

Taxonomy of the Marine Epiphytic Cyanobacterium *Cyanoplacoma adriatica* from the Pacific Coast of Japan

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Cyanoplacoma adriatica (Chroococcales) was described by Hauck (1885) from the surface of the red alga *Pterocladia capillacea* in the Adriatic Sea. In Japan, Okamura (1916) identified a species of cyanobacteria on the brown alga *Myelophycus simplex* as *C. adriatica*. Its phylogenetic position has been unresolved because of no genetic information. Recently we collected *C. adriatica* specimens attached to *M. simplex* and several other Japanese red algae, on which we examined intraspecific morphological and genetic differences and their phylogenetic position by morphological observations and molecular phylogeny. Despite variation in morphology, there were few genetic variations among the specimens attached to different macroalgae. Therefore, this study concluded that all algae attached to different seaweeds were the same species and redefined the morphological and ecological characteristics of *C. adriatica*. The 16S rRNA gene analyses suggest that *C. adriatica* belongs to *Pleurocapsales*, not *Chroococcales*. *Cyanoplacoma regularis*, the only species in the *Cyanoplacoma* whose genetic information is available, does not make a monophyletic clade with *C. adriatica*. This suggests polyphyly of *Cyanoplacoma*. Molecular phylogenetic analyses of type species *C. vesiculosa* should be required to draw a taxonomic conclusion about *Cyanoplacoma*.

Key words: 16S rRNA gene, 16S-23S rDNA ITS region, *Cyanoplacoma adriatica*, epiphytic, marine benthic cyanobacteria, morphology, Pacific coast of Japan.

The genus *Cyanoplacoma* Molinari & Guiry (Molinari-Novoa and Guiry 2021) was first described by Bornet and Thuret (1876) as *Placoma* Schousb. ex Bornet & Thur. (type: *C. vesiculosa* (Schousb. ex Bornet & Thur.) Molinari & Guiry). Initially, Geitler (1932) classified *Placoma* as *Entophysalidaceae*. Komárek and Anagnostidis (1998) suggested that *Placoma* should be *Hydrococcaceae*. Subsequently, Hoffmann (2005) included

Placoma as a member of *Entophysalidaceae* again. Komárek et al. (2014) proposed a new classification system, adopting the views of Geitler (1932) and Hoffmann (2005). Molinari-Novoa and Guiry (2021) decided that “*Placoma*” was an illegitimate name because it had already been used in *Rubiaceae* of the angiosperms (Gmelin 1791). Based on this discussion, Molinari-Novoa and Guiry (2021) proposed new combinations of all taxa

Sinicarum 1: 1–176. Science Press, Beijing (in Chinese).

Appendix

List of sequences used in this study.

Taxon, GenBank accession number for 16S rRNA.

Chamaecalyx incrassatus SAG 29.84: AJ344559;
Chamaesiphon geitleri No1023: KY704109;
Chamaesiphon investiens UAM 386: JQ070061;
Chamaesiphon minutus PCC 6605: CP003600;
Chamaesiphon polonicus SAG 32.87: KM019983;
Chamaesiphon polymorphus CCALA 037: KY704110;
Chamaesiphon starmachii clone 1_po_IS: KY704124;
Chamaesiphon subglobosus PCC 7430: AY170472;
Chlorogloea purpurea SAG 13.99: KM019990;
Chroococciopsis cubana SAG 39.79: AJ344558;
Chroococciopsis sp. BB79.2 SAG 2023: AJ344552;
Chroococciopsis sp. BB82.3 SAG 2024: AJ344553;
Chroococciopsis sp. BB84.1 SAG 2025: AJ344554;
Chroococciopsis sp. BB96.1 SAG 2026: AJ344555;
Chroococciopsis thermalis PCC 7203: CP003597;
Chroococcus turgidus CCIBt3508: MF072352;
Chroococcus violaceus CCIBt3549: MF072345;
Cryptococcus brasiliense CCIBt3410: MF072345;
Cryptococcus komarkovae CCALA 054: MF072346;
Cyanoarbor violascens C2: KU318401; *Cyanoarbor violascens* C5: KU318402; *Cyanobacterium aponinum* PCC 10605: CP003947; *Cyanobacterium stanieri* PCC 7202: CP003940; *Cyanobium gracile* PCC 6307: CP003495; *Cyanobium* sp. JJ21R2: AM710352; *Cyanoplacoma regularis* UCFM_PR: KF264594; *Foliisarcina bertioensis* CENA333: KT731153; *Foliisarcina bertioensis* CENA346: KT731162;

