

SCIENCE

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SOME INSECT IMMIGRANTS IN OHIO.¹

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In the following paper the term immigrant is to be understood as given in our lexicons, viz: a species that has come to this State from elsewhere and taken up its permanent abode in our midst. While such species are largely of foreign origin, yet this is not true in all cases, and the term foreign is hereafter intended to apply to territory outside of the State of Ohio. Nor do I intend to enumerate all of the foreign species that have gained a residence within the boundaries of the State, but to give some facts relative to the time, place and method of introduction of a number of them. Without wishing to present a paper on Economic Entomology, it will be necessary to use, as illustrations, injurious or beneficial species, from the fact that these are more closely watched and their movements best understood; but among the earlier known species we find that even these are often difficult to follow in their advance across the country. There are, seemingly, two what we may term gateways through which the majority of species that have come to us from the east, have made entrance into the State, and, later, spread out over the north-west. The first, and apparently the most important one of these, being at the extreme northeastern part, adjoining Lake Erie, and which we might term the north gate, and, second, the valley of the Ohio River, from a point where it begins to form the eastern boundary of the State, southward—perhaps to Wheeling, W. Va. Now, there also appear to be two great national avenues or highways which insect migrations follow; progressing more rapidly along either one or the other, but not equally so along both, and often following only one; the more sub-tropical species, whether American or introduced, taking the southern or what I would call the Great Southwestern route, while the sub-arctic, including, besides American, such species as have come to us from England or Europe north of latitude 45° north, take what I would term the Great Northwestern route. The division between these two great thoroughfares will be indicated, approximately, by a line drawn from New York City, latitude 40° 43' north, to St. Louis, Missouri, latitude 38° 38' north, thence to Pueblo, Colorado, latitude 38° 17' north (about), the line of separation trending northward, east of St. Louis, under the influence of the Gulf Stream and the Great Lakes, chiefly the former. Of course it is not to be understood that this line is direct, as it is doubtless more or less irregular, and, from its very nature, to some extent unstable, nor is it to be supposed to form a radical boundary, as some northern forms gradually work their way south of it, and *vice versa*. Yet it will, I think, be found approximately correct.

One of the first species to push its way across our country was the Angoumois Grain Moth, *Sitotroga cerealella* Oliver. From the best information we can obtain, it seems to have been introduced into this country from southern France, as early as 1728, occurring at that time in North Carolina. This is a southern species, and it is no way likely that it entered from the north, but found its way into Ohio, where it appeared, probably about 1840, from Kentucky. It has not, so far as I am aware, been observed in any considerable numbers north of the line indicated, but has pushed its way to the southern part of Texas. The wheat midge, *Diplosis tritici* Kirby, which probably came to us from England, via Quebec, Canada, entered the United States through northern Vermont in 1828-29, pushing southward and westward, but seemingly making more rapid progress to the west. This

certainly entered Ohio through the northern gateway, over-running the State, as also Indiana. Though reported, first in 1843, and again in 1847, in central Ohio, it was in 1849 reported in destructive numbers along the northern part of the State, while the eastern and southern portions seemed exempt. Therefore, I conclude that it came to the State through the north gate. It is one of the species that has followed both the northwestern and southwestern routes, but has probably made more rapid progress and advanced farther along the former. Of the early movement of the Hessian Fly, *Cecidomyia destructor* Say, in Ohio, I have no exact data. It might have come up from the South, or entered by either of the two eastern gateways. Like the wheat midge, however, it appears to have made more rapid progress north of the line than south of it. The Imported Cabbage butterfly, *Pieris rapæ* Linn., a native of England, but first appearing in this country in the vicinity of Quebec, Canada, in 1860, pushed its way southward, and in ten years had reached southern New York. From here it gradually moved to the west and south, being first observed in Ohio, about Cleveland, in 1873, a year earlier than elsewhere in the State. From this we infer another entrance through the north gate. Though spreading southward, so that the line given does not at present mark the boundaries of its habitat, yet it flourishes best near or to the north of it, and is not nearly so abundant in the Gulf States, though reintroduced into South Carolina in 1873 and in Florida in 1874. It has mainly followed the northwestern route, but, like the wheat midge, its southern boundary lays far south of the line. The three clover insects, *Cecidomyia leguminicola* Lint., *Hylesinus trifolii* Muel., *Phytonomus punctatus* Fab., without exception, I believe, first came to us from the north-east; though the last two are now known to occur in extreme south-western Ohio and south-eastern Indiana. They probably entered the State from the south east by way of the Ohio River, at a later date, there being none continuous of the northern colonies to the southward so far as I have been able to observe or learn. The *Phytonomus*, two specimens of which were, last spring, found by Mr. Dury near Cincinnati, I feel confident was carried into the Ohio River by some of its smaller tributaries, one of which, Beaver River, rises in north-eastern Ohio, by the exceedingly high waters of last spring; and conveyed down by the current and left along the shores.

