Cryptogamie, Bryologie, 2018, 39 (2): 177-183

New moss records for the Mediterranean islands

Marta PUGLISI * *& Maria PRIVITERA*

Dipartimento di Scienze Biologiche, Geologiche e Ambientali, Università di Catania, Via A. Longo 19, 95125 Catania, Italy

Abstract – In this paper the moss novelties recorded for some Mediterranean islands are presented: two new records for Sicily (*Ptychostomum cernuum* and *Physcomitrium eurystomum*), one new record for Ischia in the Neapolitan archipelago (*Campylopus brevipilus*), one new record for Crete (*Trichodon cylindricus*) and three new records for Cyprus (*Myurella julacea*, *Syntrichia subpapillosissima* and *Grimmia anodon*). The occurrence of *Schistidium atrofuscum* in Cyprus is confirmed. Notes on habitat, Mediterranean distribution and conservation are provided for each species; some morphological remarks on the Cyprus specimens of *Myurella julacea* and *Syntrichia subpapillosissima* are given too.

Mosses / new records / conservation / Mediterranean islands

INTRODUCTION

The Mediterranean is among the richest regions in the world for wild species. The Mediterranean basin is the second largest biodiversity hotspot on Earth, the largest of the world's five Mediterranean-climate regions and third richest hotspot in terms of its plant diversity (Mittermeier *et al.*, 2005). The Mediterranean Sea contains nearly 5,000 islands and islets; while many of these are quite small, there are also many larger islands such as Sicily, Sardinia, Cyprus and Crete. These islands shelter a high number of species, and represent a real stake for the protection of the Mediterranean biodiversity. On these closed spaces, everything is excessive: touristic pressure, climate change, pollutions, invasive species. Generally, the islands are highly vulnerable ecosystems on which intense environmental fluctuations or human interference, even of a low intensity, can considerably affect the flora and vegetation. For this reason from many years a lot of investigations on the bryophyte flora and vegetation of the Mediterranean islands and islets was carried out, with a particular focus on Sicily and its surrounding islets, which host some of the Europe's rarest bryophytes (eg., Privitera & Puglisi, 1997, 2006, 2009; Dia & Campisi, 2006, 2009; Dia *et al.*, 2003; Puglisi, 2009).

* Corresponding author: mpuglisi@unict.it

doi/10.7872/cryb/v39.iss2.2018.177

MATERIAL AND METHODS

The data here presented refer to new collections from Sicily, Ischia (Neapolitan archipelago) and Crete, performed in the years 2013, 2014 and 2016, as well as to an old collection from Cyprus dating back to 1988. The species were collected from different habitats, some of which very peculiar, such as a cave on the Mt Etna, some fumaroles of Ischia, the highest areas of the Troodos Mountains of Cyprus.

The moss nomenclature and distribution in the Mediterranean follow Ros *et al.* (2013); that of the liverworts follows Söderström *et al.* (2016). The Italian regional distribution is based on Aleffi *et al.* (2008), while the chorotypes and the ecological features are drawn from Hill *et al.* (2007) and Dierβen (2001), respectively. The specimens are kept in the Vegetal Biology Section of the Department of Biological, Geological and Environmental Sciences of University of Catania (CAT).

RESULTS AND DISCUSSION

The occurrence of some remarkable mosses, scarcely known in the Mediterranean region, is here reported. These are: *Ptychostomum cernuum* (Hedw.) Hornsch. and *Physcomitrium eurystomum* Sendtn., new records for Sicily, *Campylopus brevipilus* Bruch &Schimp., found at Ischia and new record for Southern Italy, *Trichodon cylindricus* (Hedw.) Schimp., new record for Crete, *Myurella julacea* (Schwägr.) Schimp., *Syntrichia subpapillosissima* (Bizot & R.B.Pierrot *ex* W.A.Kramer) M.T. Gallego & J.Guerra and *Grimmia anodon* Bruch & Schimp., new records for Cyprus (Fig. 1). For Cyprus the occurrence of *Hypnum cupressiforme* Hedw. var. *resupinatum* (Taylor) Schimp is reported too. Among the species discussed in this paper, *Ptychostomum cernuum* and *Physcomitrium eurystomum*, regarded as threatened in many European Countries, are candidate for the under working new red list of the European bryophytes.

Ptychostomum cernuum (Hedw.) Hornsch.

