

Contribution to the lichenized and lichenicolous fungi in Bulgaria. II, the genus *Caloplaca*

Jan Vondrák^{1*} & Štěpánka Slavíková-Bayerová²

¹Department of Botany, Faculty of Biological Sciences, University of South Bohemia, Branišovská 31, CZ-370 05, České Budějovice, Czech Republic

²Institute of Botany, Academy of Sciences of the Czech Republic, CZ-252 43 Průhonice, Czech Republic

Received 12 November 2005 / Accepted 4 January 2006

Abstract. An annotated list of *Caloplaca* species occurring in Bulgaria, mainly the Rhodopes, Black Sea coast, and Pirin Mountains, is provided. Based on our collections, 50 taxa are listed, of which 17 are reported for the first time from the country: *Caloplaca adriatica*, *C. albolutescens*, *C. cerinella*, *C. chrysodeta*, *C. crenulatella*, *C. erodens*, *C. flavocitrina*, *C. aff. furax*, *C. fuscoatroides*, *C. hungarica*, *C. inconnexa* var. *inconnexa*, *C. inconnexa* var. *nesodes*, *C. marmorata*, *C. obscurella*, *C. polycarpa*, *C. tirolensis*, and *C. xerica*. *C. aff. furax* is probably an undescribed taxon resembling the Mediterranean *C. furax*, but differing in particular characters.

Key words: biodiversity, Black Sea coast, *Caloplaca*, lichens, Mount Strandzha, Pirin Mountains, the Rhodopes

Introduction

The generic concept of the genus *Caloplaca* has been recently regarded as highly artificial (e.g. Gaya *et al.* 2003). Some recent works have found heterogeneity within *Caloplaca* (Kärnefelt 1989; Gaya *et al.* 2003; Søchting & Lutzoni 2003). Some *Caloplaca* species, namely those from the section *Gasparrinia*, should be taken into *Xanthoria* (Søchting & Lutzoni 2003), and some species of *Fulgensia* should be placed in *Caloplaca* (Gaya *et al.* 2003). Nevertheless, the classical conception (cf. Clauzade & Roux 1985) is used here.

This paper lists the species of *Caloplaca* collected in Bulgaria during four excursions in 2002, 2004, and 2005 in the Rhodopes, Pirin Mountains, Mt Strandzha, and on the Black Sea coast. Fifty taxa are discussed here, of which 17 are new to the country; a few samples remain undetermined. Some taxa occurring on the Black Sea coast belong to difficult groups (e.g. *C. citrina* agg.); they may represent undescribed taxa and would therefore be worthy of molecular study.

Materials and Methods

All the samples detailed below were collected by the authors and vouchers are currently deposited in the herbarium of the Faculty of Biological Sciences at the University of South Bohemia in České Budějovice (CBFS) and in the private herbarium of Š. Slavíková-Bayerová. The nomenclature of taxa mentioned in the text that are not followed by an authority follows Nimis & Martellos (2003) and the nomenclature of insoluble lichen pigments follows Meyer & Printzen (2000). The floristic regions and fundamental knowledge on the distribution of species reported from Bulgaria are based on Mayrhofer *et al.* (2005).

Special part

The species are followed by the list of recorded localities. Diagnostic characters and notes on taxonomy are given for selected taxa. More frequently used synonyms are mentioned under the current names. Species new to Bulgaria are indicated by an asterisk before the name.

*Corresponding author: e-mail: j.vondrak@seznam.cz

**Caloplaca adriatica* (Zahlbr.) Servít (syn. *C. schaeereri* var. *adriatica* Zahlbr.)

The Rhodopes: Distr. Plovdiv, Asenovgrad, Dobrostan, calcareous rocks in small polje ca 2 km W of village, alt. 1300 m, 41°56' N, 24°53' E, on hard limestone rock, 25 Aug 2004 (CBFS 2199).

Note: This species superficially resembles *C. velana* Flörke var. *schaeereri* (Arnold) Clauzade & Cl. Roux or *C. subochracea* (Wedd.) Werner, but differs from both species in possessing thin septa in mature spores (Clauzade & Roux 1985).

**C. albolutescens* (Nyl.) H. Olivier

The Rhodopes: Distr. Kurdzhali, Kurdzhali, Shiroko Pole, protected area "Sredna Arda", ca 5 km E of village, alt. ca 240 m, 41°37' N, 25°31' E, on concrete wall near railway station "Sredna Arda", 15 Aug 2004 (CBFS 2008, 2031).

Note: Laundon (1992a) considers *C. albolutescens* a synonym to *C. teicholyta*, but some authors recognize *C. albolutescens* as a different species (Wade 1965; Clauzade & Roux 1985; Wirth 1995; Nimis & Martellos 2003). After checking the variability of both species, we also consider it to be a good species. The Bulgarian specimens agree well with the type material (H-Nyl. 29845, holotype!).

C. alociza (A. Massal.) Mig. (syn. *C. agardhiana* (A. Massal.) Cl. Roux)

The Rhodopes: Distr. Kurdzhali, Kirkovo, Starovo, ca 2 km E of village, alt. 390 m, 41°28' N, 25°25' E, concrete on well, 10 Aug 2004 (CBFS 2160).

Note: Some authors (Clauzade & Roux 1985; Nimis & Poelt 1987) distinguish *C. agardhiana* (without hymenial crystals) and *C. alociza* as the different species. However, we agree with Wunder (1974), who considers them as synonyms, the presence of hymenial crystals being ecologically derived.

C. arenaria (Pers.) Müll. Arg. (syn. *C. lamprocheila* (DC.) Flagey)

Black Sea coast: Distr. Burgas, Rezovo, coastal rocks N of the village, alt. ca 5–10 m, 42°00' N, 28°00' E, on coastal siliceous rock, 13 Jul 2005 (CBFS 3245). **The Rhodopes:** Distr. Plovdiv, Asenovgrad, Gornoslav, in pine forest above village, alt. 650 m, 41°55' N, 24°59' E, on small schist outcrop in open pine forest, 26 Aug 2004 (CBFS 2124); Distr. Kurdzhali, Kurdzhali, Kaloyantsi, alt. 320 m, 41°38' N, 25°32' E, on acid exposed volcanic rocky outcrop, 16 Aug 2004 (CBFS 2073); Kaloyantsi, protected area "Yumrouk Skala", ca 5 km SW of village, alt. ca 320 m, 41°37' N, 25°31' E, on outcrop of base-rich volcanic rock above railroad and on acid volcanic stones in large stony debris on N-exposed slope, 15 Aug 2004 (CBFS 2019, Sel. exs. *Caloplaca*, no. 14); Distr. Kurdzhali, Kirkovo, Bregovo, in Vurbitsa river valley ca 2 km E of village, alt. 300 m, 41°28' N, 25°25' E, on rather acid volcanic rock, 11 Aug 2004 (CBFS 2137); Bregovo, in valley of small affluent to river Vurbitsa ca 1 km S of village, alt. 280 m, 41°28' N, 25°25' E, on base-rich volcanic rock, 11 Aug 2004 (CBFS 2002); Distr. Haskovo, Stambolovo, Byal Kladenets, protected area "Golemya Sipey" S of village, alt. 420 m, 41°37' N, 25°40' E, on acid volcanic pebbles conglomerated by calcareous cement and on acid volcanic rock, 17 Aug 2004 (CBFS 2084, 2093); Stambolovo, Rabovo rocks above village, alt. 340 m, 41°40' N, 25°40' E, acid, on strongly exposed volcanic rock, 18 Aug 2004 (CBFS 2024).

Note: We use this taxon in modern sense (cf. Wirth 1995), unlike older authors (e.g. Wade 1965) who used the name *C. arenaria* for the taxa *C. erythrocarpa* and *C. teicholyta*. However, the application of *C. arenaria* is misunderstood as the type of *Lichen arenarius* Pers. is missing in Persoon's herbarium (Thijsse, pers. comm.). Therefore, this taxon needs neotypification.

