

## Review of *Nealiturus* gr. *fenestratus* (Herrich-Schäffer, 1834) (Homoptera: Cicadellidae) of the fauna of Russia

### Обзор видов группы *Nealiturus fenestratus* (Herrich-Schäffer, 1834) (Homoptera: Cicadellidae) фауны России

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КЛЮЧЕВЫЕ СЛОВА: *Nealiturus*, систематика, морфология, вибрационные сигналы, фауна России.

**ABSTRACT.** Male calling signals in representatives of *Nealiturus fenestratus* (Herrich-Schäffer, 1834) group of the fauna of Russia are investigated. *N. guttulatus* (Kirschbaum, 1868) and *N. hui* (Chang, 1938) **comb.n.** (= *Bothrognathus hui* Chang, 1938), which were regarded as synonyms of *N. fenestratus* are demonstrated to be good species. *N. guttulatus* was found only in central regions of European Russia (up to the southern boundary of the forest steppes zone); farther southwards it is replaced by *N. argillaceus* Mityaev, 1975, which is widespread also in Kazakhstan and Central Asia. The range of *N. hui* includes southeastern Transbaikalia, southern part of the Russian Far East, adjacent regions of Mongolia and China and possibly, also Japan. *N. fenestratus* s. str. occurs in central and southern parts of European Russia and also, in Kazakhstan and Central Asia. Illustrated descriptions and oscillograms of calling signals of four species studied are given.

**РЕЗЮМЕ.** Проведено исследование призывных сигналов самцов видов группы *Nealiturus fenestratus* (Herrich-Schäffer, 1834) фауны России. Показано, что *N. guttulatus* (Kirschbaum, 1868) и *N. hui* (Chang, 1938) **comb.n.** (= *Bothrognathus hui* Chang, 1938), считавшиеся синонимами *N. fenestratus*, представляют собой самостоятельные биологические виды. *N. guttulatus* встречается только в центральных районах европейской России (на юг — до зоны лесостепи включительно); южнее его сменяет *N. argillaceus* Митяев, 1975, широко распространённый также в Казахстане и Средней Азии. Ареал *N. hui* включает юго-восток Забайкалья, южную часть Дальнего Востока России, прилегающие районы Китая и Монголии, а также, вероятно, Японию. *N. fenestratus* s. str. распространён в центральных и южных районах европейской части России, а также в Казахстане и Средней Азии. Приведены иллюстрирован-

ные описания и осциллограммы призывных сигналов четырёх изученных видов.

According to Nast [1972], the genus *Nealiturus* Distant, 1918 (Homoptera: Cicadellidae: Deltocephalinae: Opsiini) includes about 20 palaeartic species. The shape of male genitalia in representatives of the genus is rather uniform and coloration for the most part is variable. Therefore, discrimination between species of *Nealiturus* provides many difficulties. Young & Frazier [1954] place the forms with shafts of penis forming almost full circle into separate genus *Circulifer* Zakhvatkin, 1935, described for *C. haematoceps* (Mulsant et Rey, 1855) and related forms. However, Zakhvatkin [1935] did not give diagnosis of the genus in his paper. For this reason species with more short shafts forming semicircle occasionally are also listed under this generic name [e.g. Dlabola, 1954]. Among *Nealiturus* s. str. (i.e. excluding *Circulifer*) a group of species with black or brown coloration (especially, in males) can be separated. Usually, it is named *Nealiturus fenestratus* group after the name of the oldest species included.

Until the last one-third of XX century most of authors recognized two european species in this group, namely, *N. fenestratus* (Herrich-Schäffer, 1834) and *N. guttulatus* (Kirschbaum, 1868). Their illustrated descriptions and diagnostic characters are given in Ribaut [1952]. Later his concept of these species was accepted by Dlabola [1954], Emelyanov [1964] and certain other authors. Still, investigation of sufficient sample almost always allows revealing specimens with intermediate characters, and in later years *N. guttulatus* was regarded as a synonym of *N. fenestratus*.

Records of *N. fenestratus* from the Russian Far East are given in Vilbaste [1968], Anufriev [1978] and Anufriev and Emelyanov [1988]. Certain differences between european and the far-eastern forms in the shape of pygofer processes led Anufriev [1978] to suggest that

populations from the Southern Maritime Province can represent separate species. Still, he preferred to use the name *N. fenestratus* in his monograph. On the other hand, none of these authors mention *Bothrognathus hui* Chang, 1938, which was described from China [Chang, 1938] and is listed as a synonym of *N. fenestratus* in Nast [1972].

In the preliminary list of Auchenorrhyncha of Turkey *N. guttulatus* and *N. transversalis* (Puton, 1881) are treated as synonyms of *N. fenestratus* [Lodos & Kalkandelen, 1985]. Nonetheless, in the opinion of the authors, farther taxonomic investigation of this group is needed. For this reason they provide separate lists of records for each of three forms.

Thus, recently, most of authors hold to the idea that nearly all forms described in this group are synonyms of *N. fenestratus*, which is a variable transpalearctic species occurring from Western Europe to China and Japan.

Also, several species closely related to *N. fenestratus* were described by Dubovskiy [1966] and Mityaev [1971, 1975] from Central Asia and Kazakhstan. Later they were only mentioned in the work on the fauna of Auchenorrhyncha of Kazakhstan [Mityaev, 2002].

Recently Dmitriev [2002] has found distinct differences between nymphs of *N. fenestratus* and *N. guttulatus*. Therefore, he presented new evidence in support of the opinion that these forms are separate species.

It is apparent, that the problem of taxonomic status of different forms of *Neotaliturus* gr. *fenestratus* was not conclusively solved. For this reason, I undertook investigation of vibratory signals of representatives of this group. Presently, it is well-known fact, that these are mainly differences in male calling signals structure, which provide precopulatory reproductive isolation between closely related species of Auchenorrhyncha.

