Codoniaceae

Fossombronia caespitiformis De Not. ex Rabenh.
Sheltered taluses and basic soils.
Loc: 24-25-26.

Fossombronia echinata Macvicar
Acidic soils, generally of sandy-clayey texture, in wet depressions.
Loc: 1-2-4-5-6-7-8-10-12-14-18-19-20-21-24-2 7.

Fossombronia husnotii Corb.
Sandy soils, in depressions or wet taluses.
Loc: 24-25-26-29.

Arnelliaceae

Gongylanthus ericetorum (Raddi) Nees
Taluses or acidic soils protected by shrubs.
Loc: 2-3-4-5-7-8-9-22-24-25-29.

Cephaloziellaceae

Cephaloziella stellulifera (Tayl. ex Spruce) Schiffn.
Sheltered acidic soil in taluses.
Loc: 2-3-7-8-9-14-24.

Cephaloziella turneri (Hook.) Müll. Frib.
Sheltered acidic soil in taluses.
Loc: 24-26-28.

Calypogeiaceae

Calypogeia fissa (L.) Raddi
Very humiferous and wet soils in *Alnus* formations.
Loc: 38

Frullaniaceae

Frullania dilata (L.) Dumort.
Quercus rotundifolia trunks, occasionally on rocks.
Loc: 3-6-10-12-21-24.

Frullania tamarisci (L.) Dumort.
On acidic and sheltered rocks.
Loc: 38.

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ANTHOCEROTOPHYTA (hornworts)

Anthocerotaceae

Anthoceros caucasicus Steph.
Sandy-loamy soils, in wet depressions.
Loc: 27-29.

Phaeoceros bulbiculosus (Broth.) Prosk.
Taluses, sandy or sandy-loamy soils in wet depressions.
Loc: 7-9-10-12-20-22-24-28-29-32.

Phaeoceros laevis (L.) Prosk.
Sandy soils in wet depressions.
Loc: 3-5-14-15-18-19-20-24-26-31.

MARCHANTIOPHYTA (liverworts)

Targioniaceae

Targionia hypophylla L.
Sheltered taluses, ledges or accumulated soils on acidic or basic rocks.
Loc: 5-9-21-22-25-26-39-40.

Lunulariaceae

Lunularia cruciata (L.) J. Lindb.
Wet, nitrified soils.
Loc: 3-5-8-10-12-15-17-18-19-20-21-28-32.

Cleveaceae

Athalamia spathysii (J. Lindb.) S. Hatt.
Wet soils of diverse nature, sometimes nitrified.
Loc: 4-7-12-14-15-18-27.

Corsiniaceae

Corsinia coriandrina (Spreg.) Lindb.
Wet acidic soils, slightly nitrified.
Loc: 7-9-14-18-19-20-27-28-29.

Oxymitraceae

Oxymitra incrassata (Broth.) Sérgio & Sim-Sim
Exposed and sunny acidic or basic soils among oaks, cork trees and pines.
Loc: 3-4-7-8-13-18-19-20-27.

Ricciaceae

Riccia bicarinata J. Lindb.
Sandy, acidic soils among pine and cork trees.
Loc: 4-13.

Riccia ciliata Hoffm.
Acidic soils among oaks and cork trees.
Loc: 15.

Riccia glauca L.
Acidic, sandy-clayey soils, in exposed and sunny situations.
Loc: 2-4-29.

Riccia gougetiana Durieu & Mont.
Wet, acidic, sandy or sandy-clayey soils.
Loc: 1-7-9-12-14-15-18-19-20-21-22-27-29.

Riccia gougetiana var. ***armatissima*** Levier ex Müll. Frib.
Acidic, sandy-clayey soils.
Loc: 27.

Riccia lamellosa Raddi
Acidic or basic soils, generally nitrified.
Loc: 1-2-13-18-19-21-25-35-40.

Riccia macrocarpa Levier
Acidic soils of sandy texture, in cork tree and pine formations.
Loc: 3-4-14-18-19-20-27-29.

Riccia nigrella DC.
Basic or occasionally acidic soils.
Loc: 1-2-3-4-6-13-30.

Riccia papillosa Moris
Acidic, sandy soils among cork trees.
Loc: 13.

Riccia sorocarpa Bisch.
Basic, clayey soils among oaks.
Loc: 25-26-28.

Riccia trichocarpa M. Howe
Sandy soils in wet depressions of cork tree and pine formations.
Loc: 18-19.
We consider this taxon as a synonym of *Riccia canescens* Steph. (cf. Schumacker & Váňa 2000, Jovet-Ast 1986).

Metzgeriaceae

Metzgeria furcata (L.) Dumort.
Base of *Alnus* trunks.
Loc: 38.

