Biodiversity of the Collembola Fauna of Wetland Kerkini (N. Greece), with description of the sexual dimorphism of *Entomobrya atrocincta* Schött 1896 (Collembola: Entomobryomorpha)

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Abstract. A report on the results of a research into some aspects of the collembolan fauna of the Greek Nature Reserve associated with Lake Kerkini, known as Wetland Kerkini, is presented. The nature reserve is large and includes a wide variety of habitats, many of which were not included in this preliminary survey. From the areas sampled we recorded 44 species, of which 39 were previously described, two (*Folsomia potapovi* Jordana & Baquero **n. sp.**, *Entomobrya naziridisi* Jordana & Baquero **n. sp.**), are new to science, while three are identified to generic level; a further 21 are new records for Greece, and an additional 11 species are new records to the Greek Mainland. Sampling with Berlese-Tullgren funnels and Malaise traps allowed us to capture species typical of soil and species present over vegetation. This summary is based on the records held in the online database of the Fauna Europaea Project.

Résumé. Biodiversité de la faune de Collemboles de la zone humide de Kerkini (N. Grèce), avec la description du dimorphisme sexuel d'*Entomobrya atrocincta* Schött 1896 (Collembola : Entomobryomorpha). La faune de collemboles de la réserve naturelle Grecque associée au lac Kerkini fait l'objet du présent rapport de recherche. La réserve naturelle est étendue et comporte une grande variété d'habitats, dont beaucoup ne sont pas compris dans cette étude préliminaire. Dans les aires étudiées, nous avons enregistré 44 espèces, parmi lesquelles 2 sont nouvelles pour la science (*Folsomia potapovi* Jordana & Baquero **n. sp.**, *Entomobrya naziridisi* Jordana & Baquero **n. sp.**), 21 sont observées pour la première fois en Grèce et 11 pour la première fois en Grèce continentale. L'échantillonnage au moyen des pièges Berlese-Tullgren et Malaise a permis de capturer les espèces typiques du sol ou présentes sur la végétation. Ce rapport est basé sur les données mises en ligne par le projet Fauna Europaea.

Keywords: Soil entomofauna, Malaise trap, Berlese-Tullgren, sexual dimorphism, *Folsomia*.

Greece is the least entomologically surveyed country in the whole of Europe. For this reason it was decided in August of 2003 to undertake a complete biodiversity assessment of the nature reserve associated with Lake Kerkini and known as Wetland Kerkini (Fig. 1) in as far as such a project could be carried out on a voluntary and unfunded basis.

It was obvious from the start that recording the diversity of the invertebrates, and within them the hexapods, would comprise the bulk of the work. The survey work, called Project Kerkini, has so far involved the assistance of more than 50 scientists in 15 countries around Europe and the organizers are extremely grateful for all the help that has been freely offered.

Lake Kerkini is an artificial lake, created in 1932 on the river Strymon immediately south of the Greek border with Bulgaria and 80 km north of Thessaloniki. The area was originally an inland delta, a very large marsh where the river unloaded the debris it had collected on its journey past the Ryla and Pirin mountains of Bulgaria, and as a wetland habitat it was unique in Europe.

To the north the lake is bounded by the 2000 m Serbo-Macedonian massif (Kerkini Mountains) which forms the border with Bulgaria. The Serbo-Macedonian massif is dissected by the narrow Ruppel Gorge through which the Strymon river enters Greece. The southwest reach of the lake is bordered by the 1000 m Mavrovouni Mountains. The nature reserve includes parts of both mountain ranges, extending to the summit of the Kerkini Mountains, all of the riverine habitats between the border and the lake, about 20 km, and has a total area of about 200 square km. The vegetation of the area is classified as para-Mediterraean and mountainous Mediterranean.

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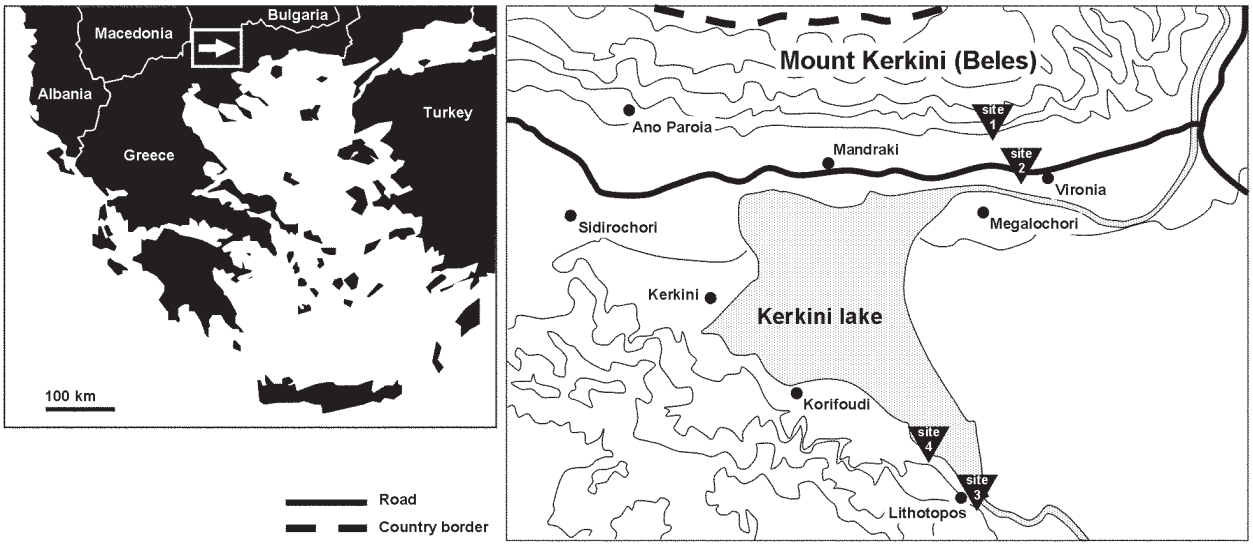

Figure 1
Map of sampling stations. See the text for details. The coordinates for the left map are 44º06'N-34º55'N, 19º18'E-29º06'E.

The Collembola, although important in soil ecology, are one of the least studied groups within the hexapods and it is not surprising to find very few records of this group in Greece. This paper therefore represents an important step forward which will hopefully lead to further studies in the future.

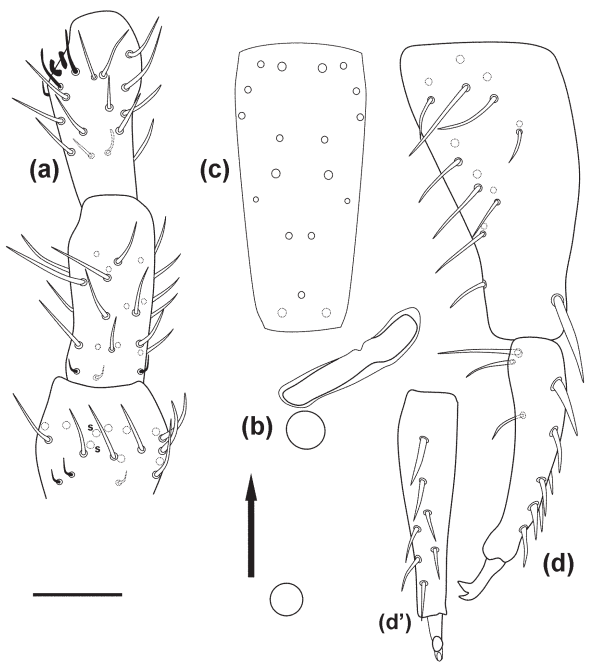

Figure 2
Folsomia potapovi Jordana & Baquero n. sp. **a,** Antennal segments I-III, dorsal view; **b,** eyes and post-antennal organ or PAO (the arrow points to the anterior part of the head); **c,** manubrium in posterior view; **d,** furcula in lateral view (d', dens in anterior view) (bar: 0.025 mm).

Methods

The Collembola were collected between April 2004 and December 2005. Longitude, latitude and altitude data are from a Garmin 12XL GPS.

All the specimens recorded in this study were collected from a total of ten sites ranging in elevation from 30 m a.s.l. to 1000 m a.s.l. (Tab. 1). Specimens were collected in five sites from leaf litter and in four sites from malaise trap bottles and once from under old cow dung. The malaise traps were kindly donated by the Taxonomic Museum of Antwerp through the intervention of Guido Van de Weyer. The bulk of the material is derived from the malaise trap samples.

The samples were collected by G. Ramel and the identifications and descriptions by E. Baquero and R. Jordana.

Malaise trap

The Malaise traps were placed in open sunny positions at four localities. The length of time the traps were exposed in the field was not scientifically chosen but arose as a result of a variety of negative influences. Only the trap set on the Kerkini Mountains (Fig. 1, site 2, called Beles) ran it course and was taken down after a little more than one year. Sample collection from the trap at Strymon (site 1) was terminated when the trap was stolen. Collection at Lithotopos (site 3) was terminated after a second act of vandalism required the trap to be dismantled for extensive repairs, and at Kerkini (site 4) the trap was destroyed by unusually strong winds. The collecting bottles were half filled with 70 % ethyl alcohol and the specimens were stored in plastic vials in 70 % ethyl alcohol before being posted from Greece to Spain for identification.

Site 1. Strymon River Site. 41°15'21"N 23°14'11"E, altitude

Table 1. Samples and species captured during the study. Remarks column: *, new for Greek Mainland; **, new for Greece. Legend for the Biogeographic distribution of identified species: CO, cosmopolitan; EC, present in continental Europe; EM, present in continental Europe and Mediterranean area; EN, endemic; HO, Holartic; ME, present in the Mediterranean area; PA, Palaearctic; PO, present in oriental Palaearctic. (1), a first instar; (2), a male of *Friesea* and a specimen of *Lepidocyrtus*, probably new species, that are not described awaiting new material.

