

to Sydney. Thus ended a very pleasant and profitable two weeks' stay on Newfoundland.

CONCLUSION

It will be seen from the above, that besides fishes I collected a number of marine and fresh-water invertebrates, also some insects and aquatic plants, all of which (apart from certain duplicates) will remain in the National Collections in Ottawa, where so few specimens in these lines from Newfoundland were found before.

There will therefore be further notes or articles when these specimens (now all sorted out or in the hands of specialists) have been identified in the course of time; but I have found it best, in this article dealing with the fishes from the trip to give a general (and I trust not too detailed) account of my observations and collecting for each day during my stay on the island. In the future, it will be necessary merely to record the invertebrates I secured, and refer for a general account of the trip and the natural surroundings of each place, to this article.

It is my hope also that, besides naturalists, the average Canadian, who knows altogether too little about Newfoundland, may read with some interest this narrative of explorations by an enthusiastic, marine biologist. Life on Newfoundland is simple and its people poor, compared to Canada, and it is well that we, who come to their shores, should enter into the same spirit with which they greet us.

This article must, of course, not be understood as an account of the fishes hitherto recorded from Newfoundland. It deals solely with Canadian, scientific explorations of the island, as to its fishes, etc., and the other subject would fill a whole book, and is a laborious undertaking, scattered as the records are in the literature of a dozen different countries. It is to be hoped that the Newfoundlanders themselves will sometime soon give to the scientific world a complete account of the fishes frequenting their shores and inland waters.

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THE CANADIAN NATIONAL COLLECTION OF INSECTS

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IN 1904, the late Dr. James Fletcher, then Dominion Entomologist, having described a few new species and races of Canadian Diurnal Lepidoptera, deposited his types in the United States National Museum at Washington in order to secure a safe depository for them. It is evident, therefore, that, even at this quite recent date, the Canadian National Collection of Insects, as an entity, was non-existent. This collection has been formed by the union of two separate entomological collections, viz: that of the Biological Division of the Geological Survey, Department of Mines, and that of the Entomological Branch, Department of Agriculture, and the purpose of the present paper is to trace the steps leading up to the amalgamation of these two units into a single definite National Collection.

The material derived from the first mentioned source consisted (1) of specimens collected at odd times by members of the Geological Survey when in the field, (2) of the insects collected by the

members of the Canadian Arctic Expedition of 1913-18 and treated of in Volume III of the *Report*, and (3) of collections of insects purchased in or prior to 1914 by the Canadian Government; of these collections the three outstanding ones were those made by Capt. Gamble Geddes, of Toronto, Mr. J. D. Evans, of Trenton, Ont., and Mr. C. H. Young, of Ottawa.

The Geddes collection consisted chiefly of Diurnal Lepidoptera and contained a number of showy exotic species; the Canadian material was largely the result of a collecting trip made in 1883 by Capt. Geddes, from Edmonton, Alta., to the Crow's Nest Pass and the species obtained were at the time considered great rarities; now-a-days most of them excite little interest and the inaccurate system of labelling used by Geddes has still further reduced their value to the scientist—*Sic transit gloria collectionis!*

The Evans Collection acquired in 1914 was a general one, made chiefly in the vicinity of Sud-

bury and of Trenton and contained much material of interest and value. A large portion of it had been named by specialists in the United States to whom Mr. Evans sent his specimens. Unfortunately, the best and rarest specimens were usually retained and in consequence a certain proportion of the material has been lost to the National Collection.

The Young collection, purchased in 1913, was the result of twenty years of collecting Lepidoptera in the vicinity of Ottawa. It was especially rich in Microlepidoptera and most valuable on account of the perfect condition of the specimens. W. D. Kearfott, of Montclair, N.J., described a considerable number of new species in the Pyralidae and Tortricidae from Young's material and in most cases returned paratypes so that at least a certain portion of the type material is retained in Canada.

No attempt was made by the members of the Biological Division of the Geological Survey to work over or arrange the above mentioned collections other than had been done by the owners and it was not until 1917, as we shall see later, that they were made readily available for scientific study.

