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Catalogue of troglobitic Staphylinidae (Pselaphinae excluded) of the world

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ABSTRACT

All troglobitic Staphylinidae (excluding subfamily Pselaphinae) currently known in the world are listed together with all their known localities. 44 species belonging to five subfamilies, Omaliinae, Staphylininae, Paederinae, Tachyporinae and Aleocharinae are known so far from the Palaearctic, Neotropical and Oriental regions.

Key words**:** Coleoptera, Staphylinidae, troglobitic species

INTRODUCTION

The family Staphylinidae includes about 48,700 described species in the world (Newton, pers. comm.) and it is the second largest family of Coleoptera after Curculionidae. It is not surprising that such a large family was able to adapt their life style to many varied habitats. They can be found beneath bark of dead trees or pieces of wood, many species can be collected from leaf litter or deeper layers of soil, others in stream banks, in dung, animal carcasses, fungi or decaying fruits, and members of some tropical groups are most commonly taken at lights. Many species in a number of genera are known to be associated to ants or termites especially in the tropics, and others have parasitoid larvae of fly pupae. Some are linked to bat guano inside the caves, but only few rove-beetle species are true troglobites, strictly adapted for cave-dwelling way of life.

We are treating here only troglobitic species belonging to subfamilies traditionally placed in Staphylinidae *sensu stricto*, i.e. excluding the former Pselaphidae and Scaphidiidae which have been recently included as subfamilies within the family Staphylinidae. The current subfamily Pselaphinae has many more troglobites, about 150 species all over the world (Poggi et al 1998), particularly in Europe (Besuchet 1985; Hlaváč et al in press) and in USA (Besuchet 1982; Chandler 1992; Chandler & Reddell 2001). Scaphidiinae are mycophagous and there are no cave records for this subfamily.

Many species of Staphylinidae are found in caves or pits (under the expression pit we understand here deep, vertical cave sometimes called alpine cave) but most of them are either accidental visitors or at most troglophiles, species having a regular association with dark-zone cave habitats but not presenting any special adaptation for this way of life. For example there are 15 troglophilic Staphylinidae known from USA caves where no real troglobitic species occur (Peck & Thayer 2003). Only few members of this family are really strictly troglobitic, species adapted to live in caves or pits and sometimes in the mesocavernous shallow substratum (henceforth referred to here as ‚MSS') (Culver 2001). The majority of Coleoptera highly adapted to these hypogean habitats are members of the family Carabidae (mainly Trechinae) and Leiodidae (Leptodirini) which have developed very successful strategies and they are dominant amongst the cavernicolous Coleoptera.

CATALOGUE OF TROGLOBITIC STAPHYLINIDAE

It is always imprecise the boundary between true troglobites and troglophiles, and also between hypogean (deep underground) and endogean (soil) environments: there are species for all degrees of adaptations with intermediate stages, and some species mainly adapted to each of these environments can mix and occur together. In order to make a catalogue of the true troglobitic Staphylinidae, which are adapted to the hypogean environment, we take in account only species presenting the following characters: (1) depigmented body, (2) eyes very reduced (microphthalmous) or absent (eyeless/anophthalmous), (3) legs and antennae slender and long, (4) whole or part of body with long, fine setae, and (5) exclusive presence in caves or pits or in the MSS. The species only known from either the MSS or the deep soil but in agreement with (3) and (4) have been included in our list. Endogean species can show characters (1) and (2) and can sometimes be found in caves and more often in the MSS, but they are not in agreement with (3) and (4), being therefore excluded. We have taken into account some small endogean-like species only when they are known exclusively from caves, not having never been found in the soil or in the upper MSS. Finally, the

exclusive presence in caves is not enough for including species not in agreement to characters (1) and (2).

