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Hygropetric and litter-inhabiting spiders (Araneae) from the Abruzzo Apennines (Central Italy)

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Abstract: We present the results of a study of spider material extracted by means of Berlese apparatus from wet mosses and by litter sieving in broadleaf woods within several natural reserves of the Abruzzo region (Central Italy). The main aim of the work is to contribute to the knowledge of the spider fauna of the Apennines; currently one of the lesser known in Italy. In total, 520 spiders, belonging to 49 species and 14 families were collected. The most abundant and diverse family was Linyphiidae, with 278 individuals belonging to 22 species. Altogether we provide 28 new records for the Abruzzo region, including two species of Theridiidae, twenty of Linyphiidae, four of Hahniidae and two of Thomisidae. We also present additional unpublished records of several rare, litter-inhabiting species collected by litter sieving in the same area. Data on habitat preferences and details on the Italian distribution of the rarest species are presented.

Key words: Berlese apparatus, Dysderidae, Linyphiidae, litter sieving, National Park of Gran Sasso, National Park of Monti della Laga, regional fauna

Hygropetric habitats become established on rocky or soil surfaces, with thin water films moving down in a mostly laminar flow. This habitat is colonised mainly by bryophytes (mosses and peat-mosses) and often harbours unique assemblages of arthropods, characterised by endemic or rare species. Hygropetric communities have received very little attention, both from an ecological and faunistic point of view, especially concerning spiders. We present the results of material sampled within the framework of a comprehensive study program on the Apenninic fauna, in which particular attention was given to hygropetric habitats.

The main aims of the present work are to characterise the hygropetric spider assemblages, focusing on both petrimadicolous habitats, developing on rocky surfaces, and limimadicolous ones, developing on the soil surface, and to contribute to the knowledge of the spider fauna of the Apennines; currently one of the lesser known in Italy (PESARINI 1995, ISAIA 2003). We also present additional unpublished records of several rare, litter-inhabiting species collected by litter sieving in the same area, including details on their Italian distribution and habitat preference.

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Material and Methods

We performed 50 samplings of wet mosses over an area that encompasses the Gran Sasso and Monti della Laga National Park (27 sites), Abruzzo, Lazio and Molise National Park of (2 sites), Sirente-Velino Regional Park (3 sites), springs of the Pescara river Natural Reserve (1 site), Zompo Lo Schioppo Natural Reserve (1 site), springs of the Vera river Natural Reserve (2 sites), Simbruini Mountains SCI (1 site) and Pantano Zittola SCI (2 sites). The remaining 11 samples were performed in similar habitats close to the natural reserves. Most of the sites (47) are located in Abruzzo, only three of them are located outside the border of the region, in Molise (two sites at Pantano Zittola SCI) and one in Lazio (Alvito, Valle di Rio). Details on sampling sites are listed in Tab. 2. Samplings were done mostly in winter or spring between 1993 and 2002, however most samples were performed in the same seasons in 2003 and 2004. On the basis of the most distinctive features of the habitat, we sorted the sampling sites into two groups: limimadicolous (13) and petrimadicolous (37). In the case of limimadicolous habitats, mosses develop directly on the soil. They are generally shaded by riparian vegetation and kept humid by spray from

small waterfalls. According to Vaillant's definition (VAILLANT 1956) petrimadicolous habitats develops on rocky substrates, with a subtle film of water running on the rock surface.

Mosses were identified to genus or species level (Tab. 1). Nomenclature follows ALEFFI et al. (2008). For the limimadicolous habitat we identified: *Bryum* cf. *schleicheri, B. pseudotriquetum, Cirriphyllum crassinervium, Cratoneuron decipiens, Ctenidium molluscum* (*Eucladium verticillatum* and *Neckera complanata*. The petrimadicolous sites were characterized by *Barbula* sp., *Brachythecium* sp., *Didymodon* sp., *Hymenostilium* sp., *Orthothecium rufescens*, *Pellia endiviaefolia*, *Plagiomnium ellipticum*, *P. undulatum*, *Rhynchostegium megapolitanum, R. murale* and *R. riparioides*. *Cratoneuron commutatum, C. filicinum, Eucladium verticillatum* and *Brachythecium* sp. were present in both habitats. Spiders were extracted from wet mosses, both limimadicolous and petrimadicolous, by means of Berlese apparatus. For sample collection we used jute bags.

Furthermore, in order to improve the study and provide additional data on litter-inhabiting spiders, we performed several more samplings by litter sieving in the same area. Details on litter sieving samplings are listed in the text.

Specimens were identified to species level, with the exception of juveniles, which we identified at genus or family level whenever possible. Material is stored in ethanol 70% in Isaia's collection, at the Dipartimento di Biologia Animale e dell'Uomo, Università di Torino. Two legs of each *Parachtes* specimens have been stored at the cryo-collection facility at the CRBA (Centre de Recursos de Biodiversitat Animal, Universitat de Barcelona) for future molecular analyses.

