

## A REVIEW OF THE DISTRIBUTION OF THE *MYCOMICROTHELIA* KEISSL. 1936 GENUS IN ROMANIA

VICOL Ioana

**Abstract.** Recent data on the *Mycomicrothelia* genus chorology have not been reported for Romania. The information found in literature revealed a low distribution of the *Mycomicrothelia* genus on Romanian territory. Atmospheric pollution could be a cause of the lack of species belonging to the *Mycomicrothelia* genus within forests from Romania. In this paper, the worldwide and national chorological data, substrate, taxonomy and cenotaxonomy of *Mycomicrothelia* genus are presented. As the main conclusion, the *Mycomicrothelia* genus has not been identified on an extended area from Romania.

**Keywords:** *Mycomicrothelia* genus, chorology, Romania.

**Rezumat. O recenzie a distribuției genului *Mycomicrothelia* 1936 în România.** Date recente asupra corologiei genului *Mycomicrothelia* nu au fost semnalate în România. Informațiile găsite în literatura de specialitate au evidențiat o distribuție redusă a genului *Mycomicrothelia* pe teritoriul României. Poluarea atmosferică ar constitui o cauză a absenței speciilor din genul *Mycomicrothelia* în pădurile din România. În acest articol sunt prezentate date corologice la nivel național și internațional, tipul de substrat, cenotaxonomia și taxonomia genului *Mycomicrothelia*. În concluzie, genul *Mycomicrothelia* nu a fost identificat pe o arie cât mai extinsă a teritoriului României.

**Cuvinte cheie:** genul *Mycomicrothelia*, corologie, România.

### INTRODUCTION

The species from *Mycomicrothelia* Keissl. 1936 genus are widely distributed at the worldwide level (APTROOT et al., 2007; APTROOT, 2009; LÜCKING et al., 2011; CÁCERES et al., 2014; XAVIER-LEITE et al., 2015; BUNGARTZ et al., 2012; KINALIOĞLU, 2009).

Ancient forests represent refugia for epiphytic lichen species (MALÍČEK & PALICE, 2013). Nowadays, worldwide, native forests are threatened by changing their structure (PALTTO et al., 2011; BRUNIALTI et al., 2012).

The oldest information about the distribution of the *Mycomicrothelia* genus in Romania dates back to 1884 (HASZLINSZKY 1884 cited by MORUZI et al., 1967). The lichen species from *Mycomicrothelia* genus were identified in mountainous and hilly areas. The habitats where the lichen species from the *Mycomicrothelia* genus were found are the forests (BURLACU et al. 1969; CIURCHEA, 2004) and the arboretum (CIURCHEA & SZABÓ, 1966; CIURCHEA, 1972; CIURCHEA, 2004).