The last world list of troglobitic Staphylinidae (Bordoni & Oromí 1998) comprised 29 species which are all also listed here. In addition we consider as being troglobites five species which were known at that time but were not included in that list, *viz*: *Lathrobium* (*Lathrobium*) *uenoi* Watanabe; *L.* (*L.*) *youzawanum* Watanabe; *Lobrathium* (*Lobrathium*) *bellesi* Bordoni; *Micranops bifossicapitata* Outerelo & Oromí and *Ischnosoma spelaeus* W. Scriba. Eight more species have been described since the former list was published: *Uenohadesina styx* Smetana; *Domene (Domene) hetzeli* Feldman; *Domene (Lathromene) caurelensis* Outerelo, Gamarra & Salgado; *Domene gallaeciana* Feldmann & Hernando; *Medon feloi* Assing; *M. antricola* Assing; *Micranops spelaeus* Frisch & Oromí and *Alevonota oromii* Assing and *Apteranillus minosianus* Lecoq & Quéinnec. In addition, one species of *Domene* and one species of *Ocypus* are awaiting for the description, and *Apteranopsis palmensis* Hernández & Martín has been placed in synonymy with *Alevonota tanausui* Hernández & Martín. In all we currently recognise 44 species of troglobitic Staphylinidae (excluding subfamily Pselaphinae) belonging to five subfamilies, Omaliinae, Staphylininae, Paederinae, Tachyporinae and Aleocharinae and they are listed here below.

We maintained the original names for the caves referred to herein, so we find useful to list the expressions for „cave“ in all languages where troglobitic Staphylinidae have been found: cueva (Spanish), cova (Catalan); caverna, grotta, cava, grava (Italian); grotte, caverne (French); gruta (Portuguese); peştera (Romanian), pečina, jama (Serbian); špilja, jama (Croatian). Sima is the Spanish name for pit.

Omaliinae:
Lesteva (Lestevina) sbordonii, Bordoni, 1973: 230
Distribution: ITALY
- Grava dei Gentili, Campania, Salerno, S. Angelo a Fasanella

Uenohadesina styx Smetana, 2000: 291
Distribution: SOUTH KOREA
- Cave Yong' yeon-gul, Hwangji, Changseong-eub, Kangweon-do

Paederinae:
Domene (Domene) cavicola Coiffait, 1954: 54
Distribution: SPAIN
- Cueva Navilla Fuente, Acero, Sierra de Cazorla, Jaén province, Andalusia
References: Coiffait, 1982: 417 (redescription)

Domene (Domene) hetzeli Feldman, 2000: 327
Distribution: SPAIN
- Cueva del Brazu, Asturias, Picos de Europa, Sierra del Brazu

Domene (Canariomene) alticola Oromí & Hernández, 1986: 135
Distribution: CANARY ISLANDS: Tenerife
- Cueva de los Roques [type locality], Teide National Park
- Cueva Labrada, El Sauzal (Outerelo & Hernández 1992)
- Cueva del Viento, Icod de los Vinos (Outerelo & Hernández 1992. Description of larva)
- Cueva del Sobrado, Icod de los Vinos (Arechavaleta et al 1998 and 1999)

Domene (Canariomene) benahoarensis Oromí & Martín, 1990: 21
Distribution: CANARY ISLANDS: La Palma
- Sima Martín, Mazo [type locality] 650 m
- Búcaro de Martín (= Búcaro de Martín) Ashmole et al 1992; Medina et al. 1996; Outerelo & Hernández 1992 (description of larva)
- Cueva de Barlovento, Barlovento
- Cueva Honda de Gallegos, Barlovento (Medina et al 1996)
- Cueva de los Franceses, Franceses, Garafía (Medina et al 1996)
- Sima del Llano de los Cestos, Fuencaliente (Medina et al 1996)
- Cueva de los Andenes, Caldera de Taburiente National Park
- Cueva de los Palmeros, Las Indias, Fuencaliente (García 1996)
- Cueva del Rincón, E Rincón, El Paso
- Cueva del Diablo, Pared Vieja, Breña Baja
- Cueva del Salto de Tigalate, Tighalate, Mazo (García & González 1996)
- Cueva de la Machacadora, Mazo (García 1997)
- Cueva de los Caños, Mazo (García & González 1998)

