

Рисунок 3. Выравнивание потенциальных промоторов и сайтов связывания фактора NtcA перед генами у цианобактерий. Полужирным отмечены (–10)-боксы промотора, темно-зеленым – альтернативные (–10)-боксы, желтым – консервативные участки (сайты) с консенсусом GTA-8N-TAC, которые предположительно служат сайтами связывания активатора или репрессора (указано в заголовке); зеленым – замены в сайтах, красным – позиции старта транскрипции. Подчеркнуты максимально продолженные комплементарные участки связывания фактора. NtcA относится к семейству CAP (catabolite activator protein). Указаны ген с его характеристиками, порядок и вид цианобактерии. Рассмотрены пять порядков: Nostocales, Oscillatoriales, Prochlorales, Chroococcales, Gloeobacterales (содержит только Gloeobacteria) и неклассифицированный порядок цианобактерий, который содержит род Acaryochloris. Потенциально активируемые и репрессируемые гены разделены. Запись типа Cyanothece sp. ATCC 51142_i обозначает i-ый ортолог штамма Cyanothece sp. ATCC 51142. Знак «–» разделяет несколько сайтов в лидерной области одного вида/штамма. Вид *Anabaena* sp. PCC 7120 переименован в *Nostoc* sp. PCC 7120. Вид *Anabaena azollae* переименован в *Nostoc azollae*. Запись locus_tag служит идентификатором гена в геноме бактерий. Число в конце строки обозначает ее характеристику (качество) – близость в специальной матрике сайта длиной 20 п.н. к группе слов, которые служат образцами для поиска.

Потенциально активируемые гены:

nrtA, транспортер нитрата, 45 кДа

Chroococcales:

TTAGT**T**ACAAASTA**TAC**AAATATTTACAAGGAAAA*ATCC**CAGTCT**AGGAATGC Synechocystis sp. PCC 6803; locus_tag="sl11450"; 18.82
 TTT**GTA**ACAATSTA**TAC**GAAATTTTCCTGTTGAAGA**CTG**TAAATTT**AAAGTTAA Microcystis aeruginosa; MAE_14800; 17.76
 TTT**GTA**GCAAATA**TAC**GAAAAATTTCAAATCCCCA*TG**TAAATGCT**TTTTATCTA Cyanothece sp. PCC 8802; Cyan8802_4459; 15.76
 TTT**GTA**GCAAATA**TAC**GAAAAATTTCAAATCCCCA*TG**TAAATGCT**TTTTATCTA Cyanothece sp. PCC 8801; PCC8801_4396; 15.76
 TTC**GTA**TCTTTTGT**TAC**AAAAATTTATAAATAATG**GG**TAAATTG**CATAAACG Cyanothece sp. PCC 7822; Cyan7822DRAFT_4837; 17.18
 TTC**GTA**TCTTTTGT**TAC**CAAAAGTAACTTGAAATC**GAT**TAAATTA**CATATAAA Cyanothece sp. PCC 7424; PCC7424_3527; 18.35
 CTG**GTA**GCAATCAC**TAC**GCTGATGTGTTGCCGATTG***TGGTGATGT**AAAGTGTGT Synechococcus sp. WH 5701; WH5701_04715; 21.06
 GAT**GTA**ATGAAAGT**TAC**AGCATAATTTGTCCGAAAACAGGAT**TAAACA**CACAGGCA Synechococcus sp. PCC 7002; SYNPC7002_A1748; 18.12
 TG**GTA**ATCASCCTGA**TAC**AACATCCGCGTTTCGCTTTCCAAC**TATAAA**TAAAGAAG Synechococcus sp. WH 8102; SYNW2487; 17.06

Oscillatoriales:

ATT**GTA**GTTGCCGA**TAC**ATAAACCCCTGGTGATTTT*TCT**TAGATT**GTGGACAC Arthrospira maxima; AmaxDRAFT_3857; 17.76
 ATT**GTA**GTTGCCGA**TAC**ATAAACCCCTGGTGATTTT*TCT**TAGATT**GTGGACAC Arthrospira platensis; AplaP_010100019381; 17.76
 ATT**GTA**GTTGCCGA**TAC**ATAAACCCCTGGTGATTTT*TCT**TAGATT**GTGGACAC Arthrospira sp. PCC 8005; APCC8_010100008251; 17.76

Неклассифицированный род Acaryochloris:

CAG**GTA**TCAAATAC**TAC**AAAAAATATTTTTTAGTC*STT**TAAATTT**AAAGTTTAT Acaryochloris marina; AM1_5168; 16.35

Gloeobacterales:

TGT**GTA**TCAGAAA**CAC**GATTAGGCCGCGGTACAGC*GTG**TTTCCT**GATGTAAA Gloeobacter violaceus; gvip214; 20.47

Prochlorales:

AAT**GTA**TTTGTAA**TAC**AAACACAAGTGAAATTTAAA*ATA**AATACT**GGAGCTGT Prochlorococcus marinus CCMP1986; PMM0370; 17.06

narB, нитратредуктаза

Chroococcales:

TT**GTA**TGAAAAGT**TAC**AGTTTACTTTCAAGGATTCT***CA**GAGGAT**AAAGAA Cyanothece sp. PCC 7424; PCC7424_3462; 18.94
 CCT**GTA**TTACSA**TAC**AGCCACTTTTCTCATCCSTT**GAC**TCSTTT**TATTGAG Cyanothece sp. PCC 8801; PCC8801_2463; 18.71
 CCT**GTA**TTACSA**TAC**AGCCACTTTTCTCATCCSTT**GAC**TCSTTT**TATTGAG Cyanothece sp. PCC 8802; Cyan8802_3646; 18.71

CAAATAAACTTTAT TACAAGCATCCGCCTTAAGTTTA*ATATATAATAAATACT Cyanotheca sp. PCC 7822; Cyan7822DRAFT_4001; 20.71
 TGAGTAATAACTGT TACATAACATCCAACCAACCTTCGA*TCGCCTCTTTTAAGT Cyanotheca sp. PCC 7425; Cyan7425_4566; 18.47
 AATGTAATCTTTGGT TCTTTCTTATTTTAAAATAGTCC*ACCTCTTCTGTTTAT Cyanotheca sp. CCY0110; CY0110_23416; 22.47
 CAAGTGTTTGTCTT TACGAATGGTCAGTTTTCTGGCA**CTTTGTGCCCCCATTC Cyanotheca sp. ATCC 51142; GeneID:6168255; 22.12
 ACTGTAGGGTGTAT TACCATAGGGCAATACACCAGA***AAACATGATTTTGGT Crocosphaera watsonii; CwatDRAFT_3495; 22
 ATTTGTAATTAATAAC TACAATTTGGCCGAGAAAATCTGCCGACTATCTTTAAGTAT Microcystis aeruginosa; MAE_53960; 16.82
 TTTGTAATCATTAAG TACSTTTAAGAGGGCTCCAAGC**TGATCCAATAGCGGG Synechococcus sp. RCC307; SynRCC307_2489; 20.12

Неклассифицированный род Acaryochloris:

ACCGTAGCCSAATCT TACAATTTCTCGATTGAAATATT***AATGATTATAGAGTT Acaryochloris marina; AM1_2987; 18.24

narK/nrtP, транспортер нитрата

Chroococcales:

TCTGTAACAACAAC TACTTTTTTGCCATCAAGGGCT**TTTTGTGTATGCTTGCA Synechococcus sp. WH 7805; WH7805_09724; 18.71
 AGAGTATCAGCGGT TACGAATTTAGCGAAGAAAGAA**TGTGATTCTTTATCAC Synechococcus sp. PCC 7002; SYNPC7002_A1313; 18
 GATGTAACACAGGA TACAATAATAAATTTATTGGT***AGCTATTTGCACCAAA Synechococcus sp. CC9902; Syncc9902_2271p; 16.94;
 GATGTAATGCAAGA TACAATAATAAATTTAAGT***AGCCATTCAAACCAAA Synechococcus sp. BL107; BL107_06904; 17.53
 AAAGTTGCAATCGC TACCAAAATCGCTGCGGCACAAGA*TCACCTGATCCGATCA Synechococcus sp. CC9605; Syncc9605_2642; 19.18
 TCTGTAACAACGGC TACTCSTTGACCAAGAGGACCC**GCCGTGTATCTGGCG Synechococcus sp. WH 7803; SynWH7803_2480; 18.71
 GCGGTGACAACCGC TACCAAGCAAAAACCTGAACGCG**GATGCTGATCAATCGG Synechococcus sp. WH 8102; SYNW2462; 20.35

ntcA, транскрипционный фактор, глобальный регулятор азота

Chroococcales:

AAAGTAGCAGTTGC TACAAGCAGCAGCTAGGCTAGGCCGTACGGTAACG Synechococcus elongatus PCC 7942; Synpcc7942_0127; 16.59
 TGAGTAATAACCGC TACATGACACATCCAGACAGATCCGTAGCTTTCAG Synechococcus sp. BL107; BL107_07964; 18.59
 TGCATAATAACCGC TACAGGACACATCCAGGCAGATCCGTAACCTTCAA Synechococcus sp. CC9902; Syncc9902_2075; 18.71
 ACGGTGTTTATTGC TACAAGCACTGTCAAGCCGGCTCTTTACCTTCCCTT Synechococcus sp. RCC307; SynRCC307_2344; 20.12
 TTAGTCTCGGTGAC TACAGGGCTCGCCATGGGCGATCCTTAGCGTCCGT Synechococcus sp. WH 5701; WH5701_01395; 21.88
 TTCGTAATAACTAC TACACGGCTCGTCAGGGCACATTGTAATTTCCCA Synechococcus sp. WH 8102; SYNW0275; 17.88
 TACGTAATAACCGC TACATGGCGGCCACCGCCGGGTCCGTAATTTCCGCT Synechococcus sp. CC9605; Syncc9605_0269; 18.71
 TTCGTGTGGATTGC TACAAGGTGGAGCCAGGGCCATCCGTAGCGTCCAG Synechococcus sp. RS9917; RS9917_03753; 20.82
 ATCGTGTGCGTTGC TACAGGGTGAGAGTCAATCGCTCCTTAACCTTCCCTA Synechococcus sp. WH 7805; WH7805_07576; 22.24
 TTCGTGATGGTTGC TACACGGCACTACGGAATGATCCGTAACCTTCCAG Synechococcus sp. RS9916; RS9916_39216; 21.65
 ACCGTGTGCGTTGC TACAGGGTGGGAATCGATCGCTCCTTAATTTCCCTT Synechococcus sp. WH 7803; SynWH7803_0319; 22.24
 TTCGTGTTCTTGC TACACGGGCTGGGTGGGCTGATCCATAACATCTCG Synechococcus sp. CC9311; sync_0316; 22
 AAAGTGTGGCATGA TACAATAAATACCCCTGAATTGGTTTTACTGATC Thermosynechococcus elongatus; tll1650; 19.76
 TTTGATCCGATGA TACAATAAATACGATCGGGAGTTCGCTTAAGTGTTC Cyanotheca sp. PCC 7425; PCC7424_0372; 16.24
 TGGTAAAAGGTTA TACCAAGATTGGCTCCGGCTTTGTGTAACCTGCTGG Cyanotheca sp. PCC 7822; Cyan7822DRAFT_4473; 23.53

Nostocales:

TGAGTAGGAAAG TACAGAAAGGTTGACGGTGCTTTATTTCATTTTTCG Nostoc punctiforme; Npun_F5511; 19.41
 TGAGTAGGAAAG TACAGAAAGGTTAACGGTG***CTTTATTGATTTT Anabaena variabilis ATCC 29413; Ava_3283; 19.41
 TGAGTAGGAAAG TACAGAAAGGTTAACGGTG***CTTTATTGATTTT Nostoc sp. PCC 7120 (Anabaena sp.); alr4392; 19.41
 TGAGTAGGAATG TACAGAAAGGTTGACGGTG***CTTTATTGATTTT Nodularia spumigena; N9414_19492; 19.76
 TACGTAATTTAAA TACAATAAATCCAGCTT***TGTTTTTGATCAA Nostoc azollae (Anabaena azollae); AazoDRAFT_5432; 18.47
 AATTTATAGGTAGT TACAGTAGCCATTATTGCTTAAGATTAATAATTAT --"; AazoDRAFT_5432; 21.18
 TGAGTAGTAAAA GACAGAAAGATTGACGGTGCG*TTCTTGATTCTTC Cyndrospermopsis raciborskii; CRC_00858; 21.06

Неклассифицированный род Acaryochloris:

TATGTA TATTTTGA TACATAAAGAAACCCATCAGTCCGCTTAATTTATG Acaryochloris marina; AM1_3155; 17.76

Gloeobacterales:

TTAGTAGTCCCTAA TACAAAAAATTGCAGGGCTCGGCTTAATTGTTAA Gloeobacter violaceus; gvip454; 17.06

Prochlorales:

ATTGTTACAGTTGATACAAGATATTTTCATGGTGTCTTCTTAAGTTTTTT Prochlorococcus marinus MIT 9312; PMT9312_0248; 18.59
ACCGTCACCATTTGC TACATGGTGGTGGAGGTCCACTCCCTAACTTCATA Prochlorococcus marinus MIT 9303; P9303_24561; 21.18
ACCGTCACCATTTGC TACATGGTAGTGGAGGTCCACTCCCTAACTTCATA Prochlorococcus marinus MIT 9313; PMT1831; 21.18
ACTGTTACTGTTGATACAAGATATTTTCATCTGTCTCCTTAAATTTTTTA Prochlorococcus marinus MIT 9515; P9515_02791; 19.29
AAAGTCGCCATGGCTACATATCGTTTTTTCTTGACTTATTAATGTTCTT Prochlorococcus marinus NATL1A; NATL1_03241; 20.12
AAAGTAGTTTTTAAATACTTTTTTGAATTGCGTCGCAATTTCTTGAGCGTA --; NATL1_03241; 20.59
AAAGTCGCCATGGCTACATATCGTTTTTTCTTGACTTATTAATGTTCTT Prochlorococcus marinus NATL2A; PMN2A_1612; 20.12
AAAGTAGTTTTTAAATACTTTTTTGAATTGCGTCGCAATTTCTTGAGCGTA --; PMN2A_1612; 20.59
GAAGTATTTTATATTACAACATCAAGATTATTTTTTTGAATAAATATGAG Prochlorococcus marinus AS9601; A9601_02681; 18.35
ACTGTTACTGTTGATACAAGATATTTTAGAGTGTCTTCTTAAATTTTTTT --; A9601_02681; 19.29
GAAGTATTTTATATTACAACATCAAGATTACTTTTGGAAATATAGATGAG Prochlorococcus marinus MIT 9301; P9301_02691; 18.35
ATTGTTACTGTTGATACAAGAAATTTTAGAGTGCCTCCTTAAATTTTTTT --; P9301_02691; 19.29
TGTGTAATCTTTTTTACGTTAATTTTTTTCAGCAG**TATTATTAACAAC Prochlorococcus marinus MIT 9215; P9215_02691; 21.29
ATTGTTACTGTTGATACAAGATATTTTAAGGCGCCTCCTTAAATTTTTTT --; P9215_02691; 19.29
AAAGTCATTTTTTGAACAAGAGTTTTTAGCTTCACTTCTTATCGTCCTT Prochlorococcus marinus CCMP1375; Pro0277; 19.88
AAAGTCATTTATTTGACAAGTGGTTTTATAACCCGTCCTTAGCGTCGAT Prochlorococcus marinus MIT 9211; P9211_02711; 19.18
TTT TATTTTATGTTACAACATCAATTTAGTTGTTAAATAACTATTTG Prochlorococcus marinus CCMP1986; PMM0246; 20
AATGTTACTGTTGATACAAGTTATTTCTTGCTGTCTTCTTAAGTTTTTT --; PMM0246; 19.06

ntcB, транскрипционный активатор ассимиляции нитрата

Chroococcales:

GCTGTA TCASTATC TACATAATTGCTGGGGCAAATCCGTTAAGGTCACAGAA Cyanotheca sp. PCC 7425; Cyan7425_1599; 18.35
TGTGATCAAGATC TACGGAACATTAATCAAAAACC*TGATAGTGTCTTGAGA Cyanotheca sp. PCC 7424; PCC7424_0664; 18.47
GTTGATCAAGATC TACTGAAAGCGAAGTCAAAAACC*GTTACTGTGCATGAGA Cyanotheca sp. PCC 7822; Cyan7822DRAFT_4828; 18.71
GGTGAGAAACTTTTACTTGTTCGTAAGGCATAGT**TAGTATTAGATATATT --; Cyan7822DRAFT_4828; 19.1
TTTGTATCAAATTC TACTAAAATTAAGTGTGAATC*CCCTATTGTTGCAATAA Cyanotheca sp. PCC 8802; Cyan8802_2380; 16.24
TTTGTATCAAATTC TACTAAAATTAAGTGTGAATC*CCCTATTGTTGCAATAA Cyanotheca sp. PCC 8801; PCC8801_2329; 16.24
TTAGTATCAAATTC TACGAAATCGGTGACAAAAATA*AGATAAAGGTTAAGATA Cyanotheca sp. ATCC 51142; cce_0198; 17.18
TTAGTATCAAATTC TACGAAATCGATAGCAAAAATA*AGATAAAGGTTAAGATA Cyanotheca sp. CCY0110; CY0110_21295; 17.18
TTAGTATAAATTTTACGAAATAAGGAACAAAGCTCGTGATATGATAAAGTAT Crocosphaera watsonii; CwatDRAFT_3020; 17.88
ACGGTAGCAATTTTACCAAAAAGTCAGAATAAAAT*CGTTATCGTCATAAGG Microcystis aeruginosa; MAE_14790; 17.29
TTTGTAAACATCCGGTACAAAAAGCCCCAAAATCAATGCAGTAAACTCATTTGGG Synechococcus sp. PCC 7002; SYNPC7002_A1632; 18.82
ACTGATCAATCAACACACTTTACCATGGGAAAGTT*GCATAGATTGAAGGTA Thermosynechococcus elongatus; t111359; 20.12

Nostocales:

GCTGTAACAAAATC TACCAAATTGGGGAGCAAAATC*AGCTAACTTAATTGAA Nostoc sp. PCC 7120 (Anabaena sp.); all0602; 17.41
ACTGTAACATACTA TACTAAATTGCGGAGAATAAAC*CGTTAACTTAGTGAAA Nostoc punctiforme; Npun_F1534; 18.12
AATGTAACCAACTT TACTAAATAGCAGATAAAAAAC*CGTTAATTTAGTAAAG Nodularia spumigena; N9414_13370; 18.12
TATGTAGCAGAATC TACCAAATTGGGGAACAAAATC*CGCTAACTTAAATTAG Anabaena variabilis ATCC 29413; Ava_4535; 16.94
TTTGTAAACTGTTT TACAGACCAACTCATGCCAAC*TGACATTAGGGGGTGA Nostoc azollae (Anabaena azollae); AazoDRAFT_2534; 20.94
TTTGTATTATAACC TACTAAAATAATGGAATCAGAA*TTTAAAGTCAAAAAC Raphidiopsis brookii; CRD_01496; 17.88

TTTGTATCATAACCTACTAAAATGATGGAATCAGAA*TTTAAAGTCAAAAACCT Cylindrospermopsis raciborskii; CRC_01749; 17.76

Gloeobacterales:

TACGTAACCCAGATACATTCGTGGCCGTGCGGGCC*GGATATGGTCTG---- Gloeobacter violaceus; gvip213; 20.24

Неклассифицированный род Acaryochloris:

GTTGTATCGTTTTCTTACCGAATAGCCGGGCCAAATT*CGTACTGTGCTCTCA Acaryochloris marina; AM1_4387; 19.41

Oscillatoriales:

GTTGTAGCAATTTTTTACCAAATTATATCGAGAAATT*GGTAAAGATGAAACCC Arthrospira maxima; AmaxDRAFT_4787; 16.59

GTTGTAGCAATTTTTTACCAAATTATATCGAGAAATT*GGTAAAGATGAAACCC Arthrospira platensis; AplaP_010100013008; 16.59

GCGGTATCAAAGTGACTAAATTGTTTGAGGAAATC*GGTAAAGGTCAATTCAG Oscillatoria sp. PCC 6506; OSCI_3060008; 19.29

GTTGTAGCAATTTTTTACCAAATTATATCGAGAAATT*GGTAAAGATGAAACCC Arthrospira sp. PCC 8005; APCC8_010100003876; 16.59

GCTGTATCAACSTCTACTAAACTCAGAATGTAGATC*AAGTACCATAAATTTG Lyngbya sp. PCC 8106; L8106_02207; 17.65

TTTTATATTTTTTGGTAACTSTATACAGTGCTCCTGCGTAAGTTATGATAATATTT Trichodesmium erythraeum; Tery_4333; 25.53

Два сайта связывания NtcA-фактора у *Nostoc* sp. PCC 7120, *Nostoc punctiforme*, *Nodularia spumigena*, *Anabaena variabilis* ATCC 29413 перед геном *ntcB*.

Nostocales:

Nostoc sp. PCC 7120 (*Anabaena* sp. PCC 7120)

AAAGCTGTAACAAAATCTACCAAATTGGGGAGCAAATC*AGCTAACTTAATTGAATGCCGTAAATGTAATTAAGGCATACAA

Nostoc punctiforme

ATTACTGTAACSTAATACTACTAAATTGCGGAGAATAAAC*CGTAACTTAGT*GAAAGCTATAAATGTAATTCAGGCATATAAAA

Nodularia spumigena

AAAAATGTAACCAACTTTACTAAATAGCAGATAAAAAAC*CGTTAATTTAGT*AAAGGCCATAAATGTAATTCAGGCATATAAAA

Anabaena variabilis ATCC 29413

AAATATGTAGCAGAATCTACCAAATTGGGGAACAAAATC*CGCTAACTTAAATTAGTGCGATAAATGTAATTCAGGCATACAA

nirB, связывающий белок нитрит редуктаза

Chroococcales:

TTAGTAGCAATTGCTACAAGCSTTGACTCTGAAGCC*CGCTTAGGTGGAGCCA Synechococcus elongatus; syc0309_c; 16.24

glnA, глутаминсинтетаза первого типа

Chroococcales:

ATGGTAGCGAAAAATACATTTTTCTAACTACTTGA*CTCTTTTACGATGGATAGT C Synechocystis sp. PCC 6803; slr1756; 19.29

TTTGTATCGAAAAATACAAAACCGCCAAAGTGA*CTGTTTAGGATGGATTTTT Microcystis aeruginosa; MAE_19270; 16.24

ACAGTATCAAATTAACAAAATGAAATAAAGCCT*ATCTTTACTATCAATACTT Cyanothecce sp. CCY0110; CY0110_09196; 15.65

ACAGTATCCAATTAACAAAATGAAGTAAAGCCT*ATCTTTACTATCAATCATT Cyanothecce sp. ATCC 51142; GeneID:6171510; 16.71

TCCGATATCATGGTATACAAAATCTCAGCTATCCT*ATCCCTAGGATCAGTGATT Cyanothecce sp. PCC 8801; PCC8801_0808; 18.59

TCCGATATCATGGTATACAAAATCTCAGCTATCCT*ATCCCTAGGATCAGTGATT Cyanothecce sp. PCC 8802; Cyan8802_0837; 18.59

ATTGTAACSTCATGATACAAAAGCTGTTTCGTCCAAGTCCCTAGGATATTACATC Cyanothecce sp. PCC 7425; Cyan7425_1839; 16.35

TTCGATATCAACAGATACTTTTTTTCAATGTTTACAGATTAAGAGTGCACAATA Cyanothecce sp. PCC 7424; PCC7424_2203; 19.53

TCTGTATTGAGTAGACAAAAGTTAAAGAAACCT*ATCCCTACGATTTGATGATT --"; PCC7424_2203; 18.94

TCTGTATTGAGTAGACAAAAAATAAAGAAACCT*ATCCCTACGATTTGATGATT Cyanothecce sp. PCC 7822; Cyan7822DRAFT_1561; 18.94

ACAGTAAAGTAAAAATACATTTAGCCGACGATATT*TAAGGTATGACSTTTTATC --"; Cyan7822DRAFT_1561; 20.59

ACAGTAGCAAATTAACAAAATATGGTAAAGTGA*GTCTTTACCATCAATGACT Crocosphaera watsonii; CwatDRAFT_5271; 15.41

AGTGTCCCTGCTGATACAAAAGGGCCCTGCGGG*GTGTTTACGTTTCTCATGT Synechococcus sp. RS9916; RS9916_29064; 18.35

AAAGTGC GCGGTTGATACAAAAGGGTGT CAGATCG*ATGCC**TACGGT**TAGAAAAG Synecococcus sp. CC9311; sync_1569; 20.24
AATGTGC GCGGTTGATACAAAACAGGGCATAACGG*CTCCT**TACGGT**CGTTCCTTA Synecococcus sp. WH 8102; SYNW1073; 19.65
GATGTGACCCAGACTACAACGAAGTCCATAACT*CTTTC**TAGGAT**CAAGCGAA Synecococcus sp. PCC 7002; SYNPC7002_A1630; 21.06
AATGTACCCATTGATACAAAACCATCCCACGGCG*ATCCCT**TACGGT**CATGCGGT Synecococcus sp. WH 7803; SynWH7803_1347; 16.12
AATGTACTGACGGATACAAAACGGGTGCACATCG*ATCCCT**TACGGT**CATGCGGT Synecococcus sp. WH 7805; WH7805_02267; 16.82
AACGTACCCCTTGTACAAAATGGTGTCTTGTGG*CTGTT**TACGGT**CACATCAC Synecococcus sp. CC9605; Syncc9605_1205; 18.12
TTTGTATCAGCTGTACACAGAGGGTCCAAAGTG*CTCCG**TACGGT**CAGCTTTC Synecococcus sp. RCC307; SynRCC307_1296; 16
AGGGTTACAACGGGCACCAAAGGCCAGCGGGACC*TCTCC**AAGCAT**CGATCCCCG Synecococcus sp. WH 5701; WH5701_13575; 22.47
GAGGTAAGACTCAA**TACT**GTTCGATCGCCGATCTGTGCAAA**TAGCGG**CCCAGCTG Synecococcus sp. CC9902; Syncc9902_1265; 22.35
AATGTCCCTCTTGTACAAAATGGAGCCATCGAG*ATCTT**TACGGT**CTCTCTAA --; Syncc9902_1265; 18.71
AATGTCCCCTTGTACAAAGATGGAGCCATCGAG*ATCTT**TACGGT**CTCTCTAA Synecococcus sp. BL107; BL107_13740; 20.12
AATGTACGCATTGATACAAAAGAGGGTTCGATCC*CTCC**TACGGT**CCGCCACG Synecococcus sp. RS9917; RS9917_11790; 17.06
TATGTATCAGCTGTACAAAAGTCCGTTTCGGG*CTAC**TAGGAT**GAAAGCGG Synecococcus elongatus; Synpcc7942_2156; 14.71
TTTGTAGTCCCTTGTACAAAAAACTCTTGGGGTCACTTCT**TACCAT**TAGATTGTC Thermosynechococcus elongatus; GeneID:1010718; 16.71

Prochlorales:

AAAGTACTTATTGATACAAAATAAGTTTGTCTACG*GTAAT**TAATTT**TATTTATA Prochlorococcus marinus CCMP1375; Pro1038; 16.47
AAAGTACTTGTGATACAAAACAGATCCAAACG*CTAAT**TAATTT**CATATTTA Prochlorococcus marinus MIT 9211; P9211_10271; 17.06
CAGGTACCTGCTGCTACAAAAGAAGGCCATGTGGCTGAT**TATGGT**CGCTCTCT Prochlorococcus marinus MIT 9303; P9303_16421; 17.88
AAGGTACCTGTTGCTACAAAAGGGGGCCATGCGGCTGAT**TACGGT**CGCTCTCT Prochlorococcus marinus MIT 9313; PMT0601; 17.41
AAAGTAAACCGTTGATACATTATAAGAATCATCAA*GTTAT**TAATTT**CATAGAAT Prochlorococcus marinus MIT 9215; P9215_09701; 19.18
AAAGTAAACCGTTGATACATAACAAGAATCATCAA*GTTAT**TAATTT**CATATAAG Prochlorococcus marinus AS9601; A9601_09401; 20
AAAGTAAACCGTTGATACATAACAAGAATCATCAA*GTTAT**TAATTT**CATATAAG Prochlorococcus marinus MIT 9312; PMT9312_0880; 20
AAAGTAAATCGTTGATACATAATTAGATTCATCAA*CTTAC**TAATTT**TATTTCAA Prochlorococcus marinus MIT 9515; P9515_10031; 20.12
AAAGTAAACCGTTGATACATAACAAGAATCATCAA*GTTAT**TAATTT**CATATAAG Prochlorococcus marinus MIT 9301; P9301_09391; 20
AAAGTAAACCGTCTTAAACAAAAGAGATGCGATCG*CTTAT**TACGGT**CATAATTA Prochlorococcus marinus NATL2A; PMN2A_0141; 20.35
AAAGTAAACCGTCTTAAACAAAAGAGATGCGATCG*CTCAT**TACGGT**CAAAATTA Prochlorococcus marinus NATL1A; NATL1_07731; 20.35
AAAGTAAACCTTTGATACATAATTAGATTCGTCAA*GTTAT**TAATTT**TATTGGAG Prochlorococcus marinus CCMP1986; PMM0920; 20.12