Results and Discussion

In total, 494 spiders, belonging to 38 species, 36 genera and 14 families were extracted from wet mosses (Tab. 3). At limimadicolous sites (13 samplings) we collected 100 spiders, belonging to 11 families and 21 species. Petrimadicolous sites (37 samplings) accounted for 394 spiders, belonging to 11 families and 29 species (Tab. 2 and 3). Since they were earliest instars, 94 spiders (24%) from petrimadicolous sites, were not identifiable, even at family level. Four species (*Robertus lividus*, *Caracladus leberti*, *Diplocephalus arnoi* and *Antistea elegans*) out of 38 and juveniles belonging to the genera *Lepthyphantes* s.l., *Parachtes*, *Cryphoeca*, *Pardosa*, *Pirata* and *Xysticus* were found in both habitats. By litter sieving in the same area we collected 26 more spiders, belonging to 11 species 10 genera and 5 families.

Tab. 1: List of the identified species of mosses. Nomenclature follows ALEFFI et al. (2008)

HEPATICAE
PELLIACEAE
Pellia endiviifolia (Dicks.) Dumort.
MUSCI
POTTIACEAE
Barbula sp.
Didymodon sp.
Eucladium verticillatum (With.) Bruch & Schimp.
Hymenostylium recurvirostrum (Hedw.) Dixon
BRYACEAE
Ptychostomum pseudotriquetrum (Hedw.) J.R. Spence & H.P. Ramsay
Bryum cf. *schleicheri* DC.
Bryum sp.
PLAGIOMNIACEAE
Plagiomnium ellipticum (Brid.) T.J. Kop.
Plagiomnium undulatum (Hedw.) T.J. Kop.
Plagiomnium sp.
NECKERACEAE
Neckera complanata (Hedw.) Huebener
AMBLYSTEGIACEAE
Palustriella commutata (Hedw) Ochyra
Palustriella decipiens (De Not.) Ochyra
Cratoneuron filicinum (Hedw.) Spruce
BRACHYTHECIACEAE
Brachythecium rivulare Schimp.
Brachythecium sp.
Cirriphyllum crassinervium (Taylor) Loeske & M. Fleisch.
Rhynchostegium megapolitanum (Blandow ex F. Weber & D. Mohr) Schimp.
Rhynchostegium murale (Hedw.) Schimp.
Platyhypnidium riparioides (Hedw.) Dixon
HYPNACEAE
Ctenidium molluscum (Hedw.) Mitt.
PLAGIOTHECIACEAE
Orthothecium rufescens (Dicks. ex Brid.) Schimp.

A few comments on the most representative species are drawn below. Nomenclature and family order follows PLATNICK (2008).

Dysderidae

Two females of *Parachtes siculus* (Fig. 1) have been extracted from wet mosses at petrimadicolous sites. The identification of females in Dysderidae requires care and experience and in some cases remains doubtful. Two females have been identified thanks to the collecting activities, approximately in the same area, of several males of *P. siculus* (Fig. 2) by litter sieving (see additional unpublished records below). Furthermore, BRIGNOLI (1975) recorded this species in Val Fondillo (Pescasseroli, 20 km from our sample). According to our records and to the literature (ALICATA 1964, BRIGNOLI 1975), *P. siculus* shows a quite wide distribution in Central and Southern Italy (Fig. 3 – the map includes the other species of the genus *Parachtes* in Italy). According to the literature the species seems to prefer moist habitats, like mosses, and the litter of beech woods.

P. siculus has been found by litter sieving in the following localities (the alpha numerical code refers to the cryo-collection facility at the Centre de Recursos de Biodiversitat Animal, Universitat de Barcelona):

Abruzzo, Campli (TE), Campo volano, Loc. Macchia da Sole, National Park of Gran Sasso and Monti della Laga, litter sieving in mixed broadleaf wood, 998 m, 42°43'N – 13°39'E, 17.III.2002 leg. Osella: 2♂ (CRBALB000316, CRBALB000317), 1♀ (CRBALB000315);

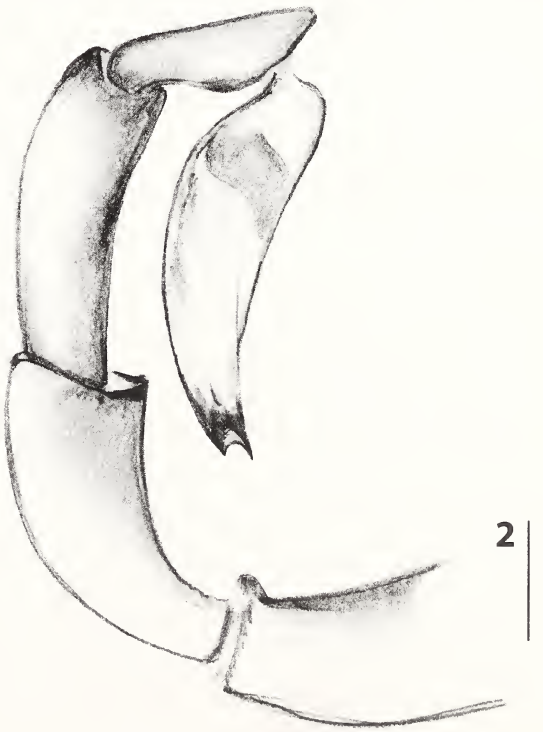
Abruzzo, Torricella Sicura (TE), National Park of Gran Sasso and Monti della Laga, litter sieving in mixed broadleaf wood, 800 m, 42°40'N – 13°36'E, 24.IX.2002 leg. Osella: 1♀ (CRBALB000321), 1♂ (CRBALB000322);

