



SURVEY OF THE GASTERAL *BASIDIOMYCOTA* (*FUNGI*) OF CROATIA

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A survey of the gasteral *Basidiomycota* of Croatia is given. 68 species belonging to 26 genera are presented. Five genera and 18 species are reported as new to Croatia. For each species, the published and unpublished sources of data are given, as well as the collections in which the material is deposited.

Key words: Biodiversity, mycobiota, bibliography

Tkalčec, Z., Mešić, A. & Antonić, O.: Pregled utrobnjača (*Basidiomycota*, *Fungi*) Hrvatske. *Nat. Croat.*, Vol. 14, No. 2., 99–120, 2005, Zagreb.

Dat je pregled gljiva utrobnjača Hrvatske. Sadrži 68 vrsta iz 26 rodova. Pet rodova i 18 vrsta prvi je put publicirano za područje Hrvatske. Uz svaku vrstu navedeni su publicirani i nepublicirani izvori podataka, kao i zbirke u kojima je pohranjen sakupljeni materijal.

Ključne riječi: biološka raznolikost, mikobiota, bibliografija

INTRODUCTION

The mycobiota of Croatia is poorly explored. The gasteral *Basidiomycota* are no exception since few mycologists have researched the group. The first data on this fungal group in Croatia were published by Stjepan SCHULZER (1857), the only Croatian mycologist in the 19th century. In the second half of the 20th century more intensive research started again. Significant contributions to the research on gasteral *Basidiomycota* during that period were made by Milica Tortić, Ivan Focht, Zdenko Tkalčec and Armin Mešić. Although it has been a century and a half since the beginning of mycological research in Croatia, no survey of the species of gasteral *Basidiomycota* has hitherto been made. Accordingly, we have prepared a survey of species of this fungal group from Croatia, including all published and most of the unpublished sources of data known to us.

MATERIAL, METHODS AND PRESENTATION

In this paper we treated all species of the class *Gasteromycetes* in the classic concept (see JÜLICH, 1984). The survey includes all the published records of species, subspecies and varieties of gasteral *Basidiomycota* from Croatia known to us. Records from daily and weekly newspapers have been excluded, as well as records from HAFNER (1997) due to false data. This survey also includes, except for a few cases, all the unpublished records known and available to us. Two manuscripts by Stjepan Schulzer have not been included (one is kept at the Library of the Hungarian Academy of Sciences in Budapest, and the other at the National and University Library in Zagreb), as well as notes by Ivan Focht, because it is not possible to interpret their data in a satisfactory way without thorough revision. We have also excluded unpublished records the identification of which was doubtful to the author himself. The survey includes data published or collected by 31 December 2004. The material known to us is deposited in the following herbaria and fungaria.

- BEO – Herbarium, Botany Department, Natural History Museum of Serbia, Beograd, Serbia and Montenegro.
- BP – Herbarium, Botanical Department, Hungarian Natural History Museum, Budapest, Hungary.
- CNF – Croatian National Fungarium, Croatian Mycological Society, Zagreb, Croatia.
- IB – Herbarium, Innsbruck University, Innsbruck, Austria.
- POZM – Herbarium, Department of Plant Ecology and Environment Protection, Adam Mickiewicz University, Poznań, Poland.
- PRM – Herbarium, Mycological Department, National Museum in Prague, Prague, Czech Republic.
- ZA – Herbarium Croaticum, University of Zagreb, Faculty of Natural Sciences and Mathematics, Botany Department, Zagreb, Croatia.

Along with each presented species we specify the published and unpublished sources of records for Croatia, as well as the collections in which the collected material is deposited. In this way we give a more or less complete survey of the published sources of data, as well as a good survey of the unpublished sources of data on species of gasteral *Basidiomycota* in Croatia. We also specify synonyms and misapplied names which the authors of records have used, as well as those used in modern taxonomic literature. We have tried to interpret all records on the basis of taxa names and dates of recording in the sense of modern taxonomy. The older the record, the greater the need for revision. So far we have revised only a part of the revisable records. We have revised all our entries in this survey, as well as a smaller number of records by other authors indicated as such in the text. Species and varieties revised by us or by authors of taxonomic literature which we have used for interpretation of records are marked with a black dot. At the end of the data specified for such species we cite the literature (in brackets) on the basis of which we have identified or revised the records. The name of each genus is fol-

lowed by the literature (given in brackets) used for the interpretation, nomenclature and synonyms of records in the genus. SCHULZER (1867) corrects one mistake from the paper by SCHULZER *et al.* (1866), so we give that quote as »SCHULZER *et al.* (1866) + SCHULZER (1867)«. We have cited abbreviations of authors of taxa according to KIRK & ANSELL (1992) and abbreviations of journals in chapter »Literature cited« according to BRIDSON & SMITH (1991).

The chapter »Excluded records« comprises: (a) records of species and infra-specific taxa we were unable to find in modern taxonomic literature, (b) records we could not interpret in the sense of modern classification, (c) records which are a *nomen nudum*, and (d) records which have been incorrectly recorded for Croatia or have been recorded for the territory which does not now belong to Croatia. When we could not check whether the author of the record had given the correct author citation, we have given it herein according to that author.

Marks and abbreviations:

- * – taxon reported from Croatia for the first time in this paper;
- – at least part of records of taxon revised;
- (1) – number in brackets indicates synonym or misapplied name under which the author of the record has quoted the taxon;
- () – empty brackets indicate that the author of the record has also quoted the taxon under the name we use;
- ? – question mark instead of an author of combination means that we could not find the author in the literature available to us;
- = ? – taxon not found in modern taxonomic literature;
- Exs. – collections in which the dried material (exsiccatum) is deposited;
- HR? – taxon most probably found in the territory of Croatia (locality not precisely quoted);
- Incl. – including;
- Lit. – literature;
- Misappl. – misapplied name;
- Ref. – references (sources of records of taxon);
- rev. – revised (when we have revised records of other authors);
- unp. – unpublished data.

