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THE *CHORTHIPPUS* OF THE PEBBLY RIVER-BEDS  
(*GLYPTOBOTHRUS PULLUS*) IN ITALY:  
CONSERVATION AND FIRST PROTECTION  
ACTIONS (ORTHOPTERA ACRIDOIDEA)

ABSTRACT - FONTANA P., TIRELLO P. & BUZZETTI F.M., 2004 - The *Chorthippus* of the pebbly river-beds (*Glyptobothrus pullus*) in Italy: conservation and first protection actions (Orthoptera Acridoidea).

Atti Acc. Rov. Agiati, a. 254, 2004, ser. VIII, vol. IV, B: 57-70.

*G. pullus* is a mountainous, xerothermophilous species; it prefers the upper terraces of the streams and the sandy and pebbly islets, with scattered herbaceous/shrubby vegetation. It often lives together with ecologically similar species as *Tetrix tuerki*, *Xya variegata* and *Epacromius tergestinus ponticus*, which are all rare in Italy and endangered because of human influences. *G. pullus* is distributed along the alpine arch, central Europe to Finland, Balkans and east to the Caucasus. In Italy it is known only from a few localities in Piedmont, Veneto and Friuli. Most of these data have not been recently confirmed. The only population in Veneto was found in 1992 along the Piave river, in locality Lerpa of Sappada around 1200 m. Its presence in Sappada has been confirmed during the researches in 2002, 2003 and 2004, within the framework of the European project ACCELERATES. Considered as bioindicator of creek and river mountainous habitats, *G. pullus* is present in the red lists of many countries. In cooperation with the municipality of Sappada, a protection project was carried out, protecting the site where the species is abundant and acts as a source for further expansion. *G. pullus* can be considered as an «umbrella species»; from its protection the conservation of many other species connected to the alpine creek habitats might benefit.

KEY WORDS - *Glyptobothrus pullus* (Philippi, 1830), Conservation, Creek habitat, Italy, Piave river.

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RIASSUNTO - FONTANA P., TIRELLO P. & BUZZETTI F.M., 2004, Il Cortipppo dei greti (*Glyptobothrus pullus*) in Italia: stato di conservazione e prime azioni di protezione (Orthoptera Acridoidea).

*G. pullus* è una specie montana e xerotermofila che predilige le terrazze superiori e le isole di ghiaia con rada vegetazione lungo i torrenti. Spesso convive con specie dalle medesime esigenze ecologiche come *Tetrix tuerki*, *Xya variegata* ed *Epacromius tergestinus ponticus*, che sono tutte alquanto rare in Italia e minacciate a causa dell'impatto antropico. *G. pullus* è ampiamente distribuito lungo l'Arco Alpino, l'Europa Centrale fino in Finlandia e ad Est attraverso i Balcani e fino al Caucaso. In Italia questa specie è nota solo di pochissime località in Piemonte, Veneto e Friuli Venezia Giulia. La maggior parte di questi dati non sono stati confermati recentemente. L'unica popolazione nota in Veneto è stata individuata lungo il Fiume Piave nel 1992, in località Lerpa a Sappada, ad una quota di 1200 m. La presenza di *G. pullus* presso Sappada è stata confermata nel 2002, 2003 e 2004, nel corso di indagini condotte nell'ambito del progetto europeo ACCELERATES. Universalmente considerato un bioindicatore dei greti e degli ambienti fluviali montani, *G. pullus* è presente nella Lista Rossa di molti stati europei. In collaborazione col Comune di Sappada, è stata intrapresa un'azione di protezione basata sulla tutela dei siti lungo il Piave dove la specie è abbondante e che potranno fungere da centro di espansione. *G. pullus* può essere considerata una «specie ombrello», poiché la sua protezione influisce sulla conservazione di molte altre specie aventi le medesime esigenze ecologiche, legate ai greti in ambienti montani.

PAROLE CHIAVE - *Glyptobothrus pullus* (Philippi, 1830), Conservazione, Greti, Italia, Piave.

