

Molecular Characterization of Twenty-Five Marine Cyanobacteria Isolated from Coastal Regions of Ireland

Supplementary Material

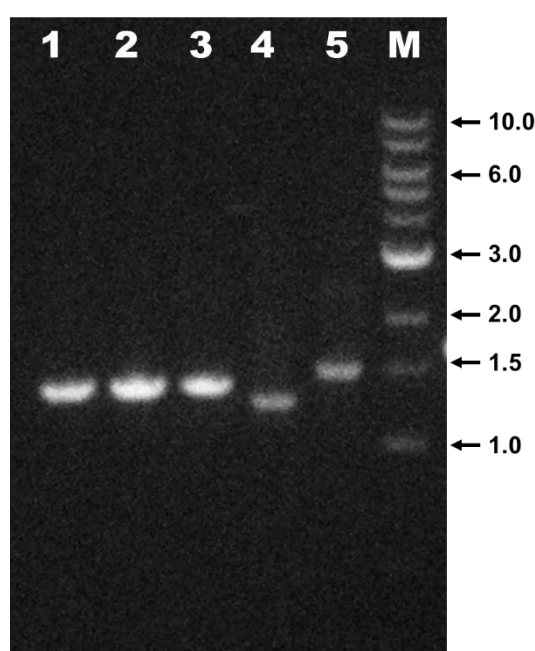


Figure S1. Representative 1% agarose gel showing PCR amplified products of 16S rRNA gene of selected cyanobacteria. Lane 1, *Chlorogloea microcystoides* SABC011701; Lane 2, *Chlorogloea microcystoides* SABC022904; Lane 3, *Kamptonema okenii* SABC011902; Lane 4, *Tychonema decoloratum* SABC011901; Lane 5, *Leptolyngbya valderiana* SABC022801; M, 1 kb DNA ladder (New England Biolabs).