Hylesinus may have been introduced in the same manner, but probably several years earlier, as it has already become abundant enough to prove destructive in Dearborn and Franklin Counties in Indiana.

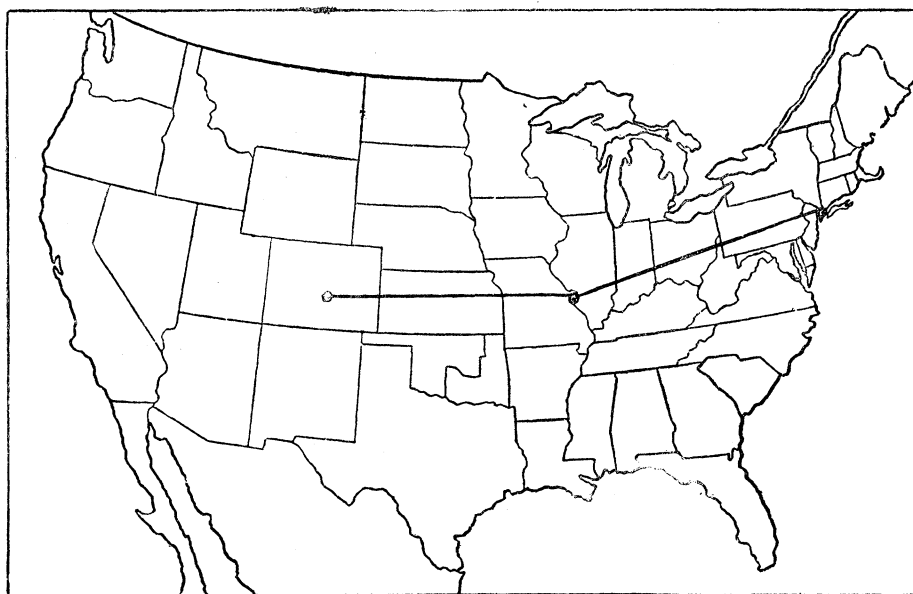
The Horn Fly, *Hematobia serrata* Rob-Desv., probably came first from the north-east, followed almost immediately by an independent introduction by way of the south-east gateway. Coming originally from France, this species, in spreading over our country, does so entirely regardless of the lines we have drawn. Still, its more rapid progress along the southern route, where the facilities for its diffusion are much inferior to those along the northern route, where it has made even less rapid progress, shows that it is swayed by the same influences that have directed the course of other species. So far, we have been dealing largely with species of trans-Atlantic origin. Now we will take an American species—the Locust Borer, *Cyrtene robinæ* Forst. This species had for upwards of a century been known in New York, as an enemy of the Black Locust, *Robinia pseudacacia* L. Some time about the year 1850 it began its invasion westward across northern Ohio, Indiana and Illinois, reaching the Mississippi River about 1865, carrying death and destruction to the Black Locust along its path, but not at once extending its ravages, to a serious degree, in the southern portion of these States. Again, reversing the order of migration that we have been following, we will take another American species, *Doryphora 10-lineata* Say.

