structure as follows:—

1. Nova Scotia.
2. New Brunswick and Eastern Quebec.
3. Central New England.
4. Montreal and vicinity.
5. Hudson Valley region.
6. Shawangunk Mountain.
7. The Taconics and the Green Mountains.
8. The crystalline rocks of New York City, New Jersey Highlands, and southward.

It is proposed to consider each of these areas separately.

Nova Scotia.

In the fourth edition of his Manual, Dana stated (see page 136 above) that "unconformability between the Upper Silurian and

the Lower Silurian rocks has been observed . . . in Nova Scotia at Cape St. George, Arisaig, Lochaber, and from Kerrowgane down the East River of Pictou, and north of Sunderland Lake." One of the stumbling-blocks in the way of accepting this statement is that within the area designated by Dana no undoubted Ordovician rocks have been recognized.

The geology around Arisaig has been well described by Williams, whose paper contains the following statement.

"*?Ordovician deposits.*—Erosion agencies appear to have worn wide channels out of the Brown's Mountain [U. Camb.] rocks before the later sedimentary formations were laid down. The coarse cross-bedded conglomerates and grits of the Malignant Cove formation, occuring at Malignant Cove and to the south, were deposited upon the cleavage surfaces of the James River slates. Their deposition was evidently influenced by strong current action and their sedimentation characters, together with their general red color, suggest for these poorly sorted but well-worn deposits a continental origin.

"Because of the orogenic disturbances suggested and because of the silicified character of its rocks, which are similar to those of the Brown's Mountain group, the Malignant Cove formation is thought to be a remnant of early Ordovician sedimentation."[1]

The Silurian rocks rest on an old rhyolite flow, and, moreover, are separated from the older rocks by a fault with a probable throw of from 3000 to 4000 feet. These structural relations are more fully discussed in Williams' later work,[2] but no essential part of his original statement as quoted need be amended. McLearn, writing more recently,[3] adds nothing to our knowledge of the structure.

Fletcher, who has written a good deal on this region,[4] scarcely ever described a contact in terms of conformability. "The Cambro-Silurian is overlain by the Silurian" is his stand-

[1]Williams, M. Y. Geology of the Arisaig-Antigonish District, Nova Scotia. Amer. Journ. Sci., ser. 4, vol. 34, p. 246, 1912.

[2]Williams, M. Y. The Arisaig-Antigonish District, Nova Scotia. Mem. Geol. Surv. Canada, no. 60, 1914.

[3]McLearn, F. H. The Silurian Arisaig series of Arisaig, Nova Scotia. Amer. Journ. Sci., ser. 4, vol. 45, p. 126-140, 1918.

[4]Fletcher, Hugh. Ann. Rept. Geol. Surv. Canada 1886, vol. 2, p. 41P, 1887.

ard way of noting a contact, so that his writings are of almost negligible value when urged in support of the Taconic Revolution. Dawson mentioned the "contrast between the Upper Silurian and the Carboniferous" at Arisaig and along the East River,[1] but did not mention the contrast or even the contact between the Cambro-Silurian and the Silurian.

Honeyman, in describing the geology of Lochaber,[2]—and I know of no better account than this—finds two distinct groups of rocks, the lower of which is Silurian in age, and so this region can scarcely be used to prove upturning between the Ordovician and the Silurian. These Silurian strata are highly altered, according to Honeyman. Dawson gives no additional information. Fletcher adds that the area is overlain to the south and north by red Devonian slates.[3]

The situation at Kerrowgare is best described in Fletcher's own words:[4]

"On Moose River, near the post-office of that name, a Silurian trough, possibly of this [Medina] age, lies among the older schists. Another belt runs down the East River of Pictou, generally on the north side from near its head to Springville. . . . On the brooks near Beaver Lake, Kerrowgare and Sunnybrae, Medina and Clinton fossiliferous strata are in contact with Cambro-Silurian and perhaps older rocks, and are overlain to the southward by a wide belt of Devonian gray slates. . . . In Blanchard Brook, not far above the bridge at Sunnybrae, Silurian sandstone, rich in fossils, is underlain by porphyritic and other Cambro-Silurian rocks, followed again upstream by Medina sandstone."

Dawson mentions fossiliferous Upper Silurian rocks along the East River of Pictou which are much altered, nearly vertical, and with NE. or SE. strike.[5] He does not describe any underlying rocks.

No statement of any contact between the Cambro-Silurian

[1]Dawson, J. W. Acadian Geology. Third ed., p. 560, 1878.
[2]Honeyman, Rev. David. Trans. Nova Scotian Inst. Sci, vol. 4, p. 440, 1878.
[3]Fletcher, Hugh. Ann. Rept. Geol. Surv. Canada 1886, vol. 2, p. 42P, 1887.
[4]*Ibid.*, p. 43P.
[5]Dawson, J. W. Acadian Geology. Third ed., p. 568, 1878.

and the Silurian at two of the points cited by Dana—Cape St. George and north of Sutherland Lake—has been seen by the writer. In Fletcher's account there is this statement: "On the shore of the little lake, south of Sutherland Lake, whitish, greenish and bluish-gray micaceous, compact quartzite and argillite are cut by dykes of dark-gray calcareous trap. Rocks of similar character are found in the brook from this lake, as far as the road, where they contain fossils, much of the land being barren."[1]

This is the only mention of Sutherland Lake that I have been able to find, and, coming in Fletcher's account closely following the mention of the localities on the East River of Pictou, it may well be the reference from which Dana assumed the location given in the last edition of his Manual.

Conclusion.—Thus it will be seen that the conclusion that there was folding at the close of the Ordovician in Nova Scotia is not supported by fact. Not only are there no undoubted Ordovician rocks in this province, but in no place has a contact showing an unconformable relation between supposedly Ordovician rocks and rocks of a later date been recorded.

New Brunswick and Eastern Quebec.

In discussing the relation of the Ordovician and Silurian rocks within the area designated above, I shall consider the localities in the following order:—

Lakes Temiscouata and Metapedia; Carleton County and central New Brunswick; Gaspé, Quebec.

In the first two of these localities the geological relations of the rocks are obscured to a high degree. The country is heavily drift-covered, and most of the rocks are possessed of a strongly developed slaty cleavage, which in many cases renders the correct interpretation of the structure of rock masses very difficult. Moreover, the rocks have been subjected to metamorphism more or less severely, so that their original characteristics are somewhat changed. Taking all of these considerations into account, it is to be wondered at that the workers in this field

[1]Fletcher, Hugh. Ann. Rept. Geol. Surv. Canada 1886, vol. 2, p. 43 P, 1887.

have been able to accomplish the amount that has been done. The words of the most recent investigator of the first rank, quoted on pages 145 to 148 below, show how these difficulties impress one who has experienced them. At Gaspé the results obtained are more certain, for there the country is more open and settled, and has been frequently visited by a large number of geologists.

Lake Temiscouata.—Logan gives a good account of the rocks in the vicinity of Lake Temiscouata,[1] but Bailey and McInnes improved somewhat on the earlier description, and I quote from their work:[2]

"The following section is a condensation of that in the Geology of Canada [p. 420], with such additional information as has been recently obtained. The section begins on the north side of Mount Wissick or Mount Lennox, where the rocks of the Silurian system may be seen to rest unconformably upon those of the 'Quebec group':—

"Greenish grey and black slates. . . . These beds occur on the north-east side of a small cove above Mt. Wissick and are part of a similar series of rocks, supposed to be of the same age as those of Point Levis, which occupy all the upper part of the lake. They have been subjected to much crumpling, and exhibit considerable irregularity of inclination, their dip, where nearest to the Silurian, being N. 40° W. $\langle$70°—80°. They have as yet yielded no fossils, and their thickness is unknown.

"Measures concealed for about half a mile. Gray quartzose sandstone, . . ."

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[1]Logan, Sir William. Geology of Canada, p. 420–421, 1863.
[2]Bailey, L. W., and McInnes, W. Ann. Rept. Geol. Surv. Canada 1887–88, vol. 3, pt. 2, p. 29 M, 1889.

The succession of beds in this section, with the thickness, dip, and strike of each bed is indicated below:

Character of rock	*Strike*	*Dip*	*Thickness in feet*
Top of section			
Grey arenaceous limestones	N 20° E	13° E	500
Grey banded limestone			30
Grey nodular limestone			30
Grey hard sandstone			30
Grey nodular limestone	N 25° E	50° E	50
Red and green shale	N 25° E	15° E	125
Overturned part of same	N 50° E	40° NW	
Cleavage of same	N 25° E	80° NW	
Grey calcareous shales	N 25° E	60° E	10
Dark grey sandstones	N 20° E	20° E	10
Coarse shaly and rubbly cg.	N 30° E	20° E	114
White sandstone or quartzite		50°	420
Grey quartzose sandstone	N 25° E	40° E	642
Base of section			

It will be seen at once that this section shows no positive evidence of an unconformity. It has been argued that the fact that the lower shales (Cambro-Ordovician) are so much more crumpled than the other rocks, indicates that the shales had undergone an earlier period of folding before the deposition of the upper beds. A glance at the strata composing the section, however, shows that these upper beds are in almost every case what we should call "competent strata," so that it would be a remarkable thing if they should be highly crumpled. The underlying series, however, is composed of shales, with a few beds of limestone an inch or two thick, beds which under severe stresses would be likely to suffer crumpling, while the more resistant sandstones and limestones might merely be warped. That the shales *within* this upper series were much disturbed is evident from the following description.[1]

"Red and green shale, in alternating bands, with green argillaceous sandstones. The dip of these beds where they overlie those . . . [immediately below] is S. 65° E.$\lessdot$15°, their strong slaty cleavage having an underlay of N. 65° W.$\lessdot$80°, but in fol-

[1]Bailey, L. W., and McInnes, W. Ann. Rept. Geol. Surv. Canada 1887–88, vol. 3, pt. 2, p. 30M, 1889.

lowing them along the precipitous face of the mountain, they are found to fold over and exhibit a dip N. 40° W. $<$ 40°. They are also broken by a fault."

Again, on page 36M: "The rocks which immediately succeed the Pointe aux Trembles, Tuladi and Squatook sandstones, referred to the Niagara formation, are the dark grey bluish-weathering and more or less calcareous slates which occupy the whole of the southern part of Lake Temiscouata. . . . The position of these slates in the Silurian system has not been certainly determined. At no point has their actual contact with the Pointe aux Trembles sandstones been observed, and though appearing to dip off from these, and conformably so (S. 65° E. $<$70°), they are everywhere so extensively crumpled that but little reliance can be placed upon their attitude. . . . The general aspect of these fossils [such poorly preserved fossils as occur in these slates], however, is that of the Lower Helderberg group."

It seems that, while there is much more reason for calling these slates Silurian than there is for calling those on the north side of Lake Temiscouata Ordovician, it does not appear that the so-called Ordovician slates have undergone longer or more intense folding.

Logan, in his account of these rocks, gave a section of them which was not as full nor as detailed as the one just cited. A justifiable misapprehension as to the attitude of the rocks as a whole has grown out of the fact that in the paragraph succeeding the section, Logan said: "The dip of these strata is S. 50° E. $<$13°."[1] Many writers[2] have interpreted this as the uniform dip of the whole series, and according to this interpretation, the Ordovician rocks are crumpled, while the Silurian rocks are practically undisturbed, and the inferred unconformity becomes almost a certainty. A glance at the section as given on page 142 above shows that the dip given by Logan was meant to refer to the uppermost beds only, no figures being given by him for the underlying strata of the section. These, as given by Bailey and McInnes, show that the dip, while it is generally directed toward the east, varies from 13° to 70°.

[1] Logan, Sir William. Geology of Canada, p. 421, 1863.
[2] *e.g.*, Bailey, L. W. Proc. Roy. Soc. Canada, vol. 4, sect. 4, p. 39, 1887.

In brief, then, the facts about the geological structure of the rocks around Lake Temiscouata are these: on the north, is a series of highly crumpled unfossiliferous slates, believed to belong to the Quebec group, separated by about half a mile from outcrops of a fossiliferous series of gently folded Silurian rocks farther south, which in their turn appear to be succeeded by highly crumpled slates, probably of Helderberg age. The assumption of an unconformity between the rocks of the Quebec group (?) and those of the Silurian cannot be substantiated, for there is a gap of half a mile between outcrops. Moreover, the difference in degree of crumpling cannot be taken as proof of a pre-Silurian folding, for the age of the lower slates cannot be shown to be Ordovician, and the slates whose age is probably Helderberg are in places no less intensely crumpled than those supposed to be Ordovician.

Lake Metapedia.—Much the same lack of decisive information with regard to geological structure is evident in the descriptions of the geology of Lake Metapedia as is indicated above for the region about Lake Temiscouata. I shall merely refer to the writings of competent observers who have worked in this field; comment seems to be unnecessary.

Logan[1] concluded that there was an unconformable relation between the nearly flat-lying Silurian sandstone on the southwest side of the lake and the strata of the "Quebec group" on the northeast. These latter are inclined from 30° to 80° and may be overturned in places, but nowhere do the two series of rocks appear in contact. Ells[2] supposed that the rocks of these two ages were in an unconformable relation, which may best be seen near Sayabec Station. Low[3] added nothing to our knowledge of the region, although he emphasized the fact that the contacts between the rocks on the east of the lake and those on the west are always obscured. The relations are more obscure here than at Lake Temiscouata and certainly are ineffective in proving late Ordovician folding.

Carleton County.—No man is more entitled to respect for dif-

[1]Logan, Sir William. Geology of Canada 1863, p. 414.
[2]Ells, R. W. Ann. Rept. Geol. Surv. Canada 1882–83–84, p. 29E, 1885.
[3]Low, A. P. Ann. Rept. Geol. Surv. Canada 1882–83–84, p. 19F, 1885.

ficult work done under difficult circumstances in this difficult region than L. W. Bailey. Of all the geologists who have touched upon the relations of the Cambro-Silurian and Silurian rocks of New Brunswick, no other has been able to correlate results into papers of such a philosophical nature as Bailey's "The Geological Factors in the Present Configuration of New Brunswick,"[1] and "On some Geological Correlations in New Brunswick."[2] The views of this geologist, arrived at through long-continued field work and reflection, should have supreme weight. Two factors which, among others, tend to make the attainment of exact results difficult in this area, are the lack of outcrops showing critical contacts, and the lack of proof of the age of the supposedly Cambro-Silurian rocks. Rocks containing Ordovician fossils have been reported from the Beccaguimic River, but these are not in contact with Silurian strata. Moreover, some of the fossils have an aspect more Silurian than Ordovician. In 1884, Bailey expressed doubts as to the value of geological correlation in this area, and by 1901 he had clearly recognized the hopelessness of arriving at a clear conception of the geological structure under present conditions. Extracts from two of his papers follow.

"Much uncertainty has, however, existed as to the exact position of the boundary between the Silurian and the supposed Cambro-Silurian rocks which border them on the south, as well as with regard to the grounds of their separation; and it has accordingly been one of the main objects of recent exploration to settle these points more definitely. In the summer of 1879, Mr. G. F. Matthew, in his study of eastern Carleton, found evidence of the looked for physical break in the occurrence, along the course of the tributaries of the Beccaguimic River, of conglomerates near the base of the Silurian system containing embedded fragments which were clearly traceable to the Cambro-Silurian rocks below; while in the same season the author of the present report was led to recognize a similar line of separation in the region west of the St. John River. The

[1]Bailey, L. W. Trans. Roy. Soc. Canada, ser. 3, vol. 3, sect. 4, p. 45-65, 1910.

[2]Bailey, L. W. Trans. Roy. Soc. Canada, ser. 2, vol. 7, sect. 4, p.143-150, 1901.

observations of Mr. Matthew derived additional importance from the fact that the rocks along the supposed line of junction were at several points found to hold organic remains which, it was hoped, would be the means of fixing definitely the age of the beds in which they are contained. . . . Unfortunately, however, the fossils obtained, [in a careful re-examination of the Beccaguimic area by Bailey] though they embrace a considerable variety of forms, such as brachiopods, crinoids, trilobites, orthocerata and graptolites, and in some instances are pretty well preserved, are mostly fragmentary and have proved too imperfect for even generic determination. . . . "

"It is further noticeable that in approaching the frontier to the southwest, these basal beds of the Silurian successively overlap different members of the Cambro-Silurian system and hide them from view [It would not seem from this description that the Cambro-Silurian rocks were very badly crumpled. This kind of overlap is characteristic where a younger formation overlies an older series which has been gently tilted]. Thus the unconformity of the two systems is strongly marked, as these are also in strong contrast in their lithological characters and in the conditions of their origin. . . ."

"It is but right, however, to state that in referring to the horizon first above named [Cambro-Silurian], this is done in the absence of any positive proof of their true position. Within the region examined they have as yet yielded no fossils, and the only evidence of age is that furnished by the unconformable overlap of the Silurian rocks, as described in previous pages, and the fact that they have supplied material for the formation of conglomerates at its base. They are thus at least as old as the Cambro-Silurian, to which they are here provisionally referred. Amid strata, however, of such diverse character, which include at many points rocks of igneous or semi-igneous origin, which are not only in contact with, but are penetrated by great masses of intrusive granite, and which are themselves, over large areas, of a highly crystalline character, the writer would hesitate to assert that there may not also occur rocks of Cambrian or even Pre-Cambrian age."[1]

[1]Bailey, L. W. Ann. Rept. Geol. Surv. Canada 1882–83–84, p. 7–10G, 1885.

In a later paper, Bailey describes two belts of so-called Cambro-Silurian rocks, one northeast and another southwest of the granitic axis in central New Brunswick.

"We may now turn with profit to consider the belt of rocks which, to the west and the southwest of the Benton syenite band, intervenes between the latter and the great Silurian tract of northern New Brunswick. . . . The only true Cambro-Silurian or Ordovician strata are those of the Beccaguimic valley, and these, representing the Lower Ordovician, are exposed only over a very limited area.

"If we now pass to the second great belt of slaty rocks in central New Brunswick, viz., that lying south of the great central granite axis, we find new light forthcoming here also, but in the direction of indicating a more recent rather than a more ancient horizon for these strata than had previously been entertained.

"As in the case of the Carleton county beds, the necessity for a change of view arises from the discovery of fossils. Up to the time of the presentation of this paper the only organic remains observed were certain obscure forms, resembling *Dictyophyta*, found by Mr. W. T. H. Reed, in the slates of Spring Hill brook, five miles northwest of Fredericton, and the collections made by Chas. Robb and others in the Nashwaak valley. Both of these tended to indicate Silurian horizons, the latter even approximating to Devonian, yet the great bulk of the strata, consisting of quartzites and slates, were still regarded and represented as Cambro-Silurian. Quite recently, however, the writer has been fortunate in finding the latter beds also to be not only fossiliferous but Silurian, the fossils consisting mainly of graptolites of the genus *Monograptus*. From their occurrence at two widely separated localities (Murray's brook, seven miles northwest of Fredericton, and the shore of the St. John river, opposite the mouth of its tributary, the Mactaquac), and the almost unvarying character of the strata over the entire district, as might be expected in deep water sediments, it seems probable that the greater part if not the whole of the area in question must now be regarded as Silurian.

"Thus in each of the great tracts of Pre-Carboniferous rocks in central New Brunswick progress towards a more assured view of their age is being made. While, however, the country remains

as at present, largely unsettled and forest-clad, only general results can be expected, the details of distribution and of structure having to await later investigation."[1]

Bailey has shown that there is no convincing evidence of the presence of Ordovician strata in New Brunswick, and that much of what has been called Ordovician is either older or younger. This demonstration is given added importance by the fact that across the border in Maine, no Ordovician strata have yet been recognized.

Gaspé.—This region is of unusual interest, for it was the first locality cited by Dana in support of his Taconic revolution. Dana based his early opinions largely upon the writings of Logan, who supposed that the rocks of the Quebec Group were unconformably overlain by the Gaspé limestone.[2]

J. M. Clarke, who has probably spent more time studying the exposures at Gaspé than any other geologist, has come to a different conclusion. This is best expressed in his article in the International Geological Congress Guide Book,[3] which carries a sketch of the geological structure as interpreted by him. In brief, his researches in this field have shown him that the whole series of Devonian limestones has been thrust over the strata of the Quebec group.

With regard to the geological relations of the rocks of the Percé section, Clarke writes on page 102 of the paper quoted above: "The uniformity of the inclination in the steep fold is expressed by the coincident dip of all the older beds, 80°—85° SE., and this fold, steeply inclined to the north, involves beds from (Cambrian) Lower Ordovician into upper Lower Devonian."

And on page 99, he writes: "The mass [Bonaventure conglomerate] everywhere sheets the upturned broken and eroded edges of the vertical Ordovician-Lower Devonian cliffs, and it here reaches its northernmost limit in recognizable expression."

Conclusions.—Thus the conclusion that the Ordovician was closed by a period of folding cannot be supported by conclusive

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[1]Bailey, L. W. On some geological correlations in New Brunswick. Trans. Roy. Soc. Canada, ser. 2, vol. 7, sect. 4, p. 147–150, 1901.

[2]Logan, Sir William. Geology of Canada, 1863, p. 390.

[3]Clarke, J. M. Geol. Surv. Canada, Guide Book No. 1, pt. 1, p. 108, 1913.

evidence from this portion of North America. Where known Ordovician rocks do occur, they either are not seen in contact with the overlying strata or else they appear to be a part of a conformable series including at least the Silurian. After a close study of the descriptions of the sections presented above the author is led to offer a suggestion which, to be sure, cannot be given much weight at present, namely, that the so-called Cambro-Silurian and the known Silurian and early Devonian strata may have been deposited in a conformable, or nearly so, series, with no greater discordance in dips than is recorded from the undisturbed rocks of New York State. After the Devonian sediments were deposited, folding of the whole series may have taken place, in which the upper and more resistant (competent) beds resisted the stresses to a greater degree than the older, non-competent shales.[1] These latter would be more likely to become crumpled and plicated, not only because of their lack of competence but also because of their position below hundreds and probably thousands of feet of superimposed strata. If the stresses were severe enough, thrust planes might well have been developed, and the most likely place for these would have been along the boundary between the lower shales and the upper limestones and sandstones, more or less parallel to the stratification. If a thrust were developed here, it is obvious that further crumpling would befall the shales as the heavy load moved over them. The over-riding rocks, not being themselves burdened with an overpowering load of superincumbent rocks, and possessing some high degree of competency, would not be likely to suffer more than gentle folding. The thrust plane, like all contacts in this country, would probably be obscured, and a casual survey of the field evidence would lead the observer to suppose that it pointed toward an erosional unconformity—a series of highly plicated shales, capped by a series of gently folded more massive rocks.

At present, this suggestion is incapable of proof, but we may look forward to detailed work in a few restricted areas to settle the point one way or the other. Just now we must confess that the state of our knowledge does not permit us to draw con-

[1]See Bailey, L. W., Trans. Roy. Soc. Canada 1909, ser. 3, vol. 3, sect 4, p. 55, 1910.

clusions as to the geological history of this region with any high degree of accuracy.

It is interesting to note in this connection that on the island of Anticosti, which lies in the St. Lawrence only 70 miles from the Gaspé peninsula, there is an unbroken series of Ordovician and Silurian strata 2372 feet thick.[1] The rocks of the two systems cannot be differentiated on structural or lithological grounds; the only guide is palaeontology. In fact there is yet considerable doubt as to where the dividing line should be drawn. This state of affairs is not what one would expect a few score of miles from the site of such extensive mountain-building as is supposed to have closed the Ordovician. There is no unconformity, no appreciable change in the nature of the sediment—or, at least, none that would indicate nearby uplift—and apparently the seas themselves were little disturbed, for several species are common to the Ordovician and the Silurian rocks. The evidence which *should* be present on Anticosti is lacking.

Central New England.

Three localities in central New England have been cited as affording evidence for the point in question, all of them in the meridional system of troughs connected with the Connecticut River valley. These localities are Lake Memphremagog on the Vermont-Quebec line, the Ammonoosuc district around Littleton, N. H., and Bernardston, Mass.

Lake Memphremagog.—No evidence of an erosional unconformity could be found in any of the writings of Ells[2] on this region, nor in the more recent papers by Robert Harvie.[3] The geological structure is evidently very complicated, if the diversity of interpretations is any guide. Ells, in 1892, thought that the Silurian was underthrust beneath the Ordovician, as shown by the fossils, while Harvie, in 1914, states that the Silurian

[1]Schuchert, C., and Twenhofel, W. H. Ordovicic-Siluric section of the Mingan and Anticosti Islands, etc. Bull. Geol. Soc. Amer., vol. 21, p. 684, 1910.

[2]Ells, R. W. Ann. Rept. Geol. Surv. Canada 1886, p. 12 J, 1887; Ann. Rept. Geol. Surv. Canada 1896, p. 12–15J, 1898; Trans. Roy. Soc. Canada, vol. 2, sect. 4, p. 122, 1892.

[3]Harvie, Robert. Summ. Report Geol. Surv. Canada 1911, p. 286, 1912; 1913, p. 212, 1914.

occupies troughs in the older rocks. No indication of an erosional unconformity has come to my notice.

Ammonoosuc District, N. H.—The most recent article on the geology of the fossiliferous Palaeozoic rocks around Littleton, N. H., is Lahee's description quoted below. This paper is chiefly valuable on account of the footnotes, which refer to practically all of the articles on this region. The only remark with which we are directly concerned is the following:

"2. The Fitch Hill granite-gneiss is intrusive into the Lyman schists, but unconformably underlies the Niagaran sediments of Fitch Hill, Littleton, thus demonstrating the presence of a regional unconformity beneath the Upper Silurian strata of the Ammonoosuc district in New Hampshire."[1]

The Lyman schists were considered tentatively by Hitchcock to be Cambrian or Ordovician, but they have yielded no fossils. A more comprehensive account of this region is Hitchcock's "New Studies in the Ammonoosuc District of New Hampshire."[2] With regard to the Lyman series, underlying the Silurian and Devonian rocks, Hitchcock recognized that "there is equal uncertainty as to the exact place of the supposed inferior schistose complex and the argillitic schists. At present the general term of Lower Silurian (Ordovician) may be applicable."

It is difficult to see how the structure of this region has any bearing on late Ordovician mountain-building. If Lahee's observations and conclusions are correct, it would seem that the Upper Silurian rocks were laid down in a sea transgressing over a country long exposed to erosion, and that is all.

Bernardston, Mass.—The geological history of the Ammonoosuc district appears to be rather closely duplicated by that of the Bernardston region, except for the fact that no igneous injection complicates the latter. In each case we have an underlying series of sedimentary rocks of unknown age, which have in each case been *supposed* to be Ordovician. These are followed in one case by upper Silurian and lower Devonian sediments, while at Bernardston only lower Devonian formations appear.

[1]Lahee, F. H. Geology of the new fossiliferous horizon and the underlying rocks, in Littleton, New Hampshire. Amer. Journ. Sci., ser. 4, vol. 36, p. 234, 1913.

[2]Hitchcock, C. H. Bull. Geol. Soc. Amer., vol. 15, p. 461–482, 1904.

Emerson has demonstrated the existence of a fault separating the fossiliferous Devonian limestone and the argillites,[1] so that, even if the argillite be proved Ordovician, its relation to the Devonian limestone will not uphold the supposition of intervening mountain-building.

In these meridional troughs of central New England, through which the Lower Devonian sea is supposed to have found its way from the maritime provinces to New York,[2] no traces of Ordovician strata are found, except around Lake Memphremagog. Here the structure is very obscure; no two geologists have agreed in print on its interpretation, so that we can hardly hope to use it in support of such a structural problem as the one with which this paper is concerned. We may then dismiss this third division of eastern North America as being absolutely noncommittal in evidence.

Montreal and Vicinity.

The two localities cited by Dana from around Montreal, in the first edition of his Manual, are Ste. Helen's Island and Belœil Mountain. These were both retained in the last edition. Though the structure of the rocks in the vicinity of Montreal is now valueless as evidence, I shall note in brief the main points of the geology there as far as it relates to our problem, because it was one of the three localities originally cited by Dana in support of the idea of the Taconic folding.

Ste. Helen's Island.—The best account of the geology of this island is in a paper by Harvie, from which the following statement is taken: "The Devonian and Silurian are represented solely by inclusions in the [igneous] breccia of Ste. Helen's Island. . . . The Ordovician is represented by the Utica, Trenton, Chazy and Calciferous formations."[3]

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[1]Emerson, B. K. A description of the "Bernardston Series" of metamorphic Upper Devonian rocks. Amer. Journ. Sci., ser. 3, vol. 40, p. 267, 1890.

[2]Clarke, J. M. Early Devonic history of New York and eastern North America. Mem. N. Y. State Mus., no. 9, pt. 2, p. 153–156, 1909.

[3]Harvie, Robert. On the origin and relations of the Palaeozoic breccia of the vicinity of Montreal. Trans. Roy. Soc. Canada, ser. 3, vol. 3, pt. 4, p. 252, 1910.

This paper is directly preceded by one by H. S. Williams entitled, "On the Fossil Faunas of the Ste. Helen's Breccias." These two papers, in conjunction with Nolan and Dixon's article[1] give in detail the geological phenomena as observed. For our purposes, however, the conclusion reached by Harvie is all that is required and is not open to question.

Beloeil Mountain.—The only recent work upon the geology of this mountain is that by O'Neill.[2] This gives a bibliography of papers on the region, and while we are not primarily interested in the historical aspect of the case, it is interesting to see how little has been written on the geology of this mountain.

Beloeil Mountain rises from the St. Lawrence lowland and is surrounded by nearly flat-lying Ordovician rocks, which are here about 3000 feet thick. The highest member of this conformable series is the Lorraine, which is found on the southeast. With regard to the mountain itself, which is composed largely of essexite and nepheline syenite, large blocks of limestone are found enclosed in the frozen magma, some of which are fossiliferous. Ells is responsible for the statement that xenoliths of Devonian limestone have been found within the igneous rock, but, though he left a sketch map of the exact spot, these blocks have never since been found. It is obvious, of course, that in any event, their presence in the magma is utterly worthless as evidence of Taconic mountain-building.

Hudson Valley.

Becraft's Mountain was cited by Dana in the earliest edition of his Manual as one of three localities proving late Ordovician mountain-making. The latest publication on this locality is one by Clarke,[3] which includes a brief review of the previous opinions on the structure of the mountain. Since Mather's Report on the First District, it has been assumed that a well-defined unconformity existed between the Hudson shales and

[1]Nolan, A. W., and Dixon, J. D. Geology of Ste. Helen's Island. Can. Rec. Sci, vol. 9, p. 53–66, 1903.

[2]O'Neill, J. J. St. Hilaire (Beloeil) and Rougemont Mountains, Quebec. Mem. Geol. Surv. Canada, no. 43, pp. 10, 24, 1914.

[3]Clarke, J. M. The Oriskany Fauna of Becraft Mountain. Mem. N. Y. State Mus., no. 3, vol. 3, 1900.

the Manlius, although in his footnote Mather was careful to state that nowhere were the rocks of the two systems actually in contact. It was, however, a justifiable assumption. That it could not be altogether justified is clearly seen from an examination of a paper by Davis,[1] from which I quote below. For the reason that no newer information about the structure of the mountain has come to my notice, these conclusions have been assumed by me.

"The observations thus detailed [the eight places where a contact of the Manlius with the Hudson beds can most nearly be seen] may be summarized as follows: A, C, and G are noncommittal; if necessary they could agree with either conclusion. B and H, if seen alone, would be taken as decisive of conformity. D, E and F imply unconformity, but with nothing of the distinctness shown in Mather's section. . . .

" . . . There is therefore no necessity of supposing unconformity at Becraft's Mountain simply because the limestones there do not belong immediately after the shales in the geological series. Moreover, the generally flat position of the limestones and tilted position of the shales east of the Hudson does not decide the question, for the shales are twice seen almost flat under the limestones of the outlier, and on the southeastern side the limestones are strongly tilted. . . . This indefiniteness of indirect evidence is the more unsatisfactory from the incompleteness of the contact outcrops; and as it is very possible for an appearance of nonconformity to arise in a series that is all folded at the same time, on account of the unequal folding of adjoining strata of different resistances, nothing but direct and clear exposure of an uneven and surely unconformable contact will suffice finally to settle this point in the structure of Becraft's Mountain."

Rondout, N. Y.—At Rondout there is apparently a clearly defined case of an unconformity between the Ordovician and Silurian (or, as has been recently suggested by Schuchert, Lower Devonian) strata. This has been described and figured by Mather, Davis, and Van Ingen and Clark. From these reports

[1]Davis, W. M. Becraft's Mountain. Amer. Journ. Sci., ser. 3, vol. 26, p. 381–389, 1883.

there is no doubt that the Silurian strata were laid down upon a surface of upturned Ordovician strata. None of the uncertainty which surrounds the relations of these two systems at Becraft Mountain exists at Rondout, as the two following quotations show.

"The Hudson River rocks were upheaved, exposed to erosive forces, presumably of the ordinary subaerial kind, and then submerged to receive the later formations on their worn edges. . . . The irregularity of the contact in the Rondout quarry completely excludes the possibility of the disagreement of dips in the over- and underlying formations being due to a fault, at least at this point, for . . . the limestone fits closely into channels worn along the strike of the softer sandstone beds, and the two rocks are so firmly consolidated that hand specimens can be easily obtained showing the line of junction. It is noteworthy that the limestone begins immediately with its fully determined calcareous character: there is no band of transitional composition; no fragments of the sandstone are contained in the overlying rock. The old worn surface was swept clean before the corals and crinoids began growing upon it, and their fragments and grindings make the first deposit. Some little pieces of crinoid stems lie directly on the bare sandstones. . . . It is therefore probable that this contact [another contact at the end of the quarry railroad in Eddyville] is not the original one, but has been produced by faulting or slipping when the rocks were folded. The possibility of such slipping is well shown in the deep quarry (Newark Lime and Cement Company) a little south of Section I, where the Water-lime is folded and slipped so as to be apparently unconformable to itself.[1]"

Twenty years after the above extract was written, Van Ingen and Clark[2] announced that the limestone contained "rounded water-worn boulders of sandstone incrusted with fossil bryozoans and corals." The rocks of this locality are so generally and complexly faulted, that one suspects that all contacts may be due to

[1]Davis, W. M. The nonconformity at Rondout, N. Y. Amer. Journ. Sci., ser. 3, vol. 26, p. 392–393, 1883.

[2]Van Ingen, Gilbert, and Clark, P. E. Disturbed fossiliferous rocks in the vicinity of Rondout, N. Y. Rept. N. Y. State Pal. 1902, p. 1209–1210, 1903.

faults, and were it not for the evidence of these incrusted boulders the same doubts might be cast on the nature of this contact. However, this evidence is decisive.

Rensellaer Plateau.—Resting upon the western flanks of the Taconics is a thick blanket of coarse sediments which makes what would otherwise be an uneven country into a fairly level plateau. These sediments, the Rensellaer grits, are composed of materials of a heterogeneous character, and have long been considered to be of Medina age.[1] The evidence for this view is largely circumstantial, it being supposed that these beds are the eastern continuation of the Medina sandstone. However, the Taconic Mountains were supposed to have been worn down by the beginning of Silurian time on the evidence of the contacts at Becraft Mountain, Rondout, and Shawangunk Mountain. It is difficult to understand how sediments of such unassorted material could have been derived from a peneplained surface. Clarke[2] has suggested that they may probably represent the eastward extension of the late Devonian sandstones of the Helderbergs, and this view is more likely to be correct than is the older and long-accepted one.

Conclusion.—It is in this region that we find the first evidence of any weight in favor of Taconic folding, though in only one locality in an exposure some ten feet across, is the evidence unquestionable. Whether the unconformities at Rondout, and at the locality next to be described, are chance occurrences, or whether we are to see in them indications of conditions that existed over a vastly wider area is a question which may not be satisfactorily answered for years to come.

Shawangunk Mountain.

No clearer case of an unconformity between the Ordovician (Normanskill) and the Silurian (Shawangunk) can be seen in eastern North America than that admirably exposed near Otisville, N. Y. Numerous excellent illustrations of it have appeared in text-books and in special articles.[3]

[1]Dale, T. N. Bull. U. S. Geol. Surv., no. 242, p. 42, 1904.
[2]Clarke, J. M. Mem. N. Y. State Mus., no. 9, pt. 2, p. 159–161, 1909.
[3]Schuchert, C. Silurian formations of southeastern New York, New Jersey, and Pennsylvania. Bull. Geol. Soc. Amer., vol. 27, p. 545, 1916; also Clarke, J. M., Bull. N. Y. State Mus., no. 107, pl. A, 1907.

The section is self-explanatory, and is direct proof of tilting at the end of the Ordovician in this region, though it does not indicate folding.

The Taconics and the Green Mountains.

That the bulk of the crystalline rocks of the Taconics and of the Green Mountains is of Cambrian and Ordovician age no one now seriously doubts. That these ranges contain rocks of later date no one has yet been able to prove. With the details of the structure of these mountains we are not here concerned, for we are interested chiefly in the relations between Ordovician rocks and rocks of later age. On the face of it, the only conclusion which is strictly dependent upon the facts is that these mountains were folded after the deposition of the youngest contained sediments (Trenton—Utica). Nowhere are these Ordovician crystalline rocks overlain, conformably or unconformably, by Silurian sediments, and only near Bernardston, Massachusetts, and in northeastern Vermont are they associated with Devonian strata. The structure at these two localities has been discussed above.

It has been said that the late or post-Ordovician age of the Taconic revolution has been determined partly by the occurrence of Silurian strata on the upturned edges of the Ordovician. In the mountainous region east of the Hudson there are no known Silurian rocks overlying the Ordovician crystallines. The Rensellaer grit was once supposed to be of Silurian age but as it contains no fossils its place in the stratigraphical column cannot be determined (see above p. 156).

The fact that no Silurian or higher strata are known to be folded in with the Ordovician of this region has been urged as a reason for placing the folding at the close of the Ordovician. This is unsafe reasoning; all the more so because geologists agree that eastern North America must have been uplifted (in an epeirogenic, if not orogenic sense) at the close of the Ordovician. The early Silurian (Medinan) sediments are not such as we should expect from the destruction of a mountain-chain of the first order of magnitude. Rather do we get sands in no way differing from normal beach sands, only local conglomerates, and

no arkoses or other heterogeneous sedimentary materials. In other words, if all of the Ordovician and earlier rocks were now inaccessible, one would not be likely to suppose, from an examination of the Silurian sediments alone, that the Silurian period was immediately preceded by mountain-building of any intensity. At Green Pond Mountain, New Jersey, the initial Silurian deposits consist of sandstone and conglomerates from twelve to fifteen hundred feet thick; and at other localities such as Otisville, New York, Delaware Water Gap, New Jersey, Lehigh Gap, Pennsylvania, there are conglomeratic layers in the Medina sandstone.[1] In all these cases the sandstones are clean and the pebbles are for the most part of vein quartz. So that even where the basal Silurian clastics are thickest there is no evidence of detritus from the wearing-down of neighboring high mountains. Vein-quartz pebbles in abundance are evidence of a nearby land mass which has been subject to long-continued erosion, and perhaps also to rejuvenation just prior to their deposition, but they never occur to the practical exclusion of other kinds of pebbles in the products of the wearing-down of young mountains. In support of the contention, we are thrown back upon the geological relations between the Ordovician and Silurian (or younger) rocks, and in this province the evidence fails us.

I have stated above that all we can say about the age of the deformation of this region is that it must be post-Upper Ordovician. We may, however, qualify this somewhat. Such metamorphism as the rocks of the Taconics and the Green Mountains have suffered is not generally thought of as having been induced near the surface. Such metamorphism is a factor, among other things, of the depth to which the rocks are buried, and in the opinion of the writer, the metamorphism of the rocks of the Taconics and the Green Mountains could only have occurred under a cover of rock measured in thousands of feet. What this cover was we may never know but that it was not Ordovician is probable, for the Upper Ordovician is but scantily represented in eastern New York State.

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[1]Schuchert, C. Silurian formations of southeastern New York, New Jersey, and Pennsylvania. Bull. Geol. Soc. Amer., vol. 27, p. 543–547, 1916.

Crystalline Rocks of New York City, New Jersey Highlands, and Southward.

Throughout the area designated above, the same general conditions prevail as characterize the region of the Taconic Mountains: metamorphosed Cambrian and Ordovician rocks with no overlying younger Palaeozoic strata. This similarity of conditions doubtless gave rise to the belief that the region south of New England had itself suffered mountain-building in the late Ordovician. That there is no evidence for this belief is shown by the extracts and remarks below.

New York City.—Dana supposed that the original Taconic Mountains extended southward through Westchester County, New York, to New York City, and thence on to Virginia. The evidence for this around New York City is unsatisfactory. Unfossiliferous crystalline rocks of supposedly Cambrian and Ordovician ages are the only Palaeozoic representatives. These are the Stockbridge dolomite and the Hudson schist. The former was correlated with the Stockbridge dolomite of western New England by Merrill on the grounds of stratigraphic continuity. Of the latter Merrill writes: "The schist of New York district is given the name Hudson because it continues northward and connects stratigraphically with the great areas of slate and shale along the Hudson River which have been called respectively the Hudson slate and the Hudson shale. The Hudson schist, Hudson slate, and Hudson shale represent different phases of alteration of the same original rock, and together they form the Hudson formation."[1]

Berkey, writing more recently, has been inclined to doubt that the Hudson schist is of Palaeozoic age.[2] He describes it under the name of the Manhattan schist, and has sought to show that it is more probably of late pre-Cambrian age. Whichever view be correct, the structure of the region cannot be considered as proving late Ordovician mountain-building. It is particularly

[1]Merrill, G. P. U. S. Geol. Surv., Geol. Atlas, New York City folio, no. 83, p. 4, 1902.

[2]Berkey, C. P. Structural and stratigraphical features of the basal gneisses of the Highlands. Bull. N. Y. State Mus., no. 107, p. 370, etc., 1907; also Geology of the New York City (Catskill) Aqueduct. Bull. N. Y. State Mus., no. 146, p. 47–48, 1911.

interesting, however, in showing that we have not yet arrived at a thoroughly satisfactory understanding of this important region.

New Jersey Highlands.—The New Jersey Highlands consist of a complex of highly folded and faulted pre-Cambrian rocks of both igneous and sedimentary origin, with which are infolded narrow strips of Palaeozoic strata which are for the most part of Cambrian and Ordovician ages. The latter are themselves more or less metamorphosed. A tabulation of the succession of formations in this and in adjoining regions as given in the Trenton Folio (No. 167) is reproduced below. Most of the correlations made south of New England are based upon lithological similarity or continuity. In some cases fossils have been found, and they make the correlation more sure.

	Southwestern New England	*New York*	*Pennsylvania*	*Maryland*	*Trenton (N.J.) Quadrangle*
Ordovician	Berkshire sch.	Hudson sch.	Octoraro sch.	Peach Bottom sl. Cardiff quartz cg. Mica sch. & phyll.	
Cambro-Ordovician	Stockbridge ls.	Stockbridge ls.	Shenandoah ls.	Cockeysville mar.	Shenandoah ls.
Cambrian	Cheshire qzte.	Poughquag qzte.	Chickies qzte.	Setters qzte.	Chickies qzte.
Pre-Cambrian	Stamford Becket, etc.	Fordham gn.	Wissahickon gn. Baltimore gn.	Baltimore gn.	Franklin ls. Wissahickon gn. Baltimore gn.

A very good though brief summary of the essential points in the geology of New Jersey is a paper by Kümmel, entitled Geological Section of New Jersey. In this paper Kümmel describes the Cambrian rocks of New Jersey under the following formational names: Hardyston quartzite and Kittatinny limestone. To the Ordovician system belong the Jacksonburg limestones and the Martinsburg shale. The latter is considerably cleaved. With regard to the interval between the Ordovician and the Silurian, he states that it is "unaccompanied in this region by folding." Between the Shawangunk conglomerate and the Martinsburg shale "there is no marked divergence of dip and strike where the two formations outcrop in proximity and the actual contact is nowhere exposed in New Jersey."[1] In a short paragraph on the structure of the Palaeozoic rocks he

[1]Kümmel, H. B. Journ. Geol., vol. 17, p. 357, 1909.

states that those strata are folded, and that the folding took place during the Appalachian revolution.

In describing the events of early Palaeozoic time as shown by the structure within the Raritan quadrangle, the authors recognize an epeirogenic uplift and withdrawal of the sea at the close of the Ordovician, but continue as follows: "It is believed that the early Palaeozoic strata of neighboring regions were somewhat deformed at this time, but this has not been demonstrated for the northern New Jersey region."[1]

Virginia.—In 1892 Darton announced the discovery of fossils in the so-called 'Archæan' rocks of the Virginian Piedmont.[2] They were found in one of the isolated belts of slates which are included within the older crystalline rocks of that region. The slate in which they occur is very fissile, and it was only by hunting among blocks in which slaty cleavage and stratification coincided, that the fossils were discovered. Walcott, to whom they were referred for identification, decided that they belonged to the "Trenton-Lorraine or upper portion of the Ordovician fauna. . . . the slates are to be correlated with the Lorraine or Hudson series." The slate overlies a sandstone, below which is an altered conglomerate. No overlying rocks are known at either this slate belt of Arvon or at any of the others in Virginia. It is impossible from this evidence alone to assign a date to the metamorphism of the slate. If the fossils are to be relied upon, all that we can say is that the slate was metamorphosed after the Upper Ordovician, but we have no means of telling how long after, although presumably it antedated the Triassic. Here again, this locality, upon which Dana placed so much importance, loses its significance as evidence for Taconic folding.

Conclusion.

A survey of the whole field in which the Taconic Revolution is supposed to have been operative, has failed to show any positive evidence of folded and eroded Ordovician rocks unconformably overlain by younger strata, with the exception of a few outcrops

[1]U. S. Geol. Surv., Geol. Atlas, Raritan folio, no. 191, p. 2. 1914.
[2]Darton, N. H. Amer. Journ. Sci, ser. 3, vol. 44, p. 50–52, 1892.

in southeastern and eastern New York State. Not only this, but such phenomena as the sedimentary succession on Anticosti, and at Percé, the nature of the early Silurian sediments in New York and New Jersey, and the coincidence of slaty cleavage in Ordovician and Devonian rocks along the Chaudière, are presumptive evidence of conformable, or nearly so, succession of Silurian or Devonian and Ordovician rocks. Devonian and later orogenic movements, differential erosion of hard and soft beds, and a thick mantle of glacial drift make the task of locating contacts one of extreme difficulty.

Constructive suggestions that have the support of field evidence are difficult to make. I have already made a suggestion to explain the difference in attitude between the so-called Cambro-Silurian black shales and the Silurian or Devonian sandstone and limestone (see p. 149 above). Ells has pointed out that the Devonian rocks of Beauce County, Quebec, along the Chaudière, have suffered just as much metamorphism as the underlying "Cambro-Silurian" rocks. He writes: "Siluro-Devonian rocks occupy a basin-shaped area of no great extent—but in cleavage, conforming to the underlying Cambro-Silurian and Cambrian rocks . . . and show clearly that all have been involved in the general scheme of folding."[1]

Blackwelder (see p. 137 above) described the belt of deformation in the Taconic Revolution as "wide enough to include most of New Brunswick, perhaps Nova Scotia, nearly all of Maine, and probably even Rhode Island" (p. 640). Of the Brunswickian orogeny (late middle Devonian) he writes: "The tract within which the rocks were crumpled during the epoch stretches from western Newfoundland through Cape Breton Island, Nova Scotia, New Brunswick, Maine, and probably southern New England, and was wide enough to include on the northwest the Gaspé Peninsula in eastern Quebec" (p. 641). So that, with the exception of the New York localities, all of the area supposedly affected by the Taconic Revolution is within that affected by the later Devonian disturbance, and if necessary, the crumpling of rocks of unknown age might be assigned to this latter disturbance. Moreover, in a few localities the folding once re-

[1]Ells, R. W. Trans. Roy. Soc. Canada 1891, vol. 9, sect. 4, p. 122, 1892.

ferred to the Taconic Revolution has been conclusively shown to be the result of either mid-Devonian or Appalachian mountain-building.

After a careful survey of the literature on this problem the writer has come to the conclusion that the only orogenic movements at the close of the Ordovician of which we have any record were localized in eastern and southeastern New York State, and that beyond this region there is no evidence of the Taconic Revolution. It is suggested that much of the deformation ascribed to the Taconic Revolution may have been due to the disturbance which characterized the Devonian in this area.

No. 4.—A NEW FOSSIL STARFISH FROM NEW ENGLAND.

By PERCY E. RAYMOND.

The most striking fossil that has been found in New England since the discovery, nearly a century ago, of *Paradoxides harlani*, has recently been acquired by the Boston Society of Natural History. It is a very well-preserved starfish, found by an enthusiastic student of natural phenomena, Mr. Olof O. Nylander, in a sandstone of Silurian age at New Sweden, Maine. The specimen is a natural mould, about one and one-half inches in diameter, and has a depth of from two to two and a half millimeters. The impression is that of the actinal surface, and is somewhat more distinct than one would expect in such a matrix.

Although there can be but little doubt of the Silurian age of this specimen, the evidence is not complete, since it was found on the surface of a loose boulder which contained no other fossils. The matrix is a dense, fine-grained clay-rock with a calcareous cement. It weathers on the surface to a creamy white, beneath the surface it is reddish brown, and there is an unweathered kernel which is dark gray. Individual minerals, with the exception of rather numerous flakes of mica, cannot be distinguished with the hand-lens. The unweathered portion reacts rather briskly to dilute hydrochloric acid; the outer shell not at all.

Rocks similar to this have been reported by Williams and Gregory[1] in the Sheridan sandstone and Ashland shales which outcrop in the vicinity of New Sweden. It is probably the same as the "calciferous quartzitic sandstone" which according to Gregory (*loc. cit.*, p. 138), is interbedded with fossiliferous shales in the northwestern part of that township.

The Generic Reference.

This starfish is one which, ten years ago, would have been described as a Palaeaster, but the recent work of Schuchert

[1]Bull. U. S. Geol. Survey, 1900, no. 165, pp. 47–50, 119, 138.

and of Spencer has shown the value of a much closer discrimination of characteristics. The large axillary interbrachials, the narrow ambulacral areas, and total lack of accessory ray-plates, show that the species belongs to the most primitive family among the Asterozoa, the Hudsonasteridae. It could be assigned to Hudsonaster, as defined by Schuchert, but the recent subdivision of that genus by Spencer makes it difficult to place a species generically unless both actinal and abactinal sides are preserved.

Schuchert,[1] in his introduction, states: "Now that this study is finished, at least for the present, it is plain to the author that his species and genera are also in some cases too comprehensive. The future student will restudy the specimens along with new material, and go more deeply into the detailed structure of the parts." Spencer has already begun a restriction of the somewhat comprehensive genus Hudsonaster. Under the authority vested in the next investigator by the paragraph quoted, I am emboldened to advance certain suggestions which will, I hope, render somewhat simpler the disposition of such specimens as the one to be described here.

The name Hudsonaster was proposed by Stürtz[2] merely to relieve Palaeasterina of one of the numerous unrelated species which had been saddled upon it. It was improperly defined, and no well-preserved specimen of the type species, *Palaeasterina rugosa* Billings, has yet been found. Schuchert, however, saw that the type was closely allied to some of the simpler Ordovician starfishes, and redefined the genus, using facts drawn principally from *Palaeaster incomptus* Meek, which, however, cannot, under the rules become the type of Hudsonaster Stürtz, although it is that of Hudsonaster Schuchert. If the genus is to be subdivided, it is first of all necessary to restrict Hudsonaster to the original type, in which case, we shall, unfortunately, know nothing of the actinal side except such inferences as may be drawn from its similarity to other species of Hudsonaster (*sensu lato*). The curious stellate plates of the abactinal surface furnish a generic character of some value.

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[1]Bull. U. S. Nat. Mus., 1915, no. 88, p. 10.
[2]Verh. Naturh. Ver. Preuss. Rheinl., 1900, vol. 56, p. 224–225.

however, and Schuchert has already pointed out a number of ways in which the type differs from *Palaeaster incomptus.*

In regard to the ambulacrals of Hudsonaster, Schuchert (*loc. cit.*, p. 55) says in the generic description: "The ambulacralia of each column may be so closely adjoining as to leave almost no space for the podial openings, or there may be laterally between adjoining ossicles very large openings." In any investigation of the ancestry of the Asterozoa, the development of pores between the ambulacral plates is one of the dominant questions, and although it is possible to group in one genus species showing the two conditions mentioned above, it seems somewhat forced to associate so closely such extremes in this respect as *Protopalaeaster narrawayi* and *Palaeaster matutinus.* I would, therefore, prefer to see Protopalaeaster returned to its generic rank, although I do not, of course, concur in Hudson's original interpretation of the specimen which served him as the type.

As a matter of fact, the so-called podial openings of neither *Palaeaster matutinus* nor any other pre-Devonian starfish now known entirely perforate the ambulacral plates, but are merely excavations in their lower surfaces. Ampullae may have been located in these cavities, and eventually, by a continued thinning of the plates above them, have worked their way within the cavity of the arm.

The process of elimination leaves three other species referred to Hudsonaster by Schuchert. These are *Hudsonaster milleri* Schuchert, *Palaeaster incomptus* Meek, and *P. matutinus* Hall. The first of these is known only from an imperfect specimen but the two others are represented by fairly complete material. The most striking feature of *P. matutinus* is the series of ambulacrals which because of the large size of the podial excavations are reduced on the ventral side to almost linear dimensions. For Hudsonasteridae of this type, with excavated ambulacral ossicles, and with approximately the same number of ambulacral as adambulacral plates, I propose the generic name **Macroporaster** with *Palaeaster matutinus* Hall as the type. Since Hall's original specimens did not show the actinal surface I designate as the genocotypes the specimens figured by Schuchert in his figure 2, Plate 2 (No. 26 in Museum of Comparative

Zoölogy). This genus will include the new species from Maine, which may be known as

Macroporaster nylanderi sp. nov.

Plate 3, fig. 7.

Type, No. 14,966, collection of the Boston Society of Natural History. Collected by Olof O. Nylander.

Horizon and locality.—Silurian. Found in a loose fragment of calcareous sandstone at New Sweden, Aroostook County, Maine.

Description.—Rays short, disk large, as in other species of the genus.

Infra-marginals small, nine or ten in a row, lying directly beneath the supra-marginals. Adambulacrals smaller than the infra-marginals, and throughout the greater part of the arm, alternating with them, so that, from the outer end of the ambulacral groove to the interbrachial plate there are as many adambulacrals as infra-marginals, or one more. In the whole column there are twelve or thirteen. An extra plate is intercalated near the middle of the arm in some cases, so that there is a small adambulacral opposite the middle of one of the infra-marginals. The ambulacrals are oblong plates which are not quite opposite, so that their line of junction is somewhat sinuous. They are deeply excavated at the line of junction between adjacent plates.

The interbrachial plates are of somewhat unusual shape, the under surface being bent abruptly, so that while the proximal portion is in a horizontal plane, the outer portion forms a sort of tongue which projects upward at an angle of about 30° with the horizontal. The outline is roughly pentagonal, the inner sides meeting at about 90°, and each of the sides against which the infra-marginals abut, shows a re-entrant angle. The horizontal face is flat or slightly convex, while the outer one is rather deeply concave. The jaw-ossicles are small.

The lower surfaces of all the adambulacrals and infra-marginals show tubercles and some traces of spines. The interbrachials appear to bear small tubercles.

Measurements.—*R*, 19 mm.; *r*, 7 mm.

For the sake of clarity it may be well to recapitulate briefly the generic characteristics of the present subdivisions of the Hudsonasteridae.

Family HUDSONASTERIDAE Schuchert.

Small asterids with large, thick plates, and no accessory ray-plates of any kind. Each interbrachial area occupied by a single large plate against which the infra-marginals abut, but which always forms a part of the outer row. Disk with a central plate surrounded by large plates arranged in regular cycles.

PROTOPALAEASTER Hudson.—Adambulacrals about twice as numerous as the infra-marginals; no podial excavations. Interbrachial plate six-sided, wide and rounded exteriorly. Type, *Protopalaeaster narrawayi* Hudson. Black River, near Ottawa, Ontario.

MACROPORASTER gen. nov.—Adambulacrals about one and one-half to two times as numerous as infra-marginals. Podial excavations large. Interbrachial six-sided, but more pointed at both ends than in Protopalaeaster. Type, *Palaeaster matutinus* Hall. Ordovician and Silurian, eastern North America.

HUDSONASTER Stürtz.—Oral side unknown.

GIRVANASTER Spencer.[1]—Ambulacrals about twice as numerous as infra-marginals, which are usually large. Interbrachials rhombic, almost diamond-shaped. Type, *Girvanaster sculptus* Spencer. Ordovician, Scotland.

COCASTER Spencer.—Adambulacrals about one and one-half times as numerous as infra-marginals. Interbrachials pentagonal, pointed inwardly. Podial excavations small or absent. Type, *Cocaster bulbiferus* Spencer. Silurian, England.

BELASTER Spencer.—Adambulacrals but slightly more numerous than infra-marginals. Interbrachials long, narrow, expanding inward. Arms rather long and slender. Type, *Belaster ordovicus* Spencer. Ordovician, Scotland.

SILURASTER Jackel.—Adambulacrals but slightly more numerous than infra-marginals. Podial openings small. Inter-

[1]Palaeontographical Soc., London, vol. for 1915, 1916, p. 70.

brachials six-sided, pointed at both ends. Type, *Siluraster perfectus* Jaekel. Upper Ordovician, Bohemia.

Another starfish which has the simple arrangement of plates on the ventral surface characteristic of the Hudsonasteridae is *Palaeaster caractaci* Gregory. This species is so much like a "Hudsonaster" that Spencer[1] at first identified it with *Protopalaeaster narrawayi*. Both Schuchert and Spencer now place it in the Mesopalaeasterinae and Spencer has erected a new genus, Caractaster, for it, considering it the most primitive member of the family in which it is now associated. The family characteristic (two rows of adradial plates) is, however, confined to the abactinal side, and only by its longer and more slender arms can it be distinguished from one of the Hudsonasteridae, if the actinal side only is preserved. The interbrachial area is still represented by only a single plate the outer end of which forms a part of the marginal series, and which is nearly oval in shape, pointed outwardly. The shape of this plate is probably of generic value, for it is evidently of a form which represents the last stage before the interbrachial is pushed inward from the margin.

The ventral side of Palaeaster is also very like that of the species here described, but fortunately the plates of the only known species of that genus are rather distinctly marked. Each of the infra-marginals has a large, smooth central space encircled by a pustulose area, which makes them easily recognizable.

From the foregoing synopsis of the characteristics of the ventral surface it appears that if only that side of the specimen is preserved, one has to depend largely upon the shape of the interbrachial plates for identification of genera, taken, however, in connection with all other characteristics which can be observed. The diagrammatic figures given in Plate 3 (fig. 1–6) serve to illustrate the variations in outline. All are seen from the oral side, with the inner end downward.

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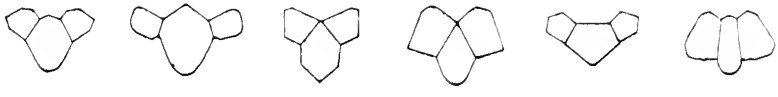
[1]Palaeontographical Soc., London, vol. for 1913, 1914, pp. 21, 30.

EXPLANATION OF PLATE.

Fig. 1. Protopalaeaster.
Fig. 2. Macroporaster.
Fig. 3. Siluraster.
Fig. 4. Girvanaster.
Fig. 5. Cocaster.
Fig. 6. Belaster.

Fig. 7. *Macroporaster nylanderi* sp. nov. The holotype, 2.75 times the natural size. Drawn by Dr. Elvira Wood.



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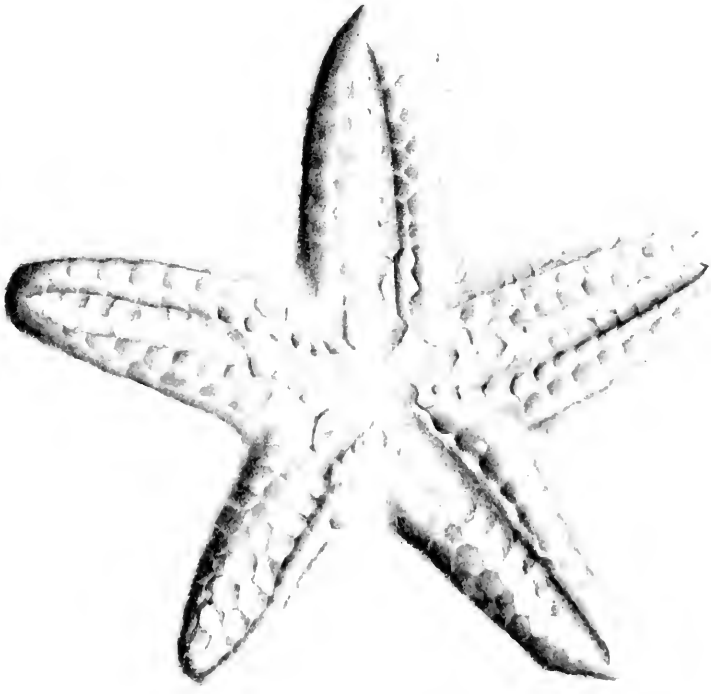

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FLORA OF BERKSHIRE COUNTY, MASSACHUSETTS

By RALPH HOFFMANN.

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PREFACE.

The following catalogue of the plants growing without cultivation in Berkshire County, Massachusetts, is based chiefly on the collections made by the writer during the last thirty years and now in the herbarium of the New England Botanical Club at Cambridge, supplemented by those of other members of the Club, deposited in the same place. A few species are entered in the list which are not represented in that herbarium but no species has been admitted which the writer has not personally examined. In the case of difficult groups every effort has been made to have the writer's identification verified by competent authorities. In the Appendix a list is given of plants which have been attributed to the County, specimens of which have not been seen by the writer or by some competent authority. A list is also given in the Appendix of plants which the writer believes have been attributed to the County through error.

No catalogue of the plants of Berkshire County has been published since Dewey's list in 1829 (*vid.* Introduction, p. 178). The great advance made in our knowledge of the New England flora since then seems to justify the publication at this time of a summary of our present knowledge of the flora of the region.

That such a list must be incomplete goes without saying. Additional introduced plants are likely to make their appearance at any time. There are doubtless a few native plants in the County which have up to the present eluded the search of collectors. Our knowledge of the range within the County of some of the plants in the list is still incomplete. One of the functions of a local list is to stimulate students to add to the knowledge therein contained. The writer will be glad to hear from anyone who has additional data to offer. Communications to be of value should be accompanied by specimens from which the identity can be determined, together with particulars of occurrence, etc. These specimens should be properly dried under pressure.

In the present list the names of all indigenous species, varieties, and forms are printed in bold-faced type; those of introduced species, varieties, and forms in small capitals. The nomenclature and order followed are those of Gray's Manual, seventh edition, except where a later name has apparently received the sanction of the editors of the

Manual. In such cases the name used in the Manual follows in parentheses. For the convenience of those who use Britton and Brown's Illustrated Flora, the name used in the second (1913) edition of that work is also given in parentheses wherever it differs (except in spelling) from that used in this list. If the generic name used by Britton and Brown differs from that here used but the specific names are the same (except for changes of gender), the generic name only is given. The Illustrated Flora, as is well known, does not recognize geographical varieties to the extent of naming them. It will be impossible therefore, for those who use the Illustrated Flora to discriminate between the species and the many varieties (over two hundred) recognized in this list.

A great number of our native plants are not sufficiently known by the people to have received a genuine popular name. Only striking plants, like the Cat-tail, Sweet Flag, and Butterfly-weed, have names that are actually current. Others belong to a group which is recognized, like Cotton Grass, but species within the group are not distinguished. Many vernacular names are given in the botanies, that are never used by the people, such as Dock-leaved Persicaria (*Polygonum lapathifolium*). In the following list all names known to be in current use are given, and others have been copied from the Manual.

The habitats given are those observed in the County.

The use of the expressions *valley* and *plateau* demands a word of explanation. The term *valley* is used to designate the trough formed by the Hoosic and Housatonic Rivers and their main tributaries. It contains the principal limestone and moraine deposits, and its slopes include wooded hillsides with well-drained leaf mould. The term *plateau* is used to designate the broad upland bounding the valley on the east. It is characterized by an absence of limestone and by cool rocky woods, ill-drained hillsides and moist fields (*vid.* Introduction, p. 182).

For convenience, the term Greylock is used to include the whole mountain-mass that culminates in Mt. Greylock of the topographic sheet, and The Dome for the mountain-mass that culminates in Mt. Everett of the topographic sheets.

To indicate the comparative frequency of the plants listed the following terms have been used, namely, "common," "frequent," "occasional," and "rare." These terms must be interpreted in connection

with the accompanying statement of habitat; thus, "Rich woods; common," implies that the species is infrequent or entirely absent except in rich woods. Moreover, the term "common" cannot be used with anything like mathematical precision. A species may be so designated if it occurs in fairly large numbers wherever the conditions are suitable, but owing to its association with a number of other species struggling for space in the same environment the total number of plants in a given area may not be nearly so great as in the case of a species which crowds out all competitors. "Frequent" means that the species may be found without much search but that there are areas in many apparently suitable localities where it is absent. "Occasional" and "rare" explain themselves. When a plant is "occasional" or "rare," all the stations where it has been found have been given. The term "local" is used when a species is common at a few stations.

Since the publication of the Manual a number of new species and varieties have been described, or the treatment of species or groups has been revised. Brief descriptions of these new species, varieties, or forms have been included in this list, generally copied from the original description, so that the list may supplement the Manual for the region which it covers.

All varieties and forms have been given a separate paragraph for convenience in using the list, instead of combining subordinate varieties and forms in the same paragraph with the species.

In a very few instances only, new combinations have been made in this list. A few combinations treated in the Manual as varieties have been reduced to forms, in accordance with the more recent treatment of these phenomena. The incised, or auricled forms of ferns, color phases of fruit or flower, which occur with the typical form and are not combined with any other character or any marked difference in range are treated as forms. A few color forms, most of which have been well known to collectors, but have not yet received a name, have been given names in this list. A list of all new forms and combinations is given in the Appendix.

Artificial keys for the determination of species in large and difficult groups are an essential feature of the standard manuals of botany. It has seemed to the author unnecessary to furnish the present work with such keys, except where the number of species found in Berkshire County is much smaller than the number covered by the manuals. In such cases keys covering only the species known to occur in Berk-

shire County have been prepared by editing the excellent keys in Gray's Manual, seventh edition.

It remains for the writer to express his sincere thanks to those who have generously helped in the preparation of the list both in the field and in the study. The assistance freely given by Prof. M. L. Fernald in the early years of the undertaking was of the greatest service to the writer. Dr. Harold St. John has kindly read the manuscript and has helped with many difficulties. Mr. C. A. Weatherby has generously given aid and advice. Mrs. Agnes Chase, Mr. W. W. Eggleston, Mr. F. F. Forbes, Mr. F. Tracy Hubbard, Mr. Bayard Long, Mr. K. K. Mackenzie, and Prof. K. M. Wiegand have very kindly aided in determining difficult species. Dr. B. L. Robinson and Miss M. Day have been frequently consulted. Without the keen eyes and industry of Mr. F. Walters and Judge J. R. Churchill the list would be poorer by a number of species. Mr. Walters has also been of great help in the study of Dewey's and Eaton's nomenclature. The map of Berkshire County has been kindly drawn by Mr. H. Harris. The writer wishes to take this opportunity to express his gratitude to Mr. and Mrs. Bernhard Hoffmann for the constant interest which they have shown in the preparation of the list.

CONTENTS.

Introduction.

History.

The first two decades of the 19th century constituted a period of active study of North American plants, by both native and foreign collectors and systematists. Pursh traveled in North America from 1799 to 1811 and published his Flora Americae Septentrionalis in London in 1814. Michaux had already published the Flora Boreali-Americana in Paris in 1803. Local students were beginning an intensive study of the regions about the chief centers of scientific interest. Dr. Jacob Bigelow's Florula Bostoniensis, the first local list published in this country, appeared in 1814; Barton's Florae Philadelphicae was published in 1818. Nuttall's Genera of North American Plants appeared in the same year.

During the second decade of the century Williams College was a local center of botanical interest and activity. Two botanists of high rank were connected with the college at that time, Chester Dewey and Amos Eaton.

Chester Dewey was a native of Berkshire County, born at Sheffield in 1784. He was graduated from Williams College in 1806, accepted a tutorship at the college in 1808, and in 1810 was appointed Professor of Mathematics and Natural Philosophy in the same institution. He held this office for seventeen years. From 1827 to 1836 he was

head of a boys' high school at Pittsfield and was at the same time a professor of chemistry in the Medical College at Pittsfield and also at the Medical College at Woodstock, Vermont. He died in 1867.

Dewey prepared a list of the plants of Berkshire County for the History of the County which was published by Rev. Dr. Field in 1829. This list, now nearly one hundred years old, has remained the only catalogue of the flora of the County. It contains the names of about 800 species and varieties of native flowering plants, ferns, and fern allies. The habitat of each plant is indicated in a very general way, and occasionally a definite locality is given. With the assistance of Mr. Frank Walters, the writer has made an analysis of this list with the following results.

There are about twenty-five names on the list of plants which are undoubtedly erroneously determined, such as *Clintonia umbellulata*, *Desmodium viridiflorum*, *Viola striata*, etc. It is sometimes possible to determine with little doubt what plant Dewey had in mind, *e. g.*, *Clintonia umbellulata* is without doubt *C. borealis* (Ait.) Raf. which is not included in the list. What is intended by *Desmodium viridiflorum* is a matter of conjecture. It may be *D. paniculatum* (L.) DC., which is not listed.

There are about twenty species on the list which have not since been found in the County. These are species which Dewey could hardly have mistaken, and the synonymy is in no way confused. Several collectors besides the writer have looked for these plants but without success. The list is given in the Appendix in the hope that these plants may still be found in the County. In many cases plants listed by Dewey were looked for in vain for many years by those interested, and finally found. In the case of *Smilax rotundifolia* only one plant has been found, which may be Dewey's very individual. In the case of *Arctostaphylos* and *Phragmites* it is certain that we have followed in Dewey's very footsteps and found the same plants growing in the same stations where he found them one hundred years ago.

There are inexplicable omissions in Dewey's list; plants are absent which he must have seen in the County and which had been described and named before his day. He lists *Selaginella rupestris* under the name *Lycopodium rupestre*, but omits *Lycopodium apoda*. *Potamogeton pusillus* L., *Viola lanceolata* L., *Desmodium nudiflorum* (L.) DC. are not on his list.

Other plants which have since been added to the list Dewey simply

failed to find. Everyone knows how hard it is to find rarities when everything is unfamiliar. It is not to Dewey's discredit, that a keen collector like Mr. Frank Walters added *Arisaema Dracontium*, *Cimicifuga racemosa* and *Dentaria laciniata* to the County-list in Dewey's own town. The great majority of species and varieties in the present list which were not contained in Dewey's list, are plants now recognized as distinct which had not in his day been separated from closely related species. There are also a number of introduced species, like *Rudbeckia hirta*, which have made their way into the County during the last one hundred years. Anyone who studies Dewey's list, keeping in mind the state of botanical knowledge in his day, will entertain a great respect for his energy and acuteness.

Dewey's chief interest in botany early became the genus *Carex*. He began to contribute studies of this genus to the American Journal of Science and Arts in 1824 and continued till 1866, the year before his death.

The following species were named either by him or by his correspondents from material collected in Berkshire County.

Carex formosa Dewey from Stockbridge.
Carex novae-angliae Schwein. from Saddle Mt. (Greylock).
Carex scabrata Schwein. from Berkshire County.
Carex longirostris Torr. from Sheffield.
Carex Davisii Schwein. and Torr. from Sheffield.
Carex Hitchcockiana Dewey from Saddle Mt.
Carex Tuckermani Dewey from Sheffield.
Carex Schweinitzii Dewey from Williamstown.
Carex setacea Dewey from Williamstown.

In 1840 Dewey was commissioned by the Governor of the State to prepare a report on the flowering plants of Massachusetts, a companion to Emerson's classic report on the trees and shrubs. There are a number of references in this report to Berkshire County, some of which are interesting enough to quote, as throwing light on the history of its flora during the last century. Of the Sweetbrier (*Rosa rubiginosa*) he says, p. 55, "Its perfectly wild state in the fields and along hedges in the north part of Berkshire County has led me to doubt its importation into that part of the state." Of the Shrubby Cinquefoil (*Potentilla fruticosa*), which is now a pest in moist pastures, he only says, p. 57, it "grows on the margin of ponds in marshy situations and on cold upland tracts." Dewey did not seem to know *Vicia Cracca* from

Berkshire, where it is now frequent. He gives it from Malden and Cambridge and calls it "a native of England." He says of *Trifolium officinale* and *Trifolium album* (*Melilotus officinalis* and *alba*), p. 66, "The yellow-flowered and the white, both finely scented are often cultivated in gardens. The white is sparingly naturalized in some places." Both are now naturalized, the white commonly, and the yellow frequently. The Pitcher Plant, Dewey calls the Side-saddle Flower, "from the resemblance in shape and position of its curved and hollow leaf to the horn of a side-saddle." The name with the equipment is now practically unknown. He says nothing about the insectivorous habits of the plant. *Agrostemma Githago,* now rare, he calls, p. 87, "a well known weed of wheat fields." *Cerastium vulgatum* he speaks of, p. 89, as of "little consequence except as yielding seed for the food of small birds." *Pyrola* (now *Moneses*) *uniflora,* common in pine woods, he says is "found near Salem by Mr. Oakes." The Canada Thistle (*Cirsium arvense*) had already become a menace, but *Cirsium pumilum* he says, has been "found near Boston." Joe-Pye-Weed (*Eupatorium purpureum*) is "said to have been recommended to the whites by an Indian of the name." The Shakers "manufactured the heads and leaves of *Guaphalium margaritaceum* [*Anaphalis margaritacea*] into mattresses, and which are said to be pleasant and healthful." *Rudbeckia hirta* is not mentioned. Of *Prunella,* of which the popular name in the books is Heal-all, Dewey says, "Not used to heal anything." *Galeopsis Tetrahit,* he says, has "sprung up from straw thrown out from crates of crockery." *Thymus Serpyllum,* now common in the central towns of the County, he says is "cultivated in gardens and naturalized in a few places, formerly used in cookery." *Dianthus Armeria, Saponaria officinalis, Rumex Acetosella, Plantago major, Arctium minus, Leontodon taraxacum* (= *Taraxacum officinale*), *Tanacetum, Inula, Tussilago, Veronica arvensis, V. agrestis,* and *V. serpyllifolia* had all become naturalized in Dewey's time.

Shortly after Dewey had become established as a professor at Williams College, A. A. Eaton, though not a member of the faculty, gave a series of lectures at the college on botany which created an unusual interest among the students and even in the community. Eaton, was born in Chatham, New York, a few miles from the border of Berkshire County in 1776; he graduated from Williams College in 1799. In 1817 he lectured on botany to enthusiastic classes at Williams College, and at their request published the first edition of his

Manual of Botany, followed in 1818 by the much enlarged second edition. In this edition is the first description of *Lonicera hirsuta*, found by one of Eaton's pupils "two miles west of the college." This species was later found in Vermont, New York, and westward, but in no other stations in Massachusetts. Moreover, Eaton's station was lost sight of until 1920, over one hundred years after its original discovery, when the writer had the pleasure of finding a flourishing colony of plants probably in the same locality that Eaton referred to.

Eaton made occasional references in his Manual to definite localities in Berkshire, which represent either his own knowledge of the County or information acquired from his pupils or from Dewey. He refers in particular to the activity of Dr. E. Emmons, who was his pupil.

Eaton must have had unusual power to arouse interest and even enthusiasm for scientific study. There is a tradition in Williamstown, for which I am indebted to Professor S. F. Clarke, that after his lectures on botany, the loafers in the village taverns when meeting in the evening discussed the new flowers that they had found. Eaton was not so accomplished a botanist as Dewey, but probably a more inspiring teacher.

In 1824 Eaton went to Troy, there to found the Polytechnic School, and in 1827 Dewey took charge of a school in Pittsfield. The latter still worked at the genus *Carex*, and doubtless kept up his interest in Berkshire plants, but the period of active botanical work on the flora of the County carried on by resident botanists was practically over. The collections in the County from that time to the present were made by botanists from the centers of scientific activity, chiefly from Boston and its vicinity, although a sheet of *Thelypteris Goldiana* in the herbarium of the Boston Society of Natural History collected in Williamstown by Torrey, but bearing no date, testifies to the presence in the County of that distinguished botanist. Oakes, also, visited the County, probably on the occasion of his trip to western Vermont. Sheets from Pittsfield and Williamstown bearing his name as collector are in the herbarium of the Boston Society of Natural History. They must have been collected prior to 1848, the date of Oakes' death. In 1858 William Boott was collecting *Carex Schweinitzii* in Williamstown, as sheets in the Gray Herbarium testify. J. W. Robbins in 1864 collected *Potamogeton alpinus* in Richmond. In 1877 the modern period of botanical work in the County may be said to have begun, inaugurated by the first visit of Judge J. R. Churchill to the County.

In that year he collected *Arabis Drummondii* on Hoosac Plateau and in the year 1920, forty-three years later, he is still active in the field, adding new plants and new stations to the list. The brothers Charles E. and Walter Faxon visited Lenox in 1872, and made collections there. Professor C. S. Sargent collected *Crataegus* in the County in 1902 and was the first to discover *Quercus Muhlenbergii* as a native of the State. Professor Brainerd was studying the violets of the County in the first decade of the 20th century. The formation in 1895 of the New England Botanical Club and the increased interest in the New England flora resulting from that step has attracted to the County in the last two decades many active collectors, whose work has enriched our knowledge of its flora. Particularly notable was a visit by Professor Fernald to Florida. Attracted by the presence on the geological map of the County of a strip of serpentine, he visited the outcrop and added two species to the county list: *Arenaria macrophylla* and an indigenous form of *Cerastium arvense*.

From 1913 to 1917 the County had again for too short a time a resident botanist. Mr. F. Walters in three seasons' collecting discovered in the southern tier of towns a large number of interesting plants which had not previously been reported from the County, besides adding materially to our knowledge of the distribution of many other species.

Physiography.

The plants comprised in the list published in this paper have been all collected within the boundaries of Berkshire County, Massachusetts. A brief description of the physiographic features of the County is essential to an understanding of the distribution of the plants here listed.

Berkshire County is the westernmost county in Massachusetts and extends entirely across the State, from Vermont to Connecticut. Its northern boundary is formed by Bennington County in Vermont and its southern boundary by Litchfield County, Connecticut. On the west it is bounded by Rensselaer and Columbia Counties, New York. It extends from lat. 42° 45′ north to about 42° 2′ south, a distance of about 49 miles. In breadth it varies from about 24 to about 12 miles. Its area is about 1000 square miles.

