

THE ORTHOPTERA OF NORTHEASTERN AMERICA.

BY

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In 1885, when I was a sophomore at Indiana University, Dr. J. C. Branner first taught me that an insect has six legs. About the same time I first learned through Dr. D. S. Jordan that insects, birds and other animals have definite scientific names and that they can be arranged and classified into orders, families, genera, species, etc. Previous to that time I had about as much knowledge of or interest in such things as the king of Zululand has in logarithms.

While Dr. Branner was professor of Geology, he was at the same time interested in Entomology, and in the spring term of 1885 formed a class in that subject and gave lectures two or three times a week. Of the members of that class I remember definitely but three, Chas. A. Bollman, Jerome McNeill and myself. We three occasionally went forth and studied insects at first hand. The 17-year locusts were on hand that spring and the first insects I ever collected to keep were some of these, which I pinned on ordinary pins and stuck on the walls of my room. I have a few of them yet.

When once started, I soon saw the advantage of a private collection, one that I could call my very own, so I secured a dozen empty cigar boxes, split some corn pith and placed a layer in the bottom of each box, and began to collect every thing from chiggers up to Cecropian moths. That collection has gradually grown until now I live in the biggest "bug house" in Indiana.

As grasshoppers were common and easily collected, McNeill and I became especially interested in them. He afterward kept up that interest and in time published a number of valuable papers on the group.

The great bugbear of our work was lack of literature. We could get specimens, but at that time we could not make books. The University library had burned in 1883, and in restocking its shelves the authorities did not take kindly to bug books. We had access only to such works as Harris' "Injurious Insects of Massachusetts", and Packard's "General Entomology". I was working my way through college and had all I could do to furnish fuel for my body, none to spare for expensive out of print works on Entomology. On a trip to Indianapolis in 1886, I happened upon a copy of Thomas' "Acrididae of North America" in a second hand book store, which for four bits became my personal property. I took it home and was able from it to name the majority of my species of grasshoppers or, rightfully, locusts. From that time on my interest in the order Orthoptera increased. I collected them in all parts of the State, and between 1887 and 1894, while living in Terre Haute, published a series of papers on the Acrididae of Indiana in the *Canadian Entomologist*. As the literature on the other families of the order was widely scattered, I prepared works on the Indiana Gryllidae, Blattidae and Locustidae, which were issued in the Proceedings of this Academy for the years 1892 and 1893. These were my first contributions to those Proceedings.

In 1903, I published in the 27th Annual Report of the Indiana Geological and Natural Resources Survey a paper of 350 pages on Indiana Orthoptera which included keys, descriptions and full notes on habits of all the species known in the State. This gave Indiana students interested in the group a single work with which they could identify and arrange their specimens, something that I had long desired for my own use but which was not extant and therefore not available to me. After that time, for a dozen or more years, I gave my attention to Coleoptera and did little along Orthopteran lines.

Since 1910 I have spent eight winters in Florida and while there have collected such Coleoptera, Orthoptera and Heteroptera as I could find at that season. My captures there between October 25 and April 15—the earliest and latest dates which I have been in the State—aggregate about 1,500 species of Coleoptera, 150 of Orthoptera and perhaps 400 of Hemiptera-Heteroptera, the last named group as yet not studied or even in great part mounted.

During the last ten years the study of Entomology has become one of the most, if not the most important among the different divisions of Zoology—this in great part due to its economic phases, its bearing upon the production of food, and therefore upon that of the H. C. L. Among injurious insects the Orthoptera take high rank. The economic entomologist, in studying the life history, food habits and other facts regarding any insect, and in devising methods for its eradication, and putting them before the public, must have a handle, a scientific name for it. He cannot call it as he would a man, John Jones of Smithville, Ind., and let it go at that, but must call it by its correct scientific handle, so that other entomologists, the world over, may know with just what species he is dealing. Our present knowledge of the Orthoptera of the eastern United States is scattered throughout hundreds of papers, the majority of them out of print and difficult to obtain. The economic entomologist is in need of a single work—a manual of Orthoptera which will give him this knowledge.

Being out of a job and realizing the truth of the old adage that "An idle brain is the devil's workshop," or, if not that, the "workshop of a soul of discontent," I saw this need and three years and more ago began the preparation of a work in which all species of Orthoptera known from the United States east of the Mississippi River or from Canada east of the 90th meridian, are treated in detail, with full diagnoses of families, tribes and genera, keys to and descriptions of all species, distribution, habits, etc., etc. Many of the 353 species and 58 varieties or races recognized from the territory covered, occur of course in the region west of the Mississippi—but there had to be a "dead-line" somewhere, and that stream furnished the one most available.