C. aurantia (Pers.) Hellb. (syn. *C. callospisma* (Ach.) Th. Fr.)

The Rhodopes: Distr. Kurdzhali, Kurdzhali, Dolishte, limestone rocks in valley ca 1 km W of village, alt. 300 m, 41°38' N, 25°35' E, 16 Aug 2004 (CBFS 2122); Distr. Haskovo, Stambolovo, Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, 17 Aug 2004 (CBFS 2072, 2086); Byal Kladenets, edge of protected area "Golemya Sipey" S of village, alt. 420 m, 41°37' N, 25°40' E, 17 Aug 2004 (CBFS 2083); Distr. Haskovo, Lyubimets, Malko Gradishte, nearby hill "Sveta Marina" ca 5 km SW of village, alt. 600 m, 41°44' N, 26°00' E, 19 Aug 2004 (CBFS 2046).

Note: This species is easily recognized by its large radial thallus delimited by flat lobes and by the absence of a grey crystalline layer beneath the layer of anthraquinones in the cortex (cf. Clauzade & Roux 1985).

C. biatorina (A. Massal.) J. Steiner

The Rhodopes: Distr. Plovdiv, Asenovgrad, Dobrostan, calcareous rocks around hut Martsiganitsa, ca 6 km W of village, alt. ca 1200 m, 41°56' N, 24°53' E, on hard limestone rock under overhang, 25 Aug 2004, parasited by *Bispora christiansenii* D. Hawksw. (CBFS 2252) and with *Xanthoria nowakii* S.Y. Kondr. & Bielczyk (CBFS 2258); Distr. Haskovo, Stambolovo, Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, vertical side of hard limestone rock, 17 Aug 2004 (CBFS 2240).

Note: All the collected samples belong to *C. biatorina* subsp. *gyalolechioides* (Müll. Arg.) Clauzade & Cl. Roux, characterized by its intensively white pruinose thallus and short ascospores. However, distinguishing *C. biatorina* subsp. *biatorina* versus subsp. *gyalolechioides* by the size and shape of ascospores (Clauzade & Roux 1985) is incorrect, since there is a wider variability in spore shape in *C. biatorina* subsp. *gyalolechioides* (Vondrák, unpubl.). There is only one previously published record from Bulgaria, namely Rila Mts (Pišút 2001).

C. cerina (Ehrh. ex Hedw.) Th. Fr.

The Rhodopes: Distr. Plovdiv, Asenovgrad, Dobrostan, forest under hut Martsiganitsa, ca 6 km W of village, alt. ca 1100 m, 41°56' N, 24°53' E, on bark of *Quercus petraea*, 25 Aug 2004 (CBFS 2244); Asenovgrad, Gornoslav, in forest above village, alt. 750 m, 41°55' N, 24°59' E, on bark of *Ostrya carpinifolia*, 26 Aug 2004 (CBFS 2127).

**C. cerinella* (Nyl.) Flagey

The Rhodopes: Distr. Haskovo, Madzharovo, in valley of river Arda, alt. 200 m, 41°39' N, 25°51' E, on bark of *Salix caprea*, 19 Aug 2004 (CBFS 2207); Distr. Haskovo, Stambolovo, Rabovo in Arda river valley, alt. 190 m, 41°40' N, 25°40' E, on bark of *Salix fragilis*, 18 Aug 2004 (CBFS 2158).

Note: The species superficially resembles *C. holocarpa* (incl. *C. cerinelloides* and *C. pyracea*). It is clearly characterized by having 12–16 spores per ascus.

C. chalybaea (Fr.) Müll. Arg.

The Rhodopes: Distr. Plovdiv, Asenovgrad, Dobrostan, calcareous rocks in small polje *ca* 2 km W of village, alt. 1300 m, 41°56' N, 24°53' E, 25 Aug 2004 (CBFS 2191); Distr. Haskovo, Stambolovo, Byal Kladenets, edge of protected area "Golemya Sipey" S of village, alt. 420 m, 41°37' N, 25°40' E, 17 Aug 2004 (CBFS 2081); Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, 17 Aug 2004 (CBFS 2090, 2168).

C. chlorina (Flot.) H. Olivier (syn. *C. cerina* var. *chlorina* (Flot.) Müll. Arg.)

Black Sea coast: Distr. Burgas, Sinemorets, coastal rocks *ca* 2 km SE of village, alt. 3-10 m, 42°00'30" N, 28°00' E, on coastal rocks under littoral-supralittoral conditions, 23 Aug 2004 (Sel. exs. *Caloplaca*, no. 15). **The Rhodopes:** Distr. Kurdzhali, Momchilgrad, Ptichar, near railway station, alt. 320 m, 41°28' N, 25°25' E, on bark of *Populus nigra*, 12 Aug 2004 (CBFS 2026); Distr. Haskovo, Madzharovo, protected area "Kovan Kaya" *ca* 3 km NNE of town, alt. 200 m, 41°39' N, 25°51' E, on bark of old *Quercus* sp., 29 Oct 2002 (CBFS 762 – sub *Caloplaca isidiigera* Vězda); Madzharovo, protected area "Momina Skala" *ca* 3 km WNW of town, alt. 200 m, 41°39' N, 25°51' E, on volcanic rocky outcrops just above water level of river Arda, 18 Aug 2004 (CBFS 2055); Madzharovo, Silen, Rabovo, valley of small brook N of village, alt. *ca* 250 m, 41°37' N, 25°40' E, corticolous on bark of *Populus nigra*, together with *Rinodina pityrea*, 18 Aug 2004 (Sel. exs. *Caloplaca*, no. 11, sub *C. virescens*). **Mt Strandzha:** Distr. Burgas, Gramatikovo, oak forest near village, 27°38' N, 42°03' E, on bark of old *Quercus frainetto*, 12 Jul 2005 (CBFS 3236).

Note: We follow the broad concept of *C. chlorina* proposed by Tønsberg (1992), who characterizes it as a variable species, which can form well-developed, flat areolae with marginal soredia, consoredia, or isidia-like projections, as well as completely leprose thalli. On the coastal locality, *C. chlorina* is very abundant, but this population differs from typical *C. chlorina* by the scarcity of isidia and soralia. This morphotype occurs in the supralittoral zone together with *C. viridirufa*.

**C. chrysodeta* (Vain. ex Räsänen) Dombr. (syn. *Leproplaca chrysodeta* (Räsänen) J.R. Laundon)

The Rhodopes: Distr. Plovdiv, Asenovgrad, Dobrostan, calcareous rocks around hut Martsiganitsa, *ca* 6 km W of village, alt. *ca* 1200 m, 41°56' N, 24°53' E, 25 Aug 2004 (CBFS 2118); Dobrostan, calcareous rocks in small polje *ca* 5 km W of village, alt. 1300 m, 41°56' N, 24°53' E, 25 Aug 2004 (CBFS 1996); Distr. Kurdzhali, Kurdzhali, Kaloyantsi, alt. 320 m, 41°38' N, 25°32' E, 16 Aug 2004 (CBFS 2005).

C. cirrochroa (Ach.) Th. Fr.

The Rhodopes: Distr. Plovdiv, Asenovgrad, Dobrostan, calcareous rocks around hut Martsiganitsa, *ca* 6 km W of village, alt. *ca* 1200 m, 41°56' N, 24°53' E, 25 Aug 2004 (CBFS 2123); Distr. Haskovo, Stambolovo, Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, 17 Aug 2004 (CBFS 1997).

C. citrina (Hoffm.) Th. Fr.

The Rhodopes: Distr. Kurdzhali, Kurdzhali, Shiroko Pole, protected area "Sredna Arda", *ca* 5 km E of village, alt. *ca* 240 m, 41°37' N, 25°31' E, on concrete wall near railway station "Sredna Arda", 15 Aug 2004 (CBFS

2015); Distr. Kurdzhali, Momchilgrad, in Vurbitsa river valley, alt. 240 m, 41°31' N, 25°25' E, on calcareous stone in river bed, just above water level, 13 Aug 2004 (CBFS 2140); Distr. Haskovo, Stambolovo, Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, on hard limestone rocks, 17 Aug 2004 (CBFS 2101).

Note: We use the narrow concept of *C. citrina*; thus, *C. dichroa* Arup, *C. flavocitrina* (Nyl.) H. Olivier, and *C. phlogina* (Ach.) Nyl. are considered as separate species (Sérusiaux *et al.* 1999; Arup 2006).

