

LICHEN MYCOTA FROM THE ISLAND OF KRK (NORTHERN ADRIATIC SEA, CROATIA)

SINIŠA OZIMEC¹, TIHOMIR FLORIJAČIĆ¹, ANĐELKO OPAČAK¹,
ZLATKO PUŠKADIJA¹ & JASENKA TOPIĆ²

¹J. J. Strossmayer University of Osijek, Faculty of Agriculture, Trg Sv. Trojstva 3,
HR-31000 Osijek, Croatia (E-mail: sinisa.ozimec@pfos.hr)

²Sisačka cesta, 2. odvojak 45a, HR-10000 Zagreb, Croatia

Ozimec, S., Florijančić, T., Opačak, A., Puškadija, Z. & Topić, J.: Lichen mycota from the island of Krk (northern Adriatic Sea, Croatia). *Nat. Croat.*, Vol. 18, No. 2, 367–385, 2009, Zagreb.

A list of 137 lichen mycota taxa from the island of Krk is presented, including 18 species new to island of Krk. The list is based on literature records and field work carried out in 2001 and 2002 year. For each taxon, references on localities and substrate are given, and comparison of taxa composition between island of Krk and island of Rab has been made.

Key words: Lichen, Flora, Lobarion, Krk, Croatia

Ozimec, S., Florijančić, T., Opačak, A., Puškadija, Z. & Topić, J.: Lišajevi otoka Krka (Sjeverni Jadran, Hrvatska). *Nat. Croat.*, Vol. 18, No. 2, 367–385, 2009, Zagreb.

U radu se daje popis 137 svojiti lišajeva zabilježenih za otok Krk, uključujući 18 vrsta zabilježenih po prvi puta. Popis je izrađen prema navodima iz literaturnih izvora i terenskih istraživanja provedenih 2001. i 2002. godine. Za svaku svojtu daju se podaci o nalazištu i podlozi. Učinjena je i usporedba sastava svojiti između otoka Krka i otoka Raba.

Ključne riječi: lišaj, flora, Lobarion, Krk, Hrvatska

INTRODUCTION

Lichens from the island of Krk were reported for the first time by ZAHLBRUCKNER (1907), and also subsequently (ZAHLBRUCKNER, 1909; 1910; 1919), according to the identification of lichen material collected by Julius Baumgartner. Further contributions to the knowledge of lichen flora of island of Krk were done by KUŠAN (1930, 1933), CHRISTENSEN & HANSEN (1994), BARČIĆ (1996), and recently by OZIMEC (2004), MAYRHOFFER *et al.* (2005), and BILOVITZ *et al.* (2007).

The island of Krk is situated in the northern part of the Adriatic Sea. It belongs to the Kvarner archipelago and encloses the Rijeka Bay from the southeast (Fig. 1). The area of the island is 405.78 km², with 189.3 km long coastal line. According to

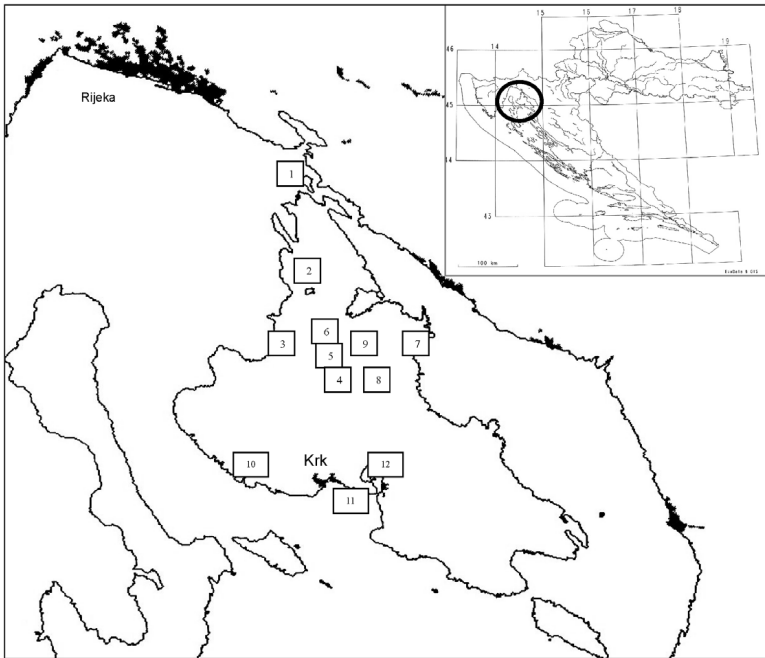


Fig. 1. Geographical position of the island of Krk and collection sites.

ROGIĆ (1961), three relief units are distinguished: lower northern part (60–70 m a.s.l.); hilly central part (100–200 m), and southern part (350–400 m), from which two mountain ridges stretch in southeastern direction, with the highest peak Obzova (569 m a.s.l.).

The climate, according to Köppen, is classified into Cfsax" type, which is the prevailing climate type in northern Adriatic area (BERTOVIĆ, 1994), characterised as moderately warm and humid climate with hot summers. The mean annual temperature is 14.3 °C, annual precipitation is 1336 mm, and air humidity is 72%.

Eumediterranean vegetational zone of evergreen holm-oak forests (*Fraxino orniquercetum ilicis*) on the island of Krk reaches the boundary of its distribution, and it is present in the form of low forests and macchia (TRINAJSTIĆ, 1995). Submediterranean vegetational zone of deciduous forests of pubescent oak, hop, and oriental horn-beam (*Quercocarpinetum orientalis* and *Ostryo-Quercetum pubescentis*) still covers large areas of northern and central parts of the island of Krk, in the form of low or fairly high forests and thickets (TRINAJSTIĆ, 1964).

MATERIAL AND METHODS

The research is based on studying the records from the older lichenological literature, herbarium voucher samples, and field investigation carried out in 2001 and 2002 at 12 collection sites listed below.