On the first stage of this study different biological species were separated basing on bioacoustic analysis. Then comparative investigation of their coloration and the structure of male genitalia were carried out in aim to find taxonomic characters for identification of collection material. Most of the drawings in the present paper are done from the specimens, which signals were investigated or from ones collected in the same biotope and at the same date. The only exceptions are material on *N. carbonarius* Mityaev, 1971 and the specimens of *N. argillaceus* Mityaev, 1975 from the foothills of Talasskiy Alatau Mountain Ridge and from the southeastern part of Balkhash region provided by Prof. I.D. Mityaev (Almaty, Kazakhstan).

In total, four species of *N. fenestratus* group were found on the territory of Russia. Their illustrated descriptions and data on vibratory calling signals and distribution are given below. External appearance and the shape of pygofer processes provide most reliable

diagnostic characters for identification of species. Still, for certain identification investigation of serial material is advisable. Contrary to the data of Dmitriev [2002], coloration of the fore and middle legs cannot be used as a taxonomic character in this group.

All species studied are rather similar in their biotope preferences. They are associated with various dry primary and secondary habitats with xerophytic vegetation and are common throughout arid zone, still, as a rule, are not numerous. Apparently, species of this group feed mainly on Asteraceae, including wormwood (*Artemisia* spp.), but usually it is impossible to establish association with specific plant with certainty.

#### *Neotaliturus fenestratus* (Herrich-Schäffer, 1834)

DESCRIPTION. Usually black, fore wings with transparent areas in the last one-third and also, as a rule, on the costal and anal margins (Figs 1–4). Only in the least pigmented males light speckles on dorsal side of a body and additional transparent spots on the fore wings present (Fig. 5).

Pygofer processes are comparatively short and broad (Figs 17–21), typically are with somewhat uneven outer margin (Figs 17–18). Stem of penis is broad, gradually narrowed towards the apex (Figs 38–40), the shape of shafts is rather variable (Figs 38–40 and 49–51).

Body length 2.6–3.0 mm in males, 3.2–3.5 mm in females.

Generally, is much darker, than most of other species, still weakly pigmented specimens sometimes are indistinguishable from most dark forms of *N. guttulatus*, *N. hui* and *N. argillaceus*. Usually, distinct differences between *N. fenestratus* and three species mentioned above can be found in the shape of pygofer processes (Figs 17–21, 25–28, 29–31 and 32–37). I failed to find reliable taxonomic characters in the shape of penis.

In coloration is very similar with *N. carbonarius* occurring in Kazakhstan, but has another shape of pygofer processes (Figs 17–21 and 22–24). Also, the narrowing of the stem of penis in the latter species is more sharply outlined than in *N. fenestratus* (Figs 38–40 and 41).

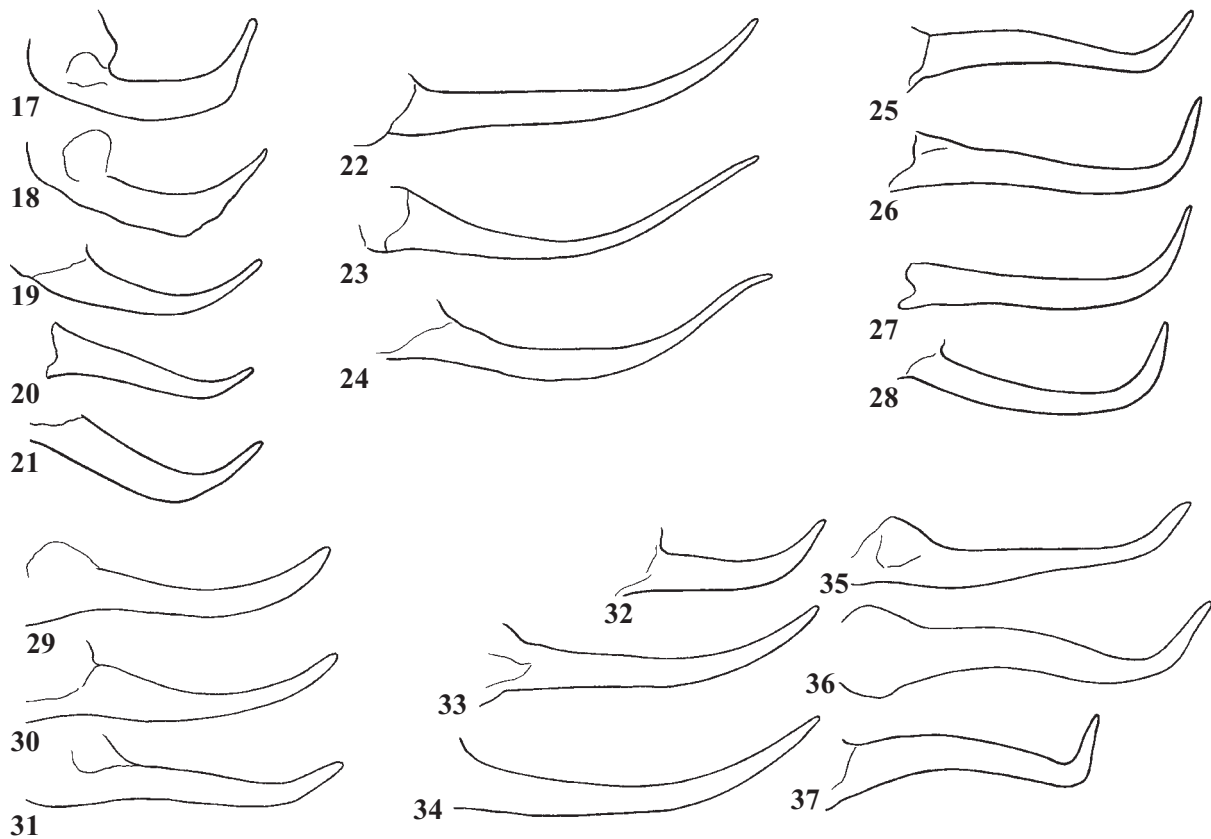
MALE CALLING SIGNALS. Recordings of calling signals were made in the following localities:

1. Crimea, environs of Pereval'noe Village (halfway from Simferopol to Alushta). 18.VI.1997. Signals of 3 ♂♂ are recorded at the temperature 25–27°C (Figs 59–64).
2. Rostov Area, Oblivskiy Distr., environs of Sosnovy (= Oporny) Village on Chir River. 10.VIII.1991. Signals of 3 ♂♂ are recorded at the temperature 30°C (Fig. 65).
3. Northern part of Saratov Area, environs of Khvalynsk, near Ulyanino Village. 15.VI.1996. Signals of 2 ♂♂ are recorded at the temperature 21 and 23°C.
4. East of Saratov Area, two localities in the environs of Ozinki Town. 26.VI.1996 and 29.VI.2004. Signals of 3 ♂♂ are recorded at the temperature 32–34 and 27°C (Figs 66–67).
5. Volgograd Area, Ilovlya River about 5 km from the mouth. 10.VI.1996. Signals of 1 ♂ are recorded at the temperature 25°C.
6. Dosang Railway Station about 60 km N of Astrakhan'. 7.VII.2000. Signals of 1 ♂ are recorded at the temperature 26°C (Figs 71–72).

Рис. 1–16. *Neotaliturus* gr. *fenestratus*, вид тела сверху (1–2, 4–10 и 12–16) и переднее крыло (3 и 11): 1–5 — *N. fenestratus*, самцы (1 — Алматы, Казахстан; 2 — Досанг, Астраханская обл.; 3 — Иловля, Волгоградская обл.; 4–5 — Сосновый, Ростовская обл.); 6–8 — *N. guttulatus*, самцы (6–7 — Хвалынск, Саратовская обл.; 8 — Пирогово, Московская обл.); 9–11 — *N. hui* (9 — самка из Читинской обл.; 10 — самец из Южного Приморья; 11 — самец из Читинской обл.); 12–16 — *N. argillaceus* (12 — самец из Дьяковки, Саратовская обл.; 13–14 — то же, Сосновый, Ростовская обл.; 15–16 — самки из Душака, Туркменистан).



Figs 1-16. Dorsal view of a body (1-2, 4-10 and 12-16) and forewing (3 and 11) of the species of *Neoliturus* gr. *fenestratus*: 1-5 — *N. fenestratus*, males (1 — Almaty, Kazakhstan; 2 — Dosang, Astrakhan' Area; 3 — Ilovlya, Volgograd Area; 4-5 — Sosnovy, Rostov Area); 6-8 — *N. guttulatus*, males (6-7 — Khvalynsk, Saratov Area; 8 — Pirogovo, Moscow Area); 9-11 — *N. hui* (9 — female from Chita Area; 10 — male from Southern Maritime Province; 11 — male from Chita Area); 12-16 — *N. argillaceus* (12 — male from Dyakovka, Saratov Area; 13-14 — same, Sosnovy, Rostov Area; 15-16 — females from Dushak, Turkmenistan).



Figs 17–37. Pygofer process of the species of *Neoditurus* gr. *fenestratus*: 17–21 — *N. fenestratus* (17 — Dosang, Astrakhan' Area; 18 — Almaty, Kazakhstan; 19 — Pereval'noe, Crimea; 20–21 — env. Serpukhov, Moscow Area); 22–24 — *N. carbonarius* (22 — South-East of Balkhash Area, Kazakhstan; 23–24 — Northern Kazakhstan); 25–28 — *N. guttulatus*, Khvalynsk, Saratov Area; 29–31 — *N. hui* (29 — Southern Maritime Province; 30–31 — Chita Area); 32–37 — *N. argillaceus* (32 — Erzin, Tyva, Southern Siberia; 33 — Dushak, Turkmenistan; 34 — South-East of Balkhash Area, Kazakhstan; 35, 37 — Grozny, Chechnya, North Caucasus; 36 — Sosnovy, Rostov Area).

Рис. 17–37. Отросток доли пигофера видов группы *Neoditurus fenestratus*: 17–21 — *N. fenestratus* (17 — Досанг, Астраханская обл.; 18 — Алматы, Казахстан; 19 — Перевальное, Крым; 20–21 — окр. Серпухова, Московская обл.); 22–24 — *N. carbonarius* (22 — юго-восточное Прибалхашье, Казахстан; 23–24 — Северный Казахстан); 25–28 — *N. guttulatus*, Хвалынский, Саратовская обл.; 29–31 — *N. hui* (29 — Южное Приморье; 30–31 — Читинская обл.); 32–37 — *N. argillaceus* (32 — Эрзин, Тыва, Южная Сибирь; 33 — Душак, Туркменистан; 34 — юго-восточное Прибалхашье, Казахстан; 35, 37 — Грозный, Чечня, Северный Кавказ; 36 — Сосновы, Ростовская обл.).

7. South Urals, Guberlya River near the Guberlya Railway Station 25 km W of Orsk. 9.VII.1996. Signals of 3 ♂♂ are recorded at the temperature 26–27°C.

8. Kazakhstan, Almaty. 1.VII.1994. Signals of 2 ♂♂ are recorded at the temperature 31°C (Figs 68–70).

Calling signal is a phrase consisting of syllables repeating with regular period of about 1–1.5 s (Figs 59, 61, 63). Each syllable includes rather prolonged more or less monotonous fragment after which up to 4–5 short discrete pulses follow (Figs 60, 62). Sometimes they are partly or entirely reduced (Figs 62, 64, 67). Signals with different pattern of syllables can be recorded in the individuals from the same locality (Figs 59–64 — three males from Pereval'noe, Crimea; 68–69 — two males from Almaty, Kazakhstan). Occasionally, gradual change of the structure of syllables can be observed within the same phrase (Figs 61, 68).

