New records and remarks on the centipede fauna of endogean habitats of Sardinia (Chilopoda)*

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ABSTRACT

Thirty-two species of centipedes, mostly collected with specific methods (soil-washing, Berlese type funnels), mostly in endogean habitats (i.e., the portion of soil comprised between the lower humus layer and the maximum depth of plant roots) of Sardinia, and representing about 60% of the centipede fauna of the island (55 species), are listed and discussed. The Mediterranean species Nannophilus eximius (Meinert, 1870) (Geophilomorpha, Schendylidae) is for the first time recorded from the island. An updated list of the centipedes of Sardinia is also given, according to their distribution in the present-day administrative division of the region. General considerations on the centipede fauna of deep-soil habitats of Sardinia are presented: the Geophilomorpha are the most represented group (20 species, more than 70% of the known Sardinian representatives of the order), followed by the Lithobiomorpha (8 species) and Scolopendromorpha (3 species); species with a small or medium body size are mostly represented, while large species apparently occur only occasionally or are represented by immature specimens; no species have been exclusively found in this habitat so far, although some species seem more frequent in endogean samples than in epigean ones; species diversity is generally low, the number of species per site ranging from 1 (30 sites out of 78) to 8 (1 site).

Key words: Chilopoda, Lithobiomorpha, Scolopendromorpha, Geophilomorpha, soil fauna, endogean habitat, Italy, Sardinia.

INTRODUCTION

Centipedes (Chilopoda) are a group of terrestrial arthropods, mostly nocturnal, lucifugous, and chiefly predators of small invertebrates; epigean (in leaf litter, under stones, fallen trunks and detached barks) or edaphic (endogean), not rare in caves and in the subterranean environment in general (including the so-called Superficial Subterranean Habitat, the MSS of the French authors – see Giachino & Vailati 2010); they occur from sea level up to 4000 m, colonizing a wide variety of habitats from forest ecosystems to open and semi-open habitats (see Lewis 1981; Minelli & Iovane 1987; Zapparoli & Minelli 2005, 2007; Minelli 2011). Approximately 3300 species are recognized to date (Minelli 2006), near 490 of which...
occur in Europe (Enghoff 2004) and about 160 in Italy (Zapparoli & Minelli 2005, 2007). Generally, they exhibit a wide geographic distribution although species with a narrow or restricted, sometimes punctiform range are also known; centipede faunas show a moderate level of endemism (e.g., not more than 30% in the whole of Italy, Zapparoli & Minelli 2005, 2007; about 20% in Sardinia, Zapparoli 2009). Although the knowledge on taxonomy, geographic distribution and habitat preferences of some species is still incomplete, they are regarded as useful biogeographic (e.g., Vigna Taglianti et al. 1993, 1999; Edcombe & Giribet 2003; Simaiakis & Mylonas 2008) and ecological indicators (e.g., Parisi et al. 2005; Tuf & Tufová 2008; Dunger & Voigtlander 2009).

The centipede fauna of Sardinia has been the object of intense faunistic research in the last decades, and new and remarkable records have been published (e.g., Zapparoli 1997, 2001; Bonato et al. 2006). Recently, an annotated catalogue has been published, where the information on the regional distribution, habitat preferences and taxonomic status of the 54 species then known for the island are summarized and updated (Zapparoli 2009). Moreover, at least two undescribed species are currently under study (Zapparoli 2009), confirming the high arthropod diversity of the area and its great biogeographic interest also for this group (see Mason et al. 2006; Cerretti et al. 2009).

In research directed to a biological inventory of a given area, centipedes are usually sampled by direct hand collection or by sifting of leaf litter and pitfall trapping (see for instance Simaiakis et al. 2005; Sammler et al. 2006), methods which give information especially on the epigean component of the fauna, i.e. those species inhabiting the surface environment (cf. Giachino & Vailati 2010). These myriapods are also collected by soil extraction using Berlese-Tullgren funnels but, although useful to collect smaller species otherwise difficult to obtain, this method needs time and it is rarely used except in the framework of quantitative studies (see for instance Wytwer 1990; Tuf 2000; Parisi et al. 2005), to obtain information on the edaphic (endogean) component of the assemblages, i.e. the species inhabiting the portion of the soil comprised between the lower humus layer and the maximum depth of plant roots (cf. Balbiano D’Aramengo et al. 2004; Fancellò et al. 2009; Giachino & Vailati 2010). As a result, this component — often including elements specialized for this habitat and with low dispersal power and, therefore, of high potential interest from a taxonomic and zoogeographic point of view — generally remains neglected in qualitative analyses.

Lately, I had the occasion to study new material from many localities of the island, mostly collected in endogean habitats with techniques not usual for these myriapods (see Material and methods). The aim of this paper is to report on this collection, giving an update on the composition of the centipede fauna of Sardinia and improving the knowledge of the microdistribution and autoecology of the species. Some preliminary remarks on the endogean centipede fauna of the study area are also given.

**MATERIAL AND METHODS**

Most of the samples here presented were collected from 1985 to 2010 in about 110 localities from 10 to 1700 m above sea level by Italian entomologists Luca Fancellò, Piero Leo (Cagliari, Italy) and Carlo Torti (Genoa, Italy). Samples by L. Fancellò and P. Leo were collected in 1985–2006 with the soil washing technique (cf. Fancellò et al. 2009). Soil was extracted up to maximum depths of about 50 cm, and the superficial humus layer was removed when present. The detritus obtained after the washing process was placed in Berlese-type sorters, modified according to Pace (1996). Samples were collected all year round except during the excessively arid summer months (June–September), both in woodland and Mediterranean maquis and garrigue habitats. This method is successfully adopted to collect endogean beetles, but it has revealed itself effective also for centipedes. Material by C. Torti was gathered in 2009–2010 by means of sampling of a quantity of soil placed on a Berlese-type sorter (C. Torti, pers. comm.). Few other samples directly collected by hand under stones by other people in 2010 and 2011 are also included.

Species are listed according to Zapparoli (2009). For each species the following data are reported:
- scientific name, Author and year of publication;
- bibliographic reference to the Catalogue of centipedes of Sardinia (Zapparoli 2009);
- material examined, listed according to the present-day administrative provinces (Cagliari prov., Carbonia-Iglesias prov., Medio Campidano prov., Nuoro prov., Ogliastra prov., Olbia-Tempio prov., Oristano prov., Sassari prov.); site, elevation above sea level and vegetal formation and/or habitat when known, date, collector/s and number of specimens (males, females, immatures not belonging to larval stadia, larvae, unsexed specimens); as a measure of body size the approximate length of specimens, measured from the anterior margin of the head shield to the posterior end of the trunk, is given in

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parentheses (but see Bonato & Minelli 2008: 255 for Geophilomorpha); number of leg-bearing segments is given for Geophilomorpha; localities are listed alphabetically and spelled according to the Road Atlas of the Touring Club Italiano (1999);
- general geographic distribution, mainly as a list of the countries or geopolitical units from where the species is known, according to Zapparoli (2009);
- chorotype according to Zapparoli (2009), based on the classification proposed by Vigna Taglianti et al. (1993, 1999);
- Italian distribution, mostly according to Zapparoli & Minelli (2007), but other papers are quoted where significant;
- ecological notes, i.e. the habitat from where the species have been collected in Sardinia according to Zapparoli (2009), including the number of records from the endogean habitat (collected by soil washing and Berlese extraction), and altitudinal range;
- remarks where relevant.

All the specimens examined are in the collection of the Author.

ABBREVIATIONS

COLLECTORS. CT = C. Torti; GD = G. De Dato; GGu = G. Guidolotti; GN = G. Nardi; LF = L. Fancello; LS = L. Spada; PL = P. Leo; RAJ = R. Abou Jaoudé.

OTHER ABBREVIATIONS USED IN FAUNISTIC LIST. ex/exx = specimen/specimens; imm. = immature/immatures; Is./Isl. = Island/Islands; Ip = number of leg-bearing segments; prov. = province; S.S. (followed by number) = State Road; S.P. (followed by number) = Provincial Road.

FAUNISTIC LIST

LITHOBIOMORPHA Pocock, 1895

LITHOBIIDAE Newport, 1844

Eupolybothrus Verhoeff, 1907

1. Eupolybothrus (Allo-polybothrus) nudicornis (Gervais, 1837)


Material examined. Cagliari prov.: Dolianova, 500 m, 9.XII.1986, PL, 1 ♂ (23 mm).

General distribution. Europe: France (mainland, Corsica), Italy (mainland, Sicily, Sardinia), Malta, Spain; North Africa: Algeria (north), Morocco (north-east), Tunisia (north).

Italian distribution. Western Alps (Cotian Alps, Ligurian Alps); Apennines, from the Ligurian Apennine to Aspromonte; Sicily (including Aeolian Isl., Ustica Is., Egadi Isl., Pantelleria Is.), Sardinia and satellite islands; Tuscan Archipelago (Capraia Is.), Pontine Isl. (Santo Stefano Is.), Ischia Is.

Chorotype. W-Mediterranean.

Ecological notes. Thermophilous species recorded in a wide range of habitats, both seminatural (Quercus ilex woods, garrigue) and man-made (Pino plantations, Eucalyptus plantations, orchards); seldom in endogean habitat samples (one record in Zapparoli 2009); sometimes in caves (trogloxene); from sea level to 1800 m.

Remarks. Subgeneric assignment according to Jeekel (1967) but see Stoev et al. (2010).

Lithobius Leach, 1814

Lithobius (Lithobius) Leach, 1814

2. Lithobius (Lithobius) castaneus Newport, 1844


Material examined. Medio Campidano prov.: Villacidro, San Sisimino, 250 m, [in argilloschist Palaeozoic soil: Fancello et al. 2009], 8.V.1986, PL, 1 ♀ (19 mm); ibidem, 250 m, 2.1.1987, PL, 1 ♂ imm. (7 mm).

