

NEMOBIUS MELODIUS, A NEW SPECIES OF CRICKET FROM OHIO

(ORTHOPTERA, GRYLLIDAE)

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The distinctive song of this cricket attracted the attention of the senior author in 1954. We were unable to secure specimens at that time, but the junior author secured tape recordings of the song. In 1956, we returned to the locality and secured specimens, and studies of the song were made in the laboratory by the junior author.

A search through The Ohio State Museum's series of *Nemobius carolinus*, with which the new form could easily be confused, resulted in the finding of a single female taken at Cincinnati, Ohio, in 1929. The junior author then discovered that tape recordings of a cricket song made at Cranberry Island, Licking County, Ohio, in September, 1954, and August, 1955, were indistinguishable from those of the new species; and specimens collected on those occasions proved referable to it.

Nemobius melodius n. sp.

This species is closely related to *Nemobius carolinus carolinus* Scudder and virtually indistinguishable from the latter in coloration and general structure. The females may be distinguished at a glance by their much longer ovipositor, and the males by the much larger number of teeth on the file of the stridulatory vein. The new species averages larger than *carolinus*, and all of our specimens are as intensively colored as the darkest individuals of *carolinus*. The song is distinctive, not closely resembling that of any other cricket known to us, and bearing little resemblance to that of *carolinus*.

Holotype. Male, taken in Carroll County, Ohio, Augusta Township, Section 34, 15 September 1956 (Edward S. Thomas and Richard D. Alexander). Form, coloration, and general appearance as in *Nemobius carolinus*, except for larger size and distinctiveness of file on stridulatory vein. Concealed genitalia as in *carolinus*. Measurements (in millimeters, made with ocular micrometer in binocular microscope): width of head, 2.46; width of pronotum, 2.52; length of pronotum, 1.86; length of body, 9.8; length of right tegmen (somewhat curled in mounting), 6.19; length of femur, 6.50; length of stridulatory vein from above, from inside edge of marginal vein to inside edge of ulnar, 1.39; number of teeth of file, 123.

Allotype. Female, same data. Same form and coloration as in *carolinus*, except for larger size and longer ovipositor. Coloration intensive. Measurements: width of head, 2.39; width of pronotum, 2.65; length of pronotum, 1.72; length of body, 9.94; length of right tegmen, 4.20; length of femur, 6.50; length of ovipositor, from caudal margin of dorsal projection at base to tip, 5.40.

Paratypes. 1 male, 7 females, same data; 1 male, Licking County, Ohio, Union Township, Cranberry Island, 15 September 1954, Richard D. Alexander; 1 male, 1 female, same locality, 21 August 1955, Richard D. Alexander; 2 females, same locality, 10 September 1954, Robert E. Woodruff; 1 female, Cincinnati, Ohio, 13 October 1929, Edward S. Thomas. All of our specimens are micropterous. The type series is in The Ohio State Museum. Paratypes will be deposited in The United States National Museum and The University of Michigan Museum of Zoology.

In addition to these, microscope slides were made of the right tegmina of 3 males of *melodius* from the type locality. These are included in the measurements in Table 1 for length of stridulatory vein and number of teeth only. The specimens are in alcohol and are not included in the paratypic series.

Individuals of the type series are quite constant in their relatively large size and their intensive coloration as compared with *carolinus*. As indicated in table 1, there is considerable overlap in measurements of *melodius* and *carolinus* in every character examined except the number and location of the teeth on the stridulatory vein and the length of the ovipositor. Nevertheless, in almost every character studied, the larger specimens of *melodius* fall outside the range of variation in *carolinus* and the smaller specimens of *carolinus* fall outside the range of *melodius*.

TABLE 1

A comparison of measurements of Nemobius carolinus and N. melodius

Morphological Character	Sex	<i>Carolinus</i>		
		Hebard (1915) (77♂, 101♀)	Ohio (10♂, 10♀)	<i>Melodius</i> (4♂, 13♀)
Width of head	♂	-----	1.66-2.12	2.00-2.46
	♀	-----	1.72-2.26	2.12-2.48
Caudal width of pronotum	♂	2.1-2.9	2.12-2.60	2.12-2.65
	♀	2.0-2.7	1.93-2.65	2.39-2.92
Length of pronotum	♂	1.6-2.0	1.13-1.61	1.53-1.86
	♀	1.6-2.0	1.30-1.80	1.66-1.95
Length of body	♂	6.9-8.8	6.38-8.82	7.75-9.80
	♀	6.3-8.4	6.60-8.85	8.25-9.94
Length of right tegmen	♂	4.8-5.8	4.13-5.80	5.25-6.19
	♀	2.9-4.4	2.57-4.00	3.32-4.20
Length of caudal femur	♂	5.5-6.4	4.25-5.75	5.40-6.50
	♀	5.0-6.4	4.32-6.25	5.85-6.90
Length of ovipositor	♀	2.6-3.9	2.59-3.10	4.69-5.40
Length of stridulatory vein	♂	-----	0.86-1.06	0.98-1.39
Number of teeth on stridulatory vein	♂	-----	(14 specimens) 51-63	(7 specimens) 110-125