C. coronata (Körb.) J. Steiner (syn. *C. autantiaca* var. *coronata* (Körb.) Jatta)

The Rhodopes: Distr. Kurdzhali, Kurdzhali, Dolishte, limestone rocks in valley *ca* 1 km W of village, alt. 300 m, 41°38' N, 25°35' E, 16 Aug 2004 (CBFS 2096); Distr. Haskovo, Stambolovo, Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, 17 Aug 2004 (CBFS 2075).

C. crenularia auct., non (With.) J.R. Laundon (syn. *C. festiva* auct., non (Th. Fr.) Zwackh)

The Rhodopes: Distr. Kurdzhali, Dzhebel, Rogozche, rocks in Vurbitsa river valley near railway station, alt. 300 m, 41°28' N, 25°25' E, 12 Aug 2004 (CBFS 2037); Distr. Kurdzhali, Kirkovo, Bregovo, in valley of small affluent to river Vurbitsa *ca* 1 km S of village, alt. 280 m, 41°28' N, 25°25' E, 11 Aug 2004 (CBFS 2036); Bregovo, in Vurbitsa river valley *ca* 2 km E of the village, alt. 300 m, 41°28' N, 25°25' E, 11 Aug 2004 (CBFS 2000, 2039); Distr. Kurdzhali, Kirkovo, Starovo, in village, alt. 350 m, 41°28' N, 25°25' E, on calcareous sandstone rocky outcrop, 11 Aug 2004 (CBFS 2029); Distr. Kurdzhali, Kurdzhali, Kaloyantsi, protected area "Yumrouk Skala", *ca* 5 km SW of village, alt. *ca* 320 m, 41°37' N, 25°31' E, 15 Aug 2004 (CBFS 2027); Distr. Haskovo, Madzharovo, by river Arda, 41°40' N, 25°50' E, 29 Oct 2002 (CBFS 706); Madzharovo, protected area "Momina Skala" *ca* 3 km WNW of town, alt. 200 m, 41°39' N, 25°51' E, 18 Aug 2004 (CBFS 2065); Distr. Haskovo, Stambolovo, Rabovo nearby dam of lake "Studen Kladenets", alt. 250 m, 41°40' N, 25°40' E, 18 Aug 2004 (CBFS 2113).

Note: *C. crenularia* (With.) J.R. Laundon described from the British Isles (Isle of Wight, BM, lectotype!) differs from Bulgarian populations in particular characters: smaller spores with thinner septa, presence of distinct cortex and absence of algae in exciple. Moreover, *C. crenularia* (With.) J.R. Laundon has rather northern and western distribution in Europe and differs strongly in ecology, preferring sheltered damp habitats (cf. Magnusson 1944; Laundon 1992a; Wetmore 1996). Therefore, the Bulgarian material from exposed xerothermic sites is provisionally named *C. crenularia* auct.

**C. crenulatella* (Nyl.) H. Olivier

Black Sea coast: Distr. Burgas, Sinemorets, coastal rocks *ca* 2 km SE of village, alt. *ca* 20 m, 42°00'30" N, 28°00' E, on coastal rocks in supralittoral zone, 22 Aug 2004 (CBFS 2232). **The Rhodopes:** Distr. Plovdiv, Asenovgrad, Dobrostan, Sv. Iliya chapel above village, alt. 1320 m, 41°56' N, 24°54' E, on hard limestone outcrops, 25 Aug 2004 (CBFS 2128); Distr. Kurdzhali, Krumovgrad, Bryagovets, stones on bank of Arda river, alt. 200 m, 41°39' N, 25°51' E, on volcanic boulders just above water level, 18 Aug 2004 (CBFS 2147); Distr. Kurdzhali, Dzhebel, Rogozche, rocks in Vurbitsa river valley near railway station, alt. 300 m, 41°28' N, 25°25' E, on sunny base-rich volcanic rock, 12

Aug 2004 (CBFS 2202); Distr. Kurdzhali, Kirkovo, Starovo, ca 2 km E of village, alt. 390 m, 41°28' N, 25°25' E, on concrete on well, 10 Aug 2004 (CBFS 2017); Distr. Kurdzhali, Kurdzhali, Shiroko Pole, protected area "Sredna Arda", ca 5 km E of village, alt. ca 240 m, 41°37' N, 25°31' E, on concrete wall near railway station "Sredna Arda", 15 Aug 2004 (CBFS 2032, 2033); protected area "Sredna Arda", ca 6 km E of village, alt. ca 240 m, 41°37' N, 25°31' E, on concrete on railway bridge across Perpere river, 15 Aug 2004 (CBFS 2016); Distr. Kurdzhali, Momchilgrad, in Vurbitsa river valley, alt. 240 m, 41°31' N, 25°25' E, calcareous stone in river bed, just above water level, 13 Aug 2004 (CBFS 2035). **Thracian Lowland:** Stara Zagora, Mihaylovo, railway station, 42°16' N, 25°31' E, on horizontal plate of concrete, 20 Aug 2004 (CBFS 2066).

Note: For the differences between *C. crenulatella* and related species, mainly *C. aquensis* Houmeau & Cl. Roux and *C. ferrarii* (Bagl.) Jatta, see Navarro-Rosinés & Hladun (1996).

C. decipiens (Arnold) Blomb. & Forssell

The Rhodopes: Distr. Plovdiv, Asenovgrad, Dobrostan, Sv. Iliya chapel above village, alt. 1320 m, 41°56' N, 24°54' E, on mortar, 25 Aug 2004 (CBFS 1993); Distr. Haskovo, Stambolovo, Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, on hard limestone rocks, 17 Aug 2004 (CBFS 2071).

C. demissa (Körb.) Arup & Grube (syn. *Lecanora incusa* (Flot.) Wain., *L. demissa* (Körb.) ex Flot.) Zahlbr.)

Black Sea coast: Distr. Burgas, Rezovo, coastal rocks N of the village, alt. ca 15 m, 42°00' N, 28°00' E, on coastal silicate rock, 13 Jul 2005 (CBFS 3206). **The Rhodopes:** Distr. Kurdzhali, Dzhebel, Rogozche, rocks in Vurbitsa river valley near railway station, alt. 300 m, 41°28' N, 25°25' E, 10 Aug 2004 (CBFS 2004); Distr. Kurdzhali, Kirkovo, Bregovo, in valley of small affluent to river Vurbitsa ca 1 km S of village, alt. 280 m, 41°28' N, 25°25' E, 11 Aug 2004 (CBFS 2028); Distr. Kurdzhali, Momchilgrad, Pritchik, rocks in Vurbitsa river valley, alt. 300 m, 41°28' N, 25°25' E, 12 Aug 2004 (CBFS 2018); Distr. Haskovo, Madzharovo, protected area "Kovan Kaya" ca 3 km NNE of town, alt. 200 m, 41°39' N, 25°51' E, 27 Oct 2002 and 19 Aug 2004 (CBFS 704, 2050); Distr. Haskovo, Stambolovo, Rabovo in Arda river valley, alt. 190 m, 41°40' N, 25°40' E, 18 Aug 2004 (CBFS 2040).

Note: *C. demissa* is a sterile species which was traditionally placed into the section *Placodium* of the genus *Lecanora*. It has been combined into *Caloplaca* on the base of several morphological characters (e.g. shape of conidia) and molecular data (Arup & Grube 1999).

C. dolomiticola (Hue) Zahlbr. (incl. *C. schaeereri* (Arnold) Cl. Roux, *C. velana* (A. Massal.) Du Rietz)

The Rhodopes: Distr. Plovdiv, Asenovgrad, Dobrostan, calcareous rocks in small polje ca 2 km W of village, alt. 1300 m, 41°56' N, 24°53' E, on hard limestone rock, 25 Aug 2004 (CBFS 2208); Distr. Kurdzhali, Kirkovo, Starovo, in village, alt. 350 m, 41°28' N, 25°25' E, on calcareous sandstone rocky outcrop, 11 Aug 2004 (CBFS 2153); Distr. Kurdzhali, Kurdzhali, Dolishte, limestone rocks in valley ca 1 km W of village, alt. 300 m, 41°38' N, 25°35' E, on hard limestone rock, 16 Aug 2004 (CBFS 2100); Distr. Haskovo, Stambolovo, Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, on hard limestone rocks, 17 Aug 2004 (CBFS 2076).

