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ON THE IDENTITY OF *EPHIPPIGERA ANNAE*
TARGIONI-TOZZETTI, 1881
(*Insecta Orthoptera Tettigoniidae*)

ABSTRACT - FONTANA P. & BUZZETTI F. M., 2001 - On the identity of *Ephippigera annae* Targioni-Tozzetti, 1881 (*Insecta Orthoptera Tettigoniidae*).

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The *neotype* of *Ephippigera annae* Targioni-Tozzetti, 1881 is designated. The view that the species belongs to the genus *Steropleurus* Bolivar, 1878 is confirmed and its affinity with some congeneric species from northern Africa is discussed. The species had not been recorded any more, neither in Sardinia was elsewhere, since the descriptions by TARGIONI-TOZZETTI (1881) and A. COSTA (1884, sub *Ephippigera coronata*). In this paper 3 males and 3 females are recorded, caught in Sardinia probably by M. Salfi in June 1938 and by C. Vidano and A. Sampò in August 1962. Probably the species is still to be found on the island. *Steropleurus annae* is very interesting biogeographically and is one of the most characteristic elements of Sardinian fauna. In this paper *Steropleurus annae* is redescribed and the habitus of the male and female, head, prothorax, subgenital and supragenital plate, cerci, and titillators of the male and head, prothorax, subgenital plate and ovipositor of the female are illustrated. A distribution map indicating all the known localities and some biological data are provided.

KEY WORDS - *Insecta*, *Orthoptera*, *Tettigoniidae*, *Steropleurus annae* (Targioni-Tozzetti, 1881), Morphology, Sardinia, protection.

RIASSUNTO - FONTANA P. & BUZZETTI F. M., 2001 - L'identità di *Ephippigera annae* Targioni-Tozzetti, 1881 (*Insecta Orthoptera Tettigoniidae*).

Viene designato il *Neotypus* di *Ephippigera annae* Targioni-Tozzetti, 1881 e viene confermata l'appartenenza della specie al genere *Steropleurus* Bolivar, 1878, nonché la sua affinità ad alcune specie nordafricane del genere. Dopo la descrizione di TARGIONI-TOZZETTI (1881) e quella di A. COSTA (1884, sub *Ephippigera coronata*), la specie non era più stata segnalata né in Sardegna né altrove. Gli esemplari studiati (3 maschi e 3

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femmine) sono stati raccolti in Sardegna in località Correboi nel giugno del 1938 (probabilmente da M. Salfi) e sul M. Corراسi nell'agosto del 1962 da C. Vidano e A. Sampò, per cui la specie è da ritenersi ancora presente sull'isola. La specie è di grande interesse biogeografico e risulta uno degli elementi più caratteristici della fauna sarda. *Steropleurus annae* viene ridescritto e sono illustrati il maschio e la femmina in toto, il capo, il protorace, le lamine sopra e sotto genitali, i cerci e i titillatori del maschio ed il capo, il protorace, la lamina sottogenitale e l'ovopositore della femmina. Viene inoltre fornita una cartina con tutte le segnalazioni note fino ad oggi e vengono esposti i pochi dati relativi alla sua biologia.

PAROLE CHIAVE - *Insecta, Orthoptera, Tettigoniidae, Steropleurus annae* (Targioni-Tozzetti, 1881), Morfologia, Sardegna, protezione.

INTRODUCTION

TARGIONI-TOZZETTI (1881) described *Ephippigera annae* on the basis of material from the Museum of Florence collected in Central Sardinia (Oristano): *e Sardinia centrali (Oristano) perducta*.

A few years later, ACHILLE COSTA (1884) in his third memory *Notizie ed osservazioni sulla geo-fauna sarda*, reporting results about his expedition in Sardinia in the Summer of 1883, gave a description of a new species of Tettigoniidae named *Ephippigera coronata* and that later proved to be a synonym of *Ephippigera annae* Targioni-Tozzetti, 1881 (BURR, 1910). After Targioni-Tozzetti's and A. Costa's findings, the species had never been recorded neither in Sardinia nor elsewhere. Furthermore both Targioni-Tozzetti's and A. Costa's material appear to have been irreparably lost and no following author has had the possibility to examine material that can be attributed to the species. Nevertheless the validity of the species has never been doubted and in the years has been attributed first to the genus *Uromenus* Bolivar, 1907 (BOLIVAR, 1907) and finally to the genus *Steropleurus* Bolivar, 1887 (LA GRECA, 1957).