RESULTS

In this paper we present 68 species of gasteral *Basidiomycota* belonging to 26 genera found on the territory of Croatia, 52 species having been revised by us. Five genera and 18 species are reported here as new to Croatia.

SURVEY OF GENERA AND SPECIES

Alpova C.W. Dodge

(Lit.: GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MONTECCHI & SARASINI, 2000)

Alpova rubescens (Vittad.) Trappe

Ref.: VRŠČAJ, 2002

Astraeus Morgan

(Lit.: ARNOLDS *et al.*, 1995; DÖRFELT, 1985; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MOYERSON & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958)

• *Astraeus hygrometricus* (Pers. : Pers.) Morgan

= *Gastrum hygrometricum* Pers. : Pers. (1)

= *Astraeus stellatus* (Scop.) E. Fisch. (2)

= *Gastrum stellatum* (Scop.) Wettst. (3)

Ref.: BLAGAIĆ, 1931 (1); BOŽAC, 1984; COURTECUISE & DUHEM, 2000; FOCHT, 1972; FOCHT, 1974; GJURAŠIN, 1898 (1); LANGE, 1974; MOESZ, 1938 (2); PICBAUER, 1928 (2); ŠKORIĆ, 1928 (3); TORTIĆ, 1964; TORTIĆ, 1993; TORTIĆ, 2002; VRŠČAJ, 2002; unsp. KOTLABA (according to unsp. TORTIĆ); unsp. MATOČEC; unsp. TKALČEC & MEŠIĆ; unsp. TORTIĆ () (2); SACCARDO, 1888 HR? (1)

Exs.: BEO, CNF, PRM

(Lit.: JÜLICH, 1984; PEGLER *et al.*, 1995)

Bovista Pers. : Pers.

(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; GMINDER *et al.*, 2000; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 1967; KREISEL, 2001; MOYERSON & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958)

• *Bovista aestivalis* (Bonord.) Demoulin

= *Bovista colorata* (Peck) Kreisel

= *Lycoperdon furfuraceum* Schaeff. (1)

= *Bovista polymorpha* (Vittad.) Kreisel (nom. illeg.) (2)

= *Bovista pusilliformis* (Kreisel) Kreisel

Ref.: GJURAŠIN, 1898 (1); MOESZ, 1938 (1); TORTIĆ, 1993 (2); unsp. TKALČEC & MEŠIĆ

Exs.: CNF

(Lit.: CALONGE, 1998; KREISEL, 1967; PEGLER *et al.*, 1995)

Bovista aestivalis (Bonord.) Demoulin **agg.**

Incl.: *Bovista aestivalis* (Bonord.) Demoulin

Bovista dermoxantha (Vittad.) De Toni

Bovista furfuracea (J.F. Gmel. : Pers.) Pers.

Bovista pusilla (Batsch : Pers.) Pers. (1)

= *Lycoperdon pusillum* Batsch : Pers. (2)

Ref.: FOCHT, 1972 (2); FOCHT, 1974 (2); VRŠČAJ, 2002 (1)

Annotation: Modern authors distinguish two or three species here, but disagreements exist about species concepts, synonymy and nomenclature (see ARNOLDS *et al.*, 1995; CALONGE, 1998; KREISEL, 2001; MOYERSON & DEMOULIN, 1996; PEGLER *et al.*, 1995).

• *Bovista nigrescens* Pers. : Pers.

Ref.: BARČIĆ, 1982; BARČIĆ, 1996; BLAGAIĆ, 1931; FOCHT, 1974; MOESZ, 1938; TORTIĆ, 1993; VRŠČAJ, 2002; unip. TKALČEC & MEŠIĆ

Exs.: CNF

(Lit.: KREISEL, 1967; PEGLER *et al.*, 1995)

• *Bovista plumbea* Pers. : Pers.

= *Bovista nuciformis* Wallr. (1)

Ref.: FOCHT, 1974; GJURAŠIN, 1898; SCHULZER *et al.*, 1866; ŠKORIĆ, 1928; TORTIĆ, 1966 a; TORTIĆ, 1966 b; VOUK & PEVALEK, 1916 (1); unip. KOTLABA (according to unip. TORTIĆ); unip. TKALČEC & MEŠIĆ; unip. TORTIĆ; SCHULZER, 1857 HR?

Exs.: CNF, PRM

(Lit.: KREISEL, 1967; PEGLER *et al.*, 1995)

* *Bovista tomentosa* (Vittad.) Quél.

Ref.: unip. TORTIĆ

Exs.: CNF

Calvatia Fr.

= *Handkea* Kreisel

(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; DEMOULIN, 1970; GMINDER *et al.*, 2000; GROB *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MOYERSON & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958)

• *Calvatia excipuliformis* (Scop. : Pers.) Perdeck

= *Handkea excipuliformis* (Scop. : Pers.) Kreisel

= *Lycoperdon saccatum* Vahl (1)

Ref.: BARČIĆ, 1982; BARČIĆ, 1996; FOCHT, 1972; FOCHT, 1974; FOCHT, 1979; KRANJČEV, 1985 (1); LISIEWSKA & TORTIĆ, 1990; TORTIĆ, 1993; TORTIĆ, 2002; VRŠČAJ, 2002; unip. LINDTNER; unip. MATOČEC; unip. TKALČEC & MEŠIĆ; unip. TORTIĆ

Exs.: BEO, CNF

(Lit.: JÜLICH, 1984; PILÁT, 1958)