The main topographical features of the County are the Housatonic

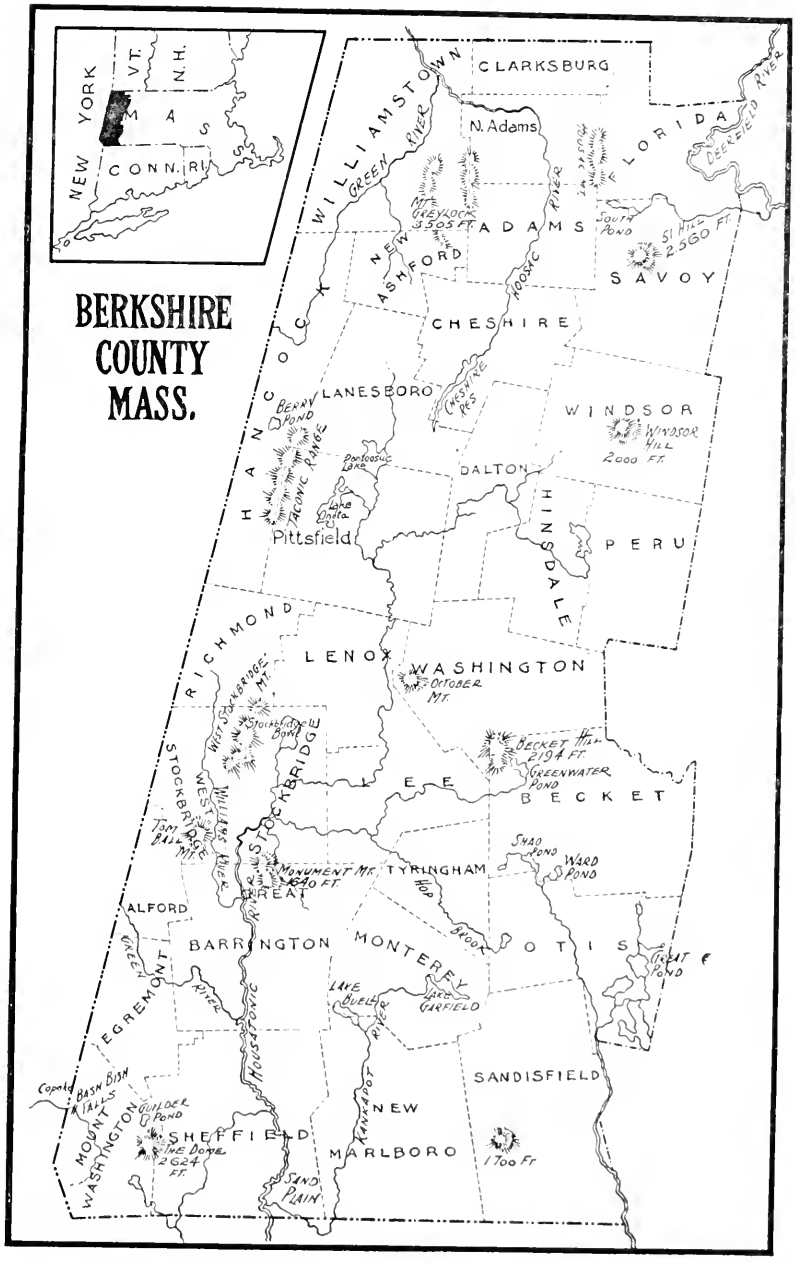

Fig. 1.—Map of Berkshire County, Massachusetts

and the Hoosac Valleys, the Taconic Range, the mountain-mass of which Mt. Greylock is the highest peak, and the Hoosac Range.

The Housatonic Valley extends from Lanesboro to Sheffield, a distance of 32 miles, about two-thirds of the length of the County. The elevation of Pontoosuc Lake on the southern boundary of Lanesboro is 1120 feet. At the southern boundary of the County, the river has fallen to less than 700 feet. The floor of the valley varies considerably. It is broad in Pittsfield, occupying about seven miles, and in Sheffield six miles, and is narrowest at Glendale, where steep hills rise abruptly from each bank. Several long valleys extend eastward from the main valley of the Housatonic: that occupied by Muddy Brook in Great Barrington, that of Hop Brook in Tyringham and that of the west branch of the Housatonic in Hinsdale and Dalton. Lake Garfield (Brewer Pond) and Lake Buel in Monterey are drained by the Konkapot River, a tributary of the Housatonic which flows south, through New Marlboro. Several long narrow valleys bring streams from the northwest to the western bank of the Housatonic, notably the Williams River through West Stockbridge and Great Barrington and the Seekonk River, with its tributary, the Green River, through Alford and Egremont.

The Hoosac River rises in Lanesboro and flows north through Cheshire, Adams, North Adams, and Williamstown, falling into the Hudson in Rensselaer County, New York. Its course is rapid throughout and it has a narrower valley than the Housatonic. In Williamstown it receives from the west the Green River which rises in Hancock and flows north in a long, narrow valley.

The Deerfield River, a tributary of the Connecticut River, borders the town of Florida for about seven miles.

The Farmington, another tributary of the Connecticut River, heading in the southern part of Becket, drains the greater portions of Otis and Sandisfield.

The western part of Mt. Washington in the extreme southwestern corner of the County lies almost entirely in the Hudson River drainage system.

The Taconic Range forms the chief feature of the western border of the County. It is formed of a succession of ranges, many of them rising in isolated peaks to over two thousand feet in height, separated by the valleys above described or by passes such as that above Lebanon, which has an altitude of 1500 feet. In the southwestern corner

of the County Mt. Everett, better known in the County as The Dome, rises to an elevation of 2624 feet. In the northern end of the County, lies the mass of which Mt. Greylock is the highest point. This peak is 3505 feet above sea level, and is the highest mountain in the State.

The eastern portion of the County is composed of a broad series of ranges, which are a continuation of the Green Mountain range of Vermont. The highest peaks rise to an elevation of 2840 feet in Florida and 2280 feet in Windsor, but there are no deep valleys separating one range from another as in the Taconic range. For long distances the upland rises steeply from the valleys of the Housatonic and the Hoosac to a very uniform level, about 2000 feet in the north, falling to 1500 feet in the south. The whole upland is so distinct in its character from either the valleys above described or from the well-drained Taconics that for convenience it will be called, in the following list, the Hoosac Plateau or the Plateau.

There are nine or ten large lakes and a number of small ponds in the County. Most of the lakes are remnants of glacial lakes formed in the river valleys. The largest are Onota and Pontoosuc in Pittsfield, Lake Mahkeenac (Stockbridge Bowl) in Stockbridge, Lakes Garfield (Brewer Pond) and Buel in Monterey, and Cheshire Reservoir in Cheshire. Several of these have comparatively soft bottoms and marshy places along part of the shore-line. There are in the upland, particularly in Becket and Otis, a number of small ponds with hard bottoms and rocky shores. There are also small ponds both on the upland and in the valleys in the center of "quaking" peat bogs. In Lenox and Sheffield there are extensive swampy woods bordering the Housatonic and its tributaries.

The altitude of much of the Plateau and of many of the hills, notably The Dome and the Greylock mass, is such that snow falls earlier and lingers later there than in the valleys, and clouds and mist often rest on the heights when the valley is clear.

The distribution of plants depends so intimately on the character of the soil and this in turn so much on past geological history that a brief account of the main geological changes that have taken place in the County is necessary. The upland designated above as the Hoosac Plateau is composed for the most part of hard igneous or metamorphic rocks dating from the Archaean and Cambrian periods. The principal rocks are granitic gneiss, sericite schist, and quartzite. The valleys of the Housatonic and Hoosac and their principal tribu-

taries have been formed in a broad belt of limestone of Cambrian and Ordovician formation. The Taconics are formed of sericite schist. The hills which rise everywhere in the valley, even at times bordering the river, are for the most part portions of the schist and the quartzite formations which through faulting have been separated from the main ranges and are often bard knobs, overlain on their flanks with limestone. A narrow band of serpentine is exposed in Florida.

The greatest differences in soil in the County are due to the presence of limestone in the valleys and its absence from the Plateau and the higher ranges. Another very important factor in the formation of soils of different nature was the glacier. Not only did the glacier transport materials of different composition and mingle them together, not only did it scrape the summits of the hills bare of soil, but at its periods of halt it caused the formation of lakes and streams through whose agency much of the transported and ground material was deposited in the form of sand-plains and moraines. On the sides of all the larger valleys are mounds of sandy or gravelly material deposited by the halting ice-sheet, and on many of the valley floors are level sandy plains, the former beds of lakes formed by an ice-obstructed gorge.

Taking into account the factors of shade, moisture, and soil the native plants of Berkshire County may be divided, with more or less exactness, into various groups or associations. The most characteristic of these groups are indicated in the following lists, which are not intended to be exhaustive but merely suggestive.

(1) Plants growing in water with submersed or floating leaves: *Isoëtes echinospora*, var. *Braunii*, *Sparganium angustifolium* and *S. fluctuans*, all the *Potamogetons*, *Elodea*, *Vallisneria*, *Ceratophyllum*, *Nymphozanthus* (*Nuphar*, Man. ed. 7), *Castalia*, *Brasenia*, *Myriophyllum exalbescens* and *M. verticillatum*, var. *pectinatum*, *Bidens Beckii*, etc.

(2) Plants of muddy, sandy or rocky shores: *Eriocaulon septangulare*, *Eragrostis hypnoides*, *Carex flava*, var. *rectirostra*, *C. Oederi*, var. *pumila*, *Cyperus aristatus*, *C. esculentus*, *C. strigosus*, *Juncus articulatus*, *J. brevicaudatus*, *J. marginatus*, *J. nodosus*, *J. pelocarpus*, *Radicula palustris*, *Hypericum boreale*, *H. canadense*, *H. ellipticum*, *Viola lanceolata*, *Apocynum cannabinum*, etc.

(3) Plants of low river banks and swales: *Pteretis nodulosa* (*Onoclea Struthiopteris*), *Bromus altissimus*, *Elymus riparius*, *E. striatus*, *Panicum clandestinum*, *Carex crinita*, *C. cristata*, *C. grisea*, *C. lanugi-*

nosa, C. longirostris, C. pubescens, C. vesicaria, and var. *monile, C. tribuloides, Populus balsamifera,* var. *virginiana* (*P. deltoides* Man. ed. 7), *Salix alba,* var. *vitellina, S. nigra, Polygonatum commutatum, Smilacina stellata, Urtica gracilis, Polygonum lapathifolium, P. virginianum, Ribes americanum, Geum virginianum, Apios tuberosa, Acer saccharinum, Impatiens pallida, Psedera vitacea, Vitis vulpina, Hypericum Ascyron, Veronica virginica, Helenium autumnale, Xanthium pungens.*

(4) Plants of low calcareous meadows: *Selaginella apoda, Carex aurea, C. flava,* var. *elatior, Scirpus lineatus, Juncus Dudleyii, Parnassia caroliniana, Lythrum alatum, Lobelia Kalmii.*

(5) Plants of calcareous bogs: *Cypripedium hirsutum, Quercus macrocarpa, Salix candida, S. serissima, Cardamine pratensis,* var. *palustris, Viola renifolia,* var. *Brainerdii, Aster puniceus,* var. *lucidulus, Solidago patula, S. uliginosa.*

(6) Plants of rich leaf mould: *Adiantum pedatum, Athyrium acrostichoides, Botrychium angustisegmentum, B. ramosum, B. virginianum, Carex laxiflora,* var. *blanda, C. laxiflora,* var. *latifolia, C. plantaginea, C. platyphylla, Arisæma triphyllum, Allium tricoccum, Trillium erectum, Cypripedium parviflorum,* var. *pubescens, Orchis spectabilis, Laportea canadensis, Asarum canadense, Claytonia caroliniana, Actæa alba, A. rubra, Hepatica acutiloba, H. americana* (*H. triloba* Man. ed. 7), *Ranunculus abortivus,* var. *cuneyclus, Caulophyllum thalictroides, Sanguinaria canadensis, Dicentra canadensis, D. Cucullaria, Dentaria diphylla, Viola canadensis, V. eriocarpa* (*V. scabriuscula* Man. ed. 7), *V. rostrata, V. Selkirkii, Panax trifolium, Osmorhiza Claytoni, Sanicula gregaria, S. trifoliata, Hydrophyllum virginianum, Collinsonia canadensis, Eupatorium urticæfolium, Solidago latifolia,* etc.

(7) Plants of dry woods: *Lycopodium clavatum, Panicum dichotomum, P. latifolium, Carex rosea, C. pennsylvanica, C. virescens, Lilium philadelphicum, Hypoxis hirsuta, Cypripedium acaule, Castanea dentata, Quercus alba, Q. Prinus, Anemonella thalictroides, Sassafras officinale, Baptisia tinctoria, Desmodium Dillenii, D. undiflorum, D. paniculatum, Polygala pauciflora, Ceanothus americanus, Viola palmata, V. sororia, Circæa lutetiana, Aralia nudicaulis, Chimaphila umbellata, Pyrola rotundifolia,* var. *americana, Vaccinium vacillans, Lysimachia quadrifolia, Aureolaria virginica* (*Gerardia virginica* Man. ed. 7), *Melampyrum lineare, Antennaria plantaginea, Helianthus divaricatus, Hieracium venosum, Sericocarpus asteroides, Solidago bicolor.*

(8) Plants of cool, moist woods: *Thelypteris Phegopteris, Lycopodium lucidulum, Taxus canadensis, Cinna latifolia, Carex leptonervia, C. norae-angliae, C. rosea*, var. *radiata, Clintonia borealis, Streptopus roseus, Trillium undulatum, Fagus grandifolia, Ribes lacustre, R. prostratum, Rubus canadensis, Oxalis Acetosella, Acer pennsylvanicum, A. spicatum, Circaea alpina, Cornus canadensis, Sambucus racemosus, Viburnum alnifolium, Aster acuminatus.*

(9) Plants of wooded swamps: *Thelypteris cristata, Osmunda cinnamomea, O. regalis*, var. *spectabilis, Carex intumescens*, var. *Fernaldii, C. tenella, Symplocarpus foetidus, Habenaria psycodes, Benzoin aestivale, Mitella nuda, Ribes hirtellum, R. triste*, var. *albinervium, Rubus hispidus, R. pubescens, Rhus Vernix, Ilex verticillata*, var. *tenuifolia, Nemopanthus mucronata, Rhamnus alnifolia, Viola incognita*, var. *Forbesii, Lysimachia thyrsiflora, Lycopus uniflorus, Viburnum cassinoides, V. Opulus*, var. *americanum, Aster puniceus, Bidens connata, Cirsium muticum, Senecio aureus.*

(10) Plants of bogs: *Carex canescens*, var. *subloliacea, C. diandra* and var. *ramosa, C. limosa, C. paupercula, C. rostrata* and var. *utriculata, Eriophorum tenellum, Rhynchospora alba, Scirpus hudsonianus, Smilacina trifoliata, Pogonia ophioglossoides, Liparis Loeselii, Sarracenia purpurea, Drosera rotundifolia, Potentilla palustris, Epilobium molle, Andromeda glaucophylla, Chamaedaphne calyculata, Ledum groenlandicum, Vaccinium corymbosum, V. macrocarpon, V. Oxycoccus, Menyanthes trifoliata, Galium labradoricum, Lonicera caerulea*, var. *villosa.*

(11) Plants of rocky summits: *Woodsia ilvensis, Agropyron caninum, Deschampsia flexuosa, Carex umbellata, Aquilegia canadensis, Corydalis sempervirens, Potentilla tridentata, Pyrus melanocarpa, Rhus copallina, Rhus toxicodendrum, Psedera quinquefolia*, var. *hirsuta, Aralia hispida, Gaylussacia baccata, Vaccinium pennsylvanicum.*

(12) Plants of dry open sand or gravel: *Juniperus communis*, var. *depressa, J. virginiana, Andropogon scoparius*, var. *frequens, Eragrostis pectinacea, Panicum lindheimeri, Carex cephalophora, C. festucacea*, var. *brevior, C. tricops*, var. *hirsuta, Cyperus filiculmis*, var. *macilentus, Spiranthes gracilis, Quercus ilicifolia, Potentilla pumila, Rubus villosus, Lespedeza hirta, Polygala verticillata*, var. *ambigua, Hypericum gentianoides, Helianthemum Bicknellii* (*H. majus* Man. ed. 7), *H. canadense, Lechea intermedia, Trichostema dichotomum, Aster ericoides, Gnaphalium polycephalum, Krigia virginica.*

Besides the factors above stated which determine the distribution of plants within their geographical range, there is the question of geographical range itself which determines the flora of a given region. The past history of plant life on this continent is not well enough known to enable us to do more than guess at the different courses which plants have taken to reach the same region, but we do know of the plants of any given region that some are commoner to the north, south, east, or west, and we think of certain plants therefore as representatives of northern, southern, eastern, or western floras. Berkshire County is a particularly interesting field for the study of the distributional relationships of plants. Its flora contains a large proportion of plants that reach the limits of their ranges within or very near its borders. The great wall of the Hoosac Plateau and the broad valley of the Connecticut apparently form a barrier against the progress farther east of many plants which are found from Berkshire County far westward. The drier soil and lower elevation of the country south of Berkshire proves a barrier to the further progress of northern plants, or it may well be that these plants have been retreating northward, after the glacial waters were drained off and that the high land or bogs of Berkshire still offer a suitable environment.

A number of plants that occur in Berkshire County have not been found farther north. These are either plants that require the warm well-drained country lacking to the north, or plants that occupy the ridges of the Alleghanies southward to Georgia and a very few that follow the coastal plain to Florida.

A great number of plants characteristic of Berkshire County are plants that need lime in the soil. Their range coincides with surprising exactness with that of the ancient sea-floors which are now exposed in the limestone areas of the north and west. These plants extend either from northern Maine through northern New Hampshire, Vermont and across New York, Ohio, and Wisconsin to Alaska, or south through Kentucky, Missouri and Kansas to Texas, according as they are plants that love warmth, or are plants of northern latitudes.

The distribution of some plants seems to be determined by none of the factors of soil or warmth as at present understood. Such plants are everywhere rare or local in their distribution.

The changes brought about by the white man have profoundly altered the original flora of the County. The clearing of the forests and the cultivation of meadows and fields have changed the appear-

ance of the valleys and to a certain extent also that of the slopes of the mountains. In 1828, according to Bascom (Appearance and Disappearance of Plants, Proceedings of the Berkshire Historical and Scientific Society, **3**: 301–315, 1899), there were in Berkshire 185 sawmills and 38 tanneries. Pine, Hemlock and Spruce have diminished more than the hardwoods. The only places where the original flora has remained unaltered are the peat bogs around small ponds and deep gorges and steep cliffs where lumbering was impossible.

The introduction of plants foreign to the County, either from Europe or from other parts of the New World, is chiefly noticeable in towns and about farm land. Certain weeds, however, follow every highway, and even wood roads, and other introduced species have invaded the rocky summits of the remotest hills. On the summit of Greylock, one can count a dozen introduced species. Three introduced species have spread so widely that they have become characteristic features of the landscape. These are the Buttercup (*Ranunculus acris*), the Daisy (*Chrysanthemum leucanthemum*, var. *pinnatifidum*) and the White Willow (*Salix alba*, var. *vitellina*).

In many parts of the County the clearings and hillside pastures are reverting to brush and small timber. Steeple-bush (*Spiraea tomentosa*) and Raspberries (*Rubus idaeus*, var. *strigosus*) first cover the ground, then Birches and White Pines spring up. A rough estimate by Mr. Cook, the State Forester, puts the percentage of forested area in five Berkshire towns as follows:—

Town	*Total area in acres*	*Percentage forest*
Pittsfield	27,000	30%
Sheffield	32,000	40%
Savoy	25,000	60%
Sandisfield	24,000	70%
Florida	12,800	85%

The plants in the following groups are those which reach the limits of their ranges in or near Berkshire County. The list is confined to species or well-marked varieties whose distribution is well known. The geographical range is based on published records and on an examination of the collections of the New England Botanical Club and the Gray Herbarium.

(1) Plants that occur in Berkshire County, but have not been found native east of the Connecticut River, ranging northwestward, westward, or southwestward, and in the case of certain calciphiles

northeastward (stations in the Connecticut Valley in parentheses): *Asplenium ebenoides, Pellaea atropurpurea, Equisetum variegatum, Sparganium fluctuans, Potamogeton alpinus, P. Friesii, Sagittaria cuneata* (*S. arifolia* Man. ed. 7), *Carex alopecoidea, C. rosea*, var. *minor, C. eburnea, C. Davisii, C. formosa, C. Hitchcockiana, C. oligocarpa, C. Schweinitzii, C. trichocarpa, C. Tuckermani, Scirpus Peckii, S. lineatus, Juncus Dudleyi, Uvularia grandiflora, Populus Tacamahacca* (*P. balsamifera* Man. ed. 7), *Salix serissima, Quercus macrocarpa, Q. Muhlenbergii, Morus rubra, Chenopodium Boscianum, Arenaria macrophylla, Cerastium nutans, Ranunculus circinatus, Podophyllum peltatum, Arabis lyrata, Ribes triste*, var. *albinervium, Waldsteinia fragarioides* (Greenfield), *Polygala Senega, Ilex monticola*, var. *mollis, Impatiens pallida* (Deerfield), *Hypericum Ascyron* (Northampton), *Viola latiuscula, V. nephrophylla, V. Selkirkii, Sanicula trifoliata, Agastache nepetoides, A. scrophulariaefolia, Blephilia ciliata, B. hirsuta, Stachys palustris*, var. *homotricha, Physalis heterophylla*, var. *ambigua, Veronica virginica, Lonicera hirsuta, Viburnum affine* (*V. pubescens* Man. ed. 7), *Lobelia siphilitica, Aster prenanthoides, Cirsium Hillii, Helenium autumnale, Solidago hispida* (Northampton).

(2) Plants that occur in Berkshire County, that have not been found in Connecticut, ranging northward, northwestward, or northeastward: *Polystichum Braunii, Thelypteris spinulosa*, var. *americana, Potamogeton strictifolius, Poa nemoralis, Cyperus Houghtonii, Carex setacea, C. lenticularis, C. deflexa, C. albicans, Juncus filiformis, Luzula parviflora, Cypripedium arietinum, Habenaria obtusata, Salix lucida*, var. *angustifolia, Alnus mollis, Polygonum lapathifolium*, var. *salicifolium* (*P. tomentosum*, var. *incanum* Man. ed. 7), *Pyrus sitchensis, Amelanchier Bartramiana, Viola renifolia, Circaea canadensis* (*C. intermedia* Man. ed. 7), *Pyrola asarifolia*, var. *incarnata, P. secunda*, var. *obtusata, Hydrophyllum canadense, Isanthus brachiatus, Symphoricarpus albus*, var. *pauciflorus, Solidago macrophylla, S. Randii, Aster polyphyllus, A. longifolius*, var. *villicaulis*.

(3) Plants that occur in Berkshire County, not found native in Vermont, ranging southward, or southwestward: *Juniperus communis, Digitaria filiformis, Eragrostis Frankii, Panicum umbrosum, Carex albolutescens*, var. *cumulata, C. laxiculmis, C. scorsa, C. atlantica* (*C. sterilis* Man. ed. 7), *C. tetanica, C. typhina, Orontium aquaticum, Juncus militaris, Chamaelirium luteum, Smilax rotundifolia, Hypoxis hirsuta, Sisyrinchium gramineum, Quercus coccinea, Polygonum tenue,*

Silene pennsylvanica, *Cimicifuga racemosa*, *Cardamine Douglassii*, *Sedum ternatum*, *Potentilla pumila*, *Prunus americana*, *Rubus Enslenii*, *Linum virginianum*, *Vitis aestivalis*, *Elatine americana* (*E. minima* Man. ed. 7), *Viola palmata*, *Angelica villosa*, *Clethra alnifolia*, *Rhododendron nudiflorum*, *Vaccinium stamineum*, *Gentiana Andrewsii*, *Cuscuta arvensis*, *Lycopus virginicus*, *Utricularia minor*, *Aster Lowrcianus*, var. *lanceolatus*, *Prenanthes Serpentaria*, *Solidago rigida*, *S. speciosa*.

PTERIDOPHYTA. FERNS AND FERN ALLIES.

POLYPODIACEAE. FERN FAMILY.

ADIANTUM. Maidenhair.

A. pedatum L. Maidenhair.— Rich woods; common. On the slopes of the plateau to 1500 feet; on the slopes of Greylock to 2000 feet.

ASPLENIUM. Spleenwort.

× **A. ebenoides** R. R. Scott.— A hybrid between *Asplenium platyneuron* and *Camptosorus rhizophyllus*. First reported from Berkshire Co. by Mrs. J. R. Sanford (*vid.* Rhodora, **8**: 113, 1906), growing on limestone rocks in the southern part of Sheffield. Three plants were subsequently found by Walters in another locality in the same town.

A. platyneuron (L.) Oakes. Ebony Spleenwort.— Rocky pastures and open rocky woods, generally at the bases of ledges; frequent. Grows chiefly on limestone, but also on serpentine (Florida) and schist (West Stockbridge). Rare on the plateau; Washington (C. S. Lewis).

forma **serratum** (E. S. Miller), comb. nov.— (*A. platyneuron*, var. *serratum* E. S. Miller, Bull. Torr. Bot. Club, **4**: 41, 1873.)

Occasional with the type, Sheffield.

A. Ruta-muraria L. Rue Spleenwort.— Limestone cliffs and boulders; occasional. Williamstown; North Adams; Lenox; Stockbridge; New Marlboro; Sheffield.

A. Trichomanes L. Maidenhair Spleenwort.— On or near shaded rocks, chiefly calcareous; frequent. Rare on the plateau; Washington and Becket (C. S. Lewis).

ATHYRIUM.

(*Asplenium* Man. ed. 7 and Ill. Fl. ed. 2 in part; *vid.* Rhodora, **19**: 170, 1917.)

A. acrostichoides (Sw.) Diels. Silvery Spleenwort.— (*Athyrium thelypteroides* Ill. Fl. ed. 2.)

Rich, moist woods, particularly along brooks; frequent, except on the plateau.

A. angustifolium (Michx.) Milde. NARROW-LEAVED SPLEENWORT.— (*Asplenium pycnocarpon* Ill. Fl. ed. 2).

Rich woods, generally in alluvial pockets spread by brooks at the bases of rich slopes, often with *Thelypteris Goldiana;* occasional in the valley. Williamstown (Churchill); Adams (Schweinfurth); Cheshire (Winslow); Pittsfield; Lenox; Stockbridge; Sheffield. On South Mountain, Pittsfield, one colony grows in rich soil on a flat rock.

The ferns which have passed in Massachusetts as *Asplenium Filix-femina* (L.) Bernh. have been lately treated as including two species and several varieties (*vid.* Butters, Rhodora, **19**: 181 seq., 1917). *Athyrium angustum* (Willd.) Presl. is apparently the only species in this group that occurs in Berkshire County. It differs from *Athyrium asplenioides* (Michx.) Desv., which is found in eastern Massachusetts, in having the horizontal or somewhat oblique rootstock completely concealed by the thick fleshy bases of the old fronds. The species and two varieties may be distinguished by the following key.

Key to Athyrium angustum and varieties.

a. Fronds dimorphic, the fertile coriaceous, contracted, sori at maturity confluent and covering the lower side of the fertile pinnules. Sun forms, found only in region of hot summers.

b. Longest pinnae of the fertile frond 5–12 cm. long, pinnules 4–12 mm. long, simple, sori mainly asplenoid (*vid.* Rhodora, **19**: 174, 176, 1917); pinnules of sterile fronds oblong-obtuse, but slightly toothed or lobed ..... *A. angustum*, f. *typicum.*

b'. Longest pinnae of fertile frond 1–2 dm. long, pinnules 12–25 mm. long, pinnatifid, sori several on each of the lower segments, often horseshoe-shaped; pinnules of sterile fronds oblong-lanceolate, strongly toothed or pinnatifid, somewhat acute.

A. angustum, var. *elatius.*

a'. Fronds not dimorphic, coriaceous or contracted, sori discrete at maturity. Forms of regions with cool summers, found also in dense shade in warmer regions. Pinnules lanceolate, sub-acute, strongly toothed or pinnatifid, the segments toothed, membranous wing along the rhachis obscure or wanting ..... *A. angustum*, var. *rubellum.*

A. angustum (Willd.) Presl. LADY FERN.— (*Asplenium Filix-femina* Man. ed. 7 in part; *Athyrium Filix-femina* Ill. Fl. ed. 2 in part; *vid.* Rhodora, **19**: 190, 1917.)

Dry open thickets; frequent.

var. **elatius** (Link) Butters.— (*Vid.* Rhodora, **19**: 191, 1917.) Dry woods, thickets and clearings; frequent in the southern part of the valley.

var. **rubellum** (Gilbert) Butters. — (*Vid.* Rhodora, **19**: 193, 1917.) Rich woods and swamps; common.

CAMPTOSORUS. Walking Leaf.

C. rhizophyllus (L.) Link. Walking Leaf; Walking Fern.— On limestone, chiefly in shade; frequent in the valley. Becket (C. S. Lewis).

forma **auriculatus**, f. nov.— Auriculis elongatis. Auricles elongated, sometimes rooting.

Limestone ledge, New Marlboro.

CRYPTOGRAMMA. Rock Brake.

C. Stelleri (Gmel.) Prantl. Slender Rock Brake.— On shaded limestone cliffs, Bullock's Ledge, Williamstown.

CYSTOPTERIS. Bladder Fern.

(*Filix* Ill. Fl. ed. 2.)

C. bulbifera (L.) Bernh. Bulb-bearing Fern.— Wet banks and moist rocks, chiefly in shade, generally but not always in calcareous soil; frequent in the valley and on the slopes of Greylock and of The Dome, but rarer on the plateau. Washington and Becket (C. S. Lewis).

C. fragilis (L.) Bernh. Fragile Bladder Fern.— Shaded cliffs, moist banks and rocky wooded hillsides; frequent.

DENNSTAEDTIA.

(*Dicksonia* Man. ed. 7; *vid.* Rhodora, **21**: 175, 1919.)

D. punctilobula (Michx.) Moore. Hay-scented Fern.— Dry woods and upland hillsides; common. When growing in shade near an opening, this fern turns the face of the frond, that is the side that does not bear the spores, to the light.

ONOCLEA.

O. sensibilis L. Sensitive Fern.— Wet meadows, swampy thickets and wet woodland; common.

forma **obtusilobata** (Schkuhr) Gilbert.— Washington (C. S. Lewis); Lenox; New Marlboro.

PELLAEA. Cliff Brake.

P. atropurpurea (L.) Link. Purple Cliff Brake.— Limestone ledges; occasional.

POLYPODIUM. Polypody.

P. vulgare L. Common Polypody.— Shaded rocks, chiefly on schist, but occasionally on limestone; common.

forma **attenuatum** (Milde) Gilbert.— Rich woods; occasional. Becket (C. S. Lewis); South Mountain, Pittsfield; Bash Bish Falls, Mt. Washington.

forma **auritum** (Willd.), comb. nov.— (*P. vulgare β auritum* Willd. Sp. Pl. **5**: 173, 1810.)

Becket (C. S. Lewis).

POLYSTICHUM.

P. acrostichoides (Michx.) Schott. Christmas Fern.— Rocky woods; common. A plant from Lee has the frond subdivided at the tip, so that there are four separate tips, the two longest 10 cm. in length.

forma **incisum** (Gray) Gilbert.— (var. *Schweinitzii* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **11**: 35, 1909.)

Occasional with the type. Williamstown; Florida; Washington and Becket (C. S. Lewis); Lenox; Stockbridge; Great Barrington. A plant collected by Walters in Lanesboro has broad obtuse and incised pinnae of the year, while the fronds of the year before are normal.

P. Braunii (Spenner) Fée.— On the margins of cold mountain brooks, on Greylock and on Fife Brook, Florida. Two plants in rich leaf mould, South Mountain, Pittsfield (S. W. Bailey). These are the only known stations for this northern fern in Massachusetts.

PTERETIS.

(*Matteuccia* Ill. Fl. ed. 2; *Onoclea* Man. ed. 7; *vid.* Rhodora, **21**: 175, 1919.)

P. nodulosa (Michx.) Nieuwl. Ostrich Fern.— (*M. Struthiopteris* Ill. Fl. ed. 2; *O. Struthiopteris* Man. ed. 7.)

Alluvial soil along rivers and brooks to an altitude of 1500 ft.; common.

PTERIDIUM. Brake; Bracken.

(*Pteris* Man. ed. 7; *vid.* Rhodora, **21**: 176, 1919.)

P. latiusculum (Desv.) Maxon. Common Brake.— (*Pteris aquilina* Man. ed. 7; *Pteridium aquilinum* Ill. Fl. ed. 2.)

Borders of woods, open woodland, rocky upland pastures and clearings; common.

THELYPTERIS. Shield Fern.

(*Aspidium* Man. ed. 7; *Phegopteris* Man. ed. 7; *Dryopteris* Ill. Fl. ed. 2; *vid.* Rhodora, **21**: 174, 176, 1919.)

T. Boottii (Tuckerman) Nieuwl. Boott's Shield Fern.— Swampy woods; frequent. Perhaps a hybrid between *Thelypteris cristata* and *T. spinulosa*, var. *intermedia*. Specimens collected in Washington by C. S. Lewis have the later fronds with laciniate segments, apparently due to the presence of a borer in the rootstock.

T. cristata (L.) Nieuwl. Crested Shield Fern.— Borders of swampy woods and low meadows; frequent.

var. **Clintoniana** (D. C. Eaton) Weatherby. Clinton's Shield Fern.— (*D. Clintoniana* Ill. Fl. ed. 2.)

Swampy woods; frequent in the valley, occasional on the plateau.

T. Dryopteris (L.) Slosson. Oak Fern.— Cool woods, often under conifers; frequent.

T. Goldiana (Hook.) Nieuwl. Goldie's Shield Fern.— Rich woods, generally in alluvial pockets spread by brooks at the bases of slopes of rich soil, often in company with *Athyrium angustifolium*; occasional in the valley. Florida (Hunnewell); Williamstown (Churchill); Cheshire (Winslow); Lanesboro (Churchill); Pittsfield; Washington (C. S. Lewis); Lenox; Stockbridge; Sheffield (Walters).

T. hexagonoptera (Michx.) Weatherby. Broad Beech Fern.— Rich moist soil in rather open woodland; occasional in the valley. Williamstown (Churchill); Hancock (Churchill); Lenox; Stockbridge; Great Barrington; Sheffield.

T. marginalis (L.) Nieuwl. Marginal Shield Fern.— Rocky or swampy woods, often on rocks; common.

forma **elegans** (Robinson) Weatherby, comb. nov.— (*Aspidium*

marginale, var. *elegans* J. Robinson, Ferns of Essex County, Mass., 151, 1875.)

Rich woods; frequent.

T. noveboracensis (L.) Nieuwl. New York Shield Fern.— Moist well-drained woods; common.

T. palustris Schott. Marsh Fern.— (*D. Thelypteris* Ill. Fl. ed. 2; *A. Thelypteris* Man. ed. 7.)

Wet meadows, swampy thickets and moist woodland; common. On the summit of Greylock, 3500 feet.

T. Phegopteris (L.) Slosson. Beech Fern.— Cool woods, especially on moist banks; frequent in the valley, common on the plateau.

T. simulata (Davenp.) Nieuwl.— Swampy woods, in small colonies; occasional. Washington (C. S. Lewis); Ward Pond, Becket; Shaw Pond, Otis; Big Pond, Otis; Sandisfield (Walters).

T. spinulosa (O. F. Müller) Nieuwl. Spinulose Shield Fern.— Swampy woods; frequent.

var. **americana** (Fisch.) Weatherby.— (var. *dilatatum*, f. *anadenium* Man. ed. 7; *D. dilatata* Ill. Fl. ed. 2.)

Common in rocky woods on the upper slopes of Greylock, and probably occasional on the plateau, as a specimen collected by C. S. Lewis from a shady swamp in Washington (altitude 1700 feet) has been identified by C. A. Weatherby as this variety.

var. **intermedia** (Muhl.) Nieuwl.— (*D. intermedia* Ill. Fl. ed. 2.)

Rocky or swampy woods; common. Broad forms approaching var. *americana* occur in cool woods and swamps, as at Ice Glen, Stockbridge; Ice Gorge, Great Barrington; The Dome, Mt. Washington. A form with very narrow pinnules, approaching var. *concordiana* occurs on Fern Cliff, Lee.

Hybrid forms of Thelypteris.

T. cristata × **marginalis.**— Lenox; Washington (C. S. Lewis).

T. cristata × **spinulosa.**— Lenox; Washington (C. S. Lewis).

T. cristata, var. **Clintoniana** × **spinulosa**, var. **intermedia.**— Cheshire (Winslow); Washington (C. S. Lewis).

T. cristata, var. **Clintoniana** × **Goldiana.**— North Adams (Churchill).

T. Goldiana × **marginalis.**— Cheshire (Winslow).

T. marginalis × **spinulosa**, var. **intermedia.**— Washington (C. S. Lewis).

WOODSIA.

W. ilvensis (L.) R. Br. Rusty Woodsia.— Exposed rocks; occasional. Stockbridge; West Stockbridge; Monterey; New Marlboro; Mt. Washington; Sheffield.

W. obtusa (Spreng.) Torr. Blunt-lobed Woodsia.— Exposed rocks or shaded ledges, chiefly calcareous; occasional in the valley. Cheshire (Winslow); Pittsfield; Stockbridge; New Marlboro; Egremont (Walters); Sheffield.

OSMUNDACEAE. FLOWERING FERN FAMILY.

OSMUNDA. Flowering Fern.

O. cinnamomea L. Cinnamon Fern.— Low wet woods, borders of swamps in the valley, and wet hillsides on the plateau, where it reaches an altitude of 2100 feet (Florida); common.

forma **bipinnatifida** Clute.— Swampy woods, Sandisfield.

forma **frondosa** (T. & G.) Britton.— (var. *frondosa* Man. ed. 7.) Sheffield (Churchill).

O. Claytoniana L. Interrupted Fern.— Moist woods and on the plateau on ill-drained hillsides; common.

O. regalis L., var. **spectabilis** (Willd.) Gray. Royal Fern.— (*O. regalis* Man. ed. 7; *vid.* Rhodora, **21**: 176, 1919.)

Borders of ponds, swamps and wet woods, reaching an altitude of 2000 feet (Savoy); frequent.

OPHIOGLOSSACEAE. ADDER'S TONGUE FAMILY.

BOTRYCHIUM. Moonwort; Grape Fern.

B. angustisegmentum (Pease & Moore) Fernald.— (*B. lanceolatum*, var. *angustisegmentum* Man. ed. 7; *vid.* Rhodora, **17**: 87, 1915; *B. lanceolatum* Ill. Fl. ed. 2.)

Rich leaf mould, chiefly under deciduous trees, often with *B. ramosum*; frequent.

B. dissectum Spreng.— (*B. obliquum*, var. *dissectum* Man. ed. 7.)

Woods and pastures; frequent.

forma **elongatum** (Gilbert & Haberer), comb. nov. (*B. obliquum*, var. *elongatum* Gilbert & Haberer, Fern Bull. **11**: 89, 1903, and Man. ed. 7.)

Pasture, Mt. Washington.

forma **obliquum** (Muhl.) Fernald.— (*B. obliquum* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **23**: 151, 1921.)

Fields, hillsides, pastures and open woods; frequent.

B. ramosum (Roth) Aschers.— (*B. neglectum* Ill. Fl. ed. 2.)

Rich leaf mould, chiefly under deciduous trees, often associated with *B. angustisegmentum*; frequent.

B. simplex E. Hitchcock.— New Ashford, in pastures not far from brook (Andrews); Washington (C. S. Lewis); rich woods, Stockbridge; Sheffield (Churchill).

B. ternatum (Thunb.) Sw., var. **intermedium** D. C. Eaton.— (*B. silaifolium* Ill. Fl. ed. 2.)

Pastures and open woods; frequent.

B. virginianum (L.) Sw. Rattlesnake Fern.— Rich woods; common. A plant from Florida has the fertile segment divided into two full-sized divisions.

var. **intermedium** Butters.— (*B. virginianum* Man. ed. 7 in part.)

Dry, rocky upland woods, North Adams (Fernald and Long).

Botrychium virginianum, var. *intermedium* has lately been distinguished from the type (*vid.* Rhodora, **19**: 207, 1917).

Ripe sporangia straw-colored, opening but slightly in dehiscence, their walls composed of regular cells; pinnules of the sterile frond ovate to lance-ovate, their ultimate segments spatulate.....*B. virginianum*, var. *intermedium*.

Ripe sporangia brown, opening rather widely in dehiscence, their walls composed, at least in part, of irregular cells with sinuous walls; pinnules of the sterile frond much dissected, lanceolate, deeply pinnatifid or nearly pinnate, and the ultimate segments oblong or cuneate or decurrent at the base, lanceolate and scarcely or not at all spatulate.....*B. virginianum*.

OPHIOGLOSSUM. Adder's Tongue.

O. vulgatum L. Adder's Tongue.— Mucky pockets in low meadows; frequent. In thin soil on a limestone outcrop in Great Barrington.

MARSILEACEAE.

MARSILEA.

M. quadrifolia L.— A small colony in the inlet to Prospect Pond, Egremont. An interesting European aquatic often cultivated and probably introduced, perhaps accidentally, at the above station.

EQUISETACEAE. HORSETAIL FAMILY.

EQUISETUM. Horsetail.

E. arvense L. Common Horsetail.— Wet roadsides, and banks and sandy shores; common.

E. fluviatile L. Pipes.— Marshes, shallow water and muddy shores; common.

E. hyemale L., var. **affine** (Engelm.) A. A. Eaton. Scouring Rush.— Sandy or gravelly banks; frequent.

forma **ramosum** A. A. Eaton.— *Vid.* Fern Bull. **11**: 112 (1903). Occasional. Florida; Great Barrington.

E. scirpoides Michx.— Wet gravelly banks; occasional. Williamstown (Andrews); North Adams; Adams (Knowlton and Bean); Stockbridge; New Marlboro.

E. sylvaticum L., var. **pauciramosum** Wilde., forma **multiramosum** Fernald.— (*E. sylvaticum* Man. ed. 7 in part).

Swampy woods and moist shaded banks; frequent.

Practically all the material of *E. sylvaticum* collected in Berkshire County is the freely-forking form, described by Professor Fernald (Rhodora, **20**: 131, 1918). A specimen from Adams, less freely forking, might be considered the typical var. *pauciramosum*.

E. variegatum Schleich.— Low ground or wet gravelly banks; occasional. Williamstown (Andrews); Stockbridge; Sheffield.

LYCOPODIACEAE. CLUB MOSS FAMILY.

LYCOPODIUM. Club Moss.

Lycopodium annotinum L.— Cool woods; frequent.

var. **acrifolium** Fernald.— *Vid.* Rhodora, **17**: 124 (1915). Mt. Washington (Floyd).

Leaves mostly spreading or reflexed, those of the fruiting branches 5.5–11 mm. long ..... *L. annotinum.*

Leaves strongly ascending or appressed, those of the fruiting branches 2.5–6 mm. long ..... var. *acrifolium.*

L. clavatum L. Common Club Moss.— Dry woods and clearings; common. A form with elongated sterile spikes, mostly simple, 2 to 3 dm. long and no fertile spikes, constant each season, has been collected in Hancock (A. K. Harrison).

var. **megastachyon** Fernald & Bissell.— Spikes solitary. (*Vid.* Rhodora, **12**: 53, 1910.)

Dry thickets; frequent, especially on the upland.

L. complanatum L., var. **flabelliforme** Fernald. GROUND PINE.— (*L. complanatum* Ill. Fl. ed. 2 in part.)

Dry woods and clearings, especially under pines; common.

L. inundatum L.— Shores of ponds and wet open ground; occasional. Bank near cold stream, altitude 2000 feet, North Adams (Andrews); Basin and Spectacle Ponds, Becket; low meadow, Sheffield.

L. lucidulum Michx.— Cool woods; common.

L. obscurum L. TREE CLUB MOSS.— Woods, generally dry, occasionally swampy; frequent.

var. **dendroideum** (Michx.) D. C. Eaton.— Open woodlands; common.

L. Selago L. Bank near cold stream on the northeast face of Greylock, altitude 2000 feet, one small station (Andrews). This is the only station known in Massachusetts for this plant of high latitudes and altitudes. Specimen in Williams College Herbarium.

L. tristachyum Pursh.— Cheshire (Winslow); rather moist woods near Ward Pond, Becket, altitude 1600 feet; dry woods, Sheffield.

SELAGINELLACEAE.

SELAGINELLA.

S. apoda (L.) Fernald.— (*S. apus* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **17**: 68, 1915.)

Wet meadows and ill-drained hillsides; frequent in the valley, apparently following the limestone up the sides of the valley, reaching an altitude of 1300 feet in Tyringham.

S. rupestris (L.) Spring.— Exposed rocks; occasional. Florida, on serpentine; West Stockbridge, on schist; New Marlboro; Sheffield, on limestone, altitude 700 feet; Bash Bish Falls, Mt. Washington.

ISOËTACEAE. QUILLWORT FAMILY.

ISOËTES. QUILLWORT.

I. echinospora Dur., var. **Braunii** (Dur.) Engelm.— (*I. Braunii* Ill. Fl. ed. 2.)

Shallow water of ponds and streams; frequent, particularly on the upland. Occasionally on exposed muddy shores and at other times at a depth of several feet.

SPERMATOPHYTA. SEED PLANTS; FLOWERING PLANTS.

GYMNOSPERMAE. GYMNOSPERMS.

TAXACEAE. YEW FAMILY.

TAXUS. Yew.

T. canadensis Marsh. Ground Hemlock.— Cool woods and shaded slopes; common.

PINACEAE. PINE FAMILY.

ABIES. Fir.

A. balsamea (L.) Mill. Balsam Fir.— Swamps and moist slopes, along the plateau from Sandisfield northward; frequent in Sandisfield, common in parts of Washington and on Greylock.

JUNIPERUS. Juniper.

J. communis L.— A single tree, 3 m. high, in open woodland, Pittsfield.

var. **depressa** Pursh. Common Juniper.— Hillside pastures and borders of woodland; frequent in Sheffield, rare elsewhere in the valley. Frequent on a gravelly hillside, Cold Spring Road, Williamstown. Occasional on the plateau, Savoy, Washington (altitude 1800 feet).

J. virginiana L. Red Cedar; Savin.— Hillside pastures; frequent in Sheffield, occasional in the Housatonic Valley as far north as Lee. A fine grove on a gravelly hillside on the Cold Spring Road, Williamstown. A few scattered trees in South Sandisfield; not noted elsewhere on the plateau.

LARIX. Larch.

L. laricina (DuRoi) Koch. Larch; Tamarack.— Wet hillsides and swamps; common.

PICEA. Spruce.

P. mariana (Mill) BSP. Bog Spruce; Black Spruce.— Peat bogs; occasional. Adams (Knowlton & Bean); Ward Pond, Becket; Wolf Swamp, Sandisfield. In the last two localities the Spruce is the host for Dwarf Mistletoe (*Arceuthobium*).

P. rubra (DuRoi) Dietr. Red Spruce.— (*P. rubens* Ill. Fl. ed. 2.) Rocky summits on the plateau; occasional in the valley, (a few trees in a swamp in Stockbridge). Some fine timber still left on Greylock.

forma **virgata** Rehder.— Williamstown (Walker).

Differs from the type by the long and slender branches entirely destitute of branchlets (*vid.* Rhodora, **9**: 110, 1907).

PINUS. Pine.

P. resinosa Ait. Red Pine; Norway Pine.— Rocky woods; rare. Summit of Tom Ball, Alford; Stockbridge.

P. rigida Mill. Pitch Pine.— Sandy soil; frequent in Sheffield, occasional in Stockbridge, New Marlboro, Sandisfield, Great Barrington; summit of The Dome, Mt. Washington.

P. Strobus L. White Pine.— In almost every soil and situation; common. Young pines grow up in the shelter of Hardback (*Potentilla fruticosa*) and gradually kill it out.

P. sylvestris L. Scotch Pine.— An occasional escape from cultivation. Lanesboro (Walters).

THUJA. Arbor Vitae.

T. occidentalis L. Arbor Vitae; White Cedar.— Commonly planted and occasionally spreading. Although Arbor Vitae has been found native in Connecticut and New York, in localities close to Berkshire Co., no native trees have been discovered in the County.

TSUGA. Hemlock.

T. canadensis (L.) Carr. Hemlock.— Rocky woods; common.

TYPHACEAE. CAT-TAIL FAMILY.

TYPHA. Cat-tail.

T. angustifolia L.— Borders of swamps; rare. Stockbridge; Sandisfield.

T. latifolia L. CAT-TAIL.— Borders of swamps and marshes, ditches; frequent.

SPARGANIACEAE. BUR-REED FAMILY.

SPARGANIUM. BUR-REED.

S. americanum Nutt.— Muddy shores; frequent.

var. **androcladum** (Engelm.) Fernald & Eames.— (*S. androcladum* Ill. Fl. ed. 2.) Occasional with the type.

The validity of this variety is questioned by Blake (Rhodora, **15**: 157, 1913).

S. angustifolium Michx.— Ponds and slow streams; frequent.

S. diversifolium Graebner.— Wet, roadside ditches on the plateau, brooks, swales, and muddy shores; common.

var. **acaule** (Beeby) Fernald & Eames.— (*S. acaule* Ill. Fl. ed. 2.) Common on the plateau.

S. eurycarpum Engelm.— Borders of ponds and rivers at low altitudes; common along the Housatonic River. Not noted on the plateau.

S. fluctuans (Morong) Robinson.— Upland ponds; occasional. Basin Pond, Becket; Shaw Pond, Otis; near East Pond, New Marlboro.

S. minimum Fries.— Border of swamp, Stockbridge.

NAJADACEAE. PONDWEED FAMILY.

NAJAS.

(*Naias* Ill. Fl. ed. 2.)

Najas flexilis (Willd.) Rostk. & Schmidt.— Ponds and slow streams; common in the valley, not noted on the plateau.

POTAMOGETON. PONDWEED.

P. alpinus Balbis.— Collected in Richmond in 1861 by J. W. Robbins. Specimen in the Gray Herbarium marked "e rivulo prope viam ferream."

P. americanus C. & S.— In streams and outlets of lakes; frequent in the valley. Stockbridge; New Marlboro; Sheffield.

P. amplifolius Tuckerm.— Ponds and sluggish streams; common.

P. angustifolius Berchtold & Presl.— Marsh, Egremont.

P. bupleuroides Fernald.— (*P. perfoliatus* Ill. Fl. ed. 2.)

Frequent in lakes in the southern part of the valley. Lake Garfield, Monterey; Lake Buell, New Marlboro; Stockbridge Bowl, Stockbridge.

P. confervoides Reichenb.— In Guilder Pond on the Dome, Mt. Washington, altitude 2000 feet. The only locality in the State for this local Pondweed.

P. dimorphus Raf.— In shallow water on sandy or gravelly bottom; frequent. Pontoosuc and Onota Lakes, Pittsfield; Shaw Pond, Otis; Lake Garfield, Monterey; Upper Spectacle Pond, Sandisfield.

The form with crested fruit is the common form in the Pittsfield lakes.

P. epihydrus Raf.— Ponds and brooks; common.

var. **cayugensis** (Wiegand) Benn.— Cranberry and Crane Ponds, West Stockbridge.

P. foliosus Raf.— In quiet shallow water; frequent. Muddy Pond, Washington; Pontoosuc and Onota Lakes, Pittsfield; Lake Buell, Monterey; Symon's Pond, Sandisfield; Mill River, New Marlboro.

P. Friesii Rupr.— Occasional; Konkapot Brook, Stockbridge; Mill River, New Marlboro.

P. heterophyllus Schreb.— Ponds, on gravelly bottom; common.

forma **longipedunculatus** (Mérat) Morong.— On gravelly bottom in deep water. Richmond Lake, Richmond; Stockbridge Bowl, Stockbridge.

forma **maximus** Morong.— Housatonic River, Stockbridge.

forma **myriophyllus** (Robbins) Morong.— Harmon Pond, Sheffield.

forma **terrestris** Schlecht.— Muddy shores, Stockbridge Bowl, Stockbridge.

P. hybridus Michx.— (*P. diversifolius* Ill. Fl. ed. 2.)

Plantin Pond, Mt. Washington.

P. lucens L.— Frequent in the southern part of the valley. Onota Lake, Pittsfield; Stockbridge Bowl, Stockbridge; Prospect Pond, Egremont; Harmon Pond, Sheffield.

P. natans L.— Ponds and slow streams; common.

P. Oakesianus Robbins.— On upland ponds; occasional. South Pond, Savoy; pools in bog, Monterey; Spectacle Pond, Sandisfield; Guilder Pond, Mt. Washington.

P. obtusifolius Mertens & Koch.— In cool ponds, on muddy bot-

tom. Shaw Pond, Becket; Parish Pond, Otis; Crane and Cranberry Ponds, West Stockbridge; Three-mile Pond, Sheffield.

P. pectinatus L.— Common throughout the southern part of the County, in shallow muddy ponds and in the Housatonic River. In Laurel Lake, Lee, it grows at the exceptional depth of six feet. Altitude 1450 feet, Muddy Pond, Washington.

P. praelongus Wulf.— In deep water (six feet) in lakes. Stockbridge Bowl, Stockbridge; Lake Garfield, Monterey; Harmon Pond, New Marlboro; Three-mile Pond, Sheffield.

P. pusillus L.— Shallow water in ponds and streams; common.

var. **tenuissimus** Mertens & Koch.— Stockbridge Bowl, Stockbridge; Prospect Pond, Egremont.

P. Robbinsii Oakes.— In shallow water of ponds and lakes, throughout the southern half of the County, generally associated with *P. pectinatus*. A plant with a single perfectly developed fruit collected in Pontoosuc Lake, Pittsfield. The sterile shoots form close mats over the bottom.

P. strictifolius Benn.— In quiet water of lakes; occasional. Onota Lake, Pittsfield; Stockbridge Bowl, Stockbridge; Crane Pond, West Stockbridge.

P. Vaseyi Robbins.— In quiet water, Lake Garfield, Monterey.

P. zosterifolius Schumacher.— (*P. compressus* Ill. Fl. ed. 2.)

In lakes and in the Housatonic River throughout the southern part of the valley.

JUNCAGINACEAE. ARROW GRASS FAMILY.

SCHEUCHZERIA.

S. palustris L.— Sedgy borders of peat bogs; rare. Sheffield; Monterey.

ALISMACEAE. WATER-PLANTAIN FAMILY.

ALISMA. Water-plantain.

A. Plantago-aquatica L.— (*A. subcordatum* Ill. Fl. ed. 2.)

Muddy shores and ditches; common.

SAGITTARIA. Arrow-head.

S. arifolia Nutt.— Shallow water; occasional. Onota Lake, Pittsfield; swale near Housatonic River, New Lenox; brook, Stockbridge; river flats, Sheffield (Churchill).

S. graminea Michx.— Lake shores; occasional in the valley. Onota Lake, Pittsfield, submersed; gravelly shore of Richmond Lake, Richmond, emersed; Stockbridge Bowl, Stockbridge.

S. heterophylla Pursh, forma **fluitans** Blake.— *Vid.* Rhodora, **15**: 159 (1913). (*S. rigida* Ill. Fl. ed. 2.)

Leaves all linear, or phyllodial and bladeless.

Shallow water of ponds; occasional. Stockbridge Bowl, Stockbridge; Crane Pond, West Stockbridge; Guilder Pond, Mt. Washington, altitude 2000 feet.

S. latifolia Willd.— Muddy shores and swamps; common. Five forms of this variable species occur in Berkshire County. The type form has been collected in Cheshire (Winslow) and North Adams (Fernald and Long).

forma **diversifolia** (Engelm.) Robinson.— Borders of lakes; frequent.

forma **gracilis** (Pursh) Robinson.— Shallow water, borders of lakes and streams; frequent.

forma **hastata** (Pursh) Robinson.— Shallow water; common.

forma **obtusa** (Muhl.) Robinson.— Swamps and riverbanks; frequent.

HYDROCHARITACEAE. FROG'S BIT FAMILY.

ELODEA. Water-weed.

(*Philotria* Ill. Fl. ed. 2.)

E. canadensis Michx. Water-weed.— Shallow water in ponds and streams; common in the valley.

VALLISNERIA. Eel Grass.

V. americana Michx. Eel Grass.— (*V. spiralis* Man. ed. 7; *vid.* Rhodora, **20**: 108, 1918.)

Shallow water of ponds and in the Housatonic River; frequent. Onota Lake, Pittsfield, covering the sandy bottom densely over many acres, turning reddish in September and browning the surface of the water; Stockbridge Bowl, Stockbridge; Crane Pond, West Stockbridge; shallow lagoons of the Housatonic River from Stockbridge to Sheffield.

GRAMINEAE. GRASS FAMILY.

AGROPYRON.

A. caninum (L.) Beauv. Awned Wheat Grass.— Rocky hills and ledges; occasional in the southern part of the valley. West Stockbridge Mt.; Tom Ball, Alford; Bear and Monument Mts., Great Barrington; New Marlboro; Sheffield.

forma **glaucum** Pease & Moore.— *Vid.* Rhodora, **12**: 71 (1910). Limestone ledges, New Marlboro and Sheffield.

Plants glaucous.

var. **tenerum** (Vasey) Pease & Moore.— *Vid.* Rhodora, **12**: 71 (1910). (*A. tenerum* Ill. Fl. ed. 2.)

Occasional on limestone hills, Sheffield.

Spikes generally long and slender (average length about 12–14 cm.), 3–12 mm. wide, awnless or with awns up to 6 mm. in length.

A. repens (L.) Beauv. Couch or Quick Grass.— Fields, roadsides, railroad embankments and cultivated ground; common.

AGROSTIS. Bent Grass.

A. alba L. White Bent Grass.— Meadows, fields, borders of streams and woods; common.

var. **aristata** Gray.— Bank of Deerfield River, Florida; sandy roadside, Lanesboro (Churchill).

var. **maritima** (Lam.) G. F. W. Mey.— (*A. maritima* Ill. Fl. ed. 2.)

Muddy shores and ditches; frequent in the valley, forming thick mats. In full blossom on Aug. 1 at Nigger Pond, Stockbridge, probably retarded by having been submerged.

var. vulgaris (With.) Thurb. Red Top.— Fields, borders of woods and streams, occasionally in damp woods and swamps; common.

A form with elongated inflorescence (*A. sylvatica* L.), occasional.

A. hyemalis (Walt.) BSP. Hair Grass.— Dry fields, rocky open hillsides, roadsides and wet sandy soil; common.

A. perennans (Walt.) Tuckerm. Thin Grass.— Low shaded ground and cool woods; common.

ALOPECURUS. Foxtail Grass.

A. aristulatus Michx. Floating Foxtail.— (*A. geniculatus*, var. *aristulatus* Man. ed. 7; *vid.* Rhodora, **19**: 165, 1917.)

Muddy shores and shallow water; frequent in the valley.

A. PRATENSIS L. MEADOW FOXTAIL.— Wet meadows, and fields; occasional. Hancock; Stockbridge; Sheffield.

ANDROPOGON. BEARD GRASS.

A. furcatus Muhl.— Dry fields and roadsides, gravelly shores; frequent in the southern part of the valley and on the flood-plain of the Deerfield River in Florida.

A. scoparius Michx., var. **frequens** Hubbard.— (*A. scoparius* Man. ed. 7 in part; *vid.* Rhodora, **19**: 103, 1917. *Schizachyrium scoparium* Ill. Fl. ed. 2 in part.)

Dry fields and rocky summits; common in the southern part of the valley, frequent elsewhere.

ANTHOXANTHUM. SWEET VERNAL GRASS.

A. ODORATUM L. SWEET VERNAL GRASS.— Meadows, pastures and wood-roads; common. Summit of Greylock, 3500 feet.

ARISTIDA. TRIPLE-AWNED GRASS.

A. dichotoma Michx. POVERTY GRASS.— Dry sandy soil, roadsides; occasional in the valley. Pittsfield; New Lenox; Sheffield.

ARRHENATHERUM. OAT GRASS.

A. ELATIUS (L.) Beauv. TALL OAT GRASS.— First observed in mowing-fields in 1917, has spread and become frequent in the valley.

ASPERELLA. BOTTLE-BRUSH GRASS.

(*Hystrix* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **14**: 187, 1912.)

A. hystrix (L.) Humb. BOTTLE-BRUSH GRASS.— (*Hystrix Hystrix* Ill. Fl. ed. 2; *Hystrix patula* Man. ed. 7; *vid.* Rhodora, **14**: 187, 1912.)

Rich woods and rocky ridges; frequent in the valley.

AVENA. OAT.

A. FATUA L.— Vacant lot, Pittsfield; dump, Lee; Stockbridge; about old saw-mill, Great Barrington. Neglected garden plot, Sheffield.

First noted in 1916, apparently becoming more frequent.

A. SATIVA L. COMMON OAT.— Frequent in waste places and along roadsides.

BRACHYELYTRUM.

B. erectum (Schreb.) Beauv.— Moist woods and flood-plains; common.

BROMUS. Brome Grass.

B. altissimus Pursh.— Rich moist soil; common along streams and in low ground.

B. ciliatus L.— Moist woods and low meadows; common.

B. commutatus Schrad.— (*B. racemosus* Ill. Fl. ed. 2 in part.)

Moist meadow and dooryard, Stockbridge.

B. hordeaceus L. Soft Chess.— Grassland, Stockbridge.

B. inermis Leyss.— Railroad embankment, Stockbridge. Specimen determined by Mrs. Agnes Chase.

Flowering scales awnless or merely awn-pointed.

B. Kalmii Gray. Wild Chess.— Dry woods and low meadows; occasional. Stockbridge; New Marlboro; Sheffield.

B. purgans L.— Rocky woods; frequent.

B. racemosus L.— Recently seeded meadow, Stockbridge.

B. secalinus L. Cheat; Chess.— Waste ground; occasional. Pittsfield; Stockbridge; Great Barrington.

B. tectorum L.— Waste ground; occasional. Lenox; Stockbridge; Great Barrington; locally common along the railroad below Housatonic.

CALAMAGROSTIS. Reed Bent Grass.

C. canadensis (Michx.) Beauv. Reed Bent Grass.— Low meadows, borders of streams and ponds; common.

CENCHRUS. Sandbur.

C. carolinianus Walt. Sandbur.— Sandy soil; locally common in the southern part of Sheffield, also on dump at woolen mill, Pittsfield.

CINNA. Wood Reed Grass.

C. arundinacea L.— Wooded swamps; occasional in the valley. Lenox; Stockbridge; Great Barrington; Sheffield. Leaves often 1.5–1.8 cm. broad.

C. latifolia (Trev.) Griseb.— Cool woods; common.

A form from Greylock has a white stripe down the mid-rib of the leaf-blade.

CYNOSURUS. Dog's Tail Grass.

C. CRISTATUS L.— Occasional in grass land. Lenox; Stockbridge.

DACTYLIS. Orchard Grass.

D. GLOMERATA L. Orchard Grass.— In shade about houses, along roadsides, in open woodland; common.

DANTHONIA. Wild Oat Grass.

D. compressa Aust.— Dry open woods, rocky summits and upland pastures; frequent.

D. spicata (L.) Beauv. White Top.— Meadows, pastures and rocky hillsides, chiefly in poor soil; common, especially on the upland.

DESCHAMPSIA.

D. caespitosa (L.) Beauv.— Borders of mowing-fields, Whitney Place, Washington; Lenox.

Appears to have been introduced with grass seed.

D. flexuosa (L.) Trin. Common Hair Grass.— Rocky woods, especially on exposed ledges; common in the valley. On Greylock almost to the summit.

DIGITARIA. Finger Grass.

(*Syntherisma* Ill. Fl. ed. 2.)

D. filiformis (L.) Koeler.— Sandy soil; locally common in the southern part of Sheffield.

D. ISCHAEMUM Schreb. ex Muhl.— (*D. humifusa* Man. ed. 7; *vid.* Rhodora, **18**: 231, 1916.)

Dry sterile soil, fields, roadsides; common.

D. SANGUINALIS (L.) Scop. Crab Grass.— Waste and cultivated ground; common.

ECHINOCHLOA.

E. CRUSGALLI (L.) Beauv. Barnyard Grass.— About barnyards and on muddy shores; common.

E. FRUMENTACEA (Roxb.) Link.— Cultivated ground, Stockbridge; roadside, Great Barrington; cultivated ground, Sheffield. First noted in 1920.

E. muricata (Michx.) Fernald.— *Vid.* Rhodora, **17**: 106 (1915). Sandy shores and roadside ditches; frequent.

Differs from *E. Crusgalli* in the trichomes of the mature spikelets which are stiffer and coarser, strongly divergent and have a conspicuous papillose or pustular base, giving to the spikelets and consequently to the inflorescence a very muricate appearance.

ELYMUS. Wild Rye.

Key to Elymus.

a. Awns straight (when mature and dry); palet 5.2–8 (rarely 8.5–9.2 in *E. virginicus*) mm. long.

b. Glumes broad (0.9–2 mm. wide), strongly indurated and more or less curved at the base.

Lemmas and glumes glabrous or merely scabrous on the margins. *E. virginicus.*

Lemmas and glumes villous-hirsute. *E. virginicus*, var. *hirsutiglumis.*

b'. Glumes narrow, often setiform (0.4–0.8 mm. wide), indurated and terete below, essentially straight.

Rachis-joints 3–4.5 (rarely 5–8) mm. long; spikelets 2–4-flowered; leaves and sheaths glabrous..... *E. riparius.*

Rachis-joints 1.5–3 mm. long; spikelets 1- (rarely 2-)flowered; foliage villous..... *E. striatus.*

a'. Awns curved outward toward apex (when mature and dry); glumes 15–20 (rarely 8–27) mm. long, rather narrow but not setiform, flat above; spikelets 4–7-flowered; leaves 13–20 mm. wide; palet 9–11 (–15) mm. long..... *E. canadensis.*

E. canadensis L.— Riverbanks; common in the valley.

E. riparius Wiegand.— *Vid.* Rhodora, **20**: 84 (1918). Riverbanks; common in the valley, also in Mt. Washington.

Differs from *E. canadensis* in the more spreading spikelets, straight awns, longer and more slender glumes, uniformly hispidulous lemmas and shorter palet. From *E. striatus*, it may be recognized by the coarser habit, glabrous foliage, larger rachis-joints, scabrous lemmas, and larger palet.

E. striatus Willd.— Alluvial riverbanks; frequent. Williamstown; Stockbridge; Great Barrington; Sheffield.

E. virginicus L.— Riverbanks and moist woods; common.

var. **hirsutiglumis** (Scribn.) Hitchc.— (*E. hirsutiglumis* Ill. Fl. ed. 2.)

Alluvial banks; Stockbridge; Great Barrington; Sheffield.

ERAGROSTIS.

E. capillaris (L.) Nees.— Sandy fields and roadsides; frequent in Great Barrington and Sheffield.

E. CILIANENSIS (All.) Link.— (*E. megastachya* Man. ed. 7; *vid.* Rhodora, **18**: 235, 1916. *E. major* Ill. Fl. ed. 2.)

Waste places, Pittsfield; Stockbridge.

E. Frankii (Fisch., Mey., & Lall.) Steud.— A single plant found in Sheffield. Specimen in the herbarium of Mr. Walter Deane.

E. hypnoides (Lam.) BSP.— Shore of Pontoosuc Lake, Lanesboro (Churchill); frequent on muddy shores of Housatonic River in Sheffield (Walters).

E. MINOR Host.— Along railroad track, Washington.

E. pectinacea (Michx.) Steud. Sandy fields; common in Sheffield, frequent elsewhere in the valley.

E. PEREGRINA Wiegand.— Along railroad track, Lee. Determined by Mr. Bayard Long.

Distinguished from *E. pilosa* and *E. Purshii* by the absence of auricular hairs on the upper sheaths, by the densely-flowered panicle, bearing a great number of ovate or ovate-oblong spikelets, and by the very short pedicels of the spikelets (*vid.* Rhodora, **19**: 93, 1917, and **21**: 133, 1919).

E. Purshii Schrad.— (*E. pilosa* Man. ed. 7 in part.)

Along paths and in waste places; occasional. Williamstown (Churchill); Washington; Pittsfield; Lee; Stockbridge; Sheffield (Walters).

"*E. pilosa* has essentially smooth empty glumes while a scabrous keel seems to be a very excellent index of *E. Purshii*," Bayard Long in Rhodora, **21**: 137 (1919).

FESTUCA. FESCUE GRASS.

F. CAPILLATA Lam.— (*F. ovina*, var. *capillata* Man. ed. 7; *vid.* Rhodora, **18**: 235, 1916.)

Roadsides; occasional. Becket; New Boston. On rocky summit of Monument Mt., Great Barrington; moist bank, Sheffield.

F. ELATIOR L. MEADOW FESCUE.— Meadows and roadsides; common.

F. nutans Spreng.— Rocky woods and moist thickets; common. Not noted on the plateau.

F. OVINA L. SHEEP'S FESCUE.— In lawns or along roadsides; occasional. Adams (Knowlton and Bean); Lenox; Stockbridge.

F. rubra L.— Roadsides in moist or dry, sterile soil; frequent, especially on the plateau.

var. SUBVILLOSA Mert & Koch.— Roadside, Stockbridge; covering a whole field, as if sown, West Stockbridge; locally common in Sheffield.

GINANNIA.

(*Holcus* Man. ed. 7; *Nothoholcus* Ill. Fl. ed. 2.)

G. LANATA (L.) Hubbard. VELVET GRASS.— (*Holcus lanatus* Man. ed. 7; *vid.* Rhodora, **18**: 234, 1916.)

Grass land; occasional. First noted in 1911, becoming more frequent. Summit of Greylock; Stockbridge; Sandisfield; Sheffield.

GLYCERIA. MANNA GRASS.

(*Panicularia* Ill. Fl. ed. 2.)

G. acutiflora Torr.— Common in swale, Stockbridge; muddy border of pond, Great Barrington.

G. borealis (Nash) Batchelder.— Borders of swamps and muddy ponds; common.

G. canadensis (Michx.) Trin. RATTLESNAKE GRASS.— Wet spots in meadows, swales and roadside ditches; common.

G. Fernaldii (Hitchc.) St. John.— (*Glyceria pallida*, var. *Fernaldii* Man. ed. 7; *vid.* Rhodora, **19**: 76, 1917. *G. pallida* Ill. Fl. ed. 2 in part.)

River swales and muddy borders of streams; occasional. Savoy; Washington; New Lenox.

G. grandis Wats. REED MEADOW GRASS.— Borders of streams, wet spots in meadows, roadside ditches; frequent.

G. laxa Scribn.— Shaded swamps and wet woods; occasional on the plateau.

G. melicaria (Michx.) Hubbard.— (*Glyceria Torreyana* Man. ed. 7; *vid.* Rhodora, **14**: 186, 1912. *Panicularia Torreyana* Ill. Fl. ed. 2.)

Wet places in woods and shaded swamps; frequent.

G. nervata (Willd.) Trin. FOWL MEADOW GRASS.— Wet meadows, wet places in woods, borders of streams, roadside ditches; common.

var. **stricta** Scribn.— Swale, Williamstown, (Churchill); swamps, Sheffield (Bean and Fernald).

G. pallida (Torr.) Trin.— Shallow water, New Marlboro; Sheffield (Churchill).

G. septentrionalis Hitchc.— Shallow water in bog hole, New Marlboro.

HIEROCHLOE. Holy Grass.

(*Savastana* Ill. Fl. ed. 2.)

H. odorata (L.) Wahlenb., var. **fragrans** (Willd.) Richter. Vanilla Grass; Seneca Grass.— (*H. odorata* Man. ed. 7; *vid.* Rhodora, **19**: 152, 1917.)

Wet hillsides and borders of swamps; frequent on the plateau, occasional in the valley (Sheffield).

HORDEUM. Barley.

H. jubatum L. Squirrel-tail Grass.— Waste places; occasional. Not noted before 1919. Lanesboro, along trolley track; Hinsdale (Churchill); barnyard, Stockbridge; clearing, Great Barrington; New Marlboro.

H. vulgare L. Common Barley.— Along railroad tracks; occasional. Williamstown; Washington; Pittsfield.

LEERSIA. Cut-grass.

(*Homalocenchrus* Ill. Fl. ed. 2).

L. oryzoides (L.) Sw. Rice Cut-grass.— Borders of swamps, low ground, ditches; common.

L. virginica Willd. White Grass.— Rich woods; occasional in the valley. Stockbridge; Great Barrington; Sheffield. Valley of the Deerfield River, Florida.

LOLIUM. Darnel.

L. multiflorum Lam.— Field, Stockbridge.

L. perenne L. Common Darnel.— Roadsides and sterile fields; occasional. Williamstown; Stockbridge.

MELICA. Melic Grass.

M. striata (Michx.) Hitchc.— (*Arena Torreyi* Ill. Fl. ed. 2.)

Wooded ledges and swamps; frequent in the valley.

MILIUM. Millet Grass.

M. effusum L.— Cool woods; rare. Summit of Greylock; ledges on Mt. Harvey, West Stockbridge.

MUHLENBERGIA. Drop-seed Grass.

M. foliosa Trin.— (*M. mexicana* Ill. Fl. ed. 2 in part.)

Moist thickets, dry banks and rocky ledges; frequent in the valley. Not noted on the plateau.

M. MEXICANA (L.) Trin.— Sandy soil, gravelly shores, riverbanks, shaded roadsides; common.

M. racemosa (Michx.) BSP.— Low meadows and marshes; common in the valley. Not noted on the plateau.

M. Schreberi J. F. Gmel. Drop-seed.— Dry woods and shaded roadsides; occasional. Stockbridge; Alford; New Marlboro.

M. sobolifera (Muhl.) Trin.— Dry, rocky woods, New Marlboro.

M. sylvatica Torr.— (*M. umbrosa* Ill. Fl. ed. 2.)

Rocky or swampy woods; frequent. Both the awnless and the long-awned forms occur. Not noted on the plateau.

M. tenuiflora (Willd.) BSP.— Rocky woods; frequent. Not noted on the plateau.

ORYZOPSIS. Mountain Rice.

O. asperifolia Michx.— Dry wooded banks and alluvial thickets; frequent in the valley; occasional on the plateau.

O. pungens (Torr.) Hitchc.— Top of Monument Mt., Great Barrington, in disintegrated quartzite.

O. racemosa (Sm.) Ricker.— Rocky woods, in rich soil; common in the valley. Not noted on the plateau.

PANICUM. Panic Grass.

Key to Panicum.

a. Annuals.

Panicle more than half the length of the entire plant.

P. capillare, var. *occidentale.*

Panicle not over one-third the length of the entire plant . . *P. Tuckermani.*

a'. Perennials.

b. Basal leaves similar to culm-leaves, not forming a winter rosette.

P. agrostoides.

b'. Basal leaves usually distinctly different from the culm-leaves, forming a winter rosette.

c. Spikelets 3 mm. or more long.

d. Leaves linear-elongated, not over 5 mm. wide.....*P. strictum.*

d'. Leaves oblong-lanceolate to ovate-lanceolate, more than 1 dm. wide.

e. Spikelets 3 mm. long; at least the lower sheaths papillose-hispid. *P. clandestinum.*

e'. Spikelets 3.5 to 4 mm. long.

Panicle spreading; blades 2.5 cm. or more wide....*P. latifolium.*

Panicle narrow; blades rarely over 1.8 cm. wide. *P. xanthophysum.*

c'. Spikelets less than 3 mm. long.

f. Spikelets glabrous.....*P. dichotomum.*

f'. Spikelets pubescent.

g. Blades elongated, not over 5 mm. long; secondary panicles from the base only or none.

Sheaths glabrous.....*P. Werneri.*

Sheaths pilose.....*P. linearifolium.*

g'. Blades usually not conspicuously elongated; secondary panicles not at the base.

h. Sheaths, or all but the lowest glabrous.

i. Culms crisp-puberulent.....*P. umbrosum.*

i'. Culms glabrous.

Spikelets 1.5 to 1.8 mm. long; in dry, sandy ground, in the valley.....*P. sphaerocarpon.*

Spikelets 2.2 to 2.8 mm. long; in moist upland. *P. boreale.*

h'. Sheaths pubescent.

j. Sheaths puberulent, not pilose.....*P. umbrosum.*

j'. Sheaths spreading, or appressed pilose or velvety.

k. Pubescence spreading.

l. Blades stiff, glabrous above, or with a few hairs. *P. tennesseense.*

l'. Blades pubescent above, or if glabrous lax.

m. Upper surface of blades with erect hairs 3 to 5 mm. long, axis of panicle long pilose. *P. implicatum.*

m'. Upper surface of blades with short or somewhat appressed pubescence.

Blades stiff; spikelets obovate; rare. *P. huachucae.*

Blades lax; spikelets elliptical; common. *P. huachucae*, var. *fasciculatum.*

k'. Pubescence crisp-appressed.

Spikelets 1.9 mm. long; blades 5 to 6 cm. long; plants blue-green.....*P. tsugetorum.*

Spikelets 1.7 mm. long; blades 3 to 5 cm. long; plants gray-green.....*P. heterophyllum.*

P. agrostoides Spreng.— Sandy shore of Big Pond, Otis; low meadows, Sheffield.

P. boreale Nash.— Borders of woods and fields, roadsides; common on the plateau; occasional in the valley, Cheshire (Churchill); low ground, Stockbridge; border of marsh, Monterey; upper part of The Dome, Mt. Washington.

P. capillare L., var. **occidentale** Rydberg. Old-witch Grass.— (*P. capillare* Man. ed. 7 in part and Ill. Fl. ed. 2.)

Sandy soil, ledges and waste ground; common.

P. clandestinum L.— Thickets, chiefly in alluvial soil; frequent. Altitude 1500 feet, Hoosac Mt., Florida.

P. dichotomum L.— Dry rocky woods; frequent in the valley.

P. heterophyllum Bosc.— (*P. columbianum* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **14**: 171, 1912.)

Dry rocky or sandy woods; occasional in the southern and western parts of the County. Stockbridge; West Stockbridge; Alford; Sheffield.

P. huachucae Ashe.— Meadow, West Stockbridge.

var. **fasciculatum** (Torr.) Hubbard.— (*P. huachucae*, var. *silvicola* Man. ed. 7; *P. huachucae* Ill. Fl. ed. 2 in part; *vid.* Rhodora, **14**: 171, 1912.)

Dry woods and clearings; common.

P. implicatum Scribn.— Dry woods, clearings, hillside pastures, wet roadsides; common.

P. latifolium L.— Thickets and clearings in rich woodland; common in the valley. Not noted on the plateau.

P. linearifolium Scribn.— Dry open woods and sandy fields; common.

P. miliaceum L. European Millet.— Railroad track, Washington; waste ground, Great Barrington.

P. sphaerocarpon Ell.— Borders of dry woods, Great Barrington; open glade, Sheffield.

P. strictum Pursh.— (*P. depauperatum* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **14**: 169, 1912.)

Sterile fields, dry open woods and rocky ledges; frequent.

P. tennesseense Ashe.— Clearings, wood roads, dry or wet woods; river banks; frequent.

An aberrant form from West Stockbridge closely approaches *P. Lindheimeri* Nash, according to Mr. F. Tracy Hubbard.

P. tsugetorum Nash.— Dry woods; frequent in the southern part of the valley.

P. Tuckermani Fernald.— (*P. philadelphicum* Man. ed. 7 and Ill. Fl. ed. 2 in part.)

Ditches, sandy roadsides and shores; occasional. Pontoosuc Lake, Pittsfield; Becket; West Stockbridge; Egremont; Mt. Washington; moist limestone outcrop, Sheffield.

Pulvini hispid:

Spikelets all or nearly all long-pedicelled, 2 to 3 mm. long; panicle tardily exserted, its lower branches mostly included during anthesis. . . . *P. capillare.*

Spikelets subsessile or only short-pedicelled along the ultimate branchlets; panicle exserted in anthesis. . . . . *P. capillare*, var. *occidentale.*

Pulvini glabrous or merely ciliate at tip.

P. Tuckermani (*vid.* Rhodora, **21**: 111, 1919).

P. umbrosum LeConte.— (*P. Ashei* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **14**: 173, 1912.)

Rocky woods and open sandy soil; occasional in the southern part of the valley. Great Barrington; Sheffield.

P. Werneri Scribn.— Dry open woods and fields, rocky summits; common in the valley.

P. xanthophysum Gray.— Dry open woods and clearings; occasional in the western and southern parts of the valley; Hancock Mt., Pittsfield; Monterey; Great Barrington; Sandisfield; Sheffield.

PASPALUM.

P. Muhlenbergii Nash.— Sterile, sandy fields; common in the southern part of the valley.

PHALARIS. Canary Grass.

P. arundinacea L. Reed Canary Grass.— Marshes and borders of brooks; frequent.

forma picta (L.), comb. nov. Ribbon Grass.— An occasional escape from gardens; Williamstown; New Ashford; Stockbridge.