Pelliaceae

Pellia epiphylla (L.) Corda
Wet taluses in *Alnus* formations.
Loc: 38.

Bryum canariense Brid.
Humified soil in oaks and cork trees.
Loc: 9.

Bryum pseudotriquetrum (Hedw.) P. Gaertn., B. Mey. & Schreb.
Taluses and soils accumulated on sheltered rocks at the edges of streams.
Loc. 12-19-20-23-24-26.

Bryum torquescens Bruch & Schimp.
Humified soil among oaks and cork trees.
Loc: 4-7-8-9-12-14-33-35-38-40

Bryum versicolor A. Braun ex Bruch & Schimp.
Dry and sandy soils, slightly nitrified.
Loc: 28-29-30.

Epipterigium tozeri (Grev.) Lindb.
Moist acidic soils.
Loc: 3-10-12-18-20-21-22-23-26-29.

Amblystegiaceae

Amblystegium riparium (Hedw.) Schimp.
On rocks and soils accumulated on rocks, at the edges of streams.
Loc: 11-12.

Brachytheciaceae

Eurhynchium praelongum (Hedw.) Schimp.
Soils accumulated on rocks, at the edges of streams.
Loc: 12.

Eurhynchium pulchellum (Hedw.) Jenn.
Soils accumulated on rocks, at the edges of streams.
Loc: 12-38.

Homalothecium aureum (Spruce) H. Rob.
Humiferous soils among oak and cork tree formations.
Loc: 3-5-7-9-11-12-15-16-18-19-20-21-27-29-3 0-32-39.

Rhynchostegium confertum (Dicks.) Schimp.
Humiferous soils among oak and cork tree formations.
Loc: 4-5-9-12-18-19-20-21.

Rhynchostegium megapolitanum (F. Weber & D. Mohr) Schimp.
Sandy slightly humiferous soils.
Loc: 24-27-28-29.

Rhynchostegium riparioides (Hedw.) Cardot
Wet rocks at the edges of streams or submerged.
Loc: 2-31-35-34.

Scleropodium touretii (Brid.) L.F. Koch
Wet acidic soils, slightly humiferous, taluses and open soils among shrubs.
Loc: 2-3-4-7-8-9-12-14-18-19-20-22-26-27-28-32-34-36-37-39-40.

Scorpiurium deflexifolium (Solms) M. Fleisch. & Loeske
Accumulated soils on rocks, in sheltered and wet places.
Loc: 12-16-19-20-21-31-32.

Fabroniaceae

Fabronia pusilla Raddi
Trunks of *Quercus rotundifolia*, occasionally on walls.
Loc: 3-12-22.

Fontinalaceae

Fontinalis duriaei Schimp.
Submerged in streams.
Loc: 31.

Hypnaceae

Hypnum cupressiforme Hedw.
On acidic rocks, on trunk of *Quercus rotundifolia* and on humiferous soils among shrubs or cork trees formations.
Loc: 12-22-23-38.

Leucodontaceae

Antitrichia californica Sull.
Acidic sheltered rocks and on trunk of *Quercus rotundifolia*.
Loc: 11-23.

Leucodon sciuroides (Hedw.) Schwägr.
Trunks of *Quercus rotundifolia*, occasionally on rocks.
Loc: 6-11-12-14.

Pterogonium gracile (Hedw.) Sm.
On rocks or on trunks of *Quercus rotundifolia.*
Loc: 12-22-27-38.

Neckeraceae

Thamnobryum alopecurum (Hedw.) Nieuwl.
Wet rocks in *Alnus* formations.
Loc: 38.

Tortula muralis Hedw.
Acidic or basic soils accumulated on rocks and artificial walls.
Loc: 1-2-3-4-5-6-8-10-11-19-21-23-32.

Trichostomum brachydontium Bruch
Taluses, ledges or fissures on acidic or basic rocks. Also, open soil among shrubs.
Loc: 1-2-3-4-5-6-7-8-10-11-14-15-18-19-20-21-22-25-27-28-29-30-32-40.

Trichostomum crispulum Bruch
Basic and exposed soils among shrubs.
Loc: 12-13-14-22-23-25.

Weissia condensa (Voit) Lindb.
Acidic and exposed soils among *Erica*.
Loc: 24.

Weissia controversa Hedw.
Taluses, acidic and exposed soils among shrubs, often stony.
Loc: 2-3-8-12-17-22-24-28.

Weissia controversa Hedw. var. ***crispata*** (Nees and Hornsch.) Nyholm
Open soils among shrubs.
Loc: 7-8.
In spite of its doubtful affinity, this taxon has been subordinated to *Weissia controversa* (cf. Nyholm 1969). However, it was described as *Hymenostomum* (*H. crispatum* Nees & Hornsch.) due to the presence of an epiphragm, which is observable in young capsules. A peristome of poorly developed teeth is eventually formed.

