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MORPHOLOGY, BIOLOGY AND BIOACOUSTICS
OF THREE SICILIAN ENDEMIC
ORTHOPTERA SPECIES
(*Insecta Orthoptera Tettigoniidae*)

ABSTRACT - MASSA B., FONTANA P. & ODÉ B., 2001 - Morphology, biology and bioacoustics of three Sicilian endemic Orthoptera species (*Insecta Orthoptera Tettigoniidae*).

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The authors report new data on biology, distribution and morphology of three endemic Sicilian taxa: *Platycleis concii* Galvagni, 1959, *Bolivarius bonneti painoi* (Ramme, 1927), *Bolivarius brevicollis trinacriae* (La Greca, 1964). Furthermore, they present for the first time oscillograms of their songs and hypothesize on their identity compared to related species.

KEY WORDS - *Insecta, Orthoptera, Tettigoniidae*, morphology, biology, bioacoustics, Sicily, endemic species.

RIASSUNTO - MASSA B., FONTANA P. & ODÉ B., 2001 - Morfologia, biologia e bioacustica di tre ortotteri endemici di Sicilia (*Insecta Orthoptera Tettigoniidae*).

Gli Autori riportano nuovi interessanti dati sulla biologia, distribuzione e morfologia di tre taxa endemici di Sicilia: *Platycleis concii* Galvagni, 1959, *Bolivarius bonneti painoi* (Ramme, 1927), *Bolivarius brevicollis trinacriae* (La Greca, 1964); inoltre presentano per la prima volta il sonogramma della loro stridulazione, facendo alcune ipotesi sulle possibili affinità tra questi taxa ed altri sistematicamente vicini.

PAROLE CHIAVE - *Insecta, Orthoptera, Tettigoniidae*, morfologia, biologia, bioacustica, Sicilia, specie endemiche.

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INTRODUCTION

In recent years we have collected new data on biological and morphological aspects of some Sicilian Tettigoniidae. We focus here on three endemic species: *Platycleis concii* Galvagni, 1959, *Bolivarius bonneti painoi* (Ramme, 1927) and *Bolivarius brevicollis trinacriae* (La Greca, 1964).

MATERIAL AND METHODS

Specimens were collected in Sicily and are preserved in the following collections: P. Fontana, Isola Vicentina, Vicenza (CF), M. La Greca, Catania (CLG) and B. Massa, Palermo (CMUP). Some microclimatic data were recorded in the natural habitat of *Platycleis concii* on 5th and 26th September 1998 on Madonie Mts. (Spina Puci, 1600 m) with a thermo-hygrometer (Hanna Instruments). To estimate one population of *Bolivarius brevicollis trinacriae* and its sedentariness on Madonie Mts. (P.no Ferro, Castelbuono, 1400 m) on 10th September 1995 we marked 34 individuals with a combination of dots on the pronotum, written by a permanent ink, and plants (*Pteridium aquilinum*) with a label carrying the combination of dots of the insect found on it; one month after, on 8th October we recovered some of them. Population was estimated by Petersen Lincoln method (BEGON, 1979)

$$N = \frac{\sum M_i n_i}{(\sum m_i) + 1},$$

where M_i is the number of marked individuals in the population which are available for sampling immediately before the day i sample, n_i is the number of individuals caught on day i , m_i is the number of marked individuals caught on day i .

Some data on feeding habits were obtained from the analysis of feculae of live individuals. Further observations on the habits of the three species were carried out rearing some individuals in laboratory. The song of the collected specimens has been recorded in the laboratory. Males have been recorded separately to prevent interaction. A DCC-recorder (Philips DCC 170) with condenser microphones (Sennheiser K30AV module with ME80) has been used for recording. Sampled fragments (44.1 kHz, 16 bits) from the recordings have been analysed.

The song terminology follows RAGGE & REYNOLDS (1998): *Calling song* (the song produced by an isolated male); *Syllable* (the sound pro-



Fig. 1. *Platycleis concii* Galvagni, 1959: Male from Madonie Mts., Spina Puci (Piano Battaglia), 1600 m, 5.IX.1998. Photo P. Fontana.



Fig. 2. *Platycleis concii* Galvagni, 1959: Female from Madonie Mts., Spina Puci (Piano Battaglia), 1600 m, 5.IX.1998. Photo P. Fontana.

duced by one complete opening and closing movement of the fore wings); *Hemisyllable* (the sound produced by one unidirectional movement, opening or closing, of the fore wings; *Echeme* (a first-order assemblage of syllables).

RESULTS

Platycleis concii Galvagni, 1959

Platycleis concii Galvagni, 1959, Mem. Mus. Stor. Nat. Verona, 7: 200.

Platycleis concii, Harz, 1969, Orth. Eur., 1: 240.

Platycleis (Platycleis) concii, Ragge, 1990, Bull. Br. Mus. Nat. Hist. (Ent.), 59: 8.

Platycleis concii, Massa, 1994, Naturalista sicil., 18: 240.

Platycleis concii, Failla et al., 1994, Checklist specie Fauna italiana, 36: 8.

Platycleis concii, La Greca, 1996, Boll. Mus. Civ. St. nat. Verona, 20: 20.

Platycleis (Platycleis) concii, Heller et al., 1998, Articulata, 7: 36.

Platycleis concii, Massa & Ragusa, 1999, Naturalista sicil., 23: 136.

MATERIAL EXAMINED: Sicily, Madonie, Collesano, V.le Madonie, 1500 m, 25-27.VII.1959, leg. A. Galvagni, 1 M and 1 F (*paratypi*) (CF); Madonie, Monte S. Salvatore, 1500 m, 21.VII.1963, 1 F (CF); M. S. Salvatore, 1700 m, 13.IX.1994, 10 MM and 7 FF, leg. B. Massa (CMUP); Madonie, Monte Spina Puci (Piano Battaglia), 1600 m, 5.IX.1998, leg. B. Massa, 13 MM and 11 FF (CF and CMUP); 26.IX.1998, 3 MM and 4 FF (CF); Madonie, loc. Quacella, 1500 m, 20.IX.1988, 1 F, leg. B. Massa (CMUP); 22.VI.1993, 1 F, leg. B. Massa (CMUP); Madonie, P.no Farina, 1400 m, 22.X.1978, 2 MM, leg. B. Massa (CMUP); Madonie, Castelbuono, P.no Pomo, 1500 m, 28.VI.1983, 2 FF and 1 nymph, leg. B. Massa (CMUP); Madonie, loc. Pomieri, 1400 m, 2.IX.1996, 1 F, leg. B. Massa (CMUP); Madonie, P.no Battaglietta, 1700 m, 8.X.1995, 7 MM and 9 FF, leg. B. Massa (CMUP).