Of the more than 400 forms treated, I have collected personally in the field 307, and have seen or studied either in my own collection or elsewhere, all but five, so that the work is based principally upon first-hand knowledge. The 58 varieties are, for the most part, treated as species by other writers, but my field work, taken in connection with my ideas of

geographical variation, caused me to reduce them to varieties or races. Where a well known species ranges over a large area, the different environments, due to altitude, variation in mean annual temperature, atmospheric conditions, difference in topography, drainage and soils, varied food plants and many other causes, are sure to bring about certain changes in its external structure. If only the extremes of these variants be at hand, they are often so different in appearance as to cause them to be considered races or even different species. However, where a large series from all parts of the range are present, intermediates are almost sure to be found and there is little use and often much resulting confusion in giving or recognizing a specific name for each slightly variable form.

The Orthoptera of the territory covered I have placed in eight families of which I will make brief mention, comparing the members of each as represented in the faunas of Indiana and Florida.

FAMILY I.—FORFICULIDAE.—The Earwigs. Narrow, flat Orthopterons, with either short outer wings or none at all, their abdomen ending in a pair of forceps-like appendages. They are mostly subtropical in distribution and occur beneath bark or in crevices in houses and ships. Twelve species are known from eastern North America, nine occurring in Florida, three in Indiana, one common to both states and one not found in either. The name earwig was given them by the peasants of Europe, who believe that they often enter the ears of humans and injure the hearing, such belief being of course nonsensical. They often do much damage by eating ripe fruit, tender shoots and corollas of flowers, etc.

FAMILY II.—BLATTIDAE.—The Cockroaches. Examples of these are familiar to all. Their distribution is mainly tropical and of many species cosmopolitan. In the houses of the poorer classes of the tropical countries they form the most annoying and disgusting of insect pests. They are omnivorous in choice of food, but live chiefly upon animal and vegetable refuse. In some parts of Brazil they are said to eat the eyelashes of the children, biting them off irregularly, often quite close to the lid, and as the children have very long black eye-lashes, their appearance thus defaced is very grotesque. Where abundant in a house, cockroaches leave a fetid, nauseous odor, well known as the "roachy odor" which is persistent and defiles both food and dishes. One writer has thus quaintly written of them and other house-dwelling insects in the screenless hotels of India :

"On every dish the booming beetle falls,
The cockroach plays, or caterpillar crawls;
A thousand shapes of variegated hues
Parade the table or inspect the stews.
When hideous insects every plate defile
The laugh how empty and how forced the smile."

While hundreds of species of cockroaches occur in the tropics, only 43 and two varieties are residents of the United States. Of these 30 species and both varieties are known east of the Mississippi, 24 species and one va-

riety occurring in Florida, 11 species in Indiana, seven common to both states, and two species and one variety not known from either.

FAMILY III.—MANTIDÆ.—This family comprises the "soothsayers" or "spraying mantids," long, ungainly bodied forms having the fore legs raptorial or fitted for grasping other insects and conveying them to the mouth. They are the tigers and cannibals among Orthoptera, living mainly upon living insects and often upon one another. A male kept in captivity in New York ate in one day three large grasshoppers and a daddy long-legs and then tackled another mantis from which he was separated with difficulty. Nine species of mantids occur in the eastern United States, seven in Florida, two in Indiana, both of which are among the seven Floridian species, and two introduced species in the outside States.

FAMILY IV.—PHASMIDÆ.—The members of this family are known as walking-sticks. They simulate twigs or leaves in form of body, and often lie stretched out in such a manner as to deceive a close observer. All are vegetable feeders and often do much damage to the foliage of trees and shrubs. They also are mainly tropical in distribution, only 11 species occurring in the Eastern States. But two of these are known from Indiana and five from Florida—one common to both states and five outside of either.

FAMILY V.—TETRIGIDÆ.—This family comprises those minute grouse or pygmy locusts which have the pronotum extending back to or beyond the tip of abdomen and the fore and middle tarsi with only two joints. They live mainly along muddy or sandy flats or on dry open wooded hillsides and are the only Indiana locusts which pass the winter as adults. About 450 nominal species are known from all parts of the earth. Only 16 species and eight varieties are recognized from the Eastern States. Of these eight species and five varieties occur in Indiana, nine species and three varieties in Florida, six species and one variety being common to both states, and five species and one variety not occurring in either.

FAMILY VI.—ACRIDIDÆ.—This family comprises the dominant group of our eastern Orthoptera. While commonly called "grasshoppers," they are in reality the locusts mentioned in the bible—the ones of which the prophet Joel wrote:

"The land is as the garden of Eden before them, and behind them a desolate wilderness: yea, and nothing shall escape them."