Domene (Canariomene) jonayi Hernández & Medina, 1990: 288
Distribution: CANARY ISLANDS: La Gomera
- M.S.S., El Cedro, Garajonay National Park
- M.S.S. Reventón Oscuro, El Cedro, Garajonay N.P. (Frisch & Oromí 2006)

Domene (Canariomene) vulcanica Oromí & Hernández, 1986: 130.
Distribution: CANARY ISLANDS: Tenerife
- Cueva de Felipe Reventón, Icod de los Vinos (Arechavaleta et al 1999; Outerelo & Hernández 1992)
- Cueva del Viento, Icod de los Vinos (Outerelo & Hernández 1992. Description of larva)
- Cueva del Bucio, Aguamansa (Sala et al 1996)

Domene (Canariomene) sylvatica Hernández & Oromí, 1993: 66.
Distribution: CANARY ISLANDS: Tenerife
- M.S.S., Barranco de Ijuana, Anaga.

Domene (Lathromene) bergidi Salgado & Outerelo, 1991: 209
Distribution: SPAIN
- Cueva de la Carretera, León province, Peñarrubia-Carucedo

Domene (Lathromene) caurelensis Outerelo, Gamarra & Salgado, 2000: 166
= *Domene (Lathromene) carrillorum* Hernando, 2002: 14
Distribution: SPAIN
- Cueva do Eixe, Mercurín do Caurel (Lugo)
References: Outerelo & Gamarra 2003: 61 (synonymy of *D. carrillorum*)

Domene (Lathromene) gallaeciana Feldmann & Hernando, 2005: 401.
Distribution: SPAIN
- Cueva do Cova do Rei Cintolo, Supena, Argomoso (Lugo)

Domene (Spelaeomene) aurouxi Español, 1970: 370
Distribution: MOROCCO
- Grotte Ifri el Caid, Grand Atlas, Ait M'Hamed
References: Coiffait 1982: 419 (redescription of female)

Domene (Spelaeomene) camusi Peyerimhoff, 1949: 81 (*Domene*)
Distribution: MOROCCO
- Grotte du Gorane, near cap Cantin, Safi
References: Vives 1977 (description of larvae); Coiffait 1982: 418 (redescription)

Domene (Spelaeomene) cantonsi Español, 1972: 51
Distribution: MOROCCO
- Cave Wit Tamdoun, Grand Atlas, region of Imouzzer des Ida Ou Tanan, near Tazentout, about 60 km NE of Agadir
References: Coiffait 1982: 418 (redescription of female); Bordoni 2003: 375 (description of male)

Domene sp. nov.
Distribution: ALBANIA
- Unknown cave near the town Girokastr (Pavićević, pers. comm.)

Lathrobium (*Lathrobium*) *uenoi* Watanabe, 1994: 21
Distribution: JAPAN
- Cave Shizushi-dô, Shizushi, Mizucho-chô, Kyoto Pref.

Lathrobium (*Lathrobium*) *yozawanum* Watanabe, 1994: 24
Distribution: JAPAN
- Cave Yôzawa-dô, Kamiyôzawa, Itsukaichi-chô, Tokyo Pref.

Lobrathium (*Lobrathium) bellesi* Bordoni, 1977: 17
Distribution: BALEARIC ISLANDS: Mallorca
- Cova de Can Sivella, Pollença.

Medon dobrogicus Decu & Georgescu, 1994
Distribution: ROMANIA
- Peştera Movile, Dobrogea méridionale

Medon vicentensis Serrano, 1993: 4
Distribution: MADEIRA
- Gruta dos Cardais, São Vicente

Medon feloi Assing, 1998: 143
Distribution: CANARY ISLANDS: La Palma
- Cueva del Salto de Tigalate [type locality], Salto de Tigalate, Mazo
- Cueva de los Laberintos, El Paso (Oromí et al 2001: Cueva del Bejenado)
- Cueva de los Sorprendidos, El Paso

Medon antricola Assing, 2006: 48
Distribution: CANARY ISLANDS: El Hierro
- Cueva de Jinama [type locality], El Golfo, Frontera (Oromí et al 2002: *Medon* n.sp.)
- Cueva de Fileba.