Observations on the Biology

Platycleis concii is an orophilous species, so far only known from Madonie Mts., where it lives between 1000 and 1700 m. Populations are often very large (GALVAGNI, 1959; MASSA, 1994). It has a summer-autumnal phenology. First neanids appear in May and live mainly on the grasslands and pastures; when growing adult, they settle inside the dwarf bushes of *Astragalus nebrodensis*, *Juniperus oxycedrus* and *Genista cupanii*, characteristic shrubs of the Madonie highlands.

Brachypterous species of Orthoptera sometimes are confined to shrubs and bushes. This may partly be due to microclimatic factors. Our measurements in the habitat show that dwarf shrubs have their own microclimatic characteristics (Table 1 and 2). Temperature is less variable and relative humidity is higher within bushes than outside

bushes. It is concluded that the shrubs provide a different microclimate than their surroundings. The microclimate within shrubs might be essential for the survival of the species in the habitat.

Table 1. Temperature inside (T in) and outside (T out) bushes in the morning and the afternoon.

time	T in	T out
11:00 a.m.	24,0° ± 1° C	22° ± 1° C
16-17:00 a.m.	23,5° ± 1° C	19° ± 1° C

Table 2. Relative humidity inside (RH in) and outside (RH out) bushes on two days in September.

date	RH in	RH out
5 th of September	35-40%	30-35%
26 th of September	50-60%	40-50%

P. concii is omnivorous; young neanids reared in laboratory fed both on other Decticinae and on vegetable matter. From 43 feculae of 18 adults (10 males and 8 females), collected on 5th September, we obtained remains of small species of Coleoptera (8 feculae), one species of Homoptera (1 fecula) and vegetable matter (34 feculae).

Reproduction takes place in August and September. Females showed to carry 10-20 eggs in this period; in the first days of August about half of the females collected carried eggs and in early September all females carried eggs. On 5th of September (11-12.30 a. m.) a quarter of the females collected had just received a spermatophore from a male. Adults are observed until late October. Only eggs survive the winter.

Morphology

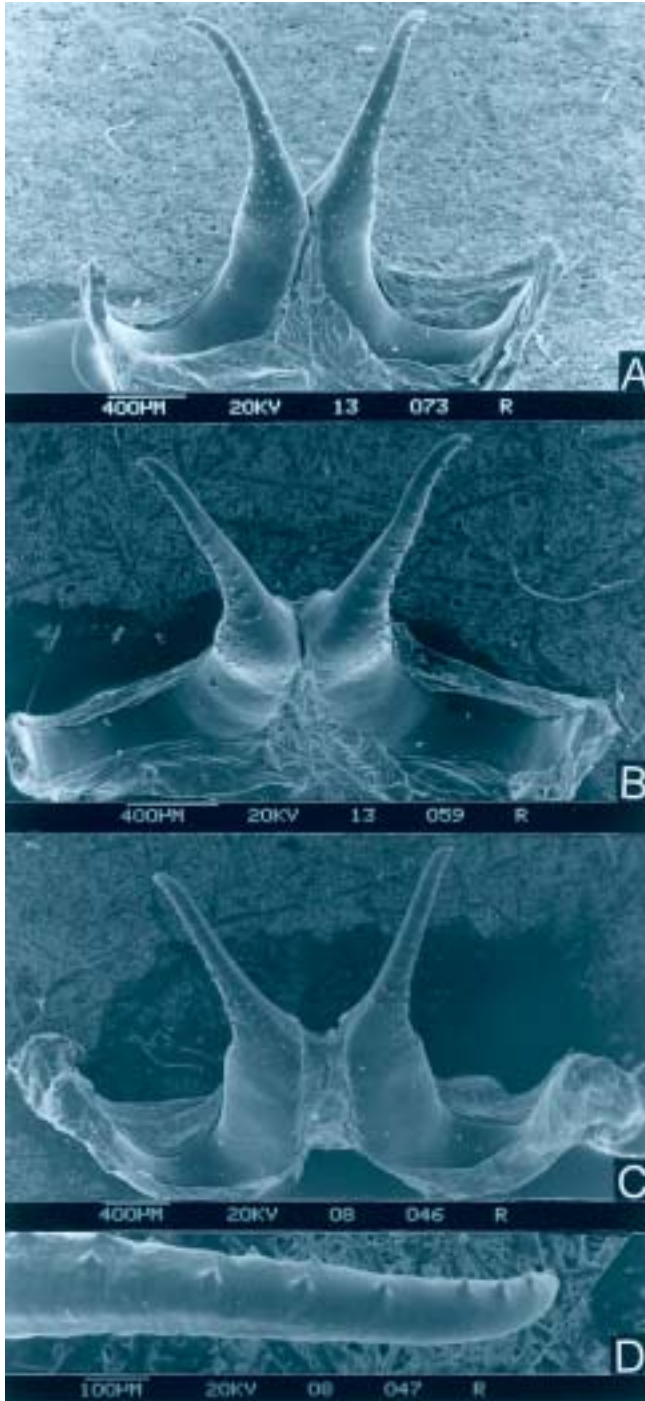
P. concii is easily recognised by the reduced tegmina, not reaching the apex of abdomen (Figs. 1 and 2); the hind wings are shorter than the tegmina. The apex of the male cerci is rounded (Fig. 3 A). The hind margin of the 10th tergum (Fig. 3 A) is depressed, broadly emarginate and forming a nearly right angle, with apices slightly bent inwards. The subgenital plate (Fig. 3 B) slightly acutely excised and bearing two keels from the middle to styli and another one, smaller, between them; styli conical, in some specimens blackish on the tip. The titillators show the structure described by GALVAGNI (1959), particularly concerning the



Figs. 3 A-D. *Platycleis concii* Galvagni, 1959: Madonie Mts., Spina Puci (Piano Battaglia), 1600 m, 5.IX.1998. 10th tergite and cerci and subgenital plate of male (A-B); last tergite and cerci and subgenital plate of female (C-D). Photo by SEM Cambridge Stereoscan, P. Fontana.

distribution of their small teeth (Figs. 4 A-D). The *Pars stridens* of male tegmen is sigmoidal and bears 79-82 teeth (Figs. 5 A-D). The last tergite of the female is characterised by hind margin rightly excised forming a slightly acute angle (Fig. 3 C); cerci are regularly conical, and preapically

Figs. 4 A-D. *Platycleis concii* Galvagni, 1959: Madonie Mts., Spina Puci (Piano Battaglia), 1600 m, 5.IX.1998. Titillators of three males, dorsal view (A-C) and apex of one of them, dorsal view (D). Photo by SEM Cambridge Stereoscan, P. Fontana.



more slender (Fig. 3 C). The female subgenital plate shows a median groove along the entire length and lobes with a regular and nearly flat surface (Fig. 3 D). Mature eggs, as obtained from fresh specimens, are black and oval (Fig. 6 A) and averagely measure 4.7 x 0.92 mm. The surface structure of the chorion is characterized by porous plates of two different sizes (Figs. 6 B-C); the diameter of the widest is 20-30 μm , while that one of the smallest, more regularly distributed along its surface, is 5-12 μm .

