



A review of the *Sarcophaga* (*Heteronychia*) (Diptera: Sarcophagidae) of Sardinia*

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Abstract

An account is given of the species of *Sarcophaga* Meigen, 1826 subgenus *Heteronychia* Brauer & Bergenstamm, 1889 known from the island of Sardinia (Italy). Most of the nearly 1,400 specimens examined were collected in the SW part of the island during 2003–2006 as part of a project investigating the arthropod diversity of the Monti Marganai and Montimannu areas (respectively Carbonia-Iglesias and Medio Campidano provinces). The study resulted in the finding of eight species of *Heteronychia*, six of which are recorded from Sardinia for the first time. *Sarcophaga* (*Heteronychia*) *penicillata* Villeneuve, 1907, previously mentioned in the literature, is excluded from the fauna of the island. *Sarcophaga* (*Heteronychia*) *thirionae* (Lehrer, 1976) is recorded for the first time from Europe and North Africa (Algeria). One species, *Sarcophaga* (*Heteronychia*) *gabrielei* **sp. nov.**, from various sites in the limestone massif of Marganai, is described as new. Previously unpublished records from other Italian regions and from other countries (Algeria, Canary Islands, Greece) are also given for several species. *Sarcophaga* (*Heteronychia*) *schnabli* Villeneuve, 1911 is recognized as a junior synonym of *S. (H.) consanguinea* Rondani, 1860 **syn. nov.** The possible synanthropy of *Sarcophaga* (*Heteronychia*) *pandellei* (Rohdendorf, 1937) is briefly discussed. A key to males and females of all known Sardinian and Corsican species of *Sarcophaga* (*Heteronychia*) is provided.

Key words: *Sarcophaga*, *Heteronychia*, Sardinia, Corsica, new species, new synonymy, new records, identification key

Introduction

Compared to mainland Italy and Sicily, the flesh fly fauna of Sardinia is poorly known. Scattered records and information on Sardinian Sarcophagidae can be found in, e.g., Costa (1882, 1883, 1884), Krausse (1910), Paoli (1910), Böttcher (1912, 1913a, 1913c), Melis (1934), Séguy (1941), Saccà and Rivosecchi (1953), Venturi (1960, 1966), Delrio *et al.* (1979), Lehrer and Luciano (1979), Luciano and Prota (1981), Povolný (1997), Panu *et al.* (2000) and Povolný (2004). Pape (1995a) reported 22 species from Sardinia in the Italian checklist, and increased this number to 27 in *Fauna Europaea* (Pape 2004a).

Heteronychia Brauer & Bergenstamm, 1889, under its current definition (see Pape 1996), is the most species-rich subgenus of *Sarcophaga* Meigen, 1826, containing approximately 90 valid species distributed mainly in the Palaearctic from the Canary Islands to the Russian Far-East and Japan (Pape 1996). The Mediterranean area, from which about 50% of the described species are known, seems to be a diversity hotspot for the taxon (Pape 2009). Mainland Italy, with 30 species recorded so far (Pape 2004a; Whitmore *et al.* 2008), hosts one of the largest faunas of the subgenus in Europe. The biology of *Heteronychia* species is

still quite poorly known, although several have been recorded as parasitoids of terrestrial snails (Coupland & Barker 2004). This life strategy may be obligate (Povolný & Verves 1997), and breeding records from dead snails (which suggest saprophagy) and locusts reported by Coupland and Barker (2004) refer to species no longer considered members of the subgenus.

No species of *Heteronychia* were listed from Sardinia in the Italian checklist (Pape 1995a), and those by Povolný (1997, 2004) of *Sarcophaga ferox* Villeneuve, 1908 and *S. pandellei* (Rohdendorf, 1937) – the latter reported also by Pape (2004a) – are the only published records from the island. Povolný (1997) also recorded *S. (H.) penicillata* Villeneuve, 1907; this record was probably a misidentification of *S. (H.) thirionae* (Lehrer, 1976) (see below) and *S. (H.) penicillata* is here excluded from the Sardinian fauna.

The aim of this paper is to revise the knowledge on the *Sarcophaga (Heteronychia)* of Sardinia, based on data from the literature, data from museum collections and part of a large flesh fly material recently (years 2003–2006) collected in SW Sardinia in the framework of an investigation of the arthropod diversity of the area (see Mason *et al.* 2006).

Material and methods

Approximately 1,400 specimens of *Heteronychia* were examined. Methods used during recent field work (2003–2006) were principally Malaise traps and hand nets (see Mason *et al.* 2006). Specimens are stored in 70° ethanol or dry-pinned, and preserved in the insect collection of the Centro Nazionale per lo Studio e la Conservazione della Biodiversità Forestale “Bosco Fontana”, Verona, unless otherwise specified. Type material of *Sarcophaga (Heteronychia) gabrielei* **sp. nov.** is all dry-pinned. When possible, male terminalia were extended while specimens were still fresh; in dried males with non-extended terminalia, these were carefully broken off with watchmaker’s forceps at the level of the epandrium and glued to a slip of card pinned together with the specimen. Most females were identified without dissection, by association with males in the same samples or by comparison with reference specimens; identification without dissection was facilitated by the fact that in specimens preserved in alcohol, the last sternites are well visible. Two female paratypes of *Sarcophaga (Heteronychia) gabrielei* **sp. nov.** were dissected for examination (by R. Richet, France): abdomens were first removed and soaked in a 10% KOH solution for a couple of hours; subsequently, the last sternites, tergite 6 and the spermathecae were removed from the rest of the abdomen, placed in beechwood creosote before being mounted in Canada balsam on a small slide (consisting of two coverslips) pinned together with the rest of the specimen.

Digital photographs of the habitus of the new species and of female abdomens were done using a Nikon DS-5M digital camera mounted on a Leica 12.5 stereomicroscope and processed by AutoMontage Pro version 5.03.0096; digital photos of details of the female terminalia were taken with an HP PhotoSmart 912 digital camera; SEM images were taken using a JEOL JSM-6335F scanning electronic microscope (ZMUC) and a Hitachi TM1000 environmental (low-vacuum) scanning electronic microscope (CNBFVR).

Terminology of the external morphology follows Merz and Haenni (2000), except for the antenna (Stuckenberg 1999). Terminology of general features of the male terminalia follows Sinclair (2000); that of features particular to the distiphallus follows Pape (1987). Measurements and ratios of the antenna, head and wing follow Tschorsnig and Richter (1998); width of parafacial is expressed as follows: width of parafacial/minor diameter of eye in exact lateral view.

The diagnosis of *Heteronychia* is based partly on the literature (see “References” in the section “Taxonomy”) and partly on the examination of most of the species currently ascribed to this taxon.

For label data of type material (including the holotype of the new species) individual lines are separated with a forward slash (/), whereas individual labels are separated with a double forward slash (//), and all information is given exactly as reported on the labels. Any comments about label data are given in square brackets. Number and sex of non-type specimens are listed with two figures separated by a backward slash (\), the first being the number of males, the second the number of females; e.g. “1\0” stands for “one male, zero females”. Collectors are listed in the same order as on labels.

Three species of *Heteronychia* not recorded from Sardinia but listed from Corsica in the literature (*cf.* Pape 2004a) have been included in the taxonomic key (see below) as they may possibly occur also in Sardinia. These are *Sarcophaga (Heteronychia) consanguinea* Rondani, 1860, *S. (H.) haemorrhoea* Meigen, 1826 and *S. (H.) vicina* Macquart, 1835, of which the following material was examined for the preparation of the key (see further on for the meaning of the abbreviations): *S. consanguinea* – 1\0: Italy, Latium, Rome prov., San Gregorio da Sassola, Ponte San Pietro, 9.IX.2004, MM (MZUR); 0\1: Italy, Latium, Rome prov., Monti della Tolfa, 29.VIII.1997, PC (CNBFVR, dRR); 1\2: Italy, Sicily, Palermo prov., Corleone, 27.VI.2005, DW DB PC ML (CNBFVR, females dRR); *S. haemorrhoea* – 1\0: Italy, Umbria, Perugia prov., Gubbio, Colonnata, 2.VII.2006, DW (CNBFVR); 0\1: same data except 18.VI.2005 (CNBFVR, dRR 2006); *S. vicina* – 1\0: Italy, Venetia, Verona prov., Monte Baldo, near Caprino, 23.IV.2006, DW (CNBFVR); 0\1: Italy, Venetia, Verona prov., Malcesine, Prea, 18.V.2002, DB (CNBFVR, dRR). No Corsican specimens of *Heteronychia* were studied except for the lectotype ♂ of *Sarcophaga (Heteronychia) schnabli* Villeneuve, 1911: Campo di Loro (Corse) / 16.VI. // *Sarcophaga / Schnabli / Type Villen.* // Coll. J. Villeneuve: [typewritten] / *Sarcophaga / Schnabli* Vill. / R.M.H.N. Belg. 15.392 // TYPE // LECTOTYPE / *Sarcophaga / schnabli* Vill. ♂ / T. Pape det. 1994 // *Sarcophaga / consanguinea / Rondani, 1860 / det. D. Whitmore 2007 (IRSNB)*. The lectotype was designated by Pape (1995b), who compared *S. (H.) schnabli* with *S. (H.) siciliana* (Enderlein, 1928). The examination of the lectotype allowed me to establish that *Sarcophaga (Heteronychia) schnabli* is a junior synonym of *Sarcophaga (Heteronychia) consanguinea* **syn. nov.**, as already suggested by Povolný (2003); this species is not yet recorded from Sardinia.

Chorotypes were assigned following the categories proposed by Vigna Taglianti *et al.* (1999), based on general distributions provided by Pape (1996, 2004a). Italian distributions are given at regional level, with regions listed in alphabetical order.

Geographic coordinates were taken with a GPS or retrieved from 1:25000 and 1:50000 maps whenever possible; coordinates are specified only when written on the locality label.

The nomenclature of the Mollusca Gastropoda listed in this paper follows Bank (2004a, 2004b).

Acronyms and abbreviations

Depositories

BMNH	Natural History Museum, London, UK.
CNBFVR	Centro Nazionale per lo Studio e la Conservazione della Biodiversità Forestale “Bosco Fontana”, Verona, Italy.
FSAG	Faculté Universitaire des Sciences Agronomiques, Gembloux, Belgium.
GDC	Gregory A. Dahlem private collection, Cincinnati, USA.
IRSNB	Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium.
MNHN	Muséum National d’Histoire Naturelle, Paris, France.
MMBC	Moravské Muzeum, Brno, Czech Republic.
MZUF	Museo Zoologico de “La Specola”, Florence, Italy.
MZUR	Museo di Zoologia, Sapienza Università di Roma, Rome, Italy.
NHRS	Naturhistoriska Riksmuseet, Stockholm, Sweden.
SMNS	Staatliches Museum für Naturkunde, Stuttgart, Germany.
TAU	Tel Aviv University, Tel Aviv, Israel.
USNM	National Museum of Natural History, Washington D.C., USA.
ZIN	Russian Academy of Sciences, Zoological Institute, St. Petersburg, Russian Federation.
ZMHB	Museum für Naturkunde der Humboldt-Universität, Berlin, Germany.
ZMUC	Natural History Museum of Denmark, Zoological Museum, University of Copenhagen, Denmark.

Collectors

AT = A.M. Tenga; BR = M. Barták; BM = B. Merz; DA = D. Avesani; DB = D. Birtele; DP = D. Povolný; DW = D. Whitmore; EG = E. Gatti; EM = E. Minari; FH = F. Hartig; FM = F. Mason; GC = G. Chessa; GM = G. Malizia; GN = G. Nardi; GS = G. Saccà; GT = G. Mantero; LC = L. Cederholm; LR = L. Rivoecchi; MB = M. Bardiani; ML = M. Lopresti; MM = M. Mei; MT = M. Tisato; NC = no collector specified on label; OC = O. Castellani; PA = P. Cornacchia; PC = P. Cerretti; SA = S. Andersen; TP = T. Pape; WH = J.C. Worm Hansen.