• *Calvatia utriformis* (Bull. : Pers.) Jaap

= *Handkea utriformis* (Bull. : Pers.) Kreisel

= *Lycoperdon utrifforme* Bull. : Pers. (1)

= *Calvatia caelata* (Bull.) Morgan (2)

= *Lycoperdon caelatum* Bull. (3)

Ref.: BARČIĆ, 1989 (2); BARČIĆ, 1996 (2); FOCHT, 1979 (2); KRANJČEV, 1985 (3); KRIVIČIĆ, 1999; MOESZ, 1938 (2); MUŽIĆ & BOŽAC, 1997 (3); RAGUZIN, 2001; ŠKORIĆ, 1928 (3); TORTIĆ, 1968 b (2); TORTIĆ, 1973 (2); TORTIĆ, 1993; VOUK & PEVALEK, 1916 (1)(3); VRŠČAJ, 1990; VRŠČAJ, 2002; unpub. LINDTNER (2); unpub. MATOČEC; unpub. TKALČEC & MEŠIĆ; unpub. TORTIĆ (rev.) (2)

Exs.: BEO (2), CNF

(Lit.: CALONGE, 1998; JÜLICH, 1984)

Clathrus P. Micheli ex L. : Pers.

= *Anthurus* Kalchbr. et MacOwan

(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; DRING, 1980; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MOYERSOEN & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958)

*• *Clathrus archeri* (Berk.) Dring

= *Anthurus archeri* (Berk.) E. Fisch.

Ref.: unpub. TKALČEC & MEŠIĆ

Exs.: CNF

(Lit.: JÜLICH, 1984; PEGLER *et al.*, 1995; PILÁT, 1958)

• *Clathrus ruber* P. Micheli ex Battarra : Pers.

= *Clathrus cancellatus* Tourn. ex L. (1)

Ref.: BARČIĆ, 1982; BARČIĆ, 1984; BARČIĆ, 1996; BLAGAIĆ, 1923 (1); BLAGAIĆ, 1931 (1); BOŽAC, 1984 (1); BOŽAC, 1986 (1); BOŽAC, 1989 (1); BOŽAC, 1993 (1); FOCHT, 1974 (1); LOHWAG, 1935; MOESZ, 1938 (1); PICBAUER, 1928 (1); RAGUZIN, 2000; TORTIĆ, 1993; VRŠČAJ, 2002; unpub. MATOČEC (1); unpub. PEINTNER; unpub. TKALČEC & MEŠIĆ; unpub. TORTIĆ

Exs.: CNF, IB, ZA

(Lit.: CALONGE, 1998; JÜLICH, 1984; PILÁT, 1958)

Crucibulum Tul. et C. Tul.

(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; GMINDER *et al.*, 2000; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MORNAND, 1985; MOYERSOEN & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958)

• *Crucibulum crucibuliforme* (Scop.) V.S. White

= *Cyathus crucibulum* Pers. : Pers. (1)

= *Nidularia crucibulum* (Pers. : Pers.) Fr. (2)

= *Crucibulum laeve* (Huds.) Kambly (3)

= *Crucibulum vulgare* Tul. et C. Tul. (4)

Ref.: COURTECUISE & DUHEM, 2000 (3); FOCHT, 1972 (3); GJURAŠIN, 1898 (1); JAAP, 1916; LISIEWSKA & TORTIĆ, 1990; RAC, 2003 (3); SCHULZER *et al.*, 1866 (1); TORTIĆ, 1964 (4); TORTIĆ, 1966 a (4); TORTIĆ, 1966 b (4); TORTIĆ, 2002 () (3); unsp. MATOČEC (3); unsp. TKALČEC & MEŠIĆ; unsp. TORTIĆ (3)(4); SCHULZER, 1857 HR? (2)

Exs.: CNF

(Lit.: CALONGE, 1998; JÜLICH, 1984)

Cyathus Haller : Pers.

(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; GMINDER *et al.*, 2000; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MORNAND, 1985; MOYERSOEN & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958)

• *Cyathus olla* (Batsch : Pers.) Pers.

= *Cyathus olla* (Batsch : Pers.) Pers. var. *nitidus* (Roth : Pers.) Pers. (1)

= *Nidularia campanulata* With. (2)

= *Cyathus sericeus* (Schaeff.) Quél. (3)

Ref.: GJURAŠIN, 1898 (3); JAAP, 1916; KRANJČEV, 1985 a; MOESZ, 1938 (3); RANDIĆ, 1998; SCHULZER *et al.*, 1866 (1); TORTIĆ, 1966 a; TORTIĆ, 1966 b; TORTIĆ, 1968 b; TORTIĆ, 1993; unsp. MATOČEC; unsp. TKALČEC & MEŠIĆ; unsp. TORTIĆ (rev.); SCHULZER, 1857 HR? (2)

Exs.: CNF

(Lit.: CALONGE, 1998; GROß *et al.*, 1980; JÜLICH, 1984)

*• *Cyathus stercoreus* (Schwein.) De Toni

Ref.: unsp. TKALČEC & MEŠIĆ; unsp. TORTIĆ (rev.)

Exs.: CNF

(Lit.: CALONGE, 1998; GROß *et al.*, 1980; JÜLICH, 1984)

• *Cyathus striatus* (Huds. : Pers.) Willd.