Ephemeraceae

Ephemerum sessile (Bruch) Müll. Hal.
Acidic sandy soils among shrubs.
Loc: 3-6-16-19-21-23-29.

Cinclidotaceae

Cinclidotus mucronatus (Brid.) A.L.M. Guim.
Rocks and accumulated soil on rocks, in a stream.
Loc: 31.

Orthotrichaceae

Orthotrichum diaphanum Brid.
Trunks of *Quercus rotundifolia*, *Q. suber*, *Pinus sp*.
Loc: 3-6-12-16-19-20.

Orthotrichum lyellii Hook. & Taylor
Trunks of *Quercus rotundifolia*.
Loc: 3-6-10-11-12-22.

Orthotrichum rupestre Schleich. ex Schwägr.
On acidic rocks.
Loc: 11.

Orthotrichum tenellum Bruch ex Brid.
Trunks of *Quercus rotundifolia*.
Loc: 3-6-11.

Zygodon rupestris Schimp. ex Lorentz
Trunks of *Quercus rotundifolia*.
Loc: 7-8-11-12-23.

Bartramiaceae

Bartramia stricta Hedw.
Taluses and ledges of sheltered, acidic rocks.
Loc: 1-5-9-11-12-22-24-23-33.

Philonotis arnellii Husn.
Sheltered soils at edges of streams.
Loc: 5-12-38.

Bryaceae

Bryum alpinum With.
On wet soils, close to streams.
Loc:1-11-23.

Bryum argenteum Hedw.
Soils of diverse nature, generally nitrified, at edges of paths, etc.
Loc: 1-3-5-7-8-9-15-18-19-20-21-22-23-27-29-30-32-35-40-41.

Bryum bicolor Dicks.
Soils of diverse nature, generally nitrified
Loc: 7-8-9-11-14-15-16-18-19-20-21-23-24-27-28-29-30.

Bryum caespiticium Hedw.
Taluses and sheltered acidic or basic soils.
Loc: 1-2-4-5-19-21-23-25-27-31.

Bryum capillare Hedw.
Fissures of rock, occasionally at base of *Quercus rotundifolia* trunks.
Loc: 1-3-5-11-22.

Bryum donianum Grev.
Acidic or basic moist soils.
Loc: 12-15-23.

Bryum gemmiparum De Not.
Wet taluses at edge of streams.
Loc: 4-5.

Bryum gemmilucens R. Wilczek & Demaret
Soils of diverse nature, generally nitrified.
Loc: 1-2-6-10-18-19-20-21-22-23-24-27-29-30.

Barbula convoluta Hedw.
Acidic or basic soils, taluses or on rocks.
Loc: 5-12-16-18-19-20-21-22-23-27.

Barbula unguiculata Hedw.
Acidic or basic soils, taluses and soil among shrubs.
Loc: 1-2-7-10-12-19-20-22-24-29-30.

Crossidium crassinerve (De Not.) Jur.
Accumulated soil on basic rocks and artificial walls.
Loc: 7-10-23.

Didymodon acutus (Brid.) K. Saito
Taluses, soils accumulated on acidic or basic rocks, edges of paths, etc.
Loc: 5-14-20-22-25.

Didymodon fallax (Hedw.) R.H. Zander
Taluses, soils accumulated on acidic or basic rocks, edges of paths, etc.
Loc: 7-8-10.

Didymodon luridus Hornsch. ex Spreng.
Soils accumulated on acidic or basic rocks, slight nitrified.
Loc: 1-3-4-7-8-9-10-11-13-15-18-19-20-21-23-24-25-28-29-30-32.

Didymodon rigidulus Hedw.
Basic and nitrified soils, taluses, edges of paths, etc.
Loc: 8-10-11-12-17.

Didymodon vinealis (Brid.) R.H. Zander
Taluses and soils accumulated on rocks.
Loc: 12-20-21-24-30-31-32-35.

Gymnostomum calcareum Nees and Hornsch.
Soils accumulated on rocks, fissures and artificial walls.
Loc: 1-7-8-10-19-29.

Gymnostomum luisieri (Sérgio) Sérgio ex Crundw.
Soils accumulated on rocks, and taluses.
Loc: 24-25.

Phascum cuspidatum Hedw.
Open soil in pastures or among shrubs, slightly nitrified.
Loc: 1-4-5-18-20.

Pleurochaete squarrosa (Brid.) Lindb.
Basic or acidic soils among shrubs, generally humiferous**.**
Loc: 3-4-5-7-8-9-12-13-14-16-18-19-20-21-22-24-23-25-27-28-29-32-39-40-41.

