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## CENTIPEDES IN RELIC WETLANDS OF NORTH-EASTERN ITALY: FAUNISTIC AND ECOLOGICAL REMARKS (CHILOPODA)\*

CHILOPODI DI ZONE UMIDE RELITTE DELL'ITALIA  
NORD-ORIENTALE: NOTE FAUNISTICHE ED ECOLOGICHE  
(CHILOPODA)\*

**Abstract** - The centipedes collected in a study on the arthropod fauna in relic wetlands of north-eastern Italy are listed and discussed in this paper. These wetlands, proposed as Special Areas of Conservation under the European Community Directive "Habitats" 92/42/CEE, are managed by the Autonomous Region Friuli Venezia Giulia. Regular samplings in the main habitats (*Phragmites australis* communities, wet, riparian and coniferous forests, damp meadows, peat bogs, including alkaline peat bogs) in seventeen biotopes of the low plain (6 sites, 0-23 m above s.l.), hill belt (7 sites, 160-200 m) and montane level (4 sites, 839-1,518 m) have been carried out by means of pitfall traps and Berlese selector in the late spring and early autumn 2001. Thirty-one species have been registered in all (18 Lithobiomorpha, 3 Scolopendromorpha, 10 Geophilomorpha), 1,567 specimens have been examined. The knowledge on the centipede fauna of the wetlands object of this study is quite satisfactory and complete, given the diversity of the sampling methods used and their replication along the year. The results obtained demonstrate that the centipede fauna appears comparatively rich, including 55% of the species recorded in Friuli Venezia Giulia and 40% of the species presently known in north-eastern Italy. Most of the species have been recorded in the low plain (23 species) and in the hill belt (21), while a lower number have been sampled in the montane level (18). A large number of faunistic records on species whose distribution in north-eastern Italy or in Friuli Venezia Giulia was poorly known (*Lithobius agilis*, *L. borealis*, *L. sp. gr. mutabilis-latro*, *L. pelidnus*, *L. salicis*, *L. burzenlandicus*, *Stigmatogaster gracilis*, *Pleurogeophilus mediterraneus*) have been assembled. With respect to the chorological spectrum of the fauna, species with European chorotype (mostly Central European) prevail, especially in the montane level. Only few species widely spread in the Mediterranean basin are present, but only in the low plain. The component of species with a wide distribution in the Holarctic Region is also small and more or less represented in all the three altitudinal levels considered. Italian endemics have not been recorded. About 87% of the centipede fauna is represented by mostly mesophilous woodland species, with a wide altitudinal range; a small portion of species able to colonize a wide spectrum of habitats in Italy is also present. *Eupolybothrus tridentinus*, *Lithobius agilis*, *L. sp. gr. mutabilis-latro*, *L. nodulipes* and *Pachymerium ferrugineum* are the species more regularly present and numerically abundant in the samplings from all the investigated biotopes. The Central European *L. dentatus* seems to characterize wetlands of the mountain level, whereas the Mediterranean *Stigmatogaster gracilis* and *Henia vesuviana* have been recorded only in the low plain. The forest habitats of the biotopes in the hill belt host the richer assemblages, with an average of 8.0 species (min-max n. of species: 6-10) sampled, according to a first semi-quantitative analysis. Rich communities are also present in the alkaline peat bogs of the low plain as well as in the more acid peat bogs of the montane level, with a mean of 7.0 to 7.5 species respectively (min-max n. of species: 5-9). Centipede assemblages in *Phragmites australis* communities as well as those in damp meadows are generally poorer, although up to 8 species have been sampled in the latter.

**Key words:** Chilopoda, North-eastern Italy, Distribution, Wetland habitats.

**Riassunto breve** - In questo lavoro sono elencati e discussi i Chilopodi raccolti nell'ambito di uno studio sul popolamento degli Artropodi nelle zone umide gestite dalla Regione Autonoma Friuli Venezia Giulia e proposte come Siti di Importanza Comunitaria ai sensi della Direttiva Europea "Habitat". Tale studio è stato effettuato in 17 località della bassa pianura (6 siti, 0-23 m s.l.m.), del piano collinare (7 siti, 160-200 m) e di quello montano (4 siti, 839-1.518 m). Campionamenti regolari con trappole a caduta e selettore Berlese sono stati eseguiti in primavera e autunno 2001 negli habitat più significativi (canneti a *Phragmites australis*, ambienti forestali, inclusi boschi umidi, formazioni riparie e di conifere, prati umidi, torbiere, incluse torbiere basse alcaline). In tutto sono stati esaminati 1.567 esemplari, riferibili a 31 specie (18 Lithobiomorpha, 3 Scolopendromorpha, 10 Geophilomorpha). I risultati ottenuti si ritengono soddisfacenti e completi, data la diversità dei metodi di raccolta usati e la loro replica durante l'anno. Si tratta nel complesso di un popolamento relativamente ricco che comprende il 55% delle specie segnalate in Friuli Venezia Giulia e il 40% di quelle note in Italia nord-orientale. La maggior parte delle specie è stata rilevata nelle località di bassa pianura (23 specie) e collinari (21), mentre più povera è la fauna nelle località del piano montano (18). Dal punto di vista zoogeografico prevalgono gli elementi a corotipo europeo (soprattutto centroeuropeo), in particolare nelle località montane; sono inoltre presenti pochissimi

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elementi ad ampia distribuzione nel bacino mediterraneo, esclusivamente nelle aree di bassa pianura, e ad ampia distribuzione nella Regione Oloartica, apparentemente senza particolari preferenze altitudinali. La presenza di elementi endemici della fauna italiana non è stata rilevata, sono state tuttavia rinvenute specie la cui distribuzione in Italia nord-orientale in generale e in Friuli Venezia Giulia in particolare era poco nota (*Lithobius agilis*, *L. borealis*, *L. sp. gr. mutabilis-latro*, *L. pelidnus*, *L. salicis*, *L. burzenlandicus*, *Stigmatogaster gracilis*, *Pleurogeophilus mediterraneus*). Dal punto di vista delle preferenze ambientali, la fauna è rappresentata per oltre tre quarti da specie ad ecologia essenzialmente forestale, generalmente mesofile, ad ampia distribuzione altitudinale, a cui si accompagna una scarsa componente di elementi eurici. Le specie numericamente più rappresentate e campionate con maggiore regolarità nelle comunità a Chilopodi degli ambienti indagati sono *Eupolybothrus tridentinus*, *Lithobius agilis*, *L. sp. gr. mutabilis-latro*, *L. nodulipes* e *Pachymerium ferrugineum*. La presenza del centroeuropeo *L. dentatus* sembra caratterizzare le aree umide del piano montano mentre i mediterranei *Stigmatogaster gracilis* e *Henia vesuviana* risultano presenti solo in quelle della bassa pianura. Da un primo esame semi-quantitativo dei dati raccolti risulta che, dopo gli ambienti forestali dei biotopi del piano collinare in cui sono state mediamente rilevate 8,0 specie (min-max numero di specie: 6-10), gli habitat che ospitano le comunità più ricche sono quelli delle torbiere alcaline della bassa pianura e delle torbiere del piano montano, in cui sono state mediamente rilevate 7,0 e 7,5 specie rispettivamente (min-max numero di specie: 5-9). Le comunità dei frammiteti e dei prati umidi appaiono invece generalmente più povere, sebbene in questi ultimi siano state anche rilevate sino a otto specie.

**Parole chiave:** Chilopoda, Italia nord-orientale, Distribuzione, Zone umide.

## 1. Introduction

Chilopoda or centipedes is a well known class of terrestrial Arthropods, including about 3,300 recognized species (MINELLI 2006), 486 of which in Europe (ENGHOFF 2004) and 162 in Italy (FODDAI et al. 1995; ZAPPAROLI & MINELLI 2005). The group is of some faunistic, biogeographic and ecological interest, as it includes species whose range is generally not extensive, sometime small; chiefly predators on small invertebrates, mostly living in the upper layers of the soil, especially in forest ecosystems where they often establish rich and numerically well represented assemblages. Moreover, centipedes are edaphobionts, sublapidicolous, subcorticicolous organisms, widespread from the sea level to more than 4,000 m in elevation (see e.g., LEWIS 1981; MINELLI & IOVANE 1987; ZAPPAROLI 2006). They could be considered useful ecological and biogeographic indicators, in spite of the still fragmentary knowledge on taxonomy, geographic distribution and habitat preferences of many species.

The centipedes of north-eastern Italy have been the subject of recent faunistic and zoogeographic syntheses (ZAPPAROLI 1989; MINELLI 1991; ZAPPAROLI & MINELLI 2005). These studies highlighted the presence a rich and complex fauna in this area, of at least 76 species, 58 of which in Friuli Venezia Giulia.

Some research has been also carried out on the habitat preferences of the species and on the quali-quantitative composition of the centipede assemblages, especially in montane and alpine ecosystems, in low plain woods (see MINELLI & IOVANE 1987 for a synthesis) and on sandy Adriatic coasts (GLEREAN 2004). Data on the centipede fauna of north-eastern Italy wetlands are however very few, concerning a peat bog habitat (*Sphagnetum magellanicum*) of a single site in Dolomites area (MINELLI 1988) and humid interdunal depression (*Schoeneto-Erianthetum*) on the Adriatic coast near Venezia (GLEREAN 2004).

Wetlands such as peat bogs, marshes, springs and ponds as well as forests are among the most highly endangered habitats in Italy as well as in Europe, chiefly in

the low plains, rarely in the submontane to alpine environments (AA. VV. 1986; STANNERS & BOURDEAU 1995; MASON et al. 2003; BLASI et al. 2007). The low plain of the northern Italy is marked by significant phenomena of emerging ground water table, forming wetland habitats of great conservation concern (MINELLI 2001). These habitats, which extended for thousand of hectares at the beginning of the 20th century, are extremely reduced and fragmented nowadays owing to increase in land reclamation, farming, urbanization, industrialization, aquaculture and water table lowering in the last decades (e.g., POLDINI 1977; CUCCHI et al. 1999; FONTANA 2006). Some remaining areas, however, still survive and sustain habitats of European value under the Community Directive "Habitats" 92/42/CEE, especially in Friuli Venezia Giulia (REGIONE AUTONOMA FRIULI VENEZIA GIULIA 2005).

The Museo Friulano di Storia Naturale (Udine, Italy) recently organized an extensive faunistic research in selected wetlands of the Friuli Venezia Giulia (COMUNE DI UDINE. MUSEO FRIULANO DI STORIA NATURALE 2003). Samplings have been carried out in 17 "Natura 2000" sites proposed as Special Areas of Conservation under the European Community Directive "Habitats" 92/42/CEE. This research, focusing on aquatic and soil invertebrates, was financially supported by the ex Azienda dei Parchi e delle Foreste Regionali of the Autonomous Region Friuli Venezia Giulia. The results about centipedes collected in the frame of these studies are presented and discussed in this paper.

## 2. Methods

### 2.1 Sampling

Sampling was carried out in 2001. In the selected environmental units of each site the following methods have been used:

- pitfall traps (pt): 3-5 traps (ca 80 mm in diameter at

the opening) have been placed and filled with an over-saturated solution of sodium chloride in vinegar; 3-5% water solution of formaldehyde was added in summer for better conservation of the specimens. Traps were exposed in May-June and September-October for a period (session) of 30-40 days.

- Berlese extractor (be): soil and litter samples have been selected and samplings were carried out in spring (March, April, June) and autumn (October, November).

In all, seventy-two pitfall trap sessions and 65 Berlese samplings were undertaken.

## 2.2 Study area and sites

The investigated biotopes are distributed from the Adriatic coast in the south to the alpine region in the north, ranging from the sea level to about 1,500 m in elevation (fig. 1). The size of the biotopes ranges from 4.4 to 80 ha, mostly 10 to 30 ha. Most of them include moors and fens and are characterized by hygrophilous vegetation. In some localities mesophilous to xerophilous grassland is present beside damp meadows, peat bogs and various types of forests.

Sites are listed below according to their elevation above sea level. For each locality, name (and Regional biotope code number according to COMUNE DI UDINE. MUSEO FRIULANO DI STORIA NATURALE 2003), municipality (and administrative province), UTM, altitude, extension (in hectares, ha), main environmental characters, habitat and microhabitat investigated, sampling method (number of collected traps on the total is given in parenthesis for pitfall samplings), and date are given. Detailed information on the sampling sites can be found

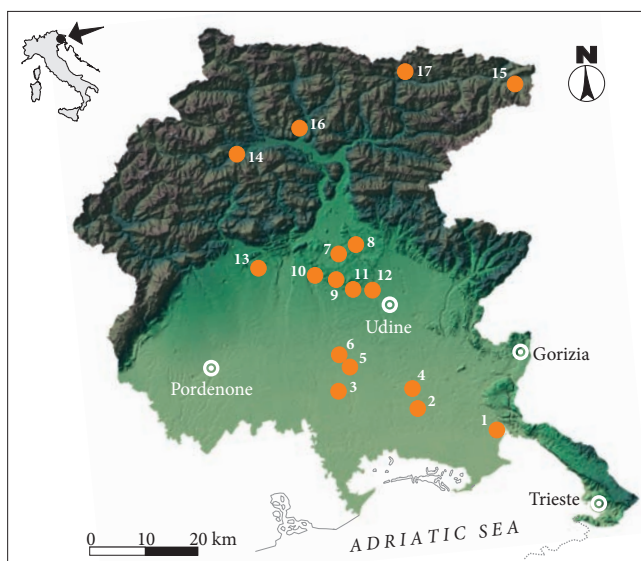


Fig. 1 - Study area and sampled biotopes. Site's numbers follow the text.

- Area di studio e biotopi campionati. Si veda il testo per i numeri relativi ai biotopi.

in POLDINI (1991), HUEMER & MORANDINI (2005) and MUSI (2005).

A. Peat bogs and marshes of the low plain (0-23 m above s.l., 6 sites, 43 replications: 26 pt sessions, 17 be samplings)

1. **Palude del Fiume Cavana** (Regional biotope code number 15), Monfalcone (GO), UL87, 0-1 m, 40 ha.

Littoral relic wetland near the spring of the River Cavana. The area is characterized by salt grasslands with *Limonium* spp. along the coast of the Adriatic Sea, halophilous and freshwater *Phragmites australis* communities towards north, and plant communities dominated by *Cladium mariscus*, *Typha latifolia* and *Schoenoplectus lacustris* near the spring. A damp meadow with *Molinia caerulea* and few old planted *Populus x euroamericana* partly covered by scrub mainly with *Frangula alnus*, *Salix* spp. and *Rubus caesius* is present in the west side.

Investigated habitats (5 replications: 4 pt sessions, 1 be sampling):

- *Phragmites* sp. [*P. australis*] community (brackish), pt, 20.V/26.VI.2001 (3/3), 4.IX/17.X.2001 [no records] (3/3);
- forest, pt, 20.V/26.VI.2001 (3/3), 4.IX/17.X.2001 (3/3);
- damp meadow, in tufts of Juncaceae, be, 29.XI.2001.

2. **Palude Fraghis** (Regional biotope code number 3), Porpetto (UD), UL 68, 8 m, 22.7 ha.

Wetland area lying in a wide lowland with a number of large springs. The vegetation is represented mostly by communities dominated by *Cladium mariscus* in the springs, by *Schoenus nigricans* in the alkaline peat bog, and by *Molinia caerulea* in the less humid soils. Secondary scrubs with *Salix cinerea*, *S. alba* and *Alnus glutinosa* are also present were mowing activities has been abandoned.

Investigated habitats (8 replications: 4 pt sessions, 4 be samplings):

- riparian forest, pt, 15.V/26.VI.2001 (3/3), 4.IX/17.X.2001 (3/3);
- *Phragmites* sp. [*P. australis*] community, under *Alnus glutinosa*, be, 1.IV.2001;
- alkaline peat bog, in tufts of *Cladium mariscus*, be, 1.IV.2001;
- alkaline peat bog, in tufts of *Cladium mariscus* and *Schoenus nigricans*, be, 23.XI.2001;
- alkaline peat bog, mud at *Cladium mariscus* base, be, 1.IV.2001;
- alkaline peat bog, pt, 15.V/26.VI.2001 (3/3), 4.IX/17.X.2001 (3/3).

3. **Risorgive di Zarnicco** (Regional biotope code number 14), Rivignano (UD), UL58-UL48, 13 m, 47 ha.

Spring system along the lower boundary of the "springs area" in the Friuli Venezia Giulia lowplain. The vegeta-



tion is mostly characterized by communities dominated by *Cladium mariscus* around the springs, by *Schoenus nigricans* in patches of alkaline peat bogs. Other relevant habitats are scrub communities dominated by *Frangula alnus* and *Salix cinerea*, as well as damp meadows dominated by *Molinia caerulea*. Small woods dominated by *Quercus robur* or by *Fraxinus angustifolia*, *Ulmus minor* and *Alnus glutinosa* are present in the mesophilous and in the hygrophilous facies of the area respectively.

Investigated habitats (8 replications: 4 pt sessions, 4 be samplings):

- riparian forest, under *Alnus glutinosa* with *Carex* sp., be, 31.III.2001;
- riparian forest, pt, 10.V/19.VI.2001 (5/5), 4.IX/16.X.2001 (5/5);
- alkaline peat bog, under *Alnus glutinosa* in *Schoenus* community, be, 31.III.2001;
- alkaline peat bog, in tufts of *Schoenus nigricans*, be, 31.III.2001, 26.XI.2001;
- alkaline peat bog, pt, 4.IX/16.X.2001 (2/4), 10.V/19.VI.2001 (3/4).

#### 4. Paludi del Corno (Regional biotope code number 4), Gonars and Porpetto (UD), UL 68, 15-16 m above s.l., 50.8 ha.

Spring located at the first stretch of the River Corno. The vegetation is mostly characterized by communities dominated by *Cladium mariscus*, by *Schoenus nigricans* and by damp meadows dominated by *Molinia caerulea*. Secondary *Salix cinerea* woods, mostly derived from herbaceous communities once regularly mowed, and *Alnus glutinosa*, *Salix alba* and *Ulmus* sp. periodically flooded woods are also present.

Investigated habitats (7 replications: 3 pt sessions, 4 be samplings):

- forest, under *Alnus glutinosa*, be, 1.IV.2001;
- forest, pt, 15.V/21.VI.2001 (1/3), 4.IX/16.X.2001 (2/3);
- alkaline peat bog, under *Alnus glutinosa*, be, 1.IV.2001;
- alkaline peat bog, in tufts of *Schoenus nigricans*, be, 1.IV.2001, 23.XI.2001;
- alkaline peat bog, pt, 15.V/21.VI.2001 (2/3).

#### 5. Risorgive di Flambro (Regional biotope code number 12), Talmassons (UD), UL58, 21-22 m, 71 ha.

Wetland area along the lower boundary of the "springs line" in the Friuli Venezia Giulia lowplain. Vegetation is characterized by communities dominated by *Cladium mariscus*, along the edges of springs and on the bottom of the lowlands, by *Schoenus nigricans* and by damp meadows dominated by *Molinia caerulea*. Besides artificial woods, semi-natural forests generally derived from herbaceous communities once regularly mowed are present. Among these are *Alnus glutinosa*, including *Salix alba* and *Fraxinus angustifolia*, dominated woods

and small patches of *Quercus robur* woods. Fragments of riparian forests dominated by *Populus nigra* and *Salix alba*, and hygrophilous woods with *Frangula alnus* and *Salix cinerea* are also present.

Investigated habitats (8 replications: 4 pt sessions, 4 be samplings):

- forest, under *Quercus robur*, be, 31.III.2001;
- forest, pt, 10.V/19.VI.2001 (3/3), 4.IX/6.X.2001 (3/3);
- alkaline peat bog, under *Salix* cf. *purpurea* in *Schoenus* community, be, 31.III.2001;
- alkaline peat bog, in tufts of *Schoenus nigricans*, be, 31.III.2001, 26.XI.2001;
- alkaline peat bog, pt, 4.IX/16.X.2001 (4/5), 10.V/19.VI.2001 (5/5).

#### 6. Risorgive di Virco (Regional biotope code number 16), Bertiole and Talmassons (UD), UL58, 23 m, 80 ha.

Wetland area near and similar from vegetation point of view to the preceding one.

Investigated habitats (7 replications: 3 pt sessions, 4 be samplings):

- wet forest, under *Alnus glutinosa*, be, 31.III.2001;
- wet forest, pt, 10.V/19.VI.2001 (3/3), 4.IX/16.X.2001 (3/3);
- alkaline peat bog, under *Alnus glutinosa* in *Schoenus* community, be, 31.III.2001;
- alkaline peat bog, in tufts of *Carex* cf. *gracilis* with *Schoenus nigricans*, be, 31.III.2001, 26.XI.2001;
- alkaline peat bog, pt, 10.V/19.VI.2001 (3/3).

#### B. Peat bogs and marshes of the hill belt (160-200 m, 7 sites, 61 replications: 28 pt sessions, 33 be samplings)

#### 7. Torbiera di Casasola (Regional biotope code number 7), Majano (UD), UM51, 160-162 m, 42 ha.

Peat bog along the River Ledra, in the morenic system of the River Tagliamento, at the southern tip of the low plain "Campo di Osoppo". Intensely used for peat extraction up to the mid-50's of the last century. Oligotrophic ponds are in the central part of the site. A *Carex elata* community covers a wide part of the bog. *Cladium mariscus* and *Carex acutiformis* dominated communities are also present. A *Phragmites australis* community colonizes the pond shores. Damp meadows dominated by *Molinia caerulea* once regularly mowed are at the edge of the flooded areas. Small patches of *Salix cinerea* high-shrubs and woods dominated by *Alnus glutinosa* and *Ulmus minor* are present in the dryer areas. Communities dominated by *Schoenus nigricans* are also present, although not extended. Communities with *Filipendula ulmaria* and *Cirsium oleraceum* are also widespread in northern slopes and along woods. Small, mainly artificial, woods with *Populus nigra*, *Salix alba*, *Platanus hybrida*, *Fraxinus excelsior* and *Alnus glutinosa* are present on the edge of the bog besides the above mentioned forests of *Alnus glutinosa* and *Ulmus minor*. Wood lines with the same species flank mowed meadows.

Investigated habitats (10 replications: 6 pt sessions, 4 be samplings):

- forest, under and in hollow of *Salix* sp., be, 13.IV.2001;
- forest, pt, 6.V/14.VI.2001 (1/3), 6.IX/14.X.2001 (3/3);
- damp meadow, pt, 6.V/14.VI.2001 (4/4), 6.IX/14.X.2001 (4/4);
- peat bog, under *Salix* sp. and *Alnus glutinosa*, be, 13.IV.2001;
- peat bog, in tufts of *Carex* cf. *elata*, be, 13.IV.2001, 13.XI.2001;
- peat bog, pt, 10.V/14.VI.2001 (3/3), 6.IX/14.X.2001 (3/3).

**8. Palude di Fontana Abisso** (Regional biotope code number 2), Buia (UD), UM 51, 163 m, 9.7 ha.

Residual wetland in the morenic system of the River Tagliamento, near the low plain "Campo di Osoppo". The marsh has been strongly reduced in 1970 after the construction of motorway A23 and other works. The vegetation is mostly characterized by *Phragmites australis* communities, *Carex elata* and *C. acutiformis* communities as well as damp meadows dominated by *Molinia caerulea*. Riparian woodlands with *Salix cinerea* and hygrophilous hedges with *Frangula alnus* and *Viburnum opulus* are also present.

Investigated habitats (6 replications: 2 pt sessions, 4 be samplings):

- peat bog, under *Alnus glutinosa*, be, 13.IV.2001;
- peat bog, under *Salix* sp., be, 13.IV.2001;
- peat bog, in tufts of *Carex* cf. *elata*, be, 13.IV.2001, 13.XI.2001;
- peat bog, pt, 6.IX/14.X.2001 (3/5), 6.V/14.VI.2001 (5/5).

**9. Prati umidi dei Quadris** (Regional biotope code number 17), Fagagna (UD), UM51, 171 m, 21.5 ha.

In the morenic system of the River Tagliamento. The vegetation is mostly characterized by damp meadows with *Molinia caerulea*, sometime mowed in the past, and a residual alkaline bog used since the 1950's for extraction of peat. Fragments of *Typha latifolia* and *T. angustifolia* communities with few *Phragmites australis* are present along the resulting square-shaped artificial pools. An hygrophilous forest, mostly including *Alnus glutinosa*, *Salix cinerea*, *S. alba* and *Ulmus minor* is also present.

Investigated habitats (9 replications: 4 pt sessions, 5 be samplings):

- wet forest, under *Alnus glutinosa*, be, 12.IV.2001;
- wet forest, under *Quercus robur*, be, 12.IV.2001;
- wet forest, pt, 15.V/21.VI.2001 (3/3), 8.IX/14.X.2001 (3/3);
- peat bog, under *Alnus glutinosa* in *Carex* sp. community, be, 12.IV.2001;
- peat bog, in tufts of *Carex* sp., be, 13.XI.2001;

- peat bog, in mole (*Talpa* sp.) burrow, be, 12.IV.2001;
- peat bog, pt, 15.V/21.VI.2001 (3/3), 8.IX/14.X.2001 (3/3).

**10. Prati di Col San Floreano** (Regional biotope code number 8), Rive d'Arcano (UD), UM41, UM51, 180 m, 35 ha.

Meadows system in the morenic hills of the River Tagliamento. The following herbaceous communities are represented according to soil conditions: meadows with *Onobrychis arenaria* and *Bromopsis erecta*, in stony developed soils never contacting the water table, on the slopes; damp meadows dominated by *Molinia caerulea*, mostly in plains or in gentle slopes; stable meadows with *Arrhenatherum elatius*, derived from the regular manuring of the *Molinia* damp meadows; alkaline peat bogs dominated by *Schoenus nigricans*, in the more depressed sites, often flooded. Plant communities with *Cladium mariscus* or with *Frangula alnus* and *Viburnum opulus* are also represented.