Methods

al = at light; hn = hand net; mt = Malaise trap.

Other

det. = determined by; dint. = surroundings of; dRR = det. R. Richet; prov. = province.

Sampling sites

Sardinian sites investigated in 2003–2006:

- A01:** Medio Campidano prov., Arbus, Piscinas, UTM 32 S 452927 4376897, hn, MB DB PA DW.
A02: Medio Campidano prov., Arbus, Marina di Arbus, UTM 32 S 454504 4383252, hn, MB DB PA DW.
A05: Carbonia-Iglesias prov., Buggerru, foce [= mouth of] Rio Mannu, UTM 32 S 449437 4365545, hn, DW DB PC GN MT (2004) or DA MB DB PC MM DW (2006).
A06: Carbonia-Iglesias prov., Buggerru, Cala Domestica, UTM 32 S 446540 4358436, hn, DA MB DB GN.
A07: Carbonia-Iglesias prov., Buggerru, Cala Domestica, UTM 32 S 446215 4358636, hn, DA MB DB GN.
A11: Oristano prov., San Vero Milis, sa Marigosa, UTM 32 T 449217 4432397, car net [unless otherwise specified], DA MB DB GN.
A16: Carbonia-Iglesias prov., Iglesias, Gonnesa, Fontanamare, UTM 32 S 451423 4348717, hn, DB PC GN MT DW.
A21: Oristano prov., Stagno di Marceddì, hn, MB DB PA DW.
C01: Carbonia-Iglesias prov., Iglesias, Case Marganai, 725 m, UTM 32 S 463890 4355925, hn, DW MB DB PA (V.2006) or DA MB DB GN (IX.2006).
C03: Carbonia-Iglesias prov., Iglesias, Vecchia Cantoniera Marganai, 491 m, UTM 32 S 0462272 4354677, hn, MB DB PA DW (V.2006) or DA MB DB PC MM DW (VII.2006).
C05: Carbonia-Iglesias prov., Iglesias, Punta Cungiaus, hill top, 636 m, UTM 32 S 462440 4355161, hn, DW MB DB PA.
C06: Carbonia-Iglesias prov., Domusnovas, Grotta San Giovanni, 325 m, UTM 32 S 0467900 4354891, hn, DB PC GN MT DW (VI.2004) or DB PC FM DW (IX.2004).
C07: Carbonia-Iglesias prov., Domusnovas, dint. Planargia-Scoveri, 625 m, UTM 32 S 0465523 4362921, hn, MB DB PA DW (V.2006) or DA MB DB PC MM DW (VII.2006).
C10: Medio Campidano prov., Villacidro, dint. Punta Piscina Argiolas, 282 m, UTM 32 S 472049 4360081, hn, MB DB PA DW.
C18: Medio Campidano prov., Villacidro, Rio Cannisoni, 390 m, UTM 32 S 469095 4362383, hn, DA MB DB PC MM DW.
C22: Medio Campidano prov., Villacidro, sorgente [= spring] s'Acqua Frischedda, 390 m, UTM 32 S 0468391 4362826, hn, MB DB PA DW.
C23: Medio Campidano prov., Villacidro, radura sponda sinistra [= clearing on left bank of] Rio Cannisoni, 401 m, UTM 32 S 0468459 4362806, hn [unless otherwise specified], MB DB PA DW.
C26: Carbonia-Iglesias prov., Domusnovas, Bega d'Aleni, 621 m, UTM 32 S 467855 4361336, hn [unless otherwise specified], MB DB PA DW (V.2006) or DA MB DB PC DW or DA MB DB PC MM DW (VII.2006).

- C27:** Medio Campidano prov., Gonnosfanadiga, Monte Idda, strada per [= road to] Monte Linas, 474 m, UTM 32 S 0466946 4368997, hn, MB DB PA DW.
- C27a:** Medio Campidano prov., Gonnosfanadiga town, 190 m, UTM 32 S 470960 4371745, hn, DW.
- C28:** Medio Campidano prov., Gonnosfanadiga, sa Punta de s'Erbaceu, 744 m, UTM 32 S 465989 4368410, hn, DW MB DB PA.
- C29:** Medio Campidano prov., Gonnosfanadiga, Monte Linas, Genna Mirratta, 794 m, UTM 32 S 465363 4366138, hn, DA MB DB GN.
- C31:** Carbonia-Iglesias province, Domusnovas, Lago Siuru, 322 m, UTM 32S 0467069 4357916, mt [unless otherwise specified], DW MB DB PA (V.2006) or DA DB PC MM DW (VII.2006).
- C32:** Medio Campidano prov., Villacidro, diga [= dam] Lago di Montimannu, 255 m, UTM 32 S 475380 4363486, DA MB DB GN.
- C33:** Carbonia-Iglesias prov., Domusnovas, dint. Punta Planotzara, 360 m, UTM 32 S 465515 4356209, hn, DA MB DB PC DW.
- C34:** Carbonia-Iglesias prov., Domusnovas, Rio sa Duchessa, 270 m, UTM 32 S 466700 4356979, hn, DA MB DB PC MM DW.
- C35:** Carbonia-Iglesias prov., Iglesias, Mamenga, 610 m, UTM 32 S 462170 4356618, hn, DA MB DB PC DW.
- C39:** Carbonia-Iglesias prov., Iglesias, Cuccuruneddu, hill top, 708 m, UTM 32 S 472379 4357784, hn, DW.
- C40:** Carbonia-Iglesias prov., Iglesias, dint. Cuccuruneddu, 609 m, UTM 32 S 0472512 4357946, hn, DA MB DB PC MM DW.
- C42:** Carbonia-Iglesias prov., Iglesias, Conca Margiani, 750 m, UTM 32 S 462440 4356936, hn, DA MB DB PC DW.
- C43:** Carbonia-Iglesias prov., Iglesias, Conca Margiani, radura [= clearing], 725 m, UTM 32 S 462470 4357011, hn [unless otherwise specified], DA MB DB PC DW [unless otherwise specified].
- C44:** Carbonia-Iglesias prov., Iglesias, Conca Margiani, 700 m, UTM 32 S 462635 4356866, hn, DA MB DB PC DW or DA MB DB PC MM DW.
- C49:** Medio Campidano prov., Villacidro, Torrente Leni, 300 m, UTM 32 S 471317 4360510, hn, DA MB DB GN.
- C50:** Medio Campidano prov., Villacidro, C. Sarais, 251 m, UTM 32 S 474215 4361145, hn, DA MB DB GN.
- C52:** Carbonia-Iglesias prov., Iglesias, San Benedetto, 550 m, UTM 32 S 459499 4358405, hn, DB PC EM MT DW (IX.2003) or DB PC EG FM DW (IX.2004).
- C57:** Medio Campidano prov., Gonnosfanadiga, Monte Linas, Pizzu Cane, 339 m, UTM 32 S 468966 4370601, hn, DA MB DB GN.
- C70:** Carbonia-Iglesias prov., Iglesias, dint. Case Marganai, 660 m, UTM 32 S 463341 4356196, al, DB PC FM DW.
- C82:** Carbonia-Iglesias prov., Iglesias, Marganai, Tintillonis, 480 m, UTM 32 S 462590 4355061, mt [unless otherwise specified], DB PC GN MT DW.
- C85:** Carbonia-Iglesias prov., Iglesias, Marganai, 540 m, UTM 32 S 463010 4355249, hn, DB PC EM MT DW.
- G02:** Nuoro prov., Oliena, Punta Sos Nidos, 986 m, UTM 32 T 536075 4456422, hn, DA MB DB GN.
- G03:** Nuoro prov., Oliena, 424 m, UTM 32 T 534746 4457479, hn, DA MB DB GN.
- G06:** Ogliastra prov., Seui, dint. Monte Tonneri, Sorgente Nuletta, 892 m, UTM 32 S 531716 4412341, hn, DA MB DB GN.
- G08:** Ogliastra prov., Seui, Monte Tonneri, 919 m, UTM 32 S 530651 4412895, hn, DB DA MB GN.
- G09:** Nuoro prov., Villanovatulo, dint. Nuraghe is Cangialis, 373 m, UTM 32 S 0517956 4400645, hn, DA MB DB GN.
- S1:** Carbonia-Iglesias prov., Iglesias, dint. Colonia Beneck, 636 m, UTM 32S 0462391 4355441, mt [unless otherwise specified], GC [unless otherwise specified].
- S2:** Carbonia-Iglesias prov., Domusnovas, sa Duchessa, 371 m, UTM 32S 0464990 4358384, mt [unless

otherwise specified], GC [unless otherwise specified].

S3: Carbonia-Iglesias prov., Domusnovas, Valle Oridda, 592 m, UTM 32S 0466973 4362228, mt [unless otherwise specified], GC [unless otherwise specified].

Other Sardinian sites:

W01: Sassari prov., Palau, Porto Rafael, hn, PC AT.

W02: Sassari prov., Golfo dell'Asinara, Osilo, San Lorenzo in Valle, hn, DB.

W03: Sassari prov., Alghero, Argentiera, hn, MM.

W04: Carbonia-Iglesias prov., Isola di San Pietro [= San Pietro Island], La Caletta, hn, MM.

Taxonomy

Genus *Sarcophaga* Meigen, 1826

Subgenus *Heteronychia* Brauer & Bergenstamm, 1889

Heteronychia Brauer & Bergenstamm, 1889: 124. Type species: *Heteronychia chaetoneura* Brauer & Bergenstamm, 1889.

References. Rohdendorf (1937) [descriptions and keys to known species, as *Pierretia* Robineau-Desvoidy]; Rohdendorf (1965) [definition of genera and subgenera of *Heteronychiina*]; Verves (1986) [Palaeartic catalogue]; Pape (1987) [diagnosis of *Heteronychia* (as genus), and key to Scandinavian species]; Verves (1989) [diagnosis of subtribe *Heteronychiina* and key to genera and subgenera]; Verves (1993) [diagnosis of *Heteronychia* (as genus), and keys to species of some subgenera]; Pape (1996) [World catalogue, as subgenus]; Povolný and Verves (1997) [diagnosis of *Heteronychia* (as genus) and key to Central European species].

Diagnosis. Gena usually entirely covered with black setulae. Thorax with 3 postsutural dorsocentral setae. Wing-vein R_1 often setose dorsally. Male hind trochanter usually with a brush of more or less tightly-spaced spine-like setae ventrally. Female mid-femoral organ, if present, situated in apical half. Abdominal tergite 3 with or without mediomarginal setae. Male terminalia: sternite 5 with brushes of stout bristles along posterior margin; epandrium often red, with a gently curving dorsal outline when viewed in profile; epandrium and protandrial segment more or less elongate, usually longer than high; cerci flattened dorsally or with a dorsal excavation; basiphallus long; vesica usually reduced, scale-like, never bilobed; apical processes of harpes often long, flattened (but may be short or extremely short, seemingly absent); juxta distinct from rest of distiphallus, sometimes elongate, longitudinally undivided or divided, with or without membranous basal appendages. Female terminalia: abdominal tergite 6 red, brown or black, undivided or divided into two hemitergites; vaginal plate present anterior to hypoproct; spermathecae usually small, globular.