Pottia starckeana (Hedw.) Müll. Hal.
Taluses, open soils at edges of paths, generally nitrified.
Loc: 1-2-3-4-5-6-18-19-22-23-25-33-36.

Pottia truncata (Hedw.) Müll. Hal.
Wet, acidic and open soils.
Loc: 1-2-3-4-6-7-14-18-20.

Pottia x andalusica Ros & R. Oliva
Taluses and open soils at edges of paths, generally nitrified.
Loc: 4-6-23.
A taxon probably of hybrid origin which was described from material collected in the Sierra Morena (cf. Ros et al. 1994). Later, reported from other places of the Iberian Peninsula (cf. Ederra 1995).

Pseudocrossidium hornschuchianum (Schultz) R.H. Zander
Taluses, soils of diverse nature, among shrubs.
Loc: 1-4-8-9-10-13-16-18-19-20-21-25-26-27-2 8-29-30.

Scopelophila cataractae (Mitt.) Broth.
Accumulated soils on rocks enriched with heavy metals, in wet conditions.
Loc: 38.
A species indicative of metalliferous soils which was reported as new for the European flora by Corley & Perry (1985). In the Iberian Peninsula, only one locality was previously known in Navarra (Goizueta), where it was collected in similar habitat (cf. Schumacker & Brugués 1991).

Syntrichia laevipila Brid.
On trunks of *Quercus rotundifolia*, *Q. suber*, *Pinus*, etc., occasionally on rocks.
Loc: 3-6-8-11-12-14-18-19-20-21-22-24-29-31.

Timmiella barbuloides (Brid.) Mönk.
Taluses, acidic or basic wet soils among shrubs.
Loc: 4-7-8-14-15-18-19-20-22-24-26-27-29-40.

Tortella humilis (Hedw.) Jenn.
Base of a trunk of *Quercus suber* and on rocks.
Loc: 14.

Tortula atrovirens (Sm.) Lindb.
Soils and accumulated soil on limestone rocks.
Loc: 1-2-3-7-13-18-19-20-21-24.

Tortula canescens Mont.
Taluses on acidic rocks, and at base of *Quercus rotundifolia* and *Q. suber* trunks.
Loc:4-6-19.

Tortula cuneifolia (With.) Turner
Taluses on acidic rocks and acidic soils among shrubs.
Loc: 1-2-12-18-19-20-21.

Tortula israelis Bizot & F. Bilewsky
Soils accumulated on rocks and artificial walls.
Loc: 12-18.

Entosthodon attenuatus (Dicks.) Bryhn
Sandy soils among shrubs.
Loc: 6-10-12-20-21-23-23-24-27-28.

Funaria hygrometrica Hedw.
Burnt, nitrified soils, edges of paths, etc.
Loc: 2-3-4-5-6-8-9-10-11-18-19-20-21-22-24-2 7-28-30.

Grimmiaceae

Grimmia laevigata (Brid.) Brid.
Acidic rocks (schists generally) and accumulated soil on acidic rocks.
Loc: 5-8-9-11-12-13-20-23-31.

Grimmia lisae De Not.
Acidic rocks, occasionally on calcareous rock.
Loc: 5-6-7-12.

Grimmia pulvinata (Hedw.) Sm.
Exposed and sunny acidic or basic rocks.
Loc: 2-3-4-5-13-20-21-24.

Grimmia trichophylla Grev.
Exposed acidic rocks.
Loc: 12-39.

Archidiaceae

Archidium alternifolium (Hedw.) Schimp.
Acidic soils of sandy-loamy texture.
Loc: 24-28-29.

Fissidentaceae

Fissidens algarvicus Solms
Sheltered and wet taluses.
Loc: 12.

Fissidens bryoides Hedw.
Soils in fissures of acidic or basic rocks.
Loc: 1-2-3-4-5-8-9-14-15-20-21-24-27-29.

Fissidens taxifolius Hedw.
Acidic to basic soils in taluses.
Loc: 12-19.

Fissidens viridulus (Sw.) Wahlenb.
Taluses and soils among shrubs.
Loc: 4-6-9-10-15-16-19-20.

Dicranaceae

Campylopus brevipilus Bruch & Schimp.
Soils in fissures and ledges of acidic rocks.
Loc: 28.

Dicranella howei Renauld & Cardot
Acidic and exposed sandy-loamy soils.
Loc: 7-8-9-14-15-16-18-19-21-23-26-27-28-29.

Dicranella varia (Hedw.) Schimp.
Very wet and shady soils at the edges of streams.
Loc: 4-12.

Ditrichaceae

Ceratodon purpureus (Hedw.) Brid.
Accumulated soil on exposed acidic rocks.
Loc: 8-9-10-11-19-23-33.