Investigated habitats (7 replications: 2 pt sessions, 5 be samplings):

- damp meadow, under *Alnus glutinosa* in *Schoenus* community, be, 12.IV.2001;
- damp meadow, in tufts of *Schoenus nigricans*, be, 12.IV.2001, 13.XI.2001;
- damp meadow, heap of vegetal debris, be, 12.IV.2001;
- damp meadow, debris from rotten *Populus*, be, 12.IV.2001;
- damp meadow, pt, 15.V/21.VI.2001 (5/5), 8.IX/14.X.2001 (5/5).

**11. Torbiera di Borgo Pegoraro** (Regional biotope code number 18), Moruzzo (UD), UM50, UM51, 185 m, 28.4 ha.

Peat bog occasionally used since the 1990's for peat extraction. The shores of resulting artificial basins are presently characterized by *Typha* sp., *Phragmites australis* and *Carex elata* communities. Damp meadows dominated by *Molinia caerulea* (not mowed) and *Carex acutiformis* (mowed) are also present as well as mesophilous prairies after the water table lowering secondarily established. Herbaceous formations are bordered by wood lines including *Alnus glutinosa*, *Platanus hybrida*, *Quercus robur*, *Fraxinus excelsior* and *Populus nigra*. A semiflooded wood with *Alnus glutinosa* and *Platanus hybrida* is also present.

Investigated habitats (7 replications: 4 pt sessions, 3 be samplings):

- forest, under *Platanus hybrida*, be, 12.IV.2001;
- forest, log of *Platanus hybrida* with Polyporaceae, be, 12.IV.2001;
- forest, pt, 15.V/21.VI.2001 (3/3), 8.IX/16.X.2001 (3/3);
- peat bog, in tufts of *Carex* cf. *elata* near *Typha latifolia*, be, 13.XI.2001;
- peat bog, pt, 15.V/21.VI.2001 (3/3), 8.IX/16.X.2001 (3/3).

12. **Torbiera di Lazzacco** (Regional biotope code number 11), Moruzzo and Pagnacco (UD), UM51, 184-195 m, 15.8 ha.

Peat bog formed by two intramorenomic impluvia. The larger one, once probably used for peat extraction, is mostly characterized by mowed meadows, *Phragmites australis* communities, *Cladium mariscus* communities, hygrophilous woods with *Alnus glutinosa* and *Carex acutiformis*, damp meadows with *Molinia caerulea*, including patches of *Schoenus nigricans*. The smaller one is characterized by damp meadows with *Molinia caerulea*, *Schoenus nigricans* and *Primula farinosa*, *Carex elata* communities, *Typha latifolia* and *Schoenoplectus lacustris* communities.

Investigated habitats (11 replications: 6 pt sessions, 5 be samplings):

- forest east, pt, 10.V/21.VI.2001 (3/3), 8.IX/16.X.2001 (3/3);
- forest west, under *Quercus robur* and *Alnus glutinosa*, be, 12.IV.2001;
- damp meadow, pt, 10.V/21.VI.2001 (2/4), 8.IX/16.X.2001 (3/4);
- peat bog east, under *Alnus glutinosa* in *Carex cf. elata* community, be, 12.IV.2001;
- peat bog east, in tufts of *Carex cf. elata*, be, 13.XI.2001;
- peat bog west, in tufts of *Schoenus nigricans* near *Cladium mariscus*, be, 12.IV.2001, 13.XI.2001;
- peat bog west, pt, 10.V/21.VI.2001 (3/3), 8.IX/16.X.2001 (3/3).

13. **Torbiera di Sequals** (Regional biotope code number 6), Sequals (PN), UM31, 190-200 m, 9.6 ha.

Remains of a wide pedemontane peat bog. Vegetation is characterized by *Carex* spp. and *Schoenus nigricans* dominated communities. Damp meadows dominated by *Molinia caerulea* are also present together with acidophilous scrub communities dominated by *Betula pendula*, *Calluna vulgaris* and *Frangula alnus* in the more dry areas and along the slopes.

Investigated habitats (11 replications: 4 pt sessions, 7 be samplings):

- forest, under *Alnus glutinosa*, be, 13.IV.2001;
- forest, in tufts of *Carex* sp., be, 13.IV.2001, 29.X.2001;
- forest, pt, 6.V/14.VI.2001 (2/3), 8.IX/14.X.2001 (2/3);
- peat bog, under *Betula* and *Castanea sativa* with *Calluna vulgaris*, be, 13.IV.2001;
- peat bog, under *Quercus* sp., be, 13.IV.2001;
- peat bog, in tufts of *Carex* sp. and *Molinia caerulea*, be, 13.IV.2001, 29.X.2001;
- peat bog, pt, 6.V/14.VI.2001 (1/3), 8.IX/14.X.2001 (3/5).

C. Peat bogs and marshes of the montane level (839-1,518 m, 4 sites, 33 replications: 18 pt sessions, 15 be samplings)

14. **Palude di Cima Corso** (Regional biotope code number 9), Ampezzo (UD), UM24, 839 m, 7.5 ha.

Montane marsh located in the basin of a semi-inferred, post-glacial lake presently represented by a small pool in the west side. Scattered damp meadows dominated by *Molinia caerulea* and *Schoenus nigricans* are present in the east side. Plant communities with *Trichophorum alpinus* and *Juncum alpinus* as well as *Cladium mariscus* are also significantly represented. Communities dominated by *Carex* spp. and *Sphagnum* sp. are present, although less expanded. Floating mats are also present. Forest habitats dominated by *Pinus sylvestris* characterize the areas far from the marsh.

Investigated habitats (6 replications: 4 pt sessions, 2 be samplings):

- forest, pt, 2.V/10.VI.2001 (4/4), 6.IX/12.X.2001 (4/4);
- peat bog, under *Alnus glutinosa* in a spot without water, be, 10.VI.2001;
- peat bog, under *Alnus glutinosa* near water, be, 10.VI.2001;
- peat bog, pt, 2.V/10.VI.2001 (3/3), 6.IX/12.X.2001 (3/3).

15. **Torbiera Scichizza** (Regional biotope code number 5), Tarvisio (UD), UM 94, 842-844 m, 9.9 ha.

Wetland area in the most western stretch of the Plain of Fusine, the watershed between the rivers Drava and Sava, between the Julian and the Caravanche Alps. The plant community is characterized by *Carex* spp. dominated communities, turning in a formation with *Molinia caerulea* association on soils with lower water content. Communities dominated by *Sphagnum* sp. are also present.

Investigated habitats (9 replications: 6 pt sessions, 3 be samplings):

- coniferous forest, pt, 5.V/9.VI.2001 (3/3), 2.IX/12.X.2001 (3/3);
- damp meadow, pt, 5.V/9.VI.2001 (3/3), 2.IX/12.X.2001 (3/3);
- peat bog, under *Alnus glutinosa* and *Berberis vulgaris*, be, 9.VI.2001;
- peat bog, in tufts of *Carex cf. fusca*, be, 9.VI.2001, 18.X.2001;
- peat bog, pt, 5.V/9.VI.2001 (5/5), 2.IX/12.X.2001 (5/5).

16. **Torbiera di Curiedi** (Regional biotope code number 13), Tolmezzo (UD), UM44, 851-874 m, 13 ha.

A system of small bogs on the plateau between Mount Dobis and Mount Diverdalce. The main bog is represented by an impluvium with a number of springs giving rise to a stream running and/or stagnating in a dell. The vegetation is mostly characterized by herbaceous communities with *Carex elata* in stagnating water patches, or *Schoenus nigricans* where water is lesser and temporarily, and damp meadow dominated by *Molinia caerulea* where slopes



increase. Part of the wetland has been destroyed after the construction of sport facilities.

Investigated habitats (10 replications: 4 pt sessions, 6 be samplings):

- peat bog north-east, under *Salix* sp. and *Alnus glutinosa* in *Carex* sp. community, be, 10.VI.2001;
- peat bog north-east, in tufts of *Carex* sp., be, 10.VI.2001, 29.X.2001;
- peat bog north-east, pt, 2.V/10.VI.2001 (2/3), 6.IX/12.X.2001 (3/3);
- peat bog north-west, in tufts of *Carex* sp., be, 10.VI.2001, 29.X.2001;
- peat bog south-east, in tufts of *Carex* sp. and *Eriophorum* sp., be, 29.X.2001;
- peat bog south-east, pt, 2.V/10.VI.2001 (3/3), 6.IX/12.X.2001 (3/3).

17. **Torbiera di Pramollo** (Regional biotope code number 10), Pontebba (UD), UM65, 1,510-1,518 m, 4.4 ha.

Active wide peat bog system separated in two plateau (higher and lower) by a slope. The water supply come from an artificial lake (Lake of Pramollo) derived from the conversion of a pre-existing bog. The vegetation is represented partly by typical communities of springs and streams running on silicate soils, partly by communities of oligotrophic depressions dominated by *Carex nigra* or *C. paupercula*, partly by communities of mesotrophic ponds dominated by *C. rostrata*, as well as by communities dominated by *Sphagnum* and *C. pauciflora*.

Investigated habitats (8 replications: 4 pt sessions, 4 be samplings):

- lower peat bog, meadow with spring with Ciperaceae and Graminaceae, be, 9.VI.2001;
- lower peat bog, pt, 5.V/9.VI.2001 (3/3), 2.IX/12.X.2001 (3/3);
- higher peat bog, under *Alnus viridis* along a stream, be, 9.VI.2001;
- higher peat bog, in tufts of *Carex* sp. with *Viola* sp., mosses and Graminaceae, be, 9.VI.2001, 18.X.2001;
- higher peat bog, pt, 9.VI/21.VII.2001 (4/5), 2.IX/12.X.2001 (4/5).

### 2.3 Faunistic list

For each species the following data are reported:

- scientific name, Author and year of publication according to MINELLI (2006);
- general geographic distribution, mainly as an alphabetical list of the countries or geopolitical units from where the species is known arranged per continent/subcontinent, according to ZAPPAROLI (2006) or critically revised from the literature (MINELLI 2006) or from other updated checklists and reviews (e.g., BONATO et al. 2005; SPELDA 2005; TUF & LAŠKA 2005; LINDNER 2007; ANDERSSON et al. 2008; BERG

et al. 2008; IORIO 2008); doubtful records are marked with ?;

- distribution in Italy according to ZAPPAROLI & MINELLI (2005);
- chorotype, that is patterns of geographic distribution, according to ZAPPAROLI & MINELLI (2005), based on the classification proposed by VIGNA TAGLIANTI et al. (1993, 1999);
- a synthesis of the local (north-eastern Italy) available data on the altitude range and (epigeic) habitats arranged from the sea level to alpine communities, mostly according to MINELLI & IOVANE (1987), ZAPPAROLI (1989), MINELLI (1991), GLERAN (2004) and personal unpublished records; data from southern Slovenian forest habitats published by Kos (1996) have been also taken in account; the frequency in the habitats sampled in this study is also given as number (in parenthesis) of sites where the species have been found; vegetal associations and floristic nomenclature is given as in original papers or labels;
- the material examined is listed: locality (with biotope code number), vegetal formation and/or habitat, elevation above sea level, date, number of specimens (males, females, immatures not belonging to larval stadia, larvae, unsexed specimens), collector and collection where the material is preserved are given for each record; collecting methods are detailed when known; localities are listed according to above list.
- remarks including taxonomic notes, comments on uncertain records where relevant.

The Jaccard index of similarity was used to evaluate the differences among biotopes as concerns the centipede species composition. The values of the index were converted in a distance matrix and a cluster average linkage analysis (using the UPGMA method) was performed using MVSP 3.12d (Kavach Computing Services 1985-2001).

### 2.4 Semi-quantitative analysis of the assemblages

A preliminary semi-quantitative analysis of the centipede assemblages has been performed. Results are given in synthetic form.

Total, min.-max. mean and median number of species per habitat for each altitudinal zone is given (habitats are listed according to species richness, altitudinal range and number of investigated localities as well as number of sites per habitat in parenthesis). The following information is reported for each locality:

- species diversity: as the total and per habitat number of species and specimens sampled (habitats listed according to species richness; sampling methods pooled), values of Shannon' index (log base e) and evenness are also given; the following must however be specified: (i) the total number of species has been calculated considering only taxa identified at species (or species group) level, that is not including records of *Lithobius* spp., *Cryptops*

spp. and *Geophilus* spp. except for “Torbiere di Sequals” (loc. n. 13) and “Torbiere di Curiedi” (loc. n. 16) for which also taxa identified at genus level has been considered; (ii) per habitat number of species has been calculated including taxa identified both at genus and at species (or species group) level; (iii) Shannon’ index and evenness have been calculated always considering only taxa identified at species (or species group) level and their corresponding number of specimens;

- species composition: as a species list of the assemblage (species listed according to the faunistic list), habitat where species have been sampled and number of specimens examined is given in parenthesis for each species;
- comments where relevant.

A bivariate analysis with the non-parametric Spearman correlation test (2 tail) aimed to verify the significance of relationships between number of species and a set of environmental or intrinsic independent variables (altitude, area, number of habitat main types, research effort as number of replicated samplings) has firstly been done. A stepwise multiple regression between dependent variable (number of species) has been then performed. The SPSS 13.0 software for Windows has been used. Alfa set was to 0.05.

All the material examined is preserved in the collections of the Museo Friulano di Storia Naturale (Udine, Italy). The following abbreviations have been used in the text: AT = A. Tagliapietra, AZ = A. Zanetti, FS = F. Stoch, GC = G. Colombetta, GG = G. Governatori, GT = G. Tomasin, ZA = M. Zanetti. Administrative provinces acronyms: GO = Gorizia, PN = Pordenone, UD = Udine. Other: ad.= adult/adults, ex./exx. = specimen/specimens; imm. = immature/immatures, lp = leg pairs.

### 3. Results

#### 3.1 Faunistic list

Order LITHOBIOMORPHA POCOCK, 1895

Family LITHOBIIDAE NEWPORT, 1844

*Eupolybothrus* VERHOEFF, 1907

Subgenus *Eupolybothrus* VERHOEFF, 1907

#### 1. *Eupolybothrus* (*Eupolybothrus*) *grossipes* (C.L. KOCH, 1847)

Material examined. – **9**, UD, Fagagna, Prati umidi dei Quadris (17): wet forest, 171 m, pt (3/3): 15.V/21.VI.2001, GC, 1 ♂, 2 ♀♀, 5 ♂♂ imm., 8 ♀♀ imm., 2 imm.; ibidem, idem (3/3): 8.IX/14.X.2001, GC, 1 ♀. – **12**, UD, Moruzzo, Torbiere di Lazzacco (11): damp meadow, 185 m, pt (3/4): 8.IX/16.X.2001, GC, 1 ♂.

General distribution. Europe: Austria, Czech Republic, France (mainland), South Germany, Italy (mainland), Slovenia, Switzerland.

Distribution in Italy. All regions except Basilicata, Apulia, Sicily, Sardinia; no records from Aosta Valley probably due to lack of research.

Chorotype. Central European.

Ecological notes. 2-2,080 m; a species mostly inhabiting woodlands, rarely present also in alpine grasslands in north-eastern Italy. It has been recorded in a wide spectrum of mesophilous woodlands, from low plain *Quercus-Carpinetum boreoitalicum* (1 site), to montane and submontane *Orno-Ostryetum* (2 sites), *Salvio-Fraxinetum* (1 site), *Fagus* woods (1 site), *Erico-Pinetum* (1 site), *Abies* woods (1 site), *Piceetum montanum* (1 site); one record in *Seslerietum* (1 site). Not recorded in the Slovenian forest habitats studied by Kos (1996).

The material examined has been collected only in two localities of the hill belt, in wet forest (1 site) and in damp meadow (1 site, 1 specimen) respectively.

Subgenus *Leptopolybothrus* JEEKEL, 1967

#### 2. *Eupolybothrus* (*Leptopolybothrus*) *tridentinus* (FANZAGO, 1874)

Material examined. – **2**, UD, Porpetto, Palude Fraghis (3): riparian forest, 8 m, pt (3/3): 15.V/26.VI.2001, GC, 1 ♀; alkaline peat bog, in tufts of *Cladium mariscus*, 8 m, be: 1.IV.2001, AZ, AT, GT, GG, 1 ♂ imm.; alkaline peat bog, in tufts of *Cladium mariscus* and *Schoenus nigricans*, 8 m, be: 23.XI.2001, GT, 2 ♂♂, 4 ♂♂ imm. – **3**, UD, Rivignano, Risorgive di Zarnicco (14): riparian forest, 13 m, pt (5/5): 10.V/19.VI.2001, GC, 6 ♂♂, 6 ♀♀, 2 ♂♂ imm.; ibidem, idem (5/5): 4.IX/16.X.2001, GC, 4 ♂♂, 1 ♂ imm.; alkaline peat bog, under *Alnus glutinosa* in *Schoenus* community, 13 m, be: 31.III.2001, AZ, AT, GT, GG, 1 imm.; alkaline peat bog, 13 m, pt (3/4): 10.V/19.VI.2001, GC, 1 ♂, 1 ♀. – **4**, UD, Gonars, Paludi del Corno (4): alkaline peat bog, in tufts of *Schoenus nigricans*, 15 m, be: 23.XI.2001, GT, 1 ♀, 3 imm.; alkaline peat bog, 15 m, pt (2/3): 15.V/21.VI.2001, GC, 1 ♂, 1 ♂ imm., 1 larva. – **5**, UD, Talmassons, Risorgive di Flambro (12): forest, 22 m, pt (3/3): 10.V/19.VI.2001, GC, 4 ♂♂, 7 ♀♀; ibidem, idem (3/3): 4.IX/16.X.2001, GC, 2 ♂♂, 2 ♀♀, 2 imm.; alkaline peat bog, 21 m, pt (4/5): 4.IX/16.X.2001, GC, 1 ♀, 1 ♀ imm.; ibidem, idem (5/5): 10.V/19.VI.2001, GC, 1 ♂, 4 imm. – **6**, UD, Bertiole, Risorgive di Virco (16): wet forest, 23 m, pt (3/3): 10.V/19.VI.2001, GC, 1 ♂, 4 imm.; ibidem, idem (3/3): 4.IX/16.X.2001, GC, 1 ♂, 1 ♀ imm., 3 larvae; alkaline peat bog, in tufts of *Carex cf. gracilis* with *Schoenus nigricans*, 23 m, be: 31.III.2001, AZ, AT, GT, GG, 1 ♂ imm.; alkaline peat bog, 23 m, pt (3/3): 10.V/19.VI.2001, GC, 2 larvae, 1 imm. – **7**, UD, Majano, Torbiere di Casasola (7): forest, 160 m, pt (3/3): 6.V/14.VI.2001, GC, 2 ♂♂, 1 ♀; ibidem, idem (3/3): 6.IX/14.X.2001, GC, 4 ♂♂, 5 ♀♀; peat bog, under *Salix* sp. and *Alnus glutinosa*, 162 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ♀. – **9**, UD, Fagagna, Prati umidi dei Quadris (17): wet forest, 171 m, pt (3/3): 15.V/21.VI.2001, GC, 4 ♂♂, 2 ♀♀; ibidem, idem (3/3): 8.IX/14.X.2001, GC, 1 ♂; peat bog, 171 m, pt (3/3): 8.IX/14.X.2001, GC, 2 ♂♂, 1 ♀, 1 imm. – **11**, UD, Moruzzo, Torbiere di Borgo Pegoraro (18): forest, 185 m, pt (3/3): 15.V/21.VI.2001, GC, 3 ♀♀; ibidem, idem (3/3): 8.IX/16.X.2001, GC, 3 ♂♂, 1 ♀; peat bog, 185 m, pt (3/3): 15.V/21.VI.2001, GC, 1 larva; ibidem, idem (3/3): 8.IX/16.X.2001, GC, 1 ♀. – **12**, UD, Pagnacco, Torbiere di Lazzacco (11): forest east, 195 m, pt (3/3): 10.V/21.VI.2001,



GC, 1 ♂, 1 ♀, 1 ♂ imm., 1 ♀ imm.; ibidem, idem (3/3): 8. IX/16.X.2001, GC, 3 ♂♂, 4 ♀♀, 2 imm. – 13, PN, Sequals, Torbiera di Sequals (6): forest, in tufts of *Carex* sp., 200 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂ imm.; forest, 200 m, pt (2/3): 8.IX/14.X.2001, GC, 2 ♀♀; peat bog, under *Betula* and *Castanea sativa* with *Calluna vulgaris*, 190 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂, 1 larva; peat bog, in tufts of *Carex* sp. and *Molinia caerulea*, 190 m, be: 29.X.2001, GT, 1 ♀ imm. – 14, UD, Ampezzo, Palude di Cima Corso (9): forest, 839 m, pt (4/4): 6.IX/12.X.2001, GC, 1 ♀; peat bog, under *Alnus glutinosa* in a spot without water, 839 m, be: 10.VI.2001, AZ, ZA, GT, AT, GG, 1 ♂.

General distribution. Europe: Albania, Austria, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Italy (mainland), Liechtenstein?, Romania, Slovenia, Switzerland, Yugoslavia (EASON 1982; KOS 1992; STOEY 1997, 2000, 2002; MATIC 1966; WÜRMLI 1972; TAJOVSKÝ 2001; ZAPPAROLI & MINELLI 2005; NEGREA 2006; PURGER et al. 2007).

Distribution in Italy. Liguria, Piedmont, Lombardy, Trentino-Alto Adige, Venetia, Friuli Venezia Giulia.

Chorotype. Central European.

Ecological notes. 2-2,000 m; a mostly mesophilous woodland species, locally recorded in low plain *Quercus-Carpinetum boreoitalicum* (6 sites), *Salvio-Fraxinetum* (1 site) and *Abieti-Fagetum* (1 site). Also in Slovenian *Quercus-Luzulo-Fagetum* and *Abieti-Fagetum dinaricum* forest communities (KOS 1996).

One of the most common species in the wetland habitats examined, being sampled in 11 localities on 17, all but one located in the low plain and in the hill belt. The material examined was collected in peat bog (10 sites, including 5 alkaline peat bogs) as well as in forest habitats (10 sites, including wet, 2 sites, and riparian forests, 2 sites).

0. *Eupolybothrus* (s. l.) sp. *grossipes* (C.L. KOCH, 1847)/*tridentinus* (FANZAGO, 1874)

Material examined. – 9, UD, Fagagna, Prati umidi dei Quadris (17): wet forest, 171 m, pt (3/3): 8.IX/14.X.2001, GC, 7 imm.

Remarks. Records based on immature mutilated specimens of uncertain identity.