Key to Sardinian and Corsican species of *Sarcophaga* (*Heteronychia*) (species in square brackets are not recorded from Sardinia):

1. Males 2
- Females 12
2. Mid femur with a subapical posteroventral comb of thick, short, tightly-spaced setae; abdominal tergite 3 without mediomarginal setae 3
- Mid femur without such a posteroventral comb, at most with a few slightly thicker setae apically; abdominal tergite 3 with or without mediomarginal setae 6
3. Cercus distinctly saddle-shaped in profile (Figs 18, 19) 4
- Cercus of a different shape 5
4. Wing-vein R_1 setose dorsally; juxta extremely long, in the shape of a shepherd's staff in lateral view, forming an

- angle with main axis of distiphallus..... *thirionae* (Lehrer, 1976)
- Wing-vein R₁ bare dorsally; juxta short, more or less in line with main axis of distiphallus *uncicurva* Pandellé, 1896
 - 5. Cercus with a dorsal excavation and straight in profile; juxta with ear-like membranous expansions at base; vesica not visible in profile *minima* Rondani, 1862
 - Cercus without a dorsal excavation and m-shaped in profile; juxta without membranous expansions at base; vesica partly visible in profile, spine-like *pandellei* (Rohdendorf, 1937)
 - 6. Wing-vein R₁ setose dorsally; epandrium red; abdominal tergite 3 usually with a pair of mediomarginal setae (sometimes short, appressed) 7
 - Wing-vein R₁ bare dorsally; epandrium red or black; abdominal tergite 3 with or without a pair of mediomarginal setae 9
 - 7. Vertex in dorsal view about 0.70–0.90 x the width of an eye; parafacial at its narrowest point 0.32–0.62 x as wide as eye width in strict lateral view; gena in profile 0.40–0.65 x height of eye; cercus with a deep dorsal excavation; vesica markedly elongated, clearly visible in profile..... *ferox* Villeneuve, 1908
 - Vertex in dorsal view about 0.35–0.50 x the width of an eye; parafacial at its narrowest point 0.13–0.26 x as wide as eye width in strict lateral view; gena in profile 0.30–0.40 x height of eye; cercus without a dorsal excavation; vesica small, not visible in profile; juxta with basal spoon-like appendages 8
 - 8. Phallus with a very long median part of juxta, reaching far beyond tip of juxtal appendages; cercus, in lateral view, abruptly narrowing in distal third and with a long, parallel-sided tip..... [*haemorrhoea* Meigen, 1826]
 - Median part of juxta not elongate, shorter than juxtal appendages or about level with the latter; cercus, in lateral view, gradually narrowing towards tip *bulgarica* (Enderlein, 1936)
 - 9. Mid tibia without an anteroventral seta (if present, then protandrial segment without marginal setae); abdominal tergite 3 without mediomarginal setae; epandrium red *gabrielei* **sp. nov.**
 - One or two anteroventral setae present on mid tibia; abdominal tergite 3 with or without a pair of strong mediomarginal setae; epandrium red or dark brown 9
 - 10. Epandrium dark brown, rarely with a slight reddish tinge; abdominal tergite 3 with a pair of strong mediomarginal setae *filia* Rondani, 1860
 - Epandrium bright red; abdominal tergite 3 usually without mediomarginal setae 11
 - 11. Pregonite with a pointed tip, hook-shaped; base of distiphallus distinctly elongate; protandrial segment shiny black with just a very narrow line of grey microtrichosity posteriorly [*vicina* Macquart, 1835]
 - Pregonite widening apically, with a rounded tip; base of distiphallus not particularly elongate; protandrial segment partly reddish, with a large spot of grey microtrichosity [*consanguinea* Rondani, 1860]
 - 12. Wing-vein R₁ setose dorsally 13
 - Wing-vein R₁ bare dorsally 15
 - 13. Abdominal tergite 6 divided into two hemitergites, red; midfemoral organ present *ferox* Villeneuve, 1908
 - Abdominal tergite 6 undivided, either red or black; midfemoral organ present or absent 14
 - 14. Midfemoral organ absent; abdominal tergite 3 with a pair of strong, upright mediomarginal setae; abdominal tergite 6 almost entirely red *bulgarica* (Enderlein, 1936) or [*haemorrhoea* Meigen, 1826]
 - Midfemoral organ present; abdominal tergite 3 without mediomarginal setae (at most with a pair of short appressed setae); abdominal tergite 6 dark brown or black..... *thirionae* (Lehrer, 1976)
 - 15. Abdominal tergite 6 divided into two hemitergites, red 16
 - Abdominal tergite 6 undivided, either entirely red, mostly black with a slight reddish tinge, or entirely black 18
 - 16. Mid femur with a conspicuous, often red, midfemoral organ near apex *pandellei* (Rohdendorf, 1937)
 - Mid femur without a midfemoral organ 17
 - 17. Ventral margin of abdominal tergite 5 entirely black; vaginal plate [dissection necessary] semicircular [*consanguinea* Rondani, 1860]
 - Ventral margin of abdominal tergite 5 at least partly red (Fig. 11); vaginal plate subtriangular (Fig. 15) *gabrielei* **sp. nov.**
 - 18. Abdominal tergite 3 with a pair of strong, upright mediomarginal setae; midfemoral organ absent 19
 - Abdominal tergite 3 without mediomarginal setae, at most with a pair of very short, appressed setae; midfemoral organ distinct near apex or absent 20
 - 19. Abdominal tergite 6 black, at most slightly brownish-red *filia* Rondani, 1860
 - Abdominal tergite 6 mostly red, darker ventrally [*vicina* Macquart, 1835]
 - 20. Abdominal tergite 6 black, sometimes with a slight red tinge *minima* Rondani, 1862
 - Abdominal tergite 6 mostly or entirely red, sometimes slightly darker on ventral sides 21
 - 21. Abdominal tergite 6 strongly narrowing towards middle; microtrichosity of abdomen thick light grey, with black markings reduced to a median line and small lateral spots on tergites 3–5 in posterior view (Fig. 20)..... *uncicurva* Pandellé, 1896

- Abdominal tergite 6 not strongly narrowing in middle; microtrichosity of abdomen less thick, black markings remaining conspicuous also in posterior view (Fig. 21) [vicina Macquart, 1835]

Sarcophaga (Heteronychia) bulgarica (Enderlein, 1936)

Helicobia bulgarica Enderlein, 1936: 100. Type locality: Bulgaria, Sliven.

Material from Sardinia. C01: 23.V.2006, 1\0; 8.IX.2006, 1\0. C26: 11.VII.2006, 2\0; 15.VII.2006, 1\0; 16.VII.2006, 1\0. C33: 13.VII.2006, 0\2. C34: 12.VII.2006, 1\0. C42: 17.VII.2006, 4\0. C44: 13.VII.2006, 6\2; 16.VII.2006, 9\4; 17.VII.2006, 0\1. S1: 18.IV–2.V.2006, 1\0; 2–16.V.2006, 0\1; 13–27.VI.2006, 2\1; 11–25.VII.2006, 1\0; 8–22.VIII.2006, 1\0; 22.VIII–5.IX.2006, 1\0. S2: 30.V–13.VI.2006, 2\0; 13–27.VI.2006, 1\0; 27.VI–11.VII.2006, 1\0; 11–25.VII.2006, 3\0; 12.VII.2006, hn, DA MB DB PC MM DW, 13\1; 8–22.VIII.2006, 2\0; 22.VIII–5.IX.2006, 4\0; 7.IX.2006, hn, DA MB DB GN, 3\3; 3–17.X.2006, 2\0. S3: 16–30.V.2006, 0\1; 11–25.VII.2006, 2\0; 15.VII.2006, hn, *idem*, 2\0; 25.VII–8.VIII.2006, 1\0.

Additional material. Italy. Abruzzi: L'Aquila prov., Cappadocia, Camporotondo, 1500 m, 23–27.VIII.2000, MM, 1\0 (MZUR, dRR); Chieti prov.: Abetina di Rosello, hill top, 1000 m, UTM 33 T 445947 4637768, 21.V.2005, DW MB DB, 0\1; Palena, 1300 m, 19.VIII.2000, MM, 1 ♂ (MZUR, dRR); Rosello, 930 m, 17.VI.2003, PC, 0\1. **Emilia-Romagna:** Bologna prov., Borgo Capanne, VIII.1949, NC, 2\0 (NHRS). **Latium:** Rome prov.: Acilia, 21.III.1945, OC, 1\0 (MZUR); Castelporziano, Tenuta Trafusa, near Trafusina, 30.V.1997, PC, 0\1; Gerano, 24.VII.2000, MM, 1\0 (MZUR, dRR); Percile, 4.VII.2000, MM, 0\1 (MZUR, dRR); Tenuta della Cervelletta, 4.V.1999, MM, 1\0 (MZUR, dRR); *idem*, 22.VIII.1999, MM, 0\1 (MZUR, dRR); *idem*, 17.IX.1999, MM, 0\1 (MZUR, dRR); *idem*, 26.IX.1999, MM, 0\2 (MZUR, dRR); *idem*, 7.X.1999, MM, 1\0 (MZUR, dRR); *idem*, 9.X.1999, MM, 1\0 (MZUR, dRR); *idem*, 15.IV.2000, MM, 1\0; *idem*, 6.VIII.2000, MM, 1\0. **Liguria:** Genoa prov., Appennino di Genova, Nostra Signora della Vittoria, VIII.1941, GM, 1\0 (MZUR); *idem*, VIII.1943, GT, 1\0 (MZUR). **Lombardy:** Mantua prov., Marmirolo, Bosco della Fontana, 8.IV.2001, PC, 1\0. **Sicily:** Caltanissetta prov., San Cataldo, VIII–IX.1928, WH, 1\0 (ZMUC); Palermo prov.: Bosco della Ficuzza, Pulpito del Re, 865 m, UTM 33 S 358963 4194405, 26.VI.2005, DW DB PC ML, 1\0; *idem*, Valle Cerasa, 990 m, UTM 33 S 362296 4190870, 24.VI.2005; *idem*, 1\0; *idem*, UTM 33 S 362011 4190550, 28.VI.2005, 1\0; *idem*, 1075 m, UTM 33 S 361516 4190767, 28.VI.2005, 0\1; *idem*, Parco delle Madonie, 29.VI.2005, 1\0. **Tuscany:** Florence, 10–18.V.1986, TP, 1\0 (ZMUC). **Venetia:** Verona prov.: Monte Pastello, near Monte, 5.IV.2002, PC MT, 2\0; Monte Baldo, Malcesine, Prea, 300 m, 18.V.2002, DB, 1\0.

Chorotype. European.

Italian distribution. Abruzzi, Emilia-Romagna, Latium, Liguria, Lombardy, Sardinia, Sicily, Tuscany, Venetia. Previously recorded only from Emilia-Romagna (Zangheri 1969) and mentioned generically from southern mainland Italy by Pape (1995a).

Biology. According to Povolný and Verves (1990, as *Heteronychia (Spatulapica) boettcheriana* (Rohdendorf, 1937)), *Sarcophaga bulgarica* is a snail parasite competing with *S. (Heteronychia) haemorrhoea*, the latter being a parasitoid of *Helix* sp. and *Cepaea hortensis* (Müller) (Gastropoda: Helicidae) (*cf.* Coupland & Barker 2004).

Remarks. Species identified using Pape (1987, as *Heteronychia boettcheriana* (Rohdendorf, 1937)) (*cf.* Pape 1995b). Records by Saccà and Rivosecchi (1953) of *Sarcophaga haemorrhoea* from Latium and Liguria refer, in part, to *S. bulgarica*. The species is new to Sardinia, but was already recorded from Corsica (Pape 2004a).

Sarcophaga (Heteronychia) ferox Villeneuve, 1908

Sarcophaga ferox Villeneuve, 1908: 123. Type locality: Santa Cruz (Tenerife), southern France.