= *Nidularia striata* (Huds. : Pers.) With. (1)

= *Cyathus hirsutus* (Schaeff.) Quél. (2)

Ref.: GJURAŠIN, 1898 (2); JELIĆ & TORTIĆ, 1973; KRANJČEV, 1985; MOESZ, 1938; RANDIĆ, 1998; SCHULZER, 1882; SCHULZER *et al.*, 1866; ŠKORIĆ, 1928; TORTIĆ, 1964; TORTIĆ, 1966 a; TORTIĆ, 1966 b; TORTIĆ, 1989; TORTIĆ, 1993; TORTIĆ, 2002; TORTIĆ & LISIEWSKA, 1978; VOUK & PEVALEK, 1915; VOUK & PEVALEK, 1916; unsp. MATOČEC; unsp. TKALČEC & MEŠIĆ; unsp. TORTIĆ; SCHULZER, 1857 HR? (1)

Exs.: CNF

(Lit.: CALONGE, 1998; GROß *et al.*, 1980; JÜLICH, 1984)

**Disciseda* Czern.

(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; GMINDER *et al.*, 2000; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; PILÁT, 1958)

*• *Disciseda bovista* (Klotzsch) Henn.

Ref.: unpub. TKALČEC & MEŠIĆ

Exs.: CNF

(Lit.: CALONGE, 1998; JÜLICH, 1984; PILÁT, 1958)

*• *Disciseda candida* (Schwein.) Lloyd

= *Disciseda calva* (Z. Moravec) Z. Moravec

Ref.: unpub. TKALČEC & MEŠIĆ

Exs.: CNF

(Lit.: CALONGE, 1998; JÜLICH, 1984; PILÁT, 1958)

**Endoptychum* Czern.

(Lit.: JÜLICH, 1984; KREISEL, 2001; MONTECCHI & SARASINI, 2000; PILÁT, 1958)

*• *Endoptychum agaricoides* Czern.

Ref.: unpub. TKALČEC & MEŠIĆ

Exs.: CNF

(Lit.: JÜLICH, 1984; MONTECCHI & SARASINI, 2000; PILÁT, 1958)

Geastrum P. Micheli ex Pers. : Pers.

(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; DÖRFELT, 1985; GMINDER *et al.*, 2000; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MOYERSON & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958; SUNHEDE, 1989)

Geastrum corollinum (Batsch) Hollós

= *Geastrum mammosum* Cheval. (1)

= *Geastrum recolligens* (With.) Desv.

Ref.: SACCARDO, 1888 (1); SCHULZER *et al.*, 1866 (1)

Geastrum coronatum Pers. : Pers.

= *Plecostoma limbatum* (Fr.) ? (1)

Ref.: SCHULZER *et al.*, 1866 (1)

• *Geastrum fimbriatum* Fr.

= *Geastrum djakovense* Schulzer (1)

= *Geastrum sessile* (Sowerby →) Pouzar (2)

Misappl.: *Geastrum rufescens* Pers. : Pers. sensu auct. p. p. non Pers.

Ref.: BARČIĆ, 1996; BLAGAIĆ, 1931; KRANJČEV, 1985; KRANJČEV, 1988; KRANJČEV, 1995; LISIEWSKA & TORTIĆ, 1990; SACCARDO, 1888 (1); SCHULZER, 1866 (1); TORTIĆ, 1964; TORTIĆ, 1966 a; TORTIĆ, 1966 b; TORTIĆ, 2002; VOUK & PEVALEK, 1916; unpub. LISIEWSKA (2); unpub. MATOČEC; unpub. TKALČEC & MEŠIĆ; unpub. TORTIĆ

Exs.: CNF, POZM (2)

(Lit.: SUNHEDE, 1989)

***Geastrum fornicatum* (Huds.) Hook.**

Ref.: STOITZNER, 1869

***• *Geastrum minimum* Schwein.**

Ref.: unpub. TKALČEĆ & MEŠIĆ

Exs.: CNF

(Lit.: SUNHEDE, 1989)

• *Geastrum pectinatum* Pers. : Pers.

Ref.: KRANJČEV, 1985; KRANJČEV, 1988; KRANJČEV, 1995; unpub. TKALČEĆ & MEŠIĆ

Exs.: CNF

(Lit.: SUNHEDE, 1989)

***• *Geastrum quadrifidum* Pers. : Pers.**

Ref.: unpub. TKALČEĆ & MEŠIĆ

Exs.: CNF

(Lit.: SUNHEDE, 1989)

• *Geastrum rufescens* Pers. : Pers.= *Geastrum schaefferi* Vittad. (1)= *Geastrum vulgatum* Vittad.

Ref.: BLAGAIĆ, 1921; BLAGAIĆ, 1931; FOCHT, 1972; KRANJČEV, 1979; KRANJČEV, 1985; KRANJČEV, 1988; KRANJČEV, 1995; TORTIĆ, 1968 b (1); TORTIĆ, 2002; unpub. MATOČEĆ; unpub. TKALČEĆ & MEŠIĆ; unpub. TORTIĆ

Exs.: CNF

(Lit.: SUNHEDE, 1989)

***• *Geastrum saccatum* Fr.**

Ref.: unpub. TKALČEĆ & MEŠIĆ

Exs.: CNF

(Lit.: SUNHEDE, 1989)

• *Geastrum schmidelii* Vittad.Misappl.: *Geastrum nanum* Pers. sensu auct. non Pers. (nom. illeg.) (1)= *Geastrum nanum* Pers. var. *coniferarum* V.J. Staněk (nom. illeg.) (2)

Ref.: KRANJČEV, 1988 (1); KRANJČEV, 1995 (1); unpub. TKALČEĆ & MEŠIĆ; unpub. TORTIĆ (2)

Exs.: CNF, PRM (2)

(Lit.: SUNHEDE, 1989)

***Geastrum striatum* DC.**= *Geastrum bryantii* Berk. (1)

Ref.: BLAGAIĆ, 1931 (1)

• *Geastrum triplex* Jungh.