*Lithobius* LEACH, 1814

Subgenus *Lithobius* LEACH, 1814

3. *Lithobius* (*Lithobius*) *agilis* C.L. KOCH, 1847

Material examined. – 1, GO, Monfalcone, Palude del Fiume Cavana (15): forest, 1 m, pt (3/3): 20.V/26.VI.2001, GC, 1 ♂, 2 ♀♀; ibidem, idem (3/3): 4.IX/17.X.2001, GC, 3 ♂♂, 1 ♀; damp meadow, in tufts of *Juncaceae*, 1 m, be: 29.XI.2001, GT, FS, 2 ♂♂, 3 ♀♀. – 2, UD, Porpetto, Palude Fraghis (3): riparian forest, 8 m, pt (3/3): 15.V/26.VI.2001, GC, 1 ♂, 1 ♀; alkaline peat bog, in tufts of *Cladium mariscus* and *Schoenus nigricans*, 8 m, be: 23.XI.2001, GT, 3 ♂♂, 1 ♀. – 3, UD, Rivignano, Risorgive di Zarnicco (14): riparian forest, 13 m, pt (5/5): 10.V/19.VI.2001, GC, 2 ♂♂, 1 ♀; ibidem, idem, pt (5/5): 4.IX/16.X.2001, GC, 1 ♂, 1 ♀; alkaline peat bog, under *Alnus glutinosa* in *Schoenus* community, 13 m, be: 31.III.2001, AZ, AT, GT, GG, 1 ♂ imm.; alkaline peat bog, in tufts of

*Schoenus nigricans*, 13 m, be: 31.III.2001, AZ, AT, GT, GG, 1 ♂; alkaline peat bog, in tufts of *Schoenus nigricans*, 13 m, be: 26.XI.2001, GT, FS, 1 ♂, 1 ♂ imm. – 4, UD, Gonars, Paludi del Corno (4): forest, 16 m, pt (1/3): 15.V/21.VI.2001, GC, 2 ♂♂; ibidem, idem (2/3): 4.IX/16.X.2001, GC, 1 ♂. – 5, UD, Talmassons, Risorgive di Flambro (12): alkaline peat bog, in tufts of *Schoenus nigricans*, 21 m, be: 31.III.2001, AZ, AT, GT, GG, 1 ♂, 1 ♂ imm.; alkaline peat bog, in tufts of *Schoenus nigricans*, 21 m, be: 26.XI.2001, GT, FS, 1 ♀ imm.; alkaline peat bog, 21 m, pt (4/5): 4.IX/16.X.2001, GC, 1 ♀ imm.; ibidem, idem (5/5): 10.V/19.VI.2001, GC, 1 ♀. – 6, UD, Bertoliolo, Risorgive di Virco (16): wet forest, under *Alnus glutinosa*, 23 m, be: 31. III.2001, AZ, AT, GT, GG, 2 ♂♂ imm., 2 ♀♀ imm.; alkaline peat bog, in tufts of *Carex* cf. *gracilis* with *Schoenus nigricans*, 23 m, be: 31.III.2001, AZ, AT, GT, GG, 1 ♂ imm., 1 ♀ imm. – 7, UD, Majano, Torbiera di Casasola (7): forest, under and in hollow of *Salix* sp., 160 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ♀ imm.; peat bog, under *Salix* sp. and *Alnus glutinosa*, 162 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ♀, 1 ♀ imm.; peat bog, in tufts of *Carex* cf. *elata*, 162 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 5 ♂♂; peat bog, in tufts of *Carex* cf. *elata*, 162 m, be: 13.XI.2001, GT, 3 ♂♂, 1 ♀; peat bog, 162 m, pt (3/3): 6. IX/14.X.2001, GC, 1 ♂, 1 ♀. – 8, UD, Buia, Palude di Fontana Abisso (2): peat bog, under *Alnus glutinosa*, 163 m, be: 13. IV.2001, AZ, ZA, GT, AT, GG, 1 ♂, 2 ♀♀, 8 imm., 8 larvae; peat bog, under *Salix* sp., 163 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 5 ♂♂ imm., 6 unsexed imm.; peat bog, in tufts of *Carex* cf. *elata*, 163 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ♀ imm.; peat bog, in tufts of *Carex* cf. *elata*, 163 m, be: 13. XI.2001, GT, 2 ♂♂, 1 ♀; peat bog, 163 m, pt (5/5): 6.V/14.VI.2001, GC, 4 ♂♂, 1 ♀, 5 imm., 8 larvae; ibidem, idem (3/5): 6. IX/14.X.2001, GC, 3 ♀♀, 5 ♂♂ imm., 5 ♀♀ juvv, 8 imm., 2 larvae. – 9, UD, Fagagna, Prati umidi dei Quadris (17): wet forest, 171 m, pt (3/3): 15.V/21.VI.2001, GC, 1 ♂, 1 ♀ imm.; ibidem, idem (3/3): 8.IX/14.X.2001, GC, 1 ♂, 2 ♀♀; peat bog, in tufts of *Carex* sp., 171 m, be: 13.XI.2001, GT, 1 ♂, 1 ♀, 2 ♂♂ imm., 3 ♀♀ imm.; peat bog, 171 m, pt (3/3): 15.V/21.VI.2001, GC, 5 ♂♂, 1 ♀, 7 ♀♀ imm.; ibidem, idem (3/3): 8.IX/14.X.2001, GC, 5 ♂♂, 14 ♀♀. – 10, UD, Rive d'Arcano, Prati di Col San Floreano (8): damp meadow, under *Alnus glutinosa* in *Schoenus* community, 180 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 2 ♂♂ imm., 1 ♀ imm.; damp meadow, in tufts of *Schoenus nigricans*, 180 m, be: 13.XI.2001, GT, 5 ♂♂, 1 ♀, 2 ♀♀ imm.; damp meadow, 180 m, pt (5/5): 15.V/21.VI.2001, GC, 3 ♂♂, 5 ♀♀; ibidem, idem (5/5): 8.IX/14.X.2001, GC, 6 ♀♀, 1 ♂ imm. – 11, UD, Moruzzo, Torbiera di Borgo Pegoraro (18): forest, under *Platanus hybrida*, 185 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♀ imm.; forest, 185 m, pt (3/3): 8.IX/16.X.2001, GC, 2 ♀♀; peat bog, 185 m, pt (3/3): 15.V/21.VI.2001, GC, 2 ♂♂; ibidem, idem (3/3): 8.IX/16.X.2001, GC, 4 ♀♀ imm. – 12, UD, Moruzzo, Torbiera di Lazzacco (11): forest west, under *Quercus robur* and *Alnus glutinosa*, 188 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♀, 1 ♀ imm.; peat bog east, under *Alnus glutinosa* in *Carex* cf. *elata* community, 188 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂, 3 ♀♀ imm.; peat bog west, in tufts of *Schoenus nigricans* near *Cladium mariscus*, 184 m, be: 13. XI.2001, GT, 1 ♀; peat bog west, 184 m, pt (3/3): 10.V/21. VI.2001, GC, 4 ♀♀ imm.; ibidem, idem (3/3): 8.IX/16.X.2001, GC, 2 ♀♀. – 13, PN, Sequals, Torbiera di Sequals (6): forest, under *Alnus glutinosa*, 200 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂ imm.; forest, in tufts of *Carex* sp., 200 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 3 ♂♂, 1 ♀ imm.; forest, in tufts of *Carex* sp., 200 m, be: 29.X.2001, GT, 1 ♂ imm., 2 ♀♀

imm. – 15, UD, Tarvisio, Torbiera Scichizza (5): peat bog, in tufts of *Carex cf. fusca*, 842 m, be: 18.X.2001, GT, FS, 2 ♂♂, 1 ♀. – 16, UD, Tolmezzo, Torbiera di Curiedi (13): peat bog north-east, in tufts of *Carex* sp., 851 m, be: 29.X.2001, GT, 1 ♀; peat bog north-east, 851 m, pt (3/3): 6.IX/12.X.2001, GC, 1 ♂, 1 ♀. – 17, UD, Pontebba, Torbiera di Pramollo (10): higher peat bog, 1,518 m, pt (4/5): 2.IX/12.X.2001, GC, 1 ♀.

General distribution. Europe: Austria, Belgium, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark (mainland), France (mainland), Germany, Greece (including Crete), Hungary, Ireland?, Italy (mainland), Liechtenstein?, Luxembourg, Poland, Romania, Slovak Republic, Slovenia, Sweden, Switzerland, The Netherlands, Ukraine (BRÖLEMANN 1930; REMY & HOFFMANN 1959; EASON 1964, 1982; MATIC 1966; WÜRMLI 1972; JEEKEL 1977; ZALESKAJA 1978; KOS 1992; STOEV 1997, 2002; WYTWER 1997; LOCK 2000; ORSZÁGH 2001; TAJOVSKÝ 2001; ZAPPAROLI 2002; DÁNYI 2005; TUF & LAŠKA 2005; ZAPPAROLI & MINELLI 2005; NEGREA 2006; PURGER et al. 2007; ANDERSON et al. 2008; BERG et al. 2008; BARBER 2009).

Distribution in Italy. Liguria, Piedmont, Aosta Valley, Lombardy, Trentino-Alto Adige, Venetia, Friuli Venezia Giulia.

Chorotype. Central European.

Ecological notes. 1-2,190 m; a species generally still poorly known from ecological point of view (MINELLI & IOVANE 1982), the only information locally available (Julian Pre-Alps) mostly concern montane pastures and meadows at 800-1,450 m above s.l. (Zapparoli unpublished), apart one record in *Orno-Ostryetum* (Trentino, Bolzano province) (MINELLI 1981; MINELLI & IOVANE 1982); in Western Alps (Ligurian Alps, Cottian Alps), *L. agilis* has been collected in *Fagus* forests and alpine open habitats (MINELLI & ZAPPAROLI 1985; Zapparoli unpublished). Also in Slovenian *Lamio orvalae-Fagetum* and *Abieti-Fagetum dinaricum* forest communities (Kos 1996).

*L. agilis* is the most common species of centipede in the investigated wetlands, being sampled in all the localities but one. The material examined has been regularly collected in peat bog (12 sites, including 4 alkaline peat bogs) and in forest (10 sites, including riparian forest, 2 sites, and wet forest, 2 sites) habitats, rarely in damp meadow (2 sites).

Remarks. Previously known in Friuli Venezia Giulia only in two localities, Tarvisio (ATTEMS 1949; MINELLI 1991) and Mount Ioanaz, 900 m (ZAPPAROLI 1989), both in Udine province. The abounding material examined testifies the wide spread of the species in the area.

#### 4. *Lithobius (Lithobius) borealis* MEINERT, 1872

Material examined. – 15, UD, Tarvisio, Torbiera Scichizza (5): coniferous forest, 843 m, pt (3/3): 5.V/9.VI.2001, GC, 1 ♂, 1 ♀. – 17, UD, Pontebba, Torbiera di Pramollo (10): lower peat bog, 1,510 m, pt (3/3): 5.V/9.VI.2001, GC, 1 ♂, 1 ♀; higher peat bog, under *Alnus viridis* along a stream, 1,518 m, be: 9.VI.2001, AZ, ZA, GT, AT, GG, 1 ♂.

General distribution. Europe: Austria, Bosnia & Herzegovina?, Bulgaria, Czech Republic, Denmark (mainland, Faroe Is.), France (mainland), Germany, Great Britain, Ireland, Italy (mainland, Sicily), Liechtenstein?, Northern Ireland, Norway (mainland), Poland, Portugal (mainland), Romania, Slovak Republic, Slovenia, Spain (mainland), Sweden, Switzerland; North Africa: Algeria (BRÖLEMANN 1921 sub *L. lapidicola*, 1930, 1932 sub *L. lapidicola*; MACHADO 1952; EASON 1964, 1982; MATIC 1966; MATIC et al. 1967; WÜRMLI 1972; MEIDELL 1990; KOS 1992; WYTWER 1997; STOEV 1997, 2002; ORSZÁGH

2001; TAJOVSKÝ 2001; ZAPPAROLI et al. 2004; TUF & LAŠKA 2005; ZAPPAROLI & MINELLI 2005; NEGREA 2006; ANDERSON et al. 2008; BARBER 2009).

Distribution in Italy. Trentino-Alto Adige, Venetia, Friuli Venezia Giulia, Sicily. First records for Friuli Venezia Giulia. Chorotype. European.

Ecological notes. 843-1,600 m; the habitat of this species is generally poorly known, records from Sicily highlight its presence in Mediterranean environments (MINELLI & IOVANE 1982); records are known in north-eastern Italy from coniferous and broadleaved montane and submontane woods (*Picea*, *Larix*, *Fagus*) (Zapparoli unpublished). Not recorded in the Slovenian forest communities studied by Kos (1996).

The material examined has been collected in peat bog (2 sites) and in coniferous forest habitats (1 site) of two localities both located in the montane zone.

#### 5. *Lithobius (Lithobius) castaneus* NEWPORT, 1844

Material examined. – 2, UD, Porpetto, Palude Fraghis (3): alkaline peat bog, in tufts of *Cladium mariscus* and *Schoenus nigricans*, 8 m, be: 23.XI.2001, GT, 2 ♂♂. – 11, UD, Moruzzo, Torbiera di Borgo Pegoraro (18): peat bog, 185 m, pt (3/3): 8.IX/16.X.2001, GC, 1 ♀. – 12, UD, Pagnacco, Torbiera di Lazzacco (11): forest east, 195 m, pt (3/3): 10.V/21.VI.2001, GC, 1 ♂, 1 ♀. – 13, PN, Sequals, Torbiera di Sequals (6): forest, 200 m, pt (2/3): 8.IX/14.X.2001, GC, 1 ♂.

General distribution. Europe: Austria, Bosnia & Herzegovina, Bulgaria?, Croatia, France (mainland, Corsica), Italy (mainland, Sicily, Sardinia), Malta, Portugal (mainland), Serbia, Slovenia, Spain (mainland); North Africa: Algeria, Morocco, Tunisia; Central America: Guatemala (introduced).

Distribution in Italy. All regions except Aosta Valley and Apulia.

Chorotype. S-European.

Ecological notes. 8-2,300 m; a woodland species being common in a wide range of forest types, locally recorded in low plain *Quercus-Carpinetum boreoitalicum* (2 sites), and submontane to alpine *Orno-Ostryetum* (1 site), *Salvio-Fraxinetum* (1 site), *Abieti-Fagetum* (1 site), *Fagus* woods (4 sites), *Erico-Pinetum* (1 site) and *Piceetum montanum* (1 site). Also recorded in the Slovenian *Luzulo albidiae-Fagetum* and *Abieti-Fagetum dinaricum* forest communities (Kos 1996).

The material examined has been collected in peat bog (2 sites, including 1 alkaline peat bog) as well as in forest (2 sites) habitats, mostly in localities of the hill belt.

#### 6. *Lithobius (Lithobius) dentatus* C.L. KOCH, 1844

Material examined. – 14, UD, Ampezzo, Palude di Cima Corso (9): peat bog, under *Alnus glutinosa* in a spot without water, 839 m, be: 10.VI.2001, AZ, ZA, GT, AT, GG, 1 ♂; peat bog, 839 m, pt (3/3): 2.V/10.VI.2001, GC, 1 ♂; ibidem, idem (3/3): 6.IX/12.X.2001, GC, 2 ♂♂. – 15, UD, Tarvisio, Torbiera Scichizza (5): peat bog, 842 m, pt (5/5): 5.V/9.VI.2001, GC, 1 ♀; ibidem, idem (5/5): 2.IX/12.X.2001, GC, 1 ♂; coniferous forest, 843 m, pt (3/3): 5.V/9.VI.2001, GC, 1 ♀; ibidem, idem (3/3): 2.IX/12.X.2001, GC, 1 ♂, 1 ♀; damp meadow, 844 m, pt (3/3): 2.IX/12.X.2001, GC, 1 ♀. – 17, UD, Pontebba, Torbiera di Pramollo (10): higher peat bog, 1,518 m, pt (4/5): 9.VI/21.VII.2001, GC, 1 ♂; ibidem, idem (4/5): 2.IX/12.X.2001, GC, 1 ♀.

General distribution. Europe: Albania, Austria, Bosnia &

Herzegovina, Belgium, Bulgaria, Belarus, Switzerland, Czech Republic, Germany, France (mainland, Corsica?), Croatia, Hungary, Italy (mainland), Liechtenstein?, Luxembourg, The Netherlands, Romania, Slovenia, Slovak Republic, Ukraine (BRÖLEMANN 1930; REMY & HOFFMANN 1959; JEEKEL 1977; ZALESSKAJA 1978; EASON 1982; KOS 1992; GOLOVATCH & ZALESSKAJA 1996; STOEV 1997, 2000, 2002; GEOFFROY 2000; LOCK 2000; ORSÁGH 2001; TAJOVSKÝ 2001; DÁNYI 2005; TUF & LAŠKA 2005; ZAPPAROLI & MINELLI 2005; NEGREA 2006; PURGER et al. 2007; BERG et al. 2008).

Distribution in Italy. Liguria, Piedmont, Aosta Valley, Lombardy, Trentino-Alto Adige, Venetia, Friuli Venezia Giulia.

Chorotype. Central European.

Ecological notes. 150-2,060 m; mostly in montane and alpine woodlands, sometimes in open montane habitats; records in north-eastern Italy have been collected from *Orno-Ostryetum* (2 sites) to *Salvio-Fraxinetum* (1 site), *Abieti-Fagetum* (1 site), *Fagus* woods (4 sites), *Erico-Pinetum* (1 site), *Abies* woods (1 site), *Piceetum montanum* (1 site), *Rhododendro-hirsuti-Pinetum mugii* (1 site), *Larix* woods (1 site), *Piceetum subalpinum* (1 site); single records are known in *Seslerietum* and in peat bog habitats (*Sphagnetum magellanicum*) respectively. Also recorded in the Slovenian *Quercus-Luzulo-Fagetum*, *Bazzanio-Abietetum* and *Abieti-Fagetum dinaricum* forest communities (Kos 1996).

The material examined has been collected mostly in peat bog habitats (4 sites), rarely in coniferous forest (1 site) and in damp meadows (1 site) only in localities of the montane zone.

#### 7. *Lithobius (Lithobius) forficatus* (LINNAEUS, 1758)

Material examined. – 4, UD, Gonars, Paludi del Corno (4): alkaline peat bog, in tufts of *Schoenus nigricans*, 15 m, be: 23.XI.2001, GT, 1 ♀. – 5, UD, Talmassons, Risorgive di Flambro (12): forest, under *Quercus robur*, 22 m, be: 31.III.2001, AZ, AT, GT, GG, 1 ♂; forest, 22 m, pt (3/3): 4.IX/16.X.2001, GC, 1 ♂. – 6, UD, Bertiollo, Risorgive di Virco (16): wet forest, 23 m, pt (3/3): 4.IX/16.X.2001, GC, 1 ♂. – 7, UD, Majano, Torbiera di Casasola (7): damp meadow, 160 m, pt (4/4): 6.IX/14.X.2001, GC, 1 ♀. – 9, UD, Fagagna, Prati umidi dei Quadris (17): wet forest, 171 m, pt (3/3): 8.IX/14.X.2001, GC, 1 ♀ imm. – 10, UD, Rive d'Arcano, Prati di Col San Floreano (8): damp meadow, heap of vegetal debris, 180 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂, 1 imm. – 11, UD, Moruzzo, Torbiera di Borgo Pegoraro (18): peat bog, 185 m, pt (3/3): 8.IX/16.X.2001, GC, 1 ♂. – 13, PN, Sequals, Torbiera di Sequals (6): peat bog, 190 m, pt (1/3): 6.V/14.VI.2001, GC, 1 ♂, 1 ♀; ibidem, idem (3/5): 8.IX/14.X.2001, GC, 1 ♂. – 14, UD, Ampezzo, Palude di Cima Corso (9): forest, 839 m, pt (4/4): 2.V/10.VI.2001, GC, 1 ♀. – 15, UD, Tarvisio, Torbiera Scichizza (5): coniferous forest, 843 m, pt (3/3): 2.IX/12.X.2001, GC, 1 ♂, 1 ♂ imm. – 17, UD, Pontebba, Torbiera di Pramollo (10): lower peat bog, meadow with spring with Ciperaceae and Graminaceae, 1,510 m, be: 9.VI.2001, AZ, ZA, GT, AT, GG, 1 ♂.

General distribution. Europe: Albania, Austria, Belgium, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark (mainland, Faroe Is.), Finland, France (mainland, Corsica but introduced), Germany, Great Britain, Greece (mainland), Hungary, Iceland, Ireland, Italy (mainland, in Sicily and Sardinia but probably introduced), Malta?, Montenegro, Norway, Poland, Republic of Macedonia, Romania, Serbia, Slovak Republic, Slovenia, Sweden, Switzerland, The Netherlands; North Africa: Algeria (introduced?), Tunisia

(introduced?); West Asia: Georgia, Russia (Krasnodar Province), Turkey; East Asia: Kuriles Isl. (introduced); North America: Canada, Greenland, USA (introduced); South America (introduced); Pacific islands: Hawaii Isl. (introduced), Atlantic islands: St. Elena Is. (introduced).

Distribution in Italy. All mainland regions, probably introduced in Aeolian Isl., Lampedusa Is. and Sardinia.

Chorotype. European.

Ecological notes. 2-2,200 m; an euryecious, mostly anthropophilous, species, common in woodlands as well as in open and disturbed habitats; locally it has been recorded from coastal *Schoeneto-Erianthetum* (1 site) and *Phragmites australis* communities (1 site), to *Chondrilletum* ("magredo", the local name for a kind of dry meadows on alluvial deposits) (1 site) and low plain *Quercus-Carpinetum boreoitalicum* (3 sites), as well as along river banks (1 site), artificial pine-woods (1 site), vineyards (1 site), *Medicago sativa* (1 site) and *Zea mays* (1 site) agroecosystems, uncultivated areas (1 site) and meadows (1 site). Also recorded in the Slovenian *Bazzanio-Abietetum*, *Quercus-Luzulo-Fagetum*, *Luzulo albidiae-Fagetum* and *Abieti-Fagetum dinaricum* forest communities (Kos 1996).

One of the most common species of centipedes in the investigated wetlands, being sampled in 11 localities on 17 located in low plain as well as in hill belt and in montane zone. The material examined has been collected in forest habitat (5 sites including coniferous forest, 1 site) as well as in peat bogs (3 sites, including 1 alkaline peat bog) and damp meadows (3 sites). *L. forficatus* also occurs in peat bog habitats of the Ligurian Apennines ("Agoraie di Sopra e Moggetto" Nature Reserve: ZAPPAROLI 2009).

#### 8. *Lithobius (Lithobius) lapidicola* MEINERT, 1872

Material examined. – 1, GO, Monfalcone (15), Palude del Fiume Cavana: damp meadow, in tufts of Juncaceae, 1 m, be: 29.XI.2001, GT, FS, 1 ♂, 3 ♀♀, 3 ♀♀ imm., 16 ♂♂ imm.; forest, 1 m, pt (3/3): 20.V/26.VI.2001, GC, 2 ♂♂, 3 ♀♀. – 5, UD, Talmassons, Risorgive di Flambro (12): forest, 22 m, pt (3/3): 10.V/19.VI.2001, GC, 1 ♀. – 9, UD, Fagagna, Prati umidi dei Quadris (17): peat bog, in tufts of *Carex* sp., 171 m, be: 13.XI.2001, GT, 3 ♂♂; peat bog, 171 m, pt (3/3): 15.V/21.VI.2001, GC, 1 ♂, 4 ♀♀. – 11, UD, Moruzzo, Torbiera di Borgo Pegoraro (18): peat bog, 185 m, pt (3/3): 15.V/21.VI.2001, GC, 1 ♂; ibidem, idem (3/3): 8.IX/16.X.2001, GC, 3 ♂♂. – 13, PN, Sequals, Torbiera di Sequals (6): peat bog, under *Quercus* sp., 190 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 imm.; peat bog, 190 m, pt (1/3): 6.V/14.VI.2001, GC, 1 ♂ imm. – 15, UD, Tarvisio, Torbiera Scichizza (5): peat bog, in tufts of *Carex* cf. *fusca*, 842 m, be: 18.X.2001, GT, FS, 1 ♂.

General distribution. Europe: Albania, Austria, Bosnia & Herzegovina, Czech Republic, Denmark (mainland), France (mainland, Corsica), Germany, Great Britain, Greece (mainland, Ionic Isl.), Hungary, Ireland, Italy (mainland, Sicily, Sardinia), Montenegro, Norway, Poland, Romania, Slovak Republic, Slovenia, Spain (mainland, Canary Isl.), Sweden, Switzerland, The Netherlands, Ukraine.

Distribution in Italy. All regions except Aosta Valley, probably due to lack of research.

Chorotype. Central European.

Ecological notes. 1-1,700 m; an euryecious species; in north-eastern Italy it has been collected in a wide range of habitats, from coastal *Schoeneto-Erianthetum* (1 site) and *Phragmites australis* communities (1 site), to low plain *Quercus-Carpinetum*



*boreoitalicum* (1 site), submontane and montane *Orno-Ostryetum* (1 site) and *Abieti-Fagetum* (1 site); also recorded in artificial pine-woods (1 site), vineyards (1 site), uncultivated areas (1 site) and meadows (1 site). Also recorded in the Slovenian *Quercus-Luzulo-Fagetum*, *Luzulo albidiae-Fagetum*, *Asperulo-Carpinetum* and *Abieti-Fagetum dinaricum* forest communities (Kos 1996).

The material examined has been collected in peat bog (4 sites), forest (2 sites) and in damp meadow (1 site) habitats in localities of the low plain as well as the hill belt and montane zone. *L. lapidicola* also occurs in peat bog habitats of the Ligurian Apennines ("Agoraie di Sopra e Moggetto" Nature Reserve: ZAPPAROLI 2009).

9. *Lithobius (Lithobius)* sp. gr. *mutabilis* L. KOCH, 1862 - *latro* MEINERT, 1872

Material examined.

*Lithobius* cf. *mutabilis*: - 2, UD, Porpetto, Palude Fraghis (3): riparian forest, 8 m, pt (3/3): 4.IX/17.X.2001, GC, 5 ♂♂, 5 ♀♀, 7 ♂♂ imm., 7 ♀♀ imm.; alkaline peat bog, 8 m, pt (3/3): 15.V/26.VI.2001, GC, 5 ♂♂, 6 ♀♀, 1 ♀ imm.; ibidem, idem (3/3): 4.IX/17.X.2001, GC, 1 ♀. - 3, UD, Rivignano, Risorgive di Zarnicco (14): riparian forest, 13 m, pt (5/5): 10.V/19.VI.2001, GC, 2 ♂♂, 4 ♀♀; ibidem, idem (5/5): 4.IX/16.X.2001, GC, 2 ♂♂, 3 ♀♀. - 11, UD, Moruzzo, Torbiera di Borgo Pegoraro (18), peat bog, 185 m, pt (3/3): 8.IX/16.X.2001, GC, 1 ♂. - 12, UD, Pagnacco, Torbiera di Lazzacco (11): forest east, 195 m, pt (3/3): 8.IX/16.X.2001, GC, 1 ♂; forest west, under *Quercus robur* and *Alnus glutinosa*, 188 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂ imm.; peat bog east, under *Alnus glutinosa* in *Carex* cf. *elata* community, 188 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♀, 2 ♂♂ imm.; peat bog west, 184 m, pt (3/3): 8.IX/16.X.2001, GC, 1 ♂, 3 ♀♀. - 15, UD, Tarvisio, Torbiera Scichizza (5): coniferous forest, 843 m, pt (3/3): 5.V/9.VI.2001, GC, 1 ♂; peat bog, under *Alnus glutinosa* and *Berberis vulgaris*, 842 m, be: 9.VI.2001, AZ, ZA, GT, AT, GG, 1 ♂; peat bog, 842 m, pt (5/5): 5.V/9.VI.2001, GC, 1 ♀. - 16, UD, Tolmezzo, Torbiera di Curiedi (13): peat bog north-east, 851 m, in tufts of *Carex* sp., 851 m, be: 10.VI.2001, AZ, ZA, GT, AT, GG, 2 ♀♀, 1 imm., 2 larvae; peat bog north-east, 851 m, pt (2/3): 2.V/10.VI.2001, GC, 1 ♂; ibidem, idem (3/3): 6.IX/12.X.2001, GC, 1 ♂, 11 ♀♀; peat bog north-west, in tufts of *Carex* sp., 874 m, be: 29.X.2001, GT, 8 ♂♂ imm., 1 ♀ imm.; peat bog south-east, in tufts of *Carex* sp. and *Eriophorum* sp., 853 m, be: 29.X.2001, GT, 3 ♂♂ imm., 2 imm.; peat bog south-east, 853 m, pt (3/3): 2.V/10.VI.2001, GC, 1 ♂, 1 ♀; ibidem, idem (3/3): 6.IX/12.X.2001, GC, 1 ♂, 1 ♀.