Note: *C. dolomiticola* is used here in a broad sense to include variable calcicolous specimens with a yellow areolated thallus. The *C. dolomiticola* complex is in urgent need of modern taxonomic revision.

**C. erodens* Tretiach, Pinna & Grube

The Rhodopes: Distr. Plovdiv, Asenovgrad, Dobrostan, calcareous rocks around hut Martsiganitsa, ca 6 km W of village, alt. ca 1200 m, 41°56' N, 24°53' E, 25 Aug 2004 (CBFS 2104); Distr. Kurdzhali, Kurdzhali, Dolishte, limestone rocks in valley ca 1 km W of village, alt. 300 m, 41°38' N, 25°35' E, 16 Aug 2004 (CBFS 2108).

Note: *C. erodens* was recently described and placed in the section *Pyrenodesmia* (Tretiach *et al.* 2003). It usually has a sterile, bluish-grey orbicular thallus with endolithic central part, which is delimited by an epilithic, obscurely lobate prothallus. It contains the pigment Sedifoliagrey. Thalli of *C. erodens* form typical shallow depressions in calcareous substrata. Bulgarian specimens agree well with the isotype material (Vězda, Lich. rar. exs., no. 499!).

C. erythrocarpa (Pers.) Zwackh (syn. *C. arenaria* auct. p.p., non (Pers.) Müll. Arg.)

Mt Strandzha: Distr. Burgas, Malko Tarnovo, wasteland near town, 42°00' N, 27°30' E, on calcareous stone, 11 Jul 2005 (CBFS 3208).

Note: The Bulgarian material is clearly conspecific with the sample of *Lecidea erythrocarpa* (Pers.) Ach. in Acharius's herbarium (H-Ach 353!) indicated by the note "ad lapides calcarios prope Dyjon, Galliae, Persoon". It can represent a piece of the type material.

**C. flavocitrina* (Nyl.) H. Olivier (syn. *C. citrina* var. *flavocitrina* (Nyl.) A.E. Wade)

Black Sea coast: Distr. Burgas, Sinemorets, coastal rocks ca 2 km SE of village, alt. ca 20 m, 42°00'30" N, 28°00' E, on shrub wood influenced by salty spray and on pebbles influenced by salty spray, 22 Aug 2004 (CBFS 2105, 2106). **The Rhodopes:** Distr. Plovdiv, Luki, Yugovo, in village, alt. 700 m, 41°55' N, 24°55' E, on N-exposed mortar, 24 Aug 2004 (CBFS 2230); Distr. Kurdzhali, Kurdzhali, Shiroko Pole, protected area "Sredna Arda", ca 5 km E of village, alt. ca 240 m, 41°37' N, 25°31' E, on concrete wall near railway station "Sredna Arda", 15 Aug 2004 (CBFS 2021); Distr. Haskovo, Stambolovo, Rabovo rocks above village, alt. 280 m, 41°40' N, 25°40' E, on base-rich volcanic rock, 18 Aug 2004 (CBFS 2185) and on bark of *Populus nigra* (2408); Distr. Haskovo, Lyubimets, Malko Gradishte, rocks nearby hill "Sveta Marina" ca 5 km SW of village, alt. 600 m, 41°44' N, 26°00' E, on exposed, lime-enriched porose volcanic rock, 19 Aug 2004 (CBFS 2051).

Note: The thallus of *C. flavocitrina* is composed of irregularly shaped yellow scales which become soresiate at the edges. Some authors consider this taxon as a variety of *C. citrina* (e.g. Wade 1965; Wetmore 2001; Santesson *et al.* 2004). However, we regard it as a species following van den Boom *et al.* (1998) and Sérusiaux *et al.* (1999), recently approved by molecular data (Arup 2006).

C. flavovirescens (Wulfen) Dalla Torre & Sarnth. (syn. *C. aurantiaca* var. *flavovirescens* (Wulfen) Th. Fr.)

The Rhodopes: Distr. Plovdiv, Luki, Jugovo, rocky outcrops around village, alt. ca 700 m, 41°55' N, 24°55' E, common on lime-enriched schist stones, 24 Aug 2004 (recorded only); Distr. Haskovo, Stambolovo, Byal Kladenets, protected area "Golemya Sipey" S of village, alt. 420 m,

41°37' N, 25°40' E, on small limestone outcrops, 17 Aug 2004 (CBFS 1998).

**C. aff. furax* Egea & Llimona

Black Sea coast: Distr. Burgas, Sinemorets, coastal rocks *ca* 2 km SE of village, alt. *ca* 20 m, 42°00'30" N, 28°00' E, on coastal rocks, 22 Aug 2004 (CBFS 2045, 2047, 2048); Rezovo, coastal rocks N of the village, alt. *ca* 5-10 m, 42°00' N, 28°00' E, on coastal siliceous rock, 13 Jul 2005 (CBFS 3239). **The Rhodopes:** Distr. Kurdzhali, Kurdzhali, Shiroko Pole, protected area "Sredna Arda", *ca* 5 km E of village, alt. *ca* 240 m, 41°37' N, 25°31' E, on concrete wall above railway, 15 Aug 2004 (CBFS 2011); Distr. Kurdzhali, Dzhebel, Rogozhe, rocks in Vurbitsa river valley near railway station, alt. 300 m, 41°28' N, 25°25' E, on base-rich volcanic rock, 12 Aug 2004 (CBFS 2006); Distr. Kurdzhali, Kirkovo, Bregovo, in valley of small affluent to river Vurbitsa *ca* 1 km S of village, alt. 280 m, 41°28' N, 25°25' E, on base-rich volcanic rock, 11 Aug 2004 (CBFS 2030, 2043); Distr. Haskovo, Madzharovo, protected area "Kovan Kaya" *ca* 3 km NNE of town, alt. 200 m, 41°39' N, 25°51' E, on base-rich volcanic boulders in river valley, just above water level, 19 Aug 2004 (CBFS 2102); Distr. Haskovo, Stambolovo, Rabovo rocks above village, alt. 280 m, 41°40' N, 25°40' E, on base-rich volcanic rock, 18 Aug 2004 (CBFS 2023).

Note: This species belongs to the *C. ferruginea* group (sensu Clauzade & Roux 1985) and is most similar to *C. pellodella*, *C. spalatensis* (= *C. areolata*) and *C. xerica*. According to Egea & Llimona (1983), *C. furax* is a strict parasite on silicolous species of *Aspicilia*. We have checked the isotype material of *C. furax* (GZU, Murc. Lichenotheca, no. 3039!) and conclude that the Bulgarian samples share the following characters with *C. furax*: thick grey thallus with irregular marginal lobes, presence of Sedifolia-grey in cortex, zeorine apothecia with grey outer margin and numerous dark grey immersed pycnidia. However, some other features of *C. furax*, such as the parasitic life-style and the blackish fibrilous prothallus, have been rarely observed in Bulgarian material. Investigation of more material of *C. furax* and using molecular methods would be useful in clarifying the relationship between the different morphotypes.

**C. fuscoatroides* J. Steiner (syn. *C. caesiorufa* auct., non (Ach.) Flagey, ?*C. ceracea* J.R. Laundon)

Black Sea coast: Distr. Burgas, Sinemorets, coastal rocks *ca* 2 km SE of village, alt. 10-30 m, 42°00'30" N, 28°00' E, on coastal rocks under supralittoral conditions, 23 Aug 2004 (Sel. exs. *Caloplaca*, no. 17); Rezovo, coastal rocks N of the village, alt. *ca* 15 m, 42°00' N, 28°00' E, on coastal silicate rock, 13 Jul 2005 (CBFS 3209, 3246).

Note: This species commonly occurs on Bulgarian seashore rocks. Although not previously published from Bulgaria, the record of *C. caesiorufa* from the locality "Burgas" (Popnikolov & Železova 1964) may refer to *C. fuscoatroides*. The name *C. caesiorufa* was also used for *C. ceracea* in the British Isles (Laundon 1992b); after checking the type material of *C. ceracea* (BM, holotype!), we consider this species morphologically indistinguishable from the specimens of *C. fuscoatroides* occurring on the Black Sea coast.

