

Mr. Morse writes: "The animal is a male, a little larger than a Newfoundland dog, nearly black in color, and has a tail about two feet in length; the snout is long, and the arms but little longer than the legs. I did not see him stand upright at all, but he went easily on all fours."

In this connection, Dr. Wilder referred to the "What is it," which was exhibited at Barnum's Museum in 1861, as "a connecting link between man and the lower animals"; but which he examined in March, 1861, and found to be only an idiotic negro-boy. It presented no resemblance to the apes beyond the smallness of the cranium, and a tendency to keep the body and limbs slightly flexed: but this last seemed to be the effect of weakness or habit, and did not appear to be connected with any anatomical peculiarity; the spread of the arms was precisely equal to the height of the body, as shown by the following measurements:

	ft.	in.
Length of body to heads of thigh-bones.	1	10
" " legs from " " "	2	2
Height of whole body, as though standing erect	4	0
Length of each arm from arm-pit to finger-tips	1	8
" " the two arms	3	4
Breadth of chest between arm-pits	4	0
Whole spread of arms	4	0
Breadth of shoulders (between tips of acromion processes)	11	7
Length of feet (about)	7	7

The Custodian announced that Mr. W. Ingalls had recently deposited in the Museum a large collection of paintings of fruits of Brazil, executed by himself, which were to be placed in the Botanical room. As the temporary arrangement of the geological department was now completed, both of these rooms would be opened to the public on the next visiting day.

Section of Entomology. October 23, 1867.

Mr. L. Trouvelot in the chair. Nine members present.

The following paper was read:—

NOTES ON THE STRIDULATION OF SOME NEW ENGLAND ORTHOPTERA. BY SAMUEL H. SCUDDER.

In studying the songs of *Orthoptera*, a serious obstacle will be

found in the feebleness or delicacy of the sounds which many species emit. To distinguish the notes clearly, one must bring his ear to within a few feet, or even inches of the insect during its stridulation—a process which requires great caution lest the extreme shyness of the little violinist should overcome his egotistic love of song. Once disturbed, these insects wait some time before recommencing to chirp; to obviate the tedious delay, I have had recourse to artificial means, imitating the note myself with a quill edge and file; a quick response is almost sure to follow.

My plan of observing them is as follows: after walking quietly toward the sound until it ceases—this generally takes place when I am at a distance of twenty or thirty feet—I wait motionless for its renewal; then, carefully marking the direction of the note, for it is almost impossible to determine the distance, I pass cautiously around the arc of a wide circle, until I get another line nearly at right angles to the first, and thus fix approximately the position of the insect. I then walk rapidly, but with as little disturbance as possible, to within five or six feet of my goal, stoop down or fall upon my hands and knees, and produce my apparatus. I commence my mock stridulation after a short delay; at first, the sounds must be subdued and separated by considerable intervals, then loud and repeated in quick succession. Before a minute has elapsed, and, often, in a few seconds, I hear the response. After holding a short conversation in this way, I permit the insect to chirp to his neighbors, and searching for him in the grass, approach him quietly while he sings, remaining motionless in the intervals. One may thus place himself within a few inches of any species living in the grass, or upon foliage of any kind, and narrowly observe all its movements.

Our *Orthoptera* stridulate in three different ways: first, by shuffling the bases of the elytra together; second, by scraping the hind thighs upon the outer surface of the elytra, and third, by rubbing together the elytra and the thickened veins of the anterior edges of the wings. *Gryllides* and *Locustariæ* use the first method; *Acrydii*, the other two. The apparatus employed in the first case, consists of a peculiar conformation of the veins at the base of the elytra; in *Gryllides*, these veins occur in the central field, but in the *Locustariæ* in the inner field of the wing.

In each of the various groups, the pitch presents a great degree of uniformity. The *Gryllides* have the shrillest note; the *Locustariæ* succeed them; among the *Acrydii*, those species which use their legs in stridulating, rank third in order of shrillness, while those which rub their wings and wing-covers together have the lowest note of all.

Harris is wrong in stating that our crickets do not begin to chirp before the autumn months; they are heard in this vicinity from the

middle of June until November; in the White Mountains their chirping did not commence this year until the 12th of August. The note of the common species (*G. neglectus*) is *cr-rur-ri* or *errri*; the rapidity with which it is uttered seems to vary very much, even in a single strain by one insect. Sometimes the notes are produced as slowly as two per second, but they may be twice as rapid; the mean seems to be the usual rate. The note is sharp and shrill, and is apparently pitched at E natural, two octaves above middle C.



Note of *Gryllus neglectus*.