Ref.: BARČIĆ, 1989; BARČIĆ, 1996; BOŽAC, 1982; BOŽAC, 1984; BOŽAC, 1986; BOŽAC, 1989; BOŽAC, 1993; FOCHT, 1972; KRANJČEV, 1985; KRANJČEV, 1988; MOESZ, 1938; TORTIĆ, 1968 b; TORTIĆ, 1993; TORTIĆ, 2002; unsp. LINDTNER; unsp. MATOČEC; unsp. TKALČEC & MEŠIĆ; unsp. TORTIĆ

Exs.: BEO, CNF

(Lit.: SUNHEDE, 1989)

Langermannia Rostk.

(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MOYERSOEN & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958; SCHULZER, 1882)

• *Langermannia gigantea* (Batsch : Pers.) Rostk.

= *Bovista gigantea* (Batsch : Pers.) Nees (1)

= *Calvatia gigantea* (Batsch : Pers.) Lloyd (2)

= *Lycoperdon giganteum* Batsch : Pers. (3)

= *Globalaria bovista* (L.) Quél. (4)

= *Lycoperdon bovista* L. (5)

Ref.: GJURAŠIN, 1898 (1); KRANJČEV, 1985 (3); KRANJČEV, 1994 (3); KRANJČEV, 1995 (3); LANGE, 1974 (2); MUŽIĆ & BOŽAC, 1997 (3); SCHULZER, 1866 (5); SCHULZER, 1882 (4); SCHULZER *et al.*, 1866 (5); TORTIĆ, 1980; unsp. TKALČEC & MEŠIĆ; BOŽAC, 1984 HR? (3); BOŽAC, 1986 HR? (3); BOŽAC, 1989 HR?; BOŽAC, 1993 HR?

Exs.: CNF

(Lit.: JÜLICH, 1984)

**Leucogaster* R. Hesse

(Lit.: GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MONTECCHI & SARASINI, 2000; PEGLER *et al.*, 1993)

• *Leucogaster nudus* (Hazsl.) Hollós

Ref.: unsp. TKALČEC & MEŠIĆ

Exs.: CNF

(Lit.: JÜLICH, 1984; MONTECCHI & SARASINI, 2000)

Lycoperdon Tourn. ex L. : Pers.

(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; DEMOULIN, 1970; DEMOULIN, 1983; GMINDER *et al.*, 2000; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MOYERSOEN & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958)

Lycoperdon caudatum J. Schröt.

= *Lycoperdon pedicellatum* Peck (nom. illeg.), non *L. pedicellatum* Batsch

Ref.: VOUK & PEVALEK, 1916

- *Lycoperdon echinatum* Pers. : Pers.
 = *Lycoperdon constellatum* Fr. (1)
 Ref.: BARČIĆ, 1982; BARČIĆ, 1996; BLAGAIĆ, 1921 () (1); KRANJČEV, 1985; SCHULZER *et al.*, 1866 (1); TORTIĆ, 1964; TORTIĆ, 1993; TORTIĆ, 2002; unpub. LINDTNER; unpub. MATOČEC; unpub. TKALČEC & MEŠIĆ; unpub. TORTIĆ; SCHULZER, 1857 HR? (1)
 Exs.: BEO, CNF
 (Lit.: CALONGE, 1998; JÜLICH, 1984)
- **Lycoperdon ericaeum* Bonord.
 = *Lycoperdon muscorum* Morgan (1)
 Ref.: unpub. TORTIĆ (1)
 Exs.: CNF
- *Lycoperdon lividum* Pers.
 = *Lycoperdon fuscum* Bonord. (1)
 Ref.: VOUK & PEVALEK, 1916 (1); unpub. TKALČEC & MEŠIĆ
 Exs.: CNF
 (Lit.: CALONGE, 1998; GMINDER *et al.*, 2000; JÜLICH, 1984)
- *Lycoperdon mammiforme* Pers. : Pers.
 = *Lycoperdon velatum* Vittad. (1)
 Ref.: BOŽAC, 1984; FOCHT, 1974 (1); GJURAŠIN, 1898; VRŠČAJ, 2003; unpub. TKALČEC & MEŠIĆ
 Exs.: CNF
 (Lit.: CALONGE, 1998; JÜLICH, 1984)
- Lycoperdon marginatum* Vittad. ex Moris et De Not.
 Misappl.: *Lycoperdon papillatum* Schaeff. sensu auct. non Schaeff. (1)
 Ref.: GMINDER *et al.*, 2000; MOESZ, 1938 (1); TORTIĆ, 1993
- *Lycoperdon molle* Pers. : Pers.
 = *Lycoperdon cupricum* Bonord. (1)
 Ref.: VOUK & PEVALEK, 1916 (1); unpub. TKALČEC & MEŠIĆ; unpub. TORTIĆ
 Exs.: CNF
 (Lit.: DEMOULIN, 1983; GMINDER *et al.*, 2000; JÜLICH, 1984)
- *• *Lycoperdon nigrescens* (Pers.) Lloyd
 = *Lycoperdon foetidum* Bonord.
 Ref.: unpub. MATOČEC; unpub. TKALČEC & MEŠIĆ
 Exs.: CNF
 (Lit.: DEMOULIN, 1983; GMINDER *et al.*, 2000; JÜLICH, 1984)
- *Lycoperdon perlatum* Pers. : Pers.
 = *Lycoperdon gemmatum* Batsch var. *perlatum* (Pers. : Pers.) Fr. (1)

= *Lycoperdon gemmatum* Batsch (2)

Ref.: BARČIĆ, 1982; BARČIĆ, 1996; BLAGAIĆ, 1921 (2); FOCHT, 1972; FOCHT, 1974; GJURAŠIN, 1898 (2); KRANJČEV, 1985; LISIEWSKA & TORTIĆ, 1990; LORINSER-JANDA, 1877 (2); MOESZ, 1938 (2); RAGUZIN, 2001; SCHULZER *et al.*, 1866 (1); ŠKORIĆ, 1928 (2); TORTIĆ, 1964; TORTIĆ, 1966 a; TORTIĆ, 1993; TORTIĆ, 2002; TORTIĆ & LISIEWSKA, 1978; VOUK & PEVALEK, 1916 (2); VRŠČAJ, 2003; unsp. MATOČEC; unsp. TKALČEC & MEŠIĆ; unsp. TORTIĆ; SACCARDO, 1888 HR? (2)

Exs.: CNF

(Lit.: CALONGE, 1998; DEMOULIN, 1983; JÜLICH, 1984)

• *Lycoperdon pyriforme* Schaeff. : Pers.