Abruzzo, Isola del Gran Sasso (AQ), Loc. Pretara, National Park of Gran Sasso and Monti della Laga, litter sieving in mixed broadleaf wood, 880 m, 42°29'N – 13°39'E, 3.III.2002, leg. Marotta, Matin, Libareti: 1♂ (CRBALB000318);

Abruzzo, Assergi (AQ), Fonte Cerreto, Loc. Macchia Grande, National Park of Gran Sasso and Monti della Laga, litter sieving in oak wood, 1150 m, 42°24'N – 13°30', 7.V.2002 leg. Marotta and Zampetta: 2♀ (CRBALB000325, CRBALB000326), 2♂ (CRBALB000323, CRBALB000324);

Abruzzo, Leofara (TE), National Park of Gran Sasso and Monti della Laga, litter sieving in mixed chestnut wood, 1100 m, 42°45'N – 13°33'E, 7.IV.2003, leg. Osella: 1♂ (CRBALB000319);

Abruzzo, Capestrano (TE), Forca di Penna, National Park of Gran Sasso and Monti della Laga, litter sieving in ilex wood, 800 m, 42°44'N – 13°32'E, 12.X.2001, leg. Marotta and Di Gaetano: 1♀.



Figs. 1-2 – **1**: *Parachtes siculus*: female, posterodorsal valva of the vulva, internal view (Alvito, Lazio). – **2**: *Parachtes siculus*: male, left palp, retrolateral view (Pretara, Isola del Gran Sasso (AQ). Scale: 0.25 mm in both figures.

Fig. 3: Distribution of *Parachtes* species in Italy. Black symbols refer to literature data, transparent symbols to new records.

Theridiidae

By litter sieving in a mixed broadleaf wood we collected a female of *Robertus ungulatus*, a Palaearctic widespread species found preferably in moist habitats under stones or in wood litter. Together with *R. lividus*, a frequent species in damp situations that was extracted both from petrimadicolous and limimadicolous mosses (see Tab. 2 and 3), both species were recorded for the first time in the Abruzzo region.

Robertus ungulatus Vogelsanger, 1944: Abruzzo, Valle Castellana (TE), National Park of Gran Sasso and Monti della Laga, litter sieving in mixed broadleaf wood, 850 m, 42°45'N 13°38'E 11.VII.2007, leg. Marotta: 1♀.

Linyphiidae

Linyphiidae were the most abundant and species-rich spiders, especially in petrimadicolous habitats. Compared to limimadicolous data, the petrimadicolous habitat showed a higher mean abundance per sample (4.8 vs 3.3 spiders/sample) and the most interesting assemblage in terms of the occurrence of rare and stenoecious species. Fifteen species were extracted from wet mosses, one of them being new for science (*Diplocephalus arnoi*, see ISAIA 2005). The only species found in both habitats were *Caracladus leberti* and *Diplocephalus arnoi*, the latter species showing a remarkable preference for the petrimadicolous sites, with 96 specimen out of 103 extracted from petrimadicolous mosses (see Tab. 2) (material for this species refers to the original description plus 4 females from S30 and one subadult male from S8).

Concerning habitat preferences of *Caracladus leberti*, our data seem to be in accordance with the literature. This species was in fact recorded in mosses and in the litter of conifer forests in southern Tyrol (THALER 1973, STEINBERGER 2005). Our record widens the distribution of this species southward in the Italian peninsula.

Gongylidiellum murcidum was previously recorded in Lombardia (ISAIA et al. 2007), in Friuli-Venezia Giulia (DI CAPORIACCO 1926) and in Veneto (HANSEN & IACONCIG 1999). All literature records, including the comprehensive catalogue by LE PERU (2007) on French spiders, refer to the occurrence of this species in riparian habitats or damp environments.

The uncommon *Mecopisthes latinus* was collected by Berlese apparatus extraction of wet petrimadicolous mosses. The original description of this species (MILLIDGE 1978) is based on material sampled by Prof. P.M. Brignoli in Toscana and Lazio, but lacks data on the habitat preference. Similarly VAN HELSDINGEN (1982) reported the collection of this species by DI CAPORIACCO (1936,

sub *M. silus*) in Toscana, without any details on the habitat. Data on habitat preference are only found in HÄNGGI (1990), who recorded this species in Switzerland in conifer woods, in mown meadows and in untilled lands. The species seems thus not necessarily related to a hygrophilous habitat, but seems to occur under various environmental conditions.

Additional samplings by litter sieving, performed in the same area, revealed some interesting records, listed below. A few comments on habitat preferences and on the Italian distribution of the most interesting species are drawn as follows.