In Prof. Marcello La Greca's collection (now belonging to the Museo Civico di Storia Naturale di Milano) a male specimen that can certainly be attributed to *Steropleurus annae* is present and Prof. La Greca himself entrusted the specimen to the first author of this note, on which to base a modern redescription of the species. That specimen, the only one provided with titillators, is designed as *neotypus* of the species and remains preserved in the La Greca collection at the Museo Civico di Storia Naturale di Milano. The authors provided the *neotypus* with a red label on which «*Ephippigera annae* Targioni-Tozzetti, 1881 – *Neotypus* – det. P. Fontana & F. M. Buzzetti» was written.

Later on it has been possible to find two more exemplars (a male and a female) belonging to the same series of the male from the La Greca collection, preserved in the Section of Entomology and Zoology applied to the environment «C. Vidano» of Di. Va. P.R.A., University of Turin. Finally, among the undetermined material of the M. Salfi collection, care of the Zoological Museum of the University of Rome «La Sapienza» (MZUR), three more specimen that can certainly be attributed to the species have been found, caught in Correboi (Gennargentu, Sardinia), the locality where A. Costa had found his *Ephippigera coronata*. The lack of material gathered to date, regarding this showy and particular species, suggest that *S. annae* may be present in Sardinia in scarce and very localised populations.

DISCUSSION

Steropleurus annae (Targioni-Tozzetti, 1881)

- 1881 *Ephippigera annae* Targioni-Tozzetti, *Boll. Soc. entom. Ital.* 13: 181.
1882 *Ephippigera annae*, Brunner von Wattenwyl, *Prodr. Eur. Orth.*: 371, 383.
1884 *Ephippigera coronata* Costa A., *Atti Reale Acc. Sc. Fis. e Mat., Napoli*, v. 1, s. 2 (9): 13, 31, 50.
1884 *Ephippigera coronata* Costa A., *Boll. Soc. entom. Ital.* 15: 241.
1903 *Ephippigera annae*, Bolivar, *Annuario Mus. Napoli* [N.S.] 1/10: 1.
1907 *Uromenus annae*, Bolivar, *Ann. Sci. nat. Paris* [9] 5:44, 53.
1907 *Ephippigera coronata*, Bolivar, *Ann. Sci. nat. Paris* [9] 5:44, 53.
1908 *Uromenus annae*, Burr, *Entom. Rec.* 20:59, 110.
1910 *Uromenus annae*, Burr, *Syn. Orthopt. W. Europ.*: 122, 125.
1927 *Uromenus annae*, Houlbert, *Encycl. sci., Zool.*, Orthopt. 2:198.
1957 *Steropleurus annae*, La Greca, *Mem. Biog. Adriatica*, 4: 69.
1964 *Ephippiger annae*, Baccetti, *Atti Acc. Naz. Ital. di Entomol., Rendiconti*: 11: 1, 7.
1969 *Uromenus (Steropleurus) annae*, Harz, *Die Orthopteren Europas*, 1: 567.
1983 *Uromenus (Steropleurus) annae*, La Greca, *Lav. Soc. ital. Biog.*, 8: 571.
1994 *Steropleurus annae*, Failla et al., *Checklist d. specie d. Fauna italiana*, 36: 10.
1996 *Steropleurus annae*, La Greca, *Boll. Mus. Civ. St. nat. Verona*, 20: 24.
1994 *Uromenus (Steropleurus) annae*, Otte, *Orthoptera species file*, 7. *Tettigonioidea*: 18.
1998 *Uromenus (Steropleurus) annae*, Heller et al., *Articulata*: 22.

Examined material: Correboi (Sardinia, Nuoro), VI.1938, 1 ♂, 1 ♀, 1 nymph ♀, coll. Salfi, MZUR; Mount Corراسi (Sardinia, Nuoro), m 1350-1400, 11.VIII.1962, 2 ♂♂, 1 ♀, leg. A. Goidanich, 1 ♂, coll. La Greca, Mus. Civ. St. nat., Milano (*Neotypus*) and 1 ♂ and 1 ♀, in coll. Entom. e Zool. appl. all'ambiente «C. Vidano», Di.Va.P.R.A., Univ. Torino.

The specimens in the La Greca collection and in the Section of Entomology and Zoology applied to the environment «C. Vidano», are labelled «A. Goidanich leg.»; nevertheless that material was caught on the top of Mount Corراسi by Carlo Vidano and Achille Sampò (A. Sampò, pers.com.), at that time belonging to the Institute of Agricultural Entomology of which Prof. A. Goidanich was director.