Collection sites

1. Islet of Sv. Marko, solitary trees and grove of *Acer monspessulanum* and *Carpinus orientalis* within dry grassland (*Stipo-Salvietum officinalis*) and limestone screes (*Drypetum jacquinianae*), c. 60–100 m, MTB 0753/3 (16.9.2001)
2. Vicinity of Njivice, by the road to Jezero, thicket of *Quercus-Carpinetum orientalis*, c. 40 m, MTB 0853/1 (7.6.2001)
3. Vicinity of Malinska and Haludovo, *Quercus-Carpinetum orientalis*, c. 60 m, MTB 0853/3 (1.3.2001)
4. Vicinity of Gabonjin, *Quercus-Carpinetum orientalis*, c. 230 m, MTB 0853/3 (27.2.2001, 21.9.2002)
5. Vicinity of Rasopasno, by the road to Soline, *Quercus-Carpinetum orientalis*, c. 150 m, MTB 0853/3 (28.2.2001)
6. Vicinity of Sužan, *Quercus-Carpinetum orientalis*, c. 100 m, MTB 0853/3 (16.9.2001)
7. Between Šilo and Gostinjac, thicket of *Juniperus communis* and *Quercus-Carpinetum orientalis*, c. 60–100 m, MTB 0853/4 (18.9.2001)
8. Between Gostinjac and Sv. Vid, *Quercus-Carpinetum orientalis* and horse chestnut tree (*Aesculus hippocastanum*), c. 200 m, MTB 0853/4 (18.9.2001)
9. Between Dobrinj and Gornja Hlapa, *Quercus-Carpinetum orientalis* and on olive trees (*Olea*), c. 180 m, MTB 0853/4 (18.9.2001)
10. Valbiska bay, *Orno-Quercetum ilicis*, c. 30 m, MTB 0953/3 (18.9.2001)
11. Prniba peninsula, between Krk and Puntarska draga, *Orno-Quercetum ilicis*; c. 30 m, MTB 0953/4 (2.3.2001)
12. Islet of Košljun, *Orno-Quercetum ilicis* and on olive trees (*Olea*), c. 6 m, MTB 0953/4 (7.6.2001)

The field identification was done by a hand lens, and in the laboratory using a dissecting microscope, a light microscope and the usual spot test, according to PURVIS *et al.* (1992) and WIRTH (1995). Some specimens were analysed by thin-layer chromatography (TLC) following ORANGE *et al.* (2001). The collections of lichen voucher samples were studied in the herbaria ZA, ZAHO, GZU and W. Nomenclature mainly follows SANTESSON *et al.* (2004), NIMIS & MARTELOS (2008), and modern treatments.

A comprehensive list of lichen mycota from the island of Krk is presented in alphabetical order. New records for the island of Krk are marked with an asterisk (*), and non-lichenized fungi traditionally treated in lichenological literature with a plus (+).

Data about locality and substrate are given for each taxon, using the following abbreviations for the substrate type: *Acer monspessulanum* (Ace mon); *Aesculus hippocastanum* (Aes hip); *Carpinus orientalis* (Car ori); *Celtis* sp. (Cel sp); *Cupressus sempervirens* (Cup sem); *Ficus carica* (Fic car); *Fraxinus ornus* (Fra orn); *Juglans regia* (Jug reg); *Juniperus communis* (Jun com); mosses (mo); *Olea europaea* (Ole eur); *Ostrya carpinifolia* (Ost car); *Paliurus spina-christi* (Pal spi); *Pinus halepensis* (Pin hal); *Pistacia* sp. (Pis sp); *Quercus ilex* (Que ile); *Quercus pubescens* (Que pub); *Salix alba* (Sal alb); *Ulmus* sp. (Ulm sp); *Vitex agnus-castus* (Vit agn).

RESULTS

List of taxa

Acrocordia conoidea (Fr.) Körb.

Krk, on limestone boulder, c. 50 m (ZAHLEBRUCKNER, 1907 as *Arthopyrenia conoidea*)
Malinska, on dry stone wall (KUŠAN, 1930 as *Arthopyrenia conoidea*)

Acrocordia gemmata (Ach.) A. Massal.

By the road to Baška, 100 m (Que pub); Suha Ričina valley, 350 m (Que pub)
(ZAHLEBRUCKNER, 1907 as *Arthopyrenia gemmata*)

Amandinea punctata (Hoffm.) Coppins & Scheid.

Vrbnik (Sal alb) (CHRISTENSEN & HANSEN, 1994 as *Buellia* aff. *punctata*)

Aspicilia calcarea (L.) Mudd

Malinska, by the road, on limestone boulder (KUŠAN, 1930 as *Lecanora calcarea*)

Aspicilia contorta (Hoffm.) Kremp.

Krk, on dry stone wall, c. 50 m (ZAHLEBRUCKNER, 1907 as *Lecanora viridescens*)
Malinska, by the road (KUŠAN, 1930 as *Lecanora contorta*)

Bacidia rubella (Hoffm.) A. Massal.

Krk (Que pub), by the road to Baška, 100 m; Suha Ričina valley, 350 m (Que pub)
(ZAHLEBRUCKNER, 1907 as *Bacidia rubella* var. *luteola*)
4 (Que pub)

Bagliettoa marmorea (Scop.) Gueidan & Cl. Roux

Near Krk, on dry stone wall, 350–400 m (ZAHLEBRUCKNER, 1907 as *Verrucaria marmorea*)

Bagliettoa parmigera (J. Steiner) Vězda & Poelt

Krk, on dry stone wall (ZAHLEBRUCKNER, 1907 as *Verrucaria calciseda*)
Cape Desiderio, SW from Krk, on old snail house (ZAHLEBRUCKNER, 1909 as *Verrucaria calciseda*)

Bagliettoa parmigerella (Zahlbr.) Vězda & Poelt

Krk, on dry stone wall, c. 50 m (ZAHLEBRUCKNER, 1907 as *Verrucaria murina*)

Bagliettoa steineri (Kušan) Vězda

Malinska, by the road, on limestone boulder (KUŠAN, 1930 as *Verrucaria steineri*)

Bilimbia sabuletorum (Schreb.) Arnold

Krk, 20 m (mo) (ZAHLEBRUCKNER, 1907 as *Bacidia sabuletorum*)

Caloplaca agardhiana (A. Massal.) Clauzade & Cl. Roux

Krk, on dry stone wall (ZAHLEBRUCKNER, 1907)

Caloplaca aurantia (Pers.) Hellb.