In addition are known other species widespread on the European (GIORDANI & INCERTI, 2008), American (CÁCERES et al., 2014; XAVIER-LEITE et al., 2015), Asia (URBANAVICHUS & ISMAILOV, 2013) and Australian (APTROOT, 2009) continents. Also, worldwide data about *Mycomicrothelia* genus are reported as follow: *Mycomicrothelia atlantica* D. Hawksw. & Coppins: Azorean Archipelago (BERGER & PRIEMETZHOFFER, 2008); Republic of Dagestan (URBANAVICHUS & ISMAILOV, 2013); *Mycomicrothelia confluens* (Müll. Arg.) D. Hawksw.: Island of Reunion in the Indian Ocean (van den BOOM et al., 2011); *Mycomicrothelia confusa* D. Hawksw.: Boulogne District, Northern France (SÉRUSIAUX et al., 2003); Liguria, Italy (GIORDANI & INCERTI, 2008); *Mycomicrothelia conothele* (Nyl.) Hawksw.: West Midnapore District, West Bengal, India (SEN, 2014); *Mycomicrothelia conothelena* (Nyl.) D. Hawksw.: Sri Lanka (WEERAKOON & APTROOT, 2014); Simlipal, Mayurbhanj, Odisha, India (Nayak et al., 2016); *Mycomicrothelia exigua* (Müll. Arg.) D. Hawksw.: North Western Ghats, India (PANDIT, 2015); *Mycomicrothelia fumosula* (Zahlbr.) D. Hawksw.: Uthai Thani, Khao Nang Rum, Thailand (APTROOT et al., 2007); *Mycomicrothelia hemisphaerica* (Müll. Arg.) D. Hawksw.: Uthai Thani, Khao Nang Rum, Thailand (APTROOT et al., 2007); Osa Peninsula, Costa Rica (BREUSS, 2008); North Western Ghats, India (PANDIT, 2015); *Mycomicrothelia lateralis* Sipman: Paluma Village, Queensland, Australia (APTROOT, 2009); *Mycomicrothelia megaspora* Aptroot & M. Cáceres: Brasil (CÁCERES et al., 2014; XAVIER-LEITE et al., 2015); *Mycomicrothelia miculiformis* (Nyl. ex Müll. Arg.) D. Hawksw.: Petchabhun, Nam Nao N.P., Thailand (APTROOT et al., 2007); Berry Springs Nature Park, Australia (APTROOT, 2009); *Mycomicrothelia minutissima* (C. Knight) D. Hawksw.: New Zealand (de LANGE et al., 2018); *Mycomicrothelia minutula* (Zahlbr.) D. Hawksw.: Cascades, South Hobart, Tasmania (APTROOT, 2009); *Mycomicrothelia modesta* (Müll. Arg.) D. Hawksw.: Fakahatchee Strand Preserve State Park, Florida (LÜCKING et al., 2011); *Mycomicrothelia obovata* (Müll. Arg.) D. Hawksw.: North Western Ghats, India (PANDIT, 2015); *Mycomicrothelia oleosa* Aptroot: Bosque Esquinas and La Gamba, Costa Rica (BREUSS, 2008); Brasil (CÁCERES et al., 2014; XAVIER-LEITE et al., 2015); *Mycomicrothelia queenslandica* (Müll. Arg.) Sipman: Balt's Spur, Tasman Peninsula (APTROOT, 2009); *Mycomicrothelia pachnea* (Körb.) D. Hawksw.: virgin forest reserve Rajhenavski Rog, Slovenia (BILOVITZ et al., 2011); *Mycomicrothelia subfallens* (Müll. Arg.) D. Hawksw.: Chiang Mai, Doi Inthanon N.P., Mae Cham road (APTROOT et al., 2007); Black Jungle (Northern Territory), Garners Beach (Queensland), Lankelly Ck, Australia (APTROOT, 2009); Fakahatchee Strand

Preserve State Park, Florida (LÜCKING et al., 2011); Brasil (CÁCERES et al., 2014; XAVIER-LEITE et al., 2015); Floreana and Santiago, Galapagos (BUNGARTZ et al., 2012); *Mycomicrothelia thelena* (Ach.) D. Hawksw.: Floreana and San Cristóbal, Galapagos (BUNGARTZ et al., 2012); Bio-Bio Region, Chile (PEREIRA et al. 2016); *Mycomicrothelia wallrothii* (Hepp.) D. Hawksw.: central, eastern, and southern forest districts, Estonia (LÖHMUS et al., 2006). *Mycomicrothelia willeyana* (Müll. Arg.) D. Hawksw.: Fakahatchee Strand Preserve State Park, Florida (LÜCKING et al., 2011); Čepkeliai state nature reserve, southern Lithuania (MOTIEJŪNAITĖ, 2015).

Most of the mentioned lichen species were found in protected areas *i.e.* *M. oleosa* (CÁCERES et al., 2014), *M. walrothii* (MOTIEJŪNAITĖ, 2015), Amazonian remnant forests *i.e.* *M. megaspora* and *M. subfallens* (XAVIER-LEITE et al., 2015) and within sites with socio-cultural importance, for instance *M. conothele* (SEN, 2014). *Mycomicrothelia melanospora* unlike *M. wallrothii* has not been identified in the reviewed papers therefore it seems to have a restricted distribution (CIURCHEA, 2004). A few lichen species from *Mycomicrothelia* genus are somehow widely distributed such as: *M. hemisphaerica* (APTROOT et al., 2007; BREUSS, 2008; PANDIT, 2015), *M. subfallens* (APTROOT et al., 2007; APTROOT, 2009; LÜCKING et al., 2011; BUNGARTZ et al., 2012; CÁCERES et al., 2014; XAVIER-LEITE et al., 2015; PEREIRA et al. 2016).

The aim of this study consists in the mapping of the *Mycomicrothelia* genus in Romania. The objective of the study is based on the characterization of the *Mycomicrothelia* genus with its substrata, habitat type, cenotaxonomy, taxonomy and worldwide distribution point of view.