Targioni-Tozzetti's description, about only a male found in the collections of the Museum of Florence (TARGIONI-TOZZETTI, 1882), but especially the Achille Costa's one, about both sexes and also based on the examination of living material (ACHILLE COSTA, 1884), are quite extensive and detailed. Nevertheless, a redescription of the male and the female is given, on the basis of modern nomenclature of the different anatomic parts and deduced from the examination of the mentioned material, is given.

Concerning the living specimen, the observations of ACHILLE COSTA (1884) are still effective: *In the living material the back of the prothorax is olive green with all the raised parts yellowish. The back of the abdomen is olive-coloured with four longitudinal series of yellow spots. The abdomen is pale yellow with the raised horniness white. The vertex and the antenna, except for the first two articles, are pale purple. The feet are the same colour as the back, greenish in the lower part. All the prothorax is bright as if it has been varnished.* Furthermore ACHILLE COSTA (1884) adds that *after the death all the mentioned colours disappear and the entire body become brown.* On the contrary both the specimens examined by TARGIONI-TOZZETTI (1882), as deduced from his notes about the colouring, and those caught by C. Vidano and A. Sampò, prepared and preserved exemplarily, have partially retained the original pattern and colour (Fig. 1).

REDESCRIPTION

Male

Head with sharp, not very prominent fastigium, impressed on both sides, with a longitudinal depression (Fig. 2A). Spherical eyes. Dark and threadlike antenna with articles of different length.

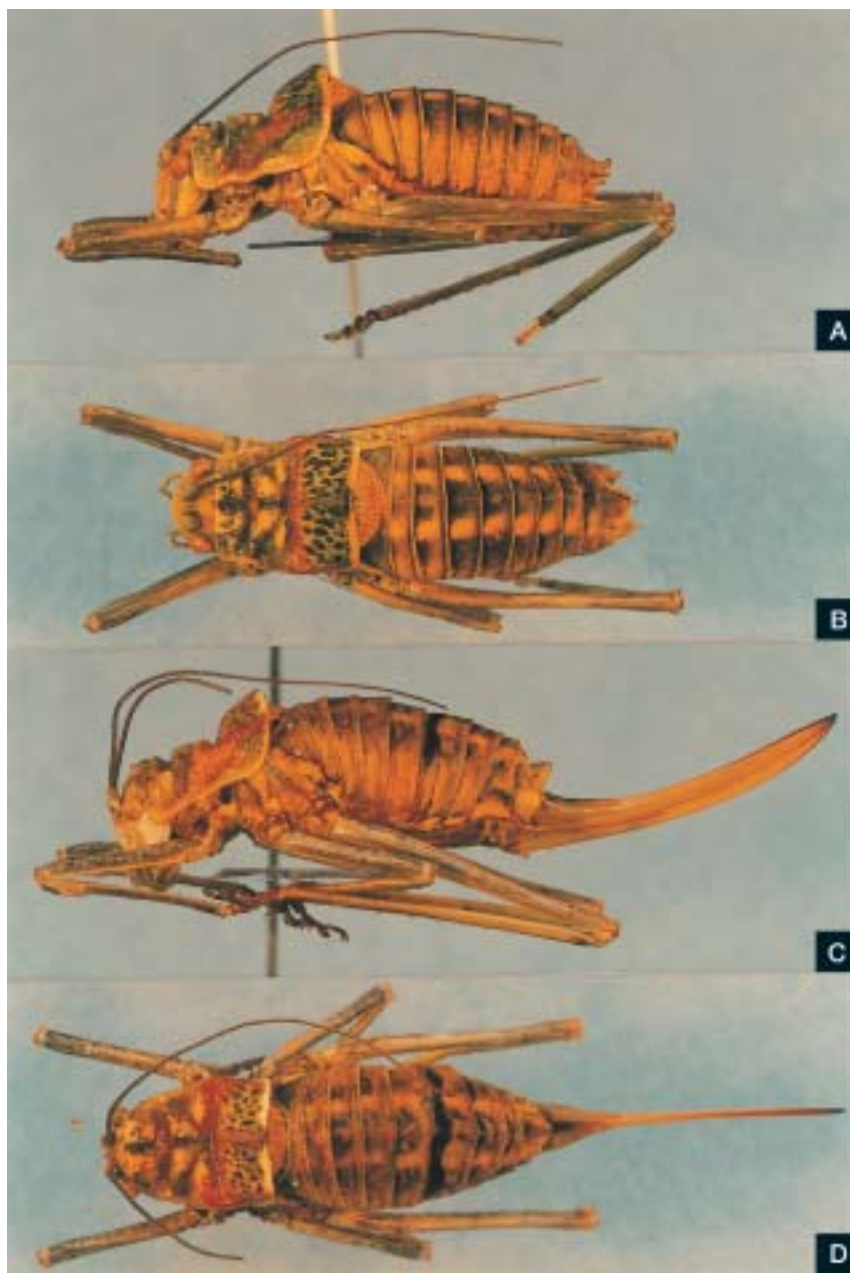


Fig. 1 (A-D). *Steropleurus annae* (Targioni-Tozzetti, 1881). A-B: male (*Neotypus*), Mount Corrasì (Sardinia, Nuoro), m 1350-1400, 11.VIII.1962, left lateral view and dorsal view. C-D: female (same locality), left lateral view and dorsal view. Photo P. Fontana.