Sardinian literature records. Cagliari prov., Costa Rei (Povolný 1997, 2004).

Type material examined. Syntype ♂: S. Cruz / 47394. III // Sammlung / Dr. Th. Becker // Type // *Sarc. ferox* / type / det. Dr. Villeneuve // Zool. Mus. / Berlin (ZMHB).

Material from Sardinia. **A06:** 10.IX.2006, 1\0. **A07:** 10.IX.2006, 1\0. **A11:** 13.IX.2006, hn, 1\0. **C03:** 23.V.2006, 0\1. **C05:** 23.V.2006, 2\0. **C28:** 22.V.2006, 1\0. **C31:** 20.V.2006, hn, 1\0; 20–23.V.2006, 2\0; 23.V.2006, hn, 1\0. **C32:** 6.IX.2006, 3\0. **C39:** 13.VII.2006, 2\0. **C43:** 17.VII.2006, 1\0; 7.IX.2006, al, DA MB DB GN, 0\1; **C52:** 26.IX.2004, 1\1, dRR. **C82:** 9.VI.2004, hn, 1\0, dRR; 9–10.VI.2004, 1\0; 10.VI.2004, 2\0. **C85:** 2.IX.2003, 1\0, dRR. **G06:** 5.IX.2006, 1\0. **G08:** 5.IX.2006, 6\4. **S1:** 18.IV–2.V.2006, 0\1; 2–16.V.2006, 0\2; 16–30.V.2006, 9\4; 30.V–13.VI.2006, 1\0; 13–27.VI.2006, 0\2; 27.VI–11.VII.2006, 0\1; 8–22.VIII.2006, 1\0; 22.VIII–5.IX.2006, 6\3; 5–19.IX.2006, 1\2. **S2:** 16–30.V.2006, 4\0; 30.V–13.VI.2006, 1\0; 13–27.VI.2006, 5\0; 25.VII–8.VIII.2006, 1\0; 8–22.VIII.2006, 21\2; 22.VIII–5.IX.2006, 51\20; 5–19.IX.2006, 13\0; 7.IX.2006, hn, DA MB DB GN, 4\0; 19.IX–3.X.2006, 0\3. **S3:** 4.IX.2003, hn, PC MT DW, 1\0, dRR; 19.IX–3.X.2006, 1\0. **W01:** 9–15.IX.1997, 5\1, dRR.

Additional material. Canary Islands. Tenerife, Laguna, 51447. VI, Sammlung Dr. Th. Becker, 1/0 (ZMHB) [old specimen bearing a handwritten identification label by Villeneuve and a label with the word “Type”, but not mentioned in the original description]. **Italy. Apulia:** Lecce prov.: Gagliano del Capo, 6.VI.1941, OC, 1\0 (MZUR); dint. Leuca, 4.VI.1941, OC, 1\0 (MZUR). **Latium:** Latina prov., Monte Circeo, VI.1948, GS, 1\0 (MZUR, det. G. Saccà); Rome prov.: Rome, IX.1948, GS, 1\0 (MZUR); *idem*, 5.IX.1950, GS, 1\0 (MZUR); *idem*, Pietralata, 16.V.1941, GS, 1\0 (MZUR); *idem*, Tenuta della Cervelletta, 19.VII.1999, MM, 1\0 (MZUR, dRR); Tivoli, Colle Vescovo, 448 m, 6.V.2000, MM, 1\0 (MZUR, dRR); *idem*, 13.VIII.2001, MM, 1\0 (MZUR, dRR); *idem*, 16.VIII.2000, MM, 1\0 (MZUR, dRR). **Sicily:** Messina prov., Taormina, XI.1949, GS, 1\0 (MZUR); Palermo prov., Bosco della Ficuzza, Valle Cerasa, 990 m, UTM 33 S 362011 4190550, 28.VI.2005, DW DB PC ML, 1\0. **Tuscany:** Grosseto prov., Arcipelago Toscano, Isola del Giglio, 8–15.VII.2000, MM, 1\0 (MZUR, dRR).

Chorotype. Mediterranean.

Italian distribution. Apulia; Latium (Saccà & Rivosecchi 1953); Sardinia (Povolný 1997, 2004); Sicily (Böttcher 1913b; Saccà & Rivosecchi 1953); Giglio Is. (Tuscany).

Biology. Unknown. Povolný (2004) observed many males feeding on bird excrements on hilltops in Sardinia and Sicily. Traveset and Sáez (1997, as *Sarcophaga bolivari* Gil Collado, 1932) mentioned *S. ferox* as a possible pollinator of *Euphorbia dendroides* in Cabrera (Balearic Islands).

***Sarcophaga (Heteronychia) filia* Rondani, 1860**

Sarcophaga filia Rondani, 1860: 385. Type locality: central and northern Italy [taken from the original description; the lectotype (see below) does not carry more precise locality information].

Type material examined. Lectotype ♂: 1006 // = *S. filia* / sec. Typ. Pand. / det. Böttcher // LECTOTYPE ♂ / *Sarcophaga / filia* Rond. / T. Pape det. 1986 // *Heteronychia / filia* (Rond.) / T. Pape det. 1986 (MZUF) (cf. Pape 1988).

Material from Sardinia. **A01:** 26.III.2006, 0\1, dRR. **A11:** 13.IX.2006, 1\1. **A21:** 25.V.2006, 1\1. **C26:** 15.VII.2006, 1\0; 16.VII.2006, 1\0. **C31:** 20–23.V.2006, 0\1; 12–17.VII.2006, 0\1. **C35:** 18.VII.2006, 0\1. **C42:** 17.VII.2006, 1\0; 18.VII.2006, 0\1. **C44:** 16.VII.2006, 1\1. **S1:** 2–16.V.2006, 2\1; 16–30.V.2006, 12\4; 30.V–13.VI.2006, 29\15; 13–27.VI.2006, 74\37; 27.VI–11.VII.2006, 16\9; 11–25.VII.2006, 3\4; 25.VII–8.VIII.2006, 0\1; 22.VIII–5.IX.2006, 0\1. **S2:** 18.IV–2.V.2006, 1\1; 2–16.V.2006, 0\1; 16–30.V.2006, 9\3; 30.V–13.VI.2006, 8\3; 13–27.VI.2006, 26\17; 27.VI–11.VII.2006, 6\1; 11–25.VII.2006, 2\3; 25.VII–8.VIII.2006, 1\0. **S3:** 13–27.VI.2006, 8\7; 27.VI–11.VII.2006, 24\3; 11–25.VII.2006, 0\4; 15.VII.2006, hn, DA MB DB PC MM DW, 3\1; 25.VII–8.VIII.2006, 1\0.

Additional material. Italy. Abruzzi: L'Aquila prov., Anversa degli Abruzzi, Sorgente Cavuto, 520 m, 30.VII.1997, PC, 1\0. **Apulia:** Foggia prov., Monte Gargano, 6 km NW of Monte Sant'Angelo, 600 m, 28.VII.1995, BM, 1\0 (NHRS); Lecce prov.: dint. Leuca, 5.VI.1941, OC, 1\0 (MZUR); *idem*, 9.VI.1941, OC, 1\0 (MZUR). **Emilia-Romagna:** Bologna prov., Borgo Capanne, VIII.1949, NC, 2\0 (NHRS). **Friuli-Venezia Giulia:** Trieste prov., Monfalcone, 19–26.VII.1987, SA, 1\0 (ZMUC). **Latium:** Latina prov.: Capo Circeo, 20.IX.1939, NC, 1\0 (MZUR); *idem*, 23.IX.1939, NC, 1\0 (MZUR); *idem*, VI.1948, GS, 1\0 (MZUR); Rome prov.: Rome [city], Insugherata, IV.1938, GS, 1\0 (MZUR); *idem*, Ponte Mammolo, 3.V.1942, NC, 1\0 (MZUR); *idem*, Tenuta della Cervelletta, 2.IV.1999, MM, 1\0 (MZUR, dRR); *idem*, 19.VII.1999, MM, 1\0 (MZUR, dRR); *idem*, 9.IX.1999, 1\0; *idem*, 2.X.1999, MM, 1\0 (MZUR, dRR); *idem*, 3.X.1999, MM, 1\0 (MZUR, dRR). **Marches:** Ascoli Piceno prov.: Grottammare, VIII.1940, LR, 1\0 (MZUR); *idem*, IX.1940, LR, 1\0 (MZUR, det. G. Saccà). **Venetia:** Venice prov., Lignano, *Rubus* shrubs near sea, 45.41 N/ 13.09 E, 28–29.VIII.1996, BR, 2\0 (ZMUC).

Chorotype. European.

Italian distribution. Abruzzi (Saccà & Rivosecchi 1953); Apulia; Emilia-Romagna (Zangheri 1950; Saccà & Rivosecchi 1953; Zangheri 1969); Friuli-Venezia Giulia, Latium, Liguria, Marches (Saccà & Rivosecchi 1953); Sardinia; Venetia (Tiensuu 1954).

Biology. One of the best-studied snail parasitoids within the subgenus; it has been bred from *Helix* spp. and *Theba pisana* (Müller) (Gastropoda: Helicidae), and *Cerņuella virgata* (Da Costa) (Gastropoda: Hygromiidae) (*cf.* Coupland & Barker 2004).

Remarks. New to Sardinia. Recorded from Corsica by Villeneuve (1911).

***Sarcophaga (Heteronychia) gabrielei* sp. nov.**

(Figs 1–16)

Type material. Holotype ♂ (Fig. 1): I – Sardegna (Carbonia-Iglesias [prov.] / Iglesias, Conca Margiani, 750 m / UTM-WGS84 32 S 0463440 4356936 / 17.VII.2006 retino [= hand net] / D. Whitmore, D. Avesani, / M. Bardiani, D. Birtele, P. Cerretti leg. / Progetto Sardegna – CNBF // HOLOTYPE ♂ / *Sarcophaga (Heteronychia) gabrielei* sp. nov. / det. D. Whitmore 2008 (CNBFVR) [holotype with terminalia extended, fully visible and attached to abdomen].