PHLEUM.

P. pratense L. Herd's Grass; Timothy.— Grassland and wood roads; common.

PHRAGMITES. Reed.

P. communis Trin. Reed.— (*P. Phragmites* Ill. Fl. ed. 2.)

Border of boggy pond, Stockbridge; boggy meadow, Sheffield. The Stockbridge station was noted by Dewey in 1829.

POA. Meadow Grass.

P. alsodes Gray.— Moist woods, and borders of brooks; common.

P. annua L. Low Spear Grass.— Cultivated and waste ground; common. Altitude 2000 feet, Savoy.

P. compressa L. Wire Grass.— Sterile soil, in fields and rocky woods, boggy meadows; common.

P. debilis Torr.— Dry wooded slopes; occasional. Egremont; Richmond; swamp, Sheffield (Churchill).

P. nemoralis L.— Low ground and rocky woods; occasional. Williamstown (Churchill); West Stockbridge; Stockbridge.

P. pratensis L. Spear Grass; Kentucky Blue Grass.— Fields, hillsides, open places in woods; common.

P. saltuensis Fernald & Wiegand.— (*P. debilis* Man. ed. 7 and Ill. Fl. ed. 2 in part; *vid.* Rhodora, **20**: 122, 1918.)

Woods; frequent on the upland.

P. saltuensis is very similar in aspect to *P. debilis* but the latter species has usually shorter, obtuse and much firmer chartaceous lemmas; broader glume, with mostly scabrous keels; longer cauline ligules (usually 2 to 2.5 mm. long); and smaller anthers (0.6 to 0.8 mm. long).

P. palustris L. Fowl Meadow Grass.— (*P. triflora* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **18**: 235, 1916.)

Wet meadows; common. A narrow form occurs in woods and on hillsides.

P. trivialis L. Rough-stalked Meadow Grass.— Low ground, chiefly along brooks and borders of swamps; common in the valley. Not noted on the plateau.

SECALE. Rye.

S. cereale L. Rye.— Occasionally self-sown on roadsides.

SETARIA. Bristly Foxtail Grass.

(*Chaetochloa* Ill. Fl. ed. 2).

S. lutescens (Weigel) Hubbard. Foxtail; Pigeon Grass.— (*S. glauca* Man. ed. 7.)

Cultivated ground; common.

S. ITALICA (L.) Beauv. MILLET.—(subsp. *stramineofructa* Hubbard, var. *Hostii* Hubbard, subv. *Metzgeri* (Kornicke) Hubbard; *vid.* Rhodora, **18**: 233, 1916.)

Occasional escape from cultivation; Becket; Stockbridge.

S. VIRIDIS (L.) Beauv.— Cultivated ground; frequent in the valley.

SORGHASTRUM.

S. nutans (L.) Nash. INDIAN GRASS; WOOD GRASS.— Dry ground; occasional in the valley. Pittsfield; Great Barrington; Sheffield.

SPHENOPHOLIS.

S. nitida (Spreng.) Scribn.— Woods; frequent in the valley.

S. pallens (Spreng.) Scribn.— Woods, both dry and moist; frequent in the valley.

SPOROBOLUS. DROP-SEED.

S. neglectus Nash.— Dry open soil; occasional in the valley. Williamstown (Churchill); North Adams; Pittsfield.

S. uniflorus (Muhl.) Scribn. & Merr.— Wet sandy fields, ditches and exsiccated margins of swamps; occasional on the plateau (Becket).

S. vaginiflorus (Torr.) Wood.— Sandy soil and dry ledges; occasional in the valley. Egremont; Sheffield.

TRISETUM.

T. spicatum (L.) Richter, var. **molle** (Michx.) Piper.— (*T. spicatum* Man. ed. 6 in part; *vid.* Rhodora, **18**: 195, 1916.)

Banks of the Deerfield River, Florida.

TRITICUM. WHEAT.

T. SATIVUM Lam. WHEAT.— Occasionally self-sown along railroad tracks.

CYPERACEAE. SEDGE FAMILY.

CAREX. SEDGE.

C. aenea Fernald.— Rocky woods and dry open ground; frequent.

C. aestivalis M. A. Curtis.— Rocky wooded slopes; frequent, especially on the plateau and on the mountains.

C. albicans Willd.— Rich woods, Hinsdale. The only known station in Massachusetts.

C. albolutescens Schwein., var. **cumulata** Bailey.— (*C. albolutescens* Man. ed. 7 in part.)

Exposed ledges at Bash Bish Falls, Mt. Washington, rocky shores of Guilder Pond, Mt. Washington, and the upper slopes of The Dome. Altitude 2100 feet.

C. alopecoidea Tuckerm.— Swale, Williamstown; meadows and swales near the river, North Adams (Fernald and Long).

C. annectens Bicknell.— (*C. setacea* Dewey, var. *ambigua* Man. ed. 7; *vid.* Bull. Torr. Bot. Club, **35**: 492, 1908.)

Dry fields and roadsides; frequent. Often occurring as if introduced with grass seed.

C. aquatilis Wahlenb.— Marshes in the valley; rare. Lake Buel, Monterey (Walters); Joyner's marsh, Egremont.

var. **cuspidata** Laestad.— With the type, Lake Buel, Monterey.

var. **virescens** Anders.—With the type at Monterey and Egremont.

C. arctata Boott.— Woods and clearings; frequent in the valley, common on the plateau.

C. atlantica Bailey.— (*C. sterilis* Man. ed. 7.)

Ice Pond, Mt. Greylock (Burnham), specimen not seen by the writer; borders of peat bogs, Lost and Ward Ponds, Becket.

C. aurea Nutt.— Low ground, wet meadows, roadside ditches; common in calcareous soil.

C. Bebbii Olney.— Low ground; common.

C. bromoides Schkuhr.— Wet woods and swamps; common.

C. brunnescens Poir.— Rocky woods, dry clearings and moist thickets; common on the plateau, occasional in the valley (Cheshire, Winslow). Common on the upper portion of Greylock.

C. canescens L.— Low ground, Florida; swampy woods, Sheffield (Fernald).

var. **disjuncta** Fernald.— Swamps and bogs; common.

var. **subloliacea** Laestad.— Borders of pools in marshes, boggy shores of ponds; common.

C. cephaloidea Dewey.— Rich woods; occasional. Williamstown; North Adams; Becket; Stockbridge; West Stockbridge; New Marlboro; Sheffield; Egremont.

C. cephalophora Muhl.— Dry open woodland; frequent in the valley, occasional on the plateau (Sandisfield).

C. communis Bailey.— Open woods; common.

C. comosa Boott.— Borders of ponds and marshes; frequent in the valley.

C. conoidea Schkuhr.— Meadows and damp pastures; common.

C. Crawfordii Fernald.— Sterile fields; common in the northern part of the plateau (Florida, Savoy); occasional elsewhere, Ice Pond, summit of Greylock (Burnham); Constitution Hill, Lanesboro.

var. **vigens** Fernald.— Pastures, Florida; border of Lake Garfield, Monterey.

C. crinita Lam.— Low ground, particularly along the Housatonic River; occasional. Florida; Lenox; Pittsfield; Sheffield.

var. **gynandra** (Schwein.) Schwein. & Torr.— (*C. gynandra* Ill. Fl. ed. 2.)

Wet places, particularly in woods; common.

var. **minor** Boott.— Ice Pond, Greylock (altitude 3500 feet); South Pond, Savoy, altitude 2000 feet.

C. cristata Schwein.— (*C. cristatella* Ill. Fl. ed. 2.)

Alluvial soil, chiefly along the Housatonic and Farmington Rivers. Occasionally at higher altitudes, Stockbridge, 1050 feet; Sheffield, along mountain brook, 1600 feet.

C. Davisii Schwein. & Torr.— Alluvial thickets in the southern part of New Marlboro and Sheffield.

C. debilis Michx., var. **interjecta** Bailey.— Occasional; Lanesboro (Churchill); summit of The Dome, Mt. Washington (Cushman).

var. **Rudgei** Bailey.— (*C. flexuosa* Ill. Fl. ed. 2.)

Open woodland, brushy pastures, thickets and roadsides; common.

C. deflexa Hornem.— Frequent along the Deerfield River, Florida. Collected on Mt. Greylock by Wm. Boott.

C. Deweyana Schwein.— Dry open or rich rocky woods; common.

C. diandra Schrank.— Peat bogs; occasional. Williamstown (Dewey); North Adams; Pittsfield; Lee; Monterey; New Marlboro (Walters); Egremont (Churchill).

var. **ramosa** (Boott) Fernald.— (*C. prairea* Ill. Fl. ed. 2.)

Borders of peat bogs and marshes; occasional. Williamstown; Clarksburg; Washington (Boott); Stockbridge; West Stockbridge; Monterey; Great Barrington (Walters).

C. digitalis Willd.— Dry open woods; common.

C. eburnea Boott.— Limestone hills, either exposed or in shade;

local. New Ashford; Lee; West Stockbridge; New Marlboro; Egremont; Sheffield. Not noted in Stockbridge.

C. echinata Murr.— (*C. stellulata* Man. ed. 7; *vid.* Rhodora, **19**: 154, 1917. *C. Leersii* Ill. Fl. ed. 2.)

Borders of ponds and bogs; occasional, chiefly at high altitudes. Ice Pond, summit of Greylock; Florida; South Pond, Savoy (altitude 2000 feet); Cheshire (Cushman); Berry Pond, Hancock (altitude 2000 feet); Washington.

var. **angustata** Carey.— Wet meadows and marshes; common.

var. **excelsior** (Bailey) Fernald.— Marshes; frequent, especially at high altitudes.

var. **ormantha** Fernald.— Wet bank, Florida; springy meadow, Savoy; bog, Hancock (altitude 2000 feet).

C. festucacea Schkuhr, var. **brevior** (Dewey) Fernald.— Open sterile soil; common in the southern part of the valley, on hills of glacial drift. Also in Washington at the edge of the plateau.

C. filiformis L.— (*C. lasiocarpa* Ill. Fl. ed. 2.)

Open marshes; common.

C. flava L.— Wet meadows and ditches; common.

var. **elatior** Schlecht.— (*C. lepidocarpa* Ill. Fl. ed. 2 in part.)

Low ground; occasional. Williamstown; Becket; Sandisfield; Monterey; Sheffield.

var. **rectirostra** Gaudin.— (*C. lepidocarpa* Ill. Fl. ed. 2 in part.)

Borders of ponds and marshes, on shores formed by receding water; common. Occasional on wet gravelly slopes.

C. foenea Willd.— Open rocky woodland; common except on the plateau.

var. **perplexa** Bailey.— Thickets; occasional. Florida; Great Barrington; New Marlboro.

C. folliculata L.— Marshes and shaded swamps; frequent.

C. formosa Dewey.— The type station is Stockbridge. The species is now extremely local there, occurring in moist thickets at two stations about two miles apart. It has been collected at Egremont (Walters).

C. gracillima Schwein.— Thickets and clearings; common in the valley, occasional on the plateau (Florida, Savoy). On Greylock to the summit.

C. granularis Muhl.— Wet meadows and roadside ditches; common.

var. **Haleana** (Olney) Porter.— (*C. Shriveri* Ill. Fl. ed. 2.)

Occasional; Williamstown (Churchill); North Adams (Fernald and Long); Stockbridge; West Stockbridge.

C. Grayii Carey.— (*C. Asa-Grayi* Ill. Fl. ed. 2.)

Swampy woods, Lenox; shaded thicket, Sheffield (Churchill); river swale, Sheffield (Bissell).

C. grisea Wahlenb.— Alluvial thickets and shaded banks of streams; frequent in the valley.

var. **rigida** Bailey.— (*C. amphibola* Ill. Fl. ed. 2.)

Alluvium of small stream, Sheffield (Bean and Fernald).

C. Hitchcockiana Dewey.— Pockets of rich soil at the base of shaded ledges; occasional. Williamstown (Davis), type locality; Pittsfield; Sheffield (Walters).

C. hystericina Muhl.— Wet meadows and borders of swamps; common.

C. intumescens Rudge.— Wet woods; occasional in the valley. Williamstown (Burnham); Great Barrington; Sheffield.

var. **Fernaldii** Bailey.— Wet woods; common. Summit of Greylock, 3500 feet.

C. laevivaginata (Kuckenth.) Mackenzie.— (*C. stipata* Man. ed. 7 in part; *vid.* Rhodora, **17**: 231, 1915.)

Low swampy ground; frequent.

C. lanuginosa Michx.— Swales along the Housatonic River; occasional in the southern part of the County. Stockbridge; Great Barrington; Sheffield. Common in Sheffield.

C. laxiculmis Schwein.— Rich woods, often under pines; frequent in the valley.

var. **copulata** (Bailey) Fernald.— Rich woods, Sandisfield.

C. laxiflora Lam.— (*C. aneeps* Ill. Fl. ed. 2.)

Rich woods; occasional. Savoy; Stockbridge; West Stockbridge; New Marlboro; Egremont (Churchill and Schneider).

var. **blanda** (Dewey) Boott.— (*C. blanda* Ill. Fl. ed. 2.)

Rich woods; frequent in the valley.

var. **latifolia** Boott.— (*C. albursina* Ill. Fl. ed. 2.)

Rich woods; occasional in the valley. North Adams; Lanesboro; Pittsfield; Stockbridge; Sheffield (Walters).

var. **patulifolia** (Dewey) Carey.— (*C. aneeps* Ill. Fl. ed. 2 in part.)

Rich woods; common.

var. **varians** Bailey.— (*C. blanda* Ill. Fl. ed. 2 in part.)

Rich woods; occasional. Savoy; Pittsfield; Stockbridge; Sheffield (Walters).

C. lenticularis Michx.— Gravelly borders of ponds and rivers; occasional. Savoy; Florida.

Perigynia ovate-elliptic, slightly convex both sides, longer than the narrow oblong, obtuse scales.

var. **Blakei** Dewey.— *Vid.* Wood, Class Book, p. 755 (1861).

Sandy shore of Big Pond, Otis.

Perigynia nearly elliptical, scales obtuse and always shorter than the perigynia.

C. LEPORINA L.—Pastures; occasional. Sandisfield; New Marlboro.

C. leptalea Wahlenb.— Wet shaded ground; common.

C. leptonervia Fernald.— (*C. laxiflora*, var. *leptonervia* Man. ed. 7; *C. aneeps* Ill. Fl. ed. 2 in part. *Vid.* Rhodora, **16**: 214, 1914.)

Cold woods and swamps; common.

C. limosa L.— Open peat bogs; local. Stockbridge; Sheffield.

C. longirostris Torr.— (*C. Sprengelii* Ill. Fl. ed. 2.)

Alluvial thickets; occasional in the valley. Lenox (Hill, Schneider and Schweinfurth); Stockbridge; Sheffield. On shaded rocks in New Marlboro.

C. lupulina Muhl.— Mudholes, borders of ponds and marshes; frequent.

var. **pedunculata** Dewey.— Mudholes and marshes; occasional in the southern part of the valley. Lenox; Great Barrington; New Marlboro.

C. lurida Wahlenb.— Low open ground; common.

var. **gracilis** (Boott) Bailey.— (*C. Baileyi* Ill. Fl. ed. 2.)

Cheshire, wet slide above Kitchen Brook (Churchill); New Marlboro, Thousand Acre Swamp.

C. mirabilis Dewey.— (*C. normalis* Ill. Fl. ed. 2.)

Roadside thickets, clearings, copses; common.

var. **perlonga** Fernald.— Borders of thickets; occasional on the plateau. Becket; Sandisfield.

C. Muhlenbergii Schkuhr.— Dry open soil; rare. Stockbridge (Dewey); Sheffield.

C. novae-angliae Schwein.— Rocky woods and banks; common on the plateau; rare in the valley. Reaches the bank of the Housatonic River in Lenox (altitude 1000 feet). Rich soil on Berry Mt., Hancock.

C. Oederi Retz, var. **pumila** (Cosson & Germain) Fernald.— Margins of ponds and roadside ditches; frequent in the valley.

C. oligocarpa Schkuhr.— Rich woods; rare. Stockbridge; New Marlboro.

C. pallescens L.— Meadows and open woods; common.

C. pauciflora Lightf.— Peat bogs; local. Ward and Lost Ponds, Becket; Wolf Swamp, Sandisfield.

C. paupercula Michx.— Sandisfield (Walters).

var. **irrigua** (Wahlenb.) Fernald.— Sphagnum swamps; local. Pittsfield; Becket.

var. **pallens** Fernald.— Shaded sphagnum swamps; local. Washington (Boott); Pittsfield; New Marlboro.

C. pedunculata Muhl.— Open woods; common, particularly in rocky woods.

C. pennsylvanica Lam.— Dry open woods and clearings; common.

var. **lucorum** (Willd.) Fernald.— Occasional. Dry woods, New Marlboro; rocky woods, West Stockbridge; dry woods, Mt. Washington (Knowlton); dry woods, Sheffield (Bean and Fernald).

C. plantaginea Lam.— Rich woods; frequent in the valley and on the lower slopes of the mountains.

Culms 6.5 cm. high, Stockbridge.

C. platyphylla Carey.— Rich woods; common in the valley.

C. polygama Schkuhr.— (*C. Buxbaumii* Ill. Fl. ed. 2.)

Joyner's Marsh, Egremont.

C. prasina Wahlenb.— Wet spots in woods; frequent in the valley and on the lower slopes of the mountains.

C. projecta Mackenzie.— (*C. tribuloides*, var. *reducta* Man. ed. 7; *vid.* Bull. Torr. Bot. Club, **35**: 264, 1908.)

Borders of swamps and wet woods; frequent in the valley, common on the plateau.

C. Pseudo-Cyperus L.— Border of Spectacle Pond, Sandisfield; Sheffield (Walters).

C. pubescens Muhl.— Rich woods, in damp glades and alluvial thickets; frequent.

C. retrorsa Schwein.— Borders of ponds and streams, wet spots in meadows; common in the valley.

var. **Hartii** (Dewey) Gray.— River alluvium, Sheffield (Churchill).

var. **Robinsonii** Fernald.— Shore of Richmond Lake, Richmond.

C. riparia W. Curtis.— (*C. lacustris* Ill. Fl. ed. 2.)

Swamps; frequent in the valley.

C. rosea Schkuhr.— Rich dry woods; common in the valley.

var. **minor** Boott.— Rich rocky woods, often on rocks and ledges; common on the hills in the valley.

var. **radiata** Dewey.— Rich rocky woods; common.

C. rostrata Stokes.— Marshes and bogs; frequent. Altitude 2000 feet, Hancock.

var. **ambigens** Fernald.— Bog, Monterey.

var. **utriculata** (Boott) Bailey.— Borders of bogs; frequent. Commoner than the type.

C. scabrata Schwein.— Wet places in woods; frequent.

C. Schweinitzii Dewey.— Swamps and swales in the Hoosac Valley; Williamstown (Williams); North Adams (Churchill). This species occurs in Salisbury, Conn., and should be looked for in the southern part of Berkshire Co.

C. scirpoides Schkuhr.— (*C. interior* Ill. Fl. ed. 2.)

Swales, wet meadows, swampy woods, borders of bogs and ponds; common.

var. **capillacea** (Bailey) Fernald.— (*C. Howei* Ill. Fl. ed. 2.)

Swampy woods; occasional. Washington; Becket; Stockbridge; West Stockbridge; New Marlboro.

C. scoparia Schkuhr.— Grassland, thickets, low ground; common.

var. **condensa** Fernald.— Low ground; common at high altitudes.

var. **moniliformis** Tuckerman.— Low ground; frequent.

var. **subturbinata** Fernald & Wiegand.— *Vid.* Rhodora, **14**: 116 (1912).

Distribution not known. Collected in a pasture in Sandisfield, and among boulders in woods in Florida (Fernald and Long).

C. scorsa E. C. Howe.— Border of peat bog, Ward Pond, Becket; in open swamps, Sheffield (Bean and Fernald).

C. setacea Dewey.— The type specimen, collected in Williamstown before 1825, is in the Gray Herbarium. The species has not since been collected in the County, which appears to be the eastern limit of its range.

C. sparganioides Muhl.— Rich or dry woodland; frequent in the valley.

C. sterilis Willd. (not of the Man. ed. 7).— Joyner's Marsh, Egremont.

For the distinction between this species, with much developed staminate spikes, and *C. atlantica* Bailey, *vid.* Ill. Fl. ed. 2.

C. stipata Muhl.— Swales and swamps, wet places in woods; common.

C. straminea Willd.— Meadows, pastures, roadsides, and open woodland; frequent.

var. **echinodes** Fernald.— Dry woods, West Stockbridge.

C. stricta Lam.— Swamps and wet meadows, borders of lakes and streams; common.

var. **angustata** (Boott) Bailey.— With the type, but less common.

var. **curtissima** Peck.— (*C. strictior* Dewey; *vid.* Bull. Torr. Bot. Club, **40**: 415, 1915.)

Occasional; Williamstown (Dewey); Florida; Hancock, altitude 2000 feet; Stockbridge; Sheffield (Churchill).

var. **decora** Bailey.— (*C. Haydeni* Ill. Fl. ed. 2.)

Occasional; Williamstown (Dewey); Savoy.

C. tenella Schkuhr.— (*C. disperma* Ill. Fl. ed. 2.)

Cold shaded swamps; common.

C. tetanica Schkuhr., var. **Woodii** (Dewey) Bailey.— Two stations in Stockbridge: one a low spot in a meadow, the other a wet hillside. The species has been collected in Salisbury, Conn., and should be looked for in the southern part of the County. A sheet in the Gray Herbarium collected by Dewey in Stockbridge before 1826 and labelled by him *C. tetanica* is this variety.

C. tincta Fernald.— (*C. mirabilis,* var. *tincta* Man. ed. 7; *vid.* Rhodora, **15**: 186, 1913.)

Fields and roadsides; common in the Deerfield Valley, Florida; occasional on the plateau. Altitude 2000 feet, Florida.

C. torta Boott.— Among the stones along mountain brooks, and along the borders of the Deerfield and Farmington Rivers; common.

C. tribuloides Wahlenb.— Low ground, particularly in swales in the valley; frequent. Not noted on the plateau. A form with a very crowded inflorescence is occasional with the type.

var. **turbata** Bailey.— Occasional, Otis.

C. triceps Michx., var. **hirsuta** (Willd.) Bailey.— (*C. complanata* Ill. Fl. ed. 2.)

Dry open woodland, clearings, and hillside pastures; common in the valley.

C. trichocarpa Muhl.— Marshes in the Hoosac Valley. Williamstown (Churchill).

C. trisperma Dewey.— Swampy woods; common.

var. **Billingsii** Knight.— Peat bogs; local. Savoy; Lost Pond, Becket; Wolf Swamp, Sandisfield.

C. Tuckermani Dewey.— Swales in the Housatonic and Konkapot Valleys in the southern part of the County; frequent in Sheffield, occasional elsewhere (Stockbridge, New Marlboro).

C. typhina Schwein.— (*C. typhinoides* Man. ed. 7; *vid.* Rhodora, **11**: 40, 1909.)

Shaded swale in the southern part of Sheffield, just inside the State Line.

C. umbellata Schkuhr.— Rocky summits and dry open soil; frequent.

var. **brevirostris** Boott.— (*C. abdita* Ill. Fl. ed. 2.)

Rocky or sandy soil. Williamstown; Sandisfield; Sheffield.

var. **tonsa** Fernald.— (*C. tonsa* Ill. Fl. ed. 2.)

Sand-plain, Ashley Falls, Sheffield.

C. varia Muhl.— (Man. ed. 7.)

Rocky woods; frequent in the valley. According to Mr. K. K. Mackenzie, Berkshire material corresponds to *C. Emmonsii* Dewey.

C. vesicaria L.— Shaded swamps and swales; frequent.

var. **jejuna** Fernald.— (*C. monile* Ill. Fl. ed. 2 in part.)

Swale near the Housatonic River, Lenox. A form closely approaching this variety at Ward Pond, Becket.

var. **monile** (Tuckerm.) Fernald.— Swampy ground; occasional. Richmond; Lenox.

C. virescens Muhl.— Dry, open woods, and clearings; common in the valley.

var. **Swanii** Fernald.— (*C. Swanii* Ill. Fl. ed. 2.)

Dry, open woods and hillside pastures; common.

C. vulpinoidea Michx.— Low ground; common.

C. lupulina × **lurida**.— Low ground; occasional. Stockbridge; Great Barrington.

CLADIUM. Twig Rush.

(*Mariscus* Ill. Fl. ed. 2.)

C. mariscoides (Muhl.) Torr.— Bogs and marshes; occasional in the valley. Stockbridge; Great Barrington; Egremont; Sheffield.

CYPERUS. Galingale.

C. aristatus Rottb.— (*C. inflexus* Ill. Fl. ed. 2.)

Sandy shores; occasional. Pontoosuc Lake, Pittsfield; Mill River, New Marlboro; Housatonic River, Sheffield. Along railroad track, Lee.

C. diandrus Torr.— Borders of lakes, and low ground; frequent.

C. esculentus L.— Sandy shores; occasional along the Housatonic River. Great Barrington; Sheffield. As a weed in cultivated ground, Lenox.

var. **leptostachyus** Boeckl.— Occasional with the type. Lenox; Great Barrington; Sheffield.

C. filiculmis Vahl, var. **macilentus** Fernald.— Dry, open soil; occasional in the valley. Lee; Great Barrington; New Marlboro. Common on the Sheffield sand-plain.

C. Houghtonii Torr.— A station on exposed rocks at Bash Bish Falls, Mt. Washington, is the only known station in the State.

C. rivularis Kunth.— Low ground; occasional in the valley. Pittsfield; Stockbridge; Sheffield.

C. strigosus L.— Low shaded ground, Mt. Washington; Sheffield.

forma **capitatus** (Boeckl.) Blake.— *Vid.* Rhodora, **15**: 200 (1913).

Sandy or muddy shores of lakes and streams; frequent.

var. **compositus** Britton.— Sandy or muddy shores, and in low ground; frequent in the valley.

var. **robustior** Kunth.— Low ground; occasional. Great Barrington; Sheffield.

DULICHIUM.

D. arundinaceum (L.) Britton.— Borders of ponds and marshes; common.

ELEOCHARIS. Spike-rush.

E. acicularis (L.) R. & S.— Shallow water and muddy shores; common.

E. intermedia (Muhl.) Schultes.— Muddy shores; occasional. Pontoosuc Lake, Pittsfield; Egremont; Mill River, New Marlboro.

E. obtusa (Willd.) Schultes.— Roadside ditches, borders of ponds and streams, open muddy spots in marshes; common.

E. olivacea Torr.— Muddy spots in marshes; occasional in the valley. Lenox; Egremont; Sheffield.

E. palustris (L.) R. & S.— Marshes, muddy shores and shallow water; common.

E. tenuis (Willd.) Schultes.— Wet places; common.

ERIOPHORUM. Cotton Grass.

E. callitrix Cham. Hare's Tail.— Peat bogs; occasional on the plateau. Savoy; Becket; Washington; New Marlboro.

E. gracile Roth.— Marshes and peat bogs; occasional. Cheshire (Cushman); Becket (Walters); Monterey.

E. tenellum Nutt.— Bogs and marshes; frequent.

E. virginicum L.— Wet meadows and bogs; frequent.

var. **album** Gray.— Occasional on the plateau. Washington; Otis.

E. viridi-carinatum (Engelm.) Fernald.— Wet meadows and swamps; common.

var. **Fellowsii** Fernald.— Larch swamp, Sheffield (Fernald).

FIMBRISTYLIS.

F. Frankii Steud.— Gravelly border of Richmond Lake, Richmond; sandy border of Konkapot River, Sheffield.

RYNCHOSPORA. Beak Rush.

R. alba (L.) Vahl.— Bogs and marshes; frequent.

var. **macra** Clarke.— Hayes Pond, Otis (Walters).

R. capitellata (Michx.) Vahl.— (*R. glomerata* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **20**: 26, 1918.)

Wet, peaty meadows, ill-drained hillsides and gravelly shores, occasional. Williamstown; Florida, flood-plain of the Deerfield River; Tyringham; Sheffield.

SCIRPUS. Bulrush.

Key to Scirpus.

a. Involucre none, bristles white, long, giving the head the aspect of *Eriophorum* . . . . . *S. hudsonianus.*

a'. Involucre foliaceous.

b. Involucral bract one (occasionally with a secondary, small involucel) appearing to be a continuation of the culm.

c. Spikelets solitary; culms flaccid; plant aquatic . . . *S. subterminalis*

c'. Spikelets distinct, paniculate or glomerulate.

d. Spikelets sessile or in glomerules.

c. Annual with tufted roots, plant low, not exceeding 4 dm.
S. Smithii, var. *setosus*.

c'. Perennial with running rootstocks; culms sharply trigonous.
Scales reddish-brown, ciliate, awn-tipped; achene planoconvex, broadly obovoid, short-mucronate ..... *S. americanus*.
Scales yellowish-brown, entire, mucronate; achene trigonous, oblong-obovoid, long-mucronate ..... *S. Torreyi*.

c''. Spikelets more or less loosely umbellulate, or paniculate.
Achenes 2 mm. long, nearly equalling the scales ..... *S. validus*.
Achenes 2.5 to 3 mm. long, much exceeded by the scales.
S. occidentalis.

b'. Involucral bracts 2 or more, leaf-like; culms leafy.
(From this point use the key in Gray's Manual, ed. 7, beginning at 1.)

S. acutus Muhl.— (*S. occidentalis* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **22**: 56, 1920.)

Borders of lakes and marshes, in shallow water; occasional. Three Mile Pond, Sheffield; Lake Buell, New Marlboro; Marsh Pond, Egremont (Walters).

S. americanus Pers.— Sandy shores; occasional. Big Pond, Otis; Stockbridge Bowl, Stockbridge.

S. atrocinctus Fernald.— Wet meadows, borders of streams and ponds, marshes; common, especially on the upland. A form with a pale involucre from Washington.

forma **brachypodus** (Fernald) Blake.— *Vid.* Rhodora, **15**: 161 (1913).

Occasional with the type on the plateau. Savoy; Washington; Becket.

S. atrovirens Muhl.— Low ground; common.

var. **georgianus** (Harper) Fernald.— (*S. georgianus* Man. ed. 7; *S. atrovirens* Ill. Fl. ed. 2 in part. *Vid.* Rhodora, **23**: 134, 1921.)

Low ground; occasional. Greylock (Winslow); Lanesboro (Churchill); Sheffield. Not noted on the plateau.

forma **sychnocephalus** (Cowles) Blake.— *Vid.* Rhodora, **15**: 161 (1913).

Roadside ditch, New Marlboro; Egremont.

S. cyperinus (L.) Kunth.— Wet meadows and marshes, river swales; frequent.

var. **pelius** Fernald.— Wet meadows, borders of rivers and lakes, marshes; common.

var. **pelius**, forma **condensatus** (Fernald) Blake.— *Vid.* Rhodora, **15**: 162 (1913).

With the variety, Sheffield.

S. hudsonianus (Michx.) Fernald.— (*Eriophorum alpinum* Ill. Fl. ed. 2.)

Peat bogs and peaty meadows; frequent.

S. lineatus Michx.— Wet, sandy or clayey soil, roadside ditches; frequent in the valley in calcareous soil.

S. Peckii Britton.— Wet meadows; occasional. Lenox; Tyringham; Sandisfield.

S. pedicellatus Fernald.— (*S. cyperinus* Ill. Fl. ed. 2 in part.)

Wet meadows, swamps and marshes; frequent. A form from Lenox has unusually reddish-brown involucels.

var. **pullus** Fernald.— Williamstown (Churchill).

S. planifolius Muhl.— Occasional in dry woods in the southwestern part of the County. Egremont; Bash Bish Falls, Mt. Washington (Knowlton).

S. rubrotinctus Fernald.— (*S. microcarpus* Ill. Fl. ed. 2.)

Wet spots in meadows, springy hillsides, marshes; common.

var. **confertus** Fernald.— Swale, Lanesboro (Churchill).

S. Smithii Gray, var. **setosus** Fernald.— (*S. debilis* Ill. Fl. ed. 2 in part.)

Muddy shore of Rudd Pond, Becket; muddy spot in marsh, Lenox.

S. subterminalis Torr.— Pools in peat bogs; frequent.

S. sylvaticus L.— Borders of streams, and swamps; occasional in the southern part of the valley. Stockbridge; New Marlboro; Monterey (Walters).

S. Torreyi Olney.— Border of shallow pond, Great Barrington.

S. validus Vahl.— Margins of ponds and slow streams, in shallow water; common.

STENOPHYLLUS.

S. capillaris (L.) Britton.— Sandy soil; common in parts of Sheffield, occasional elsewhere in the valleys. Williamstown; Stockbridge; Great Barrington.

ARACEAE. ARUM FAMILY.

ACORUS. Sweet Flag.

A. Calamus L. Sweet Flag; Calamus.— Wet meadows and marshes; common.

ARISAEMA. Indian Turnip.

A. Dracontium (L.) Schott. Green Dragon.— Alluvial soil along the Housatonic River; occasional in Great Barrington and Sheffield (Walters).

A. triphyllum (L.) Schott. Indian Turnip; Jack-in-the-Pulpit.— Rich woods and swamps; common. Altitude 2500 feet, Greylock.

var. **Stewardsonii** (Britton) G. T. Stevens.— (*A. Stewardsonii* Ill. Fl. ed. 2; *vid.* Rhodora, **23**, 136, 1921.)

Swampy woods, Richmond (Evans, Fernald and Knowlton); Sheffield. Cold swamp, Savoy, altitude 2000 feet; flood-plain of Cold River, Florida.

Distinguished from *A. triphyllum* by its strongly fluted spathe and shining leaves.

CALLA. Water Arum.

C. palustris L. Wild Calla.— Cold bogs; frequent on the plateau, occasional in the valley (Sheffield, in the sand-plain, altitude 900 feet).

ORONTIUM. Golden Club.

O. aquaticum L. Golden Club.— Big Pond, Otis, in shallow water, on sandy bottom. The most northern known station for this plant of the coastal plain.

PELTANDRA. Arrow Arum.

P. virginica (L.) Kunth. Arrow Arum.— Pools in swamps, borders of ponds and slow streams; common.

forma **latifolia** S. F. Blake.— *Vid.* Rhodora, **14**: 104 (1912). Shaw Pond, Otis.

Leaves very broad, almost equilaterally triangular, 18.5 to 28 cm. across the tips of the ears, these obtuse or subacute; sinus open.

forma **hastifolia** S. F. Blake.— *Vid.* Rhodora, **14**: 105 (1912). Shaw Pond, Otis; Round Pond, Great Barrington.

Leaves comparatively narrow, 6 to 12 cm. broad; basal lobes 7 to 13 cm. long, often twice the breadth of leaf, widely divaricate.

forma **brachyota** S. F. Blake.— *Vid.* Rhodora, **14**: 105 (1912). Washington; Stockbridge; Great Barrington.

Leaves smaller and narrower (main blade 10.5 to 20 cm. long, 3 to 5.5. cm. wide near middle); basal lobes shorter (2 to 7 cm. long), the lobes only rarely divergent.

SYMPLOCARPUS. Skunk Cabbage.

(*Spathyema* Ill. Fl. ed. 2.)

S. foetidus (L.) Nutt. Skunk Cabbage.— Swamps and low ground; common in the valley, not noted on the plateau. Hinsdale, altitude 1450 feet.

LEMNACEAE. DUCKWEED FAMILY.

LEMNA. Duckweed.

L. minor L.— Pools and slow streams; occasional in the valley. Lenox; Stockbridge; West Stockbridge; Sheffield.

L. trisulca L.— Pools in marshes, muddy ponds and slow streams; local. Washington (altitude 1450 feet); two localities in Stockbridge; Three Mile Pond, Sheffield.

SPIRODELA.

S. polyrhiza (L.) Schleid.— Stagnant pools and ponds; occasional in the valley. Williamstown; Washington (altitude 1450 feet); Stockbridge; New Marlboro; Sheffield (Walters).

ERIOCAULACEAE. PIPEWORT FAMILY.

ERIOCAULON. Pipewort.

E. septangulare Withering. Pipewort.— (*E. articulatum* Man. ed. 7; *vid.* Rhodora, **11**: 40, 1909.)

Shallow water of ponds on gravelly bottom, or on rocky shores; common.

XYRIDACEAE. YELLOW-EYED GRASS FAMILY.

XYRIS. Yellow-eyed Grass.

X. caroliniana Walt. Yellow-eyed Grass.— Peaty borders of ponds; occasional. Otis; Plant in Pond, Mt. Washington; Sheffield.

COMMELINACEAE. SPIDERWORT FAMILY.

TRADESCANTIA. Spiderwort.

T. VIRGINIANA L. Spiderwort.— One clump in a meadow near the Housatonic River, Great Barrington (Walters).

PONTEDERIACEAE. PICKEREL-WEED FAMILY.

HETERANTHERA. Mud Plantain.

H. dubia (Jacq.) MacM. Mud Plantain.— Shallow ponds and sluggish streams; occasional in the valley. Muddy Pond, Washington (altitude 1450 feet); Pontoosuc Lake, Pittsfield; outlet of Stockbridge Bowl, Stockbridge; Crane and Cranberry Ponds, West Stockbridge; Lake Buell, Monterey (Walters); lagoons of the Housatonic River, Sheffield.

PONTEDERIA. Pickerel-weed.

P. cordata L. Pickerel-weed.— Shallow water, margins of ponds and slow streams; common.

var. **angustifolia** Torr.— Occasional with the type. Great Barrington; New Marlboro.

JUNCACEAE. RUSH FAMILY.

JUNCUS. Rush.

Key to Juncus.

a. Inflorescence appearing lateral; the involucral leaf erect, similar to and continuing the naked, or essentially naked scape; rootstock creeping.
Stamens 3. Rare ..... *J. filiformis.*
Stamens 6. Common but extremely variable, represented in Berkshire Co. by four varieties, differing in the size and arrangement of flowers, and the thickness of the culms ..... *J. effusus, vid.* p. 240.

a'. Inflorescence terminal.
b. Leaves never septate, *i. e.*, with no transverse divisions.
c. Annual with soft base and fibrous roots, stems low and slender; flowers remote ..... *J. bufonius.*
c'. Perennial, flowers mostly aggregated, leaves flat (in age becoming involute).
d. Base not bulbous.
e. Auricles at the summit of the sheaths scarious, whitish, conspicuously extended beyond the point of insertion.
J. tenuis and varieties.

e'. Auricles at the summit of the sheaths not conspicuously extended beyond the point of insertion.

Bracts shorter than the cymes, flowers 2.5 to 3.5 mm. long, scattered and secund along the ascending or incurved branches, plant of dry soil, infrequent ..... *J. secundus.*

Bracts (or at least the lowermost) exceeding the cymes; flowers mostly larger, not conspicuously secund, plant chiefly of moist places, common ..... *J. Dudleyi.*

d'. Base bulbous and stoloniferous, leaves linear ..... *J. marginatus.*

b'. Leaves hollow, nodulose, *i. e.*, with divisions at regular intervals which show as dark transverse lines.

f. Seeds with definite caudate tips.

g. Flowers with the mature fruit about 2.5 (rarely 3.5) mm. long; sepals obtuse; seed ellipsoid, barely 1 mm. long, with very short tails ..... *J. brachycephalus.*

g'. Flowers with mature fruit about 4 mm. long; petals attenuate, acute; seed spindle-shaped, with conspicuous tails.

Inflorescence one-third longer than broad; capsule equalling or slightly exceeding the calyx ..... *J. canadensis.*

Inflorescence elongate; strict and narrow, 3 to 6 times longer than broad; capsule much exceeding the calyx.

J. brevicaudatus.

f'. Seeds merely pointed, or blunt, not caudate.

h. Stamens 3 ..... *J. acuminatus.*

h'. Stamens 6.

i. Upper cauline leaves bladeless (or essentially so), consisting of firm tawny or colored sheaths 2.5 to 5 cm. long; the middle leaf erect, much overtopping the inflorescence; rare ..... *J. militaris.*

i'. Upper cauline leaves with blades, or if bladeless, very small.

j. Flowers solitary, or in 2's ..... *J. pelocarpus.*

j'. Flowers more numerous, in glomerules.

k. Glomerules spherical; sepals subulate; capsules subulate or lance-subulate; involucral bract usually exceeding the inflorescence *J. nodosus.*

k' Glomerules hemispherical; sepals blunt or acuminate, at most mucronate-tipped; capsules ovoid or ellipsoid; involucral bract much shorter than the inflorescence.

Flower brown or brownish; capsule dark brown, 3 to 4 mm. long, gradually tapering to the mucronate tip ..... *J. articulatus.*

Flower greenish; capsule pale brown, 2.5 to 3 mm. long, abruptly mucronate.

J. articulatus, var. *obtusatus.*

J. acuminatus Michx.— Wet meadows and along brooks; occasional. Lenox; Otis; New Marlboro; Sheffield.

J. articulatus L.— Low ground, roadside ditches, borders of brooks and ponds; common. Altitude 1500 feet, Greylock.

var. **obtusatus** Engelm.— Wet meadows and hillside brooks; occasional in the valley. Lanesboro; Pittsfield; Great Barrington; Sheffield.

J. brachycephalus (Engelm.) Buchenau.— Bogs, wet meadows, marshy or muddy shores; frequent. Summit of Greylock, 3500 feet.

J. brevicaudatus (Engelm.) Fernald.— Wet ground; common.

J. bufonius L.— Wet roadsides and muddy shores; common, particularly on the plateau.

J. canadensis J. Gay.— Open bogs and marshes; common.

J. Dudleyi Wiegand.— Moist sandy or gravelly ground, low meadows and roadside ditches; common in calcareous soil in the valley, reaching an altitude of 1300 feet in Tyringham.

Key to Juncus effusus.

(*Vid.* Rhodora, **12**: 83–84.)

A. Flowers small, sepals 1.7 to 2.6 (rarely 2.9) mm. long, mostly somewhat spreading from the base; perianth segments not very dark but usually with two distinct brown lateral bands, rather soft in texture and therefore not rigid when dry; inflorescence small (1 to 4 cm. in diameter), or if larger with the sepals less than 2.6 mm. long.

Culms rather stout, 1.5 to 4 mm. in diameter at the top of the sheaths; sheaths pale; inflorescence small, compact.

Culms finely many-striate and usually deep green . . var. *compactus.*

Culms coarsely 12- to 15-sulcate, usually pale green.

var. *conglomeratus.*

Culms rather slender, 1 to 2 (rarely 3) mm. in diameter at the top of the sheaths; sheaths dark; inflorescence small and rather close . . . . . var. *decipiens.*

B. Flowers medium or large, sepals 2.5 to 4.2 mm. long (rarely shorter); perianth segments with no conspicuous brown bands, frequently firmer in texture, often rigid, appressed or somewhat spreading; inflorescence commonly open, rarely somewhat dense, 1.5 to 14 cm. in diameter.

Sepals rarely exceeding either the petals or the capsule, 2.5 to 3.5 mm. long, firm, not conspicuously spreading nor strongly contrasting in color with the capsule.

Culms 2 to 4.5 mm. in diameter at the top of the sheaths, not sulcate . . . . . var. *solutus.*

Sepals exceeding both the petals and the capsule, 3 to 4.2 mm. long, firm or rigid in texture and usually somewhat spreading, commonly contrasting in color with the darker capsule.

Culms 1 to 3.5 mm. in diameter at the top of the sheaths, finely striate or deeply sulcate.....var. *Pylaei*.

J. effusus L., var. **compactus** Lejeune & Courtois.— Wet meadows; rare. Williamstown; Otis.

var. **decipiens** Buchenau.— Wet meadows, hillsides, borders of brooks; common.

var. **Pylaei** (La Harpe) Fernald & Wiegand.— Springy places, swamps, and low meadows; common in cooler situations than the following.

var. **solutus** Fernald & Wiegand.— Swampy meadows; common, particularly along the Housatonic.

J. filiformis L.— Collected from only one station, a springy spot at the summit of Hoosac Mt., North Adams.

J. marginatus Rostk.— Borders of ponds, wet places in meadows, roadside ditches; frequent. Reaches an altitude of 1500 feet in Washington.

J. militaris Bigel.— Shallow water on sandy bottom, Big Pond, Otis.

J. nodosus L.— Borders of ponds, swampy meadows, roadside ditches; frequent in the valley.

J. pelocarpus Mey.— Boggy or muddy shores; frequent.

J. secundus Beauv.— Dry, open soil; occasional. Alford; Sheffield.

J. tenuis Willd.— Pastures, fields, wood-roads, roadsides; common.

var. **anthelatus** Wieg.— Low, open ground; occasional in the valley. New Ashford (Churchill); Pittsfield; Stockbridge; Great Barrington.

var. **Williamsii** Fernald.— Low open ground, Great Barrington.

LUZULA. Wood Rush.

(*Juncoides* Ill. Fl. ed. 2.)

L. campestris (L.) DC., var. **multiflora** (Ehrh.) Čelak.— Fields, meadows, and open woods; common.

L. parviflora (Ehrh.) Desv., var. **melanocarpa** (Michx.) Buchenau.— Upper slopes of Mt. Greylock.

L. saltuensis Fernald.— (*J. carolinae* Ill. Fl. ed. 2.)

Wooded banks, frequent. Sandy flood-plains of the Deerfield and Farmington Rivers; flood-plain of the Cold River. Altitude 1900 feet, Hancock.

LILIACEAE. LILY FAMILY.

ALLIUM. Onion.

A. canadense L. Wild Onion.— Alluvial ground; occasional in the southern part of the valley. Stockbridge; Sheffield.

A. tricoccum Ait. Wild Leek.— Rich woods; common on well-drained hillsides. Rare on the plateau, Sandisfield, at an altitude of 1500 feet (Walters); 2000 feet, Berry Mt., Hancock; 2500 feet, Greylock.

ASPARAGUS. Asparagus.

A. officinalis L. Asparagus.— Thickets and hedgerows, and along fences; frequent.

CHAMAELIRIUM. Devil's Bit.

C. luteum (L.) Gray. Blazing Star.— Dry woods; occasional in the southern part of the valley. Stockbridge; Great Barrington; New Marlboro; Egremont (Robbins); Sheffield. Stockbridge is the most northern known station.

CLINTONIA.

C. borealis (Ait.) Raf. Clintonia.— Cool woods, and shaded swamps; common. Summit of Greylock, 3500 feet.

CONVALLARIA. Lily of the Valley.

Convallaria majalis L. Lily of the Valley.— A patch, fifteen by twenty yards square, spreading in damp woods, one-eighth of a mile from any house, Williamstown.

ERYTHRONIUM. Dog's-tooth Violet.

E. americanum Ker. Adder's Tongue; Dog's-tooth Violet.— Rich woods and low meadows; common. Abundant in moist places on the plateau, altitude 2300 feet (Florida).

HEMEROCALLIS. Day Lily.

H. fulva L. Common Day Lily.— Roadside banks; a frequent escape.

LILIUM. Lily.

L. canadense L. Wild Yellow Lily; Meadow Lily.— Low meadows and moist thickets; common.

L. philadelphicum L. Wood Lily.— Dry, open woods, clearings, brushy pastures; common.

L. tigrinum Ker. Tiger Lily.— Roadsides; an occasional escape.

MAIANTHEMUM.

(*Unifolium* Ill. Fl. ed. 2.)

M. canadense Desf. Wild Lily of the Valley.— Woods and shaded swamps; common. Summit of Greylock, 3500 feet.

MEDEOLA. Indian Cucumber Root.

M. virginiana L. Indian Cucumber Root.— Woods; common. Altitude 2500 feet, Greylock.

OAKESIA.

(*Uvularia* Ill. Fl. ed. 2.)

O. sessilifolia (L.) Wats. Bellwort.— Woods; common.

POLYGONATUM. Solomon's Seal.

P. biflorum (Walt.) Ell. Small Solomon's Seal.— Dry or rocky woods; common.

P. commutatum (R. & S.) Dietr. Great Solomon's Seal.— River banks, and moist thickets; frequent in the valley.

SMILACINA. False Solomon's Seal.

(*Vagnera* Ill. Fl. ed. 2.)

S. racemosa (L.) Desf. False Spikenard.— Woods, dry ledges and thickets; common.

A form with bracted inflorescence collected in West Stockbridge (Evans, Knowlton and Fernald).

S. stellata (L.) Desf. Star-flowered Solomon's Seal.— Alluvial banks; frequent along the Hoosac, Housatonic and Deerfield Rivers. Border of swamp, Sheffield.

S. trifoliata (L.) Desf. Three-leaved Solomon's Seal.— Cold swamps; frequent.

SMILAX. Green Brier; Cat Brier.

S. herbacea L. Carrion-flower.— Thickets in low ground, borders of meadows; common. Altitude 2000 feet, Hancock.

S. rotundifolia L. Cat Brier; Common Green Brier.— Collected only in one station in Sheffield (Walters).

STREPTOPUS. Twisted-stalk.

S. amplexifolius (L.) DC.— Rich cool woods; frequent on the plateau, occasional elsewhere.

S. roseus Michx.— Rich woods and cool swamps; frequent throughout. Common on the upper portions of The Dome, Mt. Washington.

TRILLIUM. Trillium; Wake Robin.

T. cernuum L. Nodding Trillium.— Borders of swamps and alluvial thickets; occasional in the valley. Hinsdale (Lincoln), altitude 1450 feet; Stockbridge; Sheffield (Walters).

T. erectum L. Purple Trillium.— Rich woods and shaded swamps; common. Altitude 2000 feet, Savoy; 2500 feet, Greylock.

forma **albiflorum** f. nov.— Corollis albis. Flowers white. Type in the herbarium of the N. E. B. C., collected in rich woods, Stockbridge (R. Hoffmann).

Gates (Ann. Mo. Bot. Gard., **4**: 52, 1917) points out that *T. rhomboideum*, var. *album* Michx. applies to the smaller-flowered southern species, *T. album* Small.

T. undulatum Willd. Painted Trillium.— Cool woods; common.

UVULARIA. Bellwort.

U. grandiflora Sm.— Rich woods; common in the valley.

U. perfoliata L.— Rich or dry woods; common.

VERATRUM. False Hellebore.

V. viride Ait. American White Hellebore.— Shaded swamps, wet meadows, and borders of streams; common.

AMARYLLIDACEAE. AMARYLLIS FAMILY.

HYPOXIS. Star Grass.

H. hirsuta (L.) Coville. Star Grass.— Open woods and meadows; frequent in the valley.

NARCISSUS.

N. POETICUS L. POET'S NARCISSUS.— A single plant in a mowing field, across the road from an abandoned house, Alford (Walters).

IRIDACEAE. IRIS FAMILY.

IRIS. FLEUR-DE-LIS.

I. versicolor L. BLUE FLAG.— Wet meadows, borders of streams and ponds, wet open hillsides; common. Altitude 2000 feet, Mt. Washington.

SISYRINCHIUM. BLUE-EYED GRASS.

Key to Sisyrinchium.

a. Spathes sessile, terminal and solitary.
Pedicels loosely spreading, much exceeding the inner bract; capsules 2 to 4 mm. high. Rare ..... *S. mucronatum.*
Pedicels suberect, scarcely exceeding the inner bract; capsules 4 to 6 mm. high. Common ..... *S. angustifolium.*
a'. Spathes peduncled from the axil of the leaf-like bract.
b. Inner bract of the spathe 1.5 to 3 cm. long; stems broadly winged.
Pedicels loosely spreading, much exceeding the inner bract. *S. gramineum.*
Pedicels strongly ascending, rarely exceeding the inner bract. *S. angustifolium.*
b'. Inner bract of the spathe 1 to 1.5 cm. long; stems slender and narrowly margined ..... *S. atlanticum.*

S. angustifolium Mill.— Meadows and open places in woods; common.

S. atlanticum Bicknell.— Low meadows, borders of bogs and swamps; frequent on the plateau, occasional in the valley (Pittsfield, Stockbridge).

S. gramineum Curtis.— (*S. graminoides* Ill. Fl. ed. 2.)
Meadows and fields; common.

S. mucronatum Michx.— Meadow, Cheshire Harbor (Cushman); sandy field, Sheffield (Fernald).

ORCHIDACEAE. ORCHID FAMILY.

ARETHUSA.

A. bulbosa L. ARETHUSA.— Open bogs; occasional in the southern part of the County. Ward Pond, Becket; Monterey (Walters);

Great Barrington (Walters); New Marlboro (Walters). Possibly occurs throughout the County, as it is easily overlooked unless in flower.

CALOPOGON.

(*Limodorum* Ill. Fl. ed. 2.)

C. pulchellus (Sw.) R. Br. Grass Pink.— Borders of bogs; occasional in the valley. Williamstown; Pittsfield; Stockbridge; Great Barrington (Walters); New Marlboro; Sheffield (Walters).

CORALLORRHIZA. Coral Root.

C. maculata Raf.— Rich woods; common.

C. trifida Chatelain.— (*C. Corallorhiza* Ill. Fl. ed. 2.)

Rich woods, wet slopes and shaded peat bogs; frequent.

CYPRIPEDIUM. Lady's Slipper; Moccasin Flower.

C. acaule Ait. Pink Lady's Slipper.— (*Fissipes acaule* Ill. Fl. ed. 2.)

Dry woods and knolls in swamps; frequent. Altitude 1900 feet (Savoy).

C. arietinum R. Br. Ram's Head Lady's Slipper.— Great Barrington (Miss Helen Brown).

C. hirsutum Mill. Showy Lady's Slipper.— (*C. reginae* Ill. Fl. ed. 2.)

Cold swamps; frequent in the valley.

forma **album** (Sweet), comb. nov.— (*Vid.* Brit. Fl. Gard. **3**: 240, 1827–29.) Flowers pure white.

Williamstown (Pres. Carter); Becket (specimen in Gray Herbarium).

C. parviflorum Salisb. Smaller Yellow Lady's Slipper.— Rich woods and borders of swamps; frequent.

var. **pubescens** (Willd.) Knight. Larger Yellow Lady's Slipper.— (*C. parviflorum* Ill. Fl. ed. 2 in part.)

Rich woods; frequent.

Specimens intermediate between *C. parviflorum* and the var. *pubescens* have been collected at White Oaks, Williamstown (Churchill).

EPIPACTIS. Rattlesnake Plantain.

(*Peramium* Ill. Fl. ed. 2.)

E. pubescens (Willd.) A. A. Eaton.— Rich upland woods; frequent. Chiefly under conifers, but occasionally under deciduous trees (New Marlboro).

E. repens (L.) Crantz, var. **ophioides** (Fernald) Eaton.— (*Peramium ophioides* Ill. Fl. ed. 2.)

Under spruces on the upper slopes of Greylock (Churchill, Andrews); under hemlocks on serpentine, Florida.

E. tesselata (Lodd.) A. A. Eaton.— Under conifers; frequent.

A specimen collected in Hancock with a raceme 11 cm. long.

HABENARIA. Fringed Orchis.

× **H. Andrewsii** White (**H. lacera** × **H. psycodes**).— Becket (Walters).

H. blephariglottis (Willd.) Torr. White Fringed Orchis.— (*Blephariglottis blephariglottis* Ill. Fl. ed. 2.)

Borders of peat bogs; occasional. Becket; Sheffield.

H. bracteata (Willd.) R. Br.— (*Coeloglossum bracteatum* Ill. Fl. ed. 2.)

Rich woods; occasional. Williamstown; New Marlboro; Great Barrington; Sandisfield; Sheffield (Walters).

H. clavellata (Michx.) Spreng.— (*Gymnadeniopsis clavellata* Ill. Fl. ed. 2.)

Swampy woods; frequent.

H. dilatata (Pursh.) Gray.— (*Limnorchis dilatata* Ill. Fl. ed. 2.)

Shaded swamps; frequent. Often associated with *Cypripedium hirsutum*.

H. fimbriata (Ait.) R. Br. Large Purple Fringed Orchis.— (*Blephariglottis grandiflora* Ill. Fl. ed. 2.)

Swamps and borders of wet woods; frequent on the plateau. Florida; Washington; Becket (lowest altitude 1500 feet); Sandisfield.

H. flava (L.) Gray.— (*Perularia flava* Ill. Fl. ed. 2.)

Wet places; frequent.

H. Hookeri Torr.— (*Lysias Hookeriana* Ill. Fl. ed. 2.)

Woods; frequent.

H. hyperborea (L.) R. Br.— (*Limnorchis hyperborea* Ill. Fl. ed. 2.)

Woods; common. Very variable in height and size of flowers, perhaps including more than one species.

H. lacera (Michx.) R. Br. RAGGED FRINGED ORCHIS.— (*Blephariglottis lacera* Ill. Fl. ed. 2.)

Wet meadows; frequent. On Greylock in clearings over 3000 feet (Andrews).

H. macrophylla Goldie.— Rich woods. Savoy; Lanesboro (Churchill); Dalton (Lincoln); Sandisfield.

H. obtusata (Pursh) Richards.— (*Lysiella obtusata* Ill. Fl. ed. 2.) Bog, Hinsdale (H. L. Moody).

H. orbiculata (Pursh) Torr. LARGE ROUND-LEAVED ORCHIS.— (*Lysias orbiculata* Ill. Fl. ed. 2.)

Rich woods; frequent.

H. psycodes (L.) Sw. SMALLER PURPLE FRINGED ORCHIS.— (*Blephariglottis psycodes* Ill. Fl. ed. 2.)

Swamps and wet meadows; common. Altitude 2000 feet, Hancock. A form with pale sepals from Becket. A spike from Sheffield with 144 flowers.

forma **albiflora**, f. nov.— Corollis albis. Flowers white.

Type in N. E. B. C. herbarium, collected in Stockbridge, August 12, 1914 (R. Hoffmann).

LIPARIS. TWAYBLADE.

L. liliifolia (L.) Richard.— Rich woods in the western part of the valley; occasional. Williamstown, lower wooded slope of Greylock (Andrews); Stockbridge (Miss Helen Kobbe); West Stockbridge; Alford; Mt. Washington (Walters).

L. loeselii (L.) Richard.— Bogs and wet roadsides; frequent.

MICROSTYLIS. ADDER'S MOUTH.

(*Malaxis* Ill. Fl. ed. 2.)

M. monophyllos (L.) Lindl.— Cold bogs; occasional. Williamstown, upper wet slopes of Greylock, also in one dry grass-covered meadow (Andrews); North Adams (White); Pittsfield; Stockbridge.

M. unifolia (Michx.) BSP.— Bogs, wet woods, or dry slopes and ledges; frequent.

ORCHIS.

(*Galeorchis* Ill. Fl. ed. 2.)

O. spectabilis L. Showy Orchis.— Rich woods; frequent in the valley. Altitude 1000 feet, Sandisfield.

POGONIA.

P. ophioglossoides (L.) Ker. Rose Pogonia.— Marshes and peat bogs; frequent. Altitude 2000 feet, Hancock.

P. verticillata (Willd.) Nutt. Whorled Pogonia.— (*Isotria verticillata* Ill. Fl. ed. 2.)

Dry open woods; occasional in the valley. Great Barrington; Mt. Washington (Walters); Sheffield (Walters). For a description of specimens with anomalous flowers, collected by Walters in Mt. Washington, *vid.* Rhodora, **18**: 252 (1916).

SERAPIAS.

S. Helleborine L.— A small colony of this rare European orchid was found by Miss Caroline Wells in 1898 under Norway Spruces in Stockbridge. The station has been since destroyed.

SPIRANTHES. Ladies' Tresses.

(*Ibidium* Ill. Fl. ed. 2.)

S. cernua (L.) Richard.— Wet meadows; common.

var. **ochroleuca** (Rydb.) Ames.— In drier situations than the type; frequent.

S. gracilis (Bigel.) Beck.— Dry open soil; common.

S. lucida (H. H. Eaton) Ames.— (*Ibidium plantagineum* Ill. Fl. ed. 2.)

Gravelly shores of ponds, borders of swamps and roadside ditches; frequent in the valleys.

S. Romanzoffiana Cham.— Bogs; occasional. North Adams (White); Hinsdale (Moody); Lanesboro; Pittsfield; Monterey (Walters); Great Barrington; Egremont.

SALICACEAE. Willow Family.

POPULUS. Poplar.

P. alba L. White Poplar.— Occasionally spreading from cultivation.

P. balsamifera L., var. **virginiana** Sarg. COTTONWOOD; NECKLACE POPLAR.— (*P. deltoides* Man. ed. 7 and Ill. Fl. ed. 2.)

Along streams in the valley; frequent.

P. grandidentata Michx. LARGE-TOOTHED ASPEN.— Woods; common.

P. NIGRA L., var. ITALICA Du Roi. LOMBARDY POPLAR.— (*P. italica* Ill. Fl. ed. 2.)

Occasionally spreading from cultivated trees.

P. tacamahacca Mill. BALSAM POPLAR.— (*P. balsamifera* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Journ. Arnold Arb., **1**: 61, 1919.)

Spreading freely from planted trees. Indigenous along Cascade Brook, Hoosac Tunnel, Florida.

var. **Michauxiana** (Dode) Henry.— River-bank, North Adams (Fernald and Long).

Differs from the type in the ovate leaves with a broad, rounded or subcordate base, and slight pubescence on the midrib and veins beneath; petioles and twigs are also slightly hairy. *Vid.* Garden Chronicle, ser. **3**, **59**: 230 (1916).

P. tremuloides Michx. AMERICAN ASPEN.— Dry woods and clearings; common.

SALIX. WILLOW.

S. ALBA L. WHITE WILLOW.— Along streams; occasional. Deerfield R., Florida; Williamstown; Adams (Churchill); Pittsfield; Great Barrington; Egremont.

var. VITELLINA (L.) Koch.— Along rivers and streams; common in the valley, occasional up to an altitude of 1500 feet on the plateau.

S. candida Flügge. HOARY WILLOW.— Cold bogs; frequent.

var. **denudata** Anders.— Occasional. Stockbridge; West Stockbridge (Evans, Fernald and Knowlton); Egremont.

S. cordata Muhl.— Low ground, along streams and on the plateau, along roadsides; common. Summit of Greylock, 3500 feet.

var. **myricoides** (Muhl.) Carey.— Occasional. October Mt., Washington; Pontoosuc Lake, Lanesboro (Churchill).

S. discolor Muhl. GLAUCOUS WILLOW; PUSSY WILLOW.— Swamps and low ground, and on the plateau, along roadsides; common.

var. **eriocephala** (Michx.) Anders.— Occasional. Pittsfield.

var. **prinoides** (Pursh) Anders.— Great Barrington.

S. FRAGILIS L. CRACK WILLOW.— Borders of streams; occasional. Adams (Knowlton and Bean); Great Barrington (Cushman); Egremont.

S. humilis Marsh.— Dry open woods and sandy soil; common. Altitude 1900 feet, Florida.

S. lucida Muhl. SHINING WILLOW.— Borders of swamps, shores of lakes and streams, wet roadsides; common.

var. **angustifolia** Anders.— Marsh on Hancock Mt. (altitude 2000 feet). The only known station for the State.

var. **intonsa** Fernald.— Williamstown.

S. nigra Marsh. BLACK WILLOW.— Borders of ponds and along streams; common in the valley.

var. **falcata** (Pursh) Torr.— Occasional with the type.

S. pedicellaris Pursh, var. **hypoglauca** Fernald.— (*S. pedicellaris* Man. ed. 7 in part; *vid.* Rhodora, **11**: 161, 1909.)

Open bogs; frequent.

Leaves green above, glaucous beneath. *S. pedicellaris* has leaves green on both surfaces.

S. PENTANDRA L.— Occasionally escaped from cultivation. Stockbridge; Great Barrington.

S. petiolaris Sm.— Low ground; frequent.

S. PURPUREA L. PURPLE WILLOW.— Occasionally naturalized along brooks; Williamstown; Richmond; Stockbridge; Sheffield.

S. rostrata Richards. BEAKED WILLOW.— Borders of swamps or dry thickets; common. On the plateau forming with *S. cordata* and *S. discolor* thickets along the roadsides. A form from Great Barrington with capsules partially or completely doubled.

S. sericea Marsh. SILKY WILLOW.— Borders of swamps, along streams and in low ground; common.

S. serissima (Bailey) Fernald.— Swamps, in calcareous soil; frequent in the southern part of the valley, from Richmond and Stockbridge to Sheffield.

S. subsericea (Anders.) Schneider.— Hinsdale.

Similar to *S. petiolaris*. Leaves loosely sericeous when young, at length glabrate except the *puberulent midrib above*, rather coarsely appressed-serrate; winter buds puberulent; scales oblong, with *rounded blackish tips*; capsule lance-conic, blunt, loosely silky, 5 to 7 mm. long, its pedicel many times exceeding the gland. *Vid.* Rhodora, **11**: 12 (1909).

Hybrids of Salix.

S. alba × **fragilis.**— Watercourse, Pittsfield (Schneider); Lenox (Schneider).

S. candida × **rostrata.**— Calcareous swamp, Richmond (Evans, Fernald and Knowlton).

S. candida × **petiolaris.**— Monterey; Sheffield.

S. cordata × **rostrata.**— Florida.

S. cordata × **candida.**— Stockbridge.

S. discolor × **rostrata.**— Florida.

S. petiolaris × **sericea.**— Egremont.

The five last hybrids in the above list have been determined by Mr. F. F. Forbes.

MYRICACEAE. SWEET GALE FAMILY.

MYRICA.

M. asplenifolia L. SWEET FERN.— (*Comptonia peregrina* Ill. Fl. ed. 2.)

Dry hills and borders of woods; common in the valley.

M. Gale L. SWEET GALE.— Borders of ponds and bogs, and in swamps; common.

var. **subglabra** (Chevalier) Fernald.— Altitude 2000 feet, Guilder Pond, Mt. Washington.

Leaves glabrous or glabrate throughout. In the type the leaves are more or less pubescent, at least on the veins beneath. *Vid.* Rhodora, **16**: 167 (1914).

JUGLANDACEAE. WALNUT FAMILY.

CARYA. HICKORY.

(*Hicoria* Ill. Fl. ed. 2.)

C. cordiformis (Wang.) K. Koch. BITTERNUT.— Dry woods; frequent in the valley.

C. glabra (Mill.) Spach. PIGNUT.— Hillsides; frequent in the valley.

C. ovata (Mill.) K. Koch. SHELL-BARK OR SHAG-BARK HICKORY.— Rich woods, open hillsides; common in the valley.

JUGLANS.

J. cinerea L. BUTTERNUT.— Rich woods, open hillsides; common in the valley, frequent on the lower portions of the plateau (altitude 1800 feet, Becket).

BETULACEAE. BIRCH FAMILY.

ALNUS. ALDER.

A. incana (L.) Moench. SPECKLED ALDER.— Along streams, borders of swamps, and on the plateau along roadsides; common.

A. crispa (Ait.) Pursh, var. **mollis** Fernald.— DOWNY GREEN ALDER.— (*A. mollis* Man. ed. 7; *vid.* Rhodora, **15**: 4, 1913. *A. Alnobetula* Ill. Fl. ed. 2.)

Hoosac Mt., Florida; along the Deerfield River, Florida.

A. rugosa (Du Roi) Spreng. SMOOTH ALDER.— Borders of lakes and streams; occasional in the southern part of the valley. Stockbridge; New Marlboro (Walters); Sheffield.

BETULA. BIRCH.

B. alba L., var. **cordifolia** (Regel) Fernald. PAPER BIRCH; CANOE BIRCH.— (*B. cordifolia* Ill. Fl. ed. 2.)

Hillsides; occasional. Pittsfield; West Stockbridge; Egremont (Walters).

var. **papyrifera** (Marsh) Spach.— (*B. papyrifera* Ill. Fl. ed. 2.)

Woods; common. A specimen from Otis, determined by Dr. Rehder, with mature leaves only 5 cm. long.

B. lenta L. BLACK BIRCH; CHERRY BIRCH.— Rich woods, banks of streams; frequent.

B. lutea Michx. f. YELLOW BIRCH.— Cool rocky woods; common.

B. populifolia Marsh. WHITE BIRCH; GRAY BIRCH.— Sandy or ill-drained soil; common in the southern part of the County, frequent elsewhere. Summits of Greylock (altitude 3400 feet) and The Dome.

B. pumila L. LOW OR SWAMP BIRCH.— Cold bogs; local. D. D. Field swamp and Nigger Pond, Stockbridge; Juniper Pond, New Marlboro.

CARPINUS. HORNBEAM; IRONWOOD.

C. caroliniana Walt. AMERICAN HORNBEAM; BLUE OR WATER BEECH.— Along streams and borders of swamps, cool rocky hillsides; frequent.

CORYLUS. Hazelnut.

C. americana Walt. Hazelnut.— Dry soil; common in the extreme southern part of the County; Egremont; Sheffield. Occasional as far north as Lenox Hill (Schneider and Schweinfurth).

C. rostrata Ait. Beaked Hazelnut.— Borders of woods and roadside thickets; common on the upland and frequent in the valley, occurring occasionally with *C. americana*.

OSTRYA. Hop Hornbeam; Ironwood.

O. virginiana (Mill.) K. Koch. American Hop Hornbeam.— Open rocky woods and hillsides, particularly in calcareous soil; frequent in the valleys, occasional on the plateau (altitude 2000 feet, Savoy.)

FAGACEAE. BEECH FAMILY.

CASTANEA. Chestnut.

C. dentata (Marsh) Borkh. Chestnut.— Rich woods; common in the valley, frequent on the lower parts of the plateau, absent from the higher parts.

FAGUS. Beech.

F. grandifolia Ehrh. Beech.— Rich woods; common on the plateau, frequent in the valleys. Summit of Greylock, altitude 3500 feet.

forma **pubescens** Fernald & Rehder.— (*Vid.* Rhodora, **9**: 111, 1907.) Williamstown (Rehder).

Differs from the type in having the under side of the leaves short-pubescent, and the veins covered with a villous pubescence, not with long silky hairs.

QUERCUS. Oak.

Q. alba L. White Oak.— Dry soil; common in the southern part of the valley and on the Taconics, absent from the plateau.

Q. bicolor Willd. Swamp White Oak.— Borders of streams and swamps; occasional in the southern part of the valley. Great Barrington; Egremont; Sheffield.

Q. coccinea Muench. Scarlet Oak.— Dry soil, in the southern part of the valley; frequent. Grows to a large size only in New Marlboro and Sheffield.

Q. ilicifolia Wang. Bear Oak; Black Scrub Oak.— Sandy soil or rocky summits; common in the Sheffield sand-plain and on the summits of the southern Taconics.

Q. macrocarpa Michx. Bur Oak; Mossy-cup Oak.— Swamps, open bottom-land and hillsides; frequent in the valley.

Q. Muhlenbergii Engelm. Yellow Oak; Chestnut Oak.— On limestone ridges in the extreme southern part of the valley. One tree in Great Barrington (Sargent); frequent in Sheffield.

Q. prinoides Willd. Scrub Chestnut Oak; Chinquapin Oak.— Common on the sand-plain in southern New Marlboro and Sheffield.

Q. Prinus L. Chestnut Oak.— Rocky hillsides; common in the southern part of the valley, particularly west of the Housatonic River, occasional to the eastward (Monterey). Absent from the plateau.

Q. rubra L. Red Oak.— Woods; common throughout. The only oak found on the plateau.

Q. velutina Lam. Black Oak.— Rocky woods and dry soil; frequent in the southern part of the valley.

URTICACEAE. NETTLE FAMILY.

BOEHMERIA. False Nettle.

B. cylindrica (L.) Sw. False Nettle.— Shaded swamps, river-banks and low ground; frequent.

CELTIS. Hackberry.

C. occidentalis L. Hackberry; Sugarberry.— Hackberries are occasional along the Housatonic River in Stockbridge, Great Barrington and Sheffield, growing either in meadows on the edge of the river or in Sheffield on ledges above the river. The trees are for the most part small, but in Stockbridge there is one with a girth of nine and a half feet. Specimens from the three towns have been submitted to Dr. Rehder, who has determined some from Stockbridge and Sheffield as typical, and writes of two specimens from Stockbridge, as follows:

"The specimen collected Aug. 26, 1920, I refer to *C. occidentalis*, var. *canina* (Raf.) Sarg. (in Bot. Gaz. **67**: 217, 1919), though the under side of the leaves is as pubescent as in var. *crassifolia*, but the leaves are not scabrate above. The specimen collected on Aug. 12,

1914, I should be inclined to refer to var. *crassifolia* (Larn.) Gray, as at least one of the branchlets has the leaves distinctly scabrate above, but as it has no fruits, it may be from a young plant which like vigorous shoots has rougher and more pubescent leaves."

HUMULUS. Hop.

H. Lupulus L. Hop.— Occasional in low ground or on rocky banks; an escape from cultivation.

LAPORTEA. Wood Nettle.

L. canadensis (L.) Gaud. Wood Nettle.— (*Urticastrum divaricatum* Ill. Fl. ed. 2.)

Rich woods; common in the valleys, frequent on the plateau. Altitude on the plateau, 1800 feet, Adams; 2500 feet, Greylock.

MORUS. Mulberry.

M. alba L. White Mulberry.— An occasional escape from cultivation; New Marlboro; Sheffield.

M. rubra L. Red Mulberry.— A single tree on a limestone ledge in New Marlboro; two trees on a limestone cobble in Ashley Falls, Sheffield. The only known stations for this western tree in the State.

PARIETARIA. Pellitory.

P. pennsylvanica Muhl. Pellitory.— Shaded limestone rocks, Sheffield (Walters); shaded limestone ledge, New Marlboro.

PILEA. Richweed; Clearweed.

P. pumila (L.) Gray. Richweed; Clearweed.— Damp shaded ground, shaded ledges and waste ground; common.

ULMUS. Elm.

U. americana L. American or White Elm.— Along streams and in rich woods; common, except on the plateau, where rare.

U. campestris L. English Elm.— Seedlings growing under shade trees in Lenox.

U. fulva Michx. Slippery Elm.— Rocky woods and along streams; frequent in the valley. Not noted on the plateau.

URTICA. Nettle.

U. gracilis Ait. Common Nettle.— Moist ground and waste places; common.

U. Lyallii Wats.— (*U. gracilis* Ill. Fl. ed. 2 in part.)

Alluvial ground; occasional in the valley. Williamstown, Hancock and Lanesboro (Churchill); Lee; New Marlboro; Sheffield.

SANTALACEAE. SANDALWOOD FAMILY.

COMANDRA. Bastard Toad-flax.

C. umbellata (L.) Nutt. Bastard Toad-flax.— Sandy soil in the southern part of the valley; common on the Sheffield sand-plain and on the summit of The Dome, Mt. Washington. Occurs on rocky ledges on Monument Mt., Great Barrington.

LORANTHACEAE. MISTLETOE FAMILY.

ARCEUTHOBIUM.

(*Razoumofskya* Ill. Fl. ed. 2.)

A. pusillum Peck. Dwarf Mistletoe.— On Black Spruce (*Picea mariana*) in peat bogs; local. Ward Pond, Becket; Wolf Swamp, Sandisfield.

ARISTOLOCHIACEAE. BIRTHWORT FAMILY.

ASARUM. Wild Ginger.

A. canadense L. Wild Ginger.— Rich woods; common in the valley, less common on the plateau. Altitude 1500 feet (Windsor).

var. **acuminatum** Ashe.— (*A. acuminatum* Ill. Fl. ed. 2.)

Dry rocky upland woods, North Adams (Fernald and Long); rich woods, Adams.

POLYGONACEAE. BUCKWHEAT FAMILY.

FAGOPYRUM. Buckwheat.

F. esculentum Moench. Buckwheat.— (*Fagopyrum Fagopyrum* Ill. Fl. ed. 2.)

Occasionally persisting in old fields or escaping along roadsides.

F. TATARICUM (L.) Gaertn. INDIA-WHEAT.— In grainfields and waste ground, Sheffield (Churchill).

POLYGONUM. KNOTWEED.

(*Persicaria* Ill. Fl. ed. 7 in part.)

P. acre HBK., var. **leptostachyum** Meisn. WATER SMARTWEED. — Low ground; common.

P. amphibium L.— (*Persicaria amphibia* Ill. Fl. ed. 2.)

In shallow water or on muddy shores; common.

var. **Hartwrightii** (Gray) Bissell. Borders of swamps and in marshes; frequent.

forma **terrestre** (Leers) Blake.— (var. *terrestre* Man. ed. 7; *vid.* Rhodora, **15**: 164, 1913.)

Muddy shores; occasional. Pittsfield; Stockbridge. Specimens collected at Lake Averic, Stockbridge, show the above variety and the form growing from the same rootstock.

P. arifolium L. HALBERD-LEAVED TEAR-THUMB.— (*Tracaulon arifolium* Ill. Fl. ed. 2.)

Swamps and low ground; frequent.

P. aviculare L. KNOTGRASS; DOORWEED.— Dooryards, roadsides and cultivated ground; common.

var. **angustissimum** Meisn.— On ledges bordering Guilder Pond, Mt. Washington. Altitude 2000 feet.

var. **vegetum** Ledeb.— Yards, roadsides and cultivated ground; common.

P. Careyi Olney.— (*Persicaria Careyi* Ill. Fl. ed. 2.)

Border of Rudd Pond, Becket.

P. cilinode Michx. BINDWEED.— (*Tinaria cilinodis* Ill. Fl. ed. 2.)

Rocky woods and on ledges; common.

P. CONVOLVULUS. BLACK BINDWEED.— (*Tinaria convolvulus* Ill. Fl. ed. 2.)

Cultivated ground and clearings; common.

P. erectum L.— Yards and roadsides; occasional. Williamstown (Churchill); Lenox; New Marlboro (Walters).

P. Hydropiper L. COMMON SMARTWEED; WATER PEPPER.— (*Persicaria Hydropiper* Ill. Fl. ed. 2.)

Moist shaded ground; common.

P. hydropiperoides Michx. MILD WATER PEPPER.— (*Persicaria hydropiperoides* Ill. Fl. ed. 2.)

Borders of swamps and muddy shores; frequent in the valley.

P. lapathifolium L. Dock-leaved Persicaria.— (*Persicaria lapathifolia* Ill. Fl. ed. 2.)

Wet places; common.

var. **salicifolium** Gibthorp.—(*P. tomentosum* Schrank, var. *incanum* Man. ed. 7.)

Sandy shore of Pontoosuc Lake, Pittsfield.

P. Muhlenbergii (Meisn.) Wats.— (*Persicaria Muhlenbergii* Ill. Fl. ed. 2.)

Muddy shores of ponds, and marshes; frequent in the valley.

P. orientale L. Prince's Feather.— (*Persicaria orientalis* Ill. Fl. ed. 2.)

Occasionally persistent in waste ground, Stockbridge.

P. pennsylvanicum L., var. **laevigatum** Fernald. Pink Knotweed.— (*P. pennsylvanicum* Man. ed. 7 in part, *vid.* Rhodora **19**: 73, 1917; *Persicaria pennsylvanica* Ill. Fl. ed. 2.)

Low ground; common.

Leaves glabrous or at most sparsely strigose on the midrib beneath.

P. Persicaria L. Lady's Thumb.— (*Persicaria persicaria* Ill. Fl. ed. 2.)

Waste places and low ground; common.

P. sagittatum L. Arrow-leaved Tear-thumb.— (*Tracaulon sagittatum* Ill. Fl. ed. 2.)

Low ground; common.

P. scandens L. Climbing False Buckwheat.— (*Tinaria scandens* Ill. Fl. ed. 2.)

Alluvial thickets; frequent in the valley.

P. tenue Michx.— Open sterile soil; occasional in the southern part of the valley. Alford; Sheffield.

P. virginianum L.— (*Torara virginiana* Ill. Fl. ed. 2.)

Alluvial thickets; frequent in the southern part of the valley and along the Deerfield River, Florida.

RUMEX. Dock.

R. Acetosa L. Garden Sorrel.— Fields; occasional. Lee; Lenox; Stockbridge.

R. Acetosella L. Sheep Sorrel.— Cultivated ground, old fields, rocky ledges; common.

R. britannica L. Great Water Dock.— Swamps; common.

R. CRISPUS L. YELLOW DOCK.— Waste places and low ground; common.

R. MEXICANUS Meisn.— Waste ground; occasional. First noted in a freight-yard in 1916. Riverbanks, Williamstown; Pittsfield; Lenox; Stockbridge; Mt. Washington.