Pronotum almost rectangular dorsally with a light expansion at the level of the typical transverse *sulcus*. Characteristic sculpture with evident dark depressions in the metazona; the prozona is also wrinkled. Besides the typical transverse *sulcus* another two incisions run along the pronotum, a convex one at the back, inside the prozona and a transversal one (median *sulcus* in GALVAGNI, 1956) which divides the mesozona from the metazona. The typical transverse *sulcus* and the wrinkle of the prozona extend along the *lobi deflexi* which have a wavy lower border. In the centre of the prozona a black spot is present. The metazona is slightly raised and sloped compared to the rest of the pronotum and presents a central longitudinal keel, and two longitudinal lateral keels. In the median part of the hind border a dark spot is present.

Four thornlike processes grow on both sides of pronotum: the first process grows in a fore-lateral position in respect to the internal wrinkle of the prozona; the second process is smaller and is laterally turned; the third process is the biggest and grows in front of the typical transverse *sulcus*, at the end of the mesozona; the fourth process, the smaller one, grows behind the typical transverse *sulcus* (Fig. 2A-B).

The tegmina are dark and short, reaching the hind border of first tergite; *campus subcostalis*, *campus radialis* and *campus cubitalis* bright, *campus marginalis* dark.

Green abdomen with two bright spots on every tergite, forming two longitudinal series. Between these series a vanishing bright spot is present on each tergite; those spots are less coloured in the tergites going from front to back. The green colour become lighter going from the sides to the abdomen (Fig. 1A-B).

Supragenital plate is distinctly divided from the tenth tergite, triangular and lightly concave in the dorsal part and scarcely longer than the cerci (Fig. 3A).

The subgenital plate is trapezoidal and the distal border is provided with a light cut at an obtuse angle. The stili are very short (Fig. 3B).

Cerci with subcylindrical basal part and sharp conical apex. In the median part of the internal margin a toothlike process turned forward with wide base and black apex is present. The cerci are covered with short bristles and with short and scattered hairs (Fig. 3C).

Titillators, from a dorsal view, are almost straight with a hooklike apex forming a right angle with the main axis; in the proximal part they are slightly enlarged and brought closer together forming in combination a narrow V (Fig. 4B). From a lateral view they look enlarged at the base and lightly curved downwards (Fig. 4C).

Femora with ventral green shades; heavy green tibia; dark tarsi.