= *Bovista bresadolae* (Schulzer) De Toni (1)

= *Globaria bresadolae* Schulzer (2)

Ref.: FOCHT, 1979; KRANJČEV, 1985; MOESZ, 1938; RAGUZIN, 2001; SCHULZER, 1882; SCHULZER, 1885 (2); SCHULZER *et al.*, 1866 + SCHULZER, 1867; ŠKORIĆ, 1928; TORTIĆ, 1966 a; TORTIĆ, 1966 b; TORTIĆ, 1968 b; TORTIĆ, 1989; TORTIĆ, 1993; TORTIĆ, 2002; VOUK & PEVALEK, 1915; unsp. MATOČEC; unsp. TKALČEC & MEŠIĆ; unsp. TORTIĆ; SACCARDO, 1888 HR? (1); SCHULZER, 1857 HR?

Exs.: CNF

(Lit.: CALONGE, 1998; JÜLICH, 1984)

Lycoperdon umbrinum Pers. : Pers.

Ref.: FOCHT, 1974; LISIEWSKA & TORTIĆ, 1990; TORTIĆ, 2002; unsp. LISIEWSKA; unsp. MATOČEC; unsp. TORTIĆ

Exs.: CNF, POZM

Melanogaster Corda

(Lit.: ARNOLDS *et al.*, 1995; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MONTECCHI & SARASINI, 2000; PEGLER *et al.*, 1993; PILÁT, 1958)

Melanogaster ambiguus (Vittad.) Tul. et C. Tul.

Ref.: FOCHT, 1972

*• *Melanogaster broomeanus* Berk.

Ref.: unsp. TKALČEC & MEŠIĆ

Exs.: CNF

(Lit.: GROß *et al.*, 1980; JÜLICH, 1984; PILÁT, 1958)

*• *Melanogaster vittadinii* Soehner et A. Knapp

Ref.: unsp. TKALČEC & MEŠIĆ

Exs.: CNF

(Lit.: GROß *et al.*, 1980; JÜLICH, 1984)

***Mutinus* Fr.**

(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; PEGLER *et al.*, 1995; PILÁT, 1958)

- ***Mutinus caninus* (Huds. : Pers.) Fr.**

Ref.: BLAGAIĆ, 1917; MOESZ, 1938; TORTIĆ, 1964; TORTIĆ, 1993; TORTIĆ, 2002; VOUK & PEVALEK, 1916; VRŠČAJ, 2003; unsp. MATOČEĆ; unsp. TKALČEĆ & MEŠIĆ; unsp. TORTIĆ

Exs.: CNF

(Lit.: JÜLICH, 1984; PILÁT, 1958)

***Mycenastrum* Desv.**

(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; PILÁT, 1958)

- ***Mycenastrum corium* (Guers.) Desv.**

= *Pachyderma strossmayeri* Schulzer (1)

Ref.: SACCARDO, 1895 (1); SCHULZER, 1876 (1); unsp. TKALČEĆ & MEŠIĆ

Exs.: CNF

(Lit.: CALONGE, 1998; JÜLICH, 1984; PILÁT, 1958)

***Myriostoma* Desv.**

(Lit.: ARNOLDS *et al.*, 1995; DÖRFELT, 1985; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; PEGLER *et al.*, 1995; PILÁT, 1958; SUNHEDE, 1989)

- ***Myriostoma coliforme* (With. : Pers.) Corda**

Ref.: COURTECUISSÉ & DUHEM, 2000; FOCHT, 1974

- ***var. coliforme***

Ref.: unsp. TORTIĆ (rev.)

Exs.: CNF

(Lit.: DÖRFELT, 1985; PILÁT, 1958; SUNHEDE, 1989)

****Nidularia* Fr.**

(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MORNAND, 1985; MOYERSON & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958)

- ****Nidularia deformis* (Willd. : Pers.) Fr. et Nordholm**

= *Nidularia farcta* (Roth : Pers.) Fr. (1)

Ref.: unsp. TORTIĆ (1)

Exs.: CNF

***Phallogaster** Morgan

(Lit.: CALONGE, 1998; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MONTECCHI & SARASINI, 2000; PILÁT, 1958)

***• Phallogaster saccatus** Morgan

Ref.: unpubl. TKALČEC & MEŠIĆ

Exs.: CNF

(Lit.: CALONGE, 1998; JÜLICH, 1984; MONTECCHI & SARASINI, 2000)

Phallus Junius ex L. : Pers.

(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; JÜLICH, 1984; KREISEL, 2001; MOYER-SOEN & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958)

• Phallus hadriani Vent. : Pers.

Ref.: BOŽAC, 1984; KRANJČEV, 1995; unpubl. TKALČEC & MEŠIĆ

Exs.: CNF

(Lit.: CALONGE, 1998; PEGLER *et al.*, 1995; PILÁT, 1958)

• Phallus impudicus L. : Pers.