There is a wide gap between the number of teeth of the stridulatory file in the specimens of the two species examined, those of *carolinus* ranging from 51 to 63, as compared with 110 to 125 in *melodius*. In addition, the extent of the file on the stridulatory vein differs considerably in the two forms. In *carolinus* the teeth of the file fall far short of the ulnar vein, while in our specimens of *melodius* the teeth extend beyond the ulnar vein (fig. 1). This character provides ready separation of the males of the two species without resorting to an actual count of the number of teeth.

There is also a wide gap in the measurements of the ovipositor in the specimens of the two species before us, the longest ovipositor of *carolinus* measuring 3.10 mm., the shortest of *melodius*, 4.69.

We have examined descriptions of the following forms considered to be synonyms of *carolinus* and find that the measurements given for ovipositor length are all considerably less than those of *melodius*: *volaticus* Scudder, 1877, 3 mm.; *septentrionalis* Provancher, 1877, 3.05 mm.; *affinis* Beutenmuller, 1894, 3-4 mm.; *exiguus* Blatchley, 1900, 3.5 mm.; *angusticollis* Walker, 1904, 3.3 mm.; *macdunnoughi* Urquhart, 1938, 3.1 mm.

The wide range of variation in *N. carolinus* in size and coloration, its wide ecological amplitude and certain differences in the song suggest the possibility that the form as now known may represent a complex, such as has been found in *Acheta*, *Anaxipha*, and the *Nemobius fasciatus* group (Fulton, 1931, 1952, 1956).

Song. The song of *melodius* is a smooth, clear, musical, high-pitched, continuous trill, in which the individual sound pulses are perceptible but far too rapid to count. The quality is somewhat reminiscent of the notes of an *Anaxipha*. It was the pleasing character of the song which suggested the name for the species. The contrast with the buzzing song of *carolinus* is so great that one would not suspect the close relationship of the two species.

Audiospectrographic analysis of the calling song of six individuals of *melodius* shows it to be a monorhythmic succession of sound pulses at rates varying from 24 to 39 per second at temperatures ranging between 65° and 80° F. Over this same range, the dominant frequency varied from 4.8 to 6.1 kilocycles per second. The calling song of 22 individuals of *carolinus* from Ohio,

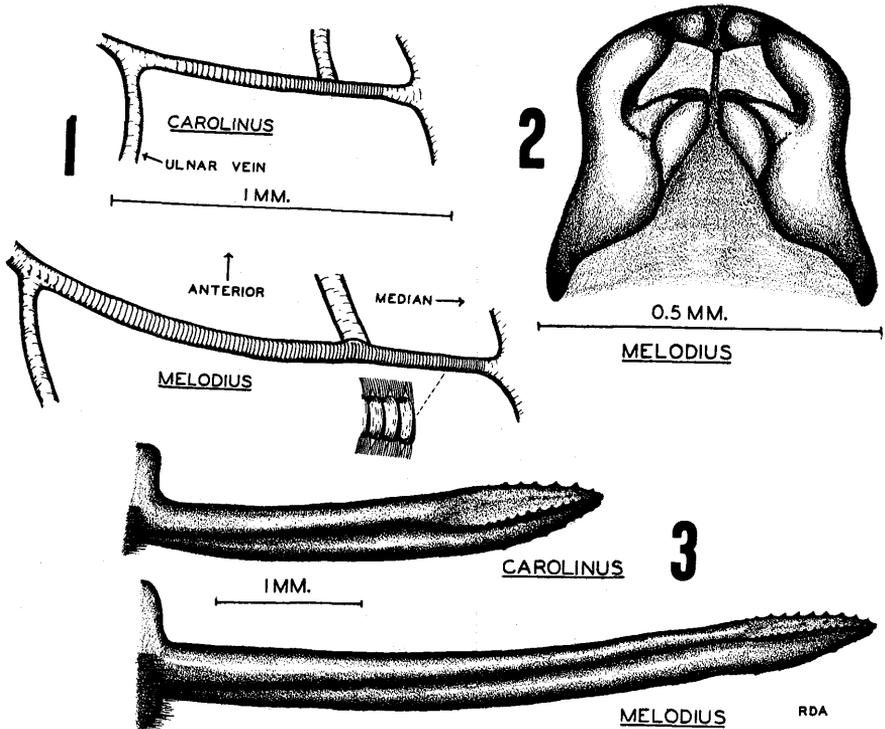


FIGURE 1. Ventral view of the stridulatory vein on the right tegmen of *Nemobius carolinus* and *N. melodius* (drawn from slides).