In the male from Astrakhan' Area abrupt amplitude trough presented in the middle of each syllable but the first (Figs 71–72). Such sudden decreasing of amplitude in the signals usually take place in immature individuals with inner cuticular structures not fully sclerotized.

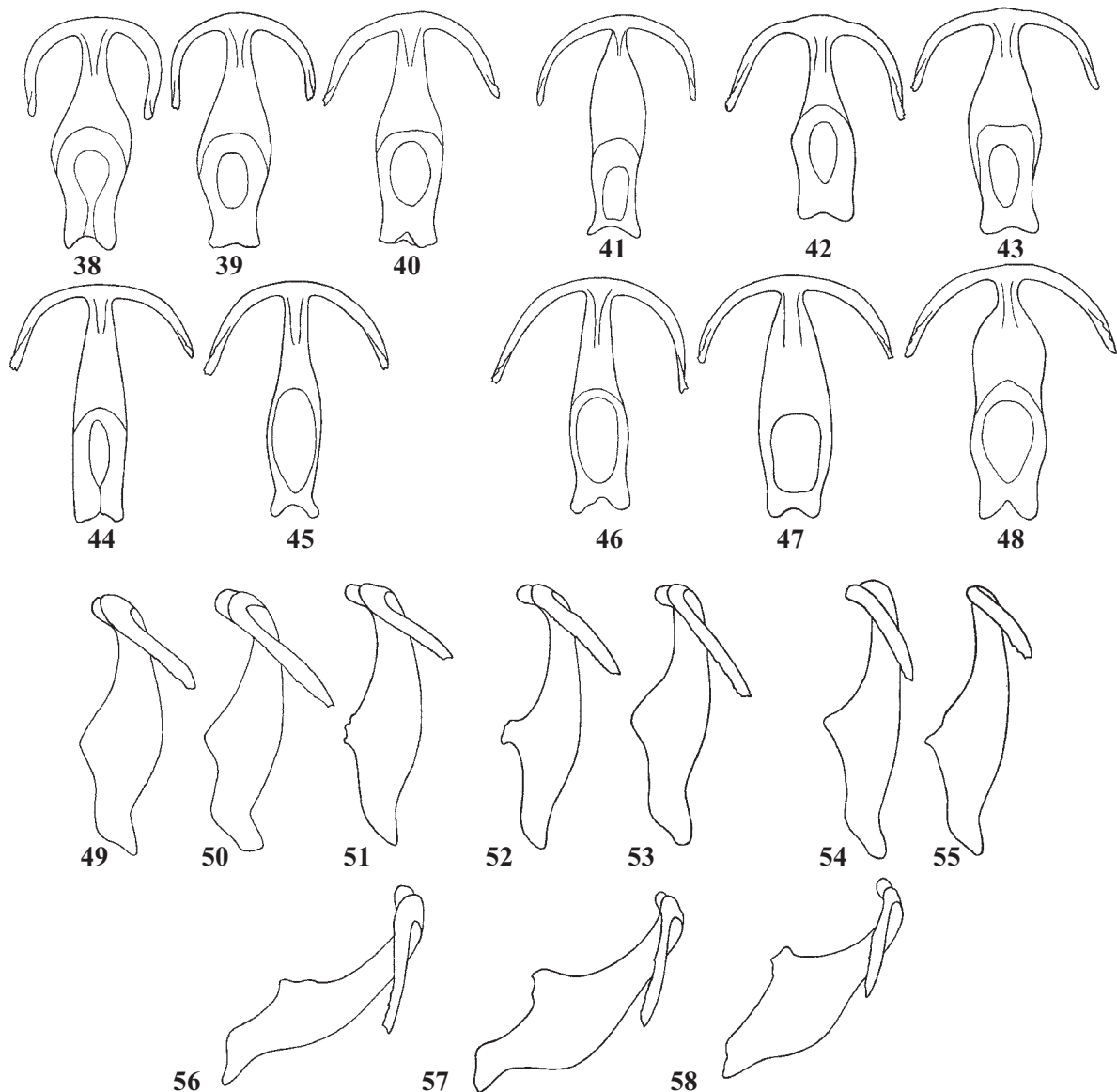
RANGE. Western Europe, Ukraine, central and southern parts of European Russia (from the southern half of Moscow Area up to the deserts of the Lower Volga Region; eastwards as far as South Urals), Kazakhstan, evidently, also Central Asia. Records from the Russian Far East, eastern part of China, Japan and, possibly, from eastern Mongolia should be referred to *N. hui*.

It is worth noting, that externally similar *N. carbonarius*, which is widespread in Kazakhstan, was never found in adjacent parts of European Russia until the present time.

#### *Neoditurus guttulatus* (Kirschbaum, 1868)

DESCRIPTION. For the most part pale-yellow with dense brown pattern on the upper side of a body and on fore wings (Fig. 8). Only in most pigmented specimens vertex, pronotum and scutellum are black with more or less developed light speckles; fore wings remain semitransparent in this case, however (Figs 6–7).

Pygofer processes are rather long and narrow, with the ends abruptly bent upwards (Figs 25–28). Penis is similar with these of other species (Figs 42–43 and 52–53).



Figs 38–58. Penis of the species of *Neoliturus* gr. *fenestratus*, frontal (38–48) and side view (49–58): 38–40 and 49–51 — *N. fenestratus* (38, 49 — Pereval'noe, Crimea; 39, 51 — Almaty, Kazakhstan; 40, 50 — Dosang, Astrakhan' Area); 41 — *N. carbonarius*, South-East of Balkhash Area; 42–43 and 52–53 — *N. guttulatus* (42–43, 53 — Pirogovo, Moscow Area; 52 — Khvalynsk, Saratov Area); 44–45 and 54–55 — *N. hui* (44, 54 — Southern Maritime Province; 45, 55 — Chita Area); 46–48 and 56–58 — *N. argillaceus* (46, 56 — Grozny, Chechnya, North Caucasus; 47, 58 — foothills of Talasskiy Alatau Mtn. Ridge, Southern Kazakhstan; 48, 57 — Dushak, Turkmenistan).