In listening one night in midsummer to the chirping of these insects, I heard two choirs, one on either side of me, separated by a garden fence. The individuals of each chirped together at the rate of about two notes per second, but, whether owing to the influence of a warmer situation, or a fuller exposure to the moonlight, one choir invariably chirped a little faster than the other, and fourteen seconds elapsed between the perfect accord of the two choirs and their complete discord; from this, fourteen seconds more to their former synchronism. These cycles occurred twice per minute, and followed each other with remarkable regularity for about an hour.

Nemobius vittatus appears quite as early as *Gryllus*, if not earlier. Its chirp, although very similar to that of *Gryllus*, can be better expressed by *ru* or *rrru*, pronounced as though it were a French word. The note is trilled forcibly, and lasts a variable length of time; sometimes for several seconds; at others, it is reduced to a short, sharp click.



Note of *Nemobius vittatus*.

* It is necessary for me to describe the peculiar system of musical notation which I have adopted. Each bar represents a second of time, and is occupied by the equivalent of a semibreve; consequently a quarter note (♩), or a quarter rest (♩), represents a quarter of a second; a sixteenth note (♪), or a sixteenth rest (♪), a sixteenth of a second, etc. For convenience' sake I have introduced a new form of rest (— or —), which indicates silence through the remainder of a measure.

A few days ago I observed one of these insects singing to its mate. At first the song was mild and frequently broken; afterward it grew impetuous, forcible and more prolonged; then it decreased in volume and extent till it became quite soft and feeble. At this point the male began to approach the female, uttering a series of twittering chirps; the female ran away, and the male, after a short chase, returned to his old haunt, singing with the same vigor as before, but with more frequent pauses: at last, finding all persuasion unavailing, he brought his serenade to a close. The pauses of his song were almost instantly followed by a peculiar jerk of the body; it consisted of an impulsive movement backward, and then, as suddenly, forward, and was accompanied by a corresponding movement of the antennæ, together and then apart. The female was near enough to be touched by the antennæ of the male during the first movement, and usually started in a nearly similar way as soon as touched.

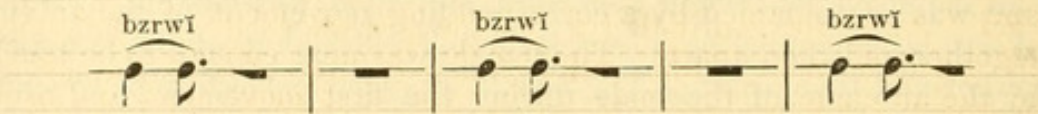
The elytra of the male are held at an angle of about twenty degrees from the body during stridulation, and, perhaps, at a slightly greater angle from each other. Even when most violent, the sound is produced by the friction of the inner edges of the elytra only, not by the whole surface; much smaller surfaces are brought together than is the case with the *Locustariæ*.

In September and October, the *Ecanthus niveus*, or white climbing cricket, may be found, often in large numbers, on the leaves of low trees and bushes. Its song lasts from one and a half to three seconds and consists of a sustained, equable, attenuated, creaking roll. I have only listened to the insect in captivity, when its utterance was faint, but Dr. Harris states that complaints are often made of the piercing shrillness of its cry.

I am familiar with but few songs of the *Locustariæ*; at the White Mountains two species—*Phaneroptera curvicauda* and *Orchelimum vulgare*—appear about the last of July. The latter shrills equally by night and day; the former is more noisy by night. In *Phaneroptera* the day and night songs differ very much; the day song is given only during sunshine, the other by night and in cloudy weather. I first noticed this while watching one of these little creatures close beside me; as a cloud passed over the sky he suddenly changed his note to one with which I was already familiar, but without knowing to what insect it belonged. At the same time, all the individuals around me whose similar day song I had heard began to respond with the night cry; the cloud passed away, and the original note was resumed on all sides. Judging that they preferred the night song to that of the day from their increased stridulation during the former period, I imitated the night song during sunshine, and obtained an immediate response

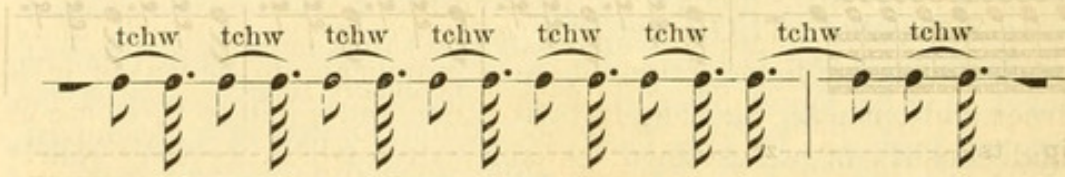
in the same language; the experiment proved that the insects could hear as well as sing.