Song

The male calling song consists of a sequence of echemes repeated mostly fairly regularly at the rate of about 1-2 echemes/s (Figs. 7 A-B). Each echeme usually consists of 3-6 syllables and lasts for about 200-300 ms. The first syllable in an echeme is almost equally loud as the following syllables, but frequently weaker. Closing hemisyllables last about 40-50 ms and are repeated within an echeme at the rate of about 12-20/s. Opening hemisyllables sometimes are visible in the oscillograms, especially in the second half of the echeme.

Bioacoustically, the song of *P. concii* fits in the group of *P. albopunctata*, *P. grisea* and *P. sabulosa*. Due to close resemblance, it seems not possible to identify the species of this group, on the basis of bioacoustic characters only.

Bolivarius bonneti painoi (Ramme, 1927)

Uromenus painoi Ramme, 1927, EOS, 3: 155-184.

Uromenus painoi, Ebner, 1938, Orth. Cat., 1: 20.

Uromenus painoi, La Greca, 1957, Mem. Biog. Adr., 4: 69.

Uromenus painoi, La Greca, 1964, Atti. Acc. Gioenia Sci. Nat. Catania, 16: 7.

Uromenus (Bolivarius) bonneti, Harz, 1969, Orth. Eur., 1: 573 (partim)

Bolivarius bonneti, Failla et al., 1994, Checklist specie Fauna italiana, 36: 10.

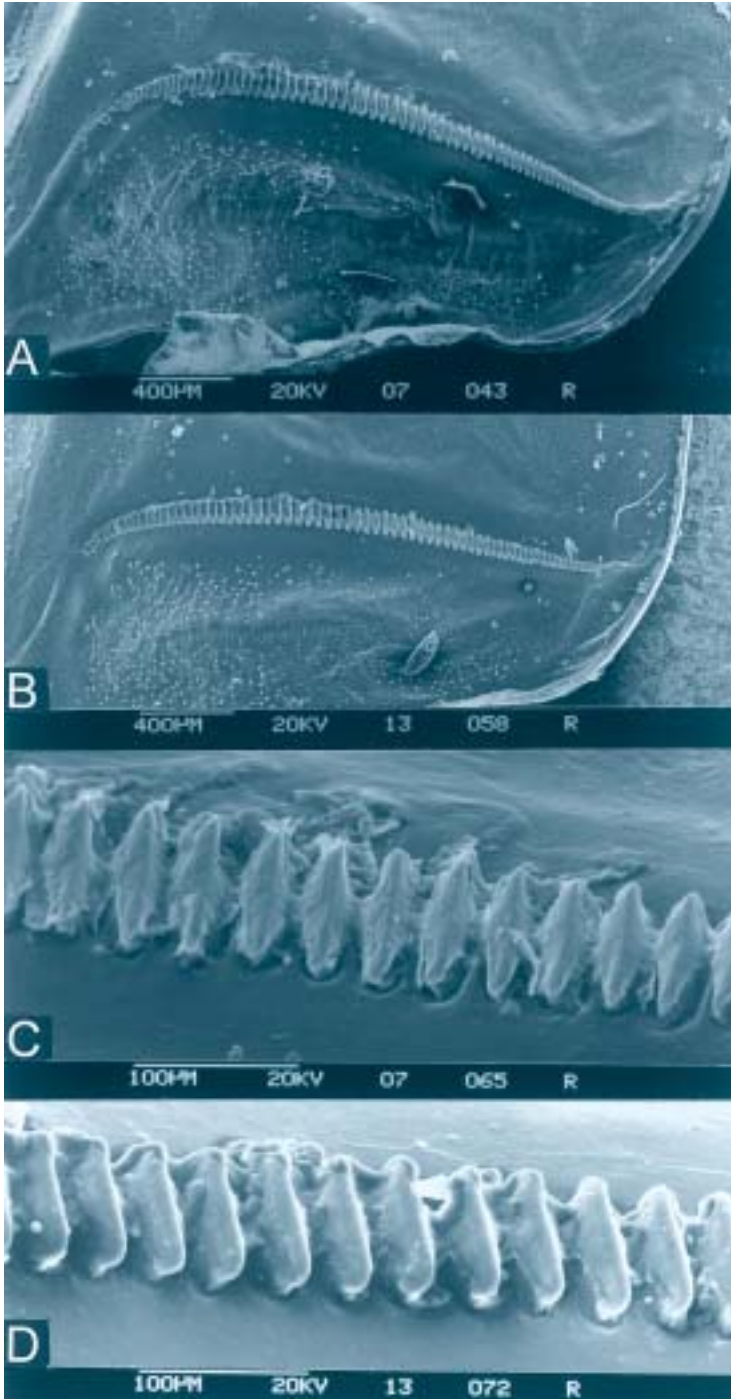
Uromenus (Bolivarius) bonneti painoi, Nadig, 1994, Rev. suisse Zool., 101: 941

Bolivarius bonneti, La Greca, 1996, Boll. Mus. Civ. St. nat. Verona, 20: 24.

Uromenus (Bolivarius) bonneti painoi, Baccetti et al, 1995, Naturalista sicil., 19 (suppl.): 178.

Bolivarius bonneti painoi, Massa & Ragusa, 1999, Naturalista sicil., 23: 137.

Figs. 5 A-D. *Platycleis concii* Galvagni, 1959: Madonie Mts., Spina Puci (Piano Battaglia), 1600 m, 5.IX.1998. *Pars stridens* of two males, dorsal view (A-B) and particular of their median portion (C-D). Photo by SEM Cambridge Stereoscan, P. Fontana.



MATERIAL EXAMINED: Sicily, Palermo, Bellolampo, 7.VII.1977, leg. G. B. Osella, 1 F (CF); 25.VII.1977, leg. G. B. Osella, 1 M (CF); Alcamo (Trapani), 14.VII.1994, leg. V. Caleca, 1 F (CF); Palermo, Godrano, 25.IX.1978, leg. I. Sparacio, 1 M (CF); Bivona (Agrigento), 30.VI.1994, leg. B. Massa, 1 M (CF); Foce del Simeto (Catania), 27.V.1998, 1 M nymph (become adult in laboratory), leg. P. Fontana (CF); Baucina (Palermo), 17.VII.1970, 1 M (CLG); Butera (Caltanissetta), 14.VI.1969, leg. Ferro, 1 M (CLG); Isole Egadi, Favignana (Trapani), VI.1966, leg. S. Riggio, 1 M, (CLG); 15.VI.1996, 1 F, leg. B. Massa (CMUP); Caltabellotta (Agrigento), 2.VI.1996, 1 F, leg. V. Caleca (CMUP); Foce del Belice (Trapani), 18.VI.1975, 1 M, leg. B. Massa (CMUP); Piana degli Albanesi (Palermo), 8.VIII.1965, 1 F, leg. S. Riggio (CMUP); S. Cipirello (Palermo), 18.VIII.1994, 1 F, leg. V. Caleca (CMUP); Ficuzza (Palermo), 19.X.1996, 1 F, leg. B. Massa (CMUP).