*Lithobius* cf. *latro*: - 7, UD, Majano, Torbiera di Casasola (7): damp meadow, 160 m, pt (4/4): 6.V/14.VI.2001, GC, 1 ♀. - 10, UD, Rive d'Arcano, Prati di Col San Floreano (8): damp meadow, in tufts of *Schoenus nigricans*, 180 m, be: 13.XI.2001, GT, 1 ♂, 1 ♀; damp meadow, 180 m, pt (5/5): 8.IX/14.X.2001, GC, 1 ♂. - 13, PN, Sequals, Torbiera di Sequals (6): forest, 200 m, pt (2/3): 8.IX/14.X.2001, GC, 2 ♂♂; peat bog, 190 m, pt (1/3): 6.V/14.VI.2001, GC, 1 ♀. - 14, UD, Ampezzo, Palude di Cima Corso (9): forest, 839 m, pt (4/4): 2.V/10.VI.2001, GC, 1 ♂, 7 ♀♀; ibidem, idem (4/4): 6.IX/12.X.2001, GC, 2 ♂♂, 3 ♀♀, 5 ♂♂ imm.; peat bog, under *Alnus glutinosa* near water, 839 m, be: 10.VI.2001, AZ, ZA, GT, AT, GG, 1 ♀, 2 ♂♂ imm. - 15, UD, Tarvisio, Torbiera Scichizza (5): peat bog, in tufts of *Carex* cf. *fusca*, 842 m, be: 18.X.2001, GT, FS, 1 ♀. - 17,

UD, Pontebba, Torbiera di Pramollo (10): lower peat bog, 1,510 m, pt (3/3): 5.V/9.VI.2001, GC, 1 ♀; ibidem, idem (3/3): 2.IX/12.X.2001, GC, 1 ♂; higher peat bog, under *Alnus viridis* along a stream, 1,518 m, be: 9.VI.2001, AZ, ZA, GT, AT, GG, 1 ♂, 2 ♀♀, 2 ♀♀ imm.; higher peat bog, 1,518 m, pt (4/5): 9.VI/21.VII.2001, GC, 1 ♀; ibidem, idem (4/5): 2.IX/12.X.2001, GC, 2 ♀♀.

General distribution. *Lithobius mutabilis* and *L. latro* are currently known as widely distributed in central and south-eastern Europe, since both have been recorded in Austria, Bulgaria, Croatia, Czech Republic, Germany, Greece (mainland), Italy (mainland), Romania, Slovak Republic, Slovenia, Switzerland. *L. mutabilis* is also known from France (mainland), Hungary, Poland, Russia (southern), Serbia, Ukraine (including Crimea), Georgia, Turkey?, whereas *L. latro* has been also recorded in Albania and Ukraine (MATIC 1966; WÜRMLI 1972; ZALESSKAJA 1978; EASON 1982; KOS 1992; STOEV 1997, 2000, 2002; ORSZÁGH 2001; TAJOVSKÝ 2001; ZAPPAROLI 2002; DÁNYI 2005; ZAPPAROLI & MINELLI 2005; NEGREA 2006; PURGER et al. 2007).

Distribution in Italy. Records of *L. mutabilis* and *L. latro* are known from Piedmont, Lombardy, Trentino-Alto Adige, Venetia and Friuli Venezia Giulia. While records of *L. mutabilis* have been published also from all the peninsular regions but in Puglia, no data are known south of Po River for *L. latro*. Not recorded in Sardinia and Sicily.

Ecological notes. The recorded altitudinal range in NE Italy is between 8-2,218 m for *L. mutabilis* and 160-1,518 m for *L. latro*; according to MINELLI & IOVANE (1987), *L. mutabilis* (inclusive of *L. latro*) is probably most frequent in woodlands though also present in other habitats; in NE Italy it has been recorded in *Prunello-Chrysopogonetum* ("magredo") (1 site) and in submontane and alpine communities such as *Orno-Ostryetum* (1 site), *Salvio-Fraxinetum* (1 site), *Fagus* woods (1 site), *Rhododendro-hirsuti-Pinetum mugii* (1 site), *Larix* woods (1 site), *Piceetum subalpinum sphagnetosum* (1 site), *Piceetum subalpinum* (1 site), *Alnetum viridis* (1 site) and *Pinus cembra* woods (1 site). Records from the Slovenian *Vaccinio myrtilli-Pinetum*, *Luzulo albidiae-Fagetum* and *Abieti-Fagetum dinaricum* forest communities has been published by Kos (1996) under *L. latro*.

The material here assigned to *L. cf. mutabilis* has been collected in peat bog (9 sites, including 1 alkaline peat bog) and in forest (5 sites including coniferous forest, 1 site, and riparian forest, 1 site) habitats, in localities of the low plain as well of the hill belt and of the montane zone. The material here assigned to *L. cf. latro* has been mostly collected in peat bogs (5 sites), although specimens from damp meadow (2 sites) and forest (2 sites) habitats, in localities of the low plain as well as of the hill belt and of the montane zone has been sampled.

Remarks. Members of this group of species have been recorded in Friuli Venezia Giulia only in few localities probably due to lack of research: one cave, Grotta La Val, Pradis di Sotto, in Pordenone province (ZAPPAROLI 1989), as *L. mutabilis*, and five epigeic sites, Mount Arvenis (DI CAPORIACCO 1938) and Mount Matajur, 1,400 m (ZAPPAROLI 1989), both in Udine province, as *L. latro*, as well as Lusevera, Cesariis, and Moggio Udinese, Val Alba, in Udine province, and Grado, Belvedere, in Gorizia province, all under *L. mutabilis* s.l. (MINELLI 1991). The rich material here examined confirm the wide spread of the *Lithobius mutabilis-latro* group of species in the region.

The taxonomic relations between *L. mutabilis* and *L. latro* are not clear. According to VERHOEFF (1900) and BRÖLEMANN (1930) they represent two races of a same species separated one from another by morphological characters such as the general size (body length 10-15 mm in *L. mutabilis*, 8-11 mm in *L. latro*), the 15th accessory apical claw (present in *L. mutabilis*, absent in *L. latro*), the male secondary sexual modifications on the 14th and 15th legs (very similar but more obvious in *L. mutabilis* than in *L. latro*). ATTEMS (1895, 1929b, 1949, 1955, 1959) always consider *L. mutabilis* and *L. latro* as two separate species in his main reviews of the south-east European centipede fauna. MANFREDI (1936, 1948) alternatively considered *L. latro* as a subspecies of *L. mutabilis* or a distinct species. LOKSA (1955) regards *L. latro* as a subspecies of *L. mutabilis*. More recently, EASON (1974) consider *L. mutabilis* and *L. latro* as two distinct species, since MATIC (1966) has found the two forms to be sympatric in Romania, and he confirmed this view in his subsequent review of the north-west European species of Lithobiomorpha (EASON 1982).

The question of the conspecificity of *L. mutabilis* and *L. latro* has been raised again by MINELLI (1985), MINELLI & IOVANE (1987) and MINELLI (1991), but the problem is still unresolved and the two forms are considered as separate species in the most updated checklist and catalogues of the centipedes of Italy (FODDAI et al. 1995; ZAPPAROLI & MINELLI 2005) and other European countries (e.g. KOS 1992; STOEVI 1997, 2002; ORSZÁGH 2001; TAJOVSKÝ 2001; ZAPPAROLI 2002; SPELDA 2005; TUF & LAŠKA 2005; NEGREA 2006).

*L. mutabilis* and *L. latro* have been found in sympatric conditions also in other areas of their range, other than Romania, such as in Austria (KOREN 1992) and in Bulgaria (STOEVI 2002), and syntopic populations have been recorded in mainland Greece (ZAPPAROLI 2002) as well as in this study (Tarvisio: Torbiera Scichizza). The coexistence of *L. mutabilis* and *L. latro* in the same area and habitat, however, could not necessary be related to a specific separation between the two forms but it should be instead connected to a variation of supposed diagnostic characters (especially of the presence/absence of 15<sup>th</sup> accessory apical claw), as recently highlighted in some other species of *Lithobiidae*, such as *Hessebius barbipes* (PORAT, 1893) from Iran (EASON 1981), *Lithobius (Ezembius) martensi* EASON, 1989 and *L. (Monotarsobius) ausobskii* EASON, 1989 from Nepal Himalayas (EASON 1989), *L. (E.) redae* EASON, 1997 from Kirghizia (EASON 1997) and *L. (L.) tylopus* LATZEL, 1880 from peninsular Italy (ZAPPAROLI 2006). Pending of a revision of the two forms, *L. mutabilis* and *L. latro* are here considered as belonging to a same group of species whose records are however listed separately.

#### 10. *Lithobius (Lithobius) muticus* C.L. KOCH, 1847

Material examined. – 1, GO, Monfalcone, Palude del Fiume Cavana (15): forest, 1 m, pt (3/3): 20.V/26.VI.2001, GC, 1 ♂, 1 ♀; ibidem, idem (3/3): 4.IX/17.X.2001, GC, 1 ♀, 1 ♂ imm. – 3, UD, Rivignano, Risorgive di Zarnicco (14): alkaline peat bog, 13 m, pt (2/4): 4.IX/16.X.2001, GC, 1 ♂. – 5, UD, Talmassons, Risorgive di Flambro (12): alkaline peat bog, 21 m, pt (4/5): 4.IX/16.X.2001, GC, 2 ♂♂, 1 ♀; ibidem, idem (5/5): 10.V/19.VI.2001, GC, 2 ♂♂, 1 ♀. – 6, UD, Bertiole, Risorgive di Virco (16): alkaline peat bog, 23 m, pt (3/3):

10.V/19.VI.2001, GC, 2 ♀♀. – 11, UD, Moruzzo, Torbiera di Borgo Pegoraro (18): forest, 185 m, pt (3/3): 8.IX/16.X.2001, GC, 1 ♂; peat bog, 185 m, pt (3/3): 8.IX/16.X.2001, GC, 1 ♂. – 12, UD, Moruzzo, Torbiera di Lazzacco (11): damp meadow, 185 m, pt (3/4): 8.IX/16.X.2001, GC, 1 ♂; peat bog west, 184 m, pt (3/3): 10.V/21.VI.2001, GC, 1 ♂, 1 ♀, 2 ♂♂ imm., 1 ♀ imm. – 15, UD, Tarvisio, Torbiera Scichizza (5): peat bog, in tufts of *Carex cf. fusca*, 842 m, be: 9.VI.2001, AZ, ZA, GT, AT, GG, 1 ♀; peat bog, 842 m, pt (5/5): 5.V/9.VI.2001, GC, 1 ♂; ibidem, idem (5/5): 2.IX/12.X.2001, GC, 1 ♀. – 16, UD, Tolmezzo, Torbiera di Curiedi (13): peat bog north-east, in tufts of *Carex* sp., 851 m, be: 29.X.2001, GT, 3 ♂♂ imm., 1 ♀ imm., 6 imm.

General distribution. Europe: Albania, Austria, Belgium, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, France (mainland), Germany, Great Britain, Greece (mainland), Hungary, Italy (mainland), Liechtenstein?, Luxembourg, Poland, Republic of Macedonia, Romania, Slovak Republic, Slovenia, Spain (mainland), Switzerland, The Netherlands, Ukraine, Yugoslavia (BRÖLEMANN 1930; REMY & HOFFMANN 1959; EASON 1964, 1982; MATIC 1966; WÜRMLI 1972; ZALESSKAJA 1978; JEEKEL 1977; SALINAS PEREZ 1990; KOS 1992; VICENTE & SERRA 1992; STOEVI 1997, 2000, 2001, 2002; WYTWER 1997; LOCK 2000; ORSZÁGH 2001; TAJOVSKÝ 2001; ZAPPAROLI 2002; DÁNYI 2005; TUF & LAŠKA 2005; ZAPPAROLI & MINELLI 2005; NEGREA 2006; PURGER et al. 2007; BERG et al. 2008; BARBER 2009).

Distribution in Italy. Lombardy, Trentino-Alto Adige, Venetia, Friuli Venezia Giulia. Also in Liguria (Genova province: MANFREDI 1935) and Emilia-Romagna (Ravenna province, Cesena province: MANFREDI 1951; ZANGHERI 1966) but records need be confirmed.

Chorotype. European.

Ecological notes. 1-2,230 m; recorded in woodlands as well as in open alpine habitats; locally quoted in *Erico-Pinetum* (1 site), *Abies* woods (1 site), *Rhododendro-hirsuti-Pinetum mugii* (1 site), *Piceetum subalpinum sphagnetosum* (1 site), *Piceetum subalpinum* (1 site), *Seslerietum* (1 site), *Festucetum halleri* (1 site); one record from peat bog habitats (*Sphagnetum magellanicum*); also along river banks (1 site), in vineyards (1 site) and meadows (1 site). Not recorded in the Slovenian forest communities studied by Kos (1996).

The material examined has been collected mostly in peat bog (7 sites, including 3 alkaline peat bogs) habitats, rarely in forest (2 sites) and in damp meadow (1 site) habitats in localities of the low plain as well as the hill belt and montane zone.

#### 11. *Lithobius (Lithobius) nodulipes* LATZEL, 1880

Material examined. – 1, GO, Monfalcone, Palude del Fiume Cavana (15): forest, 1 m, pt (3/3): 20.V/26.VI.2001, GC, 4 ♂♂, 2 ♀♀; ibidem, idem (3/3): 4.IX/17.X.2001, GC, 11 ♂♂, 4 ♀♀. – 2, UD, Porpetto, Palude Fraghis (3): riparian forest, 8 m, pt (3/3): 15.V/26.VI.2001, GC, 1 ♀. – 3, UD, Rivignano, Risorgive di Zarnicco (14): riparian forest, 13 m, pt (5/5): 10.V/19.VI.2001, GC, 4 ♂♂, 1 ♀; ibidem, idem (5/5): 4.IX/16.X.2001, GC, 1 ♂. – 4, UD, Gonars, Paludi del Corno (4): forest, 16 m, pt (1/3): 15.V/21.VI.2001, GC, 2 ♂♂, 3 ♀♀, 2 ♂♂ imm.; ibidem, idem (2/3): 4.IX/16.X.2001, GC, 2 ♀♀. – 5, UD, Talmassons, Risorgive di Flambro (12): forest, 22 m, pt (3/3): 10.V/19.VI.2001, GC, 2 ♀♀; ibidem, idem (3/3): 4.IX/16.X.2001, GC, 5 ♂♂, 7 ♀♀, 2 ♂♂ imm., 1 ♀ imm. – 6, UD, Bertiole, Risorgive di Virco (16): wet forest, 23 m, pt (3/3): 4.IX/16.X.2001, GC,

1 ♀. – 7, UD, Majano, Torbiera di Casasola (7): forest, under and in hollow of *Salix* sp., 160 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂ imm.; forest, 160 m, pt (3/3): 6.IX/14.X.2001, GC, 7 ♂♂, 5 ♀♀. – 9, UD, Fagagna, Prati umidi dei Quadris (17): wet forest, 171 m, pt (3/3): 8.IX/14.X.2001, GC, 14 ♂♂, 5 ♀♀; peat bog, under *Alnus glutinosa* in *Carex* sp. community, 171 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂, 1 ♀; peat bog, in tufts of *Carex* sp., 171 m, be: 13.XI.2001, GT, 2 ♂♂ imm.; peat bog, 171 m, pt (3/3): 15.V/21.VI.2001, GC, 1 ♀ imm.; ibidem, idem (3/3): 8.IX/14.X.2001, GC, 8 ♂♂, 20 ♀♀. – 10, UD, Rive d'Arcano, Prati di Col San Floreano (8): damp meadow, 180 m, pt (5/5): 8.IX/14.X.2001, GC, 1 ♂. – 11, UD, Moruzzo, Torbiera di Borgo Pegoraro (18): peat bog, 185 m, pt (3/3): 8.IX/16.X.2001, GC, 2 ♂♂, 2 ♀♀, 1 ♂ imm., 1 ♀ imm. – 12, UD, Pagnacco, Torbiera di Lazzacco (11): forest east, 195 m, pt (3/3): 8.IX/16.X.2001, GC, 1 ♂; damp meadow, 185 m, pt (3/4): 8.IX/16.X.2001, GC, 1 ♂; peat bog west, in tufts of *Schoenus nigricans* near *Cladium mariscus*, 184 m, be: 13.XI.2001, GT, 1 ♂; peat bog west, 184 m, pt (3/3): 10.V/21.VI.2001, GC, 3 ♂♂ imm., 1 ♀ imm.; ibidem, idem (3/3): 8.IX/16.X.2001, GC, 1 ♂, 1 ♀. – 13, PN, Sequals, Torbiera di Sequals (6): forest, in tufts of *Carex* sp., 200 m, be: 29.X.2001, GT, 1 ♂, 2 ♀♀; forest, 200 m, pt (2/3): 6.V/14.VI.2001, GC, 1 ♀; ibidem, idem (2/3): 8.IX/14.X.2001, GC, 5 ♂♂. – 14, UD, Ampezzo, Palude di Cima Corso (9): peat bog, under *Alnus glutinosa* in a spot without water, 839 m, be: 10.VI.2001, AZ, ZA, GT, AT, GG, 2 ♂♂. – 15, UD, Tarvisio, Torbiera Scichizza (5): damp meadow, 844 m, pt (3/3): 5.V/9.VI.2001, GC, 1 imm..

General distribution. Europe: Austria, Bosnia & Herzegovina, Czech Republic, Germany, Hungary, Italy (mainland), Liechtenstein?, Romania, Slovenia, Switzerland (MATIC 1966; WÜRMLI 1972; EASON 1982; KOS 1992; STOEV 1997; TAJOVSKÝ 2001; DÁNYI 2005; TUF & LAŠKA 2005; ZAPPAROLI & MINELLI 2005; NEGREA 2006; PURGER et al. 2007).

Distribution in Italy. Lombardy, Trentino-Alto Adige, Venetia, Friuli Venezia Giulia; one record from Emilia-Romagna (Parma province: MINELLI & ZAPPAROLI 2005).

Chorotype. Central European.

Ecological notes. 1-2,125 m; a species recorded in a wide range of habitats from the sea level to the montane and alpine habitats; locally known in coastal *Tortulo ruralis-Scabiosetum argenteae* (dune heath) (1 site), *Schoeneto-Erianthetum* (1 site) and *Phragmites australis* communities (1 site), where it has been probably fluitated during floods from more internal and montane areas (GLEREAN 2004); also present in *Orno-Ostryetum* (1 site), *Salvio-Fraxinetum* (1 site), *Fagus* woods (2 sites), *Larix* woods (1 site), *Alnetum viridis* (1 site), *Festucetum variaae* (1 site); some records are known from artificial pine-woods (1 site) and uncultivated areas (1 site). Also recorded in the Slovenian *Quercus-Luzulo-Fagetum*, *Asperulo-Carpinetum* and *Abieti-Fagetum dinaricum* forest communities (KOS 1996).

One of the most common species of centipedes in the investigated wetlands, being sampled in 14 localities on 17 located especially in low plain and hill belt but also in montane zone, although less frequent. The material examined has been collected mostly in forest habitats (10 sites including riparian forest, 2 sites, and wet forest, 2 sites); the species is also present in peat bogs (4 sites) and in damp meadows (3 sites).

## 12. *Lithobius (Lithobius) pelidnus* HAASE, 1880

Material examined. – 15, UD, Tarvisio, Torbiera Scichizza

(5): coniferous forest, 843 m, pt (3/3): 5.V/9.VI.2001, GC, 1 ♂.

General distribution. Europe: Austria, Belgium, Bulgaria, Central European Russia, Czech Republic, France (mainland), Germany, Italy (mainland), Liechtenstein?, Poland, Romania, Slovak Republic, Slovenia, Sweden, Switzerland, The Netherlands, Ukraine; West Asia: Caucasus? (BRÖLEMANN 1930; MATIC 1966; WÜRMLI 1972; JEEKEL 1977; ZALESSKAJA 1978; GOLOVATCH & ZALESSKAJA 1996; EASON 1982; KOREN 1992; KOS 1992; STOEV 1997, 2002; WYTWER 1997; LOCK 2000; ORSZÁGH 2001; TAJOVSKÝ 2001; IORIO & GEOFFROY 2004; TUF & LAŠKA 2005; ZAPPAROLI & MINELLI 2005; ANDERSON et al. 2008; NEGREA 2006; BERG et al. 2008).

Distribution in Italy. Trentino-Alto Adige, Friuli Venezia Giulia. Only known from few localities.

Chorotype. European.

Ecological notes. 843-900 m; no published records are known on the habitat of this species in Italy; some data have been collected in montane ecosystems of north-eastern Italy (Trentino, 1,850-2,200 m), mostly in coniferous woods (*Larix*, *Picea*, *Pinus*) but also in open stony habitats (Zapparoli unpublished), confirming the few records available from other European countries such as Poland (WYTWER 2000), Austria (KOREN 1992), Bulgaria (STOEV 2002) and Romania (MATIC 1966). *L. pelidnus* shows a clear preference for a combination of wet and humid habitats with high vegetation cover in Eastern Germany according to VOIGTLÄNDER (2005). Arborescent according to SPELDA (1999a). Not recorded in the Slovenian forest communities studied by KOS (1996).

The only specimen examined in this study has been collected in coniferous forest (1 site) in a locality of the montane zone.

## 13. *Lithobius (Lithobius) salicis* VERHOEFF, 1925

Material examined. – 12, UD, Moruzzo, Torbiera di Lazzacco (11): damp meadow, 185 m, pt (2/4): 10.V/21.VI.2001, GC, 1 ♂.

General distribution. Europe: Czech Republic, France?, Italy (mainland), Slovak Republic? (ORSZÁGH 2001; TAJOVSKÝ 2001; MINELLI & ZAPPAROLI 1985; TUF & LAŠKA 2005; ZAPPAROLI & MINELLI 2005).

Distribution in Italy. Aosta Valley, Piedmont, Liguria, Lombardy, Venetia, Friuli Venezia Giulia.

Chorotype. S-European.

Ecological notes. 2-185 m; a species poorly known from the general ecological point of view (MINELLI & IOVANE 1982), the only available records in Italy have been collected in north-eastern regions, in coastal *Schoeneto-Erianthetum* (1 site) and *Phragmites australis* communities (1 site) and in low plain *Quercus-Carpinetum boreoitalicum* (1 site); one record is also known from artificial pine-woods (1 site).

The only specimen examined has been collected in damp meadow (1 site) in a locality of the hill belt.

## 14. *Lithobius (Lithobius) tricuspis* MEINERT, 1872

Material examined. – 14, UD, Ampezzo, Palude di Cima Corso (9): forest, 839 m, pt (4/4): 2.V/10.VI.2001, GC, 1 ♂, 2 ♀♀; ibidem, idem (4/4): 6.IX/12.X.2001, GC, 2 ♂♂, 3 ♀♀; peat bog, under *Alnus glutinosa* near water, 839 m, be: 10.VI.2001, AZ, ZA, GT, AT, GG, 1 ♀.

General distribution. Europe: Austria, Belgium, Great Brit-



ain, Bulgaria?, Croatia, Czech Republic, Denmark (mainland), France (mainland, Corsica), Germany, Hungary, Italy (mainland, Sicily), Luxembourg, Poland, Slovak Republic, Slovenia, Spain (mainland), Switzerland, The Netherlands, Ukraine.

Distribution in Italy. All regions except Campania, Basilicata, Apulia and Sardinia.

Chorotype. Central European.

Ecological notes. 150-2,250 m; mostly a woodland species, seldom in alpine grasslands; locally quoted in *Orno-Ostryetum* (2 sites), *Salvio-Fraxinetum* (1 site), *Abieti-Fagetum* (1 site), *Fagus* woods (3 sites), *Erico-Pinetum* (1 site), *Abies* woods (3 sites), *Piceetum montanum* (1 site), *Rhododendro-hirsuti-Pinetum mugii* (1 site), *Piceetum subalpinum sphagnetosum* (1 site), *Piceetum subalpinum* (1 site); one record from *Seslerietum*. Also recorded in the Slovenian *Asperulo-Carpinetum* forest communities (Kos 1996).

The material examined has been collected in forest (1 site) and in peat bog (1 site) in a locality of the montane zone. *L. tricuspis* also occurs in peat bog habitats of the Ligurian (Riserva Naturale "Agoraie di Sopra e Moggetto") and Emilian ("Guadine Pradaccio" Nature Reserve) Apennines (ZAPPAROLI 2009).

#### 15. *Lithobius (Lithobius) validus* MEINERT, 1872

Material examined. – 1, GO, Monfalcone, Palude del Fiume Cavana (15): forest, 1 m, pt (3/3): 20.V/26.VI.2001, GC, 4 ♂♂, 7 ♀♀; ibidem, idem (3/3): 4.IX/17.X.2001, GC, 1 ♂, 6 ♀♀. – 3, UD, Rivignano, Risorgive di Zarnicco (14): riparian forest, 13 m, pt (5/5): 10.V/19.VI.2001, GC, 2 ♂♂, 2 ♀♀, 2 ♂♂ imm., 1 ♀ imm.; ibidem, idem (5/5): 4.IX/16.X.2001, GC, 1 ♂. – 4, UD, Gonars, Paludi del Corno (4): forest, 16 m, pt (1/3): 15.V/21.VI.2001, GC, 3 ♀♀, 1 ♂ imm., 2 ♀♀ imm.; ibidem, idem (2/3): 4.IX/16.X.2001, GC, 1 ♂ imm. – 5, UD, Talmassons, Risorgive di Flambro (12): forest, 22 m, pt (3/3): 10.V/19.VI.2001, GC, 2 ♂♂, 1 ♀. – 7, UD, Majano, Torbiera di Casasola (7): forest, under and in hollow of *Salix* sp., 160 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂; peat bog, under *Salix* sp. and *Alnus glutinosa*, 162 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂. – 11, UD, Moruzzo, Torbiera di Borgo Pegoraro (18): forest, 185 m, pt (3/3): 8.IX/16.X.2001, GC, 1 ♀. – 12, UD, Pagnacco, Torbiera di Lazzacco (11): forest east, 195 m, pt (3/3): 10.V/21.VI.2001, GC, 1 ♂; ibidem, idem (3/3): 8.IX/16.X.2001, GC, 1 ♀.