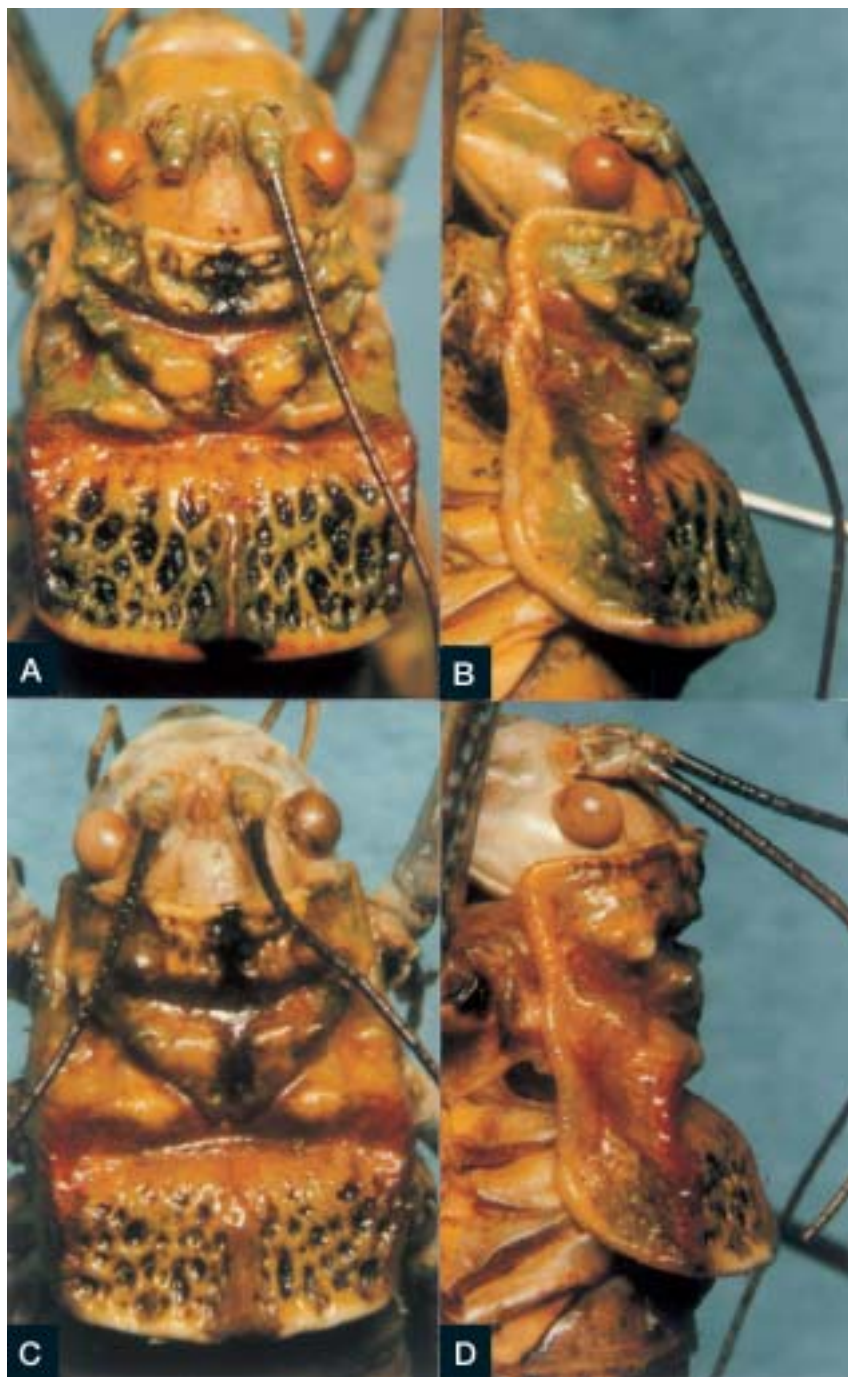


Fig. 2 (A-D). *Steropleurus annae* (Targioni-Tozzetti, 1881). A-B: male (*Neotypus*), Mount Corrasi (Sardinia, Nuoro), m 1350-1400, 11.VIII.1962, head and pronotum in dorsal view and left lateral view. C-D: female (same locality), head and pronotum in dorsal view and left lateral view. Photo P. Fontana.

Female

Head similar to that of the male (Fig. 1C).

Pronotum with typical transverse *sulcus* and the other two furrows much wider and deeper than those observed in the male. The thornlike processes are however scarcely marked except for the big tubercle in the back of the typical *sulcus* that is however lower than the male one. Sculpture, characteristics of the *lobi deflexi*, keels and turning of the metazona, are very similar to those of the male. The shape of the pronotum from a dorsal view is subtrapezoidal with lateral borders of the prozona and the metazona converging to the head. The sculpture of the metazona is less deep and defined than in the male (Fig. 1C-D).

Tegmina scarcely surpassing the fore border of first tergite and more darkly coloured than in the male.

Abdomen with two series of white spots in every tergite, less evident than in the male while the series of median spots in the first five tergites is scarcely marked (Fig. 1C-D).

Supragenital plate similar to that of the male (Fig. 3D).

Ovipositor gradually curved upward (Fig. 4A) characterised by the presence, at the base of every ventral valve, of two subtriangular dilations (Fig. 3F).

The subgenital plate is apparently lacking in diffuse and defined sclerotizations (Fig. 3E).

Tab. 1 – Main measurements (in mm) of the examined material and reported in the bibliography.

	Material	Targ.-Tozz.	A. Costa	Average
Male total length	19,10 – 21,40*	24	15	19,87
Length of the male pronotum	7,03*– 7,34	7	8	7,34
Length of hind male femur	13,46*	14	15	10,61
Female total length	22,18	–	17	19,59
Length of the female pronotum	7,49	–	8	7,97
Length of hind female femur	15,30	–	15	15,15
Ovipositor length	17,44	–	–	17,44

*Measurements of the *Neotypus*.