Рис. 38–58. Пенис видов группы *Neoliturus fenestratus*, вид спереди (38–48) и сбоку (49–58): 38–40 и 49–51 — *N. fenestratus* (38, 49 — Перевальное, Крым; 39, 51 — Алматы, Казахстан; 40, 50 — Досанг, Астраханская обл.); 41 — *N. carbonarius*, юго-восточное Прибалхашье; 42–43 и 52–53 — *N. guttulatus* (42–43, 53 — Пирогово, Московская обл.; 52 — Хвалынский, Саратовская обл.); 44–45 и 54–55 — *N. hui* (44, 54 — Южное Приморье; 45, 55 — Читинская обл.); 46–48 и 56–58 — *N. argillaceus* (46, 56 — Грозный, Чечня, Северный Кавказ; 47, 58 — предгорья Таласского Алатау, Южный Казахстан; 48, 57 — Душак, Туркменистан).

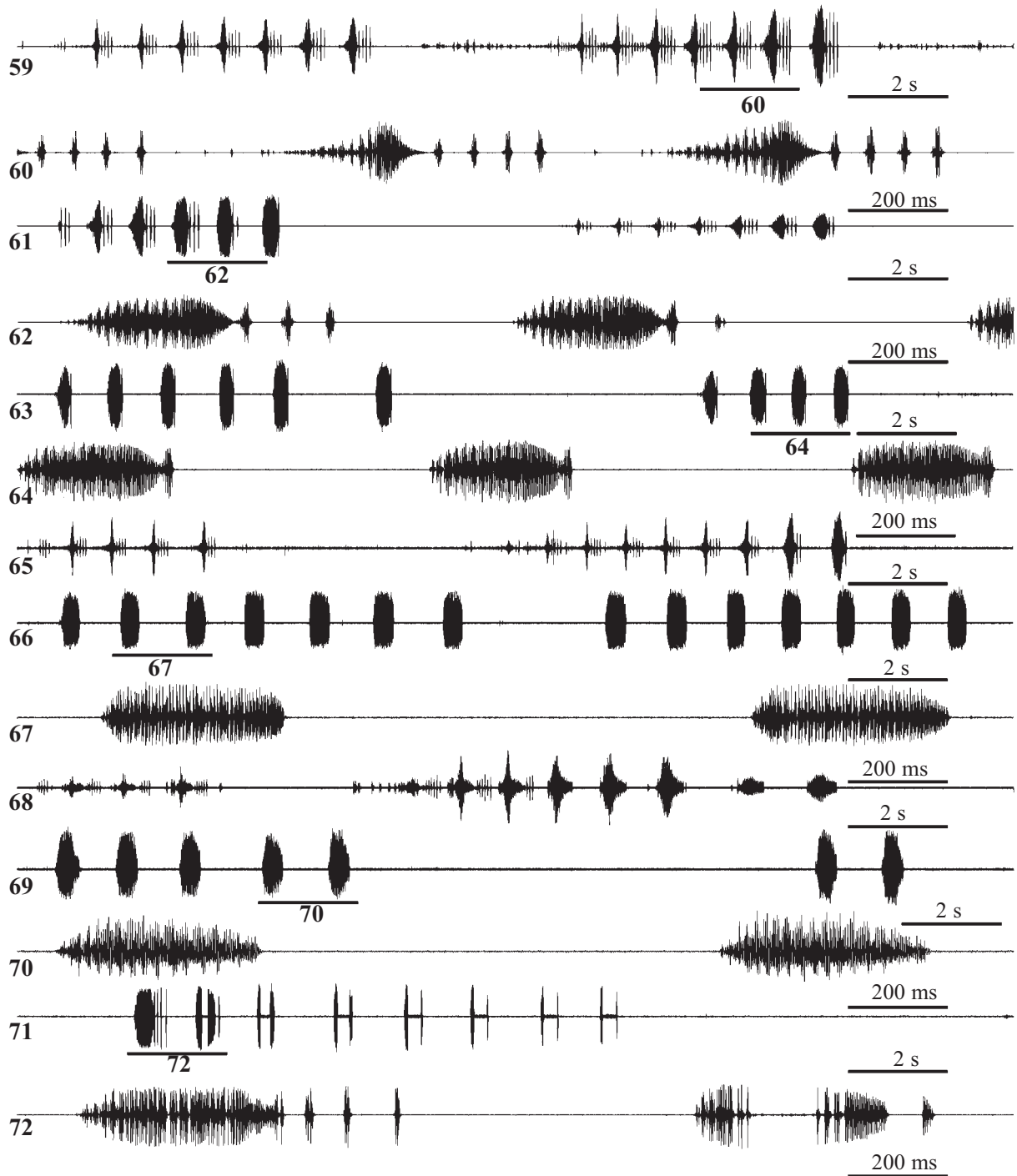
Body length 2.6–2.9 mm in males, 3.0–3.2 mm in females.

Differs from *N. fenestratus* in coloration and in the shape of pygofer processes. *N. hui* usually is distinctly darker and have another shape of pygofer processes; moreover, it is allopatric with *N. guttulatus*.

Most similar and sometimes is indistinguishable from *N. argillaceus*. In typical cases differs from it in the shape of

pygofer processes (Figs 25–28 and 32–35). Still, in the latter species this character is very variable; for this reason identification of single specimens is not always possible (e.g. Figs 25 and 36). Also, in questionable cases data on distribution should be taken into account.