TAXON	remarks	Biogeographical distribution	A20050602a	A20050602b	B2040426	H2040324	H20040420	H20040424	K2040424	W20050306	B2040506	B2040527	B2040603	B2040930	B2041007	B2041021	B2041028	B2041111	B2041118	B2041125	B2041202	B2041204	B2041209	B2041216	B2041223	B2050226	B2050313	B2050320	B2050327	B2050403	B2050410	B2050417	B2050501	B2050508	B2050605	B2050612	K2041016	K2041023	K2050226	K2050403	S2040506	total
			soil																						*Malaise*																
Neanurinae (1)				*1*																																					*1*
Ceratophysella succinea (Gisin 1949)		HO			2		9																																		11
Protaphorura glebata (Gisin 1952) cf	**	EC	15	3																																					18
Tomocerus lamelliger (Börner 1903)		EM	42	14																																					56
Tomocerus vulgaris (Tullberg 1871)	**	HO	2		1					13																															16
Cryptopygus thermophilus (Axelson 1900)		CO		2																																					2
Folsomia potapovi Jordana & Baquero n. sp.	**	EN	38																																						38
Folsomia ksenemani Stach 1947	*	EM	3																																						3
Folsomia manolachei Bagnall 1939	**	EM			6																																				6
Proisotoma minuta (Tullberg 1871)	*	CO						1																																	1
Proisotoma ripicola Linnaniemi 1912	**	EM							6																																6
Parisotoma notabilis (Schäffer 1896)		CO	9	1	4					1																															15
Isotomurus palustris (Müller 1776)	*	CO	1	1																																					2
Cyphoderus bidenticulatus Parona 1888	**	EC		1																																				1
Heteromurus major (Moniez 1889)	*	PA	3		1			21		1																															26
Pseudosinella simpatica da Gama & Busmachiu 2002	**	CO		1	1																																			2
Megalothorax minimus Willem 1900	**	HO			2																																			2
Sphaeridia pumilis (Krausbauer 1898)	*	CO			4			17																																21
Arthopalites pseudoappendices Rusek 1967	**	EC	1																																					1
Lipothrix bernardi Delamare Deboutteville 1954	**	ME	1																																					1
Lepidocyrtus cyaneus Tullberg 1871		CO		1																																				2
Xenylla maritima Tullberg 1869		CO					16							5							2	8				1	1	3	14		10					2				62
Isotoma (Desoria) tigrina Nicolet 1842	*	CO				2		581			1											25		1	9	3		90	17		1									727
Isotomurus cassagnaui Deharveng & Lek 1993	**	EC			2													1																						3
Lepidocyrtus lignorum (Fabricius 1775)	*	HO		3	1		1			1						3	2	22	9	1		2			2				5		1					26	7			86
Lepidocyrtus sp. (2)								1																																	1
Friesea sp. (2)																									1																1
Pseudachorutella balcanica Cassagnau 1978		ME												1		3		7	1			2	10		4	4			4		7			1			1			45
Xenylla brevisimilis brevisimilis Stach 1949		PA														45	2	58	16				2		1												1	1			126
Isotomurus nebulosus Lek & Carapelli 1998	**	EC																								8															8
Entomobrya naziridisi Jordana & Baquero n. sp.	**	EN						1					1	71	21	103	40	38	168	6	5	16	24	3	5	4	4	12	3	7	2	2	4					1			541
Entomobrya atrocincta Schött 1896	**	CO												35	26	81	47	46	24	2	9	11	7	2	1	1	2	13	12	7	3	5	2				1			337
Entomobrya dorsalis Uzel 1891	**	EC										2		6	4	16	11	7	12	1	12	13	14	4	3	5		4		6	4			1	1				4	*130*
Entomobrya handschini Stach 1922	*	EC									1			17	13	40	14	2	7	4	5	5	5					1												*114*
Willowsia nigromaculata (Lubbock 1873)	**	HO												1							1						1	1											*1*	*5*	*10*
Seira ferrarii Parona 1888		EM										1																													*1*
Sminthurinus concolor (Meinert 1896)	**	EM												2				8	2				1							1											*14*
Sminthurinus elegans (Fitch 1862)	**	HO																1																							*1*
Sminthurinus gisini Gama 1965	**	EC														1									1																*2*
Sminthurus multipunctatus Schäffer 1896	*	PA																				2								2											*4*
Sminthurus viridis (L. 1758)	*	CO									1		4	71	11	33			3		2		2		3																*130*
Deuterosminthurus pallipes (Bourlet 1843)	*	PA									1																					3									*4*
Fasciosminthurus dictyostigmatus Nayrolles 1993	**	CO												1																											*1*
Dicyrtomina ornata (Nicolet 1842)	**	EM																*3*				*3*											*1*								*7*
Total			115	28	24	2	26	622	6	16	4	3	5	210	75	325	116	193	242	14	36	87	65	9	19	34	11	32	108	63	9	29	6	1	2	1	28	9	3	1	9	2588

30 m. This trap ran from 23.III.2004 until 11.IV.2004 and was situated within an area of marshy vegetation nearby the river Strymon. The trap site was damp with surface water nearby and lush vegetation, the dominant trees were alder, *Alnus glutinosa* and willow, *Salix* sp., the area was grazed by buffaloes, cattle, goats and sheep. Samples: S20040506 (30.IV.2004 to 6.V.2004).

Site 2. Kerkini Mountains Site. 41°17'20"N 23°12'18"E, altitude 550 m. This trap was set from the 30.IV.2004 until 5.VI.2005 but was taken down from December to March to prevent it being weighed down and possibly torn by snow. This trap was situated on the south face of the Kerkini Mountains. The habitat was a rich meadow, cut about twice a year, backing onto mixed deciduous forest. It is a relatively moist habitat on siliceous soils, damper than sites 2 and 3, with much more luxurious vegetation, but less damp than site 1. The meadow is on the site of the old village of Ramna that was abandoned after WW2, it is fenced off, so it is not subject to grazing, or dung deposition pressure. The meadow changes drastically throughout the year, by June the vegetation is two meters tall in places, but the snow in winter flattens all the herbaceous vegetation. Samples: B20040506 (30.IV. to 6.V.2004), B20040527 (21.V. to 27.V.2004), B20040603 (28.V. to 3.VI.2004), B20040930 (24.IX. to 30.IX.2004), B20041007 (1.X. to 7.X.2004), B20041021 (15.X. to 21.X.2004), B20041028 (22.X. to 28.X.2004), B20041111 (5.XI. to 11.XI.2004), B20041118 (12.XI. to 18.XI.2004), B20041125 (19.XI. to 25.XI.2004), B20041202 (26.XI. to 2.XII.2004), B20041209 (3.XII. to 9.XII.2004), B20041216 (10.XII. to 16.XII.2004), B20041223 (17.XII. to 23.XII.2004), B20041204 (24.XII.2004 to 20.II.2005), B20050226 (21.II. to 26.II.2005), B20050313 (28.II. to 13.III.2005), B20050320(14.III. to 20.III.2005), B20050327 (21.III. to 27.III.2005), B20050403 (28.III. to 3.IV.2005), B20050410 (4.IV. to 10.IV.2005), B20050417 (11.IV. to 17.IV.2005), B20050501 (25.IV. to 1.V.2005), B20050508 (2.V. to 8.V.2005), B20050605 (30.V. to 5.VI.2005), B20050612 (6.VI. to 12.VI.2005).

Site 3. Lithotopos Village Site. 41°07'52"N 23°12'53"E, altitude 75 m. This trap ran from 18.VII.2004 until 23.IX.2004 and was situated immediately behind the village of Lithotopos, on uncultivated ground with rough grass and *Paliurus spina-christi*. This was a dryish habitat, on a siliceous soil of a north facing slope that experienced intermittent grazing by both sheep and goats.

Samples: K20041016 (10.X. to 16.X.2004), K20041023 (17.X. to 23.X.2004).

Site 4. Kerkini Lake Site. 41°09'06"N 23°11'55"E, altitude = 75 m. This trap ran from 21.II.2005 until 2.VII.2005. The trap was situated 400 meters south of the lake, at the edge of an olive orchard. In addition, there was an area, about 5 m wide, with native vegetation, dominated by *P. spina-christi*, and a more mature olive plantation behind this. This is a dried habitat on a siliceous soil of a north-facing slope with no grazing, 2.5 kilometres from the nearest village.

Samples: K20050226 (21.II. to 26.II.2005); K20050403 (28.III. to 3.IV.2005).

Other samples

The samples not obtained with Malaise trap are from sites sampled by hand or by Berlese funnels. Loose soil, dung and leaf-litter were collected in plastic bags and the fauna extracted using a make-shift Berlese-Tullgren funnel featuring a simple plastic funnel a section of fly-screen (plastic mesh) and a desk-lamp.

One sample (K20040424, 24.IV.2004) was taken from old cow dung when some Collembola were noted under it and within it whilst looking for Dermaptera. The dung was found along the shore of the Kerkinitis river near where it runs into the south-western corner of the lake.

The samples A20040819 (19.VIII.2004), A20050602a and A20050602b (2.VI.2005) were extracted from loose soil and leaf litter collected in the Kerkini Mountains (Akritohori) at 41°15'13"N 23°19'52"E, altitude 75 m. The site was very damp and shaded south facing valley floor with the dominant tree species being Plain Tree (*Platanus orientalis*).

Sample B20040426 (26.IV.2004) was extracted from leaf-litter collected from the floor of the Beech forest (*Fagus sylvatica*), at approximately 1000 m a.s.l. on the south facing slopes of the Kerkini Mountains and above the village of Vironia [conventional: 41°17'N 23°14'E], no GPS data is available.

