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OBSERVATIONS ON A PECULIAR MATING BEHAVIOUR OF SOME PODISMINI OF THE ITALIAN FAUNA (*Insecta Orthoptera Acrididae*)

Abstract - Buzzetti F. M. & Fontana P., 2002 - Observations on a peculiar mating behaviour of some Podismini of the Italian fauna (*Insecta Orthoptera Acrididae*).

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The authors provide observations on the particular copula and precopula movements of some European Podismini: *Podisma pedestris pedestris*, *Italopodisma trapezoidalis aprutiana*, *I. t. curvula*, *I. t. trapezoidalis*, *Pseudoprumna baldensis*, *Micropodisma salamandra*, *Chorpthopodisma cobellii*, *Odontopodisma decipiens insubrica*, *O. schmidti*. The term *simplokekinesis*, meaning the mating movements, is introduced here for the first time. The work is intended to stimulate the observations on this phenomenon.

Key words - Podismini, Ethology, Mating behaviour.

Riassunto - Buzzetti F. M. & Fontana P., 2002 - Osservazioni su un peculiare comportamento durante la copula di alcuni Podismini della fauna italiana (*Insecta Orthoptera Acrididae*).

Gli autori espongono alcune osservazioni sui particolari movimenti di copula e precopula di alcuni Podismini europei: *Podisma pedestris pedestris*, *Italopodisma trapezoidalis aprutiana*, *I. t. curvula*, *I. t. trapezoidalis*, *Pseudoprumna baldensis*, *Micropodisma salamandra*, *Chorpthopodisma cobellii*, *Odontopodisma decipiens insubrica*, *O. schmidti*. Viene qui introdotto per la prima volta il termine *simplokekinesis* con riferimento ai movimeti copulatorii. Il lavoro vuole essere uno stimolo a porre attenzione sul fenomeno.

Parole chiave: Podismini, Etologia, Accoppiamento.

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Introduction

The Podismini tribe belongs to the subfamily Catantopinae, family Acrididae of the Orthoptera Caelifera. One of the main ethological characteristics of these phytophagous insects is the duration of the copulation, which can last many hours (Uvarov, 1977) or even days (Fontana et Al., 2002).

During video recordings carried out for bioacoustics and ecological studies on Orthoptera, one of the authors (P. Fontana) noticed some peculiar movements during the copulation in some Acrididae of the Podismini tribe. Many other Authors have reported that in some species of the subfamily Catantopinae (which the tribe Podismini belongs) the male produces particular movements with the hind legs or the whole body during copulation (Uvarov, 1977). Although previous citations are not lacking, those Authors have concentrated their attention on the ethological description of the phenomenon, species by species.

Analyzing all their recordings, the authors schematised all the data concerning the movements of the male during copulation and in some cases, also during the precopula, trying to understand if such movements could have a significance in the relations between the considered genera.

The authors expose the results of the first observations on the mating behavior of the following species: *Podisma pedestris pedestris* (Linnaeus, 1758), *Italopodisma trapezoidalis aprutiana* (La Greca, 1969), *I. t. curvula* (La Greca, 1969), *I. t. trapezoidalis* (La Greca, 1966), *Pseudoprumna baldensis* (Krauss, 1883), *Micropodisma salamandra* (Fischer, 1854), *Chorpthopodisma cobellii* (Krauss, 1883), *Odontopodisma decipiens insubrica* Nadig, 1980 and *O. schmidti* (Fieber, 1853).

The authors aim to introduce the term *simplokekinesis* (from Grecian simplokè = mating and kinesis = movement) meaning the production of particular movements by male during copulation. Some different terms were used by former Authors, such as «Unklammerungsphase ohne Vereinigung» (embracing phase without copulation), «Stummes Schenkelschütteln» (mute thigh shaking) or «Lautlose mässiggrosseGeh-Vorbewegung» (pre-movement of slightly large silent moving), but none of these were comprehensive of the whole copulation phenomenon.

The aim of the authors is to compare the mating movements of these different species, and in particular, regarding the dynamic components of the phenomenon.

Material and methods

The video recordings are made with a digital video-camera JVC (GR-DVL107E). All the video recording are by Paolo Fontana. Field observations also contributed to the present work.

In the text we use the following terminology: *moving*, for the walking around of the individuals; *movement*, meaning the particular movements made by the male or female with some part of their body during or before the copulation.

To distinguish *precopula* movements from real *copulation* or *mating* movements, we treat copulation movements only those produced in situations of anatomical contact between male and female.

The male hind legs are more or less *bent* when their segments are basically in contact each one. The male hind legs are *open* or *roof arranged* if parallel or converging on the back.

