

Orthoptera in the Far Side of the World: the southernmost new genus of Phaneropterinae, and the ecology of some Subantarctic Orthoptera

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Abstract

A survey on orthoptera in the transition zone between the Patagonian and Subantarctic regions of Argentina, along the Atlantic coast, was conducted to improve knowledge on these insects, which in these extreme areas have evolved into peculiar species, indicative to understand the biogeographical limits of this order of insects. New data have emerged on highly specialized genera such as *Bufoacris* and *Astroma* while other more generalist genera such as *Sinipta* have shown considerable expansion southwards, probably favoured by warmer climatic conditions. A new genus and species are described here for the first time: *Caimanellus* gen. nov. with the species *Caimanellus australis* sp. nov., at present the southernmost representative of the Phaneropterinae ever recorded. More general considerations on the evolution of the distributional limits of this large group of orthopterans are here discussed.

Key words: katydids, grasshoppers, biogeography, taxonomy, conservation.

Introduction

Patagonian plains of Argentina below 45°S are traditionally comprised in the Subantarctic region, a delicate and extreme ecosystem, challenging for biodiversity (Jelinski *et al.*, 2023). The almost total absence of tree cover, uniform and wide extension of a dry steppe composed by low shrubland vegetation, the almost constant presence of strong wind, allow the presence of a reduced number of well adapted species, especially in the entomofauna. However, current knowledge of many aspects of this fauna in the arid Patagonia lowlands is still scarce (Domínguez *et al.*, 2006; Cheli *et al.*, 2010). Orthoptera are probably the most abundant insect group in extra-Andean Patagonia (Castelli *et al.*, 2023), but the species richness tends to simplify proceeding south (Otte, 1976; Saupé *et al.*, 2019), where climate conditions are most challenging even for such adaptable animals. Recent contributions have improved on different scales the knowledge of Patagonian Orthoptera. The BiodAr catalogues on Acridomorpha (Carbonell *et al.*, 2023) and Tettigoniidae (Braun and Zubarán, 2023), are the main aggregators of data on species presence in the different provinces of Argentina and Uruguay and, together with citizen science projects like iNaturalist (inaturalist.org) and GBIF (gbif.org), are the most updated source for extra-Andean Patagonia Orthoptera. Local surveys have recently improved on smaller scales but higher precision the presence of specific target species (i.e. Castelli *et al.*, 2023). In November 2022 a scientific expedition has been carried out to survey the presence and composition of Orthoptera communities along a transect in the east coastal area of the provinces of Chubut and Santa Cruz to improve their knowledge in this “far side of the world” and the results, in a wider biogeographical and ecological context, are here presented. The well-known British writer Patrick O'Brian (1914-2000) referred indeed to

this region as "The far side of the world", which is the title of the tenth volume, published in 1984, of his famous Aubrey-Maturin historical novel series. The choice of the title of this paper is intended to pay homage to the writer of whom both authors are passionate readers.

Materials and methods

A transect of about 2 degrees of latitude, from -44°51' to -46°37', covering all inland of the San Jorge Gulf in Argentina, has been carried out in the transition zone between the Patagonian and Subantarctic regions of Argentina along the Atlantic coast in a range of 0-20 km from the sea shore. The entomofauna and the presence of orthoptera was investigated by sight or sampling with an entomological net among the vegetation.

The whole Orthoptera fauna was considered using both BiodAr catalogues (with presence records at Province level) and by citizen-science observations using both GBIF and iNaturalist platforms. The specimens collected are deposited at the Museo di Archeologia e Scienze Naturali 'G. Zannato' (MCZ) in Montecchio Maggiore (Italy).

Results

Family Tettigoniidae Krauss 1902

Subfamily Phaneropterinae Burmeister 1938

Caimanellus gen. nov.

Type species: *Caimanellus australis* sp. nov.

By the scarcity of records, not allowing a complex systematic dissertation, this genus is cautiously placed within the morphologically closest relatives in the family Tettigoniidae, subfamily Phaneropterinae, tribe Odonturini.



Figure 1. Colour patterns and variability of living individuals of *Caimanellus australis* gen. nov. and sp. nov. from Playa La Mina, Magallanes (on the left, Photo Ian Walker) and from RN3 south of El Salado (on the right, Photo Andrea Cocucci), camouflaged with the ground vegetation with a parasitic mite on the abdomen.