R. OBTUSIFOLIUS L. BITTER DOCK.— Fields, roadside ditches and waste ground; common. Well established along mountain brooks.

R. PATIENTIA L. PATIENCE DOCK.— Marshes and wet meadows; occasional. Becket; Otis; Sheffield; Lanesboro (Churchill).

CHENOPODIACEAE. GOOSEFOOT FAMILY.

ATRIPLEX.

A. PATULA L., var. HASTATA (L.) Gray.— (*Atriplex hastata* Ill. Fl. ed. 2.)

Waste ground about woolen mill, Pittsfield; barnyard, Stockbridge.

CHENOPODIUM. PIGWEED; GOOSEFOOT.

C. ALBUM L. LAMB'S QUARTERS; PIGWEED.— Cultivated and waste ground; common.

var. VIRIDE (L.) Moq.— Waste ground; occasional. Stockbridge; Great Barrington.

C. Boscianum Moq.— Flood-plain of Bash Bish Brook, Mt. Washington.

C. BOTRYS L. JERUSALEM OAK.— Cultivated ground, Cheshire Harbor.

C. CAPITATUM (L.) Asch. STRAWBERRY BLITE.— (*Blitum capitatum* Ill. Fl. ed. 2.)

Newly broken ground, on the Mohawk Trail, Florida; clearing, Mt. Washington (Anson Williams).

C. FARINOSUM (Wats.) Standl.— On dump at woolen mill, Pittsfield.

C. FICIFOLIUM Sm.— On dump at woolen mill, Pittsfield.

C. GLAUCUM L. OAK-LEAVED GOOSEFOOT.— Along railroad tracks, Pittsfield; Lee.

C. hybridum L.— Rocky woods and in waste ground; frequent.

KOCHIA.

K. SCOPARIA (L.) Schrad.— Established in dooryard, Gt. Barrington.

SALSOLA.

S. Kali L., var. tenuifolia G. F. W. Mey. Russian Thistle.— (*S. kali* Ill. Fl. ed. 2 in part.)

Along railroad tracks, Pittsfield; waste ground, West Stockbridge.

AMARANTHACEAE. AMARANTH FAMILY.

AMARANTHUS. Amaranth.

A. deflexus L.— On dump at woolen mill, Pittsfield.

A. graecizans L. Tumbleweed.— Along railroad tracks and in waste ground; occasional. Pittsfield; Lee; Great Barrington; Sheffield.

A. hybridus L. Pigweed.— Waste ground; common.

A. Palmeri Wats.— On dump at woolen mill, Pittsfield.

A. Powellii Wats.— On dump at woolen mill, Pittsfield.

A. retroflexus L. Pigweed.— Waste and cultivated ground; common.

A. spinosus L.— On dump, Gt. Barrington.

A. undulatus R. Br.— On dump at woolen mill, Pittsfield.

PHYTOLACCACEAE. POKEWEED FAMILY.

PHYTOLACCA. Pokeweed.

P. americana L. Pokeweed.— (*P. decandra* Man. ed. 7; *vid.* Rhodora, **17**: 180, 1915.)

Clearings and open hillsides; frequent.

NYCTAGINACEAE. FOUR-O'CLOCK FAMILY.

OXYBAPHUS.

(*Allionia* Ill. Fl. ed. 2.)

O. nyctagineus (Michx.) Sweet.— Along railway, Cheshire (Winslow).

ILECEBRACEAE. KNOTWORT FAMILY.

ANYCHIA. Forked Chickweed.

A. canadensis (L.) BSP. Forked Chickweed.— Dry woods, Egremont; dry bank, edge of woods, Mt. Washington (Walters).

SCLERANTHUS. KNAWEL.

S. ANNUUS L. KNAWEL.— Rocky flood-plain of Green River, Egremont; locally common along sandy roadsides in the southern part of Sheffield.

AIZOACEAE.

MOLLUGO. INDIAN CHICKWEED.

M. VERTICILLATA L. CARPET WEED.— Cultivated ground, roadsides, sandy shores; common.

CARYOPHYLLACEAE. PINK FAMILY.

AGROSTEMMA. CORN COCKLE.

A. GITHAGO L. CORN COCKLE.— Rarely adventive in waste land and grain fields. Lanesboro (Churchill); Stockbridge.

ARENARIA. SANDWORT.

(*Moehringia* Ill. Fl. ed. 2 in part.)

A. lateriflora L., var. **typica** (Regel) St. John.— (*A. lateriflora* Man. ed. 7 in part, *vid.* Rhodora, **19**: 260, 1917; *Moehringia lateriflora* Ill. Fl. ed. 2.)

Occasional in the southern part of the valley. Dry bank near the Housatonic River, Stockbridge; moist soil near the Housatonic River, Sheffield (Walters); moist place on old road, Mt. Washington (Weatherby).

Leaves puberulent on the margins and on the midribs beneath, or occasionally puberulent throughout.

A. macrophylla Hook.— (*Moehringia macrophylla* Ill. Fl. ed. 2.)

On serpentine ledges in dry hypnum, Florida (Fernald).

A. SERPYLLIFOLIA L.— Dry soil on hillsides, sand-plains and along railroad tracks; locally common in the southern part of the valley.

A. stricta Michx.— Exposed limestone rocks, Sheffield (Walters); limestone outcrops, New Marlboro.

CERASTIUM. MOUSE-EAR CHICKWEED.

C. ARVENSE L. FIELD MOUSE-EAR CHICKWEED.— On lawns; occasional. Pittsfield (Lincoln); dry field, West Stockbridge (Evans, Fernald and Knowlton); Great Barrington (Walters).

Indigenous on serpentine ledges in Florida (Fernald and Long).

C. nutans Raf.— (*C. longipeduneulatum* Ill. Fl. ed. 2.)

Shaded ledges, Harvey Mt., West Stockbridge; East Mt., Great Barrington (Schweinfurth); Bash Bish Falls, Mt. Washington (Burnham).

C. VULGATUM L. COMMON MOUSE-EAR CHICKWEED.— Cultivated ground, fields, roadsides and ledges; common.

DIANTHUS. PINK.

D. ARMERIA L. DEPTFORD PINK.— Roadsides and dry fields; frequent in the southern part of the valley and about Pontoosuc Lake, Pittsfield.

D. BARBATUS L. SWEET WILLIAM.— Occasionally escaping to roadsides, especially on the upland.

D. DELTOIDES L. MAIDEN PINK.— Established along roadsides and in fields; frequent.

LYCHNIS. CAMPION.

L. ALBA Mill. WHITE CAMPION.— Occasional along roadsides. Lanesboro (Churchill); Cheshire; New Marlboro; Sheffield.

L. CHALCEDONICA L. SCARLET LYCHNIS.— An occasional roadside escape. Stockbridge; Egremont; Sheffield (Walters).

L. DIOICA L. RED CAMPION.— Occasional. Waste ground, North Adams (Fernald and Long); along railway, Cheshire (Knowlton).

L. FLOS-CUCULI L. RAGGED ROBIN.— Locally established in fields and meadows. North Adams; Adams; Cheshire; Pittsfield (Lincoln); Great Barrington and Sheffield (Walters).

SAGINA. PEARLWORT.

S. procumbens L. PEARLWORT.— Springy places and roadside ditches; frequent on the plateau, occasional elsewhere.

SAPONARIA. SOAPWORT.

S. OFFICINALIS L. BOUNCING BET.— Roadsides, railroad embankments and borders of streams; common. A double-flowered form is occasional.

S. VACCARIA L.— (*Vaccaria vaccaria* Ill. Fl. ed. 2.)

Occasionally adventive. Railroad track, North Adams; cultivated ground, Stockbridge.

SILENE. Catchfly; Campion.

S. antirrhina L. Sleepy Catchfly.— Sandy plains, dry hillsides and along railroad tracks; locally common in the southern part of the valley.

var. **divaricata** Robinson.— Limestone outcrops, Stockbridge and Sheffield.

S. Armeria L. Sweet William Catchfly.— Occasionally escaping from gardens, Sheffield.

S. dichotoma Ehrh.— Occasionally escaping from gardens, Lanesboro.

S. latifolia (Mill.) Britten & Rendle. Rattle-box; Bladder Campion.— Fields and roadsides; common in the valley.

S. noctiflora L. Night-flowering Catchfly.— Waste ground and fence rows; occasional.

S. pennsylvanica Michx. Wild Pink; Fire Pink.— Dry banks and ledges near Bash Bish Falls, Mt. Washington.

SPERGULA. Spurrey.

S. arvensis L. Corn Spurrey.— Roadsides and cultivated ground; frequent on the plateau. Occasional in the valley, Lanesboro (Churchill).

SPERGULARIA. Sand Spurrey.

(*Tissa* Ill. Fl. ed. 2.)

S. rubra (L). J. & C. Presl. Sand Spurrey.— Occasional and apparently introduced. Drive around Whitcomb's Tower, Florida; driveway, Pittsfield; path, Great Barrington.

STELLARIA. Chickweed; Starwort.

(*Alsine* Ill. Fl. ed. 2.)

S. aquatica (L.) Scop.— Well established along the Hoosac River, Williamstown.

S. borealis Bigel., var. **floribunda** Fernald.— (*S. borealis* Man. ed. 7 in part; *vid.* Rhodora, **16**: 151, 1914.)

Among boulders of sericite schist, Jencks Brook, Florida (Fernald and Long); swampy woods, Hancock (altitude 2000 feet).

Upper leaves much reduced to short scarious margined bracts; flowers numerous in terminal cymes.

var. **isophylla** Fernald.— (*S. borealis* Man. ed. 7 in part; *vid.* Rhodora, **16**: 150, 1914.)

Wet places; frequent, especially on the plateau.

Upper leaves long and but slightly reduced, herbaceous throughout; flowers few, axillary and terminal.

S. GRAMINEA L.— Grassy roadsides and thickets; frequent, especially on the plateau.

S. longifolia Muhl.— Meadows and swampy woods; occasional. Florida; Sheffield (Walters).

S. MEDIA (L.) Cyrill. COMMON CHICKWEED.— Cultivated ground; common.

PORTULACACEAE. PURSLANE FAMILY.

CLAYTONIA. SPRING BEAUTY.

C. caroliniana Michx. SPRING BEAUTY.— Rich or swampy woods; frequent. Abundant on the upper slopes of Greylock, and on the plateau. Altitude 2300 feet, Florida.

C. virginiana L. SPRING BEAUTY.— One station in Sheffield (Walters).

PORTULACA. PURSLANE; PUSLEY.

P. OLERACEA L. COMMON PURSLANE; PUSLEY.— Cultivated and waste ground; common.

CERATOPHYLLACEAE. HORNWORT FAMILY.

CERATOPHYLLUM. HORNWORT.

C. demersum L. HORNWORT.— Ponds and slow streams; common.

NYMPHAEACEAE. WATER LILY FAMILY.

BRASENIA. WATER SHIELD.

B. Schreberi Gmel. WATER SHIELD.— Ponds; frequent.

CASTALIA. WATER LILY.

C. odorata (Ait.) Woodville & Wood. WHITE WATER LILY; WHITE POND LILY.— Ponds and slow streams; common.

NYMPHOZANTHUS. Yellow Pond Lily.

(*Nymphaea* Man. ed. 7 and Ill. Fl. ed. 2.)

N. variegatus (Engelm.) Fernald. Cow Lily; Yellow Pond Lily.— (*Nymphaea advena*, var. *variegata* Man. ed. 7, *vid.* Rhodora, **21**: 187, 1919.)

Ponds and slow streams; common. In Cranberry Pond, West Stockbridge a leaf blade of this variety measured 4 dm. long, 2.6 dm. broad and the sinus was closed by an overlap of 2.5 cm.

N. microphyllus (Pers.) Fernald.— Spectacle Pond, Sandisfield; Housatonic River, Stockbridge; Sheffield (Churchill).

×? **N. rubrodiscus** (Morong) Fernald.— Probably a hybrid between *N. variegatus* and *N. microphyllus*. Spectacle Pond, Sandisfield, both parents growing near by.

RANUNCULACEAE. CROWFOOT FAMILY.

ACTAEA. Baneberry.

A. alba (L.) Mill. White Baneberry.— Rich woods; common.

A. rubra (Ait.) Willd. Red Baneberry.— Rich woods; common.

forma **neglecta** (Gillman) Robinson.— Lenox.

Specimens collected in Lanesboro (Churchill) and in Lenox are apparently hybrids between *A. alba* and *A. rubra*.

ANEMONE. Anemone.

A. canadensis L.— Alluvial ground; occasional. Richmond; Great Barrington; Sheffield.

A. cylindrica Gray.— Dry hillsides and open woods; common in the valley.

A. quinquefolia L. Wood Anemone.— Woods; common. Altitude 1400 feet, Florida.

A. riparia Fernald.— (*A. virginiana* Ill. Fl. ed. 2 in part.)

Shaded banks; occasional in the valley.

Specimens from Berkshire County have been determined by Professor Fernald. The distribution of the species in the County is still imperfectly understood.

A. virginiana L.— Roadside thickets and shaded banks; common.

Sepals leathery, greenish or greenish yellow, very pubescent on the back, narrowly oblong, acuminate, 0.7 to 1.3 cm. long.

forma **leucosepala** Fernald.— (*Vid.* Rhodora, **19**: 140, 1917.) Sheffield.

Sepals thinnish and petaloid, white, the larger ones scarcely pubescent on the back, obovate-rounded above, 1.2 to 1.7 cm. long.

ANEMONELLA.

(*Syndesmon* Ill. Fl. ed. 2.)

A. thalictroides (L.) Spach. Rue Anemone.— Dry woods; frequent in the southern part of the valley. Stockbridge; Great Barrington; New Marlboro; Egremont; Sheffield.

AQUILEGIA. Columbine; Honeysuckle.

A. canadensis L. Columbine.— Open rocky woods and ledges; common.

forma **flaviflora** (Tenney) Britton.— A form with pale yellow flowers. Sheffield.

forma **Phippenii**, (J. Robinson), n. comb.— Rocky pasture, Egremont.

A. vulgaris L.— Occasionally escaping from gardens to roadsides. Hancock; Lenox; Mt. Washington.

CALTHA. Marsh Marigold.

C. palustris L. Cowslip.— In swamps and along brooks; common.

CIMICIFUGA. Bugbane.

C. racemosa (L.) Nutt. Black Cohosh; Black Snakeroot.— Native on rich and partly shaded banks, Sheffield (Walters). Also occasionally escaping from cultivation to hedge-rows. New Marlboro; Great Barrington. Frequent in the western part of Sheffield where it probably reaches its most northern station.

Given by Dewey as only cultivated by the Shakers. May it not be that this striking plant, which he could hardly have overlooked, has worked its way northward in the last hundred years as the woods have been cleared and the soil has become drier?

CLEMATIS. Clematis; Virgin's Bower.

C. verticillaris DC. Purple Clematis.— (*Atragene americana* Ill. Fl. ed. 2.)

On rocks; occasional in the valley. Williamstown; West Stockbridge; Great Barrington; New Marlboro (Walters); Sheffield; Mt. Washington. Chiefly on limestone, but also on schist at Bash Bish Falls, Mt. Washington.

C. virginiana L. CLEMATIS.— Thickets; common.

COPTIS. GOLD THREAD.

C. trifolia (L.) Salisb. GOLD THREAD.— Rich moist woods and knolls in swamps; common.

HEPATICA. HEPATICA; LIVERLEAF.

H. acutiloba DC. HEPATICA; LIVERLEAF.— Rich woods; frequent in the valley. Occasionally growing with *H. triloba*.

forma **albiflora**, f. nov.— Sepalis albis. Flowers white. Type in N. E. B. C. collection from Williamstown, Mass. Collected May 17, 1920 (R. Hoffmann.)

The white form is commoner than the blue.

forma **rosea**, f. nov.— Sepalis roseis. Flowers light pink. Type in N. E. B. C. collection from Williamstown, Mass. Collected May 19, 1920 (R. Hoffmann.)

H. americana (DC.) Ker. HEPATICA; LIVERLEAF.— (*H. triloba* Man. ed. 7; *H. Hepatica* Ill. Fl. ed. 2. *Vid.* Rhodora, **19**: 45, 1917.)

Woods; common.

forma **candida** Fernald.— The white-flowered form, frequent, but not so common as the type.

forma **rhodantha** Fernald.— The pink-flowered form. Frequent with the type.

A form with five-lobed leaves, and one that has lobes nearly as acute as *H. acutiloba*, Sandisfield.

RANUNCULUS. CROWFOOT; BUTTERCUP.

R. abortivus L.— Clearings, ledges and rich woods; common.

var. **eucyclus** Fernald.— Rich woods; frequent. Altitude 1500 feet, Florida.

R. ACRIS L. BUTTERCUP.— Fields and roadsides; common.

R. allegheniensis Britton.— Rich woods, clearings and shaded banks; frequent in the southern part of the valley.

R. aquatilis L., var. **capillaceus** DC. White Water Crowfoot.— (*Batrachium trichophyllum* Ill. Fl. ed. 2.)

Ponds and slow streams; frequent.

R. bulbosus L. Buttercup.— Dry hillsides; frequent in the valleys. Locally common in the southern tier of towns, from West Stockbridge, Egremont and Sheffield to Sandisfield.

R. circinatus Sibth.— (*Batrachium circinatum* Ill. Fl. ed. 2.)

Ponds and slow streams; occasional. Lake Buel, Monterey (Churchill); lagoons in the Housatonic River, Sheffield (Churchill).

R. delphinifolius Torr. Yellow Water Crowfoot.— Locally common along the Housatonic River in Lenox; swamp, Stockbridge; Prospect Pond, Egremont; along the Housatonic River, Sheffield (Churchill).

forma **terrestris** (Gray) Blake.— (var. *terrestris* Man. ed. 7; *vid.* Rhodora, **15**: 164, 1913.)

Muddy shores, Lenox; mud-hole near Prospect Pond, Egremont.

R. hispidus Michx., var. **falsus** Fernald.— (*R. hispidus* Man. ed. 7 in part.)

Borders of woods; occasional in the valley. Stockbridge; New Marlboro; Great Barrington; Sheffield.

Differs from the type in having the pubescence appressed, or the petioles and stems subglabrous (*vid.* Rhodora, **22**: 30, 1920).

R. pennsylvanicus L. f. Bristly Crowfoot.— Wet shaded ground; frequent.

R. recurvatus Poir.— Moist woods; common. Altitude 1900 feet, Savoy.

R. repens L. Creeping Buttercup.— In lawns; occasional. Pittsfield; Stockbridge; Great Barrington. In a swamp, West Stockbridge (Evans, Fernald and Knowlton).

var. pleniflorus Fernald.— *Vid.* Rhodora, **19**: 138 (1917). Roadside ditches; occasional. Williamstown; Stockbridge; Alford.

The leaflets rounded or sub-cordate (not cuneate), at the base; margin crenate with broad obtuse teeth; flowers double.

R. sceleratus L.— Swamp, Sheffield (Fernald).

R. septentrionalis Poir. Swamp Buttercup.— Swampy woods; common.

THALICTRUM. Meadow Rue.

T. dioicum L. Early Meadow Rue.— Rocky woods and clearings; common.

T. polygamum Muhl. Meadow Rue.— Wet meadows, swamps, borders of streams, ill-drained hillsides; common. Grows nearly to the summit of Greylock, 3400 feet.

var. **hebecarpum** Fernald.— Low grounds; occasional. Becket; Stockbridge.

T. revolutum DC.— Roadside in low ground, Monterey; Sheffield (Churchill).

A single plant in each locality, the Monterey plant staminate, the Sheffield plant pistillate.

MAGNOLIACEAE. MAGNOLIA FAMILY.

LIRIODENDRON. Tulip Tree.

L. Tulipifera L. Tulip Tree; Whitewood.— Along streams and in swampy woods; locally frequent in the southern part of the valley. Tall trees border the Housatonic River between Glendale and Housatonic. A tree at Chesterwood, Glendale, 100 feet tall. The most northern station noted is a swamp in Lenox.

MENISPERMACEAE. MOONSEED FAMILY.

MENISPERMUM. Moonseed.

M. canadense L. Moonseed.— Alluvial thickets and rich upland woods; frequent in Sheffield, occasional as far north as Stockbridge.

BERBERIDACEAE. BARBERRY FAMILY.

BERBERIS. Barberry.

B. Thunbergii DC.— Becoming established in the southern part of the valley, occurring in pastures and swamps far from habitations. Undoubtedly carried by birds.

B. vulgaris L. Common Barberry.— Well established in one or two towns in the southern part of the valley. Stockbridge; Egremont; Sheffield. Nowhere so common as in eastern Massachusetts.

The purple-leaved form occurs spontaneously in Stockbridge.

CAULOPHYLLUM. BLUE COHOSH.

C. thalictroides (L.) Michx. BLUE COHOSH.— Rich woods; common in the valleys. Altitude 2500 feet, Greylock.

PODOPHYLLUM. MAY APPLE; MANDRAKE.

P. peltatum L. MAY APPLE; MANDRAKE.— Fence corners and rich woods; occasional and undoubtedly native in the southern and western parts of the County. Cheshire (Winslow); Hancock; meadow, West Pittsfield (Churchill); Stockbridge; West Stockbridge; Tyringham; New Marlboro (Walters); Becket (Fernald and Knowlton), probably introduced.

LAURACEAE. LAUREL FAMILY.

BENZOIN. WILD ALLSPICE; FEVER BUSH.

B. aestivale (L.) Nees. SPICE BUSH.— Swampy woods; occasional in the valley. Williamstown; Cheshire (Winslow); Lenox; Stockbridge; Sandisfield; New Marlboro; Sheffield.

SASSAFRAS. SASSAFRAS.

S. officinale Nees & Eberm. SASSAFRAS.— (*S. Sassafras* Ill. Fl. ed. 2 in part; *S. variifolium* Man. ed. 7. *Vid.* Rhodora, **20**: 99, 1918.)

Dry woods; occasional in the southern part of the valley and in Williamstown (Churchill).

var. **albidum** (Nutt.) Blake.— (var. *albidum* Man. ed. 7; *vid.* Rhodora **15**: 16, 1913, and **20**: 99, 1918.)

Dry woods, especially on rocky slopes; frequent in the southern part of the valley.

Leaves nearly or quite glabrous from the first; the bark of the new shoots glabrous and often glaucous.

PAPAVERACEAE. POPPY FAMILY.

CHELIDONIUM. CELANDINE.

C. MAJUS L. CELANDINE.— In damp soil, about buildings, on river alluvium and in shaded limestone talus (Williamstown); frequent.

PAPAVER. Poppy.

P. Rhoeas L. Field or Corn Poppy.— Occasionally persisting about gardens or adventive on dumps.

P. somniferum L. Common Poppy.— Occasionally persisting about gardens or adventive on dumps.

SANGUINARIA. Bloodroot.

S. canadensis L. Bloodroot.— Rich open woods and thickets, often at the foot of ledges; common in the valley. Not noted on the plateau above 1000 feet. Altitude 1200 feet, West Stockbridge.

FUMARIACEAE. FUMITORY FAMILY.

ADLUMIA. Climbing Fumitory.

A. fungosa (Ait.) Greene. Climbing Fumitory.— On rocks in rich open woods; occasional in the valley. Williamstown (Churchill); Stockbridge; West Stockbridge; New Marlboro; Mt. Washington.

CORYDALIS. Corydalis.

(*Capnoides* Ill. Fl. ed. 2.)

C. sempervirens (L.) Pers. Corydalis.— Ledges, rocky summits and clearings; common. Not noted on the plateau.

DICENTRA.

(*Bicuculla* Ill. Fl. ed. 2.)

D. canadensis (Goldie) Walp. Squirrel Corn.— Rich woods; frequent.

D. Cucullaria (L.) Bernh. Dutchman's Breeches.— Rich wooded hillsides; frequent in the valley. Altitude 2700 feet, Greylock.

FUMARIA. Fumitory.

F. officinalis L. Fumitory.— Occasionally persisting in gardens and on rubbish heaps. Pittsfield; Stockbridge; Sandisfield.

CRUCIFERAE. MUSTARD FAMILY.

ARABIS. Rock Cress.

A. canadensis L. Sickle-pod.— Dry wooded hills and banks; occasional in the valley. North Adams (Fernald and Long); Stock-

bridge; Great Barrington (Walters); West Stockbridge (Cushman); New Marlboro; Sheffield; Mt. Washington (Cushman). Frequent in Sheffield.

A. Drummondi Gray.— Wooded bank, Florida.

A. glabra (L.) Bernh.— Banks and wooded slopes; occasional in the valleys. Florida; North Adams (Churchill); New Marlboro; Great Barrington (Schweinfurth).

A. hirsuta (L.) Scop.— Dry shaded banks and ledges; occasional in the valley. North Adams (Fernald and Long); Adams (Knowlton and Bean); Stockbridge; Great Barrington (Walters); New Marlboro; Sheffield.

A. laevigata (Muhl.) Poir.— Dry wooded hillsides and shaded banks; frequent in the valley.

A. lyrata L.— On rocks; occasional. Locally common on West Stockbridge Mt., West Stockbridge; Sandisfield; Mt. Washington; Sheffield.

BARBAREA. Winter Cress.

B. vulgaris R. Br.— (*B. Barbarea* Ill. Fl. ed. 2.)

Low ground, roadside ditches, rich shaded banks and along streams; common.

Siliques on more or less divergent or slender, spreading ascending pedicels.

var. brachycarpa Rony & Foucand.— Cultivated ground, Lanesboro (Churchill).

var. **longisiliqua** Carion.— (*B. stricta* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **11**: 139, 1909.)

With the same habitat as the type; common in the valleys.

Siliques closely appressed to the rhachis.

BERTEROA.

B. incana (L.) DC.— Dry roadside, Cheshire (Churchill); Pittsfield (Lincoln); roadside, West Stockbridge; railroad track, Lee; edge of grain-field, Great Barrington.

BRASSICA. Mustard; Turnip.

B. arvensis (L.) Ktze. Charlock.—(*Sinapis arvensis* Ill. Fl. ed. 2.)

Fields; common.

B. CAMPESTRIS L. RUTABAGA.— An occasional escape. Dump, Lee; Sheffield (Walters).

B. JAPONICA Siebold.— Rarely adventive.

B. JUNCEA (L.) Cosson.— Roadsides and waste ground; frequent.

B. NIGRA (L.) Koch. BLACK MUSTARD.— Roadsides and waste ground; occasional. Lanesboro; New Marlboro; Sheffield.

B. NAPUS L. RAPE.— Fallow field, Williamstown.

B. OLERACEA L. CABBAGE.— Dump, Lee.

B. RAPA L. TURNIP.— Cultivated ground, Lanesboro (Churchill).

CAMELINA.

C. MICROCARPA Andrz.— Rarely adventive. In field of buckwheat, Lenox.

CAPSELLA. SHEPHERD'S PURSE.

(*Bursa* Ill. Fl. ed. 2.)

C. BURSA-PASTORIS (L.) Medic. SHEPHERD'S PURSE.— Dry fields and cultivated ground; common.

CARDAMINE. BITTER CRESS.

C. bulbosa (Schreb.) BSP.— Wet shaded ground; frequent in the southern part of the valley. Stockbridge; Great Barrington (Walters); Sheffield (Fernald).

C. Douglassii (Torr.) Britton.— Partly shaded bank, Sheffield (Walters).

C. parviflora L.— Shaded rocks, Harvey Mt., West Stockbridge.

C. pennsylvanica Muhl.— Moist ground; common.

C. PRATENSIS L. CUCKOO FLOWER.— In lawns. Williamstown; Dalton; Stockbridge.

var. **palustris** Wimm. & Grab.— (*Vid.* Rhodora, **22**: 14, 1920.)

Occasional and indigenous in cold bogs and wet meadows in the valley. Stockbridge; West Stockbridge (Evans, Fernald and Knowlton); Egremont and Sheffield (Walters).

Differs from the type in the white petals and in having the terminal leaflet of the basal leaves entire or obscurely toothed; lateral leaflets of the middle and upper cauline leaves usually with a distinct petiolule.

DENTARIA. Pepper-root.

D. diphylla Michx.— Rich woods; common. Altitude 2500 feet, Greylock.

D. laciniata Muhl.— Rich soil in low woods, Sheffield (Walters).

ERYSIMUM. Treacle Mustard.

(*Cheirinia* Ill. Fl. ed. 2.)

E. cheiranthoides L.— Waste ground; frequent. Also occasional and apparently indigenous on ledges in the valley.

HESPERIS. Rocket.

H. matronalis L. Rocket.— Roadside escape. Cheshire and Lanesboro (Churchill); Pittsfield (Lincoln).

LEPIDIUM. Pepperwort; Peppergrass.

L. apetalum Willd.— (*L. densiflorum* Ill. Fl. ed. 2.)

Williamstown (Churchill); dry roadside, Great Barrington (Walters).

L. campestre (L.) R. Br.— Occasional on roadsides. Pittsfield; Stockbridge; moist field, West Stockbridge (Evans, Fernald and Knowlton); Great Barrington.

L. virginicum L. Wild Peppergrass.— Dry fields, roadsides and waste ground; common.

RADICULA. Water Cress.

R. Armoracia (L.) Robinson. Horse Radish.— (*Armoracia Armoracia* Ill. Fl. ed. 2.)

Frequently escaping from cultivation to waste or low ground.

R. Nasturtium-aquaticum (L.) Britten & Rendle. Water Cress.— (*Sisymbrium Nasturtium-aquaticum* Ill. Fl. ed. 2.)

Brooks; frequent.

R. palustris (L.) Moench. Marsh Cress.— Roadside ditches, wet meadows and muddy shores; common in the valley.

var. **hispida** (Desv.) Robinson.— (*R. hispida* Ill. Fl. ed. 2.)

Wet places, swales and low meadows; frequent in the valley.

R. sylvestris (L.) Druce. Yellow Cress.— Established in wet meadows along the Housatonic River. Stockbridge; Sheffield. Also occasional as a weed in gardens.

RAPHANUS. Radish.

R. Raphanistrum L. Wild Radish.— Occasional in waste and cultivated ground; Lanesboro (Churchill); Great Barrington; Egremont; Sheffield.

R. sativus L. Radish.— Occasional in waste ground.

SISYMBRIUM. Hedge Mustard.

S. altissimum L.— (*Norta altissima* Ill. Fl. ed. 2.)
Roadsides and waste ground; frequent.

S. officinale (L.) DC.— (*Erysimum officinale* Ill. Fl. ed. 2.)
Roadsides and waste ground; occasional with the var. *leiocarpum*.

var. leiocarpum DC.— Roadsides and waste ground; common.

THLASPI. Penny Cress.

T. arvense L. Penny Cress.— Occasionally adventive. Great Barrington (Walters).

RESEDACEAE. MIGNONETTE FAMILY.

RESEDA. Mignonette.

R. lutea L.— Occasionally adventive. Meadow, Lanesboro (Churchill); roadside, Great Barrington.

R. odorata L. Mignonette.— Vacant lot, Pittsfield.

SARRACENIACEAE. PITCHER PLANT FAMILY.

SARRACENIA.

S. purpurea L. Side-saddle Flower; Pitcher Plant.— Peat bogs and marshes; common.

DROSERACEAE. SUNDEW FAMILY.

DROSERA. Sundew.

D. longifolia L. Long-leaved Sundew.— Peat bogs and margins of ponds; occasional. Monterey; Sandisfield; Sheffield; Mt. Washington.

D. rotundifolia L. Round-leaved Sundew.— Peat bogs, wet slopes and on the upland in roadside ditches; common.

CRASSULACEAE. ORPINE FAMILY.

PENTHORUM. Ditch Stonecrop.

P. sedoides L. Ditch Stonecrop.— Borders of ponds and ditches; common.

SEDUM. Stonecrop.

S. acre L. Mossy Stonecrop.— Exposed rocks on roadsides; occasional in the valley, generally on limestone. Lenox; Egremont; Sheffield.

S. ternatum Michx.— Apparently indigenous on moist ledges, South Mountain, Pittsfield. Occasional and probably escaped elsewhere. Stockbridge; Sheffield.

S. triphyllum (Haw.) S. F. Gray. Live-for-ever.— (*S. purpureum* Man. ed. 7; *vid.* Rhodora, **11**: 46, 1909.)

Roadsides and dry banks; frequent. Rarely flowers.

SAXIFRAGACEAE. SAXIFRAGE FAMILY.

CHRYSOSPLENIUM. Golden Saxifrage.

C. americanum Schwein. Golden Saxifrage.— Swamps and wet woods; common.

MITELLA. Miterwort.

M. diphylla L. Miterwort.— Rich woods; common.

M. nuda L.— Cold swamps, on mossy knolls; frequent in the valley. Not noted outside the calcareous regions. In pine woods, Egremont (Churchill).

PARNASSIA. Grass of Parnassus.

P. caroliniana Michx. Grass of Parnassus.— Wet meadows and roadside ditches; common in the valley. Apparently confined to calcareous soil. On a moist hillside shaded by pines, New Marlboro.

PHILADELPHUS. Mock Orange; Syringa.

P. inodorus L.— Occasionally escaping from cultivation to roadside banks. Stockbridge; Monterey.

RIBES. Currant; Gooseberry.

R. americanum Mill. Wild Black Currant.— (*R. floridum* Man. ed. 7; *vid.* Rhodora, **11**: 46, 1909.)

Swamps and alluvial thickets; frequent in the valley.

R. Cynosbati L. Prickly Gooseberry.— (*Grossularia Cynosbati* Ill. Fl. ed. 2.)

Rocky woods and pastures; common.

R. hirtellum Michx. Smooth Gooseberry.— (*R. oxyacanthoides* Man. ed. 7; N. A. Fl. **22**: pt. 3, 223, 225, 1908. *Grossularia oxyacanthoides* Ill. Fl. ed. 2.)

Swamps and low meadows, occasionally in dry woods and clearings; frequent.

R. lacustre (Pers.) Poir. Swamp Black Currant.—Moist woods and swamps; frequent on the upland.

R. odoratum Wendland.— (*R. aureum* Man. ed. 7; *vid.* Rhodora, **11**: 47, 1909.)

Established on a dry hillside, New Marlboro.

R. prostratum L'Her. Skunk Currant.— Moist woods; common on the upland.

R. triste Pall., var. **albinervium** (Michx.) Fernald.— Cold moist woods and swamps; frequent in the valley. Not noted on the plateau.

R. vulgare Lam. Red Currant.— Frequently escaping to fencerows and thickets. The form with white fruit in woods in Lenox and Stockbridge.

SAXIFRAGA. Saxifrage.

(*Micranthes* Ill. Fl. ed. 2.)

S. pennsylvanica L. Swamp Saxifrage.— Swamps, wet meadows and margins of brooks; common.

S. virginiensis Michx. Early Saxifrage.— Exposed rocks and dry hillsides; common in the valley.

TIARELLA. False Miterwort.

T. cordifolia L. False Miterwort.— Woods; common.

forma **parviflora** Fernald.— *Vid.* Rhodora, **19**: 132 (1917).

A large colony on a wooded bank in Becket (Fernald).

Differs from the typical form in having very narrow short petals (2 to 3 mm. long).

A hybrid between *T. cordifolia* and *Mitella diphylla* has been collected in Williamstown by Sanborn Tenney (*vid.* Rhodora, **8**: 91, 1906).

HAMAMELIDACEAE. WITCH-HAZEL FAMILY.

HAMAMELIS. Witch-hazel.

H. virginiana L. Witch-hazel.— Woods; common in the valley, becoming rare on the plateau. Reaches an altitude of 2000 feet in Savoy.

PLATANACEAE. PLANE TREE FAMILY.

PLATANUS. Sycamore; Buttonwood; Plane Tree.

P. occidentalis L. Sycamore; Buttonwood.— Flood-plains; common in the valley.

ROSACEAE. ROSE FAMILY.

AGRIMONIA. Agrimony.

A. gryposepala Wallr.— Open woods, clearings and roadside thickets; common.

A. striata Michx.— Low ground and moist open woods; common.

AMELANCHIER. Shadbush; Juneberry; Service Berry.

Key to Amelanchier.

a. Flowers racemose.

b. Teeth of the leaves coarse (on average leaves 3 to 5 (6) per cm.); veins conspicuous, usually straight, parallel and close together; leaves oval to oval-oblong, rarely orbicular; scrawny, slender, often arching shrub of a few rocky mountain-tops . . . . . *A. sanguinea.*

b'. Teeth of the leaves fine (5 to 12 per cm. on average leaves); veins irregular, unequally distant, usually with frequent intermediate shorter ones.

c. Leaves densely white-tomentose when young, becoming green; lower pedicels 7 to 18 mm. long, in fruit 10 to 25 mm. long.

d. Leaves rounded at the apex; petals short, 7 to 9 mm. long; 3 to 12 dm. high; stiffly upright shrubs forming patches. Shrub of rocky mountain-tops or sandy plains in the southern part of the valley . . . . . *A. stolonifera.*

d'. Leaves short acuminate, petals usually elongated, 10 to 14 mm. long. Flowers appearing very early, usually before the leaves. Shrub or tree, generally solitary, or few together, widely distributed. *A. canadensis.*

c'. Leaves nearly or quite glabrous from the first, ovate, oval or elliptical, subcordate, rounded or more rarely acute at base; apex short, acuminate margin, usually sharply serrate nearly to the base, at flowering time one-half to three-fourths grown and lurid-glaucous-purple, rarely bright green; flowers large and showy, petals elongated (10 to 18 mm. long); lower pedicels 15 to 33 mm. long, in fruit 30 to 50 mm. long. Tree or tall shrub. . . . . *A. laevis.*

a'. Flowers commonly solitary (1 to 3 together). A shrub found only on Greylock and on the Hoosac Plateau at its highest and most northern point. *A. Bartramiana.*

A. Bartramiana (Tausch.) Roem.— (*A. oligocarpa* Man. ed. 7; *vid.* Rhodora, **14**: 158, 1912.)

Summit of Greylock and of Hoosac Mt., Florida. The only known stations in Massachusetts.

A. canadensis (L.) Medic.— (*A. canadensis*, var. *Botryapium* Man. ed. 7; *vid.* Rhodora, **14**: 150, 1912. *A. intermedia* Ill. Fl. ed. 2.)

Dry woods; common.

A. intermedia Spach. (?) — An Amelanchier collected in 1920 in an open bog at Ward Pond, Becket, was sent to Professor Wiegand, who writes, "This specimen resembles *A. intermedia* Spach but is not quite like our Ithaca plants. I have seen *A. intermedia* in New England only from the bog at Rutland, Vt."

A. intermedia is a tall shrub, rarely a small tree, widely branching near the ground or at first growing in clumps: leaves elliptic-oblong or elliptic-obovate on the shoots; base rounded; apex acute; margin finely but somewhat distantly serrate; veins irregular; surface moderately tomentose when young, slightly so at maturity on the veins beneath and on the petiole; young leaves often reddish; racemes short (2 to 4 cm. long) 5- to 8-flowered, sparingly hairy; lower pedicels 8 to 14 mm. long; sepals short (2 to 3 mm. long), hairy on the inner face; petals short (7 to 8 mm. long), oblong-cuneate; fruit dark purple, juicy; fruiting racemes short, subcorymbose. The species grows in boggy soil, and should be looked for in bogs in Berkshire. *Vid.* Rhodora, **22**: 146 (1920).

A. laevis Wiegand.— (*A. canadensis* Man. ed. 7; *vid.* Rhodora, **14**: 154, 1912.)

Open woods, roadside thickets and banks of streams; common.

A. sanguinea (Pursh) DC.— (*A. spicata* Man. ed. 7; *vid.* Rhodora, **14**: 138, 1912.)

Rocky summits of some of the Taconics. Williamstown (Burnham);

West Stockbridge Mt. and Harvey Mt., West Stockbridge; Tom Ball, Alford. Also on a wooded bank at a low altitude in Sheffield. Although this species is commonly considered a calcicole, all the above stations except that in Sheffield were found to be in acid soil.

A. stolonifera Wiegand.— (*A. oblongifolia* Man. ed. 7 in part; *vid.* Rhodora, **14**: 144, 1912. *A. spicata* Ill. Fl. ed. 2.)

Rocky summits and sand-plains. Frequent in the southern part of the valley and on the Taconics.

Hybrids of Amelanchier.

Several aberrant specimens of *Amelanchier* from Berkshire submitted to Professor Wiegand were determined by him as hybrids of *A. laevis*, in one case probably with *A. canadensis* and in other cases with an undetermined parent.

Hybrids of *A. canadensis* and *A. stolonifera* from the rocky summit of West Stockbridge Mountain and the sand-plain, Sheffield, have been determined by Professor Wiegand.

CRATAEGUS. Hawthorn; Red Haw.

C. anomala Sarg.— North Adams.

C. Brainerdi Sarg., var. **asperifolia** (Sarg.) Eggleston.— North Adams; Alford.

var. **scabrida** (Sarg.) Eggleston.— Williamstown.

C. Crus-galli L.— Becket.

C. foetida Ashe.— (*C. Baxteri* Sarg.)

Great Barrington.

C. Holmesiana Ashe.— Lanesboro; Lenox; Stockbridge.

C. macrantha Lodd.— (*C. ferentaria* Sarg.)

Common.

var. **rhombifolia** (Sarg.) Eggleston.— Great Barrington.

C. macrosperma Ashe.— Common.

var. **demissa** (Sarg.) Eggleston.— Lenox.

var. **matura** (Sarg.) Eggleston.— (*C. serena* Sarg.)

Lenox.

var. **pastorum** (Sarg.) Eggleston.— (*C. glaucophylla* Sarg.; *C. genialis* Sarg.)

Williamstown; Lenox.

C. monogyna Jacq. English Hawthorn.— (*C. oxycantha* Man. ed. 7; *vid.* Rhodora, **11**: 47, 1909.)

Well established on an open hillside, Stockbridge.

C. pedicellata Sarg.— North Adams (Fernald and Long).

C. polita Sarg.— (*C. albicans* Ashe.)

Great Barrington.

C. Pringlei Sarg.— Savoy; Cheshire; Great Barrington.

var. **lobulata** (Sarg.) Eggleston.— Williamstown; Great Barrington.

C. pruinosa (Wendl.) C. Koch.— Williamstown; North Adams; Sheffield.

var. **latisepala** (Ashe) Eggleston. (*C. cognata* Sarg.)

Great Barrington.

forma **demissa** (Sarg.) Eggleston.— Great Barrington.

C. punctata Jacq.— Common.

C. rotundifolia Moench.— (*C. Dodgei* Ashe).

Williamstown; Becket; Great Barrington; open woods, Mt. Washington (Knowlton and Schweinfurth).

C. silvicola Beadle, var. **Beckwithiae** (Sarg.) Eggleston.— " One tree in a dooryard in Lenox. Not known whether native " (Eggleston, MS.).

DALIBARDA.

D. repens L.— Cool woods and borders of swamps; frequent on the plateau.

FILIPENDULA.

F. RUBRA (Hill) Robinson. QUEEN OF THE PRAIRIE.— Occasionally established in thickets, meadows and roadsides. Lanesboro (Churchill); Lenox; Stockbridge; Sheffield.

F. ULMARIA (L.) Maxim. QUEEN OF THE MEADOW.— Roadside banks and low meadows; frequent in the valley.

FRAGARIA. STRAWBERRY.

× F. GRANDIFLORA Ehrh. GARDEN STRAWBERRY.— Occasional along roadsides or near gardens. An escape from cultivation.

F. VESCA L. EUROPEAN WOOD STRAWBERRY.— Kitchen Brook, Cheshire (Churchill); persisting and spreading about old house sites, Hancock.

forma ALBICARPA Britton.— (var. *alba* Man. ed. 7.)

Occasionally escaping from cultivation. Hancock, with *F. vesca;* Stockbridge.

var. **americana** Porter. Wood Strawberry.— (*F. americana* Ill. Fl. ed. 2.)

Rich open woods and shaded ledges; common in the valley.

F. virginiana Duchesne. Field Strawberry.— Fields, meadows and roadsides; common.

Dewey in the Report on Herbaceous Plants of Massachusetts, p. 59, says that "on the hills of Washington, a white fruited strawberry is abundant in the fields. The leaves are somewhat villose."

var. **terrae-novae** (Rydb.) Fernald & Wiegand.— *Vid.* Rhodora, **13**: 106 (1911).

Frequent in the same situations as the type, occurring on cold flood-plains of mountain streams (Savoy), dry sandy fields (Pittsfield), or swampy woods (Sheffield).

Differs from the type in having the pubescence of all the petioles and the scapes closely appressed.

GEUM. Avens.

G. canadense Jacq. White Avens.— Borders of moist woods; common.

G. rivale L. Water or Purple Avens.— Wet meadows and swamps; common.

G. strictum Ait. Yellow Avens.— Borders of woods and roadside thickets; common.

G. virginianum L.— Low ground; occasional. Lenox; Stockbridge; Sandisfield; Egremont; Sheffield; Mt. Washington (Knowlton); swamp, West Stockbridge (Evans, Fernald and Knowlton).

POTENTILLA. Cinquefoil; Five-finger.

P. argentea L. Silvery Cinquefoil.— Dry fields and pastures; common.

P. arguta Pursh.— (*Drymocallis agrimonioides* Ill. Fl. ed. 2.)

Dry soil; occasional. Pittsfield; West Stockbridge; Sheffield.

P. canadensis L. Cinquefoil; Five-finger.— Fields and open woods; common.

var. **simplex** (Michx.) T. & G.— (*P. simplex* Ill. Fl. ed. 2.)

Dry fields, roadsides and open woods; commoner than the type. Summit of Greylock, 3500 feet.

P. fruticosa L. Shrubby Cinquefoil; Hard-hack.— (*Dasiphora fruticosa* Ill. Fl. ed. 2.)

Ill-drained fields and borders of swamps; common. Occasionally on dry calcareous hills. Less common on the plateau.

P. monspeliensis L.— Damp places and cultivated ground; common.

P. palustris (L.) Scop. Marsh Cinquefoil.— (*Comarum palustre* Ill. Fl. ed. 2.)

Borders of ponds, slow streams and pools in swamps; frequent.

forma **subsericea** (Becker) Wolf.— (*Vid.* Rhodora, **15**: 165, 1913.)

Occasional. Shaw Pond, Otis; Lake Buel, Monterey.

Leaves silky.

P. pumila Poir.— Dry, barren fields; frequent in the valley, becoming common in the southern part.

P. recta L.— Fields and roadsides; occasional. Pittsfield; Stockbridge (Mrs. B. Hoffmann); Great Barrington (Walters); Sheffield. First noted in 1915.

P. tridentata Ait.— (*Sibbaldiopsis tridentata* Ill. Fl. ed. 2.)

Rocky summits; occasional. Florida; Tom Ball, Alford; The Dome, Mt. Washington. In Sheffield a patch occurs in a low meadow at the foot of The Dome, at an altitude of 700 feet.

PRUNUS. Plum; Cherry.

P. americana Marsh. Wild Plum.— Roadsides in New Marlboro (Walters).

P. avium L. Sweet Cherry.— Frequently escaping to open woods and hedgerows.

P. Cerasus L. Sour Cherry.— Rarely spreading from cultivation. Sandisfield.

P. cuneata Raf. Sand Cherry.— Sand-plains; rare. Pittsfield (Lincoln); Sheffield. Also on Alum Hill, Sheffield.

P. domestica L. Garden Plum.— Occasionally spreading from cultivation.

P. nigra Ait. Wild or Canada Plum.— Riverbanks and roadside thickets; frequent.

P. pennsylvanica L. f. Wild Red Cherry; Bird Cherry.— Light soil in woods, recent clearings, burnt tracts and rocky summits; common, particularly on the upland. Occasional in swampy woods, Stockbridge.

P. persica (L.) Stokes. Peach.— (*Amygdalus persica* Ill. Fl. ed. 2.)

Occasional on dumps; Williamstown; North Adams.

P. serotina Ehrh. Black Cherry; Rum Cherry.— (*Padus virginiana* Ill. Fl. ed. 2.)

Rich woods and roadsides; common. Altitude 1800 feet, Savoy; 2600 feet, Greylock.

P. virginiana L. Choke Cherry.— (*Padus nana* Ill. Fl. ed. 2.)

Roadside thickets, fence-rows, borders of woods and mountain-tops; common. Summit of Greylock, 3400 feet.

PYRUS. Apple; Pear.

P. americana (Marsh) DC. American Mountain Ash.— (*Sorbus americana* Ill. Fl. ed. 2.)

Open woods; common on the upland. Borders of cool swamps in the valley.

P. arbutifolia (L.) L. f., var. **atropurpurea** (Britton) Robinson. Red Chokeberry.— (*Aronia atropurpurea* Ill. Fl. ed. 2.)

Swamps and borders of bogs; frequent in the southern part of the valley. Rocky hillside, Monterey. Specimens with 12- to 14-fruited cymes from Sheffield (Churchill).

P. communis L. Pear.— Occasionally self-sown in pastures and woodland.

P. Malus L. Apple.— (*Malus malus* Ill. Fl. ed. 2.)

Roadsides and woods; common.

P. melanocarpa (Michx.) Willd. Black Chokeberry.— (*Aronia melanocarpa* Ill. Fl. ed. 2.)

Dry rocky or sandy soil, hillside pastures on the plateau, and in swamps and bogs; common.

× P. prunifolia Willd. Crab Apple.— Roadside escape, Sheffield.

P. sitchensis (Roem.) Piper.— (*Sorbus scopulina* Ill. Fl. ed. 2.)

Occasional on Greylock; Hancock (Bean).

According to Dr. Rehder (*in lit.*) *P. sitchensis* (Roem.) Piper is a species of the Pacific Coast, and the New England species is *Sorbus decora* Schneid.

ROSA. Rose.

R. blanda Ait.— Dry open woods, roadside thickets and borders of streams; occasional. Greylock, altitude 2500 feet; Stockbridge; West Stockbridge; Sandisfield; New Marlboro; Sheffield.

R. carolina L.— (*R. humilis* Man. ed. 7; *vid.* Rhodora, **20**: 91, 1918. *R. virginiana* Ill. Fl. ed. 2 in part.)

Open rocky woods, pastures and roadsides; common in the valley.

R. CINNAMOMEA L. CINNAMON ROSE.— Persistent about old sites and established along roadsides, particularly on the upland.

R. GALLICA L.— An occasional roadside escape; Great Barrington; Sheffield (Churchill).

R. palustris Marsh. SWAMP ROSE.— (*R. carolina* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **20**: 91, 1918.)

Borders of ponds and streams, and in swamps; common.

R. RUBIGINOSA L. SWEETBRIER; EGLANTINE.— Open hillsides and rocky pastures; frequent.

R. SETIGERA Michx. CLIMBING OR PRAIRIE ROSE.— Two plants in a thicket above the Housatonic River, Stockbridge.

R. SPINOSISSIMA L. SCOTCH ROSE.— Roadside escape, New Marlboro.

Forms have been collected in Lanesboro, Stockbridge and Sheffield which appear to be hybrids between *R. carolina* (*R. humilis* Man. ed. 7) and *R. rubiginosa.*

In Sheffield and Egremont forms are frequent which must pass as hybrids between *R. carolina* (*R. humilis* Man. ed. 7) and *R. palustris.* Other forms appear to be hybrids between *R. blanda* and *R. palustris.* There is a great deal of variety among these forms, and the whole material needs careful study.

RUBUS. BLACKBERRY; RASPBERRY.

R. allegheniensis Porter. HIGH-BUSH BLACKBERRY. — Open woods, roadside thickets and clearings; common.

R. Andrewsianus Blanchard.— Dry hillsides; occasional in the valley, becoming frequent in the southern part. Williamstown; Stockbridge; New Marlboro; Sandisfield; Sheffield.

R. canadensis L.— Swampy woods; common on the upland, frequent in the valley. Summit of Greylock, 3500 feet.

R. elegantulus Blanchard.— Low ground and upland woods; frequent.

R. hispidus L.— Low meadows and swamps; common, especially on the plateau.

R. idaeus L., var. **strigosus** (Michx.) Maxim. RED RASPBERRY.

— (*R. idaeus* L., var. *aculeatissimus* Man. ed. 7 in part. *R. strigosus* Ill. Fl. ed. 2. *Vid.* Rhodora, **21**: 96, 1919.)

Rocky pastures and clearings; common.

×? **R. neglectus** Peck.— Open hillsides and pastures; frequent in the valley. Probably a self-perpetuating hybrid between *R. occidentalis* and *R. idaeus*, var. *strigosus*.

R. nigricans Rydb.— Borders of swamps and wet roadsides on the plateau; occasional. Florida; Washington.

R. occidentalis L. Black Raspberry; Thimbleberry.— Open rocky woods, pastures, clearings and roadside thickets; common in the valley. Not noted on the plateau proper.

R. odoratus L. Purple Flowering Raspberry.— Openings and clearings in rich woods, banks of streams and shaded ledges; common on the upland and in the lower parts of the plateau. Not noted on the summit of the plateau.

R. pergratus Blanchard.— Rocky pastures, dry open hillsides and moist woodland; common.

R. plicatifolius Blanchard.— *Vid.* Rhodora, **8**: 149 (1906).

Roadsides; occasional. Sandisfield; Sheffield.

A prostrate species related to *R. villosus* Ait., distinguished by the straight prickles, the plaited or ruffled margins of the leaves and the fact that its inflorescence is a broad raceme.

R. pubescens Raf. Dwarf Raspberry.— (*R. triflorus* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **11**: 236, 1909.)

Rich rocky woods, swamps and wet woods; common.

R. recurvans Blanchard.— Open woods, clearings and low ground; frequent.

R. setosus Bigel.— Swampy meadows and low ground; frequent on the plateau.

R. villosus Ait. Dewberry.— (*R. procumbens* Ill. Fl. ed. 2.)

Dry fields and rocky summits; common.

var. **humifusus** T. & G.— Dry open fields; occasional. Floodplain of the Deerfield R., Florida; Stockbridge; Monterey; Egremont.

As is well known, the division *Eubatus* of the genus *Rubus* presents a problem of extreme difficulty. Much of the *Rubus* collected in Berkshire is not easily determined in accordance with the treatment so far published. Forms are common, particularly on the upland, which might be referred to *R. juncus* Blanchard or to *R. nigricans* Rydb. They appear to be hybrids between *R. canadensis* and *R. hispidus*.

Peculiar forms collected on the flood-plain of the Deerfield River in Florida appear to be hybrids between *R. alleghenicnsis* and *R. villosus*, and between *R. canadensis* and *R. villosus*.

SANGUISORBA. Burnet.

S. canadensis L. Canadian Burnet.—Flood-plain of the Deerfield River, Florida (Walters).

SORBARIA.

(*Schizonotus* Ill. Fl. ed. 2.)

S. sorbifolia (L.) A. Br.— Roadside escape, Lanesboro (Churchill); Richmond; Egremont.

SPIRAEA.

S. latifolia Borkh. Meadow-sweet.— Thickets and overgrown pastures; common.

S. tomentosa L. Steeple Bush; Hardhack.— Dry and poorly drained fields and pastures; common.

forma **albiflora** Macbride.— *Vid.* Rhodora, **17**: 143 (1915).

Frequent with the type in the northern and western parts of the County. Flowers white.

WALDSTEINIA.

W. fragarioides (Michx.) Trattinick. Barren Strawberry.— Low wet ground, Pittsfield (Oakes); open woods on limestone outcrops, Great Barrington. The only localities known for the County, though Dewey (Report on Herbaceous Plants, p. 59) gives it as "common in Berkshire Co."

LEGUMINOSAE. PULSE FAMILY.

AMORPHA.

A. fruticosa L. False Indigo.— Persisting on made ground, Stockbridge.

AMPHICARPA. Hog Peanut.

(*Falcata* Ill. Fl. ed. 2.)

A. monoica (L.) Ell. Hog Peanut.— (*F. comosa* Ill. Fl. ed. 2.) Rich woods, riverbanks and clearings; common.

APIOS. Ground-nut.

(*Glycine* Ill. Fl. ed. 2.)

A. tuberosa Moench. Ground-nut.— (*G. Apios* Ill. Fl. ed. 2.) Alluvial thickets and rich damp upland; frequent in the valley.

BAPTISIA. False Indigo.

B. tinctoria (L.) R. Br. Wild Indigo.— Sandy soil in open woods; common in the southern part of the valley.

CASSIA. Senna.

C. marilandica L. Wild Senna.— Roadsides in low ground; occasional in the southern part of the valley. West Stockbridge; Egremont; Sheffield.

CORONILLA.

C. varia L.— Occasionally established along roadside banks in the valley.

CROTALARIA. Rattle-box.

C. sagittalis L. Rattle-box.— Sand-plain, Sheffield.

DESMODIUM. Tick Trefoil.

(*Meibomia* Ill. Fl. ed. 2.)

Key to Desmodium.

1. Plant prostrate ..... *D. rotundifolium.*
2. Plant erect.
   - *a.* Pod raised on a stalk many times longer than the slightly toothed calyx.
     - Leaves all crowded at the summit of sterile stems .... *D. nudiflorum.*
     - Leaves all crowded at the summit of the stem from which arises the elongated panicle ..... *D. grandiflorum.*
   - *a′.* Pod raised on a stalk little if at all surpassing the deeply cleft calyx.
     - *b.* Stipules conspicuous and persistent; flowers rather large; stem smooth ..... *D. bracteosum.*
     - *b′.* Stipules mostly deciduous, small and inconspicuous.
       - *c.* Flowers middle-sized, not very showy.
         - Stem pubescent; leaflets softly and finely pubescent. *D. Dillenii.*
         - Stem smooth; leaflets smooth ..... *D. paniculatum.*
       - *c′.* Flowers 8 to 12 mm. long, showy; stem hairy .... *D. canadense.*

D. bracteosum (Michx.) DC.— Dry thickets; occasional in the southern part of the valley. Great Barrington; Sheffield; Mt. Washington (Burnham).

D. canadense (L.) DC.— Dry open woods, roadsides and banks; common in the southern part of the valley. Occasional elsewhere (Williamstown). Altitude 1600 feet, Mt. Washington.

D. Dillenii Darl.— Borders of dry woods, clearings and thickets; frequent in the southern part of the valley.

D. grandiflorum (Walt.) DC.— Dry woods; common in the valley.

D. nudiflorum (L.) DC.— Dry woods; common in the valley. A form with one or two leaves on the scape, occasional.

D. paniculatum (L.) DC.— Borders of dry woods, thickets and clearings; frequent in the southern part of the valley.

D. rotundifolium (Michx.) DC.— (*M. Michauxii* Ill. Fl. ed. 2.) Rocky woods with southern exposure; occasional in the southern part of the valley. West Stockbridge; Great Barrington; New Marlboro; Sheffield.

GLEDITSIA. Honey Locust.

G. TRIACANTHOS L. Honey Locust.— Rarely spreading from cultivation, Egremont.

LESPEDEZA. Bush Clover.

Key to Lespedeza.

a. Flowers violet-purple, not in close spikes or heads.
Peduncles slender, mostly exceeding the leaves; stems spreading. Occasional in New Marlboro and Sheffield ..... *L. violacea.*
Peduncles mostly very short, shorter than the leaves; stems erect. Frequent in the southern part of the valley ..... *L. frutescens.*

a'. Flowers whitish or cream color, with a purple spot on the standard; in close spikes or heads.
Peduncles shorter than the dense subglobose heads ..... *L. capitata.*
Peduncles elongate, chiefly equalling the cylindric or subcylindric spikes. *L. hirta.*

L. capitata Michx.— Dry fields and open sandy soil; common in the southern part of the valley.

L. frutescens (L.) Britton.— Dry open woods; frequent in the southern part of the valley.

L. hirta (L.) Hornem.— Open sandy soil and dry open woods; frequent in the southern part of the valley.

L. violacea (L.) Pers.— Occasional on dry hills, Sheffield and New Marlboro.

LUPINUS. Lupine.

L. perennis L. Wild Lupine.— Locally common on the sand-plain in the southern part of Sheffield. Also on Alum Hill, Sheffield.

MEDICAGO. Medick.

M. arabica Huds.— On dump at woolen mill, Pittsfield.

M. hispida Gaertn.— On dump at woolen mill, Pittsfield.

M. lupulina L. Black Medick.— Fields and roadsides; common.

M. minima L.— On dump at woolen mill, Pittsfield.

M. sativa L. Lucerne; Alfalfa.— Becoming frequent along roadsides and borders of fields.

M. sp.— On dump at woolen mill, Pittsfield.

MELILOTUS. Sweet Clover.

M. alba (Desr.). White Sweet Clover.— Waste places and along roadsides; frequent in the valley. This species was rare in 1900 and has since spread rapidly along the sides of roads where the road scrapings offer it a congenial soil.

M. officinalis (L.) Lam. Yellow Sweet Clover.— Waste places and roadsides; occasional in the valley. Lee; Stockbridge; Great Barrington; Egremont. Becoming frequent.

ROBINIA. Locust.

R. Pseudo-Acacia L. Common Locust.— Frequently naturalized, forming small groves about old house-sites and along roadsides.

R. viscosa Vent. Clammy Locust.— Occasionally established on roadside banks. Stockbridge; Monterey; Egremont; Sheffield.

TRIFOLIUM. Clover.

T. agrarium L. Yellow or Hop Clover.— Dry open soil, roadsides, fields and wood roads; common.

T. arvense L. Rabbit-foot Clover.— Thin, generally sandy soil; frequent, especially in the southern part of the valley.

T. HYBRIDUM L. ALSIKE CLOVER.— Fields and roadsides; common.

T. PRATENSE L. RED CLOVER.— Fields, meadows and wood roads; common.

A form with white flowers is occasional.

T. PROCUMBENS L.— Pasture in the lower part of the Hopper, Williamstown.

T. REPENS L. WHITE CLOVER.— Fields, roadsides and lawns; common.

VICIA. VETCH.

V. ANGUSTIFOLIA Reichard.— Roadside, Sheffield (Churchill).

var. SEGETALIS (Thuillier) Koch.— Roadsides and banks; occasional. Deerfield River, Florida; Stockbridge; Sheffield.

V. Cracca L. BLUE VETCH.— Meadows and roadsides; frequent in the valley.

V. VILLOSA Roth.— Sheffield (Walters).

LINACEAE. FLAX FAMILY.

LINUM. FLAX.

(*Cathartolinum* Ill. Fl. ed. 2 in part.)

L. sulcatum Riddell.— (*C. sulcatum* Ill. Fl. ed. 2.)

Dry gravelly field, Sheffield (Walters).

L. USITATISSIMUM L. COMMON FLAX.— Occasionally adventive in waste ground and along railroad tracks. Washington; Pittsfield; Stockbridge; West Stockbridge; Sheffield.

L. virginianum L.— (*C. virginianum* Ill. Fl. ed. 2.)

Edge of dry wood, Sheffield.

OXALIDACEAE. WOOD SORREL FAMILY.

OXALIS. WOOD SORREL.

(*Xanthoxalis* Ill. Fl. ed. 2 in part.)

O. americana Bigelow. WOOD SORREL.— (*O. Acetosella* Man. ed. 7; *vid.* Rhodora, **20**: 78, 1918.)

Damp woods; common on the plateau. Occasional in moist woods or cool ravines in the valley. Descends the sides of the plateau to the bank of the Deerfield River at Florida and to the Housatonic River at

Lenox (altitude 1000 feet). Occurs in rich woods on Hancock Mt. and toward the summit of The Dome, Mt. Washington.

O. corniculata L. LADY'S SORREL.— (*X. cymosa* Ill. Fl. ed. 2.)

Fields and cultivated ground; common. Occasionally under pines in moist ground.

O. filipes Small.— (*X. filipes* Ill. Fl. ed. 2.)

Dry hills, generally calcareous; occasional. Williamstown; West Stockbridge; Sheffield.

O. REPENS Thurb.— (*X. corniculata* Ill. Fl. ed. 2.)

A weed in gardens and greenhouses. Lenox (Jenkins); Stockbridge. Probably in all large greenhouses.

O. stricta L.— (*X. strieta* Ill. Fl. ed. 2.)

Dry fields and barren hillsides; occasional. Stockbridge; Great Barrington (Walters); New Marlboro; Egremont.

ERODIUM.

E. CICUTARIUM (L.) L'Hér. STORKSBILL.— On dump at woolen mill, Pittsfield; a garden weed, Stockbridge.

GERANIACEAE. GERANIUM FAMILY.

GERANIUM. GERANIUM.

G. Bicknellii Britton.— Ledges and rocky ridges; occasional. North Adams (Fernald and Long); West Stockbridge; Mt. Washington (Walters); Sheffield.

G. maculatum L. WILD CRANESBILL.— Open woods, copses and fields; common.

G. MOLLE L.— Adventive in lawn, Stockbridge.

G. PUSILLUM Burm. f.— Adventive in chicken-yard, Stockbridge.

G. Robertianum L. HERB ROBERT.— (*Robertiella Robertiana* Ill. Fl. ed. 2.)

Moist rich or rocky woods, and on open ledges; common in the valley. Altitude 1300 feet, Tyringham.

RUTACEAE. RUE FAMILY.

PTELEA. HOP TREE.

P. TRIFOLIATA L. HOP TREE.— Escaping from cultivation, Stockbridge.

ZANTHOXYLUM. Prickly Ash.

Z. americanum Mill. Prickly Ash.— River banks and open rocky woods in the extreme southern part of the County; frequent in Sheffield, and along the Konkapot River in southern New Marlboro, occasional as far north as Stockbridge.

POLYGALACEAE. MILKWORT FAMILY.

POLYGALA. Milkwort.

P. paucifolia Willd. Fringed Polygala.— Light soil in dry woods; locally common in the southern towns, particularly in Sheffield, Egremont, and Mt. Washington, frequent as far north as Stockbridge.

P. sanguinea L. Purple Milkwort.— (*P. viridescens* Ill. Fl. ed. 2.)

Along roadsides and in poor soil in fields; occasional. Pittsfield; Becket; Sheffield (Churchill); Sandisfield.

P. Senega L. Seneca Snakeroot.— Margin of Joyner's Marsh, Egremont (Churchill and Schneider).

P. verticillata L.— Sandy soil; occasional. Stockbridge; Sheffield (Walters).

var. **ambigua** (Nutt.) Wood.— (*P. ambigua* Ill. Fl. ed. 2.)

Sandy soil and sterile fields; frequent in the valley.

EUPHORBIACEAE. SPURGE FAMILY.

ACALYPHA. Three-seeded Mercury.

A. gracilens Gray.— Clearing in dry woods, with *A. virginica* Monterey.

A. virginica L. Three-seeded Mercury.— Cultivated and waste ground, dry fields and muddy shores; common.

EUPHORBIA. Spurge.

(*Tithymalus* and *Chamaesyce* Ill. Fl. ed. 2.)

E. Cyparissias L. Cypress Spurge.— (*T. Cyparissias* Ill. Fl. ed. 2.)

Roadsides, cemeteries and about old houses; frequent.

E. hirsuta (Torr.) Wiegand.— (*C. Rafinesquii* Ill. Fl. ed. 2.)

Dry open ground, roadsides, railroad tracks and cultivated ground;

frequent. Common on limestone hills in Sheffield and New Marlboro.

E. maculata L.— (*C. maculata* Ill. Fl. ed. 2.)

Dry open ground, roadsides, railroad tracks and cultivated ground; frequent.

E. Preslii Guss.— (*C. Preslii* Ill. Fl. ed. 2.)

Waste ground, Pittsfield.

CALLITRICHACEAE.

CALLITRICHE. Water Starwort.

C. palustris L.— Pools and borders of brooks, muddy shores; frequent.

ANACARDIACEAE.

RHUS. Sumach.

(*Toxicodendron* Ill. Fl. ed. 2 in part.)

R. copallina L. Dwarf Sumach.— Dry sandy soil and rocky hills; frequent in the southern part of the valley.

R. glabra L. Smooth Sumach.— Dry sandy soil, open rocky woods and pastures; common in the southern part of the valley.

R. Toxicodendron L. Poison Ivy; Poison Oak.— (*T. Toxicodendron* Ill. Fl. ed. 2.)

Wet woods, roadsides, railroad embankments and rocky summits; frequent. Altitude 1800 feet (Washington).

var. **radicans** (L.) Torr.— (*T. radicans* Ill. Fl. ed. 2.)

Damp woods and borders of streams; occasional in the valley. Williamstown; Richmond; Stockbridge; Lee; Sandisfield; New Marlboro.

R. typhina L. Staghorn Sumach.— (*R. hirta* Ill. Fl. ed. 2.)

Borders of woods, rocky hills, roadsides and pastures; common.

R. Vernix L. Poison Sumach; Poison Dogwood.— (*T. Vernix* Ill. Fl. ed. 2.)

Swamps and low ground; occasional in the southern part of the valley.

AQUIFOLIACEAE. HOLLY FAMILY.

ILEX. Holly.

I. monticola Gray, var. **mollis** (Gray) Britton.— (*I. montana* Ill. Fl. ed. 2.)

Locally common on the summit of The Dome and about Plantin Pond, Mt. Washington. The most northern known station for this species of the Alleghany Mts.

I. verticillata (L.) Gray. Black Alder.— Common on the plateau on open ill-drained hillsides and along roadsides; frequent in the valley on the borders of ponds and swamps.

var. **tenuifolia** (Torr.) Wats.— (*I. bronxensis* Ill. Fl. ed. 2.)

Shaded swamps; frequent.

var. **padifolia** (Willd.) T. & G.— Sheffield (Churchill).

NEMOPANTHUS. Mountain Holly.

(*Ilicioides* Ill. Fl. ed. 2.)

N. mucronata (L.) Trel. Mountain Holly.— Borders of ponds, boggy woods and rocky hill-tops; common.

CELASTRACEAE. STAFF TREE FAMILY.

CELASTRUS. Staff Tree.

C. scandens L. Climbing Bitter-sweet; Waxwork.— Open rocky woods, roadside thickets and borders of streams; common in the valley.

EVONYMUS.

(*Euonymus* Ill. Fl. ed. 2.)

E. atropurpureus Jacq. Burning Bush.— Escaping from cultivation, Stockbridge.

STAPHYLEACEAE. BLADDER NUT FAMILY.

STAPHYLEA. Bladder Nut.

S. trifolia L. Bladder Nut.— Rich soil at the base of limestone ledges, and moist thickets along the Housatonic River; occasional. Pittsfield; Stockbridge; Great Barrington; Sheffield.

ACERACEAE. MAPLE FAMILY.

ACER. Maple.

A. Negundo L. Box Elder.— Apparently indigenous along the Housatonic River; also frequently escaping from cultivation.

A. pennsylvanicum L. Striped Maple; Moosewood.— Rich woods; common on the upland.

A. rubrum L. Red Maple; Swamp Maple.— Swamps, borders of ponds and rocky summits; common.

var. **tridens** Wood.— (*A. carolinianum* Ill. Fl. ed. 2.)

Low ground; occasional. Cheshire (Winslow); Pittsfield; Lenox; Stockbridge; New Marlboro; Sheffield.

A. saccharinum L. White Maple; River Maple.— Banks of streams; common.

A. saccharum Marsh. Sugar Maple; Rock Maple.— Rich woods; common, particularly on mountain slopes.

var. **nigrum** (Michx. f.) Britton. Black Sugar Maple.— (*A. nigrum* Ill. Fl. ed. 2.)

Common as a shade tree in the southern part of the valley. Indigenous on a limestone ridge in Williamstown, in alluvial woods in North Adams (Fernald), and on a cobble over the Housatonic River in Sheffield.

A. spicatum Lam. Mountain Maple.— Cool woods; common on the upland, frequent in the valleys.

SAPINDACEAE. SOAPBERRY FAMILY.

AESCULUS.

A. Hippocastanum L. Common Horse-chestnut.— Occasionally self-sown.

BALSAMINACEAE. TOUCH-ME-NOT FAMILY.

IMPATIENS. Jewelweed.

I. biflora Walt. Jewelweed; Spotted Touch-me-not.— Rich moist soil in shade; common.

forma **Peasei** A. H. Moore.— Perianth cream color, with pink spots (*vid.* Rhodora, **21**: 98, 1919, and **19**: 116, 1917).

Low ground, Stockbridge.

I. pallida Nutt. Pale Touch-me-not.— Borders of streams and moist slopes; frequent in the valley, on the lower slopes of Greylock and of the Dome. A form with whitish flowers, Lanesboro (Churchill).

RHAMNACEAE. BUCKTHORN FAMILY.

CEANOTHUS. Red-root.

C. americanus L. New Jersey Tea.— Sandy soil, borders of dry woods and roadsides; frequent in the southern part of the valley.

RHAMNUS. Buckthorn.

R. alnifolia L'Hér.— Cool swamps; frequent in the valley.

R. cathartica L. Common Buckthorn.— Roadside thickets; frequently naturalized. Generally only a single tree is found, but the species is common for nearly a mile along the roadside opposite Round Pond, Great Barrington.

VITACEAE. VINE FAMILY.

PSEDERA. Woodbine; Virginia Creeper.

(*Parthenocissus* Ill. Fl. ed. 2.)

P. quinquefolia (L.) Greene.— (*P. quinquefolia* Ill. Fl. ed. 2 in part.)

Rocky or swampy woods, thickets and borders of streams; common. Altitude 1800 feet, Washington.

var. **hirsuta** (Donn) Rehder.— Rocky woods; banks of streams; common.

P. vitacea (Knerr) Greene.— (*P. quinquefolia* Ill. Fl. ed. 2 in part.) Alluvial thickets; frequent.

VITIS. Grape.

V. aestivalis Michx. Summer Grape.— Thickets and hillsides; occasional in the valleys. Deerfield River, Florida; Adams (Knowlton and Bean); Great Barrington; Sheffield.

V. bicolor Le Conte. Summer Grape.— Rocky open woods and river-banks; frequent in the southern part of the valley.

V. labrusca L. Northern Fox Grape.— Occasional and indigenous along the Deerfield River, Florida, and the Farmington River, Sandisfield. Here and there escaping to roadsides elsewhere.

V. vulpina L. River-bank or Frost Grape.— Banks of streams and thickets; common.

TILIACEAE. LINDEN FAMILY.

TILIA. Linden.

T. americana L. Basswood.— Rich woods and banks of streams; common.

MALVACEAE. MALLOW FAMILY.

ABUTILON. Indian Mallow.

A. Theophrasti Medic. Velvet Leaf.— (*A. Abutilon* Ill. Fl. ed. 2.)

Roadsides and waste ground; occasional. Great Barrington (Walters); Sheffield.

ALTHAEA. Marsh Mallow.

A. rosea Cav. Hollyhock.— Occasionally self-sown or persisting, Pittsfield; Stockbridge; Sheffield.

HIBISCUS. Rose Mallow.

H. Trionum L. Flower-of-an-hour.— Cultivated ground; occasional. Stockbridge; Sheffield.

MALVA. Mallow.

M. Alcea L.— Open field, Lee; roadside, Great Barrington (Walters).

M. moschata L. Musk Mallow.— Roadsides; occasional in the valley. Lanesboro; Lee; Stockbridge; West Stockbridge; Alford; Egremont (Walters).

M. rotundifolia L. Cheeses.— Cultivated and waste ground; common.

HYPERICACEAE. ST. JOHN'S WORT FAMILY.

HYPERICUM. St. John's Wort.

H. Ascyron L. Great St. John's Wort.— Borders of streams in the southern part of the valley; frequent.

H. boreale (Britton) Bicknell.— Borders of ponds and marshes; frequent.

H. canadense L.— Roadside ditches and low ground; frequent.

H. ellipticum Hook.— Wet ground; common.

H. gentianoides (L.) BSP. ORANGE GRASS; PINEWEED.— (*Sarothra gentianoides* Ill. Fl. ed. 2.)

Dry soil; common in Sheffield, occasional elsewhere in the valley. New Marlboro; Union Church, Mt. Washington (altitude 1670 feet).

H. majus (Gray) Britton.— Wet ground, damp clearings and sandy shores; frequent in the valley.

H. mutilum L.— Roadside ditches and low ground; common.

H. PERFORATUM L. COMMON ST. JOHN'S WORT.— Fields and roadsides; common.

H. punctatum Lam.— Moist thickets and damp places; common.

H. virginicum L. MARSH ST. JOHN'S WORT.— (*Triadenum virginicum* Ill. Fl. ed. 2.)

Borders of ponds and marshes; common. Altitude 2000 feet, Hancock.

ELATINACEAE. WATERWORT FAMILY.

ELATINE. WATERWORT.

E. minima (Nutt.) Fisch. & Meyer.— (*E. americana* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **19**: 13, 1917.)

Submersed in shallow water on sandy bottom, Onota Lake, Pittsfield; emersed on muddy border of Goose Pond, Tyringham.

CISTACEAE. ROCKROSE FAMILY.

HELIANTHEMUM. ROCKROSE.

(*Crocanthemum* Ill. Fl. ed. 2.)

H. Bicknellii Fernald.— (*H. majus* Man. ed. 7; *vid.* Rhodora, **21**: 36, 1919. *C. majus* Ill. Fl. ed. 2.)

Dry soil and ledges; occasional in the southern part of the valley. On limestone, Monterey; New Marlboro; locally common on the sand-plain, Sheffield.

H. canadense (L.?) Michx. FROSTWEED.— (*C. canadense* Ill. Fl. ed. 2.)

Open sandy soil and rocky ledges; occasional in the southern part of the valley. On limestone, Monterey; on quartzite, Great Barrington; locally common on the sand-plain, Sheffield.

LECHEA. PINWEED.

L. intermedia Leggett.— Dry soil; common.

L. maritima Leggett, var. **interior** Robinson.— Williamstown (Churchill).

L. villosa Ell.— Dry hills, Sheffield.

VIOLACEAE. VIOLET FAMILY.

VIOLA. VIOLET.

V. affinis Le Conte.— Frequent in wet grassy places, moist lawns, swampy meadows and alder thickets in the valley.

V. ARVENSIS Murr. WILD PANSY.— Seeding itself along garden paths, Stockbridge; abundant in a fallow field, Sheffield (Bean and Fernald); fallow field, New Marlboro.

V. blanda Willd. SWEET WHITE VIOLET.— Rich woods; common.

V. canadensis L. CANADA VIOLET.— Rich woods; frequent. Altitude 1500 feet, Hoosac Mt., Florida.

V. conspersa Reichenb.— Woods, pastures, roadsides, borders of swamps; common. Altitude 1850 feet (Windsor).

V. cucullata Ait. MARSH BLUE VIOLET.— Wet open places; common. A dwarf form in moist soil under old apple trees (altitude 1500 feet), Cheshire (Brainerd).

forma **albiflora** Britton.— Frequent.

V. eriocarpa Schwein. SMOOTH YELLOW VIOLET.— (*V. scabriuscula* Man. ed. 7; *vid.* Bull. Torr. Bot. Club, **38**: 194, 1911.)

Moist rich woods; common. Altitude 1500 feet on the plateau, 2000 feet, Berry Mt., Hancock.

V. fimbriatula Sm.— Dry hillsides, open woods and sandy fields; common. A form with coarsely toothed basal lobes from Lenox, Stockbridge, and West Stockbridge.

V. incognita Brainerd. SWEET WHITE VIOLET.— Rich woods; common. Occasional under pines.

var. **Forbesii** Brainerd.— Swampy woods; frequent.

Differs from the type in being nearly or quite glabrous except for scattered hairs on the upper surfaces of the leaves (*vid.* Bull. Torr. Bot. Club, **38**: 8, 1911).

V. lanceolata L. Borders of bogs and ponds; frequent. In moist pasture, Savoy.

V. latiuscula Greene.— Dry soil; frequent in the valleys. Occa-

sionally in moist ground; low ground under pines, Stockbridge; alder thicket, Mt. Washington (Brainerd).

V. nephrophylla Greene.— Swampy woods and margins of mountain brooks and streams, chiefly in shade; common on the plateau, frequent in the valleys. Flowers late and about June 1 makes with *V. pallens* ribbons of blue and white along the roadsides on the plateau.