Ceratinella scabrosa is widely distributed in central, northern and western Europe, but in Italy it was only recorded from Lombardia, Piemonte, Alto Adige and Emilia Romagna (PANTINI & ISAIA 2008). In accordance with our data, it seems to prefer the litter of moist woods (HEIMER & NENTWIG 1991).

The Italian endemic *Palliduphantes conradini* was collected by litter sieving in a mixed broadleaf wood. This species, apparently endemic to the Abruzzo Apennine, was previously recorded in three caves in Abruzzo and in mountainous areas of the provinces of L'Aquila, Teramo and Pescara (BRIGNOLI 1971, 1979). According to our record, the species seems to also show a general preference for moist epigean habitats.

With the exception of *Palliduphantes conradini* and *Diplocephalus arnoi*, all the collected species of Linyphiidae represent new records for Abruzzo region. The actual Italian distribution of *Caracladus leberti, Gongylidiellum murcidum, Mecopisthes latinus* and *Palliduphantes conradini* is illustrated in Fig. 4.

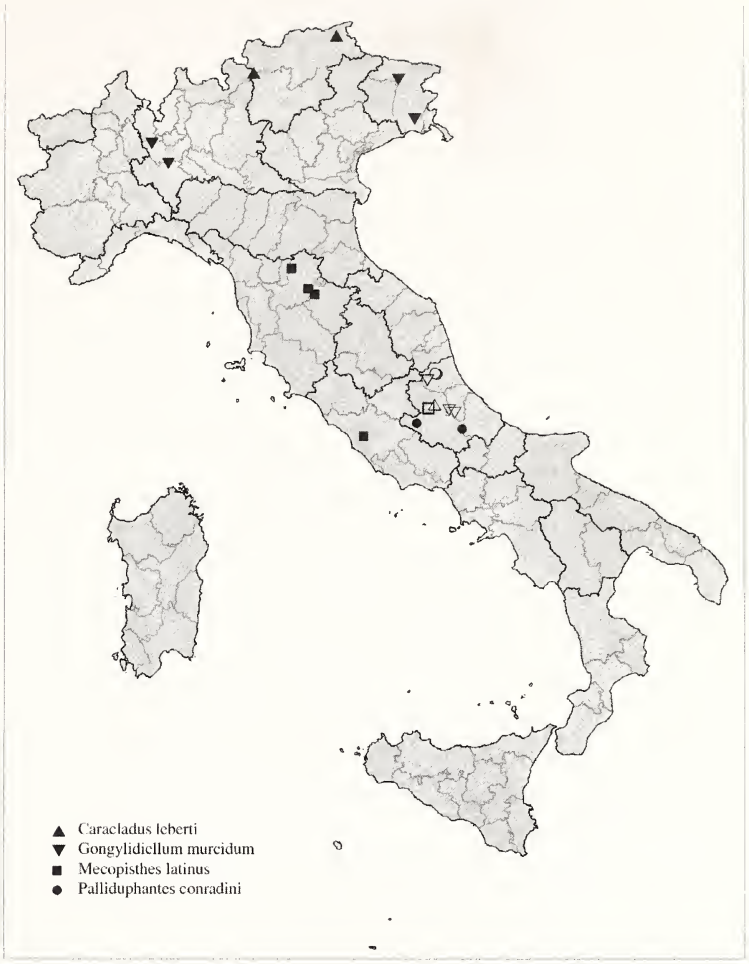


Fig. 4: Distribution of *Caracladus leberti, Gongylidiellum murcidum, Mecopisthes latinus and Palliduphantes conradini* in Italy. Black symbols refer to literature data, transparent symbols to new records.

Centromerus brevivulvatus Dahl, 1912: Abruzzo, Assergi (AQ), Fonte Cerreto, Loc. Macchia Grande, National Park of Gran Sasso and Monti della Laga litter sieving in beech wood, 1150 m, 42°24'N – 13°30', 20.XI.2002 leg. Marotta: 1♂.

Centromerus sellarius (Simon, 1884): Abruzzo, Campovalano, Macchia da Sole, National Park of Gran Sasso and Monti della Laga, litter sieving in mixed broadleaf wood, 998 m, 42°43'N – 13°39'E, 17.III.2002 leg. Osella: 1♀.

Ceratinella scabrosa (O. P.-Cambridge, 1871): Abruzzo, Leofara (TE), National Park of Gran Sasso and Monti della Laga, litter sieving in chestnut wood, 42°45'N – 13°33'E, 7.IV.2003 leg. Osella: 2♀.

Micrargus herbigradus (Blackwall, 1854): Abruzzo, Tossiccia (TE), National Park of Gran Sasso and Monti della Laga, litter sieving in beech wood, Colle Pelato, 1000 m, 42°31'N 13°36'E , 7.VI.2003 leg. Marotta and A.M. Zuppa: 1♀, 1♂.