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Starting in Colorado, it pushed its way rapidly eastward to the Atlantic coast, and, though not confined to our north-western route, as we have termed it, nevertheless, its most rapid progress and greatest destruction was executed north of our imaginary line. Even yet it has not spread southward to the Gulf of Mexico.

Another species of whose advance I am not so certain, is *Diabrotia longicornis* Say, described many years ago from examples collected near the foot of the Rocky Mountains, but which I know to now occur in Arizona and Central America. This has become a terrible pest in fields of Indian corn all over the west; and Professor Forbes of Illinois, some years since, expressed the opinion that it was moving eastward. While mentally differing from this opinion myself, yet the fact that it has, this year, been reported for the first time in Ohio, along the western border, has led me to feel that Professor Forbes' opinion may yet prove to be a correct one. Certainly we shall watch and mark its progress carefully. Its congener, *Diabrotica 12-punctata* Oliv., though we do not know it to be of southern origin, yet it is very destructive to the same cereal in the south, but this injury, so far as known, is confined, largely at least, to the territory south of the dividing

Diatræa, along the Atlantic, remains yet to be seen. They are both slowly making their way along our great south-western highway, and if either reach Ohio it will most likely be the Diatræa and along our southern border. The Harlequin Cabbage Bug, *Murgantia histrionica* Hahan, is known to occur as far south as Guatemala, through Mexico, and first came to notice in destructive numbers in Texas about 1866. Four years later, it had pushed north to Missouri, and in 1875 it had made its way to Delaware, and on the west occupied wholly or in part Arizona, Nevada, California, Indian Territory and Colorado. It is now found in extreme southern Illinois, Indiana and Ohio, in all cases, I believe, near the dividing line between the two routes, also in New Jersey, thus covering almost exactly the south-western highway, but, excepting, perhaps, in the far west and near the Atlantic, not extending far beyond it. Although an older established species, *Dynastes tityus* Linn. occupies almost exactly the same area except in the extreme east, where Dr. Lintner has recorded it at Kingston, some seventy miles north of New York City. To my personal knowledge it breeds in southern Illinois, and also at Bloomington, Indiana. I have found it at Columbus, Indiana, and have good evidence of its occurrence in the vicinity of Co-



Map indicating, approximately, the natural divide between the northern and southern insect faunas, east of the Rocky Mountains.

line, unless it be in Ohio, where, I strongly suspect, it is more destructive than we are aware. Of the south-west route, we have already observed much in relation to such species as have pushed their way over it from the east toward the south-west. Therefore, I shall speak only of such species, with two exceptions American, I believe, as have passed over the ground from south-west to north-east. One of these exceptions is the larger corn-stalk-borer, *Diatræa saccharalis* F.

According to Mr. L. O. Howard, who has studied the species quite thoroughly, it may be a native of the West Indies, or it may have originated in South America and made its way to the United States by way of these islands. Be this as it may, it occurs along the Gulf and Atlantic coasts, and, in the light of recent observations, it seems to be pushing its way northward along the Atlantic, having now reached the vicinity of Washington, D. C. Though for years known to infest both sugar-cane and maize, in Louisiana, yet we have no information of a corresponding advance northward. This, in some respects, appears to be the case with another insect, *Cylas formicarius* Fab., which breeds in the sweet potato, a native of Cochinchina, India and Madagascar, but introduced into the United States, probably, by way of Cuba. This may have been first introduced either into Florida or Louisiana, as it occurs in both States, and is now pushing its way west across Texas. Whether it will follow in the path of the

lumbus, Ohio. It has been known from southern Pennsylvania, and, later, from New York. Of the Bag or Basket-worm, *Thyridopteryx ephemeraformis* Haw., also a southern species, I only know that it breeds in southern Illinois, Indiana, and in Ohio, a short distance north of Hamilton, Butler County, while under Atlantic influences, it is sometimes abundant as far north as New York and found also in Massachusetts. The Praying Mantis, *Stagmomantis carolina* Linn., breeds in extreme southern Illinois, and also in extreme southern Indiana, but is said not to do so in Ohio. I have a male, given me some years since by Professor S. S. Gorby, State Geologist of Indiana, that was captured in a railway coach, running between Cincinnati, Ohio, and Indianapolis, and was captured between the latter city and Dayton, Ohio. I also learned that this summer a female was captured in Indianapolis, by which I judge that these two southern species are hovering in the vicinity of our boundary line.