## MATERIALS AND METHODS

Information about chorology of the *Mycomicrothelia* genus in Romania were obtained from literature (CIURCHEA, 2004). The nomenclature of lichen species, taxonomy and cenotaxonomy is according to CIURCHEA, 2004. Specimens from the Collection of the Babeş-Bolyai University Herbarium (Cluj-Napoca, Cluj County) are abbreviated as H.U.C. Also, collections of the Mycological Herbarium from Bucharest (BUCM) were consulted to find out the studied specimens.

## RESULTS AND DISCUSSIONS

In Romania, the *Mycomicrothelia* genus is represented by two species, as follows: *Mycomicrothelia melanospora* (Hepp.) D. Hawksw. and *Mycomicrothelia walrothii* (Hepp.) D. Hawksw. (CIURCHEA, 2004). In literature, the chorology of the *Mycomicrothelia* genus in Romania is less known (CIURCHEA, 2004).

### 1) *Mycomicrothelia melanospora* (Hepp.) D. Hawksw. (Fig. 1)

Bistrița-Năsăud County: Arcalia Scientific Center Park (CIURCHEA & SZABÓ, 1966; CIURCHEA, 1972; CIURCHEA, 2004; H.U.C. nr. 550693); Botoșani County: Moldavian Plateau, at Gorovei (CIURCHEA, 2004); Caraș-Severin County: Banat Mountains, Danube Defile at Cozla and Coronini (BURLACU et al. 1969; CIURCHEA, 2004).

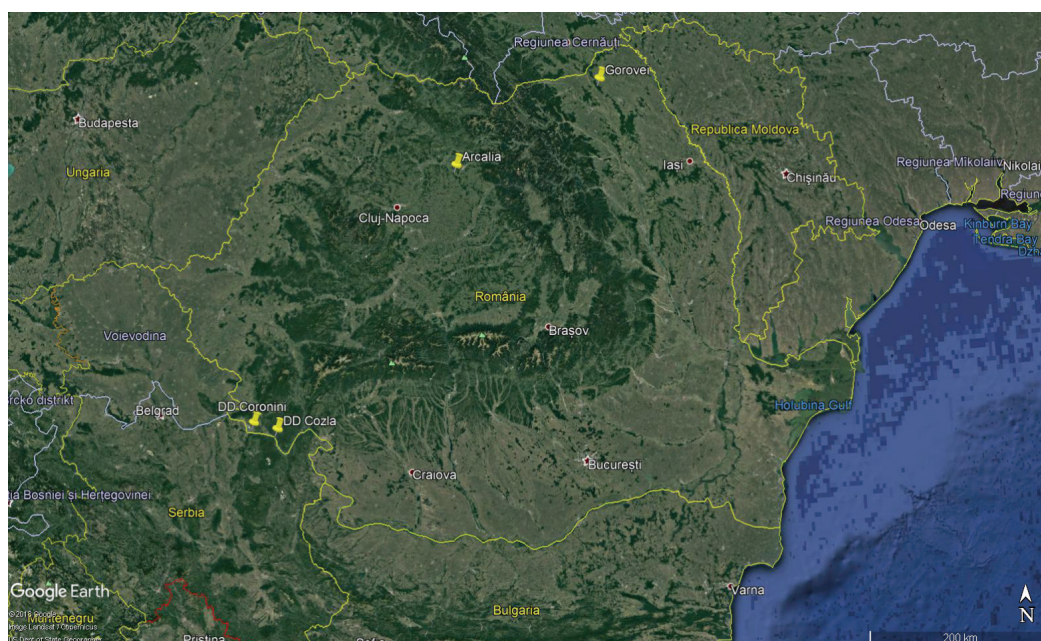


Figure 1. The spatial distribution of *Mycomicrothelia melanospora* in Romania (Source: Google Earth Pro V 7.3.2.5776. (December 14, 2015). Romania. 45° 52' 22.05"N, 26° 08' 58.69"E, Eye alt 1141.41 km. SIO, NOAA, U.S. Navy, NGA, GEBCO. US Dept of State Geographer. Landsat/Copernicus 2018. <http://www.earth.google.com> [February 11, 2019].