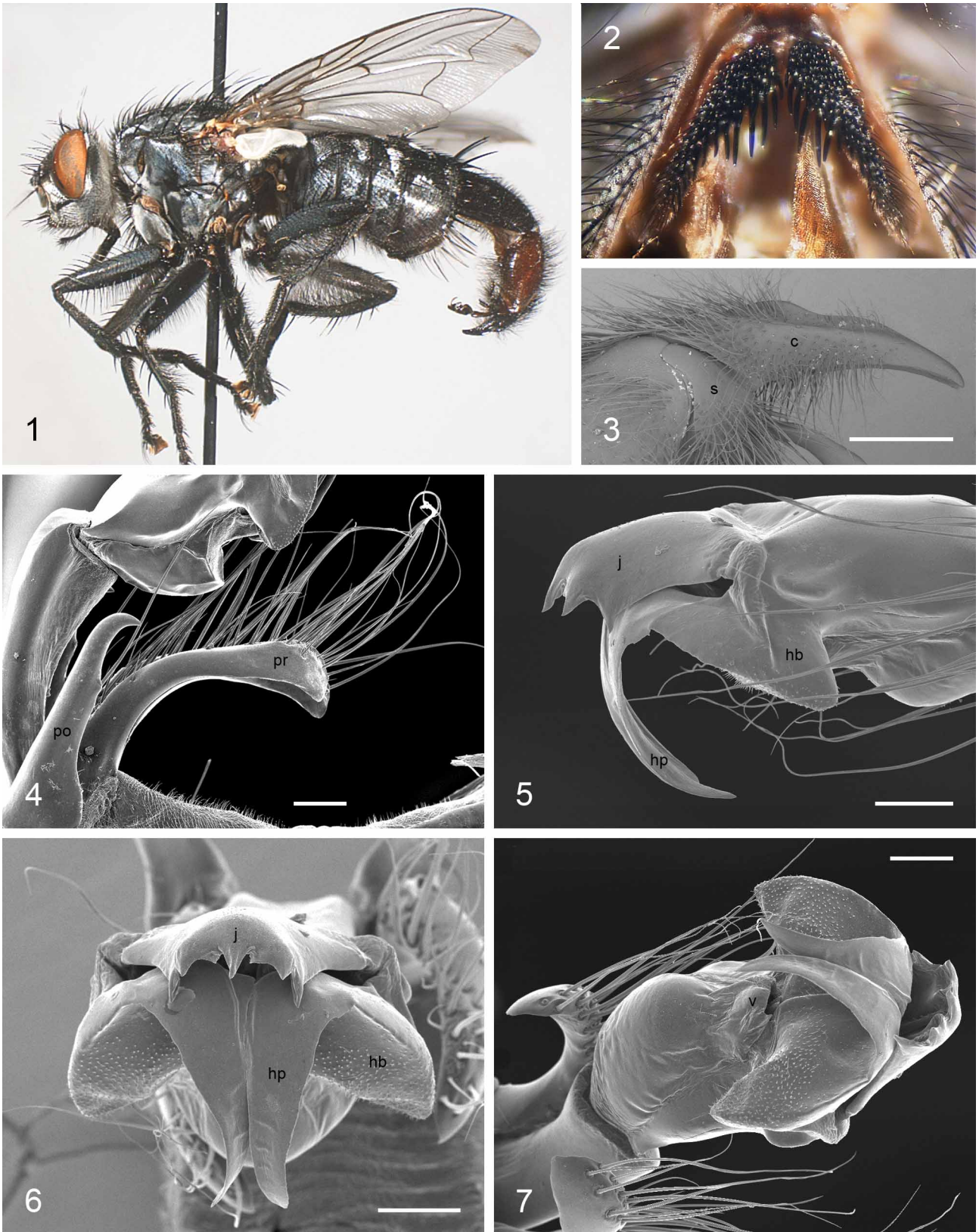
Paratypes. 16 ♂♂: same data as holotype (10 in CNBFVR, 1 in BMNH, 1 in GDC, 1 in MZUR, 1 in USNM, 1 in ZIN, 1 in ZMUC) [1 ♂ in CNBFVR with terminalia removed from abdomen and glued to a slip of card pinned with specimen]; 3 ♂♂: same data as holotype except leg. DA MB DB PC DW (ZMUC, 2 with coated terminalia on SEM stubs); 5 ♂♂ 1 ♀: same data as holotype except 18.VII.2006 (CNBFVR, 1 ♂ in IRSNB, 1 ♂ in SMNS, 1 ♂ in TAU) [1 ♂ in CNBFVR with terminalia removed from abdomen and glued to pin beneath specimen]; 1 ♂ 1 ♀: same data as holotype except UTM-WGS84 32 S 0462635 4356866, 700 m, 15.VII.2006, DA MB DB PC DW (MNHN) [terminalia dissected, in Canada balsam on small slides pinned with specimens]; 2 ♂♂: same data as previous except 16.VII.2006, DW DA MB DB PC (CNBFVR) [1 ♂ with abdomen removed and glued to a slip of card pinned with specimen]; 1 ♀: same data as previous except 17.VII.2006 (CNBFVR); 1 ♂: same data as holotype except 725 m, UTM-WGS84 32 S 0464970 4357011 (CNBFVR); 1 ♀: Sardegna (Carbonia-Iglesias), Domusnovas, Lago Siuru, 322 m, UTM-WGS84 32 S 0467069 4357916, 12.VII.2006, retino [= hand net], DW DA MB DB PC MM (CNBFVR); 1 ♂ 3 ♀♀: same data as previous except 12–17.VII.2006, Malaise trap (CNBFVR); 1 ♂: same data as previous except 20–23.V.2006, DW MB DB PA (CNBFVR) [terminalia removed from abdomen and glued to locality label]; 1 ♀: same data as previous except 7.IX.2006, retino, DB DA MB GN (CNBFVR) [terminalia dissected, placed in glycerine in a microvial pinned with specimen]; 1 ♀: Sardegna (Carbonia-Iglesias), Domusnovas, sa Duchessa, 371 m, UTM-WGS84 32 S 0464990 4358384, 4–18.IV.2006, Malaise trap S2, GC (CNBFVR); 1 ♀: *idem*, 18.IV–2.V.2006 (TAU); 1 ♂: *idem*, 30.V–13.VI.2006 (CNBFVR); 2 ♀♀: *idem*, 13–27.VI.2006 (BMNH, GDC); 1 ♂ 2 ♀♀: *idem*, 22.VIII–5.IX.2006 (CNBFVR); 1 ♀: *idem*, 5–19.IX.2006 (ZIN); 1 ♀: *idem*,

19.IX–3.X.2006 (SMNS); 1 ♀: same data except 12.VII.2006, retino, DA MB DB PC MM DW (CNBFVR); 1 ♀: Sardegna (Carbonia-Iglesias), Domusnovas, dint. P.ta Planotzara, 360 m, UTM-WGS84 32 S 0465515 4356209, 13.VII.2006, retino, DA MB DB PC DW (CNBFVR); 1 ♀: Sardegna (Carbonia-Iglesias), Domusnovas, Valle Oridda, 592 m, UTM-WGS84 32 S 0466973 4362228, 11.VII.2006, retino, DA MB DB PC MM DW (ZMUC); 2 ♂♂ 1 ♀: Sardegna (Carbonia-Iglesias), Iglesias, dint. Colonia Beneck, 636 m, UTM-WGS84 32 S 0462391 4355441, 30.V–13.VI.2006, Malaise trap S1, GC (2 ♂♂ in CNBFVR, 1 ♀ in USNM); 1 ♀: *idem*, 27.VI–11.VII.2006 (CNBFVR); 1 ♀: *idem*, 5–19.IX.2006 (MZUR); 1 ♂: Sardegna (Carbonia-Iglesias), Iglesias, Punta Cungiaus, 636 m, hill top (h. 12.30–14.30), 23.V.2006, retino, DW MB DB PA (CNBFVR) [terminalia removed from abdomen and glued to pin beneath specimen].

Diagnosis. Lower facial margin visible in profile below vibrissa; thorax with several strong presutural acrostichal setae; scutellum of male usually with a pair of apical setae; mid tibia of male without anteroventral setae; female without a midfemoral organ; mid femur of male without a posteroventral subapical comb; hind trochanter of male with a brush of short spine-like setae; hind femur of male without any anteroventral setae in addition to subapical one; hind tibia of male with long hair-like setae on ventral surface; wing-vein R_1 bare dorsally; abdominal tergite 3 without median marginal setae (rarely with a pair of weak, appressed setae); ventral sides of tergite 5 of female partly red; tergite 6 of female divided into two hemitergites; protandrial segment very elongate, lacking marginal setae; epandrium red; male cerci with a pronounced dorsal keel; pregonite with a rounded tip, widening apically, with numerous setulae on dorsal surface; phallus with harpes well developed and perpendicular to main axis of distiphallus; base of harpes with numerous sensilla on ventral surface; juxta without membranous appendages or expansions at base.

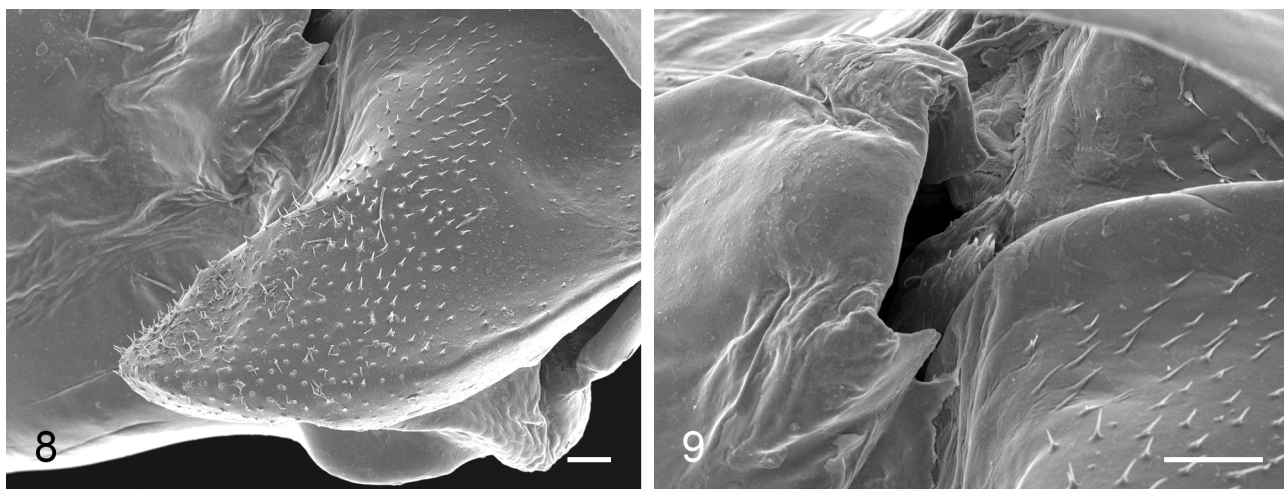
Description. Length: 7.5–13.3 mm.

Male. Colour. Head black, with dense grey microtrichosity on parafacials and fronto-orbital plate, changing with the incidence of light; frontal vitta black; gena, face and occiput grey-microtrichose; pedicel black, brownish at tip, postpedicel black; prementum black, palpus dark brown; thorax black in ground colour, grey-microtrichose with three longitudinal dark vittae; legs black; tegula black, basicosta light yellow; abdomen black, grey-microtrichose, with typical checkered pattern changing with the incidence of light; protandrial segment shiny black with a small median strip of grey microtrichosity approximately on distal 1/5; epandrium dark red; cercus black; surstylus, phallus and gonites dark brown. **Head.** Arista thickened on basal 1/3–2/5. Postpedicel 1.80–2.15 x as long as pedicel. Frons at its narrowest point 0.52–0.63 x as wide as an eye in dorsal view. Frontal vitta about half as wide as frons at its narrowest point, visibly widening towards antennal insertion. Lateral vertical seta 1.1–1.5 x as long as longest postocular setae, distinct from the latter. Six to 10 frontal setae, not descending below level of middle of pedicel. Fronto-orbital plate with a row of fine setulae near eye margin and some additional scattered setulae. Parafacial with a row of fine setae close to eye margin, the lower 4–5 stronger than the upper ones. Parafacial at its narrowest point 0.21–0.39 x as wide as eye width. Lower facial margin visible in lateral view. Facial ridge above vibrissa with decumbent setulae on approximately basal 1/3–2/5. Gena, in profile, 0.34–0.54 x the vertical height of eye (measured in the same vertical plane as height of head); gena entirely covered with black setae; postgenal setae white. Two rows of black occipital setulae behind postocular setae, remaining occipital setulae white. Prementum about 3.5 x as long as wide. **Thorax.** Postpronotum with 3 stronger setae forming a triangle. Scutum with 4–6 short + 1 (prescutellar) acrostichal, 4–5 + 3 dorsocentral, 2–3 postsutural intraalar, 2 posthumeral (outer one shorter), 1 presutural, 4 notopleural and 3 supraalar setae; postalar callus with 2 setae. Katepisternum with 3 setae. Katepimeron with fine setulae on posterior half. Scutellum with 3 (rarely 2) pairs of marginal setae: basal, subapical, apical (sometimes lacking) and 1–2 pairs of discal setae. **Legs.** Fore tibia with 2–3 anterodorsal and 1 posterior setae. Mid femur with 4–5 anterior setae near middle, 3–4 to several short anteroventral setae, 2–3 subapical posterodorsal setae, no strong setae on ventral surface; mid femur without a subapical posteroventral comb of spine-like setae but with a row of short stout setae on distal 1/4. Mid tibia with 2–3



FIGURES 1–7. Male of *Sarcophaga (Heteronychia) gabrielei* sp. nov. (**c** = cercus; **hb** = base of harpes; **hp** = apical process of harpes; **j** = juxta; **po** = postgonite; **pr** = pregonite; **s** = surstylus; **v** = vesica). **1.** Habitus (holotype). **2.** Sternite 5 (paratype, CNBFVR). **3.** Cercus and surstylus in lateral view (paratype, CNBFVR), scale bar: 0.5 mm. **4.** Gonites (paratype, ZMUC), scale bar: 0.1 mm. **5.** Harpes and juxta in lateral view (paratype, ZMUC), scale bar 0.1 mm. **6.** Distiphallus in apical view (paratype, ZMUC), scale bar: 0.1 mm. **7.** Distiphallus in ventrolateral view (paratype, ZMUC), scale bar: 0.1 mm.