Cheilothela chloropus (Brid.) Lindb.
Acidic and exposed sandy-loamy soils.
Loc: 5-7-8-14-15-16-18-19-20-21-23-24-25-27-29.

Ditrichum subulatum Hampe
Taluses and soils among shrubs.
Loc: 8-9-10-12-27.

Pleuridium acuminatum Lindb.
Sandy-loamy and sandy soils in taluses or among shrubs.
Loc: 2-3-4-6-7-8-9-12-14-15-16-18-19-20-21-2 2-23-25-30-35.

Rhabdoweisiaceae

Cynodontium bruntonii (Sm.) Bruch and Schimp.
Exposed or slightly sheltered acidic rocks.
Loc: 3-23-36.

Pottiaceae

Acaulon mediterraneum Limpr.
Acidic, bare soils which are dry the greater part of the year.
Loc: 1-4-7-13-23-28.
This taxon is considered by some authors as synonymous with *Acaulon muticum* (Hedw.) Müll. Hal. (e.g. Corley et al. 1981) or as a variety of this species (*A. muticum* var. *mediterraneum* (Limpr.) Sérgio) (e.g. Casas et al. 2001). After studying numerous populations of this taxon from the Mediterranean Region, we believe that it is a good species, characterized by echinate spores and perichaetial leaves with an entire apex, although it is obviously very close to *A. muticum*, with which it might possibly hybridize.

Aloina aloides (Schultz) Kindb.
Loamy, sandy and clayey soils, lightly nitrified, occasionally on limestone rocks.
Loc: 1-2-5-7-8-9-10-11-13-15-18-19-20-23-25-28-29-30-32.

Aschisma carniolicum (F. Weber & D. Mohr) Lindb.
Loamy or sandy-clayey soils, lightly nitrified.
Loc: 1-11-12-23-30.

Loc. nº	Locality name and Province	Altitude (m)	Vegetation	UTM square
1	El Molino, headwaters of Guadiamar river (SE)	300	M-Qs & M-Qr	29SQB4471
2	El Azulejo, headwaters of Guadiamar river (SE)	300	M-Qs & M-Qr	29SQB4469
3	Near Finca la Navarra (SE)	300	M-Qs, M-Qr & P-St	29SQB4069
4	Near El Castillo de las Guardas (SE)	400	M-Qs & P-Au	29SQB3869
5	Las Arenas-El Castillo de las Guardas road (SE)	400	M-Qr	29SQB3971
6	La Sauceda (SE)	430	M-Qs & P-Au	29SQB3972
7	Aznalcóllar. Cerro de la Andrea (SE)	200	S-Qs & M-Qr	29SQB3759
8	Aznalcóllar. Juncalejos (SE)	260	M-Qr	29SQB3660
9	Aznalcóllar. Cerro del Púlpito (SE)	280	M-Qr	29SQB3561
10	Aznalcóllar. Puente del Gago (SE)	330	M-Qr & M-Qs	29SQB3363
11	Sierra de las Piletas. El Álamo (SE)	400	M-Qs & U-Cl	29SQB2868
12	Near El Álamo (SE)	400	M-Qs & U-Cl	29SQB2768
13	Aznalcóllar-Escacena road (SE)	130	S-Qs	29SQB3655
14	Near Villamanrique de la Condesa (SE)	40	M-Qs	29SQB3825
15	Villamanrique. Near El Tinajón (SE)	40	M-Qr	29SQB3726
16	Hinojos. Near Casa Contino (SE)	60	M-Qr	29SQB3627
17	Near Hinojos (HU)	90	M-Qr	29SQB3330
18	Villamanrique. Dehesa del Boyal (SE)	20	M-Qr	29SQB4023
19	Villamanrique. Dehesa del Boyal (SE)	20	M-Qr	29SQB4022
20	Villamanrique. Dehesa del Boyal (SE)	20	M-Qr	29SQB4122
21	Villamanrique. Los Torreones (SE)	30	M-Qs	29SQB4224
22	Aznalcóllar. Near La Cruz Gorda (SE)	160	M-Qs & U-Cl	29SQB4059
23	Aznalcóllar. La Cruz Gorda (SE)	150	M-Qs & U-Cl	29SQB4062
24	Aznalcóllar. Dehesa del Perro (SE)	170	M-Qs & U-Cl	29SQB4058
25	Sanlucar La Mayor. Dehesa de las Coladas (SE)	110	M-Qs & S-Qr	29SQB4557
26	Puebla del Río. Dehesa de Abajo (SE)	30	M-Qr & C-Pa	29SQB5021
27	Aznalcázar. Near La Tiesa (SE)	50	S-Qr & A-Ro	29SQB4529
28	Aznalcázar-La Puebla del Río road (SE)	50	S-Qr & A-Ro	29SQB4631
29	La Puebla del Río. Loma Alta (SE)	50	S-Qr	29SQB5125
30	Aznalcázar. Dehesa de las Hermosillas (SE)	50	S-Qr	29SQB5133
31	Corredor de la Plata. Near Gerena (SE)	80	M-Qr & S-Qr	29SQB4660
32	Gerena. Molino Antón (SE)	110	M-Qr & S-Qr	29SQB4758
33	El Castillo de las Guardas-Nerva road (SE) (SE)	470	P-Qr & S-Qs	29SQB2875
34	El Castillo de las Guardas-Nerva road (SE)	420	P-Qr	29SQB3476
35	Chucena. Near cerro de las Palomas (HU)	100	M-Qs & U-Cl	29SQB2836
36	El Castillo de las Guardas-Nerva. Alto del Frontón (SE)	460	M-Qs & P-Qr	29SQB2975
37	Hinojos. Cerro de los Pinos (HU)	100	S-Qr	29SQB2931
38	Escacena del Campo. Cabezada de Zao (HU-SE)	400	M-Qs	29SQB2961
39	Gerena. Meseta de los Quijos (SE)	205	M-Qs	29SQB4761
40	Hinojos. Arroyo del Algarve (HU)	100	M-Qs	29SQB2834
41	Gerena. Near Guadiamar river (SE)	180	S-Qs & A-Ro	29SQB4659