Sicily, Mt Etna, Grotta del Santo, 1030 m a.s.l., 37° 42’ 31”N 14° 52’ 35” E, on shady, wet soil, 15 October 2013, *M. Frasca*

It is a subneutrophytic, hygrophytic, sciophytic moss growing on sheltered damp soil by streams and ditches. The new report refers to a collection carried out on the Mt Etna within a lava tube with dripping water where the species was found, fruited, together with *Conocephalum conicum* (L.) Dumort., at about 2 meters from the entrance from the cave floor where water collects forming a muddy puddle. *Ptychostomum cernuum* is a Circumpolar Boreal-montane species very rare in the Mediterranean region where it is reported from Italy, Montenegro, Portugal and with old reports from France, Macedonia and Sardinia. In many European countries, it is considered to be a threatened species (Hodgettes, 2015): Regionally Extinct in Great Britain, Netherlands and Switzerland; Critically Endangered in Germany; seriously threatened in Austria; Endangered in Ireland, Czech republic, Slovakia and Romania; Vulnerable in Spain. In Italy it was known only from few alpine regions, such as Piedmont with recent reports, Lombardy and Trentino Alto Adigewith old reports; no report exists from the central and southern regions. *Ptychostomum cernuum* is

Fig. 1. Location of the new findings: ❶ *Ptychostomum cernuum*; ❷ *Physcomitrium eurystomum*; ❸ *Trichodon cylindricus*; ❹ *Myurella julacea*, *Syntrichia subpapillosissima* and *Grimmia anodon*; ❺ *Campylopus brevipilus*.

new for the moss flora of Sicily. In the new finding site, the species was found in the ambit of the Habitat 8320 Fields of lava and natural excavations, according to the EU Habitat Directive 92/43/EC.

Physcomitrium eurystomum Sendtn.

Sicily, Catania, Botanical Garden, 37°30'54,90"N, 15°04'58,33"E, 48 m a.s.l., 5 May 2016, *M. Privitera*

This is a subneutrophytic, hygrophytic, photophytic species preferably colonizing exposed damp soil or mud on the margins of reservoirs with fluctuating water level. In the new site this ephemeralspecies was found, fruited, at the edge of a small pool of rainwater on the ground, together with *Leptobryum pyriforme* (Hedw.) Wilson and *Sphaerocarpos michelii* Bellardi. *Physcomitrium eurystomum* is an Eurasian temperate species, signaled in the Mediterranean only from Bulgaria, France, Italy, Israel, Syria, with old reports from Slovenia and with a single record from Turkey. It is scattered throughout Europe. In some European countries it is considered Endangered (Great Britain, Hungary, Austria) or Vulnerable (Czech Republic, Germany, Slovakia, Switzerland), (Hodgettes, 2015). In Italy *Physcomitrium eurystomum* is reported from Piedmont, Lombardy and Trentino Alto Adige and from Campania region. It is a new record for Sicily.

Trichodon cylindricus (Hedw.) Schimp.

Crete, Fasas Valley, 35°24'38.18"N, 23°52'15.11"E, 350 m a.s.l., 15 September 2016, *S. Brullo*

This species was collected at Crete on damp soil together with *Calypogeia fissa* (L.) Raddi, *Cepaloziella divaricata* (Sm.) Schiffn., *Rhynchostegiella tenella* (Dicks.) Limpr. var. *tenella*, *R. curviseta* (Brid.) Lindb., *Fissidens taxifolius* Hedw. and the fern *Osmunda regalis* L. in the ambit of the bryo-pteridophytic vegetation of the class *Adiantetea capilli-veneris* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952. This finding habitat can be referred to the Habitat 7250 Mediterranean wet inland

cliffs, proposed by Italy for the inclusion in the Annex I of the EU Habitat Directive. Ecologically it is an acidophytic-subneutrophytic, meso-hygrophytic, photo-sciophytic species, colonizing disturbed soil in fields, sandy banks, by roadsides and on shallow soil beneath cliffs. *Trichodon cylindricus* is a Circumpolar wide-temperate species quite diffused in the Mediterranean region, including the Canary Islands, as well as Corsica and Sicily. This is the first report of the species from Crete.

Myurella julacea (Schwägr.) Schimp.

Cyprus, Caledonia waterfalls, 34°54'10"N, 32°52'10"E, 1370 m, 6 October 1988, *S. Brullo*

This species was found at Cyprus, growing on moist soil in scattered shoots among other bryophytes, such as *Syntrichia montana* Nees var. *montana*, *Nogopterium gracile* (Hedw.) Crosby & W.R. Buck, *Hypnum cupressiforme* var. *resupinatum*, the last one here reported for the first time from Cyprus. The specimens from Cyprus of *H. cupressiforme* var. *resupinatum* are slender and characterized by ovate-lanceolate leaves that are homomallous, ± straight, pointing obliquely upwards, the branch leaves with usually entire margins.