Micranops bifossicapitata Outerelo & Oromí, 1987: 136 (*Domene*)
Distribution: CANARY ISLANDS: Tenerife and La Gomera
- Cueva Labrada [type locality], Tenerife, Aguagarcía, 1040 m
- Cueva Felipe Reventón, Tenerife, Icod de los Vinos, 600 m
- M.S.S., La Gomera, Bosque de El Cedro – Matarnos, 1000 m,
References: Frisch & Oromí 2006: 25 (redescription)

Micranops spelaeus Frisch & Oromí, 2006: 33
Distribution: CANARY ISLANDS: Tenerife
- Cueva Felipe Reventón, Icod de los Vinos, 595 m

Pinostygus galapagoensis Cambell & Peck, 1989: 400
Distribution: GALAPAGOS: Santa Cruz Island
- Cueva de Bellavista [type locality], Bellavista
- Cueva de Gallardo (= C. Bellavista) (Hernández et al 1992)
- Cueva de Elena, Santa Rosa (Hernández et al 1992)

Stenopholea reddelli Herman, 1969: 4
Distribution: MEXICO
- Cave Mine, Tamaulipas, Rancho del Cielo

Staphylininae:
Ocypus n. sp.
Distribution: CANARY ISLANDS: Tenerife
- Cueva de los Roques, Teide National Park (Oromí et al 2001)

Tachyporinae:
Ischnosoma spelaeus W. Scriba, 1870: 80 (*Mycetoporus*)
Distribution: SPAIN
- Cueva Rosa, Buzdongo near Santas Albas, Asturias and León

Aleocharinae:
Alevonota canariensis Oromí & Martín 1984: 43 (*Apteranopsis*)
Distribution: CANARY ISLANDS: Tenerife
- Cueva de los Roques [type locality], Las Cañadas del Teide (Martín & Oromí 1986)
- Cuevas Negras, Volcán Pico Viejo, Teide National Park (Arechavaleta et al 1998; Oromí et al 2002)

Alevonota hephaestos Hernández & García, 1989: 20 (*Apteranopsis*)
Distribution: CANARY ISLANDS: La Palma
- M.S.S., [type locality], Cubo de la Galga, Puntallana
- Cueva del Diablo, Breña Baja
- Cueva de los Palmeros, Fuencaliente (García 1996)
- Cueva del Salto de Tigalate, Mazo (García et al 1995)

Alevonota oromii Assing, 2002: 60
Distribution: CANARY ISLANDS: Tenerife
- Cueva del Sobrado [type locality], Icod de los Vinos
- Cueva del Viento, Icod de los Vinos
- MSS in Palo Blanco, Los Realejos

Alevonota outereloi Gamarra & Hernández, 1989: 53 (*Apteranopsis*)
Distribution: CANARY ISLANDS: Tenerife
- Cueva del Bucio [type locality], La Orotava
- Cueva del Bucio, La Orotava (Sala et al 1996)
- Cueva del Sobrado, Icod de los Vinos
- Cueva del Sobrado Superior, Icod de los Vinos
- Cueva de Breveritas, Icod de los Vinos
- Cueva del Viento, Icod de los Vinos
- Cueva del Mulo, Icod de los Vinos

Alevonota tanausui Hernández & Martín, 1990: 587 (*Apteranopsis*)
= *Alevonota palmensis* Hernández & Martín, 1990: 586 (*Apteranopsis*)
Distribution: CANARY ISLANDS: La Palma
- Cueva de Todoque [type locality *A. palmensis*], Los Llanos
- San Juan Cave (= Cueva de Todoque)(Ashmole et al 1992)
- M.S.S. Cubo de la Galga, Puntallana (Hernández & Martín 1990: *A. palmensis*)
- Cueva de los Palmeros, Fuencaliente [type locality *A. tanausui*]
- Cueva del Salto de Tigalate, Mazo (García et al 1995) (*A. palmensis*)
- Cueva Virgen de Fátima, El Paso (García & Govantes 1996: *A. palmensis*; Dumpiérrez et al 2005)
- Cueva de los Palmeros, Fuencaliente (García 1996) (*A. palmensis*)
- Cueva de los Caños, Mazo (García & González 1998)
- Cueva del Ratón, Fuencaliente
- Cueva Honda de Gallegos, Barlovento
References: Assing 2002: 59 (synonymy of *A. palmensis*)

