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|---------------------------------|---------------------------------|
| Poa, pratensis. L. | <i>Musci.</i> |
| Triticum, repens. L. | Sphagnum, acutifolium. Ehrh. |
| Hordeum, jubatum. Ait. | Dicranum, varium. Hedw. |
| Hierochloa, borealis. R. & S. | Ceratodon, purpureus. Brid. |
| Setaria, viridis. Beauv. | Funaria, hygrometrica. Hedw. |
| <i>Equisetaceæ.</i> | Bryum, cæspiticium. Linn. |
| Equisetum, arvense. L. | Mnium, cuspidatum. Hedw. |
| E. pratense. Ehrh. | M. punctatum. Linn. |
| <i>Filices.</i> | Polytrichum, juniperinum. Hedw. |
| Polypodium, vulgare. L. | Fontinalis, antipyretica. L. |
| Pteris, aquilina. L. | Hypnum, lætum. Brid. |
| Adiantum, pedatum. L. | H. cupressiforme, Hedw. |
| Asplenium, Trichomanes. L. | H. molluscum. Hedw. |
| A. Felix-femina. Bernh. | <i>Lichenes.</i> |
| Phegopteris, Dryopteris. Fee. | Cetraria, Icelandica. Ach. |
| Aspidium, Filix-mas. Swartz. | Sterocaulon, paschale. Linn. |
| Cystopteris, fragilis. Bernh. | Cladonia, pyxidata. Fr. |
| Botrychium, Virginicum. Swartz. | <i>Fungi.</i> |
| <i>Lycopodiaceæ.</i> | No N. S. collection. |
| Lycopodium, annotinum. L. | |

An analysis of the Nova Scotian Flora derived from species under observation, yield the result given below in tabular form. It is but just however, to explain, that owing to deficient representation of cyperaceæ gramineæ, and of all the cryptogamous orders outside of Filices and Lycopodiaceæ. "There being no list of fungi," the result is vitiated to a considerable extent.

TABLE I.—FLORA OF NOVA SCOTIA.

| | Nat. Orders. | Genera. | Species and var. |
|------------|--------------|---------|------------------|
| Exogens | 71 | 244 | 518 |
| Endogens | 14 | 59 | 116 |
| Acrogens | 5 | 50 | 114 |
| Thallogens | 1 | 14 | 26 |
| Total | 91 | 367 | 774 |

A similar tabulation of the foregoing list of species gives the following results, viz.:

| | | | |
|------------|----|-----|-----|
| Exogens | 48 | 127 | 178 |
| Endogens | 10 | 34 | 44 |
| Acrogens | 4 | 19 | 24 |
| Thallogens | 1 | 3 | 3 |
| Total | 63 | 183 | 249 |

Thus of the seven hundred and seventy-four species constituting the Nova Scotian flora, two hundred and forty-nine, or nearly one-third of the whole are common to it and the Coloradian flora. These are collected into one hundred and eighty-three genera, or one-half that of Nova Scotia.

Comparing these species by their divisions, we find the closest alliance between the flor-exists in the Exogens and Endogens, of which considerably over one-third of each division is found. Of the Acrogenous less than one-fourth are present; of the Thallogenous a little less than one-eighth; this, however, may be owing to deficiency in our collection of Thallogens.

ART. III.—NATURAL HISTORY AND THE FISHERIES. BY A. P. REID, M. D., &c.

(Read before the Institute Jan. 10, 1876.)

IN this Province we have as a people been always so engaged in efforts that tend directly to increase pecuniary gain, that any study or pursuit that did not very clearly point in this direction got quietly shelved, unless by the few, who had an ardent desire to become acquainted with the operations of nature which surround us; and this is the more to be deplored since all our industries are so closely connected with what is revealed by the study of Natural Science.

The products of the sea are our main source of wealth, and yet how very very few, have the slightest scientific knowledge of *Marine Fauna*. The practical man says what use is it, will it teach how to catch cure or sell the fish any better than we now do by following the old *rule of thumb*, whose maxims are the result of lengthened experience? As to the sale it is of course regulated by the demand, the method of curing a matter of taste, convenience and demand, but as to the *catch* it is quite a different thing.

In this a knowledge of the life history of the different species of fish, would not only lend more certainty to the present pursuit, but also continue in coming years an undiminished abundance of this our prime necessity.

The coal fields of England may give out, and Scientists be unable to increase the amount, but it is not so with our staple. The abundant hand of nature multiplies it from year to year with lavish extravagance, and did we not know her laws as they may be found out by studying the life *history* of each species we could deal with certainty instead of chance or luck. We must however know when where and how they obtain their food; and when, where, and how they avoid their natural enemies, the cause of their migrations, and such like, and then we would not fear a *failure* in the *catch* with the significance it implies. That this does often happen is not to be wondered at, for our ignorance is supreme; the best naturalists know so very little about those animals whose habitat is in the deep sea, because few scientists are favorably situated for this variety of study.