Table 1. Data of studied localities. M-Qs=Myrto-Quercetum suberis, M-Qr=Myrto-Quercetum rotundifoliae, S-Qs=Sanguisorbo-Quercetum suberis, P-St=Pyro-Securinegeto tinctoriae, U-Cl=Ulicino-Cistetum ladaniferi, C-Pa=Crataego-Populetum albae, A-Ro=Asparago-Rhamnetum oleoides, S-Qr=Smilaci-Quercetum rotundifoliae, P-Au=Phyllireo-Arbutetum unedi. SE = Seville, HU = Huelva.
Tabla 1. Datos relativos a las localidades estudiadas.

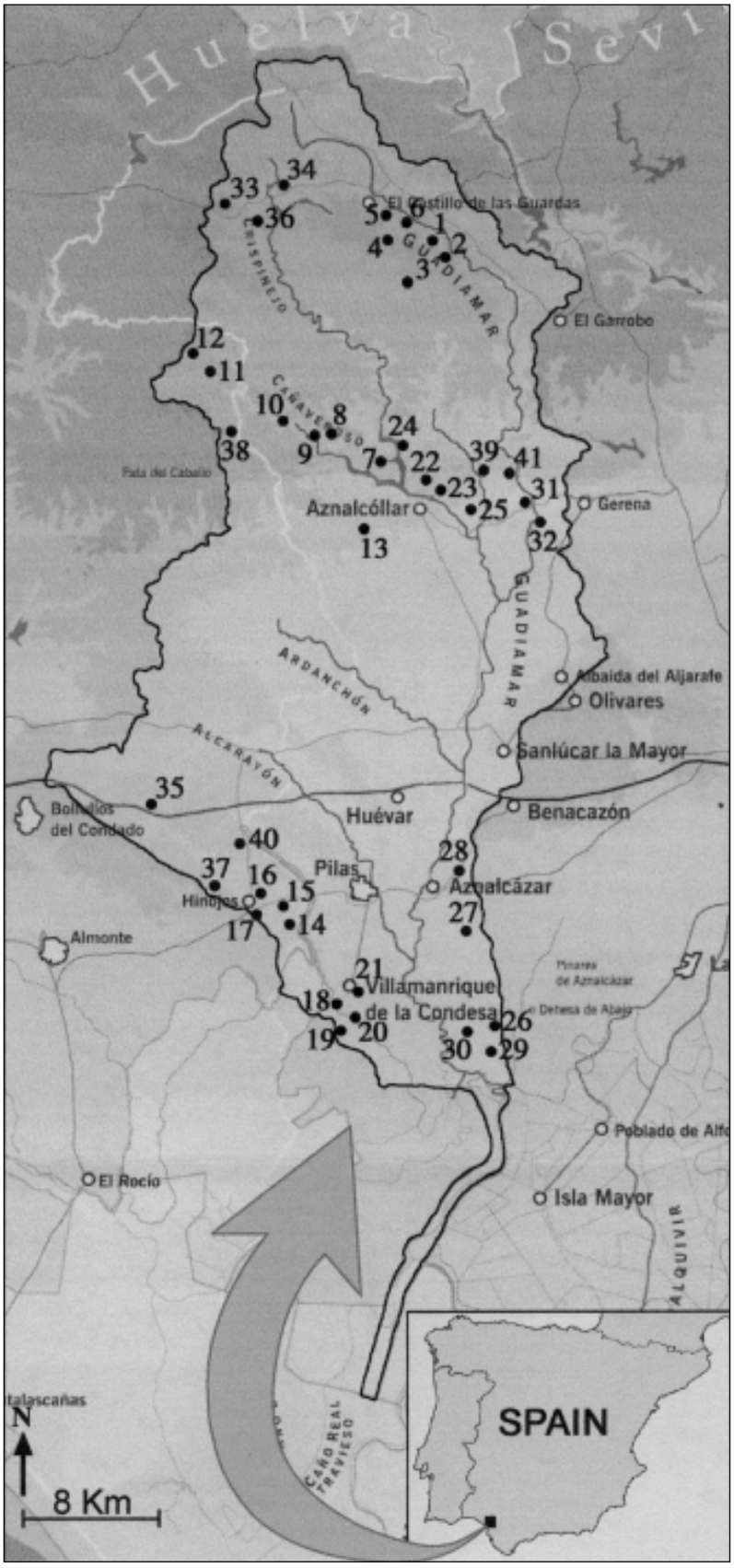

Figure 1. Guadiamar river basin and localization of studied localities.
Figura 1. Cuenca del río Guadiamar y situación de las localidades estudiadas.

The climate is typically Mediterranean, most pronounced in the Guadalquivir valley, but with a more continental influence in Sierra Morena. Two bioclimatic belts can be recognized: the thermo-Mediterranean belt in the plain of the Guadalquivir valley, and extending to 400 m elevation into the Sierra Morena, and the meso-Mediterranean belt that appears over 400 m in high plateaus open to the north and in shady valleys. The low-lying zone of the marshes presents a dry ombrotype (P=500-600 mm), the intermediate zone has a subhumid ombrotype (P=600-700 mm), while in the Sierra Morena, in the upper part of the basin, the predominant ombrotype is subhumid (P=700-900). A humid ombrotype (P=1000 mm) appears in the highest areas of the Aznalcóllar and Escacena mountains.

Vegetation

We will describe the different types of potential vegetation using concept of vegetation series (Rivas-Martínez 1987). According to Cabezudo & Pérez Latorre (2000), in the thermo-Mediterranean belt with a subhumid-dry ombrotype, on acid substrata, a forest of *Quercus rotundifolia* (Myrto-Querceto rotundifoliae S.) develops, although this is frequently transformed into pasture with isolated trees by cattle grazing. On basic substrata, the predominant series