Diagnosis: Pronotum with typical sulcus behind the second third and consequently metazona long more than half of prozona, without humeral sinus. Squamipterous, with tegmina of the females elliptical, partially overlapping. Supra anal plate of the females triangular, truncated. Subgenital plate of the females, simple, elliptical, transverse with two slight dimples at sides, apex truncated. Cerci conical, short and stout. Ovipositor short and large dorso-ventrally, saber-like, slightly upward curved in the dorsal part, tapering strongly in the apical part, equipped with several spines. Distal half coarsely serrulated.

Derivatio nominis: The genus name refers to the peculiar shape and colour pattern on the abdominal tergites, resembling the scales of a small caiman. Moreover, while this insect is the southernmost Phaneropterinae recorded, the reptile genus *Caiman* Spix 1825 reaches as well in Argentina, to the south of Entre Ríos, the southernmost localities recorded for a crocodylian.

Distribution: Known for three different localities in the eastern Patagonian plains, the genus is, occurring in the South American Dominio.

Affinities: *Caimanellus* is the only representative of the Odonturini in the southern Argentina and can be distinguished from other Argentinian Odonturini like both *Cohnia* Buzzetti, Fontana et Carotti 2010 and *Xenicola* Uvarov 1940 by the presence in these latter genera of an almost straight ovipositor and a general greenish colour pattern without dorsal protuberances, and from *Anisophya* Karabag 1960, for the presence in this latter genus of shorter, more massive and arched ovipositor and a more uniform general colour pattern, without dorsal protuberances.

***Caimanellus australis* sp. nov.**

Type locality and type material:

- Argentina, Chubut Province, Florentino Ameghino Department, Estancia la Jorgelina, Lat: -44.862194, Long: -66.747889, elevation 489 m, 16.XI.2022,

R. Battiston leg., Coll. MCZ, 1 ♀ holotype.

Further material examined:

- Argentina, Santa Cruz Province, Magallanes Department, RN3 south of El Salado, Lat: -48.955991, Long: -67.647758, 18.XII.2021, A. A. Cocucci obs. (iNaturalist record: 103478427, 2 pictures of an adult female in its natural habitat, figure 1 right).
- Argentina, Santa Cruz Province, Magallanes Department, Playa La Mina, Lat: -49.157188, Long: -67.631866, 17.I.2024, I. Walker obs. (iNaturalist record: 196939970, 1 picture of an adult female resting on a finger, figure 1 left).
- Argentina, Santa Cruz Province, Lago Buenos Aires, Lat: -47.240322, Long: -71.197872, 24.XII.2023, M. Cabezas obs. (iNaturalist record: 194829315, 3 pictures of an adult female collected in a jar).
- Argentina, Santa Cruz Province, Lago Buenos Aires, Lat: -47.242633, Long: -71.188522, 19.XII.2023, M. Cabezas obs. (iNaturalist record: 194422734, 1 picture of a juvenile).
- Argentina, Santa Cruz Province, Lago Buenos Aires, Lat: -46.740985, Long: -71.52993, 08.XII.2023, M. Cabezas obs. (iNaturalist record: 194389792, 1 picture of a female).

Description of the female holotype (figure 2): general colour of living individuals whitish-grey finely dotted with black, pattern extending from the main body on legs and ovipositor, except for the whitish wings. Two dark brown dorsal stripes visible on the pronotum, and on the abdomen, forming on the tergites a yellowish-white herringbone dorsal pattern, ending in a series of three small protuberances on the dorsal posterior margin of each tergite, particularly evident in the 3rd, 4th, 5th tergites. Antennae whitish, reaching the tip of the ovipositor.