Malinska, on dry stone wall (KUŠAN, 1930 as *Caloplaca callopisma*)

Caloplaca cerina (Hedw.) Th. Fr. var. *cerina*

By the road to Baška, 100 m (Que pub); E of Krk, in dry grassland, 350–400 m (ZAHLEBRUCKNER, 1907 as *Caloplaca cerina*)

Malinska, 50 m (Pali spi) (ZAHLEBRUCKNER, 1919 as *Caloplaca cerina*)

Vrbnik (Sal alb) (CHRISTENSEN & HANSEN, 1994 as *Caloplaca cerina*)

11 (Ace mon)

Caloplaca citrina (Hoffm.) Th. Fr.

Baška, on dry stone wall (ZAHLEBRUCKNER, 1919)

Caloplaca erythrocarpa (Pers.) Zwackh.

Krk, by the road, 50 m (ZAHLEBRUCKNER, 1907 as *Caloplaca arenaria* var. *lallavei*)

Caloplaca flavescens (Huds.) J.R. Laundon

Vidohlam, on limestone outcrop (CHRISTENSEN & HANSEN, 1994)

Camping Pušća, N from Omišalj, 0–30 m (MAYRHOFER *et al.*, 2005)

Caloplaca haematites (St.-Amans) Zwackh

Krk (Fic car, Ole eur) (ZAHLEBRUCKNER, 1907)

Malinska, 50 m (Pal spi) (KUŠAN, 1930)

* *Caloplaca herbidella* (Hue) H.Magn.

3 (Que pub)

Caloplaca ochracea (Schaer.) Flagey

Malinska, on dry stone wall (KUŠAN, 1930 as *Blastenia ochracea*)

Caloplaca polycarpa (A. Massal.) Zahlbr.

Malinska, on dry stone wall (KUŠAN, 1930)

Caloplaca saxicola (Hoffm.) Nordin

Vrbnik, Veli grad, on limestone boulders, c. 100 m (ZAHLEBRUCKNER, 1919 as *Caloplaca murorum*)

Vidohlam, on limestone outcrops (CHRISTENSEN & HANSEN, 1994 as *Caloplaca saxicola* subsp. *saxicola*)

* *Candelaria concolor* (Dicks.) Stein

1 (Car ori)

3 (Que pub)

4 (Fra orn, Que pub)

8 (Aes hip)

10 (Car ori)

Catillaria lenticularis (Ach.) Th.Fr.

Malinska, as a parasite on *Aspicila calcarea* on stone wall (KUŠAN, 1930)

Camping Pušća N from Omišalj, 0–30 m (MAYRHOFER et al., 2005)

Cladonia convoluta (Lam.) Anders

E from Krk, 300–400 m, on soil (ZAHLEBRUCKNER, 1907)

Malinska (KUŠAN, 1930)

Vidohlam, on shallow soil (CHRISTENSEN & HANSEN, 1994)

Between Krk and Vrh, c. 100 m (BILOVITZ et al. 2007)

Bay W from Sv. Fuska, 20 m (BILOVITZ et al. 2007)

Cladonia foliacea (Huds.) Willd.

Krk, 300–400 m, on soil (ZAHLEBRUCKNER, 1907)

Islet of Košljun near Punat, on soil (BARČIĆ, 1996)

Cladonia furcata (Huds.) Schrad. subsp. *furcata*

In valley E from Krk, 300–400 m (ZAHLEBRUCKNER, 1907)

Cladonia pocillum (Ach.) O.J. Rich.

Njivice, S from Omišalj, c. 30 m (ZAHLEBRUCKNER, 1909 as *Cladonia pyxidata* var. *pocillum*)

* *Cladonia pyxidata* (L.) Hoffm. subsp. *pyxidata*

4 (Jun com)

9 (Car ori)

Cladonia rangiformis Hoffm.

E of Krk, by the road to Baška, 300–400 m, on soil (ZAHLEBRUCKNER, 1907)

Vidohlam, on shallows soil (CHRISTENSEN & HANSEN, 1994)

Islet of Košljun near Punat, on soil (BARČIĆ, 1996)

Hrusta above Stara Baška, 300 m (MAYRHOFER et al., 2005)

7 (Jun com)

Cladonia symphy carpia (Flörke) Fr.

Vidohlam, on shallow soil (CHRISTENSEN & HANSEN, 1994)

Clauzadea immersa (Weber) Hafellner & Bellem.

Krk, on dry stone wall (ZAHLEBRUCKNER, 1907 as *Lecidea immersa*)

Collema crispum (Huds.) F.H. Wigg.

Between Krk and Vrh, c. 100 m (BILOVITZ et al. 2007)

Collema cristatum (L.) F.H. Wigg.

Camping Pušća N of the town of Omišalj, 0–30 m (MAYRHOFER et al., 2005)

Suha Ričina Valley near Baška, 100 m (Que pub); Veli vrh, 470 m (BILOVITZ et al., 2007)

Collema flaccidum (Ach.) Ach.

By the road from Krk to Baška, 100 m (Que pub); area Sus, S from Punat, 100–150 m; Suha Ričina valley, 350 m (ZAHLEBRUCKNER, 1907 as *Collema rupestre*)

7 (Que pub)

8 (Que pub)

* *Collema furfuraceum* (Arnold) Du Rietz

3 (Que pub)

Collema fuscovirens (With.) J.R. Laundon

Malinska, on dry wall (KUŠAN, 1930 as *Collema furvum*)

Collema nigrescens (Huds.) DC.

Krk (Que pub); by the road to Baška, 100 m; area Sus, S from Punat, 100–150 m; Suha Ričina valley, 350 m (ZAHLEBRUCKNER, 1907 as *Collema vespertilio*)

Malinska (Que pub) (KUŠAN, 1930 as *Collema vespertilio*)

5 (Que pub)

6 (Que pub)

8 (Que pub)

Collema polycarpon Hoffm. subsp. *polycarpon*

Stara Baška, Cape Crnika, ca. 50 m, in crevices of limestone boulders (ZAHLEBRUCKNER, 1919 as *Collema orbiculare*)

* *Collema subflaccidum* Degel.

3 (Que pub)

Collema tenax (Sw.) Ach.

