

NEOCONOCEPHALUS LYRISTES (REHN AND HEBARD)
IN THE MIDDLE WEST
(Tettigoniidae, Orthopt.)

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On October 6, 1929, the writer collected three specimens of *Neoconocephalus lyristes* (Rehn and Hebard)¹ in a marl bog known as Cedar Swamp, in Champaign County, Ohio. The species had not then been recorded west of the Atlantic coastal plain.

Subsequently specimens were taken at the same locality on August 24, 1930; August 7, 1931, and September 11, 1932. We have also found the species at Clear Lake, near Medway, Clark County, Ohio, (one male, October 4, 1931, Milton B. Trautman and Edward S. Thomas) and at Silver Lake, in Miami County, near New Carlisle, (four males, October 2, 1932, Charles F. Walker and Edward S. Thomas). On July 20, 1932, the species apparently had not yet reached maturity at Cedar Swamp, when a careful search disclosed no singing males. All specimens captured by us have been males, located by means of their song. We have done a little sweeping and have searched carefully for female specimens, without success as yet.

N. lyristes has doubtlessly been confused with the much commoner *N. nebrascensis* (Bruner) by collectors in the middle-west. Blatchley (1920, 517) states that in central and northern Indiana *nebrascensis* is the commonest of the three species of *Neoconocephalus* there occurring, and further (pp. 518-19) that Davis (Ms.) was unable to separate certain Indiana individuals from New Jersey specimens of *lyristes*, except by the labels they bore. In Ohio, *nebrascensis* is abundant in the south and very rare in the northern portions, and there seems little doubt but that some of Blatchley's northern records of *nebrascensis* should prove to be in fact *lyristes*. Unfortunately, I have been unable to obtain access to Mr. Blatchley's specimens.

¹Determined by Morgan Hebard. My determinations of *N. nebrascensis* (Bruner), hereinafter mentioned, also were confirmed by Mr. Hebard.

Suspecting from Walker's (1904, 338) description of the habitat and song of his specimens from Sarnia, Ontario, that they were *lyristes* and not *nebrascensis*, I sent specimens of the two species to Dr. Walker for comparison. Under date of January 26, 1933, he writes that his Sarnia specimens "are undoubtedly *lyristes*, as you suspected."

An examination with T. H. Hubbell of his specimens taken in Berrien County, Michigan, shows them to be typical *nebrascensis*, as recorded by him, (1922, 60). This appears to be the northernmost unquestioned recorded occurrence for this species east of the Mississippi.

Neoconocephalus lyristes, while superficially similar to *nebrascensis* in appearance, can readily be distinguished by a number of characters. In habitat and song, the two species differ markedly.

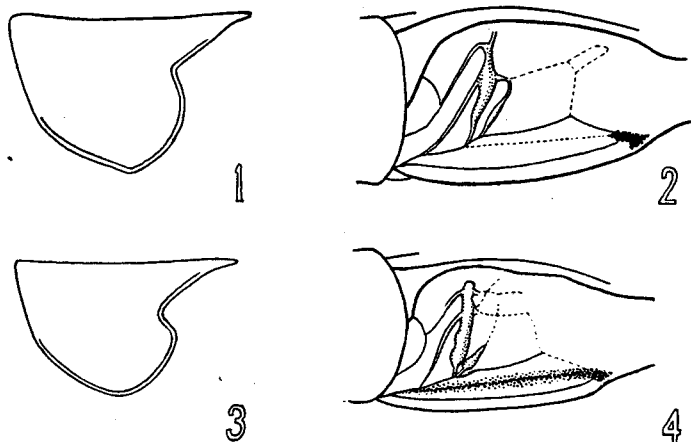
A comparison of the two species made by Mr. Hebard and the writer at Philadelphia in 1931 revealed that the most trustworthy structural character is the tegminal sinus of the pronotum, which in *nebrascensis* is decidedly "open," that is, forming an obtuse angle; in *lyristes*, it is almost rectangular. Among the series of 58 specimens of *nebrascensis* and the 15 specimens of *lyristes* in the Ohio State Museum, this character is perfectly constant and obvious, with no apparent intergradation. Another good character we found to be the long, dark line along the sinistral margin of the stridulating field in *lyristes*, which, in the other species is represented by an obscure, dark dot at the caudal end.

Rehn (1906, 366) has pointed out that *nebrascensis* is of "more robust build, with broader tegmina, wider and more arcuate tympanum, more expanded caudal section of the pronotum, and deeper lateral lobes of the same," all of which holds good with the Ohio material of the two species.