The second, and by far the greater, source of supply for the National Collection of Insects has been, as stated in the opening paragraph, the collections of the Entomological Branch. These collections date back to 1887, when Dr. Fletcher was appointed Dominion Entomologist and Botanist, his own personal collection forming the nucleus around which the collections of the then Division of Entomology were built. Dr. Fletcher was fully recognisant of the value of such a collection and states in his first Report that "reference collections of preserved entomological and botanical specimens will, of course, be necessary for the advantageous prosecution of entomological and botanical work. Temporary cases have already been provided for the former and no effort will be wanting on my part to build up, with all expedition, a collection".

In his 1893 Report, referring to a collection of twenty cases of insects, exhibited at the World's Fair in Chicago, Dr. Fletcher states that "the collection, when returned, will form the nucleus of a reference collection. Such a collection of reference has been much needed in the past. I hope, during the coming winter, to much increase this collection from the large amount of material which had accumulated previous to the appointment of my assistant, Mr. Guignard, and which could not be arranged, owing to pressure of other work".

In 1899, with the appointment of Mr. Arthur Gibson as Assistant to Dr. Fletcher, a fresh impetus was given to the building up of the collection; Mr. Gibson not only presented his own

valuable personal collection to the Division, but proved most ardent and assiduous in the collecting and breeding of specimens; under his care, fresh material was rapidly added and a serviceable working collection gradually evolved.

Dr. Fletcher's Reports from 1900-1909 mention with almost monotonous regularity a great yearly increase in specimens collected and received; a growing interest in Nature Study, which became apparent all through the Dominion about this time, was responsible for many donations to the Division's collection and throughout the Reports we constantly meet with acknowledgments to such well-known collectors and entomologists as W. H. Harrington, Ottawa; C. H. Young, Ottawa; N. Criddle, Aweme, Man.; J. B. Wallis, Winnipeg, Man.; T. N. Willing, Regina, Sask.; F. H. Wolley-Dod, Calgary, Alta.; J. W. Cockle, Kaslo, N.S.; G. W. Taylor, Wellington, B.C.; A. W. Hanham, Duncan, B.C.; and many others in all parts of the country. From the 1905 Report I quote the following: "The collections of insects and plants in the Division have been largely increased during the past year. Mr. Gibson, who has charge of the insect cabinets, has mounted and placed a large number of specimens, the collection of lepidoptera is now in excellent working order. Efforts will be made to build up the reference collections of the other classes of insects as quickly as possible, as information is being constantly sought for from the Division by the large number of students in all parts of the Dominion who are giving so much attention to Nature Study".

At this time the collections had increased to such an extent that they occupied between 150-200 large drawers, besides a great deal of unworked material in store boxes.

In 1910, Dr. C. Gordon Hewitt, in his first report as Dominion Entomologist, stated that "in the absence of a national collection of Canadian insects, every endeavour is being made to render our systematic collection as complete and representative as possible". Again in his 1912 Report he writes: "It is our aim that this collection shall ultimately become a national collection of the insects of Canada, for such it is virtually at present. During the last year the arrangement of several of the orders has been started. The Lepidoptera are now almost in order". In 1913, he reports that Mr. Germain Beaulieu, appointed to the Division in 1912, had "assiduously devoted himself to the arrangement of our now rapidly increasing collection. The Hemiptera have been arranged and special attention has been devoted to several orders of the Coleoptera". He also reports that the late Mr. F. W. L. Sladen had been placed in charge of the Aculeate Hymenoptera.

In the 1914 Report, he states that: "The Collection of Insects, which now constitutes the National Collection, has increased materially during the past year owing to the increase in the staff of the division and the greater opportunities which are now afforded to secure insects of all orders by the presence of field officers in the various provinces".