Krk, on moss covered limestone boulders, c. 20 m (ZAHLEBRUCKNER, 1907 as *Collema pulposum*)

Degelia plumbea (Lightf.) P.M. Jørg & P. James

By the road from Krk to Baška, 100 m (Que pub); Suha Ričina valley, 350 m (ZAHLEBRUCKNER, 1907 as *Parmeliella plumbea* var. *myriocarpa*)

Čavlena bay, 100–150 m (Que pub) (ZAHLEBRUCKNER, 1909 as *Parmeliella plumbea*)

4 (Que pub)

6 (Que pub)

Dermatocarpon miniatum (L.) W. Mann

Between Baška and Krk, c. 250 m, on limestone boulders (KUŠAN, 1933)

Dimerella pineti (Ach.) Vězda

Krk, on dry stone wall, c. 50 m (ZAHLEBRUCKNER, 1907 as *Microphiale diluta*)

Diploschistes gypsaceus (Ach.) Zahlbr.

E from Krk, by the road to Baška, on limestone soil (ZAHLEBRUCKNER, 1907 as *Diploschistes scruposus* var. *albissimus*)

Diploschistes muscorum (Scop.) R. Sant.

Cape Crnika, SW from Krk, near the sea (ZAHLEBRUCKNER, 1909 as *Diploschistes scruposus* var. *bryophilus*)

Diploschistes scruposus (Schreb.) Norman

Malinska, c. 50 m (ZAHLEBRUCKNER, 1919 as *Diploschistes scruposus* var. *arenarius*)

Diplotomma alboatrum (Hoffm.) Flot.

In the port of Krk (Fic car) (ZAHLEBRUCKNER, 1907 as *Buellia alboatra* var. *arthroa*)
12 (Que ile)

Diplotomma epipolium auct. non (Ach.) Arnold

Krk, on dry stone wall by the road, c. 50 m (ZAHLEBRUCKNER, 1907 as *Buellia alboatra* var. *epipolia*)

Dirina cretacea (Zahlbr.) Tehler

Krk, on limestone boulder by the sea (ZAHLEBRUCKNER, 1907, 1909 as *Chiodecton cretaceum*)

Encephalographa elisae A. Massal

Krk, on dry stone wall, c. 50 m (ZAHLEBRUCKNER, 1907 as *Encephalographa elisae*)

Evernia prunastri (L.) Ach.

Čavlena bay, 100–150 m (ZAHLEBRUCKNER, 1919)
Ponikve, 70 m (Que pub) (BILOVITZ *et al.*, 2007)
4 (Ace mon, Fra orn, Jun com, Ost car)
9 (Ole eur)
10 (Que ile)

Flavoparmelia caperata (L.) Hale

Čavlena bay, 100–150 m (ZAHLEBRUCKNER, 1910 as *Parmelia caperata*)
Malinska (Ole eur) (KUŠAN, 1930 as *Parmelia caperata*)
Ponikve, 70 m (Que pub) (BILOVITZ *et al.*, 2007)
1 (Ace mon, Car ori)
2 (Que pub)
3 (Cup sem, Que ile, Que pub)
4 (Ace mon, Fra orn, Jun com, Ost car)
5 (Que pub)
6 (Fra orn, Que pub)
7 (Jun com, Ole eur, Que pub,)
8 (Aes hip)
9 (Que pub, Ulm sp)
10 (Que ile)

Fulgensia fulgens (Sw.) Elenk.

Cape Crnika near Stara Baška, c. 50 m (ZAHLEBRUCKNER, 1919 as *Caloplaca fulgens*)

Fulgensia fulgida (Nyl.) Szatala

E from Krk, c. 300–400 m, on limestone (ZAHLEBRUCKNER, 1907 as *Caloplaca fulgida*)

Cape Desiderio SW from Krk, on limestone soil by the sea (ZAHLEBRUCKNER, 1910 as *Caloplaca fulgida*)

Fuscopannaria olivacea (P.M.Jørg.) P.M.Jørg.

Krk (JØRGENSEN, 1978 as *Pannaria olivacea*)

Graphis scripta (L.) Ach.

Between Malinska and Čavlena bay, 50 m (Car ori) (ZAHLEBRUCKNER, 1919)

4 (Car ori)

Gyalecta luetkemulleri Zahlbr.

Krk, on limestone boulders near the sea (ZAHLEBRUCKNER, 1907)

Heppia lutosa (Ach.) Nyl.

Vicinity of Krk, 25–50 m (ZAHLEBRUCKNER, 1909 as *Heppia despreauxii*)

Hydropunctaria adriatica (Zahlbr.) Keller & Gueidan

Čavlena bay, on coastal rocks (ZAHLEBRUCKNER, 1919 as *Verrucaria adriatica*)

Hydropunctaria maura (Wahlenb.) Keller et al.

Krk, on limestone boulder by the sea (ZAHLEBRUCKNER, 1907 as *Verrucaria maura*)

Hyperphyscia adglutinata (Flörke) H. Mayrhofer & Poelt

Vrbnik (Sal alb) (CHRISTENSEN & HANSEN, 1994)

12 (Ole eur)

Hypogymnia physodes (L.) Nyl.

Ponikve, 70 m (Que pub) (BILOVITZ *et al.*, 2007)

3 (Jun com)

4 (Ace mon, Car ori, Fra orn, Jun com)

9 (Car ori, Olea, Ulm sp)

* *Hypogymnia tubulosa* (Schaer.) Hav.

4 (Fra orn)

Lecania cyrtella (Ach.) Th. Fr.

Vrbnik (Sal alb) (CHRISTENSEN & HANSEN, 1994)

Lecania erysibe (Ach.) Mudd

Baška, on dry stone wall near the sea, on flysch (ZAHLEBRUCKNER, 1919 as *Lecanora rabenhorstii* f. *erysibe*)

Lecanora agardhiana Ach. subsp. *agardhiana*

Krk, on dry stone wall (ZAHLEBRUCKNER, 1907 as *Lecanora agardhiana*)

Lecanora albescens (Hoffm.) Branth & Rostr.

At the crossing from Baška to Stara Baška, c. 360 m, on limestone boulders (ZAHLEBRUCKNER, 1919)

Lecanora allophana Nyl.