Body length from the head vertex to the apex of the ovipositor: 18.83 mm (table 1). Head semicircular from above and elongated in a frontal view; fastigium subconical, weakly developed. Eyes semicircular form above

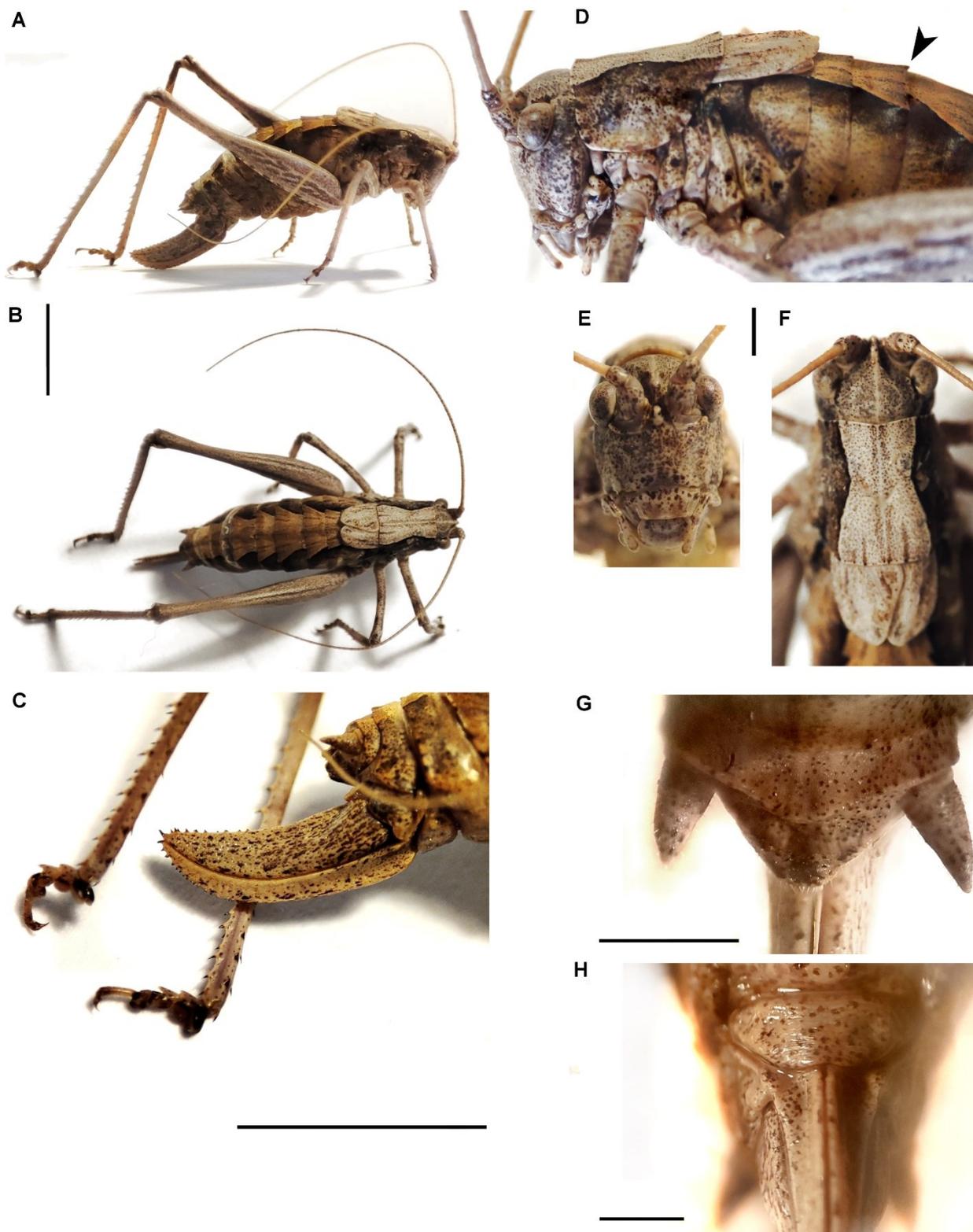


Figure 2. *Caimanellus australis* gen. nov. and sp. nov., female holotype. **A-B:** lateral and dorsal view of the habitus (scalebar: 5 mm); **C:** ovipositor (scale bar: 5 mm); **D-F:** head and pronotum in lateral, frontal and tow views with tergal spines evidenced (scale bar: 1 mm); **G-H:** terminalia in dorsal and ventral view (scale bar: 1 mm).

Table 1. Measures in mm of the female holotype of *Caimanellus australis* gen. nov. and sp. nov.