Many of the differences mentioned by Rehn, while perfectly obvious to the naked eye, are less valuable when reduced to figures since the difference is often found to result in fractions of a millimeter. Our series of Ohio *lyristes* is very constant as regards width of tympanum, eight specimens giving an average of 4.30 mm., with extremes of 4.55 and 4.13 mm. As compared with these, a series of 10 *nebrascensis* gives an average width of 4.82 mm., with extremes of 4.41 and 5.11 mm. Only one specimen of *nebrascensis*, an obvious "runt," comes within the measurements of the other species, and this individual in

relative proportions shows ratios well within those for *nebrascensis*.

The left tegmina of the eight *lyristes* average 8.38 mm. in breadth; those of ten *nebrascensis* 9.17 mm., while the average length of the former (37.6 mm.) actually exceeds that of the larger *nebrascensis* with 36.8 mm. The relative proportions of the tegmina of the two forms may best be expressed by dividing the width into the length, the resulting ratio for *lyristes* averaging 4.49, with extremes of 4.23 and 4.65; that for *nebrascensis* 4.01, with extremes of 3.57 and 4.21. The ratios in the two series approach each other, but do not overlap.



Figs. 1 and 2. *Neoconocephalus nebrascensis* (Bruner). 1, Lateral view of pronotum, showing deeper lateral lobe and shallower, obtuse tegminal sinus. 2, Tympanum, showing more arcuate form and fuscous shading restricted to small spot.

Figs. 3 and 4. *Neoconocephalus lyristes* (R. and H.). 3, Lateral view of pronotum. 4, Tympanum.

The specimens mentioned above are mounted with wings unspread. Our few spread specimens give similar ratios. Measurements were made with a micrometer disc in a binocular microscope, except in the case of the tegminal lengths which were obtained with dividers.

I find the stridulating field of the two forms to be quite distinctive in many details, particularly in the form of the heavy stridulating vein, which in *lyristes* is heaviest toward the sinistral end, while in *nebrascensis* it is widest near the middle and tapers decidedly to the left. The accessory vein at the

sinistral margin, immediately caudad of the stridulating vein is short and very heavy in *lyristes*; longer and much weaker in *nebrascensis*.

In addition, there seem to be minor differences in the coloration of the brown individuals, in the nature of the maculation of the tegmina and in the form of the fastigium of the vertex, though the latter characters shows considerable of variation, especially in *nebrascensis*.

The song of *lyristes* is a continuous, uninterrupted, loud, thin buzz, which might be paraphrased thus: "Bz-z-z-z-z-z-z-z." It is continued for indefinite periods. In our experience, the insect begins to sing in full sunlight late in the afternoon. Walker reports his specimens as singing in the morning hours.

The song of *nebrascensis* does not closely resemble that of any other member of the genus, so far as I am aware. It consists of a series of buzzing notes of a lower pitch than that of *lyristes*. Each note lasts for a trifle more than one second and is followed by a pause of a half-second or less, the series of notes thus forming a rhythmical song which is continued for an indefinite period, thus: "Bz-z-z-z-z-t, bz-z-z-z-z-t, bz-z-z-z-zt, . . ." I have never heard *nebrascensis* sing before sunset.

All three of the Ohio localities in which we have taken *lyristes* are apparently glacial relict bogs, showing a decided prairie influence in their vegetation. The species has invariably been associated with (although not always in) Shrubby Cinquefoil (*Dasyphora fruticosa*) and it has also been taken frequently on Big Bluestem grass (*Andropogon furcatus*). Cedar Swamp is the only arbor-vitae bog remaining in Ohio. All of the bogs in question contain many plants which are either of boreal or of prairie origin, such as *Toxicodendron vernix*, *Triadenum*, *Ibidium cernuum*, *Lobelia kalmii*, *Parnassia caroliniana*, *Solidago ohioensis*, *S. riddellii*, *Sorghastrum nutans*, *Agalinis purpurea*, *Sanguisorba canadensis*, and *Anticlea elegans*.

As contrasted with the habitat of *lyristes*, *nebrascensis* occurs normally in boggy spots in or near woodland, and in sloughs and river-bottom marshes bordered by willows or other trees. It seldom occurs far away from trees of some sort and in fully fifty percent of the cases, we have found the singing males perched in woody vegetation. At Cedar Swamp, the only locality where we have noticed both species, *nebrascensis* occurred in trees and shrubbery around the border of the bog, while *lyristes* invariably was found over the marl bog itself,

either in the *Dasyphora* heath or in prairie grasses. At this locality *N. ensiger* occurred commonly associated with *lyristes*, although the former species was more abundant in the weedy sedge meadows nearer to the borders of the bog.