With the raising of the Division of Entomology to the status of a Branch in 1914, and its subsequent separation from the Experimental Farms to occupy its present quarters on the sixth floor of the Birks' Building, more room was afforded for the collections; Dr. Hewitt was also in the same year appointed Honorary Curator of Entomology in the National Museum. To quote from his Report of 1915: "Arrangements were completed at the beginning of the year (i.e. 1914) for the co-ordination of the work of this Branch and that of the National Museum (the Victoria Memorial Museum of the Geological Survey) in the matter of entomological collections, to prevent duplication. The collections of this Branch and of the Geological Survey now constitute the national collection of insects".

From Dr. Hewitt's report as Honorary Curator of Entomology for 1916, I quote the following:—

"The congestion and restriction of available space in the Museum caused by the temporary use of the building by Parliament rendered it impossible to continue our plans for arranging the national collection of insects in the steel cabinets that have been provided for its accommodation.

"In the absence of the working room required for consultation and of a qualified man in charge of the collection in the Museum, it was considered advisable to postpone further efforts to transfer to the cabinets in the Museum the main and working portion of the insect collection that is now housed in the offices of the Entomological Branch of the Department of Agriculture until the Museum is vacated by Parliament, when normal conditions will again prevail and the necessary space will be available. Our work in the Museum, therefore, has been confined to the task of transferring to the cabinets for safe storage the insects belonging to various collections that had been purchased by or donated to the Museum in the past and which were contained in a miscellaneous collection of storage boxes and cabinets.

"The main collection of insects is still in the office of the Entomological Branch and not only have considerable additions been made to it through the field work of the officers of the Branch and gifts of other collaborators, but very satisfactory progress in the identification and arrangement of the large accumulation of unclassified material can be recorded".

The steel cabinets mentioned—twelve in num-

ber, with six hundred drawers—were transferred in 1917 to the offices of the Entomological Branch owing to the congestion in the Museum building. Thus was effected the complete unification of the various Government insect collections into one definite national collection of insects.

The succeeding years saw a large increase in the specimens received from various sources, chiefly from field officers connected with the various Branch laboratories: the valuable collection of the late W. H. Harrington, of Ottawa, especially rich in Hymenoptera and including many types of new Canadian species, was also acquired by purchase in 1918.

In his 1919 Report, Dr. Hewitt states that "owing to the increasing magnitude of the collections and the growing demands for assistance in the determination of small collections of insects submitted by individuals and institutions, it has been necessary to arrange for the appointment of a specially qualified officer to take charge of the national collection and to devote his attention to systematic studies".

This led to my own appointment as Chief of the Division of Systematic Entomology in April, 1919, with special charge of the National Collection. At the time of my appointment the status of the National Collection was, roughly speaking, as follows:—

(1) 12 steel cabinets with 600 drawers containing the entire collection of North American Lepidoptera which had been brought together and rearranged according to the Barnes & McDunnough "Check List" of 1917 by Mr. Gibson and me in the summer of 1918, whilst I was on a visit to Ottawa for this purpose. This arrangement did not include the Microlepidoptera which were largely unidentified and unclassified. The cabinets also contained the balance of the Geddes, Evans and Young collections as originally transferred by the Museum staff, as well as a number of empty drawers, destined for the collections of other orders of insects.

(2) The Harrington Collection, which remained as originally purchased in four large wooden cabinets with glass-topped drawers.

(3) The classified collections of the Entomological Branch, exclusive of Lepidoptera, contained in wooden Schmitt boxes in so-called Skinner cabinets, comprising approximately 200 boxes of Coleoptera, 100 of Diptera and 60 of Hemiptera. The Neuropteroid insects and the Orthoptera were in wooden cabinets with large glass-topped drawers and had suffered so severely from the ravages of *Anthrenus* as to render them practically worthless. The Aculeate Hymenoptera were still in charge of the Dominion Apiarist, Mr. Sladen, at the Central Experimental Farm.

Besides the above, there was a very large accumulation of miscellaneous insects, entirely unclassified and unsorted, contained in all manner of drawers and store-boxes. The named collections, exclusive of the Lepidoptera and a portion of the Coleoptera in charge of Dr. Swaine, were found on examination to be arranged according to more or less antiquated systems of classification and the series of specimens under a single specific name were often much mixed; it was evident that a revision of the entire collection would have to be made in order to place it on a sound nomenclatorial basis. To accomplish satisfactorily such a piece of work a good library of taxonomic works was the first essential and it was soon evident that the library of the Entomological Branch was totally inadequate for the needs of a systematist.