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

Italian distribution. Northern Italy except Aosta Valley and adjacent areas (Pennine Alps, Leopontine Alps) and Po Plain; from Emila-Romagna to Calabria, no records from the Adriatic side; Sicily (including Aeolian Isl., Ustica Is., Egadi Isl., Pantelleria Is.), Sardinia and satellite islands; Tuscan Archipelago (Elba Is., Montecristo Is.), Ischia Is.

Chorotype. S-European.

Ecological notes. Woodland species commonly inhabiting oakwoods (especially Quercus ilex), rare-
ly other woodlands; sparse records are known from shrub and open Mediterranean habitats (under *Pistacia lentiscus*, *Erica arborea* and *Arbutus unedo*, garrigue, maquis) as well as from montane formations (shrubs dominated by *Juniperus* sp. or *Alnus* sp.); rarely in man-made habitats (settlements, orchards); seldom in endogean habitat samples (four records in Zapparoli 2009); sometimes in caves (subtroglophilic); from sea level to 1800 m.

3. *Lithobius* (*Lithobius*) lapidicola Meinert, 1872


**Material examined.** *Cagliari prov.*: Villasimius, 25 m, 4.1.1993, PL, 1 ♂ (9 mm). *Ogliastra prov.*: Baunei, forest area of Monte Lopene, 710 m, *Pinus pinaster* wood, 21.V.2010, CT, 1 ♂ (8 mm); Jerzu, Sant’Antonio, 700 m, *Quercus ilex* wood, 14.IX.2009, CT, 1 ♂ (8 mm); Lanusei, near S.S. 198, before Bivio del Carmine, 730 m, *Quercus ilex* wood, 12.III.2010, CT, 2 ♀♂, 1 ♀ imm. (6 mm, 7 mm); Villagrande Strisaili, Bosco di Santa Barbara, *Quercus ilex* wood, 27.VII.2009, CT, 2 ♀♂, 1 ♀ imm., 1 ♀ imm. (7 mm, 9 mm). *Sassari prov.*: Foresta Burgos [Bono Burgos], Sos Nibberos, 970 m, in moss, 18.V.2010, CT, 2 imm. (5 mm), 1 larva (2 mm).

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

**Italian distribution.** All mainland regions except Aosta Valley, probably for lack of research; Sicily (including Pantelleria Is., Linosa Is.), Sardinia and satellite islands; Tuscan Archipelago (Elba Is., Pianosa Is., Monte Cristo Is.), Ischia Is.

**Chorotype.** Centraleuropean.

**Ecological notes.** A common euryoecious species recorded in both seminatural (*Quercus ilex* woods, *Q. suber* woods, garrigue, *Alnus* sp. montane shrubs) and man-made (*Pinus* plantations, orchards) habitats; seldom in endogean habitat samples (four records in Zapparoli 2009); sometimes in caves (trogloxene); from sea level to 1800 m.

4. *Lithobius* (*Lithobius*) sardous Silvestri, 1898


**Material examined.** *Cagliari prov.*: Domus de Maria, Sant’Andrea, 50 m, 29.XII.1991, PL, 2 ♀♀ (10 mm); Teulada, 150 m, 3.III.1991, PL, 1 ♂ (♀ mm). *Carbonia-Iglesias prov.*: Domusnovas, Sa Duchessa, 350 m, 18.XII.1991, PL, 2 ♀♀ (10 mm, 11 mm).

**General distribution.** Italy (Sardinia).

**Italian distribution.** Only in southern Sardinia (Iglesiente, Sarrabus).

**Chorotype.** Sardinian endemic, W-Mediterranean affinities (?).

**Ecological notes.** The habitat preferences of this species are virtually unknown (see also Zapparoli 2009): the approximately ten records hitherto published were from sites at low elevation, and near half of them are from endogean habitat samples (see also Zapparoli 2009); never recorded in caves; from 50 to 350 m.

5. *Lithobius* (*Lithobius*) pilicornis Newport, 1844


**Material examined.** *Nuoro prov.*: Forni, Monte Spada, road side, UTM 32T 524151 4436075, 1281 m, direct sampling, [under stones], 14.IX.2009, GN LS, 1 ♀.

**General distribution.** Europe: France (mainland, Corsica), Great Britain (including Channel Isl.), Italy (northern regions, Sardinia), Portugal (mainland, Azores Isl., Madeira Is.), Spain (mainland, Canary Isl.), The Netherlands; North Africa: Morocco. Introduced in Ireland, Nicobar Isl. (India) and Sao Tomé Is. (Gulf of Guinea).

**Italian distribution.** In central and western Alps, from Adige valley to Ligurian Alps; in Ligurian Apennine, from Cadibona pass to Monte Penna; in Sardinia, only in the Gennargentu massif and adjacent areas.

**Chorotype.** W-European.

**Ecological notes.** Woodland species, recorded from *Quercus ilex* woods, riparian habitats (under *Alnus* sp. and *Nerium oleander*) and montane formations (*Alnus* sp. shrubs); also in caves (trogloxene); from 800 to 1600 m. No record from endogean habitat samples.

6. *Lithobius* (*Lithobius*) turritanus Fanzago, 1881


**Material examined.** *Carbonia-Iglesias prov.*: Carbonia, Barbussi, 180 m, 11.XI.1986, PL, 1 ♀ (13 mm), 1 imm. (8 mm).

**GENERAL DISTRIBUTION.** Italy (Sardinia). Italian distribution. Only in Sardinia (all provinces). Chorotype. Sardinian endemic, W-Mediterranean affinities (?)

**ECOLOGICAL NOTES.** A very common, thermophilous species regularly recorded in oakwoods (Quercus iles); sparse records are known from a wide range of open and shrub Mediterranean habitats (maquis, garrigues, meadows), riparian habitats, montane formations as well as from man-made habitats (pinewoods, orchards, Eucalyptus plantations); rarely in endogean habitat samples (six records in Zapparoli 2009); sometimes in caves (trogloxene); from sea level to 1300 m.

**Lithobius (Sigibius) Chamberlin, 1913**

7. **Lithobius (Sigibius) micropodus** Matic, 1980


**MATERIAL EXAMINED.** Cagliari prov.: Isili, 400 m, 7.I.1993, PL, 1 ♂ (6 mm).

**GENERAL DISTRIBUTION.** Europe: Albania, Belgium, Bulgaria, Denmark (mainland), Finland, France (mainland), Germany, Great Britain, Greece (mainland, insular), Ireland (mainland, Sicily, Sardinia), Republic of Macedonia, Norway, Poland, Portugal (mainland), Romania, Spain (mainland, Balearic Isl.), Sweden, Switzerland, The Netherlands, Ukraine, ex-Yugoslavia [Bosnia-Herzegovina, Croatia, Serbia]; Scandinavian and north European populations are mainly synanthropic; West Asia: Turkey; North America (introduced): Canada, U.S.A. Italian distribution. North-eastern (Venetia) and north-western (SW Lombardy, S Piedmont) regions; Apennines, from the Ligurian Apennine to the Pollino Massif, no records from south-eastern regions; Sicily (including Aeolian Isl.), Sardinia and satellite islands; Tuscan Archipelago (Elba Is., Montecristo Is., Giannutri Is.), Pontine Isl. (Zannone Is.), Ischia Is., Tremiti Isl. (San Nicola Is.).

**CHOROTYPE.** European.

**ECOLOGICAL NOTES.** Mostly in Quercus iles woods but also in open and shrub Mediterranean habitats (under Pistacia lentiscus, under Cistus sp.) as well as in other semi-natural habitats (e.g., riparian habitats); very rare in man-made habitats (orchards); often in endogean habitat samples (four records in Zapparoli 2009); no records from caves; from sea level to 1300 m.

**Lithobius (Monotarsobius) Verhoeff, 1905**

9. **Lithobius (Monotarsobius) crusipes** L. Koch, 1862

**Lithobius (Monotarsobius) crusipes** L. Koch, 1862: Zapparoli 2009: 103.
2009: 104.

**Material examined.** *Olbia-Tempio prov.*: Golfo Aranci, Capo Figari, 20 m, 19.I.1994, PL, 1 ♂ (10 mm).

**General distribution.** Europe: Albania, Austria, Belgium, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark (mainland), Finland, France (mainland), Germany, Great Britain, Greece (mainland), Dodecanese Isl., Crete), Hungary, Iceland, Ireland, Italy (mainland, Sicily, Sardinia), Liechtenstein, Luxembourg, Republic of Macedonia, Malta, Montenegro, Northern Ireland (?), Norway (mainland), Poland, Portugal (Madeira Is.), Romania, Russia (Central European territories, Siberia), Serbia, Slovakia, Slovenia, Spain (mainland, Canary Isl.), Sweden, Switzerland, The Netherlands, Ukraine; North Africa: Algeria; Tunisia; West Asia: Caucasus, Jordan, Israel, Syria, Turkey; North America: USA, probably introduced.

**Italian distribution.** Few records from the eastern and central Alps (Venetia, Trentino-Alto Adige, Lombardy); in peninsular regions it has been recorded only in the southern Apennines (Calabria); widespread in Sicily (including Aeolian Isl., Ustica Is., Egadi Isl., Pantelleria Is., Linosa Is., Lampedusa Is.), Sardinia and satellite islands; Pontine Isl. (Ponza Is.), Ischia Is.

**Chorotype.** Sibero-European.

**Ecological notes.** The habitat preferences of this species are poorly known: few records from semi-natural Quercus ilex woods and Eucalyptus plantations have been hitherto published; this is the only record from endogean habitat samples; rarely in caves (trogloxene); elevation range unknown but mostly from low-middle elevation sites (one record at 20 m above s.l.).

**Lithobius** s.l. spp.

**Material examined.** *Cagliari prov.*: Quartu Sant’Elena, Cala Regina, 15 m, 28.III.1990, PL, 1 larva 12 lp (4 mm); San Nicolò Gerrei, 600 m, 1.III.1996, PL, 1 larva 12 lp (4 mm); Sarroch, Nuraghe s’Orcu, 50 m, 25.II.1991, PL, 1 ♀ imm. (5 mm); Sinnai, Punta Serpeddì, 900 m, 28.III.1993, PL, 1 larva 12 lp (6 mm). *Carbonia-Iglesias prov.*: Carbonia, Barbusi, 180 m, 1.XII.1991, PL, 1 larva 10 lp (2 mm), 2 larvae 12 lp (4 mm).