C. granulosa (Müll. Arg.) Jatta

The Rhodopes: Distr. Plovdiv, Asenovgrad, Dobrostan, calcareous rocks around hut Martsiganitsa, *ca* 6 km W of village, alt. *ca* 1200 m, 41°56'

N, 24°53' E, 25 Aug 2004 (CBFS 2116); Dobrostan, calcareous rocks in small polje *ca* 2 km W of village, alt. 1300 m, 41°56' N, 24°53' E, 25 Aug 2004 (CBFS 1995).

C. grimmiae (Nyl.) H. Olivier (syn. *C. congregiens* auct., non (Nyl.) Zahlbr., *C. consociata* J. Steiner)

Black Sea coast: Distr. Burgas, Sinemorets, coastal rocks *ca* 2 km SE of village, alt. *ca* 20 m, 42°00'30" N, 28°00' E, on coastal rocks, parasite on *Candelariella vitellina*, 22 Aug 2004 (CBFS 2054); Rezovo, coastal rocks N of the village, alt. *ca* 5-10 m, 42°00' N, 28°00' E, on coastal siliceous rock, parasitic on *C. vitellina*, 13 Jul 2005 (CBFS 3238). **The Rhodopes:** Distr. Plovdiv, Asenovgrad, Dobrostan, nearby small polje *ca* 5 km W of village, alt. 1300 m, 41°56' N, 24°53' E, on exposed silicate stone, 25 Aug 2004 (CBFS 2115); Distr. Kurdzhali, Kirkovo, Bregovo, in valley of small affluent to river Vurbitsa *ca* 1 km S of village, alt. 280 m, 41°28' N, 25°25' E, on base-rich volcanic rock, 11 Aug 2004 (CBFS 2001); Distr. Haskovo, Madzharovo, by river Arda, 41°40' N, 25°50' E, on sunny volcanic rock, parasitic on *C. vitellina*, 27 Oct 2002 (CBFS 707).

Note: This species is strictly parasitic on *Candelariella vitellina*, its thallus consisting of inconspicuous brown areoles, with apothecia superficially similar to those of *Caloplaca viridirufa*.

C. herbidella (Hue) H. Magn.

Pirin Mts: Distr. Blagoevgrad, N part of Pirin National Park, by green marked path from hut Banderitsa to bivouac Kazana, *ca* 400-500 m N of hut Banderitsa, alt. 1830 m, on bark of *Pinus nigra*, 25 Jun 2004 (herb. Slavíková-Bayerová 3292).

Note: This species belongs to the *C. ferruginea* group and is characterized by the presence of granular to vertically elongated isidia on a grey to whitish thallus. *C. furfuracea* is a very similar species, but it never produces elongated isidia and has some apothecia with an outer thalline margin (Wetmore 2004).

C. holocarpa (Hoffm. ex Ach.) A.E. Wade (incl. *C. pyracea* (Ach.) Th. Fr.)

Black Sea coast: Distr. Burgas, Sinemorets, coastal rocks *ca* 2 km SE of village, alt. *ca* 15 m, 42°00'30" N, 28°00' E, on dead shrub bark influenced by salt from sea, 22 Aug 2004 (CBFS 2119). **The Rhodopes:** Distr. Haskovo, Madzharovo, protected area "Momina Skala" *ca* 3 km WNW of town, alt. 200 m, 41°39' N, 25°51' E, on soft limestone boulder nearby river Arda, 18 Aug 2004 (CBFS 2143); Distr. Haskovo, Stambolovo, Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, on smooth bark of young *Fraxinus excelsior*, 17 Aug 2004 (CBFS 2167); Stambolovo, Rabovo nearby dam of lake "Studen Kladenets", alt. 250 m, 41°40' N, 25°40' E, on base-rich weathered volcanic rock, 18 Aug 2004 (CBFS 2234). **Mt Strandzha:** Burgas, Gramatikovo, oak forest near village, 27°38' N, 42°03' E, on bark of old *Quercus cerris*, 12 Jul 2005 (CBFS 3222).

Note: Some authors place corticolous and lignicolous ecotypes into the separate taxon, *C. pyracea* beside the saxicolous *C. holocarpa* (e.g. Clauzade & Roux 1985; Nimis & Tretiach 1999). Nevertheless, we have investigated both ecological variants in detail and consider them to be morphologically identical; therefore, we follow the broader concept of *C. holocarpa* (e.g. Diederich & Sérusiaux 2000).

**C. hungarica* H. Magn. (syn. *C. ferruginea* var. *hungarica* (H. Magn.) Clauzade & Cl. Roux)

Pirin Mts: Distr. Blagoevgrad, N part of Pirin National Park, by green marked path from hut Banderitsa to bivouac Kazana, ca 1100-1200 m NW of hut Banderitsa, alt. 2100-2150 m, on branch of *Pinus nigra*, 25 Jun 2004 (herb. Slavíková-Bayerová 3300). **The Rhodopes:** Distr. Haskovo, Stambolovo, Rabovo nearby dam of lake "Studen Kladenets", alt. 250 m, 41°40' N, 25°40' E, on bark of *Pistacia terebinthus*, 18 Aug 2004 (CBFS 2214).

Note: This species is similar to *C. ferruginea*, but differs in having a very thin whitish thallus which is less ferruginous, C- apothecia (see also Magnusson 1944).

**C. inconnexa* (Nyl.) Zahlbr. var. *inconnexa* (syn. *C. tenuatula* subsp. *inconnexa* (Nyl.) Clauzade & Cl. Roux)

The Rhodopes: Distr. Kurdzhali, Kurdzhali, Dolishte, limestone rocks in valley ca 1 km W of village, alt. 300 m, 41°38' N, 25°35' E, on hard limestone rock, on *Acarospora cervina*, *Aspicilia calcarea*, and *Placocarpus schaereri*, 16 Aug 2004 (CBFS 2098, 2109, 2194); Distr. Haskovo, Stambolovo, Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, on exposed hard limestone rock, 17 Aug 2004 (CBFS 2080).

Note: This species is usually characterized by a yellow to yellow-orange, parasitic thallus, which is usually incorporated among the areoles of a host lichen species (Poelt 1958). Nevertheless, mature thalli can be non-parasitic in later stages (e.g. Vězda 1970; Diederich & Sérusiaux 2000). According to Sipman & Raus (1999), the extent of parasitism and autotrophy cannot be exactly determined.

**C. inconnexa* var. *nesodes* Poelt & Nimis

Black Sea coast: Distr. Burgas, Sinemorets, coastal rocks ca 2 km SE of village, alt. 10-30 m, 42°00'30" N, 28°00' E, on coastal rocks under supralittoral conditions, parasitic on *Aspicilia* sp., 23 Aug 2004 (Sel. exs. *Caloplaca*, no. 18).

Note: Bulgarian specimens agree well with the type material of *C. inconnexa* var. *nesodes* [Italy, GZU, holotype!]. *C. necator* Clauzade & Poelt, another species parasitic on silicolous *Aspicilia* species, is a smaller lichen with smaller spores (Nimis & Poelt 1987).

C. lactea (A. Massal.) Zahlbr. (syn. *Gyalolechia lactea* (A. Massal.) Arnold)

The Rhodopes: Distr. Kurdzhali, Kurdzhali, Dolishte, limestone rocks in valley ca 1 km W of village, alt. 300 m, 41°38' N, 25°35' E, 16 Aug 2004 (CBFS 2238); Distr. Kurdzhali, Kurdzhali, Shiroko Pole, protected area "Sredna Arda", ca 5 km E of village, alt. ca 240 m, 41°37' N, 25°31' E, on calcareous boulder, 14 Aug 2004 (CBFS 2197); Distr. Haskovo, Stambolovo, Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, 17 Aug 2004 (CBFS 2235).

Note: This lichen is similar to *C. marmorata*, but differs in having paler, orange-red apothecia and distinctly shorter and thicker spores (Navarro-Rosinés & Hladun 1996).