## INTRODUCTION

The *Chorthippus* of the pebbly river-beds, *Glyptobothrus pullus* (Philippi, 1830), is a small grasshopper, extremely rare in Italy and in Europe (FONTANA et al., 2002). The rarity of this grasshopper derives from its ecological needs and from the lost or the transformation of most of the natural habitats along rivers. During the research project carried out in summer 2002 by the University of Padua, within the framework of the European project ACCELERATES (*Assessing Climate Change Effects on Land use and Ecosystems; from Regional Analysis to The European Scale*), the presence of the *Chorthippus* of the pebbly river-beds was confirmed for the river Piave and in particular on Lerpa locality, near Sappada. Thanks to further observations during summer 2003, new small groups of the species were found on the north of the developed area of Sappada, and near the joint with Val Visdenda. These new findings confirmed the importance of the Piave populations, which appears to be the only of such a consistency and able to be a source for the species conservation.

## METHODS

Data from the concerning literature as well the collection of several Italian museums and private collections have been considered. In particular the material in the private collection of Paolo Fontana (Isola Vicentina, Italy), the collection of Bruno Massa (University of Palermo, Italy) and the collection of the Museo civico di Storia Naturale of Trieste and the Museo Friulano di Storia Naturale of Udine have been examined. Field observations have been carried out during summer 2002 and 2003. Totally 7 sites along the river Piave have been visited and most of them more than once. All sites have been recorded with a GPS (Global Position System) using a *e-garmin*. In order to estimate the population density at Lerpa locality (Sappada) we used the «marking-recapture» technique. This method consists of collecting, marking and releasing the individuals located in a given area and during a given time. The population is estimated repeating the sample the day after with the same modalities, counting the marked and unmarked individuals and applying the numbers to the following mathematical formula:

$$\text{Estimated population} = \frac{\text{total number of sampled individuals} \times \text{number of marked individuals}}{\text{Number of re-captured marked individuals}}$$

During field observation we recorded the song of some males in order to study the bioacoustics of Italian populations of *G. pullus*. The recordings have been done in the field, using a DAT recorder (Sony TCD 100) with condenser microphone (Sony). The results of the bioacoustics analysis will be the object of a separate publication.

PECULIARITY OF THE *CHORTHIPPUS* OF THE PEBBLY REVER-BEDS

*G. pullus* (Philippi, 1830), is an Orthoptera Caelifera of the family Acrididae and in particular of the subfamily Gomphocerinae. It is a small grasshopper: the male measures 12-15 mm and the female 17-21 mm. The wings are shorter than the body (brachypterous), especially in the female which is on the whole squatter; holopterous individuals are rare (Fig. 3). Colour variable from ash-grey to reddish-brown, individuals completely purple (rufism) or very dark, almost black (melan-

ism) are not rare (Figs. 1-4). The characteristics differentiating it from other species are the hind tibiae, red with a whitish basal ring and black knees. Even its song, though light, is peculiar of this species: *G. pullus* sings during the day, the song is buzzing/rustling and lasts 2-4 seconds, starting light, becoming louder and finishing light (ODÉ & FONTANA, 2002; FONTANA et al., 2002).

*Ecology.* It is a mountain species, associated with hot and dry habitats along sunny pebbly river-beds, or to the upper terraces of streams, and to the neighbouring sandy and pebbly islets (SCHWARZ-WAUBKE, 1997a and 2001; BELLMAN & LUQUET, 1995; INGRISH & KÖHLER, 1998; CARRON, 1999). Its altitudinal distribution varies from 500 to 2000 m, but mostly between 1000-1250 m of altitude. According to SCHWARZ-WAUBKE (1997b) *G. pullus* feeds mostly on Poaceae and only rarely on other herbaceous plants or on mosses. Most of the specimens of *G. pullus* have a small home range (less than 20 m<sup>2</sup>) and a small tendency of dispersal but few specimens have a much greater distance of walking (SCHWARZ-WAUBKE, 1998).

*Distribution.* *G. pullus* is distributed along the Alps, in central Europe and through the Balkans East to the Caucasus (HARZ, 1975; FONTANA et al., 2002). Throughout its range it is present in a few isolated populations. In Italy (Fig. 5) it is known from a few alpine localities in Piedmont (Pian del Prà, Val Pellice), Veneto (Sappada, Ospitale di Cadore) and Friuli Venezia Giulia (Rifreddo and Lago di Predil). According to LA GRECA (1996) it originated from an Angarian group of Gomphocerinae species that reached Europe during Pleistocene.