<i>Caimanellus australis</i> ♀ holotype	mm
Total length (from the head vertex to the apex of the ovipositor)	18.83
Minimum distance between the eyes	1.96
Eye width	0.68
Eye length	1.00
Pronotum length	3.09
Pronotum height	1.72
Posterior femur length	12.49
Posterior femur width	2.09
Supraanal lamina length	1.67
Supraanal lamina length width at the base	0.86
Subgenital lamina length	2.15
Subgenital lamina width at the base	0.81
Cerci length	0.87
Cerci width at base	0.48
Ovipositor length	5.33
Ovipositor width	1.71

and oval in dorso-ventral versus from lateral view. Pronotum smooth but densely dotted; in lateral view trapezoidal in shape, flat on dorsum but slightly raised at the posterior and anterior margin and without humeral sinus; typical sulcus behind the middle, fore margin of pronotal disc straight, hind margin slightly concave in an obtuse angle. Lateral margins from above with a marked narrowing at the sulcus. Hind femurs 3.2 times as long as the pronotum and 6 times longer than wide in lateral view.

Tegmina squamiform, ovate, not exceeding the first

abdominal tergite, with campus mediocubitalis constituting more than half of tegmen total length. Hind wings reduced but present. Supra anal plate triangular, truncated, with a light longitudinal incisure. Subgenital plate simple, elliptical, transverse, with two slight dimples at sides, apex truncated. Cerci conical, short and stout, finely haired. Ovipositor short and large (max length/max width: 2.97), saber-like, slightly upward curved in the dorsal part, tapering strongly and pointed in the apical part, equipped with several short spines. Distal half coarsely serrulated.

The male is unknown.

Affinities: *Caimanellus australis* is the only known species of the genus *Caimanellus* and it differs from other species of South American Odonturini for its morphology (see above), colour pattern, and the three unique small protuberances on the distal margin of each tergite.

Derivatio nominis: The species name *australis* refers to the southernmost distribution currently recorded for the family Phaneropterinae.

Distribution: Argentina, Patagonia, provinces of Chubut and Santa Cruz.

Ecological notes: this species lives in the low sclerophyllous vegetation of the south-eastern Patagonian lowlands (figure 3) on or near bushes where it can camouflage among *Chuquiraga avellanadae* Lorentz. The three females were observed at the adult stage in the late austral spring- early summer, between November and January, showing an early life cycle if compared to the Orthoptera fauna of its habitat. All the three specimens were observed alone without any other individual in the surroundings, indicating that the species is scarce and probably occurs in fragmented populations.



Figure 3. Left: Estancia la Jorgelina, the type locality of *Caimanellus australis* gen. nov. and sp. nov. in Argentina, Chubut province, Department of Florentino Ameghino. Right: records of *C. australis* (stars and potential distribution).



Figure 4. Cryptic habitus of *Astroma compactum* in its natural habitat in Argentina, Chubut province, Department of Florentino Ameghino.

Family Proscopiidae Serville 1845

***Astroma compactum* Brunner von Wattenwyl 1890**

- Argentina, Chubut Province, Florentino Ameghino Department, Lat: -44.862194, Long: -66.747889, elevation 489 m, 16.XI.2022, R. Battiston leg., Coll. MCZ, 3 ♀ sub-adult (figure 4). Specimens apterous, with a morphology and size compatible with subadults of *Astroma compactum*, the only species of this genus reported for this area, according to the literature (see: Mello-Leitão, 1939).

Distribution: Chile: Los Andes, Santiago. Argentina (La Rioja, Mendoza, San Luis, Chubut).

Biogeographical notes: *Astroma* Charpentier 1845 together with *Asromoides* Tapia 1981, reaching generally the same latitudes, is the genus of Proscopiidae with the southernmost distribution, even if its records in literature or in geographic databases are often general and not precise. The new presence records presented here should be considered among the southernmost known for this genus.

Family Tristiridae Rehn 1906

***Bufonacris terrestris* Walker 1871**

- Argentina, Chubut Province, Florentino Ameghino Department, Lat: -44.862194, Long: -66.747889, elevation 489 m, 16.XI.2022, R. Battiston leg., Coll. MCZ (figure 5), 2 ♂, 2 ♀.

Distribution: Chile: Strait of Magellan, Argentina: Chubut, Santa Cruz.