Samples H20040324 (24.III.2004) and H20040424 (24. IV.2004) were extracted from decomposing vegetation in the back garden of a house in the village of Himmaros [conventional 41°07'N 23°15'E], 3 km south of the southern most tip of the lake.

Table 2. Comparison of *Folsomia potapovi* Jordana & Baquero **n. sp.** with related species with 2+2 eyes and manubrium with 1 + 1 anterior setae. Abbreviations: Man. ant.: manubrium anterior; Man. post.: manubrium posterior; Dens ant.: Dens anterior; Dens post.: Dens posterior; "-": no data.

Species	Distribution	PAO constricted	Sensilla	Micro-sensilla	Man. post. setae	Dens ant. setae	Dens post. setae
F. amplissima	North of Siberia, Rusia	yes	43/22235	11/100	11+11	7-8	3
F. brevicauda	North of Europe	-	-	10/001	-	3	3
F. manolachei	Palaearctic	yes	43/22235	10/100	8+8 (+1)	7-8	3
F. nigromaculata	Pyrenees	no	43/22235	11/111	8-9+8-9	5-7	5
F. potapovi n. sp.	Greece	yes	43/22233	10/000	8+8 (+1)	7	3
F. ocellata	Spain	yes	43/22235	11/111	-	5	4
F. quadrioculata	Holartic	yes	43/22235	10/100	8+8 (+1)	8	3

Table 3. *Entomobrya naziridisi* Jordana & Baquero **n. sp.** Measurements of some specimens from the type series, in micrometers. Abbreviations: max: maximum; min: minimum; aver: average. "-": no data (lack of antennae).

	Code samples													
	B15-05ap	**B15-05bp**	**B15-05cp**	**B15-05dp**	**B15-05ep**	**B15-05fp**	**B15-05gp**	**B15-05hp**	**B15-05ip**	**B15-05jp**	**B15-05kp**	**max**	**min**	**aver**
Antennal I	90	100	120	160	130	130	120	130	130	110	100	160	90	120
Antennal II	200	180	230	260	220	220	240	-	250	-	230	260	180	226
Antennal III	-	160	-	160	230	200	-	-	-	-	-	230	160	188
Antennal V	-	210	-	250	230	200	-	-	-	-	-	250	200	223
Antenna	-	650	-	830	810	750	-	-	-	-	-	830	650	760
Head	270	250	310	370	310	310	360	300	350	300	320	370	250	314
Antenna/head ratio	-	2.60	-	2.24	2.61	2.42	-	-	-	-	-	2.61	2.24	2.47
Thorax II	100	160	150	200	200	160	190	160	200	160	190	200	100	170
Thorax III	80	110	60	130	140	130	140	110	140	110	100	140	60	114
Abdominal I	50	70	50	120	80	100	110	90	90	100	90	120	50	86
Abdominal II	60	110	90	150	90	140	140	110	140	140	90	150	60	115
Abdominal III	70	90	80	100	100	110	120	90	180	160	100	180	70	109
Abdominal IV	360	330	340	400	340	400	410	380	420	350	360	420	330	372
Abdominal IV/III ratio	5.14	3.67	4.25	4.00	3.40	3.64	3.42	4.22	2.33	2.19	3.60	5.14	2.19	3.62
Abdominal V	90	80	70	110	90	110	110	70	110	110	90	110	70	95
Abdominal VI	30	50	50	40	50	50	60	50	90	60	40	90	30	52
Body	1110	1250	1200	1620	1400	1510	1640	1360	1720	1490	1380	1720	1110	1425
Manubrium	250	270	260	320	280	300	310	300	320	270	290	320	250	288
Dens	350	300	350	440	340	390	420	370	400	360	360	440	300	371
Unguis	35	40	35	35	35	40	40	32	35	40	40	40	32	37
Unguiculus	20	20	25	25	20	20	22	20	20	22	20	25	20	21
Tenent hair	40	40	40	45	40	40	45	40	35	40	40	45	35	40

Sample H20040420 (20.IV.2004) was collected from the floor of one of the many poplar plantations (*Populus* x *canadensis*) between the village of Himmaros and the river Strymon.

Abbreviations

MNCN, Museum National de Ciencias Naturales (Madrid); MNHN, Muséum national d'Histoire naturelle (Paris); MZNA, Museum of Zoology, University of Navarra; NHM, Natural History Museum (London).

Measurements

The specimens were sorted by sample and morphology and some were mounted in slides (Hoyer medium) for identification under optic microscope.

For the measurements a Olympus U-DA drawing attachment UIS (Universal Infinity System) and a scale calibrated with a slide of Graticules Ltd. (1 mm/0,01 div) has been used.

Table 4. Comparative set of characteristics between *E. naziridisi* Jordana & Baquero **n. sp.** and *Entomobrya* species with the same value in Ch.11 and Ch.12 (macrochaetae on T1 and T2 areas on thoracic tergite II, see figure 5b). The values for *E. atrocincta* are added. **Legend**: Character, Place, Description, Value; **Ch.1**, H1, An2-An3, 1-6; **Ch.2**, H2, A5-A7, 1-3; **Ch.3**, H3, S'0, 0-1; **Ch.4**, H4, S1-S3-S4, 0-3; **Ch.5**, H5, Ps2-Ps3-Ps5, 0-3; **Ch.6**, Labral papilla, "simple and smooth papilla (1),; wrinkled or with some projections (2); a projection setae like (3)", 1-3; **Ch.7**, eyes G&H size, = E&F (1), <E&F (2), 1-2; **Ch.8**, Antennal vesicle, "no bulb (0), lobule simple (1), ; bilobulate (2), trilobulate (3) ", 0-3; **Ch.9**, Ratio Ant./Head, > or = 3 (1), > or = 2 < 3 (2), < 2 (3), 1-3; **Ch.10**, Thoracic tergite II mane MS, with Ms type 1 (1),without Ms or type 2 (2), 1-2; **Ch.11**, T1, m1-m2-m2i-m2i2; >4 (5), 0-5; **Ch.12**, T2, a5-m4-m4i-m5; >8 (9), 0-9; **Ch.13**, Smooth setae on tibiotarsi, not or 1 in TtIII = 0, double file = 1, 0-1; **Ch.14**, Unguis internal teeth, 1(1), 2(2), 3(3), 4(4), 1-4; **Ch.15**, Unguis dorsal tooth, basal =1, internal teeth level = 2, 1-2; **Ch.16**, Unguis internal edge, without ciliation (0), with ciliation (1), 0-1; **Ch.17**, External unguiculous, smooth (0), serrate (1), 0-1; **Ch.18**, A1 Abd. II, a2-a3 , 0-2; **Ch.19**, A2 Abd. II, m3 series, 0-7; **Ch.20**, A3 Abd. III, a1, 0-1; **Ch.21**, A4 Abd. III, above m2 , 0-3; **Ch.22**, A5 Abd. III, m3-m4 series, 0-4; **Ch.23**, A6 Abd. IV, a1-a5 (A1-D1); >8 (9), 0-9; **Ch.24**, A7 unpair seta, ma0 (A03), 0-1; **Ch.25**, A7 Abd. IV, ma1-ma4 (A2-E1); >9 (10), 0-10; **Ch.26**, A8 unpair seta, m0 (A04), 0-1; **Ch.27**, A8 Abd. IV, m1-m3 (A4a-C2a); >5 (6), 0-6; **Ch.28**, A9 unpair seta, mp0 (A05), 0-1; **Ch.29**, A9 Abd. IV, mp1-mp3 (A5-B5); >6 (7), 0-7; **Ch.30**, A10 Abd. IV, p1a-p3 (A6--B6); >5 (6), 0-6; **Ch.31**, A11 Abd. IV, T1(ma4e) as thrichobotrium, 0-1; **Ch.32**, A12 Abd. IV, T2(m4) as thrichobotrium, 0-1; **Ch.33**, A13 Abd. IV, T4(mp4) as thrichobotrium, 0-1; **Ch.34**, A14 Abd. IV, T6 (p4) as thrichobotrium, 0-1; **Ch.35**, Ratio Abd.IV/Abd.III, 2 < R < 4 (1), R > 4 (2), 1-2; **Ch.36**, Manubrial plate , setae number; >10 (11), 0-11; **Ch.37**, Manubrial plate , pseudopores 1-2, 1-2; **Ch.38**, Mucro, sub-apical tooth without (0), normal (1), big (2), 0-2; **Ch.39**, Mucro, basal spine , 0-1. Differences in bold.