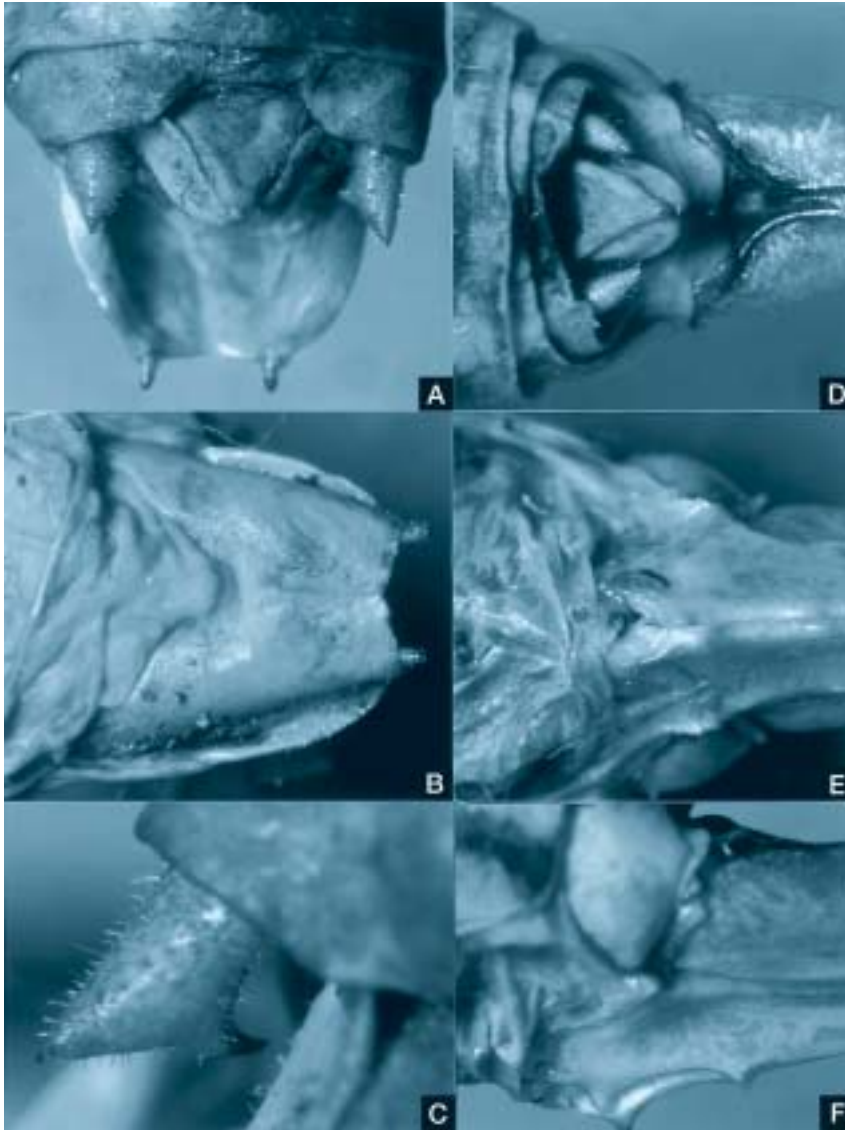


Fig. 3 (A-F). *Steropleurus annae* (Targioni-Tozzetti, 1881). A-C: male (*Neotypus*), Mount Corrasì (Sardinia, Nuoro), m 1350-1400, 11.VIII.1962, abdomen apex in dorsal view; ventral view of subgenital plate and dorsal view of left cercus. D-F: female (same locality), dorsal view and ventral view of abdominal apex and particular of the base of the ovipositor in left lateral view. Photo P. Fontana.

AFFINITIES

According to CHOPARD (1943) and LA GRECA (1964) the species of the genus *Steropleurus* Bolivar, 1878 are characterised by a triangular and small male supragenital plate. Also according to DEFAUT (1999), the species having males with the supragenital plate distinctly divided from the tenth tergite, triangular or subtriangular in shape and of small dimensions have to be named as *Steropleurus*. For the characteristics above mentioned, the belonging of *Ephippigera annae* Targioni-Tozzetti, 1881 to the genus *Steropleurus* has to be confirmed, as proposed by LA GRECA (1957).

Steropleurus annae, though, is not easily confused with other congenerical species, especially due to the shape of the pronotum and in particular due to the sculpture of the metazona. For the general shape of the titillators, for the bright colour and the delicacy of the general structure it seems to be close to some Moroccan species of the genus *Steropleurus*, as appears from Nadig's revision (NADIG, 1995).