V. ODORATA L. ENGLISH OR SWEET VIOLET.— Plants sent by Miss Mitford from England to Miss Catherine Sedgwick in the first half of the 19th century, and set out on a shaded bank in Stockbridge, have spread and perpetuated themselves to the present time.

V. pallens (Banks) Brainerd. SWEET WHITE VIOLET.— Wet places; common. Ice Pond, Greylock (altitude 3000 feet).

Blossoming late and forming with *V. nephrophylla* ribbons of blue and white along upland roads, in early June.

V. palmata L.— Dry woods; frequent in the southern and western part of the valley. Altitude 1700 feet, West Stockbridge Mt.

V. papilionacea Pursh.— Moist shaded places; common. Often in door-yards and in rich ground. A white-flowered form is frequent.

V. pubescens Ait. DOWNY YELLOW VIOLET.— Rich woods; common. Less common than *V. eriocarpa* and generally in drier woods.

V. renifolia Gray.— Cold swamp, Stockbridge; damp woods, Great Barrington.

var. **Brainerdii** (Greene) Fernald.— *Vid.* Rhodora, **14**: 88 (1912).

Cold swamps and cool woods.

Upper leaf-surfaces quite glabrous from the first or in anthesis (flowering time) with only a very few scattered and quickly deciduous hairs.

V. rostrata Pursh. LONG-SPURRED VIOLET.— Rich woods; frequent. Altitude 1200 feet, New Boston.

forma **Phelpsiae** Fernald.— *Vid.* Rhodora, **17**: 180 (1915).

Rich rocky woods, West Stockbridge (Walters). Flowers white.

V. rotundifolia Michx. EARLY YELLOW VIOLET.— Woods; common. Generally under deciduous trees but occasionally under pines (Stockbridge).

V. Selkirkii Pursh. GREAT-SPURRED VIOLET.— Rich woods, generally on or near rocks, but often in leaf mould; frequent in the northern tier of towns, Williamstown, Florida, Adams and Savoy,

becoming less common farther south, and confined to cool glens in the southern part of the valley. Ice Glen, Stockbridge; Ice Gorge, Great Barrington; rich woods, Sandisfield.

V. septentrionalis Greene.— Open woods, dry clearings, grassy hillsides and rocky summits; frequent. Common along the Deerfield and Farmington Rivers on dry banks.

V. sororia Willd.— Rich woods; common, particularly in dry woods in the southern part of the valley. A white-flowered form is frequent.

V. triloba Schwein.— Frequent in dry woods in the southern part of Sheffield and New Marlboro. Mt. Washington (Walters).

Hybrids of Viola.

V. cucullata × **fimbriatula**.— Frequent.
V. cucullata × **septentrionalis**.— Williamstown; Sheffield.
V. cucullata × **sororia**.— Cheshire (Brainerd).
V. fimbriatula × **septentrionalis**.— Frequent.
V. fimbriatula × **sororia**.— Williamstown; Stockbridge.
V. palmata × **affinis**.— Great Barrington.
V. palmata × **cucullata**.— Sheffield.
V. palmata × **sororia**.— Sheffield.
V. septentrionalis × **sororia**.— Stockbridge.

The above determinations have been verified by Mr. F. F. Forbes.

THYMELAEACEAE. MEZEREUM FAMILY.

DAPHNE.

D. Mezereum L.— Established along roadside thickets in Lenox and Richmond (Lincoln).

DIRCA. Leatherwood; Moosewood.

D. palustris L. Wicopy; Leatherwood; Moosewood.— Damp rich woods; frequent. On limestone ridges, Williamstown and Sheffield.

LYTHRACEAE. LOOSESTRIFE FAMILY.

DECODON. Swamp Loosestrife.

D. verticillaris (L.) Ell., var. **laevigatus** T. & G.— (*D. verticillaris* Man. ed. 7 in part; *vid.* Rhodora **19**: 154, 1917.)

Borders of ponds and streams; frequent.

The var. *laevigatus* is glabrous with bright green leaves as contrasted with var. *pubescens* which has the stem and lower surface of the leaves more or less tomentose-pubescent.

LYTHRUM. Loosestrife.

L. alatum Pursh.— Swampy meadows (calcareous), Stockbridge; Sheffield.

L. Salicaria L. Spiked Loosestrife.— Borders of streams and wet meadows; now frequent along the Hoosac and Housatonic Rivers and their tributaries.

ONAGRACEAE. EVENING PRIMROSE FAMILY.

CIRCAEA. Enchanter's Nightshade.

C. alpina L.— Cool woods; frequent.

C. canadensis Hill.— (*C. intermedia* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **19**: 87, 1917.)

Moist gravelly soil; occasional. Wet slide above brook, Cheshire (Churchill); border of Lake Averic, Stockbridge; flood-plain of Bash Bish Brook, Mt. Washington; moist clearing, Sheffield.

Generally only a few plants in a station, suspiciously intermediate between *C. alpina* and *C. latifolia*.

C. latifolia Hill.— (*C. lutetiana* Man. ed. 7; *vid.* Rhodora, **17**: 223, 1915.)

Woods and clearings; common.

EPILOBIUM. Willow-herb.

E. angustifolium L. Fire-weed.— Clearings and borders of woods; common.

forma **albiflorum** (Dumort.) Haussk.— Harvey Mt., West Stockbridge.

E. coloratum Muhl.— Ditches, wet roadsides and swamps; common.

E. densum Raf.— (*E. lineare* Ill. Fl. ed. 2.)

Swamps; common.

E. glandulosum Lehm., var. **adenocaulon** (Haussk.) Fernald.— (*E. adenocaulon* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **20**: 35, 1918.)

Roadside ditches, swamps, moist clearings and borders of streams; common.

E. HIRSUTUM L.— Established in a roadside ditch in low ground, Lenox.

E. molle Torr.— (*E. strictum* Ill. Fl. ed. 2.)

Bogs; common.

E. palustre L.— Low ground, Stockbridge.

var. **monticola** Haussk.— Bogs and wet meadows; frequent.

GAURA.

G. BIENNIS L.— Rarely adventive in grassland or waste ground. North Adams; Lee.

LUDVIGIA. FALSE LOOSESTRIFE.

(*Isnardia* Ill. Fl. ed. 2.)

L. palustris (L.) Ell. WATER PURSLANE.— Muddy borders of ponds and marshes, and in ditches; common.

OENOTHERA. EVENING PRIMROSE.

O. biennis L. COMMON EVENING PRIMROSE.— Fields, roadsides and clearings; common.

O. muricata L.— Dry hillsides, roadsides and waste ground; common.

O. pumila L.— (*Kneiffia pumila* Ill. Fl. ed. 2.)

Fields and roadsides; common.

HALORAGIDACEAE. WATER MILFOIL FAMILY.

MYRIOPHYLLUM. WATER MILFOIL.

M. exalbescens Fernald.— *Vid.* Rhodora, **21**: 122 (1919).

Shallow water in ponds; occasional. Stockbridge Bowl, Stockbridge; Cranberry Pond, West Stockbridge; Three-mile Pond, Sheffield.

Differs from *M. spicatum* as follows: the principal leaves of the primary stems have 14 to 21 pairs of rigid slenderly linear divisions; the bracts are rhombic obovate; the bractlets are suborbicular or reniform, broader than long, and distinctly shorter than in most of *M. exalbescens*, 0.5 to 0.8 mm. long.

In *M. exalbescens* the dried stems very strongly tend to become white (though not always); in *M. spicatum* the old herbarium specimens still retain a fulvous or olivaceous tone in the stems.

M. verticillatum L., var. **pectinatum** Wallr.— Locally common in the inlet on the west end of Pontoosuc Lake, Pittsfield.

PROSERPINACA. Mermaid Weed.

P. palustris L. Mermaid Weed.— Borders of ponds or shallow water in slow streams; occasional. Cheshire; Lenox; Big Pond, Otis; Egremont (Walters); Sheffield.

ARALIACEAE. GINSENG FAMILY.

ARALIA.

A. hispida Vent. Bristly Sarsaparilla.— Rocky summits and hillside clearings; frequent.

A. nudicaulis L. Wild Sarsaparilla.— Woods; common.

A. racemosa L. Spikenard.— Rich woods; common.

PANAX. Ginseng.

P. quinquefolium L. Ginseng; Sang.— Rich woods; formerly frequent, now occasional. Williamstown; Florida; Cheshire (Winslow); Dalton (Lincoln); Pittsfield; Becket (Walters); Stockbridge; Sandisfield (Walters).

P. trifolium L. Dwarf Ginseng; Ground-nut.— Rich woods and borders of swamps; common. Altitude 2000 feet, Savoy.

UMBELLIFERAE. PARSLEY FAMILY.

AEGOPODIUM.

A. Podagraria L., f. variegata Hort. Goutweed.— The form with variegated leaves occasionally spreads from abandoned yards. Stockbridge.

ANGELICA. Angelica.

A. atropurpurea L. Purple Angelica.— Low ground and borders of streams; common. Altitude, 1500 feet (Windsor).

A. villosa (Walt.) BSP.— Dry woods; occasional in the southern

part of the valley. Great Barrington; New Marlboro; Mt. Washington.

CARUM. Caraway.

C. Carvi L. Caraway.— Along roadsides and about farm buildings; frequent.

CICUTA. Water Hemlock.

C. bulbifera L.— Wet places; common.

C. maculata L. Spotted Cowbane.— Wet meadows, borders of brooks and ponds, and swamps; common.

CONIOSELINUM. Hemlock Parsley.

C. chinense (L.) BSP.— Cool swamps; occasional in the valley. Williamstown (Churchill); Lenox; West Stockbridge (Evans, Fernald, Knowlton); Stockbridge; Sheffield.

CONIUM. Poison Hemlock.

C. maculatum L. Poison Hemlock.— Waste ground, often about abandoned house sites; occasional. New Ashford; Hancock; West Stockbridge; New Marlboro.

CRYPTOTAENIA. Honewort.

(*Deringa* Ill. Fl. ed. 2.)

C. canadensis (L.) DC. Honewort.— Dry woods and thickets; common.

DAUCUS. Carrot.

D. Carota L. Wild Carrot.— Fields and roadsides; common.

HERACLEUM. Cow Parsnip.

H. lanatum Michx. Cow Parsnip.— Borders of streams, and roadsides in low ground; frequent.

HYDROCOTYLE. Water Pennywort.

H. americana L.— Wet meadows, ill-drained pastures and damp open woods; common.

LEVISTICUM. Lovage.

L. officinale (L.) Koch. Lovage.— (*Hipposelinum Levisticum* Ill. Fl. ed. 2.)

Occasionally established about old house sites. Monterey; Mt. Washington (Knowlton).

OSMORHIZA. Sweet Cicely.

(*Washingtonia* Ill. Fl. ed. 2.)

O. Claytoni (Michx.) Clarke. Sweet Cicely.— Rich woods; common in the valleys. Altitude 1800 feet, Adams.

O. longistylis (Torr.) DC.— Rich woods and thickets; occasional in the valley. North Adams (Burnham); Stockbridge; West Stockbridge; Monterey; Great Barrington (Walters).

PASTINACA. Parsnip.

P. sativa L.— Wild Parsnip.— Waste places, roadsides and fields; common. The juice is poisonous to the touch.

SANICULA. Black Snakeroot.

S. gregaria Bicknell.— Damp rich woods; frequent in the valley.

S. marilandica L.— Woods and thickets; common.

S. trifoliata Bicknell.— Rich woods; frequent in the valley.

SIUM. Water Parsnip.

S. suave Walt.— (*S. cicutaefolium* Man. ed. 7; *vid.* Rhodora, **17**: 131, 1915.)

Muddy shores; common.

ZIZIA.

Z. aurea (L.) Koch. Golden Alexanders.— Meadows, borders of woods and roadsides; common.

CORNACEAE. DOGWOOD FAMILY.

CORNUS. Cornel; Dogwood.

C. alternifolia L. f.— Open woods, clearings and fence rows; common in the valley, occasional on the plateau.

C. Amomum Mill. KINNIKINNIK; SILKY CORNEL.— Borders of streams and swamps; common.

C. canadensis L. BUNCHBERRY; DWARF CORNEL.— (*Chamaepericlymenum canadense* Ill. Fl. ed. 2.)

Damp woods and knolls in swamps; common. Very common on The Dome, Mt. Washington, in rather dry woods.

C. circinata L'Hér. ROUND-LEAVED CORNEL.— (*C. rugosa* Ill. Fl. ed. 2.)

Rocky woods and limestone ledges; frequent in the valley.

C. florida L. FLOWERING DOGWOOD.— (*Cynoxylon floridum* Ill. Fl. ed. 2.)

Dry woods; frequent in the southern part of the valley, occasional elsewhere. North Adams (Lincoln).

C. paniculata L'Hér.— (*C. femina* Ill. Fl. ed. 2.)

Copses in dry soil; common in the valley, particularly in the southern part.

C. stolonifera Michx. RED-OSIER DOGWOOD.— Borders of streams and swamps, and low thickets; common in the valley, frequent on the plateau.

NYSSA. TUPELO; SOUR GUM.

N. sylvatica Marsh. BLACK GUM; TUPELO.— Borders of ponds in the southern part of the valley, as far north as the northern part of Great Barrington; occasional. A group of small trees grew on the dry rocky summit of Monument Mt., Great Barrington (altitude 1600 feet), until destroyed by fire.

ERICACEAE. HEATH FAMILY.

ANDROMEDA.

A. glaucophylla Link. BOG ROSEMARY.— (*A. Polifolia* Ill. Fl. ed. 2 in part.)

Bogs; frequent.

ARCTOSTAPHYLOS. BEARBERRY.

(*Uva-ursi* Ill. Fl. ed. 2.)

A. Uva-ursi (L.) Spreng., var. **coactilis** Fernald & McBride. BEARBERRY.— (*A. Uva-ursi* Man. ed. 7 in part; *vid.* Rhodora, **16**: 212, 1914.)

Rocky ridge of West Stockbridge Mt.; a few plants in dry open woods, Egremont; frequent on exposed summits, Mt. Washington. The West Stockbridge locality was known to Dewey in 1829.

Branches invested with a dense canescent almost felt-like tomentum which is persistent, at least for several years.

CHAMAEDAPHNE. Leather Leaf.

C. calyculata (L.) Moench. Leather Leaf.— Bogs and marshy borders of ponds; frequent.

CHIMAPHILA. Pipsissewa.

C. maculata (L.) Pursh. Spotted Wintergreen.— Dry woods. Lenox (Lincoln); Sandisfield.

C. umbellata (L.) Nutt., var. **cisatlantica** Blake. Prince's Pine; Pipsissewa.— (*C. umbellata* Man. ed. 7 in part; *vid.* Rhodora, **19**: 241, 1917.)

Dry woods; common.

Differs from true *C. umbellata* in having the flowers more or less racemose.

CHIOGENES. Creeping Snowberry.

C. hispidula (L.) T. & G.— Cold swamps and cold springy banks; occasional. Savoy; Becket; Washington; Pittsfield; Stockbridge; New Marlboro.

CLETHRA. White Alder.

C. alnifolia L. Sweet Pepperbush.— Shore of Symon's Pond, Sandisfield (Walters).

EPIGAEA.

E. repens L. Trailing Arbutus; Mayflower.— Dry woods and open hillsides; frequent on schist and quartzite, practically absent from limestone. A small patch in Great Barrington on a limestone hillside with *Kalmia latifolia.*

GAULTHERIA. Wintergreen.

G. procumbens L. Checkerberry; Wintergreen.— Woods and clearings; common. On limestone, under pines, Sheffield.

GAYLUSSACIA. Huckleberry.

G. baccata (Wang.) C. Koch. Black Huckleberry.— Dry hillsides clearings and rocky summits; frequent in the southern part of the valley. Occasional in swampy woods, Stockbridge.

forma **glaucocarpa** (Robinson) Mackenzie.— Rocky summits and dry slopes; frequent in the southern part of the valley.

KALMIA. Laurel.

K. angustifolia L. Sheep Laurel; Lambkill.— Pastures, open swamps, rocky summits and rocky borders of ponds; common, especially on the upland.

K. latifolia L. Mountain Laurel; Mountain Ivy.— Hillside pastures, woods and borders of swamps; common, except in calcareous soil. One bush on a limestone ledge, Sheffield. Growing in Great Barrington on a limestone hill. Altitude 2000 feet, Savoy.

K. polifolia Wang. Pale Laurel.— Bogs; occasional on the plateau. Savoy; Washington; Becket; New Marlboro.

LEDUM. Labrador Tea.

L. groenlandicum Oeder.— Borders of bogs; frequent on the plateau, rare in the valley. Pittsfield; Stockbridge; Sheffield (Mrs. W. T. Day).

LYONIA.

(*Xolisma* Ill. Fl. ed. 2.)

L. ligustrina (L.) DC. Male Berry.— Wet woods, upland pastures and swamps; common.

MONESES. One-flowered Pyrola.

M. uniflora (L.) Gray. One-flowered Pyrola.— Under pines; frequent.

MONOTROPA. Indian Pipe; Pinesap.

M. Hypopitys L. Pinesap.—(*Hypopitys americana* Ill. Fl. ed. 2.) Dry woods; frequent. Under hemlocks at Gilder Pond, Otis (altitude 1400 feet).

M. uniflora L. Indian Pipe; Corpse Plant; Ghost Flower. — Rich woods; common.

PYROLA. Wintergreen; Shin Leaf.

P. asarifolia Michx., var. **incarnata** (Fisch.) Fernald.— Cold shaded bog, Stockbridge.

P. chlorantha Sw.— Leaves rounded to base and apex, rather numerous (4 to 11) in a rosette (*vid.* Rhodora, **22**: 51, 1920).

Woods, often near swamps; common.

var. **paucifolia** Fernald.— (*P. chlorantha* Man. ed. 7 in part.)

Leaves mostly cuneate at base and truncate or sub-truncate at summit; somewhat flabelliform-obovate, few (1 to 7 or even wanting) in a rosette (*vid.* Rhodora, **22**: 51, 1920).

Great Barrington.

P. elliptica Nutt. Woods; common.

P. rotundifolia L., var. **americana** (Sweet) Fernald. Round-leaved Shin Leaf.— (*P. americana* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **22**: 122, 1920.)

Dry open woods; common in the valley, occasional on the plateau. Altitude 2000 feet, Florida.

P. secunda L.— Woods; common.

var. **obtusata** Turcz.— Cold bogs, in sphagnum; rare. Stockbridge; Sandisfield.

RHODODENDRON.

(*Azalea* Ill. Fl. ed. 2 in part.)

R. canescens (Michx.) G. Don. Pink Azalea.— (*A. canescens* Ill. Fl. ed. 2.)

Woods, upland pastures and swamps; common.

R. maximum L. Great Laurel; Rose Bay.— Swamps. Williamstown (Oakes); Washington (altitude 1750 feet); Richmond.

The Richmond station has been destroyed by gardeners from the Lenox estates who have dug up the plants. Nothing is known of the Williamstown station excepting a sheet in the herbarium of the Boston Soc. Nat. Hist. labelled "Williamstown, Oakes."

R. nudiflorum (L.) Torr. Pink Azalea.— (*A. nudiflora* Ill. Fl. ed. 2.)

Swamp, Sheffield; Mt. Washington (Churchill).

VACCINIUM. Blueberry; Cranberry.

V. atrococcum (Gray) Heller. Black High Blueberry.— Swamps and upland pastures; frequent, especially on the plateau.

On gravelly hills near the Housatonic River in Pittsfield, where glacial drift overlies the limestone.

V. canadense Kalm.— Swamps and upland woods; common on Greylock and on the plateau as far south as Washington and Becket. Occurs also on The Dome, Sheffield, and on the adjoining mountain mass. A specimen collected by Churchill in a bog in Lanesboro has practically glabrous leaves. Lowest altitude 1150 feet, swamp on the divide between Pittsfield and Cheshire.

V. corymbosum L. High-bush Blueberry.— Common in hillside pastures on the plateau; frequent in the valley in swamps and on the borders of ponds, absent from calcareous soil, except where glacial drift overlies thickly the limestone.

var. **amoenum** (Ait.) Gray.— Savoy (altitude 2000 feet); woods, Mt. Washington (Churchill).

var. **pallidum** (Ait.) Gray.— With the type; occasional. Lenox; Stockbridge; New Marlboro; Great Barrington; West Stockbridge (Evans, Fernald and Knowlton).

V. macrocarpon Ait. Cranberry.— (*Oxycoccus macrocarpus* Ill. Fl. ed. 2.)

Bogs; frequent. Occasional on wet roadsides on the plateau.

V. Oxycoccos L. Small Cranberry.— (*Oxycoccus Oxycoccus* Ill. Fl. ed. 2.)

Bogs; occasional on the plateau. Savoy; Becket; New Marlboro (Walters); Sandisfield.

var. **ovalifolium** Michx.— (var. *intermedium* Man. ed. 7; *vid.* Rhodora, **11**: 54, 1909.)

Peat bog, Sheffield.

V. pennsylvanicum Lam. Low Blueberry.— (*V. angustifolium* Ill. Fl. ed. 2.)

Open woods and pastures, rocky summits; common except in calcareous soil. Occasional on limestone cobbles and in calcareous meadows.

var. **myrtilloides** (Michx.) Fernald.— Leaves and young twigs pilose; leaves with bristle-tipped teeth. Distinguished from *V. canadense* by the bristle-tipped teeth of the leaves and their lustrous appearance (*vid.* Rhodora, **10**: 148, 1908).

Hillside pasture, Florida.

var. **nigrum** Wood.— (*V. nigrum* Ill. Fl. ed. 2.)

With the type; frequent.

V. stamineum L. DEERBERRY.— (*Polycodium stamineum* Ill. Fl. ed. 2.)

Dry woods; occasional. Mt. Greylock; Stockbridge; Great Barrington; Egremont; Sheffield.

V. vacillans Kalm.— Dry woods, rocky hillsides and open summits; frequent in the southern part of the valley.

PRIMULACEAE. PRIMROSE FAMILY.

LYSIMACHIA. LOOSESTRIFE.

L. NUMMULARIA L. MONEYWORT.— Wet meadows, roadside banks and ditches; frequent.

× **L. producta** (Gray) Fernald.— A hybrid between *L. quadrifolia* and *L. terrestris*. Edge of wet woods, Sandisfield.

L. quadrifolia L.— Woods; common.

L. terrestris (L.) BSP.— Wet woods and swamps; common.

L. thyrsiflora L.— (*Naumburgia thyrsiflora* Ill. Fl. ed. 2.)

Cold swamps; common.

L. VULGARIS L.— Escaped from cultivation in a thicket on the banks of the Housatonic River, Great Barrington (Walters).

STEIRONEMA.

S. ciliatum (L.) Raf.— Borders of woods, low ground and roadside thickets; common. A form with crowded flowers on short pedicels from Sandisfield.

TRIENTALIS. CHICKWEED WINTERGREEN.

T. borealis Raf. CHICKWEED WINTERGREEN.— (*T. americana* Man. ed. 7; *vid.* Rhodora, **11**: 236, 1909.)

Woods; common.

OLEACEAE. OLIVE FAMILY.

FRAXINUS. ASH.

F. americana L. WHITE ASH.— Rich woods; common. Summit of Greylock.

forma **iodocarpa** Fernald.— Occasional with the type, from which it differs in having reddish-purple keys (*vid.* Rhodora, **14**: 192, 1912).

F. nigra Marsh. BLACK ASH.— Swamps and borders of streams; common.

F. pennsylvanica Marsh. RED ASH.— Occasional along the Housatonic River in Sheffield.

var. **lanceolata** (Borkh.) Sarg. GREEN ASH— Williamstown (Churchill).

LIGUSTRUM. PRIVET.

L. VULGARE L. PRIVET.— On a limestone ridge, Williamstown.

SYRINGA. LILAC.

S. VULGARIS L. COMMON LILAC.— Persisting and spreading about old house sites; occasional.

GENTIANACEAE. GENTIAN FAMILY.

BARTONIA.

B. virginica (L.) BSP.— Mossy knolls in upland pasture, Great Barrington.

GENTIANA. GENTIAN.

G. Andrewsii Griseb. CLOSED GENTIAN.— (*Dasystephana Andrewsii* Ill. Fl. ed. 2.)

Moist woods and low ground; occasional in the valley. North Adams (Churchill); Alford; Sheffield (Churchill).

Corolla with nearly truncate summit; the firm true lobes nearly obsolete, narrowed at the summit; the broader intervening thin prolongations of the membranous bands forming a fimbriate-dentate border.

forma **albiflora** Britton.— Low shaded ground, Sheffield.

G. clausa Raf. CLOSED GENTIAN.— (*G. Andrewsii* Man. ed. 7 and Ill. Fl. ed. 2 in part; *vid.* Rhodora, **19**: 148, 1917.)

Moist woods and low ground, common.

Corolla with the broad rounded lobes 2 to 8 mm. long; as broad or broader than the intervening 2- to 3-cleft appendages.

G. crinita Froel. FRINGED GENTIAN. Wet meadows, hillside pastures and borders of swamps, common in the valley.

G. quinquefolia L. — Upland pastures, open hillsides and shaded banks; frequent in the valley. A specimen from Sheffield 7.5 dm. tall.

MENYANTHES. Buckbean.

M. trifoliata L. Buckbean.— Bogs; frequent.

NYMPHOIDES. Floating Heart.

(*Limnanthemum.*)

N. lacunosum (Vent.) Fernald. Floating Heart.— Shallow water in cool ponds; occasional. Becket; Lee Pond, Mt. Washington; Parish Pond, Otis (Walters).

APOCYNACEAE. DOGBANE FAMILY.

APOCYNUM. Dogbane.

A. androsaemifolium L. Spreading Dogbane.— Roadside thickets, borders of woods and rocky summits; common.

A. cannabinum L. Indian Hemp.— Low ground and gravelly shores; common.

A. medium Greene.— Flood-plain of the Deerfield River, Florida; roadside, Great Barrington.

VINCA. Periwinkle.

V. minor L. Periwinkle; Blue Myrtle.— Established and spreading about old houses and in cemeteries; occasional.

ASCLEPIADACEAE. MILKWEED FAMILY.

ASCLEPIAS. Milkweed.

A. amplexicaulis Sm.— Sand-plain, Ashley Falls, Sheffield.

A. incarnata L. Swamp Milkweed.— Borders of streams and ponds, and marshes; common in the valley.

var. **pulchra** (Ehrh.) Pers.— (*A. pulchra* Ill. Fl. ed. 2.)

Low ground; common on the plateau.

A. phytolaccoides Pursh. Poke Milkweed.— (*A. exaltata* Ill. Fl. ed. 2.)

Roadside thickets and rich open woods, generally on the upland; frequent.

A. quadrifolia Jacq.— Dry rocky woods; occasional in the southern part of the valley. Stockbridge; Great Barrington; Egremont; Sheffield; Mt. Washington.

A. syriaca L. Common Milkweed.— Roadside banks and thickets, railroad embankments, low open fields; common.

var. **inermis** Churchill.— Low ground, Lanesboro (Churchill). *Vid.* Rhodora, **20**: 206 (1918).

A form which lacks the spinous processes on the short, straight pods.

A. tuberosa L. Butterfly-weed.— Sandy soil; occasional in the southern part of the valley. Stockbridge; Great Barrington; Sheffield.

CONVOLVULACEAE. CONVOLVULUS FAMILY.

CONVOLVULUS. Bindweed.

C. arvensis L., var. obtusifolius Choisy.— Railroad tracks, Coltsville, Pittsfield (Churchill); Union Station, Pittsfield; roadside, Stockbridge.

C. sepium L. Wild Morning Glory; Hedge Bindweed.— Low ground, fields and roadsides; common.

C. spithamaeus L.— Sandy soil; occasional in the southern part of the County. Great Barrington (Schweinfurth); Sheffield.

CUSCUTA. Dodder.

C. arvensis Beyrich.— Field, Sandisfield (Walters).

C. Gronovii Willd. Dodder.— Low ground, frequent in the valley.

IPOMOEA. Morning Glory.

I. purpurea (L.) Roth. Common Morning Glory.— Occasionally escaping from cultivation to dumps and waste ground.

POLEMONIACEAE. POLEMONIUM FAMILY.

PHLOX. Phlox.

P. maculata L. Wild Sweet William.— Established in a thicket near an old house, Sandisfield.

P. paniculata L. Garden Phlox.— Occasionally escaping to roadside thickets. Great Barrington (Walters); Mt. Washington.

P. subulata L. Wild or Moss Pink.— Spreading in a graveyard, Sheffield.

HYDROPHYLLACEAE. WATER LEAF FAMILY.

HYDROPHYLLUM. Waterleaf.

H. canadense L.— Borders of mountain brooks at the base of Mt. Greylock, Williamstown; Cheshire (Winslow).

H. virginianum L.— Rich woods; common. Valley of the Deerfield River, Florida; altitude 2000 feet, Berry Mt., Hancock.

BORAGINACEAE. BORAGE FAMILY.

CYNOGLOSSUM. Hound's Tongue.

C. boreale Fernald.— Clearings and open woods; occasional. Stockbridge; Great Barrington.

C. officinale L. Common Hound's Tongue.— Pastures; occasional.

ECHIUM. Viper's Bugloss.

E. vulgare L. Blue-weed.— Dry gravelly soil, open hillsides, along railroad tracks and stony flood-plains; locally common in the western part of the valley and in southern New Marlboro. Occasional on the flood-plain of the Deerfield River, Florida. According to Bascom (Berkshire Hist. and Sci. Soc., **3**: 307, 1899) *Echium vulgare* first appeared in the County in 1849.

forma albiflorum, f. nov.— Corollis albis. Flowers white.

With the type, Egremont. Type specimen in the herbarium of the N. E. B. C. collected on the stony flood-plain of Green River, Egremont, July 15, 1920 (Hoffmann).

LAPPULA. Stickseed.

L. echinata Gilibert.— (*L. Lappula* Ill. Fl. ed. 2.)

Railroad track, Pittsfield (Churchill); adventive in chicken-yard, Stockbridge.

L. virginiana (L.) Greene. Stickseed; Beggar's Lice.— Open woods, thickets and rich soil along streams; frequent in the valley.

LITHOSPERMUM. Gromwell.

L. arvense L.— Adventive in waste ground, Great Barrington.

L. officinale L.— Open hillsides and roadside thickets; occasional

in the valley. Williamstown; New Ashford (Walters); Stockbridge; West Stockbridge; Egremont; Great Barrington (Schweinfurth); Sheffield.

MYOSOTIS. Forget-me-not.

M. laxa Lehm. Wild Forget-me-not.— Borders of ponds and low ground; occasional in the southern part of the valley. Monterey; New Marlboro; Egremont (Walters); Great Barrington (Walters).

M. scorpioides L. Garden Forget-me-not.— Naturalized in brooks, swampy woods, and in the back-waters of rivers; frequent.

SYMPHYTUM. Comfrey.

S. asperum Lepechin.— (*S. asperrimum* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **18**: 23, 1916.)

Established about old house, Stockbridge; roadside, Sheffield (Walters).

S. officinale L. Common Comfrey.— Moist soil, West Stockbridge (Evans, Fernald and Knowlton).

VERBENACEAE. VERVAIN FAMILY.

VERBENA. Vervain.

V. angustifolia Michx.— Sandy soil on limestone hills; occasional in Egremont and Sheffield.

V. bracteosa Michx.— Adventive in waste ground near railroad station, Pittsfield.

V. hastata L. Blue Vervain.— Low ground, and dry fields; common.

V. urticaefolia L. White Vervain.— Roadsides and waste ground, in dry or moist soil; frequent.

LABIATAE. MINT FAMILY.

AGASTACHE. Giant Hyssop.

(*Lophanthus* Ill. Fl. ed. 2.)

A. nepetoides (L.) Ktze.— Railroad embankment, Williamstown (Churchill).

A. scrophulariaefolia (Willd.) Ktze.— Borders of woods and

thickets; occasional in the valley. Alford; Great Barrington (Walters); New Marlboro; Sheffield.

var. **mollis** (Fernald) Heller.— Thicket, Stockbridge.

AJUGA. Bugle Weed.

A. GENEVENSIS L.— Established on roadside banks, Pittsfield (Lincoln).

BLEPHILIA.

B. ciliata (L.) Raf. Wood Mint.— Roadsides and meadows; occasional in the southern and western part of the valley. Stockbridge; West Stockbridge; Sheffield.

B. hirsuta (Pursh) Benth.— Occasional. Wet roadside, West Stockbridge; swampy place in woods, Sandisfield (Walters).

COLLINSONIA. Horse Balm.

C. canadensis L. Rich-weed.— Rich damp woods; common in the valley. Altitude 1600 feet, New Marlboro.

GALEOPSIS. Hemp Nettle.

G. TETRAHIT L. Common Hemp Nettle.— Shaded brook, Hancock (Churchill).

Calyx-teeth in fruit 17 to 5 to 11 mm. long. Corolla large, about 2 cm. long (*vid.* Rhodora, **12**: 142, 1912).

var. BIFIDA (Boenn.) Lej. & Court.—(*G. Tetrahit* Man. ed. 7 in part; *vid.* Rhodora, **12**: 142, 1910.)

Waste places; common.

Calyx-teeth in fruit 5 to 8 mm. long. Corolla about 14 to 16 mm. long and much more slender than in the species.

HEDEOMA. Mock Pennyroyal.

H. HISPIDA Pursh.— Dry fields and limestone ridges; occasional in the southern part of the valley and possibly indigenous. Great Barrington; Sheffield (Walters); New Marlboro (Walters).

H. pulegioides (L.) Pers. American Pennyroyal.— Dry woods, fields and stony hillsides; common in the valley.

ISANTHUS. False Pennyroyal.

I. brachiatus (L.) BSP.— Dry limestone hills; occasional in the valley. Williamstown (Churchill); Sheffield.

LAMIUM. Dead Nettle.

L. amplexicaule L.— Adventive in a vacant lot, Pittsfield; cultivated ground, Stockbridge; cultivated field, Sheffield.

LEONURUS. Motherwort.

L. Cardiaca L.— Waste ground about farm buildings and old sites; common.

LYCOPUS. Water Horehound.

L. americanus Muhl.— Low ground; common in the valley.

L. uniflorus Michx. Bugle Weed.— Low shaded ground; common.

L. virginicus L. Bugle Weed.— Rich moist soil; frequent in the valley.

MENTHA. Mint.

M. arvensis L.— Low ground; frequent.

var. **canadensis** (L.) Briquet.— (*M. canadensis* Ill. Fl. ed. 2.) Wet places; common.

var. **lanata** Piper.— Big Pond, Otis.

M. Cardiaca Gerarde.— A specimen in the N. E. B. C. herbarium, collected in Berkshire Co., locality not given.

M. piperita L. Peppermint.— Brooks; frequent in the valley.

M. spicata L. Spearmint.— Along brooks and wet places in meadows; frequent in the valley.

MARRUBIUM. Horehound.

M. vulgare L. Common Horehound.— On dump at woolen mill, Pittsfield.

MONARDA. Horse Mint.

M. didyma L. Oswego Tea; Bee Balm.— Occasionally established near dwellings. Pittsfield (Lincoln); Sheffield; Sandisfield (Walters); in a damp thicket in Great Barrington, as if native.

M. fistulosa L., var. rubra Gray. Wild Bergamot.— Near dwelling, Lanesboro (Churchill).

M. mollis L. Wild Bergamot.— Hillsides and thickets in calcareous soil; locally common in the southwestern part of the valley, as far east as the borders of Lee and Monterey.

NEPETA. Catnip.

N. Cataria L. Catnip.— Waste places about farm buildings, roadsides and clearings; common.

N. hederacea (L.) Trevisan. Gill-over-the-Ground.— (*Glecoma hederacea* Ill. Fl. ed. 2.)

Moist ground along roadsides and about buildings; frequent. Occasionally in moist woods.

ORIGANUM. Wild Marjoram.

O. vulgare L. Wild Marjoram.— Locally established on limestone hillsides in the valley. Williamstown; North Adams; Stockbridge; West Stockbridge; New Marlboro; Egremont.

PHYSOSTEGIA. False Dragon Head.

(*Dracocephalum* Ill. Fl. ed. 2.)

P. virginiana (L.) Benth. False Dragon Head.— Occasionally established along roadsides; Pittsfield (Lincoln); West Stockbridge.

PRUNELLA. Self Heal.

P. vulgaris L. Self Heal; Heal All.— Lawn, Pittsfield.

var. **lanceolata** (Barton) Fernald.— (*P. vulgaris* Man. ed. 7 in part; *vid.* Rhodora, **15**: 182, 1913.)

Fields, meadows, open places in woods, lawns and roadsides; common. Summit of Greylock.

forma **candida** Fernald.— (*Vid.* Rhodora, **15**: 184, 1913.)

Savoy; Stockbridge; Sheffield (Walters).

forma **iodocalyx** Fernald.— Riverbank, North Adams (Fernald and Long).

Professor Fernald has shown (Rhodora, **15**: 182, 1913) that the common *Prunella* in New England differs from the European *P. vulgaris* in the character of the principal cauline leaves (the median ones). In the European plant these leaves are ovate or ovate-oblong, rounded at the base, averaging one-half as broad as long. This plant is found occasionally in lawns. In the common *Prunella* of the fields and roadsides the principal cauline leaves are lanceolate to oblong, gradually narrowed or cuneate at base, averaging one-third as broad as long.

PYCNANTHEMUM. Mountain Mint.

(*Koellia* Ill. Fl. ed. 2.)

P. flexuosum (Walt.) BSP.— Dry fields and low meadows; occasional in the southern part of the valley. Stockbridge; Sandisfield (Walters); Sheffield.

P. muticum (Michx.) Pers.— Lanesboro (Churchill); Great Barrington; Sandisfield (Walters).

P. virginianum (L.) Durand & Jackson.— Dry fields; frequent in the valley, and in Mt. Washington. Specimens from Lanesboro (Churchill) and Sheffield have pubescent stems.

SALVIA. Sage.

S. sylvestris L.— Adventive on a dry hillside, Sheffield. This is the third station recorded for the United States (*vid.* Rhodora, **19**: 39, 1917).

SATUREJA. Savory.

(*Clinopodium* Ill. Fl. ed. 2.)

S. Acinos (L.) Scheele.— Dry bank, Williamstown (Churchill); field, Sheffield (Mrs. O. P. Phelps).

S. vulgaris (L.) Fritsch. Basil.— Dry open woods and thickets; frequent in the valley, rare on the plateau (Sandisfield).

SCUTELLARIA. Skullcap.

S. galericulata L.— Wet meadows and swamps; common.

S. lateriflora L. Mad-dog Skullcap.— Wet meadows, swamps and borders of streams; common.

STACHYS. Hedge Nettle.

S. palustris L. Woundwort.— Roadsides in poor wet soil; occasional. Williamstown (Churchill); Stockbridge; West Stockbridge; Sheffield.

var. **homotricha** Fernald.— Dry field, West Stockbridge.

TEUCRIUM. Germander.

T. Botrys L.— Dry soil in pastures; occasional in the southern part of the valley. Great Barrington (Walters); Sheffield (Walters).

T. occidentale Gray, var. **boreale** (Bicknell) Fernald.— Locally common along the Housatonic River in Sheffield.

THYMUS. Thyme.

T. Serpyllum L. Creeping Thyme.— Thoroughly naturalized and locally common on hillsides and along roadsides in calcareous soil in the central part of the valley. Altitude of 1400 feet (Gilder Pond, Otis). Not noted in suitable localities in Egremont and Sheffield. At Berry Pond, Hancock, at an altitude of 2000 feet, a small patch growing with *Vaccinium pennsylvanicum* in mininacid soil.

TRICHOSTEMA. Blue Curls.

T. dichotomum L. Blue Curls.— Sandy or gravelly fields; frequent in the valley.

SOLANACEAE. NIGHTSHADE FAMILY.

DATURA. Jamestown Weed; Jimson Weed.

D. Tatula L. Purple Thorn Apple.— (*D. Stramonium* Ill. Fl. ed. 2 in part.)

Adventive on roadside, Sheffield.

LYCOPERSICUM. Tomato.

L. esculentum Mill. Tomato.— (*L. Lycopersicon* Ill. Fl. ed. 2.)

Occasionally self-sown on dumps and on shores of rivers.

LYCIUM. Matrimony Vine.

L. halimifolium Mill. Common Matrimony Vine.— Established in a vacant lot, Lee; spreading on a dry hillside, New Marlboro.

NICANDRA.

(*Physalodes* Ill. Fl. ed. 2.)

N. Physalodes (L.) Pers. Apple of Peru.— Waste ground, Sheffield.

NICOTIANA. Tobacco.

N. affinis L. & O.— Occasional on dumps.

PETUNIA. Petunia.

P. nyctaginiflora Juss.— (*P. axillaris* Ill. Fl. ed. 2.)
Waste ground, Sheffield.

PHYSALIS. Ground Cherry.

P. heterophylla Nees.— Dry hill, Sheffield.

var. **ambigua** (Gray) Rydb.— Sandy soil, Florida; New Marlboro; Great Barrington and Sheffield (Walters).

P. pruinosa L.— Occasional and apparently introduced. Bank near garden, Stockbridge; sandy bank along the Housatonic River, Sheffield (Walters).

P. subglabrata Mackenzie & Bush.— Waste ground, Stockbridge.

SOLANUM. Nightshade.

S. Dulcamara L. Bitter-sweet.— Borders of streams and swamps; common. Shaded calcareous ledges, West Stockbridge.

S. nigrum L. Common Nightshade.— Open fields and shaded ledges; occasional. Stockbridge; Great Barrington; Sheffield.

SCROPHULARIACEAE. FIGWORT FAMILY.

AGALINIS.

(*Gerardia* Man. ed. 7 in part; *vid.* Rhodora, **20**: 133, 1918.)

A. tenuifolia (Vahl) Raf. Slender Gerardia.— Open wooded hillsides; rare. Stockbridge; Sheffield.

AUREOLARIA.

(*Gerardia* Man. ed. 7 in part; *Dasystoma* Ill. Fl. ed. 2. *Vid.* Rhodora **20**: 133, 1918.)

A. pedicularia (L.) Raf.— Dry open woods; occasional in the southern part of the valley. Great Barrington; Sheffield.

A. villosa Raf. Downy False Foxglove.— (*Gerardia flava* Man. ed. 7; *Dasystoma flava* Ill. Fl. ed. 2.)

Dry woods; occasional in the southern part of the valley. Great Barrington; New Marlboro.

A. virginica (L.) BSP. Smooth False Foxglove.— Dry woods; frequent in the valley.

CHELONE. Turtlehead; Snakehead.

C. glabra L. Turtlehead; Snakehead.— Swamps and wet meadows; common. Summit of Greylock, 3500 feet.

C. Lyoni Pursh.— Established for several rods along a brook, Stockbridge.

GRATIOLA. Hedge Hyssop.

G. virginiana L.— Roadside ditches and muddy shores; occasional in the valley. Becket (Walters); Stockbridge; Great Barrington; Sheffield.

ILYSANTHES. False Pimpernel.

I. dubia (L.) Barnhart.— Wet places in woods and muddy shores; frequent.

LINARIA. Toadflax.

L. canadensis (L.) Dumont. Blue Toadflax.— Sandy roadsides and fields; frequent in the southern part of the valley.

L. minor (L.) Desf.— (*Chaenorrhinum minus* Ill. Fl. ed. 2.)

Along railroad, West Pittsfield (Churchill).

L. vulgaris Hill. Butter and Eggs.— (*L. Linaria* Ill. Fl. ed. 2.)

Fields and roadsides; common.

MELAMPYRUM. Cow Wheat.

M. lineare Lam. Cow Wheat.— Dry woods; common in the southern part of the valley.

MIMULUS. Monkey Flower.

M. ringens L. Monkey Flower.— Wet places; common.

PEDICULARIS. Lousewort.

P. canadensis L. Lousewort; Wood Betony.— Open woods and grassy banks; common.

forma **praeclara** A. H. Moore.— *Vid.* Rhodora, **16**: 128 (1914). Common.

PENTSTEMON. Beard-tongue.

P. hirsutus (L.) Willd.— Dry fields and rocky hills; frequent in the southern part of the valley.

P. LAEVIGATUS Ait.— (*P. Penstemon* Ill. Fl. ed. 2.)

Fields; occasional in the southern part of the valley. Lee; New Marlboro; Sheffield. Probably introduced with grass seed.

var. DIGITALIS (Sweet) Gray.— (*P. Digitalis* Ill. Fl. ed. 2.)

Fields; occasional in the southern part of the valley. Stockbridge; Great Barrington; Egremont; Sheffield.

SCROPHULARIA. FIGWORT.

S. leporella Bicknell.— Fields and roadsides; frequent.

S. marilandica L.— Rich shaded soil; frequent.

VERBASCUM. MULLEIN.

V. BLATTARIA L. MOTH MULLEIN.— Old fields; rare. New Ashford; Pittsfield; Great Barrington.

V. THAPSUS L. MULLEIN.— Hillsides, clearings and old fields; common.

VERONICA. SPEEDWELL.

V. americana Schwein. AMERICAN BROOKLIME.— Brooks, ditches and swampy places; common.

V. Anagallis-aquatica L. WATER SPEEDWELL.— Brooks; rare. Stockbridge Bowl, Stockbridge; Sheffield.

The material of *V. Anagallis-aquatica* from Berkshire has been determined by Dr. F. W. Pennell as *V. catenata* Pennell, var. *glandulosa* Farwell.

V. ARVENSIS L. CORN SPEEDWELL.— Dry hillsides; frequent in the valley.

V. officinalis L. COMMON SPEEDWELL.— Hillsides and open woods; common.

V. peregrina L. PURSLANE SPEEDWELL.— Cultivated ground; occasional. Pittsfield; Stockbridge; West Stockbridge; Great Barrington (Walters); Sandisfield.

V. scutellata L. MARSH SPEEDWELL.— Swamps and wet places; common.

V. SERPYLLIFOLIA L.— Damp grassy ground; common.

V. TEUCRIUM L.— Roadside escape; occasional. Williamstown; New Marlboro; Egremont; Mt. Washington (Churchill).

V. TOURNEFORTII L.— Waste ground; occasional. Lanesboro; Pittsfield.

V. virginica L. CULVER'S ROOT.— (*Leptandra virginica* Ill. Fl. ed. 2).

Borders of streams and roadside thickets; frequent in the southern part of the valley. Altitude 1100 feet, Sheffield.

LENTIBULARIACEAE. BLADDERWORT FAMILY.

UTRICULARIA. BLADDERWORT.

U. clandestina Nutt.— (*U. geminiscapa* Ill. Fl. ed. 2.)

Pools in marshes; occasional. Pittsfield; Stockbridge.

U. cornuta Michx.— (*Stomoisia cornuta* Ill. Fl. ed. 2.)

Swampy borders of ponds; frequent.

U. gibba L.— Pools in marsh. Egremont; Pittsfield (Dewey).

U. intermedia Hayne.— Pools in bogs and marshes; frequent.

U. minor L.— Pools in marshes. Monterey; Great Barrington.

U. vulgaris L., var. **americana** Gray.— (*U. macrorhiza* Ill. Fl. ed. 2.)

Ponds and slow streams, pools in marshes; common.

OROBANCHACEAE. BROOM-RAPE FAMILY.

CONOPHOLIS. SQUAW-ROOT; CANCER-ROOT.

C. americana (L. f.) Wallr. CANCER-ROOT.— Oak woods, Shaker Mt., Pittsfield (Lincoln); Hancock (Churchill). Perhaps more widely distributed and overlooked.

EPIFAGUS. BEECH-DROPS.

(*Leptamnium* Ill. Fl. ed. 2.)

E. virginiana (L.) Bart.— Dry woods, under beech-trees; frequent. On Greylock to an altitude of 2500 feet.

OROBANCHE. BROOM-RAPE.

(*Thalesia* Ill. Fl. ed. 2.)

O. uniflora L. ONE-FLOWERED CANCER-ROOT.— Dry woodlands; frequent in the valley. On *Solidago rugosa* and *Aster cordifolius* (Evans, Fernald and Knowlton).

PHRYMACEAE. LOPSEED FAMILY.

PHRYMA. Lopseed.

P. Leptostachya L. Lopseed.— Open woods in low ground; frequent in the valley.

PLANTAGINACEAE. PLANTAIN FAMILY.

PLANTAGO. Plantain.

P. aristata Michx.— Dry fields and waste ground; frequent in the southern part of the valley. Naturalized from the West.

P. lanceolata L. Rib Grass.— Fields and meadows; common.

P. major L. Common Plantain.— About dwellings and along roadsides; common.

P. media L.— Adventive in a lawn, Lenox.

P. Rugelii Dene.— Fields and roadsides, and about dwellings; common.

RUBIACEAE. MADDER FAMILY.

CEPHALANTHUS. Buttonbush.

C. occidentalis L. Buttonbush.— Borders of ponds and slow streams, and in swamps; common.

GALIUM. Bedstraw; Cleavers.

G. Aparine L.— Riverbanks and rich soil at low altitudes; frequent in the valley.

G. asprellum Michx. Rough Bedstraw.— Alluvial thickets and low ground; common.

G. boreale L. Northern Bedstraw.— Meadows; occasional. Williamstown (Churchill); Sandisfield; Sheffield. Plants collected in Sheffield with hispid fruit.

G. circaezans Michx. Wild Liquorice.— Dry woods and clearings; frequent in the southern part of the valley.

G. Claytoni Michx.— Swamps and wet meadows; common.

G. erectum Huds.— Roadsides and fields; occasional. Lanesboro; Becket; Lenox; Great Barrington (Walters).

G. labradoricum Wiegand.— Bogs; frequent.

G. lanceolatum Torr. Wild Liquorice.— Rich woods; common.

G. MOLLUGO L.— Roadsides and fields; common from West Pittsfield to Richmond, occasional elsewhere in the valley. Williamstown; Adams; Cheshire; Stockbridge; Tyringham.

G. palustre L.— Wet meadows and shores of ponds; common.

G. pilosum Ait.— Dry woods; rare. Sheffield.

G. tinctorium L.— Alluvial banks. Sheffield; Great Barrington (Walters).

G. trifidum L.— Swamps and wet shores; common.

G. triflorum Michx. SWEET-SCENTED BEDSTRAW.— Rich woods; common.

G. VERUM L. YELLOW BEDSTRAW.— Roadsides and meadows; occasional. New Ashford; Lenox (Lincoln); Stockbridge; Great Barrington; Sheffield.

HOUSTONIA.

H. caerulea L. BLUETS; INNOCENCE.— Pastures, meadows, roadsides and along woodroads; common. Occasionally in open moist pine woods, Stockbridge.

H. longifolia Gaertn.— Dry hills and rocky ridges in the western part of the valley; local. West Stockbridge; Great Barrington; Sheffield (Bailey).

MITCHELLA. PARTRIDGE BERRY.

M. repens L. PARTRIDGE BERRY.— Woods; common. Occasionally on limestone but under pines.

CAPRIFOLIACEAE. HONEYSUCKLE FAMILY.

DIERVILLA. BUSH HONEYSUCKLE.

D. Lonicera Mill. BUSH HONEYSUCKLE.— (*D. Diervilla* Ill. Fl. ed. 2.)

Rocky woods and dry banks; common. Not noted on calcareous soil.

LINNAEA. TWIN-FLOWER.

L. borealis L., var. **americana** (Forbes) Rehder. TWIN-FLOWER. — (*L. americana* Ill. Fl. ed. 2.)

Moist mossy woods; occasional on the plateau. Savoy; Washington; Harmon Pond, New Marlboro; Mt. Washington (Mrs. W. T. Day).

LONICERA. Honeysuckle.

L. caerulea L., var. **calvescens** Fernald & Wiegand. Mountain Fly Honeysuckle.— (*L. caerulea*, var. *villosa* Man. ed. 7 in part.)

Swamps; occasional. Lanesboro; Pittsfield (Knowlton); Stockbridge.

Leaves only sparingly pilose or glabrate; the new twigs glabrous or merely puberulent or sparingly pilose, becoming glabrate (*vid.* Rhodora, **12**: 210, 1910).

var. **villosa** (Michx.) T. & G.— Bogs and wet hillsides; common, especially on the plateau.

L. canadensis Marsh. American Fly Honeysuckle.— Woods; frequent.

L. dioica L.— Rocky woods and swamps; frequent. Common in thickets in the sand-plain, Sheffield.

L. hirsuta Eat.— Bullock's Ledge, Williamstown.

This species was discovered "on a rocky hill, two miles west of the college" in Williamstown in 1817 by a pupil of Amos Eaton and described in the second edition of Eaton's Manual of Botany in 1818. The species was later found in Vermont, Pennsylvania and as far northwest as Manitoba, but no additional stations were found in Massachusetts, nor were botanists able to rediscover Eaton's station. In 1920 the writer had the good fortune to find the plant growing in some abundance at the above locality, probably the type station.

L. sempervirens L. Trumpet Honeysuckle.— Escaped on rocky hillside, Great Barrington.

L. tatarica L. Tartarian Honeysuckle.— Occasional as an escape in thickets, Stockbridge.

L. Xylosteum L. European Fly Honeysuckle.— Locally frequent as an escape in thickets about Stockbridge Bowl, Stockbridge.

SAMBUCUS. Elder.

S. canadensis L. Common Elder; Elderberry.— Low ground; common.

S. racemosa L. Red-berried Elder.— Rocky woods, banks and clearings; common.

SYMPHORICARPUS. Snowberry.

S. albus (L.) Blake.— (*S. racemosus* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **16**: 118, 1914.)

Dry calcareous hill, Sheffield. The most eastern known station.

var. LAEVIGATUS (Fernald) Blake.— (*S. racemosus* Ill. Fl. ed. 2 in part; *vid.* Rhodora, **16**: 119, 1914.)

Roadside banks; occasionally escaping from cultivation.

TRIOSTEUM. HORSE GENTIAN.

T. aurantiacum Bicknell.— Rocky woods and dry thickets; frequent in the southern part of the valley.

VIBURNUM. VIBURNUM.

V. acerifolium L. MAPLE-LEAVED VIBURNUM.— Woods; common.

V. affine Bush.— (*V. pubescens* Man. ed. 7 and Ill. Fl. ed. 2; *vid.* Rhodora, **20**: 14, 1918.)

Rocky woods, on schist, West Stockbridge Mt., West Stockbridge. The only station known in Massachusetts.

V. alnifolium Marsh. HOBBLE-BUSH.— Cool woods and swamps; common. Occasionally growing as a small tree.

V. cassinoides L.— Swamps and low thickets; common.

V. dentatum L. ARROW-WOOD.— Borders of streams and marshes, wet hillsides; common, especially on the plateau.

V. LANTANA L. WAYFARING TREE.— Occasionally escaping from cultivation to open woods, Stockbridge.

V. Lentago L. SWEET VIBURNUM; SHEEPBERRY; NANNYBERRY. — Thickets, moist woods and banks of streams; frequent.

var. **sphaerocarpum** Gray.— Occasional with the type, Pittsfield.

V. opulus L., var. **americanum** (Mill.) Ait. HIGH-BUSH CRANBERRY.— Swamps and cold woods; frequent.

VALERIANACEAE. VALERIAN FAMILY.

VALERIANA. VALERIAN.

V. OFFICINALIS L. GARDEN VALERIAN.— Grassy roadside, Lanesboro (Churchill).

DIPSACACEAE. TEASEL FAMILY.

DIPSACUS. TEASEL.

D. SYLVESTRIS Huds. WILD TEASEL.— Established in a few small stations in Sheffield.

SCABIOSA.

S. OCHROLEUCA L.— Adventive in gravel pit, Pittsfield (Lincoln).

SUCCISA. DEVIL'S BIT.

S. AUSTRALIS (Wulp.) Reichenb.— Established in low ground in Pittsfield. First reported in 1892. A small station in low ground in Lenox.

CUCURBITACEAE. GOURD FAMILY.

CUCUMIS. GOURD; SQUASH; PUMPKIN.

C. MELO L. MUSKMELON.— Occasional on dump heaps.

C. SATIVUS L. CUCUMBER.— Occasional on dump heaps.

CUCURBITA.

C. MAXIMA Duchesne. SQUASH.— Occasional on dump heaps.

C. MOSCHATA Duchesne. CROOKNECK SQUASH.— Occasional in waste ground.

ECHINOCYSTIS. WILD BALSAM-APPLE.

(*Micrampelis* Ill. Fl. ed. 2.)

E. lobata (Michx.) T. & G. WILD CUCUMBER.— Riverbanks and waste places; common.

SICYOS. ONE-SEEDED BUR CUCUMBER.

S. angulatus L. ONE-SEEDED BUR CUCUMBER.— Riverbanks and waste places; frequent.

CAMPANULACEAE. BLUEBELL FAMILY.

CAMPANULA. BELLFLOWER.

C. aparinoides Pursh. MARSH BELLFLOWER.— Marshes, wet meadows and borders of brooks and ponds; common.

C. RAPUNCULOIDES L. BELLFLOWER.— Roadsides and banks; frequent.

var. UCRANICA (Bess.) C. Koch.— Occasional. Lanesboro (Churchill).

C. rotundifolia L. HAREBELL; BLUEBELL.— Rocky ledges and

meadows; frequent on and about The Dome, Mt. Washington, on West Stockbridge Mt., along the flood-plain of the Deerfield River, Florida. Occasional elsewhere. Stockbridge; New Marlboro. There seems to be no explanation for the extremely local distribution of this species. In the southwestern part of Sheffield and the southern part of New Marlboro it grows freely on outcrops of limestone and of schist, and in meadows, but in no other township is it even frequent.

forma **alba** Rand & Redfield.— Limestone outcrop with the type, Sheffield. Flowers white. (*Vid.* Flora of Mt. Desert, p. 124.)

C. uliginosa Rydb.— Marshes and banks of streams; occasional. Washington (Johnson); Lenox; Stockbridge; Egremont; Sheffield.

SPECULARIA. Venus's Looking-glass.

S. perfoliata (L.) DC. Venus's Looking-glass.— Dry hillsides and rocky woods; frequent in the southern part of the valley.

LOBELIACEAE. LOBELIA FAMILY.

LOBELIA.

L. cardinalis L. Cardinal-flower.— Borders of streams and ponds; frequent in the valley.

L. Dortmanna L. Water Lobelia.— Shallow water, borders of ponds; frequent on the plateau.

L. inflata L. Indian Tobacco.— Clearings, hillsides, dry roadsides and fields, borders of ponds and streams; common.

L. Kalmii L.— Wet meadows, ditches, and shores of lakes; frequent in the valley, always in calcareous soil.

L. siphilitica L. Great Blue Lobelia.— Low ground; rare. In three localities in Sheffield, near the Connecticut Line (Walters).

L. spicata Lam.— Grassy fields; common.

forma **albiflora**, f. nov.— Corollis albis. Flowers white. Occasional with the type, Stockbridge.

The type in Coll. N. E. B. C. collected in a field in Stockbridge, Mass., July 16, 1916 (R. Hoffmann).

COMPOSITAE. COMPOSITE FAMILY.

ACHILLEA. Yarrow.

A. Millefolium L. Common Yarrow.— Roadsides and dry fields; common. The form with red flowers occasionally occurs about houses, appearing as if an escape.

AMBROSIA. Ragweed.

A. artemisiifolia L. Ragweed; Roman Wormwood.— (*A. elatior* Ill. Fl. ed. 2.)

Roadsides, waste places and cultivated ground; common.

A. trifida L.— Occasionally adventive. Flood-plain of the Hoosac River, Williamstown; chicken-yard, Stockbridge.

ANAPHALIS. Everlasting.

A. margaritacea (L.) B. & H. Pearly Everlasting.— Dry open woods, upland pastures and clearings; common.

ANTENNARIA. Everlasting; Ladies' Tobacco.

A. Brainerdii Fernald.— Bank of Deerfield River, Florida.

A. canadensis Greene.— Wooded banks; frequent.

A form with purplish stem, with petaloid bracts, from Savoy.

A. fallax Greene.— Rich open woods; frequent in the valley.

A. neglecta Greene.— Fields and open woods; common, especially on the plateau. Altitude 2300 ft., Florida. Plants collected from Great Barrington approach var. *simplex* Peck.

A. neodioica Greene.— Open woods, often on thin soil over rocks; common.

var. **grandis** Fernald.— Open woods; frequent.

A. occidentalis Greene.— Rich open woods and grassy banks; frequent.

A. Parlinii Fernald.— Rich open woods and grassy banks; frequent in the valley.

A. petaloidea Fernald.— Rocky woods; frequent in the valley.

A. plantaginifolia (L.) Richards.— Dry woods; frequent in the southern part of the valley. Occasional as far north as Cheshire (Cushman).

ANTHEMIS. Chamomile.

A. Cotula L. May-weed.— Roadsides and waste places; common.

ARCTIUM. Burdock.

Key to Arctium.

a. Heads corymbose, long-peduncled; leaf-blades round-ovate, obtuse; petioles strongly angular, deeply furrowed.

Petioles solid; heads very large and broad, 3 to 4.5 cm. in diameter; involucre glabrous, green ..... *A. Lappa.*

Petioles hollow; heads smaller, 2 to 2.7 cm. broad; involucre more or less arachnoid ..... *A. tomentosum.*

a'. Heads racemose or sub-racemose, rarely long-peduncled; leaf-blades ovate-oblong, usually less obtuse; petioles slightly angular.

Heads medium, 2.5 to 3.5 cm. broad; the middle and inner bracts of the involucre equalling or exceeding the corollas; achenes dark brown. *A. nemorosum.*

Heads small, 1.5 to 2.5 cm. broad; the middle and inner bracts of the involucre conspicuously shorter than the corollas; achenes gray or ashy-brown ..... *A. minus.*

A. LAPPA L. GREAT BURDOCK.— Roadsides and waste places; rare. Williamstown; Sheffield (Walters).

A. MINUS (Hill) Bernh. COMMON BURDOCK.— (*A. minus* Man. ed. 7; *vid.* Rhodora, **12**: 47, 1910.)

Waste ground and roadsides; common.

A. NEMOROSUM Lejeune.— Waste ground, Stockbridge. This species is very variable. The specimen from Stockbridge is treated as form **c** by Fernald & Wiegand (Rhodora, **12**: 45, 1910).

A. TOMENTOSUM Mill.— Frequent in waste ground, Lee. (*Vid.* Rhodora, **12**: 45, 1910.)

ARTEMISIA. WORMWOOD.

A. ABSINTHIUM L. WORMWOOD.— Roadside near Greenwater Pond, Lee; waste ground, Sheffield.

A. BIENNIS Willd.— Waste ground, Pittsfield; Lee.

A. LUDOVICIANA Nutt.— Railroad track, Lee.

A. VULGARIS L. COMMON MUGWORT.— Roadsides and waste ground; occasional. Cheshire; West Stockbridge; Great Barrington; Lanesboro (Walters); Lenox.

ASTER. ASTER.

A. acuminatus Michx.— Cool rich woods; common. Summit of Greylock. The monstrous form with chaffy paleae instead of flowers has been found at Otis and Sandisfield (Walters).

A. cordifolius L.— Borders of woods and thickets, roadsides and shaded yards; common, especially in the valley. A form from Egremont with flowers almost pure white when fresh, drying bluish-white. Many specimens which have been referred to this species have the upper surface of the leaves smooth, almost greasy to the touch.

var. **Furbishiae** Fernald.— Shaded bank of brook, Lee.

var. **polycephalus** Porter.— With the type; frequent.

A. divaricatus L.— Open woods; common. Almost to the summit of Greylock, 3400 feet.

A. dumosus L.— Sheffield (Walters). Specimen examined but since lost.

A. ericoides L.— Dry open soil; common in the southern part of the valley, frequent elsewhere in the valley.

Specimens from Stockbridge approach var. *Pringlei* Gray.

var. **villosus** T. & G.— With the type; occasional.

A. foliaceus Lindl.— Wet roadside bank, Sandisfield.

"The chief characters separating [this species] from *A. novi-belgii* and *A. longifolius* are its very few large heads (involucre, excluding the enlarged outer bracts, 7–9 mm. high) chiefly solitary on elongate pedicels which are naked or have 1 or 2 large dilated foliaceous bracts, and the essentially equal herbaceous or foliaceous involucral bracts" (*vid.* Rhodora, **17**: 13, 1915).

A. laevis L.— Dry soil, borders of woods and roadside thickets; common in the valley.

var. **amplifolius** Porter.— With the type, Stockbridge.

A. lateriflorus (L.) Britton.— Thickets in low ground; common in the valley.

var. **bifrons** (Gray) Fernald.— Low ground, Sheffield.

var. **hirsuticaulis** (Lindl.) Porter.— (*A. hirsuticaulis* Ill. Fl. ed. 2.) Swampy woods; frequent in the valley. Occasionally in dry thickets, Sheffield.

var. **thyrsoideus** (Gray) Sheldon.— Thickets in low ground; frequent.

A. linariifolius L.— (*Ionactis linariifolius* Ill. Fl. ed. 2.)

Dry open soil; frequent in the southern part of the valley.

A. longifolius Lam.— Low shaded ground, borders of swamps; frequent in the valley. Flood-plain of the Deerfield River, Florida.

var. **villicaulis** Gray.— Low ground; frequent in the valley. Often associated with the type.

A. Lowrieanus Porter, var. **lanceolatus** Porter.— Sheffield (Walters). Determined by Professor Fernald.

A. macrophyllus L.— Clearings and open woods, roadside thickets; common.

var. **excelsior** Burgess.— Clearings; occasional. Great Barrington.

var. **ianthinus** (Burgess) Fernald.— (*A. ianthinus* Ill. Fl. ed. 2.)

Open woods; occasional. Florida; Stockbridge; West Stockbridge; New Marlboro; Alford; Mt. Washington.

A. multiflorus Ait.— Dry soil; occasional. Williamstown; Lanesboro (Walters); New Marlboro (Walters); Egremont; Sheffield.

var. **exiguus** Fernald.— Dry hillside, West Stockbridge.

A. novae-angliae L. NEW ENGLAND ASTER.— Thickets in low ground and ill-drained hillsides; common in the valley, rare on the plateau. October Mt., Washington (altitude 1850 feet).

forma **roseus** (Desf.), comb. nov.— With the type; occasional. Stockbridge; West Stockbridge.

A. novi-belgii L.— Common along the flood-plain of the Deerfield River, Florida.

A. paniculatus Lam.— Roadside thickets in low ground and wet meadows; common in the valley, infrequent on the plateau (Washington, altitude 1850 feet).

var. **acutidens** Burgess.— Low ground; occasional. Lenox; Stockbridge; Alford.

var. **bellidiflorus** (Willd.) Burgess.— With the type; frequent.

var. **simplex** (Willd.) Burgess.— With the type; frequent.

var. **cinerascens** Fernald.— Open woods, New Marlboro (Walters). Specimen in F. Walters' herbarium.

A. polyphyllus Willd.— (*A. Faxoni* Ill. Fl. ed. 2.)

Dry banks and low meadows in calcareous soil; occasional. Stockbridge; West Stockbridge.

A. prenanthoides Muhl.— Banks of streams and low ground; locally common along the Green River, Williamstown, the Green River, Egremont, and in wet fields in the northern part of Lenox. Frequent elsewhere in the valley.

A. puniceus L.— Swamps, wet meadows, borders of marshes and roadside ditches; common. Summit of Greylock, 3400 feet.

var. **compactus** Fernald.— A form closely approaching this variety but not the typical eastern Massachusetts form is occasional in the valley. Pittsfield; Stockbridge; West Stockbridge; Sheffield.

var. **demissus** Lindl.— Low ground; frequent in the valley. Altitude 1450 feet, Washington.

var. **firmus** (Nees) T. & G.— Low ground; frequent.

var. **lucidulus** Gray.— Wet meadows; frequent in the valley.

The most clearly marked of the varieties of *A. puniceus* and apparently distinct enough to deserve specific rank.

var. **lucidulus** Gray, forma **albiflorus**, f. nov.— Corollis albis. Flowers white. The type collected in a low meadow in Lee, Sept., 1919, now in the N. E. B. C. collection.

A. Schreberi Nees.— Dry woods and thickets; common.

A. tardifolius L.— Shady roadsides; frequent in the valley.

var. **vestitus** Fernald.— Occasional. Lee; Sandisfield (Walters); Sheffield. Two forms occur: one lax and soft-pubescent, the other stiff and harsh-pubescent.

A. Tradescanti L.— Low ground; occasional. Stockbridge; Great Barrington; Sheffield (Walters). Never in the field a very well-marked species; too near *A. paniculatus*.

A. umbellatus Mill.— (*Doellingeria umbellata* Ill. Fl. ed. 2.)

Low ground, borders of swamps and mountain streams, roadside thickets; common on the plateau and in Clarksburg, elsewhere in the valley occasional in swamps. Begins to be common at an altitude of about 1500 feet. Not noted on Greylock, rare on The Dome.

A. undulatus L.— Dry open woods and clearings; common.

A. vimineus Lam.— Thickets and roadsides in low ground; common in the valley, infrequent on the plateau.

var. **foliolosus** (Ait.) Gray.— Wet woods and low thickets; frequent in the valley.

BELLIS. Daisy.

B. PERENNIS L.— Occasionally established in lawns. · Dalton; Stockbridge.

BIDENS. Bur Marigold.

B. Beckii Torr. Water Marigold.— (*Megalodonta Beckii* Ill. Flora ed. 2.)

Ponds; frequent, especially in the valley.

B. cernua L. Stick-tight.— Wet places; common.

var. **minima** (Huds.) DC.— Peat bog, Sandisfield.

Tiny, spatulate or oblanceolate leaves and usually solitary campanulate heads.

B. comosa (Gray) Wiegand.— (*Vid.* Rhodora, **17**: 25, 1919.)

River bog, Sheffield (Churchill).

B. connata Muhl. Swamp Beggar-ticks.— Swamps and low ground; common.

B. frondosa L. COMMON BEGGAR-TICKS.— Waste places, roadsides and low ground; common.

B. vulgata Greene. BEGGAR-TICKS.—Along roadsides and in damp soil; frequent.

CENTAUREA. STAR THISTLE.

C. JACEA L.— Occasionally adventive. Williamstown (Churchill); Sandisfield (Walters).

C. MACULOSA Lam.— Well established in dry fields in Sheffield. Vacant lot, Pittsfield.

C. NIGRA L., var. RADIATA DC. KNAPWEED.— Waste ground, Pittsfield; dry fields, Sandisfield and Sheffield (Walters).

CHRYSANTHEMUM. OX-EYE DAISY.

C. LEUCANTHEMUM L., var. PINNATIFIDUM Lecoq. & Lamotte. DAISY; WHITE-WEED.— Fields, meadows and wood-roads; common.

CICHORIUM. CHICORY.

C. INTYBUS L. CHICORY.— Roadsides and waste places; frequent in the valley but nowhere common.

CIRSIUM. THISTLE.

C. ARVENSE (L.) Scop. CANADA THISTLE.— Old fields, pastures, roadsides and clearings; common.

forma ALBIFLORUM (Rand & Redfield), n. comb.— *Vid.* Flora of Mount Desert, p. 120. Frequent.

var. INTEGRIFOLIUM Wimm. & Grab.— Low field, Stockbridge.

C. discolor (Muhl.) Spreng. FIELD THISTLE.— Dry banks and low open ground; frequent in the valley.

C. Hillii (Canby) Fernald.— Edge of field, Egremont (Walters).

C. LANCEOLATUM (L.) Hill. COMMON OR BULL THISTLE.— Pastures and clearings; common in the valley.

C. muticum Michx. SWAMP THISTLE.— Swamps and wet woods; common.

C. pumilum (Nutt.) Spreng. PASTURE OR BULL THISTLE.— (*C. odoratum* Ill. Fl. ed. 2.)

Pastures and open hillsides; common.

COREOPSIS.

C. TINCTORIA Nutt.— Occasionally persistent about gardens or on dumps. Pittsfield; Stockbridge.

CREPIS. HAWK'S BEARD.

C. CAPILLARIS (L.) Wallr.— Established in a meadow, Stockbridge. Probably introduced with grass seed.

ERECHTITES. FIREWEED.

E. hieracifolia (L.) Raf., var. **praealta** (Raf.) Fernald.— (*E. hieracifolia* Man. ed. 7 in part; *vid.* Rhodora, **19**: 27, 1917.)

Recent clearings, particularly after fires, and shaded ledges; common.

Upper leaves attenuated to base or petioled. In the type the leaves scarcely decrease in size into the inflorescence.

ERIGERON. FLEABANE.

E. annuus (L.) Pers. DAISY FLEABANE.— Old fields and waste places; common.

E. canadensis L. HORSE-WEED.— (*Leptilon canadense* Ill. Fl. ed. 2.)

Waste places, cultivated ground, old fields and dry hillsides; common.

E. philadelphicus L.— Borders of swamps and moist woods; common.

E. pulchellus Michx. ROBIN'S PLANTAIN.— Borders of woods and grassy banks; common.

E. ramosus (Walt.) BSP. DAISY FLEABANE.— Fields and roadsides; common.

var. **discoideus** (Robbins) BSP.— With the type; frequent.

var. **septentrionalis** Fernald & Wiegand.— Fields; frequent.

Stem and leaves sparingly hispidulous or nearly glabrous instead of cinereous-strigose (*vid.* Rhodora, **15**: 60, 1913).

EUPATORIUM. THOROUGHWORT.

Key to Eupatorium purpureum, E. maculatum, and E. falcatum.

a. Florets 9 to 15 (rarely 8 to 20); inflorescence or its divisions flat-topped; stem speckled, if not obscured by too deep purple, not glaucous. *E. maculatum.*

a'. Florets 5 to 7 (rarely 3 to 8); inflorescence convex; stems rarely speckled, more or less glaucous.

Stems fistulose, purple, plainly glaucous; leaves in 4's to 6's, bluntly toothed, scabrous-puberulent beneath or glabrate; florets scarcely exserted; corolla 3.5 to 4.8 mm. long, very rarely longer . . *E. purpureum.*

Stems solid, green with purple nodes, faintly glaucous; leaves in 3's or 4's, very rarely in 2's or 5's, sharply toothed, villous-pubescent beneath, or glabrate; florets much exserted; corollas 5.5 to 7.5 mm. long; heads paler than in the other species . . . . . *E. falcatum.*

E. falcatum Michx.— (*E. purpureum* Man. ed. 7 in part; *vid.* Rhodora, **22**: 68, 1920.)

Dry woods, Stockbridge, New Marlboro.

E. maculatum L. Joe-Pye Weed.— (*E. purpureum*, var. *maculatum* Man. ed. 7; *vid.* Rhodora, **22**: 64, 1920.)

Wet meadows and borders of swamps; common.

A plant from swampy woods, Lenox, with the upper leaves 26 cm. long and about 4 cm. broad has been determined by Professor Wiegand as a shade form of this species.

E. perfoliatum L. Boneset; Thoroughwort.— Low ground; common.

A form with the leaves in 3's from Sheffield (Walters).

var. **truncatum** Gray.— Damp woods, Mt. Washington; Sheffield (Walters).

E. purpureum L. Joe-Pye Weed.— Rich open woods and roadside thickets; common in the valley.

E. sessilifolium L.— Dry open woods on limestone knoll, New Marlboro.

E. urticaefolium Reichard. White Snakeroot.— Rich woods; common. Altitude 2500 feet, Greylock.

GALINSOGA.

G. parviflora Cav.— Railroad, Cheshire (Churchill); cultivated ground, Lenox; garden weed, Sheffield. First noted in 1918.

G. aristulata Bicknell.— (*G. parviflora*, var. *hispida* Man. ed. 7; *vid.* Rhodora, **22**: 98, 1920.)

First noted in 1899 and now thoroughly established as a garden weed and in waste places in the valley. Introduced from South America.

GNAPHALIUM. Cudweed.

G. decurrens Ives. Everlasting.— Dry hillsides and dry open woods; frequent in the valley.

G. polycephalum Michx. Common Everlasting.— (*G. obtusifolium* Ill. Fl. ed. 2.)

Dry open hillsides; common.

G. uliginosum L. Low Cudweed.— Roadsides in low ground and old fields; common.

HELENIUM. Sneezeweed.

H. autumnale L. Sneezeweed.— Banks of streams; frequent in the valley.

H. nudiflorum Nutt.— Dry bushy pasture, Great Barrington.

HELIANTHUS. Sunflower.

H. annuus L. Common Sunflower.— In waste ground; occasional.

H. decapetalus L. Wild Sunflower.— Open woods, thickets and clearings; common in the valley.

H. divaricatus L. Wild Sunflower.— Rocky woods, clearings and dry open soil; frequent in the valleys and on the southern Taconics.

H. giganteus L.— A small clump at the edge of a swamp, Stockbridge. Perhaps introduced.

H. strumosus L. Wild Sunflower.— Dry roadside thickets, clearings and open woods; frequent in the valley.

H. tuberosus L. Jerusalem Artichoke.— Roadsides in low ground, waste ground; frequent.

HELIOPSIS. Ox-eye.

H. helianthoides (L.) Sweet.— Dry woods, Lenox.

H. scabra Dunal.— Roadside, Lenox; adventive beside trolley track, Stockbridge.

HIERACIUM. Hawkweed.

H. aurantiacum L. Orange Hawkweed; Devil's Paintbrush.— Fields; common, especially on the plateau, where the plant has become a pest in mowing-fields.

H. canadense Michx.— Borders of woods and rocky shores; common.

H. FLORENTINUM All. KING DEVIL.— Adventive, Egremont (Walters).

H. paniculatum L.— Dry open woods; common in the southern part of the valley.

var. **glandulosum** Hoffmann.— (*Vid.* Rhodora, **19**: 37, 1917.) Dry woods; occasional. Sandisfield; Stockbridge; Great Barrington. A variety based on the presence of stipitate glands on the branches of the inflorescence.

H. PILOSELLA L. MOUSE-EAR.— Established in lawn, Williamstown.

H. PRAEALTUM Goelnat, var. DECIPIENS Koch.— Sandy ground, Sheffield (Churchill).

H. PRATENSE Tausch. KING DEVIL.— Occasionally adventive in fields, but not yet well established anywhere. West Stockbridge; New Marlboro; Great Barrington (Walters); Sheffield. Frequent in Sheffield (Churchill, 1919).

H. scabrum Michx.— Dry woods; common.

H. venosum L. RATTLESNAKE-WEED.— Dry woods; common in the southern part of the valley.

HYPOCHAERIS. CAT'S-EAR.

H. RADICATA L.— Adventive in newly seeded grassland, Sandisfield (Walters).

INULA. ELECAMPANE.

I. HELENIUM L. ELECAMPANE.— Roadsides and pastures in low ground, borders of swamps; frequent.

KRIGIA. DWARF DANDELION.

K. virginica (L.) Willd.— Dry open soil, in sterile fields or on outcrops; frequent in the southern part of the valley.

LACTUCA. LETTUCE.

Key to Lactuca canadensis and varieties.

Vid. Rhodora, **22**: 9, 1920.

a. Leaves with linear-falcate, usually entire lobes; upper unlobed leaves (if any) linear or linear-lanceolate.

b. Leaf-base sagittate or auriculate.....var. *typica.*

b'. Leaf-base tapering, not sagittate.....f. *angustipes*.

a'. Leaves with broadly falcate, or obovate and obliquely truncate, entire or toothed lobes; upper leaves similar or unlobed and lanceolate or ovate-lanceolate, rarely oblanceolate or obovate, entire or rarely toothed.

c. Leaf-base sagittate, clasping.....var. *latifolia*.

c'. Leaf-base tapering, not sagittate.....f. *exauriculata*.

a''. Leaves all unlobed, lanceolate, oblong, oblanceolate or obovate, entire or denticulate, the lowest sometimes shallowly lobed.

d. Cauline leaves lanceolate to ovate lanceolate, entire or rarely toothed.

e. Leaf-base sagittate, clasping.....var. *integrifolia*.

e'. Leaf-base not sagittate.....f. *angustata*.

d'. Cauline leaves oblanceolate or obovate, usually toothed.

f. Leaf-base sagittately clasping.....var. *obovata*.

f'. Leaf-base tapering, not sagittate.....f. *stenopoda*.