MALE CALLING SIGNALS. Recordings of calling signals were made in the following localities:



Figs 59–72. Oscillograms of calling signals of *Neoliturus fenestratus* from Pereval'noe, Crimea (59–64); Sosnovy, Rostov Area (65); Ozinki, Saratov Area (66–67); Almaty, Kazakhstan (68–70) and Dosang, Astrakhan' Area (71–72). Faster oscillograms of the parts of signals indicated as "60", "62", "64", "67", "70" and "72" are given under the same numbers.

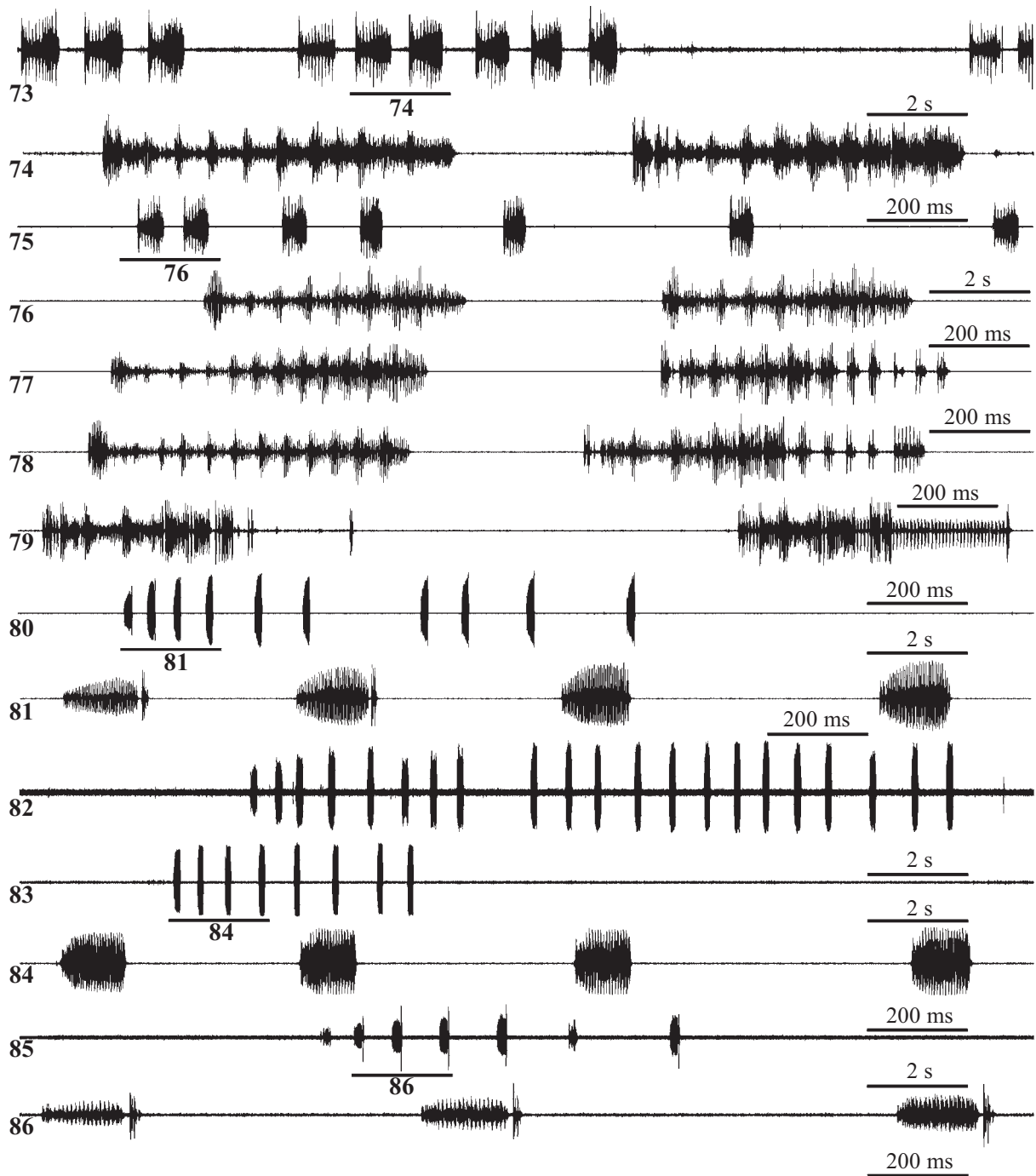
Рис. 59–72. Осциллограммы призывных сигналов *Neoliturus fenestratus* из Переваляного, Крым (59–64); Соснового, Ростовская обл. (65); Озинок, Саратовская обл. (66–67); Алматы, Казахстан (68–70) и Досанга, Астраханская обл. (71–72). Фрагменты сигналов, помеченные цифрами "60", "62", "64", "67", "70" и "72", представлены при большей скорости развёртки на осциллограммах под соответствующими номерами.

1. Moscow Area, environs of Pirogovo. 23.VIII.1987. Signals of 5 ♂♂ are recorded at the temperature 23°C (Figs 73–74).

2. Northern part of Saratov Area, environs of Khvalynsk, near Ulyanino Village. 15.VI.1996. Signals of 2 ♂♂ are recorded at the temperature 21 and 23°C (Figs 75–79).

Calling signal consists of single or regularly repeating syllables (Figs 73, 75). Each syllable is a succession of partially merged pulses with rather variable shape and duration (Figs 76–79).