General distribution. Europe: Albania, Austria, Bosnia & Herzegovina, Croatia, Czech Republic, France (mainland), Southern Germany, Hungary, Italy (mainland), Poland, Portugal (mainland), Romania, Slovak Republic, Slovenia, Spain (mainland), Switzerland, Ukraine, Yugoslavia; West Asia: Caucasus, Turkey (northern).

Distribution in Italy. Piedmont, Lombardy, Trentino-Alto Adige, Venetia, Friuli Venezia Giulia, Marches, Latium?, Campania, Basilicata, Calabria.

Chorotype. S-European.

Ecological notes. 2-2,080 m; mostly a woodland species, rarely recorded over the tree line; locally is known in low plain *Quercus-Carpinetum boreoitalicum* (2 sites) as well as in montane *Fagus* (1 site) and *Abies* woods (1 site); one record from *Seslerietum*. Also quoted in the Slovenian *Quercus-Luzulo-Fagetum* forest communities (Kos 1996).

The material examined has been collected mostly in forest habitats (6 sites), including riparian forest (1 site); one record from peat bog (1 site) in localities of the low plain and the hill belt.

#### 00. *Lithobius (Lithobius)* spp.

Material examined. – 1, GO, Monfalcone, Palude del Fiume Cavana (15): forest, 1 m, pt (3/3): 20.V/26.VI.2001, GC, 2 ♂♂ imm., 1 ♀ imm.; ibidem, idem (3/3): 4.IX/17.X.2001, GC, 1 ♂ imm., 1 ♀ (*L. mutabilis*?); ibidem, idem (3/3): 4.IX/17.X.2001, GC, 2 imm., 1 larva; in *Phragmites* sp. [*P. australis*] community (brackish), 0 m, pt (3/3): 20.V/26.VI.2001, GC, 1 ♂ imm., 1 ♀ imm. – 2, UD, Porpetto, Palude Fraghis (3): alkaline peat bog, 8 m, pt (3/3): 15.V/26.VI.2001, GC, 1 ♂ imm.; alkaline peat bog, in tufts of *Cladium mariscus* and *Schoenus nigricans*, 8 m, be: 23.XI.2001, GT, 1 ♂ (*L. mutabilis*?); alkaline peat bog, in tufts of *Cladium mariscus*, 8 m, be: 1.IV.2001, AZ, GT, AT, GG, 1 ♂ imm.; forest, 8 m, pt (3/3): 4.IX/17.X.2001, GC, 1 larva. – 3, UD, Rivignano, Risorgive di Zarnicco (14): riparian forest, 13 m, pt (5/5): 10.V/19.VI.2001, GC, 2 ♂♂ imm., 1 ♀ imm.; ibidem, idem (5/5): 4.IX/16.X.2001, GC, 3 imm. – 4, UD, Gonars, Paludi del Corno (4): alkaline peat bog, in tufts of *Schoenus nigricans*, 15 m, be: 23.XI.2001, GT, 2 imm.; alkaline peat bog, under *Alnus glutinosa*, 15 m, be: 1.IV.2001, AZ, AT, GT, GG, 2 imm.; alkaline peat bog, 15 m, pt (2/3): 15.V/21.VI.2001, GC, 1 ♂ imm. – 5, UD, Talmassons, Risorgive di Flambro (12): alkaline peat bog, under *Salix* cf. *purpurea* in *Schoenus* sp., 21 m, be: 31.III.2001, AZ, GT, AT, GG, 3 imm., 3 larvae; forest, 22 m, pt (3/3): 10.V/19.VI.2001, GC, 1 ♂ imm. (*L. agilis*?). – 6, UD, Bertiole, Risorgive di Virco (16): alkaline peat bog, 23 m, pt (3/3): 10.V/19.VI.2001, GC, 2 ♂♂ imm.; alkaline peat bog, in tufts of *Carex* cf. *gracilis* with *Schoenus nigricans*, 23 m, be: 26.XI.2001, GT, FS, 1 imm.; alkaline peat bog, under *Alnus glutinosa* in *Schoenus* sp. community, 23 m, be: 31.III.2001, AZ, GT, AT, GG, 20 imm.; wet forest, 23 m, pt (3/3): 10.V/19.VI.2001, GC, 1 ♂; wet forest, under *Alnus glutinosa*, 23 m, be: 31.III.2001, AZ, GT, AT, GG, 3 imm. – 7, UD, Majano, Torbiera di Casasola (7): damp meadow, 160 m, pt (4/4): 6.V/14.VI.2001, GC, 1 imm.; forest, 160 m, pt (3/3): 6.IX/14.X.2001, GC, 1 ♂, 5 ♀♀ (*L. salicis*?); ibidem, idem (3/3): 6.IX/14.X.2001, GC, 8 imm.; forest, under and in hollow of *Salix* sp., 160 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 22 imm.; peat bog, 162 m, pt (3/3): 10.V/14.VI.2001, GC, 2 larvae; ibidem, idem, pt (3/3): 6.IX/14.X.2001, GC, 9 imm.; peat bog, under *Salix* sp. and *Alnus glutinosa*, 162 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 8 ♂♂, 3 ♀♀, 19 imm. – 8, UD, Buia, Palude di Fontana Abisso (2): peat bog, 163 m, pt (3/5): 6.IX/14.X.2001, GC, 8 imm., 2 larvae (*L. agilis*?); ibidem, idem, pt (5/5): 6.V/14.VI.2001, GC, 5 imm., 8 larvae (*L. agilis*?); peat bog, under *Alnus glutinosa*, 163 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 8 imm., 8 larvae (*L. agilis*?); peat bog, under *Salix* sp., 163 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 6 imm. (*L. agilis*?). – 9, UD, Fagagna, Prati umidi dei Quadris (17): peat bog, 171 m, pt (3/3): 15.V/21.VI.2001, GC, 2 ♂♂, 2 larvae; ibidem, idem, pt (3/3): 8.IX/14.X.2001, GC, 2 ♀♀, 4 imm.; peat bog, in tufts of *Carex* sp., 171 m, be: 13.XI.2001, GT, 5 imm.; peat bog, under *Alnus glutinosa* in *Carex* sp. community, 171 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂ imm., 1 imm.; wet forest, 171 m, pt (3/3): 15.V/21.VI.2001, GC, 1 ♂ imm., 1 ♀, 1 ♀ imm. (*L. mutabilis*?); ibidem, idem, pt (3/3): 8.IX/14.X.2001, GC, 5 imm.; wet forest, under *Alnus glutinosa*, 171 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂ imm. (*L. lapidicola*?). – 10, UD, Rive d'Arcano, Prati di Col San Floreano (8): damp meadow, 180 m, pt (5/5): 15.V/21.VI.2001, GC, 3 ♂♂, 2 ♀♀; ibidem, idem, pt (5/5): 8.IX/14.X.2001, GC, 3 imm.; damp meadow, heap of vegetal debris, 180 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂ imm.; damp meadow,

under *Alnus glutinosa* in *Schoenus* sp. community, 180 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 2 imm. – **11**, UD, Moruzzo, Torbiera di Borgo Pegoraro (18): forest, 185 m, pt (3/3): 15.V/21.VI.2001, GC, 1 ♂; peat bog, 185 m, pt (3/3): 8.IX/16.X.2001, GC, 2 ♂♂. – **12**, UD, Moruzzo, Torbiera di Lazzacco (11): damp meadow, 185 m, pt (3/4): 8.IX/16.X.2001, GC, 1 imm.; forest east, 195 m, pt (3/3): 10.V/21.VI.2001, GC, 1 ♂ imm., 1 ♀ imm.; forest west, under *Quercus robur* and *Alnus glutinosa*, 188 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 2 ♂♂ imm., 8 ♀♀ imm. 2 larvae; peat bog west, 184 m, pt (3/3): 8.IX/16.X.2001, GC, 7 imm.; peat bog west, in tufts of *Schoenus nigricans* near *Cladium mariscus*, 184 m, be: 13.XI.2001, GT, 2 imm.; ibidem, idem, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ex. (*L. agilis*?). – **13**, PN, Sequals, Torbiera di Sequals (6): forest, in tufts of *Carex* sp., 200 m, be: 29.X.2001, GT, 5 imm.; peat bog, 190 m, pt (3/5): 8.IX/14.X.2001, GC, 1 imm.; peat bog, in tufts of *Carex* sp. and *Molinia caerulea*, 190 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 2 larvae; ibidem, idem, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ♀ imm., 1 imm.; peat bog, in tufts of *Carex* sp. and *Molinia caerulea*, 190 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂ imm., 1 ♀; peat bog, under *Betula* sp. and *Castanea sativa* with *Calluna vulgaris*, 190 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 imm. 2 larvae. – **15**, UD, Tarvisio, Torbiera Scichizza (5): coniferous forest, 843 m, pt (3/3): 5.V/9.VI.2001, GC, 1 ♀ imm.; ibidem, idem, pt (3/3): 2.IX/12.X.2001, GC, 3 ♀♀ (*L. mutabilis*?); damp meadow, 844 m, pt (3/3): 2.IX/12.X.2001, GC, 1 ♀; peat bog, in tufts of *Carex cf. fusca*, 842 m, be: 18.X.2001, GT, FS, 3 imm. – **16**, UD, Tolmezzo, Torbiera di Curiedi (13): peat bog north-east, under *Salix* sp. and *Alnus glutinosa* in *Carex* sp. community, 851 m, be: 10.VI.2001, AZ, ZA, GT, AT, GG, 6 imm., 3 larvae; peat bog north-west, in tufts of *Carex* sp., 874 m, be: 10.VI.2001, AZ, ZA, GT, AT, GG, 3 imm.; ibidem, idem, be: 29.X.2001, GT, 27 imm. – **17**, UD, Pontebba, Torbiera di Pramollo (10): peat bog (upper), in tufts of *Carex* sp.? with *Viola* sp., mosses and Gramineae, 1,518 m, be: 9.VI.2001, AZ, ZA, GT, AT, GG, 1 ♂, 1 ♀ imm.; ibidem, idem, be: 18.X.2001, GT, FS, 2 imm.

Remarks. Quotations based on immature or mutilated specimens of uncertain identity, giving evidence on the presence in the sampled habitats.

Subgenus *Monotarsobius* VERHOEFF, 1905

16. *Lithobius (Monotarsobius) aeruginosus* L. KOCH, 1862

Material examined. – 3, UD, Rivignano, Risorgive di Zarnicco (14): riparian forest, 13 m, pt (5/5): 10.V/19.VI.2001, GC, 1 ♂. – **9**, UD, Fagagna, Prati umidi dei Quadris (17): wet forest, under *Quercus robur*, 171 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂; peat bog, mole (*Talpa* sp.) burrow, 171 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂; peat bog, 171 m, pt (3/3): 8.IX/14.X.2001, GC, 1 ♂. – **10**, UD, Rive d'Arcano, Prati di Col San Floreano (8): damp meadow, in heap of vegetal debris, 180 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 2 ♂♂, 1 ♀; damp meadow, debris from rotten *Populus*, 180 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 3 ♂♂.

General distribution. Europe: Albania, Austria, Belgium, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, France (mainland), Germany, Greece (mainland, Crete?), Hungary, Italy (mainland), Liechtenstein?, Luxembourg?, Romania, Slovak Republic, Slovenia, Spain (Balearic Is.), Switzerland, The Netherlands, Ukraine; West Asia: Iran, Turkey (BRÖLEMANN 1930; REMY & HOFFMANN 1959; MATIC

1966; WÜRMLI 1972; NEGREA & MATIC 1973; JEEKEL 1977; ZALESKAJA 1978; EASON 1982; KOS 1992; STOEV 1997, 2000, 2002; LOCK 2000; ORSZÁGH 2001; TAJOVSKÝ 2001; ZAPPAROLI 1986, 1999, 2002; DÁNYI 2005; TUF & LAŠKA 2005; ZAPPAROLI & MINELLI 2005; NEGREA 2006; BERG et al. 2008).

Distribution in Italy. Piedmont, Lombardy, Trentino-Alto Adige, Venetia, Friuli Venezia Giulia, Emilia-Romagna.

Chorotype. Central European.

Ecological notes. 2-1,450 m; a species poorly known from the general ecological point of view (MINELLI & IOVANE 1982), probably mostly related to woodlands; the few local data have been collected in low plain *Quercus-Carpinetum boreoitalicum* (2 sites); one record from *Zea mays* agroecosystems; materials from *Fagus* woods (4 sites) and pastures (2 sites) have been also examined from some submontane and montane localities (600-1,450 m) of south-eastern Alps (ZAPPAROLI unpublished). Also recorded in the Slovenian *Bazzanio-Abietetum*, *Vaccinio myrtilli-Pinetum*, *Quercus-Luzulo-Fagetum*, *Luzulo albidiae-Fagetum*, *Asperulo-Carpinetum*, *Lamio orvalae-Fagetum* and *Abieti-Fagetum dinaricum* forest communities (Kos 1996).

The material examined has been collected in a wide type of habitats, from damp meadows (2 sites), to riparian forests (1 site), wet forests (1 site) and peat bogs (1 site) in localities of the low plain and hill belt.

Subgenus *Sigibius* CHAMBERLIN, 1913

17. *Lithobius (Sigibius) burzenlandicus* VERHOEFF, 1931

Material examined. – 2, UD, Porpetto, Palude Fraghis (3): alkaline peat bog, mud at *Cladium mariscus* base, 8 m, be: 1.IV.2001, AZ, AT, GT, GG, 1 ♀.

General distribution (inclusive of *L. b. wardaranus* (VERHOEFF, 1937) and *L. b. euxinicus* (PRUNESCU, 1965)). Europe: Albania?, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Croatia, Hungary, Italy (mainland?), Poland, Republic of Macedonia, Romania, Slovenia, Slovak Republic, Yugoslavia (LOKSA 1955; MATIC 1966; KOS 1992; STOEV 1997, 2000, 2001, 2002; WYTWER 1997; ORSZÁGH 2001; TAJOVSKÝ 2001; TUF & LAŠKA 2005; ZAPPAROLI & MINELLI 2005; NEGREA 2006).

Distribution in Italy. The few records from Italy (Venetia, Abruzzo, Apulia) are uncertain and need be revised.

Chorotype. S-European.

Ecological notes. Records range between 2-560 m; habitat preferences almost unknown, probably euryecious (cf. STOEV 2002). Not recorded in the Slovenian forest communities studied by Kos (1996).

The only specimen examined in this study is assigned to this species tentatively; it has been collected in alkaline peat bog habitats of the low plain (1 site).

18. *Lithobius (Sigibius) microps* MEINERT, 1868

Material examined. – 3, UD, Rivignano, Risorgive di Zarnicco (14): riparian forest, 13 m, pt (5/5): 4.IX/16.X.2001, GC, 1 ♂.

General distribution. Europe: Albania, Belgium, Bosnia & Herzegovina?, Bulgaria, Croatia?, Denmark (mainland), Finland, France (mainland), Germany, Great Britain, Greece (mainland and insular), Ireland, Italy (mainland, Sicily, Sardinia), Republic of Macedonia, Norway, Poland, Portugal (mainland), Romania, Serbia?, Spain (mainland, Balearic

Isl.), Sweden, Switzerland, The Netherlands, Ukraine; north European populations are mainly synanthropic; West Asia: Turkey; North America: Newfoundland (introduced), New England (introduced?).

Distribution in Italy. Piedmont, Lombardy, Venetia, Liguria, Emilia-Romagna, Marches, Tuscany, Latium, Abruzzi, Campania, Basilicata, Apulia, Calabria, Sicily, Sardinia.

Chorotype. European.

Ecological notes. 13-1,100 m; quoted as common in some Mediterranean environments (MINELLI & IOVANE 1982), the habitat of this species in Italy is generally poorly known; in north-eastern regions only few records from vineyards (2 sites) are known. Not recorded in the Slovenian forest communities studied by Kos (1996).

The only specimen examined has been collected in riparian forests habitat (1 site) of the low plain.

Order SCOLOPENDROMORPHA POCOCK, 1895

Family CRYPTOPIIDAE KOHLRAUSCH, 1881

*Cryptops* LEACH, 1815

Subgenus *Cryptops* LEACH, 1815

#### 19. *Cryptops (Cryptops) anomalans* NEWPORT, 1844

Material examined. – 1, GO, Monfalcone, Palude del Fiume Cavana (15): in *Phragmites* sp. [*P. australis*] community (brackish), 0 m, pt (3/3): 20.V/26.VI.2001, GC, 1 ex..

General distribution. Europe: Albania, Austria, Belgium, Bosnia & Herzegovina, Bulgaria, Croatia, European Turkey, France (mainland, Corsica), Germany, Great Britain (introduced), Greece (mainland and insular, including Crete), Hungary, Italy (mainland, Sicily), Republic of Macedonia, Montenegro, Romania, Ukraine (including Crimea), Serbia, Slovak Republic, Slovenia, Spain (mainland), Switzerland, The Netherlands; North Africa: Algeria, Morocco, Tunisia; North America: Canada (introduced), USA (introduced).

Distribution in Italy. Piedmont, Lombardy, Venetia, Trentino-Alto Adige, Friuli Venezia Giulia, Liguria, Emilia-Romagna, Marches, Tuscany, Umbria, Latium, Abruzzo, Molise, Campania, Basilicata, Calabria, one record from Sicily.

Chorotype. S-European.

Ecological notes. 0-1,800 m; a mostly mesophilous woodland species, few records from agroecosystems; although no data have been published for north-eastern Italy, this species has been collected in some *Fagus* woods of south-eastern Alps (Zapparoli unpublished). Not recorded in the Slovenian forest communities studied by Kos (1996).

The only specimen examined has been collected in a *Phragmites australis* community (1 site) of the low plain. The presence of *C. anomalans* in localities at low elevation above the sea level is unusual and could be related to fluitation during floods of individuals from more internal and montane areas as suspected for other centipedes (see also *L. nodulipes*, *S. acuminata*) and soil Coleoptera (GLERAN 2004).

#### 20. *Cryptops (Cryptops) hortensis* (DONOVAN, 1810)

Material examined. – 2, UD, Porpetto, Palude Fraghis (3): in *Phragmites* sp. [*P. australis*] community, under *Alnus glutinosa*, 8 m, be: 1.IV.2001, AZ, AT, GT, GG, 1 ad., 8 imm. – 3, UD, Rivignano, Risorgive di Zarnicco (14): alkaline peat bog, under *Alnus glutinosa* in *Schoenus* community, 13 m,

be: 31.III.2001, AZ, AT, GT, GG, 5 imm.; alkaline peat bog, in tufts of *Schoenus nigricans*, 13 m, be: 31.III.2001, AZ, AT, GT, GG, 1 ex. – 4, UD, Gonars, Paludi del Corno (4): forest, under *Alnus glutinosa*, 16 m, be: 1.IV.2001, AZ, AT, GT, GG, 2 exx.; alkaline peat bog, in tufts of *Schoenus nigricans*, 15 m, be: 1.IV.2001, AZ, AT, GT, GG, 1 imm.; alkaline peat bog, in tufts of *Schoenus nigricans*, 15 m, be: 23.XI.2001, GT, 1 imm. – 5, UD, Talmassons, Risorgive di Flambro (12): forest, under *Quercus robur*, 22 m, be: 31.III.2001, AZ, AT, GT, GG, 30 imm.; alkaline peat bog, under *Salix* cf. *purpurea* in *Schoenus* community, 21 m, be: 31.III.2001, AZ, AT, GT, GG, 1 imm. – 6, UD, Bertiole, Risorgive di Virco (16): wet forest, under *Alnus glutinosa*, 23 m, be: 31.III.2001, AZ, AT, GT, GG, 6 imm.; wet forest, 23 m, pt (3/3): 4.IX/16.X.2001, GC, 1 imm.; alkaline peat bog, under *Alnus glutinosa* in *Schoenus* community, 23 m, be: 31.III.2001, AZ, AT, GT, GG, 2 ad., 6 imm.; alkaline peat bog, in tufts of *Carex* cf. *gracilis* with *Schoenus nigricans*, 23 m, be: 26.XI.2001, GT, FS, 4 imm. – 9, UD, Fagagna, Prati umidi dei Quadris (17): wet forest, under *Alnus glutinosa*, 171 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 imm. – 14, UD, Ampezzo, Palude di Cima Corso (9): peat bog, under *Alnus glutinosa* in a spot without water, 839 m, be: 10.VI.2001, AZ, ZA, GT, AT, GG, 7 exx..

General distribution. Europe: Albania, Austria, Belgium, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark (mainland), Finland, France (mainland, Corsica), Germany, Great Britain, Greece (mainland and insular, including Crete), Hungary, Iceland, Ireland, Italy (mainland, Sicily, Sardinia), Republic of Macedonia, Montenegro, Norway, Poland, Portugal (mainland, Azores Isl., Madeira Is.), Romania, Russia (European), Slovak Republic, Slovenia, Spain (mainland, Canary Isl.), Switzerland, Sweden, The Netherlands, Ukraine; North Africa: Morocco; West Asia: Armenia, Azerbaijan, Georgia, Turkey (northern), Tadjikistan, Turkmenistan, Uzbekistan; North America: Canada (introduced), USA (introduced); Atlantic islands: St. Elena Is. (introduced); Pacific islands: Hawaii Isl. (introduced).

Distribution in Italy. All regions.

Chorotype. Centralasiatic-European.

Ecological notes. 2-1,800 m; a mostly mesophilous woodland species, few records from artificial habitats; locally recorded in low plain *Quercus-Carpinetum boreoitalicum* (4 sites) as well as in montane *Picea* (1 site) and *Abies* woods (1 site) and in *Piceetum montanum* (1 site). Also recorded in the Slovenian *Bazzanio-Abietetum*, *Vaccinio myrtilli-Pinetum*, *Quercus-Luzulo-Fagetum*, *Luzulo albidiae-Fagetum*, *Asperulo-Carpinetum*, *Lamio orvulae-Fagetum* and *Abieti-Fagetum dinaricum* forest communities (Kos 1996).

The material examined has been collected in peat bog (5 sites, including 4 alkaline peat bogs) and forest habitats (4 sites, including wet forest, 2 sites) as well as in *Phragmites australis* communities (1 site), mostly in localities of the low plain.

#### 21. *Cryptops (Cryptops) parisi* BRÖLEMANN, 1920

Material examined. – 1, GO, Monfalcone, 15, Palude del Fiume Cavana (15): forest, 1 m, pt (3/3): 20.V/26.VI.2001, GC, 3 exx.

General distribution. Europe: Albania, Austria, Belgium, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Eu-



ropean Russia (Transcarpathia), Finland, France (mainland), Germany, Great Britain (introduced), Greece (mainland, including Ionian Is.), Italy (mainland), Ireland, Republic of Macedonia, Montenegro, Norway, Poland, Romania, Sweden (introduced), Slovak Republic, Slovenia, The Netherlands; West Asia: Turkey (northern); North America: Newfoundland (introduced).

Distribution in Italy. All regions except for Sicily and Sardinia.

Chorotype. S-European.

Ecological notes. 1-2,000 m; very common in mesophilous woods, sometime also in artificial habitats; locally recorded in low plain *Quercus-Carpinetum boreoitalicum* (3 sites), and in submontane and montane *Abieti-Fagetum* (1 site), *Fagus* woods (6 sites), *Erico-Pinetum* (1 site), *Abies* woods (2 sites), *Rhododendro-hirsuti-mugetum* (1 site); also recorded in vineyards (1 site). Also recorded in the Slovenian *Bazzanio-Abietetum*, *Vaccinio myrtilli-Pinetum*, *Quercus-Luzulo-Fagetum*, *Luzulo albidiae-Fagetum*, *Asperulo-Carpinetum*, *Lamio orvalae-Fagetum* and *Abieti-Fagetum dinaricum* forest communities (Kos 1996). *C. parisi* also occurs in peat bog habitats of the Ligurian Apennines ("Agoraie di Sopra e Moggetto" Nature Reserve: ZAPPAROLI 2009).

The material examined has been collected in forest habitat (1 site) in a single locality of the low plain.

#### 00. *Cryptops (Cryptops)* sp.

Material examined. – 13, PN, Sequals, Torbiera di Sequals (6): forest, in tufts of *Carex* sp., 200 m, be: 29.X.2001, GT, 1 ex. – 16, UD, Tolmezzo, Torbiera di Curiedi (13): peat bog north-east, 851 m, pt (2/3): 2.V/10.VI.2001, GC, 1 imm.

Remarks. Immature or mutilated specimens giving evidence on the presence of an unidentified species in the sampled habitats.

Order GEOPHILOMORPHA POCOCC, 1895

Family HIMANTARIIDAE COOK, 1895

*Stigmatogaster* LATZEL, 1880

#### 22. *Stigmatogaster gracilis* (MEINERT, 1870)

Material examined. – 5, UD, Talmassons, Risorgive di Flambrò (12): forest, 22 m, pt (3/3): 4.IX/16.X.2001, GC, 1 ex.

General distribution. Europe: Albania, Croatia, France (mainland, Corsica), Greece (mainland and insular, excluding Crete), Italy (mainland, Sicily, Sardinia), Montenegro, Spain (Balearic Isl.); North Africa: Algeria, Tunisia.

Distribution in Italy. All regions except Aosta Valley; no records from Friuli Venezia Giulia was formerly known.

Chorotype. Mediterranean.

Ecological notes. The altitudinal range in north-eastern Italy of this species, probably extends from the sea level to 900-1,000 m being known from the low plain (e.g. Adria, Rovigo province) to submontane (e.g. Piano del Cansiglio, Belluno province) localities, according to the few and most modern literature data (MARCUIZZI & MINELLI 1971; MINELLI 1991). *S. gracilis* is known in Italy as mostly related to thermophilous woodlands (MINELLI & IOVANE 1987; ZAPPAROLI 2006), but no detailed records are available on the habitat preference of the north-eastern populations.