In particular many affinities can be observed with *S. innocentii* *innocentii* Finot & Bonnet, 1884 and *S. bouiblani* Nadig, 1995 for the shape of the titillators, further with *S. innocentii innocentii* for the form and dimension of male and female supragenital plates and with *Steropleurus moulouyae moulouyae* Nadig, 1995 for the profile of the ventral valves of the ovipositor. On the contrary, among the morphological characteristics examined, similarities with the Iberian species of the genus are not evident.

DISTRIBUTION AND BIOGEOGRAPHICAL MEANING

S. annae is known only in three localities in Sardinia and in particular in Central Sardinia: Oristano (TARGIONI-TOZZETTI, 1182), the Gennargentu massif in Correboi locality (ACHILLE COSTA, 1884 and collection M. Salfi, MZUR) and Mount Corراسi, in the Supramonte di Oliena (Coll. Agr. Ent. Inst. Turin Univ.). The data from Oristano is the least defined, but since Targioni-Tozzetti write about Central Sardinia without any specification it is possible that the species could be characteristic of the hilly internal regions of Sardinia.

S. annae belongs to a genus of Ephippigerinae among the most ancient of the West Mediterranean. The genus *Steropleurus* Bolivar, 1878 is in fact a palaeoethyrrhenal genus evolved following the Miocene fragmentation of the Tirrenide (LA GRECA, 1996). The greatest number of species of the genus is present in Spain and in Morocco while a few

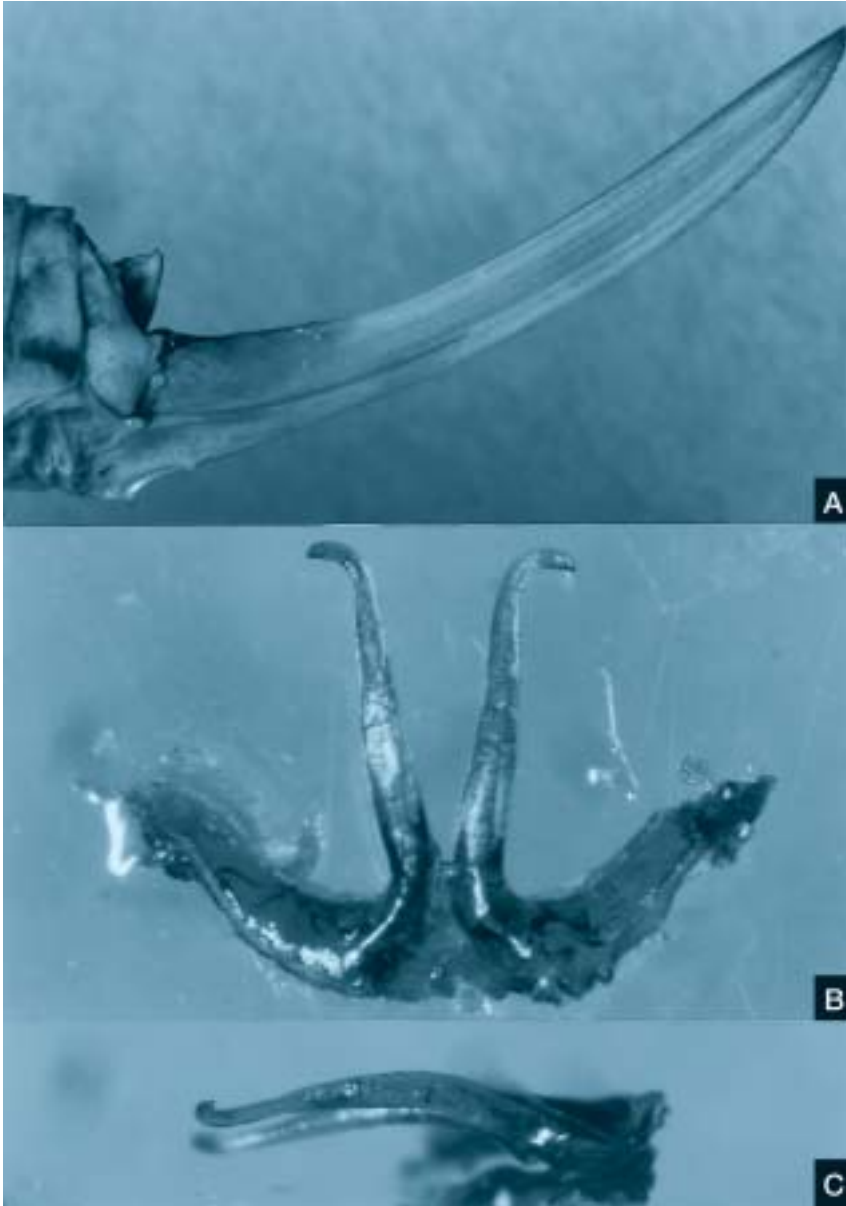


Fig. 4 (A-C). *Steropleurus annae* (Targioni-Tozzetti, 1881). A: female, Mount Corراسi (Sardinia, Nuoro), m 1350-1400, 11.VIII.1962, left lateral view of apex of abdomen and ovipositor. B-C: male (*Neotypus*), (same locality), dorsal view and right lateral view of the titillators. Photo P. Fontana.

species have been recorded in Algeria, Tunisia and Libya. In Europe the genus is present in Spain, in France (Corsica excluded) and in Italy where it is known for Sardinia only.