As before stated, we have used as examples species of economic interest, only for the reason that their movements are better understood. A careful study of the geographical distribution of other species would, doubtless, throw more light upon the problem. Our dividing line is supposed to be correct only in a general way, as, of course, there can be no such thing as an exact or continuous line of demarkation. This will of necessity be more or less irregular. Again, a species spreads over an area

particularly adapted for its occupancy. But, no sooner is this done than the individuals along the frontier begin to adapt themselves to an environment but slightly unfavorable, and, as their adaptation changes, so do they slowly advance outward from the territory originally occupied. A series of unfavorable seasons might occasion the occupation of a wide margin of adjoining country, while a series of unfavorable seasons might sweep this tide of advance back to the place of its origin. But, as the receding tide of the ocean leaves many pools of water in the depressions of rock, so will there be left, in especially favorable nooks, a few of the insects which will retain their hold and form small, local colonies, of perhaps not more than a few individuals, and the offspring of these will meet the investigator long distances from the real habitat of the species. There is scarcely a collector who does not know of one or more small, secluded areas, in his neighborhood, that are rich in varieties, and which he seldom visits without satisfaction, and frequently he is astonished at his success. How long this ebb and flow has been going on, and how many species have been brought to us in this way, are problems we are yet unable to solve. Therefore these facts have been brought together, and are here presented, not as a finished, nor, indeed, as an advanced study, but rather as a primary outline, to be revised and modified as our knowledge of the geographical distribution of our species shall be enlarged by additional study and research.

A SKELETON OF STELLER'S SEA-COW.

BY BARTON W. EVERMANN, PH.D., ASSISTANT, DIVISION OF SCIENTIFIC INQUIRY, U. S. FISH COMMISSION.

DURING the time from March to September of last year the U. S. Fish Commission steamer "Albatross" was engaged, under the direction of the State and Treasury Departments, in making investigations regarding the habits, distribution, and abundance of the fur seal in Bering Sea and the North Pacific Ocean; and it was my good fortune to accompany the vessel as senior naturalist.

While carrying on these investigations, we had occasion to visit the Commander Islands, situated in Bering Sea, off the coast of Kamchatka about 80 miles. We spent the first week of June on or about these islands, and in this article I wish to call attention to one of the most interesting and valuable results of our visit to Bering Island, the more important one of the group. This was no less than the discovery of a nearly perfect skeleton of the now extinct Steller's sea-cow, *Rytina gigas*.

This remarkable animal was first discovered in the fall of 1741 by Captain Vitus Bering when his ship was wrecked upon the island now bearing his name. Geo. W. Steller was the surgeon and naturalist of Bering's party, and it is to him that we owe about all that we know about the sea cow in life.

At the time of its discovery this large marine mammal was quite abundant about Bering Island, as Steller reports that he saw them in great herds feeding upon the kelp and other sea-weeds that grow in abundance in the shallow water about the island. It was soon discovered that the flesh of the sea-cow was good eating, and the men killed many of them for food.

According to Steller, the sea-cow when fully grown was 24 to 30 feet in length, 20 feet in girth, and weighed 6,000 to 8,000 pounds. It was of a nut-brown color and covered with hair, matted like the outer bark of a tree. The skin was exceedingly thick, and so tough that the hunters had to cut it with an ax. The head was very small when compared with the great size of the body, the jaws were toothless, but were furnished with a thick, horny pad. The anterior limbs were modified into flippers, while the hind limbs were entirely absent, and the tail was widely forked, as in the sperm whale.

This animal was gregarious, stupid, sluggish, and comparatively helpless, being unable to protect itself by diving, and was occasionally washed ashore by breakers.