Morphological notes: In Patagonia, and sometimes in very close localities, both *Bufonacris terrestris* and *Bufonacris bruchii* Brancsik 1901 are recorded. Their species separation is based mostly on external morphological characters and mostly on the more or less evident

spinulation of the pronotum (Rehn, 1942; Cigliano, 1989). However, in our collections a great variability has been observed. In the very same localities in an area of few meters, and likely in the same population individuals, almost all the degrees of spinulation have been observed (figure 6), mostly of the *terrestris* morphotype but some very similar to the *bruchii* morphotype. Considering this variability, the not marked geographical separation between these two species and the great variability of a single population, a more detailed investigation, possibly involving molecular analysis should be carried out to confirm the validity of both species as separate taxa.

Family Acrididae MacLeay 1821

***Sinipta dalmani* (Stal 1861)**

Examined material:

- Argentina, Chubut Province, Florentino Ameghino Department, Lat: -44.862194, Long: -66.747889, elevation 489 m, 16.XI.2022, R. Battiston leg., Coll. MCZ, 2 ♂.

- Argentina, Chubut Province, Escalante Department, Lat: -45.585739, Long: -67.634596, elevation 605 m, 16.XI.2022, R. Battiston obs., 1 ♀.

- Argentina, Chubut Province, Escalante Department, Lat: -45.741990, Long: -67.502266, elevation 125 m, 16.XI.2022, R. Battiston leg., Coll. MCZ, 3 ♀, 1 ♂ (figure 7).

- Argentina, Chubut province, Escalante Department, Lat: -44.366203, Long: -65.227608, 17.X.2021, A. A. Cocucci obs. (iNaturalist record: 99400952, 4 pictures of an adult ♀ in natural habitat).

Biogeographical notes: This species, described from Uruguay, and known to be distributed from Uruguay to North Argentina has been recently documented for the



Figure 5. Cryptic habitus of *Bufonacris terrestris* in its natural habitat in Argentina, Chubut province, Department of Florentino Ameghino.

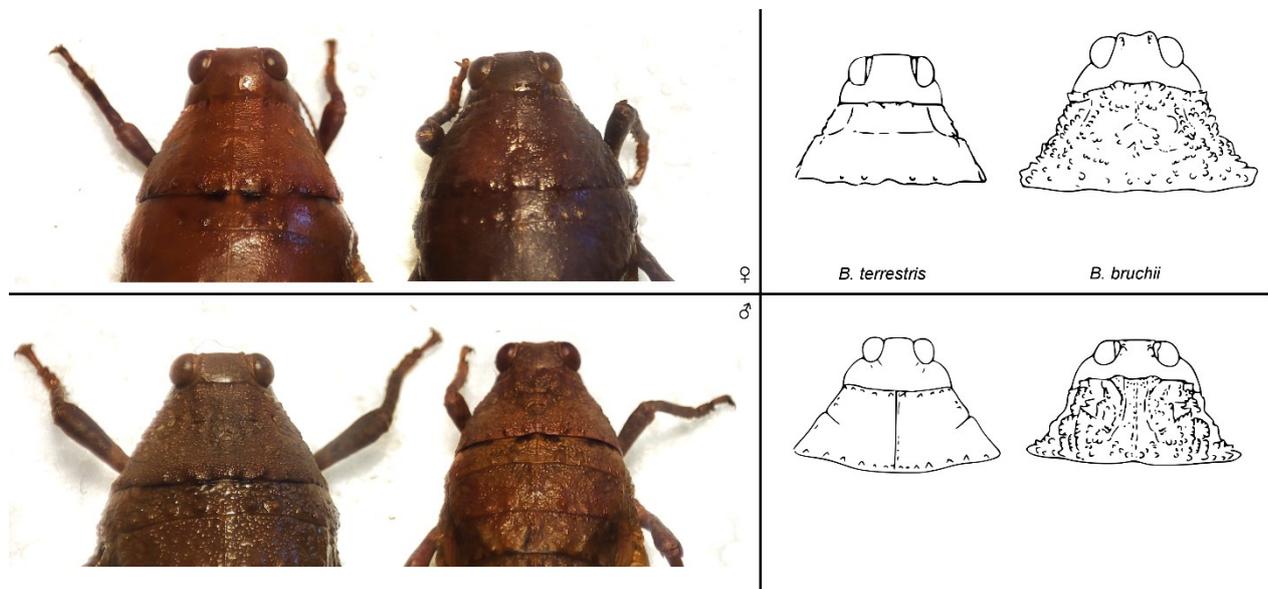


Figure 6. Variability of the pronotum of *Bufonacris terrestris*. Left: two females (above) and two males (below) from the same population of *B. terrestris* in Chubut. Right: females and males' drawings of *B. terrestris* and *B. bruchii* from Cigliano, 1989 modified.