Saaristoa abnormis (Blackwall, 1841): Abruzzo, Rocca Santa Maria, Ceppo (TE), National Park of Gran Sasso and Monti della Laga, litter sieving in beech wood,

1550 m, 42°40'N 13°27'E, 25.VII.2001 leg. Marotta and A.M. Zuppa: 1♀.

Palliduphantes conradini (Brignoli, 1971): Abruzzo, Valle Castellana (TE), National Park of Gran Sasso and Monti della Laga, litter sieving in mixed broadleaf wood, 850 m, 42°45'N 13°36'E, 11.VII.2007 leg. Marotta: 1♂.

Tenuiphantes tenebricola (Wider, 1834): Abruzzo, Rocca Santa Maria, Ceppo (TE), National Park of Gran Sasso and Monti della Laga, litter sieving in beech wood, 1550 m, 42°40'N - 13°27'E 25.VII.2001 leg. Marotta and A.M. Zuppa: 1♂.

Hahniidae

According to the general preference for litter and soil habitats of these spiders, Hahniidae are found with higher frequencies in limimadicolous compared to petrimadicolous mosses (1.08 vs 0.81 spiders/sample). *Antistea elegans* was the most abundant species extracted from wet mosses, followed by immature specimens of *Cryphoeca* sp. One male of *Cryphoeca silvicola* and one male of *Hahnia ononidum* were found.

Additional sampling by litter sieving revealed the presence of *Hahnia helveola* in the litter of a beech wood. No Hahniidae were previously recorded in the Abruzzo region.

Hahnia helveola Simon, 1875: Abruzzo, Tossiccia (TE), National Park of Gran Sasso and Monti della Laga, litter sieving in beech wood, Colle Pelato, 1000 m, 42°31'N 13°36'E, 7.VI.2003 leg. Marotta and A.M. Zuppa: 1♀.

Thomisidae

Two females of *Ozyptila claveata* were extracted from wet mosses by means of Berlese apparatus (see Tab. 2 and 3). Three males of *Cozyptila blackwalli* were sampled by litter sieving. Despite their widespread distribution both species represent new records for the Abruzzo region, indicating the general lack of investigations in this area.

Cozyptila blackwalli (Simon, 1875): Abruzzo, Isola del Gran Sasso (TE), National Park of Gran Sasso and Monti della Laga, litter sieving in mixed broadleaf wood in the nearby of Lago Pagliare, 880 m, 42°28'N - 13°41', 11.VII.2007 leg. Marotta: 3♂.

Conclusions

The present study highlights the potential of hygropetric and litter habitats for biodiversity studies, especially concerning the occurrence of several rare and stenoecious species. The potential of these habitats is furthermore evident considering the results obtained by the study of the non-araneologic material (Osella et al. in press), sampled in the framework of the same study program, with three new taxa described: *Trichoniscus* n. sp. (Taiti in litt.), (Isopoda); *Dianous coerulescens* ssp. *italicus* Puthz, 2002 (Coleoptera, Staphylinidae) and *Lesteva martinae* Zanetti, 2008 (Coleoptera, Staphylinidae).

Concerning the spider fauna, 28 new records for Abruzzo are provided, including a new family record (Hahniidae): twenty Linyphiidae (*Bathyphantes gracilis*, *B. nigrinus*, *Caracladus leberti*, *Centromerus brevivulvatus*, *C. sellarius*, *C. sylvaticus*, *Ceratinella brevis*, *C. scabrosa*, *Dicymbium nigrum* (s.str.), *Erigone dentipalpis*, *Gnathonarium dentatum*, *Gongylidiellum murcidum*, *Mecopisthes latinus*, *Micrargus herbigradus*, *Oedothorax fuscus*, *Prinerigone vagans*, *Saaristoa abnormis*, *Tenuiphantes tenebricola*, *Walckenaeria acuminata*, *W. alticeps*), four Hahniidae (*Antistea elegans*, *Cryphoeca silvicola*, *Hahnia helveola*, *H. ononidum*), two Theridiidae (*Robertus lividus*, *R. ungulatus)* and two Thomisidae (*Cozyptila blackwalli*, *Ozyptila claveata)*.

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Tab. 2: Details of the sampling sites. A code (column **C**) is assigned to each locality (**Gr**: group; L: limimadicolous; P: petrimadicolous; **Mun**: municipality; **Pr**: province (AQ: L'Aquila; FR: Frosinone; IS: Isernia; PE: Pescara; TE: Teramo); **El**: elevation a.s.l.; **Coord**: Coordinates UTM-WGS84).