Morphology

After its description as *Uromenus painoi* (RAMME, 1927), this taxon was treated by LA GRECA (1964), who considered it a Sicilian endemic. In 1969 HARZ, referring to a personal communication of Morales Agacino, proposed the synonymy *Uromenus painoi* Ramme 1927 = *U. bonneti* Bolivar 1907 (living in Tunisia and Pelagian Is.); LA GRECA (1994) shared this opinion and recorded new localities for this species in Western Sicily, Egadi Is. included. Due to the small numbers of Sicilian specimens examined, NADIG (1994) was not able to confirm the synonymy. Nevertheless, he recognized some diagnostical characters between the two taxa, like the pronotal keel shape, the ratio length/height of the ovipositor, the extension of lateral spines at the apex of the titillators. He proposed to treat them as different subspecies.

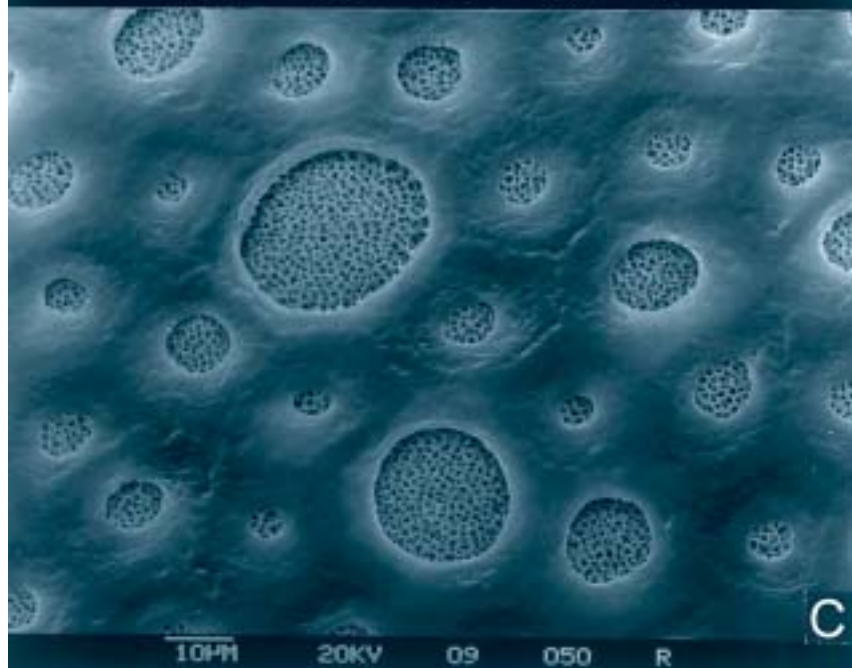
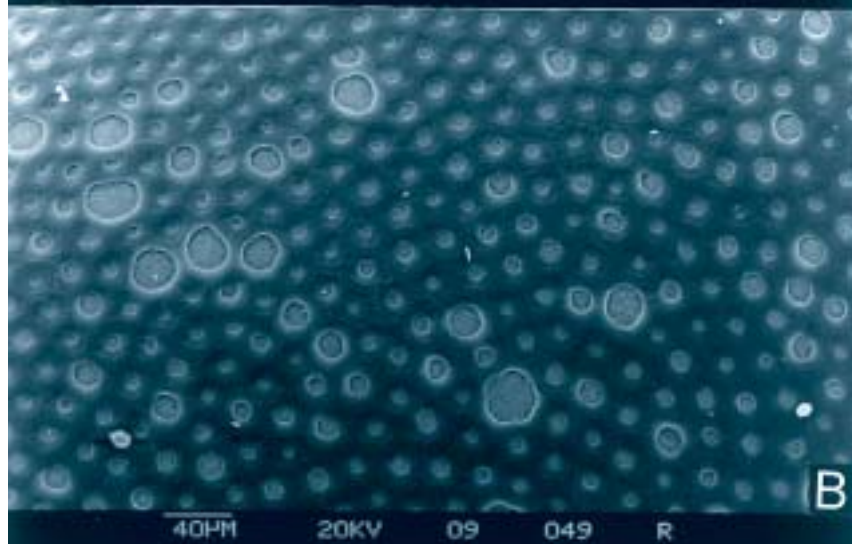
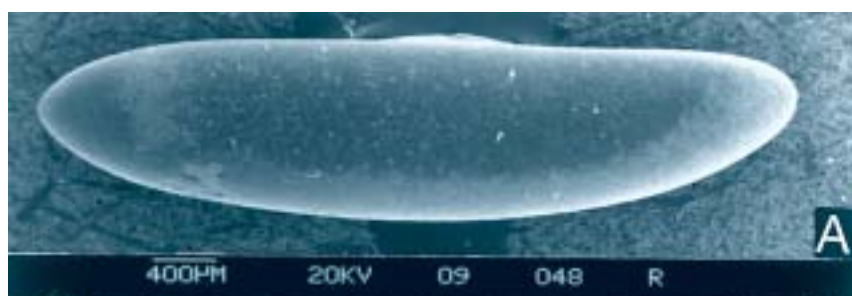
In vivo this taxon is bright green, with dark tegmina and whitish pleural areas (Fig. 8). The titillators (Figs. 9 A-C) are characterised by 4-5 teeth at the apex and the external apical part; in lateral view they are slightly curved. The *Pars stridens* is regularly bent and bears about 170 small teeth.

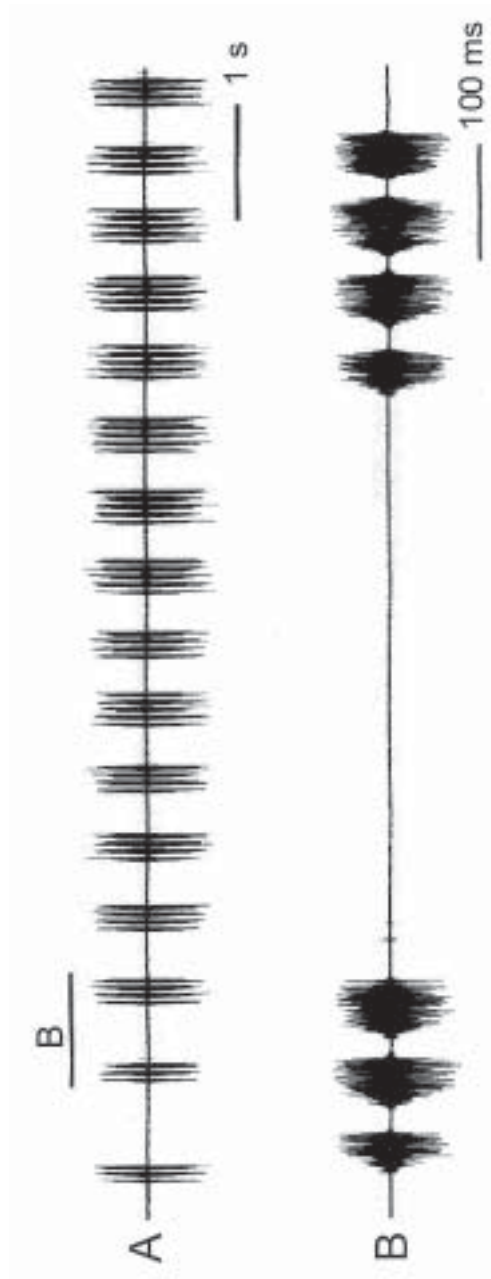
It has a spring-summer phenology, but there are some autumnal records.