The only specimen examined has been collected in forest habitat (1 site) in a locality of the low plain.

Family DIGNATHODONTIDAE COOK, 1895

*Henia* C.L. KOCH, 1847

Subgenus *Chaetechelyne* MEINERT, 1870

#### 23. *Henia (Chaetechelyne) vesuviana* (NEWPORT, 1845)

Material examined. – 4, UD, Gonars, Paludi del Corno (4): forest, under *Alnus glutinosa*, 16 m, be: 1.IV.2001, AZ, AT, GT, GG, 1 ♀, 3 imm. – 6, UD, Bertolo, Risorgive di Virco (16): alkaline peat bog, under *Alnus glutinosa* in *Schoenus* community, 23 m, be: 31.III.2001, AZ, AT, GT, GG, 6 ♂♂, 2 ♀♀, 6 imm.

General distribution. Europe: Croatia, France (mainland, Corsica), Hungary?, Italy (mainland, Sicily, Sardinia), Portugal (mainland, Madeira Is.), SW Romania?, Slovenia, Spain (mainland, Balearic Isl.), Switzerland; records from Central Europe (Austria, Belgium, Germany, Great Britain, Luxembourg, The Netherlands) are mostly related to anthropogenic habitats; the European distribution of the species has been revised by LINDNER (2007); North Africa: Tunisia?; North America: introduced.

Distribution in Italy. All regions.

Chorotype. W-Mediterranean.

Ecological notes. 2-1,400 m; a woodland species generally related to forest habitats dominated by *Quercus* spp., although sometimes also present in other habitats (from broadleaved forests to more or less open habitats: MINELLI & IOVANE 1982; ZAPPAROLI 2006); only one record in low plain *Quercus-Carpinetum boreoitalicum* is known from north-eastern Italy. Not recorded in the Slovenian forest communities studied by Kos (1996).

The material examined has been collected in forest (1 site) and in alkaline peat bog (1 site) habitats in localities of the low plain.

Family SCHENDYLIDAE VERHOEFF, 1908

*Schendyla* BERGSØE & MEINERT, 1866

#### 24. *Schendyla nemorensis* (C.L. KOCH, 1837)

Material examined. – 7, UD, Majano, Torbiera di Casasola (7): forest, under and in hollow of *Salix* sp., 160 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 imm.; peat bog, under *Salix* sp. and *Alnus glutinosa*, 162 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ex. – 13, PN, Sequals, Torbiera di Sequals (6): forest, in tufts of *Carex* sp., 200 m, be: 29.X.2001, GT, 1 ex. – 17, UD, Pontebba, Torbiera di Pramollo (10): higher peat bog, in tufts of *Carex* sp.? with *Viola* sp., mosses and Gramineae, 1,518 m, be: 18.X.2001, GT, FS, 1 ex. 41 lp.

General distribution. Europe: Austria, Belgium, Bosnia & Herzegovina, Bulgaria?, Croatia, Czech Republic, Denmark (mainland), Finland, France (mainland), Germany, Great Britain, Greece (including Crete), Ireland, Italy (mainland, Sicily, Sardinia), Latvia, Norway, Poland, Portugal (Azores Isl.), Romania?, Slovak Republic, Slovenia, Spain (mainland, Balearic Isl.), Sweden, The Netherlands; North Africa: Algeria, Morocco, Tunisia; North America: introduced.

Distribution in Italy. All regions except Aosta Valley and Basilicata.

Chorotype. European.

Ecological notes. 160-1,000 m; a woodland species, from thermophilous to mesophilous forests but also in open and

semi-open habitats; no detailed records are known for north-eastern Italy but material from *Ostryo-Quercetum*, *Fagus* woods and open montane habitats of the south-eastern Alps (765-1,800 m) has been examined (Zapparoli unpublished). Also recorded in the Slovenian *Bazzanio-Abietetum*, *Vaccinio myrtilli-Pinetum*, *Quercu-Luzulo-Fagetum* and *Abieti-Fagetum dinaricum* forest communities (Kos 1996).

The material examined has been collected in forest (2 sites) and in peat bog (2 sites) habitats in localities of the hill belt and montane zone.

Family GEOPHILIDAE COOK, 1895

*Pachymerium* C.L. KOCH, 1847

25. *Pachymerium ferrugineum* (C.L. KOCH, 1835)

Material examined. – **1**, GO, Monfalcone, Palude del Fiume Cavana (15): damp meadow, in tufts of Juncaceae, 1 m, be: 29.XI.2001, GT, FS, 3 imm. – **2**, UD, Porpetto, Palude Fraghis (3): in *Phragmites* sp. [*P. australis*] community, under *Alnus glutinosa*, 8 m, be: 1.IV.2001, AZ, AT, GT, GG, 3 exx.; alkaline peat bog, in tufts of *Cladium mariscus* and *Schoenus nigricans*, 8 m, be: 23.XI.2001, GT, 1 imm.; alkaline peat bog, mud at *Cladium mariscus* base, 8 m, be: 1.IV.2001, AZ, AT, GT, GG, 4 exx. – **3**, UD, Rivignano, Risorgive Zarnicco (14): riparian forest, under *Alnus glutinosa* with *Carex* sp., 13 m, be: 31.III.2001, AZ, AT, GT, GG, 2 ad., 1 imm.; alkaline peat bog, under *Alnus glutinosa* in *Schoenus* community, 13 m, be: 31.III.2001, AZ, AT, GT, GG, 2 exx.; alkaline peat bog, in tufts of *Schoenus nigricans*, 13 m, be: 31.III.2001, AZ, AT, GT, GG, 15 exx. – **4**, UD, Gonars, Paludi del Corno (4): alkaline peat bog, in tufts of *Schoenus nigricans*, 15 m, be: 1.IV.2001, AZ, AT, GT, GG, 1 ex.; alkaline peat bog, in tufts of *Schoenus nigricans*, 15 m, be: 23.XI.2001, GT, 1 ex. – **5**, UD, Talmassons, Risorgive di Flambro (12): alkaline peat bog, under *Salix* cf. *purpurea* in *Schoenus* community, 21 m, be: 31.III.2001, AZ, AT, GT, GG, 1 ex. 43 lp; alkaline peat bog, in tufts of *Schoenus nigricans*, 21 m, be: 31.III.2001, AZ, AT, GT, GG, 4 exx.; alkaline peat bog, in tufts of *Schoenus nigricans*, 21 m, be: 26.XI.2001, GT, FS, 4 exx. – **6**, UD, Bertolo, Risorgive di Virco (16): alkaline peat bog, under *Alnus glutinosa* in *Schoenus* community, 23 m, be: 31.III.2001, AZ, AT, GT, GG, 1 imm.; alkaline peat bog, in tufts of *Carex* cf. *gracilis* with *Schoenus nigricans*, 23 m, be: 31.III.2001, AZ, AT, GT, GG, 3 ad., 4 imm.; alkaline peat bog, in tufts of *Carex* cf. *gracilis* with *Schoenus nigricans*, 23 m, be: 26.XI.2001, GT, FS, 2 imm.; alkaline peat bog, 23 m, pt (3/3): 10.V/19.VI.2001, GC, 1 imm. – **7**, UD, Majano, Torbiera di Casasola (7): forest, under and in hollow of *Salix* sp., 160 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 imm.; peat bog, under *Salix* sp. and *Alnus glutinosa*, 162 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ad., 1 imm.; peat bog, in tufts of *Carex* cf. *elata*, 162 m, be: 13.XI.2001, GT, 2 exx. – **8**, UD, Buia, Palude di Fontana Abisso (2): peat bog, under *Alnus glutinosa*, 163 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 5 imm.; peat bog, under *Salix* sp., 163 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 15 imm.; peat bog, in tufts of *Carex* cf. *elata*, 163 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 2 ad., 5 imm.; peat bog, in tufts of *Carex* cf. *elata*, 163 m, be: 13.XI.2001, GT, 21 exx. – **9**, UD, Fagagna, Prati umidi dei Quadris (17): wet forest, under *Alnus glutinosa*, 171 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 11 exx.; peat bog, under *Alnus glutinosa* in *Carex* sp. community, 171 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ex. – **10**, UD, Rive d'Arcano, Prati di Col San Flo-

reano (8): damp meadow, under *Alnus glutinosa* in *Schoenus* community, 180 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ex.; damp meadow, in tufts of *Schoenus nigricans*, 180 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 imm.; damp meadow, in tufts of *Schoenus nigricans*, 180 m, be: 13.XI.2001, GT, 2 exx.; damp meadow, heap of vegetal debris, 180 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ex.; damp meadow, debris from rotten *Populus*, 180 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 3 exx.; damp meadow, 180 m, pt (5/5): 15.V/21.VI.2001, GC, 1 ex. – **11**, UD, Moruzzo, Torbiera di Borgo Pegoraro (18): forest, log of *Platanus hybrida* with Polyporaceae, 185 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ex. 41 lp; peat bog, in tufts of *Carex* cf. *elata* near *Typha latifolia*, 185 m, be: 13.XI.2001, GT, 1 ex. 41 lp; peat bog, 185 m, pt (3/3): 8.IX/16.X.2001, GC, 1 imm. – **12**, UD, Moruzzo, Torbiera di Lazzacco (11): forest west, under *Quercus robur* and *Alnus glutinosa*, 188 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 2 ad., 1 imm.; peat bog east, under *Alnus glutinosa* in *Carex* cf. *elata* community, 188 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 4 ad., 10 imm.; peat bog west, in tufts of *Schoenus nigricans* near *Cladium mariscus*, 184 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ex.; peat bog west, in tufts of *Schoenus nigricans* near *Cladium mariscus*, 184 m, be: 13.XI.2001, GT, 14 exx. – **13**, PN, Sequals, Torbiera di Sequals (6): forest, under *Alnus glutinosa*, 200 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 2 imm.; forest, in tufts of *Carex* sp., 200 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ad., 2 imm.; peat bog, under *Betula* and *Castanea sativa* with *Calluna vulgaris*, 190 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ad., 1 imm.; peat bog, under *Quercus* sp., 190 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ad., 2 imm.; peat bog, in tufts of *Carex* sp. and *Molinia caerulea*, 190 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ad., 1 imm.; peat bog, in tufts of *Carex* sp. and *Molinia caerulea*, 190 m, be: 29.X.2001, GT, 3 exx. – **15**, UD, Tarvisio, Torbiera Scichizza (5): peat bog, in tufts of *Carex* cf. *fusca*, 842 m, be: 9.VI.2001, AZ, ZA, GT, AT, GG, 3 imm.; peat bog, in tufts of *Carex* cf. *fusca*, 842 m, be: 18.X.2001, GT, FS, 1 ex. – **16**, UD, Tolmezzo, Torbiera di Curiedi (13): peat bog north-east, under *Salix* sp. and *Alnus glutinosa* in *Carex* sp. community, 851 m, be: 10.VI.2001, AZ, ZA, GT, AT, GG, 6 imm.; peat bog north-east, in tufts of *Carex* sp., 851 m, be: 10.VI.2001, AZ, ZA, GT, AT, GG, 1 ad., 1 imm.; peat bog north-east, in tufts of *Carex* sp., 851 m, be: 29.X.2001, GT, 26 ad., 15 imm.; peat bog north-west, in tufts of *Carex* sp., 874 m, be: 10.VI.2001, AZ, ZA, GT, AT, GG, 4 ad., 11 imm.; peat bog north-west, in tufts of *Carex* sp., 874 m, be: 29.X.2001, GT, 3 ad., 4 imm.; peat bog south-west, in tufts of *Carex* sp. and *Eriophorum* sp., 853 m, be: 29.X.2001, GT, 1 imm..

General distribution. Europe: Albania, Austria, Belgium, Bosnia & Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark (mainland), European Russia, Finland, France (mainland, Corsica), Great Britain, Greece, Hungary, Italy (mainland, Sicily, Sardinia), Latvia, Republic of Macedonia, Norway, Poland, Portugal (mainland, Azores Isl., Madeira Is.), Romania, Slovak Republic, Slovenia, Spain (mainland, Balearic Isl., Canary Isl.), Sweden, The Netherlands; North Africa: Algeria, Central Sahara, Libya, Morocco, Tunisia; West Asia: Caucasus, Iran, Palestine, Turkey, Uzbekistan; East Asia: Pribilof Is. (Russia), Japan (introduced); North America: Alaska, introduced elsewhere; Central America: Mexico (introduced); South America: Chile (Juán Fernández Is., introduced; Easter Is., introduced); Pacific islands: Hawaii Isl. (introduced).

Distribution in Italy. All regions.

Chorotype. W-Palaearctic.

Ecological notes. 1-1,400 m; an euryecious species, mostly frequent in open and semi-open habitats, as well in seashore, rarely occurring in forest; psammophilous according to MINELLI (1982); the few records in north-eastern Italy have been quoted in *Prunello-Chrysopogonetum* ("magredo") (1 site), in *Chondriletum* ("magredo") (1 site) and in low plain *Quercus-Carpinetum boreoitalicum* (1 site); also present in artificial habitats such as vineyards (1 site) and meadows (1 site). No records from the Slovenian forest communities studied by Kos (1996).

One of the most common species of centipedes in the investigated wetlands, being sampled in 15 localities on 17 especially located in the low plain and the hill belt, becoming less frequent in the montane level. It has been regularly found in peat bog habitats (16 sites, including 5 alkaline peat bogs), from where the most part of the specimen has been collected (212 on 253 examined), but also occurs in forests (6 sites, including riparian forests, 1 site, and wet forests, 1 site), in damp meadows (2 sites) and in *Phragmites australis* communities (1 site), although rarely. *P. ferrugineum* is a constant species also in peat bog habitats of Bavaria (southern Germany) (POPP 1965; SPELDA 2005).

*Clinopodes* C.L. KOCH, 1847

26. *Clinopodes flavidus* C.L. KOCH, 1847

Material examined. – 2, UD, Porpetto, Palude Fraghis (3): alkaline peat bog, in tufts of *Cladium mariscus* and *Schoenus nigricans*, 8 m, be: 23.XI.2001, GT, 1 ex. – 4, UD, Gonars, Paludi del Corno (4): forest, under *Alnus glutinosa*, 16 m, be: 1.IV.2001, AZ, AT, GT, GG, 1 imm. – 6, UD, Bertiole, Risorgive di Virco (16): wet forest, under *Alnus glutinosa*, 23 m, be: 31.III.2001, AZ, AT, GT, GG, 1 imm. – 9, UD, Fagagna, Prati umidi dei Quadris (17): peat bog, under *Alnus glutinosa* in *Carex* sp. community, 171 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ad., 1 imm. – 10, UD, Rive d'Arcano, Prati di Col San Floreano (8): damp meadow, debris from rotten *Populus*, 180 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 3 exx.

General distribution. Europe: Albania, Austria, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Cyprus, European Russia, Greece (mainland and insular, including Crete), Italy (mainland, Sicily), Republic of Macedonia, Montenegro, Poland, Romania, Serbia, Slovak Republic, Slovenia, Ukraine (Crimea); West Asia: Caucasus, Palestine, Syria, Turkestan, Turkey.

Distribution in Italy. All regions except Aosta Valley and Sardinia.

Chorotype. Turanic-European.

Ecological notes. 2-2,070 m; euryecious species recorded in northern and central Italy from a wide range of forest habitats, not frequent in open and semi-open habitats; the few records from north-eastern Italy have been collected in *Prunello-Chrysopogonetum* ("magredo") (1 site) and in low plain *Quercus-Carpinetum boreoitalicum* (4 sites). Also recorded in the Slovenian *Bazzanio-Abietetum*, *Quercus-Luzulo-Fagetum* and *Asperulo-Carpinetum* forest communities (Kos 1996).

The material examined has been collected in peat bog (2 sites, including 1 alkaline peat bog) and forest (2 sites, including wet forests) habitats and in damp meadows (1 site) in localities of the low plain and the hill belt.

*Geophilus* LEACH, 1814

27. *Geophilus alpinus* MEINERT, 1870

Material examined. – 14, UD, Ampezzo, Palude di Cima Corso (9): peat bog, under *Alnus glutinosa* in a spot without water, 839 m, be: 10.VI.2001, AZ, ZA, GT, AT, GG, 1 imm. (uncertain identification). – 17, UD, Pontebba, Torbiera di Pramollo (10): higher peat bog, in tufts of *Carex* sp.? with *Viola* sp., mosses and Gramineae, 1,518 m, be: 18.X.2001, GT, FS, 1 ex.

General distribution. Europe: Austria, Bulgaria, Croatia, Denmark (mainland), European Russia, France (mainland, Corsica), Germany, Great Britain, Greece (including Ionian Isl. and Crete), Hungary, Ireland, Italy (mainland, Sicily, Sardinia), Montenegro, Norway, Poland, Romania, Slovenia, Sweden, The Netherlands; North Africa: Morocco, Tunisia.

Distribution in Italy. All regions except Apulia.

Chorotype. European.

Ecological notes. 240-2,140 m; a mostly woodland species; samplings from north-eastern Italy have been collected in *Fagus* wood (2 sites), where it seems quite common (Zapparoli unpublished), *Erico-Pinetum* (1 site), *Piceetum montanum* (1 site) and *Larix* wood (1 site); one record in open alpine habitats (*Seslerio-Sempervirentetum*). Also recorded in the Slovenian *Bazzanio-Abietetum*, *Quercus-Luzulo-Fagetum*, *Abieti-Fagetum dinaricum* forest communities (Kos 1996 as *G. insculptus*).

The only specimen certainly identified has been collected in peat bog habitats (1 site) of the montane zone.

Remarks. *Geophilus alpinus* MEINERT, 1870 has been recently recognized as the correct name for *G. insculptus* ATTEMS, 1895 (see also SPELDA 1999b, 2005; MINELLI 2006; BARBER 2009).

28. *Geophilus carpophagus* LEACH, 1815

Material examined. – 1, GO, Monfalcone, Palude del Fiume Cavana (15): damp meadow, in tufts of Juncaceae, 1 m, be: 29.XI.2001, GT, FS, 1 ♂ 49 lp. – 2, UD, Porpetto, Palude Fraghis (3): in *Phragmites* sp. [*P. australis*] community, under *Alnus glutinosa*, 8 m, be: 1.IV.2001, AZ, AT, GT, GG, 1 ex.; alkaline peat bog, in tufts of *Cladium mariscus* and *Schoenus nigricans*, 8 m, be: 23.XI.2001, GT, 7 exx.; alkaline peat bog, mud at *Cladium mariscus* base, 8 m, be: 1.IV.2001, AZ, AT, GT, GG, 1 ex. 51 lp. – 4, UD, Gonars, Paludi del Corno (4): alkaline peat bog, in tufts of *Schoenus nigricans*, 15 m, be: 1.IV.2001, AZ, AT, GT, GG, 1 ♀; ibidem, idem: 23.XI.2001, GT, 1 unsexed specimen because mutilated. – 5, UD, Talmassons, Risorgive di Flambro (12): alkaline peat bog, under *Salix* cf. *purpurea* in *Schoenus* community, 21 m, be: 31.III.2001, AZ, AT, GT, GG, 3 imm. 51 lp. – 13, PN, Sequals, Torbiera di Sequals (6): forest, in tufts of *Carex* sp., 200 m, be: 29.X.2001, GT, 1 ♂ 43 lp.

General distribution. Europe: Albania, Belgium, Croatia, Czech Republic, Denmark (mainland), Finland, France (mainland, Corsica), Germany, Great Britain, Greece (only in Ionian Isl., Southern Sporades and Crete), Ireland, Italy (mainland, Sicily, Sardinia), Latvia, Montenegro, Norway, Poland, Portugal (mainland, Azores Isl., Madeira Is.), Romania, Slovak Republic, Slovenia, Spain (mainland, Balearic Isl., Canary Isl.), Sweden, The Netherlands; North Africa: Algeria, Morocco, Tunisia; West Asia: Palestine, Turkey.

Distribution in Italy. All regions except Aosta Valley and Calabria.



Chorotype. European.

Ecological notes. 1-1,800 m; mostly a woodland species; the few records from north-eastern Italy have been collected in low plain *Quercus-Carpinetum boreoitalicum* (1 site) and in *Abies* wood (1 site). Also recorded in the Slovenian *Abieti-Fagetum dinaricum* forest communities (Kos 1996).

The material examined has been mostly collected in peat bog habitats (4 sites, including 3 alkaline peat bogs), but the species also occurs in *Phragmites australis* communities (1 site), forest habitats (1 site) and damp meadows (1 site), chiefly in localities of the low plain.

#### 00. *Geophilus* sp.

Material examined. – 6, UD, Bertiole, Risorgive di Virco (16): alkaline peat bog, in tufts of *Carex* cf. *gracilis* with *Schoenus nigricans*, 23 m, be: 26.XI.2001, GT, FS, 1 imm. 49 lp. – 7, UD, Majano, Torbiera di Casasola (7): forest, under and in hollow of *Salix* sp., 160 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 imm. 43 lp. – 13, PN, Sequals, Torbiera di Sequals (6): forest, under *Alnus glutinosa*, 200 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ex. mutilated.

Remarks. Quotations based on immature or mutilated specimens giving evidence on the presence in the sampled habitats.

*Pleurogeophilus* VERHOEFF, 1901

#### 29. *Pleurogeophilus mediterraneus* (MEINERT, 1870)

Material examined. – 7, UD, Majano, Torbiera di Casasola (7): peat bog, under *Salix* sp. and *Alnus glutinosa*, 162 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ♀ 65 lp.

General distribution. Europe: France (mainland), Greece (mainland, Dodecanese Is.), Hungary, Italy (mainland), Spain (Balearic Is.) (ATTEMS 1929a; BRÖLEMANN 1930; ZAPPAROLI 2002; ZAPPAROLI & MINELLI 2005).

Distribution in Italy. Liguria, Lombardy, Trentino-Alto Adige, Veneto, Friuli Venezia Giulia.

Chorotype. S-European.

Ecological notes. 150-1,200 m; the habitat of this species is generally poorly known; only local records from *Orno-Ostryetum* (1 site) and *Salvio-Fraxinetum* (1 site) are known for north-eastern Italy.

The only specimen examined has been collected in peat bog habitats (1 site) of the hill belt.

Family LINOTAENIDAE COOK, 1904

*Strigamia* GRAY, 1843

#### 30. *Strigamia acuminata* (LEACH, 1815)

Material examined. – 1, GO, Monfalcone, Palude del Fiume Cavana (15): forest, 1 m, pt (3/3): 20.V/26.VI.2001, GC, 1 ♀ 41 lp; damp meadow, in tufts of Juncaceae, 1 m, be: 29.XI.2001, GT, FS, 1 ♂ 39 lp, 1 ♀ 41 lp. – 2, UD, Porpetto, Palude Fraghis (3): in *Phragmites* sp. [*P. australis*] community, under *Alnus glutinosa*, 8 m, be: 1.IV.2001, AZ, AT, GT, GG, 2 ♂♂ 39 lp; 1 ♀ 41 lp; alkaline peat bog, in tufts of *Cladium mariscus* and *Schoenus nigricans*, 8 m, be: 23.XI.2001, GT, 2 ♂♂ 39 lp; alkaline peat bog, 8 m, pt (3/3): 15.V/26.VI.2001, GC, 1 ♀ 41 lp. – 9, UD, Fagagna, Prati umidi dei Quadris (17): wet forest, under *Alnus glutinosa*, 171 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂ imm. 39 lp; wet forest, under *Quercus*

*robur*, 171 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♀ 41 lp; wet forest, 171 m, pt (3/3): 15.V/26.VI.2001, GC, 1 ♂ 39 lp, 1 ♀ 41 lp; ibidem, idem (3/3): 8.IX/14.X.2001, GC, 1 ♂ 39 lp; peat bog, under *Alnus glutinosa* in *Carex* sp. community, 171 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂ 39 lp, 1 ♀ 41 lp; peat bog, in tufts of *Carex* sp., 171 m, be: 13.XI.2001, GT, 1 ♂ imm. 39 lp. – 12, UD, Pagnacco, Torbiera di Lazzacco (11): peat bog east, in tufts of *Carex* cf. *elata*, 188 m, be: 13.XI.2001, GT, 1 ♀. – 13, PN, Sequals, Torbiera di Sequals (6): forest, under *Alnus glutinosa*, 200 m, be: 13.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂ 39 lp. – 14, UD, Ampezzo, Palude di Cima Corso (9): peat bog, under *Alnus glutinosa* in a spot without water, 839 m, be: 10.VI.2001, AZ, ZA, GT, AT, GG, 2 ♀♀, 2 imm. – 15, UD, Tarvisio, Torbiera Scichizza (5): peat bog, under *Alnus glutinosa* and *Berberis vulgaris*, 842 m, be: 9.VI.2001, AZ, ZA, GT, AT, GG, 2 ♂♂ 39 lp, 1 ♀; peat bog, 842 m, pt (5/5): 2.IX/12.X.2001, GC, 3 ♂♂, 3 ff. – 17, UD, Pontebba, Torbiera di Pramollo (10): higher peat bog, under *Alnus viridis* along a stream, 1,518 m, be: 9.VI.2001, AZ, ZA, GT, AT, GG, 1 ♂ 39 lp.

General distribution. Europe: Albania, Austria, Belgium, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark (mainland), France (mainland), Germany, Great Britain, Hungary, Italy (mainland, Sicily), Luxemburg, Poland, Romania, Slovak Republic, Slovenia, Spain (mainland), Switzerland, The Netherlands, Yugoslavia; West Asia: Caucasus, Turkey; North America: introduced in Canada (Quebec) and USA (New York, Ohio, Michigan, Wisconsin) according to KEVAN (1983) (see also BEHAN-PELLETIER 1993); occurrence in the North West Territories (Canada), Alaska, Aleutian Isl. (USA) and other islands in the Bering Sea, based on the probable identity with *S. chionophila* Woods, 1862 (cf. ATTEMS 1909; CHAMBERLIN 1911, 1923, 1946; EASON 1964; KEVAN 1983), needs confirmation as the synonymy require validation (MINELLI 2006).