2) *Mycomicrothelia walrothii* (Hepp.) D. Hawksw. (Fig. 2)

Hunedoara County: Retezat Mountains (CRETZOIU, 1941; MORUZI et al., 1967; CIURCHEA, 2004).

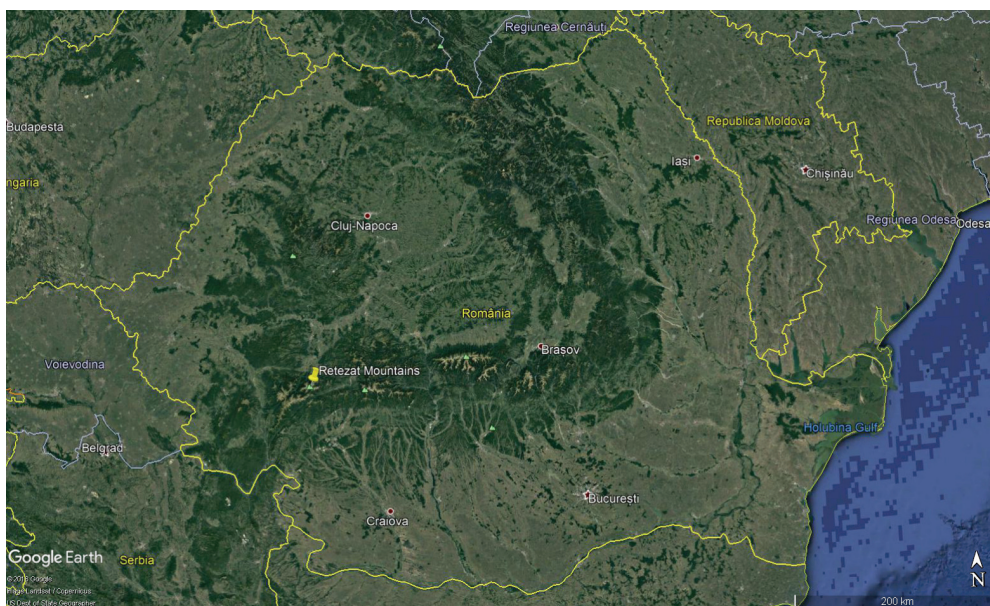


Figure 2. The spatial distribution of *Mycomicrothelia walrothii* in Romania (Source: Google Earth Pro V 7.3.2.5776. (December 14, 2015). Romania. 45° 52' 22.05"N, 26° 08' 58.69"E, Eye alt 1141.41 km. SIO, NOAA, U.S. Navy, NGA, GEBCO. US Dept of State Geographer. Landsat/Copernicus 2018. <http://www.earth.google.com> [February 11, 2019].

The Romanian Red List does not present any data regarding the conservation status of the species belonging to the *Mycomicrothelia* genus (SÂRBU et al., 2007; ARDELEAN et al., 2013). The low distribution of *Mycomicrothelia* in Romania could be attributed to atmospheric pollution, destruction and fragmentation of natural habitats. The studied species grew up on corticolous substrata, especially on conifers, the smooth bark of *Betula* (birch) and other deciduous trees (Table 1). The two lichen species of the *Mycomicrothelia* genus belong to the *Xanthorion* and *Graphidion* communities. Thus, these lichen species prefer both nitrophilous and acidophilous bark (CIURCHEA, 2004).

Table 1. The substrata colonized by species of the *Mycomicrothelia* genus (CIURCHEA, 2004).

| Species                            | Substrata   |
|------------------------------------|---|
| <i>Mycomicrothelia melanospora</i> | Smooth bark of deciduous arbuscles<br><i>Picea abies</i> (L.) H. Karst.<br>Coniferous trees<br><i>Acer negundo</i> L.<br><i>Acer campestre</i> L.<br><i>Fraxinus ornus</i> L. |
| <i>Mycomicrothelia walrothii</i>   | On birch trunks   |

The sociology of the studied genus is represented by the following cenotaxons: *Arthonio-Lecidelletea elaeochromae* Drehwald 1993 including *Graphidetalia scriptae* Hadač 1944, *Graphidion scriptae* Ochsner 1928, and *Pyrenuletum nitidae* Hil 1925 on the one hand and *Physcietea* Tomaselli et De Micheli 1957 that include *Physcietalia adscendentis* Hadač 1944 em Barkm. 1958, *Xanthorion parietinae* Ochsner 1928 and *Physcietum adscendentis* Frey et Ochsner 1926 (Table 2). The taxonomy of the *Mycomicrothelia* genus is presented in Table 3.