Ending, the *tremulation* is a shivering movement of some part of the body.

Observations

Podisma pedestris pedestris (Linnaeus, 1758)

Before mating, the male of *P. p. pedestris* (Trentino Alto Adige region, Monte Pasubio) approaches the female slowly and swings side to side, therefore jumping on the famale. During copulation the male of this subspecies moves the hind legs simultaneously one forward and the other backward. Male hind legs are open during the movements and not bent. Male movements can also contain some tremulation of hind legs.

It appears that there is a relation between male movements and female moving because it seems that male movements are produced only when the female is not moving.

The female of this species shows tremulation of hind legs and antennae after male movements, maybe stimulated by the male movements. During female tremulation the male remains motionless.

The position of the antennae of both sexes is peculiar for each sex during copulation: the antennae remain straight in the female and open in the male.

Previous descriptions of mating behaviour of *P. p. pedestris* are present in Stäger, 1930; Faber, 1953; Jacobs, 1963; Detzel, 1998.

Italopodisma trapezoidalis aprutiana (La Greca, 1969)

The male of *I. t aprutiana* (Abruzzo region, Abruzzo National park, Rif. Pesco Iorio) produces measured movements of hind legs moving one forward and the other backward simultaneously. Male hind legs are bent, except for the tarsus which is not in contact with the tibia, and roof arranged.

The authors also examined a recording of two mating exemplars of *I. t. aprutiana* (Abruzzo region, Abruzzo National Park, Valico del Campitello), in which the male also produces movements whilst the female is moving. Male hind legs are open and not bent. Furthermore the movements look arranged in a series.

In both cases anatomical contact was noticed and male antennae were motionless.

Italopodisma trapezoidalis curvula (La Greca, 1969)

In *I. t. curvula* (Lazio region, Monti Ernici, Campo Catino) male movements during anatomical contact of this subspecies are the same observed in *I. t. aprutiana*, but male hind legs are bent and roof arranged. Male antennae remain motionless during movements.

Italopodisma trapezoidalis trapezoidalis (La Greca, 1966)

In *I. t. trapezoidalis* (Abruzzo region, Abruzzo National Park, Lago Vivo), before anatomical contact has been observed, precopula movements are produced by the male, maybe aimed to gain an optimal position on the female. During precopula movements, tremulations for 1 sec. of male hind legs were also noticed with bent and open legs. Subsequently, the male moves from one side of the female to the other side and when it stops at one side, it produces tremulations of hind legs.

When anatomical contact is gained (Fig. 1), male movements are the same as the other subspecies of *I. trapezoidalis*. The male produces copulation movements whilst the female moves and the antennae remain motionless whilst the female antennae are moving. Male hind legs are bent and open.

Pseudoprumna baldensis (Krauss, 1883)

Male of *P. baldensis* (Veneto region, Monte Baldo) produces copulation movements moving from one side of the female to the other side.

Fig. 1. *Italopodisma trapezoidalis trapezoidalis*, mating behaviour, Abruzzo region, Abruzzo National Park, La Meta, 20.VIII.2000; photo P. Fontana.

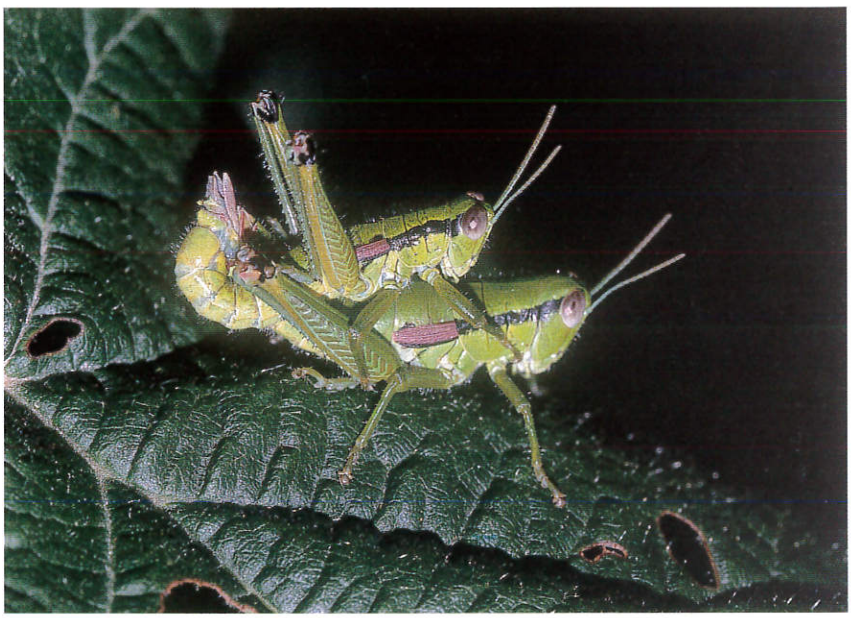

Fig. 2. *Odontopodisma decipiens insubrica*, mating behaviour, Lombardia region, Monte Barro, 13.VII.2002; photo P. Fontana.