This species is exceedingly shy, and the observer must be patient who would hold converse with it. One insect which I had disturbed, and beside which I was standing, could not, at first, decide to resume his song; he was afraid of the intruder, but enticed by a neighboring songster, gave utterance several times to a barely discernible, short click, or *ti*; after five or six of these efforts, his desires overcame his fears. The note by day is *bzrwĩ*, and lasts for one third of a second.



Note of *Phaneroptera curvicauda* by day.

The night song consists of a repetition, ordinarily eight times, of a note which sounds like *tchw*. It is repeated at the rate of five times in three quarters of a second, making each note half the length of the day note.



Note of *Phaneroptera curvicauda* by night.

The song of the common meadow grasshopper—*Orchelimum vulgare*—is more complicated. Commencing with *ts*, it changes almost instantly into a trill of *zr*; at first there is a crescendo movement which reaches its volume in half a second; the trill is then sustained for a period, varying from one to twenty seconds (generally from six to eight seconds) and closes abruptly with *p*. This strain is followed by a series of very short staccato notes sounding like *jip!*, repeated at one-half second intervals; the staccato notes and the trill alternate *ad libitum*. The staccato notes *may* be continued almost indefinitely, but are very rarely heard more than ten times in succession; it ordinarily occurs three or four times before the repetition of the phrase, but not more than two or three times when the phrase is not repeated. I have known it to be entirely omitted, even before the repetition of a phrase. The interval between the last *jip!* and the recommencement of the phrase never exceeds one quarter of a second. The night song differs from that of the day in the rarer occurrence of the intermediate notes and the less rapid trill of the phrase; the pitch of both is at B flat.

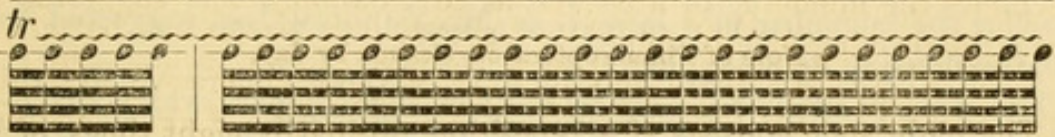
ts ----- zr -----



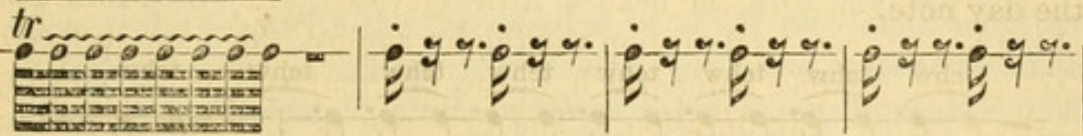
zr -----



zr -----



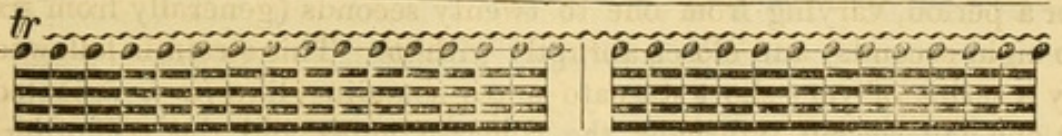
zr ----- p jip jip jip jip jip jip



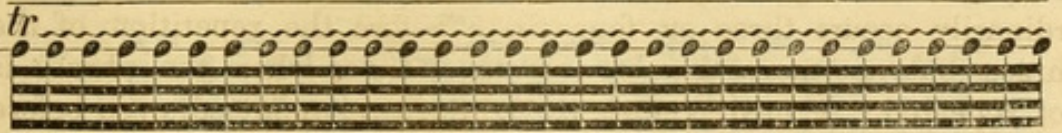
jip ts ----- zr -----



zr -----



zr -----



zr ----- p jip

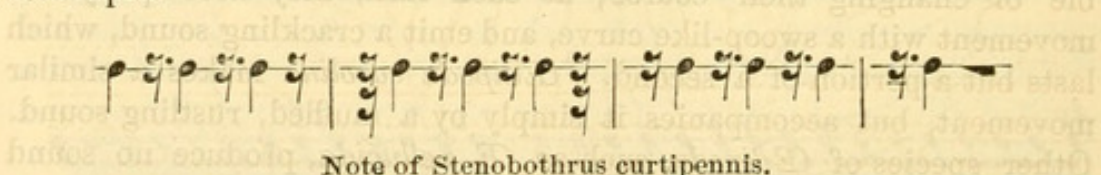


Note of Orchelimum vulgare.

Xiphidium makes a note very similar to that of *Orchelimum*, but so faint as to be barely perceptible, even close at hand.