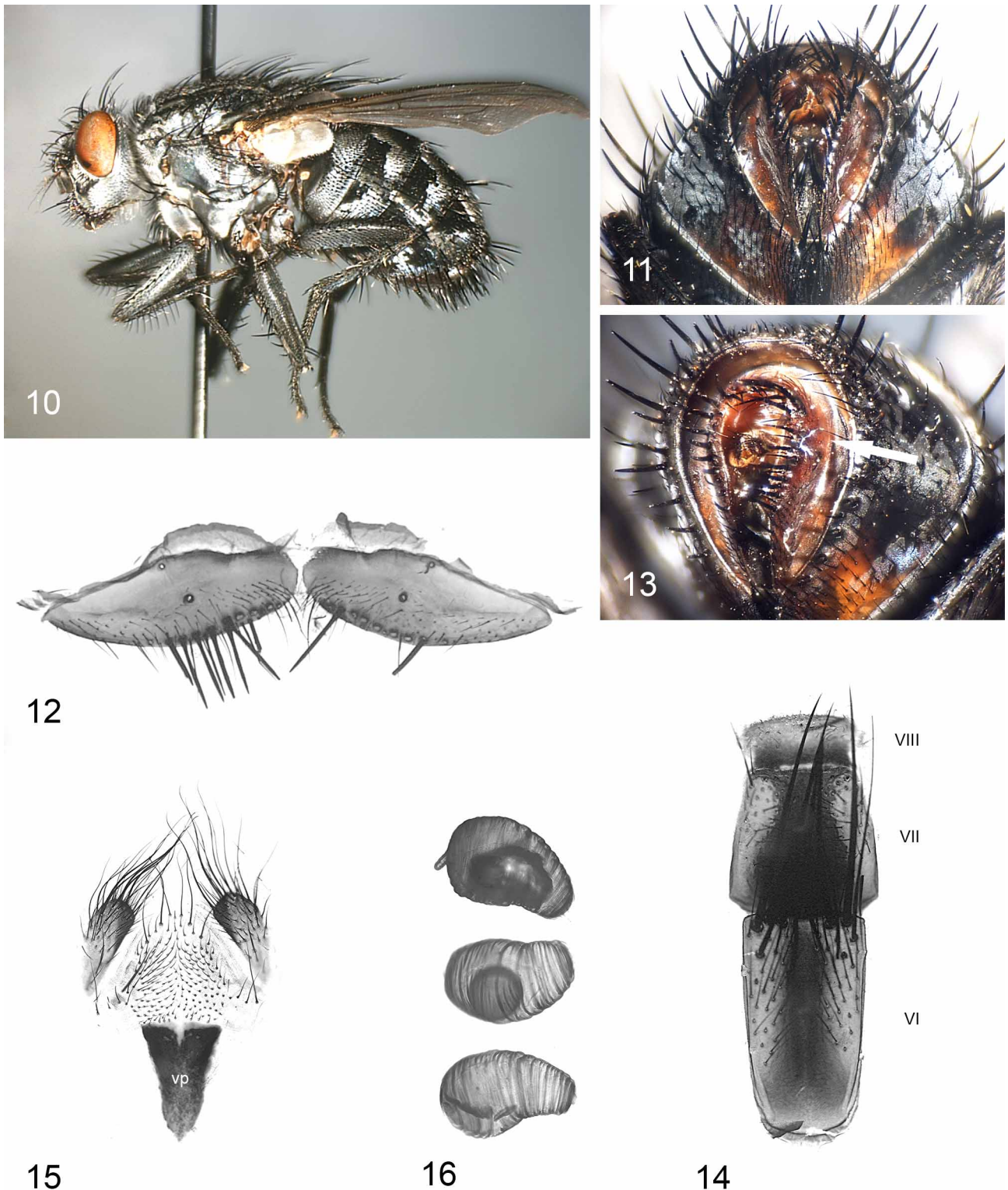
anterodorsal, 2–3 posterodorsal, 1 dorsal and 0 anteroventral setae (except for 1 anteroventral seta on left leg of one paratype). Mid femur and tibia with long wavy setae on posteroventral surface. Hind trochanter with a ventral brush of tightly spaced spine-like setae. Hind femur with a strong subapical seta but no additional anteroventral setae, and with only hair-like posteroventral setae. Hind tibia with a row of anterodorsal setae of irregular length, 2–3 posterodorsal and 1 anteroventral seta; hind femur and hind tibia with numerous long wavy setae on ventral surface. *Wing*. Costal spine short, usually about 1/3–1/2 x as long as crossvein R-M, sometimes indiscernible. Vein R₁ bare dorsally. Setae on dorsal surface of vein R₄₊₅ extending over halfway to crossvein R-M. Second costal section 1.20–1.54 x fourth costal section. Small spines on costa reaching about 1/2 to 4/5 of the way across fourth costal section. Wing cell r₄₊₅ open at wing margin. **Abdomen**. Syntergite 1+2 and tergite 3 without median marginal setae; sometimes a weak pair of setae present on tergite 3. Tergite 4 with a pair of strong median marginal setae and several lateral marginal setae. Tergite 5 with a complete row of marginal setae. **Terminalia**. Sternite 5 (Fig. 2) strongly indented, v-shaped, with brushes of tightly spaced stout, short setae along each of its processes and a row of long, thick setae along inner margin of each process. Protandrial segment without a row of setae along posterior margin. Epandrium with a gently curved external edge, about 1.5 x as long as high. Cercus (Fig. 3) with a pronounced dorsal keel, downcurved and apically pointed. Surstylus (Fig. 3) of irregular shape, with rounded edges and widening posteriorly. Pregonite (Fig. 4) tongue-shaped, widening apically and with numerous setae on dorsal surface. Postgonite (Fig. 4) with a hooked tip. Distiphallus: apical process of harpes (Fig. 5) long, projecting ventrally (curving downwards in dead specimens), gradually tapering into a blunt tip when viewed apically (Fig. 6); base of harpes appearing elbow-shaped in lateral view (Fig. 5) and flattened in a dorso-ventral direction (Fig. 7), ventral surface covered with microscopic sensilla (Fig. 8); juxta well developed (Fig. 5), about half as long as rest of distiphallus, and straight with respect to the latter; in lateral view with three tooth-like processes (Fig. 5), in apical view with six visible tooth-like processes disposed symmetrically on either side of a longer central process (Fig. 6); lateral styli narrow, hidden by juxta (Fig. 7); vesica as in Fig. 9.



FIGURES 8–9. Male of *Sarcophaga (Heteronychia) gabrielei* sp. nov., scale bars: 0.02 mm. **8.** Detail of harpes (paratype, ZMUC). **9.** Vesica (paratype, ZMUC).

Female (Fig. 10). Differs from male as follows: **Head**. Frons at its narrowest point 0.91–1.20 x as wide as an eye in dorsal view. Frontal vitta about 0.4 x as wide as frons, only slightly widening anteriorly. Lateral vertical seta strong, about twice as long as longest postoculars. Two proclinate fronto-orbital setae present. **Thorax**. Scutellum always without apical setae. *Legs*. Fore tibia with 3–4 anterodorsal setae. Mid femur with several strong setae on posteroventral surface. Mid femur lacking mid-femoral organ. Mid tibia with 3 anterodorsal and 1–2 anteroventral setae. Hind trochanter without modified setae. Hind femur with several anteroventral and posteroventral setae. Hind tibia with 3–4 anteroventral setae. All femora and tibiae without long wavy hairs on posteroventral surface. *Wings*. Costal spine well developed, approximately the same length as crossvein R-M. **Terminalia**. Ventral sides of tergite 5 partly red, tergite 6 red (Fig. 11). Tergite 6

divided into two hemitergites (Fig. 12), each folded longitudinally at approximately a right-angle (Fig. 13). Sternites 6, 7 and 8 as in Fig. 14. Vaginal plate present, contiguous with hypoproct, elongate and subtriangular (Fig. 15). Spermathecae in Fig. 16.



FIGURES 10–16. Female of *Sarcophaga (Heteronychia) gabrielei* sp. nov. (**vp** = vaginal plate). **10.** Habitus (paratype, CNBFVR). **11.** Last abdominal segments (paratype, CNBFVR). **12.** Tergite 6 (paratype, MNHN) (photo by R. Richet). **13.** Last abdominal segments (paratype, CNBFVR), arrow showing longitudinal fold on tergite 6. **14.** Sternites 6, 7 and 8 (paratype, MNHN) (photo by R. Richet). **15.** Vaginal plate, hypoproct and cerci (paratype, MNHN) (photo by R. Richet). **16.** Spermathecae (paratype, MNHN) (photo by R. Richet).

Etymology. Dedicated to the memory of my dear friend and entomologist Graziano Gabriele.

Distribution. Sardinia.

Biology. Unknown.

Ecology. The new species was collected in seven localities of the Marganai forest. It was most abundant at Conca Margiani, a relatively open part of a N-NE-facing limestone hillside otherwise densely covered by holm-oak forest (Fig. 17). In July, when most specimens of *Sarcophaga gabrielei* were collected (both males and females), the area was covered by many flowering bushes of *Euphorbia pithyusa cupanii* (Euphorbiaceae) and *Bupleurum fruticosum* (Apiaceae). The flies were attracted mainly to the yellow flowers of the latter plant and were collected either on the flowers or on the surrounding limestone rocks.

Remarks. In general appearance, *Sarcophaga (Heteronychia) gabrielei* resembles *S. (H.) porrecta* Böttcher, 1913 from southern and eastern Europe (cf. Pape 2004a), with which it shares the absence of anteroventral setae on hind femur in addition to the subapical one, the presence of numerous long, black, hair-like setae on posteroventral surface of hind tibia and the relatively long protandrial segment. *Sarcophaga (Heteronychia) gabrielei* differs from *S. (H.) porrecta* in lacking an anteroventral seta on mid tibia, in the much greater length of the protandrial segment and in the shape of the cercus and phallus (cf. Povolný 1996). The new species can also be distinguished by the absence of marginal setae on the protandrial segment. The external appearance of the female terminalia of *Sarcophaga (Heteronychia) porrecta* is also very similar to that of *S. (H.) gabrielei*.



FIGURE 17. The limestone landscape of Conca Margiani (Sardinia, Iglesias), type locality of *Sarcophaga (Heteronychia) gabrielei* sp. nov. (photo: CNBFVR archive).

Sarcophaga (Heteronychia) minima Rondani, 1862

Sarcophaga minima Rondani, 1862: 113. Type locality: Parma, Italy.

