



University of South Bohemia  
in České Budějovice  
Faculty of Science



**Relation of *Pleurocapsa cuprea* Hansgirg  
to the genus  
*Hildenbrandia* (Rhodophyta)**

RNDr. Thesis  
(shortened version)

**Mgr. Lenka Caisová**

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## **Annotation**

*Pleurocapsa cuprea* has been originally described as a relatively common freshwater cyanobacterial species with specific habitat preferences. Due to the striking resemblance of some diagnostic features to the red algal genus *Hildenbrandia*, morphological, molecular as well as pigment analyses have been done to either confirm or disprove the relationship of *Pleurocapsa cuprea* to the Cyanobacteria.

## **Declaration**

I declare that this RNDr. thesis was fully worked out by myself and the named coauthor using the cited literature only. I declare that in accordance with the Czech legal code § 47b law No. 111/1998 in valid version.

I consent to the publication of my RNDr. thesis in an edition made by removing marked parts archived by Faculty of Science in an electronic way in the public access section of the STAG database run by the University of South Bohemia in České Budějovice on its web pages.

## **Translation into Czech language:**

Prohlašuji, že svoji rigorózní práci jsem vypracovala samostatně pouze s použitím pramenů a literatury uvedených v seznamu citované literatury.

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České Budějovice, 30<sup>th</sup> March 2011

Caisová Lenka

**Authors' contribution to the article:**

**Relation of *Pleurocapsa cuprea* Hansgirg to the genus *Hildenbrandia*  
(Rhodophyta)**

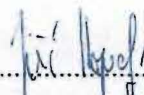
Lenka Caisová and Jiří Kopecký

Lenka Caisová (LC) designed the study and prepared the manuscript. LC performed the morphological observation and the DAPI staining as well as the phylogenetic analysis of the present study. LC was partially involved in the transmission electron microscope (TEM) analyses.

Jiří Kopecký performed the high-performance liquid chromatography (HPLC) analysis, evaluated the data and prepared them for publication. He also contributed to the part of the manuscript focused on the analysis of pigments.



Lenka Caisová



Ing. Jiří Kopecký, CSc.

## **Thesis content**

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## 1. Paper

# Relation of *Pleurocapsa cuprea* Hansgirg to the genus *Hildenbrandia* (Rhodophyta)

Lenka Caisová & Jiří Kopecký

2008

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## Abstract

*Pleurocapsa cuprea* HANSGIRG 1892 was described as a cyanobacterial species from mountain streams in the southern Tyrol and Bohemia, and commonly identified from natural localities. Diagnostic features include a verrucose surface and copper colour of the colonies, with occasional occurrence of pseudodichotomic branching of the thallus. Natural material of *P. cuprea* was studied recently and compared with the type material from a collection of cryptogams (Natural History Museum Vienna). The morphology of its macroscopic red patches (colonies) and cells in particular are similar those of the rhodophyte *Hildenbrandia rivularis*. This paper presents a comparison of morphological and molecular characters of *P. cuprea* and *H. rivularis* and the partial molecular sequence data of *P. cuprea*. It also reports results from 4,6-diamidino-2-phenylindole staining, transmission electron microscope analyses and analyses of pigments. According to the results of variable analyses, *P. cuprea* is an eucaryotic alga and should be classified to the Rhodophyta, close to the group of the freshwater species of the genus *Hildenbrandia* as a special species of this genus. The relationships between *P. cuprea* and *H. rivularis* are discussed.

## Translation into Czech language:

*Pleurocapsa cuprea* HANSGIRG 1892 byla popsána jako sinice z horský potoků v Tyrolsku a v Čechách. Diagnostickými znaky jsou bradavičnatý povrch a oranžové zbarvení kolonií, a pseudodichotomické větvení stélky. Morfologie studovaného přírodního materiálu *P. cuprea* byla porovnána s typovým materiálem uloženým v přírodovědném muzeu ve Vídni. Makroskopické kolonie a morfologie buněk *P. cuprea* jsou velice podobné červené řase *Hildenbrandia rivularis*. Tato práce srovnává morfologické znaky a molekulární pozici obou dvou studovaných taxonů: sinice *P. cuprea* a červené řasy *H. rivularis*. Stejně tak jsou demonstrovány výsledky DAPI barvení, transmisní elektronové mikroskopie a HPLC analýzy pigmentů. Na základě získaných výsledků, *P. cuprea*, původně popsána jako sinice, je eukaryotická řasa a měla by být klasifikována jako červená řasa, konkrétně jako druh sladkovodního rodu *Hildenbrandia*.

## 2. Curriculum vitae

Name: Lenka Caisová  
University of South Bohemia, Faculty of Sciences  
Branišovská 31  
České Budějovice  
CZ – 370 05  
Czech Republic  
e-mail: lcaisova@gmail.com

### Education

- 2002 – 2005 University of South Bohemia, Faculty of Biological Sciences: Bc. studies, Biology, bachelor thesis, Přehled větvených vláknitých řas vybraných lokalit jižních Čech a porovnání jejich variability [A review of branched filamentous green algae in selected locations in South Bohemia and a comparison of their variability]; supervisor Prof. RNDr. Jiří Komárek, DrSc.
- 2005 – 2007 University of South Bohemia, Faculty of Biological Sciences: MSc. studies, Biology, diploma thesis, Taxonomie rodu *Stigeoclonium* v České Republice [A taxonomy of the genus *Stigeoclonium* in the Czech Republic]; supervisor Prof. RNDr. Jiří Komárek, DrSc.

### Professional experience

- 2005 – present Researcher; Institute of Botany v.v.i., Czech Academy of Sciences of the Czech Republic, Třeboň, CZ – 379 82, Czech Republic (part-time employment).