Nostocales:

TCTGTAAACAAAGACTACAAAACCATCTAATGTTTGTAGAACT**TAGGAT**ATTTTCAGG Anabaena variabilis ATCC 29413; Ava_0147; 15.88
CCTTTAACGAAAACCAAAAACCTTCTCAAGTCAACTATTT**TACGAT**ATTTCCAGG Nostoc azollae (Anabaena azollae); AazoDRAFT_1773; 21.18
TCTGTAAACAAAGACTACAAAACCTGTCTAATGTTTGTAGAACT**TACGAT**ATTTTCAGG Nostoc sp. PCC 7120 (Anabaena sp.); alr2328; 15.88
TCTGTAAACATAAGCTACAAAATCCGCTAATGTCTACTATTT**TAAGAT**ATTTCTGG Nostoc punctiforme; Npun_R5387; 16
GCTGTAGCAAAAAGTACAAAATCTTCTAATGTCCAGGATTT**TATGAT**ATTTTCAGG Nodularia spumigena; N9414_03588; 16
ATCGTAAACAAACAAACAACTGGTGGGGA*TCTAGTCTT**TAGGAT**ATTTTCAGA Raphidiopsis brookii; CRD_02136; 17.88
ATCGTAAACAAACAAACAACTGGTGGGGA*TCTAGTCTT**TAGGAT**ATTTTCAGA Cylindrospermopsis raciborskii; CRC_02160; 17.88

Oscillatoriales:

AGTGTAAATGCTTGTACAAAACCTTAATCAATCTGAGTCACT**TATGAT**CAACCAGA Lyngbya sp. PCC 8106; L8106_18726; 17.06
AGTGTAAAGCACTCAATACAAAACCTTAATCAATTTGAAGTCACT**TATGAT**CAACCAGA Arthrospira maxima; AmaxDRAFT_3347; 16.82
TCTGTATCCCCTGCTACCAAAGCATAAGTTGCATAGCGCAG**GATAAT**AATCCATG Arthrospira platensis; AplaP_010100011066; 17.65
TCTGTATCGCCTGCTACCAAAGCATAAGTTGCATAGCGCAG**GATAAT**AATCCATG Arthrospira sp. PCC 8005; APCC8_010100012680; 17.53
AGTGTAAAGCACTCAATACAAAACCTTAATCAATTTGAAGTCACT**TATGAT**CAACCAGA --; APCC8_010100012680; 16.82
TTTGTATCAAGAAAACAAAACCTTGTGACAGTCAA*TGCC**TATGAT**CGCTCAA Oscillatoria sp. PCC 6506; OSCI_3060031; 16
AGCGTAAACACCCGATACAAACATTTCAATTTAAATTTCTTAT**TATTAT**TTGAGTGT Trichodesmium erythraeum; Tery_3834; 17.76

Неклассифицированный род Acaryochloris:

ACTGTATTTTCTGATACAAAATCTCTGTGATCCAGTCTCT**TAGGAT**ATTAGGCT Acaryochloris marina; AM1_1497; 16

Gloeobacterales:

AGCGTATCTCAGAC TACAAAACACCTCCCCGACC*CTCCTTAGTATGGGTTGGC Gloeobacter violaceus; gvip146; 18.59

nirA, ферредоксин-зависимая нитритредуктаза

У штаммов *Prochlorococcus marinus* MIT 9215, MIT 9515, MIT 9301, MIT 9312, MIT 9211, CCMP1986, CCMP1375, AS9601, MED4 нет гена *nirA*. У штаммов *Prochlorococcus marinus* MIT 9313, MIT 9303 возможно вырожденные тандемные повторы.

Chroococcales:

AGTGTAAATTTACGT TACAAATTTTAAACGAAACGGGAACCC TATATTGATCTCTA Synechocystis sp. PCC 6803; slr0898; 17.29
TCTGTTACAGACAA TACAAAATTACCCAAGTTAAAACGAAT TAAATAACAGATA Microcystis aeruginosa; MAE_18410; 18.47
TTGGTAACAAAGTACACAAAGTAAGCCGTGTTTTCT*CCGTAAGTTACGAAGTA Cyanothece sp. PCC 7822; Cyan7822DRAFT_1390; 19.29
TTGGTAACAAAAGACACAAAGTAGTCGGGAAATTTCTCCGGTAAGTTACACAAGT Cyanothece sp. PCC 7424; PCC7424_1683; 18.35
TTTGTAACTTAATA TACCAATTACCCTCTAGGACT*CCCCTAAGTTAGCCAGAT Cyanothece sp. PCC 7425; Cyan7425_4573; 18.35
TTTGTACATTAGC TACAAAATATCTC*AAATGGTAGAGGTTAAATAGGTACAA Cyanothece sp. ATCC 51142; cce_1223; 18.24
TTTGTACAACTGATACAAAATTATCCAAAACAAA*CCAT TAAATGAGAACAA Cyanothece sp. PCC 8802; Cyan8802_3641; 16.59
TTTGTACAAATTAATACAAAATTATCCAAAACAAA*CCAT TAAATGAGAACAA Cyanothece sp. PCC 8801; PCC8801_2468; 17.06
TTTGTACATTAGC TACAAAATTTCTCGGATTGTAG*AGT TAAATAGGTACAA Cyanothece sp. CCY0110; CY0110_23451; 18.24
TTTGTACATTAGC TACATAAATTTCTCCTATTGTGAAGTT TAAAT TAAATACAA Crocosphaera watsonii; CwatDRAFT_3683; 19.29
AAAGTAGCAAAATTTACAAATGTTTCATGATTCATCT*GGCTAAATTTGGATGTTT Thermosynechococcus elongatus; tlr1349; 15.65
CCCAGTAAACAC TACAAAATCTCCCTGACTGAAT*GTTTACCTTTGGTCAAAT Synechococcus sp. PCC 7002; SYNPC7002_A1827; 18.24
TTCGTAGCAACGGT TACTTCCCTCCAGCGGGCTCAAT*CCAT TAAAGTAGTCAAAA Synechococcus sp. RCC 307; SynRCC307_2482; 19.41
GACGTAGCCATTGT TACAAATTTGCGGGACCGAATCCTCTGAAAAAGGGCAACT Synechococcus sp. CC9605; Syncc9605_2656; 16.82
AACGTGGCCACTCG TACAGCTCAGCAGCCTGTGACTGTAT TGAAGCCCGTCAG Synechococcus sp. WH 5701; WH5701_13695; 20.94
ACGGTCTAATTCGC TACCGACTGAAAGGGATACGCA*CGG TTAATTTGTGTGAGT Synechococcus sp. CC9902; Syncc9902_2284; 22.24
ACGGTCTAATTCGC TACCGACAAAAGGGCATTGAC*GAGG TTAATTTGTGTGAGT Synechococcus sp. BL107; BL107_06834; 22.24
TTGGTCCAACCGAT TACCGAAAGATCACACCACAGATCGCTATAAACCTTTTCT Synechococcus sp. CC9311; sync_2898; 20.94
TTGGTCCAACCGC TACCGATGGATCCCCAGGCCAACCGCTAGAAGACTTCTGC Synechococcus sp. RS9917; RS9917_06020; 20.94
ACTGTTCAAATTCGC TACCGACAGCAACGGTACGAAC*GAGTTCACTTACATCTAA Synechococcus sp. WH 7805; WH7805_09654; 19.53
AATGTTCGAACTGC TACCGACAGCAATACAACGAAA*CGGAAAACCTGTTGTTGG Synechococcus sp. WH 7803; SynWH7803_2492; 19.53
GTTGTAGTTTCTGT TACCAATTGCGAATCGAGAACT*GCCTAATCTGCCGAGTA Synechococcus elongatus; syc0310_d; 17.29

Prochlorales:

GATGTATTGAATGATACCAAAATAAATAAAAAATTTGGTAAAACCTGATACATC Prochlorococcus marinus NATL1A; NATL1_21711; 17.06
TTGGTAAAAACTGATACATCTAAAGTTTAGATTTTAAAGGTTAATTATAAATGT --"; NATL1_21711; 18.35
GATGTATTGAATGATACCAAAATAAATAAAAAATTTGGTAAAACCTGATACATC Prochlorococcus marinus NETL2A; PMN2A_1298; 17.06
TTGGTAAAAACTGATACATCTAAAGTTTAGATTTTAAAGGTTAATTATAAATGT --"; PMN2A_1298; 18.35
TTTGTCAATCTGATACCACTAATACCCTCTTCGTTGAGGCTTAATGGCTCCAT Prochlorococcus marinus MIT 9303; P9303_29861; 20.47
TTTGTCAATCTGATACCGCCAATGCCCTCTTCGCTGAGGCTTAATGGCTCCAT --"; P9303_29861; 21.18
TTTGTCAATCTGATACCACTAATACCCTCTTCGCTGAGGCTTAATGGCCCCAT --"; P9303_29861; 20.47
TTTGTCAATCTGATACCGCCAATACCCTCTTCCATCAGGCTTAATGACTCCAT Prochlorococcus marinus MIT 9313; PMT2239; 21.18
TTTGTCAATCTGATACCGCCAATACCCTCTTCCATCAGGCTTAATGACTCCAT --"; PMT2239; 21.18
TTTGTCAATCTGATACCGCCAATACCCTCTTCCATCAGGCTTAATGACTCCAT --"; PMT2239; 21.18

Nostocales:

ATCGTAACAATTTATACGATTTTAAACAGAAATCTCG*TCTTAAGTTATGAGTAT Nostoc punctiforme; Npun_R1528; 18.94
TTTGTAGCTACTTACTACTTTTTACCTGAGATCCCG*ACATAACCTTAGAAGTA Nostoc sp. PCC 7120 (Anabaena sp.); alr0607; 17.76
AAGGTAGCAATGATACTATTTTAACTATAAACTCA*CCTTAACCTGATAAGTT Nodularia spumigena; N9414_05289; 19.29
TAAGTAATTATGACTACGCCACTCTACGAGAGCAGG*AATCAAACCTGGATTTCCT Nostoc azollae (Anabaena azollae); AazoDRAFT_0101; 20.47

GGT TCT TCCAGAAT TACTGAATTGCTATCACTAGACCTCG TAGAAC CAGCAAGA Anabaena variabilis ATCC 29413; Ava_4539; 25.41
TCT GTA AACTGAGTATACGAATCCTTCCCGAAATTTG*CCCTAGGTTATCAATAT Cylindrospermopsis raciborskii; CRC_00047; 18.82
TCC GTA AACTGAGTATACGAATCCTTCCCGAAATTTG*CCCTAAATTATCAATAT Raphidiopsis brookii; CRD_02595; 19.88

Oscillatoriales:

TTT GTA AACTTTTGC TACGATTAACCTC*AAATTTTCCTTCTACTGTAGGTAGTA Lyngbya sp. PCC 8106; L8106_10091; 18.82
AAT GTT AAATCTAA TACAGACTGAAAG*AACTAATTTGTTAACGTTTGGCCAA -"-; L8106_10091; 18.59
TTT GTT ATATAAGC TACGAATCTTTATTTCCSTTTC*CTTTAAATTGATAAATC Trichodesmium erythraeum; Tery_1068; 19.41
CCT CGT TAATTAAT TACSTAATAATACCCAGACATT*AGATAAGTTTAAACTTT Arthrospira maxima; AmaxDRAFT_3713; 21.82
TAT GTA TCTTCAAC TACAAATTATCACTGATTCTGA*ATTTAATCTACAAATCA Arthrospira platensis; AplaP_010100015448; 16.35
TTG GTA TTCCAAA TACSTAAAACCTGGCAAG*****TATGCGTTTTTTTAC -"-; AplaP_010100015448; 19.65
TCT GTA ACATTAGC TACGAACAACCTCTCGATCCACG*CCCTACAGTGTTCCTTA Oscillatoria sp. PCC 6506; OSCI_2880001; 17.53
AAG GTA GTAATTA TACTCTTTGCTGACTAAATATTTCTCTGTAATCTTGACCA -"-; OSCI_2880001; 18.94
TGAG TAATTAATA TACGGTTTTAGTTAAG*****TATAACCACTAAGG -"-; OSCI_2880001; 20.47
TAT GTA TCTTAAAC TACAAATTATCACTGATTCTGA*ATTTAATCTACAAATCA Arthrospira sp. PCC 8005; APCC8_010100020361; 16.47

Неклассифицированный род Acaryochloris:

TTT GTA ACGACTGA TACGAACGATCCCAATGGGAGT*CGCTAAGTTAGTATCCC Acaryochloris marina; AM1_2984; 16.82

Gloeobacteriales:

AAT GTA TCTGGGGT TACGTAAAGTTAAGTTCSTTCAAAGCATTCGTGGGACGCT Gloeobacter violaceus; gvip212; 19.65

glnN, глутаминсинтетаза третьего типа

Chroococcales: -35 box

TTT GTA TCTATATTTGTCTATTTTAAAAAATCATCT*TGCGTATGATTTGGGGG Synechocystis sp. PCC 6803; slr0288; 22.82
TCT GTA TAGATCTTATCTGTTTTTAGGATTAGTCT*TGCGTAGTATGGTGC GG Synechococcus sp. PCC 7002; SYNPC7002_A0246; 24.94
TCT GTA GCAACGGCTTTCATCTCAGGGGTTGCCTGC*CGACTTGGATGTCTTCC Synechococcus sp. WH 5701; WH5701_08944; 19.29
TCC GTA AACAACACCACATTCAGCTGTCACCGCGCTCCTGTTCTGTGTGCTCA Synechococcus sp. RS9917; RS9917_10876; 21.18
TCT GTA TCTTTTCTAGCGATCGAGCTGGTCACCAT*TGAGTACGATCAATTGA Synechococcus elongatus; syc1338_c; 23.29
CTC GTA CATGGTGTGGCTTACACCGATGAGGAGA*ACGTGAGCCTCAATGTG Synechococcus sp. WH 7805; WH7805_04111; 27.06
CTC GTA CATGGTGTGGCTTACACCGATGCGGAGA*GTGTGAGCCTCAACGTG Synechococcus sp. WH 7803; SynWH7803_1458; 28.94
TTG GTGAGCAAAA TACGCACCTGAGGCCATAAACCATGCCAATCCATCAC Synechococcus sp. CC9311; sync_1253; 22.71
TTT GTA ATGTTTGA TACAAATCTCTCGATCATCTG*TTCTTAAGATGAAGGCT Microcystis aeruginosa; MAE_09050; 16.71
TGAG TAAGCTCGTGA TACAAAAAAGCGAATTTCTC*CCCCTACTGTATGAAAT Cyanotheca sp. PCC 7425; Cyan7425_4041; 17.41