**C. marmorata* (Bagl.) Jatta (syn. *C. lactea* f. *rubra* (de Lesd.) Zahlbr.)

The Rhodopes: Distr. Kurdzhali, Kurdzhali, Dolishte, limestone rocks in valley ca 1 km W of village, alt. 300 m, 41°38' N, 25°35' E, 16 Aug 2004

(CBFS 2243); Distr. Haskovo, Stambolovo, Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, on hard limestone rocks, 17 Aug 2004 (CBFS 2103).

**C. obscurella* (Körb.) Th. Fr.

The Rhodopes: Distr. Plovdiv, Asenovgrad, Dolnoslav, in village, alt. 400 m, 41°55' N, 24°59' E, on bark of *Platanus acerifolia*, 26 Aug 2004 (CBFS 2126); Distr. Kurdzhali, Kurdzhali, Kaloyantsi, alt. 320 m, 41°38' N, 25°32' E, on bark of *Quercus frainetto*, 16 Aug 2004 (CBFS 2088); Distr. Kurdzhali, Kirkovo, Starovo, in forest ca 2 km E of village, alt. 390 m, 41°28' N, 25°25' E, on bark of *Q. frainetto*, 10 Aug 2004 (CBFS 2003); Distr. Kurdzhali, Momchilgrad, Ptichar, near railway station, alt. 320 m, 41°28' N, 25°25' E, on bark of *Pyrus communis*, 13 Aug 2004 (CBFS 2044); Distr. Haskovo, Madzharovo, protected area "Kovan Kaya" ca 3 km NNE of town, alt. 300 m, 41°39' N, 25°51' E, in old oak forest, on bark of *Q. frainetto*, 19 Aug 2004 (CBFS 2053); Distr. Haskovo, Stambolovo, Rabovo nearby dam of lake "Studen Kladenets", alt. 250 m, 41°40' N, 25°40' E, on bark of *Acer monspesulanum*, 18 Aug 2004 (CBFS 2014); Rabovo in Arda river valley, alt. 190 m, 41°40' N, 25°40' E, on bark of *Salix fragilis*, 18 Aug 2004 (CBFS 2022) and on bark of *Populus nigra*, mostly in lower part of trunk and on above-ground parts of roots (Sel. exs. *Caloplaca*, no. 13). **Mt Strandzha:** Distr. Burgas, Gramatikovo, oak forest near village, 27°38' N, 42°03' E, on bark of old *Quercus cerris*, 11 Jul 2005 (CBFS 3207).

Note: This rather inconspicuous species from the section *Pyrenodesmia* is usually sterile, but it is characterised by its crater-like soralia.

C. ochracea (Schaer.) Flagey (syn. *Blastenia ochracea* (Schaer.) Trevis., *Gyalolechia ochracea* (Schaer.) Syd., *Xanthocarpia ochracea* (Schaer.) A. Massal. & De Not.)

The Rhodopes: Distr. Kurdzhali, Kurdzhali, Dolishte, limestone rocks in valley ca 1 km W of village, alt. 300 m, 41°38' N, 25°35' E, hard limestone rock, 16 Aug 2004 (CBFS 2254).

Note: This species is the only European *Caloplaca* with 4-celled ascospores (Hafellner & Poelt 1979). It superficially resembles *C. lactea* and some forms of *C. adriatica*.

C. pellodella (Nyl.) Hasse (syn. *C. conglomerata* (Bagl.) Jatta, *C. amabilis* Zahlbr.)

The Rhodopes: Distr. Haskovo, Madzharovo, protected area "Kovan Kaya" ca 3 km NNE of town, alt. 200 m, 41°39' N, 25°51' E, on base-rich volcanic boulders in Arda river valley, just above water level, 27 Oct 2002 and 19 Aug 2004 (CBFS 703, 2114).

Note: The lead-grey, squamulose thallus and apothecia with dark grey exciple are typical characters of this species (cf. Wetmore 1996). Two records are known from Bulgaria: valley of river Strouma and western pathhills of Pirin Mts (Pišút 1971, 2001).

**C. polycarpa* (A. Massal.) Zahlbr. (syn. *C. tenuatula* (Nyl.) Zahlbr.)

The Rhodopes: Distr. Kurdzhali, Kurdzhali, Dolishte, limestone rocks in valley ca 1 km W of village, alt. 300 m, 41°38' N, 25°35' E, 16 Aug 2004 (CBFS 2251); Distr. Haskovo, Stambolovo, Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, 17 Aug 2004 (CBFS 2236); Byal Kladenets, protected area "Golemya Sipey" S of village, alt. 420 m, 41°37' N, 25°40' E, 17 Aug 2004 (CBFS 2227).

Mt Strandzha: Distr. Burgas, Malko Tarnovo, wasteland near town, 42°00' N, 27°30' E, on limestone outcrop, 11 Jul 2005 (CBFS 3244).
Note: The species is mostly parasitic on *Verrucaria calciseda*. When its yellow areolated thallus is indistinct, it resembles *Caloplaca holocarpa*.

C. rubelliana (Ach.) Lojka

Black Sea coast: Distr. Burgas, Sinemorets, coastal rocks ca 2 km SE of village, alt. ca 5 m, 42°00'30" N, 28°00' E, on coastal rocks in supralittoral zone, 22 Aug 2004 (CBFS 2107).

Note: This species is characterized by immersed apothecia without a true exciple. The hymenium is only up to 70 µm high and spores only 7.5–9.5 × 4–5 µm in size (Wetmore & Kärnefelt 1999). One record is known from Bulgaria: valley of river Strouma (Pišút 1995). We have seen *C. rubelliana* only once in the supralittoral zone of the Black Sea. It is also known from the Black Sea coastal rocks of the Crimea Peninsula of the Ukraine (Khososovtsev 2002).

C. saxicola (Hoffm.) Nordin (syn. *C. murorum* (Hoffm.) Th. Fr., *C. tegularis* auct., non (Ehrh.) Zahlbr.)

Black Sea coast: Distr. Burgas, Sinemorets, coastal rocks ca 2 km SE of village, alt. ca 10 m, 42°00'30" N, 28°00' E, sunny coastal silicate rock, 22 Aug 2004 (CBFS 2250). **The Rhodopes:** Distr. Kurdzhali, Kurdzhali, Dolishte, limestone rocks in valley ca 1 km W of village, alt. 300 m, 41°38' N, 25°35' E, on hard limestone rock, 16 Aug 2004 (CBFS 2085); Distr. Haskovo, Lyubimets, Malko Gradishte, rocks nearby hill "Sveta Marina" ca 5 km SW of village, alt. 600 m, 41°44' N, 26°00' E, on exposed, lime-enriched porose volcanic rock, 19 Aug 2004 (CBFS 2052).

Note: *C. saxicola* is a variable species from the section *Gasparrinia*. It contains conspicuously lobate forms as well as forms with strongly reduced thallus (Wade 1965; Nordin 1972). *C. saxicola* also includes forms strongly pruinose as well as apruinose.

C. saxifragarum Poelt (syn. *C. pyracea* f. *microcarpa* (Anzi) Dalla Torre & Sarnth.)

Pirin Mts: Distr. Blagoevgrad, N part of Pirin National Park, by green marked path from hut Banderitsa to bivouac Kazana, ca 400 m E of bivouac Kazana, alt. 2413 m, 41°46'12.7" N, 23°24'35.5" E, on lignificated part of *Potentilla* growing on limestone with *C. tiroliensis*, 25 Jun 2004 (herb. Slavíková-Bayerová 3315, 3316; CBFS 3007).

Note: This little known taxon from the *C. holocarpa* group is characterized by its small apothecia and a specific ecology, being arctic-alpine lichen found on plant stems and debris (cf. Poelt 1955). Its relationship with other species of the *C. holocarpa* group, namely *C. thuringiaca*, is unclear and needs further investigation. Only a few records are known from Bulgaria, all from Pirin Mts (cf. Mayrhofer *et al.* 2005).

C. stillicidiorum (Vahl) Lyngby (syn. *C. cerina* f. *chloroleuca* Sm., *C. cerina* var. *stillicidiorum* (Vahl) Th. Fr.)