Song

The song of this species has been studied on the basis of two recordings of one male specimen only. For the moment this is sufficient

Figs. 6 A-C. *Platypleis concii* Galvagni, 1959: Mature egg, extracted from abdomen of a female collected on Madonie Mts., Spina Puci (Piano Battaglia), 1600 m, 5.IX.1998. In toto (A) and particular of microstructure of chorion (B-C). Photo by SEM Cambridge Stereoscan, P. Fontana.





Figs. 7 A-B. Oscillograms of the song of *Platycleis concii* Galvagni, 1959; Sicily, Madonie Mts., Spina Puci, 5.IX.1998, rec. 9.IX.1998 (25.5°C). A: overview of 10 s; B: detail of 1 s.



Fig. 8. *Bolivarius bonneti painoi* (Ramme, 1927): Male reared in laboratory, Foce del Simeto (Catania). VII.1998. Photo P. Fontana.

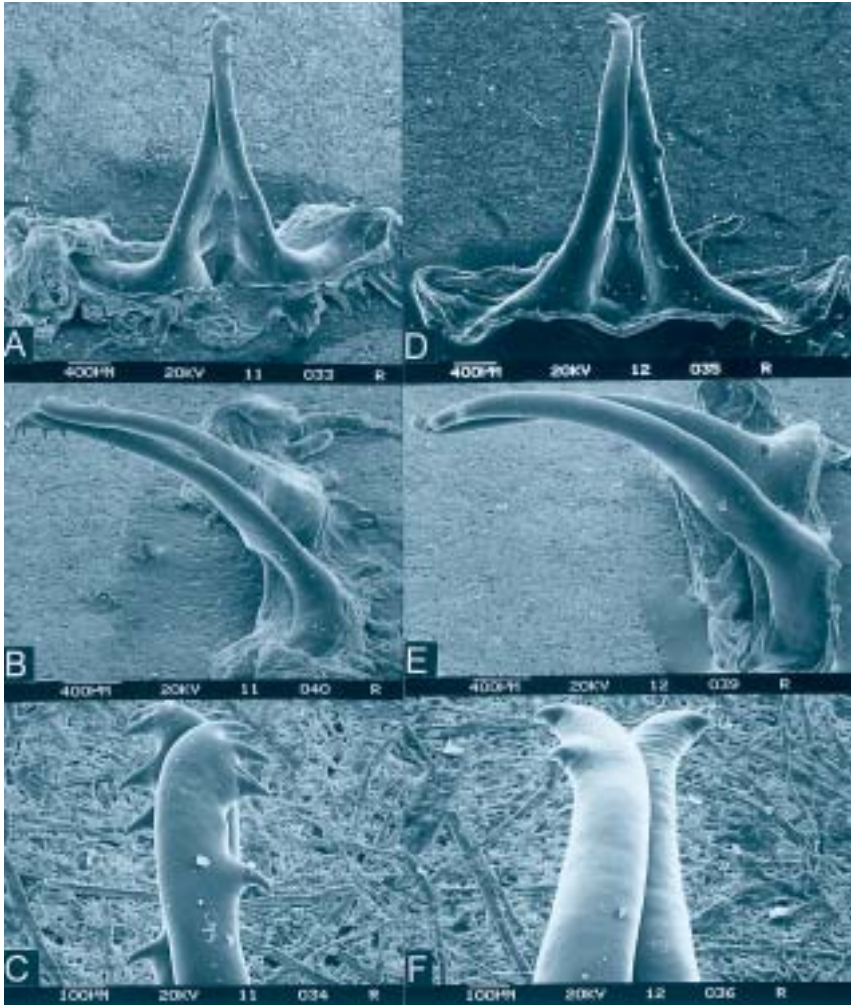
to outline the characteristics of the song, but more recorded material is needed to support the following description.

The male calling song (Figs. 11 A-B) consists of a series of syllables repeated fairly regularly at the rate of about 0.4-0.5/s. Only closing hemisyllables are loud and last for about 700-800 ms. Individual tooth-impacts are visible in the oscillogram. In the first part of a syllable - about 150 ms - the tooth-impact rate is quite high, about 150-160/s. This first part is followed by 300-400 ms of less densely grouped tooth-impacts (70-80/s). A syllable, again, is finished with fast tooth-impacts (about 250 ms, with 160-170 tooth-strokes/s). One syllable consists of about 100 tooth-strokes, visible in the oscillogram. The characteristic pattern of tooth-strokes within a syllable is caused either by differences in the density of stridulatory teeth or by differences in the speed of the wing movement.