L. canadensis L., var. **typica** Wiegand. WILD LETTUCE; HORSEWEED.— Roadsides, thickets and low ground; frequent.

var. **typica** Wiegand, forma **angustipes** Wiegand.— Roadsides, dry woods and low ground; frequent. Often hirsute on the lower part of the stem.

var. **latifolia** O. Kuntze.— Roadsides, thickets and low ground; common.

var. **latifolia** O. Kuntze, f. **exauriculata** Wiegand.— With the type; occasional.

var. **integrifolia** (Bigel.) Gray.— Occasional, Mt. Washington.

var. **integrifolia** (Bigel.) Gray, f. **angustata** Wiegand.— Occasional; dry thicket, Stockbridge.

var. **obovata** Wiegand.— (*L. integrifolia* Man. ed. 7.)

Cheshire (E. J. Winslow).

var. **obovata** Wiegand, f. **stenopoda** Wiegand.— A specimen transitional to var. *integrifolia*, f. *angustata* from a dry roadside thicket, New Marlboro.

The above forms have been determined by Professor Wiegand.

L. SCARIOLA L. PRICKLY LETTUCE.— Waste ground; rare. Williamstown (Churchill); Pittsfield.

var. INTEGRATA Gren. & Godr.— Waste ground; occasional. Florida; Cheshire; Great Barrington.

L. spicata (Lam.) Hitchc. WILD BLUE LETTUCE.— Shaded banks; common.

LAPSANA. Nipple-wort.

L. COMMUNIS L.— Roadside, Lenox. A few plants only, noted in 1920; a single plant in cultivated ground, Lee (1920), the plant from Lee strigose-pubescent.

LEONTODON. Hawkbit.

L. AUTUMNALIS L. Fall Dandelion.— Grassland; occasional. Williamstown; Lenox; Hinsdale; Washington.

Locally common in Williamstown, and the eastern part of Hinsdale.

LEPACHYS.

(*Ratibida* Ill. Fl. ed. 2.)

L. PINNATA (Vent.) T. & G. Cone-flower.— Long established for many rods along a dry roadside bank in Lenox.

MATRICARIA. Wild Chamomile.

M. CHAMOMILLA L.— Adventive, Cheshire (Winslow).

M. SUAVEOLENS (Pursh) Buchenau. Pineapple-weed.—(*M. matricarioides* Ill. Fl. ed. 2.)

First noted in 1895 when rare. Now frequent in waste ground and along roadsides. Summit of Greylock, 3500 feet.

ONOPORDUM. Cotton Thistle.

O. ACANTHIUM L. Cotton Thistle.— Hillside pasture, Lanesboro (Winslow). Noted by Dewey in Pittsfield in 1829.

PETASITES. Sweet Coltsfoot.

P. palmatus (Ait.) Gray.— Wooded bord ers of cold swamps; rare. Williamstown (Churchill); Pittsfield.

PRENANTHES. Rattlesnake-root.

(*Nabalus* Ill. Fl. ed. 2.)

P. alba L. White Lettuce; Rattlesnake-root.— Rich woods; common in the valley, infrequent on the plateau.

P. altissima L.— Rich woods; frequent.

var. **hispidula** Fernald.— Rich woods; occasional. Lenox; Otis; Stockbridge; Sheffield (Walters).

P. serpentaria Pursh. LION'S-FOOT; GALL-OF-THE-EARTH.— Dry thicket, Sheffield.

P. trifoliata (Cass.) Fernald. GALL-OF-THE-EARTH.— Woods; common. Summit of Greylock, 3400 feet.

RUDBECKIA. CONE-FLOWER.

R. HIRTA L. BLACK-EYED SUSAN; YELLOW DAISY.— Fields; common. Not mentioned by Dewey. Introduced from the West after 1850.

The following forms have been noted: —

a. Rays greenish or streaked with green.

b. Rays purple at base.

c. Heads with green chaff replacing the flowers.

R. laciniata L. TALL CONE-FLOWER.— Borders of streams, moist banks and upland meadows; frequent. The double form, cultivated under the name "Golden Glow" occasional as an escape.

SENECIO. GROUNDSEL; RAGWORT.

S. aureus L. GOLDEN RAGWORT.— Low woods, wet meadows and swamps; common.

S. obovatus Muhl.— Rocky woods, moist banks and ledges; common in calcareous soil, and frequent elsewhere.

S. VULGARIS L.— Waste ground, Williamstown.

SERICOCARPUS. WHITE-TOPPED ASTER.

S. asteroides (L.) BSP.— Dry open woods; frequent in the southern part of the valley.

SOLIDAGO. GOLDEN-ROD.

Key to Solidago.

a. Heads clustered along the axils of the leaves or in spikes or panicles, not in flat-topped corymbs.

b. Bracts of rigid involucre with abruptly spreading herbaceous tips; heads in clusters or compactly clustered racemes, disposed in a dense somewhat leafy and interrupted wand-like compound spike; local. *S. squarrosa.*

b'. Bracts of the involucre without green tips and appressed.

c. Heads clustered along the axils of the leaves, or in wand-like, or pyramidal compact panicles, not in spreading open panicles.

d. Heads mostly large, the involucres 6 (rarely 5) to 12 mm. high, forming an erect terminal thyrse; species confined in Berkshire County to Mt. Greylock and The Dome.

Heads very large, 8 to 12 mm. high, leaves thin; upper slopes of Mt. Greylock ..... *S. macrophylla.*

Heads medium, 5 to 6 mm. high; leaves thick and firm; dry ledges on The Dome ..... *S. Randii.*

d'. Heads small, involucres 2 to 5 (rarely 6) mm. high; species of general distribution.

e. Heads clustered in the axils, or in short spikes from the upper axils, but not forming a dense, wand-like panicle, or a compact pyramidal panicle.

f. Leaves and stems smooth or nearly so, not hoary or grayish.

Stem terete (round), leaves all sessile ..... *S. caesia.*

Stem angled, the lower leaves abruptly narrowed to margined petioles ..... *S. latifolia.*

f.' Leaves and stems hoary or grayish.

Rays of the flowers cream-color or nearly white .... *S. bicolor.*

Rays of the flowers orange-yellow ..... *S. hispida.*

e'. Heads forming a dense wand-like or a compact pyramidal panicle.

g. Stem minutely hoary; plant of dry or sandy soil on rocky hill-tops and along the Deerfield R. ..... *S. puberula.*

g'. Stem glabrous up to the inflorescence; plants of bogs and wet meadows, or if in dry thickets only in the southern part of the country. (N. B.— *S. neglecta*, before its racemes spread, might be looked for here. It may be distinguished in this stage from *S. uliginosa* by its broader lower leaves.)

Plant of bogs and wet meadows ..... *S. uliginosa.*

Plant of dry open woods and thickets, so far noted only in Sheffield ..... *S. speciosa.*

c'. Heads in spreading open panicles, the form of inflorescence commonly associated with golden-rods.

h. Leaves commonly veiny, not 3-ribbed (but sometimes obscurely triple-nerved). (N. B.— *S. ulmifolia* might be looked for here. It may be distinguished by its thin leaves, usually beset with soft hairs beneath.)

i. Basal leaves long-petioled, conspicuously larger than the 10 to 30 (to 40) remote or sub-remote cauline ones.

j. Stems strongly angled; leaves very rough on the upper surface; plant of bogs and swamps. *S. patula.*

j'. Stems rounded or nearly so; leaves smooth or smoothish.

k. Leaves mostly serrate, the lower and middle cauline (as well as the basal) rather abruptly narrowed to the base; racemes pubescent ..... *S. arguta*

k'. The uppermost leaves chiefly entire, all tapering gradually to the base; racemes smooth.
Panicle usually as broad as high; rays 8 to 12. *S. juncea.*
Panicle usually longer than broad; rays 2 to 8. *S. neglecta.*

i'. Basal leaves similar to the 30 to 100 (to 200) ordinarily almost uniform or gradually reduced cauline ones.

l. Leaves all entire, with prominent mid-rib but obscure veins; leaves when crushed yield an odor as of anise. . . . . *S. odora.*

l'. Leaves all or nearly all toothed, the veins prominent.
Stems glabrous; plant of dry woods and copses in the southern part of the valley. . *S. ulmifolia.*
Stems pubescent; common plant of damp thickets and borders of woods and fields. . . . . *S. rugosa.*

h'. Leaves more or less plainly 3-ribbed, 2 of the lower veins becoming prominent and elongated, parallel with the midrib.

m. The lower leaves elongated and many times exceeding the reduced upper ones; plant very common in dry open soil. . *S. nemoralis.*

m'. Leaves thinner, essentially uniform from base to summit of the stem.

n. Involucre 2 to 2.8 mm. long, making *tiny* heads, crowded in dense broad panicles. *S. canadensis* and var. *Hargeri.*

n'. Involucre 3.2 to 5 mm. long.
Stem closely and minutely pubescent throughout; leaves short-hairy below. . *S. altissima.*
Stem glabrous up to the inflorescence, leaves smooth below or slightly pubescent on the nerves. . . . . *S. serotina.*

a'. Heads in flat-topped corymbs.
Heads large, leaves thick and broad; plant noted in only one locality in Sheffield. . . . . *S. rigida.*
Heads small, leaves long and narrow, plant common in moist soil, roadsides, etc. . . . . *S. graminifolia*, var. *Nuttallii.*

S. altissima L.— Moist roadside thickets and banks; frequent in the valley.

S. arguta Ait.— Dry woods, clearings and roadside thickets; common in the valley.

S. bicolor L.— Dry ground; common.

S. caesia L.— Dry woods and clearings; common.

var. **axillaris** (Pursh) Gray.— Rich woods; frequent in the valley.

var. **paniculata** Gray.— Rich woods; occasional. Pittsfield; Sheffield.

Neither of the above varieties is very well marked in the field.

S. canadensis L.— Low ground; occasional. Lenox; Stockbridge; Sheffield.

Generally replaced by the var. *Hargeri*.

var. **Hargeri** Fernald.— Low ground; frequent in the valley and along the Deerfield River, Florida.

Stems villous; leaves closely cinereous-puberulent beneath, thus resembling *S. altissimus* L., from which it differs in having the tiny heads of *S. canadensis*. The villous stems suggest *S. rugosa* from which the triple-nerved leaves distinguish it (*vid.* Rhodora, **17**: 11, 1915).

S. graminifolia (L.) Salisb., var. **Nuttallii** (Greene) Fernald.— (*Euthamia graminifolia* Ill. Fl. ed. 2 in part.)

Low open ground, moist roadsides; common. Summit of Greylock, 3500 feet.

S. hispida Muhl.— Open rocky woods and dry soil; frequent in the southern part of the valley.

S. juncea Ait. — Dry thickets, roadsides and open fields; common.

S. latifolia L.— (*S. flexicaulis* Ill. Fl. ed. 2.)

Shaded banks, rocky woods and moist thickets; common in the valleys. Occasionally in swamps, Sheffield. Altitude 2500 feet, Greylock.

S. macrophylla Pursh.— Common on the upper slopes of Greylock, above 2500 feet. The only known station in Massachusetts.

S. neglecta T. & G.— Swampy meadows, bogs a nd ill-drained hillsides; frequent.

S. nemoralis Ait.— Dry fields; common.

S. suaveolens Schoepf.— (*S. odora* Man. ed. 7; *vid.* Rhodora, **21**: 70, 1919.)

Dry thickets; occasional in Great Barrington and Sheffield.

S. patula Muhl.— Swamps, in calcareous soil; common.

S. puberula Nutt.— Rocky hill-tops, in disintegrated quartzite and schist; Monument Mt., Great Barrington; Tom Ball, Alford; The Dome, Mt. Washington; clearing in dry woods, Sheffield. Also

frequent on dry banks and sandy shores along the Deerfield River, Florida.

S. Randii (Porter) Britton.— Ledges on the borders of Guilder Pond (altitude 2000 feet) and Plantin Pond, Mt. Washington. The only known stations in Massachusetts.

S. rigida L.— Dry limestone hillside, Sheffield. A large colony, scattered over several acres. The only known station in the County and the second in the State.

S. rugosa Mill.— Borders of fields and thickets; common. Summit of Greylock, 3500 feet, with the variety.

var. **villosa** (Pursh) Fernald.— Summit of Greylock, some typical material but often running into the type.

S. serotina Ait.— Banks of streams and low ground; common in the valley.

var. **gigantea** (Ait.) Gray.— Low ground; frequent.

S. speciosa Nutt.— Frequent in Sheffield in meadows and on open hillsides (Walters).

S. squarrosa Muhl.— Rocky banks of streams and dry wooded banks; occasional. Frequent along the Deerfield River, Florida; along a wood road, Great Barrington; clearing in dry woods, Sheffield; near Bash Bish Falls, Mt. Washington.

S. uliginosa Nutt.— Bogs; frequent in the valley.

S. ulmifolia Muhl.— Occasional on dry hills, Sheffield.

SONCHUS. Sow Thistle.

S. ARVENSIS L.— Garden weed, Lenox.

var. GLABRESCENS Wimmer & Grabowski. — (*S. arvensis* Man. ed. 7 in part.)

Adventive along railroad track, Lenox.

A variety in which the involucres and pedicels are entirely glabrous (*vid.* Rhodora, **12**: 145, 1910).

S. ASPER (L.) Hill.— Waste places; frequent.

S. OLERACEUS L. Common Sow Thistle.— Waste places; frequent, but less so than *S. asper*.

TANACETUM. Tansy.

T. VULGARE L. Common Tansy.— Roadsides and about farm buildings; common.

var. CRISPUM DC.— Occasional with the type. Williamstown; Alford; New Marlboro.

TARAXACUM. DANDELION.

(*Leontodon* Ill. Fl. ed. 2.)

T. LAEVIGATUM (Willd.) DC. RED-SEEDED DANDELION.— (*T. erythrospermum* Man. ed. 7; *L. erythrospermum* Ill. Fl. ed. 2.)

Fields and hillsides in thin soil; frequent.

T. OFFICINALE Weber. COMMON DANDELION.— (*L. Taraxacum.*)

Fields and roadsides; common.

var. PALUSTRE (Sm.) Blytt.— Swamps; occasional. Stockbridge; New Marlboro (Walters); Sheffield (Walters).

TRAGOPOGON. GOAT'S BEARD.

T. PRATENSIS L.— Fields and roadsides; frequent.

TUSSILAGO. COLTSFOOT.

T. FARFARA L. COLTSFOOT.— Brooks, ditches and wet slopes; common.

XANTHIUM. COCKLEBUR.

X. echinatum Murr.— Clear dry sand, Sheffield (Walters).

X. pungens Wallr.— (*X. canadense* Man. ed. 7; *X. pennsylvanicum* Ill. Fl. ed. 2.)

Alluvial ground; frequent in the valley.

X. SPINOSUM L.— Dump at woolen mill, Pittsfield.

APPENDIX.

Fugitive Species.

The following species though found growing spontaneously are not to be regarded as a constituent part of the flora of the County. They occur either on dump heaps where ripe fruit or roots have been thrown, or they spring up for a season in grass or grain-fields or along railroad tracks. Some are shrubs or herbaceous plants grown for ornament and occasionally escaping but not spreading. One group occurs only where screenings from wool are thrown out near a mill.

These species have been entered in the Flora under the families to which they belong, but have not been included in the table of statistics.

Panicum miliaceum L.
Echinochloa frumentacea (Roxb.) Link
Setaria italica L. (Beauv.)
Secale cereale L.
Triticum sativum L.
Hordeum vulgare L.
Tradescantia virginiana L.
Narcissus poeticus L.
Serapias Helleborine L.
Ulmus campestris L.
Polygonum orientale L.
Fagopyrum tataricum (L.) Gaertn.
Kochia scoparia (L.) Schrad.
Chenopodium Botrys L.
Chenopodium capitatum (L.) Asch.
Chenopodium farinosum (Wats.) Standl.
Chenopodium ficifolium Sm.
Atriplex patula L., var. hastata (L.) Gray.
Amaranthus deflexus L.
Amaranthus Palmeri Wats
Amaranthus Powellii Wats.
Amaranthus spinosus L.
Amaranthus undulatus R. Br.
Agrostemma Githago L.
Lychnis chalcedonica L.
Saponaria Vaccaria L.
Silene Armeria L.
Silene dichotoma Ehrh.
Aquilegia vulgaris L.
Papaver Rhoeas L.
Papaver somniferum L.
Brassica japonica Siebold.
Brassica Napus L.
Brassica oleracea L.
Brassica Rapa L.
Camelina microcarpa Andrz.
Hesperis matronalis L.
Raphanus sativus L.
Thlaspi arvense L.
Reseda odorata L.
Philadelphus inodorus L.
Prunus Persicaria (L.) Stokes.
× Pyrus prunifolia Willd
Rosa setigera Michx.
Rosa spinosissima L.
Amorpha fruticosa L.
Gleditsia triacanthos L.
Medicago arabica Huds.
Medicago hispida Gaertn.
Medicago minima L.
Geranium molle L.
Geranium pusillum Burm. f.
Erodium cicutarium (L.) L'Her.
Ptelea trifoliata L.
Evonymus atropurpureus Jacq.
Aesculus Hippocastanum L.
Althaea rosea Cav.
Malva Alcea L.
Daphne Mezereum L.
Epilobium hirsutum L.
Aegopodium Podagraria L.

Levisticum officinale (L.) Koch.
Lysimachia vulgaris L.
Ipomoea purpurea (L.) Roth.
Phlox maculata L.
Phlox subulata L.
Marrubium vulgare L.
Monarda fistulosa L., var. rubra Gray.
Physostegia virginiana (L.) Benth.
Salvia sylvestris L.
Datura Tatula L.
Lycopersicum esculentum Mill.
Nicotiana affinis L. & O.
Petunia nyctaginiflora Juss.
Nicandra physalodes (L.) Pers.
Chelone Lyoni Pursh.
Linaria minor (L.) Desf.
Plantago media L.
Lonicera sempervirens L.
Viburnum Lantana L.
Scabiosa ochroleuca L.
Cucumis Melo L.
Cucumis sativus L.
Cucurbita maxima Duchesne.
Cucurbita moschata Duchesne.
Valeriana officinalis L.
Artemisia ludoviciana Nutt.
Bellis perennis L.
Coreopsis tinctoria Nutt.
Crepis capillaris (L.) Wallr.
Helianthus annuus L.
Heliopsis helianthoides (L.) Sweet.
Hypochaeris radicata L.
Lapsana communis L.
Matricaria Chamomilla L.
Xanthium spinosum L.

Excluded Species.

GROUP I.

The following species were reported from Berkshire County by Dewey in the list published in 1829 (see Introduction, page 178), but they have not since been found in the County. In many cases, Dewey has included species whose range excludes the probability of their occurrence in the County. Occasionally the species listed by him probably represents a species known to occur in the County and not given by him. In a few cases, marked below by an asterisk, it is probable that Dewey actually found the species listed and that it has not been collected since.

The names are those given by Dewey. If they differ from those of the seventh edition of Gray's Manual, the latter are given after the original names. Where a locality is given, it is quoted from Dewey's list.

* Lygodium palmatum "Becket."
Picea alba (P. canadensis (Mill.) P. rubra not listed).
Abies Fraseri "Saddle Mt."
Potamogeton perfoliatum (P. perfoliatus L.) P. bupleuroides Fernald?
Agrostis sericea (Muhlenbergia capillaris (Lam.) Trin.)
Aira truncata (Sphenopholis obtusata (Michx.) Scribn.)
Poa quinquefida (Tridens flavus (L). Hitchc.)
Festuca fluitans (Glyceria fluitans (L.) R. Br.)
Festuca tenella (F. octoflora Walt.)
Elymus glaucifolius (E. canadensis L., var. glaucifolius (Muhl.) Gray)

Cyperus flavescens	
Cyperus poaeformis	
Eleocharis capitata	
Carex retroflexa	
Carex muricata	
Carex cespitosa (C. Goodenowii J. Gay)	
Carex xanthophysa (C. Michauxiana Boeckl.)	
Carex bullata	Afterwards determined by Dewey himself as *C. Tuckermani* Dewey.
Juncus setaceus	
Juncus polycephalus	
Convallaria umbellata (Clintonia umbellulata (Michx.) Morong.)	Probably *C. borealis* (Art.) Raf. which is omitted from Dewey's list.

Cymbidium odonthorhizum (Corallorhiza odontorhiza Nutt.)

There is a strong probability on other grounds than Dewey's statement that this species has been collected in the County. An old negro, janitor of the G.A.R. Post at Pittsfield, told the writer that he had collected the root, known to him as "Crawley Root" for a drug company in about 1870 in chestnut woods, Pittsfield.

* Cymbidium hyemale (Aplectrum hyemale (Muhl.) Torr.)	
Salix tristis	(no S. humilis listed.)
Myrica cerifera	"Sheffield alluvium."
Betula rubra (B. nigra L.)	
* Cannabis sativa	
* Urtica dioica	
Draba arabisans	
Sysimbrium amphibium (Radicula aquatica (Eat.) Robinson)	"Great Barrington."
* Arabis thaliana (Sisymbrium thalianum (L.) J. Gay)	
Ribes triflorum (Ribes rotundifolium Michx.)	
Rubus trivialis (R. villosus Ait.?)	
Desmodium viridiflorum	
Desmodium ciliare (D. obtusum (Muhl.) DC.)	
Vicia sativa	"now common in all parts of Berkshire."
* Oxalis violacea	"Saddle Mt."
Polygala rubella (P. polygama Walt.)	
Callitriche intermedia (C. heterophylla Pursh)	
Rhus aromaticum (R. canadensis Marsh.)	Perhaps from the station in Pownal, Vt.
Malva crispa	
Malva sylvestris	
Cistus corymbosus (Helianthemum corymbosum Michx.)	

Lechea minor
Viola villosa (V. hirsutula Brainerd)
Viola striata
Azalea viscosa (Rhododendron viscosum (L.) Torr.)
* Rhodora canadensis (Rhododendron canadense (L.) B.S.P.) "Pittsfield."
Vaccinium frondosum (Gaylussacia frondosa (L.) T. & G.)
Vaccinium virgatum (V. vacillans not listed)
Gentiana saponaria (G. Andrewsii and G. clausa not listed)
Myosotis arvensis
Monarda clinopodia
Pycnanthemum verticillatum
Pycnanthemum incanum
Veronica Beccabunga (V. americana not listed)
Viburnum nudum
Aster salicifolius
Aster phlogifolius (A. patens Ait., var. phlogifolius Nees)
Cnicus altissimus (Cirsium altissimum (L.) Spreng.)
Conyza marilandica (Pluchea camphorata (L.) D.C.)
Helianthus tracheliifolius (H. divaricatus not listed)
Prenanthes virgata
Hieracium marianum

In addition to the above, Dewey, in Report on Herbaceous Plants of Massachusetts, states that *Cuphea petiolata* (L.) Koehne, has been found in Pittsfield.

GROUP II.

The following species have been reported from Berkshire County by correspondents of the writer, but either no specimens exist or the writer has been unable to see them.

Populus candicans Ait.	Adams (Burnham).
Polygonum dumetorum L.	Sheffield (Walters).
Alliaria officinalis Andrz.	Pittsfield (Lincoln).
Cuscuta Coryli Engelm.	Mt. Washington (Stetson).
Pycnanthemum incanum (L.) Michx.	Mt. Washington (Burnham).
Solidago erecta Pursh.	Mt. Washington (Stetson).

Doubtful Species.

Panicum lucidum Ashe. A specimen from rocky woods of Great Barrington, which Mrs. Chase thinks may be *P. lucidum*, but a vernal form which is not entirely characteristic.

P. meridionale Ashe.— A doubtful specimen from edge of low meadow in poor soil, Sheffield.

Asclepias purpurascens L.— Material collected in fruit in sandy ground near the Housatonic River in Stockbridge in 1920, probably belongs to this species. There has been no opportunity to verify by material in flower.

Tabular List of Families.

Families	*Genera*		*Species*		*Varieties*		*Forms*	
	Native	Introd.	Native	Introd.	Native	Introd.	Native	Introd.
PTERIDOPHYTA								
Polypodiaceae	15		33		5		7	
Osmundaceae	1		3		2		2	
Ophioglossaceae	2		7		2		2	
Marsileaceae		1		1				
Equisetaceae	1		6		1		1	
Lycopodiaceae	1		8		3			
Selaginellaceae	1		2					
Isoëtaceae	1		1					
SPERMATOPHYTA								
Gymnospermae								
Taxaceae	1		1					
Pinaceae	6	1	10	2	1		1	
Angiospermae								
Monocotyledoneae								
Typhaceae	1		2					
Sparganiaceae	1		6		2			
Najadaceae	2		24		2		4	
Juncaginaceae	1		1					
Alismaceae	2		5				4	
Hydrocharitaceae	2		2					
Gramineae	34	10	94	34	6	2	1	1
Cyperaceae	10		142	1	56		4	
Araceae	6		8				3	
Lemnaceae	2		3					
Eriocaulaceae	1		1					
Xyridaceae	1		1					
Pontederiaceae	2		2		1			
Juncaceae	2		18		6			
Liliaceae	15	2	28	3	1			
Amaryllidaceae	1		1					
Iridaceae	2		5					
Orchidaceae	11		36		2		2	
Dicotyledoneae								
Salicaceae	2		16	6	8	1		
Myricaceae	1		2		1			
Juglandaceae	2		4					
Betulaceae	5		12		1			
Fagaceae	3		12		1		1	
Urticaceae	8	1	10	2	1			
Santalaceae	1		1					
Loranthaceae	1		1					

Families	*Genera*		*Species*		*Varieties*		*Forms*	
	Native	Introd.	Native	Introd.	Native	Introd.	Native	Introd.
Aristolochiaceae	1		1		1			
Polygonaceae	2	1	17	9	3		2	
Chenopodiaceae	1	1	2	3		1		
Amaranthaceae		1		3				
Phytolaccaceae	1		1					
Nyctaginaceae		1		1				
Illecebraceae	1	1	1	1				
Aizoaceae		1		1				
Caryophyllaceae	5	6	9	17	3			
Portulacaceae	1	1	2	1				
Ceratophyllaceae	1		1					
Nymphaeaceae	3	5						
Ranunculaceae	11		29	3	2	1	8	
Magnoliaceae	1		1					
Menispermaceae	1		1					
Berberidaceae	2	1	2	2				
Lauraceae	2		2					
Papaveraceae	1	1	1	1				
Fumariaceae	3	1	4	1				
Cruciferae	7	5	6	14	3	2		
Resedaceae		1		1				
Sarraceniaceae	1		1					
Droseraceae	1		2					
Crassulaceae	2		2	2				
Saxifragaceae	6		12	2			1	
Hamamelidaceae	1		1					
Platanaceae	1		1					
Rosaceae	14	2	74	14	8	2	3	1
Leguminosae	9	5	18	15				1
Linaceae	1		2	1				
Oxalidaceae	1		4	2				
Geraniaceae	1		3					
Rutaceae	1		1					
Polygalaceae	1		4		1			
Euphorbiaceae	2		5	1				
Callitrichaceae	1		1					
Anacardiaceae	1		5		1			
Aquifoliaceae	2		3		2			
Celastraceae	1		1					
Staphyleaceae	1		1					
Aceraceae	1		6		2			
Balsaminaceae	1		2				1	
Rhamnaceae	2		2	1				
Vitaceae	2		6		1			
Tiliaceae	1		1					
Malvaceae		3		4				

Families	*Genera*		*Species*		*Varieties*		*Forms*	
	Native	Introd.	Native	Introd.	Native	Introd.	Native	Introd.
Hypericaceae	1		9	1				
Elatinaceae	1		1					
Cistaceae	2		5					
Violaceae	1		22	2	2		1	
Thymelaeaceae	1		1					
Lythraceae	2		2	1				
Onagraceae	4	1	13	2	1		1	
Haloragidaceae	2		3					
Araliaceae	2		5					
Umbelliferae	10	4	15	4				
Cornaceae	2		8					
Ericaceae	17		34		7		1	
Primulaceae	3		6	1				
Oleaceae	1	2	3	2	2		1	
Gentianaceae	4		7				1	
Apocynaceae	1	1	3	1				
Asclepiadaceae	1		6		2			
Convolvulaceae	2		4	1				
Polemoniaceae		1		1				
Hydrophyllaceae	1		2					
Boraginaceae	3	3	3	8				
Verbenaceae	1		3	1				
Labiatae	15	7	21	16	4	1	2	
Solanaceae	2	1	2	4	1			
Scrophulariaceae	12	1	20	8	1	1	1	
Lentibulariaceae	1		6					
Orobanchaceae	3		3					
Phrymaceae	1		1					
Plantaginaceae	1		2	2				
Rubiaceae	4		16	3				
Caprifoliaceae	7		17	3	2	1		
Dipsacaceae		2		2				
Cucurbitaceae	2		2					
Campanulaceae	2		4	1		1	1	
Lobeliaceae	1		6				1	
Compositae	25	18	110	42	40	5	1	1

Summary by Divisions and Classes.

	Genera		*Species*		*Varieties*		*Forms*	
	Native	Introd.	Native	Introd.	Native	Introd.	Native	Introd.
Pteridophyta	22	1	50	1	13		11	
Spermatophyta	363	88	1073	252	179	17	54	5
Gymnospermae	7	1	11	2	1		1	
Angiospermae	356	87	1062	250	176	17	53	5
Monocotyledoneae	93	12	376	38	78	2	18	1
Dicotyledoneae	263	75	686	213	102	15	35	4

Summary by Minor Groups.

Families		118
Genera		
native	385	
introduced	89	
Total		474
Species		
native	1123	
introduced	254	
Total		1377
Varieties		
native	192	
introduced	17	
Total		209
Forms		
native	65	
introduced	5	
Total		70

Whole number of plants, (species, varieties and forms) not including 96 listed as fugitives, 1,656.

Observations on Soil Relations.

Observations made during one season with the field set devised by Mr. E. T. Wherry for testing the alkalinity and acidity of the soil are given below.

Plants Growing in Leaf Mould	*Reaction*
Caulophyllum thalictroides in mucky pocket	10 + alk.
" " from slopes of Greylock, alt. 2600 ft.	3 + ac.
Athyrium angustifolium	10 + alk.
" "	3 + alk.
Dentaria laciniata	7 + alk.
Thelypteris Goldiana	3 + alk.
Viola canadensis *Hepatica acutiloba* *Viola renifolia*, var. *Brainerdii* *Mitchella repens*	neutral
Cypripedium pubescens (alt. 1700 ft.)	3 + acid

Plants Growing in Low Meadows and the Edges of Bogs	
Juncus Dudleyi	10 + alk.
Viola affinis	10 + alk.
Selaginella apoda (*S. apus* Man. ed. 7)	7 + alk.
" "	neutral
Solidago patula (four localities)	neutral
Lobelia Kalmii	neutral
Cypripedium hirsutum	neutral
Parnassia caroliniana (two localities)	10 + alk.
" " " "	3 + alk.
Sarracenia purpurea	3 + alk.
" "	3 + ac.
Menyanthes trifoliata	3 + alk.
Vaccinium macrocarpon	3 + alk.
Vaccinium pennsylvanicum (on mossy log in calcareous marsh)	3 + acid
Juncus marginatus	neutral
Carex aurea	3 + alk.
Ledum groenlandicum	7 + acid
Potentilla fruticosa	10 + acid
Drosera rotundifolia	10 + acid
" "	3 + acid
Mitella nuda	neutral

Plants of Dry Woods	*Reaction*
Viola palmata	3 + alk.
" "	3 + acid
Panicum dichotomum	neutral
Panicum latifolium	neutral
Cypripedium acaule in subsoil	3 + acid
Pogonia verticillata in oak-leaf mould	10 + acid
Gerardia quercifolia	3 acid
Lysimachia quadrifolia under pines	7 acid

Plants of Exposed Rocks	
Woodsia ilvensis on schist	7 acid
Amelanchier sanguinea " "	3 acid
Camptosorus rhizophyllus on limestone	10 + alk.
Selaginella rupestris " "	" " "
Arenaria stricta " "	" " "
Liparis Loeselii	" " "

Plants of Open Fields	
Thymus Serpyllum	3 + alk.
" "	neutral
" "	3 + acid
Pycnanthemum flexuosum	3 + alk.

Plants of Ill-drained Woods		
Solidago macrophylla	(alt. 2700 ft.)	100 + acid
Trillium erectum	(alt. 2500 ft.)	100 + acid
Epigaea repens		3 + acid
Potentilla tridentata	(alt. 2300 ft.)	3 + acid

Plants of Sandy Fields	
Lechea intermedia	3 + acid
Carex festucacea, var. *minor*	neutral

List of New Forms and Combinations.

INDEX.

Numbers in heavy-face type refer to the annotated list.
Synonyms are in italics.

No. 6.—NEW ENGLAND SAWFLIES OF THE GENUS TENTHREDELLA ROHWER.[1]

BY MARCUS T. SMULYAN, PH. D.

Introduction.

The studies herein contained are based principally upon the collections of the American Entomological Society, the Boston Society of Natural History, Doctor A. D. MacGillivray, Urbana, Illinois; Doctor G. C. Crampton, Amherst, Massachusetts; the United States National Museum; Peabody Museum, Yale University; the Museum of Comparative Zoölogy, Harvard University; Cornell University; Mr. A. P. Morse, Wellesley, Massachusetts; the Peabody Museum, Salem, Massachusetts; and the Maine, New Hampshire, Connecticut and Massachusetts Agricultural Experiment Stations. Practically all of the still-existing types in North America of the species concerned here, and of many others, have been examined, and in a number of cases where the types are lost, metatypes, or at least authentic specimens, were seen. The types of *nigricollis* and *leucostoma* (W. F. Kirby) I have not examined, as both are in the British Museum, but Mr. S. A. Rohwer, of the United States National Museum, who has seen them, was kind enough to advise me in regard to them.

The writer wishes to express his indebtedness and thanks to the persons and institutions above mentioned, for the loan of material for which Professor Fernald was kind enough to assume responsibility, or for the privilege of examining their collections. Especially do I wish to thank Doctor A. D. MacGillivray for the courtesy and favors shown me during my stay in Urbana, Illinois, and Mr. E. T. Cresson of Swarthmore, Pennsylvania, for items of information and for his interest in the work; Doctor Henry Skinner and Mr. E. T. Cresson, Jr., of the American Entomological

[1] This paper forms a part of a thesis for the degree of Doctor of Philosophy at the Massachusetts Agricultural College, Amherst, Massachusetts. The work was done under the direction of Professor H. T. Fernald and Doctor G. C. Crampton of the Department of Entomology, and my sincere thanks are due both these gentlemen for their aid and guidance.

Society, Mr. C. W. Johnson of the Boston Society of Natural History, Mr. Samuel Henshaw of the Museum of Comparative Zoölogy, Harvard University, Mr. C. S. Ball, assistant in the Peabody Museum, Yale University, for facilitating my work at their respective museums; Abbé V. A. Huard, Curator of the Museum of Public Instruction, Quebec, Canada, for information in regard to the Provancher types; and last, but certainly not least, Mr. S. A. Rohwer, of the United States National Museum, for his readiness to coöperate, by furnishing information, or otherwise, in making this paper more nearly accurate and complete.

It was the intention of the writer at first to study the entire genus, but pressure of other work and lack of material soon compelled him to abandon this and to limit himself to the species within the restricted geographical area of New England. Another untoward condition was found in the non-existence or loss of a number of the types. However, through Professor Fernald's and his own efforts, the writer did succeed in bringing together sufficient New England material to allow him to draw fairly satisfactory conclusions in regard to most of the species found within that area, so far, of course, as external characters gave means to do so.

A few forms, isolated specimens, found in Doctor MacGillivray's collection are not included in this paper out of respect to the wishes of Doctor MacGillivray.

Collections and Workers.

The most valuable collections of the North American species of this genus, from the standpoint of the types contained, are those of the American Entomological Society, Doctor A. D. MacGillivray, United States National Museum, of Harris in the Boston Society of Natural History, and of the Museum of Comparative Zoölogy, Harvard University, in our own country; that of Provancher in the Museum of Public Instruction, Quebec, and of W. H. Harrington, Ottawa, Ontario, in Canada; and that of the British Museum in Europe. The types in the last three collections are, as far as I know, exclusively of species described from Canada. The collections of the American Entomological Society, Doctor MacGillivray, and Harris contain practically all of the types of the species thus far described from New England.

The more notable past and present workers in this genus are Norton, the elder Cresson, MacGillivray and Rohwer in this country; Provancher, Harrington and W. F. Kirby in Canada; Konow and Enslin in Germany; and Cameron and W. F. Kirby again, in Great Britain.

History of Tenthredella.

Up to 1910 this genus bore the name *Tenthredo*, a genus established by Linnaeus in the 4th edition of the Systema Naturae (1744), being the first of the four genera which composed his new order Hymenoptera, and included by him in the 10th edition of the same in 1758. The new name *Tenthredella* was applied by S. A. Rohwer in 1910 (Proc. U. S. Nat. Mus., vol. 39, p. 117, 1910), who found that *Tenthredo* Linn. was not a valid name for this genus, that is, the *Tenthredo* of authors.

According to Rohwer, Latreille fixed *Tenthredo scrophulariae* L. as the type of *Tenthredo* in 1810. *Tenthredo scrophulariae* L., however, belongs to the genus *Allantus* Jurine and was named as the type of that genus by Curtis in 1839. *Allantus* Jur. and *Tenthredo* L. are therefore isogenotypic. *Tenthredo* L. equalling *Allantus* Jur., *Tenthredo* of authors had no name (*Rethra* Cameron not being a synonym of *Tenthredo* of authors according to Rohwer) and he therefore gave it the name *Tenthredella*.

Tenthredella Rohwer.

Type: *Tenthredo atra* Linnaeus.

Owing to the diversity of opinion which exists as regards the definition of *Tenthredella* in relation to *Tenthredo* L. (formerly *Allantus* Jur.) the writer has deemed it advisable not to adopt a definition of the genus as a whole in the present paper, and his distinction between the two genera is based merely on the species of the two as they are found in the geographical area to which he has limited himself. For this reason no synonymy of *Tenthredella* is given.

Characters of Tenthredella.

Body usually elongate and rather slender; eyes reach close to clypeus, their inner margins strongly convergent ventrally; clypeus emarginate; inner and upper margins of the antennal

sockets strongly upraised and as a rule extending backward more or less as longitudinal ridges defining laterally a median depressed area; antennae usually long and slender, as a rule much longer than, or as long as, the head and thorax together, not or scarcely thickened before the apex, and composed of nine segments, the third of which is longer than the fourth; wings with two radial and four cubital cells, the second and third of the latter each receiving a recurrent vein; the basal vein meets the subcostal considerably before or basal to the point of origin of the cubital and is parallel with the first recurrent; lanceolate cell divided by a short vertical cross-vein.

Geographical Distribution.

Tenthredella is almost entirely a Nearctic and Palearctic genus, a few species being reported from the northern part of the Oriental region. Dalle Torre (1894) lists one species from the Ethiopian region (Senegal, Africa), but as Konow (1905) does not list it, it probably does not belong to this genus. Another is listed from the Neotropical region (Venezuela), but it is probably not a *Tenthredella*. No representatives of this genus, as far as I know, have been reported from the Australian region.

The genus is represented in all the zones of North America above Mexico, but appears to be rather rare in the Arctic zone. The farthest north that a specimen has thus far been taken seems to be Lat. 65° [*leucostoma* (W. F. Kirby)].

The greatest recorded altitude in North America at which a specimen has been taken is approximately 11,000 feet, a male *varifrons* (Rohwer) having been taken on the top of Las Vegas Range, New Mexico, by Cockerell (Can. Ent., vol. 41, p. 111, 1909). In New England the greatest altitude for which I have a record is, roughly, from 6200 to 6293 feet, a number of specimens of *eximia* (Norton) and *secunda* (MacGillivray) having been taken near the summit of Mt. Washington, New Hampshire, by Mr. George Dimmock.

Habits.

The adult *Tenthredella*, like the Hymenoptera in general, delights largely in a bright-sunshiny, warm, and quiet atmosphere. The best localities for collecting seem to be in open places along

the edges of woods or along hedges, and they are usually found on low-growing plants, or on the lower parts of taller ones. Their strongly developed mandibles fit them for a predatory life, and the writer has seen evidences of this in connection with his examination of cabinet material, having found a number of female specimens with the remains of some soft-bodied insect between the mandibles. They are even cannibalistic: the larger and stronger females when confined in small jars will often turn upon the smaller insects, even their own males, confined with them. In the writer's experience, this seemed to be more especially true of the females of *verticalis* (Say).

Mr. E. P. Venables of Vernon, British Columbia, in the Canadian Entomologist (vol. 46, p. 121, 1914), reports a *T. variegata* (Norton) in confinement feeding greedily upon "house flies."

External Anatomy.

Head.

Plate 4, figs. 1, 3.

The head when viewed from the front is triangular in outline. Viewed from above, it is rectangular in general outline (the greater diameter being transverse). It deviates, however, from this form quite often by narrowing backwardly on each side from about the middle of the eyes, assuming the outline of a trapezoid in which two of the opposite sides converge more or less from front to rear. The latter feature is often quite marked, and is fairly constant, within limits, in some species. It is more general, or more marked in the male sex (see Sexual Differences). The head is always concave or hollowed out behind.

The compound eyes are large and prominent and their inner margins are strongly convergent ventrally. Their general shape is elongate-oval with somewhat sinuous inner margins.

The areas contiguous to the eyes are spoken of as the orbits. Thus *inner orbit* means the area along the inner margin on the front; *lower orbit*, the area along the lower margin, above the clypeus and mandibles, etc.

The clypeus (nasus, hypostoma, etc., of the older authors) is an hexagonal plate bounded above by the central portion of the front or frons below the antennae (*i. e.*, the hyperclypeus) with

which it is fused, and the tentorial fossae; laterally, it extends somewhat beyond the inner margins of the eyes; anteriorly or below it extends more or less over upon the labrum. The lower margin is always emarginate. This emargination, however, is usually rather variable, and seems to be of no specific taxonomic significance. It varies not only in depth and width, but sometimes also in outline; thus while the outline is as a rule rounded, it is sometimes practically obtuse, that is, the edges of the emarginated area are straight or nearly so and the lateral oblique up-and-down edges form obtuse angles with the horizontal transverse edge. This plate varies also in the degree of its extension over the labrum. Normally, only the *lobes* (*i. e.*, the apparent extension on each side formed by the emargination) extend over the labrum and only slightly, but quite often the *disc* (*i. e.*, the mesal portion) also extends over it and the lobes more than normally. Some of the older authors used the term "produced" to indicate the latter condition. It is always sparsely covered with long, whitish, and sub-erect hairs which have their origin in minute punctures. Owing to the fineness and sparsity of the punctures the clypeus appears smooth; occasionally, however, it is more or less markedly roughened.

The hyperclypeus is the median portion of the front below the antennae; its general outline may be said to be that of an isosceles triangle. Anteriorly or below it is always broadly fused with the clypeus, and its lateral boundaries are somewhat sinuous sutures which run obliquely from the tentorial fossae to between and alongside the inner margins of the antennal sockets. Except rarely, however [usually in *grandis* (Norton)], the lateral oblique sutures are obsolete, and the region forms an uninterrupted portion of the front below the antennae.

The frons or front is the portion of the head lying between the compound eyes and is considered as extending from the clypeus below to the posterior tangent of the two posterior ocelli above. For convenience, the portion of the front lying above the bases of the antennae is termed *front above antennae;* that below, the *front below antennae.*

The vertex is the portion of the top of the head behind the front; laterally it extends as far as the cheeks.

The median region of the head above the antennae is raised

into a rather broad plateau (the area on each side of it, especially on the front, slopes toward it). This plateau is divided by sutures or furrows into a number of distinct areas, and the anterior portion is excavated or hollowed out. The plateau begins its upward and backward course as two narrow longitudinal and usually blunt ridges. These *supra-antennal ridges* have their origin at the bases of the antennae, and each one really begins as a dilatation or an upraising of the inner and upper margin of the antennal socket. They are invariably more prominent anteriorly, at the base of the antennae, and vary somewhat in the degree of prominence, as I have tried to indicate by such terms as *moderately prominent, fairly prominent, quite prominent* and *prominent*. They vary also in their backward extent; thus while they generally extend, though less prominently, back to the anterior ocellus, they may extend to only about half-way there [as in *grandis* (Norton), etc.]; or they may exist only as upraised margins of the antennal sockets [as in *cogitans* (Provancher)]. The supra-antennal ridges form the lateral and longitudinal boundaries or walls of the anterior excavation alluded to above and which will be referred to as the *frontal fovea*. The supra-antennal ridge is an important generic character, at least as the genus is at present defined. The depth of the frontal fovea is directly correlated with the degree of prominence of the supra-antennal ridges; thus prominent supra-antennal ridges imply a deep frontal fovea; fairly prominent supra-antennal ridges, a fairly deep frontal fovea, etc. For this reason only exceptional conditions worthy of mention will be noted, or when it is desired to emphasize a condition. It is often divided in the middle, or slightly above, by a transverse swelling—the equivalent, probably, of the "frontal crest" of authors in other groups.

Lying above (postero-laterally) the frontal fovea and anterior ocellus are two narrow, elongate plates. They are broad posteriorly and taper to a point anteriorly and are separated from each other mesially, beyond the anterior ocellus, by the stem of the Λ-shaped *epicranial suture*. Each of these ocellar plates bears on its upper portion one of the two posterior ocelli. The epicranial suture is as a rule well defined, but varies in length, the oblique portions or arms being even sometimes practically obsolete [*rufopecta rufopecta* (Norton)].

The ocelli, three in number, are arranged in the form of a triangle. Each of the two posterior is situated on the upper portion of one of the ocellar plates, while the anterior is located at the head of the frontal fovea, within the angle formed by the two oblique arms of the epicranial suture.

On the vertex, immediately beyond the ocellar plates and posterior ocelli, is a well-defined quadrangular plate which extends to the posterior margin of the head and forms the posterior area of the median plateau. This plate, *vertex plate*, is more or less transversely convex and is wider than long, although sometimes, as is the rule in *verticalis* (Say), the difference is very slight. It is very often slightly carinate medially and longitudinally.

The cheeks or genae occupy the lateral portions of the head behind the compound eyes. Each cheek bears at its terminus below a semichitinous membranous region by means of which the mandibles articulate with the head.

The mandibles are broad basally, and are gradually attenuated toward the apex, ending pointedly. They may be described as strong, stout curved hooks. Their inner face is toothed. The basal portion of the outer face is as a rule in part or entirely rather coarsely punctate, and well covered with long, sub-erect, whitish hairs which have their origin in the punctures.

The labrum has its origin beneath the clypeus and, as stated, is more or less overlapped by it. Its lateral and lower margins are free and rest upon the mandibles. The latter margin is always rounded, but varies in degree from rather broadly, through subacutely, to rather acutely, although the last condition is comparatively rare. The anterior margin bears a dense fringe of short golden hairs. The surface of the labrum is, as a rule, more or less sparsely punctate, and like the clypeus is sparsely covered with long, whitish and sub-erect hairs.

The hind aspect of the head is concave. In its upper medial portion occurs the approximately rectangular occipital foramen. Immediately above the foramen occurs a quadrangular sclerite (broader above than below) to which, in this paper, the term *occiput* has been restricted; its lateral bounds or sutures are in line with the lateral limits of the vertex plate on the vertex. Usually, however, these sutures are obsolete. Situated laterally to

both the occiput and the foramen are the extensive postgenae which extend to the vertex above and more narrowly between the maxillae and cheeks, or genae proper, to the lower margin of the latter below, and constitute the greater part of the wall of the hinder aspect of the head.

The maxillae and labium are of the usual mandibulate type, and their respective palpi are composed of six and four segments. The maxillary palpi are much longer.

The antennae (Pl. 5, fig. 8) are generally long and slender and, as a rule, distinctly longer than the head and thorax (taken from the anteriormost portion of eye to posterior margin of the metaepisternum). Sometimes, however, as in *redimacula* (MacGillivray), they are but slightly longer than the head and thorax, and sometimes, again, as in *xantha* (Norton), they are about equal to the same. They are always composed of nine segments. The first or basal segment is subcylindrical, short, stout, and is borne upon a contracted basal portion or stalk. The second is somewhat beaker-shaped, and is the shortest of the nine segments. The third segment is the longest, and is always considerably longer than the next succeeding or fourth segment. The relative length of these two segments varies among the individuals of the same species and is apparently valueless as a specific character. The apical segments are more slender, and are more or less attenuated at the end, giving the antennae a setaceous appearance.

The head (excepting the clypeus, labrum, and mandibles, which see) is rather densely clothed with short, fine, erect, silvery hairs which issue from minute punctures. The vertex is usually more coarsely punctate. On the antennae beyond the second segment the hairs are very short and only sub-erect.

Thorax.

PLATE 5, FIGS. 7, 9.

Prothorax. — The pronotum conveniently divides itself into two parts: (1) an anterior region, narrow dorsally but broadened out laterally, which occupies the cervical or neck region; and (2) a posterior region — the collar, — which extends to the mesothorax. The collar is deeply emarginate medially on the dorsal surface, so that it consists principally of two dorso-lateral lobelike pieces, one on each side, each of which extends back as far as

the tegula at the base of the anterior wing; these dorso-lateral lobe-like pieces will be referred to in the description as the *lobes of collar*. The anterior region extends laterally over the posterior portion of the lateral faces of the propleura down to the bases of the anterior coxae. These broad antero-lateral portions of the pronotum will be spoken of as the *lateral faces of the pronotum*.

The propleura are latero-ventral plates situated in the cervical region. The lateral portion on each side gradually narrows toward the head; ventrally they meet in a median longitudinal line. In the descriptions the lateral and ventral portions will be known, respectively, as the *lateral face*, and the *ventral face of the propleura*.

The prosternum is a rectangular plate lying on the ventral surface and extending from slightly beneath the propleura anteriorly, to between the anterior coxae behind; it is folded upon itself posteriorly, causing it to appear narrower behind and, as a consequence, triangular in outline.

The pronotal lobe is the small and comparatively inconspicuous elongate region which lies immediately behind the lobe of the collar and below the anterior portion of the tegula.

Mesothorax. — The prescutum is the anterior medial, pear-shaped portion of the dorsal surface of the mesothorax. It extends forward between the lobes of the collar and posteriorly, wedge-like, into the mesoscutum to slightly beyond the posterior tangent of the tegulae. A median longitudinal suture divides it into similar halves.

The mesoscutum is the most extensive portion of the dorsal surface of the mesothorax. It extends forward on each side between the tegulae and the prescutum to slightly under the lobes of the collar, and to the bases of the hind wings posteriorly, falling short of the latter, however, medially to make room for the forward extension of a well-defined quadrate plate, — the mesoscutellum. On each side, postero-laterally, the mesoscutum drops down abruptly into a deep trough or sinus, — the mesothoracic sinus, — which extends obliquely from the scutellum to the base of the anterior wing.

The mesoscutellum, just mentioned, is a quadrate plate situated postero-medially with respect to the mesoscutum; it is continued on each side as a very narrow transverse piece from its

posterior angles on top of the narrow ridges (which it helps to form) between the mesoscutum and the true meso-postscutellum, to the base of the anterior wing. These continuations will be referred to as the *mesoscutel transverse extensions* in the descriptions. The mesoscutellum is, as a rule, more or less convex and often elevated (the degree of elevation depending upon the degree of convexity), and sometimes it is markedly convex and elevated [*mellina* (Norton)]. I have tried to indicate the progressive degree of convexity and elevation by the terms *slightly convex, moderately convex, fairly strongly convex*, etc. It often, too, shows a complete or partial, slight, median longitudinal carina.

The post-tergite (Crampton, 1914; "postscutellum" of some authors) is the small and somewhat triangular plate which lies directly behind the mesoscutellum. It should be remarked in this connection that the application of the term post-scutellum to this sclerite is inadmissible, as the true meso-postscutellum is present though not superficially visible, being, as pointed out by Snodgrass (1910), invaginated and hidden within the insect body. This sclerite, like the mesoscutellum, shows as a rule a median longitudinal carina which is usually smooth, shiny and rather broad.

The meso-epimeron is roughly plano-convex in outline. It lies immediately beneath the wings and above the episternum, and extends somewhat obliquely from the mesocoxa to opposite the anterior portion of the base of the fore wing. The greater part of its surface is more or less depressed, and a slight, obliquely transverse swelling somewhat anterior to the middle, divides it into two unequal parts.

The meso-episternum is rather large; it lies immediately below the meso-epimeron, and like it extends from the base of the meso-coxa to opposite the anterior portion of the base of the anterior wing. On the ventral surface it fuses with the sternum. In this paper, however, the term is applied only to the lateral portion. The meso-episternum projects more or less away from the body, and is, as a rule, produced into a point about in the middle of the line of its greatest projection. I have tried to indicate the variability of the latter feature by such terms as *slightly pointed, moderately pointed, fairly sharply pointed*, etc., and *blunt* when no pointedness occurs. The lower limit of the meso-episternum is

considered to be an imaginary line extending roughly from the lateral aspect of the base of the mesocoxa, across the point, to the lower margin of the pronotum.

Immediately in front of the meso-episternum, and posterior to the pronotal lobe of the prothorax, occurs a comparatively small elongate triangular plate, — the basalar plate (Crampton, 1914), the first parapterum of Snodgrass (1910).

The term *mesopleuron* is a collective one, and will be used to designate the entire lateral portion of the mesothorax; it includes, therefore, the meso-epimeron, meso-episternum, and the basalar plate.

The pectus is the rather extensive region on the ventral surface of the mesothorax between the anterior and intermediate coxae; posteriorly it is continued as a narrow tail-like piece between the latter coxae. It is composed of the fusion of the continuations of the meso-episternum with the mesosternum. It is widely and roundly emarginate anteriorly, and is divided into similar halves by a median longitudinal suture.

The tegulae are the small, strongly chitinized, scale-like plates which lie over the anterior portions of the bases of the anterior wings.

Metathorax. — The metascutum is irregular both in outline and in surface. It is free in front on the dorsal surface, and extends over the invaginated meso-postscutellum nearly to the posterior visible portion of the mesothorax. Anteriorly it is seen as two narrow blunt ridges, one on each side, extending somewhat obliquely forward, and connected by a narrow, transverse, median piece immediately in front of the metascutellum. Each of these ridges bears on top a small, pale, scale-like cenchrus (*pl.* cenchri). Postero-laterally the metascutum, like the mesoscutum, drops down abruptly into the deep metathoracic sinus.

The metascutellum is apparently much wider than long owing to its being doubled or rolled upon itself. In position it bears the same relation to the metascutum and meta-postscutellum, that the mesoscutellum bears to the mesoscutum and meso-postscutellum, being situated medially and bounded by the metascutum anteriorly, by the metathoracic sinuses laterally, and by the meta-postscutellum posteriorly. Again like the mesoscutellum, it is continued transversely on each side from its

posterior angles on top of the ridges between the metascutum and meta-postscutellum, to the base of the hind wing, and these continuations will be termed *metascutel transverse extensions.*

The meta-postscutellum, the postnotum of Snodgrass (1910), extends transversely across the whole of the dorsal surface. It is much wider than long, almost vertical, and somewhat bulged medially and longitudinally. It is bounded anteriorly by the metascutellum and metathoracic sinuses; behind, it articulates with the first abdominal segment.

The meta-epimeron is smaller than the meso-epimeron, but similar in outline, — plano-convex. It lies immediately above the diamond-shaped meta-episternum.

The term *meta-episternum* will be applied to only a portion of the episternum of the metathorax, *viz.*, the visible lateral, diamond-shaped portion which is bounded by the meso-epimeron in front, by the meta-epimeron above, by the posterior coxa behind, and by the intermediate coxa below. The remainder of the meta-episternum lies on the ventral surface, where it has fused with the metasternum, and cannot, as a rule, be seen, being masked by the intermediate and posterior coxae.

The thorax, like the head, is quite densely clothed with very fine, short, more or less erect silvery hairs. Its surface, too, is more or less roughened with punctures and striations. The meso-episternum is sometimes quite rough [*grandis* (Norton)]. The punctures on the prescutum are, as a rule, finer and denser than on the mesoscutum; sometimes, however [*cogitans* (Provancher)], they are very minute and dense on both. The post-tergite is, as a rule, coarsely punctate.

Abdomen.

The sessile and cylindrical abdomen ends acutely in the female (Pl. 4, fig. 2); in the male it is slightly rounded off on each side at the apex (Pl. 4, fig. 4). In pinned and dried specimens, it is more often dilated and flattened, owing to the relaxation of the muscles. This is especially true of the abdomen of the female which as a consequence very frequently appears more or less oval in outline. The upper or dorsal surface consists of nine distinct segments or terga, although the last or ninth tergum in the female, when it is sufficiently exserted, shows a faint transverse line of

division which is, in all probability, the line of union of the original ninth and tenth terga. In the male, the ninth segment, which is rather short, is often not visible, being wholly retracted. The first or basal tergum ("basal plates" and "propodium" of systematists) articulates with the meta-postscutellum, and to all appearances seems to be a part of the thorax, as it does not articulate with the second tergum behind, and, indeed, some have so regarded it. It has no sternal counterpart on the venter (the term *venter* is in this paper restricted to the ventral surface of the abdomen); the sternum of the second tergum is, therefore, the first sternum. It is divided by a median longitudinal cleft into similar lateral halves, and is roundly and rather widely emarginate behind. The lateral portions of the remaining terga are continued for a short distance on the venter. A spiracle occurs in each tergum, except in the last one in the female. The ninth segment in both sexes bears a pair of small, hairy, unsegmented, finger-like cerci. There are only six sterna in the female, the remainder not existing as such, for they have been modified in connection with the ovipositing apparatus. The posterior margin of the last or sixth sternum is emarginate, usually narrowly and deeply, but sometimes widely and shallowly [*grandis* (Norton), and *nigricollis* (W. F. Kirby)], and from the middle of this emargination there projects backward a small, flat, triangular process, the free angle of which projects into the basal portion of the sheath of the ovipositor. In the male there are seven sterna, and the last one, which is comparatively large, will be referred to as the *hypopygidium* in the descriptions. The two rather large processes which protrude more or less from the apical end of the abdomen of the male are the claspers, — appendages of the sexual organs. The two serrate and laterally ribbed saws in the female (Pl. 4, figs. 5, 6) are enclosed within a chitinized sheath which consists of a broader and apparently heavier basal portion and a somewhat longer and more slender apical portion (Pl. 4, fig. 2). Each of these portions is composed of two plates, one on each side, the plates on the same side articulating. The somewhat longer and more slender apical portion of the sheath will be spoken of as the *slender portion of sheath of ovipositor* in the descriptions.

The abdomen is clothed with very short and fine, sub-erect to

nearly procumbent, silvery hairs. The dorsal surface of the abdomen in the female, however, is, as a rule, practically bare, with the exception of the apical region, and on the apical portion of the sheath of the ovipositor the hairs are as a rule longer and coarser. On the apical dorsal portion in the male they are, as a rule, erect.

Legs.

The legs are long and slender. They increase in length and somewhat in stoutness beginning with the anterior pair. The coxae are subconical and are close together. The trochanters are ditrochate, and the femora have a small basal portion marked off from the remainder by a distinct annulus. Each tibia is armed at its apex with two strongly developed acute spines or spurs. On the anterior tibiae one of these two spurs is bifid; on the intermediate and posterior they are subequal. Each of the four basal segments of the tarsi bears an arolium at its apex on the ventral surface, and the apical segment bears a pair of curved bifid claws, between which there is a pulvillus. The outer tooth of the bifid claws is longer than the inner; in the males, however, the difference is often not very marked. The hairy vestiture on the tibiae and tarsi is somewhat coarser than on the other parts, and the hair on the ventral face of the anterior tibiae, in line with the bifid spur, gradually increases in length toward the apex, and on that portion is quite prominent. The hind legs in the male are relatively strongly and stoutly formed, and the hairs on the posterior tibiae and tarsi are somewhat longer than on the corresponding tibiae and tarsi of the female.

Wings.

The wings though often hyaline are usually faintly or distinctly clouded, in part or entirely. As a rule the cloudiness or infumation consists of a pale honey-yellow coloration and is mentioned as such in the descriptions. The term *clouded* in the descriptions refers to an infumation which is without color, or in which the color is not very distinct. As regards the terminology of the veins, the system used by Cresson is adopted. Any one desiring the venation of a *Tenthredella* wing according to the Comstock-Needham system may refer to "A Study of the Wings of the Tenthredinoidea, a Superfamily of Hymenoptera," by Alexander

Dyer MacGillivray, Proceedings of the United States National Museum, vol. 29, no. 1438, p. 569–654, pl. 31, figs. 56 and 57 (*Tenthredo* and *Macrophya*), 1906. The late Fr. W. Konow's system will be found illustrated and explained in the Zeitschr. für Syst. Hym. and Dipt., vol. 1, part 1, p. 37–39, 1901.

Fore Wings (Pl. 5, fig. 11). — The fore wings are large. The stigma is large and well chitinized, and the basal portion (portion internal to the stigma) of the costal vein becomes spatulate before reaching it. The costal cell though sometimes hyaline is usually more or less translucent and the relative degree of translucency is indicated by such terms as *slightly, moderately, fairly strongly,* and *strongly translucent.* The marginal or radial cell is always divided by a more or less curved or bowed radial cross-vein. There are four submarginal or cubital cells normally. The basal vein meets the subcostal considerably basal to the point of origin of the cubital vein and is parallel with the first recurrent vein. The second and third submarginal or cubital cells each receive a recurrent vein. The lanceolate cell is normally divided by a short vertical cross-vein. The second cubital cell, as a rule, contains a strongly developed point or dot in its apical half, and there is usually a fainter one in the apical half of the median cell.

The costa is, as a rule, ferruginous, or pale ferruginous (beyond the stigma it is, as a rule, duller), and unless it is distinctive from the general condition it will not be mentioned in the descriptions. The submedian and anal veins are usually in part or entirely paler than the rest.

Hind Wings (Pl. 5, fig. 10). — The radial and lanceolate cells, unlike those of the anterior wings, are undivided, and the stigmal cell is unchitinized. There is only one closed submarginal or cubital cell and only one closed discoidal cell, the two constituting the "middle cells." The cubital cell contains, as a rule, a chitinized dot at its lower anterior angle, but it is not as strongly developed as the one in the second cubital cell of the fore wing. The transverse medial vein meets the submedian before, at, or beyond the point of union (apically) of the latter with the anal vein. The anterior margin above the stigmal cell is furnished with a series of frenal hooks which, during flight, catch hold of the frenal fold in the hind margin of the anterior wing, along the apical portion of the anal cell.

The costa basal to the stigmal cell is of the same color, or generally slightly paler than the corresponding portion in the front wing. The axillary vein is invariably, and the submedian and the anal veins are usually, as in the fore wings, in part or entirely paler than the other veins.

In the descriptions only those features which are different from the corresponding features of the fore wings will be mentioned.

Sexual Differences.

Aside from the presence of the ovipositor in the female (Pl. 4, fig. 2) and the presence of the more or less apparent claspers (Pl. 4, fig. 4) in the male, the latter can at once be distinguished from the female by its comparative slenderness and consequent smaller size. Furthermore, the outline of the abdomen at its apex is distinctly different: in the male it is slightly rounded off on each side, whereas in the female it is distinctly acute. Again, the posterior legs in the male are relatively strongly and stoutly formed and the hair on the posterior tibiae and tarsi is somewhat longer than the hair on the corresponding tibiae and tarsi of the female. The teeth of the claws in the male are not so widely spread, and often the difference in the length between the inner and the outer tooth does not seem to be so great as in the female of the same species. The head of the male is, as a rule, narrower behind the eyes than through them, and in those species where this is also true of the females, the difference is accentuated, so that in general it may be said that the head of the male is relatively narrower behind the eyes. However, this condition does not seem to be a primary one, but is apparently dependent upon and correlated with the slenderness of the body, for the females of the slenderer species, and the slenderer females of the stouter species often show such a condition. Finally, the lighter coloring or markings are, as a rule, more extensive in the males.

Constancy of Characters and Definition of Color Terms.

The writer has been unable to find in the material thus far examined, except in two or three instances, external anatomical characters which may be regarded as of primary taxonomic value. Except in these instances, owing to their apparent variability these characters are not absolutely reliable. The anatom-

ical characters used in the descriptions should be looked upon, therefore, as being in the main only of supplementary value, supplementing coloration. I have found coloration, in spite of its variability, the better criterion for the separation of the species. The anatomical characters, nevertheless, proved very helpful.

T. signata (Norton) and *semirubra* (Norton) have proved troublesome, and I am not at all sure that I have accurately determined and delimited either. The former appears to be especially variable, and *variant 5* of the females approaches *semirubra*. In the case of *semirubra*, the type of which is unfortunately lost, what is its relation to *attracta* (Norton) (*attracta* is a *Tenthredella* and not a *Tenthredopsis*, and its type which I have rediscovered is in the collection of the American Entomological Society) and to *barnstoni* (W. F. Kirby)? (The type of the latter is in the British Museum and I have not seen it.) More material is needed, and this applies not only to these two species but to the whole genus, so that a systematic examination of the genitalia of the males and ovipositors of the females will be possible. Both show differences, as I have found from the examination of isolated specimens (Pl. 4, figs. 5, 6), and can probably be used for taxonomic purposes. Morice has found specific differences in the saws of *Dolerus* (Trans. Ent. Soc. London, 1913, pt. 3). *Tenthredella* and the *Tenthredinidae* as a whole are in a generalized state and care must be exercised in the use of characters for purposes of classification.

The predominating colors are black, yellow, and ferruginous, or some shade of the last two, and these have often proved difficult to describe. The clypeus is, as a rule, and the labrum and the basal portion of the mandibles are invariably yellow or white, or some shade of these. The apical portion of the mandibles is ferruginous, or pale ferruginous, and the extreme apex as well as the inner face is black, and the ferruginous is often black or blackish basally. The term *mandibles* refers to the broad basal portion. The palpi are as a rule of the same color as the labrum and basal portion of the mandibles, or slightly paler, and unless distinctive from these, will not be mentioned in the descriptions. The apical portions of the bifid claws are likewise ferruginous, and finely margined with black.

Owing to the diversity of the coloration, certain general descriptive color terms had to be invented. In connection with the

legs, for instance, four faces, *viz.*, anterior, dorsal, posterior, and ventral, are recognized (the legs, exclusive of the coxae, considered as being perpendicular to the body), and the more general terms, *before*, *above*, *behind*, and *beneath* refer, respectively, to those faces, and are used in those cases where a color is principally, but not exclusively, on the particular face to which it refers. Thus there may be an expression as "femora with a longitudinal black band above," or "tibiae black, yellowish before," etc. Again, in connection with the abdomen, *side of tergum* is a general term for the lateral portion of an abdominal tergum, and *terga on the venter* refers to the overlapping portions of the terga on the venter when they differ in color from the sterna. The prescutum is often margined along its converging sides with a different color, and this particular marking is termed "V-spot."

Abnormalities.

Abnormalities occur very largely in the venation of the wings and consist principally in the presence of extra or additional veins. Five cubital cells were found in each of the anterior wings of a female *secunda* (MacGillivray), the second cubital cell being divided into two smaller cells by an extra transverse cubital vein; the closed cubital cell in one of the hind wings of a male *semirubra* (Norton) was similarly divided. The left hind wing of the type of *dubitata* (MacGillivray) besides having the closed cubital cell transversely divided, has an additional longitudinal vein in its apical portion between the cubital and the discoidal veins. There is also a well-developed extra vein in the same specimen in the first discoidal cell of the left fore wing, extending from the lower apical angle about half-way toward the cubital vein, and there is a shorter backward-extending spur from the transverse medial in the right wing. Similar spurs are sometimes found in other parts of the wings in specimens of other species. One fore wing of a male *verticalis* (Say) had a subcontracted lanceolate cell. Rarely, a transverse cubital vein is missing in the fore wings.

A most interesting abnormality was found in a female *semirubra* from Amherst, Massachusetts. This specimen has four ocelli, the anterior ocellus being replaced by two smaller ones. This unique variant is in the collection of the Massachusetts Agricultural College.

Characters Leading to Tenthredella.

The following characters leading from the suborder *Chalastogastra* (or *Tenthredinoidea*) have been taken by the writer from the table given by Doctor Enslin in "Die Tenthredinoidea Mitteleuropas" (Deutsch. Ent. Zeitschr., Beiheft, Dec., 1912). The distinction between *Tenthredella* and *Tenthredo* L., however, is the writer's own and is designed merely for the separation of the species of the two genera as found in the geographical area to which he has limited himself (see History of Tenthredella). The distinction between the two as given here might perhaps be criticised on the score that it is not absolutely positive, but this is owing to the fact that the two genera, the Nearctic species at least, do not seem to be clearly defined. In the opinion of the writer, the true relation between these two genera, as they occur in North America at least, is yet to be determined. Mr. S. A. Rohwer of the United States National Museum gives a classification of the Chalastogastra in the Proceedings of the Entomological Society of Washington (vol. 13, p. 215, 1911), but it is only to tribes.

Anterior wings with at least three (four) cubital cells; antennae have their origin above the clypeus and between the eyes; a free and visible ovipositor sheath present; the genitalia in the male in part visible at the apex of the abdomen; first abdominal tergum longitudinally divided; anterior tibiae with two strongly developed apical spines or spurs; pronotum deeply semicircularly emarginate behind; basal vein meets the subcostal considerably before or basal to the point of origin of the cubital vein; antennae with more than four (nine) segments and not capitate; radial cell divided by a cross-vein; lanceolate cell not petiolated; basal vein parallel with the first recurrent vein; hind coxae not elongated, the apices of the hind femora not reaching to the apex of the abdomen; inner margins of the eyes strongly convergent ventrally and reaching rather close to the clypeus.

Inner and upper margins of the antennal sockets strongly upraised and, as a rule, extending backward more or less as longitudinal ridges defining laterally a depressed median area; antennae usually long and slender and, as a rule, much longer than, or as long as, the head and thorax together (taken from the anteriormost portion of the eye to the posterior margin of the meta-episternum) and not, or scarcely, thickened before the apex; species usually elongate and

rather slender; body very often ferruginous, or with ferruginous ..... *Tenthredella* Rohwer.

Inner and upper margins of the antennal sockets not, or only slightly, upraised, and the depressed median area absent or only slightly indicated; antennae as a rule as long as, or shorter than, the head and thorax together and very often distinctly thickened before the apex; species robust or compact; body black and yellow (the yellow may not be fully developed rarely, and appears reddish) ..... *Tenthredo* Linnaeus.

Table of Species.

The writer has experienced some difficulty in making out this table, owing to the variation in color and especially to variations in the shades of the particular colors. The more important variations are noted, but, in general, the colors as given must be interpreted broadly, for it was found practically impossible to take cognizance of every rare and slight variation and still have a satisfactory table. The point to be emphasized in this connection is that it is not the shade of a particular color which is important in marking the species, but the distribution of that color, or the color pattern. It has been the aim to incorporate these minor but troublesome exceptions in the descriptions which must after all be considered the court of last resort.

Table for the Separation of the Females.

(The general term *pale* signifies any color not black.)

1. Abdominal dorsum black ..... 2.
   Abdominal dorsum in part pale ..... 12.
   Abdominal dorsum entirely pale; if with narrow transverse bands of black, then the antennae in part black ..... 24.
2. Apical segments of antennae white, or yellowish white ..... 3.
   Apical segments of antennae not white ..... 4.
3. Meso-episternum markedly roughened; mesoscutellum as a rule in part white, and as a rule strongly convex; abdomen as a rule blue black ..... *grandis* (Norton), p. 408.
   Meso-episternum smooth; mesoscutellum black and but slightly convex; legs in part dark ferruginous... *nigricollis* (W. F. Kirby), p. 411.
4. Head above clypeus and lower margin of eye black, or only slightly pale ..... 5.
   Head above clypeus and lower margin of eye with considerable pale ..... 10.
5. Pectus, and mesopleura in part pale ferruginous ..... 6.
   Pectus and mesopleura not ferruginous ..... 7.

6. Antennae in greater part dull ferruginous; clypeus black, or with a white spot on each side; a white spot or a band as a rule on the posterior portion of the meso-episternum; mesoscutellum slightly convex, sometimes flattish. . . . . *rufopecta rufopecta* (Norton), p. 417.
   Antennae black; clypeus white; a broad white band on the whole length of the meso-episternum and angulated anteriorly; mesoscutellum quite strongly convex. . . . . *rufopecta mellicoxa* (Provancher), p. 419.
7. Legs in greater part ferruginous (rarely dull yellow-ocher) . . . . . 8.
   Legs not ferruginous . . . . . 9.
8. A band on the meso-episternum, posterior portion of the pectus, and sides of venter, white, or straw color . . . . . *lineata* (Provancher), p. 420.
   Meso-episternum, pectus, and venter black . . . . . *leucostoma* (W. F. Kirby), p. 415.
9. Posterior tibiae entirely, and intermediate tibiae above, black . . . . . *flavomarginis* (Norton), p. 412.
   Posterior and intermediate tibiae yellow, or straw color, except apical portions and slightly at base. . . . *cinctitibiis cinctitibiis* (Norton), p. 413.
10. Surface along upper posterior margin of eye black, yellow or yellowish behind this to the posterior margin of the head; pectus, and meso-episternum entirely, or almost entirely, black; venter with straw-colored spots or blotches . . . . . 11.
    Surface along upper posterior margin of eye to posterior margin of head, black (the black sometimes not fully developed in front); a broad obtuse-angled band on the meso-episternum, the greater posterior mesal portion of the pectus, and the venter to the ovipositing apparatus solidly pale yellow to straw-white . . . . . *angulifera* (Norton), p. 430.
11. Dorsal surface of thorax beyond prescutum with yellowish spots; sterna of venter as a rule black; mesoscutellum slightly to moderately convex . . . . . *lobata maculosa* Smulyan, p. 423.
    Dorsal surface of thorax beyond prescutum with no spots; sterna of venter as a rule more or less straw-colored; mesoscutellum usually strongly convex . . . . . *lobata lobata* (Norton), p. 422.
12. Abdominal dorsum with a transverse pale band . . . . . 13.
    Abdominal dorsum not so banded . . . . . 14.
13. Front above antennae and vertex with a large black spot trilobed anteriorly and somewhat less distinctly laterally; surface along upper posterior margin of eye black, yellow behind this to posterior margin of head (except very rarely); front above antennae and vertex rather smooth and shining; prescutum with a yellow V-spot; 5th, or 5th and 6th terga, yellowish to light brown . . . . . *verticalis* (Say), p. 425.
    Front above antennae and vertex with no such spot; area behind upper part of eye to posterior margin of head entirely black; front above antennae and vertex dull and roughened; prescutum black; 3d, 4th, and 5th terga ferruginous . . . . . *cogitans* (Provancher), p. 459.
14. Head in greater part black, yellow, or pale yellow (rarely with considerable ferruginous); dorsal surface of thorax beyond collar black, and with or without pale markings . . . . . 15.

Head in greater part, and antennae, ferruginous; dorsal surface of thorax ferruginous with black markings. . *redimacula* (MacGillivray), p. 457.

15. Dorsal surface of thorax beyond collar much marked with pale. A rather broad yellow line from nearly the posterior margin of the head along the inner orbit to about the middle of eye; mesoscutellum broadly yellow on each side; a broad obtuse-angled yellow band on the meso-episternum; greater apical portion of posterior femora ferruginous . . . . . *formosa* (Norton), p. 438.

Dorsal surface of thorax beyond collar with no, or with few pale markings . . . . . 16.

16. Legs yellow (may be brown, or brownish in part) and black . . . . . 17.

Legs largely ferruginous, or pale ferruginous, and black . . . . . 22.

17. Front below antennae, anterior half of meso-episternum in part, and as a rule more or less of the basal portion of the venter, yellow, or yellowish . . . . . 18.

Front below antennae, and anterior half of meso-episternum, black; basal portion of venter as a rule not yellowish . . . . . 19.

18. Front above antennae and vertex with a large black spot distinctly trilobed anteriorly and less distinctly laterally; meso-episternum except a small longitudinally elongate spot on the upper anterior portion along and touching the meso-epimeron, yellow, or pale yellow; prescutum, except very rarely, with a yellow V-spot . . . . . *secunda* (MacGillivray), p. 433.

No such black spot on front above antennae and vertex; meso-episternum with a yellow, or pale yellow, obtuse-angled band, or only a large spot on the anterior portion; prescutum with no V-spot . . . . . *eximia* (Norton), p. 435.

19. Coxae entirely, or in greater part, yellow, or pale yellow; meso-episternum as a rule with an oblique yellowish band on the posterior half. Legs, at least in part, with longitudinal black bands or lines, or interrupted bands or lines (often widely); lower half, or nearly half, of cheeks and lower orbit, posterior dorsal margin of lobes of collar rather broadly, tegulae, and greater part of meta-postscutellum, yellow to cream-white . . . . . *signata*, var. 1, inclusive (Norton), p. 445.

Coxae entirely or in greater part black, as a rule no band on the posterior half of the meso-episternum; legs with much black, or with more black than yellow . . . . . 20.

20. Tibiae yellow to straw color except apical portions, and slightly at base; coxae black . . . . . *cinctitibiis abdominalis* Smulyan, p. 414.

Tibiae not of that type; coxae may be yellowish in part . . . . . 21.

21. Coxae black; posterior dorsal margin of lobes of collar, tegulae, and intermediate femora, black . . . . . *semirubra* (Norton), p. 449.

Coxae in part yellowish; posterior dorsal margin of lobes of collar, tegulae, and the intermediate femora usually before, or beneath, yellowish . . . . . *signata*, var. 2, etc. (Norton), p. 446.

22. Coxae entirely, or in greater part, black; pectus, and meso-episternum

black; front below antennae black (except orbits sometimes and rarely hyperclypeus).....23.

Coxae yellow, or yellowish; front below antennae, narrow inner orbit above, an obtuse-angled band on meso-episternum, and posterior mesal portion of pectus, yellow; apical portion of posterior femora and of posterior tibiae, and posterior tarsi, black .....*pallicola* (MacGillivray), p. 439.

23. Legs with much black, or with more black than ferruginous (ferruginous sometimes light); four or more basal abdominal terga, and posterior femora, black.....*tricolor* (Norton), p. 441.

Legs with comparatively little black (typically); abdomen with only first tergum black (second may be dusky); posterior femora black only in part.....*basilaris* (Provancher), p. 443.

24. Abdominal dorsum ferruginous (sutures of basal terga may be black); mesoscutellum slightly convex (sometimes fairly strongly); mesoscutum with a black spot on each side; propleura black.....25.

Abdominal dorsum pale yellowish brown; mesoscutum with no black spots; propleura not black; mesoscutellum markedly convex, and elevated.....*mellina* (Norton), p. 452.

25. Apical half of posterior femora color of body; basal terga on venter black; pectus almost entirely and pronotum in greater part black; hyperclypeus as a rule yellow; antennae beyond two basal segments black to a variable extent; sutures of basal segments of abdominal dorsum black .....*xantha* (Norton), p. 455.

Apical half of posterior femora black except beneath: basal terga on venter not black; pectus with only small posterior mesal portion black; hyperclypeus color of body; antennae with no black, and sutures of basal terga not black; pronotum with only anterior portion black, and faintly.....*macgillivrayi* Smulyan, p. 454.

Table for the Separation of the Males.

(The general term *pale* signifies any color not black.)

1. Abdominal dorsum black [in *rufopecta rufopecta* (Norton) and *rufopecta mellicoxa* (Provancher) the black is not fully developed sometimes, so that some of the terga are pale, and in *angulifera* (Norton) there are small pale spots at the junctures of some of the terga].....2.

Abdominal dorsum in part pale.....6.

Abdominal dorsum entirely pale. Abdominal dorsum pale yellowish brown; vertex and dorsal surface of thorax largely, and legs in part, of same color; pectus, and mesopleura almost entirely yellowish; dorsal surface of thorax with yellowish markings; mesoscutellum markedly convex and elevated; a black spot on front above antennae in region of ocelli.....*mellina* (Norton), p. 453.

