

Ber. nat.-med. Verein Innsbruck	Suppl. 10	S. 231 – 236	Innsbruck, April 1992
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8th International Congress of Myriapodology, Innsbruck, Austria, July 15 - 20, 1990

Centipedes in Urban Environments: Records from the City of Rome (Italy)

by

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Synopsis: The results of a survey of the Centipede fauna in the city of Rome are presented and discussed in order to provide a first picture of the fauna of these Arthropods in a Mediterranean area heavily influenced by human presence and to examine the effect of an urban environment in modifying the animal communities. Records have been collected by qualitative methods in 57 sites ordered into four selected habitats: A) green areas planted with trees; B) green, non planted areas; C) artificial caves; D) built-up areas. 34 species have been recorded: the most frequent are *Lithobius forficatus* (L.) and *Himantarium gabrielis* (L.). *Eupolybothrus imperialis* (MEINERT), an Apenninic endemic known only for few localities in Italy, is also frequent. The greatest faunistic richness has been observed in the habitats of type A (23 species).

1. Introduction:

Although there are a number of studies on soil Arthropoda in European anthropized areas, they deal in the main with Insecta (see SUKOPP & WERNER 1982). Researches on the centipede fauna of urban and sub-urban habitats are very few; the more recent and significant data available concerns especially cities of Northern Europe: Copenhagen (ENGHOFF 1973), Kiel (TISCHLER 1980), and Göteborg (ANDERSSON 1983); a few records have been also published for London (DAVIS 1979), Vienna (KÜHNELT 1989) and Bonn-Bad Godesberg (FRÜND 1989).

In this paper the results of a study on the centipede fauna recorded in urban and sub-urban areas of Rome (Italy) in the last ten years are presented. The aim of this study is to provide a first picture of the fauna of these arthropods in a mediterranean area heavily influenced by man and to examine the effect of an urban environment in modifying the animal community composition.

Apart from occasional data published by MATIC (1971) and some records on the fauna from artificial caves by ZAPPAROLI (1980), until now the centipedes of urban areas of Rome were scarcely known. The only faunistic data available has been recently published by ZAPPAROLI (1990). Records collected in the same district at the end of the last century (MEINERT 1871, 1872; SILVESTRI 1894) are available and are compared with data here presented with the aim of testing whether in the last 100 years the qualitative composition of the fauna has undergone modification.

2. Study Area:

The city of Rome (about 41° 53' lat N, 12° 28' long E) is situated in the sub-coastal plain of Central Italy, along the rivers Tiber and Aniene, at 50 - 140 m a. s. l., about 30 km from the Tyrrhenian Sea and 40 km from the Preapennines. Natural substrata are essentially represented by fluvial clays (holocenic), pozzolanas and tuffs (pleistocenic), marine clays and sands (pleistocenic and pliocenic). However, especially in the central area of the city, these formations are covered by a thick layer of surface material. The city is in an area with Mediterranean climate, with an an-

nual period of aridity about 2-3 months long, about 670 mm of annual rainfall concentrated in autumn and winter and an annual mean temperature of about 16° C approx. Annual mean min 11° C, annual mean max. 20° C.

About 2700 years old, Rome is the largest Italian town (385 km²) and with the greatest number of inhabitants (3 million). Its urban web shows high environmental diversification, characterized by a relatively large historical centre (with parks, monumental buildings, archeological areas, river banks) and a semiperipheral and peripheral zone – more recently built – including uncultivated fields, wet areas and green areas in continuity with the surrounding “Campagna Romana”.

The Great Outer Ring-road is taken as the boundary of the study area. This is a very important thorough fare completely surrounding the city in a ring about 20 km of diameter, built some thirty years ago and of great influence in recent urban development of the city.

3. Methods:

The records have been collected by qualitative methods (direct collecting under stones, decayed timber, etc.) in ten years (1979–1989), mainly between February and May. 51 collecting sites have been visited and most of them have been examined more than twice. For a detailed list of species and of the collecting sites see ZAPPAROLI (1990). Only one worker has collected the samples. The collecting sites are grouped in four categories following their main habitat characteristics: vegetation structure, position in the city, size, human influence. These categories, giving however only a first approach to the high environmental heterogeneity of the city, are considered according to the increasing degree of human influence:

A) green areas planted with trees – parks, historic villas, Botanic Garden, Zoological Garden, archaeological sites – mostly in the central area of the city and of large size; the most frequent tree species are *Pinus* spp., *Platanus* spp., *Robinia* sp., *Quercus* spp., *Laurus* spp. (17 collecting sites);

B) green, non planted areas – open uncultivated fields, seldom covered with shrubs, or meadows – mostly in the peripheral zones of the city, large in size and sometimes in continuity with the surrounding non-urbanized areas. (15 collecting sites);

C) artificial caves – catacombs, cellars and caves – opening into parks, uncultivated fields and built-up areas. (16 collecting sites);

D) built-up areas – roadsides, flower-beds, houses, terraces and small gardens – small in size and in both central and peripheral zones. (10 collecting sites).