Type material examined. Holotype ♂: 1019 // HOLOTYPE ♂ // *Sarcophaga / minima* Rond. / T. Pape det. 1986 // *Heteronychia / minima* (Rond.) / T. Pape det. 1986 (MZUF).

Material from Sardinia. **A01:** 26.III.2006, 1\0. **A02:** 25.V.2006, 3\0. **A05:** 14.VI.2004, 1\1, dRR. **A21:** 25.V.2006, 0\1. **C26:** 15.VII.2006, al, 0\1; 17.VII.2006, 1\0. **C42:** 17.VII.2006, 0\1; 18.VII.2006, 2\1. **C43:** 7.IX.2006, al, DA MB DB GN, 1\0. **C44:** 16.VII.2006, 2\0; 17.VII.2006, 1\0. **C52:** 26.IX.2004, 1\0, dRR. **C70:** 23.IX.2004, 1\0, dRR. **S1:** 16–30.V.2006, 1\0; 30.V–13.VI.2006, 1\0; 13–27.VI.2006, 1\2. **G02:** 4.IX.2006, 6\2. **S2:** 24.IX.2004, hn, DB PC FM DW, 14\1, dRR; 25.IX.2004, hn, DB PC FM DW, 4\1, dRR; 16–30.V.2006, 2\1; 30.V–13.VI.2006, 3\0; 13–27.VI.2006, 5\15; 27.VI–11.VII.2006, 6\4; 11–25.VII.2006, 3\2; 12.VII.2006, hn, DA MB DB PC MM DW, 0\3; 25.VII–8.VIII.2006, 0\4; 8–22.VIII.2006, 2\2; 22.VIII–5.IX.2006, 11\4; 5–19.IX.2006, 3\0; 7.IX.2006, hn, DA MB DB GN, 3\0; 19.IX–3.X.2006, 2\0. **S3:** 13–27.VI.2006, 1\1; 11–25.VII.2006, 0\1; 12.VII.2006, hn, DA MB DB PC MM DW, 7\0.

Additional material. Italy. Abruzzi: Chieti prov., Vasto, Marina di Vasto, seashore vegetation, 7–12.VIII.2002, BR, 1\0 (ZMUC). **Apulia:** Foggia prov., Monte Gargano, Monte Sant’ Angelo, 800 m, 29.VII.1995, BM, 1\0 (NHRS). **Latium:** Latina prov., Isola di Ponza, Semaforo, 26.VI.1966, NC, 1\0 (MZUR); Rome prov., Tivoli, Colle Vescovo, 448 m, 16.VIII.2000, MM, 2\0 (MZUR, dRR). **Sicily:** Palermo prov.: Bosco della Ficuzza, 900 m, on *Ammi visnaga*, 30.VII.2003, PC MT, 1\0; *idem*, Cima Cucco (hill top), 995 m, UTM 33 S 360328 4192550, 25.VI.2005, DW DB PC ML, 6\0; *idem*, Valle Cerasa, 990 m, UTM 33 S 362011 4190550, 23.VI.2005, 1\0; same data as previous, 24.VI.2005, 0\1, dRR; Corleone, nr. Bivio Ponte Casale, field with *Ammi visnaga*, 476 m, UTM 33 S 353645 4190330, 2\0; Madonie, Piano Zucchi, 1240 m, 21.V.2004, PC DB GN DW, 1\0; Siracusa prov., Lentini, Reina river, 20 m, 15.VII.1949, FH, 1\0 (MZUR); Trapani prov., Isola di Favignana, Faro, 2.VII.2005, DW DB PC ML, 3\0. **Tuscany:** Grosseto prov., Arcipelago Toscano, Isola del Giglio, 8–15.VII.2000, MM, 9\5 (MZUR, dRR).

Chorotype. Euro-Mediterranean.

Italian distribution. Abruzzi; Apulia; Emilia-Romagna (type locality; Zangheri 1950, 1969); Latium (Saccà & Rivosecchi 1953); Sardinia; Sicily (Böttcher 1913b; Saccà & Rivosecchi 1953); Giglio Is. (Tuscany); Venetia (Saccà & Rivosecchi 1953).

Biology. A suspected parasitoid of *Theba pisana* (Gastropoda: Helicidae), *Cernuella virgata* and *Trochoidea elegans* (Gmelin), and of *T. simulata* (Ehrenberg) (Gastropoda: Hygromiidae) in Israel (*cf.* Coupland & Barker 2004).

Remarks. New to Sardinia. Recorded from Corsica by Villeneuve (1911, as *S. fertoni* n. sp.).

Sarcophaga (Heteronychia) pandellei (Rohdendorf, 1937)

Pierretia (Eupierretia) pandellei Rohdendorf, 1937: 376. Type locality: France, Var, Cavalière.

Sardinian literature records. Cagliari prov., Costa Rei (Povolný 1997).

Material from Sardinia. **A05:** 14.VII.2006, 1\0. **A11:** 13.IX.2006, hn, 1\0. **A16:** 5.VI.2004, 0\1, dRR. **C01:** 8.IX.2006, 2\0. **C03:** 23.V.2006, 2\0; 13.VII.2006, 2\0. **C06:** 11.VI.2004, 0\1, dRR; 12.VI.2004, 1\0, dRR; 23.IX.2004, 0\2, dRR. **C07:** 20.V.2006, 3\0; 13.VII.2006, 2\0. **C10:** 21.V.2006, 0\1. **C18:** 11.VII.2006, 4\0. **C22:** 24.V.2006, 2\0. **C23:** 16.V.2006, 1\0; 19.V.2006, 0\4; 21.V.2006, 1\0; 19–24.V.2006, mt, 1\0; 24.V.2006, 21\0. **C26:** 24.V.2006, 1\0; 11.VII.2006, 15\0; 16.VII.2006, 1\2; 17.VII.2006, 1\0. **C27:** 22.V.2006, 4\1. **C27a:** 22.V.2006, 1\0. **C29:** 12.IX.2006, 0\1. **C31:** 20.V.2006, hn, 3\0; 20–23.V.2006, 1\0; 23.V.2006, hn, 3\1; 12.VII.2006, hn, 1\0; 12–17.VII.2006, 10\2. **C32:** 6.IX.2006, 3\2. **C33:** 13.VII.2006, 3\4. **C34:** 12.VII.2006, 16\5. **C40:** 13.VII.2007, 1\0. **C42:** 17.VII.2006, 23\2; 18.VII.2006, 3\1. **C43:** 17.VII.2006, 1\0. **C44:** 13.VII.2006, 2\2; 16.VII.2006, 9\3; 17.VII.2006, 3\1; 18.VII.2006, 0\1. **C49:** 9.IX.2006, 1\0. **C50:** 9.IX.2006, 11\4. **C52:** 1.IX.2003, 0\1, dRR; 26.IX.2004, 1\0, dRR. **C57:** 12.IX.2006, 1\0. **C82:** 9.VI.2004, hn, 3\1, dRR; 10.VI.2004, 7\0; 11.VI.2004, 13\0. **C85:** 31.VIII.2003, 0\1, dRR; 2.IX.2003, 1\1, dRR. **G03:** 4.IX.2006, 0\1. **G09:** 6.IX.2006, 1\0. **S1:** 18.IV–2.V.2006, 3\0; 2–16.V.2006, 3\1; 16–30.V.2006, 8\5; 30.V–

13.VI.2006, 26\6; 13–27.VI.2006, 37\18; 27.VI–11.VII.2006, 12\12; 11–25.VII.2006, 4\4; 13.VII.2006, hn, DA MB DB PC MM DW, 4\0; 25.VII–8.VIII.2006, 5\3; 8–22.VIII.2006, 1\1; 22.VIII–5.IX.2006, 3\1; 5–19.IX.2006, 1\0; 19.IX–3.X.2006, 0\2; 3–17.X.2006, 1\0. **S2:** 23.IX.2004, hn, DB PC FM DW, 1\0, dRR; 24.IX.2004, hn, *idem*, 2\0, dRR; 25.IX.2004, hn, *idem*, 0\6, dRR; 18.IV–2.V.2006, 0\1; 16–30.V.2006, 3\0; 30.V–13.VI.2006, 20\3; 13–27.VI.2006, 9\7; 27.VI–11.VII.2006, 9\3; 11–25.VII.2006, 4\3; 12.VII.2006, hn, DA MB DB PC MM DW, 14\2; 8–22.VIII.2006, 3\1; 22.VIII–5.IX.2006, 9\6; 5–19.IX.2006, 3\1; 7.IX.2006, hn, DA MB DB GN, 7\1; 19.IX–3.X.2006, 1\0. **S3:** 23.IX.2004, hn, DB PC FM DW, 2\1, dRR; 2–16.X.2006, 1\0; 30.V–13.VI.2006, 0\1; 13–27.VI.2006, 2\1; 27.VI–11.VII.2006, 1\2; 11–25.VII.2006, 1\4; 15.VII.2006, hn, DA MB DB PC MM DW, 3\2; 25.VII–8.VIII.2006, 4\0; 8–22.VIII.2006, 0\1; 22.VIII–5.IX.2006, 1\1; 5–19.IX.2006, 1\1; 19.IX–3.X.2006, 2\1. **W01:** 1–15.IX.1997, 2\3, dRR.

Additional material. **Corsica.** Cap Corse, Macinaggio, 23–31.VIII.2001, MM, 1\0 (MZUR). **Italy.** **Calabria:** Reggio Calabria prov., Gioiosa Ionica, 112 m, 12.V.2004, PC DB GN DW, 0\1, dRR. **Latium:** Latina prov., Capo Circeo, 22.IX.1939, GS, 1\0 (MZUR); Rome prov.: Rome, Caffarella, 26.VII.1940, 1\0 (MZUR); *idem*, Portonaccio, 25.IV.1942, NC, 1\0 (MZUR); Riofreddo, 6.IX.1940, [M.] Cerruti, 1\0 (MZUR); Subiaco, 30.IX.1999, MM, 1\0 (MZUR, dRR); Santa Maria della Pace, 30.IX.1999, 1\0 (MZUR, dRR); Rome [city], Tenuta della Cervelletta, 19.VIII.1999, 1\0 (MZUR, dRR); *idem*, 2.X.1999, MM, 0\1 (MZUR, dRR); *idem*, 3.X.1999, MM, 1\0 (MZUR, dRR); Rome [city], Valle dell'Insugherata, 23.IX.1999, MM, 1\0 (MZUR, dRR); Tivoli, Colle Vescovo, 448 m, 18.IX.1999, 1\2 (MZUR, dRR). Viterbo prov., Nepi, 27.IX.1999, MM, 1\1 (MZUR, dRR). **Liguria:** La Spezia prov., Monterosso al Mare, 25.IX.1997, BM, 1\0 (NHRS). **Sicily:** Messina prov., Taormina, Monte Ziretto, 24.V.1950, [F.] Hartig & Grshn [= I. Von Griesheim], 1\0 (MZUR); Palermo prov.: Bosco della Ficuzza, 30.VII.2003, PC MT, 1\1; *idem*, 31.VII.2003, PC MT, 1\0.

Chorotype. Mediterranean.

Italian distribution. Calabria; Latium, Liguria (Saccà & Rivosecchi 1953); Sardinia (Povolný 1997); Sicily, Tuscany (Saccà & Rivosecchi 1953).

Biology. Unknown.