Vicinity of Krk, 50 m (Cel spe) (ZAHLEBRUCKNER, 1907 as *Lecanora subfusca*)

* *Lecanora chlarotera* Nyl.

3 (Cup sem)

4 (Car ori)

11 (Que ile)

Lecanora horiza (Ach.) Linds.

Vrbnik (Sal alb) (CHRISTENSEN & HANSEN, 1994 as *Lecanora sienae*)

Lecanora pruinosa Chaub.

Krk, on dry stonewall and by the road to Baška, c. 300–400 m (ZAHLEBRUCKNER, 1907)

Lecanora pulicaris (Pers.) Ach.

Malinska (Que pub) (KUŠAN, 1930)

* *Lecanora saligna* (Schrad.) Zahlbr. var. *saligna*

9 (Ole eur)

Lecidella elaeochroma (Ach.) M. Choisy

Malinska (Que pub) (KUŠAN, 1930 as *Lecidea elaeochroma*)

1 (Ace mon, Car ori)

2 (Car ori)

3 (Car pri)

8 (Que pub)

9 (Que pub)

10 (Que pub)

11 (Ace mon, Ole eur)

12 (Pis sp)

Leptogium cyanescens (Rabenh.) Körb.

By the road from Krk to Baška, c. 100 m (Que pub) (ZAHLEBRUCKNER, 1907 as *Leptogium tremelloides*)

12 (Que ile)

Leptogium lichenoides (L.) Zahlbr.

Vicinity of Krk, 20 m (mo) (ZAHLEBRUCKNER, 1907 as *Leptogium atrocoeruleum* var. *pulvinatum*)

Lobaria pulmonaria (L.) Hoffm.

By the road from Krk to Baška, 100 m (Que pub) (ZAHLEBRUCKNER, 1907)

Čavlena bay, 100–150 m (Que pub) (ZAHLEBRUCKNER, 1909)

Malinska (Fra orn) (KUŠAN, 1933)

Lobothallia radiosa (Hoffm.) Hafellner

Malinska, on dry stone wall (KUŠAN, 1930 as *Lecanora radiosa* var. *subcircinata*)

* *Melanelixia fuliginosa* (Duby) O. Blanco et al. subsp. *glabratula* (Lamy) J.R. Laundon

3 (Que pub)

* *Melanelixia glabra* (Schaer.) O. Blanco et al.

8 (Car ori)

Melanelixia subargentifera (Nyl.) O. Blanco et al.

Malinska (Car ori) (MAYRHOFER et al., 2005)

* *Melanelixia subaurifera* (Nyl.) O. Blanco et al.

2 (Car ori)

4 (Ace mon, Car ori, Fra orn, Jun com)

+ *Naetrocymbe fraxinii* (A. Massal.) R.C. Harris

Between Malinska and Čavlena bay, 50 m (Fra orn) (ZAHLEBRUCKNER, 1919 as *Arthopyrenia fraxinii*)

Nephroma laevigatum Ach.

By the road to Baška, 100 m (Que pub); area Sus, S from Punat, 100–150 m; Suha Ričina valley, 350 m (ZAHLEBRUCKNER, 1907 as *Nephromium lusitanicum*)

Čavlena bay, 100–150 m (Que spe) (ZAHLEBRUCKNER, 1909 as *Nephroma lusitanicum*)

Malinska (mo, Fra or, Que pub) (KUŠAN, 1930 as *Nephroma lusitanicum*)

4 (Que pub)

9 (Que pub)

Normandina pulchella (Borrer) Nyl.

Malinska (Que pub) (KUŠAN, 1930)

4 (Que pub, mo)

8 (Que pub, mo)

10 (Que ile)

Ochrolechia turneri (Sm.) Hasselrot

Malinska (Car ori) (MAYRHOFER et al., 2005)

4 (Que pub)

7 (Que pub)

Opegrapha atra Pers.

Krk (Car ori) (ZAHLEBRUCKNER, 1919)

Opegrapha calcarea Sm.

Krk, on dry stone walls, c. 50 m, and on limestone boulders near the sea (ZAHLEBRUCKNER, 1907 as *Opegrapha chevallieri*)

Pannaria rubiginosa (Ach.) Bory

Malinska (Fra orn, Que pub) (KUŠAN, 1930)

Parabagliettoa cyanea (A. Massal.) Gueidan & Cl. Roux

Malinska, on dry stone wall (KUŠAN, 1930 as *Verrucaria cyanea*)

* *Parmelia saxatilis* (L.) Ach

11 (Ole eur)

Parmelia sulcata Taylor

Ponikve, 70 m (Que pub) (BILOVITZ *et al.*, 2007)

1 (Ace mon)

2 (Car ori)

3 (Que pub)

4 (Ace mon, Car ori, Fra orn)

5 (Ace mon)

6 (Fra orn)

7 (Ole eur)

8 (Aes hip)

9 (Que pub, Ulm sp)

10 (Que ile)

* *Parmelina pastillifera* (Harm.) Hale

1 (Ace mon)

3 (Que pub)

11 (Ole eur)

Parmelina tiliacea (Hoffm.) Hale

Near Rasopasno, 150 m (Que pub) (MAYRHOFER *et al.*, 2005)

4 (Jun com, Que pub)

5 (Car ori)

7 (Ace mon)

8 (Aes hip)

10 (Que ile)

11 (Ole eur)

12 (Que pub)

Parmotrema perlatum (Huds.) M. Choisy

Čavlena bay, 100–150 m (ZAHLEBRUCKNER, 1910 as *Parmelia perlata*)

Gabonjin (Fra orn) (MAYRHOFER *et al.*, 2005 as *Parmotrema chinense*)

3 (Que ile)

4 (Ace mon, Fra orn, Jun com)

5 (Ace mon)

6 (Que pub)

7 (Jun com, Que pub)

- 9 (Que pub)
- 10 (Que ile)
- 11 (Ole eur)
- 12 (Ole eur)

Pertusaria albescens (Huds.) M. Choisy & Werner
Malinska (Que pub) (KUŠAN, 1930 as *Pertusaria globulifera*)

- 4 (Ace mon, Que pub)
- 5 (Que pub)
- 10 (Que ile)

* *Pertusaria amara* (Ach.) Nyl.