Myurella julacea differs from the other European species of *Myurella* in the closely imbricate leaves, scarcely altered when dry and moist, leaf margins denticulate to spinose denticulate below, especially at base, leaf apex with or without short straight apiculus. The specimens collected at Cyprus are characterized by very concave leaves with denticulate margins, obtuse, sometimes shortly apiculate; costa faint and double, very indistinct, or lacking; leaf median cells with papillae strongly projecting on the dorsal face, each cell with one high papilla in the distal end. For the features of the leaf papillae the specimens of Cyprus approach to *Myurella tenerrima* (Brid.) Lindb. from which they however mostly differ for the absence in the leaves of a reflexed apiculus and the margins crenulate above.

Myurella julacea is a subneutrophytic-basiphytic, mesophytic, photo-sciophytic species growing on shaded, damp soil among rocks, in rock crevices or on cliffs, often in calcareous areas, although it is not restricted to basic substratum. It is a Circumpolar Boreo-arctic montane species not common in the Mediterranean region. It is a new record for Cyprus.

Syntrichia subpapillosissima (Bizot & R.B.Pierrot *ex* W.A.Kramer) M.T.Gallego & J.Guerra

Cyprus, Mt Chionistra (Olympos), 34°56'17"N, 32°51'56"E, 1860 m a.s.l., 7 October 1988, *S. Brullo*

Syntrichia subpapillosissima was collected on Mt Chionistra, which is the highest peak of the Troodos mountain range; this mountain range is an ophiolite, considered the most complete and best-studied ophiolite in the world. For the geological heritage of international significance in 2015 Troodos Geopark was included in the UNESCO Global Geopark Network. *Syntrichia subpapillosissima* was found, in the ambit of the *Juniperus foetidissima* Willd. and *Pinus nigra* J.F.Arnold subsp. *pallasiana* (Lamb.) Holmboe woods referred to the priority Habitat 9560* Endemic forest with *Juniperus* spp. In the finding site itgrew on dry, exposed plutonic rocks, together with *Orthotrichum cupulatum* Hoffm. *ex* Brid.var. *cupulatum* and *Tortella tortuosa* (Hedw.) Limpr. var. *tortuosa*; these rocks are typical ofthe highest parts of Mt Chionistra. The specimens collected at Cyprus are characterized by upper and middle laminal cells with 2-(3) pedicellate, bifurcate papillae per cell, 8–10 µm long; leaf apex mostly acuminate, more rarely rounded, sometimes dentate and hyaline, tapering into hair point; hair point 2,5-3 mm long, strongly spinose, brown-reddish in the lower third. *Syntrichia subpapillosissima* can be confused with

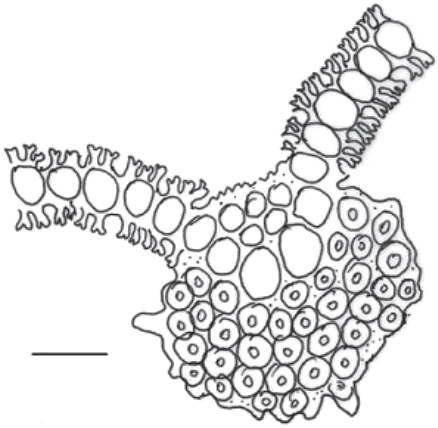

Fig. 2. *Syntrichia subpapillosissima*: leaf transverse section. Scale bar = 30 μm.

S. papillosissima (Copp.) Loeske but the middle laminal cells with more than 1 papilla, bifurcate, rarely with stellate branching at the apex, are distinctive (Fig. 2). Moreover, it can be easily distinguished from *Syntrichia ruralis* (Hedw.) F.Weber & D. Mohr var. *ruraliformis* (Besch.) Delogne for the occurrence of pedicellate leaf papillae. *Syntrichia subpapillosissima* is known to date in the Mediterranean region from some countries (Spain, Andorra, Balearic Islands, Portugal, France, Crete, Croatia, Macedonia, Morocco, Algeria and Turkey) but it is likely to be more spread. Revision of herbarium specimens of *Syntrichia ruralis* complex could highlight new localities.

Grimmia anodon Bruch & Schimp.