2. Apical segments of antennae white, or yellowish white. Meso-episternum markedly roughened; mesoscutellum in part white, and as a rule

strongly convex; abdomen generally bluish black
.....*grandis* (Norton), p. 410.
Apical segments of antennae not white.....3.

3. Pectus, and as a rule meso-episternum in part, and legs in greater part, pale ferruginous.....4.
Pectus, meso-episternum, and legs not ferruginous.....5.

4. Antennae black; clypeus, and lower portion to lower half of cheek, white; a minute elongate white spot at the summit of the inner orbit (may be discolored); a broad white band on the whole length of the meso-episternum.....*rufopecta mellicoxa* (Provancher), p. 419.
Antennae in greater part dull ferruginous; clypeus with only a white spot on each side (sometimes coalescing); cheeks not white, and no spot at the summit of the inner orbit; meso-episternum with only a white spot, or band, on the posterior half....*rufopecta rufopecta* (Norton), p. 418.

5. Surface along upper posterior margin of eye to posterior margin of head, black (black sometimes not fully developed in front); pectus, and meso-episternum except a small longitudinally elongate spot on the upper anterior portion along and usually touching the meso-epimeron, yellowish to straw color; pale spots at junctures of abdominal terga; venter straw color except slightly at apex.....*angulifera* (Norton), p. 432.
Surface along upper posterior margin of eye black, pale yellow behind this to posterior margin of head; only an approximately right-angled band on the meso-episternum, and only posterior mesial half of pectus, straw color; dorsal surface of thorax beyond collar much marked with pale yellow; venter not so extensively straw-colored
.....*lobata maculosa* Smulyan, p. 425.

6. Abdominal dorsum black and ferruginous, or pale ferruginous.....7.
Abdominal dorsum black and yellowish to brown. Front above antennae and vertex with a large black spot distinctly trilobed anteriorly and somewhat less distinctly laterally; surface along upper posterior margin of eye black, yellow behind this to the posterior margin of the head; dorsal surface of thorax much marked with yellow; pectus, and mesopleura in greater part, yellow.....*verticalis* (Say), p. 427.

7. Front below antennae yellowish, or straw color.....8.
Front below antennae black.....11.

8. Front above antennae and vertex with a large black spot distinctly trilobed anteriorly and somewhat less distinctly laterally; a well-marked yellowish V-spot on prescutum.....9.
Front above antennae and vertex with no such spot; prescutum black, or only with a minute yellow spot on each side.....10.

9. Surface along upper posterior margin of eye to posterior margin of head, black (black sometimes not fully developed in front); pectus, mesopleura in greater part, coxae, and pronotum in greater part, yellowish to straw color.....*secunda* (MacGillivray), p. 435.
Surface along upper posterior margin of eye black, straw color behind this to posterior margin of head; mesopleura largely black, only an approximately right-angled straw-colored band on meso-episternum, and pectus

black in part; intermediate and posterior coxae with much black; pronotum largely black.....*nortoni* Smulyan, p. 428.

10. A yellow line from nearly the posterior margin of head along inner orbit to about middle of eye; dorsal surface of thorax beyond collar much marked with yellow; posterior femora ferruginous, black, and yellow .....*formosa* (Norton), p. 439.

Only a short yellowish line at the summit of the inner orbit; dorsal surface of thorax beyond collar with no yellow markings; posterior femora yellowish and black.....*eximia* (Norton), p. 437.

11. Legs in part ferruginous: black, yellowish, or straw color, and ferruginous.....12.

Legs without ferruginous: black, and yellowish, or straw color. Coxae black except anterior sometimes in part; posterior femora, pectus and mesopleura, lobes of collar, and tegulae, black .....*semirubra* (Norton), p. 450.

12. Coxae wholly or in greater part yellowish; pectus entirely or in part, mesopleura in part, posterior dorsal margin of lobes of collar, and tegulae, yellow, or yellowish.....*signata* (Norton), p. 447.

Coxae wholly or in greater part black; pectus, mesopleura, lobes of collar, and tegulae, black.....*mutans* (Norton), p. 451.

DESCRIPTIONS OF SPECIES.

I have deemed it advisable to redescribe the species of other authors in every instance. The bibliography, as far as I know, is complete in every instance and consists merely of reference to a species; an interrogation mark before the reference indicates doubt, the writer not having seen the specimens in question. Mere references to habitat or distribution are cited in connection with habitat, and the name of the writer who is responsible for such a reference follows in parenthesis. Whether these last are in all cases correct is a question. I venture to say that, in some instances, at least, they are not, owing to incorrect determinations.

Tenthredella grandis (Norton).

Allantus grandis Norton, Boston Journ. Nat. Hist., vol. 7, 1860, p. 239, n. 7, ♀.

Tenthredo grandis Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 227, n. 1, ♀ ♂.

Tenthredo grandis Provancher, Nat. Can., vol. 10, 1878, p. 195, n. 1, ♀ ♂.

Tenthredo grandis Provancher, Faun. Ent. Can., vol. 2, 1883, p. 221, n. 1, ♀ ♂.

Tenthredo dubitatus MacGillivray, Journ. N. Y. Ent. Soc., vol. 5, 1897, p. 103, ♀.

Tenthredo dubitata MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 83–84.

Tenthredo grandis MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 84.

The types are lost, but an authentic specimen of each sex is in the Norton Collection in the Peabody Museum, Yale University. Type locality, Farmington, Connecticut.

The type of *dubitata* is in the collection of Doctor A. D. MacGillivray, Urbana, Illinois.

Female. — Head. — Black; the following parts yellowish white, or white: as a rule a small spot on each side of clypeus or the greater anterior half of same (spots coalescing), labrum except margin (often brown) of variable width, mandibles, usually a very small spot on cheek close to eye, four apical segments of antennae (usually also the preceding segment in part beneath) and sometimes a small elongate spot on outside of basal segment; basal segments of palpi brown, apical segments as a rule paler, or dirty white. Head behind eyes as wide as through them, sometimes slightly narrower; supra-antennal ridges prominent to about half-way toward the anterior ocellus; hyperclypeus usually completely marked off.

Thorax. — Black; the following parts yellowish white, or white: the posterior dorsal margin of lobes of collar as a rule, often a spot of variable size on the lateral face of the pronotum, mesoscutellum in part as a rule (usually in greater part), a spot of variable size usually on meta-episternum. Mesoscutellum as a rule strongly convex; meso-episternum markedly rough, and quite sharply pointed.

Abdomen. — Blue-black; sides and as a rule posterior margin of basal tergum (latter sometimes only in part) yellowish white, or white. Sixth sternum roundly, broadly, and shallowly emarginate.

Legs. — Black; the following parts dull white or straw color (sometimes discolored, and sometimes with a brownish tinge on tarsi): coxae sometimes with a very small spot outside at apex, apical half to two-thirds of anterior femora before (broader apically), intermediate femora usually with a small spot at apex before (sometimes minute), anterior tibiae before, intermediate tibiae as a rule from only slightly at apex to entirely before, posterior tibiae rarely with a small spot at apex before, anterior and intermediate tarsi except apices of segments and generally

basal segments above faintly, the apical segment and the three middle segments of the posterior tarsi as a rule in part beneath.

Wings. — Fore wings clouded, apical half strongly as a rule, with a subviolaceous tinge; costa from brown to nearly black; stigma brown to black, but usually dark brown; costal cell strongly translucent; veins and nerves brown to black. Hind wings hyaline, apical half faintly clouded; veins brown, the subcostal and the basal portion of the externo-medial as a rule darker; stigmal cell clouded.

Male. — The male differs from the female as follows: the lower half or more of the clypeus, and a small spot on the metascutellum rarely, yellowish white or white; blue tint to abdomen fainter as a rule or wanting, and the posterior margin of the second tergum sometimes in part yellowish white; the basal half of the venter often irregularly straw color; apical third of the intermediate femora sometimes before, and a small spot usually at the apex of the posterior femora and tibiae before, straw color (often faint on latter).

Length. — Females, 11.5–14.5 mm.; males, 11–12.5 mm.

Redescribed from fifteen females and ten males.

I have examined *dubitata* (MacG.) very carefully and find it to be the same as this species. The only difference of any consequence which I could find was in the color of the antennae (what is left of them), and the coloration of these is rather peculiar, varying from what may be termed dull pale brown, through reddish brown, to black. The head and legs are reddish black, the normal deep black apparently not having fully developed. The abdomen, however, is blue-black, and the white on the mesoscutellum, though not extensive, is present. In addition, the character of the surface of the meso-episternum, the supra-antennal ridges, and other anatomical characters are unmistakably those of *grandis*. It appears to be only a color variant. Of interest, too, are the abnormalities in the venation in two of its wings (see *Abnormalities*).

Habitat. — Amherst, Blue Hill, and North Adams, Massachusetts (June); Cornish, New Hampshire (July); Farmington, Connecticut; Speculator, Ithaca, and Poughkeepsie, New York (June and July); Stockton, New Jersey; Pennsylvania;

Illinois. Records from Canada are as follows: Ottawa, Ontario (June, Harrington); Quebec (?) (Provancher); Nerepis, New Brunswick (July, Rohwer).

Tenthredella nigricollis (W. F. Kirby).

Tenthredo nigricollis W. F. Kirby, List Hym. Brit. Mus., vol. 1, 1882, p. 308, n. 109, ♀, pl. 12, fig. 3.
Tenthredo nigricollis MacGillivray, Can. Ent., vol. 27, 1895, p. 79, ♀.
Tenthredo nigricollis MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 84.

The type is in the British Museum, and I have not seen it. Type locality, Newfoundland ("captured in April").

Female. — Head. — Black; lower two-thirds of clypeus, labrum, mandibles, and the four apical segments of the antennae cream white. Head behind eyes narrower than through them (difference may be slight); vertex-plate distinctly wider than long; supra-antennal ridges fairly to quite prominent.

Thorax. — Black; tegulae dark dull ferruginous (may be black in part); a large white spot on the meta-episternum. Mesoscutellum from rather flattish to moderately convex; mesoepisternum rather blunt, surface smooth.

Abdomen. — Black; sides of basal tergum white; sixth sternum widely, roundly, and shallowly emarginate.

Legs. — Dark ferruginous (anterior tibiae and tarsi paler); the following parts black: coxae, trochanters, anterior and intermediate femora behind and completely basally (more extensive on latter), posterior femora, posterior tibiae apically and very slightly at base, more or less of four basal segments of posterior tarsi — may be only blackish; extreme apices of four basal segments of intermediate tarsi may be dusky. Arolia small. [A specimen from Seldovia, Alaska, taken by Kincaid (Harriman Expedition, 1899) had the legs beyond the trochanters almost entirely ferruginous.]

Wings. — Fore wings faintly pale honey-yellow; costa blackish near stigma; stigma practically black; costal cell moderately translucent, more strongly beyond costal cross-vein; veins black or blackish. Hind wings hyaline, apical half very faintly clouded.

Length. — 11–11.5 mm.

Redescribed from two specimens.

All specimens of this species which I have seen (and two of which are here described) though fairly constant in themselves, differ somewhat from Kirby's description of the type specimen, but Mr. S. A. Rohwer of the United States National Museum who has seen the type, assures me they are the same.

Habitat. — New Hampshire; Maine (July); New York; Riverton, New Jersey (Viereck); Sitka, Seldovia, and Kukak Bay, Alaska (June and July); Newfoundland (April, W. F. Kirby).

Tenthredella flavomarginis (Norton).

Allantus flavomarginis Norton, Boston Journ. Nat. Hist., vol. 7, 1860, p. 254, n. 35, ♀.

Tenthredo flavomarginis Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 238, n. 30, ♀.

Tenthredo flavomarginis MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 90.

The type is lost. There is an authentic female specimen, however, in the Norton Collection in the Peabody Museum, Yale University. Type locality, Farmington, Connecticut.

Female. — Head. — Black; the following parts yellow: clypeus, labrum, mandibles, a large spot touching eye or the whole lower portion of cheek, and a minute elongate spot at the summit of the inner orbit. Head behind eyes very slightly wider than through them; supra-antennal ridges quite prominent; antennae fairly long but stoutish.

Thorax. — Black; the following parts yellow: posterior dorsal margin of lobes of collar rather broadly, tegulae, a very small spot sometimes on the lower margin of the lateral face of the pronotum, a very small spot sometimes on the margin of the meso-epimeron in front of the meta-episternum, the upper margin of the meta-epimeron sometimes in part, and sometimes a large spot on the meta-episternum, and the upper portion of the meta-postscutellum sometimes. Mesoscutellum moderately convex; meso-episternum moderately pointed.

Abdomen. — Black; basal tergum with its sides and usually its posterior margin straw color.

Legs. — Black; the following parts yellowish: the apical portion of the anterior coxae beneath, the anterior and very often the intermediate trochanters beneath, anterior femora before, the intermediate femora usually wholly or in part before, anterior and intermediate tibiae except a broad longitudinal line (somewhat broader on latter) above, anterior and intermediate tarsi,— the four basal segments of the intermediate, and sometimes of the anterior, more or less brown above and at apices; apical segment of the posterior tarsi brown or brownish.

Wings. — Fore wings usually pale honey-yellow, entirely or only apical half; stigma brown; costal cell quite strongly translucent; veins and nerves black. Hind wings hyaline, apical half faintly clouded.

Length. — 11–13.5 mm. Rather stout.

Redescribed from four specimens.

Habitat. — White Mountains ["woods," "near Glen House" (Geo. Dimmock), and "Notch" (Norton)], New Hampshire; Farmington, Connecticut; New Jersey (Ashmead); Colorado; New Mexico; Nevada; Berg Bay, Yakutat, and Seldovia, Alaska (♀ and ♂, June and July, Kincaid); Nova Scotia, Canada (W. F. Kirby).

Tenthredella cinctitibiis cinctitibiis (Norton).

Tenthredo cinctitibiis Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 239, n. 31, ♀.

?Tenthredo cinctitibiis Provancher, Nat. Can., vol. 13, 1882, p. 299, n. 24, ♀.

?Tenthredo cinctitibiis Provancher, Faun. Ent. Can., vol. 2, 1883, p. 748, n. 24, ♀.

Tenthredo cinctitibiis MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 90.

The type is lost. Type locality, "Caribou Island, Straits of Belle Isle," between Newfoundland and Labrador.

Female. — Head. — Black; the following parts yellow, or straw color: clypeus, labrum, mandibles, very often a spot on lower portion of cheek touching eye and which may be continued on lower orbit, a minute elongate spot at summit of inner orbit, a very narrow line very often on the outside of the basal segment of the antennae which may be continued on second segment. Head

behind eyes slightly wider than through them; supra-antennal ridges as a rule prominent, but usually only to about half-way toward the lower ocellus.

Thorax. — Black; the following parts yellow, or straw color: posterior dorsal margin of lobes of collar rather broadly, and a spot on the meta-episternum (sometimes minute); tegulae very often dark brown and sometimes narrowly margined with yellow. Mesoscutellum from moderately to fairly strongly convex; meso-episternum generally rather blunt.

Abdomen. — Black; sides of basal tergum yellowish, or straw color.

Legs. — Black; the following parts yellow, or straw color: anterior femora before in greater part to almost entirely (varying in extent toward base), often more or less of the anterior face of the intermediate femora — but usually faintly, the anterior and intermediate tibiae except a short longitudinal dash at base behind on former and a more extensive spot on latter and the apical portion of both except before, posterior tibiae except at base and apical portion, and the tarsi; the latter usually brownish, with the four basal segments as a rule darker at apices, but the posterior may be blackish in greater part.

Wings. — Fore wings somewhat pale honey-yellow; stigma brown, sometimes nearly black, more or less pale at base; costal cell quite strongly translucent; veins dark brown to blackish. Hind wings hyaline, apical half faintly clouded; veins brown.

Length. — 11.5–12.5 mm.

Redescribed from six specimens.

Habitat. — White Mountains, New Hampshire. I have the following records from Canada: Cap Rouge, Quebec (Provancher); Labrador; St. Martin's Falls, Albany River, Hudson Bay (W. F. Kirby).

This species is apparently alpine, or northern.

Tenthredella cinctitibiis abdominalis Smulyan.

Tenthredella cinctitibiis abdominalis Smulyan, Can. Ent., vol. 47, 1915, p. 324, ♀.

The type is in the collection of the United States National Museum: No. 19094.

Type locality, "Carriage Road," Mt. Washington, New Hampshire (Mr. George Dimmock).

Female. — Differs from *T. cinctitibiis cinctitibiis* in having the abdomen beyond the fourth segment ferruginous and the mesoscutellum only very slightly convex.

Length. — 11 mm.

Described from one specimen.

There is another specimen of the same sex in the U. S. National Museum, but it bears no locality label.

Tenthredella leucostoma (W. F. Kirby).

Tenthredo rufipes Say, Long's Second Expd., vol. 2, 1824, p. 317, n. 3, ♀ (*nec* Klug, 1814).

Allantus leucostoma W. F. Kirby, Fauna Bor.-Amer., vol. 4, 1837, p. 256, n. 354, ♀.

Tenthredo rufipes Leconte, Writ. Thos. Say, vol. 1, 1859, p. 212, n. 3, ♀ (also ed. 1869).

Allantus leucostoma Norton, Boston Journ. Nat. Hist., vol. 7, 1860, p. 254, n. 34, ♀.

Tenthredo rufipes Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 237, n. 28, ♀.

Allantus leucostoma Bethune, Can. Ent., vol. 7, 1875, p. 159, n. 354, ♀.

Tenthredo rufipes Provancher, Nat. Can., vol. 10, 1878, p. 199, n. 11, ♀.

Tenthredo rufipes Provancher, Faun. Ent. Can., vol. 2, 1883, p. 225, n. 11, ♀.

Tenthredo rufipes MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 91.

The type of *leucostoma* is in the British Museum, and was not examined. Type locality, Canada, lat. 65° north.

The type of *Tenthredo rufipes* Say is lost. Type locality, "Northwest Territory."

Female. — Head. — Black, shining; the following parts pale yellow: clypeus, labrum, mandibles, a small spot usually on lower portion of cheek close to the eye, and a minute elongate spot at the summit of the inner orbit (often discolored); antennae often rufescent apically beneath, very rarely entirely, and sometimes the two basal segments ferruginous inside. Head behind eyes from very slightly narrower to very slightly wider than through them; supra-antennal ridges prominent.

Thorax. — Black; posterior dorsal margin of lobes of collar

usually pale yellow, rarely light ferruginous (occasionally entirely black); tegulae pale yellow (sometimes with a shade of brown), occasionally light ferruginous; a yellow spot of variable size on the meta-episternum, and the meta-postscutellum with a variable amount of pale olive. Mesoscutellum generally but slightly convex; meso-episternum moderately pointed.

Abdomen. — Black; sides of basal tergum straw color.

Legs. — Pale ferruginous, very rarely dull yellow ochre; anterior coxae beneath usually, trochanters, anterior tibiae usually before, anterior tarsi and the intermediate ones often, paler; the anterior femora usually with a narrow longitudinal yellowish band of varying distinctness above (quite often interrupted); the following parts black: the anterior coxae usually at base and often in greater part outside, a spot on the trochanters above sometimes, apical half to two-thirds of the posterior tibiae, and the posterior tarsi except the apical segment. Arolia quite large.

Wings. — Fore wings pale honey-yellow, sometimes hyaline; intercostal cell generally moderately translucent; stigma brown to dark brown; veins black, rarely brown. Hind wings hyaline, apical portion as a rule faintly clouded.

Length. — 10–13.5 mm.

Redescribed from a large number of females.

The male of this species is apparently very rare.

Habitat. — Amherst, North Adams, and Winchendon, Massachusetts (June and July); Bretton Woods, Kearsarge, and Durham, New Hampshire (July); Capens, Orono, Eastport, and Moosehead, Maine (June to August inclusive); New Haven, Connecticut (June); Poughkeepsie, New York (Juné); New Jersey (Ashmead); Indiana; Algonquin, Illinois; Colorado. I have the following records from Canada: Nova Scotia (W. F. Kirby); Labrador; St. John, New Brunswick (July, Rohwer); Ottawa, Ontario (June, Harrington); Quebec (?) (Provancher); St. Martin's Falls, Albany River, Hudson Bay (W. F. Kirby).

This species occurs comparatively far north ("Lat. 65°," W. F. Kirby), farther north, according to my records, than any other species.

Tenthredella rufopecta rufopecta (Norton).

Allantus rufopectus Norton, Boston Journ. Nat. Hist., vol. 7, 1860, p. 255, n. 38, ♀ ♂.

Tenthredo rufopectus Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 237, n. 27, ♀ ♂.

Tenthredo rufopectus Provancher, Nat. Can., vol. 10, 1878, p. 199, n. 10, ♀ ♂.

Tenthredo rufopectus Provancher, Faun. Ent. Can., vol. 2, 1883, p. 225, n. 10, ♀ ♂.

Tenthredo rufopecta MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 91 (in part).

The types are lost. Type locality, Farmington, Connecticut,? "and Pennsylvania."

Female. — Head. — Black, shining; the following parts white: a small spot on each side of clypeus frequently, labrum (sometimes with a brownish tinge), mandibles; color of antennae like that of legs and pectus but much duller, the two basal (except rarely on the inside) or the two basal and the basal half of the third segment black, a slender black line above and as a rule a very narrow ring at apices of segments beyond the basal segments, rarely again almost entirely immaculate. Head narrowed behind eyes; vertex-plate as a rule strongly convex and comparatively smooth; oblique arms of epicranial suture often practically obsolete; supra-antennal ridges only moderately prominent; posterior half of frontal fovea often very shallow.

Thorax. — Black, shining; the following parts white: posterior dorsal margin of lobes of collar, tegulae, transverse extensions of meso- and metascutellum, a spot or a somewhat oblique band except very rarely on the posterior portion of the meso-episternum, and a large spot on the meta-episternum; the following parts bright, pale ferruginous: posterior portion of meso-epimeron generally, meso-episternum except upper anterior portion, pectus, meta-epimeron as a rule in part and rarely entirely, and meta-episternum. Mesoscutellum but slightly convex, often flattish, the greater anterior portion sloping gently as a rule toward the mesoscutum; meso-episternum as a rule fairly sharply pointed.

Abdomen. — Black, shining; the following parts white: the sides of the basal tergum except very rarely, the posterior margin of same medially, narrowly, and rarely the sides of the remaining terga irregularly.

Legs. — Pale ferruginous, or pale yellowish ferruginous (salmon orange); trochanters, anterior and intermediate tibiae and tarsi, generally paler; the following parts black: a narrow ring at apex of intermediate femora, a broader ring at apex of posterior femora, a narrow ring at apices of anterior and intermediate tibiae and segments of their tarsi, apical portion (from about half to two-thirds) of posterior tibiae, and posterior tarsi except often the last segment. Arolia small, especially on hind tarsi.

Wings. — Fore wings hyaline, very often faintly or very faintly clouded; costa whitish at base, brown basal to stigma; stigma brown to dark brown, rarely with a very small pale spot at base; costal cell hyaline, somewhat translucent beyond costal crossvein; veins and nerves black, or blackish, sometimes brown. Hind wings hyaline, apical half very faintly clouded; veins brown, subcostal and basal portion of the externo-medial as a rule black.

Male. — The male differs from the female as follows: clypeus apparently always with a white spot on each side, sometimes coalescing; very often the anterior dorsal margin of the pronotum is narrowly margined with white, completely or interruptedly; rarely a small white spot on lower portion of the lateral face of the pronotum; the pale ferruginous on the mesopleura not so extensive sometimes; as a rule basal sterna of venter white; the black at apex of intermediate femora very often occurs only as a small spot; black at apex of intermediate tibiae rarely more extensive; posterior tibiae very rarely entirely black.

Two males from an unknown locality had the greater basal portion of the abdominal dorsum very light brown, the black not having fully developed.

Length. —Females, 9–11 mm.; males, 9–10.5 mm.

Redescribed from many specimens of both sexes.

Habitat. —Mt. Greylock, Amherst, North Adams, and Auburndale, Massachusetts (May to July inclusive); St. Johnsbury, Vermont (June); New Haven, and Farmington (Norton), Connecticut (June); Capens, and Orono, Maine (July and August); Durham, New Hampshire; Poughkeepsie, Ithaca, and McLean, New York (June to August inclusive); Delaware Water Gap, New Jersey (Viereck); Pennsylvania; Maryland; Virginia; Illinois (Norton); Wisconsin; "Western States" (Cresson). I have the

following records from Canada: Ottawa, Ontario (June and July, Harrington); St. John, and Nerepis, New Brunswick (June to August inclusive, Rohwer); Nova Scotia (W. F. Kirby); and Quebec (?) (Provancher).

This subspecies is apparently widely distributed.

Tenthredella rufopecta mellicoxa (Provancher).

Tenthredo mellicoxa Provancher, Nat. Can., vol. 10, 1878, p. 198, n. 9, ♀ ♂.
Tenthredo mellicoxa Provancher, Faun. Ent. Can., vol. 2, 1883, p. 224, n. 9, ♀ ♂.
Tenthredo rufopecta MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 91 (in part).

The types are in the Provancher Collection, Museum of Public Instruction, Quebec, Province of Quebec, Canada.

Type locality, ? Province of Quebec, Canada.

Female. — Differs from female *rufopecta rufopecta* (Norton) as follows: antennae black; a minute elongate white spot at the summit of the inner orbit, a small white spot on lower portion of cheek close to eye, and clypeus entirely white; lower margin of lateral face of pronotum as a rule white, a broad obtuse-angled white band (obscured somewhat by the ferruginous usually) on the whole length of the meso-episternum (angulated anteriorly and extending there somewhat on the pectus), upper margin of meta-epimeron and the posterior margin of the basal tergum of the abdomen narrowly white; the anterior and intermediate legs except for a very small spot on the intermediate and sometimes on the anterior femora at apex above, immaculate; posterior tibiae at base slightly faintly black; costa of fore wing darker. Mesoscutellum quite strongly convex.

One male from New Hampshire (Durham) differs from the female as follows: lower portion of cheek, prosternum, ventral face of propleura, lateral face of pronotum, upper posterior margin of meso-epimeron, white; the venter except the hypopygidium which is blackish, reddish white; terga 3 to 6 inclusive pale brown; pectus and legs somewhat paler; an elongate black spot on the femora at apex above; a longitudinal blackish line on the anterior and intermediate tibiae above; posterior tibiae almost entirely black; intermediate tarsi darkish above (anterior missing).

I do not regard this male as typical, and in this view am borne

out by Provancher's description of the male and by an additional specimen from Ohio which I have seen that has the prosternum and ventral face of propleura and the entire abdominal dorsum black, while the elongate black spots at the apices of the anterior and intermediate femora and the longitudinal blackish line on the anterior tibiae are not present.

Length. — Females, 10.5–12.5 mm.; male, 10 mm.

Redescribed from seven females and one male.

Habitat. — Maine (July and August); Mt. Ascutney, Vermont; Mt. Washington, Durham, New Hampshire; Columbus, Ohio (May); Baldwin, Kansas (May); Quebec (?), Canada (Provancher).

This subspecies apparently does not occur in southern New England, or else it is very rare.

Tenthredella lineata (Provancher).

Tenthredo lineata Provancher, Nat. Can., vol. 10, 1878, p. 198, n. 9, ♀.
Tenthredo lineata Cresson, Trans. Amer. Ent. Soc., vol. 8, 1880, p. 43, ♀.
Tenthredo lineata Provancher, Faun. Ent. Can., vol. 2, 1883, p. 224, n. 9, ♀.
Tenthredo lineata MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 88.

The type is in the Provancher Collection, Museum of Public Instruction, Quebec, Province of Quebec, Canada.

Type locality, ? Province of Quebec, Canada.

Female. — Head. — Black, shining; antennae more or less rufescent beyond the third segment; the following parts yellowish, or straw color: clypeus, labrum, mandibles, lower portion of cheek, lower orbit — extends as a rule slightly on to the lower portion of the inner orbit, — anteriormost portion of the supra-antennal ridges as a rule very narrowly, a minute elongate spot at the summit of the inner orbit; palpi sometimes reddish. Head behind eyes distinctly narrower than through them, and vertex plate distinctly wider than long; supra-antennal ridges usually quite prominent.

Thorax. — Black; the following parts straw color, or white: more or less of the lower margin of the lateral face of the pronotum, posterior dorsal margin of the lobes of collar rather broadly, tegulae, a comparatively narrow angulated or non-angulated

band on the whole or nearly the whole length of the meso-episternum, a small elongate spot sometimes on margin of meso-epimeron in front of meta-episternum, posterior portion of pectus from slightly to nearly half, and a large spot on the meta-episternum. Mesoscutellum generally only slightly convex; meso-episternum as a rule rather blunt.

Abdomen. — Black; the sides of the first tergum, the terga on the venter except the last one, and a more or less broken median longitudinal line on the apical portion of the dorsum, straw color.

Legs. — Pale ferruginous or pale yellowish ferruginous (trochanters, often apparently a slender longitudinal band on anterior femora, anterior tibiae and their tarsi before, paler); anterior coxae more or less whitish beneath; the following parts black: anterior and posterior coxae as a rule very slightly at base above and outside, very small spots as a rule on the trochanters above, a rather broad ring at the apex of the posterior and usually a very faint and very narrow ring or spot at the apex of the intermediate femora, apical third of posterior tibiae, and posterior tarsi except apical segment (only blackish as a rule).

Wings. — Fore wings hyaline, sometimes very faintly clouded; stigma reddish brown, paler at base; costal cell from very slightly to slightly translucent; veins and nerves brown. Hind wings hyaline, apical half rarely very faintly clouded.

Length. — 9.5–11 mm. Slender.

Redescribed from six specimens.

A female from Maine (Machias, July) differs from the general condition in having the antennae almost entirely black, a longitudinal black line on the apical portion of the anterior and intermediate tibiae and on the basal segments of their tarsi above (broader on those of intermediate legs); a small spot at the base and the apical two-thirds of the posterior tibiae, and posterior tarsi except the last segment, black; stigma and veins blackish. Length, 11.5 mm.

This species resembles *rufopecta rufopecta* (Norton) and *rufopecta mellicoxa* (Provancher).

Habitat. — New Hampshire; Machias, Maine (July); New Jersey (Ashmead); Colorado; Minnesota; Sitka, Virgin Bay, Gustavus Point, and Seldovia, Alaska (June, Kincaid). Records

from Canada are as follows: St. John, New Brunswick (July, Rohwer); Quebec (?) (Provancher); St. Martin's Falls, Albany River, Hudson Bay (W. F. Kirby).

Tenthredella lobata lobata (Norton).

Allantus lobatus Norton, Boston Journ. Nat. Hist., vol. 7, 1860, p. 253, n. 32, ♀.

Tenthredo lobatus Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 229, n. 6, ♀.

Tenthredo lobata Provancher, Nat. Can., vol. 13, 1882, p. 299, n. 23, ♀.

Tenthredo lobata Provancher, Faun. Ent. Can., vol. 2, 1883, p. 748, n. 23, ♀.

Tenthredo lobata MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 88 (in part).

The types are lost. Type locality, Farmington, Connecticut.

Female. — Head. — Yellowish white, or straw color (palpi sometimes greenish); the following parts black: back of head, a large spot on front above antennae and vertex, trilobed anteriorly and less distinctly laterally, extending from the posterior margin of the head to between the bases of the antennae medially and united by a somewhat oblique isthmus about midway between the posterior margin of the eye and posterior margin of the head with an elongate smaller spot behind the upper part of the eye which extends back about half-way toward the posterior margin of the head, an elongate spot on the posterior half of the cheek (the lower portion usually not fully developed), antennae except the basal segment usually on the inside and a longitudinal line outside. Head behind eyes from slightly to distinctly narrower than through them; supra-antennal ridges moderately to fairly prominent.

Thorax. — Black; the following parts yellowish white, or straw color: margins of pronotum except dorsally, pronotal lobe, tegulae, V-spot on prescutum, upper margin of the meso-epimeron in part, usually a short narrow obliquely up-and-down band on the lower anterior portion of meso-episternum, meso- and meta-scutellar transverse extensions, upper margin of meta-postscutellum medially, upper margin of meta-epimeron narrowly, a spot on the meta-episternum. Mesoscutellum usually strongly convex; meso-episternum sharply pointed.

Abdomen. — Black; the following parts straw color: sides of

basal tergum, medial portion of posterior margin of same narrowly, and venter except small apical portion spotted irregularly.

Legs. — Yellowish, or straw color; the following parts black: anterior coxae at base and in greater part outside, intermediate and posterior coxae except very small apical portion, posterior femora except slightly at base (sometimes paler before), intermediate behind, and a longitudinal band on the anterior above (usually abbreviated basally), a longitudinal line which broadens out apically on the anterior and intermediate tibiae above (basal portion very faint sometimes), posterior tibiae slightly at base and the apical portion, the apices of the basal segments of the anterior and intermediate tarsi often except before faintly, and the four basal segments of the posterior tarsi from entirely to only above and at apices. Arolia small.

Wings. — Fore wings with a faint pale honey-yellow tinge; costa more often brown; stigma brown to dark brown; costal cell usually slightly translucent, more strongly beyond cross-vein; veins black or blackish. Hind wings hyaline, apical half may be very faintly clouded; veins and nerves brown, or blackish.

Length. — 11–12 mm.

Redescribed from three specimens.

Habitat. — Amherst and Plymouth, Massachusetts (July and August); Maine (July); St. Hyacinthe, Quebec, Canada (Provancher); Farmington, Connecticut (Norton); Virginia (Cresson); Delaware Water Gap, New Jersey (Viereck).

It may be that Cresson's and Viereck's records refer to *lobata maculosa*, since they did not distinguish between the two subspecies.

Tenthredella lobata maculosa Smulyan.

Allantus lobatus var. *a* Norton, Boston Journ. Nat. Hist., vol. 7, 1860, p. 253, n. 32, ♀.

Tenthredo lobatus var. *a* Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 229, n. 6, ♀.

Tenthredella lobata maculosa Smulyan, Can. Ent., vol. 47, 1915, p. 321–326, ♀ ♂.

Tenthredo lobata MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 88 (in part).

The type is in the Norton Collection in the Peabody Museum, Yale University.

Type locality, Farmington, Connecticut.

Female. — Differs from *lobata lobata* as follows:

Head. — A yellowish, or yellowish-white spot, or longitudinal line usually on each side of the posterior portion of the vertex-plate, and very often a minute elongate spot at the terminus of each arm of the epicranial suture; the black spot on the posterior half of the cheek sometimes coalesces with that along the upper part of the eye; basal segment of antennae usually black inside, and the yellowish line outside sometimes absent. Supra-antennal ridges from moderately prominent to prominent.

Thorax. — Margin of pronotum not interrupted antero-dorsally; V-spot on prescutum very often not complete posteriorly; the following additional parts yellow or yellowish white: a short longitudinal line on the mesoscutum on each side of the posterior portion of the prescutum, a triangular spot at the posterior end of the mesoscutum immediately in front of each anterior angle of the mesoscutellum, the anterior margin of the mesoscutellum in part rarely, a small spot on the metascutum behind and under each cenchrus, and the greater mesal upper half of the meta-postscutellum; as a rule only a small spot at the upper anterior angle of the meso-episternum, and very often a small yellowish-white, or straw-colored spot at the posterior end of the pectus on each side of the median longitudinal suture. Mesoscutellum from slightly to moderately convex; meso-episternum from moderately to fairly sharply pointed.

Abdomen. — Venter with only the terga straw color.

Legs. — Trochanters black above, sometimes almost entirely; anterior femora usually black behind; very frequently intermediate femora black except more or less before; the black on apical portion of posterior tibiae often more extensive above — about half-way up toward base.

Wings. — Fore wings sometimes hyaline; costa not brown.

Described from type and five paratypes. Two of the paratypes are in the collection of the Boston Society of Natural History, two in the collection of the American Entomological Society at Philadelphia, and the fifth is in the collection of the Connecticut Agricultural Experiment Station at New Haven, Connecticut.

Male. — The male differs from the female as follows: greater part of lateral face of pronotum straw color; an approximately right-angled band on the meso-episternum, posterior mesal half of pectus, and basal half of venter entirely straw color; intermediate coxae black only at base above, the posterior coxae except inside and inner longitudinal half beneath, and the apical two-thirds of the posterior tibiae black (continued to base above).

Length. — Females, 11–13 mm.; male, 11 mm.

I have seen only one male. It is in the collection of the Boston Society of Natural History.

This subspecies approaches *fisheri* Rohwer from Maryland, and may prove to be the same.

Habitat. — Sharon, Auburndale, and Woods Hole, Massachusetts (June and July); Farmington (Norton) and Westville, Connecticut (June). I have records also from New York, New Jersey, and Virginia, but they may refer to *lobata lobata*.

Tenthredella verticalis (Say).

Tenthredo verticalis Say, Long's Second Expd., vol. 2, 1824, p. 317, n. 2, ♀.

Tenthredo verticalis Leconte, Writ. Thos. Say, vol. 1, 1859, p. 212, n. 2, ♀ (also ed. 1869).

Allantus verticalis Norton, Boston Journ. Nat. Hist., vol. 7, 1860, p. 250, n. 28, ♀ ♂.

Tenthredo verticalis Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 228, n. 5, ♀ ♂.

Tenthredo verticalis Provancher, Nat. Can., vol. 10, 1878, p. 196, n. 5, ♀ ♂.

Tenthredo verticalis Provancher, Faun. Ent. Can., vol. 2, 1883, p. 222, n. 5, ♀ ♂.

Tenthredo verticalis MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 85–86, ♀ ♂.

The type is lost. Type locality, "Northwest Territory."

Female. — Head. — Yellow; the following parts black: back of head except complete or incomplete margins of occiput (lateral lines often extend for some distance on vertex-plate), a large spot on front above antennae and vertex, distinctly trilobed anteriorly and somewhat less distinctly laterally, extending longitudinally from the posterior margin of the head to between the bases of the antennae medially (rarely the posterior lateral lobe is almost entirely cut off from the remainder of the spot by a very narrow line), an elongate spot behind the upper

part of the eye extending about half-way toward the posterior margin of the head, an elongate spot on posterior half of cheek (the lower half almost always not fully developed; the last two spots coalesce sometimes); antennae black (apical segments rarely rufescent), the basal segment yellow on the inside, and very often the second segment is similarly brownish yellow; palpi often greenish. Head behind eyes about as wide as through them, very rarely distinctly narrower; supra-antennal ridges generally fairly prominent; frontal fovea generally broader posteriorly.

Thorax. — Black; the following parts yellow: margin of pronotum (often interrupted) broadening considerably on the lobes of collar, tegulae, pronotal lobe, prosternum quite often completely or in part, V-spot on prescutum (very rarely obscured), a short longitudinal line on mesoscutum on each side of posterior portion of prescutum (occasionally absent), mesoscutellum with its transverse extensions, post-tergite, upper margin of meso-epimeron in part, the meso-episternum rarely with one or more spots or an obtuse-angled band, the pectus often posteriorly with a small spot on each side of the median longitudinal suture, a minute spot usually behind each cenchrus on metascutum, meta-scutellum with its transverse extensions, except very rarely the upper margin of the meta-epimeron narrowly or broadly, except very rarely a spot on the meta-episternum, and the meta-post-scutellum entirely or in greater part. Mesoscutellum moderately convex; meso-episternum fairly sharply or quite sharply pointed.

Abdomen. — Black; the following parts pale yellow, or brownish yellow, or sometimes light brown: basal tergum in greater part (generally with a minute brownish spot laterally about in the middle), sides of 2d, 3d, 4th, and 6th terga (rarely of all terga), a median longitudinal band on same (often absent on 6th), the 5th tergum and very often the 6th entirely or in greater part, the two apical terga rarely, and the venter down to the ovipositing apparatus (rarely entirely).

Legs. — Yellow, or yellowish (tibiae and tarsi often greenish); the following parts black: anterior coxae as a rule slightly at base outside, the intermediate from slightly at base to almost entirely, and the posterior except as a rule a small apical portion, the middle femora as a rule at apex above and rarely taking the form

of a short longitudinal band, apical half or somewhat more of posterior femora, rarely middle tibiae at apex, a small spot at the base and the apical portion of the posterior tibiae.

Wings. — Fore wings usually faintly pale honey-yellow; stigma brown to dark brown, pale at base; costal cell slightly translucent; veins black or blackish, rarely brown. Hind wings hyaline, apical half often very faintly clouded.

Male. — Differs from the female as follows: head behind eyes distinctly narrower than through them; often the black spot above eyes, and the elongate spot on the posterior half of cheek are not fully developed, so that they appear brownish or only faintly brownish; pronotum yellow except a transverse black band on the dorsal aspect which is as a rule continued narrowly and medially on the sides; propleura yellow; mesopleura, except lower portion or very narrow lower border of meso-epimeron, and pectus, yellow (the latter as a rule with a brownish band on each side); the upper half or more of the meta-epimeron, and the meta-episternum, yellow.

Abdomen. — Yellowish, or brownish yellow, or sometimes light brown to brown (the darker colors usually on the apical portion); the following parts black: basal tergum except sides and posterior margin, 2d tergum with a variable amount and interrupted medially and longitudinally, 3d and 4th terga usually with transverse lines at their anterior and posterior margins and also interrupted medially.

Legs. — Yellow, or yellowish (the tibiae and tarsi of the intermediate and posterior pairs brownish, or yellow-brown); the following parts black: a longitudinal band on the posterior coxae and trochanters above (generally interrupted, or incomplete on both), a spot sometimes on the anterior and intermediate trochanters above, anterior femora except rarely with a longitudinally elongate spot at apex above, and a longitudinal band on the intermediate and posterior femora above (often abbreviated basally on the former).

Wings. — Usually hyaline.

Length. — Females, 10–14 mm.; males, 9.5–11.5 mm.

Redescribed from many specimens of both sexes.

Variety. — In a single female from Maine the black behind the upper part of the eye extended all the way back to the posterior margin of the head.

Habitat. — Woods Hole, Martha's Vineyard, Amherst, Auburndale, Lunenburg, Chester, and Sherborn, Massachusetts (May to August inclusive); St. Johnsbury, Burlington, and Amsden, Vermont (June to August inclusive); Durham, New Hampshire; Eastport, Capens, Machias, South West Harbor, and Orr's Isle, Maine (June to August inclusive); Nova Scotia (W. F. Kirby), Quebec (?) (Provancher), and Ontario (June and July, Harrington), Canada; New York; Illinois; Pennsylvania; New Jersey (Norton); "Western States" (Cresson).

This seems to be a widely distributed species, and is quite common in New England. Both sexes were very common in Amherst, Massachusetts, during the spring and summer of 1911, but the following year both were rather rare.

Tenthredella nortoni Smulyan.

Tenthredella nortoni Smulyan, Can. Ent., vol. 47, 1915, p. 321–323, ♂.

The type is in the collection of the United States National Museum: No. 19093. Type locality, Massachusetts.

Male. — Head. — Straw color; the following parts black: the back of head, a large spot on front above antennae and vertex, distinctly trilobed anteriorly and somewhat less distinctly laterally, extending from the posterior margin of the head to between the bases of the antennae medially and connecting rather narrowly about half-way between the posterior margin of the eye and the posterior margin of the head with a smaller elongate spot behind the upper part of the eye which extends back about half-way toward the posterior margin of the head; an elongate brownish spot on the posterior half of cheek, the upper portion of which is black; antennae black, the inside of the basal segment in part rufescent, or straw color. Head behind eyes distinctly narrower than through them; vertex-plate quite convex; supra-antennal ridges fairly prominent.

Thorax. — Black; the following parts straw color: prosternum except medially and longitudinally, a minute spot on the ventral face of the propleura on each side, margin of pronotum (inter-

rupted dorsally) which may broaden out on the posterior dorsal margin of the lobes of collar and on the lower portion of the lateral face of the pronotum, pronotal lobe, a V-spot on prescutum, tegulae (brownish in part), transverse mesoscutel extensions, upper margin of meso-epimeron, an approximately right-angled band on the lower limit of meso-episternum (wider on the anterior half) and which may be narrowly interrupted about in the middle, pectus except a rather broad band on each side and more narrowly meso-anteriorly, a large spot on the meta-episternum, upper margin of meta-epimeron narrowly, transverse metascutel extensions, and the upper margin of the meta-postscutellum narrowly sometimes. Mesoscutellum fairly strongly convex; meso-episternum sharply pointed.

Abdomen. — From pale to quite pale ferruginous; two basal terga completely and more or less of the third or third and fourth except medially and longitudinally, black; sides of basal tergum and basal half of venter straw color.

Legs. — Straw color; the following parts black: the outside of the anterior coxae more or less and the intermediate above or above and outside, the posterior coxae except the inner face and the inner longitudinal half beneath, a longitudinal band on the anterior and intermediate femora above (it may be abbreviated in greater part toward the base on the former), the posterior femora behind and faintly at base before, a longitudinal line on the anterior and intermediate tibiae above which broadens out apically, posterior tibiae entirely or almost entirely, the intermediate tarsi above and the posterior except the apical segment (may be only brownish in both).

Wings. — Fore wings hyaline, or faintly clouded; costa may be brown; stigma brown to dark brown; costal cell only slightly translucent but quite strongly beyond costal cross-vein; veins blackish. Hind wings hyaline, apical portion may be very faintly clouded; veins brownish to blackish.

Length. — 9–10 mm.

Described from one specimen.

This species may be Norton's *angulata*, the type of which is lost. It answers fairly well to the description of *angulata* except in an important respect in connection with the coloration of the

head, *viz.*, the presence of the lobate black spot on the front above the antennae and vertex. It is possible, of course, that Norton failed to mention this, or to bring it out clearly, but he noted it in describing *lobata* and *angulifera*, both of which were described previous to *angulata*. The lobate spot in *lobata* and its relation to the black behind the upper part of the eye, which is the same as in *nortoni*, are accurately noted in a later redescription of *lobata* (Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 229), but the redescription of the coloration of the head of *angulata*, in the same publication, does not differ materially from the original description.

Habitat. — Massachusetts; New York; New Jersey.

Tenthredella angulifera (Norton).

Allantus angulifer Norton, Boston Journ. Nat. Hist., vol. 7, 1860, p. 252, n. 31, ♀ ♂.

Tenthredo angulifera Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 229, n. 7, ♀ ♂.

Tenthredo angulifera Provancher, Nat. Can., vol. 10, 1878, p. 197, n. 6, ♀ ♂.

Tenthredo angulifera Provancher, Faun. Ent. Can., vol. 2, 1883, p. 223, n. 6, ♀ ♂.

Tenthredo angulifera MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 88.

Two female cotypes, both in rather poor condition, in the Harris Collection, in the museum of the Boston Society of Natural History, manuscript number 430: one from Dublin, New Hampshire, taken in July, 1835; the other from Maine, collected by J. W. Randall in 1836, probably in the vicinity of Hallowell, as Mr. Randall did most of his collecting there.

Female. — HEAD. — Yellowish white, or yellowish; the following parts black: back of head, a large spot on front above antennae and vertex, distinctly trilobed anteriorly and less distinctly laterally, extending from the posterior margin of the head to between the bases of the antennae medially and uniting as a rule rather broadly along the posterior margin of the head with a smaller spot occupying the whole area behind the upper part of the eye (sometimes the anterior portion of the latter spot is more or less faded, or better perhaps, the black is not fully developed, and very rarely, too, there is a very small yellow spot in each posterior angle of the vertex-plate); the latter spot as a rule

continued as a narrow angular brownish discoloration for some distance on the cheek along the margin of the eye; posterior half of cheeks as a rule darker yellow, or brownish; antennae black, basal segment sometimes yellowish inside; palpi often greenish. Head behind eyes somewhat narrower than through them; supra-antennal ridges fairly prominent; frontal fovea as a rule wider posteriorly.

Thorax. — Black; the following parts yellowish, or straw color: margin of pronotum (usually interrupted mesodorsally and widening on the posterior dorsal margin of lobes of collar and on the lateral face of pronotum), pronotal lobe, lower portion of lateral face of propleura as a rule, ventral face of propleura, prosternum, tegulae, V-spot on prescutum (usually not complete posteriorly; in a specimen from New York it was completely absent), meso- and metascutellar transverse extensions, the upper margin of the meso-epimeron in greater part rather broadly, an obtuse-angled band on lower limit of meso-episternum (much broader on anterior half and extending somewhat on the pectus), pectus except rather wide lateral and anterior borders, upper margin of meta-epimeron narrowly, meta-episternum almost entirely, and the greater upper portion of the meta-post-scutellum (interrupted medially and longitudinally). Meso-scutellum from quite strongly to strongly convex, and more or less elevated; meso-episternum generally sharply pointed.

Abdomen. — Black; the following parts yellowish white, or straw-white: very often from three to four small and sometimes indistinct spots in a median line at junctures of terga beginning at juncture of second and third, as a rule posterior margins of the six basal terga very narrowly, sides of six or seven basal terga, and venter except the greater part of the terminal portion beyond the sixth sternum.

Legs. — Yellowish, or straw color (anterior tibiae, anterior and middle tarsi often greenish); the following parts black: intermediate coxae at base above and roughly the outer longitudinal half of the posterior, a short longitudinal band on the apical portion of the anterior femora above and a longitudinal band on the intermediate above (latter as a rule abbreviated basally), the apical half of the posterior femora (the black above is as a rule

continued farther up toward the base and sometimes all the way up), a usually interrupted longitudinal line on the anterior and intermediate tibiae above, a small spot at the base and the apical portion of the posterior tibiae, and posterior tarsi except apical segment faintly (rather brownish); basal segments of intermediate tarsi brownish above.

Wings. — Fore wings usually faintly pale honey-yellow; stigma brown to dark brown, pale at base; costal cell slightly translucent, sometimes moderately; veins and nerves blackish, sometimes brown. Hind wings hyaline, apical half usually very faintly clouded.

Male. — The male differs from the female as follows: V-spot on prescutum often abbreviated and sometimes entirely absent; pectus, and meso-episternum except a small longitudinally elongate spot on the upper anterior portion along and usually touching the meso-epimeron entirely straw-white, or straw color; metapostscutellum sometimes entirely black; pale spots at juncture of terga large and somewhat diamond-shaped; venter except greater part of hypopygidium straw-white, or straw color; intermediate coxae as a rule without any black; posterior coxae with a longitudinal black band above (sometimes abbreviated apically) and sometimes with black on outside in addition; posterior trochanters with some black above; posterior femora with a longitudinal band above (broader apically) and its tibiae almost entirely black.

Wings. — Fore wings hyaline, or only faintly clouded.

Length. — Females, 9.5–13 mm.; males, 9.5–10 mm.

Redescribed from fourteen females, including cotypes, and four males.

This species may be, as pointed out by Norton (Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 230) Say's *ventralis,* but there is not sufficient evidence that it is, the type of *ventralis* being lost.

Habitat. — Amherst, Pelham and Chester, Massachusetts (June to August inclusive); Dublin, Hanover and Durham, New Hampshire (July); Orono, Maine (July and August); Norwich, and Mt. Equinox, Vermont (June and July); Tiverton, Rhode Island (August); Ithaca, and Albany (Norton), New York (August); Delaware Water Gap, New Jersey (Viereck); Ohio; Canada.

Tenthredella secunda (MacGillivray).

Allantus angulifer var. *a* Norton, Boston Journ. Nat. Hist., vol. 7, 1860, p. 252, n. 31, ♀.

Tenthredo secundus MacGillivray, Journ. N. Y. Ent. Soc., vol. 5, 1897, p. 105, ♀ ♂.

Tenthredo simulatus MacGillivray, Journ. N. Y. Ent. Soc., vol. 5, 1897, p. 105, ♀.

Tenthredo simulata MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 87.

Tenthredo secunda MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 87-88.

The type of *Allantus angulifer* var. *a* Norton is in the Harris Collection in the museum of the Boston Society of Natural History, manuscript number 430. It is in rather poor condition. It was taken by J. W. Randall in 1836, probably in the vicinity of Hallowell, Maine, where Randall did most of his collecting.

The female type of *Tenthredo secunda* MacGillivray is in the collection of Doctor A. D. MacGillivray, Urbana, Illinois. Type locality, Mt. Washington, New Hampshire. The male paratype is in the collection of Cornell University, Ithaca, New York.

The type of *Tenthredo simulata* MacGillivray is also in the collection of Doctor MacGillivray. Type locality, Winchendon, Massachusetts.

Female. — Head. — Yellow, or pale yellow; the following parts black: the back of head, a large spot on front above antennae and vertex, trilobed anteriorly and less distinctly laterally, extending from the posterior margin of the head to between the bases of the antennae medially and uniting rather broadly along the posterior margin of the head with a smaller spot behind the upper part of the eye occupying the whole area between the posterior margin of the eye and the posterior margin of the head and which is continued angularly and faintly for some distance along eye on cheek (rarely the whole of the latter spot is somewhat faded, or rather, the black is not completely developed); posterior half of cheek brownish yellow; antennae black, basal segment usually rufescent inside. Head behind eyes narrower than through them; supra-antennal ridges as a rule fairly prominent; frontal fovea usually with a slight transverse swelling about in the middle.

Thorax. — Black; the following parts yellow, or pale yellow:

prosternum, propleura except narrow upper portion of lateral face, pronotum except a narrow transverse band on dorsal portion which at its terminus laterally meets an up-and-down band on the lobes of the collar (the latter band is sometimes in part or entirely absent), pronotal lobe, a V-spot on prescutum (very rarely absent), tegulae, transverse mesoscutel extensions, posttergite except a narrow median longitudinal area usually, the upper half to two-thirds of the meso-epimeron, meso-episternum except a longitudinally elongate spot on the upper anterior portion along and touching the meso-epimeron, the pectus except slightly meso-anteriorly usually and a rather broad oblique band on each side (these bands may be broken and often entirely absent but their course is indicated by brownish or very faint brownish bands), transverse metascutel extensions, the meta-postscutellum except at its juncture with the abdomen (very rarely almost entirely black), the upper half to two-thirds of the meta-epimeron, and the meta-episternum. Mesoscutellum generally quite strongly convex; meso-episternum generally sharply pointed.

Abdomen. — From dark dull to pale ferruginous; four basal terga black; the following parts yellowish, or often yellowish ferruginous: sides of from four to six basal terga, posterior margin of first tergum usually, and venter to fifth or sixth segment.

Legs. — Yellowish or straw color (sometimes with a reddish cast in places); the following parts black: small spots on the posterior trochanters above sometimes, a short longitudinal band on the anterior femora at apex and a longitudinal band on the whole length of the intermediate and posterior above (much broader apically on the last), a longitudinal line on the intermediate tibiae and a slightly interrupted one (interrupted somewhat basal to center) on the anterior, the posterior tibiae above and sometimes the whole apical portion also; the apical portion of the posterior tibiae, and the posterior and intermediate tarsi as a rule, brownish.

Wings. — Fore wings hyaline or faintly clouded with pale honey-yellow; stigma from light brown to dark brown, as a rule pale at base; costal cell slightly translucent, sometimes moderately; veins black, or blackish. Hind wings hyaline, apical half usually very faintly clouded; veins usually brownish.

In one specimen from "Mass." the yellow was represented throughout by a bleached straw color.

Male. — The male differs from the female as follows: basal segment of antennae yellowish inside and there may be also a longitudinal line outside; the pectus entirely yellow, or pale yellow, and the meso-epimeron the same except a narrow lower border; the basal segments of the intermediate tarsi may show a longitudinal black line above.

Length. — Females, 10.5–12 mm.; males, 9–9.5 mm.

Redescribed from thirteen females and two males.

After studying the types and examining additional material, I do not hesitate to call *simulata* (MacGillivray) a synonym of this species. The description of *simulata* is not quite complete. The second abdominal tergum, except its sides, is black, not yellowish white, as it might be understood, and the intermediate and posterior femora are with longitudinal black bands above, as in *secunda*.

Habitat. — Auburndale (June), and Winchendon, Massachusetts; Franconia, and Mt. Washington ("near summit"), New Hampshire; Round Bluff, and Machias, Maine (July and August); Saguenay River, Quebec (July), and Ontario, Canada.

Tenthredella eximia (Norton).

Tenthredo eximia Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 231, n. 11, ♀, ♂ (?).

? Tenthredo eximia Provancher, Nat. Can., vol. 10, 1878, p. 198, n. 7, ♂.

? Tenthredo eximia Provancher, Faun. Ent. Can., vol. 2, 1883, p. 224, n. 7, ♂.

Tenthredo novus MacGillivray, Journ. N. Y. Ent. Soc., vol. 5, 1897, p. 105–106, ♀.

Tenthredo eximia MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 87.

Tenthredo nova MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 89-90.

The female type from Mt. Washington, New Hampshire, is lost. The male "type" from Maine, type number 206, is in the collection of the American Entomological Society, Philadelphia, Pennsylvania. This male is certainly not typical, and must be looked upon as a variant, if it is a male of this species at all.

The type of *Tenthredo nova* MacGillivray is in the collection of Doctor MacGillivray, Urbana, Illinois, and was examined. Type locality, Mt. Washington, New Hampshire.

Female. — Head. — Black; the following parts yellow, sometimes pale yellow: clypeus, labrum, mandibles, lower half to two-thirds of cheek, lower orbit, front below antennae, anteriormost portion of supra-antennal ridges, and a short line (narrowing as a rule toward anterior end) at the summit of the inner orbit (rarely this line is shorter than usual and appears as a small elongate spot). Head behind eyes somewhat narrower than through them (difference sometimes slight); supra-antennal ridges generally fairly prominent.

Thorax. — Black; the following parts yellow, or pale yellow: prosternum, ventral face of propleura and usually the lower portion of the lateral face, margin of pronotum except dorsally and as a rule broadening out on the posterior dorsal margin of the lobes of collar, as a rule a spot on the lower portion of the lateral face of the pronotum (usually large, taking in the greater part of same), tegulae, the upper margin of the meso-epimeron (sometimes only in part), a narrow band on the lower limit of the posterior half of the meso-episternum which broadens out into a large angular spot on the anterior half and which extends somewhat on the pectus (rarely the band on posterior half absent), variable posterior mesal portion of pectus, the upper margin of the meta-epimeron narrowly, meta-episternum entirely, or nearly so. Mesoscutellum generally fairly strongly convex; meso-episternum moderately sharply pointed.

Abdomen. — Ferruginous; four basal terga and as a rule the slender portion of the sheath of the ovipositor black; sides of from two to four basal terga, and basal half of venter (sometimes slightly more and sometimes slightly less) yellowish.

Legs. — Yellowish (brownish toward the extremities, the posterior tibiae and tarsi especially as a rule); the following parts black: middle coxae slightly at base above and sometimes a very small spot at apex above, posterior slightly at base above and outside and a small spot at apex above, small spots on the posterior trochanters above and rarely the same on the intermediate, a short longitudinal band on the anterior femora at apex above (rarely reduced to a spot and rarely again continued narrowly nearly to base), a longitudinal band on the intermediate femora above, and approximately the apical half to two-thirds of the

posterior femora except on the ventral face (above continued to base), a longitudinal dash (sometimes faint) on the anterior tibiae at base above, and a longitudinal dash at base or a line down the whole length on the intermediate above, posterior tibiae (sometimes only blackish) except the greater basal portion beneath, and the basal segment or segments of the posterior tarsi (very often only blackish).

Wings. — Fore wings somewhat clouded, entirely or only apical half, very often with a faint pale honey-yellow tinge; stigma brown, pale at base; costal cell moderately translucent; veins black or blackish. Hind wings hyaline, apical half faintly or very faintly clouded.

Male. — The male differs from the female as follows: basal segment of antennae may be yellowish inside; the pectus, and the meso-episternum except a small variable portion along the meso-epimeron yellow; only two basal terga black (third and fourth blackish in part); posterior coxae may have a broad longitudinal band above, and the posterior femora are broadly black above, or both above and behind; anterior tibiae may have a line down the whole length above.

Length. — Females, 10–11 mm.; males, 9–9.5 mm.

Redescribed from eleven females and two males.

What I regard as the male of this species, the typical male at least, is here for the first time described. I have seen only two specimens, one in the collection of the American Entomological Society, and the other in the United States National Museum.

Tenthredella nova (MacGillivray), which I have carefully examined, answers to Norton's description of *eximia* and is undoubtedly the same. Further evidence in support of this view is found in the fact that both were taken in the same locality, Mt. Washington, New Hampshire, and in the interesting additional fact that, of the fourteen specimens of both sexes which I have seen, ten bore labels marked "Mt. Washington, N. H.," and three "N. H.," and were probably taken on Mt. Washington. The fourteenth was labelled "Wash. Terr." Some of those marked "Mt. Washington" were taken near its summit; the height of the mountain is 6293 feet.

I have the following additional records as regards the distribu-

tion of this species: Maine, New Hampshire and Massachusetts (Cresson); New Jersey (Ashmead); Quebec (?) (Provancher), and Ottawa, Ontario (Harrington), Canada. How trustworthy these records are I am unable to say, for, judging from determined material which I have seen, there seems to be a misunderstanding on the part of some as to what this species is.

Tenthredella formosa (Norton).

Tenthredo formosus Norton, Proc. Ent. Soc. Phila., vol. 3, 1864, p. 14, n. 28, ♀ ♂.
Tenthredo formosus Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 231, n. 10, ♀ ♂.
Tenthredo formosa MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 86–87.

The female type, number 201, from Massachusetts is in the collection of the American Entomological Society, Philadelphia, Pennsylvania, and was examined. The male type from Maine is lost.

Female. — Head. — Black, shining; the following parts yellow: clypeus, labrum, mandibles, lower two-thirds of cheeks and lower orbit, front below antennae, anteriormost portion of the supra-antennal ridges, a rather broad line (the inner margin somewhat lobed) extending along the inner orbit from about the middle of the eye to nearly the posterior margin of the head; antennae beyond third segment rufescent except above. Head behind eyes slightly narrower than through them; supra-antennal ridges quite prominent.

Thorax. — Black; the following parts yellow: prosternum, ventral face of propleura and the lower portion of the lateral face, the lower portion of the lateral face of the pronotum, posterior dorsal margin of lobes of collar, tegulae, a minute spot on the prescutum on each side opposite the bases of tegulae, a spot at the posterior end of the mesoscutum immediately in front of each anterior angle of the mesoscutellum, the mesoscutellum on each side almost its whole length (broadly), post-tergite except a narrow median longitudinal area, posterior portion of the upper margin of the meso-epimeron, an obtuse-angled band on the meso-episternum (broader anteriorly), very small posterior mesal portion of pectus, a small spot on the metascutum beneath each cenchrus, a small spot on the metascutellum on each side, the

transverse metascutel extensions, the upper medial portion of the meta-postscutellum, the upper margin of the meta-epimeron narrowly, and the meta-episternum. Mesoscutellum moderately convex; meso-episternum fairly sharply pointed.

Abdomen. — Ferruginous; four basal terga black; the sides of the four basal terga, and the posterior margin of the first narrowly, and the venter to the ovipositing apparatus, yellowish.

Legs. — Yellowish (intermediate and posterior coxae with a reddish tinge); the following parts black: a longitudinal band on the anterior and intermediate femora above, small spots on the posterior trochanters above, a short longitudinal band at base of posterior femora above and a spot at the apex (probably an interrupted band), a rather broad longitudinal line on the anterior and intermediate tibiae above, and the posterior tarsi except the apical segment; the following parts dark ferruginous: apical two-thirds of the posterior femora, posterior tibiae (apical half blackish), and the apical segment of posterior tarsi. Arolia quite large.

Wings. — Fore wings pale honey-yellow, apical half more strongly; stigma brown, pale at base; costal cell quite strongly translucent; veins black. Hind wings faintly clouded.

Length. — 14 mm.

Redescribed from the type specimen.

"The male has most of the tergum rufous, and the breast and coxae of a waxen color" (Norton).

This apparently is a very rare species. The female type specimen is the only one that I have seen, and, as far as I know, there are no records of any having been captured since Norton described the species in 1864.

Tenthredella pallicola (MacGillivray).

Tenthredo pallicola MacGillivray, Can. Ent., vol. 27, 1895, p. 80, ♀.

Tenthredo pallicolus MacGillivray, Journ. N. Y. Ent. Soc., vol. 5, 1897, p. 106, ♀.

Tenthredo pallicolus var. *beulahensis* Rohwer, Can. Ent., vol. 41, 1909, p. 108, ♀.

Tenthredo pallicola MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 89.

The type is in the collection of Doctor A. D. MacGillivray, Urbana, Illinois, and was examined. Type locality, Mt. Washington, New Hampshire, Mrs. A. T. Slosson, collector.

T. pallicolus is only a redescription of *pallicola*, according to Doctor MacGillivray, and was called a new species by mistake.

The type of var. *beulahensis* Rohwer I presume is in the United States National Museum. Type locality, Beulah, New Mexico.

Female. — Head. — Black; the following parts yellow: clypeus, labrum, mandibles, lower half of cheeks, lower orbits, front below antennae, a narrow inner orbit above the base of the antennae, a very narrow longitudinal band on the outside of the basal segment of the antennae; antennae rufescent beyond third segment. Head behind eyes slightly narrower than through them; supra-antennal ridges fairly prominent.

Thorax. — Black; the following parts yellow: the prosternum, the propleura except a small upper portion of the lateral face, a small spot on the lower portion of the lateral face of the pronotum, the posterior margin of the lobes of collar interruptedly, and very broad dorsally, tegulae, an obtuse-angled band on lower limit of meso-episternum, the anterior portion of which is much broader and extends somewhat on the pectus, the pectus except rather broadly on the sides and anteriorly, a small spot on the upper margin of the meso-epimeron below the posterior wings, the upper margin of the meta-epimeron narrowly in part, and the meta-episternum. Mesoscutellum fairly convex; meso-episternum from slightly to moderately pointed.

Abdomen. — Dark dull ferruginous; basal tergum and slender portion of sheath of ovipositor black; the posterior margin of basal tergum on each side narrowly yellowish.

Legs. — Pale ferruginous; the following parts yellowish: coxae, trochanters, basal half of anterior femora (the whole length of the anterior face), basal portions of middle and posterior femora, and the anterior face of the anterior tibiae faintly (in a specimen from New Mexico these yellow parts have a reddish cast); the following parts black: the intermediate coxae very slightly at base above and the posterior slightly above and outside at base, a very narrow incomplete ring at apex of intermediate femora, apical third of posterior femora except ventrally (continued somewhat farther above), a small spot at the base and the apical portion of the posterior tibiae, and the posterior tarsi except the apical segment.

Wings. — Fore wings faintly pale honey-yellow; stigma nearly black, pale at base; costal cell fairly strongly translucent; veins blackish. Hind wings hyaline, apical half faintly clouded.

Length. — 11 mm.

Redescribed from the type specimen.

T. pallicolus var. *beulahensis* (Rohwer) is the same as *pallicola*, since it differs principally from *pallicolus* (MacGillivray) in having "the inner orbits narrowly yellow," and the latter is only a redescription of *pallicola*.

Habitat. — Mt. Washington, New Hampshire; Beulah (on foliage of *Veratrum*, July, Rohwer), and Cloudburst (June), New Mexico.

Tenthredella tricolor (Norton).[1]

Allantus tricolor Harris, MS. (nomen nudum).

Allantus tricolor Norton, Boston Journ. Nat. Hist., vol. 7, 1860, p. 247, n. 22, ♀.

Tenthredo tricolor Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 236, n. 22, ♀.

Tenthredella rohweri Smulyan, Can. Ent., vol. 47, 1915, p. 323, ♀.

The type is in the Harris Collection in the Museum of the Boston Society of Natural History, manuscript number 515; in rather poor condition. It was taken by J. W. Randall in 1836, probably in the vicinity of Hallowell, Maine.

Female. — Head. — Black; the following parts yellow, or yellowish white: clypeus, labrum, mandibles, and a minute elongate spot at the summit of the inner orbit; lower portion of cheek and lower orbit, lower portion of inner orbit, and the inside of the two basal segments of the antennae, ferruginous. Head behind eyes not quite as wide as through them (difference slight); supra-antennal ridges from quite prominent to prominent; posterior portion of frontal fovea sometimes rather shallow.

Thorax. — Black; posterior dorsal margin of the lobes of collar narrowly in part, and a spot on the meta-episternum, yellowish,

[1] *Tenthredo tricolor* Gmelin, 1790, = *Arge pagana* Panzer (Enslin, 1917). Since *Tenthredo tricolor* Gmelin is not *Tenthredella tricolor* (Gmelin), *Tenthredella tricolor* (Norton) is the valid name for this species. *Tenthredella rohweri* Smulyan cannot stand.

or yellowish white; tegulae dull ferruginous, sometimes in greater part black. Mesoscutellum from rather flat to slightly convex; meso-episternum from rather blunt to slightly pointed.

Abdomen. — Ferruginous; four basal terga except usually the posterior mesal portion of the fourth, three basal terga on the venter, and more or less of the two basal sterna, black; sides of basal tergum yellowish, or yellowish white.

Legs. — Reddish ferruginous, paler toward the extremities; anterior tarsi, and anterior tibiae except above, with a yellowish cast; the following parts black: coxae, trochanters, basal half of anterior femora behind, intermediate femora except apical half before, posterior femora, posterior tibiae except one- to two-thirds of basal portion beneath, and the first segment of the posterior tarsi usually (blackish). Arolia fairly large.

Wings. — Fore wings faintly pale honey-yellow; stigma brown, basal half paler; costal cell moderately to fairly strongly translucent; veins black, or blackish. Hind wings hyaline, apical half faintly clouded; veins brownish, subcostal and basal portion of externo-medial usually blackish.

Length. — 11–13 mm.

Redescribed from two females including the type.

Variety. — Two females from Machias, Maine, differ somewhat from the general condition and represent a variety. The basal segments of the antennae, cheeks, and orbits are black; the posterior dorsal margin of the lobes of the collar comparatively broadly, and the tegulae sometimes almost entirely, pale yellow; five basal terga of the abdomen and more of the venter may be black; coxae in part somewhat, and trochanters almost entirely, ferruginous (the ferruginous beyond the coxae may be paler and the intermediate tibiae may have a yellowish cast before); the anterior and intermediate femora almost entirely, and the posterior tarsi except the apical segment, black. Mesoscutellum somewhat more convex; arolia smaller.

Habitat. — Capens, and Machias, Maine (July); Montana; New Jersey (Ashmead); New Hampshire, Colorado, and Canada (Cresson).

Tenthredella basilaris (Provancher).

Tenthredo basilaris Provancher, Nat. Can., vol. 10, 1878, p. 196, n. 3, ♀.
Tenthredo basilaris Provancher, Faun. Ent. Can., vol. 2, 1883, p. 222, n. 3, ♀.
Tenthredo basilaris MacGillivray, Can. Ent., vol. 27, 1895, p. 79, ♀.

The type is in the Provancher Collection, Museum of Public Instruction, Quebec, Province of Quebec, Canada.

Type locality, ? Province of Quebec, Canada.

Female. — HEAD. — Black; the following parts yellow, or pale yellow: clypeus, labrum, mandibles, lower portion of cheek or spot on same, lower orbit usually, a small spot sometimes on hyperclypeus, the anteriormost portion of the supra-antennal ridges often (sometimes rufescent), and a minute elongate spot at the summit of the inner orbit; the two basal segments of the antennae dull ferruginous (the second one usually black in part). Head behind eyes from fully as wide to distinctly narrower than through them; supra-antennal ridges generally fairly prominent.

THORAX. — Black; the following parts yellowish, or yellowish white: the posterior dorsal margin of lobes of collar, tegulae (sometimes brown), and a large spot on the meta-episternum. Mesoscutellum from slightly to moderately convex; meso-episternum moderately sharply pointed.

ABDOMEN. — Dark dull ferruginous; basal tergum black, the second often dusky; sides of first tergum yellowish, or yellowish white.

LEGS. — Ferruginous, usually paler toward the extremities; the following parts black: coxae except the anterior beneath to a variable extent, trochanters above and the posterior sometimes entirely, femora slightly at base above and approximately the apical half of the posterior except beneath usually (above rarely continued to base), a small spot at the base and the apical portion of the posterior tibiae; the following parts dull white, or yellowish: the anterior coxae beneath to a variable extent, the trochanters beneath as a rule, quite often the anterior femora before faintly, the anterior tibiae before, and very often the anterior tarsi before.

WINGS. — Fore wings pale honey-yellow, sometimes rather faint, and often more heavily on apical half; costal cell fairly

strongly translucent; stigma brownish, basal half pale; veins black or blackish, sometimes brown. Hind wings hyaline, apical half faintly clouded; veins brownish.

Length. — 10–11.5 mm.

Redescribed from four specimens.

Variety. — Two females from New Hampshire (one from Jefferson, in the United States National Museum), represent a variety, differing principally from the general condition as follows: the cheeks from lower half to in greater part, lower orbit, inner orbit up to base of antennae, a spot on the hyperclypeus, the anteriormost portion of the supra-antennal ridges, and a short angular line on the upper portion of the inner orbit, dark ferruginous (in one case the inner orbit up to the base of the antennae with a yellowish tinge); antennae beyond third segment rufescent beneath; tegulae brown, and the posterior margin of lobes of collar may be dark ferruginous; from two to three basal terga on venter blackish; anterior coxae entirely black; a longitudinal black band on the basal half of the intermediate femora above and a broader one on the whole length of the posterior above (in one case the latter band widens out and takes in the whole of the apex); no black at apex of posterior tibiae. Arolia larger, being fairly large.

This species is cataloged by Cresson, Dalla Torre, and Konow as a synonym of *signata* (Norton). Provancher himself called it *signata* in his Addit. Faun. Can. Hym., 1889 (p. 473), probably on the authority of Cresson who compared a specimen of *basilaris* with specimens which were determined as *signata*. My own studies lead me to regard *basilaris* (Provancher), for the present at least, as a distinct species, which conclusion is in accord with the views of Mr. W. H. Harrington, a Canadian worker (Can. Ent., vol. 25, 1893, p. 61). This species may indeed approach *signata* which is apparently very variable, but I have had no difficulty thus far in separating the two. I might also add that *basilaris* approaches *tricolor* in certain respects.

Habitat. — Amherst and Springfield, Massachusetts (June); Jefferson and Franconia, New Hampshire (June); Capens, Maine (July); Newport, New York (May); Quebec (?) (Provancher), and Ottawa, Ontario (Harrington), Canada.

Tenthredella signata (Norton).

Allantus signatus Norton, Boston Journ. Nat. Hist., vol. 7, 1860, p. 247, n. 23, ♀.
Tenthredo signatus Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 232, n. 13, ♂ ♀.
Tenthredo signata Provancher, Nat. Can., vol. 10, 1878, p. 201, n. 17, ♂.
Tenthredo signata Provancher, Faun. Ent. Can., vol. 2, 1883, p. 227, n. 17, ♂.
Tenthredo remota MacGillivray, Can. Ent., vol. 27, 1895, p. 81, ♀.
Tenthredo slossonii MacGillivray, Can. Ent., vol. 32, 1900, p. 179, ♂.
Tenthredo signata MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 85.
Tenthredo slossoni MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 89.

Two female cotypes in the Harris Collection in the Museum of the Boston Society of Natural History, manuscript number 431. In one the head and abdomen are missing. Type locality, Hallowell, Maine (on golden-rod in September), J. W. Randall, collector.

The male type from Maine is in the collection of the American Entomological Society, Philadelphia, Pennsylvania, number 208.

The type of *Tenthredo remota* is in the collection of Doctor A. D. MacGillivray, Urbana, Illinois, and was examined. Type locality, Franconia, New Hampshire.

The type of *Tenthredo slossonii* is also in Doctor MacGillivray's collection and was also examined. Type locality, Franconia, New Hampshire.

Female. — Head. — Black; the following parts varying from yellow to cream-white: clypeus, labrum, mandibles, lower portion to lower half of cheeks and lower orbit, rarely a minute spot on the anteriormost portion of the supra-antennal ridges, and a minute elongate spot at the summit of the inner orbit; antennae sometimes dull rufescent beneath beyond the third segment. Head behind eyes as wide as through them; supra-antennal ridges generally prominent.

Thorax. — Black; the following parts yellow, or pale yellow: broad margin of the prosternum often, the posterior dorsal margin of the lobes of collar broadly and as a rule the margin of the remaining portion of the pronotum from in part to entirely, the lateral face of the pronotum sometimes in greater part, tegulae, upper margin of meso-epimeron, a short oblique band on the posterior half of the meso-episternum, small posterior mesal

portion of pectus usually (often reduced to a small spot at the posterior end on each side of the median longitudinal suture), meta-episternum entirely or almost entirely, the upper margin of the meta-epimeron narrowly but sometimes broadly, a spot sometimes on each side of the post-tergite, the meso- and meta-scutellar transverse extensions sometimes, and the meta-post-scutellum in greater part. Mesoscutellum generally moderately convex; meso-episternum from moderately to quite sharply pointed.

Abdomen. — Ferruginous, usually bright; from two to four basal terga, and usually one to two basal terga on the venter, black; sides of the basal tergum, and usually the posterior margin narrowly, yellow, or pale yellow.

Legs. — Yellow, or pale yellow (sometimes ferruginous yellow and usually in part brownish yellow); the following parts black: coxae usually slightly at base and sometimes a broad longitudinal band on the intermediate and posterior above, trochanters with more or less above, a longitudinal band on the femora above (widely interrupted sometimes on the intermediate and posterior and often on the anterior, the intermediate sometimes black behind and the posterior sometimes also blackish before), a broad longitudinal line on the anterior and intermediate tibiae above (sometimes interrupted), posterior tibiae except more or less of the basal portion beneath, and the posterior tarsi except the apical segment.

Wings. — Fore wings faintly pale honey-yellow, sometimes practically hyaline; stigma brown, usually dark brown and paler at base; costal cell generally quite strongly translucent; veins black, sometimes only blackish. Hind wings hyaline, apical half often very faintly clouded; veins from brown to blackish.

Length. — 11–13 mm.

Variant 1. — Oblique yellow band on the posterior half of the meso-episternum present but narrow and broken, posterior femora black except slightly beneath at base [*remota* (MacGillivray)].

Variant 2.—Oblique yellow band on the meso-episternum reduced to a small spot near the base of the intermediate coxae; coxae in greater part blackish; trochanters black; anterior and

intermediate femora black behind (latter somewhat blackish before), and the posterior black except ventrally. Fore wings distinctly pale honey-yellow.

Variant 3. — Lower orbit black, and only a minute spot on the lower portion of the cheek; meso-epimeron very narrowly and brokenly margined above, and no trace of an oblique band on meso-episternum; only a yellow spot on the meta-episternum, and the meta-postscutellum is black; coxae in greater part black; posterior femora blackish before.

Variant 4. — Cheeks and lower orbits black; upper margin of the meso-epimeron black, and no trace of an oblique band on the meso-episternum; only a very small spot on the meta-episternum, and the meta-postscutellum black; coxae except small apical portions black; posterior femora blackish before.

Variant 5. — Lower orbit black, and only a spot on the lower portion of the cheek; the upper margin of the meso-epimeron very slightly yellowish immediately in front of the meta-episternum but no trace of the oblique band on the posterior half of the meso-episternum; a small spot on the meta-episternum; the meta-postscutellum black; anterior coxae above and slightly at base beneath, and the intermediate and posterior practically entirely, black; intermediate and posterior trochanters black; anterior femora except before, and the intermediate and the posterior, black; posterior tibiae entirely black.

Male. — Head. — Black; the following parts yellow, or pale yellow: clypeus, labrum, mandibles, lower portion to lower half of cheeks and lower orbits, and a minute elongate spot at summit of inner orbit; antennae often not so deeply black beneath beyond the third segment, and rarely quite pale. Head behind eyes narrower than through them (difference sometimes very slight); supra-antennal ridges prominent.