Alevonota junoniae Hernández & Martín, 1990: 589 (*Apreronopsis*)
Distribution: CANARY ISLANDS: La Palma
- Sima Martín, Mazo, [type locality], 650 m (Ashmole et al 1992)
- Búcaro de Martín (= Sima Martín) (Medina et al 1996)
- Cueva de los Caños, Mazo (García & González 1998)

Apteranillus bordati Lecoq, 1988: 319 (*Anopsapterus*)
Distribution: ALGERIA
- Unknown cave, El Abiod Sidi Cheïkh; Monts des Kasours

Apteranillus minosianus Lecoq & Quéinnec, 2005: 45
Distribution: MOROCCO
- Unknown cave, Maroc, Atlas de Beni-Mellal, Azizal province, subterranean stream at Aïn Melghfi, 1250 m, Tamalloukt, hamlet at 8 km NNE of Ouaouizaght

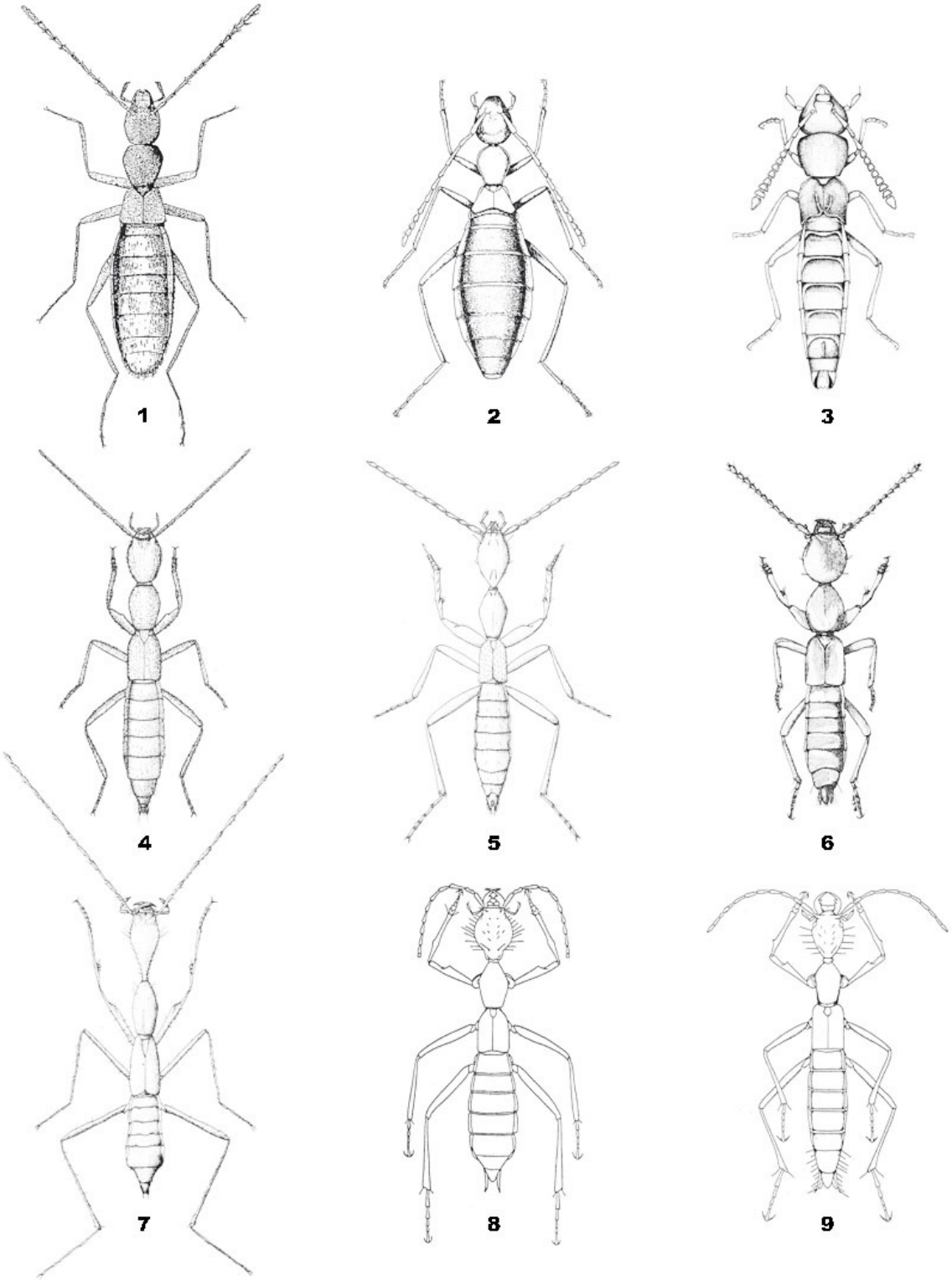
Apteranillus rotroui Scheerpeltz, 1935: 245 (*Antrosemnotes*)
Distribution: MOROCCO
- Grotte du Daya Chiker, Moyen Atlas, 38 km south of Taza