Table 2. The cenotaxonomy of the studied lichen species (CIURCHEA, 2004).

| Species                            | Class   | Order   | Alliance   | Association  |
|------------------------------------|---|---|--|--|
| <i>Mycomicrothelia melanospora</i> | <i>Physcietea</i><br>Tomaselli et De<br>Micheli 1957                            | <i>Physcietalia</i><br><i>adscendentis</i> Hadač<br>1944 em Barkm. 1958 | <i>Xanthorion</i><br><i>parietinae</i><br>Ochsner 1928 | <i>Physcietum</i><br><i>adscendentis</i> Frey et<br>Ochsner 1926 |
|                                    | <i>Arthonio-</i><br><i>Lecidelletea</i><br><i>elaeochromae</i><br>Drehwald 1993 | <i>Graphidetalia</i><br><i>scriptae</i><br>Hadač 1944                   | <i>Graphidion</i><br><i>scriptae</i><br>Ochsner 1928   | <i>Pyrenuletum</i><br><i>nitidae</i><br>Hil 1925                 |
| <i>Mycomicrothelia walrothii</i>   | N/A   | N/A   | N/A  | N/A  |

Legend: N/A data are not available



Table 3. The taxonomy of studied lichen species (www.speciesfungorum.org).

| Species                            | Kingdom          | Division           | Class                       | Order                            | Family                                  |
|------------------------------------|------------------|--------------------|-----------------------------|----------------------------------|---|
| <i>Mycomicrothelia melanospora</i> | Fungi R.         | Ascomycota         | Dothideomycetes O.          | Pleosporales                     |   |
| <i>Mycomicrothelia walrothii</i>   | T. Moore<br>1980 | Caval. Sm.<br>1998 | E. Erikss. et Winka<br>1997 | Luttr. ex<br>M.E. Barr<br>(1987) | Arthopyreniaceae Walt.<br>Watson (1929) |

## CONCLUSIONS

In Romania, the *Mycomicrothelia* genus is rather poorly represented; therefore, further field studies are needed to reveal new localities where these lichen species could be distributed.

## ACKNOWLEDGEMENTS

The work was performed within the project no. RO1567-IBB03/2019, funded by the Romanian Academy.