**Medio Campidano prov.:** Tuili, Sa Giara, 580 m, 26.XII.1990, PL, 1 larva 10 lp (4 mm); Villacidro, 260 m, 1.III.1992, PL, 1 larva 12 lp (5 mm); Villacidro, San Sisinnio, 250 m, 2.I.1987, PL, 1 ♂ imm. *Nuoro prov.*: Tonara, 820 m, 27.X.1992, PL, 1 larva 8 lp (3 mm). *Sassari prov.*: Bono, Monte Rasu, 900 m, XII.1989, PL, 1 larva 12 lp (2 mm).

**Remarks.** Records here reported are based on immature specimens (mostly larvae) all collected with the soil-washing technique (see Material and methods), belonging to at least two different species.

**SCOLEPENDROMORPHA** Pocock, 1895

**Cryptopidae** Kohlrausch, 1881

**Cryptops** Leach, 1815

**Cryptops** (**Cryptops**) *punicus* Silvestri, 1896

**Cryptops** (**Cryptops**) *punicus* Silvestri, 1896: Zapparoli 2009: 108.

**Material examined.** *Carbonia-Iglesias prov.*: Sant’Antioco Is., Cala Sapone, 10 m, 12.II.1987, PL, 3 imm. (11 mm, 15 mm, 19 mm).

**General distribution.** Europe: Italy (Montecristo Is., Sardinia, Sicily and circum-Sicilian islands); North Africa: Algeria, Tunisia, Libya.

**Italian distribution.** Sicily (including Ustica Is., Pantelleria Is., Lampedusa Is.), Sardinia and satellite islands; Tuscan Archipelago (Montecristo Is.).

**Chorotype.** W-Mediterranean.

**Ecological notes.** Few records from Mediterranean habitats (under *Pistacia lentiscus*, garrigues); rarely in endogean habitat samples (three records in Zapparoli 2009); occasionally in caves (trogloxene); from sea level to 1400 m.

11. **Cryptops** (**Cryptops**) *trisulcatus* Brölemann, 1902


**Material examined.** *Cagliari prov.*: Capoterra, Gutthuru Mannu, 110 m, 20.XI.2008, PL, 1 ex (16 mm); Serri, 550 m, 27.X.1992, PL, 4 imm. (9–10 mm); Sinnai, Maído, 500 m, 17.V.1991, PL, 1 imm. (6 mm). *Carbonia-Iglesias prov.*: Iglesias, Monte cani, 400 m, 25.I.1986, PL, 1 imm. (12 mm). *Medio Campidano prov.*: Siddi, Pranu Siddi, 340 m, 2.XII.1989, PL, 2 imm. (7 mm); Villacidro, Foresta di Montimannu, 280 m, 8.V.1986, PL, 1 ex (15 mm); Villacidro, San Sisinnio, 250 m, 2.I.1987, PL, 1 imm. (10 mm). *Ogliasta prov.*: Elini, Bosco del Carmine, 800 m, Quercus ilex wood, 18.III.2009, CT, 1 imm. (9 mm). *Olbia-Tempio prov.*: Golfo Aranci, Capo Figari, 20 m, 19.I.1994, PL, 1 imm. (11 mm). *Sassari prov.*: Porto Conte, low maquis, XI.2010, direct sampling, GD GGu, 1 imm. (8 mm).
**GENERAL DISTRIBUTION.** Europe: France (mainland, Corsica), Greece (Ionian Is., Southern Sporades, Crete), Italy (mainland, Sicily, Sardinia), Maltese Archipelago, Portugal (mainland), Romania, Spain (mainland, Balearic Is., Canary Is.); North Africa: Algeria, Tunisia; West Asia: Turkey (south-east).


**HIMANTARIIDAE** Cook, 1895

Himantarium C.L. Koch, 1847

13. Himantarium gabrielis (Linnaeus, 1767)

**GENERAL DISTRIBUTION.** Europe: France (mainland, Corsica), Italy (mainland, Sicily, Sardinia), Maltese Archipelago, Portugal (mainland), Spain (mainland, Balearic Is.); North Africa: Algeria, Morocco.


**CHOROTYPE.** W-Mediterranean.

**ECOLOGICAL NOTES.** Mostly in open Mediterranean habitats, in garrigues and other open habitats, also on beaches; rarely in Quercus spp. seminatural woods as well as in Eucalyptus plantations and in orchards; rarely in endogean habitat samples (three records in Zapparoli 2009); exceptionally in caves (trogloxene); from sea level to 1400 m.

**SCOLOPENDRIDAE** Newport, 1844

Scolopendra Linnaeus, 1758

12. Scolopendra oraniensis Lucas, 1846


**GENERAL DISTRIBUTION.** Europe: France (mainland, Corsica), Italy (mainland, Sicily, Sardinia), Maltese Archipelago, Portugal (mainland), Spain (mainland, Balearic Is.); North Africa: Algeria, Morocco.

**ECOLOGICAL NOTES.** Thermophilous species, mostly in open Mediterranean habitats (maquis, garrigues) as well as in oakwoods (Quercus ilex, Q. pubescens, Q. suber), rarely in other habitats (riparian habitats with Alnus sp.); frequent in endogean habitat samples (five records in Zapparoli 2009); occasionally in caves (trogloxene); from sea level to 1300 m.
Chorotype. Mediterranean.

Ecological Notes. In Quercus spp. woods, but also under Erica arborea and Arbustus unedo shrubs and in Eucalyptus plantations; seldom in endogean habitat samples (ten records in Zapparoli 2009); sometimes in caves (trogloxene); from sea level to 1200 m.

Haplophilus Cook, 1896

14. Haplophilus sardous Verhoeff, 1901


Material examined. Cagliari prov.: Dolianova, 500 m, 9.XII.1986, PL, 1 ♂ 91 lp (44 mm); Esterzili, Monte Santa Vittoria, 750 m, 25.II.1989, PL, 1 ♂ 105 lp (28 mm). Nuoro prov.: Macomer, 620 m, 20.III.1987, PL, 1 ♂ 115 lp (36 mm).

General distribution. Italy (Sardinia).

Italian distribution. Only in Sardinia (almost all provinces, no records from Olbia-Tempio and Oristano provices).

Chorotype. Sardinian endemic, (W-) Mediterranean affinities.

Ecological Notes. The habitat preferences of this species are unknown (see also Zapparoli 2009): epigean but also in caves (trogloxene); frequent in endogean habitat samples (six records in Zapparoli 2009); elevation range from 130 to 750 m. Remarks. Generic assignment according to Minelli (2006) and Minelli & Bonato (in press).

Stigmatogaster Latzel, 1880

15. Stigmatogaster gracilis (Meinert, 1870)

Stigmatogaster gracilis (Meinert, 1870); Zapparoli 2009: 118.

Material examined. Cagliari prov.: Armangia, 300 m, 16.X.1992, PL, 1 ♂ 91 lp (24 mm); Cagliari, Tuivixeddu, 80 m, XI.1986, PL, 1 ♀ 115 lp (32 mm); Serri, 550 m, 27.X.1992, PL, 1 ♂ 91 lp (39 mm), 1 ♀ 93 lp (20 mm). Carbonia-Iglesias prov.: Carbonia, Barbusi, 180 m, 11.XI.1986, PL, 1 ♀ 95 lp (29 mm); Sant’Antioco Is., Cala Sapone, 10 m, 12.II.1987, PL, 1 ♂ 93 lp (40 mm), 3 ♀♀ 97 lp (2 exx 47 mm, 1 ex 25 mm). Medio Campidano prov.: Siddi, Prano Siddi, 340 m, 2.XII.1989, PL, 1 ♂ 97 lp (55 mm), 1 ♂ 91 lp (20 mm); Villacidro, Foresta di Montimannu, 8.V.1986, PL, 1 ♀ 103 lp (56 mm), 4 ♂♂ 85, 89 (2 exx), 91 lp (20, 25, 28, 30 mm); ibidem, 280 m, 8.XI.1986, PL, 1 ♂ 89 lp (30 mm). Nuoro prov.: Bolorata, Badde Salighes, 850 m, 5.I.1991, PL, 2 ♂♂ 97 lp (23 mm, 24 mm); Fonni, Monte Spada, road side, UTM 32T 524151 4436075, direct sampling, [under stones], 1281 m, 14.IX.2009, GN LS, 1 ♂ 97 lp (41 mm); Fonni, Monte Spada, UTM 32T 525284 4436237, 1269 m, pastures with ferns, direct sampling, under stones, 14.IX.2009, GN LS, 1 ♂ 95 lp (55 mm); Nuoro, Monte Ostobene, 443 m, Pinus pinea wood, 18.V.2010, CT, 1 ♂ 97 lp (21 mm). Ogliastra prov.: Baunei, calcareous plateau of Golgo, near church of San Pietro, 485 m, Quercus ilex wood, 21.V.2010, CT, 1 ♂ 98 lp (26 mm); Cardedu, Perda e’ Pera, 25 m, pasture, 22.V.2010, CT, 1 ♂ 93 lp (42 mm); Gairo, 850 m, 15.III.1992, LF, 1 ♀ 89 lp (37 mm); Jerzu, Sant’Antonio, 700 m, Quercus ilex wood, 18.III.2009, CT, 1 ♂ 91 lp (35 mm); Lanusei, Bocco di Selene, Quercus ilex wood, 27.VII.2009, CT, 1 ♂ 89 lp (29 mm); Perdasdefogu, 470 m, 2.III.1990, PL, 1 ♂ 105 lp (22 mm). Sassari prov.: Bono, Monte Rusu, 900 m, XII.1989, PL, 1 ♂ 93 lp (33 mm); Chiaramonti, 350 m, 30.XII.1994, PL, 1 ♂ 103 lp (26 mm).