- 3 (Que ile)
- 10 (Que ile)

* *Pertusaria hemisphaerica* (Flörke) Erichsen

- 4 (Fra orn)

* *Pertusaria pertusa* (Weigel) Tuck.

- 8 (Aes hip)
- 12 (Pis sp)

Pertusaria pustulata (Ach.) Duby

Between Krk and Dobrinj, 160 m (Pal spi) (ZAHLEBRUCKNER, 1919)

Phlyctis argena (Spreng.) Flot.

Gabonjin, 200 m (Que pub) (MAYRHOFER *et al.*, 2005)

Physcia adscendens (Fr.) H. Olivier

E from Krk, 300–400 m (ZAHLEBRUCKNER, 1907)
Vrbnik (Sal alb) (CHRISTENSEN & HANSEN, 1994)

- 1 (Ace mon, Car ori)
- 3 (Car ori)
- 8 (Car ori, Jun com)
- 11 (Que ile)
- 12 (Pin hal, Ole eur)

Physcia aipolia (Humb.) Fürnrh.

By the road from Krk to Baška, 100 m (Que pub) (ZAHLEBRUCKNER, 1907)
Čavlena bay, 100–150 m (Que pub) (ZAHLEBRUCKNER, 1910)
Malinska (Fra orn, Que pub) (KUŠAN, 1930)

- 1 (Ace mon, Car ori)
- 2 (Car ori)
- 5 (Car ori)
- 6 (Que pub)
- 8 (Ace mon, Jun com)

10 (Que ile)

11 (Que ile)

Physcia leptalea (Ach.) DC.

E from Krk, 300–400 m (ZAHLEBRUCKNER, 1907 as *Physcia stellaris* var. *leptalea*)

Čavlena bay (ZAHLEBRUCKNER, 1910 as *Physcia stellaris* var. *leptalea*)

Between Krk and Vrh, c. 100 m (BILOVITZ *et al.* 2007)

Physcia tenella (Scop.) DC.

Vicinity of Malinska (KUŠAN, 1930)

Physconia distorta (With.) J.R. Laundon

Bay W from Sv. Fuska, 20 m (Que pub, Pinus) (BILOVITZ *et al.*, 2007)

4 (Que pub)

5 (Ace mon, Que pub)

9 (Ole eur)

10 (Que pub)

Placidium rufescens (Ach.) A. Massal.

By the road from Krk to Glavotok, on limestone soil, c. 150 m (ZAHLEBRUCKNER, 1909 as *Dermatocarpon rufescens*)

Placynthium nigrum (Huds.) Gray

Malinska, on dry wall (KUŠAN, 1930)

* *Platismatia glauca* (L.) W.L. Culb. & C.F. Culb.

4 (Ace mon)

* *Pleurosticta acetabulum* (Neck.) Elix & Lumbsch

5 (Que pub)

Porina aenea (Wallr.) Zahlbr.

Between Krk and Dobrinj, 160 m (Car ori); between Malinska and Čavlena bay, 50 m (ZAHLEBRUCKNER, 1919 as *Porina carpinea*)

Porina linearis (Leigh.) Zahlbr.

Malinska, on dry wall (KUŠAN, 1930 as *Porina persicina*)

Pseudevernia furfuracea (L.) Zopf

Ponikve, 70 m (Que pub) (BILOVITZ *et al.*, 2007)

4 (Car ori, Fra orn, Jun com)

7 (Jun com)

9 (Ole eur)

Psora decipiens (Hedw.) Hoffm.

Malinska, on dry stone wall and on soil (KUŠAN, 1930 as *Lecidea decipiens*)

Suha Ričina valley near Baška, 100 m (Que pub) (BILOVITZ *et al.*, 2007)

Punctelia subrudecta (Nyl.) KrogGabonjin, 200 m (Fra orn) (MAYRHOFER *et al.*, 2005)

1 (Ace mon)

4 (Ace mon, Jun com)

5 (Ace mon)

8 (Aes hip)

10 (Que ile)

11 (Ole eur)

12 (Pis sp, Que pub)

Pyrenula nitida (Weigel) Ach.

Between Malinska and Čavlena bay (Car ori) (Z AHLBRUCKNER, 1919)

Pyrenula nitidella (Schaer.) Müll. Arg.

Between Krk and Dobrinj, 160 m (Car ori) (Z AHLBRUCKNER, 1919)

Ramalina dalmatica J. Steiner et Zahlbr.

Čavlena bay, 100–150 m (Z AHLBRUCKNER, 1910)

Ramalina farinacea (L.) Ach.Bay W from Sv. Fuska, 20 m (Que pub, Pinus) (BILOVITZ *et al.*, 2007)

4 (Ace mon, Car ori, Fra orn)

5 (Ace mon)

9 (Car ori)

Ramalina fastigiata (Pers.) Ach.

Vrbnik (Sal alb) (CHRISTENSEN & HANSEN, 1994)

Rinodina immersa (Körb.) Zahlbr.Camping Pušća N from Omišalj, 0–30 m (MAYRHOFER *et al.*, 2005)*Rinodinella dubyanoides* (Hepp) H. Mayrhofer & PoeltCamping Pušća N from Omišalj, 0–30 m (MAYRHOFER *et al.*, 2005)*Solenopsora cesatii* (A. Massal.) Zahlbr. var. *cesatii*E from Krk by the road to Baška, 300–400 m, on limestone (Z AHLBRUCKNER, 1907 as *Pseudolecania cesatii*)*Solenopsora cesatii* var. *grisea* (Bagl.) NimisE from Krk, 300–400 m, on limestone (Z AHLBRUCKNER, 1919 as *Solenopsora liparina*)*Solenopsora marina* (Zahlbr.) Zahlbr.Krk, on limestone boulders by the sea (Z AHLBRUCKNER, 1907 as *Placolecania marina*)*Solenopsora olivacea* (Fr.) H. Kiliass subsp. *olivacea*Malinska, on dry stone wall (KUŠAN, 1930 as *Catillaria olivacea*)