## REFERENCES

- APTROOT A. 2009. Additional lichen records from Australia 70. Species of *Anisomeridium* and *Mycomicrothelia*, with a note on *Arthopyrenia*. *Australian Lichenology*. University Melbourne Press. **64**: 22-25.
- APTROOT A., SAIPUNKAEW W., SIPMAN H.J.M., SPARRIUS L.B., WOLSELEY P.A. 2007. New lichens from Thailand, mainly microlichens from Chiang Mai. *Fungal Diversity*. Springer. Amsterdam. **24**: 75-134.
- ARDELEAN IOANA-VIOLETA, KELLER CRISTINA, SCHEIDEGGER C. 2013. Lichen flora of Rodnei Mountains National Park (Eastern Carpathians, Romania) including new records for the Romanian mycoflora. *Folia Cryptogamica Estonica*. University of Tartu Press. **50**: 101-115.
- BERGER F. & PRIEMETZHOFFER F. 2008. New or interesting records of lichens and lichenicolous fungi from the Azores. *Herzogia*. BioOne Press. Praga. **21**: 125-146.
- BILOVITZ P. O., BATIČ F., MAYRHOFER H. 2011. Epiphytic lichen mycota of the virgin forest reserve Rajhenavski Rog (Slovenia). *Herzogia*. BioOne Press. Budapest. **24**(2): 315-324.
- BREUSS O. 2008. The lichens of the Golfo Dulce region. Liqueños de la región de Golfo Dulce. *Stapfia*. Academic Publisher. Berlin. **88**: 193-208.
- BRUNIALTI G., FRATI L., LOPPI S. 2012. Fragmentation of Mediterranean oak forests affects the diversity of epiphytic lichens. *Nova Hedwigia*. Academic Publisher. Stuttgart. **96**(1-2): 265-278.
- BUNGARTZ, F., ZIEMMECK, F., YÁNEZ AYABACA, A., NUGRA, F., APTROOT, A. (2012). CDF Checklist of Galapagos Lichenized Fungi - FCD Lista de especies de Hongos liquenizados Galápagos. In: BUNGARTZ, F., HERRERA, H., JARAMILLO, P., TIRADO, N., JIMÉNEZ-UZCÁTEGUI, G., RUIZ, D., GUÉZOU, A., ZIEMMECK, F. (eds.). Charles Darwin Foundation Galapagos Species Checklist - *Lista de Especies de Galápagos de la Fundación Charles Darwin*. Charles Darwin Foundation / Fundación Charles Darwin, Puerto Ayora, Galapagos: <http://checklists.datazone.darwinfoundation.org/true-fungi/lichens/> Last updated: 18 Nov 2012.
- BURLACU L., CIURCHEA M., CODOREANU V. 1969. Contribuții la cunoașterea florei și vegetației lichenologice arboricole din pădurile dintre Cozla și Pescari (Jud. Caraș-Severin). *Analele Științifice ale Universității "Al. I. Cuza" din Iași. Secțiunea II Biologie*. Edit. Universitaria. Iași. **15**(2): 357-367.
- CÁCERES MARCELA EUGENIA DA SILVA, NASCIMENTO L.E.L., APTROOT A., LÜCKING R. 2014. Liqueños brasileiros: novas descobertas evidenciam a riqueza no Norte e Nordeste do país. *Boletim do Museu de Biologia Mello Leitão (Nova Série)*. Torino. **35**: 101-119.
- CIURCHEA MARIA. 2004. Determinatorul lichenilor din România. Edit. Bit. Iași. 488 pp.
- CIURCHEA M. & SZABÓ A.T. 1966. Licheni corticoli din Parcul Arcalia (R. Bistrița). *Studia Universitatis Babeș-Bolyai*. Cluj-Napoca. **1**: 13-23.
- CIURCHEA MARIA. 1972. Cercetări asupra florei și vegetației lichenologice arboricole din regiunea Arcalia. *Contribuții Botanice*. Grădina Botanică București: 133-139.
- CRETZOIU P. 1941. Conspectul lichenilor pyrenocarpi din România. *Analele Institutului de cercetări și experimentație forestieră*. Brașov. **8**: 51-158.
- DE LANGE P., BLANCHON D., KNIGHT A., ELIX J., LÜCKING R., FROGLEY K., HARRIS A., COOPER J., ROLFE J. 2018. *Conservation status of New Zealand indigenous lichens and lichenicolous fungi, 2018*. New Zealand Threat Classification Series 27. Department of Conservation, Wellington. 64 pp.
- GIORDANI P. & INCERTI G. 2008. The influence of climate on the distribution of lichens: a case study in a borderline area (Liguria, NW Italy). *Plant Ecology*. Elsevier. Paris. **195**: 257-272.
- HAZSLINSZKY F. 1884. A Magyar birodalom Zuzmó-flórája. Kiadja A.K.M. *Természettudományi társulat*, Budapest: 1-304.
- KINALIOĞLU K. 2009. Lichens from the Amasya, Çorum, and Tokat regions of Turkey. *Mycotaxon*. Ingenta Connect Publication. Ithaca, NY. **109**: 181-184.