CLUSTAL O(1.2.4) multiple sequence alignment

```

Hyella_patelloides      ctcagaatgaacgctggcgggtatgcttaacacatgcaagtcgaacgaattcttcggaatg      60
Hyella_gigas            -----cagtaccg--tgcag--tcgacggtagaacctcgggttcata      38
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      agtggcggacgggtgagtaacg-cgtgagaacctgccttcaggatggggacaacagttgg      119
Hyella_gigas            gatggcggacgggtgagtaacacgtgtagaatctgcctccaggatcggggacaacacagcggg      98
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      aaacgactgctaatacccaataagccgcaaggtaaaagatttatcgctgaagaggggct      179
Hyella_gigas            aaactgctgctaatacccgatgtgcctaagggtgaaagattaattgcctggagatgagct      158
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      cgcgtccgattagctagttggtagaggtaaaggcttaccaaggcagcgatcggtagctggg      239
Hyella_gigas            cgcgtccgattagctagttggtagagtaaaagcctaccaaggctcgcgatcggtagctggg      218
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      ctgagaggacgagcagccacactgggactgagacacggccagactcctacgggaggcag      299
Hyella_gigas            ctgagaggatgagcagccacactgggactgagacacggccagactcctacgggaggcag      278
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      cagtgggaatttttcgaatgggcgcaagcctgacggagcaataccgctgaggaggga      359
Hyella_gigas            cagtgggaatttttcgaatgggcgaaagcctgacggagcaagaccgctgaggaggatga      338
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      aggcctttgggttgtaaacctcttttctcaaggagaagacctgacggtagcttgggaat      419
Hyella_gigas            aggcctttgggttgtaaacctcttttctcagggaagaataactgacggtagcttgggaat      398
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      cagcatcggttaactcgtgccagcagccggttaatacggaggatgcaagcgttattcg      479
Hyella_gigas            aagcatcggttaactcgtgccagcagccggttaatacggaggatgcaagcgttattcg      458
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      gaattattggcgtaaaagcgtccgaggtggtgcctcaagtctgctgtaaaaccgaag      539
Hyella_gigas            gaattattggcgtaaaagcgttcgtaggtggctgtcaagtctgctgtaaaaccgggg      518
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      cttaaactcgggcaggcagtggaactgaagcactagatgacgtaggggtagagggaat      599
Hyella_gigas            cttaaactcggaaaaactgtggaactgaacagctagatgtaggggttagagggaat      578
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      ttccagtgtagcgggtgaaatgctgtagagattggaagaacaccagtgccgaaggcgtct      659
Hyella_gigas            ttccagtgtagcgggtgaaatgctgtagatctcgggaagaacaccagtgccgaaggcgtct      638
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      actggaccgtaactgacactcaggacgaaagctagggtagcgaagggttagatataccc      719
Hyella_gigas            actggaccataactgacactcaggacgaaagctaggggagcgaagggttagatataccc      698
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      ctgtagcttagctgtaaacgatggatactaggcgttgctgtatcgaccgagcagtg      779
Hyella_gigas            ctgtagcttagctgtaaacgatggatactagggttgctgtatcgaccgagcagtg      758
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      cgtagccaacgcgttaagtatccgcctggggagtagcacgcaagtgtaaaactcaaa      839
Hyella_gigas            cgtagccaacgcgttaagtatccgcctggggagtagcacgcaagtgtaaaactcaaa      818
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      gaattgacggggcccgacaaagcggtaggtatgtggtttaattcgatgcaacgcaag      899
Hyella_gigas            gaattgacggggcccgacaaagcggtaggtatgtggtttaattcgatgcaacgcaag      878
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      aaccttaccaggccttgacatcccgaattctggggaactcagaagtgcttcgggaa      959
Hyella_gigas            aaccttaccaggccttgacatctcagaatcttggggaactcagaagtgcttcgggaa      938
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      cgtggagacaggtggtgcatggctgtcagctcgtgctgagatgttgggttaagtc      1019
Hyella_gigas            cgtgaacacaggtggtgcatggctgtcagctcgtgctgagatgttgggttaagtc      998
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      ccgcaacgagcgcaaccctcgtccttagttgcatcattaagtgggcactttagggaga      1079
Hyella_gigas            ccgcaacgagcgcaaccctcgtccttagttgcatcattaagtgggcactttagggaga      1058
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      ctgccggtgacaaacggagggaaggtggggatgacgtcaagtcagcatgccccttacgt      1139
Hyella_gigas            ctgccggtgacaaacggagggaaggtggggatgacgtcaagtcagcatgccccttacgt      1118
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      ctgggctacacagctactacaatggtcaggacaaggcgagcaactcgagagtgagc      1199
Hyella_gigas            ctgggctacacagctactacaatgggaaggacagaggtagcaagcgagtgagc      1178
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      gaatctcatcaaacctggccacagttcagattgaggctgcaactcgctgcatgaagg      1259
Hyella_gigas            gaatcccat-aaacctttcctcagttcagattgaggctgcaactcgctgcatgaagg      1237
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      ggaatcgtagtaatcgaggtagcactatcggtgaatccgttccgggcttgtaga      1319
Hyella_gigas            ggaatcgtagtaatcgaggtagcactatcggtgaatccgttccgggcttgtaga      1297
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

Hyella_patelloides      caccgccgtcacaccatggaagctggccac-gccggaagtcgttacctaaccctttt      1378
Hyella_gigas            caccgccgtcacaccatggaagctggccac-gccggaagtcgttacctaaccctttt      1357
                        *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

```

Figure S2. Alignment of 16S rRNA gene sequences of *Hyella patelloides* LEGE 07179 (*Hyella_patelloides*) and *Hyella gigas* SABC011201 (*Hyella_gigas*).