C	Gr	Region	Mun	Pr	Locality	Habitat	El	Coord	Date	Leg.
S1	L	Abruzzo	Popoli	PE	San Callisto springs	Mosses on clay soil	309	42°11'N 13°49'E	28II00	G. Osella
S2	P	Abruzzo	Montereale	AQ	Fra Clemente Fountainhead	Mosses on carbonate rock	950	42°31'N 13°14'E	30IX00	G. Osella
S3	L	Molise	Montenero Valcocchiara	IS	Pantano Zittola, SCI "Pantano Zittola"	Mosses in peatbog	859	41°41'N 14°05'E	8XII99	G. Osella
S4	P	Abruzzo	Civitella Alfedena	AQ	La Camosciara, National Park of Abruzzo, Lazio and Molise	Wet mosses on carbonatic rock	1205	41°46'N 13°54'E	24IX00	G. Osella
S5	L	Molise	Montenero Valcocchiara	IS	Fiume Zittola, SCI "Pantano Zittola"	Mosses in peatbogs	822	41°42'N 14°05'E	12II00	G. Osella
S6	P	Abruzzo	Ortona dei Marsi	AQ	Fiume Giovenco, Cesoli	Mosses on carbonatic rock	871	42°00'N 13°42'E	21X00	G. Osella
S7	P	Abruzzo	L'Aquila	AQ	Rio Forcella, S. Marco di Preturo	Mosses on carbonatic peebles	797	42°23'N 13°15'E	17IX00	G. Osella
S8	L	Abruzzo	Capestrano	AQ	Sorgenti Presciano, National Park of Gran Sasso and Monti della Laga	Mosses on caly soil	339	42°16'N 13°46'E	22XII96	G. Osella
S9	P	Abruzzo	Rocca di Mezzo	AQ	Fonte Anatella, Rovere, Regional Park of Sirente Velino	Mosses on carbonatic rock	1400	42°10'N 13°33'E	25IX93	G. Osella
S10	P	Abruzzo	Rocca di Mezzo	AQ	Fonte Anatella, Rovere, Regional Park of Sirente Velino	Mosses on carbonatic rock	1418	42°10'N 13°33'E	27X93	S. Stornelli
S11	P	Lazio	Alvito	FR	Valle di Rio	Mosses on carbonatic rock and ivy	475	41°41'N 13°45'E	4XII99	L. Di Martino
S12	P	Abruzzo	Canistro	AQ	La Sponga Spring, SCI "Monti Simbruini"	Mosses on carbonatic rock	848	41°55'N 13°23'E	1X00	G. Osella
S13	L	Abruzzo	Avezzano	AQ	Castelnuovo	Mosses on clay soil	696	42°03'N 13°32'E	12V90	G. Osella
S14	L	Abruzzo	Villavallelonga	AQ	Villavallelonga	Mosses on clay soil	982	41°52'N 13°37'E	11IV99	G. Osella
S15	P	Abruzzo	Popoli	PE	Pescara springs, Natural Reserve "Sorgenti del Pescara"	Mosses on carbonatic rock	254	42°10'N 13°49'E	15I94	G. Osella
S16	P	Abruzzo	Morino	AQ	Zompo Lo Schioppo, Natural Reserve "Sorgenti del Pescara"	Mosses on carbonatic rock	629	41°51'N 13°24'E	29X96	M. Di Giorgio
S17	L	Abruzzo	Opi	AQ	Sangro River, National Park of Abruzzo, Lazio and Molise	Mosses on river bank (clay)	1155	41°46'N 13°49'E	10XI96	C. Di Marco
S18	P	Abruzzo	Rocca S. Maria	TE	Waterfall, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	1035	42°41'N 13°26'E	13IV97	G. Osella
S19	L	Abruzzo	Avezzano	AQ	Castelnuovo	Mosses on river bank (clay)	960	42°05'N 13°27'E	1III91	Osella

C	Gr	Region	Mun	Pr	Locality	Habitat	El	Coord	Date	Leg.
S20	P	Abruzzo	Celano	AQ	Gole di Celano, Regional Park of Sirente Velino	Mosses on carbonatic rock	1038	42°05'N 13°34'E	20V94	S. Stornelli
S21	P	Abruzzo	Crognaleto	TE	Vomano river, Aprati, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	668	42°33'N 13°29'E	30XI03	A. Di Egidio
S22	P	Abruzzo	Rocca S. Maria	TE	Ceppo, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	1301	42°40'N 13°27'E	30XI03	G. Osella
S23	P	Abruzzo	Isola del Gran Sasso	TE	Ruzzo waterfall, Pretara, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	749	42°28'N 13°40'E	30XI03	A. Di Egidio
S24	P	Abruzzo	Montereale	AQ	Aterno River, Aringo	Mosses on carbonatic rock	950	42°33'N 13°16'E	20III04	G. Osella
S25	P	Abruzzo	L'Aquila	AQ	Springs of Vera River, Tempera, Natural Reserve "Sorgenti del Vera"	Mosses on carbonatic rock	754	42°22'N 13°27'E	17II04	G. Pannunzio
S26	P	Abruzzo	Isola del Gran Sasso	TE	Forca di Valle, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	782	42°31'N 13°37'E	19IX04	A. Di Egidio
S27	P	Abruzzo	Crognaleto	TE	Fosso dell'Acero, Cesacastina, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	1300	42°35'N 13°26'E	9V04	A. Di Egidio
S28	L	Abruzzo	Bussi sul Tirino	PE	Tirino river, National Park of Gran Sasso and Monti della Laga	Mosses on river bank (clay)	316	42°13'N 13°49'E	15II04	G. Osella
S29	P	Abruzzo	Bussi sul Tirino	PE	Tirino River, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	347	42°16'N 13°47'E	15II04	G. Osella
S30	P	Abruzzo	Popoli	PE	San Callisto springs	Mosses on carbonatic rock	309	42°11'N 13°49'E	28V04	G. Osella
S31	P	Abruzzo	Pietracamela	TE	San Giacomo stream, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	978	42°32'N 13°33'E	24V04	A. Di Egidio
S32	L	Abruzzo	Cortino	TE	Tordino springs, Vernesca, National Park of Gran Sasso and Monti della Laga	Mosses on flysch	926	42° 38'N 13°29'E	5IX04	A. Di Egidio
S33	L	Abruzzo	Cortino	TE	Tordino springs, Vernesca, National Park of Gran Sasso and Monti della Laga	Mosses on flysch	821	42°39'N 13°29'E	13VI04	A. Di Egidio
S34	P	Abruzzo	Isola del Gran Sasso	TE	Ruzzo waterfall, Pretara, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	806	42°28'N 13°40'E	18V04	A. Di Egidio
S35	P	Abruzzo	Popoli	PE	San Callisto springs	Mosses on carbonatic rock	353	42°10'N 13°48'E	18IV04	G. Osella
S36	P	Abruzzo	Cortino	TE	Padula, National Park of Gran Sasso and Monti della Laga	Mosses on rocks	980	42°37'N 13°28'E	29V04	A. Di Egidio