Species	**Ch.1**	**Ch.2**	Ch.3	**Ch.4**	**Ch.5**	**Ch.6**	Ch.7	**Ch.8**	Ch.9	Ch.10
Entomobrya schoetti	3	1	0	3	2	2	2	2	2	1
Entomobrya marginata	3	**2**	0	**2**	**3**	**1**	2	2	2	1
Entomobrya unostrigata	3	1	0	3	**3**	2	2	2	2	1
Entomobrya regularis	**4**	1	0	3	2	2	2	**1**	2	1
Entomobrya naziridisi n. sp.	3	1	0	3	2	2	2	2	2	1
Entomobrya atrocincta	3	1	0	2	2	2	2	1	2	1
Species	Ch.11	Ch.12	Ch.13	Ch.14	**Ch.15**	**Ch.6**	Ch.17	**Ch.18**	**Ch.19**	**Ch.20**
Entomobrya schoetti	2	4	0	4	1	**1**	0	2	**3**	1
Entomobrya marginata	2	4	0	4	1	0	0	**1**	**2**	1
Entomobrya unostrigata	2	4	0	4	**2**	0	0	2	4	1
Entomobrya regularis	2	4	0	4	1	0	0	2	**3**	**0**
Entomobrya naziridisi n. sp.	2	4	0	4	1	0	0	2	4	1
Entomobrya atrocincta	2	3	0	4	2	0	0	1	2	1
Species	**Ch.21**	**Ch.22**	**Ch.23**	**Ch.24**	**Ch.25**	**Ch.26**	**Ch.27**	**Ch.28**	**Ch.29**	**Ch.30**
Entomobrya schoetti	2	2	0	0	**6**	0	**3**	0	2	2
Entomobrya marginata	**0**	**1**	0	0	**0**	0	**2**	0	2	2
Entomobrya unostrigata	**0**	**1**	**4**	**1**	4	**1**	**1**	**1**	**3**	2
Entomobrya regularis	2	**1**	**2**	0	3	0	**3**	0	2	**3**
Entomobrya naziridisi n. sp.	2	2	0(1)	0	3(4)	0	5	0	2	2
Entomobrya atrocincta	1	1	0	0	2	0	3	0	2	2
Species	**Ch.31**	Ch.32	**Ch.33**	Ch.34	**Ch.35**	**Ch.36**	Ch.37	Ch.38	Ch.39	
Entomobrya schoetti	0	1	1	0	1	4	2	1	1	
Entomobrya marginata	0	1	1	0	1	?	?	1	1	
Entomobrya unostrigata	**1**	1	**0**	0	**2**	**3**	2	1	1	
Entomobrya regularis	0	1	1	0	**2**	?	?	1	1	
Entomobrya naziridisi n. sp.	0	1	1	0	1	4	2	1	1	
Entomobrya atrocincta	0	1	1	0	2	4	1	1	1	

Results

Among the 323 samples obtained from the whole sampling for all invertebrates of the Project Kerkini, 39 samples contained springtails: 2588 specimens, distributed among 29 genera and 44 species (Table 1).

Descriptions of new species

Folsomia potapovi Jordana & Baquero n. sp.
(Figs 2a–2d, 3a–3f)

Type-locality. Geece, Kerkini Mountains (Akritohori), 41°15'11,3"N 23°19'52,0"E, altitude 75 m. Sample obtained from loose soil and leaf litter in a valley floor with the Plain Tree (*Platanus orientalis*) as dominant tree. Leg. Gordon Ramel.

Type-specimens. Holotype (female) in slide A20050602a-04ap, two paratypes in slide A20050602a-04bp, two paratypes on SEM stubs and 33 paratypes in ethyl alcohol.

Material repository. MZNA.

Description. Total body length about 1 mm (slide mounted specimens 0.95 to 1.2 mm). Body blackish and with uniform granulation (Fig. 3a). Head with 2 + 2 eyes arranged far from each other (Fig. 2b, 3a). Postantennal organ with a slight constriction, 4 times as long as the anterior corneole diameter. Antennal length 0.20–0.23 mm. Antennal segment I with 2+1 microsensilla and 2 sensilla; antennal segment II with two microsensilla; antennal segment III with 2 (sensorial organ) + 1 lateral microsensillum and 2 sensilla (Fig. 2a, 3b). Palp bifurcate.

Unguis without internal tooth (Fig. 3c). Ventral tube with 3+3 latero-distal and 6 anterior setae. Retinaculum with 4+4 teeth in each ramus and 1 seta on the corpus. Manubrium (0.08-0.09 mm) with 1+1 anterior setae and 17 posterior setae: 3+3 latero-proximal, 3+3 centro-medial, 1+1 more distal, 1+1 lateral, and 1 distal seta (fig. 2c–2d). Dens (dens + mucro 0.07–0.08 mm) with 7 anterior and 3 posterior setae. Mucro with two teeth (Fig. 2c–2d, 3d).

Chaetotaxy. Thoracic macrochaetotaxy: 1, 1. Sensillar formula 43/22233. There are seven thin setae on the posterior area of abdominal tergite VI that can be confused with sensilla (Fig. 3e–f). Microsensillar formula 10/000.

Comment. The microsensilla formula is different in the closest species considered: *F. amplissima* Potapov & Babenko 2000, *F. brevicauda* Agrell 1939, *F. manolachei* Bagnall 1939, *F. nigromaculata* Najt 1981, *F. ocellata* Jordana 1979 and *F. quadrioculata* (Tullberg 1871) (tab. 2). *Folsomia potapovi* **n. sp.** is different by sensilla and microsensilla formulas

The combination of characters including the median sensilla (in front of p-row and between macrochaetae 1 and 2, 2+2 eyes, absence of thickened sensilla on abdominal V, maxillary palp bifurcate, few setae on anterior side of *manubrium*, the number of setae on anterior dens, and the number and position of microsensillum (in the hind corner of thoracic tergite II), place this species in the *quadrioculata* group. The species with 2+2 Omma and *manubrium* with 1+1 anterior setae are compared in the tab. 2. *F. potapovi* is differentiated from all of them by the sensilla and microsensilla formula. The closest species are *F. manolachei* and *F. quadrioculata*, which present different levels of granulation in some areas on the body: bands with secondary granulation on the posterior part of the tergites in *F. quadrioculata*, and a more extensive and irregular pattern in *F. manolachei* (Deharveng 1982). *F. potapovi* n. sp. have the thoracic tergite II corner sensilla within p-row as *F. manolachei*, but the granulation is uniform with moderate granules in the posterior part of the thoracic tergite II and the posterior part of the abdominal tergite VI as *F. quadrioculata*.

Derivatio nominis. The name of this species is dedicated to Mijail Potapov.

Entomobrya naziridisi Jordana & Baquero n. sp.
(Figs 4a–4d, 5a–5e, 6a–6d)

Type-locality. Greece, Kerkini Mountains. 41°17'19,5"N 023°12'18,4"E, altitude 550 m. Malaise trap working between 12.XI and 18.XI.2004. The habitat was a rich meadow, cut about twice a year, backing onto mixed deciduous forest.

Type-specimens. Holotype (female) in slide B20041118-05fp, 10 paratypes in slides B20041118-05ap to B20041118-05ep, B20041118-05gp to B20041118-05kp (one in each slide), and 157 paratypes in ethyl alcohol (same data as the Holotype).

Other material: A20050602a, 1 spec.; B20040603, 1 spec.; B20040930, 71 spec.; B20041007, 21 specs.; B20041021, 103 specs.; B20041028, 39 spec.; B20041111, 38 spec.; B20041119, 1 spec.; B20041125, 6 specs.; B20041202, 5 specs.; B20041204, 16 specs.; B20041209, 24 specs.; B20041216, 3 specs.; B20041223, 5 specs.; B20050226, 4 specs.; B20050313, 4 spec.; B20050320, 12 spec.; B20050327, 3 specs.; B20050403, 7 specs.; B20050410, 2 specs.; B20050417, 2 specs.; B20050501, 4 specs.; H20040424, 1 spec.; K20050226, 1 spec.; B20040603, 1 spec. (see localisation data in Methods).

Material repository. MZNA.

Description. Body length up to 1.6 mm without antennae. Ground colour variable, from pale yellow to green or greyish very similar to *E. schoetti* Stach 1922, (sensu Jordana & Baquero 1999, Fig.14) in the more pale form. Eye patches dark blue, and eight eyes. Dark patches behind the antennal insertion and the eyes. Antennae pigmented, with a darker annuli in the distal part of antennal segments I, II and III. Thoracic tergites II-III and abdominal tergites I-IV with lateral patches, narrow transversal patches at the end of thoracic tergite II and abdominal tergites I-IV. In the abdominal tergites III and IV there are lateral pale patches, in the abdominal tergite IV ten (5+5) characteristic small pale patches in the anterior median area (Fig. 4a). Eyes GH<EF (Fig. 6b). Antennae reaching to the anterior part of the abdominal tergite IV, with a bilobed apical vesicle, and two types of sensilla (Fig. 6a). Dimensions of the different parts of the body of three specimens are given in Tab. 3. Head trichobothrium present. Labral setae formula 5, 5, 4, as in other *Entomobrya* species. Each labral papillae with very small, not setaceous, projections (Fig. 4b). Trochanteral organ with 13–17 setae in a "V" disposition. There are no differentiated setae on tibiotarsus, with exception of the smooth terminal setae on legs III. Unguis with basal paired inner teeth inserted at 60 % of ungual length. Unguiculus spike-like, with smooth (only very finely serrated) inner edge (Fig. 4c, 6d). Manubrial plate with four setae and two pseudopores. Mucro as in the figure 4d. Set of 39 characters in tab. 4 (following Jordana & Baquero 2005), for comparison with closely related species. Figures 5a–5e show the diagnostic macrochaetotaxy for *Entomobrya naziridisi* Jordana & Baquero **n. sp.** following Jordana & Baquero (2005). Disposition of the macrochaetae on thoracic tergite II as in Figure 6c.