When, in 1743, the news of the discovery of Bering Island reached Kamchatka, several expeditions were fitted out for the purpose of hunting the sea-cow and the various fur-bearing animals, such as the sea otter, fur seal, and blue fox, which are

found there; and very soon many whaling vessels began to stop there to lay in a supply of sea-cow meat for food. So great was the destruction wrought by these whalers and fur-hunters that by 1754, only 13 years after its discovery, the sea cow had become practically exterminated. In 1768, according to the investigations of Dr. L. Stejneger of the National Museum, who has made a most careful study of the question, this large and important marine mammal became wholly extinct, the last individual ever seen alive having been killed in that year; and the fate which overtook *Rytina* so speedily has almost become that of the buffalo, and will as certainly become that of the fur seal unless it be protected.

Mr. Frederic A. Lucas of the National Museum has recently published a most interesting and valuable paper on "Animals Recently Extinct or Threatened with Extermination," in which he gives in readable form about all that is known of the sea-cow. In this paper, of which I have made free use in the present article, Mr. Lucas states that, up to 1883, but two skeletons of the sea-cow were known. One of these is in the Imperial Museum at St. Petersburg, and the other is in the Imperial Academy of Helsingfors. There are two ribs in the British Museum. During Dr. Stejneger's stay of about two years (1882-1883) upon Bering Island, he succeeded in finding a number of skulls, ribs, vertebrae, and other bones. One complete skeleton was found buried in the sand, but the bones were too far decayed to permit handling. From the various individual bones found by Dr. Stejneger a fairly good skeleton was "made up," which is now in the National Museum. This, together with the two skeletons at St. Petersburg and Helsingfors, and the two ribs in the British Museum, constituted the total amount of material pertaining to *Rytina* found in the museums of the world at the time of my visit to Bering Island.

Being conversant with these facts, imagine my surprise and delight upon learning, soon after landing, that a native had recently found a nearly perfect skeleton in a good state of preservation, and that he would sell it. I took the first opportunity to examine the skeleton, and was not slow in deciding that it should be purchased for our National Museum. This skeleton was found in 1891 by the same native who found the one which was sent to the Czar. It was embedded in the sand to a depth of a few inches, and lay several rods from the present water-line. It is in a good state of preservation and proves to be very nearly complete. The cervical vertebrae are complete and show that the number is seven instead of six—a point that was in dispute until settled by the study of this skeleton made by Mr. Lucas of the National Museum.

Unfortunately the anterior limbs are incomplete, and whether Steller's sea-cow had any hand or finger bones must still remain an unsettled question.

PLANT DISEASES, CAUSED BY NEMATOID WORMS OF THE GENUS APHELENCHUS BAST. I.

BY DR. J. RITZEMA BOS, MEMBER OF THE INTERNATIONAL PHYTOPATHOLOGICAL COMMISSION, PROFESSOR OF ZOOLOGY AND ANIMAL PHYSIOLOGY, AGRICULTURAL COLLEGE, WAGENINGEN, NETHERLANDS.

Bis vor kurzer Zeit waren bloß aus den Nematoden Gattungen *Heterodera* Gruff und *Tylenchus* Bastian in Pflanzenschmarotzende Arten bekannt; in den letzten drei Jahren gelang es mir drei neue, bisher unbeschriebene Species aus der Gattung *Aphelenchus* Bastian als die Ursache von Pflanzenkrankheiten zu entdecken.

Bekanntlich sind die *Aphelenchen* den *Tylenchen* nächstverwandte; es sind beide aalförmige Anquilluliden mit schwach geringelter Cuticula und mit einem Mundstachel hinter der Mundöffnung zum Durchbohren von Zellwänden. Während aber bei *Tylenchus* der Darm in der halben Länge des Oesophagus eine kugelförmige oder ovale muskulöse Anschwellung (den "Muskelmagen") besitzt, und nachher am Hinterende des Oesophagus eine nochmalige Anschwellung (den "Magen"), findet sich bei *Aphelenchus* wohl das erst genannte, nicht das zweite Organ, sodass der eigentliche Darm unmittelbar hinter den Muskelmagen anfängt. Es haben weiter die Männchen der *Tylenchus*-