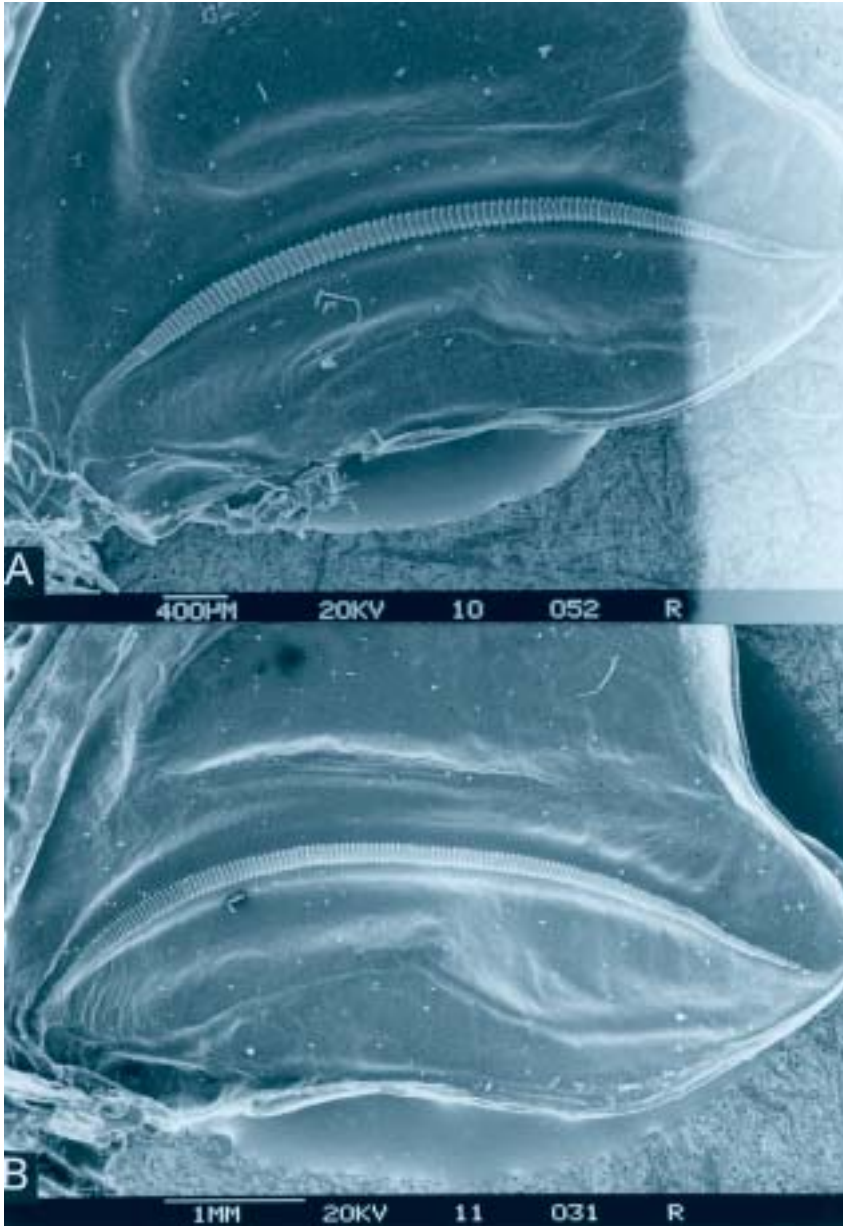
Bolivarius brevicollis trinacriae (La Greca, 1964)

Uromenus brevicollis trinacriae La Greca, 1964, Atti. Acc. Gioenia Sci. Nat. Catania, 16: 4.

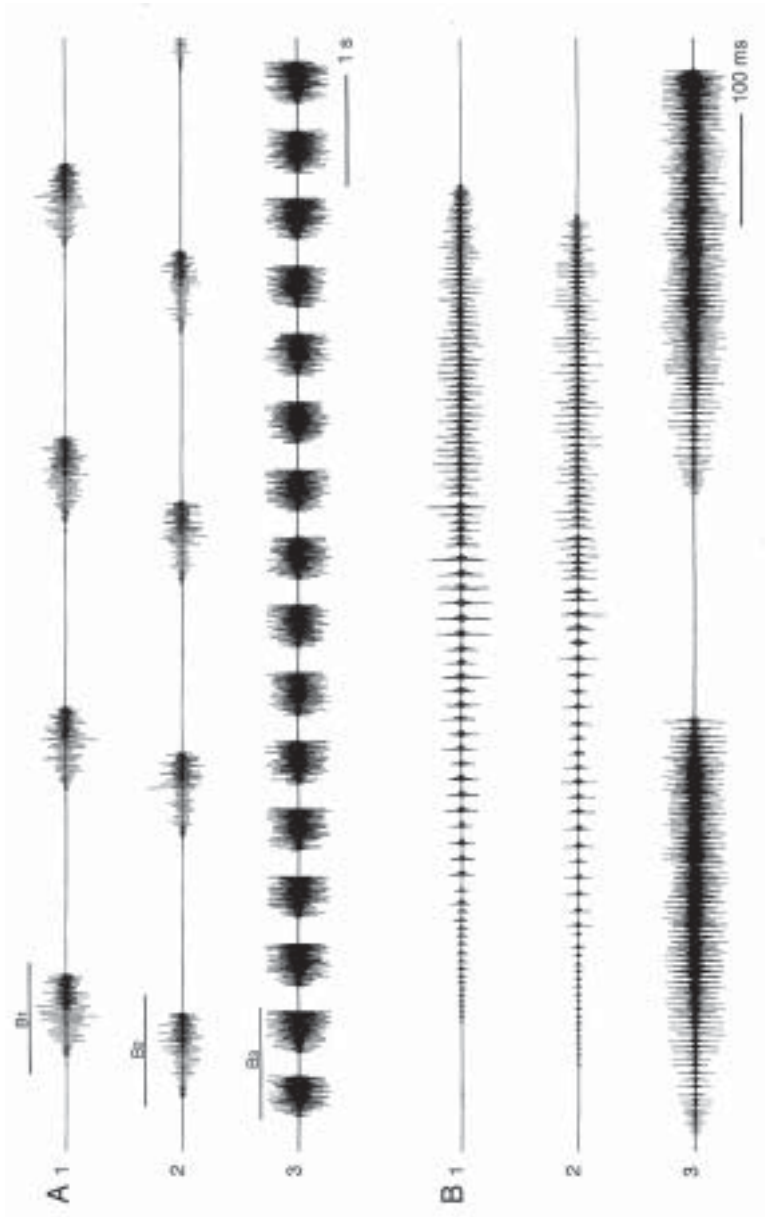
Uromenus (Bolivarius) brevicollis trinacriae, Harz, 1969, Orth. Eur., 1: 573.



Figs. 9 A-F. *Bolivarius bonneti painoi* (Ramme, 1927), same individual of Fig. 8; titillators in dorsal and lateral left view, particular of apex, dorsal view (A-C); *Bolivarius brevicollis trinacriae* (La Greca, 1964), Madonie Mts., P.la Mandarini (Palermo), 1300 m, 30.VIII.1998; titillators, dorsal, lateral left view and particular of apex, dorsal view (D-F). Photo by SEM Cambridge Stereoscan, P. Fontana.



Figs. 10 A-B. *Bolivarius brevicollis trinacriae* (La Greca, 1964), Madonie Mts., P.Ila Mandarini (Palermo), 1300 m, 30.VIII.1998, *pars stridens* (A); *Bolivarius bonneti painoi* (Ramme, 1927), Foce del Simeto (Catania). VII.1998, *pars stridens* (B). Photo by SEM Cambridge Stereoscan, P. Fontana.



Figs. 11 A-B. Oscillograms of the song of *Bolivarius bonneti painoi* (Ramme, 1927), Sicily, Foce del Simeto (1, 2), rec. 9.VII.1998, 26.1° C, and *B. brevicollis trinacriae* (La Greca, 1964), Sicily, Madonie Mts., P.la Mandarinì (3), 30.VIII.1998, rec. 8.IX.1998, 25.5° C. A: overview of 10 s; B: detail of 1 s.

Uromenus brevicollis trinacriae, Nadig, 1994, Rev. suisse Zool., 101: 935.

Bolivarius brevicollis trinacriae, Failla et al., 1994, Checklist specie Fauna italiana, 36: 11.