Gloeobacteriales:

CGAG TAACGGCCCATCCSCTCGATCTGGGGCCACCGCGCCGGCAATCCCTATC Gloeobacter violaceus; gll2499; 25.06

Неклассифицированный род Acaryochloris:

TCC GTA TCCGTTCTATCCATTTAAGGAATAAAT*TTGCGTACCATCAGGAAG Acaryochloris marina; AM1_0336; 24.47

glnB/glnK, азот регулирующий белок из семейства P-II

Cyanotheca sp. PCC 7424 и Crocosphaera watsonii близкие родственники. Возможно у бактерий произошли замены (вставки и делеции) в регуляторной области перед геном glnB, что привело к потере консервативных сайтов связывания:

Cyanotheca sp. PCC 7424 ATT*GTA STAACSTTTTAC**AAAAATTTTTGGGTTAATGG*TGATAGAAA GTGACAG PCC7424_0456; 15.41
Crocosphaera watsonii ATCAATACTCATCAATAC TTAATAAATCTTAGGGTTTATGG*GCAACTGGGTGGGAA CwatDRAFT_5924; 22.47

Замены в регуляторной области перед геном glnB у Nostoc azollae (Anabaena azollae) привели к потере консервативных сайтов связывания:

Nostoc azollae AAC*AAAAAAGAGGTTGATATAAAATACATAACACTCATGTAAATAAGTAAAGCTA AazodRAFT_6171; 28.35

Chroococcales:

ACG**GTA**CTGATTTT**TAC**AAAAAAC*TTTTGGAGAACATGT**TAAAAGTGTCTGG** Synechocystis sp. PCC 6803; ssl0707; 17.76
AAT**GTA**GCTATTGC**TAC**ACGCTATACTCTTTTGCCAA*TGCT**TAAATAAAGATTA** Thermosynechococcus elongatus; tll0591; 17.06
TC**GTA**TTCTCTG**TAC**CTAGAGATGATTAAAATCATTGGCT**TGTGGAGTCTAAA** Microcystis aeruginosa; MAE_59130; 22.24
ATT**GTA**CTAACTTT**TAC**AAAAATTTTTGGGTTAATGG*TGAT**TAGAAAAGTGACAG** Cyanothece sp. PCC 7424; PCC7424_0456; 15.41
ACAAA**ACTAAATCTTACCAATGCTTAAAAATCTTAGG*GTTTATAGTTAAGTCT** Cyanothece sp. ATCC 51142; cce_1775; 21.53
CG**GTA**ATCAGCTT**TAT**GTTAACCCTGGTATTGGTAT*GAG**TATCGCACCAATC** Cyanothece sp. CCY0110; CY0110_30376; 25.53
CCC**AAACTGGGTTTAC**AAAAACTTTTCGGATCTTAGA*TGAT**TCTAAGCTTAAGA** Cyanothece sp. PCC 8801; PCC8801_1848; 23.65
CCC**AAACTGGGTTTAC**AAAAACTTTTCGGATCTTAGA*TGAT**TCTAAGCTTAAGA** Cyanothece sp. PCC 8802; Cyan8802_1874; 23.65
CA**AGGCAAAACCATTAC**GCTAAAATAATTTTCAGAAAACAT**TATGATTA**AATTC Cyanothece sp. PCC 7822; Cyan7822DRAFT_4871; 24.94
GCT**GTA**GCAGTA**ACTCA**ACTGTGGTCTAGTCAGCGG*GTT**TACCAAGAGTCG** Synechococcus elongatus; syc1192_d; 17.29
ACC**GTA**ACGACCGT**TAC**GCCTTCCCCAGGACTCGCT**CGAT**TGGAATGAGCCGG** Synechococcus sp. RCC307; SynRCC307_1895; 20.71
TT**GTA**TCAACACG**TACA**ACTCATAGACCGGAATTCAGGCC**TAATAGGGGTGTG** Synechococcus sp. CC9311; sync_2331; 18.24
CCC**GTA**ACAACAGC**TAC**GCCGAAGCCCTGCGCACTCAGGCC**TAATGGCCGCAGT** Synechococcus sp. WH 5701; WH5701_15331; 20.24
TC**GTA**TCAAAACG**AACA**ACGATTGGACCAAAGACCAGTCG**TAATGGGTGTAGA** Synechococcus sp. WH 7805; WH7805_12458; 20.35
TC**GTA**AGCGAATCG**AACA**ACGACTGGGCTGGTACCAGCGG**TAATGGGGACACA** Synechococcus sp. WH 7803; SynWH7803_2035; 20.47
TCT**GTA**ACAGCAAT**CAC**ACCCCAAGGTGTGTTCCGAGCCAT**TCTGGATT**CAGTT Synechococcus sp. BL107; BL107_16790; 19.65
TCT**GTA**ACAGCGAT**GAC**ACCCCTGGGTGTGTTCCG***AGC**CATCCTGGATTCA** Synechococcus sp. CC9902; Syncc9902_0470; 20.12
TCT**GTA**ACAGCCG**CAC**GCACGGCTCCGAGAACCG***GGC**CATCCTTGATACC** Synechococcus sp. CC9605; Syncc9605_2206; 20.47

Nostocales:

AGAG**CAGATACGGTTAAA**AAAAAGTTGCAATTCTCATAAGTGTCTTT**TAAAATAAG** Anabaena variabilis ATCC 29413; Ava_0137; 21.29
AGAG**CAGATACGGTTAAA**AAAAAGTTGCAATTCTCATAAGTGTCTTT**TAAAATAAG** Nostoc sp. PCC 7120 (Anabaena sp.); all2319; 21.29
TCAT**TACAGAGCAGATAC**GGTTAAAAAAGTTG*****CAATTCT**CATAAGTGT** -"-; all2319; 26.47
AAAG**AATCTACACTTTAAA**AAAAAGTTGTAATTA*TTACAT**TATCTTTTAGGAAAAG** Nostoc punctiforme; Npun_F4466; 22.71
CT**GTA**GTTACAGCT**TCAG**ACAAAGGATCTGG*****TTAGAT**TATAAACGA** -"-; Npun_F4466; 20.24
TT**GTA**GGGCGCAT**TAC**AGTTTAAAAAAGTGG*****CAATTCT**TACATACTT** Nodularia spumigena; N9414_06139; 29.53
AAG**GTGATATAAAATAC**ATAAGATATATTTCT***CATCAGTGT**TAAATGAAT** Raphidiopsis brookii; CRD_00313; 20.12
AAG**GTGACATAAAATAC**ATAAGATGGATTTCT***CACCAGTGT**TAAATGAAT** Cylandrospermopsis raciborskii; CRC_02206; 20

Oscillatoriales:

AGT**GTA**TCATATGT**TAC**TAAATTTTTTTGATGACGCGG*TGAT**TATCAAGCTTATG** Lyngbya sp. PCC 8106; L8106_23605; 16.47
ATT**GTA**TCACGATT**TAC**CAATTGCGGGGCTTTGATAG*TGAT**TATCAATGGTTT** Arthrospira maxima; AmaxDRAFT_1137; 18.35
ATT**GTA**TCACGATT**TAC**CAATTGCGGGGCTTTGATAG*TGAT**TATCAATGGTTT** Arthrospira platensis; AplaP_010100021771; 18.35
ATT**GTA**TCACGATT**TAC**CAATTGCGGGGCTTTGATAG*TGAT**TATCAATGGTTT** Arthrospira sp. PCC 8005; APCC8_010100026158; 18.35
GAT**GTA**GCAAAACA**TAC**ACCTACTTCACCAGT*AGCACGGG**CATATCCATCAGC** Trichodesmium erythraeum; Tery_2842; 17.76

Prochlorales:

TTT**GTA**TCATTGGG**TAC**AAAACTTATCTTCGCTATCCCCCT**TAATGGATATAAC** Prochlorococcus marinus NATL2A; PMN2A_0993; 17.06
TTT**GTA**TCATTGGG**TAC**AAAACTTATCTTCGCTATCCCCCT**TAATGGATATAAC** Prochlorococcus marinus NATL1A; NATL1_18621; 17.06
GCT**GTA**CTCATT**TAG**TAGAACTTATTTACTAAACCTATAT**TAAAAAGATCAA** Prochlorococcus marinus MIT 9312; PMT9312_1556; 21.53
TTAG**TAGA**ACTTATT**TACT**TAAACCTATA***TAAACTATAT**TAAAAAGACCAA** Prochlorococcus marinus MIT 9215; P9215_17311; 23.06
GCAT**TATCA**AATAG**TAC**GGTTCTTATTTCTGAAGAAAAT**CCACATTGTTAATT** -"-; P9215_17311; 21.41
TAT**GTA**TCATCAAT**TACA**AACATTATTCTCGCTAGAGGCG**TAAATAGGTGCAAC** Prochlorococcus marinus CCMP1375; Pro1616; 15.53
TTT**GTA**TCAACAGT**TAC**AGTTACAAGCTAATTACAAAGGCT**TATATATATCTAG** Prochlorococcus marinus MIT 9515; P9515_16421; 19.06
TTT**TAT**TTCAAAA**TAC**CTTTACTAAAACCTATATAAAAAG**TAAATAATTCGCA** Prochlorococcus marinus CCMP1986; PMM1463; 21.88
TTT**GTA**TCAATGAT**AACA**ATCTTAGTATCGTTAAAAGGGTT**TATATGATTTTATG** -"-; PMM1463; 16.82

Gloeobacterales:

ATG**GTA**GTCTCACC**AAC**ACCACCGGCTGGC**ATCGGG****TGCT**TAGTTAGTGGTCT** Gloeobacter violaceus; gvip021; 22.35

Неклассифицированный род Acaryochloris:

TAAG**TAGC**SCTGGCC**CAC**AAA**CTTCCAATTTGGAA**AAT**GATGAT**ATTTCCA Acaryochloris marina; AM1_3158; 20.94

icd, изоцитратдегидрогеназа

Chroococcales:

TTC**GTA**ACAGCCAAT**GC**AATCAGAGCCTCCAGAAAG*GAT**TATGAT**CTGCTCC**G** Synechocystis sp. PCC 6803; slr1289; 20.59
GAC**GTA**ACTGG*ACT**CC**AACCAGTGACCCCATCGAT*GTC**AACGAT**GTACTCTA Cyanothece sp. CCY0110; CY0110_04106; 27.06
TCT**GTA**GCGGTATT**TAC**CGAACAAAACTGCTAT**GA**TAAATAG**CGACTGT Cyanothece sp. PCC 7424; PCC7424_0313; 18.94
GGT**GTT**TTAGGGAT**TAC**AAAAAGTTGACSTTCATGC***CAGTATATA**AAGCAGTC Cyanothece sp. PCC 8801; PCC8801_3969; 19.65
ACT**CT**AAAATGTT**TAC**GATAACATTAATGGTACTAATAT**TATTAT**ACATTTAT Cyanothece sp. PCC 8802; Cyan8802_4014; 22.24
CAAG**TAA**ATGCCGAT**TAC**TTTTAATTTCTCTTGGCAA**CGAT**AGT**TTAGCTACAC Crocosphaera watsonii; CwatDRAFT_3583; 22.24
AAT**GTA**TATGGTTT**TAC**CTGTGGCTGTAACATTTA**TTAT**TATGTT**TACTATGG --"; CwatDRAFT_3583; 20.71

Oscillatoriales:

CTAG**TAGT**CTATCT**TAC**TAAAATTCGCCATAATTACAAACT**TAACT**AGAGAAAT Trichodesmium erythraeum; Tery_0071; 19.41
ACCG**AAT**CTTTGTT**TAC**AAAATTCACATAATTTTA**AGAT**TAA**TTTTCAATAAA Lyngbya sp. PCC 8106; L8106_03474; 20.24
GAT**CT**ACCTCCACT**TAC**AAATACTACACCGATCG**CC**TAA**TTCTGAAGTGA Arthrospira maxima; AmaxDRAFT_4514; 20
ACGG**TC**GAAAGCGG**TAC**TACATTTCCGGCTCAATT**GGG**TAGA**ATGGGGTTTA Oscillatoria sp. PCC 6506; OSCI_4110009; 22.47

Nostocales:

TCAG**TAAAA**ATTCC**TG**CAACACCTCTAATCCCT***CAT**TACCCA**AGTCAGCT Nostoc azollae (Anabaena azollae); AazoDRAFT_0802; 19.88
GAC**ATAG**CAAAATA**TAC**AAGCCTGCCACATAAGGT**TTTT**TTGA**ATAGCAGCGT Nostoc punctiforme; Npun_R5474; 19.76
ACT**ATT**TTTTGATCG**TAC**AAAATTCGCGCGGTTTCACTGAA**AATCCT**TATATCAGA Anabaena variabilis ATCC 29413; Ava_4831; 21.18
GCC**GAA**GGCAATCG**TAC**AAAATTCGAACTTCACTGA**TTCAAT**AGCTTAAC Nodularia spumigena; N9414_14022; 21.06
ACT**ATT**TTTTGATCG**TAC**AAAATTCGCGCGGTTTCACTGAA**AATCCT**TATACCGAA Nostoc sp. PCC 7120 (Anabaena sp.); alr1827; 21.18

Prochlorales:

TCC**CCA**ATAGTAGC**TAC**TCTCCATCTTTTCAGCAGG**AAT**TATCAT**TCCGCGCA Prochlorococcus marinus CCMP1986; PMM1596; 24.59
AAT**TCAT**TCACAAAT**TAC**AATACGAAGAACTTTAATG*AGT**TATCT**TTTGTCTTTA Prochlorococcus marinus MIT 9312; PMT9312_1688; 22.12
AAT**TCAT**TCGCAAAT**TAC**AATACGAGGAACCTTCAATG*AGT**TATAT**TTTATTAAT Prochlorococcus marinus MIT 9215; P9215_18691; 23.06
AAT**TCAT**TCGCAAAT**TAC**AATACGAGGAACCTTTAATG*AGT**TATCT**TTTATTAAT Prochlorococcus marinus AS9601; A9601_18051; 23.06
AAT**TCAT**TCGCAAAT**TAC**AATACGAGGAACCTTCAATG*AGT**TATCT**TTTATTAAT Prochlorococcus marinus MIT 9301; P9301_17881; 23.06
TTC**AGAC**CAATTAC**TAC**CAAAGTAGAACGACAAATCTTGCT**TCTAAT**TTTTTCTT Prochlorococcus marinus NATL1A; NATL1_20451; 21.65
TTC**AGAC**CAATTAC**TAC**CAAAGTAGAACGACAAATCTTGCT**TCTAAT**TTTTTCTT Prochlorococcus marinus NATL2A; PMN2A_1170; 21.65

amt1/amtB, транспортер аммония

Chroococcales:

AAAG**TAGT**AAATCA**TAC**AGAAAACAATCATGTAAAAA*****TTGA**ATACTCT**AA** Synechocystis sp. PCC 6803; sl10108; 16.24
AAT**GTA**TCAACGAA**TAC**AGAAATCTCAGATCAAAAAA***AC**AAAGAT**CGAAAAA Microcystis aeruginosa; MAE_40010; 16.12
GAT**GTA**TAACGTGA**TAC**AGAACTGCTTAAGTCAGACC**TGT**TGGA**ATCTAAAAA Cyanothece sp. PCC 7425; Cyan7425_0782; 17.88
AAAG**TAT**CTTATGT**TAC**AGAAAACAACCTT*AAAAAG**CAT**AAGA**ATTTTTAAG Cyanothece sp. PCC 7424; PCC7424_0499; 16.94
AAT**GTA**TTTTTTGA**TAC**AGAAATTTTCCSTAAAAAAG**AGT**AATA**AAAAAAAACA Cyanothece sp. PCC 8801; PCC8801_1229; 16.82
AAT**GTA**TTTTTTGA**TAC**AGAAATTTTCCSTAAAAAAG**AGT**AATA**AAAAAAAACA Cyanothece sp. PCC 8802; Cyan8802_1259; 16.82
ACAG**TAT**GATTTGT**TAC**AGAAAAAAGCTTTAAAAAC***CAT**AAAA**ATCTTGGCG Cyanothece sp. PCC 7822; Cyan7822DRAFT_4819; 17.65
ACT**TTTT**ATGCAAGC**TAC**AGAATTATCTCCTAATGAAG**CTC**AAGAT**TATTTAAA Cyanothece sp. CCY0110; CY0110_08851; 22
AAG**GGT**TTTTGTTT**TAC**CGAAACGAGTCTGTTGTTTA*ACGG**CAAAGT**TAAAGTC Cyanothece sp. PCC 7822; Cyan7822DRAFT_2270; 23.88

CTC**TTT**TAGAGTTTAT**TAC**ACTAAGTAAGGAAATGAC****TGCT**TAAAAA**ACCTTT Cyanothece sp. ATCC 51142; cce_3261; 24.94
AAAG**GTA**GCAAAAGT**TAC**GTATATCACCAGTCTGCCT***AGCC**CAGAGT**TGTGAGA Synechococcus elongatus; syc1821_c; 17.53
AGC**GTA**TCATTTT**TAC**AGAATGTTAGTGGTAAACA***TTTT**TAAAAA**CCAGGGT Synechococcus sp. PCC 7002; SYNPC7002_A2208; 17.88
GGT**GTA**CCTGCAAG**TAC**ATCTTAGGTGAGTGCAGG*TCAT**CACGAC**AGTCCGA Synechococcus sp. WH 7805; WH7805_07696; 20
AAT**GTA**TAAACGT**TAC**AGATTTTCCAATCTGAGAAC**TGGT**GC**AATCAAAAAC Thermosynechococcus elongatus; tll1985; 17.41
CTG**GTA**TTATAAAC**TAC**AGGCTGCTGAATCAATTTTT**TCC**TATGGC**CACTAAT Crocosphaera watsonii; CwatDRAFT_6540; 19.76

Oscillatoriales:

AAAG**GTA**GCATTTG**TAC**AGAAAGTTAAGACAATTA***CAG**TGCGAT**ATTTTTT Trichodesmium erythraeum; Tery_4477; 16.35
AGT**GTA**GTCTGAAA**TAC**AGAAAATTACTCTAATCTGT**TT**CAAGAT**CATCAAC Lyngbya sp. PCC 8106; L8106_22019; 18.47
TCT**GTA**GTTTTGT**TAC**AACTTTTCGGTCTGTTCTAC***CGC**TTTAAT**CGAGCCA --"; L8106_22019; 16.59
TCT**GTA**TTGCAGT**TAC**AGAAATCTGATTAA*******GATAAT**GTTAACA Arthrospira maxima; AmaxDRAFT_4502; 18.82
TCT**GTA**TCATGGAA**TAC**AGAATTTAGGTTAA*******TATAGT**GTTAAGA Arthrospira platensis; AplaP_010100009550; 17.88
TCT**GTA**TTGCAGT**TAC**AGAAATCTGATTAA*******GATAAT**GTTAACA Arthrospira sp. PCC 8005; APCC8_010100023060; 18.82
AAT**GTA**TATTTGG**TAC**AGAAGGTAAGGAACAAATAT**TGAT**TGGAAT**CTTTTGAA Oscillatoria sp. PCC 6506; OSCI_2480010; 18.47

Nostocales:

-TAG**GTA**TCTGATCA**TAC**AGAA***TTACAGCTTGAGTAAATA**GAAAAT**CAATCAA Nodularia spumigena; N9414_16726; 17.88
AAT**GTA**TAAACCA**TAC**AGAA***TTAATGTTTAGGTAAATA**GAAAAT**CAATCAA Anabaena variabilis ATCC 29413; Ava_2954; 16.24
AAT**GTA**TAACTAA**TAC**AGAA***TTAATGTTTAGGTAAATA**GACAAT**CAATCAA Nostoc sp. PCC 7120 (Anabaena sp.); alr0990; 15.18
ATAG**GTA**TCAAAC**TAC**GTAA***CTTCAATTAAGTA*ATG**TAAATTA**ACTTGT Nostoc azollae (Anabaena azollae); AazoDRAFT_0734; 19.06
AAT**GTA**GTTAAGGA**TAC**AAATCGTTGGTGTAGGAAG*AAA**AAGAAG**TGTTGAA Nostoc punctiforme; Npun_R3288; 16
ATT**GTA**GATTGAACA**TAC**AGAACTGAACATAGATAACAGTTTT**GATAAT**TTACAGT Cylandrospermopsis raciborskii; CRC_00109; 20.12
ATT**GTA**GATTGAACA**TAC**AGAACTGAACATAGATAACAGTTTT**GATAAT**TTACAGT Raphidiopsis brookii; CRD_01628; 20.12

Gloeobacteriales:

CAT**GTA**GTCAATTG**TAC**AAATGAGTCGCGACAGATTCG*CTT**AACTCT**CCTTATT Gloeobacter violaceus; glr3061; 16.35

Неклассифицированный род Acaryochloris:

AAT**GTA**TCTAAAA**TAC**AGATTTACAGTACCTAGCA***CTG**TTGAAT**CGATTAG Acaryochloris marina; AM1_3533; 16.47

Prochlorales:

TAT**GTA**TAAATGAT**TAC**CAGATAGCAACTCTATTTT*ACCCAT**TATTTG**TATTTGT Prochlorococcus marinus CCMP1375; Pro0295; 18
TTC**GTA**TAAACGAT**TAC**CAGAAGGATTACAAGATTT*CTCCAT**TATTTAGAAT**TGT Prochlorococcus marinus MIT 9211; P9211_02901; 19.53
TTAG**GTA**CTTTGCAT**TAC**CAGAAAAGACGCTTGTTC**TTTGCCCT**TGGAGAT**GTA Prochlorococcus marinus MIT 9215; P9215_02871; 21.18
TTG**GTA**GCAACGAC**TAC**TAGACACTGATAAGTTTTTT**GAG**CAGAAT**TGTATAT --"; P9215_02871; 18.71
TTG**GTA**TCAACA**TAC**TAGACACTGATAAGTTTTTT**GAA**TAAATTT**TAAATTT Prochlorococcus marinus MIT 9301; P9301_02861; 18.47
TTG**GTA**ACAACGAC**TAC**TAGACACTAATAAGTTTTTT**GAG**CAAAAT**TAAATAT Prochlorococcus marinus AS9601; A9601_02851; 19.06
TTG**GTA**GCAACGAC**TAC**TAGACACTAATAAGTTTTTT**GAG**CAAAAT**TGAATAT Prochlorococcus marinus MIT 9312; PMT9312_0265; 18.71
TTG**GTA**TAAACGAC**TAC**TAGACATACATAAGTTTTCT**GAG**CAAAAT**TATATAT Prochlorococcus marinus CCMP1986; PMM0263; 19.65
TTG**GTA**TAAATGAA**TAC**TCGACATAGACA*GTTTTCA**GAG**CAAAAT**TATGAAT Prochlorococcus marinus MIT 9515; P9515_02961; 20.94
TTT**GTA**TCAACACT**TAC**ATCTTGTAAGTATATGTTGC**ATAC**CATATTT**AAATATT Prochlorococcus marinus NATL2A; PMN2A_1629; 17.65
TTT**GTA**TCAACACT**GAC**ATCTTGTAAGTATAAGTTGC**GTAC**CATATTT**AAATATT Prochlorococcus marinus NATL1A; NATL1_03411; 19.65
GAAG**GC**CTTAGGCC**TAC**CAAGACGACACAGAGTTGAC*ACAG**CAAAAAG**AGCTCC Prochlorococcus marinus MIT 9313; PMT1853; 24.35
GAG**GC**CTTAGGCC**TAC**CAAGACGACACAGAGTTGAC*ACAG**CAAAAAG**AGCTCC Prochlorococcus marinus MIT 9303; P9303_24801; 24.35

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Chroococcales:

TTT**GTA**TACCATG**TAC**GGATTTTCTCGATCAAAC**CTG**TAAAGAT**CACTAAA Cyanothece sp. PCC 8801; PCC8801_0807; 19.29
TTT**GTA**TACCATG**TAC**GGATTTTCTCGATCAAAC**CTG**TAAAGAT**CACTAAA Cyanothece sp. PCC 8802; Cyan8802_0836; 19.29

TTTGTAATCATGAGT TACAATTTTATTTTTATTCCCCGGTTTTATATTTATCTTTT Cyanothece sp. PCC 7425; Cyan7425_1838; 17.65
 GCGATAAAAAGGTCA TACCTTAAATATCGTCGGCTAA*ATGTATTTTTACTTTACT Cyanothece sp. PCC 7822; Cyan7822DRAFT_1560; 24.35
 AGTGTGATAAGAAA TACACTACAGGAAAATCGGTAATAATCTATAATTTTGATTA Cyanothece sp. CCY0110; CY0110_24111; 20.47
 CGTGTGATAAGAAA TACACTACAGGAAAATTGCTAAAATCTATAATTTTGATTA Cyanothece sp. ATCC 51142; cce_1944; 21.29
 AAGGAAAACCATG TACCTTCAGTCATGGGAGTATGT*CAATATAAACGAAGCT Synechococcus sp. PCC 7002; SYNPC7002_A1631; 23.76
 CGTGTAGTGTCAAG TCGCTGCCAAATCCCCGGCATGT*CGATAAATTTCAAATCG Synechococcus elongatus; syc1936_c; 22.94
 TTTGTAATCCGTCAG TACATTTTTTCTCTTGT*****CACTATTCATGAGGGCT Synechococcus sp. WH 7805; WH7805_02272; 20.35
 TTCGTAATAGATGT TACTATTAGCGCATCTA*****GTTAAATTTATTGGGAG Crocosphaera watsonii; CwatDRAFT_4305; 21.18

Nostocales:

TTTGTAAGTCTTTGT TACAGAACGTCTGGATTAC****AGGTAATATTTAACCTTT Nostoc sp. PCC 7120 (Anabaena sp.); all2327; 17.06
 TTTGTAAGTCTTTGT TACAGAACGTCTGGATTAC****AGGTAATATTTAACCTTT Anabaena variabilis ATCC 29413; Ava_0146; 17.06
 GGGGTTGTCTATTGT TACTCCTTGTGTACCCAATT**TCCTAAAGTAAAACCAC Nostoc azollae (Anabaena azollae); AazoDRAFT_1772; 22.35
 AAGGTTGTCTGGAT TACAGGTTATATTAACCTTTCTTTCTTAATCTGCACAAAA --; AazoDRAFT_1772; 22.59
 TTTGTAAGCTTATGT TACAGATATCTGGATTATCA***GGTTATATTTAACCTTT Nostoc punctiforme; Npun_F5388; 16.35
 TTTGTAATTTTTTGT TACAGCTTATCTGGATTACA***GGTTATATTTAACCTTT Nodularia spumigena; N9414_03583; 18.47
 GTTGTATTGTTTGT TACGATTGTTCAAGTTTTTG***GGTTATGTTAAGTTTTT Raphidiopsis brookii; CRD_02137; 19.41
 GTTGTATTGTTTGT TACGATTGTTCAAGTTTTCTG***GGTTATGTTAAGTTTTT Cylandrospermopsis raciborskii; CRC_02161; 19.41

Oscillatoriales:

TTTGTAATCAAGCAT TACACTATAACACGACATGGCT*CAGATAATTTGAAAGAA Lyngbya sp. PCC 8106; L8106_18731; 18.47
 TTTGTAATGAGTGC TACACTATGACGCAACCTGGAT*CAATAATTTAAAGAT Arthrospira maxima; AmaxDRAFT_3348; 18.47
 TTTGTAATGAGTGC TACACTATGACGCAACCTGGAT*CAATAATTTGAAAGAT Arthrospira platensis; AplaP_010100011061; 18.47
 TTTGTAATGAGTGC TACACTATGACGCAACCTGGAT*CAATAATTTAAAGAT Arthrospira sp. PCC 8005; APCC8_010100012675; 18.47

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Prochlorales:

CCAGTAATAAAAGT TACACTATTTGTCTTTTAAA***TACTAAAGTGTTCAAAG Prochlorococcus marinus CCMP1986; PMM1520; 18.82
 TTCGTAATGGATTG AACTTTTATGTCACCAATGGGGTCTTTTACGTTTCTATTAC Prochlorococcus marinus CCMP1375; Pro1678; 23.65
 CAAGTAATAAAATT TACACTATTTCTTAGAAAA***TACTAGAGTATTTATAG Prochlorococcus marinus MIT 9215; P9215_17881; 21.06
 CCAGTAATAAAATT TACACTATTTCTGCAGATAAAA***TACTAAAGTGTTTAAAG Prochlorococcus marinus AS9601; A9601_17241; 21.29
 CCAGTAATAAAATT TACACTATTTCTGCAGATAAAA***TACTAAAGTGTTTAAAG Prochlorococcus marinus MIT 9301; P9301_17121; 21.29
 CCAGTAATAAAATT TACACTATTTATCAGATAAAA***TACTAAAGTGTTTAAAG Prochlorococcus marinus MIT 9312; PMT9312_1612; 21.29
 CTTGTAAGAAACAC TATCTTTTTTAGATATATTTT**TATTATTATTATTTATA --; PMT9312_1612; 22.94

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Chroococcales:

AATGTATATACAAA TACTCCCTCGACCCGAGACATCGAATTATGGACTTACTTT Synechococcus sp. WH 8102; SYNW1274; 19.41
 AAGATAATAACAAA TACTGCCTGGCTTGTAGATCT**AAATATTGTGTCGTTTT Synechococcus sp. BL107; BL107_12815; 21.53
 CATGCAGCAGGCGG TACGGGTGTCGGACTACACCGGCTTCTTCAATGCCGAAGC Synechococcus sp. WH 5701; WH5701_13215; 22.82
 TCAGTAACCAAGTG GACTATGAGCAATTGCAGACCCTTTCTTAAATTTAGAAG Synechococcus sp. PCC 7002; SYNPC7002_A0624; 22.71
 TTGGTCTAAAAAT TACTAGCTAATCAGAAC*****CGTAATAATCCCTAAAC Cyanothece sp. ATCC 51142; cce_1665; 21.18
 TTTGTAAAATTTTGTAAAGTGATATTGACA*****AAATATTTTTTAATGTCA --; cce_1665; 21.18
 TAAATAGTGTTATT TACACAAAATAAAGTTTTGT***AATGATAATTTTGCTGT Cyanothece sp. PCC 7424; PCC7424_0512; 20.59
 AAAATAATTAATATT TACAGATGATAACGAATTATTA*CATTATCTTTATAAGGAT Cyanothece sp. PCC 7822; Cyan7822DRAFT_5105; 18.94
 TATGTAAAGTATAAA TACTACTGTAATTTGTTTGGTTGAAATAATACAAAAAC --; Cyan7822DRAFT_5105; 21.18
 TTTGTAAAGATGAA GACTATTTGAGCAATTATTGA**TGATAATAATCAAGGTGG Microcystis aeruginosa; MAE_41230; 22.12

Prochlorales:

CCTGTCAAAAAGATTACCATCTACTTTTAAA*****AGATATTTTTAAATACAA Prochlorococcus marinus MIT 9301; P9301_09611; 21.65
TTGGTTTCAAAATA TACTTTGAAAAATTTTGA*****TTTTATTTTTGTGTAATA Prochlorococcus marinus CCMP1986; PMM1352; 22.12
--CGTCCCAATCCC TACTTACGAATCTTTTTTA*****AGTTATAAAATGTATTT Prochlorococcus marinus MIT 9515_1; P9515_09801; 21.65
ATTGTTTCATTTTT TACGCCAAAACTCACAAAT**GTTATGATCAATGTTA Prochlorococcus marinus MIT 9515_2; P9515_15131; 21.06

Oscillatoriales:

AATTTAACCGCAAT TACACTATAATAGCAGAAACA**ACTTAAATTTAGCAACC Trichodesmium erythraeum; Tery_0754; 20.71
CGAGTATAAGTATA TAGCTACCTTTTAG*****TCATATCATCAATAACT --"; Tery_0754; 24.12

Nostocales:

TAACTAAATTTTCAT TACTAATCGTGGTGGATTTCAAGTTATATACTTGGATTTTT Nostoc sp. PCC 7120 (Anabaena sp.); all4148; 21.65
CCCATAGGGCGGTCTACCCTTCGGGAACCTCCGAG**GAGTACAATTAGTGGTG Anabaena variabilis ATCC 29413; Ava_0981; 26.59
TTGGTACGAAATAC TAGTAATAAACCTAA*****AACTTACTGGGAATAA Nostoc azollae (Anabaena azollae); AazoDRAFT_4699; 20.35

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Chroococcales:

TATGTATCAGGCGAATACATTTATTGTGG*****TTTTATGTTTCAGTTAGC Synechococcus sp. CC9902_1; Syncc9902_0323; 20.94
TCAGTAGTGGGTTATACCCTTCGGGTCTTC*****CAATATTCACAGGTGGC Synechococcus sp. CC9902_2; Syncc9902_0324; 20.82
ACGGTAGTCAGGTGTCTCTCATGGCAGCG*****TCCATAATACAGTCCA Thermosynechococcus elongatus; tlr1246; 23.41
TAGATATATTGCCATACTTTGTGATTTGTATAGAAC**CAATATTAGACGATTTT Cyanothece sp. PCC 7425; Cyan7425_2214; 25.29
CATGTATCATTGAA TACCATCGACAGTA*****AAGTATTGCGTCTTTAG --"; Cyan7425_2214; 19.65

Неклассифицированный род Acaryochloris:

TAGTTAGAGAAAGT TACAAGTTTAAATTATTTCTGAATTTGTATTGAATTTTACA Acaryochloris marina; AM1_0866; 20.35
TTTTGATTTGAATTT TACAAAATAAGCACCCACCATAACGTAGTTATATCTGGGG --"; AM1_0866; 16

Prochlorales:

TATGTAGCAGTTAA TACTTGATTTTCGTATACCCAAATACACTATCTTTGAGGTGT Prochlorococcus marinus AS9601; A9601_12271; 18.35
TTCGTATACCCAAATACACTATCTTTGAGGTGTA***CTTTAAATTTTCGTGTGA --"; A9601_12271; 21.06
TTAGTAATTTGTAT TACATGATAGAAAAATG*****AGGTATTTTTTTTTATCT Prochlorococcus marinus CCMP1986_1; PMM1121; 19.76
AAAGTATCGTTTGA TACTTTGTGATTATACT*****AGTTATACAGTATCTTTA --"; PMM1121; 20.12
TGAGCAGTTTTTTG TACCCAATGCCTAT*****CCTTATGATTGATCTTA Prochlorococcus marinus MIT 9313_1; PMT0802; 21.88
CTAGTAGTCAGTGCTCTCAGTCTCAA*****TACTATCTTTGCCGAATT --"; PMT0802; 21.76
AATGTAGTCGTTGAT TACTTGATTTAGTATATCGAAGTACAT TATCTTTAAAGTGT Prochlorococcus marinus MIT 9215_1; P9215_12571; 19.41
TTAGTATATCGAAGTACATTATCTTAAAGTGTC***CTTTAAATTTTCGTGTGA --"; P9215_12571; 21.65
TTACTAGGCATGTT TACCAAATTATGACTTGCGAAA*ATCTATCCTCTACTTAG Prochlorococcus marinus MIT 9211; P9211_08291; 21.76
TATTTAATTTATATG TACTGTCCTGTTATTAAT*****AAATATTTTTAGTAATTC Prochlorococcus marinus MIT 9215_2; P9215_12551; 22.12
AATGTAGTCTTTGAT TACTTGATTTTGTATGCCCAAATACACTATCTTTGAGGTGT Prochlorococcus marinus MIT 9312_1; PMT9312_1131; 19.53
TTTTGATGCCCCAAATACACTATCTTTGAGGTGTA***CTCTAAAATTTTCGTGTG --"; PMT9312_1131; 20.24
AAAGTATCAATGGT TACATCTCCTTGAACTT*****TTATATCATTTCAAGAT Prochlorococcus marinus MIT 9312_2; PMT9312_1264; 18.12
AATGTAGCGGTTGCTACTTTGATTTTCGTATGGGTTAATACACTATCTTTAAGGTGT Prochlorococcus marinus MIT 9301_1; P9301_12271; 19.18
TTCGTATGGGTTAA TACACTATCTTAAAGGTGTA***CTTTAAATTTTCGTGTGA --"; P9301_12271; 20.59
CTTGTATAAAAAGT TACAACGCCTTGAA*****ACTTATATTTCTTTTCT Prochlorococcus marinus MIT 9301_2; P9301_13641; 17.53
GGTGTAAACATAAGCTACTTTTAGCCTCCTCTTGACATTTGTTAAATTTGATACAA Prochlorococcus marinus NATL1A_1; NATL1_04791; 20
TTTTGTAATTTTTTA TACAAAAGATATAGATAA*****AAATATAAACTTTTTTCT Prochlorococcus marinus NATL1A_2; NATL1_19301; 16.94
GGTGTAAACATAAGA TACTTTTACTCTCCTCAACGAAACGTTAAATTTTCGATACAA Prochlorococcus marinus NATL2A; PMN2A_1757; 20
CTTGCAACCATTGAT TACATCTGTACACCAAGTG**GTGTTTAAATCAGAAGTT Prochlorococcus marinus MIT 9303_1; P9303_26321; 20.82
TGAGCAGTTTTTTG TACCCAATTCCTAT*****CCCTATGATTTGATCAAT Prochlorococcus marinus MIT 9303_2; P9303_14071; 21.88

ACTGTAACGGGACTACTGCTTTATTCTCTTAAGTA*ATCGATAATTTGAATTGT Prochlorococcus marinus CCMP1375; Pro0737; 21.65
AATGTAAGTACTGATTATACCTTTTTTATGTAGC*****TTTTATGGTACCATTTG Prochlorococcus marinus MIT 9515_1; P9515_12121; 19.65
TCCGATCATTTGCTACATAGAAGTGAATCTATTAA*TCCTACTTAAAAATGTT Prochlorococcus marinus MIT 9515_2; P9515_13341; 17.65

Nostocales:

TTAGTAGCAAAAAGTACTTTTTTACAGTTAATA*****ATGTATATTTAACTTATT Anabaena variabilis ATCC 29413_1; Ava_4059; 19.53
CTCCTATCTTTGCCATACAGTCGAAATG*****CTCTATAATAATCAGCT Anabaena variabilis ATCC 29413_2; Ava_2510; 24.24
CTTGTAATGTGAGATAAATTCTTAAACTCCTGT****TAATATTTGGAAAAGAC Nodularia spumigena; N9414_09004; 22.82
ATTGTAATTTGTTATATTTATAATAATTCTCATTCT***TCATATACTGAAGACAA Nostoc sp. PCC 7120 (Anabaena sp.); alr0834; 22.71
ATACATAAAAAACATACAAGGAAATATTATAAT****AATATATCATATCATGC Raphidiopsis brookii; CRD_01401; 20.12
AAAGTCTTTGGATTACCCATTAGTGGGTAAGGACGCTAATTTATAAAGAGGTGT -"-; CRD_01401; 22.12
TTGGTACATTAACCTGCGATCGCTCACAA*****CCATATATTTAAAGAAAT Cylindrospermopsis raciborskii; CRC_01524; 24

Oscillatoriales:

TATGTACAAGCTATACCTTTTTGTAGTTCTCAGCTTGAA**TATACC TAAAATAT Trichodesmium erythraeum; Tery_1234; 19.41

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Chroococcales:

TCGGTTCGGGTTGATACCAAAGCGGTGGGGGGCCCTTTTT*****TACCTTCC Synechococcus sp. WH 8102; SYNW2442; 21.06
TTAGTTCGTTTTGATACGAAAGAAGGGTCTGTTGATCCG*****TACCTTCC Synechococcus sp. CC9902; Syncc9902_2250; 21.53
TTAGTTCGTTTTGATACGAAAGAAGGATGCTGTTGATCCG*****TACCTTCC Synechococcus sp. BL107; BL107_06989; 21.53
ACGGTAGCTGTCATACAAGAAGGGCATTGTTGATCCG*****TATTGTCCG Synechococcus sp. RCC307; SynRCC307_2454; 19.06
TTGGTAGTCAGCGCTACTAGTGAAGGTTTGCCTCGCTGAGAA****TGTCATGA Synechococcus sp. WH 7805; WH7805_09844; 20.59
AAGGTCCGATTGAATACATTTCTGCAGTTCTCGCCCTCCA*****TACCTTTT Synechococcus sp. CC9605; Syncc9605_2620; 23.18
ACGGTATCCTATGCTACATAATTTTTTCTTAACCTACTCG*****TAGTATGG Synechocystis sp. 6803; slr0447; 18.47
AAAGTAGCGAAAGTTACAAAAATCTGCTAACCTAGCCG*****TAATATCA Microcystis aeruginosa; MAE_06220; 16.12
TTTGTATCTAAAGTTACAATTTCCAGTCGGGTCTAGCCT**TAACATACAAACT Cyanothece sp. PCC 7424; PCC7424_2862; 16.94
AGTGTATAATAGATCACATCTTTAAGGAGGGGGGAG*****TTTTATCATCT Cyanothece sp. PCC 7425; Cyan7425_2260; 21.18
ACTGTATCCAATGTACAATTTTTCGGTTAACCTAGTTTTA**CCATACAATCT Cyanothece sp. PCC 7822; Cyan7822_1357; 16.71
CTTGTAGCCTAGCATACAGTTTTGCCCAATAACCTCCTCTTA*AGCTATGGGGA Thermosynechococcus elongatus; tlr1120; 20.59

Oscillatoriales:

TGGGTAGTAATTAATACCCTTGTCTGTTGTTTATCCAT*****TTTTAACCTAA Lyngbya sp. PCC 8106; L8106_19671; 19.29
TTTTGTATCTAAAAATACAATAAACACTTAACCTAGTCC***TAATATCACAC Oscillatoria sp. PCC 6506; OSCI_2210004; 16.94
ACTGTATTAATAGCTACATTTTTTGGCGTTGACTTA*****GCC TAGGATAC Arthrospira sp. PCC 8005; APCC8_010100028378; 17.76
ACTGTATTAATAGCTACATTTTTTGGGGTTGACTTA*****GCC TAGGATAC Arthrospira platensis; AplaP_010100001300; 17.76

Nostocales:

ATTGTAAATTTGTAACCTTTTTTCTCGTAAATCCCATAC**TAATATCTGTT Cylindrospermopsis raciborskii; CRC_00451; 24
TGGGTATTAATCATACAAATATTAATATTGTAA*****AGTTATTTTTT Nostoc punctiforme; Npun_F4615; 18.12
CTAGTAAACTATCGCACTATCATCACACTTTAAAGTT*****TGATATTTGTCA -"-; Npun_F4615; 24.12
TTGGTATCCAAGATAACTTTTTACTAGTAAACTATCG*****CACTATCATCA -"-; Npun_F4615; 23.18
TTAGTATCAAAAATAACAATTCAGTAAATATCAAAAC**TAATATCACAA Nostoc sp. 7120 (Anabaena sp.); all1951; 18.94
TTAGTATCAAAAATAACAATTCAGTAAATATCAAAAC**TAATATCACAA Anabaena variabilis; Ava_4361; 18.94

Prochlorales:

ATGGTATAACCGGATACGGAAACTTATCTTCGTT*****TACTGAAATAG Prochlorococcus marinus NATL1A; NATL1_19191; 20.24
TTTGTATCATTACATACAGAATCATGCCTGGCTGAT*****CTTTACGTTCC Prochlorococcus marinus MIT9313; PMT2229; 17.41
TTTGTATCATTACATACAGAATCATGCCTGGCTGAT*****CTTTACGTTCC Prochlorococcus marinus MIT9303; P9303_29741; 17.41
AATGTTACCTATGCTACAAAATAAATCCCCTC*****GTTTATAACTT Prochlorococcus marinus CCMP1986; PMM0970; 18.24

CTTGTAGATTTATCTATTTACGTGATTGATGTATCGGCTGG**GGATAAAAATTC --"; PMM0970; 22.82
AAAGTTACGACCGATACAAAACGAATCCTCACTCGTTAATAACTTTTACTTTTAT Prochlorococcus marinus AS9601; A9601_08881; 18.94
AAAGTTACGACAGATACAAAACSTAATCCTCACTCGTTAATAACTTTTACTTTTAT Prochlorococcus marinus MIT9215; P9215_09181; 18.47
TCAATTAATAACTTTTACTTTTATCCCCSTAATGAGGGTCAATT*ACCTAATTTTAT Prochlorococcus marinus MIT9312; PMT9312_0829; 21.53
AAAGTTACGACTGATACAAAACSTAATCCTCACTCGTTAATAACTTTTACTTTTAT Prochlorococcus marinus MIT9301; P9301_08861; 17.88

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Chroococcales:

TGAGTATCASCSTGATACAACATCCGCGTTCGCTTTCCAACATAAAATAAGAAG Synechococcus sp. WH 8102; SYNW2487; 17.06
GTTGTAACGACGGCTACATTTTTGACCCTGGGGTTAC*TACTACCATTCGCCCTT Synechococcus elongatus; syc1986_d; 19.29

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Chroococcales:

TCCGTAGCTGATCACCACCGCGCTGCCACCGGTGCC*GCAGACAGTGGAAAGGGC Synechococcus sp. WH 8102; SYNW1412; 22.24
TTTGTAGCGGTTCAACTCCGCAGAGCATCAAAGCC*GCAGACAGTTAAATTGC Synechococcus sp. CC9605; Syncc9605_1082; 21.88
CGGGTATCGCCTGTACCCGCATTGGGGTCTATCGCAGCCGGAGATTGGATAGGC Synechococcus sp. RCC307; SynRCC307_2478; 21.06
CTGGTAGCAACCGTCAACAACGCCACCGCTCTGATGG*GGTGAAGGTTCAAGGGC Synechococcus sp. WH 5701; WH5701_03684; 20
TATGTAGTCTGTGATACTGTTTTTGGGATTGAGATC*GTCTAAGGTTCAAGGAAA Microcystis aeruginosa; MAE_18840; 19.76
AAAGAAATGGCAGCTACGGGCATATCCAGCACC***CGACATAATAGCCTAGT Synechocystis sp. PCC 6803; sll1077; 22.24
AAAGTAGCACAGAAACACAGTTAACTTAATCATCCCT*AGCTAGGGTAGGGGATA --"; sll1077; 20.71
TTAGTAATTTTTGATACTGTTTGTAGAGAGCCAAAT*TGATAAACTTTGCAACG Cyanotheca sp. PCC 7822; Cyan7822_2040; 20.12

Oscillatoriales:

ACGGTAACSTTTTAAACCGGTTTGTCTTCGCAAGAAT*TGCTATAACTTGTAATAT Arthrospira sp. PCC 8005; APCC8_010100011683; 20.71
ATAGTATAGGGTTCTACATCTTTGGTAACTACAGCATGGGCGGCTATTATTCGCG Arthrospira platensis; AplaP_010100008946; 20.59
ATCGTATAGGGTTCTACATTCTTAGTTACTACAGAATGAGCCGCTATTATTCGCC Arthrospira maxima; AmaxDRAFT_4146; 21.29

Nostocales:

TTTGTAGTTTTTATAACAGTTTTATTACCATTAACA**TGTATTGATCGCAACTA Cylindrospermopsis raciborskii; CRC_02094; 19.06
TTTGTAGTTTTTATAACAGTTTTATTACCATTAACA**TGTATTATCCCAGTTA Raphidiopsis brookii; CRD_02353; 19.06

Неклассифицированный род Acaryochloris:

TTTGTATCSTAAAATACAATTATTCATATCTAGACT*TGATAATTTCTTGTATAG Acaryochloris marina; AM1_2833; 18.24

mutS, белок мисматч репарации, коррекции неспаренных оснований

Chroococcales:

TCTGTTGATGGAATACGATTCCGCTCGTATTGCCGT*CTGTAACCTTTGTCGT Synechococcus sp. WH 8102; SYNW2476; 22.12
GATGTAAAACSTCTGTTTCAGCATGCGGGCAGCTCCCGA*GCTGATCATTTGCCAA --"; SYNW2476; 22.47
TTGGTTGCTTTGGCTACATCTTGTGGCTGGCGTGGAG*ACGTAGAAGGCAGCTT Synechococcus sp. CC9902; Syncc9902_2283; 22.12
AATGTGACTTCAGATACAGCTTCGAAGCAGATGCAG**CCGTAGAAGGCACCAT Synechococcus sp. WH 7803; SynWH7803_2490; 20
AGTGTGCTTCGGCTACACSTTGAAGCATTGGCAG**CCGTAGAAGGCTTTCC Synechococcus sp. WH 7805; WH7805_09664; 20.71

Prochlorales:

GATGTATCAGTTTTTACCAAATTTTTTATTTATTT***TGGTATCATTTCAATAC Prochlorococcus marinus NATL1A; NATL1_21691; 17.18
TTGGTATCATTCAAACATCSTATCTATCCATTTA***ATTGATTAATTGGTTT --"; NATL1_21691; 19.76
GATGTATCAGTTTTTACCAAATTTTTTATTTATCT***TGGTATCATTTCAATAC Prochlorococcus marinus NATL2A; PMN2A_1297; 17.18
TTGGTATCATTCAAACATCSTATCTATCCATTTA***ATTGATTAATTGGTTT --"; PMN2A_1297; 19.76

rnc, рибонуклеаза III

Chroococcales:

GATGTAGCGGGCGAC**TAC**CGATATCGGGCGCTC***CTGACGGGGGCT**TGGCGGG**GACT Synechococcus sp. WH 8102; SYNW0152; 19.06
GATGTAGCGTTGGC**TAC**CGGCAGAAAAGCTC***GTGACGGGGGCT**TGGCGGG**GACT Synechococcus sp. CC9902; Syncc9902_0179; 20.47
GATGTAGCGCTCAC**TAC**TTCTTCAGTAATTC***TCACGGGGGCT**TGGCGGG**GACT Synechococcus sp. CC9605; Syncc9605_0149; 21.06
GATGTAGCGTTGGC**TAC**CGGCAGAAAAGCTC***GTGACGGGGGCT**TGGCGGG**GACT Synechococcus sp. BL107; BL107_05764; 20.47
CCGGTAGCGTTCC**TACC**ACCTGGA*****TCGACGGGGGCT**TGGCGGG**GACT Synechococcus sp. WH 5701; WH5701_03639; 22
AATGTAGTAGTGAC**TAC**CGGCGCCGCTGTTCAATCTCACGGGGGCT**TGGCGGG**GACT Synechococcus sp. WH 7803; SynWH7803_0204; 19.18
AATGTAGTAGTGAC**TAC**CGGTGTCAGTCTTT**TGTCAT**CACGGGGGCT**TGGCGGG**GACT Synechococcus sp. WH 7805; WH7805_08251; 19.18

Prochlorales:

GATGTAGTACCGGC**TACC**CGGAACAGTTGGCAAAA***AACGGGGGCTTGGCGGG**GACT Prochlorococcus marinus MIT 9303; P9303_25991; 19.41
GATGTAGTACCGGC**TACC**CGGAACAGTTGGCAAAA***AACGGGGGCTTGGCGGG**GACT Prochlorococcus marinus MIT 9313; PMT1948; 19.41
ACT**A**TATATAGGGCT**TGA**AGATTGTGATAATTACCTT***ACGGGGGCTTGGCGGG**GACT Prochlorococcus marinus MIT 9211; P9211_17271; 24.47
TAGGTAGTGAACAG**AAC**CCGGCTTATGACCTGCTTT*****CACCC****TATTA**ATTAA --"; P9211_17271; 23.06
CATGTAGCTTATGC**AAC**TATTTTTTAGCATTT*******ACGGGGGCTTGGCGGG**GATT Prochlorococcus marinus CCMP1375; Pro1762; 20.71
GCAGTATCGAGAGG**TACT**TGGCTTGGTAAACCC*****GTTTGGGTGCAAG**GCAA --"; Pro1762; 21.29

Oscillatoriales:

AAG**GT**CGGAGGAAC**TAC**GGTTGGTCTTTTACCAG******TTCCGCTTGAAT**GCAC Oscillatoria sp. PCC 6506; OSCI_3820007; 23.29
ATC**CTA**TTGTGAGAT**TACT**TATGAATTAGAGAGAGT*****CAGCGAAGGCAAT**TGCG Lyngbya sp. PCC 8106; L8106_28616; 23.06
GTT**GT**TGGTGGAGAT**TACT**TTCTGAGGT**CAGAA**AGC*****GGGAAATTAGAAG**TCAG Trichodesmium erythraeum; Tery_1105; 23.53
GAT**GT**TGTGAGCAAT**TAC**GCATGGT**GATCT*********CAATAACTACAGT**TAAC Arthrospira maxima; AmaxDRAFT_5300; 21.76
GAT**GT**TGTGAGCAAT**TAC**GCATGGT**GATCT*********CAATAACTACAGT**TAAC Arthrospira sp. PCC 8005; APCC8_010100014955; 21.76

Nostocales:

CGT**GTA**AAGCAATT**TAC**ACAGAGAACAGAA*******CCCGGCTTACCAC**CAAC Nostoc sp. PCC 7120 (Anabaena sp.); all4107; 20.12
CGT**GTA**AAGCAATT**TAC**ACAGAGAACAGAA*******CCCGGCTTACTAC**CAAC Anabaena variabilis ATCC 29413; Ava_0797; 20.12
TCGGTAAACCCCGG**TAC**GGAGCAAGGCCAG*******AGGAACTACGGT**TGGT Nodularia spumigena; N9414_22623; 23.88
GGT**TTA**GCTTCCGG**TAC**AAATATACCAC*******CTATGTCTATAA**TAGC Raphidiopsis brookii; CRD_02283; 19.76
GGT**TTA**GCTTCTGG**TAC**AAATATACCAC*******CTGTGTCTATCATA**AAACylindrospermopsis raciborskii; CRC_02811; 18.71

hupS, гидрогеназа

Chroococcales:

TCT**GTA**AAATTTAA**TAC**ATTTTCATAAATTCTCT***TGTCATGAT**TTTCATGGTAAT Cyanothece sp. ATCC 51142; cce_1063; 18.71
TTT**GTA**GCTAATGC**TACT**TTTTAGGAGGAATAAGGTTTT**TATAAC**GTGAAATTTAT Cyanothece sp. PCC 7822; Cyan7822_1668; 18.47
TCT**GTA**AAATTTAA**TAC**ACTTTTATAATCTTTG***TGTCATGAT**TTTCATGGTGAA Cyanothece sp. CCY0110; CY0110_26288; 18.94
TCT**GTA**ACTGATGAT**TAC**GTTTAATAATAATTAATTTTT**TATAAG**GTAACCTTTAA Cyanothece sp. PCC 7424; PCC7424_1817; 19.53
ACAG**TAA**AAAAATAA**GAC**ATTATTGCTAAATTTA***TGTTATTAT**TTTCATGACAAA Crocosphaera watsonii; CwatDRAFT_0515; 20.35

Nostocales:

TCT**GT**CTAAAAAAC**TACT**TATTTAAAACAAA*******TATAAT**TTTGATTTAAC Anabaena variabilis; Ava_4596; 20.35
TCT**GT**CTAAAAAAC**TACT**TATTTAAAACAAA*******TATAAT**TTTGATTTAAC Nostoc sp. PCC 7120 (Anabaena sp.); all0688; 20.35

Oscillatoriales:

ACT**GTA**TTATCTGA**TAC**CGTTGCTTAGTTGAATTGCAT**TCTCTG**TCAAGATAAGC Lyngbya sp. PCC 8106; L8106_01867; 18.35
AAA**GTA**TCAAAAAT**TAC**AAATTTTTAGACAAA****AATAACAAT**TAATTTAAAAAT Trichodesmium erythraeum; Tery_3369; 17.53

Гены с неизвестной функцией:

Chroococcales:

TCGGTAGTCGCCGC **TAC**ATCTGGTGGGGTGGGCAGACCGTCTCCACCGCT**TAGGGT**TT Synechococcus sp. WH 8102; SYNW0153; 20.12
CCC**GTAG**TCGACAC**TAC**ATTTGGTGGGGTGGTCAGATCGTGCACCCCGCT**TAGCGT**TTG Synechococcus sp. RS9917; RS9917_05010; 21.41
CCGGTAGTCACTAC**TAC**ATTTGGTGGGGTGGTCATACGTCACGCTCCCGCT**TAGCGT**TTG Synechococcus sp. WH 7805; WH7805_08246; 19.65
CCGGTAGCCAACGC**TAC**ATCTGGTGGGGTGGCCAGTTTCGCTCACCACCGCT**TAGTGT**TTA Synechococcus sp. CC9902; Syncc9902_0180; 20.35
CCGGTAGCCAACGC**TAC**ATCTGGTGGGGTGGCTAGATCGTTTCACCACCGCT**TAGTGT**TTA Synechococcus sp. BL107; BL107_05754; 20.35
CCGGTAGTCACTAC**TAC**ATTTAGTGGGGTGGCCAGACGGCAGCTCCCGCT**TAGCGT**TTG Synechococcus sp. WH 7803; SynWH7803_0205; 19.65
GTGGTAGGGAACGC**TAC**CGGTGGTGGCCTTCCCAAACAGGGCTCCCTGGCT**TAGCGT**GG Synechococcus sp. WH 5701; WH5701_03644; 21.76
ACT**GAT**GGATTGTC**TG**GATTGATGGGGTAGCCAGATGCCAGACCCCGCT**TATTTTT**TG Synechococcus sp. CC9311; sync_0203; 28.24