The Rhodopes: Distr. Plovdiv, Asenovgrad, Dobrostan, calcareous rocks in small polje ca 5 km W of village, alt. 1300 m, 41°56' N, 24°53' E, muscicolous on *Homalothecium sericeum*, *Pseudoleskeella catenulate*, and *Schistidium* cf. *crassipilum*, 25 Aug 2004 (CBFS 1992, Sel. exs. *Caloplaca*, no. 12).

Note: This species belongs to the *C. cerina* group and differs from similar taxa by its yellow-grey pruinose apothecial discs. Such pruinose apothecia

occasionally occur within populations of *C. cerina* s. str., therefore, the relation of both species needs further investigation.

C. subsoluta (Nyl.) Zahlbr. (syn. *C. irrubescens* (Nyl. ex Arnold) Zahlbr.)

The Rhodopes: Distr. Kurdzhali, Dzhebel, Rogozche, rocks in Vurbitsa river valley near railway station, alt. 300 m, 41°28' N, 25°25' E, 12 Aug 2004 (CBFS 2007); Distr. Kurdzhali, Kirkovo, Bregovo, in valley of small affluent to river Vurbitsa ca 1 km S of village, alt. 280 m, 41°28' N, 25°25' E, 11 Aug 2004 (CBFS 2038); Distr. Kurdzhali, Momchilgrad, Ptichar, rocks in Vurbitsa river valley, alt. 300 m, 41°28' N, 25°25' E, 12 Aug 2004 (CBFS 2034); Distr. Haskovo, Madzharovo, protected area "Kovan Kaya" ca 3 km NNE of town, alt. 240 m, 41°39' N, 25°51' E, 19 Aug 2004 (CBFS 2149); Distr. Haskovo, Stambolovo, Rabovo rocks above village, alt. 280 m, 41°40' N, 25°40' E, 18 Aug 2004 (CBFS 2025).

Note: This easily recognisable taxon (Wetmore 2003) is one of the most frequent *Caloplaca* species on sunny volcanic rocks in the eastern Rhodopes.

C. teicholyta (Ach.) J. Steiner (syn. *C. caliacrae* Creţiu, *C. arenaria* auct. p.p., non (Pers.) Müll. Arg., *C. erythrocarpa* auct., non (Pers.) Zwackh)

The Rhodopes: Distr. Kurdzhali, Kurdzhali, Dolishte, limestone rocks in valley ca 1 km W of the village, alt. 300 m, 41°38' N, 25°35' E, on hard limestone rock, 16 Aug 2004 (CBFS 2087); Distr. Haskovo, Stambolovo, Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, on hard limestone rock, 17 Aug 2004 (CBFS 2074).

Note: *C. teicholyta* has an orbicular thallus delimited by short lobes; it has a roughly sorediate to blastidiate centre, and is usually sterile. Richly fertile forms have often been named *C. arenaria*.

C. thallincola (Wedd.) Du Rietz

Black Sea coast: Distr. Burgas, Sinemorets, coastal rocks ca 2 km SE of village, alt. 0–10 m, 42°00'30" N, 28°00' E, on coastal rocks under littoral conditions, 23 Aug 2004 (CBFS 2247, Sel. exs. *Caloplaca*, no. 20).

Note: This species from the *C. aurantia* group forms a conspicuous component in maritime supralittoral lichen communities. It has already been reported from the Bulgarian Black Sea coast by Vězda (Lich. sel. exs., no. 1363, PRM!).

**C. tiroliensis* Zahlbr.

Pirin Mts: Distr. Blagoevgrad, N part of Pirin National Park, by green marked path from hut Banderitsa to bivouac Kazana, ca 400 m E of bivouac Kazana, alt. 2413 m, 41°46'12.7" N, 23°24'35.5" E, on lignificated part of *Potentilla* growing on limestone, intermixed in populations of *Caloplaca saxifragarum*, 25 Jun 2004 (herb. Slavíková-Bayerová 3315, 3316).

Note: *C. tiroliensis* is characterized by its yellow-greyish apothecia and invisible thallus. It differs from species of the *C. holocarpa* group (incl. *C. saxifragarum* and *C. schoeferi*), by the yellow colour of its apothecia and from *C. stillicidiorum* by its yellow apothecial margin (Poelt 1955). Bulgarian material has been compared with samples of *C. tiroliensis* from the Alps deposited in GZU.

C. variabilis (Pers.) Müll. Arg.

The Rhodopes: Distr. Kurdzhali, Kurdzhali, Dolishte, limestone rocks in valley ca 1 km W of village, alt. 300 m, 41°38' N, 25°35' E, 16 Aug 2004 (CBFS 2094); Distr. Haskovo, Stambolovo, Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, 17 Aug 2004 (CBFS 2077, 2089); Byal Kladenets, edge of protected area "Golemya Sipey" S of village, alt. 420 m, 41°37' N, 25°40' E, 17 Aug 2004 (CBFS 2082).

C. viridirufa (Ach.) Zahlbr. (syn. *C. aractina* (Fr.) Häyrén, *C. fuscoatra* auct., non (Decuille) Zahlbr.)

Black Sea coast: Distr. Burgas, Sinemorets, coastal rocks ca 2 km SE of village, alt. 0-10 m, 42°00'30" N, 28°00' E, on coastal rocks in supralittoral zone, 23 Aug 2004 (CBFS 2248, Sel. exs. *Caloplaca*, no. 16). **The Rhodopes:** Distr. Haskovo, Stambolovo, Rabovo rocks above village, alt. 280 m, 41°40' N, 25°40' E, base-rich volcanic rock, 18 Aug 2004 (CBFS 2042).

Note: *C. viridirufa* is characterized by its grey thallus with conspicuous glossy blackish prothallus. Its apothecia have orange-red to black discs surrounded by a blackish true exciple. This taxon has been named *C. aractina* for a long time. However, *C. aractina* is conspecific with *C. viridirufa*, which has priority (Vondrák & Vitikainen, unpubl.). Apart from the inland locality, it is one of the dominant species on coastal rocks around the Black Sea. The occurrence of *C. viridirufa* on coastal rocks is well-known from Scandinavia (Nordin 1972).

C. xantholyta (Nyl.) Jatta (syn. *Leproplaca xantholyta* (Nyl.) Hue)

The Rhodopes: Distr. Kurdzhali, Kurdzhali, Dolishte, limestone rocks in valley ca 1 km W of village, alt. 300 m, 41°38' N, 25°35' E, 16 Aug 2004 (CBFS 2091); Distr. Haskovo, Stambolovo, Byal Kladenets, limestone rocks in valley below village, alt. 350 m, 41°37' N, 25°40' E, 17 Aug 2004 (CBFS 2078).

**C. xerica* Poelt & Vězda

The Rhodopes: Distr. Haskovo, Lyubimets, Malko Gradishte, rocks nearby hill "Sveta Marina" ca 5 km SW of village, alt. 600 m, 41°44' N, 26°00' E, on exposed Ca-enriched volcanic rock, 19 Aug 2004 (CBFS 2177, 2179, 2181).

Note: *C. xerica* is similar to *C. spatatensis* (= *C. areolata*), but clearly differs by its lobulate thallus surface. Moreover, *C. spatatensis* is a calcicolous species occurring on bird-perching places (Martellos & Nimis 2000), whilst *C. xerica* usually grows on base-rich xerothermic silicate rocks (Poelt 1975). At its only known Bulgarian locality, *C. xerica* forms a large population.

Acknowledgements. We are grateful to the curators of the herbaria mentioned in the text for their valuable help with the loan of material, to Dr Ulf Arup and Dr Pere Navarro-Rosinés for their comments on several *Caloplaca* samples, to Jiří Košnar for his determination of bryophytes, and to Prof. Mark Seaward for linguistic corrections to the text.