Bolivarius brevicollis trinacriae, La Greca, 1996, Boll. Mus. Civ. St. nat. Verona, 20: 24.

Bolivarius brevicollis trinacriae, Massa & Ragusa, 1999, Naturalista sicil., 23: 137.

MATERIAL EXAMINED: Sicily, Madonie, loc. Mandarinini (Palermo), 1300 m, 30.VIII.1998, leg. B. Massa, 3 M, 1 F (CF); Madonie, Castelbuono, loc. Monticelli, 900 m, 26.IX.1976, 1 M and 1 F, leg. B. Massa (CMUP); Madonie, loc. Liccia, 900 m, VIII.1990, 1 F, leg. B. Massa (CMUP); Madonie, loc. P.no Pomo, 1500 m, 10.IX.1995, 1 F, leg. B. Massa (CMUP); Madonie, loc. P.no Ferro, 1400 m, 10.IX.1995, 3 MM and 9 FF, leg. B. Massa (CMUP); 8.X.1995, 3 MM and 6 FF, leg. B. Massa (CMUP); Madonie, Petralia, loc. Mandarinini, 1300 m, 8.X.1995, 2 MM and 3 FF, leg. B. Massa (CMUP); Madonie, Isnello, 800 m, 8.VIII.1995, 1 F, leg. B. Massa (CMUP); Nebrodi, Mt. Trefinaidi, 900 m, 11.VII.1999, 1 F, leg. M. Arnone (CMUP).

Observations on the Biology

The species only occurs on the Sicilian highlands of Madonie, Nebrodi and Etna mountains, where it has summer-autumnal phenology. It occurs at the edges of woods, on sunny clearings, mainly at altitudes between 1000 and 1600 m.

By daylight it stays motionless, often on the most exposed branches of the fern *Pteridium aquilinum*, with its fore legs extended onwards and hind ones extended backwards.

On the basis of our research population density is about 3 ind./10 m². The species is remarkably sedentary; 30% of the individuals marked on 10th September 1995 was recovered on the same plant one month later, on 8th October. Dense vegetation of *P. aquilinum* in clearings and along pathways plays an important role for this insect, representing a perfectly mimetic perch (Figs. 14-15) for its sun exposure by daylight. On the basis of our survey, we conclude that at least two factors are a threat to the populations of *B. brevicollis trinacriae*, that is: 1) cow grazing and consequent frequent trimp on vegetation, which reduce remarkably the number of *P. aquilinum* plants on clearings; 2) forestry cutting of *P. aquilinum* at the edge of pathways and roads, generally performed for fire prevention, also reduces perch numbers for this insect, which in turn must switch over onto other plants, less cryptic than *P. aquilinum*, and may undergo a higher predation by insectivorous birds (e. g. *Lanius senator*).

We observed mating in laboratory; it occurs by daylight with the typical habits of Ephippigerini, that is the male lets its last sternites to join those of the female, maintaining an abdomen-abdomen position, and embracing with fore and middle legs its ovipositor (Figs. 12 A-B and 13 A). After mating, which can last up to three hours, the female, folding the abdomen, feeds slowly the edible part of the spermatophore (Fig. 13 B).

Morphology

Adults of *B. brevicollis trinacriae* collected in Sicily show in vivo a dark green or green brownish coloration, interrupted only by brown tegmina and whitish lateral border of the pronotum and pleural areas (Figs. 14 and 15). Legs are also brown ochre. Titillators (Figs. 9 D-F) are characterised by 1-2 apical teeth; in lateral view they are markedly bent. *Pars stridens* is curved and bears about 140 small teeth.

Song

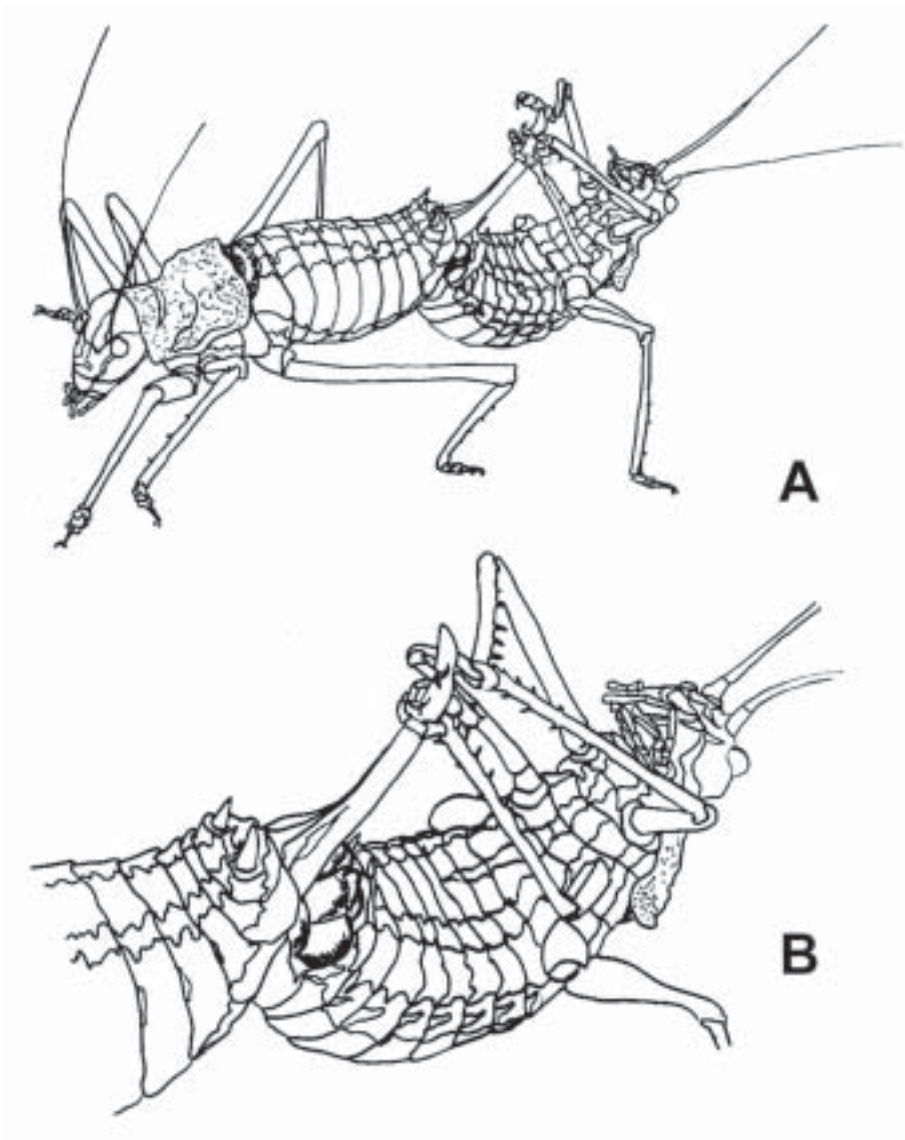
The male calling song of this species is much more like a straightforward *Uromenus*-type song. The song is composed of a series of syllables, by RAGGE & REYNOLDS (1998) referred to as echeme, with a repetition rate of about 1.6 syllables/s. A syllable lasts for 400-450 ms and consists of about 80-90 tooth-impacts, that are spread quite regularly over the syllable.