Apteranillus ruei Español, 1969: 173
Distribution: MOROCCO
- Kef Aziza cave, Boudenib region, Pre-Saharan Morocco

Apteraphaenops longiceps brevicornis Peyerimhoff, 1911: 90
Distribution: ALGERIA
- Grotte Ardjer-Idkhi, near top of djebel Haïzer, central part of Djurdjura range, 1500m
- Grotte Ifri bou-Arab, near top of djebel Haïzer, central part of Djurdjura range, 1210m

Apteraphaenops longiceps longiceps Jeannel, 1907: 112
Distribution: ALGERIA
- Grotte Ifri Khaloua, near top of djebel Haïzer, central part of Djurdjura range

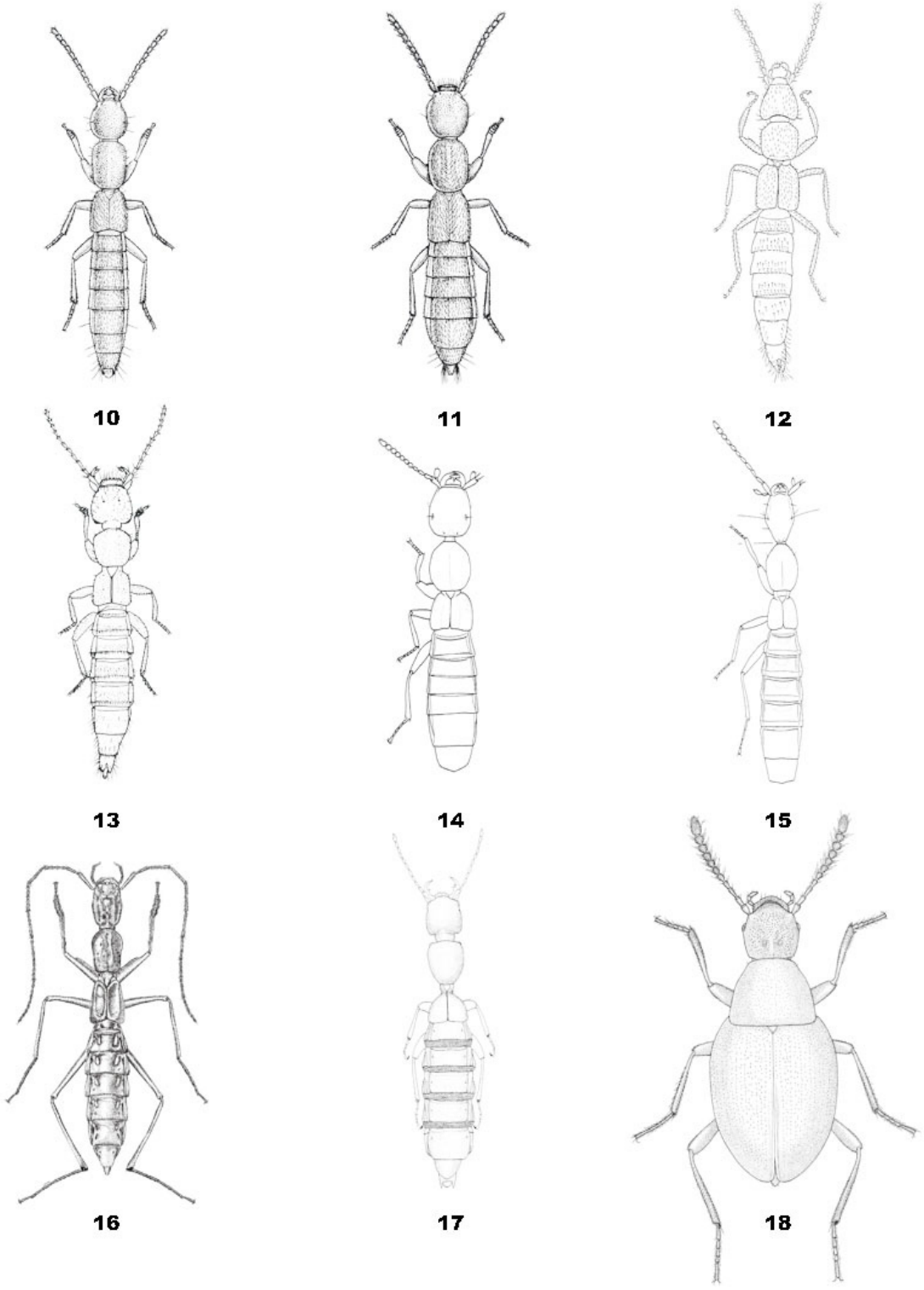
Cantabrodytes vivesi Español, 1975: 135
Distribution: SPAIN
- Cueva de Jesu, Oviedo, Mesetas de Con
- Cueva de Fu-Martín, Asturias, Prunales de Parres



Figs. 1-9 – 1) *Alevonota canariensis* Oromí & Martín, ex Oromí & Martín 1984; 2) *Apteranillus ruei* Español, ex Español, 1969; 3) *Cantabrodytes vivesi* Español ex Español, 1975; 4) *Domene (Canariomene) benahoarensis* Oromí & Martín, ex Oromí & Martín, 1990; 5) *Domene (Canariomene) jonayi* Hernández & Medina, ex Hernández & Medina, 1990; 6) *Domene (Canariomene) sylvatica* Hernández & Oromí, ex Hernández & Oromí, 1993; 7) *Domene (Canariomene) vulcanica* Oromí & Hernández, ex Oromí & Hernández, 1986; 8) *Domene (Spelaeomene) aurouxi* Español, ex Español, 1970; 9) *Domene (Spelaeomene) cantonsi* Español, ex Español, 1972.

Note: larva described in the same paper by Eduard Vives.
References: Outerelo et al 2000: 113.

Typhlomalota glenniei Cameron, 1947: 30
Distribution: northern INDIA



Figs. 10-18 – 10) *Lathrobium* (*Lathrobium*) *uenoi* Watanabe, ex Watanabe, 1994; 11) *Lathrobium* (*Lathrobium*) *yozawanum* Watanabe, ex Watanabe, 1994; 12) *Medon dobrogicus* Decu & Georgescu, ex Decu & Georgescu, 1994; 13) *Medon vicentensis* Serrano, ex Serrano, 1993; 14) *Micranops bifossicapitata* Outerelo & Oromí, ex Outerelo & Oromí, 1987; 15) *Micranops spelaeus* Frisch & Oromí, ex Frisch & Oromí, 2006; 16) *Pinostygus galapagoensis* Cambell & Peck, ex Cambell & Peck, 1989; 17) *Stenopholea reddelli* Herman; ex Herman, 1969; 18) *Uenohadesina styx* Smetana, ex Smetana, 2000.