CLUSTAL O(1.2.4) multiple sequence alignment

```

TycDec -----cacttcggt---ctgtggcggatgagtgagta-cacatga-g
KamOke acagtgcagtcgacggagtaacttcggtacttagtggcggacgggtgagtaacgcgtgaga
          ***** :***** * :***** * :*****

TycDec atctgcctccaggtcagggaacaacagcgggaaactgtgttaacccatgtgcctaag
KamOke atctgccccttaggagggggacaacagttggaacgactgctaatacccatatgtccgaga
          ***** :***** :***** :***** :***** :*****

TycDec ggtgaatgattaatgcctggtgatcagctcgcgtccgatcagcttggtgtagtaaa
KamOke ggtgaaacattaatggcctgaggaggagctcgcgtctgattagctagttggtgggtaaa
          ***** :***** :***** :***** :***** :*****

TycDec agcctacc-gggctccgatcggtagctggtctgagatgatgagcagccagctggtacta
KamOke ggcctaccaaggcgacgatcagtagctggtctgagaggatgatcagccacactgggactg
          ***** :***** :***** :***** :***** :*****

TycDec aaacacggccctactcctacaggaggcagcagtgagggaattttccgggtggcgaaat
KamOke agacacggcccgagactcctacgggaggcagcagtgagggaattttccgcaatgggcgaag
          ***** :***** :***** :***** :***** :*****

TycDec cctgacggagcgcgacgcgtgggggatgaacgctctggtgttataacctctttctca
KamOke cctgacggagcaagaccgcgtgaggagggaaggtctgtgattgtaaacctctttctca
          ***** :***** :***** :***** :***** :*****

TycDec ggggaagaattactgacggtacctgaagaataatcatcggctaactcgtgccagcagccg
KamOke ggggaagaagaactgacggtacctgagggaatcagcatcggctaactcgtgccagcagccg
          ***** :***** :***** :***** :***** :*****

TycDec cgatacgacggaggatgaagcggtattatgggcgtaaagcggttcgtaggtg
KamOke cggttaatacggaggatgaagcggtattatgggcgtaaagcggttcgtaggtg
          ***** :***** :***** :***** :***** :*****

TycDec gctgttctagtctgccgttaaagacgggtccttaactcctgaacaactgtgaaaactgaa
KamOke gctaagcaagtctgctgttaaagacgggagctaaactcgtgaaaggcggtggaactgca
          ***** :***** :***** :***** :***** :*****

TycDec cagctatattatggtaggagtaaggagaattcctggttagcgatgaaatgcgtagatat
KamOke tagctagagtgtggtaggggtagagggaattcccagtgtagcggtgaaatgcgtagatat
          ***** :***** :***** :***** :***** :*****

TycDec cgggaagaaacacgggtggcgaaggcgcttactgggccataactgacactgaacgacgac
KamOke tgggaagaaacacgggtggcgaaggcgcttactgggccataactgacactgatggacgaa
          ***** :***** :***** :***** :***** :*****

TycDec tgtagggcagcgaaggagtagatactcctgtagtcctagctgcaacgatggatact
KamOke agctaggggagcgaaggagtagataccctgtagtcctagcgtgaacgatgaacact
          ***** :***** :***** :***** :***** :*****

TycDec aggtgttgctcgtatcgactcgagcagtgccgtagctaacgcgttaagtatccgcctgg
KamOke aggtgttgccctgatcgacccgggagtgccgtagccaacgcgttaagtgctccgctgg
          ***** :***** :***** :***** :***** :*****

TycDec gtagtacgcacgctattgtgatactcagaggtgttgacggggggccgcacaagcggtgga
KamOke ggagtacgctcgcaagagtgaactcaagggaattgacggggggccgcacaagcggtgga
          ***** :***** :***** :***** :***** :*****

TycDec gtatgtgtgtttatcgtatgcgacgcaagaaccttacgagggttgactgttcagaat
KamOke gtatgtgtgtttatcgtatgcgacgcaagaaccttaccaaggcttgacatgcgcgcaat
          ***** :***** :***** :***** :***** :*****

TycDec cttgaggaaacctaatactgccttcaggagctggaaacacatgtggtgcatggctgtcgtc
KamOke ccttcagagatgaggagtgctacgggagcgcggaacaggtggtgcatggctgtcgtc
          ***** :***** :***** :***** :***** :*****

TycDec agctcgtgcatgagatgttgggttaagtcgcgcaagagcgcaactctcgtccttagtc
KamOke agctcgtgctgtagatgttgggttaagtcgccgaacgagcgcaacccctcgtccttagtc
          ***** :***** :***** :***** :***** :*****

TycDec gctatcattaagttgggcactttaggggagactcgggagacataccggaggaaaggtgggg
KamOke gccatcattaagttgggcactctaggggagactcgggtgacaaacggaggaaaggtgagg
          ***** :***** :***** :***** :***** :*****

TycDec atgatgtcatgttagtatgccctatgtcctgggctacacatgtactacaatgggaagg
KamOke atgacgtcaagtcacatgcccttacgtcttgggctacacacgtactacaatgtcgcg
          ***** :***** :***** :***** :***** :*****

TycDec acagagggtagcaagcgcgagtgcaagcctatcctataaaccttttctcagttcagat
KamOke acaaggggcagccaaccagcgatggtgacaaatcccataaacctgggtcagttcagat
          ***** :***** :***** :***** :***** :*****

TycDec cgcagggtgcatctcgcgtgaaagggtatcgcttggtatcgcatgtcagcatagtc
KamOke tgcaggctgcaactgcctgcatgaaggaggaaatcgtagtaatccaggtcagcactact
          ***** :***** :***** :***** :***** :*****

TycDec gcggtgaatgcgttccgggccttgtaacacccgctgtcacacattggaagttggacat
KamOke ggggtgaatgcgttccgggccttgtaacacccgctgtcacacattggaagttggacac
          ***** :***** :***** :***** :***** :*****

TycDec gccagatgtcattactctc--agtgcaaggagggggatgccgatgcatt
KamOke gcccgaaagtcgtactccaaccgttcgaggaggagcgcctgaatggt
          ***** :***** :***** :***** :***** :*****