- LÖHMUS P., ROSENVALD R., LÖHMUS A. 2006. Effectiveness of solitary retention trees for conserving epiphytes: differential short-term responses of bryophytes and lichens. *Canadian Journal of Forest Research*. Toronto. **36**: 1319-1330.
- LÜCKING R., SEAVEY F., COMMON R.S., BEECHING S.Q., BREUSS O., BUCK W.R., CRANE L., HODGES M., HODKINSON B.P., LAY E., LENDEMER J.C., MCMULLIN R.T., MERCADO-DÍAZ J.A., NELSEN M.P., RIVAS PLATA E., SAFRANEK W., SANDERS W.B., SCHAEFER JR. H.P., SEAVEY J. 2011. The lichens of Fakahatchee Strand Preserve State Park, Florida. *Proceedings from the 18<sup>th</sup> Tuckerman workshop*. Bulletin of the Florida Museum of Natural History, Florida. **49**(4): 127-186.
- MALÍČEK J. & PALICE Z. 2013. Lichens of the virgin forest reserve Žofinský prales (Czech Republic) and surrounding woodlands. *Herzogia*. BioOne Press. Praga. **26**: 253-292.
- MORUZI CONSTANȚA., PETRIA ELENA., MANTU ELENA. 1967. Catalogul Lichenilor din România. *Acta Botanica Horti Bucurestiensis*. Edit. Academiei R. S. R. București: 1-389.
- MOTIEJŪNAITĖ J. 2015. Lichens and allied fungi from the Čepkeliai state nature reserve (southern Lithuania). *Botanica Lithuanica*. Vilnius. **21**(1): 3-12.
- NAYAK S.K., BAJPAI R., UPRETI D.K., SATAPATHY K.B. 2016. Diversity of lichen flora of Odisha, India - A review. *Studies in Fungi*. New Delhi. **1**(1): 114-124.
- PALTO H., NORDBERG A., NORDÉN B., SNÄLL T., 2011. Development of secondary woodland in oak wood pastures reduces the richness of rare epiphytic lichens. *PLOS ONE*. Heber Press. London. **6**(9): e24675.
- PANDIT G. 2015. Review of lichens of the high level Ferricretes and Mesas of the North Western Ghats, India. *Current Research in Environmental & Applied Mycology*. Elsevier. Paris. **5**(3): 180-195.
- PEREIRA I., WANG X.Y., OH S.O., SÁNCHEZ P., HUR J.S. 2016. Lichens of the surrounding areas of Termas of Chillán and Las Trancas, Bío-Bío Region, Chile. *Gayana Botanica*. Scimago Press. London. **73**(1): 104-112.
- SÂRBU ANCA, SÂRBU I., OPREA A., NEGREAN G., CRISTEA V., GHEORGHE C., CRISTUREAN I., POPESCU G., OROIAN SILVIA, TĂNASE C., BARTÓK KATALIN., GAFTA D., ANASTASIU PAULINA, CRIȘAN, F. COSTACHE I., GOIA IRINA, MARUȘCA T., OȚEL V., SĂMĂRGHIȚAN MIHAELA, HENȚEA SORANA, PASCALE GABRIELA, RĂDUȚOIU D., BAZ ADRIANA, BORUZ VIOLETA, PUȘCAȘ M., HIRIȚIU MARIANA, STAN I., FRINK J. 2007. *Arii speciale pentru protecția și conservarea plantelor în România*. Edit. Victor B. Victor. București. 397 pp.
- SEN U. K. 2014. Assessment of lichens in selected sacred groves of West Midnapore District, West Bengal, India. *International Journal of Conservation Science*. Scimago Press. London. **5**(1): 85-94.
- SÉRUSIAUX E., DIEDERICH P., ERTZ D., VAN DEN BOOM P. 2003. New or interesting lichens and lichenicolous fungi from Belgium, Luxembourg and Northern France. XI. *Lejeunia*. *Revue de Botanique*. Elsevier. Paris. **173**: 1-48.
- URBANAVICHUS G. & ISMAILOV A. 2013. The lichen flora of Gunib plateau, inner-mountain Dagestan (North-East Caucasus, Russia). *Turkish Journal of Botany*. Academic Press. Istanbul. **37**: 753-768.
- VAN DEN BOOM P. P. G., BRAND M., ERTZ D., KALB K., MAGAIN N., MASSON D., SCHIEFELBEIN U., SIPMAN H. J. M., SÉRUSIAUX E. 2011. Discovering the lichen diversity of a remote tropical island: working list of species collected on Reunion (Mascarene archipelago, Indian Ocean). *Herzogia*. BioOne Press. Praga. **24**: 325 -349.
- WEERAKOON G. & APTROOT A. 2014. Over 200 new lichen records from Sri Lanka, with three new species to science. *Cryptogamie, Mycologie*. BioOne Press. Praga. **35**(1): 51-62.
- XAVIER-LEITE A.B., MENEZES A.A., SOUSA-SOUTO L., APTROOT A., LÜCKING R., SANTOS V.M., CÁCERES MARCELA EUGENIA DA SILVA. 2015. Epiphytic microlichens as indicators of phytosociological differentiation between Caatinga and Brejos de Altitude. *Acta Botanica Brasilica*. Academic Press. Brazil. **29**(4): 457-466.

Vicol Ioana

Institute of Biology of the Romanian Academy of Sciences, Spl. Independentei no. 296, sect. 6, 060031, Bucharest, Romania.

E-mail: ioana.vicol@ibiol.ro

Received: March 15, 2019

Accepted: July 09, 2019