References

- Arup, U. 2006. A new taxonomy of the *Caloplaca citrina* group in the Nordic countries, except Iceland. – *Lichenologist* 38: 1-20.
- Arup, U. & Grube, M. 1999. Where does *Lecanora demissa* (Ascomycota, Lecanorales) belong? – *Lichenologist* 31: 419-430.
- Clauzade, G. & Roux, C. 1985. Likenoj de Okcidenta Europo. Ilustrita Determinlibro. – Bulletin de la Societe Botanique du Centre-Ouest, Nouvelle Serie, Numero Special 7. Royan, France.
- Diederich, P. & Sérusiaux, E. 2000. The lichens and lichenicolous fungi of Belgium and Luxembourg. An annotated checklist. Musée National d'Histoire Naturelle, Luxembourg.
- Egea, J.M. & Llimona, X. 1983. *Caloplaca furax* Egea & Llimona, un nuevo liquen parásito sobre *Aspicilia* silicilolus, en la Sierra del Relumbrar (Albacete, SE de España). – *Collectanea Botanica* 14: 265-269.
- Gaya, E., Lutzoni, F., Zoller, S. & Navarro-Rosinés, P. 2003. Phylogenetic study of *Fulgensia* and allied *Caloplaca* and *Xanthoria* species. – *American Journal of Botany* 90: 1095-1103.
- Hafellner, J. & Poelt, J. 1979. Die Arten der Gattung *Caloplaca* mit plurilocularen Sporen (*Meroplacis*, *Triophthalmidium*, *Xanthocarpia*). – *Journal of the Hattori Botanical Laboratory* 46: 1-41.
- Kärnefelt, I. 1989. Morphology and phylogeny in the Teloschistales. – *Cryptogamic Botany* 1: 147-203.
- Khodosovtsev, O.Y. 2002. [New for Ukraine and rare species of the genus *Caloplaca* Th. Fr. (Teloschistaceae) from southern Ukraine]. – *Ukrayinskyi Botanichnyi Zhurnal* 59: 321-329. (In Ukrainian)
- Laundon, J.R. 1992a. *Caloplaca*. – In: O.W. Purvis, B.J. Coppins, D.L. Hawksworth, P.W. James & D.M. Moore [eds]. *The Lichen Flora of Great Britain and Ireland*, pp. 141-159. Natural History Museum Publications & British Lichen Society, London.
- Laundon, J.R. 1992b. New British species of *Caloplaca*. – *Lichenologist* 24: 1-5.
- Magnusson, A.H. 1944. Studies in the *Ferruginea*-group of the genus *Caloplaca*. – Göteborgs Kungliga Vetenskaps- och Vitterhets Samhället Handlingar, Sjätte Följden, Ser. B, 3(1): 1-71.
- Martellos, S. & Nimis, P.L. 2000. Checklist of Italian Lichens 3.0 (<http://dbiodbs.univ.trieste.it/global/italic1>). [last visit Oct., 2005]
- Meyer, B. & Printzen, C. 2000. Proposal for a standardized nomenclature and standardization of insoluble lichen pigments. – *Lichenologist* 32: 571-583.
- Mayrhofer, H., Denchev, C.M., Stoykov, D.Y. & Nikolova, S.O. 2005. Catalogue of the lichenized and lichenicolous fungi in Bulgaria. – *Mycologia Balcanica* 2: 3-61.
- Navarro-Rosinés, P. & Hladun, N.L. 1996. Les especies saxícola-calcícolas del grupo de *Caloplaca lactea* (Teloschistaceae, líquenes), en las regiones mediterránea y medioeuropea. – *Bulletin de la Societe Linneenne de Provence* 47: 139-166.
- Nimis, P.L. & Martellos, S. 2003. A second checklist of the lichens of Italy with thesaurus of synonyms. Museo Regionale di Scienze Naturali, Aosta.
- Nimis, P.L. & Poelt, J. 1987. The lichens and lichenicolous fungi of Sardinia (Italy): an annotated list. – *Studia Geobotanica* 7 (Supplement 1): 1-269.
- Nimis P.L. & Tretiach, M. 1999. Itinera Adriatica – Lichens from the eastern part of the Italian peninsula. – *Studia Geobotanica* 18: 51-106.
- Nordin, I. 1972. *Caloplaca* sect. *Gasparrinia* in Nordeuropa. Taxonomiska och Ekologiska Studier. Skriv Service AB, Uppsala.

- Pišút, I. 1971. Interessante Flechtenfunde aus Mittel-, Süd- und Südosteuropa. – *Fragmenta Balcanica, Musei Macedonici Scientiarum Naturalium* 8: 165-169.
- Pišút, I. 1995. Interessante Flechtenfunde aus Mittel-, Süd- und Südosteuropa 2. – In: Farkas, E.E., Lücking, R. & Wirth, V. [eds]: *Scripta Lichenologica – Lichenological Papers Dedicated to Antonín Vězda*. – *Bibliotheca Lichenologica* 58: 281-287.
- Pišút, I. 2001. Beitrag zur Kenntnis der Flechten Bulgariens III. – *Acta Rerum Naturalium Musei Nationalis Slovaci, Bratislava* 47: 21-25.
- Poelt, J. 1955. Mitteleuropäische Flechten III. – *Mitteilungen der Botanischen Staatssammlung München* 2: 46-56.
- Poelt, J. 1958. Über parasitische Flechten. II. – *Planta* 51: 288-307.
- Poelt, J. 1975. Mitteleuropäische Flechten X. – *Mitteilungen der Botanischen Staatssammlung München* 12: 1-32.
- Popnikolov, A. & Železova, B. 1964. [Flora of Bulgaria. Lichens]. *Narodna Prosveta, Sofia*. (In Bulgarian)
- Santesson, R., Moberg, R., Nordin, A., Tønsberg, T. & Vitikainen, O. 2004. Lichen-forming and Lichenicolous Fungi of Fennoscandia. *Museum of Evolution, Uppsala University, Uppsala*.
- Sérusiaux, E., Diederich, P., Brand, A.M. & van den Boom, P. 1999. New or interesting lichens and lichenicolous fungi from Belgium and Luxembourg. VIII. – *Lejeunia* 162: 1-95.
- Sipman, H. & Raus, T. 1999. A lichenological comparison of the Paros and Santorini island groups (Aegean, Greece), with annotated checklist. – *Willdenowia* 29: 239-297.
- Söchting, U. & Lutzoni, F. 2003. Molecular phylogenetic study at the generic boundary between the lichen-forming fungi *Caloplaca* and *Xanthoria* (Ascomycota, Teloschistaceae). – *Mycological Research* 107: 1266-1276.
- Tønsberg, T. 1992. The sorediate and isidiate, corticolous, crustose lichens in Norway. – *Sommerfeltia* 14: 1-331.
- Tretiach, M., Pinna, D. & Grube, M. 2003. *Caloplaca erodens* [sect. *Pyrenodesmia*], a new lichen species from Italy with an unusual thallus type. – *Mycological Progress* 2: 127-136.
- van den Boom, P., Sérusiaux, E., Diederich, P., Brand, M., Aptroot, A. & Spier, L. 1998. A lichenological excursion in May 1997 near Han-sur-Lesse and Saint-Hubert, with notes on rare and critical taxa of the flora of Belgium and Luxembourg. – *Lejeunia* 158: 1-58.
- Vězda, A. 1970. Neue oder wenig bekannte Flechten in der Tschechoslowakei. I. – *Folia Geobotanica et Phytotaxonomica* 5: 307-337.
- Wade, A.E. 1965. The genus *Caloplaca* Th. Fr. in the British Isles. – *Lichenologist* 3: 1-28.
- Wetmore, C.M. 1996. The *Caloplaca sideritis* group in North and Central America. – *The Bryologist* 99: 292-314.
- Wetmore, C.M. 2001. The *Caloplaca citrina* group in North and Central America. – *The Bryologist* 104: 1-11.
- Wetmore, C.M. 2003. The *Caloplaca squamosa* group in North and Central America. – *The Bryologist* 106: 147-156.
- Wetmore, C.M. 2004. The isidiate corticolous *Caloplaca* species in North and Central America. – *The Bryologist* 107: 284-292.
- Wetmore, C.M. & Kärnefelt, I. 1999. What is *Caloplaca cinnabarina*? – *The Bryologist* 102: 683-691.
- Wirth, V. 1995. Die Flechten Baden-Württembergs, Teil 1 & 2. Eugen Ulmer GmbH & Co., Stuttgart.
- Wunder, H. 1974. Schwarzfrüchtige, saxicole Sippen der Gattung *Calolaca* (Lichenes, Teloschistaceae) in Mitteleuropa, dem Mittelmeergebiet und Vorderasien. – *Bibliotheca Lichenologica* 3: 1-186.