The occasional records published by MATIC (1971) are also considered; data on artificial caves are mostly deduced from ZAPPAROLI (1980). Data from MEINERT (1871, 1872) and SILVESTRI (1894) has been considered after critical revision. The ecological remarks are based mainly on data given by MINELLI & IOVANE (1987) on the habitat preferences of Italian centipedes.

4. Results:

A total of 34 species (10 Geophilomorpha, 5 Scolopendromorpha, 18 Lithobiomorpha, 1 Scutigermorpha) have been collected in the city of Rome between 1979 – 1989; the distribution in the habitats considered is summarized in Table 1. The number of species recorded is rather high and it represents more than 60 percent of the species assumed as occurring in Central Italy (about 55).

From the zoogeographical point of view, the following chorotypes are represented (*Lamyctes fulvicornis* is not considered): W-Palaearctic: 8 species (24 %), European s.l.: 9 (27 %), Mediterranean s.l.: 10 (30 %), endemic (Appenninic or Tyrrhenian): 6 (18 %).

From the ecological point of view, the species recorded could be indicatively grouped as follows: woodland (including mesophilous woodlands) species: 13 (38 %), euryoecious species: 12 (35 %), thermophilous species: 6 (18 %), open habitat species: 2 (6 %), man-made habitat species: 1 (3 %).

Comparing the qualitative composition of the fauna recorded in the four sampling habitats it is possible to observe:

A decrease in the number of species from habitats A (23 species) to D (11 species); a general decrease in species of Geophilomorpha from A (35 %) to D (absent); a general stability in species of Lithobiomorpha in habitats A, B and C (50–53 %) and a high rate in D (64 %).

Tab. 1: List of the species collected in the City of Rome (1979 – 1989). A – D Habitat categories (number of sites collected); F Frequency categories; EC Ecological categories (e euryoecious, m man-made habitats, mw mesophilous woodlands, o open habitats, t thermophilous habitats, w woodlands); Z Zoogeographical categories (WP W-Paleartic; M Mediterranean s.l.; EN endemic (Apenninic or Tyrrhenian); E European s.l.; In introduced); S data from SILVESTRI (1894).