Several of these locusts, at times, after one or two favorable seasons, increase in such numbers as to do enormous damage, the fully winged forms often congregating and migrating in vast droves, stopping wherever food appears abundant and stripping the country bare in a few hours. Of one of these migrations the poet Southey wrote:

"Onward they came, a dark continuous cloud
Of congregated myriads numberless,
The rushing of whose wings was as the sound
Of a broad river headlong in its course
Plunged from a mountain summit, or the roar
Of a wild ocean in the autumn storm,
Shattering its billows on a shore of rocks."

There is an Arab legend to the effect that "A locust unto Mahomet said: "We are the army of the great God; we produce ninety-nine eggs; if the hundred were completed, we should consume the whole earth and all that is in it."

These locusts or short-horned grasshoppers are the Orthoptera which are so common in our meadows and pastures, on our city lawns, and along our roadsides from mid-April until late November. From the eastern United States 130 species and 21 varieties of the Family Acrididae are recognized by me, 51 species and ten varieties belonging to the single genus *Melanoplus*. Of the entire number 50 species and three varieties occur in Indiana, 52 species and 11 varieties in Florida, 22 species and one variety being common to both states and 50 species and eight varieties of the eastern forms not known from either of the two states.

FAMILY VII.—TETTIGONIDAE.—This family, formerly known as Locustidae, comprises our Orthoptera commonly known as katydids, long-horned green grasshoppers, cone-head grasshoppers, camel crickets, stone crickets, etc. Some of the larger green-winged forms—the true katydids—are either known to you in person or through their strident notes, one of them being quoted by Holmes as saying:

"I sit among the leaves here, when evening zephyrs sigh,
And those that listen to my voice I love to mystify;
I never tell them all I know, altho' I'm often bid,
I laugh at curiosity and chirrup, 'katy-did.'"

There are many characters separating the Tettigoniidae from the locusts or Acrididae, one of the most interesting being that the auditory organ or ear is situated on the basal ring of the abdomen in the locust and on the tibiae of the front pairs of legs in the katydids, as also in the crickets. The males only of the winged forms stridulate, the note being a sexual or love call, but both sexes possess the auditory organ. In the wingless form of all Orthopterons both stridulating organs and ears are absent. As I have mentioned on another occasion before this Academy; These katydids and crickets were the first musicians of the earth, as by means of their shrilling organs they enlivened the solitudes of the strange old Devonian forests with their love calls and wooing notes.

Ninety-seven species and 14 varieties of Tettigoniidae are recognized from the Eastern States, 40 species and three varieties occurring in Indiana, 46 species and nine varieties in Florida, ten species and one variety being common to both states and 21 species and three varieties not found in either.

FAMILY VIII.—GRYLLIDAE.—*The Crickets*.—Some of the members of this family, as the ground and field crickets, are very common insects and familiar to all. Others, as the mole crickets, the tree crickets and bush crickets, are more often heard than seen. One of the smallest of our eastern species occurs only in the nests of ants. All are chiefly vegetable feeders and in the aggregate do much damage to forage and other crops.

Forty-seven species and 14 varieties or subspecies of crickets are known

from the Eastern States. Of these 22 species and six varieties occur in Indiana, 29 species and eight varieties in Florida, 11 species and four varieties being common to the two states, and seven species and four varieties of our eastern forms not occurring in either state.

While the aggregate number of forms of Orthoptera occurring in North-eastern America is few as compared with the Coleoptera, they often apparently make up in individuals what they lack in number of species. Those with which we are most familiar are diurnal and move freely from before the intruder on their domains. Those which are nocturnal we know best by their strident notes which form the great bulk of the music of that autumnal choir which fills the air at night from mid-July until the hoar frosts of autumn have brought death to the musicians. Blot the Orthoptera from our insect fauna and the weird music of nature would almost wholly disappear.

The trills of crickets—black Gryllids, brown Nemobids and white Oceanthids—seem to form most of the night sounds, though the note of the broad-winged or true katydid is the loudest and most strident of them all. By day the songs of the green grasshoppers—our meadow musicians par excellence—ring out from every swale and lowland meadow in unbroken symphony as long as the afternoon sun shines brightly upon the choir.

By day also the males of our common locusts chirrup and call from their grassy retreats, some while at rest, others while winging their way from one point to another and still others while hovering a few feet above the supposed hiding places of the opposite sex. All in all, the order Orthoptera comprises one of the most interesting groups of the great class of insects.