The pause between movements from one side to the other can be long, even some seconds. Male antennae can move to reach female antennae.

During female moving, the male remains motionless and produces movements shortly after the female has stopped.

Micropodisma salamandra (Fischer, 1854)

The male of *M. salamandra* (Veneto region, Monte Summano) produces the same copulation movements of *P. baldensis*, but simultaneously, tremulations of the whole body occur in both sexes. The male hind legs remain bent, the leg by the female side is turned forward, the other backward. Male antennae are motionless.

Examining the track recorded on Monte Summano (VI, loc. Santuario di Santorso), it is noticed that the male sterniti are not in contact with the female tergiti during copulation movements, therefore excluding the hypotheses that transferring of vibrations or sound between male thorax and female pronotum occurs. If such a vibration is present, it has to be searched for in those mutual contacting structures as the first abdominal segment of both sexes or the male tibial spines with female abdominal segments.

Chorpthopodisma cobellii (Krauss, 1883)

Male copulation movements in *C. cobellii* (Trentino Alto Adige region, Monte Pasubio) are the same of *Micropodisma salamandra*, with male hind legs bent. Some male copulation movements, similar to tremulations, can be noticed.

Odontopodisma decipiens insubrica Nadig, 1980

Males of *O. d. insubrica* (Lombardia region, Monte Barro) produce side to side copulation movements on the female, with hind legs bent and not roof arranged (Fig. 2).

Odontopodisma schmidti (Fieber, 1853)

During copulation movements the male of *O. schmidti* (Veneto region, Val Belluna) moves the hind legs side to side, simultaneously moving the fore body portion to the same side. Hind legs are bent and open, the male antennae are more open than the female ones.

SPECIES	PRECOPULA MOVEMENTS	COPULATION MOVEMENTS	POSITION OF MALE HIND LEGS
Podisma p. pedestris (Linnaeus, 1758)	Male: slow approaching to the female, swinging side to side.	Male: hind legs, one forward and the other backward simultaneously. Hind legs tremulations. Female: hind legs tremulation.	Not bent and open.
Italopodisma t. aprutiana (La Greca, 1969)	Not observed	Male: hind legs, one forward and the other backward simultaneously.	Bent (tarsus not contacting tibia). Roof arranged.
Italopodisma t. curvula (La Greca, 1969)	Not observed	Male: hind legs, one forward and the other backward simultaneously.	Bent and roof arranged.
Italopodisma t. trapezoidalis (La Greca, 1966)	Male: hind legs tremulations.	Male: hind legs, one forward and the other backward simultaneously.	Bent and open.
Pseudoprumna baldensis (Krauss, 1883)	Not observed	Male: side to side on the female.	Bent.
Micropodisma salamandra (Fischer, 1854)	Not observed	Male: side to side on the female. Whole body tremulations.	Bent. Leg by female side turned forward, the other backward.
Chorpthopodisma cobellii (Krauss, 1883)	Not observed	Male: side to side on the female. Tremulations.	Bent.
Odontopodisma d. insubrica Nadig, 1980	Not observed	Male: side to side on the female.	Bent and open. Leg by female side turned forward, the other backward.
Odontopodisma schmidti (Fieber, 1853)	Not observed	Male: side to side on the female.	Bent and open.

Discussion

Regarding the male *simplokekinesis* (copulation movements), according to our preliminary observations, two main groups can be noticed within the considered genera: one comprising *Podisma* and *Italopodisma*, the other with *Pseudoprumna*, *Micropodisma*, *Chorthopodisma* and *Odontopodisma*. The first group is characterized by males producing one forward and one backward hind legs copulation movements, the latter by males producing side to side copulation movements.

No further evidence confirming this grouping is found from the observation on the precopula movements and the position of male hind legs during copulation movements.

Furthermore, observation on male precopula movements of the treated species and on *simplokekinesis* of other species belonging to the tribe Podismini could improve the ethological knowledge on this group. Nevertheless, if a correspondence between *simplokekinesis* and systematic of the investigated species is to be recognized, it may be possible to contribute to better define the systematic and phylogeny of the Podismini.

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