The education of our fishermen does not fit them for research, and besides neither their merchants nor the Government give encouragement to induce them to do one bit more work than they can get along with, or to lay themselves out to observe systematically the phenomena that from time to time occur.

Had we an Academy of Science under the patronage of the Government,—or an independent one of sufficient wealth such as exists in the older countries,—annual prizes for the best essays on the natural history of the marine food fishes, would ere long not only increase our scientific knowledge, but in time greatly eliminate the theory of chance and the so called bad years from the list of probabilities. We would learn why fish frequent certain grounds at certain seasons and why they leave for other localities, with the best way to guard their food supply and spawning seasons and so increase their numbers. Even small prizes to amount to no more than \$100 per year, would before long prove of general public benefit; but into the details I have not at present time to enter.

If the schools that are now scattered all around the coast were properly utilized, every child would soon learn the known natural history of those animals that their daily life makes them familiar with; and would in addition to knowledge gained, have their powers of observation utilized. Thus before many years the errors that now

prevail (and no doubt there are many) would be corrected and the great deficiencies gradually supplemented, until in time an army of fishermen would surround our coasts, who were well educated in their calling.

Then give them facilities for making known the facts gleaned during their lonely watch and work on the deep sea, and prosperity would continually attend instead of either a feast or a famine.

Continued supply would extend the demand, and a good and cheap food make an independent, happy, wealthy, and numerous population.

It would neither be costly nor difficult to initiate this improvement, for there is a series of school books that treat on this subject, that should be placed in the hands of every scholar who has learned to read. A Hugh Miller is wanted to do for Marine Zoology what has been by him so efficiently done for Geology, and since Nova Scotia has produced naturalists, whose fame is not confined to this hemisphere, we need not fear but a fair opportunity alone is needed to bring forth other minds who can by observation in their every day labour, enrich science, their country, and themselves, by teaching us that of which we now know but little.

The United States Government, following in the track of that of France and England, have in late years devoted much attention to the food fishes that live in the inland waters and rivers, and as a result of the increased knowledge, means have been taken to fill the depleted waters and keep them continually stocked. The success has been so great, that the Dominion Government, following in their wake, has energetically set to work to repair the ravages that ignorance has made in what was at one time a very large source of income, and plentiful tables; and before many years we confidently hope that a salmon will not be a curiosity, nor prohibited article of diet to the mass of the people. A fish requires no expense to fit it for use but that alone of catching it; an ox or a sheep demands continued care and attention for years, and at a great cost for food—yet 20 cents per pound is rather a common price for salmon, and from 5 to 10 cents per pound for what really costs the most for its production. The reason is evident—the

natural history of the latter has been long and carefully studied, is more easily acquired, and has received (and justly so) the most fostering care of Governments and Societies. The other we would know nothing about unless for the energy of some gentlemen who at great inconvenience, time and labour (for which they receive no remuneration) have gathered a few facts, meagre indeed, but all we have. In this Province we are greatly indebted to Dr. B. Gilpin, who in a series of papers read before this Society on the *food fishes of Nova Scotia* has given us the result of his observations and that of those who have preceded him, making a valuable contribution to our knowledge.

It is high time that government should essay some practical assistance to the *deep sea* as well as inland fisheries, for it is indeed the main stay, the great export of this country.

There is another subject that most pressingly demands our attention in the furtherance of the ideas referred to, and which so far has not received even the semblance of care. I refer to Marine Aquaria, a living museum of the objects we desire to study.

To learn the history of plants, and for our convenience, we need to place them in artificial surroundings; but the objects of our solicitude must be situated as far as known, in their natural relations, and to do so we have conservatories where this can be carried out, and as a result our knowledge is nearly perfect. As to the result of this long continued and daily expense, it would take volumes to describe the benefits accruing to agriculture and every other industry in which the products of the soil receive attention.

To illustrate the advantage of this kind of artificial study. The cinchona bark and quinine (its product), without which life would be impossible in some countries, to strangers, was nearly becoming extinct, and likewise the ipecacuanha plant, of nearly as much use; and what was to be done? They grew in distant and almost inaccessible parts of Central and South America, and but little could be found out about them. After a great deal of difficulty, Mr. Hooker, of Kew Gardens, London, England, got some cuttings and seeds, and set to work to unravel their history. He produced numerous plants, and concluded that the Hill country in India

would give the conditions necessary to successful growth. They were by dint of great exertion, after repeated partial failures, reduced to a commercial success; and quinine has fallen in price owing to this new source of supply, with the certainty now that it will not be exterminated.