C	Gr	Region	Mun	Pr	Locality	Habitat	El	Coord	Date	Leg.
S37	P	Abruzzo	Rocca S. Maria	TE	Paranesi, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	975	42°41'N 13°30'E	3X04	G. Osella
S38	P	Abruzzo	L'Aquila	AQ	Springs of Vera River, Tempera, Natural Reserve "Sorgenti del Vera"	Mosses on carbonatic rock	754	42°22'N 13°27'E	17II04	G. Pannunzio
S39	P	Abruzzo	Crognaleto	TE	Zingano Stream, Aprati, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	700	42°33'N 13°28'E	24X04	A. Di Egidio
S40	L	Abruzzo	Pizzoli	AQ	Passo delle Capannelle, National Park of Gran Sasso and Monti della Laga	Mosses on flysch	1298	42°26'N 13°20'E	21III04	G. Osella
S41	P	Abruzzo	Pietracamela	TE	Arno stream, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	1403	42°30'N 13°32'E	2V04	A. Di Egidio
S42	P	Abruzzo	Rocca S. Maria	TE	Ceppo, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	1054	42°40'N 13°28'E	30XI03	G. Osella
S43	P	Abruzzo	Capestrano	TE	Presciano springs, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	335	42°16'N 13°47'E	14III04	G. Osella
S44	P	Abruzzo	Pietracamela	TE	Arno stream, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	1317	42°30'N 13°32'E	27VI04	A. Di Egidio
S45	P	Abruzzo	Cortino	TE	Padula, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	950	42°38'N 13°28'E	10X04	A. Di Egidio
S46	P	Abruzzo	Isola del Gran Sasso	TE	Ruzzo waterfall, Pretara, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	726	42°28'N 13°40'E	22II04	A. Di Egidio
S47	L	Abruzzo	Valle Castellana	TE	Salinello gorges, Macchia da Sole, National Park of Gran Sasso and Monti della Laga	Mosses on river bank (clay)	697	42°44'N 13°35'E	29VII04	A. Di Egidio
S48	P	Abruzzo	Crognaleto	TE	Zingano stream, Aprati, National Parc of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	758	42°33'N 13°28'E	9V04	A. Di Egidio
S49	P	Abruzzo	Pietracamela	TE	San Giacomo stream, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	1063	42°32'N 13°33'E	3X04	A. Di Egidio
S50	P	Abruzzo	Pizzoli	AQ	Passo delle Capannelle, National Park of Gran Sasso and Monti della Laga	Mosses on carbonatic rock	1251	42°26'N 13°20'E	30XI03	G. Osella

Tab. 3: Species list of spiders extracted from wet mosses by means of Berlese apparatus, with reference to sampling sites and number of specimens (males, females and immatures). See Tab. 2 for sampling sites codes. **COR**: corotype according to VIGNA TAGLIANTI et al. (1992, 1999) – APP: Appeninic, EUR: European, OLA: Holarctic, PAL: Palaearctic, SEU: S-European, SIE: Sibero-European, WEU: W-European, **L**: limimadicolous sites, **P**: petrimadicolous, **n**: number of samples. * indicates new record for Abruzzo region. Alphanumerical code for *Parachtes siculus* refers to cryo-collection facility at the Centre de Recursos de Biodiversitat Animal, Universitat de Barcelona. Nomenclature and order of families according to PLATNICK (2008).