Distribution in Italy. All regions except Apulia, Calabria, Sardinia.

Chorotype. Central European.

Ecological notes. 1-2,000 m; a woodland species quoted as typical of beechwoods although present also in other types of submontane and montane forests (MINELLI & IOVANE 1982); in north-eastern Italy it has been collected in a wide range of woodlands, from *Orno-Ostryetum* (1 site) to *Abieti-Fagetum* (1 site), *Fagus* wood (5 sites), *Erico-Pinetum* (1 site), *Picea* wood (1 site), *Abies* wood (1 site), *Rhododendro-hirsuti-Pinetum mugii* (1 site), *Larix* wood (1 site), *Piceetum subalpinum sphagnetosum* (1 site); also in peat bog habitats (*Sphagnetum magellanicum* of Dolomites (1 site)). Also recorded in the Slovenian *Bazzanio-Abietetum*, *Vaccinio myrtilli-Pinetum*, *Quercus-Luzulo-Fagetum*, *Luzulo albidae-Fagetum*, *Lamio orvulae-Fagetum* and *Abieti-Fagetum dinaricum* forest communities (Kos 1996). *S. acuminata* also occurs in peat bog habitats of the Ligurian Apennines ("Agoraia di Sopra e Moggetto" Nature Reserve: ZAPPAROLI 2009).

The material here examined has been collected in localities of the low plain as well as of the hill belt and montane zone, mostly in peat bog habitats (6 sites, including 1 alkaline peat bog) although the species is also present in forests (3 sites), in damp meadows (1 site) and in coastal *Phragmites australis* communities (1 site). The occurrence of *S. acuminata* in low elevation sites is unusual, even if in forest habitats, and could be related to fluitation during floods of individuals from more internal and montane areas as suspected for other centipedes

(*L. nodulipes*, *C. anomalans*, see above) and soil Coleoptera (GLEREAN 2004).

### 31. *Strigamia transsilvanica* (VERHOEFF, 1928)

Material examined. – **4**, UD, Gonars, Paludi del Corno (4): alkaline peat bog, 15 m, pt (2/3): 15.V/21.VI.2001, GC, 1 ♀ 47 lp. – **6**, UD, Bertoliolo, Risorgive di Virco (16): alkaline peat bog, under *Alnus glutinosa* in *Schoenus* community, 23 m, be: 31.III.2001, AZ, AT, GT, GG, 5 ♂♂ 47 lp, 1 ♂ 45 lp, 3 imm. 47 lp, 1 imm. 49 lp. – **9**, UD, Fagagna, Prati umidi dei Quadris (17): peat bog, in tufts of *Carex* sp., 171 m, be: 13.XI.2001, GT, 1 ♂ 49 lp, 1 ♀ 49 lp; peat bog, 171 m, pt (3/3): 8.IX/14.X.2001, GC, 1 ♀ 47 lp. – **10**, UD, Rive d'Arcano, Prati di Col San Floreano (8): damp meadow, debris from rotten *Populus*, 180 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♀ 47 lp. – **11**, UD, Moruzzo, Torbiera di Borgo Pegoraro (18): forest, 185 m, pt (3/3): 15.V/21.VI.2001, GC, 1 ♂ 47 lp; ibidem, idem (3/3): 8.IX/16.X.2001, GC, 1 ♀ 49 lp. – **12**, UD, Moruzzo, Torbiera di Lazzacco (11): forest west, under *Quercus robur* and *Alnus glutinosa*, 188 m, be: 12.IV.2001, AZ, ZA, GT, AT, GG, 1 ♂ 47 lp. – **15**, UD, Tarvisio, Torbiera Scichizza (5): peat bog, 842 m, pt (5/5): 2.IX/12.X.2001, GC, 1 ♀ 47 lp. – **17**, UD, Pontebba, Torbiera di Pramollo (10): higher peat bog, under *Alnus viridis* along a stream, 1,518 m, be: 9.VI.2001, AZ, ZA, GT, AT, GG, 1 ♀ 45 lp.

General distribution. Europe: Albania, Austria, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, France (mainland), Germany, Greece (mainland), Hungary, Italy (mainland), Latvia, Montenegro, Poland, Republic of Macedonia, Romania, Serbia, Slovak Republic, Slovenia, Switzerland (ATTEMS 1929a; MATIC 1972; WÜRMLI 1972; KOS 1992; STOEV 1997, 2000, 2001, 2002; WYTWER 1997; ORSZÁGH 2001; TAJOVSKÝ 2001; ZAPPAROLI 2002; BONATO et al. 2005; DÁNYI 2005; IORIO 2005; TUF & LAŠKA 2005; ZAPPAROLI & MINELLI 2005; PURGER et al. 2007).

Distribution in Italy. Liguria, Piedmont, Lombardy, Trentino-Alto Adige, Venetia, Friuli Venezia Giulia.

Chorotype. S-European.

Ecological notes. 2-1,700 m; probably a mostly woodland species although its ecology is still poorly known; in north-eastern Italy it has been recorded (see MINELLI & IOVANE 1987 under *Strigamia* cf. *acuminata*) in low plain *Quercus-Carpinetum boreoitalicum* (3 sites) and in *Salvia-Fraxinetum* (1 site); one record also in *Zea mays* agroecosystems. Also recorded in the Slovenian *Luzulo albidiae-Fagetum*, *Asperulo-Carpinetum*, *Lamio orvulae-Fagetum* and *Abieti-Fagetum dinaricum* forest communities (Kos 1996).

The material examined has been mostly collected in peat bog (5 sites, including 2 alkaline peat bogs), forest (2 sites) and damp meadow (1 site) habitats, in localities of the low plain as well as the hill belt and montane zone.

### 3.2 Semi-quantitative analysis of the assemblages

#### A. Peat bogs and marshes of the low plain (0-23 m, 6 localities)

Total number of species: 22. Min.-max., mean, median number of species per investigated habitats (number of sampled sites in parenthesis): alkaline peat bogs (5 sites): 5-9 species, mean 7.0, median 7.0; forests (including wet and riparian forests) (6 sites): 4-8 species, mean 6.3, median 6.5; damp meadows (1 site): 5 species; *Phragmites australis* communities (2 sites): 2-4 species, mean 3.0, median 3.0.

#### 1 - Palude del Fiume Cavana (15)

Species diversity: 10 species/104 exx. (forest: 7 spp./67 exx., damp meadows: 5 spp./34 exx., brackish *Phragmites australis* community: 2 spp./3 exx.); Shannon's index: 1.84; evenness: 0.80.

Species composition: *Lithobius agilis* (forest: 7 exx., damp meadows: 5 exx.), *L. lapidicola* (forest: 5 exx., damp meadows: 23 exx.), *L. muticus* (forest: 4 exx.), *L. nodulipes* (forest: 21 exx.), *L. validus* (forest: 18 exx.), *Lithobius* sp. (forest: 8 exx., brackish *Phragmites australis* community: 2 exx.), *Cryptops anomalans* (brackish *Phragmites australis* community: 1 ex.), *C. parisi* (forest: 3 exx.), *Pachymerium ferrugineum* (damp meadows: 3 exx.), *Geophilus carpophagus* (damp meadows: 1 ex.), *Strigamia acuminata* (forest: 1 ex., damp meadows: 2 exx.).

Remarks. *Cryptops anomalans* and *C. parisi* have been collected only in this locality. No species of *Eupolybothrus* have been recorded.

#### 2 - Palude Fraghis (3)

Species diversity: 11 species/92 exx. (alkaline peat bog: 9 spp./47 exx., riparian forest: 4 spp./29 exx., *Phragmites australis* community: 4 spp./16 exx.); Shannon's index: 1.87; evenness: 0.78.

Species composition: *Eupolybothrus tridentinus* (riparian forest: 1 ex., alkaline peat bog: 7 exx.), *Lithobius agilis* (riparian forest: 2 exx., alkaline peat bog: 4 exx.), *L. castaneus* (alkaline peat bog: 2 exx.), *L. sp. gr. mutabilis-latro* (riparian forest: 24 exx. of *L. cf. mutabilis*, alkaline peat bog: 13 exx. of *L. cf. mutabilis*), *L. nodulipes* (riparian forest: 1 ex.), *L. burzenlandicus* (alkaline peat bog: 1 ex.), *Lithobius* sp. (alkaline peat bog: 3 exx., forest: 1 ex.), *Cryptops hortensis* (*Phragmites australis* community: 9 exx.), *Pachymerium ferrugineum* (alkaline peat bog: 5 exx.; *Phragmites australis* community: 3 exx.), *Clinopodes flavidus* (alkaline peat bog: 1 ex.), *Geophilus carpophagus* (alkaline peat bog: 8 exx.; *Phragmites australis* community: 1 ex.), *Strigamia acuminata* (alkaline peat bog: 3 exx.; *Phragmites australis* community: 3 exx.).

Remarks. *L. burzenlandicus* has been collected only in this locality.

#### 3 - Risorgive di Zarnicco (14)

Species diversity: 10 species/91 exx. (riparian forest: 8 spp./60 exx., alkaline peat bog: 5 spp./31 exx.); Shannon's index: 1.95; evenness: 0.85.

Species composition: *Eupolybothrus tridentinus* (riparian forest: 19 exx., alkaline peat bog: 3 exx.), *Lithobius agilis* (riparian forest: 5 exx., alkaline peat bog: 4 exx.), *L. sp. gr. mutabilis-latro* (riparian forest: 11 exx. of *L. cf. mutabilis*), *L. muticus* (alkaline peat bog: 1 ex.), *L. nodulipes* (riparian forest: 6 exx.), *L. validus* (riparian forest: 8 exx.), *L. aeruginosus* (riparian forest: 1 ex.), *L. microps* (riparian forest: 1 ex.), *Lithobius* sp. (riparian forest: 6 exx.), *Cryptops hortensis* (alkaline peat bog: 6 exx.), *Pachymerium ferrugineum* (alkaline peat bog: 17 exx., riparian forest: 3 exx.).

Remarks. *L. microps* has been collected only in this locality.

#### 4 - Paludi del Corno (4)

Species diversity: 11 species/46 exx. (alkaline peat bog: 7 spp./20 exx., forest: 6 spp./26 exx.); Shannon's index: 2.15; evenness: 0.90.

Species composition: *Eupolybothrus tridentinus* (alkaline peat bog: 7 exx.), *Lithobius agilis* (forest: 3 exx.), *L. forficatus* (alkaline peat bog: 1 ex.), *L. nodulipes* (forest: 9 exx.), *L. validus* (forest: 7 exx.), *Lithobius* sp. (alkaline peat bog: 5 exx.), *Cryp-*

*tops hortensis* (forest: 2 exx., alkaline peat bog: 2 exx.), *Henia vesuviana* (forest: 4 exx.), *Pachymerium ferrugineum* (alkaline peat bog: 2 exx.), *Clinopodes flavidus* (forest: 1 ex.), *Geophilus carpophagus* (alkaline peat bog: 2 exx.), *Strigamia transsilvanica* (alkaline peat bog: 1 ex.).

Remarks. Shannon's index is the highest recorded among the localities of the low plain.

#### 5 - Risorgive di Flambro (12)

Species diversity: 11 species/109 exx. (forest: 7 spp./72 exx., alkaline peat bog: 6 spp./37 exx.); Shannon's index: 1.91; evenness: 0.79.

Species composition: *Eupolybothrus tridentinus* (forest: 17 exx., alkaline peat bog: 7 exx.), *Lithobius agilis* (alkaline peat bog: 5 exx.), *L. forficatus* (forest: 2 exx.), *L. lapidicola* (forest: 1 ex.), *L. muticus* (alkaline peat bog: 6 exx.), *L. nodulipes* (forest: 17 exx.), *L. validus* (forest: 3 exx.), *Lithobius* sp. (alkaline peat bog: 6 exx., forest: 1 ex.), *Cryptops hortensis* (forest: 30 exx., alkaline peat bog: 1 ex.), *Stigmatogaster gracilis* (forest: 1 ex.), *Pachymerium ferrugineum* (alkaline peat bog: 9 exx.), *Geophilus carpophagus* (alkaline peat bog: 3 exx.).

#### 6 - Risorgive di Virco (16)

Species diversity: 11 species/107 exx. (alkaline peat bog: 8 spp./79 exx., wet forest: 6 spp./28 exx.); Shannon's index: 1.95; evenness: 0.85.

Species composition: *Eupolybothrus tridentinus* (wet forest: 10 exx., alkaline peat bog: 4 exx.), *Lithobius agilis* (wet forest: 4 exx., alkaline peat bog: 2 exx.), *L. forficatus* (wet forest: 1 ex.), *L. muticus* (alkaline peat bog: 2 exx.), *L. nodulipes* (wet forest: 1 ex.), *Lithobius* sp. (alkaline peat bog: 23 exx., wet forest: 4 exx.), *Cryptops hortensis* (alkaline peat bog: 12 exx., wet forest: 7 exx.), *Henia vesuviana* (alkaline peat bog: 14 exx.), *Pachymerium ferrugineum* (alkaline peat bog: 11 exx.), *Clinopodes flavidus* (wet forest: 1 ex.), *Geophilus* sp. (alkaline peat bog: 1 ex.), *Strigamia transsilvanica* (alkaline peat bog: 10 exx.).

#### B. Peat bogs and marshes of the hill belt (160-200 m, 7 localities)

Total number of species: 20. Min.-max., mean, median number of species per investigated habitats (number of sampled sites in parenthesis): forests (5 sites): 6-10 species, mean 8.0, median 8.0; peat bogs (6 sites): 2-9 species, mean: 5.7, median: 5.0; damp meadows (3 sites): 2-8 species, mean: 4.7, median: 4.0.

#### 7 - Torbiera di Casasola (7)

Species diversity: 10 species/131 exx. (forest: 7 spp./66 exx., peat bog: 6 spp./62 exx., damp meadow: 2 spp./3 exx.); Shannon's index: 1.75; evenness: 0.80.

Species composition: *Eupolybothrus tridentinus* (forest: 12 exx., peat bog: 1 ex.), *Lithobius agilis* (forest: 1 ex., peat bog: 13 exx.), *L. forficatus* (damp meadow: 1 ex.), *L. sp. gr. mutabilis-latro* (damp meadow: 1 ex. of *L. cf. latro*), *L. nodulipes* (forest: 13 exx.), *L. validus* (forest: 1 ex., peat bog: 1 ex.), *Lithobius* sp. (peat bog: 41 exx., forest: 36 exx., damp meadow: 1 ex.), *Schendyla nemorensis* (forest: 1 ex., peat bog: 1 ex.), *Pachymerium ferrugineum* (forest: 1 ex., peat bog: 4 exx.), *Geophilus* sp. (forest: 1 ex.), *Pleurogeophilus mediterraneus* (peat bog: 1 ex.).

Remarks. *Pleurogeophilus mediterraneus* has been collected only in this locality.

#### 8 - Palude di Fontana Abisso (2)

Species diversity: 2 species/123 exx. (peat bog: 2 species/123 exx.); Shannon's index: 0.67; evenness: 0.96.

Species composition: *Lithobius agilis* (peat bog: 30 exx.), *Lithobius* sp. (peat bog: 45 exx. of probably *L. agilis*), *Pachymerium ferrugineum* (peat bog: 48 exx.).

Remarks. The value of species richness and Shannon's index of this locality are the lowest among all the localities sampled, whereas evenness is the highest.

#### 9 - Prati umidi dei Quadris (17)

Species diversity: 12 species/196 exx. (wet forest: 9 spp./84 exx., peat bog: 9 spp./112 exx.); Shannon's index: 1.90; evenness: 0.77.

Species composition: *Eupolybothrus grossipes* (wet forest: 19 exx.), *E. tridentinus* (wet forest: 7 exx., peat bog: 4 exx.), *Eupolybothrus* sp. *grossipes/tridentinus* (wet forest: 7 exx.), *Lithobius agilis* (wet forest: 4 exx., peat bog: 39 exx.), *L. forficatus* (wet forest: 1 ex.), *L. lapidicola* (peat bog: 8 exx.), *L. nodulipes* (wet forest: 19 exx., peat bog: 33 exx.), *L. aeruginosus* (wet forest: 1 ex., peat bog: 2 exx.), *Lithobius* sp. (peat bog: 17 exx., wet forest: 9 exx.), *Cryptops hortensis* (wet forest: 1 ex.), *Pachymerium ferrugineum* (wet forest: 11 exx., peat bog: 1 ex.), *Clinopodes flavidus* (peat bog: 2 exx.), *Strigamia acuminata* (wet forest: 5 exx., peat bog: 3 exx.), *S. transsilvanica* (peat bog: 3 exx.).

Remarks. The number of specimens here sampled is the highest of the whole sampling.

#### 10 - Prati di Col San Floreano (8)

Species diversity: 8 species/62 exx. (damp meadow: 8 spp./62 exx.); Shannon's index: 1.52; evenness: 0.73.

Species composition: *Lithobius agilis* (damp meadow: 26 exx.), *L. forficatus* (damp meadow: 2 exx.), *L. sp. gr. mutabilis-latro* (damp meadow: 3 exx. of *L. cf. latro*), *L. nodulipes* (damp meadow: 1 ex.), *L. aeruginosus* (damp meadow: 6 exx.), *Lithobius* sp. (damp meadow: 11 exx.), *Pachymerium ferrugineum* (damp meadow: 9 exx.), *Clinopodes flavidus* (damp meadow: 3 exx.), *Strigamia transsilvanica* (damp meadow: 1 ex.).

Remarks. No species of *Eupolybothrus* have been collected in this locality.

#### 11 - Torbiera di Borgo Pegoraro (18)

Species diversity: 11 species/42 exx. (peat bog: 9 spp./26 exx., forest: 6 spp./16 exx.); Shannon's index: 2.08; evenness: 0.87.

Species composition: *Eupolybothrus tridentinus* (forest: 7 exx., peat bog: 2 exx.), *Lithobius agilis* (forest: 3 exx., peat bog: 6 exx.), *L. castaneus* (peat bog: 1 ex.), *L. forficatus* (peat bog: 1 ex.), *L. lapidicola* (peat bog: 4 exx.), *L. sp. gr. mutabilis-latro* (peat bog: 1 ex. of *L. cf. mutabilis*), *L. muticus* (forest: 1 ex., peat bog: 1 ex.), *L. nodulipes* (peat bog: 6 exx.), *L. validus* (forest: 1 ex.), *Lithobius* sp. (peat bog: 2 exx., forest: 1 ex.), *Pachymerium ferrugineum* (forest: 1 ex., peat bog: 2 exx.), *Strigamia transsilvanica* (forest: 2 exx.).

Remarks. Shannon's index is the highest recorded among the localities of the hill belt

#### 12 - Torbiera di Lazzacco (11)

Species diversity: 12 species/115 exx. (damp meadow: 4 spp./5 exx., peat bog: 6 spp./70 exx., forest: 8 spp./40 exx.); Shannon's index: 1.94; evenness: 0.78.

Species composition: *Eupolybothrus grossipes* (damp meadow: 1 ex.), *E. tridentinus* (forest east: 13 exx.), *Lithobius agilis* (forest west: 2 exx., peat bog east: 4 exx., peat bog west: 7 exx.), *L. castaneus* (forest east: 2 exx.), *L. sp. gr. mutabilis-*



*latro* (forest east: 1 ex. of *L. cf. mutabilis*, forest west: 1 ex. of *L. cf. mutabilis*, peat bog east: 3 exx. of *L. cf. mutabilis*, peat bog west: 4 exx. of *L. cf. mutabilis*), *L. muticus* (damp meadow: 1 ex., peat bog west: 5 exx.), *L. nodulipes* (damp meadow: 1 ex., forest east: 1 ex., peat bog west: 7 exx.), *L. salicis* (damp meadow: 1 ex.), *L. validus* (forest east: 2 exx.), *Lithobius* sp. (damp meadow: 1 ex., forest: 14 exx., peat bog: 10 exx.), *Pachymerium ferrugineum* (forest west: 3 exx., peat bog east: 14 exx., peat bog west: 15 exx.), *Strigamia acuminata* (peat bog east: 1 ex.), *S. transsilvanica* (forest west: 1 ex.).

Remarks. *L. salicis* has been collected only in this locality.

#### 13 - Torbiera di Sequals (6)

Species diversity: 13 species/67 exx. (forest: 10 spp./38 exx., peat bog: 5 spp./29 exx.); Shannon's index: 2.00; evenness: 0.83.

Species composition: *Eupolybothrus tridentinus* (forest: 3 exx., peat bog: 3 exx.), *Lithobius agilis* (forest: 8 exx.), *L. castaneus* (forest: 1 ex.), *L. forficatus* (peat bog: 3 exx.), *L. lapidicola* (peat bog: 2 exx.), *L. sp. gr. mutabilis-latro* (forest: 2 exx. of *L. cf. latro*, peat bog: 1 ex. of *L. cf. latro*), *L. nodulipes* (forest: 9 exx.), *Lithobius* sp. (forest: 5 exx., peat bog: 10 exx.), *Cryptops* sp. (forest: 1 ex.), *Schendyla nemorensis* (forest: 1 ex.), *Pachymerium ferrugineum* (forest: 5 exx., peat bog: 10 exx.), *Geophilus carpophagus* (forest: 1 ex.), *Geophilus* sp. (forest: 1 ex.), *Strigamia acuminata* (forest: 1 ex.).

Remarks. Total species richness of this locality as well as of its forest habitats is the highest among the whole sampling.

#### C. Peat bogs and marshes of the montane level (839-1,518 m, 4 localities)

Total number of species: 17. Min.-max., mean, median number of species per investigated habitats (number of sampled sites in parenthesis): forests (including coniferous forests) (2 sites): 4-5 species, mean 4.5, median 4.5; peat bogs (4 sites): 5-9 species, mean 7.5, median 8.0; damp meadows (1 site): 2 species.

#### 14 - Palude di Cima Corso (9)

Species diversity: 9 species/51 exx. (peat bog: 8 spp./23 exx., forest: 4 spp./28 exx.); Shannon's index: 1.75; evenness: 0.80.

Species composition: *Eupolybothrus tridentinus* (forest: 1 ex., peat bog: 1 ex.), *Lithobius dentatus* (peat bog: 4 exx.), *L. forficatus* (forest: 1 ex.), *L. sp. gr. mutabilis-latro* (forest: 18 exx. of *L. cf. latro*, peat bog: 3 exx. of *L. cf. latro*), *L. nodulipes* (peat bog: 2 exx.), *L. tricuspis* (forest: 8 exx., peat bog: 1 ex.), *Cryptops hortensis* (peat bog: 7 exx.), *Geophilus* sp. (peat bog habitat: 1 ex. probably *G. alpinus*), *Strigamia acuminata* (peat bog: 4 exx.).

Remarks. *L. tricuspis* has been collected only in this site, mostly in the forest habitat. *L. agilis* and *P. ferrugineum*, the most common species among the investigated localities, have not been recorded in this area.

#### 15 - Torbiera Scichizza (5)

Species diversity: 12 species/45 exx. (peat bog: 8 spp./29 exx., coniferous forest: 5 spp./13 exx., damp meadow: 2 spp./3 exx.); Shannon's index: 2.23; evenness: 0.90.

Species composition: *Lithobius agilis* (peat bog: 3 exx.), *L. borealis* (coniferous forest: 2 exx.), *L. dentatus* (peat bog: 2 exx., coniferous forest: 3 exx., damp meadow: 1 ex.), *L. forficatus* (coniferous forest: 2 exx.), *L. lapidicola* (peat bog: 1 ex.), *L. sp.*

*mutabilis-latro* (peat bog: 3 exx. = 1 ex. of *L. cf. latro* + 2 exx. of *L. cf. mutabilis*, coniferous forest: 1 ex. of *L. cf. mutabilis*), *L. muticus* (peat bog: 3 exx.), *L. nodulipes* (damp meadow: 1 ex.), *L. pelidnus* (coniferous forest: 1 ex.), *Lithobius* sp. (coniferous forest: 4 exx., damp meadow: 1 ex., peat bog: 3 exx.), *Pachymerium ferrugineum* (peat bog: 4 exx.), *Strigamia acuminata* (peat bog: 9 exx.), *S. transsilvanica* (peat bog: 1 ex.).

Remarks. Species richness, Shannon's index and evenness in this locality are the highest among the localities of the montane level; Shannon's index is the highest of the whole sampling localities. *L. pelidnus* has been collected only in this locality. No species of *Eupolybothrus* have been recorded.

#### 16 - Torbiera di Curiedi (13)

Species diversity: 5 species/161 exx. (peat bog: 5 spp./161 exx.); Shannon's index: 0.97; evenness: 0.70.

Species composition: *Lithobius agilis* (peat bog north-east: 3 exx.), *L. sp. gr. mutabilis-latro* (peat bog north-east: 18 exx. of *L. cf. mutabilis*, peat bog north-west: 9 exx. of *L. cf. mutabilis*, peat bog south-east: 9 exx. of *L. cf. mutabilis*), *L. muticus* (peat bog north-east: 10 exx.), *Lithobius* sp. (peat bog north-west: 30 exx., peat bog north-east: 9 exx.), *Cryptops* sp. (peat bog north-east: 1 ex.), *Pachymerium ferrugineum* (peat bog north-east: 49 exx., peat bog north-west: 22 exx., peat bog south-east: 1 ex.).

Remarks. Species richness in this locality is the lowest among the localities of the montane level. No species of *Eupolybothrus* have been recorded.

#### 17 - Torbiera di Pramollo (10)

Species diversity: 9 species/25 exx. (peat bog: 9 spp./25 exx.); Shannon's index: 1.73; evenness: 0.79.