*Presence in Italy.* *G. pullus* has been recorded in Italy for the first time (erroneously) by GIGLIO TOS (1915) from Abruzzo region (Villetta Barrea); the first certain Italian record is due to BACCETTI (1958) who examined a female collected in Piedmont (Val Pellice). No other literature data are available since FONTANA et al. (2002) published the records concerning the population individuated by Bruno Massa (University of Palermo) along the river Piave in Veneto region. Very few data are also available in the entomological collections of the Italian museums of Trieste and Udine. Italian localities of *G. pullus* are summarised in Tab. 1.

Locality	Altitude	Region	Province	Source
Raibl (= Predil) lake	959	Friuli V.G. reg.	UD	Trieste Museum
Pian del Pra, Val Pellice	1750	Piedmont	TO	Baccetti, 1958
Sappada (Piave river)	1200	Veneto reg.	BL	Coll. Massa (Palermo)
Termine di Cadore (Piave river)	450	Veneto reg.	BL	Udine Museum
Sappada, Lerpa (Piave river)	1200	Veneto reg.	BL	new datum
Sappada Nord (Piave river)	1250	Veneto reg.	BL	new datum
S. Stefano Cadore (Piave river)	1026	Veneto reg.	BL	new datum

Tab. 1. known Italian locality fro *G. pullus*.

## THE POPULATIONS ALONG THE RIVER PIAVE

In Lerpa locality, near Sappada, a large population of *G. pullus* lives on a wide pebbly terrace with scattered vegetation; some isolated groups of 4-6 individuals have been found in other stretches of the Piave (Fig. 6). The first population in Veneto has been found along the upper course of the Piave, at Sappada, by Bruno Massa (University of Palermo) and a second one at Ospitale di Cadore, by Ivo Pecile (Udine, Italy).

The Piave River originates at 2037 m in the Carnish Alps in the Belluno district; with wide bends it crosses the East Veneto region and flows, after 220 km, into the Adriatic sea at Cortellazzo, in Venice district. Along its course the Piave river has a great richness of environments, characterised by their respective floras and faunas. As all wet areas, even the Piave has suffered in the past great humans transformations and this had a deep impact on the consistence and variety of its flora and fauna.

During a research project of the University of Padova, within the framework of the European project ACCELERATES, the presence of *G. pullus* was confirmed in summer 2002, at Lerpa loc., near Sappada (Fig. 8). Thanks to further observations during summer 2003, new small populations of the species were found north of the town of Sappada, and near the joint with Val Visdenda. These new findings have confirmed the importance of the Lerpa locality population, which appears



Figs. 1-2. *G. pullus*, Piave river, Sappada (Italy), Lerpa loc: fig. 1, male; fig. 2, female (Photo P. Fontana).





Figs. 3-4. *G. pullus*, Piave river, Sappada (Italy), Lerpa loc: fig. 3, holopteran female; fig. 4, reddish female (Photo P. Fontana).



Fig. 5. Distribution of *G. pullus* in Italy: Pian del Pra, Val Pellice (A), Sappada (Piave river) (B) and Raibl (= Predil) lake (C).

to be the only of such a consistency and adequate to be a source for the species conservation. In Lerpa locality the presence of *G. pullus* has been quantified by the «marking-recapture» technique. The Lerpa locality population has been estimated during 2002 as consistent of approximately 50 individuals living in an area of about 1000 m<sup>2</sup>. During 2003, nymphs were observed since the beginning of June and adults from the end of July and during 2004 many adults were observed in the end of July.



#### CONSERVATION OF THE SPECIES

The *Chorthippus* of the pebbly river-beds, because of its ecological needs, is considered a species critically endangered by extinction; some countries (France, Switzerland and Austria) report it in the Red List, together other species under the threat of extinction and needing urgent protection (FONTANA et al., 2002). *G. pullus* often cohabits with species characteristic of similar habitat, such as *Tetrix tuerki* (Krauss, 1876), *Xya variegata* (Latreille, 1809) and *Epacromius tergestinus ponticus* (Karny, 1907), all very rare entities in Italy and threatened by extinction (Carron, 1999). All these species are good bioindicators: in fact their presence in a given habitat can provide useful information on its conservation status. Therefore the chorthippus of the pebbly river-beds is a bioindicator of mountain creek habitats; as regards the Piave river it may be defined as an «umbrella species» because protection actions favouring it will certainly positively affects other species, both animal and vegetal, living in the same habitat.