- Cave Moila Swallet, Chakrata district, Bodyar

Typhlozyras camusi Jeannel, 1960: 207

Distribution: MOROCCO
- Grotte de Torobeit, western Rif, nord-east of Bab Taza, 1800 m

DISCUSSION

The 44 troglobitic species so far known world-wide have the following distribution: Palaearctic region 41; Neotropical 2 and Oriental 1. They are included in five subfamilies: Omaliinae (2 spp.), Staphylininae (1 sp.), Paederinae (28 spp.), Tachyporinae (1 sp.) and Aleocharinae (14 spp.). The dominant group is the subtribe Lathrobiina within Paederinae (*Domene, Lathrobium, Lobrathium* and *Medon*) with 21 species (47.7 %) and the aleocharine tribe Athetiini (only the genus *Alevonota*) with 6 species (13.6 %). Geographically there are three dominant regions, the richest one being the Mid Atlantic Macaronesian islands (Canary Islands and Madeira) with 17 species in five genera (*Ocypus, Domene, Medon, Micranops* and *Alevonota*). Tenerife has nine species, La Palma five species, La Gomera two species and El Hierro and Madeira one species, all being endemic to a single island except *Micranops bifosicapitata* Outerelo & Oromí, which is known from Tenererife and La Gomera. Other important regions are the Maghreb (Morocco and Algeria) which hosts ten species in four genera (*Domene, Apteraphaenops, Apteranillus* and *Typhlozyras*), and mainland Spain (including the Balearic islands) with eight species in four genera (*Domene, Lobrathium, Ischnosoma* and *Cantabrodytes*). These three relatively small regions host 35 species what is 79.6 %. The rest of troglobitic Staphylinidae are known from Japan (2 species of *Lathrobium*), Korea (one species of *Uenohadesia*), Italy (one species of *Lesteva*), Balkan peninsula (one species of *Medon* and one undescribed species of *Domene*), Galapagos Islands (one species of *Pinostygus*), Mexico (one species of *Stenopholea*) and finally northern India with one species of *Typhlomalota*.

Karstic regions of the Balkan peninsula, from Slovenia in the north down to Greece in the south is undoubtedly the richest area for troglobitic beetles in the world, with hundreds of troglobitic species of Carabidae, Leiodidae (Guéorguiev 1977; Pretner 1973, 1977) and Staphylinidae of the subfamily Pselaphinae (Hlaváč et al in press). So it is surprising that this region is so poor in troglobitic Staphylinidae, the sole described species being *Medon dobrogicus* Decu & Georgescu from Peştera Movile (Dobrogea, Romania); a new troglobitic species belonging to genus *Domene* will be soon described from Albania (Pavićević, pers. comm.). Other important areas for cave beetles such as Italy, France and north-eastern Spain are also lacking troglobitic Staphylinidae. We think that the main reason is that they cannot compete in feeding strategy with troglobitic ground beetles of the subfamily Trechinae, which are dominant predators in caves all along the north of the Mediterranean basin.This argument can be also supported by the fact that highly troglomorphic Trechinae are absent from the Canary Islands and the Maghreb, where the richest fauna of troglobitic Staphylinidae is found, like species such as *Domene vulcanica* and *Domene aurouxi* from Tenerife and Morocco, respectively. The hypothesis is also valid for the Iberian Peninsula, where troglobitic Staphylinidae are found in its northwestern and southern areas, being absent in the northeast where highly troglomorphic Trechinae (*Aphaenops, Hydraphaenops Paraphaenops* and *Geotrechus*) or Driptinae (*Ildobates neboti*) ground beetles occur in the caves (Bellés 1987). Moreover, the extraordinary *Pynostigus galapagoensis*, probably the largest troglobitic rove beetle in the world, occurs in the Galapagos Islands where no troglomorphic ground beetles are known (Peck 2006).

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