Squamarina cartilaginea (With.) P. James

E from Krk by the road to Baška, on limestone (ZAHLEBRUCKNER, 1907 as *Lecanora crassa*)
By the road from Krk to Glavotok, c. 150 m, on limestone soil (ZAHLEBRUCKNER, 1910 as *Lecanora crassa*)
Cape Crnika near Stara Baška, c. 50 m, on limestone soil (ZAHLEBRUCKNER, 1919 as *Lecanora crassa*)
Camping Pušća N from Omišalj, 0–30 m (MAYRHOFER *et al.*, 2005)
Punat, on stone wall, c. 100 m (MAYRHOFER *et al.*, 2005)
By the road from Punat to Stara Baška, c. 200 m (MAYRHOFER *et al.*, 2005)
South slope of Hrusta, above road near Stara Baška, c. 200 m (MAYRHOFER *et al.*, 2005)
South slope of peak Obzovo, calcareous grassland, 500 m (MAYRHOFER *et al.*, 2005)
Bay W from Sv. Fuska, 20 m (BILOVITZ *et al.*, 2007)
Ponikve, 70 m (BILOVITZ *et al.*, 2007)

Squamarina gypsacea (Sm.) Poelt

Above Batomalj near Baška, c. 200 m, on limestone boulders (ZAHLEBRUCKNER, 1919 as *Lecanora gypsacea*)
South slope of peak Obzovo, calcareous grassland, 500 m (MAYRHOFER *et al.*, 2005)

Squamarina lentigera (Weber) Poelt

By the road to Baška (ZAHLEBRUCKNER, 1907 as *Lecanora lentigera*)

Staurolemma omphalaroides (Anzi) P.M. Jørg. & Henssen

E from Krk in Suha Ričina valley, c. 350 m, (Que pub); by the road to Baška, c. 100 m (ZAHLEBRUCKNER, 1907 as *Physma omphalaroides*)

Synalissa symphorea (Ach.) Nyl.

Near Baška, on limestone boulders (KUŠAN, 1933)

Tephromela atra (Huds.) Hafellner s.l.

Above Batomalj near Baška, c. 200 m, on limestone boulder (ZAHLEBRUCKNER, 1907 as *Lecanora atra*)

Toninia sedifolia (Scop.) Timdal

Malinska, by the road (KUŠAN, 1930 as *Toninia coeruleonigricans*)

Toninia tumidula (Sm.) Zahlbr.

Above Batomalj near Baška, c. 200 m, on limestone boulder (ZAHLEBRUCKNER, 1907 as *Toninia mesenteriformis*)

Verrucaria nigrescens Pers.

Near Krk, on dry stone wall, c. 50 m (ZAHLEBRUCKNER, 1907)
Veli vrh, 470 m (BILOVITZ *et al.*, 2007)

Xanthoria parietina (L.) Th.Fr.

Vicinity of Krk (Ole eur) (ZAHLEBRUCKNER, 1907)
Area Sus, S from Punat (Que pub) (ZAHLEBRUCKNER, 1907)

- Vrbnik (Sal alb) (CHRISTENSEN & HANSEN, 1994)
 Stana above Stara Baška, c. 200 m (Vit agn) (MAYRHOFER *et al.*, 2005)
 Punat, on various shrubs, c. 100 m from the coast (MAYRHOFER *et al.*, 2005)
 Ponikve, 70 m (Que pub) (BILOVITZ *et al.*, 2007)
 Between Krk and Vrh, c. 100 m (BILOVITZ *et al.*, 2007)
- 1 (Ace mon)
 - 2 (Car ori)
 - 5 (Car ori)
 - 6 (Que pub)
 - 7 (Jug reg)
 - 8 (Aes hip)
 - 10 (Que ile)
 - 11 (Car ori, Ole eur)
 - 12 (Ole eur)

DISCUSSION

The currently known lichen flora of the island of Krk consists of 137 taxa (136 lichenized taxa and one non-lichenized fungus traditionally included in the lichenological literature), classified into 70 genera. The most diverse genera are *Caloplaca* (11 species), *Collema* (9), *Lecanora* (8), and *Cladonia* (7). Eighteen taxa: *Caloplaca herbiddella*, *Candelaria concolor*, *Cladonia pyxidata* subsp. *pyxidata*, *Collema furfuraceum*, *Collema subflaccidum*, *Hypogymnia tubulosa*, *Lecanora chlorotera*, *Lecanora saligna* var. *saligna*, *Melanelixia fuliginosa* subsp. *glabratula*, *Melanelixia glabra*, *Melanelixia subaurifera*, *Parmelia saxatilis*, *Parmelina pastillifera*, *Pertusaria amara*, *Pertusaria hemisphaerica*, *Pertusaria pertusa*, *Platismatia glauca*, and *Pleurosticta acetabulum*, are new records for the island of Krk.

Analyses of growth forms showed that crustose lichens were dominant (55.1 %), foliose were also numerous (28.7 %), followed by fruticose (9.6 %), and squamulose lichens (6.6 %).

The lichen mycota of island of Krk was compared with that of island of Rab, the southernmost island of Kvarner archipelago. There are many old data referring to lichens found on the island of Rab in the past, reported in papers of ZAHLBRUCKNER (1907, 1909, 1910, 1919), SZATALA (1928), KUŠAN (1930, 1933), and JØRGENSEN (1978). The known lichen mycota for Krk consists of 137 taxa in 70 genera, and of 141 taxa in 65 genera for Rab. There are 63 taxa in common to both areas. The lichen genera *Caloplaca*, *Cladonia*, *Collema* and *Lecanora* are also the most diverse on Rab, with addition of saxicolous genus *Verrucaria*. The lichen mycota of Krk is characterized by a larger number of foliose lichens (e.g. *Hypogymnia*, *Melanelixia*, *Physcia*, *Parmelia*, *Parmelina*), while crustose lichens (e.g. *Arthonia*, *Clauzadea*, *Placidium*, *Verrucaria*) are more frequent on Rab.

Four recorded species: *Degelia plumbea*, *Lobaria pulmonaria*, *Nephroma laevigatum*, and *Normandina pulchella* are specific for the epiphytic lichen alliance *Lobaria pulmonariae*. This alliance is rare and endangered across the Europe due to disturbance of forest habitats and air pollution, and requires sufficient number of old trees

which can support lichen cover. During 19th and 20th century many native sub-mediterranean forests on Krk are being cleared for the purpose of urbanisation and building of industrial, energetic or tourism facilities. Thus species like *Lobaria pulmonaria* was not found again in the field, because previously recorded lichen habitats do not exist any more.