General distribution. Europe: Albania, Austria, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, France (mainland, Corsica), Greece (mainland, insular including Crete), Italy (mainland, Sicily, Sardinia), Montenegro, Spain (Balearic Isl.); North Africa: Algeria, Tunisia.

Italian distribution. In all of mainland Italy, but with no records from the north-western and north-eastern Alps and from the south-eastern regions; Sicily (including Aeolian Isl., Egadi Isl.), Sardinia and satellite islands; Tuscan Archipelago (Capraia Is., Elba Is., Pianosa Is., Montecristo Is., Giglio Is., Giannutri Is.), Pontine Isl. (Zannone Is., Palmarola Is., Ponza Is.), Ischia Is., Capri Is., Tremiti Isl. (Pianosa Is.).

Chorotype. Mediterranean.

Ecological Notes. A common thermophilous species, mostly recorded in Quercus spp. woods, mostly Q. ilex; a number of records also from open and shrubby Mediterranean habitats; also in man made habitats (Pinus plantations); very frequent in endogean habitat samples (thirty-five records in Zapparoli 2009); no records from caves; from sea level to 1281 m.

Dignathodontidae Cook, 1895

Dignathodon Meinert, 1870

16. Dignathodon microcephalus (Lucas, 1846)

Dignathodon microcephalus (Lucas, 1846); Zapparoli 2009: 123.

Material examined. Carbonia-Iglesias prov.: Sant’Antioco Is., Cala Sapone, 10 m, 12.II.1987, PL, 1 ♂ 73 lp (36 mm).

General distribution. Europe: Albania, Austria, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, France (mainland, Corsica), Greece (mainland, insular including Crete), Italy (mainland, Sicily,
Sardinia), Luxembourg (introduced?), Montenegro, Portugal, Romania, Serbia, Slovakia, Spain (mainland, Balearic Isl.), Ukraine (Crimea); North Africa: Algeria, Morocco, Tunisia; West Asia: Jordan, Israel, Syria, Turkey.

**Italian distribution.** Southern slopes of eastern pre-alpine ranges; Ligurian Apennine, peninsular regions from the Tuscan-Emilian to central Apennines, few records from the southernmost mainland regions (Volturno plain, Gargano, Salento); Sicily (including Aeolian Isl., Egadi Isl.), Sardinia and satellite islands; Tuscan Archipelago (Capraia Is., Elba Is., Pianosa Is.), Ischia Is., Capri Is.

**Chorotype.** Mediterranean.

**Ecological Notes.** Few records from *Quercus ilex* woods and *Pistacia lentiscus* shrubs; often in endogean habitat samples (one record in Zapparoli 2009); no records from caves; from sea level to 730 m.

**Henia (Chaetechelyne) Meinert, 1870**

18. **Henia (Chaetechelyne) vesuviana** (Newport, 1845)

**Material examined.** Cagliari prov.: Isili, 400 m, 7.I.1993, PL, 1 ♂ imm. 67 lp (13 mm). *Carbonia-Iglesias prov.:* Carbonia, Barbusi, 180 m, 11.XI.1986, PL, 1 ♀ imm. 59 lp (22 mm); Fluminimaggiore, 250 m, 26.X.1991, PL, 1 ♂ 73 lp (17 mm); Iglesias, Montecani, 400 m, 25.I.1986, PL, 1 ♂ 73 lp (10 mm); Sant’Antioco Is., Rio Triga, 100 m, 4.II.1990, PL, 1 ♀ imm. 59 lp (17 mm). *Medio Campidano prov.:* Abbas, Passo Bidderti, 450 m, 26.X.1991, PL, 3 ♂ imm. 73, 73, 75 lp (16–18 mm).

**Nuoro prov.:** Nuoro, Monte Orteobene, 720 m, Pinus sp. and *Quercus ilex* wood, 18.V.2010, CT, 1 imm. (fragment); Oniferi, 260 m, 7.XII.1994, PL, 1 ♂ imm. 65 lp (15 mm); ibidem, 260 m, 7.XII.1994, PL, 2 ♂ imm. 61 lp (15 mm); Tonara, 820 m, 27.X.1992, PL, 1 ♀ imm. 65 lp (13 mm). *Ogliastra prov.:* Bau- nei, forest area of Monte Lopene, 710 m, *Pinus pinaster* wood, 21.V.2010, CT, 1 ♂ imm. 67 lp (26 mm), 2 ♀ imm. 63, 73 lp (13, 15 mm); Elini, roadside of S.S. 198, Bivio del Carmine, 850 m, *Quercus ilex* wood, 12.III.2010, CT, 1 ♀ imm. 69 lp (11 mm); Elini, Bosco del Carmine, 800 m, *Quercus ilex* wood, 18.III.2009, CT, 1 ♀ imm. 65 lp (14 mm); Gairo, 850 m, 14.II.1992, PL, 1 ♀ imm. 67 lp (7 mm); ibidem, 850 m, 15.III.1992, LF, 1 ♂ 65 lp (20 mm); 1 ♀ 69 lp (23 mm); Jerzu, Genna Su Ludu, 840 m, 7.III.1989, PL, 1 ♀ 67 lp (27 mm); Osini, in the valley of nuraghi, after Scala di San Giorgio, 810 m, *Quercus ilex* wood, 15.III.2010, CT, 2 ♂ imm. 63, 67 lp, 1 ♀ imm. 71 lp (13–18 mm).

**Oriostro prov.:** Asuni, 200 m, 27.XII.1990, PL, 1 ♀ imm. 65 lp (9 mm); Baudaldu, 140 m, 1.III.1989, PL, 2 ♂ ♀ imm. 71, 73 lp (15–18 mm). *Sassiari prov.:* Burgos, Foresta Burgos, 730 m, XII.1989, PL, 1 ♀ imm. 57 lp, 1 ♀ imm. 59 lp (15 mm, 17 mm).

**General distribution.** Europe: Bosnia-Herzegovina, Bulgaria, Croatia, France (mainland, Corsica), Greece (mainland, insular including Crete), Hungary, Iberian Peninsula, Italy (mainland, Sicily, Sardinia), Macaronesia; North Africa: Maghreb; West Asia: Turkey, Caucasus.

**Italian distribution.** From Liguria to Calabria and Salento, in peninsular regions mostly along the Tyrrhenian side; Sicily (including Aeolian Isl., Egadi Isl., Pantelleria Is., Linosa Is. Lampedusa Is.), Sardinia and satellite islands; Tuscan Archipelago (Capraia Is., Elba Is., Pianosa Is., Montecristo Is., Giannutri Is.), Ischia Is., Capri Is.
very few records along the central and lower Po Plain and in south-eastern regions; Sicily (including Aeolian Isls., Egadi Isls., Pantelleria Is.), Sardinia and satellite islands; Tuscan Archipelago (Capraia Is., Elba Is., Pianosa Is., Giglio Is.), Ischia Is., Capri Is., Tremiti Is. (San Nicola Is., San Domino Is.).

**CHOROTYPE.** W-Mediterranean.

**ECOLOGICAL NOTES.** Woodland species, mostly in *Quercus* spp. woods (generally *Q. ilex*); often also in open and shrub Mediterranean habitats; often in endogean habitat samples (sixteen records in Zapparoli 2009); occasionally in caves (trogloxene); from sea level to 1100 m.

**SCHENDYLIDAE Verhoeff, 1908**

*Nannophilus* Cook, 1896

19. *Nannophilus eximius* (Meinert, 1870)

**MATERIAL EXAMINED.** Cagliari prov.: Esterzili, Monte Santa Vittoria, western slope, 750 m, 25.I.1989, PL, 1 ex 75 lp (18 mm).

**GENERAL DISTRIBUTION.** Europe: Cyprus, Greece (mainland, Dodecanese, Crete), Italy (mainland, Sardinia, Sicily), Maltese Archipelago, Portugal (Madeira Is.), Spain (Canary Is.); North Africa: Algeria, Tunisia (Attems 1929; Minelli et al. 1981; Zapparoli 2002; Enghoff 2004; Simaiakis et al. 2005).

**ITALIAN DISTRIBUTION.** Few records from southern peninsular regions (Calabria; Apulia, Salento); Sicily (including Aeolian Isls., Egadi Isls., Lampedusa Is., Linosa Is.), Sardinia.

**CHOROTYPE.** Mediterranean.

**ECOLOGICAL NOTES.** Thermophiluos species, but habitat preferences of Sardinian populations are unknown; it has been recorded from sea level to nearly 100 m in elevation in circumsicilian and East Mediterranean islands, in low maquis, subcoastal pastures, phrygana and beach habitats (Zapparoli 1995; Simaiakis et al. 2005). The above specimen was sampled on schistose soil, in a shady and damp spot of a steep canyon (P. Leo, pers. comm.).

**NOTES.** First record from Sardinia.

*Scheidylia* Bergsøe & Meinert, 1866

20. *Scheidylia armata* Brölemann, 1901


**MATERIAL EXAMINED.** Carbonia-Iglesias prov.: Carbonia, Monte Sirai, 130 m, 22.XII.1990, PL, 1 ex 35 lp (6 mm), Medio Campidiano prov.: Villacidro, San Sisinnio, 250 m, 2.I.1987, PL, 1 ex 39 lp (11 mm). **Ostirano prov.:** Arzaduli, 250 m, 30.XII.1994, PL, 6 exx 35 (3 exx)–37 (3 exx) lp (5–8 mm); Gonnoscampana, 165 m, 2.XII.1989, PL, 1 ex 33 lp (6 mm).

**GENERAL DISTRIBUTION.** Europe: France (mainland), Italy (central regions, Sardinia).

**ITALIAN DISTRIBUTION.** Sardinia and satellite islands; a single record from northern Latium (Zapparoli in press).

**CHOROTYPE.** W-Mediterranean.

**ECOLOGICAL NOTES.** In shrub (maquis) and sclerophyllous woodland (*Quercus ilex, Q. suber*) Mediterranean habitats; sometimes in endogean habitat samples (no records in Zapparoli 2009); no records from caves; from sea level to 250 m.