From the very first, therefore, it was clear that the development of the National Collection of Insects must proceed along the following three lines:—

(1) The gradual sortation of the unclassified material into families and genera in order to make it available for systematic study.

(2) The transference of the collection into permanent steel cabinets, accompanied by a critical revision of the species and an arrangement according to the latest taxonomic views.

(3) The building up of a taxonomic library capable of sustaining the demands placed upon it by the systematist.

It is along these lines that we have been working for the past six years and I am proud to say that to-day we have a National Collection of Insects which ranks among the leading collections of the North American Continent and a taxonomic library which is not only one of the finest specialized libraries in the Government Service, but also probably the best of its kind in Canada.

At first the work progressed but slowly, as I had only the services of one laboratory assistant at my disposal; in September, 1922, however, we were extremely fortunate in securing the appointment of Mr. C. H. Curran to the Division and he was at once put in charge of the Diptera; in July, 1923, Mr. H. L. Viereck, the well-known Hymenopterist, was temporarily, and a year later permanently, appointed to take charge of the Hymenoptera and at last this large and much neglected family is receiving the attention it merits on account of the economic importance of so many of its members. The number of laboratory assistants has been increased to three and a clerk-stenographer is of invaluable assistance in the preparation of manuscript and in general library work.

Apart from the divisional staff, several other members of the Branch force have assisted materially in revising the collections. Mr.

Norman Criddle, Field Officer in Manitoba, has charge during the winter months of the Coleoptera, and Dr. Swaine and Mr. Hopping of the Division of Forest Insects have been most active in working over the wood and bark-boring groups of beetles. Mr. R. Buckell, now Field Officer in British Columbia, spent several winters working over the Orthoptera and has rearranged our entire collection.

As occasion required, further steel cabinets and drawers have been purchased and the main National Collection has now been, with the exception of a small section of the Hymenoptera, entirely transferred to these permanent receptacles, and to a very large extent revised from the standpoint of nomenclature, either by one of our own staff or by some specialist in the United States.

The number of specimens added yearly to the collections has been very large; in 1920 the collection of Lepidoptera of the late Mr. F. H. Wolley-Dod, of Midnapore, Alta., was bequeathed to the Entomological Branch; this collection was especially rich in Western Noctuidae and represented the result of many years' collecting in the Rocky Mountain foothills. In 1921, on the death of Mr. Sladen, the Aculeate Hymenoptera were transferred from the Central Experimental Farm to the main National Collection and, in addition, his collection of British Hymenoptera was purchased; in 1923 a large portion of the collection of J. W. Cockle, of Kaslo, B.C., was purchased, including all the type material; in 1924 the Treherne collection of Thysanoptera, a most valuable lot of slide material, including a number of types, was acquired from his estate; the Curran collection of Diptera was also added.

The Faunal Surveys carried on by my Division during the summer months have resulted in much additional material and have also furnished considerable new data regarding the distribution of species; these surveys are made by members of the staff assisted by several seasonal investigators; the region between the Ottawa river and Georgian Bay in Ontario has been given especial attention and we are also investigating the insect fauna of the north shore of Lake Erie which contains many southern elements. Two more extended trips were made by me to the eastern slopes of the Rocky Mountains, to Nordegg, Alta., in 1921 and to Waterton Lakes National Park in 1923; the resulting material, combined with the large collections made at Banff, Alta., in 1922 by a seasonal assistant and with the specimens contained in the Wolley-Dod collection, has given us a very fair idea of the fauna of this interesting region.

From the Field Officers in charge of the various Branch laboratories, especially in the west, we have received large consignments of valuable material

each year and great credit is due these officers for the continued zeal shown by them in the building up of the National Collection. Members of the Geological Survey, the Topographical Survey and other Departments of the Government, whose work often takes them into unexplored and inaccessible regions, have shown much interest in obtaining collections of insects for us; their material has frequently contained species of great rarity. From donations by private individuals and from exchanges of specimens, considerable additions have also been secured.