Cyprus, Mt Chionistra (Olympos), 34°56'18"N, 32°51'56"E, 1855 m a.s.l., 7 October 1988, *S. Brullo*

Grimmia anodon is a subneutrophytic, xerophytic, photophytic moss, growing on exposed limestone, tuff or schist, occasionally on walls. At Cyprus it was found, fruited, on dry and exposed bare rocks in proximity to the finding site of *Syntrichia subpapillosissima*; here it was mixed to *Schistidium atrofuscum* (Schimp.) Limpr., whose occurrence in Cyprus is confirmed. The specimens of *Schistidium atrofuscum* collected at Cyprus are characterized by the perichaetial leaves wholly covering the capsule, the short, ± rudimentary peristome teeth, most leaves lacking hair point; these characters allow to distinguish this species from *Schistidium helveticum* (Schkuhr) Deguchi, also already known from Cyprus. *Grimmia anodon* is a Circumpolar Wide-temperate species, diffused in the Mediterranean region andhere reported for the first time from Cyprus.

Campylopus brevipilus Bruch & Schimp.

Italy, Campania, Ischia, Mt Rotaro, 205 m a.s.l., 40°44'24"N, 13°55'25"E, 14 April 2014, *S. Pennisi*

It is an acidophytic, hygrophytic-m xerophytic, photophytic, thermophytic species, growing on wet blanket bogs, heatlands and on peaty lake-margins, in periodically waterlogged depressions, sometimes on dry gritty and sandy soil. It was collected at Mt Rotaro near a fumarole mouth together with *Tortella squarrosa* (Brid.) Limpr.. and *Dicranella heteromalla* (Hedw.) Schimp. This is a very peculiar

habitat referred to the EU Habitat Directive with the code 8320, Fields of lava and natural excavations.This temperate-oceanic species is not common in the Mediterranean countries. Up to now, in Italy *Campylopus brevipilus* was known with old reports from some northern regions and with few recent reports from Tuscany, Umbria, Sardinia and Sicily. This reportt represents a new record for the moss flora of southern Italy.

The new records here discussed represent a floristic contribution that goes beyond mere finding report since they refer to rare or very rare species collected in peculiar habitats of conservation interest, such as some Natural Habitats listed in Annex 1 of the EU Habitats Directive. Among these species, *Syntrichia subpapillosissima* and *Myurella julacea* were discovered at Cyprus, on the Troodos in the Endemic forests with Juniperus spp. (code 9560*), constitute a priority habitat for conservation. *Campylopus brevipilus* and *Ptychostomum cernuum* were found in the Habitat 8320 corresponding to Fields of lava and natural excavations. The former was found near the mouth of fumaroles in tropical environmental conditions, and the latter in a lave tube of the Mt Etna under low light conditions. Despite the fact that bryophytes are hardly ever mentioned as characteristic for some of the European habitats (Gigante *et al.*, 2016), they contribute to the characterization and biodiversity of these habitats, substantially so in cases like the Habitat 8320. Moreover, the presence of *Physcomitrium eurystomum* and *Ptychostomum cernuum* is of high conservation value since they are considered at high risk of extinction in many European Countries, and are candidates for the under working new red list of the European bryophytes.

Acknowledgements. Thanks are due to Salvatore Brullo (University of Catania) for the moss collection from Cyprus and his valuable suggestions. Thanks are also to the reviewers for their helpful comments.

REFERENCES

ALEFFI M., TACCHI R. & CORTINI PEDROTTI C., 2008 — Checklist of the Hornworts, Liverworts and Mosses of Italy. *Bocconea* 22: 1-255.

DIA M.G. & CAMPISI P., 2006 — First record of *Pseudocrossidium obtusulum* (Lindb.) H.A. Crum & L.E. Anderson (Pottiaceae, Musci) in Italy. *Nova Hedwigia* 82 (1-2): 205-208.

DIA M.G. & CAMPISI P., 2009 — New or interesting records to the moss flora of Italy. *Cryptogamie, Bryologie* 30 (1): 199-201.

DIA M.G., PRIVITERA M. & PUGLISI M., 2003 — New reports of *Pseudocrossidium replicatum* (*Pottiaceae*, *Musci*) from Sicily. *Flora Mediterranea* 13: 297-301.

DIERβEN K., 2001 — Distribution, ecological amplitude and phytosociological chracterization of European bryophytes. *Bryophytorum bibliotheca* 56: 1-289.