21. *Scheidylia carnioleensis* (Verhoeff, 1902)


**MATERIAL EXAMINED.** Cagliari prov.: Sadali, Foresta di Addoli, 750 m, 13.XII.1993, PL, 1 ex 45 lp (11 mm). Nuoro prov.: Dorgali, La Traversa, 200 m, 9.X.1992, PL, 1 ex 45 lp (19 mm). Olbia-Tempio prov.: Aggius, 490 m, 21.IV.1993, PL, 1 ex 47 lp (22 mm). Sassari prov.: Bon, Monte Rasu, 900 m, XII.1989, PL, 2 exx 45, 47 lp (27 mm).

**GENERAL DISTRIBUTION.** Europe: Austria, France (mainland), Italy (mainland, Sardinia), Romania (Dobruja), Serbia, Slovenia.

**CHOROTYPE.** S-European.

**ITALIAN DISTRIBUTION.** Northern regions but no records from Aosta Valley and the central and lower Po Plain; from the Tuscan-Emilian to the central and southern Apenines (one record from Baslicata); Sardinia; Tuscan Archipelago (Elba Is., Montecristo Is.).

**ECOLOGICAL NOTES.** The habitat preferences of this species are poorly known: only few records from semi-natural woods have been hitherto published; rare in endogean habitat samples (no records in Zapparoli 2009); no records from caves; elevation range 200–900 m.

22. *Scheidylia mediterranea* Silvestri, 1897

*Scheidylia mediterranea* Silvestri, 1897: Zapparoli 2009: 130.

**MATERIAL EXAMINED.** Cagliari prov.: Capoterra, Gutturu Mannu, 110 m, XII.2005, PL, 2 exx 51, 53 lp (8 mm, 11 mm); ibidem, 20.XI.2008, PL, 6 exx 49 (1 ex), 51 (3 exx), 53 (2 exx) lp (10–13 mm); Dolianova, 500 m, 9.XII.1986, PL, 2 exx 51 lp (9 mm,
New records and remarks on the centipede fauna of endocean habitats of Sardinia (Chilopoda)


Material examined: Carbonia-Iglesias prov.: Fluminimaggiore, 250 m, 26.X.1991, PL, 1 ex 49 lp (11 mm). Ogliastra prov.: Sadali, road to Cantoniera Genna Uassa, near cave of Janas, 816 m, 24.V.2010, CT, 3 exx 43 lp (9–13 mm); road from Villanova to Gairo Taquisara, near Genna Filigi, 920 m, maquis, 23.V.2010, CT, 1 ex 45 lp (15 mm). Olbia-Tempio prov.: Loiri, Ovili, 140 m, coppice Quercus ilex wood, 18.V.2010, CT, 1 ex 45 lp (12 mm).

General distribution. Europe: Austria, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, France (mainland), Greece (mainland), Italy (mainland, Sicily, Sardinia), Romania (Dobruja), Spain (mainland).

Italian distribution. Liguria, Tuscan-Emilian Apennines (one record); NW Sicily, Sardinia and satellite islands.

Chorotype. Mediterranean.

Ecological notes. Mostly in oakwoods (Quercus ilex) but also in Mediterranean shrub habitats; no records from caves; frequent in endogean habitat samples (thirty-one records in Zapparoli 2009); from sea level to 1000 m.

23. Schendyla montana (Attems, 1895)


Material examined. Carbonia-Iglesias prov.: Fluminimaggiore, 250 m, 26.X.1991, PL, 1 ex 49 lp (11 mm). Ogliastra prov.: Sadali, road to Cantoniera Genna Uassa, near cave of Janas, 816 m, 24.V.2010, CT, 3 exx 43 lp (9–13 mm); road from Villanova to Gairo Taquisara, near Genna Filigi, 920 m, maquis, 23.V.2010, CT, 1 ex 45 lp (15 mm). Olbia-Tempio prov.: Loiri, Ovili, 140 m, coppice Quercus ilex wood, 18.V.2010, CT, 1 ex 45 lp (12 mm).

General distribution. Europe: Austria, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, France (mainland), Greece (mainland), Italy (mainland, Sicily, Sardinia), Romania (Dobruja), Spain (mainland).

Italian distribution. Liguria, Tuscan-Emilian Apennines (one record); NW Sicily, Sardinia and satellite islands.

Chorotype. Mediterranean.

Ecological notes. Mostly in oakwoods (Quercus ilex) but also in Mediterranean shrub habitats; no records from caves; frequent in endogean habitat samples (thirty-one records in Zapparoli 2009); from sea level to 1000 m.

24. Schendyla nemorensis (C.L. Koch, 1837)


Material examined. Cagliari prov.: Capoterra, Gutturu Mannu, 110 m, XII.2005, PL, 2 exx 43 lp (11 mm); Domus de Maria,
San’Andrea, 50 m, 29.XII.1991, PL, 1 ex 37 lp (6 mm); Ilii, 400 m, 7.I.1993, PL, 2 exx 43, 45 lp (18 mm, 20 mm); ibidem, 400 m, 7.I.1993, PL, 1 ex 37 lp (9 mm); Monte [dei] Sette Fratelli (Natural Park), 535 m, maquis with Quercus ilex, Q. suber, Arbutus unedo, Erica sp., 25.V.2010, CT, 2 ex 43 lp (7 mm, 11 mm); Pula, Pisina Manna, 450 m, 15.II.1992, PL, 10 exx 39 lp (6–15 mm), 6 exx 41 lp (9–13 mm); Quarto Sant’Elena, Cala Regina, 15 m, 19.III.1995, PL, 1 ex 41 lp (9 mm); Sadià, Foresta di Addoli, 750 m, 18.I.1995, PL, 1 ex 41 lp (9 mm); ibidem, 750 m, 19.1.1996, PL, 2 exx 43, 45 lp (8 mm, 13 mm); Sinnai, Monte dei Sette Fratelli, 560 m, 6.II.1990, PL, 2 exx 43, 45 lp (10 mm, 12 mm); Sinnai, Punta Serpeddì, 900 m, 17.V.1991, PL, 3 exx 41 lp (8 mm, 10 mm, 12 mm). **Carbonia-Iglesias prov.:** Carbonia, Barbisi, 180 m, 1.XII.1991, PL, 1 ex 39 lp (6 mm). **Nuoro prov.:** Lula, Monte Albo, 630 m, 28.XII.1988, PL, 4 exx 43 lp (3 exx), 45 (1 ex) lp (7–11 mm); ibidem, 630 m, 24.XI.1992, PL, 1 ex 43 lp (9 mm); Monte Ortobene, 443 m, Pinus pinea wood, 18.V.2010, CT, 1 ex 43 lp (12 mm); Oliena, 430 m, maquis with Quercus ilex coppice, Pistacia lentiscus and Cistus sp., 18.V.2010, CT, 1 ex 45 lp (12 mm), 2 exx (11–12 mm). **Ogliastra prov.:** Arzana, road to Ruinas, 785 m, Quercus ilex wood, 23.V.2010, CT, 1 ex 45 lp (10 mm); Baunei, 480 m, limestone plateau, Quercus ilex wood, 17.III.2009, CT, 1 ex 45 lp (14 mm); ibidem, 17.III.2009, CT, 1 ex 43 lp (8 mm), 1 ex (fragment); Baunei, near Perda Longa, 20 m, limestones between Ceratonia silqua, Cistus sp. and Arbutus unedo, [III.2009], CT, 2 exx 41 (9 mm), 43 (13 mm) lp. Cardedu, Perda e’ Pera, 35 m, maquis, under Pistacia lentiscus, 16.III.2010, CT, 3 exx 39 (6 mm), 41 (8 mm), 45 (11 mm) lp; ibidem, isolated trees, under Ceratonia silqua, 22.V.2010, CT, 1 ex 37 lp (12 mm); Elini, roadside of S.S. 198, Bivio del Carmine, 850 m, Quercus ilex wood, 12.III.2010, CT, 7 exx 41 (2 exx), 43 (2 exx), 45 (3 exx) lp (7–16 mm); Elini, Bosco del Carmine, 800 m, Quercus ilex wood, 18.III.2009, CT, 2 ex 43 lp (15 mm), 45 lp (9 mm); Gairo Marina, Is Piscinas, 70 m, Quercus ilex wood, 22.V.2010, CT, 1 ex 45 lp (10 mm); ibidem, 22.V.2010, CT, 1 ex 43 lp (7 mm); Gairo, 850 m, 15.III.1992, LF, 1 ex 43 lp (17 mm); Gairo, Taquisara, 915 m, Quercus ilex wood, 23.V.2010, CT, 1 ex 45 lp (in two fragments of 5 mm each); Lanusei, Bosco Selene, 900 m, IV.1993, PL, 1 ex 41 lp (11 mm); Lanusei, Bosco di Selene, 970 m, Quercus ilex wood, 15.III.2009, CT, 3 exx 43 lp (7 mm, 8 mm, 11 mm); Talana, at the side of the plateau, 1060 m, Quercus ilex wood, 27.V.2010, CT, 4 ex 41 (1 ex), 43 (3 exx) lp (6–10 mm); ibidem, at the junction of S.P. 56 and S.P. 37, 170 m, maquis with Quercus ilex, 27.V.2010, CT, 2 ex 43 lp (6 mm); Trèi, 190 m, Quercus ilex wood on schist, 21.V.2010, CT, 3 ex 41 (6 mm), 43 (9 mm), 45 lp (7 mm); ibidem, north of the village, 190 m, maquis with Quercus ilex, 17.III.2010, CT, 1 ex 43 (11 mm), 2 exx 45 lp (10 mm, 12 mm); Villagrande Strisaili, 830 m, 10.I.1993, PL, 2 ex 41 lp (12 mm). **Cristano prov.:** Gonnostramatza, 165 m, 2.XII.1989, PL, 3 exx 37 lp (7 mm, 8 mm, 9 mm).