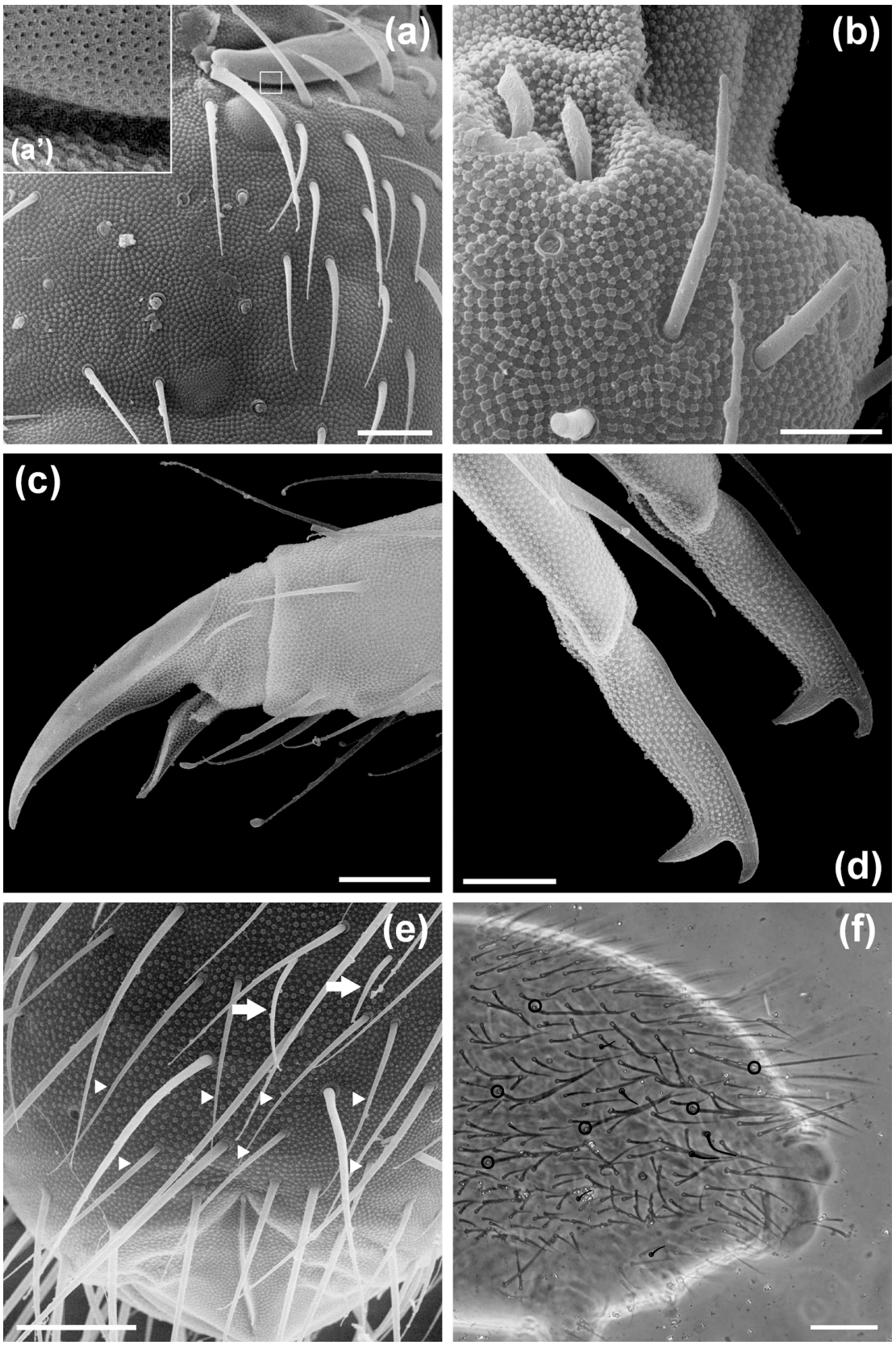
(a)
(a')
(b)
(c)
(d)
(e)
(f)

Figure 3
Folsomia potapovi Jordana & Baquero **n. sp.** (a-e, SEM microphotographs; f, light microscope photograph). **a,** Eyes and PAO (a', detail of the PAO in the area of the square) (bar: 10 micrometers); **b,** detail of the antennal segment III sensory organ with two sensilla, not totally hidden by integumentary folds, and a guard sensillum (bar: 4 micrometers); **c,** unguis and unguiculus of leg III (bar: 9 micrometers); **d,** mucro and tip of the dens (bar: 6 micrometers); **e,** dorsolateral view of the distal area of abdominal tergite VI, showing the two dorsolateral sensilla (arrows), and seven thin setae easily confused with sensilla (small arrowheads) (bar: 20 micrometers); **f,** disposition and shape of the sensilla of abdominal tergite VI, and macrosetae (circles) (bar: 50 micrometers).

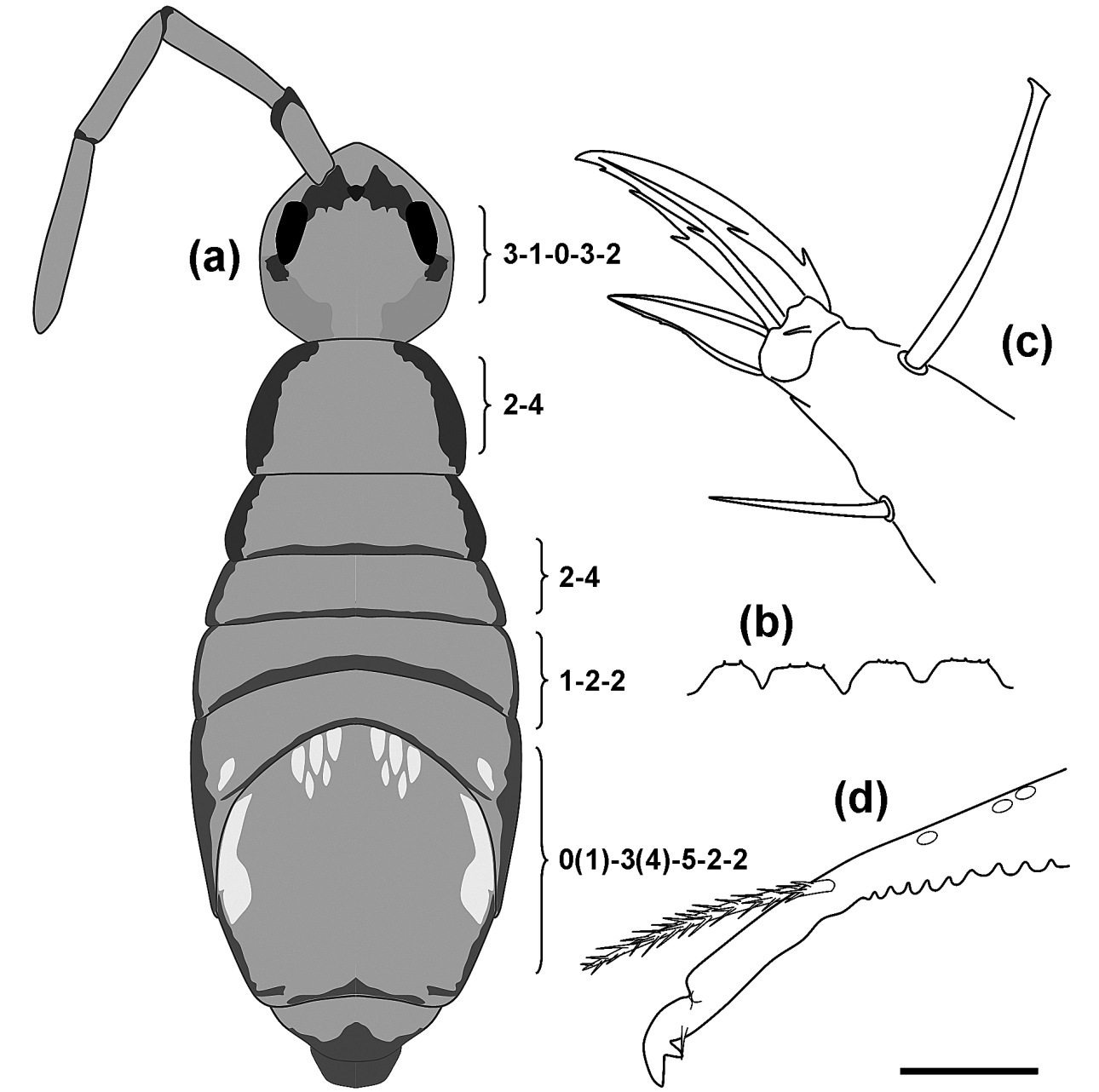

Figure 4
Entomobrya naziridisi Jordana & Baquero **n. sp. a,** Color pattern and number of the considered macrosetae for the chaetotactic formula on each tergite and head; **b,** labral papillae; **c,** unguis, unguiculus and tenent hair of leg III; **d,** tip of furcula (bar for b-d: 0.1 mm).