Species	A (17)	B (15)	C (16)	D (10)	Σ	F	EC	Z	S
<i>Himantarium gabrielis</i> (L.)	6	3	1	-	10	I	e	M	+
<i>Stigmatogaster gracilis</i> (MEINERT)	1	-	-	-	1	III	t	M	+
<i>Dignathodon microcephalus</i> (LUCAS)	-	1	-	-	1	III	t	M	+
<i>Henia bicarinata</i> (MEINERT)	1	-	-	-	1	III	e	M	-
<i>H. vesuviana</i> (NEWPORT)	6	2	-	-	8	II	e	M	+
<i>Schendyla nemorensis</i> (C.L. KOCH)	2	-	-	-	2	III	w	WP	+
<i>Clinopodes flavidus</i> C.L. KOCH	2	1	-	-	3	III	e	E	+
<i>Geophilus carphophagus</i> LEACH	-	-	-	-	-	-	-	-	+
<i>G. flavus</i> (DE GEER)	-	-	-	-	-	-	-	-	+
<i>G. insculptus</i> ATTEMS	-	-	-	-	-	-	-	-	+
<i>G. linearis</i> C.L. KOCH	3	-	-	-	3	III	e	WP	+
<i>G. romanus</i> SILVESTRI	-	-	-	-	-	-	-	-	+
<i>Pachymerium ferrugineum</i> (C.L. KOCH)	1	3	1	-	5	II	e	WP	+
<i>Strigamia crassipes</i> (C.L. KOCH)	1	-	-	-	1	III	w	E	-
Geophilomorpha (No. of species)	8	5	2	-	10				12
- " - %	35	28	16	-	29				46
<i>Cryptops anomalans</i> NEWPORT	1	2	4	1	8	I	mw	E	+
<i>C. hortensis</i> LEACH	2	1	1	1	5	I	mw	WP	+
<i>C. parisi</i> BROLEMANN	2	-	2	-	4	III	e	E	-
<i>C. trisulcatus</i> BROLEMANN	-	-	-	1	1	III	e	M	-
<i>Scolopendra cingulata</i> LATREILLE	-	4	-	-	4	III	o	M	+
Scolopendromorpha (No. of species)	3	3	3	3	5				3
- " - %	13	17	25	27	15				12
<i>Lamyctes fulvicornis</i> MEINERT	-	-	-	5	5	II	m	In	-
<i>Eupolybohrus fasciatus</i> (NEWPORT)	6	-	-	-	6	II	w	En	+
<i>E. imperialis</i> (MEINERT)	3	-	9	2	14	I	mw	En	+
<i>Lithobius acuminatus</i> BROLEMANN	3	2	-	-	5	II	t	En	-
<i>L. calcaratus</i> C.L. KOCH	-	2	1	-	3	III	w	E	-
<i>L. castaneus</i> NEWPORT	1	1	-	-	2	III	w	M	+
<i>L. dahli</i> VERHOEFF	4	-	2	1	7	II	mw	En	-
<i>L. erythrocephalus</i> C.L. KOCH	1	-	-	-	1	III	t	WP	-
<i>L. forficatus</i> (L.)	11	4	5	2	22	I	e	WP	+
<i>L. lapidicola</i> MEINERT	4	2	-	2	8	II	o	WP	+
<i>L. macilentus</i> L. KOCH	1	-	1	-	2	III	w	E	-
<i>L. melanops</i> NEWPORT	-	-	-	2	2	III	w	WP	+
<i>L. microps</i> auct.	-	2	-	-	2	III	e	E	-
<i>L. microps</i> MEINERT	-	2	-	-	2	III	t	M	-
<i>L. mutabilis</i> L. KOCH	-	1	-	-	1	III	w	E	+
<i>L. romanus</i> MEINERT	1	1	-	-	2	III	t	En	+
<i>L. tricuspis</i> MEINERT	-	-	-	1	1	III	w	E	+
<i>L. tylopus</i> LATZEL	2	2	1	-	5	II	e	En	+
Lithobiomorpha (No. of species)	12	10	6	7	18				10
- " - %	52	55	50	64	53				38
<i>Scutigera coleoptrata</i> (L.)	-	-	2	1	3	III	o	M	+
Scutigeraomorpha (No. of species)	-	-	1	1	1				1
- " - %	-	-	8	9	3				4
CHILOPODA (38 species)	23	18	12	11	34				26

In order to give an idea of the frequency of each species, the centipede fauna is subdivided into three arbitrary groups of decreasing value: Group I, species present in more than 9 sites of the total of collecting sites or in all the habitats investigated; Group II, species present in 5 – 9 sites or in three of the investigated habitats; Group III species present in 1 – 4 sites or in one or two of the investigated habitats.

Group I includes five species:

Lithobius forficatus, widely distributed in W-Palearctic region; generally very common in artificial or disturbed habitats but it has also been found in woodlands. In the city of Rome it seems the most common centipede; it was observed in all the sampled habitats, but the highest proportion of the records have been collected in wooded areas.

Himantarium gabrielis, holomediterranean species: euryoecious; in Italy it is present in Mediterranean habitats as well as in woodlands and in artificial habitats. The largest proportion of the records from Rome have been collected in wooded areas.

Eupolybothrus imperialis, Apenninic endemic (described on material collected on Imperial Ruins); this species is poorly known from the faunistic and ecological point of view. In Rome it has been collected in artificial caves (see also ZAPPAROLI 1980), where it is very frequent, and only a small amount of data from epigeous habitats in historic villas (e.g.: Botanic Garden and Villa Borghese) has been recorded in this study.

Cryptops hortensis. W-Palearctic species: in Italy it occurs especially in mesophilous woods. Records from Rome are few but the species is present in all the habitats sampled.

Cryptops anomalans, European species; frequent in mesophilous woods.

Eight species are included in Group II:

Henia vesuviana, W-Mediterranean; woodland species present also in open communities or in artificial habitats. The records from Rome have been collected especially in wooded areas or in artificial caves.

Lithobius lapidicola, W-Palearctic; euryoecious.

Lithobius dahli, Tyrrhenian species; apparently frequent in woods. In Rome this species has been recorded in wooded areas of some historic villas.

Eupolybothrus fasciatus, Apenninic species; present especially in woodlands. In Rome this species has been collected only in the wooded areas of some historic villas.