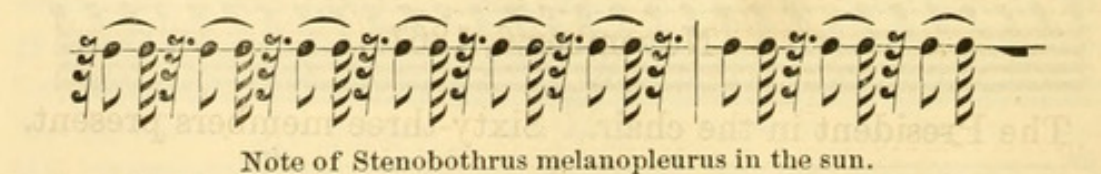
There is a species of *Conocephalus* (*C. ensiger*) which is found all over New England, but I have not heard its song. *C. robustus*, however, which makes the southern sea beaches of New England resound with its shrill, incessant din, could hardly fail to attract attention. It is heard equally by night and day, and the resemblance of its song to that of *Cicada canicularis* is quite striking. The note often lasts for many minutes, and seems, at a distance, to be quite uniform; on a nearer approach, one can hear it swelling and decreasing in volume, while there is a corresponding muscular movement from the front of the abdomen backwards, two and a half times a second. This is accompanied by a buzzing sound, quite audible near at hand; it resembles the humming of a bee, or, as Mr. Sanborn has suggested to me, the droning of a bagpipe.

The *Acrydii* stridulate only by day; of those genera which stridulate by rubbing the hind femora against the elytra, I am acquainted with the notes of but two—*Stenobothrus* and *Arcyptera*. The *Stenobothri*, when about to stridulate, place themselves in a nearly horizontal position, with the head a little elevated; they then raise both hind legs at once, and grating the thighs against the outer surface of the elytra, produce notes which, in the different species, vary in rapidity, number and duration. The first one or two movements are frequently noiseless or faint. *S. curtipennis*, abundant everywhere in New England, produces notes in sunny weather at the rate of about six a second, and continues them from one and a half to two and a half seconds. When the sky is overcast, the movements are less rapid.



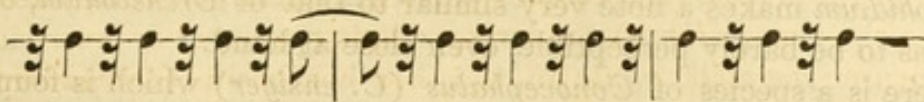
Note of *Stenobothrus curtipennis*.

S. melanopleurus, as I have proved by many examples, makes, in the sun, from nine to twelve notes, at the rate of fifty-three in fifteen seconds; the usual number of notes is ten.

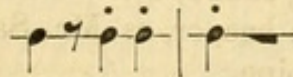


Note of *Stenobothrus melanopleurus* in the sun.

In the shade the rate falls to forty-three in fifteen seconds, the number of notes remaining the same.

Note of *Stenobothrus melanopleurus* in the shade.

The stridulation of the *Stenobothri* is never very distinct, but in *Arcyptera lineata*, a very shy species, it can be heard at a distance of fifty feet. These insects usually make four notes, but the number is sometimes greater. The first, a quarter of a second in length, is duller than the others, and followed by a pause of a quarter second; the other notes are of the same length, but sharply sounded, and follow each other rapidly.

Note of *Arcyptera lineata*.

Those *Acrydii* which produce sounds by rubbing their wings and elytra together, stridulate only during flight, and are nearly all confined to the genus *Edipoda*; their hind wings are often brilliantly variegated. These insects seem to have the sound under control, for although they generally make it during flight, they may omit it when frightened. *Tragocephala viridifasciata* and *Edipoda sordida* produce this sound during the whole of their undeviating flight; the note is perfectly uniform. *Edipoda verruculata*, *æqualis* and others, stridulate only during intervals of flight, and seem to exercise the power more at will; the flight of these insects is well sustained, and they are capable of changing their course; at each turn, they accompany the movement with a swoop-like curve, and emit a crackling sound, which lasts but a portion of a second. *Edipoda carolina* makes a similar movement, but accompanies it simply by a muffled, rustling sound. Other species of *Edipoda*, such as *E. pellucida*, produce no sound whatever.

November 6, 1867.

The President in the chair. Sixty-three members present.

Dr. B. G. Wilder spoke of symmetry and of distorted symmetry in animals and plants, especially in the leaves of the elms, and of the hop-hornbeam.



Scudder, Samuel Hubbard. YYYY. "Notes on the stridulation of some New England Orthoptera." *Proceedings of the Boston Society of Natural History* 11, 306–313.

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