**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 (?), Slovakia, Slovenia, Spain (Balearic Isl.), Sweden, The Netherlands; North Africa: Algeria, Morocco, Tunisia; West Asia: Caucasus, Iran, Palestine, Turkey, Uzbekistan; East Asia: Pribilof Isl. (Russia), Japan (introduced).

**GEOPHILIDAE** Cook, 1895

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


**Material examined.** *Carbonia-Iglesias prov.:* Sant’Antioco Is., Cala Sapone, 10 m, 12.II.1987, PL, 1 imm. 53 lp (12 mm); ibidem, 12.II.1987, PL, 1 ex 53 lp (29 mm).

**General distribution.** Europe: Albania, Austria, Belgium, Bosnia-Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark (mainland), European Russia, Finland, France (mainland, Corsica), Great Britain, Greece (mainland and insular including Crete), Hungary, Italy (mainland, Sicily, Sardinia), Latvia, Republic of Macedonia, Norway, Poland, Portugal (mainland, Azores Isl., Madeira Is.), Romania, Slovakia, 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 Isl. (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).

**ITALIAN DISTRIBUTION.** All mainland regions, but few records are known from the south-eastern peninsular regions (Gargano, Salento); Sicily (including Aeolian Isl., Ustica Is., Egadi Is., Pantelleria Is., Linosa Is., Lampedusa Is.), Sardinia and satellite islands; Tuscan Archipelago (Capraia Is., Elba Is., Montecristo Is., Giglio Is.), Pontine Is. (Palmarola Is., Ponza Is., Ventotene Is., Santo Stefano Is.), Ischia Is., Tremiti Is. (Pianosa Is., Capraia Is., San Domino Is.).

**CHOROTYPE.** W-Palaearctic.

**ECOLOGICAL NOTES.** In open and shrub habitats, also on beaches; this is the only record from the endogean habitat; no records from caves; from sea level to near 1200 m.

**Geophilus Leach, 1814**

26. *Geophilus alpinus* Meinert, 1870


**MATERIAL EXAMINED.** Cagliari prov.: Esterizili, Monte Santa Vittoria, 750 m, 25.I.1989, PL, 1 ♂ 47 lp (12 mm); Sinnai, Punta Serpeddi, 900 m, 28.III.1993, PL, 1 ♂ 47 lp (17 mm); Teulada, 150 m, 3.III.1991, PL, 1 ♂ 47 lp (23 mm). *Carbonia-Iglesias prov.:* Fluminimaggiore, 250 m, 26.X.1991, PL, 2 ♂♂ 41 lp, 4 ♀♀ 41 (1 ex), 43 (3 exs) lp (10–22 mm). Medio Campidano prov.: Siddi, Pranu Siddi, 340 m, 2.XII.1989, PL, 1 ♀ 55 lp (28 mm); ibidem, 2.XII.1989, PL, 2 ♂♂ 53 lp (10 mm); ibidem, 2.XII.1989, PL, 1 ♀ 53 lp (24 mm); Villacidro, Foresta di Montimannu, 280 m, 8.V.1986, PL, 1 ♂ 45 lp, 5 ♀♀ 43, 45, 49, 55 (2 exx) lp (10–22 mm); Villacidro, San Sinsinno, 250 m, 2.I.1987, PL, 2 ♂♂ 43, 45 lp (9 mm, 11 mm). Nuoro prov.: Desulo, Bruunc Spina, 1700 m, 14.XI.1992, PL, 3 ♀♀ 51, 53, 53 lp (10–15 mm). Ogliastra prov.: Baunei, near S.S. 125, 720 m, small *Quercus ilex* wood in canyon, 21.V.2010, CT, 1 ♂ 47 lp (14 mm); Elini, Bivio del Carmine, roadside of S.S. 398, 850 m, *Quercus ilex* wood, 12.III.2010, CT, 2 ♀♀ 47, 49 lp (19 mm, 22 mm); Elini, Bosco del Carmine, 800 m, *Quercus ilex* wood, 18.III.2009, CT, 1 ♂ 47 lp (17 mm); road from Villanova to Gairo Taquisara, near Genna Filigi, 920 m, maquis, 23.V.2010, CT, 1 ♀ 47 lp (11 mm); Trieri, 190 m, *Quercus ilex* wood on schist, 21.V.2010, CT, 1 ♀ 45 lp (14 mm). Olbia-Tempio prov.: Golfo Aranci, Capo Figari, 20 m, 19.I.1994, PL, 1 ♂ 51 lp (23 mm). *Oristano prov.:* Asuni, 200 m, 27.XII.1990, PL, 1 imm. ♂♂ 45 lp (14 mm); Mogoro, 90 m, 2.XII.1989, PL, 1 ♀ 55 lp (26 mm); Morgongiori, 330 m, 22.XII.1993, PL, 1 ♀ 51 lp (13 mm). Sassari prov.: Bono, Monte Rasu, 900 m, XII.1989, PL, 1 ♂ 47 lp (14 mm).

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

**ITALIAN DISTRIBUTION.** Alps and eastern Prealps, no records from the Po Plain; peninsular regions from the Tuscan-Emilian Apennines to Calabria, no record from south-eastern regions; Sicily (including Egadi Is., Pantelleria Is., Lampedusa Is.), Sardinia and satellite islands; Tuscan Archipelago (Giglio Is., Giannutri Is.), Ischia Is.

**CHOROTYPE.** European.

**ECOLOGICAL NOTES.** Mostly in *Quercus ilex* woods, but also in Mediterranean shrub and open habitats and in maquis; rarely recorded in riparian habitats; frequently in endogean habitat samples (thirteen records in Zapparoli 2009); sometimes in caves (trogloxene); from sea level to 1700 m.

27. *Geophilus carpoplagus* Leach, 1815


**MATERIAL EXAMINED.** Cagliari prov.: Sinnai, Punta Serpeddi, 900 m, 17.V.1991, PL, 1 imm. 49 lp (15 mm). *Oristano prov.:* Bauladu, 140 m, 1.III.1989, PL, 1 imm. 53 lp (20 mm).

**GENERAL DISTRIBUTION.** Europe: Austria, Bulgaria, Croatia, Denmark (mainland), European Russia, France (mainland, Corsica), Germany, Great Britain, Greece (mainland, Ionian Isl., Crete), Ireland, Italy (mainland, Sicily, Sardinia), Latvia, Montenegro, Norway, Poland, Portugal (mainland, Azores Isl., Madeira Is.), Romania, Slovakia, Slovenia, Spain (mainland, Balearic Isl., Canary Isl.), Sweden, The Netherlands; North Africa: Algeria, Morocco, Tunisia; West Asia: Palestine, Turkey.

**ITALIAN DISTRIBUTION.** Alps and eastern Prealps, no records from Aosta Valley and eastern adjacent areas, central and lower Po Plain; peninsular regions, but few records are known from south-eastern areas (Campania, Gargano, Basilicata); Sicily (including Aeolian Isl., Pantelleria Is.), Sardinia; Tuscan Archipelago (Elba Is., Montecristo Is., Giglio Is., Giannutri Is.).

**CHOROTYPE.** European.

**ECOLOGICAL NOTES.** Mostly in oakwoods (especially *Quercus ilex*), rarely in other habitats such as pine-woods and open habitats (including garrigues and montane *Alnus* sp. shrubs); some records from man-
made habitats (*Eucalyptus* plantations, orchards); sometimes in endogean habitat samples (five records in Zapparoli 2009); rarely in caves (trogloxene); from 140 to 1800 m in elevation.

28. *Geophilus fucorum* Brölemann, 1909


**Material examined.** **Nuoro prov.:** Lula, Monte Albo, 630 m, 11.III.1989, PL, 1 ex 49 lp (19 mm). **Ogliastra prov.:** Osini, in the valley of nuraghi, after Scala di San Giorgio, 810 m, *Quercus ilex* wood, 15.III.2010, CT, 1 ♂ 49 lp (25 mm).

**General distribution.** Europe: France (mainland Mediterranean coast), Great Britain (?), Italy (mainland, Sicily, Sardinia), Spain (Balearic Isl.). **Italian distribution.** Few records from Liguria, Tuscany, Sicily and Sardinia (Zapparoli & Minelli 2005; Minelli 2006; Minelli & Bonato in press).

**Chorotype.** W-Mediterranean.

**Ecological notes.** A littoral species, but two records from *Quercus ilex* woods are also known; the above-mentioned records are the only known ones from the endogean habitat; no records from caves; up to 810 m above sea level.