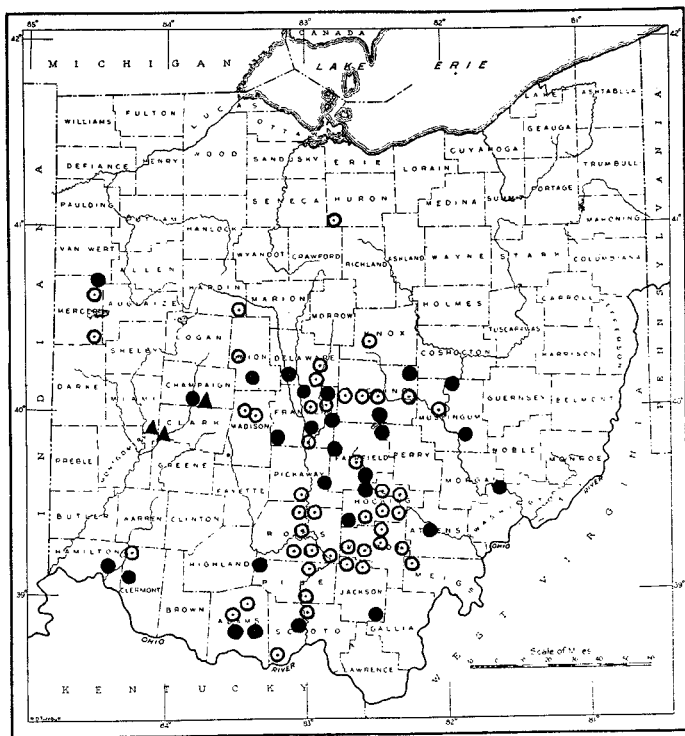


Fig. 5. Map showing known distribution of *Neoconocephalus nebrascensis* and *N. lyristes* in Ohio. *Nebrascensis*, dotted circles indicate sound records; black circles, records of specimens collected. *Lyristes*, black triangles, records of specimens collected.

It seems altogether probable that *Neoconocephalus lyristes* may have invaded the Great Lakes region from the Atlantic seaboard in early postglacial times by way of the Mohawk-Hudson outlet, over the same route believed to have been followed by a number of Atlantic coast plants.² On the other hand, *nebrascensis* would seem probably to be of western origin.

²It is also of interest in this connection to note that Cedar Swamp is the only known Ohio station for the grasshopper, *Paroxya atlantica* Scudder, a species with a range similar to that of *N. lyristes*. *Argia bipunctulata* (Hagen), has also been recorded by Donald J. Borror (Ohio Jour. Sci., 30: 414, 1930) from this bog, which is the first record west of the Alleghenies for this dragonfly.

In view of the very different songs of the two forms, the distinct structural and color characters, the occurrence of both within the same range in portions of the middle west and the absence of known intergrades, it seems certain that *lyristes* cannot be a subspecies of *nebrascensis*, as placed by Blatchley (1920, 518), but that it represents a distinct species, as originally described by Rehn and Hebard (1905, 45).

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INSECTS. A BOOK FOR TEACHERS, STUDENTS, AND ALL OTHERS INTERESTED IN THE VAST WORLD OF THE SIX-FOOTED. Western Nature Study Series, GAYLE PICKWELL, Editor. Pages i-xv and 1-304; 139 figures, incl. colored frontispiece. 1933. Published for The Natural Science Department, San Jose State Teachers College (Calif.), by Suttonhouse, San Francisco. \$3.00.

It is refreshing to find a book in which all of the illustrations are original, but to our task! As indicated in the table of contents this volume is a product of joint authorship. Of the twenty chapters, eight are by Gayle Pickwell, eleven by Carl D. Duncan and one by Karl S. Hazeltine, who, with Emily Smith are Editors of the Western Nature Study Series. Some of the photographs by Pickwell are very good. The line drawings are good, but should have had much more reduction by the engraver.

This book is well bound, printed on excellent paper and appears to be a very high grade of natural history. Structure, function and general behavior are woven together all the way through it. Only one chapter (XII) is given to systematic entomology, one to the value of insects and one to harmful insects. Chapter XX is an excellent summary and discussion of the general literature of insect life available to teachers in nature study.

This volume gave the reviewer a real thrill as he has mourned many times over the serious lack of amateur groups in this country that are interested in insects. The United States is one of the richest entomological fields in the world. Perhaps its very richness has overwhelmed the amateur in that he cannot get his material named. We lack the numerous excellent handbooks available in Europe on European insects and in many groups will lack them for many years to come. Probably some blame for this lack of general interest can be laid at the door of our high schools whose superficial teaching arouses little interest in the minds of bright students. The numerous amateur entomologists of Europe appear to come from the private schools of England and the excellent secondary schools on the continent. May we not hope in vain for more books of this type from our Colleges of Education and State Normal Schools!—C. H. K.