#### PROTECTION

The invertebrate protection is based on the conservation of habitat where they develop and reproduce and also for *G. pullus* it is more effective to protect its microhabitat than to simply try to prevent its collecting or damaging. The conservation of the populations living along the Piave is possible by protecting the sites where the species lives, preventing all the human activities, such as excavations, paving, insecticide treatments etc. The town administration of Sappada agreed to start a conservation campaign for *G. pullus*, fencing off the micro-habitat in Lerpa locality during street restoration works in summer 2003 (Fig. 7) and financing the preparation of didactic panels and a small illustrated pamphlet, to inform both citizens and tourists that even such a small inconspicuous organism may be an important heritage for the ecosystem of the Piave river. The population of *G. pullus* in Lerpa locality was very abundant in summer 2004, after the protection of its natural habitat during summer 2003 (figs 8, 9).



Fig. 6. Habitat of *G. pullus*, Piave river, Sappada (Italy), Lerpa loc., left bank, (Photo P. Fontana).



Figs. 7-9. Conservation campaign versus *G. pullus*: fig. 7, fencing off the micro-habitat of *G. pullus* in Lerpa locality, Sappada (Piave river), during street restoration works in summer 2003; fig. 8, the same habitat during summer 2002; fig. 9, the same habitat after street restoration works in summer 2004. (Photos P. Fontana).

## CONCLUSION

*G. pullus* is a rare and endangered species in Italy and in other European countries; its ecological needs make it an excellent bioindicator of mountain creek habitats. The few Italian localities where the species has been recorded in the past should be again investigated to verify their conservation status. In addition, new suitable localities should be checked, searching for *G. pullus* and other endangered species living in the same habitat, as *Tetrix tuerki*, *Xya variegata* and *Epacromius tergestinus ponticus*. The possibility to reintroduce *G. pullus* into suitable places where it is presently absent or from others, where it disappeared, should be considered; in this case the population of Sappada could be a good source area. The conservation campaign of *G. pullus* by fencing off its micro-habitat and informing citizens and tourists, supported by the town administration of Sappada, should be applied for other endangered species.

## ACKNOWLEDGEMENTS

We are glad to thank the municipality of Sappada for supporting protection actions versus *G. pullus*, the Museo Friulano di Storia Naturale of Udine and the Museo civico di Storia Naturale of Trieste for providing us their interesting data and Lucia Coletto and Francesca Tami (University of Padua, Italy) for their kind help.

## ZUSAMMENFASSUNG

*G. pullus* ist eine montane, xerothermofiele Art. Sie präferiert die höhere Terrassen von Flüssen und Bächen, Sand- und Kiesflächen und Inseln mit schütterer Vegetation. Sie wird öfter vergesellschaftet durch oekologisch verwandte Arten wie *Tetrix tuerki*, *Xya variegata* und *Epacromius tergestinus ponticus*, die auch selten sind in Italien und bedroht durch humanen Einflüsse. *G. pullus* ist verbreitet entlang den alpinen Bogen, Mitteleuropa bis Finland, den Balkan und im Osten bis in den Kaukasus. In Italien ist die Art nur bekannt von einige Fundorte in Piemonte, Veneto und Friuli V.G. Vielen dieser Daten sind nicht rezent bestätigt. Die einige Population in Veneto ist in 1992 gefunden entlang den Fluss Piave, bei Lerpa di Sappada (1200 m). In 2002 and 2003 würde die Art wiedergefunden bei Untersuchungen im Rahmen des europäischen Project ACCELERATES. *G. pullus* wird betrachtet als ein Bioindikator von alpinen Bach- und Flüsshabitaten und ist representiert auf Roten Listen von viele Länder. Zusammen mit die Behörden von die Gemeinde Sappada wird ein Schutzprogramm entwickelt für die Kernpopulation, die als Quelle für weitere Ausbreitung dienen kann. *G. pullus* kann betrachtet werden als eine Schirmart. Wenn diese Art geschützt wird, dan werden viele andere Arten davon profitieren.

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