Many gentlemen here have conservatories, and in so far tend to further our knowledge of Natural Science; and the commissioners of the Public Gardens are also laudably engaged in the same most necessary work, and they know that their efforts are appreciated. I also trust, since they have one of the finest public gardens in the Dominion, that they will at once set about a marine aquarium, a most necessary, and withal an inexpensive improvement, and one that would be by far the most attractive, and in full vigour all the year round, and besides it would be the first of any moment in the Dominion.

It is pleasant to enter a conservatory and see the quaint luxurious vegetation of the tropics, and thousands of flowers of every shade and size; but this pales at once before the interest and beauty that attracts and rivets attention when standing before an aquarium well stocked with the living representatives of the fishes that inhabit our littoral waters, and much more so could we visit the famous Brighton Aquarium, with its assembly of *deep sea species*. I will not dwell longer on this part of the subject, for the suggestion will call up the appropriate ideas.

But the aquarium has its use, it teaches in language understood by the lowest intelligence, and proposes problems which the brightest mind has yet to carefully study ere there is a prospect of solution.

How appropriate that the rising youth of Halifax should practically know something of those really strange animals that contribute to the prosperity of his country. Practical natural history could thus be inculcated, and a foundation would be laid of more than provincial greatness.

As to the cost. This can be completely governed by the extent, and can be enlarged as circumstances would warrant. We are so near the sea, that there would be but trifling expense in supplying with water, and only sufficient would be required to make up for

waste and leakage, evaporation being supplied by fresh water, because a proper proportion of marine plants would purify the water for the respiration of the fishes. No high temperature is necessary, hence the cost for heating would be small. The cost of attendance also would be limited, and did specimens die, it would be very easy to replace them.

With this as an initiative, it would not be long before natural history would be studied and understood, and then in addition to the culture of our people, would we find the economic advantage, for knowledge will always be of practical service. I will give an illustration: I was invited some years ago by a friend of mine, Mr. S— in London, Ontario, to pay him a visit, and he introduced me to a room filled with little boxes. On close examination I found thousands of insects, of every variety, all alive and in different stages of growth. I could not but admire the extent of his collection, and his knowledge of their habits, but said I, Mr. S—, “apart from the pure scientific aspect of this subject, of what practical use is the study of the vast majority of these species.” He replied that perhaps no subject of natural history was of more service to man than this science of Entomology, and in going over his collection, he, in pointing out the life history showed that almost every one deserved careful attention. This species devoured the cabbage plant—another the potato—another wheat—and so on until there was very vividly brought to my recollection the more than half forgotten fact, that almost every vegetable has a form of animal life that preys on it, and in many cases brings famine or great want on large sections of peoples. That all had natural enemies which curtailed their numbers, but that this required great time and study to ferret out.

He pointed out many species about which enough was known to control or prevent their ravages, but yet a large number of species remained whose history needed to be worked up. He spoke of the Colorado potato bug, that had not then reached Canada, but which advent was expected, and the Entomological Society were busy searching into its life history, so as to be able to check its hitherto unobstructed career, and with what success we now can judge.

Neither the Government, the City, nor private gentlemen can make any mistake by encouraging in every way any branch of Natural Science; but pre-eminent above all I think to dwellers near the sea, is by a thorough study of marine fauna and flora, to feed our people by removing good fish from the list of luxuries, and to keep the balance of trade in our favor.

ART. IV.—NOTES ON SPECIMENS OF IRON ORES, ETC., COLLECTED IN PICTOU COUNTY FOR THE PHILADELPHIA EXHIBITION. BY EDWIN GILPIN, M.A., F.G.S., ETC.

(Read February 14th, 1876.)

My purpose this evening is not to enter upon an elaborate scientific discussion of the minerals found in the district, but to show the relation they bear to the industrial development of the county. The first resources of a new country and those most readily drawn upon are the products of the waters and the forests, and such minerals as are most easily extracted for exportation in a raw state. These alone are insufficient for the permanent development of a country, fishing towns and villages grow slowly, and the yield of the forest diminishes in an increasing ratio. The census, our most reliable teacher of political economy, shows the simple fact that wherever coal and iron exist together, there the most flourishing populations are concentrated; that the commercial prosperity of every country is in direct ratio to the quantity of coal employed within its territory for the smelting and working up of iron and allied minerals.

Bearing these facts in mind, we will now briefly pass in review the various ores of iron that surround one side of the Pictou Coal Field; first glancing at the earliest information we have on the subject.

The indications of iron ore in the vicinity of the East River of Pictou, attracted early attention, and the General Mining Association of London, in 1828, or shortly after they opened their Pictou Collieries, endeavored to turn it to practical account. They