consists of *Quercus rotundifolia* forest (Smilaci mauritanici-Querceto rotundifoliae S.). On margins of these forests of *Q. rotundifolia*, a *Rhamnus oleoides* formation (Asparago-Rhamnetum oleoides) appears, which degrades to a *Cistus* sp. formation (Ulici eriocladi-Cistetum ladaniferi). When the ombrotype is subhumid, on acid substrata, *Quercus suber* forest is predominant (Myrto-Querceto suberis S.) with a marginal zone of *Arbutus unedo* and *Pistacia lentiscus* (Phyllireo-Arbutetum unedi pistacietosum) or *Cistus ladanifer* (Ulici-Cistetum ladaniferi) as the substitution stage.

In the meso-Mediterranean belt with a subhumid-dry ombrotype and on acid substrata, the vegetation consists of formations of *Pyrus bourgeana* and *Quercus rotundifolia* (Pyro bourgaeanae-Querceto rotundifoliae S.), which can include cork trees (*Quercus suber*) along humid water-courses and in shady areas. In the same conditions, when the ombrotype becomes subhumid-humid, the vegetation is represented by cork trees (Sanguisorbo-Querceto suberis S.) with a shrubby margin of *Phyllirea angustifolia* (Phyllireo-Arbutetum unedi) and Fabaceae (*Adenocarpus telonensis* (Loisel.) DC., *Cytisus scoparius* (L.) Link). *Erica* sp. and *Cistus* sp. formations (Erico-Cistetum populifolii) or a low scrub of *Erica* (Ulici-Ericetum umbellatae) appears as a first phase in the degradation of this cork woodland.

Edaphic-hygrophilous series consist of *Salix* sp. formations (Saliceto pedicellatae S.) and *Populus* sp. formations (Crataego-Populetum albae S.), which are accompanied by elms (*Ulmus minor* Mill.) and ash-trees (*Fraxinus angustifolia* Vahl). On riverbeds with alluvial deposits, formations of *Securinega tinctoria* develop (Pyro-Securinegeto tinctoriae S.), *Nerium oleander* formations (Rubo-Nerieto oleandri S.) being dominant in the beds of temporary streams.