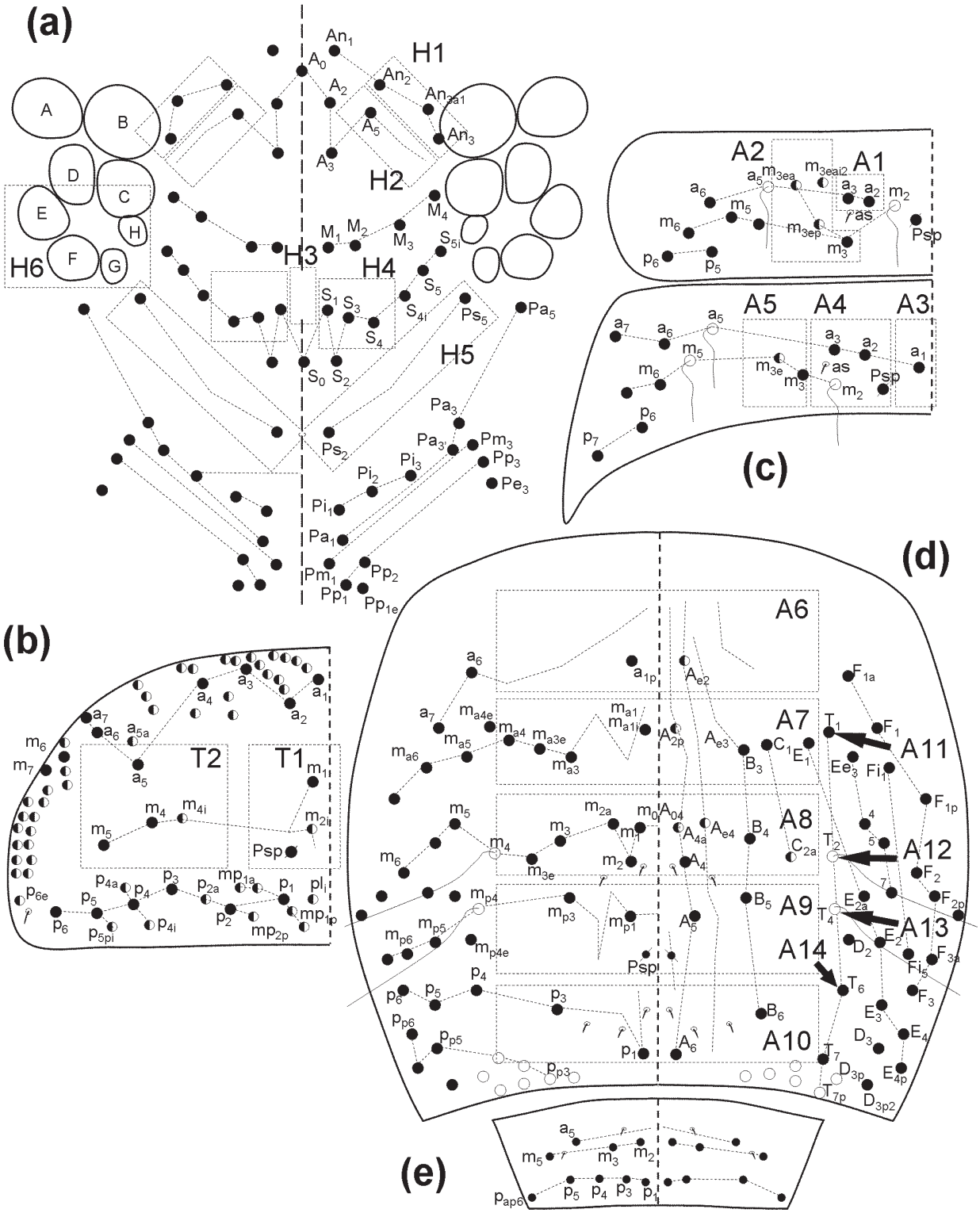

Figure 5
Entomobrya naziridisi Jordana & Baquero **n. sp.** macrochaetotaxy. **a,** Head; **b,** thoracic tergite II; **c,** abdominal tergites II-III; **d,** abdominal tergite IV (the arrows point to the trichobothrium insertions); **e,** abdominal tergite V.

Comment. Individuals of this species were confused with *E. schoetti* during the initial sorting of samples. Three or more colour morphologies were observed for this species at the time: completely pale, pale with some coloured antennae and other patches, darker background coloured with transversal lines on the posterior end of the tergites, with paler patches on the abdominal tergite IV, etc. The meticulous examination of more than twenty slide mounted specimens revealed a very similar macrochaetotaxy, with some variations in areas A2, A6 and A7 of the abdominal tergites (see set of characters). H1-H5 and A3-A5 are invariant. Only five species share the characters T1 and T2: *Entomobrya schoetti* Stach 1922, *Entomobrya marginata* (Tullberg 1871), *Entomobrya unostrigata* Stach 1930, *Entomobrya regularis* Stach 1963, *Entomobrya naziridisi* n. sp. Pale specimens can be confused with *E. lindbergi* Stach 1960, but the macrochaetotaxy of thorax II is 3–4 instead of the 2–4 seen in the new species.

Derivatio nominis. The name is dedicated to Theodoros Naziridis.

Sexual dimorphism in *Entomobrya atrocincta* Schött 1896

(Figs 7a–7g, 8a–8e)

The species of the genus *Entomobrya* have been traditionally identified using coloration (Stach 1963). The study of long series of slides from large collections of *Entomobrya* species has demonstrated, after the observation of the complete macrochaetotaxy, that specimens with similar colour pattern could have

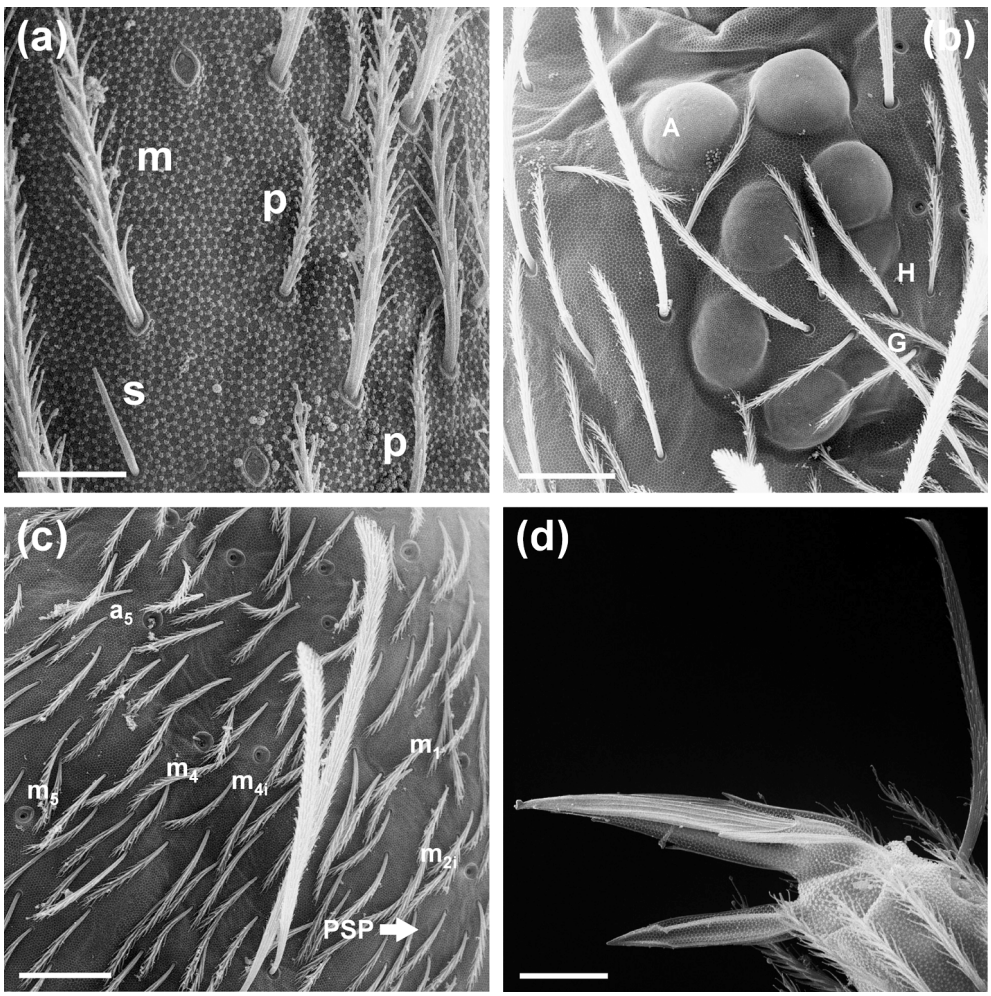

Figure 6
Entomobrya naziridisi Jordana & Baquero **n. sp.** SEM microphotographs. **a,** Detail of the antennal segment IV, showing two different types of sensilla (a: smooth; p: pectinated), and the typical ciliated macrochaetae (m) (bar: 7 micrometers); **b,** eyes, G-H reduced, scarcely visibles (bar: 20 micrometers); **c,** left side of thoracic tergite II (bar: 20 micrometers); **d,** leg III: unguis, unguiculus and tenent hair (bar: 10 micrometers).