DISCUSSION AND CONCLUSIONS

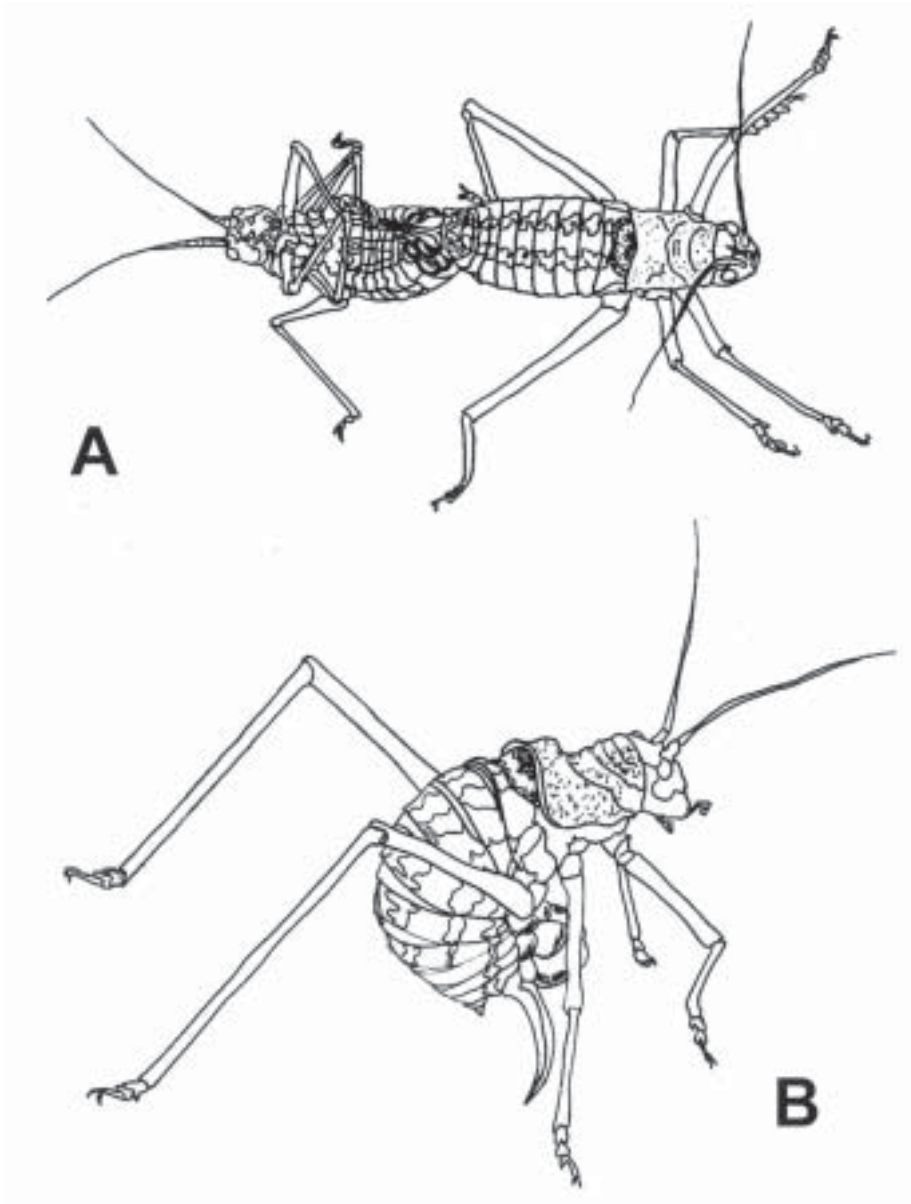
Our research revealed new information on three Sicilian endemics.

The song of *Platycoleis concii* resembles that of *P. albopunctata albopunctata* (Goeze, 1778) (widely distributed in Central-North Europe to Iberian peninsula and North Italy), *P. grisea grisea* (Fabricius, 1771) (distributed from Central Europe to Mediterranean, including Etna in Sicily) and *P. sabulosa* Azam, 1901 (widespread over the Mediterranean area). Its occurrence in the montane area of Madonie may have been originated during the last glaciation from isolated populations of ancestors of one of the above listed species. Concerning the morphological characters of *P. concii*, its female subgenital plate is different from that of *P. albopunctata*, while it is more similar to that of *P. sabulosa* and *P. grisea* (HARZ, 1969; RAGGE, 1990). The basal part of titillators of *P. concii* is wide, as in *P. albopunctata* and especially in *P. grisea*, while in *P. sabulosa* it is slender and the apical part is less curved (RAGGE, 1990). Furthermore, the last tergite of the male matches that of *P. grisea* more than that of *P. sabulosa*. Finally, *P. grisea* inhabits highlands in Southern Italy, Corsica and Sicily, thus sharing this habitat with *P. concii*. GALVAGNI (1959) had already hypothesised the affinity with *P. grisea grisea*.

Bolivarius bonneti painoi is present in western as well as in eastern Sicily. Its song is very particular, and the comparison with that of *Bolivarius bonneti bonneti* from Tunisia, when available, will clarify the relationship between the two taxa.



Figs. 12 (A-B). *Bolivarius brevicollis trinacriae* (La Greca, 1964). Pair mating (A) and particular (B) (in laboratory) depicted from photos. Drawing by M. C. Rizzo.



Figs. 13 (A-B). *Bolivarius brevicollis trinacriae* (La Greca, 1964). Pair mating (A) and female, folding the abdomen to feed the edible part of the spermatophore (B) after mating (in laboratory), depicted from a photo. Drawing by M. C. Rizzo.



Fig. 14. *Bolivarius brevicollis trinacriae* (La Greca, 1964) male, Madonie Mts., P.Ila Mandarinì (Palermo), 1300 m, 30.VIII.1998. Leg. B. Massa, Photo P. Fontana.



Fig. 15. *Bolivarius brevicollis trinacriae* (La Greca, 1964) female, Madonie Mts., P.Ila Mandarinì (Palermo), 1300 m, 30.VIII.1998. Leg. B. Massa, Photo P. Fontana.

From a conservationist point of view, we found some possible threats to *B. brevicollis trinacriae*, namely cow grazing on clearings and forestry cutting at the edge of pathways and roads, both reducing the fern *P. aquilinum*, plant utilised by this insect as cryptic perch by day. We would like to urge to apply a more ecological management in the highlands where this species lives, within Natural Regional Parks (Parco Naturale Regionale delle Madonie, Parco Naturale Regionale dei Nebrodi and Parco Naturale Regionale dell'Etna).

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