Species composition: *Lithobius agilis* (higher peat bog: 1 ex.), *L. borealis* (higher peat bog: 1 ex., lower peat bog: 2 exx.), *L. dentatus* (higher peat bog: 2 exx.), *L. forficatus* (lower peat bog: 1 ex.), *L. sp. gr. mutabilis-latro* (higher peat bog: 8 exx. of *L. cf. latro*, lower peat bog: 2 exx. of *L. cf. latro*), *Lithobius* sp. (peat bog, upper: 4 exx.), *Schendyla nemorensis* (higher peat bog: 1 ex.), *Geophilus alpinus* (higher peat bog: 1 ex.), *Strigamia acuminata* (higher peat bog: 1 ex.), *Strigamia transsilvanica* (higher peat bog: 1 ex.).

Remarks. The number of specimens here sampled is the lowest of the whole sampling. No species of *Eupolybothrus* have been recorded.

## 4. Discussion

### 4.1 Faunistic, zoogeography and habitat preferences of the species

Overall, the relic wetlands of Friuli Venezia Giulia represent a set of habitats with high species richness, as highlighted by this study which fills in some of the gaps in the previous faunistic and ecological knowledge of the area.

Thanks to this study, the knowledge on the centipede fauna of the wetlands is now quite satisfactory and complete, given the diversity of the sampling methods used, pitfall traps and Berlese selector. Pitfall traps materials could in fact be regarded as representative of the epigeal

component of the taxocoenoses, whereas Berlese selector best investigates its edaphic component (WYTWER 1990, 1995). Moreover, samplings replication in late spring and early autumn allow the interception of a wide number of species of soil arthropods in general and chiefly myriapods, in temperate Europe in the most suitable periods of the year for collecting (e.g. MINELLI 1981; KIME 1997; GRELLI et al. 2000). The number of pitfall trap sessions and Berlese samplings varies however among habitats, biotopes and altimetric zones (tabs I, III; see also Methods for details), although quite balanced in all (68 pitfall trap sessions vs 69 Berlese samplings; 7.2-8.7 replications/site). All samplings were positive (at least one specimen collected) except one (Palude del Fiume Cavana, Monfalcone, GO, *Phragmites* sp. [*P. australis*] community (brackish), pt, 4.IX/17.X.2001).

The species recorded are listed in tab. I. Thirty-one species have been registered in all (18 Lithobiomorpha, 3 Scolopendromorpha, 10 Geophilomorpha), 1,567 specimens have been examined. Ascertained number of species range from 2 (Palude di Fontana Abisso: hill belt) to 13 (Torbiera di Lazzacco: hill belt) per site/habitat. The highest total number of species has been collected in the low plain and in the hill belt biotopes, with 23 and 21 species respectively; 18 species have been sampled in the biotopes of the montane level. Number of species of the biotopes in the low plain is quite similar, ranging between 10-11 species, whereas in the hill belt and in the montane level it extends between 2-13 and 5-12 species respectively.

The number of species shows an inverse correlation with the elevation above sea level ( $r_s = -0.102$ ;  $p < 0.01$ ;  $n = 17$ ), while it appears directly correlated to the number of habitat types ( $r_s = 0.615$ ;  $p < 0.01$ ), according to the results of the non-parametric Spearman correlation test. Moreover, the number of species is not significantly correlated with the area ( $r_s = 0.140$ ; n.s.) nor with sampling effort ( $r_s = 0.270$ ; n.s.). The number of habitats is the best predictor that explains the number of species among the four selected independent variables (42.88 % of explained variance;  $F = 11.26$ ;  $p < 0.01$ ), according to the results of the stepwise multiple regression test.

The number of species appears, therefore, significantly correlated to the landscape heterogeneity, indirectly assessed by the number of habitat types. Area "per se" did not appear a variable that explains the number of species, at least for the extension range of the investigated biotopes (4.2-50.8 ha). A lot of evidence is available that highlights the role of habitat heterogeneity in species diversity (MALANSON & CRAMER 1999; TEWS et al. 2004). A great number of different habitats may favour the presence of more niches and resources for more species and individuals (KREBS 2009). A similar species-area and species-habitat heterogeneity relationship in marshland environments has been obtained in Italy for other zoological taxa (e.g., birds: BENASSI et al. 2007).

Four clusters, although at low similarity values,

seem recognizable from the UPGMA analysis (fig. 2): i) one cluster includes all the biotopes of the low plain and the hilly belt, except for ii) the site at lower elevation (1. Cavana, 0-1 m above s.l.) to which is directly linked, iii) one cluster, linked to the above mentioned two groups, includes three of the four peat bogs and marshes of the montane level (14. Palude di Cima Corso; 15. Torbiera Scichizza; 17. Torbiera di Pramollo) and iv) one cluster includes the biotopes with the lowest number of species (8. Palude di Fontana Abisso, 2 species; 16. Torbiera di Curiedi, 5 species). The biotopes that cluster at the highest value (0.75) are Paludi del Corno (site n. 4) and Risorgive di Virco (site n. 6), both in the low plain.

The number of species sampled represents 55% of the species recorded in Friuli Venezia Giulia (58 species according to ZAPPAROLI & MINELLI 2005) and nearly 40% of those quoted in north-eastern Italy as a whole (76 species according to MINELLI 1991). The faunistic richness of wetland habitats in Friuli Venezia Giulia is comparatively higher than that reported for other representative habitats of north-eastern Italy, also object of recent and intensive investigations by means of both pitfall traps and direct samplings, such as the woodlands of the Low Plain in Veneto and Friuli Venezia Giulia (*Quercus-Carpinetum boreoitalicum*), with 23 species (MINELLI 1982), and the montane and alpine habitats of the Dolomites, with 25 species (MINELLI 1988).

A large number of records pertaining to species whose distribution in north-eastern Italy or in Friuli Venezia Giulia was formerly poorly known, certainly due to lack of research, such as *Lithobius agilis*, *L. borealis*, *L. sp. gr. mutabilis-latro*, *L. pelidnus*, *L. salicis*, *L. burzenlandicus*, *Stigmatogaster gracilis*, *Pleurogeophilus mediterraneus*, is reported in this study. Other species widely spread in the Mediterranean basin, and recorded in Friuli Venezia Giulia as well, but not reported in this study, could also be however present in the biotopes considered. Among these, *Scutigera coleoptrata* (LINNAEUS, 1758) and *Dignathodon microcephalus* (LUCAS, 1846) could be present in localities of the low plain. The fact that some species widely spread in north-eastern Italy, where not found seems additionally noteworthy. No records have been actually collected for the lithobiomorph *Harpolithobius anodus* (LATZEL, 1880) and the geophilomorph *Dicellogophilus carniolensis* (C.L. KOCH, 1847), in spite of intensive samplings. Both species are South European elements whose range is chiefly oriental, common in the montane and submontane mesophilous forests of the area (ZAPPAROLI 1989; MINELLI & IOVANE 1987; MINELLI 1991), but also recorded in the Padano-Venetian *Quercus-Carpinus* lowland woods (MINELLI 1982) and in many submontane forest habitats of Slovenia (Kos 1996).

The analysis of the main chorotypes represented in the centipede fauna (tab. II) shows an high percentage

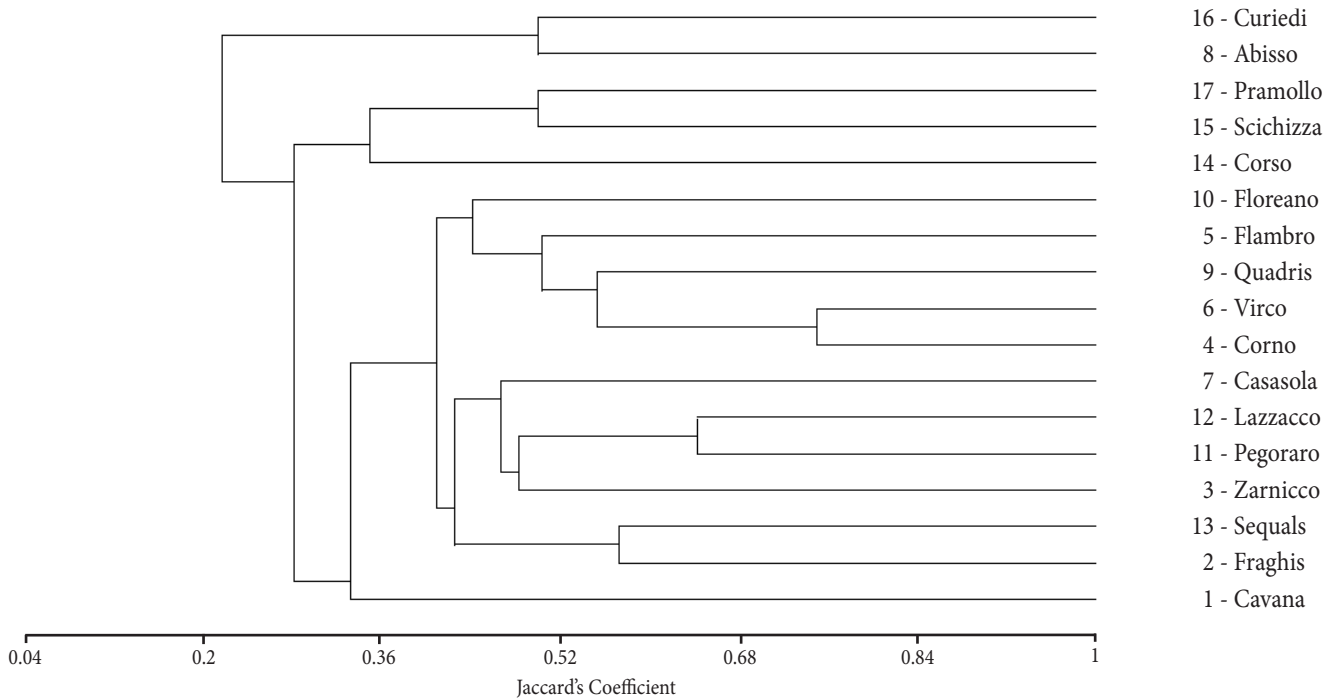


Fig. 2 - Cluster analysis (UPGMA method) of the 17 sites sampled obtained by modified values of Jaccard index.  
 - Cluster analysis (metodo UPGMA) dei 17 siti campionati ottenuta dai valori modificati dell'indice di Jaccard.

of species widely spread in Europe (26 species, 83.9%), mostly Central European (10 species, 32.2%), where the highest value has been recorded in the montane zone (47.1% of the species recorded in the level); also well represented are the European s. str. and the S-European components (8 species both, 25.8% each), where the highest value has been recorded in the montane zone (35.3%) and in the low plain (27.4%) respectively. The percentage of the species widely spread in the Holoarctic region (3 species, 9.7%), whose value is more or less the same in all the three altitudinal zones (4.5-5.9%), and of those widely spread in the Mediterranean basin (2 species, 6.4%), occurring only in the low plain (9.0%), are on the contrary both very small. No Italian endemic elements have been recorded.

About 87% of the centipede fauna is mostly represented by mesophilous woodland species (*Eupolybothrus grossipes*, *E. tridentinus*, *L. castaneus*, *L. sp. gr. mutabilis-latro*, *L. tricuspis*, *L. validus*, *L. aeruginosus*, *Cryptops anomalans*, *C. hortensis*, *C. parisi*, *Schendyla nemorensis*, *Geophilus alpinus*, *G. carpophagus*, *Strigamia acuminata*, *S. transilvanica*), generally with a wide altitudinal range and sometimes present also in open alpine habitats (*L. dentatus*, *L. muticus*). The few forest species related to more termophilous conditions (*Stigmatogaster gracilis*, *Henia vesuviana*) are restricted to the low plain. A small portion of species colonizing a wide spectrum of habitats in Italy is also present (*Lithobius forficatus*, *L. lapidicola*, *Pachymerium ferrugineum*, *Clinopodes flavidus*).

Tab. I - Checklist of species per site, chorotype, number of species and specimens collected by methods and diversity indices. Abbreviations: ext = extension of sites (in ha), ele = elevation of sites (in m above s.l.); hab = number of main habitats; sam = number of samplings per site (pitfall traps/Berlese); F = n. of localities in which the species is present and number of specimens sampled, in parenthesis; n. spp. = number of species; p/B = number of specimens collected by pitfall traps (p) and Berlese extraction (B); Sh = Shannon's index (log base e); E = evenness; chorotypes: CAE = Centralasiatic European, CEU = Central European, EUR = European, MED = Mediterranean, SEU = South European, TUE = Turanic European, WME = West Mediterranean, WPA = West Palearctic. \* = *Geophilus sp.* probably *G. alpinus*.

- Elenco delle specie per località, corotipo di appartenenza, numero di esemplari raccolti per metodo e indici di diversità. Abbreviazioni: ext = superficie del sito (in ha), ele = quota del sito (in m s.l.m.); hab = numero di habitat; sam = numero di campionamenti per sito (pitfall traps/Berlese); F = n. di località in cui la specie è presente e numero di esemplari campionati, in parentesi); corotipi: CAE = Centroasiatico Europeo, CEU = Centro Europeo, EUR = Europeo, MED = Mediterraneo, SEU = Sud Europeo, TUE = Turanico Europeo, WME = Ovest Mediterraneo, WPA = Ovest Paleartico. \* = *Geophilus sp.* probabilmente *G. alpinus*.

Legend: 1. Palude del Fiume Cavana (15); 2. Palude Fraghis (3); 3. Risorgive Zarnicco (14); 4. Paludi del Corno (4); 5. Risorgive di Flambro (12); 6. Risorgive di Virco (16); 7. Torbiera di Casasola (7); 8. Palude di Fontana Abisso (2); 9. Prati umidi dei Quadris (17); 10. Prati di Col San Floreano (8); 11. Torbiera di Borgo Pegoraro (18); 12. Torbiera di Lazzacco (11); 13. Torbiera di Sequals (6); 14. Palude di Cima Corso (9); 15. Torbiera Scichizza (5); 16. Torbiera di Curiedi (13); 17. Torbiera di Pramollo (10).



Species	Chorotype	Altitudinal zones and localities																	R
		Low plain 0-23 m above s.l.; 22.7-80 ha 22/21 replications					Hill belt 160-200 m above s.l.; 9.6-42.0 ha 28/33 replications					Montane level 839-1,518 m above s.l.; 4.4-13.0 ha 18/15 replications							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
1. <i>Eupolybothrus (E.) grossipes</i>	CEU	40/0	22.7	47.0	50.8	71.0	80.0	42.0	9.7	21.5	35.0	28.4	15.8	9.6	7.5	9.9	13.0	4.4	4.4-80.0
2. <i>E. (Leptopolybothrus) tridentinus</i>	CEU	0-1	8	13	15-16	21-22	23	160-162	163	171	180	185	184-195	180-200	839	842-844	851-874	1,510-1,518	0-1,518
0. <i>Eupolybothrus</i> spp.	-	3	3	2	2	2	2	3	1	2	1	2	3	2	2	3	1	1	1
3. <i>Lithobius (L.) agilis</i>	CEU	4/1	4/4	4/4	3/4	4/4	3/4	6/4	2/4	4/5	2/5	4/3	6/5	4/7	4/2	6/3	4/6	4/4	68/69
4. <i>L. (L.) borealis</i>	EUR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2 (20)
5. <i>L. (L.) castaneus</i>	SEU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11 (129)
6. <i>L. (L.) dentatus</i>	CEU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1 (7)
7. <i>L. (L.) forficatus</i>	EUR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16 (191)
8. <i>L. (L.) lapidicola</i>	CEU	5/23	2/4	5/4	3/-	2/3	-/6	2/12	18/12	36/7	15/11	8/1	6/7	-/8	-	-/3	2/1	1/-	2 (5)
9. <i>L. (L.) sp. gr. mutabilis</i> s.-/ <i>latro</i> <sup>2</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4 (6)
10. <i>L. (L.) muticus</i>	EUR	4/-	37/- <sup>1</sup>	1/-	1/-	6/-	2/-	12/1	-	-	-	-	5/4 <sup>1</sup>	3/- <sup>2</sup>	18/3 <sup>2</sup>	2/1 <sup>1/2</sup>	17/19 <sup>1</sup>	5/5 <sup>2</sup>	2 (16)
11. <i>L. (L.) nodulipes</i>	CEU	21/-	1/-	6/-	9/-	17/-	1/-	12/1	-	48/4	1/-	6/-	8/1	6/3	-/2	1/-	-	-	14 (148)
12. <i>L. (L.) pelidnus</i>	EUR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1 (1)
13. <i>L. (L.) salicis</i>	SEU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1 (1)
14. <i>L. (L.) tricuspis</i>	CEU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1 (9)
15. <i>L. (L.) validus</i>	SEU	18/-	-	8/-	7/-	3/-	-	-/2	-	-	-	1/-	2/-	-	-	-	-	-	7 (41)
16. <i>L. (Monotarsobius) aerruginosus</i>	-	10/-	2/2	6/-	1/4	1/6	3/24	26/52	23/22	18/8	8/3	3/-	10/15	1/14	-	5/3	-/39	-/4	16 (313)
17. <i>L. (M.) burzenlandicus</i>	CEU	-	-	1/-	-	-	-	-	-	1/2	-/6	-	-	-	-	-	-	-	3 (10)
18. <i>L. (Sigibius) microps</i>	EUR	-	-	1/-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1 (1)
19. <i>Cryptops (Cryptops) anomalous</i>	SEU	1/-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1 (1)
20. <i>C. (C.) horrensis</i>	CAE	3/-	-/9	-/6	-/4	-/31	1/18	-	-	-	-	-	-	-	-/7	-	-	-	7 (77)
21. <i>C. (C.) parisi</i>	SEU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1 (3)
00. <i>Cryptops (C.) sp.</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2 (2)
22. <i>Stigmatogaster gracilis</i>	MED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1 (1)
23. <i>Hemia (Chaetechelyne) vesuviana</i>	WME	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2 (18)
24. <i>Schendyla nemorensis</i>	EUR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3 (4)
25. <i>Pachymermium ferrugineum</i>	WPA	-/3	-/8	-/20	-/2	-/9	1/10	-/5	-/48	-/12	1/8	1/2	-/32	-/15	-	-/4	-/72	-	15 (253)
26. <i>Climopodes flavidus</i>	TUE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5 (8)
27. <i>Geophilus alpinus</i>	EUR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5 (16)
28. <i>G. carpophagus</i>	EUR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3 (3)
00. <i>Geophilus</i> sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1 (1)
29. <i>Pleurogeophilus mediterraneus</i>	SEU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8 (33)
30. <i>Strigamia acuminata</i>	CEU	1/2	1/5	-	-	-	-	-	-	3/5	-	-	-	-	-/4	6/3	-	-	8 (20)
31. <i>S. transsilvanica</i>	SEU	-	-	-	1/-	-	-/10	-	-	1/2	-/1	2/-	-/1	-	-	1/-	-	-	
<b>Total number of species (localities/ altitudinal zones) and specimens (pitfall/Berlese extractor) and diversity indices</b>	n. spp. p/B Sh E	10 70/34 1.84 0.80	11 44/48 1.87 0.78	10 60/31 1.95 0.85	11 24/22 2.15 0.90	11 56/53 1.91 0.79	11 22/85 1.95 0.85	11 54/77 1.75 0.80	12 150/46 1.90 0.77	2 41/82 0.67 0.96	8 26/36 1.52 0.73	11 39/3 2.08 0.87	12 54/61 1.94 0.78	13 17/50 2.00 0.83	9 31/20 1.75 0.80	12 28/17 2.23 0.90	5 20/141 0.97 0.70	9 10/15 1.73 0.79	31 (746/820)

Class of chorotypes	Chorotypes	Altitudinal zones					
		Low plain (0-23 m)		Hill belt (160-200 m)		Montane level (839-1,518 m)	
		n.	%	n.	%	n.	%
Species widely distributed in the Holarctic region (3 - 9.7%)							
	Centro-Asiatic-European (1 - 3.2%)	1	4.5	1	5.0	1	5.9
	Turanic-European (1 - 3.2%)	1	4.5	1	5.0	-	-
	W-Palearctic (1 - 3.2%)	1	4.5	1	5.0	1	5.9
Species widely distributed in Europe (26 - 83.9%)							
	European (8 - 25.8%)	4	18.2	4	20.0	6	35.3
	Central-European (10 - 32.2%)	7	31.8	8	40.0	8	47.1
	S-European (8 - 25.8%)	6	27.4	5	25.0	1	5.9
Species widely distributed in the Mediterranean area (2 - 6.4%)							
	Mediterranean (1 - 3.2%)	1	4.5	-	-	-	-
	W-Mediterranean (1 - 3.2%)	1	4.5	-	-	-	-
<b>Total (31)</b>		<b>22</b>	<b>100</b>	<b>20</b>	<b>100</b>	<b>17</b>	<b>100</b>

Tab. II - Chorological spectrum.  
- *Spettro corologico*.

	Altitudinal zones								
	Low plain (0-23 m)			Hill belt (160-200 m)			Montane level (839-1,518 m)		
	n. sites (pt/be)	min-max n. spp.	mean n. spp.	n. sites (pt/be)	min-max n. spp.	mean n. spp.	n. sites (pt/be)	min-max n. spp.	mean n. spp.
<i>Phragmites</i> communities	2 (3: 2/1)	2-4	3.0	-	-	-	-	-	-
Peat bogs	5* (23: 8/15)	5-9	7.0	6 (31: 12/19)	2-9	5.7	4 (27: 12/15)	5-9	7.5
Forest habitats	6 (16: 12/4)	4-8	6.3	5 (19: 10/9)	6-10	8.0	2 (4: 4/0)	4-5	4.5
Damp meadows	1 (1: 0/1)	5	-	3 (11: 6/5)	2-8	4.7	1 (2: 2/0)	2	-

Tab. III- Min-max and mean number of species per main habitats and altitudinal zones; number of sampled sites is given for each habitat (pt/be: number of replications, given in parenthesis by pt = number of pitfall trap sessions/be = number of Berlese samplings); \* = alkaline peat bogs.

- *Numero minimo, massimo e medio di specie per habitat fondamentali e fasce altitudinali; per ogni habitat è indicato il numero di siti campionati (pt/be: numero di repliche, tra parentesi: pt = numero di campionamenti con pitfall traps/be = numero di campionamenti con selettore Berlese); \* = torbiere alcaline.*

#### 4.2 Semi-quantitative analysis of the assemblages

A first attempt to characterize the centipede assemblages is here presented. The available evidence can be supposed of some use at least to roughly describe the communities and identify the diagnostic species, although operator heterogeneity and non-standardized sampling methods did not allow an exhaustive analysis. Number of specimens sampled per species and sites and min.-max and mean number of species per habitat are summarized in tabs I and III respectively.

The most recurrently and numerically abundant species in the sampled wetlands are:

- *Lithobius agilis*, Central European, being collected in 16 biotopes (191 specimens sampled, 107 [including 28

immatures] by pitfall traps, 84 [incl. 38 immatures] by Berlese selector), mostly occurring in peat bog habitats (121 exx., inclusive of 15 exx. in alkaline peat bogs), but also in forests (39 exx.) and in damp meadows (31 exx.); rare and less regular in the montane level;

- *Pachymerium ferrugineum*, W-Palearctic, occurring in 15 biotopes (253 specimens, mostly collected by Berlese selector but three), occurring mostly in peat bog habitats (170 exx. + 44 exx. in alkaline peat bogs), uncommon in forest (24 exx.), seldom in damp meadows (12 exx.), rarely in *Phragmites* communities (3 exx.); chiefly in the low plain and the hill belt, less regular in the montane level;

- *Lithobius nodulipes*, Central European, in 14 biotopes (148 specimens, 137 by pitfall traps, 11 by Berlese selec-

tor), mostly in forest (97 exx.), also present in peat bogs (48 exx.), rarely in damp meadow (3 exx.); chiefly in the low plain and the hill belt, rare in the montane level;

- *Lithobius* sp. gr. *mutabilis-latro*, widespread in Central and Southern Europe, sampled in 11 biotopes (136 exx. [101 by pitfall traps, 35 by Berlese selector], 97 exx. [*L. cf. mutabilis*: 73 by pitfall traps, 24 by Berlese selector] + 39 exx. [*L. cf. latro*: 28 by pitfall traps, 11 by Berlese selector]); less regular in the low plain;
- *Eupolybothrus tridentinus*, Central European, in 11 biotopes (129 exx., 110 collected by pitfall traps, 19 by Berlese selector mostly immature or larvae), mostly in forest habitats (90 exx.) but also in peat bogs (39 exx.); mostly in the low plain and the hill belt.

The Central European *L. dentatus* seems to characterize the wetland habitats of the montane level, mostly sampled in peat bogs (8 exx.), but also in coniferous forest (3 exx.) and in damp meadows (1 ex.). The Mediterranean *Stigmatogaster gracilis* and *Henia vesuviana* have been recorded only in the biotopes of the low plain, in forest (1 ex.) the former, in forest (1 ex.) and in alkaline peat bogs (14 exx.), the latter.

The hygrophilous forest habitats of the biotopes of the hill belt, mostly dominated by *Alnus* sp., *Salix* spp. and *Ulmus* sp., host the richer assemblages of centipedes, as an average of 8.0 species has been sampled (min-max n. of species: 6-10).

Rich centipede assemblages are also present in the plant communities of the alkaline peat bogs of the low plain, mostly belonging to *Erucastro-Schoenetum nigricantis* association, as well as of the montane level, under more acid soil conditions and belonging to a variation of the above mentioned vegetal association. A mean of 7.0 and 7.5 species has been collected in these two types of habitats respectively (min-max n. of species: 5-9 in both).

Damp meadows, mostly belonging to *Plantago-Molinietum caeruleae* association, and *Phragmites australis* communities generally host poorer centipede assemblages (min-max n. of species 2-8, mean 4.7, in damp meadows; min-max n. of species 2-4, mean 3.0, in *P. australis* communities), although up to 8 species have been sampled in the first type of habitat (Prati di Col San Floreano, UD, 180 m s.l.m.).

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