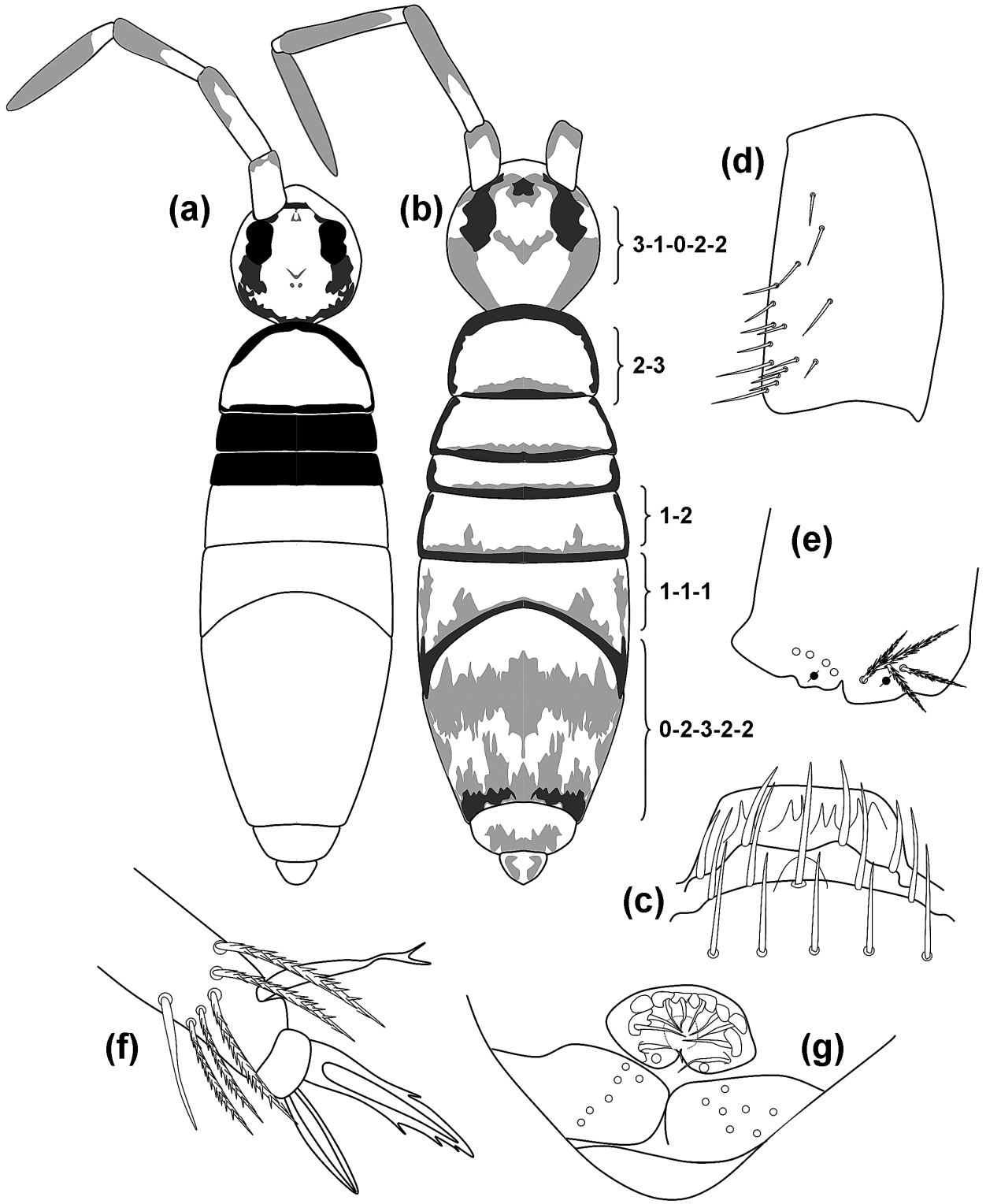

Figure 7
Entomobrya atrocincta. **a,** Color pattern of a male; **b,** color pattern of a female and number of the considered macrosetae for the chaetotactic formula on each tergite and head; **c,** labrum and labral papillae; **d,** trochanter of leg III; **e,** manubrial plate; **f,** leg III: unguis, unguiculus and tenent hair; **g,** male genital plate.

different macrochaetotaxy and vice versa. In this context we should consider the situation of specimens from different geographical regions identified as *E. multifasciata* (Tullberg 1871) using colour pattern. The species status of *E. atrocincta* seems well justified because it has very characteristic colour and macrochaetotacic patterns (Fig. 7a). Microscope examination of individuals of this species sorted based on the typical coloration showed them all to be males. This necessitated searching for females using the macrochaetotaxy observed in the males, which were then found amongst specimens sorted according to coloration similar to *E. multifasciata* (Fig. 7b).

Species Description. Coloration in Figures 7a (male) and 7b (female). Eight eyes (GH<EF). Antennal papilla with simple lobe. Antennal total length and head diagonal ratio ≥ 2 < 3. Labral papilla wrinkled or with some projections (Fig. 7c). Trocanteral organ with approximately 16 setae (Fig. 7d). Manubrial plate with four setae (Fig. 7e). Unguis and unguiculus as in Figure 7f. Male genital plate as in figure 7g. Figures 8a-e show the diagnostic macrochaetotaxy for *E. atrocincta* following the nomenclature of Jordana & Baquero 2005. Comparison of 39 characters with other species is shown in Table 4.

Comments. It is clear that macrochaetotaxy and coloration are necessary for the definitive identification of species in the genus *Entomobrya.* The study of *Entomobrya* species from the north Palaearctic Region has allowed us to ascribe the *E. atrocincta* macrochaetotaxy pattern to specimens identified as *E. multifasciata* from Norway (Fjellberg Coll.), France (MNHN) and Iberian peninsula (Arbea Coll., MNCN, MZNA), and specimens of *E. atrocincta* from France (MNHN), Iberian peninsula (MNCN, MZNA), Japan (NHM) and Greece (this study). Many authors have cited *E. multifasciata*, *E. marginata*, or similar forms from localities across the Holartic region. These records need re-evaluation in light of the new observations reported here.

Some observations about *Isotoma* (*Desoria*) *tigrina* Nicolet 1842

Following Fjellberg (1979) *I.* (*D.*) *tigrina* is one of the most common and widespread species of *Isotoma* in Europe and probably has cosmopolitan distribution (Potapov 2001). Some specimens from caves and other biotopes (Spain) in the collection of the Museum of Zoology, University of Navarra, present characteristics of normal and ecomorphic forms. These characteristics have been compared with specimens captured in this study and the descriptions of Fjellberg (1979, 1980) and Potapov (2001). The size is similar: up to 2.0 mm for the specimens from Greece, 2.1 mm following the descriptions. The pin seta of antennal segment IV is pointed and presents a short basal process, but this process is scarcely visible in some specimens due the position of the antenna. The ventrolateral sensilla of antennal segment I are large and thick (4-5 in specimens from Greece and Spain; 6 in Fjellberg 1980; 4-8 in Potapov 2001); these sensilla are bevelled, with a very pointed tip, and there is one similar sensilla at the apical end of antennal segments II and III. The shape of the PAO is variable, 1-3 times as long as an eye **A**, with an incision at the middle of both sides. The labrum ventroapical ciliation in the traditional descriptions consists of a single row of cilia; in the specimens from Greece and Spain a 1–3 rows of cilia can be observed, but never a clear composite fringe. The manubrial thickening presents a clear incision in the specimens from Greece and Spain. This character has not been mentioned by Fjellberg (1980) and Potapov (2001). Only some specimens from Spain show a pointed prolongation, mentioned by Fjellberg as manubrial teeth sharp. Our observations suggest that this feature is variable.

Discussion

Among the 44 species collected during Project Kerkini, 21 were new for the Fauna of Greece, 11, still recorded in the islands, were new for the Greek mainland. Three specimens could not be identified to species level and nine were still recorded.

These results were not surprising, as the sampled region (northern Greece) had not been studied previously, and the sampling procedure (mainly Malaise traps) had not been used before. Very few papers refer to the Greek mainland. Denis (1933, 1935 and 1936) described some species from Macedonia. Ellis (1966) described two species: *Orchesella balcanica* Stach 1960 and *Seira graeca* Ellis 1966, which we could not find. The papers by Cassagnau (1967, 1968a, 1969, 1973), Cassagnau & Péja (1979), Deharveng (1981) and Cassagnau, Dallai and Deharveng (1979) dealt with the neanurid fauna, which was underrepresented in our samples because of sampling method bias. Deharveng (1987) cited three species in a paper on *Tetracanthella*. Pomorski & Skarzynski (1997) give some references reviewing species of *Metaphorura***.** Detsis (2001) gave some new records. Potapov (2001) in his book about the Palaearctic Fauna of Isotomidae noted some of the records in the above papers, Bretfeld (1999) reported on Symphypleona and Tsiafoulia *et al*. (2005) add new records. Combined, all these works reported 38 species from the Greek mainland. As respects to the islands, there were two fundamental papers by Ellis (1974 and 1976) about the fauna of Rhodos and

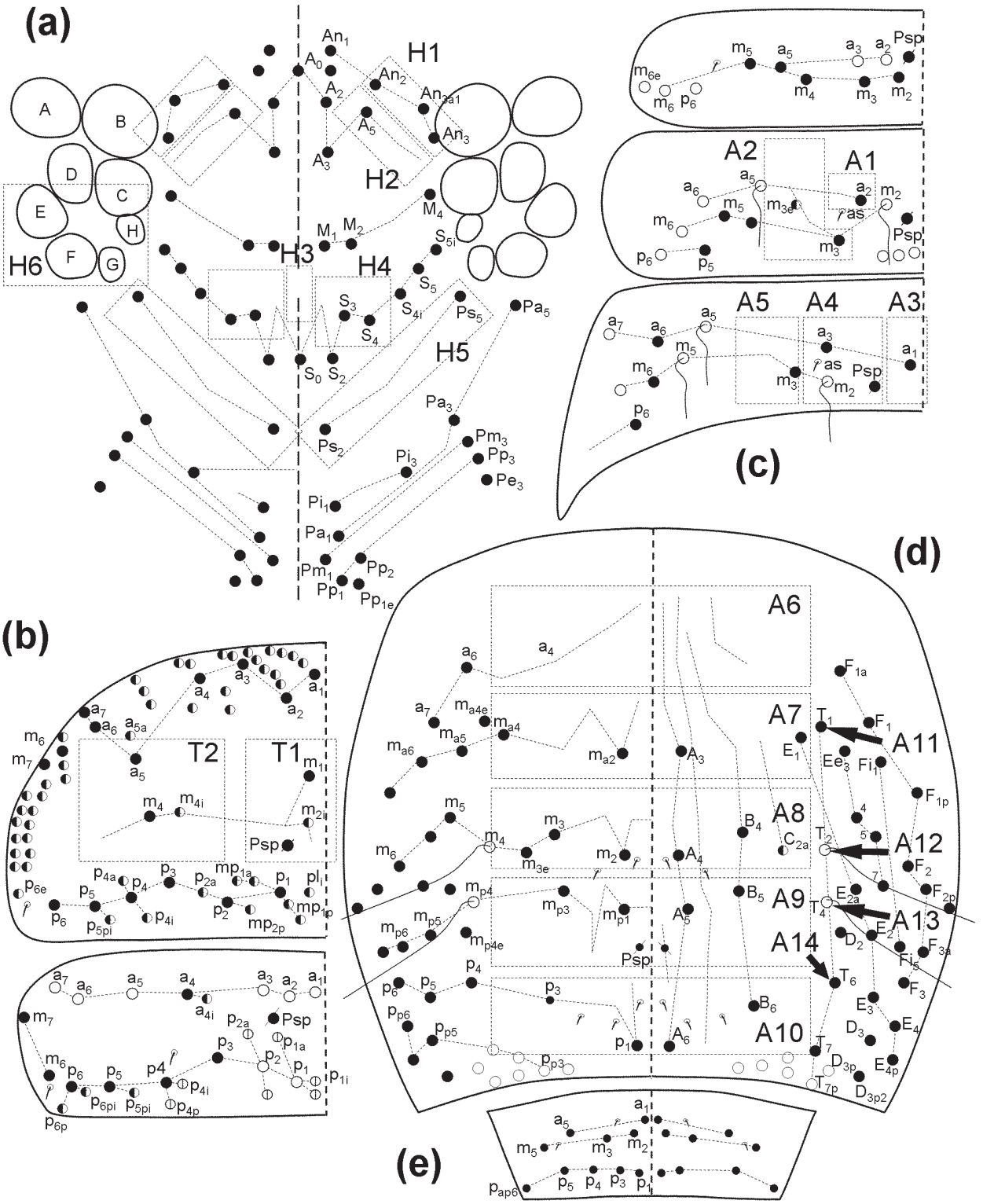

Figure 8
Entomobrya atrocincta macrochaetotaxy. **a,** Head; **b,** thoracic tergite II and III; **c,** abdominal tergites I-III; **d,** abdominal tergite IV (the arrows point to the trichobothrium insertions); **e,** abdominal tergite V.