### Membership in scientific organizations

Czech Algological Society (CAS)  
Phycological Society of America (PSA)

### International cooperation

- 2006, 2007 biological survey in Altai, Kazakhstan, Irbis project (3 months)
- 2008 archeological survey in Belo Horizonte, Brasil, Lagoa Santa project (4 weeks)
- 2008 Experimental Phycology and Culture Collection of Algae (SAG), Georg-August-Universität Göttingen (Prof. Dr. Thomas Friedl), Germany, Sokrates/Erasmus program (3 months)
- 2009 The Culture Collection of Algae at the Botanical Institute of the University at Innsbruck (Dr. Georg Gärtner), Austria (1 week)
- 2009 Culture Collection of Algae and Protozoa (CCAP), (Dr. Thomas Pröschold), Scottish Association for Marine Science, Dunstaffnage Marine Laboratory, Dunbeg by Oban, Scotland (4 weeks)

2009 – 2011 Botanisches Institut – Universität zu Köln, Cologne (Prof. Dr. Michael Melkonian), Germany (19 months)

### Publications:

**Caisová, L.** 2006. *Pleurocapsa cuprea*, originally described as blue – green alga, is a eukaryotic alga similar to the species *Hildenbrandia rivularis* (Rhodophyta) *Czech Phycology*. 6: 69–76.

**Caisová, L.** 2007. Diversity of Cyanophyta and Algae of the Katon-Karagay National Park Territory (East Kazakhstan). In: *Modern Approaches to Biodiversity Protection in the Context of Steady Development Achievement of Republic Kazakhstan, International Science Conference Papers*. East-Kazakhstan State University, Usk-kamenogorsk, pp. 46–52.

**Caisová, L.** 2008. Sinice a řasy na kůře stromů [Cyanobacteria and algae growing on the bark tree]. *Veronica*. 22: 9 pp.

**Caisová, L., Husák, Š. & Komárek, J.** 2008. *Nitella mucronata* (Br.) Miquel (Charophyta) in the Czech Republic. *Fottea*. 8: 105–107.

**Caisová, L. & Kopecký, J.** 2008. Relation of "*Pleurocapsa cuprea*" to the genus *Hildenbrandia* (Rhodophyta). *Phycologia*. 47: 404–415.

Zapomělová, E., Hrouzek, P., Řeháková, K., Šabacká, M., Stibal, M., **Caisová, L., Komárková, J. & Lukešová, A.** 2008. Morphological variability in selected heterocystous cyanobacterial strains as a response to varied temperature, light intensity and medium composition. *Folia Microbiologica*. 53: 333–341.

**Caisová, L., Bešta, T., Chlachula, J., Komárek, J. & Husák, Š.** 2009. Taxonomic investigations of cyanobacterial and algal flora from the Southern Altai, East Kazakhstan. *Biodiversity Research and Conservation*. 15: 13–22.

**Caisová, L. & Gąbka, M.** 2009. Charophytes (Characeae, Charophyta) in the Czech Republic: taxonomy, autecology and distribution. *Fottea*. 9: 1–43.

**Caisová, L., Marin, B., Sausen, N., Pröschold, T. & Melkonian, M.** 2011. Polyphyly of *Chaetophora* and *Stigeoclonium* within the Chaetophorales (Chlorophyceae), revealed by sequence comparisons of nuclear-encoded SSU rRNA genes. *Journal of Phycology*. 47: 164–177.

### Projects

2009 The phylogeny of ecologically important polymorphic filamentous green algae, 038/2008P GAJU - Grant Agency of the University of South Bohemia (GAJU), awarded to – L. Caisová

2009 – 2012 The phylogeny of polymorphic filamentous green algae, Grant Agency CR no 206/09/0697, awarded to Prof. RNDr. Jiří Komárek, DrSc.



## International conferences and meetings

- 2009 9<sup>th</sup> International Phycological congress in Tokyo (Japan), **Caisová, L.**: Taxonomy of the genus *Rhexinema* (Ulvophyceae) based on phylogeny of the 18S rRNA and morphology, poster presentation.
- 2009 13<sup>th</sup> Evolutionary Biology Meeting at Marseilles (France): **Caisová, L.** & Kopecký, J.: Relation of *Pleurocapsa cuprea* Hansgirg to the genus *Hildenbrandia* (Rhodophyta), oral presentation.
- 2010 13<sup>th</sup> Wissenschaftliche Tagung der Sektion Phykologie, Insel Reichenau im Bodensee (Constance), **Caisová, L.**, Marin, B. Sausen, N., Pröschold, T. & Melkonian, M.: Do traditional morphological features correspond to phylogenetic relationships of distinct genera of the order Chaetophorales?, oral presentation.
- 2011 59<sup>th</sup> Annual meeting of the British Phycological Society at Cardiff (Wales), **Caisová, L.**, Marin, B. & Melkonian, M.: Is ITS2 evolution linked to speciation? A comparative analysis of the Ulvales as a case study, oral presentation.

## Other activities

- Summer term 2008 Phycology, practice (teaching, University of South Bohemia)
- June 2008 Determination course for limnologists and hydrobiologists (Czech Algological Society) – oral presentation: Morphotypes of chaetophorean genera *Chaetophora*, *Draparnaldia* and *Stigeoclonium* and their determination, Chlum u Třeboně, Czech Republic.
- February 2009 Determination course for limnologists and hydrobiologists (Czech Algological Society) – oral presentation: Green algae in the Czech Republic. Brno, Czech Republic.
- April 2009 Phytobenthos (Czech Algological Society) – oral presentation: Red algae and green filamentous algae – their occurrence in the Czech Republic. Vyškovec, Czech Republic.