The affinities of *S. annae* with the species from North-Africa (especially Moroccans) of the genus, could suggest the origin of these species comes from a common ancient stock, former to the Miocene fragmentation of the Tirrenide. Another Ephippigeridae is known in Italy and Europe only in Sardinia: *Praephippiger pachygaster* (Lucas, 1849). This species, known only in Algeria and Tunisia (and Sardinia) is recorded in Sardinia only by BRUNNER (1882), on the basis of material from the Florence Museum. This tall species, as *S. annae*, should be still present on the island in rare isolated populations.

HABITAT

The specimens from Mount Corrasi were caught by Carlo Vidano and Achille Sampò on yew-trees (*Taxus baccata*) which grew forcing their way into the rocks, or growing among the rocks on the ground and only where these trees could avoid the moufflons (*Ovis musimon musimon*) or other ungulates grazing (A. Sampò pers. com.). This observation partly coincides with the affirmation of ACHILLE COSTA (1884) who caught the specimens of his *E. coronata* right on yew-trees and tamarisks. The identity of this last host tree was given uncertainly by ACHILLE COSTA (1884) himself which in a footnote thus expressed his uncertainty about his own identification: *Also, this species is not mentioned in the first memory because I doubt its identification.* The presence of tamarisks in the Correboi Valley, in the centre of the Gennargentu massif, seems unlikely and during an excursion in this locality, carried out in August 1999 by one of the Authors (P. Fontana), the presence of this tree was not detected, instead *Erica arborea* L., that A. Costa doesn't mention, was plentiful. However the environment in Correboi locality is quite different from that described by ACHILLE COSTA (1884). Reading *Notizie ed osservazioni sulla Geo-fauna sarda* by ACHILLE COSTA (1882-1886) it is partly possible to reconstruct the natural environment of a no-longer-existing Sardinia, with nowadays rare and scattered flora and fauna that were once widely distributed, and instead today's common species, seldom caught by A. Costa. The yew-tree in particular was more widely distributed in Sardinia before the end of XIX century, since a radical vegetation transformation of the island started, with the destruction of the forests which covered it and the ensuing transformation into pastures intensively grazed by ovine herds intro-

duced from the Lazio Region. The contemporary situation sees a slow and partial recovering of some vegetal essences such as *Taxus baccata*, especially in the mountainous areas where the herds' pressure has been diminishing of late (Prof. A. Casale, pers. com.).

The few data about the ecological needs of *S. annae*, highlight how the species might be prevalently shrub dwelling if not arboreal dwelling and how it may be related to evergreen essences such as the yew-tree.

CONCLUSIONS

Steropleurus annae, in ACHILLE COSTA's (1884) words, *for the elegance of the colour (in living material) and for the prothorax shape is one of the most singular Ephippigera of Europe*. The beauty of this rare species, let alone its particular biology apparently related to unusual plant for the Ephippigerinae of the European fauna, make of *Steropleurus annae* one of the most interesting Sardinian endemites, and among the Orthoptera one of the species with most biogeographical value in all the West Mediterranean.

The lack of findings, since those of the end of '1800s by Targioni-Tozzetti and A. Costa, might suggest that the species had become extinct because of the heavy transformations of the vegetal environment of the whole of Sardinia that occurred in a few decades, starting from the end of 19th century. In reality the species was already scarce in the times of ACHILLE COSTA (1884) who wrote: *Seems quite rare; in fact searching for it everywhere for the entire day, I could find no more than the three mentioned*. The new data and especially the captures of C. Vidano and A. Sampò in August 1962, make probable, if not sure, the presence of *S. annae* in Sardinia nowadays. This species, whose distribution and biology have to be researched more deeply, as previously explained needs direct protection by the appropriate authorities for the defence of the environmental heritage, both for its great biogeographical interest, and for its relation with a vegetational kind by now not only relictual all over Sradinia, but also in many countries facing the Mediterranean.

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