FIGURE 2. Ventral view of the male genitalia of *Nemobius melodius* (holotype).

FIGURE 3. Lateral view of the ovipositors of *Nemobius carolinus* and *N. melodius* (latter drawn from specimen No. 4, Carroll Co. O.).

Illinois, and Virginia varied from 58 to 76 pulses per second, and from 4.6 to 5.95 kilocycles per second over about the same temperature range. A fuller analysis of the songs will be found in an accompanying paper by Alexander.

Ecology. The specimens from the type locality were found in an extensive marsh, for guidance to which we are indebted to Mr. Forest Buchanan, of Amsterdam, Ohio. The marsh occupies a preglacial valley in the unglaciated Allegheny Plateau which was deeply filled with silts when the outlet of the original stream system was blocked by an early glacier. The swamp contains a number of northern relict plants, such as Toothed Arrow-wood (*Viburnum recognitum*, until recently known universally as *V. dentatum*), Winterberry (*Ilex verticillata*), Smaller Forget-

me-not (*Myosotis laxa*) and Speckled Alder (*Alnus rugosa*, formerly known as *A. incana*). The habitat in which the colony of *melodius* was found was, however, not unusual. The insects occurred at the margin of a portion of the marsh which was grazed by livestock, with scattered saplings of Pin Oak (*Quercus palustris*) and Cocksbur Thorn (*Crataegus crus-galli*) and tangles of Swamp Rose (*Rosa palustris*). The wetter portions were densely vegetated with Soft Rush (*Juncus effusus*), Rice Cut-grass (*Leersia oryzoides*), Silky Cornel (*Cornus obliqua*), Arrow-leaf Tearthumb (*Polygonum sagittatum*), Sneezeweed (*Helentium autumnale*), Pinkweed (*Polygonum pensylvanicum*), Broad-fruited Bur-reed (*Sparganium eurycarpum*) and several species of sedges. Technical names of plants are those of Gray's Manual of Botany, Eighth Edition.

The majority of our specimens of *melodius* were secured by tearing apart a soggy, decayed log, honey-combed with insect burrows, about 20 feet from the marsh proper. A number of individuals, however, were heard singing and some were collected in tussocks of marsh vegetation in the wetter portions. *Nemobius carolinus* was everywhere found associated with the new species. *Nemobius socius* swarmed in grassy places. Two specimens of *Tetrix subulata* Linnaeus a northern relict species, were collected in the area.

On the taller marsh vegetation, *Chorthippus longicornis* Latreille, *Melanoplus femur-rubrum femur-rubrum* DeGeer and *Oecanthus nigricornis* F. Walker were abundant. Other noteworthy species included *Orchelimum campestre* Blatchley, *Conocephalus nigropleurum* Bruner, and *C. attenuatus* Scudder.

Cranberry Island is a typical sphagnum-cranberry bog in Buckeye Lake. The colony of *melodius* was found in the sphagnum moss in the shrub border at the margin of the bog-meadow. *Nemobius carolinus* and *N. socius* were found abundantly in association with it.

It will be noted that the two foregoing stations have definite northern aspects. Such is not the case with the Cincinnati specimen. It was taken in the flood-plain of the Little Miami River. There are no northern relict bogs within many miles of this locality and, indeed, no sizeable marsh. The possibility exists, of course, that the specimen is mislabelled or that it was a waif, transported down stream on flotsam from farther north. This, however, must be purely speculative until careful field work throws more light on the ecology and distribution of the species.

N. melodius is apparently neither abundant nor wide-spread in distribution. The majority of the individuals at the type locality occupied a very small area, perhaps 10 yards square, with two or three singing males within a diameter of a hundred feet. The Cranberry Island colony was even more restricted. After a lapse of two and one years, respectively, the two colonies were found in the identical spots as on the previous visits. No other singing male was noted over large areas of similar habitat at either station.

Of 101 females of *carolinus* from Ontario, Pennsylvania, North Carolina, South Carolina, Georgia, and Texas, measured by Hebard in his monograph of the genus *Nemobius*, no specimen had an ovipositor measuring more than 3.9 mm. The large series of *carolinus* in The University of Michigan Museum of Zoology disclosed no female specimen with a long ovipositor.

The senior author has paid particular attention to the Orthopterous fauna of boreal relict bogs in Ohio for 29 years without having recognized the new species except at the type locality. However, in view of the fact that the males are unrecognizable in the field except by their song and the females scarcely more obvious, it is almost certain that the presence of the species has been overlooked in more than one locality. Careful field work in boreal relict bog situations in the northern United States and southern Canada should surely disclose additional stations for this interesting cricket.

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