Pachymerium ferrugineum, W-Palearctic species; euryoecious.

Lithobius tylopus, Apenninic species; mainly recorded in woodland.

Lithobius acuminatus, Apenninic species; mainly recorded in thermophilous habitats.

Lamyctes fulvicornis, anthropochorous species; known in Europe only in artificial habitats. In Rome this species occurs in the seedling nursery for ornamental plants and, consequently, it is very common in terraces, between the flower-pots or in its ground; no specimen has been recorded out of these habitats. All the specimens collected were female, confirming the thelytoky of this species in Europe.

The remaining 21 species are included in Group III. Regarding these the following points should be made:

The larger proportion of the species in this group seem to be present only in habitats A and B, the number of species present in other habitats as well is few (*Scolopendra cingulata*, *Cryptops trisulcatus*, *Lithobius melanops*, *L. calcaratus*, *L. macilentus*, *L. tricuspis*).

Some woodland species very common in mesophilous woods of Central Italy, such as *Lithobius castaneus*, *Cryptops parisi* and *Strigamia crassipes* seem to be uncommon in the urban area investigated.

Most of the thermophilous species (*Stigmatogaster gracilis*, *L. microps* MEINERT, *Dignathodon microcephalum*, *Lithobius romanus*) belong to this category, and these are present only in sampled habitats type A and B.

The actual qualitative composition of the centipede fauna of the study area may be compared with data produced by SILVESTRI (1894, which includes also MEINERT 1871, 1872). However, it is necessary to note that this comparison is based on non homogenous data. Neither the precise collecting sites nor data on frequency or habitat are detailed in the older works. It is also presumed that the old records were made mainly in the immediate neighbourhood of the city, now intensely built up. Some of MEINERT's records were collected in the archaeological sites of Imperial Rome now surrounded by built up areas but in a peripheral position in the last century.

SILVESTRI (1894) listed 25 species (Table 1), but his knowledge on the centipede fauna of the area was certainly incomplete; this low number might be related to the intensity of the investigations. All the species of SILVESTRI's list are recorded also in the present sampling with the exception of four Geophilomorpha, *Geophilus carpophaqus*, *G. flavus*, *G. insculptus* and *G. romanus*. The first three are quite euryoecious species (mainly in woodlands or in thermophilous habitats but sometimes collected also in man-made habitats); *G. romanus* seems to be especially frequent in mediterranean thermophilous habitats.

Assuming that both old and new records have been collected without taxonomical bias, it is interesting to compare the percentages of each order in the collections from the two dates (Table 1). In fact, in the actual composition of the centipede fauna it is possible to remark a decrease in the proportion of geophilomorph species (29 %) compared to a century ago (46 %). Moreover, a lower percentage of lithobiomorph species is shown in the composition of the fauna stated by SILVESTRI (1894) (38 %) compared with the present (53 %). No significant difference is to be noted in the case of Scolopendromorpha.

5. Discussion:

More evidence is necessary for a better knowledge of centipede communities in anthropized environments, especially on population density and dynamics. Also quantitative samples are required for a more complete indication of the modification of faunal composition in relation to human activity. However, together with information on other soil Arthropod communities (Carabidae, Isopoda, Diplopoda, etc.) this data can be used, as in the case of natural habitats, in the planning and management of urban recreational green areas.

The following initial indications can be deduced from this study.

Owing to the high variety of urban habitats, the centipede fauna of the study area shows a high heterogeneity both from a zoogeographical and an ecological point of view.

As described in the case of other soil-dwelling invertebrate groups (SCHAEFER 1982) urbanization seems to be a stress factor for the centipede fauna and a decrease in number of species is shown related to the degree of human influence.

Owing to their greater number of species, Geophilomorpha and Lithobiomorpha communities are more useful as ecological indicators than Scolopendromorpha. Geophilomorpha seem to show a greater sensitivity in respect to environmental modifications and, probably owing to their lower dispersal capacity, a decreasing percentage of species is shown following an increase in human influence. Lithobiomorpha form an higher percentage of species in the anthropized habitats explored, especially in built-up areas.

6. Acknowledgement:

Research partially carried out with a grant from the Consiglio Nazionale delle Ricerche.

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Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Berichte des naturwissenschaftlichen-medizinischen Verein Innsbruck](#)

Jahr/Year: 1992

Band/Volume: [S10](#)

Autor(en)/Author(s): Zapparoli Marzio

Artikel/Article: [Centipedes in Urban Environments: Records from the City of Rome \(Italy\). 231-236](#)