first time in Chubut province in 2023 by Castelli *et al.* (2023) between -43° and -44° of latitude (without precise locality).

Our record at $45^{\circ}44'31.2''$ of South latitude is currently the southernmost reported for this genus and, in general, for the tribe Amblytropidiini.

Ecological notes: this species has been found on tall

grasses but never on the low sclerophyllous vegetation of the south-eastern Patagonian lowlands. This may constitute a distributional limit even if it is clearly shifting south in the last years. The two females were observed at the adult stage in the late austral spring- early summer, between November and December, showing an early life cycle if compared to the Orthoptera fauna of its habitat.



Figure 7. *Sinipta dalmani*: female (above) and male (below) from Argentina, Chubut province, Department of Escalante. Scale bar 5mm.

Discussion

The inland of Saint Jorge Gulf is known to be one of the windiest places of South America, with an annual average speed of 9.1 m/s severe wind episodes, especially in November-December with prolonged peaks of 25 m/s (Labraga, 1994). These conditions with a dominant low and scattered arid sclerophyllous vegetation are very challenging for any Orthoptera. *Bufoenacris* with its massive stone-like body, apterous and barely able to jump, seems the most well adapted and frequent Orthoptera in this region. Besides the here reported adult individuals, some very young nymphs have been observed in other localities of the transect, confirming the presence of well settled populations with probably overlapping generations. Delicate forms like the flightless stick-grasshopper *Astroma* and the brachypterous *Caimanellus* gen. nov. are interesting and probably sedentary species in these extreme environments and their elusive ecology is practically unknown. Moreover, it must be noted that only few brachypterous Phaneropterinae are known for South America, and some of them from few specimens (Buzzetti *et al.*, 2010; Braun, 2011; Cohn *et al.*, 2014)

even if new data is coming up, in particular thanks to the citizen contributions. What seems can be evinced by these findings in the transition zone between the Patagonian and Subantarctic regions is that the adult stage of these species can be found in late austral spring, in November-December, when winds are stronger. *Sinipta* is clearly moving south from its natural range in the temperate South-American, since all the records in the south are from the very last years, probably helped by milder temperatures and conditions. *Caimanellus* gen. nov. has no known relatives in this area, where it seems native and well adapted to the local vegetation by the cryptic appearance that resembles spines or bark of the dry bushes.

The nearest species of Phaneropterinae known in the northern areas is *Cosmophyllum olivaceum* Blanchard 1851. *Scaphura elegans* (Serville 1838), *Tetana grisea* Brunner von Wattenwyl 1878 stop here at the latitude of the Valdés peninsula (-43°) with *S. elegans* and the other southernmost species of this family already known in New Zealand stop at -46° of south latitude. This makes these new records of *Caimanellus australis* gen. nov. and sp. nov. comprised between -44° and -49° of south latitude extremely interesting to understand the biology and

limits of this large and wide spread family of Orthoptera. It must be noted that even if New Zealand, as an island is a geographical limit, the continental southern records of *Scaphura* are very recent in this southern edge of its distribution (see: GBIF, 2023 and iNaturalist) and may expand further in the next years. At the same time Phaneropterinae are expanding northwards in the northern hemisphere, in these years and the northernmost distribution limit just shifted north in Finland in the summer 2023 with *Phaneroptera falcata* (Poda 1761) passing the 61° of north latitude (iNaturalist record: 177510073). All these apparently delicate orthopterans are now expanding their global distribution on Earth both north and south and a warmer climate may be a key factor in this process. Further investigations are strongly encouraged to improve the knowledge on the ecology of these insects, scouts of biodiversity in the far sides of the world.

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