ACKNOWLEDGMENTS

The authors express their gratitude to Professor Dr Helmut Mayrhofer, Institute of Plant Sciences, Karl-Franzens-University Graz (Austria), for help with identification of the species and valuable comments.

Received February 9, 2009

REFERENCES

- BARČIĆ, B., 1996: Flora i vegetacija otočica Košljuna. Franjevački samostan na Košljunu, Punat.
- BERTOVIĆ, S., 1994: Prilog ekologijsko-prostornom tumačenju i značajkama reljefa i podneblja u Gorskom kotaru. In: FRKOVIĆ, A. (ur.) Zbornik radova: 40 godina Nacionalnog parka »Risnjak« (1953.–1993.). JP Uprava NP »Risnjak«, 115–120.
- BILOVITZ, P. O., HARUTYUNYAN, S. & MAYRHOFFER, H., 2007: Belege zur »Flora von Istrien« aus anderen Herbarien. In: STARMÜHLER, W. (ed.): Vorarbeiten zu einer »Flora von Istrien« Teil X. Carinthia II 197/117: 456–460.
- CHRISTENSEN, S. N. & HANSEN, E. S., 1994: Lichens from Croatia. Acta Bot. Croat. **53**, 101–113.
- JØRGENSEN, P. M., 1978: The lichen family Pannariaceae in Europe. Opera Botanica **45**, 1–123.
- KUŠAN, F., 1930: Neue Beiträge zur Flechtenflora des kroatischen und dalmatinischen Küstenlandes. Acta Bot. Croat. **5**, 18–47.
- KUŠAN, F., 1933: Predradnje za floru lišaja Hrvatske i Dalmacije. II. izvještaj. Acta Bot. Croat. **8**, 105–118.
- MAYRHOFFER, H., MEŠL, R. & BILOVITZ, P. O. 2005. Belege zur »Flora von Istrien« aus anderen Herbarien. Flechten. In: STARMÜHLER, W. (ed.): Vorarbeiten zu einer »Flora von Istrien« Teil VIII. Carinthia II 195/115, 640–646.
- NIMIS, P. L. & MARTELOS, S., 2008: *ITALIC*-The Information System on Italian Lichens. Version 4.0. University of Trieste, Department of Biology, IN4.0/1.
- ORANGE, A., JAMES, P. W. & WHITE, F. J., 2001: Microchemical methods for the identification of lichens. British Lichen Society, 1–101.
- OZIMEC, S., 2004: Epiphytic lichens of Gorski kotar and Kvarner region. (in Croatian). Doctoral Thesis, University of Zagreb.
- PURVIS, O. W., COPPINS, B. J., HAWKSWORTH, D. L., JAMES, P. W., MOORE & D. M., 1992: The lichen flora of Great Britain and Ireland. Natural History Museum and the British Lichen Society, London
- ROGIĆ, V., 1961: Krk. Geogr. glasnik **23**, 67–101.
- SANTESSON, R., MOBERG, R., NÖRDIN, A., TØNSBERG, T. & VITIKAINEN, O., 2004: Lichen-forming and lichenicolous fungi of Fennoscandia. Museum of Evolution, Uppsala University, Uppsala.
- SZATALA, Ö., 1928: Beiträge zur Flechtenflora der Insel Arbe. Mag. Bot. Lapok **26**, 27–45.
- TRINAJSTIĆ, I., 1964: O vegetacijskom pokrovu otoka Krka. Acta Bot. Croat. **23**, 119–131.
- TRINAJSTIĆ, I., 1995: Plantgeographical division of forest vegetation of Croatia. Ann. Forest. **20/2**, 37–66.

- WIRTH, V., 1995: Die Flechten Baden-Württembergs 1–2. Verlag Eugen Ulmer, Stuttgart.
- ZAHLBRUCKNER, A., 1907: Vorarbeiten zu einer Flechtenflora Dalmatiens. Die Flechten der Inseln Arbe und Veglia. Österr. Bot. Zeitschr. 57, 389–400.
- ZAHLBRUCKNER, A., 1909: Vorarbeiten zu einer Flechtenflora Dalmatiens V. Österr. Bot. Zeitschr. 59, 315–321, 349–354, 398–407, 439–444, 488–503.
- ZAHLBRUCKNER, A., 1910: Vorarbeiten zu einer Flechtenflora Dalmatiens VI. Österr. Bot. Zeitschr. 60, 13–22, 71–81.
- ZAHLBRUCKNER, A., 1919: Vorarbeiten zu einer Flechtenflora Dalmatiens VII. Österr. Bot. Zeitschr. 68, 60–77, 148–165, 237–253, 297–326.

SAŽETAK

Lišajevi otoka Krka (Sjeverni Jadran, Hrvatska)

S. Ozimec, T. Florijančić, A. Opačak, Z. Puškadija & J. Topić

Danas poznatu floru lišajeva otoka Krka čini 137 svojti (136 liheniziranih i jedna svojta neliheniziranih gljiva), svrstanih u 70 rodova. Podaci za izradu florne liste prikupljeni su iz literaturnih izvora i nadopunjeni rezultatima terenskog istraživanja na 12 lokaliteta na otoku Krku, tijekom 2001. i 2002. godine. Vrsta su najbrojniji rodovi: *Caloplaca*, *Collema*, *Lecanora* i *Cladonia*. Po prvi puta je za lišajsku floru otoka Krka zabilježeno 18 vrsta. Analiza životnih oblika ukazuje na dominaciju lišajeva korastog talusa (55,1 %), zatim slijede listasti (28,7 %), grmasti (9,6 %) te ljuskasti lišajevi (6,6 %). Usporedba sastava svojti lišajeva otoka Krka i otoka Raba ukazuje na veću zastupljenost listastih lišajeva na Krku, odnosno korastih lišajeva na Rabu. Epifitska sveza *Lobarion pulmonariae*, koja sadrži rijetke lišajске vrste i indikator je starih i očuvanih šumskih ekosistema, fragmentarno je prisutna na otoku Krku.