Remarks. Species identified using Povolný and Verves (1986). *Sarcophaga (Heteronychia) pandellei* was by far the most common species of the subgenus in the study area. Males collected at site C23 on 24.V.2006 were attracted to a bait consisting of decaying meat on a bone, whereas the male from C27a was collected near a rubbish container in the centre of the small town of Gonnosfanadiga. These observations indicate that the species is partly synanthropic; this is unusual for species of *Heteronychia*, which are usually associated with natural environments and are rarely mentioned among the typically synanthropic *Sarcophaga*, although Rohdendorf (1959) mentioned *S. (H.) plotnikovi* Rohdendorf, 1925, *S. (H.) shnitnikovi* (Rohdendorf, 1937) and *S. (H.) turana* (Rohdendorf, 1937) as showing synanthropic features in Central Asia. *Sarcophaga (Heteronychia) pandellei* was already recorded from Corsica (Pape 2004a).

Sarcophaga (Heteronychia) thirionae (Lehrer, 1976)

(Fig. 18)

Leclercqiomys thirionae Lehrer, 1976: 197. Type locality: Turkey, Gemlik.

Heteronychia (Ctenodasypygia) penicillata Villeneuve, 1907: Povolný 1992: 181, figs 3, 6 (misidentification); Povolný 1996: 91–92, figs 2–3 (misidentification).

Type material examined. Holotype ♂: TURQUIE / Bursa: / Gemlik / 28.7.67 // *Leclercqiomys* n.g. / *thirionae* n. sp. / Det. LEHRER // Holotypus / Det. LEHRER // HOLOTYPE (FSAG) [terminalia on a slide, separate from rest of specimen].

Material from Sardinia. **A21:** 25.V.2006, 0\3. **C26:** 24.V.2006, 1\0. **S2:** 25.IX.2004, hn, DB PC FM DW, 2\0. **W02:** 17.VII.2004, 1\0.

Additional material. **Algeria.** Mascara, IV.09, NC, 1\0 (IRSNB). **Greece.** Attikí, Akropolis, 31.V.92, DP,

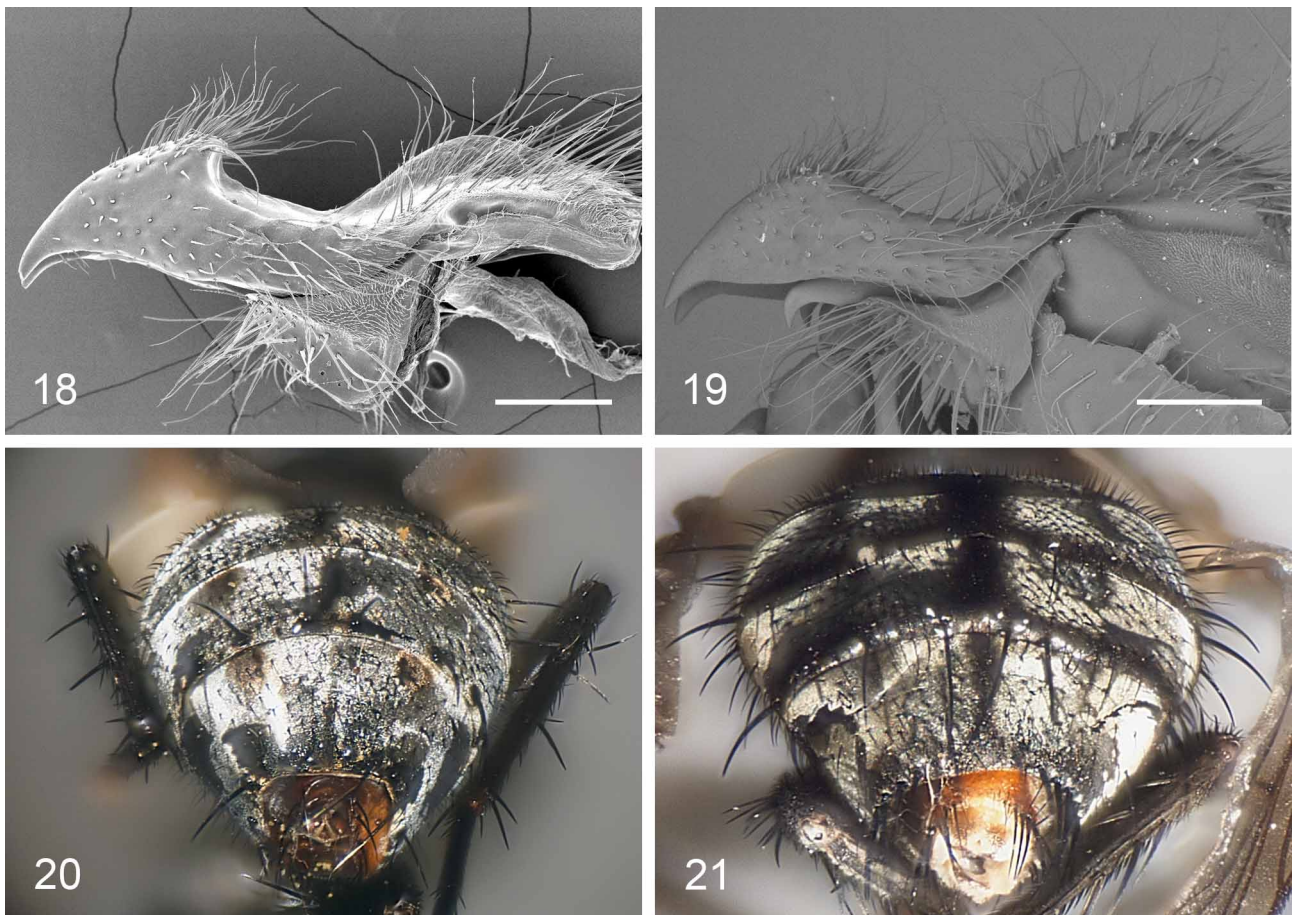
4\0 (MMBC, as “*Heteronychia penicillata* det. Povolný”); Crete, Agios Konstantinous, 13 km SE Malia, 27.VI.1979, swept in dry riverbed, LC, 1\0 (ZMUC).

Chorotype. Mediterranean.

Italian distribution. Sardinia.

Biology. Povolný (1992) observed specimens in copula and females larvipositing on terrestrial molluscs (probably of the genus *Helicella*) on the coasts of the Black Sea in southern Bulgaria.

Remarks. Povolný (1992: 181, figs 3, 6; 1996: 91–92, figs 2–3) misidentified specimens of *Sarcophaga* (*Heteronychia*) *thirionae* from Bulgaria and Greece as “*Heteronychia penicillata*” (his detailed illustrations leave very little doubt as to the identity of these specimens as *S. (H.) thirionae*). The same author was most probably referring to *S. thirionae* also when mentioning *S. penicillata* from Sardinia (Povolný 1997), as no specimens of this species from Sardinia were found in Povolný’s collection (MMBC); *S. penicillata* is therefore excluded from the Sardinian fauna. Böttcher (1913b, as *Sarcophaga uncurva* Pandellé, 1896) may have misidentified one or more specimens of *S. thirionae* from mainland Italy (Pavia), although his schematic illustration (Böttcher 1913b:127, fig. 52) leaves some doubt. *Sarcophaga* (*Heteronchia*) *thirionae* is known with certainty from Algeria (above record), Bulgaria (Povolný 1992, 1996, as “*Heteronychia penicillata*”), Greece [above records and Povolný (1996, as “*Heteronychia penicillata*)”], Sardinia (present records), and Anatolia (type locality), and is here formally recorded from Europe and North Africa for the first time (cf. Pape 1996, 2004a). I have examined several specimens of a closely related, undescribed species from mainland Italy, Sicily and Croatia (CNBFVR, MMBC, MZUR).



FIGURES 18–21. 18. Cercus and surstylus of male *Sarcophaga* (*Heteronychia*) *thirionae* (Lehrer), scale bar: 0.2 mm. 19. Cercus and surstylus of male *Sarcophaga* (*H.*) *uncurva* Pandellé, scale bar: 0.2 mm. 20. Abdomen of female *Sarcophaga* (*H.*) *uncurva*. 21. Abdomen of female *Sarcophaga* (*H.*) *vicina* Macquart.

***Sarcophaga (Heteronychia) uncicurva* Pandellé, 1896**

(Figs 19–20)

Sarcophaga uncicurva Pandellé, 1896: 183. Type locality: France, Var, Hyères.

Type material examined. Lectotype ♂: ♂ / S497 // *Sarcophaga uncicurva* / Pandellé, 1896 / LEPTOTIPO [sic!] / Desig. Peris et al. / Bol. R. Soc. Esp. Hist. Nat. (MNHN) (cf. Pape 2004b).

Material from Sardinia. A11: 13.IX.2006, 0\1. S2: 13–27.VI.2006, 1\0. W03: 24.III.2004, 2\0. W04: 10–25.VII.2004, 2\0.

Additional material. Italy. Calabria: Cosenza prov., Villapiana, beach, 18.V.1998, PC MM, 4\0. **Latium:** Latina prov., Capo Circeo, spiaggia sud [= south beach], 21.IX.1939, NC, 1\0 (MZUR). **Sicily:** Agrigento prov., Torre Salsa, dune [= dunes], 22.V.2004, PC DB GN DW, 4\3.

Chorotype. W-Mediterranean.

Italian distribution. Calabria (Böttcher 1913b); Latium (Saccà & Rivosecchi 1953); Lombardy (Böttcher 1913b, doubtful); Sardinia; Sicily (Böttcher 1913b); Tuscany (Verity 1918; Saccà & Rivosecchi 1953). Saccà and Rivosecchi (1953) recorded this species also from the Marches, but the specimen (in MZUR) belongs to an undescribed species closely related to *S. thirionae*. Böttcher's (1913b:127) illustration of *S. uncicurva* does not correspond to Pandellé's species (see above), so his record from Pavia (Lombardy) should be considered doubtful.

Biology. A parasitoid of *Eobania vermiculata* (Müller), *Theba pisana* (Gastropoda: Helicidae) and *Cernuella virgata* (Gastropoda: Hygromiidae) (cf. Coupland & Barker 2004).

Remarks. New to Sardinia. Not yet recorded from Corsica (Pape 2004a).

Conclusions

The eight reported species, two of which European, one Euro-Mediterranean, four Mediterranean (one W-Mediterranean) and one, at the present state of knowledge, a Sardinian endemic, highlight the strong Mediterranean character of the Sardinian *Sarcophaga (Heteronychia)* assemblage. None of the six widespread Palaearctic species of *Heteronychia* occurring in mainland Italy (Pape 1996) were found in Sardinia.

A comparison with the neighbouring island of Corsica, from which 7 species of *Sarcophaga (Heteronychia)* have been recorded so far (Villeneuve 1911; Séguy 1941; Pape 2004a), shows that at least the three species occurring in Corsica included in square brackets in the above identification key can be expected also in Sardinia: *S. (H.) consanguinea*, *S. (H.) haemorrhoea* and *S. (H.) vicina*. The first is widespread in Italy from north to south and Sicily (cf. Whitmore & Richet 2007). The other two are widespread European elements, the first with extension to Turkey, the second with extension to Transcaucasia (Georgia) (Pape 1996). Being less typically Mediterranean species, *S. (H.) haemorrhoea* and *S. (H.) vicina* may occur only at higher elevations in Corsica, a hypothesis which (if confirmed) could explain their absence in the abundant material studied from Sardinia, which has very few high mountains compared to Corsica; however, the highest elevations of Sardinia (i.e. the Gennargentu area) were not thoroughly investigated during this study. A few additional W-Mediterranean species could possibly also be found on the island, like for example *S. (H.) villeneuveana* (Enderlein, 1928), known so far from southern France, Spain, Morocco and Algeria; morphologically it is similar to *S. (H.) thirionae* and *S. (H.) uncicurva*: males can be distinguished from the former by the dorsally divided juxta, and from the latter by the longer juxta and dorsally setose wing-vein R₁; in the female sex, *S. (H.) villeneuveana* is almost indistinguishable from *S. (H.) thirionae*.

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