**Material examined.** Cagliari prov.: Dolianova, 500 m, 9-XII.1986, PL, 1 ♂ 35 lp (7 mm), 1 ♂ 37 lp (11 mm), with 4+4 coxal pores; Domus de Maria, Sant’Andrea, 50 m, 29.XII.1991, PL, 1 ♂ 37 lp (12 mm); Muravera, San Priano, 25.XI.2006, LF, 1 ♂ 35 (8 mm), 1 ♂ 33 (7 mm), 1 ♂ 37 (7 mm) lp (*G. piae* L. Bonato & M. Zapparoli det. 2010); Pula, Pixina Manna, 450 m, 15.II.1992, PL, 1 ex 39 lp (4 mm); Sadali, Foresta di Addoli, 750 m, 19.I.1996, PL, 7 exx 37–39 lp (7–9 mm); San Vito Montelora, 19.XII.2006, LF, 1 ♂ 33 lp (5 mm, 6 mm, 7 mm), 1 ♂ 35 lp (8 mm) (*G. piae* L. Bonato & M. Zapparoli det. 2010); Sinnai, Punta Serpeddi, 900 m, 28.III.1993, PL, 1 ♂ 35 lp (8 mm). **Carbonia-Iglesias prov.:** Carbonia, Barbusi, 180 m, 1.XII.1991, PL, 1 ex imm. 37 lp (7 mm). **Medio Campidano prov.:** Villacidro, San Sisinnio, 250 m, 7.V.1991, PL, 1 ♂ 37 lp (7 mm). **Nuoro prov.:** Bolotana, 6.II.2007, LF, 1 ♂ 37 (9 mm), 1 ♂ 39 lp (9 mm) (*G. piae* L. Bonato & M. Zapparoli det. 2010); Gennargentu, Brunci Spina, 1.V.2006, LF, 1 ♂ 35 lp (7 mm) (*G. piae* L. Bonato & M. Zapparoli det. 2010); Lula, Monte Albo, 630 m, 28.XII.1988, PL, 1 ♂ 39 lp (7 mm); ibidem, 630 m, 24.XII.1992, PL, 1 ♂ 37 lp (7 mm); Macomer, 620 m, 20.III.1987, PL, 7 exx 39 lp (8–10 mm); Monte Orotene, 443 m, *Pinus pinea* wood, 18.V.2010, CT, 5 exx 37–39 lp (5–6 mm); Olloai, roadside of S.S. 128, between S.P. 29 and S.P. 22, 800 m, coppice *Quercus ilex* wood, 12.III.2009, CT, 1 ♂ 39 lp (7 mm); Orotelli, 4.XII.2000, LF, 1 ♂ 37 lp 3+3 coxal pores (7 mm) (*G. piae* L. Bonato & M. Zapparoli det. 2010); Tonara, 820 m, 27.X.1992, PL, 1 ♂ 39 lp 2+2 coxal pores (10 mm). **Ogliastra prov.:** Baunei, near S.S. 125, 720 m, small *Quercus ilex* wood in canyon, 21.V.2010, CT, 1 imm. 35 lp (4 mm); ibidem, 21.V.2010, CT, 1 ♂ 35 lp 2+2 coxal pores (6 mm); Talana, at the side of the plateau, 1060 m, *Quercus ilex* wood, 27.V.2010, CT, 1 ♂ 37 lp (7 mm); Usassai, S.S. 198 km 64, 650 m, *Quercus ilex* wood, 15.III.2009, CT, 1 ♂ 39 lp (9 mm). **Oristano prov.:** Ulì Tirso, 28.XII.2006, LF, 2 ♀♀ 37 lp (10 mm, 15 mm) (*G. piae* L. Bonato & M. Zapparoli det. 2010). **Sassari prov.:** Cargeghe, 23.XII.2000, LF, 1 ♂ 35 lp (6 mm), 1 ♂ 39 lp (7 mm) (*G. piae* L. Bonato & M. Zapparoli det. 2010); Chiaramonni, 350 m, 30.XII.1994, PL, 2 ♀♀ 35–37 lp (up to 6 mm); Foresta Burgos [Bono Burgos], 970 m, *Quercus ilex* wood, 18.V.2010, CT, 1 ♂ 37 lp (9 mm); Padria, 250 m, 16.XII.1986, PL, 1 ♂ 35 lp (8 mm); Romana, Rio Melas, 23.XII.2006, LF, 1 ♂ 37 lp (5.5 mm) (*G. piae* L. Bonato & M. Zapparoli det. 2010); Torralba, 350 m, XII.1986, PL, 4 exx 39 lp, 2 exx 37 lp (5 mm, 6 mm).

**Remarks.** *G. minimus* Verhoeoff, 1928 and *G. piae* Minelli, 1983 are two strictly related species only known from Italy and both occurring in Sardinia. *G. minimus* has also been recorded in Liguria and Tuscany, whereas *G. piae* is known from the Tuscan Archipelago (Giannutri Is.) and Sicily. The habitat preferences of the Sardinian populations of the two species are poorly known. Both have been recorded in *Quercus* woods (*Q. ilex*, *Q. suber*) but *G. piae* has been sampled also in open Mediterranean habitats. *G. minimus* is only occasionally present in caves (trogloxene), while no subterranean records are known for *G. piae*. Altitudinal limits range from 600 to 930 m in *G. minimus*; only one record from 1000 m above s. l. is known for *G. piae* but the species is also present at lower elevations. According to the material examined (near 50 exx) the species of this group are quite frequent in endogean habitat samples. Elevation ranges from 50 to 900 m. Although some specimens have been identified as *Geophilus piae* by L. Bonato and M. Zapparoli, the whole material needs further investigation to be able to identify it with confidence at the specific level.

30. *Geophilus orquidatum* Brölemann, 1909


**Material examined.** Cagliari prov.: Cagliari, Tuviixeddu, 80 m, XI.1986, PL, 13 exx 47 lp (10–19 mm); Esterzili, Monte Santa Vittoria, 750 m, 25.I.1989, PL, 1 ex 47 lp (12 mm); Quartu Sant’Elena, Cala Regina, 15 m, 28.III.1990, PL, 1 f 55 lp, 1 f 59 lp (15–17 mm); Sadali, Foresta di Addoli, 750 m, 19.I.1996,
EcoLOGICAL NOTES. Only two habitat records are known so far, i.e. vegetal formations dominated by Quercus suber and Pistacia lentiscus, respectively, from sea level to 350 m in elevation. The new material was collected in a Pinus pinaster wood, in maquis with Quercus ilex and Pistacia lentiscus, and in shrubs with Ceratonia silqua, Cistus sp. and Arbus tus unedo, and it extends the upper altitudinal limit to 710 m; also in endoge an habitat samples (no records in Zapparoli 2009); no records from caves.

Stenotaenia C.L. Koch, 1847

32. Stenotaenia sorrentina (Attems, 1903)

Material examined. Capig liari prov.: Capoterra, Gutturu Mannu, 110 m, 20.XI.2008, PL, 1 ♂ imm. 57 lp (21 mm), 1 imm. (fragment); Esterzili, Monte Santa Vittoria, 750 m, 25.I.1989, PL, 2 imm. 61, 63 lp (17 mm, 22 mm); ibidem, 750 m, 25.I.1989, PL, 2 imm. 61, 63 lp (10 mm, 11 mm); Silius, 510 m, 6.XI.1986, PL, 3 exx 61 lp (18–20 mm); ibidem, 510 m, 6.XI.1986, PL, 1 imm. 61 lp (8 mm). Carbonia-Ig lesi as prov.: Sant’Antioco Is., Cala Sapone, 10 m, 12.II.1987, PL, 1 imm. 61 lp (10 mm); ibidem, 12.II.1987, PL, 2 ♂♂ 63 lp (24 mm), 67 lp (29 mm), 3 ♀♀ 69 lp (32, 27, 27 mm). Medio Campidano prov.: Arbus, Paso Biderteti, 450 m, 26.X.1991, PL, 2 imm. 59, 61 lp (7 mm, 24 mm); Villacidro, San Sisinnio, 250 m, 2.I.1987, PL, 1 imm. 57 lp (13 mm); ibidem, 250 m, 7.V.1991, PL, 1 imm. 57 lp (9 mm).

Nuovopro.: Nuoro, Monte Ortobene, 443 m, Pinus pinea wood, 18.V.2010, CT, 1 imm. 61 lp (11 mm); Ollolai, roadside of S.S. 128, between S.P. 29 and S.P. 22, 800 m, coppice Quercus ilex wood, 12.III.2009, CT, 2 imm. 61 lp (12, 18 mm). Ogliasta prov.: Jerzu, Sant’Antonio, 700 m, Quercus ilex wood, 18.III.2009, CT, 1 ♂ 61 lp, 1 ♂♀ 61 lp (15, 18 mm); Perdasdefogu, 470 m, 2.II.1990, PL, 2 imm. 59, 61 lp (12 mm, 13 mm); Ullassai, 675 m, Quercus ilex wood, 22.V.2010, CT, 1 imm. 59 lp (7 mm). Oriostro prov.: Asdau, 250 m, 15.XII.1990, PL, 1 ex 63 lp (22 mm); ibidem, 30.XII.1994, PL, 1 ♂ 57 lp (21 mm), 4 ♀♀ 61 lp (20 mm), 61 (20 mm), 59 (22 mm), 69 (15 mm) λp, 4 imm. 59, 59, 61, 61 lp (7–10 mm); Asuni, 200 m, 27.XII.1990, PL, 1 imm. 61 lp (13 mm); Gonnosnametza, 165 m, 2.XII.1989, PL, 3 imm. 57, 59, 59 lp (13 mm, 19 mm, 20 mm).

General distribution. Europe: Italy (mainland, Sar dinia, Sicily?), France (Corsica?); records from other regions, mainly in the Balkans, need to be reassessed. Italian distribution. From the Maritime and Ligurian Alps to Gargano and Calabria; Sicily, Sardinia; Tuscan Archipelago, Pontine Is. (Zannone Is., Palmara lo Is., Ponza Is., Ventotene Is.), Ischia Is., Capri Is. (Bonato & Minelli 2008).

NEW RECORDS AND REMARKS ON THE CENTIPEDE FAUNA OF ENDOGENAN HABITATS OF SARDINIA (CHILOPODA)

Geophilus richardi Brölemann, 1904


Material examined. Cagliari prov.: Capoterra, Gutturu Mannu, 110 m, 20.XI.2008, PL, 1 ♂ imm. 57 lp (21 mm), 1 imm. (fragment); Esterzili, Monte Santa Vittoria, 750 m, 25.I.1989, PL, 2 imm. 61, 63 lp (17 mm, 22 mm); ibidem, 750 m, 25.I.1989, PL, 2 imm. 61, 63 lp (10 mm, 11 mm); Silius, 510 m, 6.XI.1986, PL, 3 exx 61 lp (18–20 mm); ibidem, 510 m, 6.XI.1986, PL, 1 imm. 61 lp (8 mm). Carbonia-Iglesias prov.: Sant’Antioco Is., Cala Sapone, 10 m, 12.II.1987, PL, 1 imm. 61 lp (10 mm); ibidem, 12.II.1987, PL, 2 ♂♂ 63 lp (24 mm), 67 lp (29 mm), 3 ♀♀ 69 lp (32, 27, 27 mm). Medio Campidano prov.: Arbus, Paso Biderteti, 450 m, 26.X.1991, PL, 2 imm. 59, 61 lp (7 mm, 24 mm); Villacidro, San Sisinnio, 250 m, 2.I.1987, PL, 1 imm. 57 lp (13 mm); ibidem, 250 m, 7.V.1991, PL, 1 imm. 57 lp (9 mm).