= *Ithyphallus impudicus* (L. : Pers.) E. Fisch. (1)

Ref.: BARČIĆ, 1989; BARČIĆ, 1996; BLAGAIĆ, 1917 (1); BLAGAIĆ, 1921; BLAGAIĆ, 1931; FOCHT, 1974; KRANJČEV, 1979; KRANJČEV, 1980; LANGE, 1974; LISIEWSKA & TORTIĆ, 1990; RAGUZIN, 2000; SCHULZER *et al.*, 1866; ŠKORIĆ, 1928; TORTIĆ, 1966 a; TORTIĆ, 1966 b; TORTIĆ, 1968 a; TORTIĆ, 1968 b; TORTIĆ, 2002; VOUK & PEVALEK, 1916 (1); unpubl. MATOČEC, unpubl. TKALČEC & MEŠIĆ; unpubl. TORTIĆ; SCHULZER, 1857 HR?

Exs.: CNF

(Lit.: CALONGE, 1998; PEGLER *et al.*, 1995; PILÁT, 1958)

Pisolithus Alb. et Schwein.

(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MOYER-SOEN & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958)

• Pisolithus arhizus (Scop. : Pers.) Rauschert

= *Pisolithus tinctorius* (P. Micheli ex Pers. : Pers.) Coker & Couch

Ref.: RAGUZIN, 2001; unpubl. TKALČEC & MEŠIĆ

Exs.: CNF

(Lit.: JÜLICH, 1984; PEGLER *et al.*, 1995; PILÁT, 1958)

Rhizopogon Fr. emend. Tul. et C. Tul.

(Lit.: ARNOLDS *et al.*, 1995; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MARTÍN, 1996; MONTECCHI & SARASINI, 2000; MOYER-SOEN & DEMOULIN, 1996; PEGLER *et al.*, 1993; PILÁT, 1958)

Rhizopogon obtextus (Spreng.) R. Rauschert= *Rhizopogon luteolus* Fr. emend. Tul. et C. Tul. (1)

Ref.: TORTIĆ, 2002; unsp. TORTIĆ (1)

Exs.: CNF

Rhizopogon roseolus (Corda) Th. Fr.= *Rhizopogon rubescens* (Tul. et C. Tul.) Tul. et C. Tul. (1)

Ref.: FOCHT, 1974 (1); JAAP, 1916 (1); MARTÍN, 1996; MUŽIĆ & BOŽAC, 1984; unsp. POUZAR (according to unsp. TORTIĆ) (1)

Exs.: PRM (1)

Rhizopogon roseolus (Corda) Th. Fr. agg.Incl.: *Rhizopogon briardii* Boud.*Rhizopogon hymenogastrosporus* Soehner*Rhizopogon lapponicus* P. Karst.*Rhizopogon luteorubescens* A.H. Sm.*Rhizopogon provincialis* Tul. et C. Tul.*Rhizopogon rubescens* (Tul. et C. Tul.) Tul. et C. Tul.*Rhizopogon sardous* Pacioni*Rhizopogon ventricisporus* A.H. Sm.*Rhizopogon vulgaris* (Vittad.) M. Lange

Ref.: KREISEL, 2001

Scleroderma Pers. : Pers.(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MOYERSON & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958; SIMS *et al.*, 1995)*• ***Scleroderma areolatum*** Ehrenb.

Ref.: unsp. KOTLABA (according to unsp. TORTIĆ); unsp. TKALČEC & MEŠIĆ; unsp. TORTIĆ (rev.)

Exs.: CNF, PRM

(Lit.: JÜLICH, 1984; PEGLER *et al.*, 1995; SIMS *et al.*, 1995)• ***Scleroderma bovista*** Fr.= *Scleroderma fuscum* (Corda) E. Fisch. (1)Ref.: MOESZ, 1938; SCHULZER, 1882 a; SCHULZER *et al.*, 1866; TORTIĆ, 1993; TORTIĆ, 2002; VOUK & PEVALEK, 1916 () (1); unsp. TKALČEC & MEŠIĆ; unsp. TORTIĆ

Exs.: CNF

(Lit.: JÜLICH, 1984; PEGLER *et al.*, 1995)• ***Scleroderma cepa*** Pers. : Pers.

Ref.: TORTIĆ, 1968 b; unsp. TKALČEC & MEŠIĆ

Exs.: CNF

(Lit.: JÜLICH, 1984; PEGLER *et al.*, 1995)

- ***Scleroderma citrinum*** Pers. : Pers.
 = *Scleroderma vulgare* Hornem. (1)
 Misappl.: *Scleroderma aurantium* (L. : Pers.) Pers. sensu auct. non L. (2)
 Ref.: BARČIĆ, 1982 (2); BARČIĆ, 1996 (2); BLAGAIĆ, 1931 (1); GJURAŠIN, 1898 (1); KRANJČEV, 1979 (1); KRANJČEV, 1985 a (2); SCHULZER, 1882 a (1); SCHULZER *et al.*, 1866 (1); ŠKORIĆ, 1928 (1); TORTIĆ, 1964 (2); TORTIĆ, 1968 b (2); TORTIĆ, 2002 (1); VOUK & PEVALEK, 1916 (1); unpub. MATOČEC (2); unpub. TKALČEC & MEŠIĆ; unpub. TORTIĆ (1)(2); SCHULZER, 1857 HR? (1)
 Exs.: CNF
 (Lit.: JÜLICH, 1984; PEGLER *et al.*, 1995)
 - ***Scleroderma polyrhizum*** (J.F. Gmel. : Pers.) Pers.
 = *Scleroderma geaster* Fr. (1)
 Ref.: FOCHT, 1974 (1); unpub. TKALČEC & MEŠIĆ; BOŽAC, 1984 HR? (1)
 Exs.: CNF
 (Lit.: JÜLICH, 1984; CALONGE, 1998)
 - ***Scleroderma verrucosum*** (Bull. : Pers.) Pers.
 = *Scleroderma bresadolae* Schulzer (1)
 Ref.: BARČIĆ, 1982; BARČIĆ, 1996; FOCHT, 1974; GJURAŠIN, 1898; RAGUZIN, 1998; RAGUZIN, 2001; SACCARDO, 1888 b (1); SCHULZER, 1884 a (1); SCHULZER, 1884 b (1); SCHULZER, 1885 (1); TORTIĆ, 1968 b; TORTIĆ, 2002; TORTIĆ & LISIEWSKA, 1978; VRŠČAJ, 2003; unpub. MATOČEC; unpub. TKALČEC & MEŠIĆ; unpub. TORTIĆ; FOCHT, 1979 HR?
 Exs.: CNF
 (Lit.: JÜLICH, 1984; PEGLER *et al.*, 1995; SIMS *et al.*, 1995)
- Sphaerobolus*** Tode : Pers.
 (Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; GMINDER *et al.*, 2000; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MOYERSOEN & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958)
- ***Sphaerobolus stellatus*** Tode : Pers.
 Ref.: FOCHT, 1972; GJURAŠIN, 1898; unpub. TKALČEC & MEŠIĆ
 Exs.: CNF
 (Lit.: CALONGE, 1998; JÜLICH, 1984)
- Tulostoma*** Pers. : Pers.
 (Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; GMINDER *et al.*, 2000; GROß *et al.*, 1980; JÜLICH, 1984; KREISEL, 2001; MORNAND, 1989; MOYERSOEN & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958; WRIGHT, 1987)
- ****Tulostoma armillatum*** Bres.
 = *Tulostoma fulvellum* Bres.