The possibilities of satisfactorily determining specimens have naturally increased from year to year as the various groups have been revised; in consequence not only our own field officers, but provincial museums, universities and colleges, school-teachers and private collectors have availed themselves to an ever-increasing extent of our services in the matter of identifications. As these services are given on the understanding that we may retain material of value to the National Collection, we have profited considerably from this branch of our work.

The net results of the work of the past six years may be briefly summarized in a few paragraphs.

The National Collection of Insects is now contained in 31 steel cabinets of 1,550 drawers apportioned as follows: Lepidoptera, 625 drawers; Coleoptera, 250 drawers; Diptera, 225 drawers; Hymenoptera, 200 drawers; Hemiptera, 50 drawers; Orthoptera, 50 drawers; Odonata, 75 drawers; Ephemeridae, 50 drawers; Neuropteroid insects (partially unclassified), 25 drawers. There are besides two cabinets of alcohol material, in-

cluding collections of Arachnida, Odonata and Ephemerida, and several slide-cabinets containing our material in plant-lice, fleas, thrips, etc.

The divisional staff has published about 120 taxonomic papers, which include descriptions of 736 new species; of these, I am responsible for 200, Mr. C. H. Curran for 250, and Mr. H. L. Viereck for 286. The types of these new species are nearly all deposited in the Canadian National Collection and the paratype material has been used very advantageously as a medium of exchange for paratype material contained in other institutions. As a result, type material of approximately 2,000 species is now contained in the collection and this number is being constantly added to. It is gratifying to note that workers in entomology in Canada outside of our Branch Staff, are beginning to deposit the types of their new species with us and it is to be hoped that such a practice will increase as the Canadian National Collection is the most logical and the safest depository for the types of Canadian insects.

I cannot conclude without calling particular attention to the debt of gratitude which we owe to Dr. J. H. Grisdale, Deputy Minister of Agriculture, and to Mr. Arthur Gibson, Dominion Entomologist, for their constant interest in the plans for the building-up of the National Collection and their willingness to further the same. Without their co-operation it would have been impossible to have secured the necessary authorization for the purchase of insect cabinets and books, nor could we have increased the divisional staff to its present size.

NOTES AND OBSERVATIONS

THE UBIQUITOUS HOUSE SPARROW.—Stretching eastward from the "Eastern Gap" of Toronto Bay lies a long beach washed by the waters of Lake Ontario. Strong winds have swept the clean sand inland, where it has piled into long smooth dunes, on which the various species of Willow and Poplar have found root and are flourishing. The smooth, more level, spots have brought forth a crop of many sand-loving plants such as Sea Rocket, Beach Pea, Wormwood, and the well-known Sweet Clover. Remote from the city and all dwellings, as it is, this is the last place where one would expect to find the common House Sparrow. Yet on several occasions I had noticed small flocks of this bird whose life-history is so linked up with haunts of man. At first I accepted their presence in such a spot as an evidence of the birds' wandering, but soon found it meant much more than mere wandering. Once, as I suddenly appeared at the top of a low sand dune, I came

upon a small flock of six or eight sparrows, feeding at the roots of the Sweet Clover on a smooth, level sand. Naturally, I thought of seeds as being the attraction, but, after I had flushed three or four such flocks, always from similar locations, and reflected that the end of June was hardly the time for seeds, I determined to learn the true state of affairs. On flushing the next flock, I turned aside and examined the ground. There was apparently nothing to be found but smooth, clean sand surrounding the weed-stalks, in which lay crisp Willow leaves, half buried. Then I raked my fingers through the sand—at once the secret came to light. I disclosed a large, whitish grub—fat and juicy. Half a dozen of such would have been a full meal for any Sparrow. With very little trouble I located and exposed several others, all within a few square feet of sand.

Then I began to wonder, how did the House Sparrow stumble on such a treasure? A little



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