Nuovopro.: Nuoro, Monte Ortobene, 443 m, Pinus pinea wood, 18.V.2010, CT, 1 imm. 61 lp (11 mm); Ollolai, roadside of S.S. 128, between S.P. 29 and S.P. 22, 800 m, coppice Quercus ilex wood, 12.III.2009, CT, 2 imm. 61 lp (12, 18 mm). Ogliasta prov.: Jerzu, Sant’Antonio, 700 m, Quercus ilex wood, 18.III.2009, CT, 1 ♂ 61 lp, 1 ♂♀ 61 lp (15, 18 mm); Perdasdefogu, 470 m, 2.II.1990, PL, 2 imm. 59, 61 lp (12 mm, 13 mm); Ullassai, 675 m, Quercus ilex wood, 22.V.2010, CT, 1 imm. 59 lp (7 mm). Oriostro prov.: Asdau, 250 m, 15.XII.1990, PL, 1 ex 63 lp (22 mm); ibidem, 30.XII.1994, PL, 1 ♂ 57 lp (21 mm), 4 ♀♀ 61 lp (20 mm), 61 (20 mm), 59 (22 mm), 69 (15 mm) λp, 4 imm. 59, 59, 61, 61 lp (7–10 mm); Asuni, 200 m, 27.XII.1990, PL, 1 imm. 61 lp (13 mm); Gonnosnametza, 165 m, 2.XII.1989, PL, 3 imm. 57, 59, 59 lp (13 mm, 19 mm, 20 mm).

General distribution. Europe: Italy (mainland, Sardinia, Sicily?), France (Corsica?); records from other regions, mainly in the Balkans, need to be reassessed. Italian distribution. From the Maritime and Ligurian Alps to Gargano and Calabria; Sicily, Sardinia; Tuscan Archipelago, Pontine Is. (Zannone Is., Palmarola Is., Ponza Is., Ventotene Is.), Ischia Is., Capri Is. (Bonato & Minelli 2008).
Chorotype. Italian endemic; European affinities.

Ecological Notes. Mostly in Quercus ilex woods, also in maquis; frequently in endoge-an habitat samples (eight records in Zapparoli 2009); no records from caves; from sea level to 1300 m.

DISCUSSION

More than 500 specimens belonging to 32 species have been examined, from near 120 sites (429 specimens collected by P. Leo and L. Fancello from 78 sites; 112 specimens collected by C. Torri from 38 sites), corresponding to about 60% of the centipede fauna of Sardinia (55 species). The finding of the geophilomorph Nannophilus eximius, a Mediterranean Schendylidae for the first time recorded from Sardinia, is noteworthy. An updated list of the centipedes of Sardinia is presented in Tab. 1.

After the records published in Zapparoli (2009) – about 600 specimens belonging to 29 species (6 Lithobiomorpha, 3 Scolopendromorpha, 20 Geophilomorpha) – this is the second report on the centipedes of Sardinia including samples explicitly from endoge-an habitats, both in calcareous and granitic soils. The data collected confirm centipedes as a quite common component of the arthropod fauna in the deep-soil habitat and, although arising from opportunistic samples, give the occasion for some considerations on this fauna in Sardinia:

- from a taxonomic point of view, the Geophilomorpha are the most represented group: at least 23 species are present, representing nearly 80% of the Sardinian species of the order (29 species); eight species of Lithobiomorpha (out of 12 occurring in Sardinia, excluding the specialized subterranean and uncertain species) and three species of Scolopendromorpha (out of five, excluding the specialized subterranean species) were also collected; although some exceptions exist and the knowledge is still fragmentary, the observed pattern corroborates the general assumption on data from continental Europe (e.g., Geoffroy 1979; Friünd 1987; Barber & Keay 1988; Barber 1992; Tuf & Ožanová 1999; Lewis 2003), according to which geophilomorphs are mainly found below the surface and lithobiomorphs are mainly surface dwellers;

- species with a small or medium body size are most represented among the Lithobiomorpha (e.g., Lithobius lapidicola, L. microps and L. turritanus); filiform species are most represented among the Geophilomorpha (e.g., Schendyla spp., Geophilus gr. minimus - piae, G. richardi);

- large-sized species seem to occur only occasionally (e.g., Eupolybothrus nudicornis, Lithobius castaneus, Scolopendra oraniensis), as very few specimens were sampled and chiefly consisting of immature stadia (e.g., Cryptops trisulcatus, Himantarium gregilis, Stigmatogaster spp., Henia vesuviana), including larvae (e.g., Lithobius s.l.), clearly smaller in size;

- so far, no species have been found exclusively in this habitat, although an undescribed species of Geophilidae currently still under study has been sampled, to date, only in deep-soil (Zapparoli 2009); however, after a rough quantitative comparison between the number of specimens and localities represented in other recent Sardinian collections (i.e., Minelli 1983; Minelli et al. 1994; Zapparoli 2009), some species seem more frequent in endoge-an samples than in those from epige-an habitats (e.g., Dignathodon microcephalus, Henia brevis, Schendyla spp., Geophilus spp. gr. minimus-piae), or, at least, they seem to be more successfully sampled with the soil washing and Berlese techniques than with others;

- as all the species have also been collected in more superficial layers by hand collection, pitfall traps or litter sifting (cf. Zapparoli 2009), their presence in the endoge-an habitats should be temporary and related to the existence of seasonal vertical migrations, a well known phenomenon in temperate and Mediterranean areas with an alternation of wet and dry seasons, probably involving both adult and/or immature stadia according to the species (e.g., Dowdy 1944; Lewis 1981; Tuf 2002);

- species diversity is generally low, the number of species per site ranging from 1 (30 sites) to 8 (1 site); 41 sites (53% of those examined here) host 1–2 species (sites were mostly sampled once, exceptionally twice), 28 sites (36%) host 3–4 species (sites mostly sampled once, exceptionally 2–3 times), 7 sites (9%) host 5–6 species (each sampled 1–3 times), 2 sites (2%) host 7–8 species (each sampled 2–3 times); a total of six species per single sample were collected in two localities (number of specimens in parentheses): Sant’Antioco, Cala Saponu, 10 m, Carbonia-Iglesias prov., 12.II.1987 (Cryptops punicus (3), Stigmatogaster gracilis (5), Dignathodon microcephalus (1), Henia bicarinata (1), Pachymerium ferrugineum (2), Stenotaenia sorrentina (6)) and Esterzili, Monte Santa Vittoria, 750 m, Cagliari prov., 25.I.1989 (Haplophilus sardou (1), Nannophilus eximius (1), Schendyla mediterranea (5), Geophilus alpinus (1), G. osquidatum (1), Stenotaenia sorrentina (5)).
Tab. 1. List of centipedes of Sardinia and their distribution according to the present-day administrative provinces.

Abbreviations. CA = Cagliari prov., CI = Carbonia-Iglesias prov., VS = Medio Campidano prov., NU = Nuoro prov., OG = Ogliastra prov., OT = Olbia-Tempio prov., OR = Oristano prov., SS = Sassari prov. X = present; - = no records; ? = uncertain record (not included in the totals).

<table>
<thead>
<tr>
<th>Species Name</th>
<th>CA</th>
<th>CI</th>
<th>VS</th>
<th>NU</th>
<th>OG</th>
<th>OT</th>
<th>OR</th>
<th>SS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Scutigera coleoptrata (Linnaeus, 1758)</td>
<td>X</td>
<td>X</td>
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<td>X</td>
<td>X</td>
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<td>2. Lamprolis enigmaticus (Newport, 1844)</td>
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<tr>
<td>3. Eupolybothrus (E.) fasciatus (Newport, 1845)</td>
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<td>4. E. (Allopolybothrus) nudicornis (Gervais, 1837)</td>
<td>X</td>
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<td>5. Lithobius (L.) aligerus Manfredi, 1953</td>
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<td>6. L. (L.) castaneus Newport, 1844</td>
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<td>7. L. (L.) doderni Silvestri, 1908</td>
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<td>8. L. (L.) forficatus (Linnaeus, 1758)</td>
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<td>9. L. (L.) inermis L. Koch, 1856</td>
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<td>10. L. (L.) lapicida Meinert, 1872</td>
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<td>11. L. (L.) molophai Restivo De Miranda, 1978</td>
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<td>12. L. (L.) neagaticus Zapparoli, 1997</td>
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<tr>
<td>13. L. (L.) pilicornis Newport, 1844</td>
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<tr>
<td>14. L. (L.) sardous Silvestri, 1898</td>
<td>X</td>
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<td>15. L. (L.) sardus Manfredi, 1956</td>
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<td>16. L. (L.) sbernonesi Matic, 1967</td>
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<td>17. L. (L.) turritanus Fanzago, 1881</td>
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<td>18. L. (Sigibius) micropodus Matic, 1980</td>
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<td>19. L. (S) micros L. Koch, 1868</td>
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<td>22. C. (C) punicus Silvestri, 1896</td>
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<td>23. C. (C) trinckatus Brölemann, 1902</td>
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<td>25. Plutonium zwierleini Cavanna, 1881</td>
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<td>26. Scolopenda oraniensis Lucas, 1846</td>
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<td>27. Himantarium gabrielis (Linnaeus, 1767)</td>
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<td>28. Hatophilus sardous Verhoeff, 1901</td>
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<td>30. Steignatogaster superba (Meinert, 1870)</td>
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<td>31. Dignathodon microcephalus (Lucas, 1846)</td>
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<td>32. Henia (Meinertia) bicarinata (Meinert, 1870)</td>
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<td>33. H. (Pseudoactenobolus) brevis (Silvestri, 1896)</td>
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<td>35. Hydroschendyla submarina (Grube, 1872)</td>
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<td>36. Nannophilus eximius (Meinert, 1870)</td>
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<td>37. Schendyla armata Brölemann, 1901</td>
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References
New records and remarks on the centipede fauna of endogean habitats of Sardinia (Chilopoda)

Zootaxa, 2318: 1–602.


Marzio Zapparoli