Crete, respectively. By adding the papers by Cassagnau (1968b) about *Neanurella microphthalma*; Cassagnau (1973) with the description of *Tremoseia* from Corfu and continental area; Cassagnau & Péja (1979) from Eubee Island and continent; Poinsot (1972), Dunger (1994) on Palaearctic Tullbergidae; Sterzynska and Ehrnsberger (1997) which included only a few species; the original information given by Bretfeld (1999) and the recent paper of Schulz & Lymberakis (2006) adding 18 species to Fauna of Creta, we obtained a total of 131 species for the islands.

Although no current checklist exists for the Collembola Fauna of Greece, by combining all the above sources, including Fauna Europaea (2007) (with 135 species), 180 species were actually cited for Greece at some time, of which 11 were recorded in both the islands and the mainland. With our 21 new records (Table 1), the grand total for the Collembola Fauna of Greece rises to 201 species. This represents an increase of 82 % of continental mainland and 12 % over the current data in the Fauna of Greece.

The fauna described here comprises principally elements from continental European, in addition to the Palaearctic and Holartic regions, with some incorporation of other faunas – Mediterranean – (Bellinger *et al*. 2007): 12 species (1304 specimens) are cosmopolitan, 6 species (126 specimens) are Holartic, 4 species (160 specimens) are Palaearctic, 8 species (277 specimens) are European continental, 7 species (93 specimens) are European and Mediterranean, 2 species (624 specimens) are endemic, and 1 species (1 specimen) is Mediterranean. Half of the species have a general distribution (cosmopolitan, Holarctic or Palaearctic), and account for 61 % of the specimens captured; the European fauna is represented by 22 species (50 % of total species), with 994 specimens (38 % of captured specimens), but in this case 579 specimens belongs to the two new and endemic species. The sampling protocol was not very exhaustive because it was designed mainly for fly insects (Malaise trap); nevertheless the eight Berlese-Tullgren funnels samples contributed 27 species and 839 specimens, while the 31 Malaise trap samples contributed 23 species and 1749 specimens. The cosmopolitan *I*. (*D*.) *tigrina* is the more abundant species (727 specimens, 28 % of the total), appearing in the two sampling methods –583 in soil, 144 in the Malaise trap–; *Entomobrya naziridisi* Jordana & Baquero n. sp. (541 specimens, 21 %); *Entomobrya atrocincta* (337 specimens, 13 %); *Sminthurus viridis* (L. 1758) and *Entomobrya dorsalis* Uzel 1891 (= *E. puncteola* Uzel, 1891) (130 specimens respectively, 5 %); *Xenylla brevisimilis brevisimilis* Stach 1949 (126 specimens, 5 %); *Entomobrya handschini* Stach 1922 (114 specimens, 4 %). These seven species contribute 81 % of the total specimens.

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References

Bellinger P. F., Christiansen K. A., Janssens F. 1996-2007. Checklist of the Collembola of the World. http://www.collembola.org, retrieved: [13 August 2007].

Bretfeld G. 1999. Synopses on Palaearctic Collembola, Volume 2. Symphypleona. *Abhandlungen und Berichte des Naturkundemuseums Görlitz* **71**(1): 1-318.

Cassagnau P. 1967. Diagnoses Préliminaires de deux nouveaux Bilobella de Grèce (Collemboles Neanuridae). *Biologia Gallo-Hellenica* **1**(1): 50-52.

Cassagnau P. 1968a. Les espèces européennes du genre *Bilobella* (Collemboles Neanuridae). *Bulletin du Muséum National d`Histoire Naturelle* **40**(2): 292-307.

Cassagnau P. 1968b. *Neanurella microphthalma* n. g., n. sp. Nouveau Collembole de l'Ile d'Eubée (Grèce) *Biologia Gallo-Hellenica* **1**(2): 137-142.

Cassagnau P. 1969. Sur un nouveau genre de Katiannini (Collemboles Symphypléones) récoltés en Gréce continentale. *Biologia Gallo-Hellenica* **2**(2): 123-132.

Cassagnau P. 1973 Sur un nouveau genre de Collemboles récolté en Grèce continentale et a Corfou. *Biologia Gallo-Hellenica* **5**(1): 65-75.

Cassagnau P., Dallai R., Deharveng L. 1979. Le polymorphisme des chromosomes polytènes de *Lathriopyga longiseta* Caroli (Collembole Neanurinae). *Caryologia* **32**(4): 461-483.

Cassagnau P., Peja N. 1979. Diagnoses préliminaires de quelques Neanuridae de Grèce et d'Albanie. *Biologia Gallo-Hellenica* **8**: 205-222.

Deharveng L. 1981. La famille des Odontellidae: Phylogenèse et Taxonomie. *Travaux du Laboratoire d'Ecobiologie des Arthropodes Edaphiques, Toulouse* **5**(3): 1-151.

Deharveng L. 1982. A propos des *Folsomia* du groupe *quadrioculata* Tullberg, 1871. *Revue d'Ecologie et de Biologie du Sol* **19**: 613-627.

Deharveng L. 1987. Révision taxonomique du genre Tetracanthella Schött, 1891. *Travaux du Laboratoire d'Ecobiologie des Arthropodes Edaphiques, Toulouse* **5**(3): 1-151.

Denis J. R. 1933. Collemboles récoltés par M. P. Rémy en Yugoslavie et en Macedoine grecque (Note préliminaire). *Bulletin de la Société Entomologique de France* **38**(14): 211-213.

Denis R. 1935. Collemboles récoltés en Yougoslavie et en Macédoine grecque par Rémy en 1930. *Annales de la Société entomologique France* **104**: 329-344.

Denis R. 1936. Collemboles récoltés en Yougoslavie et en Macédoine grecque par Rémy en 1930. *Annales de la Société entomologique France* **105**: 263-277.

Detsis V. 2000. Vertical distribution of Collembola in deciduous forest under mediterranean climatic conditions *Belgian Journal of Zoology* **130**(suppl. 1): 55-59.

Ellis W. N. 1966. On *Orchesella balcanica* Stach, 1960, and *Seira pillichi graeca* n. ssp., from Greece (Collembola, Entomobryidae). *Entomologische Berichten* **26** (8): 142-147.

Ellis W. N. 1974. The spring fauna of Collembola (Insecta) from Rhodos, with descriptions of some new taxa. *Beaufortia* **292**(22): 105-152.

Ellis W. N. 1976. Autumn fauna of collembola from Central Crete. *Tijdschrift Voor Entomologie* **119**(8): 221-326.

Fauna Europaea Web Service, 2004. Fauna Europaea version 1.1, available online at http://www.faunaeur.org, retrieved: [13 August 2007].

Fjellberg A. 1979. Revision of the European species in the *Isotoma olivacea*-group (Collembola: Isotomidae). *Entomologica Scandinavica* **10**: 91-108.

Fjellberg A. 1980. *Identification keys to Norwegian Collembola*, Norsk Entomologisk Forening (Ed.), Ås-NLH, Norway. 152 p.

Jordana R., Baquero E. 1999. Redescription of *Entomobrya schoetti* (Collembola, Entomobryidae, Entomobryinae), third record of the world fauna. *Boletín de Sanidad Vegetal, Plagas* **25**: 99-105.

Jordana R., Baquero E. 2005. A proposal of characters for taxonomic identification of *Entomobrya* species (Collembola, Entomobryomorpha), with description of a new species. *Abhandlungen und Berichte des Naturkundemuseums Görlitz* **76**: 117-134.

Poinsot N. 1972. Etude systématique et écologique des collemboles isotomidae de Provence. *Annales de la Société entomologique France* (N.S.) **8**(3): 669-661.

Pomorski R.J., Skarzynski D. 1997. A redescription of *Metaphorura denisi* Simon Benito, 1985 (Collembola: Onychiuridae: Tullbergiinae) *Genus* **8**(3-4): 489-496.

Potapov M. 2001. Synopses on Palaearctic Collembola, Volume 3. Isotomidae. *Abhandlungen und Berichte des Naturkundemuseums Görlitz* **73**: 1-603.

Schulz H.-J., Lymberakis P. 2006. First contribution to the knowledge of the Collembola fauna of the White Mountains (Lefká Ori) in West Crete (Insecta, Collembola, Isotomidae) *Senckenbergiana biologica* **86**(2): 229-234.

Stach J. 1963. *The Apterygotan fauna of Poland in relation to the world-fauna of this group of insects. Tribe: Entomobryini*. Polska Akademia Nauk, Kraków, 126 p., 43 pl.

Sterzynska M., Ehrnsberger R. 1997. Marine algae wrack Collembola of European coasts. *Abhandlungen und Berichte des Naturkundemuseums Görlitz* **69**(2): 165-178.

Tsiafoulia M.A., Kallimanisa, A.S., Katanab, E., Stamoua G.P., and Sgardelis S. P., 2005. Responses of soil microarthropods to experimental short-term manipulations of soil moisture. *Applied Soil Ecology* **29**(1): 17-26.

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