Ref.: unpub. PEINTNER

Exs.: IB

• *Tulostoma brumale* Pers. : Pers.

= *Tulostoma mammosum* (P. Micheli) ex Fr. (1)

Ref.: JAAP, 1916 (1); KRANJČEV, 1985; KRANJČEV, 1995; RANDIĆ, 1998; unpub. TKALČEC & MEŠIĆ; unpub. TORTIĆ

Exs.: CNF

(Lit.: GROß *et al.*, 1980; JÜLICH, 1984; PILÁT, 1958)

• *Tulostoma fimbriatum* Fr.

Ref.: RANDIĆ, 1998; unpub. TKALČEC & MEŠIĆ

Exs.: CNF

(Lit.: GROß *et al.*, 1980; JÜLICH, 1984; PILÁT, 1958)

• *Tulostoma melanocyclum* Bres.

Ref.: WRIGHT, 1987

Exs.: BP

(Lit.: WRIGHT, 1987)

Annotation: Author of the quote specified that locality (Šugarska Duliba, Velebit) belongs to Hungary, but the locality belongs to Croatia.

Tulostoma squamosum J.F. Gmel. : Pers.

Ref.: FOCHT, 1974; MOESZ, 1938; TORTIĆ, 1993

Vascellum F. Šmarda

(Lit.: ARNOLDS *et al.*, 1995; CALONGE, 1998; DEMOULIN, 1970; GMINER *et al.*, 2000; JÜLICH, 1984; KREISEL, 2001; MOYERSON & DEMOULIN, 1996; PEGLER *et al.*, 1995; PILÁT, 1958; SACCARDO, 1888)

• *Vascellum pratense* (Pers. : Pers.) Kreisel

= *Lycoperdon pratense* Pers. : Pers. (1)

= *Lycoperdon depressum* Bonord. (2)

= *Vascellum depressum* (Bonord.) F. Šmarda (3)

= *Lycoperdon hyemale* Bull. (4)

= *Bovista queletii* (Schulzer) De Toni (5)

= *Globalia queletii* Schulzer (6)

Ref.: FOCHT, 1972 (1); FOCHT, 1974 (1); FOCHT, 1979 (1); KRANJČEV, 1985 (1); MOESZ, 1938 (4); SCHULZER, 1885 (6); TORTIĆ, 1966 a (3); TORTIĆ, 1966 b (3); TORTIĆ, 1993; VOUK & PEVALEK, 1916 (2); VRŠČAJ, 2003; unpub. TKALČEC & MEŠIĆ; unpub. TORTIĆ () (3); SACCARDO, 1888 HR? (5)

Exs.: CNF

(Lit.: JÜLICH, 1984)

EXCLUDED RECORDS

Anixia minuta Schulzer = ?

Ref.: SCHULZER, 1872

Dictyophora croatica Mužic et Božac – nom. nud.

Ref.: MUŽIC & BOŽAC, 1997

Endoptychum agaricoides Czern.

= *Secotium acuminatum* Mont. (1)

= *Secotium thunii* (Schulzer) Schulzer (2)

Ref.: SACCARDO, 1888 (2); SCHULZER, 1883 a (1); SCHULZER, 1883 b (1)

Annotation: Authors of the quotes specified Slavonia (part of Croatia today) as a locality, but Schulzer found the species in the part of former Slavonia that now belong to Serbia and Montenegro (SCHULZER, 1865).

Geastrum striatum DC.

=! *Geastrum coronatum* Pers. : Pers.

Ref.: SACCARDO, 1888 HR?

Annotation: We exclude this record due to incorrect synonymy.

Lycoperdon involvatum Schulzer – nom. nud.

Ref.: SCHULZER *et al.*, 1866

Lycoperdon silvaticum Schulzer – nom. nud.

Ref.: SCHULZER *et al.*, 1866

Lycoperdon silvaticum Wettst. = ?

Ref.: ŠKORIĆ, 1928; VOUK & PEVALEK, 1916

Scleroderma vulgare Hornem.

= ! *Scleroderma bovista* Fr.

= ! *Scleroderma verrucosum* (Bull. : Pers.) Pers.

Ref.: BLAGAIĆ, 1921

Annotation: We exclude this record due to incorrect synonymy.

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