```

Figure S3. Alignment of 16S rRNA gene sequences of *Tychonema decoloratum* SABC011901 (TycDec) and *Kamptonema okenii* SABC011902 (KamOke).

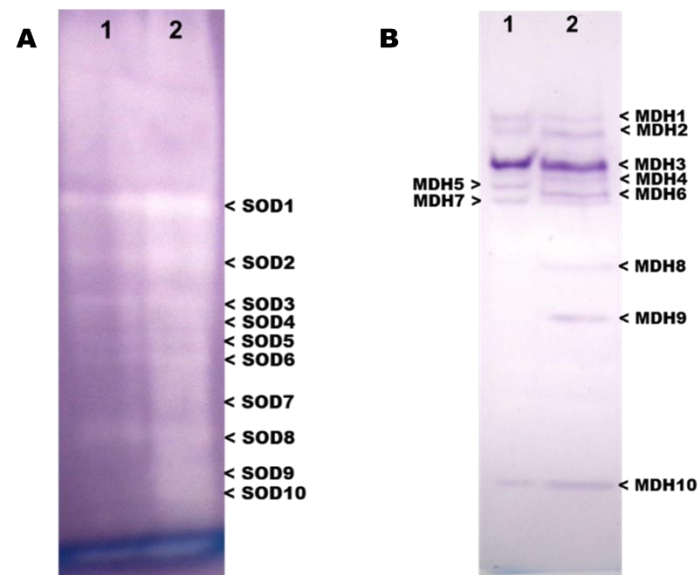


Figure S4. Native-PAGE gels showing superoxide dismutase (SOD) (A) and malate dehydrogenase (MDH) (B) isoenzymes profile of *Tychonema decoloratum* SABC011901 (lane 1) and *Kamptonema okenii* SABC011902 (lane 2).