GIGANTE D., ATTORRE F., VENANZONI R., ACOSTA A.T.R., AGRILLO E., ALEFFI M., ALESSI N., ALLEGREZZA M., ANGELINI P., ANGIOLINI C., ASSINI S., AZZELLA M.M., BAGELLA S., BIONDI E., BOLPAGNI R., BONAR G., BRACCO F., BRULLO S., BUFFA G., CARLI E., CARUSO G., CASAVECCHIA S., CASELLA L., CERABOLINI B.E.L., CIASCHETTI G., COPIZ R., CUTINI M., DEL VECCHIO S., DEL VICO E., DI MARTINO L., FACIONI L., FANELLI G., FOGGI B., FRATTAROLI A.R., GALDENZI D., GANGALE C., GASPARRI R., GENOVESI P., GIANGUZZI L., GIRONI F., GIUSSO DEL GALDO G., GUALMINI M., GUARINO R., LASEN C., LASTRUCCI L., MANELI F., PASTA S., PAURA B., PERRINO E.V., PETRAGLIA A., PIRONE G., POPONESSI S., PRISCO I., PUGLISI M., RAVERA S., SBURLINO G., SCIANDRELLO S., SELVAGGI A., SPADA F., SPAMPINATO G., STRUMIA S., TOMASELLI M., TOMASELLI V., UZUNOV D., VICIANI D., VILLANI M., WAGENSOMMER R.P. & ZITTI S., 2016 — A methodological protocol for Annex I Habitats monitoring: the contribution of Vegetation science. *Plant sociology* 53 (2): 77-87.

HILL M.O., PRESTON C.D., BOSANQUET S.D.S. & ROY D.B., 2007 — *BRYOATT: Attributes of British and Irish Mosses, Liverworts and Hornworts*. Cambridge, Centre for Ecology and Hydrology, 88 p.

HODGETTS N.G., 2015 — *Checklist and country status of European bryophytes towards a new Red List for Europe.* Irish Wildlife Manuals, No. 84. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.

MITTERMEIER R.A., GIL P.R., HOFFMANN M., PILGRIM J., BROOKS T., MITTERMEIER C.G., LAMOREUX J. & DA FONSECA G.A.B., 2005 — *Hotspots Revisited: Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions*. University of Chicago, Press for Conservation International, 392 p.

PRIVITERA M. & PUGLISI M., 1997 — *Riella notarisii* (Mont.) Mont. (*Hepaticae*, *Riellaceae*), rediscovered in Italy. *Flora Mediterranea* 7: 149-152.

PRIVITERA M. & PUGLISI M., 2006 — On the occurrence of some interesting mosses on Linosa (Pelagian archipelago, Sicily). *Flora Mediterranea* 16: 5-9.

PRIVITERA M. & PUGLISI M., 2009 — The circum-Sicilian islands as important refuge areas for some remarkable bryophytes. *Plant biosystems* 143 (S1): 126-135.

PUGLISI M., 2009 — New interesting records to the moss flora of Sicily (Italy). *Cryptogamie, Bryologie* 30 (3): 395-398.

ROS R.M., MAZIMPAKA V., ABOU-SALAMA U., ALEFFI M., BLOCKEEL T.L., BRUGUÉS M., CROS R.M., DIA M.G., DIRKSE G.M., DRAPER I., EL-SAADAWI W., ERDAĞ A., GANEVA A., GABRIEL R., GONZÁLEZ-MANCEBO J.M., GRANGER C., HERRNSTADT I., HUGONNOT V., KHALIL K., KÜRSCHNER H., LOSADA-LIMA A., LUÍS L., MIFSUD S., PRIVITERA M., PUGLISI M., SABOVLJEVIĆ M., SÉRGIO C., SHABBARA H.M., SIM-SIM M., SOTIAUX A., TACCHI R., VANDERPOORTEN A., WERNER O., 2013 — Mosses of the Mediterranean, an annotated checklist. *Cryptogamie, Bryologie* 34 (2): 99-283.

SÖDERSTRÖM L., HAGBORG A., VON KONRAT M., BARTHOLOMEW-BEGAN S., BELL D., BRISCOE L., BROWN E., CARGILL D.C., COSTA D.P., CRANDALL-STOTLER B.J., COOPER E. D., DAUPHIN G., ENGEL J.J., FELDBERG K., GLENNY D., GRADSTEIN S. R., HE X., HEINRICHS J., HENTSCHEL J., ILKIU-BORGES A.L., KATAGIRI T., KONSTANTINOVA N.A., LARRAÍN J., LONG D.G., NEBEL M., PÓCS T., PUCHE F., REINER-DREHWALD E., RENNER M.A.M., SASS-GYARMATI A., SCHÄFER-VERWIMP A., SEGARRAMORAGUES J.G., STOTLER R.E., SUKKHARAK P., THIERS B.M., URIBE J., VÁŇA J., VILLARREAL J.C., WIGGINTON M., ZHANG L. & ZHU R.-L., 2016 — World checklist of hornworts and liverworts. *PhytoKeys* 59:1-828.