Taxa	COR		L (n=13)	P (n=37)	TOT
Segestriidae					
Segestria sp.				S9: 1juv	1
Dysderidae					
Dysdera sp.				S12: 1juv; S48: 1juv; S49: 7juv	9
Parachtes sp.			S14:3juv;	S9: 1juv; S10: 3juv; S11: 2juv; S18: 2juv	11
Parachtes siculus (Caporiacco, 1949)	APP			S11: 2♀ (CRBALB000309; (CRBALB000320)	2
Theridiidae				S22: 3 juv	3
Robertus lividus (Blackwall, 1836)	SIE	*	S32: 1♀;	S4: 1♀, 1♂	3
Linyphiidae					
Bathyphantes gracilis (Blackwall, 1841)	OLA	*		S12: 2♀	2
Bathyphantes nigrinus (Westring, 1851)	PAL	*		S22: 1♀	1
Caracladus leberti (Roewer, 1942)	WEU	*	S14 2♀, 1♂	S10: 1♀;	4
Centromerus sylvaticus (Blackwall, 1841)	OLA	*	S17: 1♀		1
Ceratinella brevis (Wider, 1834)	PAL	*		S35: 1♀	1
Dicymbium nigrum s. str. (Blackwall, 1834)	PAL	*		S24: 2♀; S29: 1♀, 1♂; S40: 1♀; S43:1♀	6
Diplocephalus arnoi Isaia, 2005	APP		S1: 3♀; S8: 1juv; S25: 3♀;	S4: 7♀, 3♂; S6: 11♀, 1♂; S12: 1♂; S16: 1♂; S23: 1♀; S29: 6♀; S30: 19♀, 6♂; S31: 2♀; S34: 1♂; S37: 1♀; S38: 14♀; S41: 1♂; S43: 6♀; S44: 11♀; S46: 2♀; S49: 2♀	103
Erigone dentipalpis (Wider, 1834)	OLA	*	S13: 1♀		1
Gnathonarium dentatum (Wider, 1834)	PAL	*		S50: 2♀, 2♂	4
Gongylidiellum murcidum Simon, 1884	PAL	*		S27: 1♂; S29: 1♀; S43: 2♂	4
Lepthyphantes s.l.			S25: 1 juv;	S7: 2 juv; S30: 1 juv	4
Mecopisthes latinus Millidge, 1978	SEU	*		S9: 1♀	1
Oedothorax fuscus (Blackwall, 1834)	PAL	*		S45: 1♀	1
Prinerigone vagans (Audouin, 1826)	EUR	*	S13: 1♀		1
Walckenaeria acuminata Blackwall, 1833	PAL	*		S4: 1♀; S6: 1♀; S12: 1♀; S16: 1♀; S42: 1♀	5
Walckenaeria alticeps (Denis, 1952)	PAL	*	S14: 1♀		1
Not identified					119
Tetragnathidae					
Metellina sp.				S12: 1juv; S23: 1juv	2
Metellina merianae (Scopoli, 1763)	EUR		S47: 1♀		1
Pachygnatha sp.			S19: 1juv;		1

Taxa	COR		L (n=13)	P (n=37)	TOT
Araneidae					
Araneus sp.			S8: 1juv		1
Lycosidae					
Alopecosa sp.				S36: 1juv	1
Pardosa sp.			S5: 4juv;	S43: 2juv; S50: 2juv	8
Pirata sp.			S5: 7 juv; S13: 2 juv; S17: 1 juv; S19: 1 juv; S28: 6juv; S47: 3 juv;	S24: 1 juv; S27: 1 juv; S29: 2juv, S35: 1 juv; S 36: 1 juv; S39: 1 juv; S43: 1 juv; S45: 1 juv; S48: 1 juv; S50: 1 juv	31
Trochosa sp.				S30: 1juv	1
Not identified					2
Hahniidae					
Antistea elegans (Blackwall, 1841)	EUR	*	S5: 1♀, 8 juv;	S7: 2♀, 1 juv; S12: 1♀, 3 juv; S24: 5 juv; S38: 1♀; S45: 1♀	23
Cryphoeca sp.			S25: 1 juv; S17: 3 juv S32: 1 juv;	S9: 3 juv; S31: 2 juv;	10
Cryphoeca silvicola (C.L. Koch, 1834)	PAL	*		S9: 1♂	1
Hahnia sp.				S22: 1 juv; S27: 1 juv; S30: 1 juv; S34: 4 juv; S43: 1 juv	8
Hahnia ononidum Simon, 1875	OLA	*	S14: 1♂		1
Dictynidae					
Dictyna sp.				S15: 1juv; S21: 1juv; S37: 1juv; S38: 1juv; S42: 1juv	5
Liocranidae					
Scotina celans (Blackwall, 1841)	EUR		S5: 1♂		1
Clubionidae					
Clubiona sp.				S15: 1juv	1
Gnaphosidae					
Zelotes sp.			S8: 1juv;		1
Thomisidae					
Ozyptila sp.				S15: 3juv	3
Ozyptila claveata (Walckenaer, 1837)	EUR	*	S17: 2♀		2
Xysticus sp.			S14: 4 juv	S10: 1 juv;	5
Salticidae					
Euophrys sp.			S17: 1juv;	S6: 2juv;	3
Heliophanus sp.				S23: 1juv	1
Not identified					94