RANGE. Western Europe, central part of European Russia within the limits of zone of mixed and broad-leaved

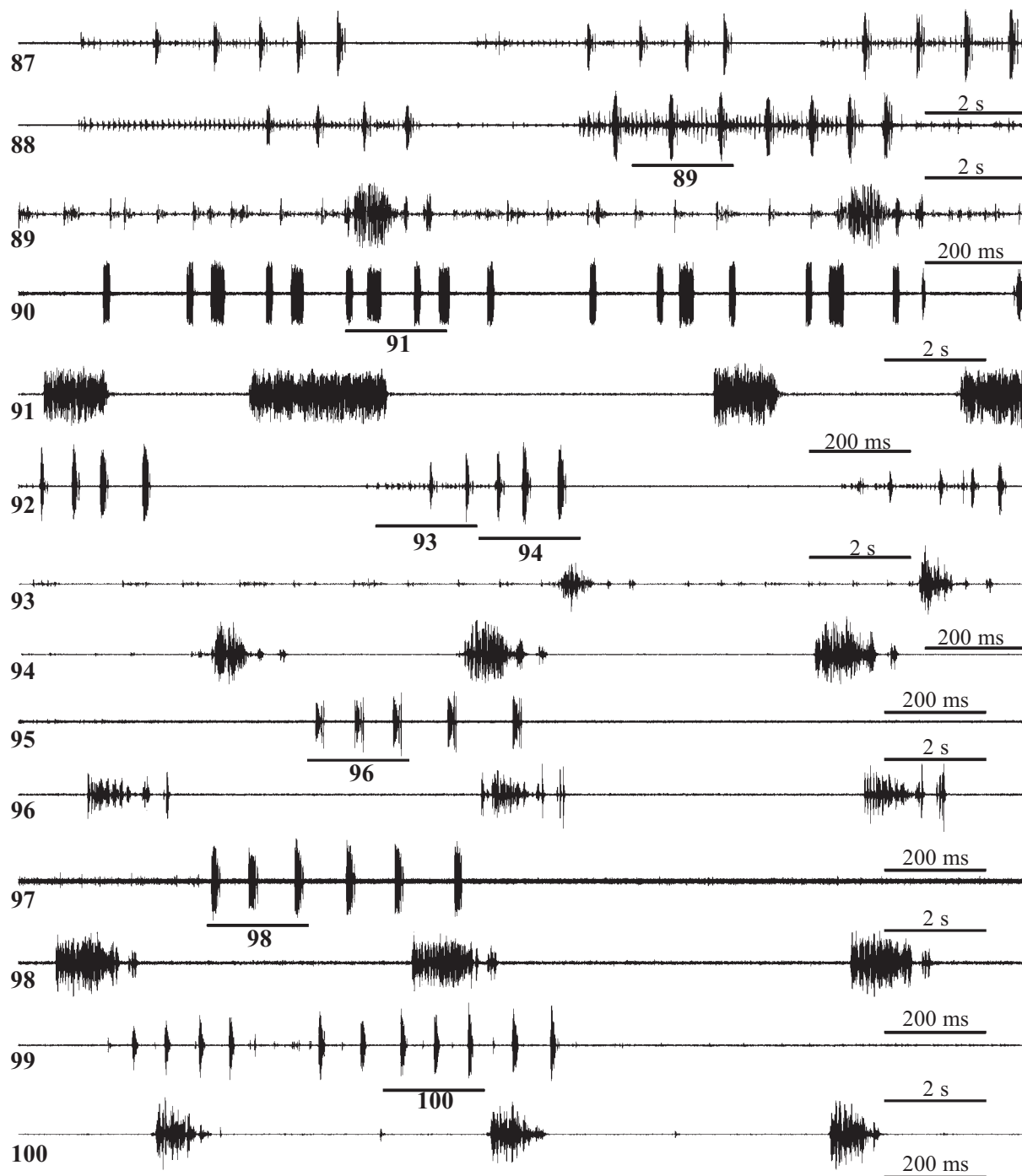


Figs 73–86. 73–79 — oscillograms of calling signals of *Neoliturus guttulatus* from Pirogovo, Moscow Area (73–74) and Khvalynsk, Saratov Area (75–79); 80–86 — same, *N. hui* from Southern Maritime Province (80–81) and Chita Area (82–86). Faster oscillograms of the parts of signals indicated as “74”, “76”, “81”, “84” and “86” are given under the same numbers.

Рис. 73–86. 73–79 — осциллограммы призывных сигналов *Neoliturus guttulatus* из Пирогово, Московская обл. (73–74) и Хвалынского, Саратовская обл. (75–79); то же, *N. hui* из Южного Приморья (80–81) и Читинской обл. (82–86). Фрагменты сигналов, помеченные цифрами “74”, “76”, “81”, “84” и “86”, представлены при большей скорости развёртки на осциллограммах под соответствующими номерами.

forests and also, in forest steppes. Farther south, in steppes dominated by gramineous vegetation and wormwood (*Artemisia* spp.) is replaced by *Neoliturus argillaceus*. Apparently, most part or all records from Kazakhstan [Mityaev, 2002] should be referred to the latter species.

In the northern part of Saratov Area (environs of Khvalynsk) was collected together with *N. fenestratus* in the same biotope in polydominant steppe on the slopes of chalk hills.



Figs 87–100. Oscillograms of calling (87–89, 92–100) and courtship (90–91) signals of *Neoditurus argillaceus* from Grozny, Chechnya, North Caucasus (87–91); Sosnovy, Rostov Area (92–94); Dyakovka, Saratov Area (95–96 and 97–98 — different signals of the same male) and Dushak, Turkmenistan (99–100). Faster oscillograms of the parts of signals indicated as “89”, “91”, “93–94”, “96”, “98” and “100” are given under the same numbers.

Рис. 87–100. Осциллограммы призывных сигналов (87–89, 92–100) и сигналов ухаживания (90–91) *Neoditurus argillaceus* из Грозного, Чечня, Северный Кавказ (87–91); Соснового, Ростовская обл. (92–94); Дьяковки, Саратовская обл. (95–96 и 97–98 — разные сигналы одного самца) и Душака, Туркменистан (99–100). Фрагменты сигналов, помеченные цифрами “89”, “91”, “93–94”, “96”, “98” и “100”, представлены при большей скорости развертки на осциллограммах под соответствующими номерами.