Geitleribactron purpureum Tovel-1: KT819296; *Geitleribactron purpureum* Tovel-2: KT819265; *Gloeobacter killaeensis* JS1: NR121745; *Gloeobacter violaceus* PCC 7421: BA000045; *Gloeotheca aurea* CCALA 1111: MF781017; *Gloeotheca citrififormis* PCC 7424: CP001291; *Gomphosphaeria aponina* SAG 52.96: KM019999; *Hyella caespitosa* PCC 7516: X78681; *Hyella disjuncta* PCC 6712: AJ344557; *Hyella patelloides* LEGE 07179: KR676351; *Hyella* sp. PCC 7301: AB039009; *Inacoccus carmineus* CCIBt3411: MF072347; *Inacoccus carmineus* CCIBt3475: MF072349; *Leptolyngbya boryana* NIES-2135: AP018203; *Microcystis aeruginosa* NIES-843: AP009552; *Microcystis viridis* NIES-102: AP019314; *Myxosarcina* sp. PCC 7312: AJ344561; *Myxosarcina* sp. PCC 7314: AB074511; *Oculatella kauaiensis* CXA033 clone 2: MH463393; *Oculatella ucrainica* KZ-5-4-1: KY098843; *Odorella benthonica* CalAq792 clone cl1: MH702368; *Plectolyngbya hodgsonii* ANT. LPR2.2: AY493583; *Pleurocapsa concharum* PCC 7327: CP003590; *Pleurocapsa concharum* VP3-02: FR798927; *Pleurocapsa fuliginosa* HA4302-MV1: JN385285; *Pleurocapsa minor* HA4230-MV1: KC525080; *Prochlorococcus marinus* str. MIT 9303: CP000554; *Prochlorococcus marinus* MIT9313: BX548175; *Staniera cyanosphaera* PCC 7437: CP003653; *Staniera* sp. NIES-3757: AP017375; *Synechococcus elongatus* PCC 6301: AP008231; *Synechococcus elongatus* PCC 7942: AF132930; *Trichocoleus desertorum* Mon69 clone D: MK478718; *Trichocoleus* sp. ACSSI 301: MT425926; *Waterburya agarophytonicola* K14: OK044280; *Xenococcus* sp. PCC 7305: AF132783; *Xenococcus spongiosum* TAU-MAC 0615: KY744806.

福岡将之, 鈴木秀和, 神谷充伸, 田中次郎: 本州太平洋沿岸産海藻付着藍藻イワヒゲノコブ *Cyanoplacoma adriatica* の分類

イワヒゲノコブ *Cyanoplacoma adriatica* (Hauck) Molinari & Guiry (クロオコッカス目 *Chroococcales*) は, Hauck (1885) によりアドリア海産紅藻カタオバクサ *Pterocladia capillacea* (S.G.Gmelin) Santlices & Hommersand 上から記載された。日本では岡村 (1916) が褐藻イワヒゲ *Myelophycus simplex* (Harvey) Papenfuss 上の藍藻を本種として以降イワヒゲのみに産するとされるが, 分類学的研究に必要な遺伝情報は不明だった。今回本邦産イワヒゲと紅藻数種上から本種と同定できる試料を得たため, 形態観察と分子系統解析により種内の形態・遺伝的差異やその系統を検討した。形態は基質間で

有意な差があったが, 各配列間の遺伝的差異はほぼ見られず単系統になったため, 各海藻上藻体を全て同種とし, 分類形質を再定義した。分子系統解析の結果, 本種はプレウロコブサ目に含まれた。*Cyanoplacoma* 属で唯一遺伝情報が得られていた *C. regularis* (Broady & Ingerfeld) Molinari & Guiry は本種と近縁にならず, 本属の多系統性が示された。今後本属の系統を解明するためにはタイプ種 *C. vesiculosa* (Schousb. ex Bornet & Thur.) Molinari & Guiry の分子系統解析が必要となる。

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