Methods

For the study of the bryophyte flora, 41 localities (Table 1, Figure 1), were selected to include most of the potential vascular plant formations present in the area. Most of the sampling sites were established along the basin of Guadiamar river and its principal tributaries, since this was the zone affected by the mining accident. The plains are heavily cultivated and, except in some areas, bryophyte communities are not found there.

The catalogue has been arranged in systematic order following Buck and Goffinet (2000) for the mosses and Grolle and Long (2000) for the liverworts and hornworts. The nomenclature of Corley et al. (1981) and Corley & Crundwell (1991) for mosses and Grolle & Long (2000) for liverworts and hornworts has generally been followed. For the authors' names of taxa we have followed Brummitt & Powell (1992). For each taxon the number of the localities (Loc.) where it was found and the habitat or habitats where it was collected are given. Also, in the case of problematic or rare taxa, additional taxonomic and chorological comments are included.

Results

The catalogue comprises 123 taxa, including 93 mosses, 3 hornworts and 27 liverworts. Samples of all the taxa are deposited in the MUB Herbarium (University of Murcia). *Scopelophila cataractae* (Mitt.) Broth. is the second record from the Iberian Peninsula.

BRYOPHYTA (Mosses)

Polytrichaceae

Pogonatum aloides (Hedw.) P. Beauv.
Taluses, occasionally on open soils among *Cistus* sp. and *Erica* sp. formations.
Loc: 9-22-24.

Polytrichum juniperinum Hedw.
Soil on rocks, ledges and taluses.
Loc: 5-7-8-9-12-28.

Funariaceae

Entosthodon fascicularis (Hedw.) Müll. Hal.
Sandy-loamy soils on taluses, edges of paths or open soils among shrubs.
Loc: 3-4-6-18-22-23-24-29-32-40.

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Bryophyte diversity in the Guadiamar river basin (SW of Spain)

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Abstract

A study of the bryophyte flora of the Guadiamar river basin (southwestern Spain) was carried out. Forty-one localities along this river and its main tributaries were sampled. A total of 123 taxa are mentioned, of which 93 are mosses, 27 liverworts and 3 hornworts. *Scopelophila cataractae* (Mitt.) Broth., which grows exclusively on soils rich in heavy metals, is the second record from the Iberian Peninsula.

Key words: Bryophytes, Flora, Guadiamar river, SW Spain.

Resumen

Diversidad briofítica en la cuenca del río Guadiamar (Suroeste de España).

Se realiza un estudio de la flora briofítica de la cuenca del río Guadiamar (sudoeste de España), mediante recolecciones en 41 localidades distribuidas a lo largo de este río y de sus principales afluentes. En conjunto se citan 123 taxones, de los cuales 93 son musgos, 27 hepáticas y 3 antocerotas. *Scopelophila cataractae* (Mitt.) Broth., especie que vive exclusivamente en suelos ricos en metales pesados, se cita por segunda vez en la península Ibérica.

Palabras clave: Briófitos, Flora, Río Guadiamar, SO de España.

Introduction

In 1998, noxious and acidic waters flowed into the Guadiamar river, when a containment dam owned by a mining company in Aznalcóllar (Seville, Spain) broke. This situation generated enormous ecological and socioeconomic concern and the Spanish State and the Junta of Andalusia were forced to undertake a scientific and technical program in an attempt to recover ecological losses and to change the negative image, which people had of mining after the accident. The hope was that the name of the Guadiamar river would be associated with an area where, in spite of the gravity of an ecological disaster, the administration had reacted in time, by undertaking a project of ecological restoration of the local ecosystems.

The objective of this study is to provide an inventory of the bryophyte flora of the Guadiamar river basin, focusing on a low-lying area affected by the disaster (from Aznalcóllar to the South). This inventory will serve as a reference for comparison with future surveys, in order to assess the dynamics and recovery of the bryophytic vegetation. These studies are included in the Research Program of the Corredor Verde de Guadiamar (PICORVE) (cf. Junta de Andalucía 2000).

The physical medium

The Guadiamar river is a tributary of the Guadalquivir river. The basin presents two clearly differentiated zones: in the northern sector the Sierra Morena constitutes the head of the river basin; this area is formed mainly of metamorphic and igneous rocks (micaschiste, granites, diorites, etc.), which impart a marked impermeable character to this sector of the basin. The second area, to the south of the town of Aznalcóllar, is the Guadalquivir valley. This is developed on detrital materials of the Upper Miocene Andaluciense-Tortoniense, which to the South are progressively more recent and permeable, with the occasional presence of loamy elements forming the marshes of the low Guadalquivir.