*Neoliturus hui* (Chang, 1938) **comb.n. et stat.rest.**

*Bothrognathus hui* Chang, 1938

DESCRIPTION. Typically, black with more or less developed speckled pattern on the upper side of the body and transparent areas in all cells of the fore wings (Figs 10–11). In most pigmented specimens light marks on vertex, pronotum and scutellum are almost entirely absent and the basal half of the forewings is black with the exception of small transparent spots close to the anal margin (Fig. 9). Occasionally, weakly pigmented females with coloration and pattern similar with this of *N. guttulatus* (as in Fig. 8) can be found in this species.

Pygofer processes are rather broad, with apices smoothly bent upwards (Figs 29–31). Penis with the stem distinctly more slender than in related species (Figs 44–45), in side view is similar with this of other representatives of the group (Figs 54–55).

Body length 2.7–2.9 mm in males, 3.1–3.5 mm in females.

On the territory of Russia is allopatric with three other species, also, differs from them in the shape of pygofer processes and, as a rule, by the slender stem of penis. Differences in external appearance and coloration can be revealed only on serial material.

MALE CALLING SIGNALS. Recordings of calling signals were made in the following localities:

1. South-east of Chita Area, Klichinskiy Mtn. Ridge at the crossing with Urulyunguy River (15 km W of Klichka Town). 20, 21 and 23.VII.2003. Signals of 3 ♂♂ are recorded at the temperature 22, 26–28 and 31–32°C (Figs 82–86).

2. Southern Maritime Province, Pogranichny Distr., environs of Barabash-Levada Village. 15.VII.1995. Signals of 1 ♂ are recorded at the temperature 26–28°C (Figs 80–81).

Calling signal is a succession of short syllables repeating with a period from about 0.5 up to 2–3 s (Figs 80, 82–83, 85). Each syllable consists of rather prolonged part followed by single short discrete pulse (Fig. 86). Sometimes this pulse is absent in certain or all syllables of the song (Figs 81, 84).

RANGE. Steppes of eastern Transbaikalia, southern part of the Russian Far East, evidently, also, adjacent regions of eastern Mongolia and China, Japan.

REMARKS. The generic name *Bothrognathus* is an objective synonym of *Neoliturus* [Nast, 1972]. For this reason, the name of the species is used here in a new combination *Neoliturus hui* **comb.n. et stat.rest.**

*Neoliturus argillaceus* Mityaev, 1975

DESCRIPTION. Comparatively light-coloured species, in external appearance is similar with *N. guttulatus*. Usually, pale-yellow with strongly developed brown pattern (Fig. 14), rarely is almost black with light speckles on the upper side of a body (Figs 12–13). Also, in populations from Kazakhstan and Central Asia females with pale yellowish coloration and with partly or almost entirely reduced dark spots present (Figs 15–16).

The shape of pygofer processes (Figs 32–37) and penis (Figs 46–48 and 56–58) varies considerably. Usually, pygofer processes are rather long and smoothly bent upwards (Figs 33–35).

Body length 2.5–3.1 mm in males, 3.1–3.6 mm in females.

Differs from *N. fenestratus* and *N. hui* due to more light coloration. Very similar with *N. guttulatus* (see the same item in the description of the latter species).

MALE CALLING SIGNALS. Recordings of signals were made in the following localities:

1. North Caucasus, Chechnya, Terskiy Mtn. Ridge in the environs of Grozny City. 4 and 7.VII.1986. Calling (Figs 87–89) and courtship (Figs 90–91) signals of 4 ♂♂ are recorded at the temperature 22 and 28°C.

2. Rostov Area, Oblivskiy Distr., environs of Sosnovy (= Oporny) Village on Chir River. 17.VIII.1992. Calling signals of 1 ♂ are recorded at the temperature 28–30°C (Figs 92–94).

3. Saratov Area, Krasnokutskiy Distr., Dyakovka Village. 10.VII.2004. Calling signals of 1 ♂ are recorded at the temperature 27°C (Figs 95–98).

4. Southern Turkmenistan, environs of Dushak Town. 14.V.1994. Calling signals of 3 ♂♂ are recorded at the temperature 31°C (Figs 99–100).

5. Southern Siberia, Southern Tyva, environs of Erzin Village. 11.VIII.1989. Calling signals of 1 ♂ are recorded at the temperature 27°C.

Calling signal is a phrase usually lasting up to 5–8 s and consisting of repeating short syllables (Figs 87–88, 92, 95, 97, 99). Occasionally, additional low-amplitude pulses present in the gaps between syllables (Figs 87–89, 92–93). Temporal pattern of syllables can vary distinctly even in different signals of the same male (Figs 95–96 and 97–98 — two signals of the male from Dyakovka, Saratov Area).

In individuals from the environs of Grozny, signal of another type was also recorded. It consists of alternating short and long fragments with similar pattern (Figs 90–91). Usually fragments of different duration are grouped in pairs; sometimes several short fragments precede prolonged one. Males emitted such signal only in the presence of females. Apparently, it can be classified as courtship one.

RANGE. Southern part of European Russia, Kazakhstan, Central Asia, Southern Siberia (Tyva), evidently, also Mongolia.

Usually, on *Artemisia* spp. in steppes and semideserts. In Rostov Area was found in the same location with *N. fenestratus*. These two species were never collected in the same biotope, however.

REMARKS. Interpretation of the species is based on comparison of our material with the specimens from the collection of Prof. Mityaev, bearing the label “*N. argillaceus*”. In my opinion, for certain identification of this form investigation of calling signals of individuals from different regions of Kazakhstan including type locality is desirable, however.

Specimens from several localities in Southern Kazakhstan determined by Prof. Mityaev as *N. lituratus* Dubovskiy, 1966 actually belong to *N. argillaceus* in the sense defined above. Thus, at least a part of records of the former species from Kazakhstan [Mityaev, 2002] is erroneous. According to primary description, *N. lituratus* is similar in coloration with *N. guttulatus*, but in the shape of male genitalia including pygofer processes it is closely related to *N. fenestratus*. I have never seen the specimens with such combination of characters in the material studied.

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