Thorax. — Black; the following parts yellow, or yellowish: prosternum usually, the ventral face of the propleura entirely or in greater part usually, the posterior dorsal margin of the lobes of collar narrowly or broadly and quite often the posterior lateral margin of the same in part, as a rule the lateral face of the pronotum from slight lower portion to entirely, more rarely the

whole pronotum except a narrow median band from lower margin to lower margin, tegulae, the upper margin of the meso-epimeron, a narrow or broad and sometimes angulated band on the whole or nearly the whole length of the meso-episternum, pectus from posterior half to entirely (the black between the yellow on the pectus and the meso-episternum is often faded or not fully developed so that the two are entirely yellow except for the upper anterior portion of the latter along the meso-epimeron), the post-tergite often from slightly to entirely, the upper margin of the meta-epimeron (sometimes very broadly), meta-episternum entirely or almost entirely, and usually the meta-postscutellum from in part to entirely. Mesoscutellum slightly convex, sometimes moderately; meso-episternum rather blunt, often moderately pointed.

Abdomen. — Ferruginous, sometimes quite pale, and sometimes again quite dull; the basal tergum, the second from small anterior portion to almost entirely, and sometimes the two apical segments, blackish or black; the sides of the basal tergum, and usually the posterior margin, yellowish.

Legs. — From pale to dull ferruginous; the following parts yellowish: coxae except a broad longitudinal black band on the intermediate and posterior (rarely the black on latter more extensive), trochanters except more or less black above, anterior femora before or entirely and a longitudinal black band above (more rarely black behind), the intermediate femora very often before, and quite often the anterior tibiae and tarsi before; the following additional parts black: a longitudinal black band on the intermediate and posterior femora above (rarely interrupted on the former and quite often, and usually widely, on the latter, so that it is indicated only by an elongate spot at the base and apex), often a longitudinal line on the anterior and intermediate tibiae above, posterior tibiae as a rule from slightly at apex to apical half (rarely entirely blackish), rarely the basal segments of the anterior and intermediate tarsi above, and usually the posterior tarsi except the apical segment.

Wings. — Fore wings hyaline or faintly clouded, apical half sometimes strongly clouded, and rarely entirely pale honey-yellow; costa basal to stigma in part or entirely black sometimes;

stigma from light brown to nearly black, as a rule paler at base; costal cell moderately to strongly translucent; veins blackish or black, rarely brown. Hind wings hyaline, or with the apical half faintly clouded, rarely entirely faintly clouded; veins blackish, or brown.

Length. — 9.5–11 mm.

Redescribed from eight females and ten males including types.

This species is apparently a very variable one (see *Constancy of Characters*). The specimens I have examined, however, formed practically a complete series.

Tenthredella remota (MacGillivray) differs from the typical condition principally in having the posterior femora almost entirely black. I cannot readily separate *slossonii* of the same author from the series of males that I have examined.

Habitat. — Amherst and Chester, Massachusetts (August); Durham, Franconia, Bretton Woods, "Twin Mountain" and Mt. Washington, New Hampshire (June and July); Hallowell, Orono and Waldoboro, Maine (July and August); Darien, Connecticut (June); Ithaca, New York; New Jersey (Ashmead); Labrador, and Quebec (?) (Provancher), Canada.

Tenthredella semirubra (Norton).

Tenthredo semirubra Norton, Proc. Ent. Soc. Phila., vol. 3, 1864, p. 14, n. 29, ♀.
Tenthredo semirubra Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 236, n. 24, ♀ ♂.
? Tenthredo semirubra Provancher, Nat. Can., vol. 13, 1882, p. 299, n. 25, ♀.
? Tenthredo semirubra Provancher, Faun. Ent. Can., vol. 2, 1883, p. 748, n. 25, ♀.
? Tenthredo barnstonii MacGillivray, Can. Ent., vol. 27, 1895, p. 81, ♂.
Tenthredo semirubra Rohwer, Can. Ent., vol. 41, 1909, p. 148, ♂.

The types are lost. Type locality of female, "Massachusetts"; that of male not given.

The type of *barnstoni* W. F. Kirby is in the British Museum; I have not seen it.

Female. — Head. — Black; the following parts yellow to cream-white; clypeus (sometimes only lower two-thirds), labrum, mandibles, and a minute elongate spot at the summit of the inner orbit (very often discolored); antennae usually rufescent to a variable extent beyond the third segment. Head behind eyes

from slightly wider to very slightly narrower than through them; supra-antennal ridges from moderately to quite prominent.

Thorax. — Black; tegulae quite often with a paler margin; meta-episternum rarely with a white spot. Mesoscutellum only slightly convex; meso-episternum quite sharply pointed, rarely only slightly.

Abdomen. — Ferruginous; two to four basal terga, and venter from slightly at base down to third sternum, black; the sides of the basal tergum cream-white, but rather narrowly.

Legs. — Black; the following parts yellowish, or straw color: anterior femora usually from slightly at apex to in greater part before, anterior tibiae except above, or behind, and the anterior tarsi (the basal segments as a rule darker above, or behind); the intermediate tibiae before, and its tarsi, from pale yellow-brown through brown to reddish brown (the basal segments of the latter as a rule darker above, or behind, and often blackish); the apical segment of the posterior tarsi brown, or reddish brown.

Wings. — Fore wings pale honey-yellow; costa usually dark brown, or blackish; stigma dark brown, rarely pale brown, slight basal portion usually paler; costal cell strongly translucent; veins blackish, or black, rarely brown. Hind wings hyaline, apical half faintly clouded.

Male. — The male differs from the female as follows: a small, or minute spot often on the lower portion of the cheek next to the eye; tegulae sometimes brown and sometimes pale yellow-brown; a pale yellow spot on the meta-episternum; abdomen with only the basal, and the second tergum in part, black; more or less of the anterior coxae and trochanters beneath quite often, and the anterior femora entirely or almost entirely before, yellowish, or straw color; anterior tarsi sometimes brownish with the basal segments above black; the middle trochanters often beneath, and as a rule the middle femora in greater part or entirely before, and often the middle tibiae before, yellowish, or straw color. Head behind eyes more or less narrower than through them, and sometimes as wide; supra-antennal ridges often prominent to only half-way toward the anterior ocellus; mesoscutellum from rather flat to slightly convex; meso-episternum from moderately sharply pointed to blunt.

WINGS. — Fore wings more often only faintly clouded.

Length. — Females, 10.5–14.5 mm.; males, 9–11 mm.
Redescribed from seven females and six males.
(For remarks on this species see *Constancy of Characters.*)

Habitat. — Orono, and South West Harbor, Maine (June and July); Intervale, and Mt. Washington, New Hampshire (June); Amherst, Auburndale, Melrose, and Taunton, Massachusetts (June to August inclusive); Florissant, Colorado ("on flowers of *Heracleum lanatum*," July, Rohwer); Alaska; Cap Rouge, Quebec (Provancher), and Nerepis, New Brunswick (August, Rohwer), Canada.

Tenthredella mutans (Norton).

Tenthredo mutans Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 236, n. 23, ♂.
Tenthredo mutans Provancher, Nat. Can., vol. 10, 1878, p. 201, n. 16, ♂.
Tenthredo mutans Provancher, Faun. Ent. Can., vol. 2, 1883, p. 227, n. 16, ♂.
Tenthredo mutans MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 90.

The type from Canada, No. 229, is in the collection of the American Entomological Society, Philadelphia, Pennsylvania, and was examined.

Male. — HEAD. — Black; the following parts cream-white: clypeus, labrum, mandibles, lower portion of cheek and lower orbit, and a minute elongate spot at the summit of the inner orbit; antennae rufescent beneath beyond the third segment. Head behind eyes very slightly narrower than through them; supra-antennal ridges quite prominent.

THORAX. — Black; a spot on the meta-episternum, and one on the posterior end of the pectus on each side of the median longitudinal suture, white. Mesoscutellum moderately convex; meso-episternum quite sharply pointed.

ABDOMEN. — Light ferruginous; the basal tergum, the anterior half of the second, and a fainter band along the posterior margin of the latter, black.

LEGS. — Coxae and trochanters black, the anterior in greater part beneath dull yellowish; anterior and intermediate femora black, the former dull yellowish and the latter yellowish brown

before; the posterior femora ferruginous with a longitudinal black band above; anterior tibiae dull yellowish, intermediate brown, both blackish above; posterior tibiae ferruginous; anterior tarsi dull yellowish and the intermediate brown, both blackish above; posterior tarsi black, apical segment ferruginous.

Wings. — Fore wings clouded, apical half strongly; costa deep brown; stigma almost black; costal cell quite strongly translucent; veins blackish. Hind wings hyaline, apical portion faintly clouded.

Length. — 11.5 mm.

Redescribed from one male.

Habitat. — Massachusetts; New Hampshire (Cresson); Canada.

Tenthredella mellina (Norton).

Allantus mellinus Harris, MS. (nomen nudum).

Allantus mellinus Norton, Boston Journ. Nat. Hist., vol. 7, 1860, p. 248, n. 24, ♀ ♂.

Tenthredo mellinus Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 227, n. 2, ♀ ♂.

Tenthredo mellina Provancher, Nat. Can., vol. 10, 1878, p. 195, n. 2, ♂, ♀ (?).

Tenthredo mellina Provancher, Faun. Ent. Can., vol. 2, 1883, p. 221, n. 2, ♂, ♀ (?).

The types, manuscript number 516, are in the Harris Collection in the Museum of the Boston Society of Natural History, Boston, Massachusetts. Both are in rather poor condition, the male in particular, only the thorax, wings, and the intermediate and posterior legs remaining. The type locality is probably the vicinity of Hallowell, Maine; J. W. Randall, collector.

Female. — Head. — Pale yellowish brown; the following parts yellow: clypeus, labrum, mandibles, lower portion to fully lower half of cheek, lower orbit, front below antennae, anterior portion of supra-antennal ridges, inner orbit above base of antennae, a faint narrow line sometimes along the posterior margin of the head, and along the sides and above the occiput (the yellow on the front below the antennae extends sometimes above the bases of the antennae on each side of the frontal fovea, giving the pale yellow-brown on the front above the antennae a distinctly trilobed anterior margin). Head behind eyes narrower than through them; supra-antennal ridges fairly prominent, some-

times only to about half-way toward the anterior ocellus; antennae generally long.

THORAX. — Pale yellowish brown; the following parts yellow, or yellowish: posterior margin of lobes of collar (somewhat broader dorsally) and sometimes the margin of the greater part of the whole pronotum, pronotal lobe, tegulae, a short faint longitudinal line sometimes on the mesoscutum on each side of the prescutum opposite the tegulae, the mesoscutellum often in part or entirely with its transverse extensions, post-tergite, and metascutellum sometimes with its transverse extensions, a large spot on the meta-episternum, and the upper portion of the meta-postscutellum as a rule. Mesoscutellum generally markedly convex and elevated; meso-episternum sharply pointed.

ABDOMEN. — Pale yellowish brown, somewhat discolored apically (due to age in all probability); sides of the basal tergum, and sometimes this tergum irregularly in greater part, and the basal half or more of the venter, yellowish, or yellowish white.

LEGS. — Pale yellowish brown; the following parts yellowish: anterior coxae entirely or almost entirely and often the intermediate in part, trochanters, anterior femora except above and the intermediate and posterior slightly at base, and the anterior tibiae sometimes before.

WINGS. — Fore wings usually faintly honey-yellow; stigma from brownish to dark brown, base and upper part usually pale; costal cell moderately translucent; veins black. Hind wings hyaline, apical half very faintly clouded.

Male. — The male differs from the female as follows:

HEAD. — Cheeks in greater part yellow; a black spot on the front above antennae (the greater diameter transverse), a very small elongate spot on the vertex-plate on each side, and the lateral sutures of the occiput, black; antennae with a small black spot on the outside of each of the two basal segments, and blackish above beyond the third segment.

THORAX. — A narrow transverse black band on the dorsal aspect of the pronotum; the pronotum almost entirely, the pectus, the mesopleura, and a V-spot on the prescutum, yellowish.

Legs. — All the coxae, the anterior femora except a short longitudinal band at the apex above, and the intermediate except a band on the whole length above, yellowish; a black longitudinal band on the apical half of the posterior coxae, and a dash on the intermediate and posterior femora at base above.

Length. — Females, 10.5–12 mm.; male, 10.5 mm.

Redescribed from five females including the type specimen, and one male.

Habitat. — Amherst and Springfield, Massachusetts (July); Orono, Maine (July); White Mountains, New Hampshire; New Jersey (Ashmead); Chilinguck Depot, "Washington Territory" (Norton); Popoff Island, Alaska (on *Heracleum lanatum*, Kincaid). The following records from Canada: Quebec (?) (Provancher); Ottawa, Ontario (Harrington); Nerepis, New Brunswick (July, Rohwer); Labrador (Norton).

Tenthredella macgillivrayi Smulyan.

Tenthredo mellinus var. *a* Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 227, n. 2, ♀.

Tenthredella macgillivrayi Smulyan, Can. Ent., vol. 47, 1915, p. 323–324, ♀.

? *Tenthredo mellina* MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 84 (in part).

The type is in the collection of the Museum of Comparative Zoölogy, Harvard University, Cambridge, Massachusetts: No. 8856. Type locality, Norway (Norton), Maine.

A paratype from New Hampshire ("Twin Mt.") is in the collection of the New Hampshire Agricultural Experiment Station, Durham, New Hampshire.

A metatype from New York (Gloversville) is in the New York State Collection, New York State Museum, Albany, New York.

Female. — Head. — Dark ferruginous: the following parts yellow: clypeus, labrum, mandibles, a small spot at the base of the antennae near eye, and a very faint narrow complete or partial inner orbit (in a New York specimen which I have seen the inner orbit was more distinct); a small spot in the anterior portion of the frontal fovea, and the occiput narrowly below and on the sides, black. Head behind eyes only very slightly narrower than through them; supra-antennal ridges fairly prominent and sometimes only to about half-way toward the anterior ocellus.

THORAX. — Dark ferruginous; the following parts black: prosternum, propleura, lateral face of pronotum in part faintly, a large spot on the mesoscutum on each side, the lower margin of the meso-epimeron in part sometimes, small posterior mesal portion of pectus, and the metascutum anterior to cenchri; tegulae and meta-episternum pale yellow. Mesoscutellum only slightly convex; meso-episternum from fairly sharply to quite sharply pointed.

ABDOMEN. — Dark ferruginous; sides of basal tergum yellowish white.

LEGS. — Darkish ferruginous (paler toward the extremities); anterior pair yellowish before; coxae sometimes slightly at base, and approximately the apical half of the posterior femora except beneath, black.

WINGS. — Front wings pale honey-yellow; stigma brown, basal half paler; costal cell from fairly to quite strongly translucent; veins black, or blackish, brown toward base of wing. Hind wings faintly honey-yellow; veins brown.

Length. — 10.5–11 mm.

Described from two specimens. The four specimens which I have seen are quite constant, and are apparently quite distinct from *mellina* (Norton). Indeed, the species is apparently nearer *xantha* (Norton).

Habitat. — Norway (Norton), Maine; Twin Mountain, New Hampshire; Gloversville, New York (August); "Can."

Tenthredella xantha (Norton).

Tenthredo xanthus Norton, Proc. Ent. Soc. Phila., vol. 3, 1864, p. 13, n. 26, ♀.
Tenthredo xanthus Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p 228, n. 3, ♀.
? Tenthredo mellina MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 84 (in part).

Type and a number of paratypes from Colorado in the collection of the American Entomological Society, Philadelphia, Pennsylvania, were examined. Type, No. 202.1.

Female. — HEAD. — Ferruginous; the following parts yellow, or pale yellow: clypeus, labrum, mandibles, lower portion (sometimes as much as half) of cheeks, lower orbits, front below anten-

nae, anteriormost portion of supra-antennal ridges usually, narrow inner orbits above bases of antennae; the following parts black: a variable area usually along the sides and above the foramen, lateral sutures of occiput, a small spot in the anterior portion of the frontal fovea, and usually a minute spot outside and touching each posterior ocellus, and the antennae beyond the second segment to a variable extent. Head behind eyes somewhat wider than through them; supra-antennal ridges prominent to about half-way toward the anterior ocellus; antennae as long as, or slightly longer than, the head and thorax.

Thorax. — Ferruginous (tegulae paler, and usually yellow-brown); the following parts yellow, or pale yellow: prosternum from in part to entirely, ventral face of propleura usually to a variable extent, small lower portion of lateral face of propleura sometimes, sometimes a small spot on the lower margin of the lateral face of the pronotum, the posterior dorsal margin of the lobes of collar and usually rather broadly, tegulae sometimes, the upper margin of the meso-epimeron in part, the posterior mesal portion of the pectus usually (rarely as much as half), upper margin of meta-epimeron in part or entirely, and a large spot on the meta-episternum; the following parts black: the whole prothorax except the parts named above (and the pronotal lobe and usually a small adjacent area which are ferruginous), a small spot usually on the anteriormost portion of the prescutum, a spot on the mesoscutum on each side, the meso-epimeron usually to a variable extent, the meso-episternum often narrowly along and touching the meso-epimeron and sometimes posterior portion slightly, and the pectus except small antero-lateral portion (and the yellow part named above), metascutum preceding cenchri, meta-epimeron, portion of meta-episternum not yellow, and the meta-postscutellum at its juncture with the abdomen. Mesoscutellum from slightly to moderately convex; meso-episternum from rather blunt to moderately pointed.

Abdomen. — Ferruginous; sides of basal tergum yellowish; the following parts black: the basal terga at their junctures narrowly, and as a rule the first, second, third and fifth terga on venter.

Legs. — Ferruginous (tarsi usually paler); the following parts yellow, or pale yellow: anterior coxae in greater part, the middle

and posterior coxae from in part to entirely beneath, trochanters except above, anterior femora and tibiae before (usually faintly on latter); the following parts black: anterior coxae slightly at base above, a broad longitudinal band (usually broken or interrupted and often widely) on middle and posterior coxae above, small spots on trochanters above, and femora very slightly at base above. Arolia as a rule fairly large.

Wings. — Fore wings pale honey-yellow, as a rule more deeply on apical half; stigma dark brown to black, basal half pale; costal cell fairly strongly translucent; veins black. Hind wings hyaline, apical half as a rule faintly pale honey-yellow; subcostal as a rule like the costa in color, other veins blackish.

Length. — 11–12.5 mm.

Redescribed from four specimens.

Habitat. — Orono and South West Harbor, Maine (June and July); New Hampshire; Yakima City, "Washington Territory"; Beulah, New Mexico (July); Colorado.

Tenthredella redimacula (MacGillivray).

Tenthredo redimacula MacGillivray, Can. Ent., vol. 27, 1895, p. 78, ♀.
Tenthredo redimacula MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 84.

The type is in the collection of Doctor A. D. MacGillivray, Urbana, Illinois, and was examined.

Type locality, Mt. Washington, New Hampshire, Mrs. A. T. Slosson, collector.

Female. — Head. — Dull ferruginous (antennae paler); the following parts black: the back of head along the sides and above the foramen (the black along the sides often continued upward to the vertex), the lateral sutures of the occiput, a spot on front above antennae extending from between the bases of the antennae to the vertex-plate but as a rule rather broadly interrupted transversely across the region of the anterior ocellus (rarely this spot is continued to the posterior margin of the head and transversely to the eyes), a band from the base of each antenna to clypeus, often the lower margin of the cheek narrowly and the lower orbit, and rarely also the lower or anterior margin of the hyperclypeus; the following parts pale yellow: clypeus, labrum, mandibles, as a rule

a very narrow complete or partial inner orbit and sometimes only a minute elongate spot at the summit; palpi usually reddish in part. Head behind eyes as wide as through them, sometimes slightly narrower; vertex-plate distinctly wider than long; supra-antennal ridges from moderately to fairly prominent, but sometimes only at base of antennae; antennae as a rule but slightly longer than the head and thorax.

Thorax. — Dull ferruginous (tegulae paler, and usually yellow-brown); the following parts black: the whole prothorax except the posterior dorsal margin of lobes of collar (and often this is yellowish), a spot of variable size on the anterior portion of the prescutum, and a usually larger spot on each side of the mesoscutum, posterior margin of mesoscutellum, meso-epimeron from lower half to entirely, a narrow longitudinal band as a rule on the anterior portion or on the whole length of the meso-episternum along and touching the meso-epimeron (rarely the meso-episternum in greater part), pectus (the black as a rule extends somewhat on the posterior portion of the meso-episternum), meta-scutum anterior to cenchri, metascutellum sometimes from in part to entirely, the lower half of the meta-epimeron to entirely, meta-episternum, and the meta-postscutellum at its juncture with the abdomen; meta-episternum with a pale yellow spot. Mesoscutellum only slightly, but sometimes fairly strongly convex; meso-episternum rather blunt.

Abdomen. — Ferruginous, or dull ferruginous; the following parts black: rarely the posterior portion of the basal tergum, the second, third and fourth terga from solidly to only at their junctures, but as a rule more or less solidly, the three basal segments of the venter and variably and irregularly beyond (rarely practically the whole venter), and the sheath of the ovipositor in part or entirely; sides of basal tergum yellowish white.

Legs. — Pale ferruginous (tarsi usually still paler); the following parts black: anterior coxae (rarely irregularly), middle and posterior coxae irregularly but sometimes entirely, trochanters usually with a variable amount above and sometimes entirely, femora very slightly at base above, the anterior and intermediate at apex above, and the apical fourth to one-third of the posterior (rarely the black at base and apex on all femora united), middle

and hind tibiae slightly at base and sometimes faintly at apex; the following parts yellowish, or straw-color: the anterior femora from in greater part to almost entirely before and very often the intermediate before faintly, anterior tibiae before or except only above, intermediate except at apex or in part or entirely above, and the posterior except the apical third usually and except sometimes above in addition.

WINGS. — Fore wings from faintly to distinctly pale honey-yellow; stigma from ferruginous to brown, as a rule pale at base; costal cell fairly strongly translucent; veins light brown, rarely blackish. Hind wings hyaline, apical half very faintly clouded.

Length. — 10–11 mm. Rather robust.

Redescribed from eight specimens.

Habitat. — Mt. Washington, New Hampshire (July). One specimen was taken at an altitude of 5500 to 6000 feet.

Tenthredella cogitans (Provancher).

Allantus cogitans Provancher, Nat. Can., vol. 10, 1878, p. 163, n. 3, ♀.
Tenthredo cogitans Cresson, Trans. Amer. Ent. Soc., vol. 8, 1880, p. 43, ♀.
Allantus cogitans Provancher, Faun. Ent. Can., vol. 2, 1883, p. 212, n. 3, ♀.
Tenthredo neoslossoni MacGillivray, Can. Ent., vol. 46, 1914, p. 138, ♀.
Tenthredo neoslossoni MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 84.

The type is in the Provancher Collection, Museum of Public Instruction, Quebec, Province of Quebec, Canada.

Type locality, ? Province of Quebec, Canada.

The type of *neoslossoni* is in Doctor MacGillivray's collection where I examined it. Type locality, Franconia, New Hampshire.

Female. — HEAD. — Black; the following parts yellowish: clypeus, labrum, mandibles, lower orbit, front below antennae, a small elongate spot at the summit of the inner orbit (somewhat discolored); antennae dull ferruginous (in a Canadian specimen which I have seen they were practically black beyond the two basal segments). Head behind eyes fully as wide as through them; supra-antennal ridges moderately prominent and that only immediately above the bases of antennae; frontal fovea in greater part shallow; antennae stoutish; front above antennae and vertex finely roughened by shallow and irregular punctures.

THORAX. — Black; the following parts pale cream-color: posterior dorsal margin of lobes of collar broadly, mesoscutellum, and a large spot on the meta-episternum; tegulae dark ferruginous. Prescutum and mesoscutum very finely and densely punctate; mesoscutellum moderately convex; meso-episternum with its anterior upper portion roughened by rather coarse and irregular punctures, and moderately pointed.

ABDOMEN. — Black; third, fourth, and fifth terga with their corresponding sterna dull ferruginous, and the sides of the basal tergum pale cream-color.

LEGS. — The following parts black: anterior coxae above and outside and beneath at base, the middle and posterior coxae, trochanters, a narrow longitudinal band on the anterior femora above, the posterior femora entirely and the intermediate except the apical half before, and apical third of posterior tibiae; the following parts ferruginous: the remainder of the anterior coxae and anterior and intermediate femora, the anterior tibiae except the anterior face, the intermediate tibiae and the basal two-thirds of the posterior; the following parts cream-white: anterior face of anterior tibiae and all the tarsi.

WINGS. — Fore wings faintly pale honey-yellow; stigma brown; costal cell fairly strongly translucent; veins blackish. Hind wings hyaline, apical half faintly clouded.

Length. — 10 mm. Robust.

Redescribed from one specimen.

Tenthredella neoslossoni (MacGillivray) is the same as a specimen of *cogitans* in the collection of the American Entomological Society. This specimen was received by Cresson from Provancher himself and is, therefore, a metatype, or at least an authentic specimen.

Habitat. — Franconia, New Hampshire; Quebec (?) (Provancher), Canada.

Unidentified and Misplaced Species.

Tenthredo angulata Norton.

Tenthredo angulatus Norton, Proc. Ent. Soc. Phila., vol. 3, 1864, p. 13, n. 27, ♂.
Tenthredo angulatus Norton, Trans. Amer. Ent. Soc., vol. 2, 1868–9, p. 230, n. 9, ♂.
Tenthredo angulata MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 87.

The type of this species is lost.

Norton's original description is as follows: "Black, with the orbits, face below antennae, collar, V spot on thorax, an angular line and spots on pleura and the breast white; apical half of abdomen rufous. (Long 0.32. Br. wings 0.70 in.)

"♂. Shining black; antennae very long, enlarged and flattened in middle, 3rd joint a little longer than 4th; head polished, an orbital line interrupted at summit and diverging from outer side of eye in its upper half, the face below antennae, edge of anterior angle, V spot on thorax, a large slender angular line on pleura, a spot above posterior coxae and the breast, white; coxae black above; the four anterior legs white, black above; posterior legs black, their trochanters white and femora in the middle whitish; abdomen rufous, the two basal segments and sides of third black, at base beneath paler; wings hyaline, nervures blackish.

"Massachusetts. (Coll. Ent. Soc. Philad.) One specimen.

"This resembles *T. dissimilis*, especially in the length and form of antennae, but there is no angular line on the pleura of that."

It is quite possible that I have redescribed this species as new under the name of *nortoni*. See discussion in connection with *nortoni*.

Tenthredo frigida MacGillivray.

Tenthredo frigida MacGillivray, Can. Ent., vol. 27, 1895, p. 80, ♂.
Tenthredo frigida MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 88.

The type of this species is probably lost.

Doctor MacGillivray's description is as follows:

"♂ Black, with the following parts yellowish-white: clypeus, labrum, the mandibles except tips which are rufous, cheeks, tegulae, collar, a spot above anterior coxae, a line on pleurae, a

spot above posterior coxae, a narrow margin to the sides of the basal plates, the prosternum, the pectus, the anterior coxae, the anterior trochanters, and femora except a black line above; remainder of legs rufous except a black line above on the middle femora and the posterior trochanters and a black spot at the base of the posterior femora above, and the apices of the segments of the posterior tarsi black; the abdomen except the basal half of the first segment, rufous; costa rufous, stigma black; veins black; clypeus emarginate; third segment of the antennae one-third longer than fourth; front deeply hollowed out between the eyes; eyes strongly converging below. Length, 10 mm.

"*Habitat.* — Mt. Washington, New Hampshire (Mrs. Slosson); Olympia, Washington (Trevor Kincaid).

"This species is related to *rubella*, Cress., but differs in having the four anterior femora with a black line above."

The type is not in Doctor MacGillivray's collection, and, according to him, it is probably lost.

Tenthredo fernaldi MacGillivray.

Tenthredo fernaldi MacGillivray, Can. Ent., vol. 32, 1900, p. 177, ♀.
Tenthredo fernaldi MacGillivray, Bull. Conn. Geol. and Nat. Hist. Surv., no. 22, 1916, p. 83.

The type is in Doctor MacGillivray's collection. Type locality, Amherst, Massachusetts, Professor C. H. Fernald, collector.

This species is a color variant of *Tenthredo dubia* (Norton), (*Allantus* Jur.).

INDEX TO SUBJECTS AND TERMS.

INDEX TO NAMES.

(Synonyms are in italics; major references in heavy-face type.)

EXPLANATION OF PLATES.

All figures, except 5 and 6 (Plate 4), were prepared with the aid of the camera lucida.

PLATE 4.

Fig. 1. — Dorsal view of the head of *Tenthredella verticalis* (Say), female. *e*, eye; *es*, epicranial suture; *fv*, frontal fovea; *o*, ocellus; *sr*, supra-antennal ridge; *vp*, vertex-plate.

Fig. 2. — Ventral view of the posterior portion of the abdomen of *Tenthredella verticalis* (Say), female. *ce*, cereus; *so*, sheath of ovipositor; st_6, sixth sternum; *t*, tergum.

Fig. 3. — Front view of the head of *Tenthredella verticalis* (Say), female. *as*, antennal socket; *ch*, cheek; *cl*, clypeus; cl_1, hyperclypeus; *e*, eye; *es*, epicranial suture; *f*, tentorial fossae; *fv*, frontal fovea; *lb*, labrum; *md*, mandible; *o*, ocellus; *sr*, supra-antennal ridge.

Fig. 4. — Ventral view of the posterior portion of the abdomen of *Tenthredella verticalis* (Say), male, the posterior portion of the genitalia showing at the end. *cp*, clasper of the genitalia; *hp*, hypopygidium; st_6, sixth sternum; *t*, tergum.

Fig. 5. — Lateral view of the posterior portion of the saw of *Tenthredella rufopecta rufopecta* (Norton), greatly enlarged.

Fig. 6. — Lateral view of the posterior portion of the saw of *Tenthredella verticalis* (Say), greatly enlarged.

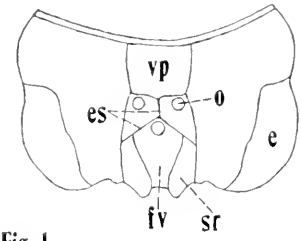

Fig. 1

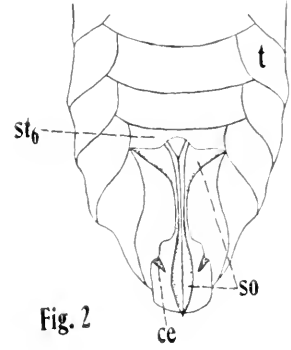

Fig. 2

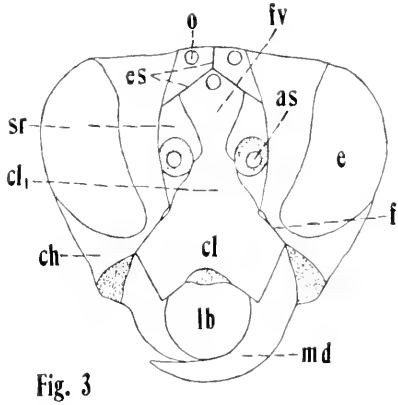

Fig. 3

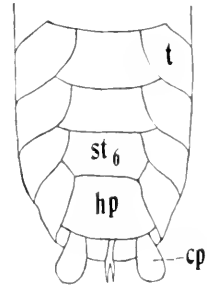

Fig. 4

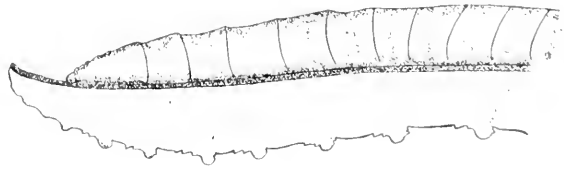

Fig. 5

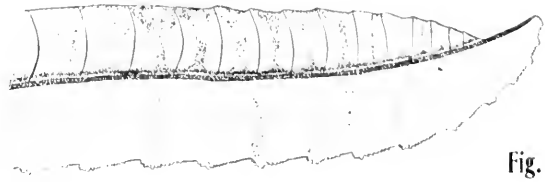

Fig. 6

PLATE 5.

Fig. 7. — Lateral view of the thorax of *Tenthredella verticalis* (Say), female. *ac*, anterior coxa; *b*, basalar plate; *em*, meso-epimeron; em_1, meta-epimeron; *et*, meso-episternum; et_1, meta-episternum; *fp*, lateral face of pronotum; *ic*, intermediate coxa; *lc*, lobe of collar; *mc*, mesoscutellum; mc_1, metascutellum; *mp*, meta-postscutellum; *ms*, mesoscutum; ms_1, metascutum; *n*, pronotal lobe; *pc*, posterior coxa; *pp*, propleuron; *ps*, prescutum; *pt*, post-tergite; *sp*, spiracle; t_1, first abdominal tergum; t_2, second abdominal tergum.

Fig. 8. — Antenna of *Tenthredella verticalis* (Say), female.

Fig. 9. — Dorsal view of the thorax of *Tenthredella verticalis* (Say), female. *mc*, mesoscutellum; mc_1, metascutellum; *mp*, meta-postscutellum; *ms*, mesoscutum; ms_1, metascutum; *pn*, pronotum; *ps*, prescutum; *pt*, post-tergite; *s*, sinus; *t*, tegula; t_1, first abdominal tergum; *x*, cenchrus.

Fig. 10. — Posterior wing of *Tenthredella verticalis* (Say), female. *a*, anal vein, anal cell; ap_1, first apical cell; ap_2, second apical cell; *ax*, axillary vein; *bs*, basal vein; *c*, costa or costal vein, costal cell; *cu*, cubital vein; cu_1, first cubital cell; cu_2, second cubital cell; *d*, discoidal vein, discoidal cell; *em*, externo-medial vein, externo-medial cell; *l*, lanceolate cell; *r*, radial vein, radial cell; *re*, recurrent vein; *sc*, subcostal vein or subcosta; *sm*, submedian vein, submedian cell; *st*, stigma; *tc*, transverse cubital vein; *tm*, transverse medial vein.

Fig. 11. — Anterior wing of *Tenthredella verticalis* (Say), female. (First cubital cell and first transverse cubital vein not lettered.) *a*, anal vein, anal cell; ap_1, first apical cell; ap_2, second apical cell; *bs*, basal vein; *c*, costa or costal vein, costal cell; *ci*, transverse costal vein; *cu*, cubital vein; cu_2, second cubital cell; cu_3, third cubital cell; cu_4, fourth cubital cell; *d*, discoidal vein; d_1, first discoidal cell; d_2, second discoidal cell; d_3, third discoidal cell; *em*, externo-medial vein, externo-medial cell; *l*, lanceolate cell; *pm*, posterior margin; *r*, radial vein; r_1, first radial cell; r_2, second radial cell; re_1, first recurrent vein; re_2, second recurrent vein; *sc*, subcostal vein or subcosta; *sd*, subdiscoidal vein; *sm*, submedian vein, submedian cell; *st*, stigma; tc_2, second transverse cubital vein; tc_3, third transverse cubital vein; *tl*, transverse vein of lanceolate cell; *tm*, transverse medial vein; *tr*, transverse radial vein.

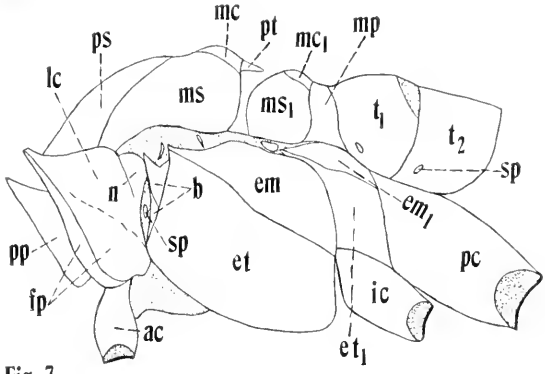

Fig. 7

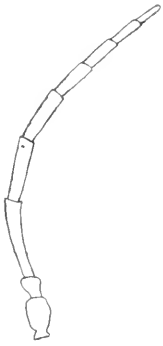

Fig. 8

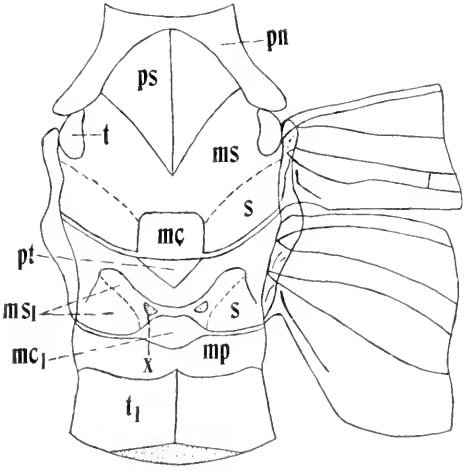

Fig. 9

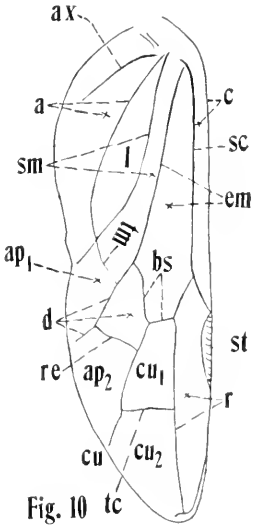

Fig. 10

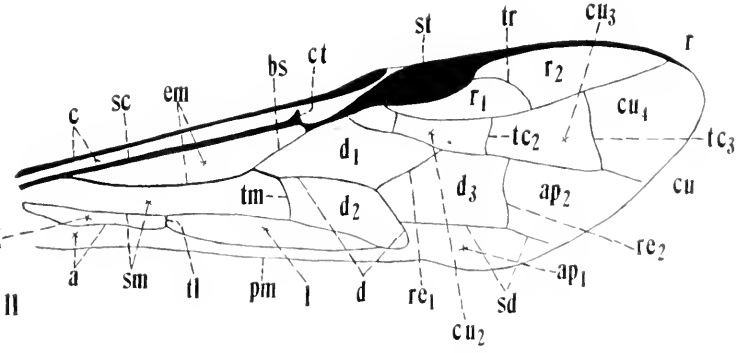

Fig. 11

No. 7.—NEW FOSSILS FROM THE CHAPMAN SANDSTONE.

BY PERCY E. RAYMOND.

A small collection lately acquired by the Boston Society of Natural History from Mr. Olof O. Nylander, contains two fossils which were recognized as new by the collector, and which Dr. Edward Wigglesworth has been good enough to turn over to me for study. Although Clarke (1909), and later Williams and Breger (1916), have made known a very considerable fauna from material collected by Mr. Nylander, the success which rewards the continued efforts of that enthusiastic naturalist indicates that the Chapman sandstone still holds much that will contribute to our knowledge of the life of New England in Lower Devonian times.

The first of these new fossils is a well-preserved cast of the interior of a shell which appears to be the same species as one which Clarke figured as *Rensselaeria* sp., and the other is a cranidium of a *Calymene*, the first representative of the genus to be reported from the Devonian of Maine.

Family Centronellidae Hall and Clarke.

Subfamily **Rensselaeriinae**, nov.

The families of the Telotremata are distinguished from one another by the type of support which carries the brachia. The present family takes its name from a genus which differs from most of the other members of the family in having a smooth shell, and is further peculiar in having a wide and pronounced sinus in the brachial valve. In view of the predominence of biconvex, plicated shells like *Rensselaeria* and its allies, it would seem advantageous to make a subfamily Centronellinae, for such genera as are allied to *Centronella*, and another, the Rensselaeriinae, for the dominant group.

Prorensselaeria, gen. nov.

It is proposed to include in this genus those Rensselaeriinae which retain to adulthood the primitive characteristics of possess-

ing a completely divided hinge-plate (cardinal process) in the brachial valve, lightly impressed muscle-scars, and only a rudiment of a dorsal median septum. The shell is short, with a wide hinge, as in the young stages of Rensselaeria.

Type, *Prorensselaeria nylanderi*, sp. nov.

Prorensselaeria nylanderi, sp. nov.

Pl. 6, figs. 3, 4.

Type, no. 15076, collection Boston Society of Natural History.

Description.—Shell approximately circular in outline, biconvex, with numerous, subequal fine plications. Valves subequal, the pedicle somewhat the deeper, the greatest convexity of both being a short distance in front of the umbones; the shells flatten forward so that they approach each other at a small angle and the front is thin. The width at the hinge (on the cast) is about three-fourths the greatest width, which is a little behind the middle of the brachial valve. The plications are rounded, coarser in the middle of the front than on the lateral slopes, are separated by furrows of less than their own width, and become faint, or entirely obliterated, on the highest parts of the valves. There are a few strongly marked growth lines, but no concentric striae.

The interior of the brachial valve, as reproduced in wax from the natural cast, shows a large, double cardinal process, the parts separated by a groove which reaches to the floor of the valve. Each moiety of the process appears as half a cone, the upper anterior margin bearing the brachial support. These cones are not in contact and their surfaces are smooth, so that there is no chance that they have been separated by the loss of a connecting plate. The visceral groove expands and becomes deeper in front of the cardinal process, and is bordered by a pair of low ridges which die out abruptly just before reaching the bottom of the valve. Behind these ridges and the visceral furrow are the narrow, elongate, faintly impressed scars of the adductor muscles, bounded laterally by sinuous, linear, scarcely elevated ridges, and separated by a sharp, almost indistinguishable, rudimentary median septum.

The pedicle valve is slightly distorted, the posterior end having been pushed a little toward the front, causing a slight buckling, shown by a curving wrinkle across the most convex part of the shell. This has brought the muscular area into a position almost

at right angles to the plane of union of the valves, so that it is hardly seen from above. The teeth are short, strongly divergent, and are supported by low, rounded, stout dental lamellae which are parallel throughout the greater part of their length, but diverge at the front. Between them are the elongate, narrow scars of the pedicle, separated by a narrow groove. In front of these muscles, and entering the angle formed by the divergent arms of the anterior ends of the dental lamellae, are the faint scars of the diductors and adductors. The adductors are elongate, almost linear, separated by a narrow groove. The outlines of the diductors are vague, especially toward the front; the scars are elongate, and extend nearly halfway to the front of the shell.

Measurements.—Length of brachial valve measured on internal cast from hinge-line to front 33 mm.; width at hinge 30 mm.; greatest width 44 mm.; length of pedicle valve measured on mould of exterior 39 mm., which is somewhat less than the true length; thickness of internal cast 22 mm. There are 10 plications in 10 mm. at the front, and 14 in the same width at the sides.

Comparisons.—The short wide outline of this shell distinguishes it sharply from *Rensselaeria ovoides*, but there are several similar shells in the Lower Devonian of Maine. *Rensselaeria mainensis* Williams is a short shell, but the brachial valve is as long as wide, and the plications are coarser than those of the present species. *R. mainensis* agrees with *Prorensselaeria* rather than with *Rensselaeria* in having a divided cardinal process, and although it has a more fully developed median septum in the brachial valve than does *P. nylanderi*, it is probably to be referred to the same genus as that species. The only other species of *Rensselaeria* previously described from the Chapman sandstone is *Rensselaeria atlantica* Clarke. That species differs very much in its outline from the one here described, since the adult is longer than wide, and the width at the hinge is so great as to give the shell a square-shouldered appearance. This shell is a typical *Rensselaeria*, with the hinge-plate perforated at maturity, strongly impressed muscle-scars, and a well-developed septum in the brachial valve. Clarke has pointed out that the young shells of this species are less elongate than the adults, and some of them have a fully divided hinge-plate, so that the young is more fully comparable to *P. nylanderi* than is the adult.

Among the *Rensselaeriae* described by Clarke from the Moose River sandstone are three short, wide forms, *R. callida* Clarke, *R. diania* Clarke and *R.* cf. *crassicosta* Koch, all of which have few and strong plications, and almost no characteristics of *Rensselaeria*. The figures suggest that they are Pentameroids.

Horizon and locality.—The specimen was collected from the Chapman sandstone at Edmunds Hill, Chapman Plantation, Aroostook County, Maine. A single pedicle valve of *Spirifer sparsa* Clarke is on the same fragment.

Family CALYMENIDAE Milne-Edwards.

Genus CALYMENE Brongniart.

Calymene wigglesworthi, sp. nov.

Pl. 6, figs. 1, 2.

Type, no. 15077, collection Boston Society of Natural History.

Description.—Cranidium of average size for the genus, narrow, and strongly convex. Glabella high, elongate, nearly parallel-sided in front of the eyes, with three pairs of furrows. The anterior glabellar lobes are small, the second pair isolated and oval, the posterior pair nearly isolated and subcircular. The dorsal furrows are deep and narrow, joining in front and separating the glabella from the narrow, upturned rim. Fixed cheeks narrow, sloping abruptly at the sides. Palpebral lobes small, opposite the second glabellar lobes, and close to the dorsal furrows. Occipital furrow narrow on the axial and wide and shallow on the pleural lobes. Surface somewhat sparsely covered with small rounded granules and small sharp spinules. These are particularly abundant on the anterior rim.

Measurements.—Length of cranidium 15 mm.; width at palpebral lobes 18 mm.; at genal angles, about 28 mm. (specimen imperfect); length of glabella with the nuchal ring 13.5 mm.; width at basal lobes 11.5 mm.; at anterior end 9 mm.

Comparisons.—But few species of *Calymene* have as yet been described from the American Devonian. *Calymene platys* Green (Hall, 1888, pl. 1) from the Schoharie is a large form and differs from the present species in many respects, the most important being the lack of the anterior lateral glabellar lobes.

Calymene camerata Conrad, from the Cobleskill limestone, as

described by Hall (1852, p. 337, pl. 78, fig. 1a–f), presumably from Conrad's type, is similar to the species here described, especially in the ornamentation, but has a much wider cephalon and wider brim.

Calymene camerata as identified by Weller (1903, p. 25, pl. 22, fig. 22–25), from the Decker Ferry of New Jersey, is more like *C. wigglesworthi* than *C. camerata* Conrad, in being narrow, with a narrow brim, but the anterior lateral glabellar lobes are faint or absent, and the palpebral lobe is remarkably close to the dorsal furrows. I should not consider the figured specimens as belonging to either species. *Calymene camerata* has also been reported from the Helderberg of Maryland by Maynard (1913, p. 494, pl. 89, fig. 9). Only the pygidium is figured and there is no description.

Calymene rugosa Shumard may be from the Devonian, but only the pygidium is known.

C. wigglesworthi most closely resembles some of the many varieties which pass under the name of *Calymene blumenbachi* Brongniart, approaching closely such a form as that figured by Salter (1865, pl. 8, fig. 7), as showing the long narrow type of cephalon with long glabella. Our species differs from that chiefly in the much more delicate ornamentation.

Williams (1914, pl. 21, figs. 2, 2a, 5) has reported *Calymene blumenbachi* from the Pembroke formation (Upper Silurian) of southeastern Maine. The specimens are not described, but as figured, the cranidium is quite similar to that of *C. wigglesworthi*, differing chiefly in having the anterior lateral glabellar lobes larger. The kind of ornamentation is not indicated.

Horizon and locality.—The single cranidium is from the Chapman sandstone at Edmunds Hill, Chapman Plantation, Aroostook County, Maine. On the same fragment of rock are more or less imperfect specimens of *Spirifer cymidis* Clarke, *S. sparsa* Clarke, an *Eatonia*, *Leptaena*, and some poorly preserved bryozoans.

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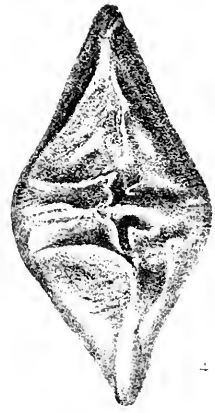

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J. Henry Blake del.

EXPLANATION OF THE PLATE.

PLATE 6.

Fig. 1. *Calymene wigglesworthi*, sp. nov. Cranidium of the type. $\times \frac{2}{3}$.

Fig. 2. Detail of the ornamentation of same, greatly enlarged.

Fig. 3. *Prorensselaeria nylanderi*, gen. et sp. nov. Dorsal view. $\times \frac{4}{3}$.

Fig. 4. Hinge view of same. $\times \frac{4}{3}$.

No. 8.—NEW FOSSILS FROM THE VICINITY OF BOSTON.

BY THOMAS H. CLARK.

Since the publication of Crosby's Geology of the Boston Basin, which contains a chapter on palaeontology by Grabau, very little has been written on fossils from the immediate vicinity of Boston. Sears (1905) has added to the localities at which Lower Cambrian and Pleistocene fossils have been found; Shimer (1907, 1907a) has published two short papers dealing with Cambrian species; more recently, Raymond (1913, 1914) has added two trilobites to the meager fauna; and Shimer[1] has brought up to date our knowledge of Post-glacial fossils from Boston Bay.

One reason for the paucity of publications upon the palaeontology of the region is the fact that seldom is an investigator fortunate enough to stumble upon anything "worth while." There must be a great many single fossils, which would be of interest to local scientists, tucked away in museum drawers because their finders have not considered them sufficiently important to describe. With this in mind, the writer feels no need to apologize for the short notices which follow, but rather hopes that they will serve to bring out more of like nature. We shall never know one half of what is our due if we wait for a mythical someone else who is "going to monograph the whole fauna."

1. LOWER CAMBRIAN FOSSILS FROM REVERE BEACH.

Recently, while looking over the pebbles on Revere Beach, I noticed one particularly because of its resemblance to the red Cambrian limestone at Attleboro. When I broke it open, I was delighted to find within it the pygidium of a minute Lower Cambrian trilobite. I proceeded to search for similar ones, and found some fifty or sixty pebbles and cobbles of red limestone and shale, mostly two or three inches in diameter. Some of these were identical, lithologically, with the Lower Cambrian limestone at

[1] Shimer, H. W. Post-glacial history of Boston. Amer. Journ. Sci., ser. 4, vol. 40, p. 437–442, 1915. Proc. Amer. Acad. Arts and Sci., vol. 53, p. 141–163, 1918.

Attleboro, not only in the way they had weathered in some layers to an almost incoherent soft spongy mass but also in the peculiar appearance of the thin white hair-line cross-sections of the small fossils. There were also pebbles of a more compact rock resembling the slates of Pearl Street, North Weymouth, and these contained, moreover, epidotic concretions like those characteristic of the Weymouth rocks. Still others were composed of a red or pinkish-white limestone with a pitted surface. These pits are in some cases deep and narrow enough to be called tunnels; they ramify in all directions with no relation to the stratification or to any observed fossils. So far as I know, this mode of weathering has not been observed in any of the Lower Cambrian outcrops about Boston. Boulders of limestone and chert weathered in this peculiar way have been found by the writer on the beaches at Hull, Massachusetts.

The fossils are scarce. Most of the pebbles yield none, but the complete list is imposing for this region, and is given below. Species that have been reported previously from near-by localities (including Washington and Rensselaer Counties, New York) are so designated.

Acrotreta taconica (Walcott)—eastern New York.
Acrotreta sp.
Hyolithes americanus Billings—North Attleboro, Nahant, Massachusetts; eastern New York.
H. impar Ford—Nahant, Massachusetts; eastern New York.
H. princeps Billings—North Attleboro, Nahant, Massachusetts.
Orthotheca cylindrica Grabau—North Attleboro, Nahant, North Weymouth, Massachusetts.
Salterella sp.
Eodiscus bellimarginatus (Shaler and Foerste)—North Attleboro, Massachusetts.
Weymouthia nobilis (Ford)—North Weymouth, Massachusetts; eastern New York.
Callavia, two species—North Weymouth, Massachusetts.
Ptychoparia attleborensis (Shaler and Foerste)—North Attleboro, Massachusetts.
Agraulos sp.
Dipharus inspcratus, gen. et sp. nov.

Acrotreta taconica, *Hyolithes princeps*, *Orthotheca cylindrica*, *Callavia* sp., and *Ptychoparia attleborensis* are fairly common; the other species are represented by one or two specimens each.

This fauna shows very close affiliation with that of the Lower Cambrian rocks at Nahant and Attleboro, Massachusetts, and also of Washington and Rensselaer Counties, New York. In the small size of the specimens it especially resembles the fauna of the last-named region, whereas the abundance of fragments of *Callavia* indicates a connection with the fauna of North Weymouth, which is the only locality near by where that genus has previously been found. The outcrops of Lower Cambrian rocks around Boston are few in number and limited in extent, but, taken as a whole, the fauna is a homogeneous one and is not radically different from that of eastern New York.

The discovery is of particular interest in suggesting an undiscovered locality of fossiliferous Lower Cambrian rocks at no great distance from Revere Beach. The pebbles were all found within a mile of the southern end. All of the materials of the beach are of glacial origin, distributed along shore by marine currents and waves, and our pebbles were probably deposited by the ice approximately where they are now found. The glacier advanced over this part of Massachusetts from the northwest, so that we should look in that direction for the Lower Cambrian outcrops whence these fragments were derived. Sears, in his volume on the Geology of Essex County, has plotted dozens of localities at which Cambrian rocks outcrop, some substantiated by fossils. There are some recorded in Saugus near Breakheart Hill, rather too far east for our purpose. Much criticism has been launched at Sears of late because some of his localities do not seem to be where he mapped them, but it should be remembered that no one since has spent one-tenth of the time which he did exploring the Essex County ledges. The discovery of these pebbles strengthens the view that the country to the north and northwest holds further outcrops of Cambrian rocks which will doubtless be found by later ambitious seekers.

In the notes which follow it has not been thought necessary to submit a complete bibliography with each species. Where it has been discussed by Grabau in Crosby's Geology of the Boston Basin, a page reference to that article is given which will lead the reader to a nearly complete bibliography up to 1900. A supplementary bibliography has been added on page 479.

Acrotreta taconica (Walcott).

Linnarssonella taconica Walcott, C. D., Amer. Journ. Sci., ser. 3, vol. 34, p. 189–190, pl. 1, figs. 18, 18a–d, 1887.

Our specimens are slightly larger than those from Washington County, New York, but otherwise agree with the type material in all respects. These brachiopods are the only fossils in this collection that show any trace of a former chitinous shell. The largest, a brachial valve, is 5 mm. wide and 4.5 mm. long.

Hyolithes americanus Billings.

Grabau, 1900, p. 647.

Hyolithes impar Ford.

Grabau, 1900, p. 652.

The two species named above are represented in our collection by one specimen each.

Hyolithes princeps Billings.

Grabau, 1900, p. 643.

This species is very common. Our largest specimen, incomplete at both ends, is 40 mm. long, 14 mm. wide at the larger and 9.5 mm. wide at the smaller end.

Orthotheca cylindrica Grabau.

Grabau, 1900, p. 654.

Two specimens. The longest is 5.5 mm. long and 0.3 mm. thick. This is smaller than most of the individuals of this species that have been found around Boston, but it is probably immature.

Salterella sp.

This is a gently curved form, 12 mm. long, 3 mm. in diameter at the larger end; its proximal end is hemispherical. Several septa are shown, the bases of which are not to be seen in our specimen because it is broken longitudinally not quite through the middle. It appears as if the rounded proximal end might represent the position of one of the septa rather than the original terminus of the shell.

Eodiscus bellimarginatus (Shaler and Foerste).

Grabau, 1900, p. 670. Raymond, 1913, p. 103.

Our material includes two pygidia of this species. One of these was found in a remarkably fine state of preservation and showed

a row of very stout high tubercles situated on the axial lobe, almost high enough to be called spines. Unfortunately, the material of which the fossil was composed was exceedingly friable, with the result that the specimen was badly damaged merely by rubbing against the sides of the tray in which it was resting. The tubercles and much of the rest of the pygidium were abraded. It may be that the type material originally carried higher spines than the specimens now show.

Weymouthia nobilis (Ford).

Raymond, 1913, p. 102, figs. 15, 16.

This species, originally discovered at Troy, New York, and rediscovered by the writer at North Weymouth, Massachusetts, after the type had been lost, has recently been reported by Kiaer from the Lower Cambrian rocks of Norway. Originally known from a single specimen at Troy, this genus is now found to be nearly cosmopolitan in range. We have two specimens: a cephalon and a pygidium. The cephalon is proportionately longer than in the type; the pygidium is of the usual shape.

Callavia, two or more species.

Numerous fragments of individuals belonging to this genus occur in the collection, indicating a species with cephalic widths of from 5 mm. to 15 mm. None of them is well enough preserved to be identified with any of the species that is found at North Weymouth, although some are probably conspecific with the latter.

Ptychoparia attleborensis (Shaler and Foerste).

Grabau, 1900, p. 681.

This is the commonest trilobite present. We know it from several examples of the cephalic shield only. They are all small, 2 or 3 mm. across and about as long. The type material consists of both minute and larger specimens, but none of the larger forms occurs in our material.

Agraulos sp.

We have one specimen, imperfect and poorly preserved, but it belongs without a doubt to this genus, although specific determination is out of the question.

Family SOLENOPLEURIDAE Angelin.

Dipharus, gen. nov.

One of the smallest trilobites found in the pebbles appears to be a wholly new form, and a very remarkable one. Not only is it a new species, but it seems that a new genus must be formed to receive it. The genera of trilobites from the Lower Cambrian are few in number, perhaps a dozen exclusive of those belonging to the Eodiscidae and the Mesonacidae, and inasmuch as trilobites were probably at a maximum during or even before the Lower Cambrian, many more genera should eventually be discovered, and we may confidently look forward to the time when a far richer fauna will be recorded from eastern Massachusetts.

This genus is characterized by a long elevated glabella of approximately equal width throughout, with one transverse furrow close to the anterior end. The cheeks are elevated; the eyes are borne on high conical elevations opposite the glabellar furrow and there is a depressed anterior border. The thorax and pygidium are unknown.

Genotype, *Dipharus insperatus*, sp. nov.

Dipharus insperatus, sp. nov.

Type, no. 1693, Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Known from one cephalon only. Specimen minute, about two-thirds of a millimeter in both length and width. The glabella is less than one-third the width of the cephalon and is marked off from the cheeks by deep V-shaped furrows. It is obtusely rounded in front, expands backward very slightly, but contracts again toward the posterior end; highly elevated, the elevation increasing toward the occipital ring which carries a prominence directed backward, and a scar which may represent the base of a tubercle. There is no occipital furrow. One glabellar furrow is present, and crosses the glabella as a low wide depression at about one-fourth the length from the anterior end; the glabella is somewhat constricted at this place. The facial sutures in front of and behind the eyes are nearly straight, directed diagonally to lateral and posterior mar-

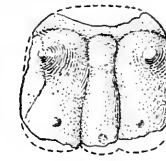

FIG. 1.—*Dipharus insperatus*, sp. nov., sketch of the type. × 20.

FIG. 1a.—Profile of same. × 20.

gins. No eye-lines are present. The eyes are situated on conical elevations of remarkable height, standing nearly twice as high as the glabella above the dorsal furrow. Each fixed cheek bears a very small tubercle near its posterior margin.

It might be supposed that this specimen is immature, and merely represents the nepionic stage of some larger form. There are several reasons for disbelieving this. As far as we now know, the eyes and free cheeks are ventral on the protaspis, and if they are present at all in the adult, they travel during development over the margin and backward on the cephalon. Hence the larger the free cheeks and the farther back the eyes occur, the later the stage in development. It would appear then that this specimen is at least in the neanic stage although it may not be as large as a full-grown individual. The presence of the highly elevated palpebral lobes indicates a stage of development beyond any nepionic stage known. The fact, too, that the glabellar furrows are mostly obliterated shows that the species is in an advanced stage of evolution as far as a Lower Cambrian form is concerned. One very remarkable feature about this trilobite is the presence of an anterior trans-glabellar furrow. Obliteration of the furrows usually proceeds toward the posterior end, and seldom does the occipital furrow become obliterated. In our specimen there is no trace of the occipital furrow, but the anterior furrow has been retained, probably in the same way that the anterior furrow is kept in many Agnostids, as a retained larval characteristic.

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1913. On the genera of the Eodiscidae. Ottawa Naturalist, vol. 27, p. 101–106, text-fig. 1–16.

(An almost complete specimen of *Microdiscus? nobilis* discovered at North Weymouth, and the new generic name *Weymouthia* proposed for it.)

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1905. The physical geography, geology, mineralogy and paleontology of Essex County, Massachusetts. 4to, Salem, Mass., 418 pp., illustr., map. (See p. 380–388.)

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1907. An almost complete specimen of *Strenuella strenua* (Billings). Amer. Journ. Sci., ser. 4, vol. 23, p. 199–201, 3 text-figs. Addendum in same journal, page 319.

1907a. A Lower-Middle Cambrian transition fauna from Braintree, Mass. Amer. Journ. Sci., ser. 4, vol. 24, p. 176–178, 1 text-fig.

(From a single boulder from Braintree:

Aerothele gamagei Hobbs	M. Cambrian
Hyolithes shaleri Walcott	M. Cambrian
Paradoxides harlani Green	M. Cambrian
Strenuella strenua (Billings)	L. Cambrian
Olenellus (*Holmia*) *bröggeri* Walcott	L. Cambrian
Ptychoparia rogersi Walcott	M. Cambrian
Agraulos quadrangularis (Whitfield)	M. Cambrian)

Walcott, C. D.

1887. Fauna of the "Upper Taconic" of Emmons, in Washington County, New York. Amer. Journ. Sci., ser. 3, vol. 34, p. 187–199, pl. 1.

1910. On Olenellus and other genera of the Mesonacidae. Smithsonian Misc. Coll., vol. 53, no. 6, p. 231–422, pl. 23–44.

(*Olenellus bröggeri* Grabau and *O. bröggeri* Burr referred to *Callavia crosbyi* Walcott, p. 279.

Olenellus sp. Burr and *O.* sp. Grabau named *Callavia burri* Walcott, p. 280.)

Middle Cambrian.

(**Grabau,** 1898 and 1900, and **Raymond,** 1914, give exhaustive bibliographies.)

Raymond, P. E.

1914. Notes on the ontogeny of *Paradoxides*, with the description of a new species from Braintree, Mass. Bull. Mus. Comp. Zoöl., vol. 58, p. 225–244, 1 pl.

(*P. haywardi* Raymond is described as a species distinct from *P. harlani* Green.)

Shimer, H. W.

1907. A Lower-Middle Cambrian transition fauna from Braintree, Mass. Amer. Journ. Sci., ser. 3, vol. 24, p. 176–178, 1 text-fig.

2. AN "OBOLUS PEBBLE" FROM THE BOSTON BASIN.

Pebbles and boulders of quartzite containing an Upper Cambrian fauna rich in individuals but poor in species are very common on the beaches of Martha's Vineyard and Nantucket, and have been found to a limited extent on the mainland. They have been found as boulders *in situ* in the Carboniferous conglomerates of the Narragansett Basin, but the parent ledge has not yet been revealed. Beyond the limits of that basin these boulders have been reported from the beaches at Marshfield, Truro, and Provincetown, Massachusetts. It appears that within the Narragansett Basin the boulders in place are numerous in the southern and central parts but absent from the northern part. None has hitherto been reported from the Boston Basin, either in the drift or in place.[1]

A few years ago I found one such boulder on the northern shore of Hull, Massachusetts. It is composed of a quartzite which has suffered the loss of most of its secondary quartz, so that it is now a none too compact sandstone. It is white, of fine grain; the grains are angular and the stratification is obscure except where indicated by the fossils. When whole it weighed about four pounds. It contains abundant fossils, all of which belong to the species *Obolus* (*Westonia*) *rogersi* Walcott.[2]

The boulder lay on the outer beach whose materials have been derived from Telegraph Hill, a drumlin which had been partly destroyed by the waves but is now protected by the rip-rap along

[1] Woodworth, J. B. Monogr. U. S. Geol. Surv., no. 33, p. 109–113, 1899.

[2] Walcott, C. D. Cambrian Brachiopoda. Monogr. U. S. Geol. Surv., no. 51, p. 463–465, 1912.

the railroad. Its place of origin as a glacial block must have been still farther northwest, and if we may reason upon analogy with the boulders in the Narragansett Basin, then it seems probable that this was one of the boulders in the Roxbury conglomerate somewhere in the Boston Basin. If this be correct, and there seems to be nothing to the contrary, it must be recognized that the source of the *Obolus* boulders was sufficiently widespread to have supplied the Carboniferous conglomerates of both the Narragansett and the Boston Basins. Walcott early suggested that those occurring in the Narragansett Basin might have been derived from the Upper Cambrian beds of Newfoundland. This, taken literally, is improbable, but it is extremely likely that there was a more or less continuous outcrop of Upper Cambrian quartzite extending from Newfoundland southward which originated as a sandstone on the flanks of Appalachia. This quartzite probably lay off to the east of our present shore-line, for not only has no trace of it been found south of Newfoundland, as would be expected had it lain to the west of the shore-line, but that position is more in accord with the fact that the boulders occur almost exclusively in the eastern parts of the basins. Whether the sediments of the Narragansett and the Boston Basins were accumulated centripetally, as hinted by Woodworth, or were all introduced in essentially one direction, has little or no bearing upon this matter, unless similar boulders should be found in the western parts of the basins.

3. ASPIDELLA-LIKE MARKINGS FROM THE CAMBRIDGE SLATE.

It is fortunate for us that the drift is not absolutely continuous over the country around Boston, for then we should be dependent upon drift boulders for our knowledge of the bed-rock. As it is we seldom have recourse to the character of the drift in attempting to understand the distribution of the solid rock beneath. There is so much that we are uncertain about, however, that any evidence we may gain from the drift is welcome. The limits within which such evidence is admissible as applying to specific known outcrops should be recognized before it is used. Granting a lithological similarity between the erratics and the supposed parent outcrop, then the drift should be in the path of the ice

from this outcrop; and in this connection it is obvious that evidence from unassorted drift is more desirable than that from eskers, kames, etc., whose materials may have been shifted considerably to one side or the other of the path of glacial motion by the waters which deposited them. Unless this relation between erratics and parent ledge be established, the evidence, though valuable, loses much of its force through its very indefiniteness. Thus in the article on fossils from Revere Beach, it has been impossible to assign a specific location where those fossils occur *in situ*.

The rock to be described here was picked up on the beach at Crow Point, Hingham, Massachusetts, near the wharf, at the foot of the drumlin whence it was certainly derived. It is a fragment of shale 19 cm. long, 11 cm. wide and 1.5 cm. thick, breaking easily along the stratification planes. A great many of the boulders from this drumlin are of shale, many more in proportion than from other drumlins. This finds a ready explanation in the fact that about one mile to the northwest lies Slate Island, an island composed almost wholly of ledges of shale and slate. It seems almost certain that this thin slab of shale was brought by the glacier from the Slate Island ledge, especially as it is identical lithologically with the shale of that place. This conclusion represents as high a degree of probability as is possible.

The rock is a finely banded shale with dark and light layers alternating, each about one millimeter thick; surfaces of the laminae are strewn with great numbers of elliptical markings from 2 mm. to 20 mm. in diameter along their long axes, and all similarly oriented. These have many of the characteristics of *Aspidella*,[1] a so-called fossil described by Billings from the pre-Cambrian of Newfoundland.

In form these markings are identical with Billings' type material. They are surrounded by a raised ring within which is a sunken annular area from which the surface rises conically to a central apex or ridge. None of our specimens shows much elevation, 2 mm. being the maximum. One shows radial lines such as Billings figured, but they are present on only one side. The markings are of all sizes between the limits stated; they are about

[1] See Walcott, C. D. The pre-Cambrian fossiliferous formations. Bull. Geol. Soc. Amer., vol. 10, p. 231, 1899.

three-quarters as wide as long, and show no recognizable arrangement over the surface of the rock. I have been able to compare these with specimens of *Aspidella* from the pre-Cambrian rock of St. John's, Newfoundland, and with the exception of the much greater size of the specimens from that locality, the only essential difference is that ours are much flatter.

Doubt has been cast upon the organic nature of *Aspidella*. The writer does not hesitate to state that he believes it inorganic in origin. A tentative explanation is that these structures represent the sites of vents from which gas escaped, but not as large bubbles, for these usually make deep crater-like depressions, as recently shown by Twenhofel,[1] who, however,

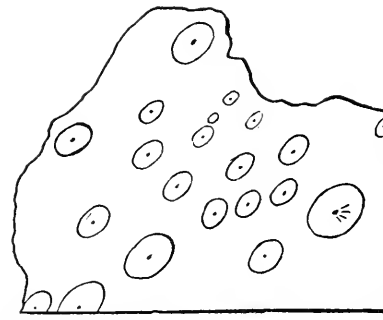

FIG. 2.—Sketch showing form and distribution of the *Aspidella*-like markings on a portion of the rock. × ½.

states that the slope of the sides of the depression formed by a bursting bubble depends upon the viscosity of the mud and its angle of repose. Gas seeping up through mud of very low viscosity and escaping in a succession of very small bubbles would not form a deep crater, but the disturbance of the mud would rather be evenly distributed around the vent. In our specimens, as in some of those from Newfoundland, the markings are practically flat. It is noteworthy that in the material from Newfoundland the markings do not vary much in relative depth on any one surface, although there is a great deal of variation in different pieces of slate. If *Aspidella* is a fossil we should have to explain why the parent organism

[1] Twenhofel, W. H. Impressions made by bubbles, raindrops and other agencies. Bull. Geol. Soc. Amer., vol. 32, p. 359–371, 1921.

made a certain kind of impression at this level, another a few millimeters above, others still further above, and finally, perhaps, the original form still higher. Under the escaping-gas hypothesis these differences may be explained on the basis first, of variations in the amount of escaping gas; and secondly, variations in the viscosity of the mud of successive strata. There still remains to be explained the peculiar bilateral symmetry of the markings. They are seldom, if ever, found with a circular outline, as one would expect if the water were perfectly still. If, however, there were a current, one would expect to find these markings drawn out in the direction in which the current was flowing. The most obvious reason is that the rocks have been distorted, compressed in the direction of the smaller diameter of the markings. It is well known that the slates of Slate Island have been sheared in two directions at two distinct times, so that one set of shear phenomena cuts across an earlier one. The pre-Cambrian rocks of Newfoundland, in common with most other rocks of like age have not escaped this deformative process.

Vol. 5, p. 1-4, pl. 1. May 25, 1921

Occasional Papers
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Boston Society of Natural History.

EGG-CAPSULES OF THE TEN-RIBBED WHELK.

BY CHARLES W. JOHNSON.

Among the interesting specimens obtained by Mr. Arthur B. Fuller during his trip on a beam trawler to the Georges Bank, August 6 to 11, 1920, were three clusters of the egg-capsules of the Ten-ribbed Whelk, *Chrysodomus decemcostatus* (Say). This is the *Fusus decemcostatus* of the older authors, and was later referred to the genus *Neptunea* Bolten. By the method of elimination, as pointed out by Dr. William H. Dall,[1] *Chrysodomus* Swainson will now have to stand as the name of this genus.

These egg-capsules are commonly referred to by fishermen as "sea-corn," from their resemblance to kernels of corn. As this term also includes the irregular clusters of egg-capsules of the Common Whelk, *Buccinum undatum* Linn., some confusion has existed that may account for our lack of a more intimate knowledge of the egg-capsules of this common species. In the Report of the United States Commissioner of Fish and Fisheries for 1879 (1882, p. 787–835), is an interesting "List of collections made by the fishing vessels of Gloucester and other New England sea-ports for the United States Fish Commission, from 1877 to 1880." The Mollusca were determined by Professor A. E. Verrill. In this list "sea-corn (eggs of *Buccinum*)" is mentioned over a dozen times, and in other places it is cited as "sea-corn (eggs of *Buccinum undatum*)." The specimens were collected on all the banks from the Georges to the Grand Bank of Newfoundland, in depths ranging from 30 to 250 fathoms. The following item on page 829 seems of special interest: "Captain D. E. Collins and crew, sch. Gussie Blaisdell. A specimen of branching sea-corn (eggs of *Buccinum*

[1]Proc. U. S. Nat. Mus., 1918, vol. 54, p. 207-215.

undatum) 19 inches high, . . . from lat. 46° 40′ N., long. 50° W." This would be on the Grand Banks, near the Eastern Shoals, in about 40 fathoms. These large masses of capsules were undoubtedly produced by several individuals. Specimens before me measuring from 5 to 7 inches in length, 4 to 4.5 inches wide, and 3 to 3.5 inches high, and containing probably from 2,000 to 2,500 capsules, seem out of all proportion for a single shell. Mr. Olof O. Nylander says he has seen two and three specimens apparently forming a single bunch. Clusters containg 544 capsules are recorded. The irregular cluster shown on the plate facing page 65 of The Shell Book (by Julia E. Rogers, 1908), is probably what would be called "branching." The usual size of the clusters is from 2.5 to 3 inches in diameter, as shown on Plate 1, fig. 1, containing between 300 and 400 capsules. The bunches of capsules form a fairly good substitute for a sponge. "These are called 'sea wash-balls,' being used instead of soap by sailors to wash their hands."

Under *Chrysodomus*, Dr. Dall, in the paper above referred to, says: "Ovicapsules massed, sessile either in a heap as in *Buccinum*, or in a cylindrical erect group." Forbes and Hanley,[1] under *Fusus antiquus* Linn., the type of the genus *Chrysodomus*, say: "The capsules are only half an inch in diameter, are convex outwardly, and concave in the inner side, coarse and corrugated, and piled one upon another in a conical heap, three inches or so high."

Professor A. E. Verrill[2] under *Buccinum cyaneum* Brug. says: "Numerous examples of clusters of cylindrical, often very much elongated, clusters of egg-capsules have been brought from the Grand Bank by the Gloucester fishermen. These, I suppose, belong to this species, but I have no positive evidence. The clusters are usually about an inch in diameter and 3 to 5 inches long. By the fishermen, these are called 'sea-corn' and 'green-corn.'" Friele[3] under *Buccinum terraenovae* Beck. says: "The egg-capsules (fig. 16a, b) have been described by Mörch in Catal. des Moll. du Spitzb., p. 16, without, however, his referring them to any particular species. Ootheca is long and cylindrical in form, occurring now as a naked stem now with a projecting branch. Length about 100 mm.; breadth from 16 to 20 mm." These resemble the egg-capsules in question,

[1]History of British Mollusca, 1853, vol. 3, p. 426.
[2]Trans. Conn. Acad. Arts and Sci., 1882, vol. 5, p. 495.
[3]Norwegian North Atlantic Exped., 1876–78, vol. 3, Moll. 1, 1882, p. 33.

but the cluster is much more slender in proportion to their length and the arrangement of the capsules is less regular. "The species is known only from Greenland and the Polar Sea."

That the egg-clusters obtained by Mr. Fuller were those of *C. decemcostatus* was readily proven by finding among some egg-capsules of *B. undatum* in the collection of the Society a small cluster of the former, about one inch in height, from which I took embryonic shells of *C. decemcostatus* about 7 mm. in length; the smooth protoconch of about two whorls was followed by half a whorl, having about nine revolving ridges, the anterior ones poorly defined.

The three cylindrical clusters of egg-capsules were obtained from a depth of about 45 fathoms between the Georges and Nantucket Shoals, attached to living specimens of the Great or Deep-water Scallop (*Pecten magellanicus* Gmelin). Two were attached to one shell about 1.25 inches apart, as shown in the photograph (Plate 1, fig. 2). The length of the clusters varies from 3 to 3.5 inches (75 to 90 mm.) with a diameter at the base of about 1.5 inches (37 mm.) and at the top 1.25 inches (31 mm.). For a better anchorage the attached portion of the base extends on all sides about a quarter of an inch beyond the capsules. There are between 45 and 50 capsules in each cluster, which, when taken from the water, were lemon yellow in color. Each capsule is about half an inch in diameter, convex above and roughened by reticulated lines. As the specimen dries, these lines become more pronounced by the contraction of the interstices, giving the surface a pitted appearance. The attached portion of each capsule is broad, contracted above and then expanded into the broad capsule, which is folded down on the one below; the base of the upper one is usually attached to the upper sides of the two below, thus overlapping like the tiles on a roof and arranged somewhat spirally, the contracted portion serving as a hinge, beneath which are openings through which water can flow and the young escape. As the opening of the capsule is a wide slit at the end just under the top, this portion of the capsule is always free.

There were apparently from three to four eggs in the fresh capsules, but in the old dry capsules there were only one or two young shells. In this connection it might be of interest again to refer to the following paragraph in Dr. Dall's paper. "In many cases, as in *Buccinum* and *Busycon*, it was shown many years ago by Lovèn and others that a single ovicapsule

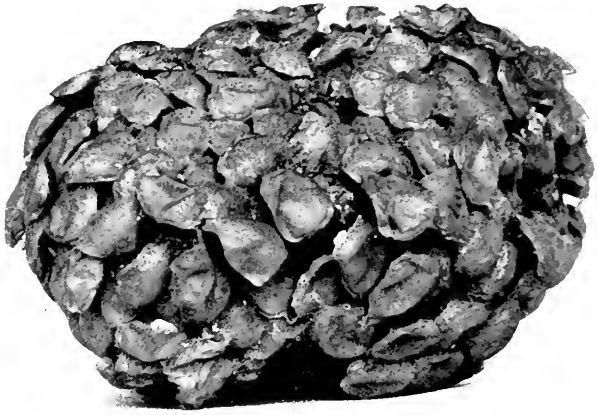
contains a number of ova fertile and unfertile. The unfertile eggs serve as food for the larvae developed from the fertile ones and there is a certain amount of competition between the larvae in the capsule which results in the most vigorous larvae getting more food and making a larger growth than the more weakly coinhabitants of the capsule. Thus at the time of leaving the capsule and coming into the outer world, it sometimes happens that there will be perceptible differences between the individuals issuing from a single capsule, not only in actual size but in the length of the coil of whorls and the size and compactness of the larval apex."

In the beam trawl only a small percentage of the larger shells that get into the net actually reach the deck of the vessel, most of them going through the coarse-meshed net before reaching the pocket; thus their relative abundance is only problematical. As it was, the number of *Chrysodomus decemcostatus* was about double that of *Buccinum undatum*. In all, some 56 specimens were collected, including some of remarkably large size. One *Chrysodomus* measured 5.5 inches with about 0.25 of an inch broken away, making its total length about 147 mm., with a diameter of 90 mm. Gould gives the length as 3 inches, and Tryon 2.5 to 4 inches. The number of ribs varies somewhat, about one half having ten (counting the subsutural rib), one fourth eleven, and the other fourth nine ribs.

The specimens of *Buccinum* collected were also unusually large for New England waters, one with apex broken measuring nearly 5 inches or about 125 mm. in length, with a diameter of 2.5 inches. Gould gives its length as usually 3 inches, and Tryon 3.25 inches. The specimens also varied greatly in form and sculpture, the spire in many being unusually high, with the longitudinal undulations wanting on the body whorl.

EXPLANATION OF PLATE.

Fig. 1. Egg-capsules of the Common Whelk (*Buccinum undatum*).
Fig. 2. Egg-capsules of the Ten-ribbed Whelk (*Chrysodomus decemcostatus*).



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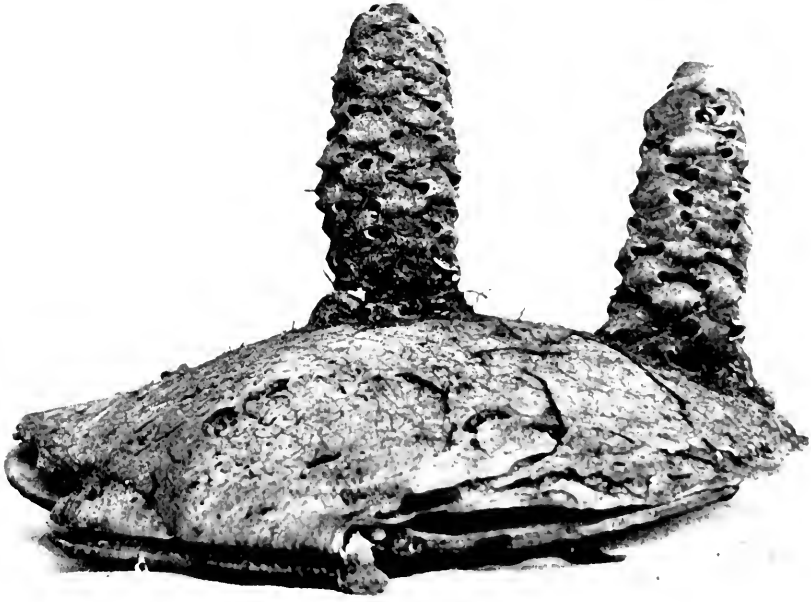

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