Prochlorales:

GCG**GTAG**CCGGTAC**TAC**ATCTGGTGGGCTAGGCAAATGCCACGCTCTCGCT**TAGTGT**TTG Prochlorococcus marinus MIT 9313; PMT1948; 20.35
GCG**GTAG**CCGGTAC**TAC**ATCTGGTGGGCTAGGCAAATGCCACGCTCTCGCT**TAGTGT**TTA Prochlorococcus marinus MIT 9303; P9303_25971; 20.35
CCAG**TAC**CTCTCGA**TAC**TGCTGGTGCCTCTTACCGCACCTTTGCA*CC**TTGCCT**GT Prochlorococcus marinus CCMP1375; Pro1761; 22.24
AAA**ATA**TGTAGTCC**TAT**ATGTGGTGGGTGTGCAAATCATTACTCTCTCGCT**TAGCGT**TT Prochlorococcus marinus NATL2A; PMN2A_1178; 24.12

HNH белковое семейство эндонуклеазы

Chroococcales:

TTGGTGCTCAGCGT**TAC**CAAGGGGGGCTTGGTGGAAATCGA**TAGCAT**G Synechococcus sp. WH 8102; SYNW2097; 22.12
ACTGTGCTCGGGGC**TAC**CGAGACAAACGTGGTGTGCCAA**TAGCAT**G Synechococcus sp. CC9902; Syncc9902_1985; 22.47
ACTGTGCTCGGGGC**TAC**CGAGACAAACGTGGTGTGCCAA**TAGCAT**G Synechococcus sp. BL107; BL107_08459; 22.47
GCAGTGCTCGGGGC**TAC**CGAGACAGCTTCACATCGC*CGA**TAGCAT**G Synechococcus sp. CC9605; Syncc9605_0346; 23.53
AGG**GTAGT**GAAGAT**CAC**AGTGATGTTCTGTGATTCTCGA**TAGCAT**G Synechococcus sp. CC9311; sync_0407; 21.53
TTGGTAGTGGGGGG**CAC**AAGGCGTCATTTGTGACCC*CGT**TAGCAT**G Synechococcus sp. WH 7805; WH7805_07131; 22.35
GAG**GTAGT**GAGGGT**CAC**AAAGCGTTGGTTGTGACCC*CGA**TAGCAT**G Synechococcus sp. WH 7803; SynWH7803_0404; 20.35

Prochlorales:

AAT**GTA**ATAAGGGAA**ACT**GCAACAAGGAGTTAATAC*CA**TAGCAT**G Prochlorococcus marinus NATL1A; NATL1_19741; 21.18
AAT**GTA**ATAAGGGAA**ACT**GCAACAAGGAGTCAATAC*CA**TAGCAT**G Prochlorococcus marinus NATL2A; PMN2A_1099; 21.18
CCAG**TAT**CAACTTT**TAG**ATGCAACGAGAATTTTAAATTAT**TACTCT**T Prochlorococcus marinus CCMP1986; PMM1528; 20.35
TTAG**TA**AATCACGTG**AAC**AGCCGCTTCCGTTTCATGC*CA**TAGCAT**G Prochlorococcus marinus MIT 9211; P9211_16481; 22

Nostocales:

AAAG**TA**AGAAGTTT**TAC**TTAAAACTGCTAACTCTTCACT**GATAAC**T Nostoc punctiforme; Npun_R5632; 19.29
GCAG**TA**ATAAGAGC**TAA**ACTTCTGTTTTTACTGAGGTA**TAGCCAA** Nostoc sp. PCC 7120 (Anabaena sp.); all2457; 21.29

Chroococcales:

CAAG**TC**GCTGGCG**TAC**CCAAATCACAGGCTGTCAGCG*CA**TGATGC**CTTC Synechococcus sp. WH 8102; SYNW2456; 22.71
AAAG**TC**GCCAGGGC**TAC**CTGAATCACAGGCTGCCAGTG*G**CTTGATGC**CTCC Synechococcus sp. WH 7805; WH7805_09759; 22.82
TCGG**TA**AACAAACAAC**CAC**CTAGTTCAACAGACAGACGGATCTTT**TGATGAG**TTG Synechococcus sp. CC9902; Syncc9902_2264; 21.18
TCAG**TA**AACAAACAAC**CAC**CTTAGCTCAGCAGACACAGTTCTTT**TGATGT**ATTG Synechococcus sp. BL107; BL107_06944; 20.71
GGGG**TA**TAAACAGAG**CAC**TAAAAAACCACCCTCGAGCCGGT**TGATGA**CCTG -"-; BL107_06944; 20.59
TTGG**TA**ACCGATGC**CAC**CTGCCCTGGCAGGACAGAAGC*CT**TGGATGG**CCCC Synechococcus sp. RS9917; RS9917_06045; 22.71
TCGG**TA**GCGATAAC**CAC**CAGAGTTGTCAATGCCGCTGT*CC**TGATCA**AGCC Synechococcus sp. WH 5701; WH5701_03589; 21.53
GCT**GTAT**GACTTGT**TAC**AGCTTCGGTCGCTCAATGCT**TG**TACATCT**AGC Synechococcus sp. PCC 7002; SYNPC7002_A0469; 18.71
GCC**GTAT**CCCGAAC**TAC**AGAAGTGGACTCTGAGCGAT**TT**TATAGT**CCCTT Synechococcus elongatus; Synpcc7942_1032; 20.24
TTGG**TA**GCGACAAT**CAC**CTTACCACAAACCTCATGGG**GA**TATCAT**GAAT Cyanothecae sp. PCC 8801; PCC8801_1913; 22.24

Prochlorales:

AGCGTATTTAAATA TACACATCTTAATTCTTTAAAGC**TTTTAGAGTGCTT Prochlorococcus marinus NATL2A; PMN2A_0733; 18.59
TTTGTATTTTTAGCTACCTAGTTAATTTAAACTTGCT*CCATATTTTTATAA -"-; PMN2A_0733; 19.18
AGTGTATTGATAAA TACATTTATTGTTGTCATATAGTT*TCTTGCCTTCTTT Prochlorococcus marinus NATL1A; NATL1_15711; 18.94
TTTGTATTTTTAGATACCTGAGTTATGAATATCTTGAT*TCATATTTTTATAA -"-; NATL1_15711; 20.24
TTGGTAGCCATAAA TACGAATAAAGATCTAAAGCTA***AAGTAAAAGTTAC Prochlorococcus marinus MIT 9215; P9215_11721; 18.71
TTGGTAGCTATAAA TACGAATAAAGATATAAAGCTA***AAGTAAAAGTTAC Prochlorococcus marinus MIT 9301; P9301_11431; 18.35
TTGGTAGCCATAAA TACGAATAAAGATATAAAGCTA***AAGTAAAAGTTAC Prochlorococcus marinus AS9601; A9601_11421; 18.71
TTTGTAGTTTTAAA TACTAAATATCGTCCCAAGCTA***AAGTAAAAAGTTA Prochlorococcus marinus CCMP1986; PMM1038; 18
TTTGTAGCTATAAA TACGAATTAAGATTCGAAGCTA***AAGTAAAAGTTAT Prochlorococcus marinus MIT 9312; PMT9312_1049; 17.29

Oscillatoriales:

TCAGTAGTTTTATGCTACAAAAACCTGCAAAACCCCAA**AAGTGGGATCGCT Oscillatoria sp. PCC 6506; OSCI_3880026; 16.47
TTCGTATCATTAGTTACAGCCTCTAGACTCAGACTCC**CCTTATCGTGGGA Lyngbya sp. PCC 8106; L8106_30150; 18.71
TTGGTATCATTAAC TACAGTTCCCGGACGGACTCAGCC*CCTTATCATCAGA Arthrospira platensis; AplaP_010100003884; 19.18
CTAGTACC CGCGTTG CACTACACTTCCGGCGGAACAGT**CCCTAGAATTGGC -"-; AplaP_010100003884; 24.12
TTGGTATCATTAACTACAGTTCCCGGACGGACTCAGCC*CCTTATCATCAGA Arthrospira maxima; AmaxDRAFT_2064; 19.18

Неклассифицированный род Acaryochloris:

CAGGTATCAAAAACA TACAGTTTTAGAGATATCAAGTTAC*CAGTAAGATACCC Acaryochloris marina; AM1_1414; 19.41

Потенциально репрессируемые гены:

gifA, фактор инактивации IF7 глутаминсинтетазы

Chroococcales:

AAATTTTTGTTTTCTGTATAAAATGT TACAGAATTTG**TGCTATAAAATATTAAT Synechocystis sp. PCC 6803; ssl1911; 8.67
GATTAGGGCATT TTTGTAAAAATAGATACAGAATTGTA**TGTATATATATTTAG Microcystis aeruginosa; MAE_49490; 12
TATCTAAAAAAAATGTAAACAATAGATACAGAAAATA**AATCGTTCATCCTTCT Cyanothece sp. PCC 7424; PCC7424_2046; 9.33
TAAAGTCSSTATTTTGTAGCAAATGT TACAGAATTTG**TGTATACATAGTAGT Cyanothece sp. ATCC 51142; cce_0259; 12
CAAAAACATCATTTTGTAGCAAATGT TACAGAATTTTA**TGTATAAAATAATAAT Cyanothece sp. CCY0110; CY0110_12762; 9.33
TTAATCAAAAAASTGT TAAATTAGATACAGAATAAAT**CGTTCATCTCTCCAAT Cyanothece sp. PCC 7425; Cyan7425_2387; 13.33
CATTTCAAAAAAATGTAAAAATAGATACAGAATAAAA**TTTTAAGTTTGTCTAG Cyanothece sp. PCC 7822; Cyan7822DRAFT_4909; 12.67
STTTTCAAGATTCTGTATAAATTGCTACAGTTTAAATGTGGTATATATAGTAATAG Cyanothece sp. PCC 8801; PCC8801_2371; 12
STTTTCAAGATTCTGTATAAATTGCTACAGTTTAAATGTGGTATATATAGTAATAG Cyanothece sp. PCC 8802; Cyan8802_2421; 12
AAAGATGTATAACGTAGCAATTTATACAGAAAATA**TTGCTAGATTTAAATC Synechococcus elongatus; Synpcc7942_0900; 8.67
AAAATATGTTTTCTGTATCAAAATTTACAGAAAATA**AAATATAATGAGGTTAG Synechococcus sp. PCC 7002; SYNPC7002_A0582; 8.67
ATAATACSAAAAGTGT TAAATTAGATACAGAAAATA**ATCGTTCATCTTCGCT Thermosynechococcus elongatus; tll1670; 15.33

Неклассифицированный род Acaryochloris:

TTCAATTTAAAAATGT TATATTTGATACAGAAATTA**ATCGTTCATCCCTTAA Acaryochloris marina; AM1_2559; 15.33

Nostocales:

AAAATTGCAATTCTGTAACTTTAGCTACAGAAATCT**CGCTAATATAAGAACT Nodularia spumigena; N9414_03593; 13.33
GAAATTGCTATTTCTGTAGCTTACGATACAGAATTTTACGCTACTATCATAAATGTG Nostoc azollae (Anabaena azollae); AazoDRAFT_1774; 12.67
AAATCTTCAATTCCGTAGCATAAGATACAGAATTTCT**TGCTATATTTAAATGTG Nostoc sp. PCC 7120 (Anabaena sp); asl2329; 8
AATTTATGTA AAAAGTAGCTTATGT TACAGAATTTT**TGTATGTTAGTCTTG Nostoc punctiforme; Npun_F5386; 13.33
AGATGCTCAATTTCTGTAGCATAAGATACAGAATTTT**CGCTATATTTAATTATG Anabaena variabilis ATCC 29413; Ava_0148; 10
CAATTTGGGATTTG GTAGTTTAAAGT TACGGAATTTCC**TGTACTATGAGGAAG Cylandrospermopsis raciborskii; CRC_02159; 16

CAAATTAGAATTTG GTAGTTTAAGT TACGGAAATCC**TGCTACTATAAAAAAG Raphidiopsis brookii; CRD_02135; 16

Oscillatoriales:

TTAAAACTCATTTT GTAAAAACGC TACAGAATTTTC**GTGTATGATGAAAGAG Lyngbya sp. PCC 8106; L8106_21554; 14
CTCAGAAGACGGAA GTAAAGGAAACA TCCTGAAGGAATTTACCTCAAATACTCTGC Trichodesmium erythraeum; Tery_3029; 21.33
ACTTCTGGTATTCT GTAAAAATAGAC TACAGAATTT**TATAGTATAGTAGTAAGC Arthrospira maxima; AmaxDRAFT_1837; 13.33
ACTTCTGGTATTCT GTAAAAATAGAC TACAGAATTT**TATAGTATAGTAGTAAGC Arthrospira sp. PCC 8005; APCC8_010100011341; 13.33
AAAAAAGCGATTTT GTAAATTTGAA TACAGAATTGTC**TGTATAGTCATAAAA Oscillatoria sp. PCC 6506; OSCI_3000009; 16.67

gifB, фактор инактивации глутаминсинтетаза

Chroococcales:

ATTTTGTGGACCATTCTTGACATGATCTTGAAAAACC GTAAAAATGGA TACAG Synechocystis sp. PCC 6803; s111515; 6
ATATGAAGTCTCATTACTTGACATTCTCAAAAAATCT GTAAACAATAGA TACAG Cyanothece sp. ATCC 51142; cce_2638; 8
AATTTTTATAAAGCCSTGACAAATTCACCTGCAAAAAT GTAAACAATAGA TACAG Cyanothece sp. PCC 8801; PCC8801_3716; 10
AATTTTTATAAAGCCSTGACAAATTCACCTGCAAAAAT GTAAACAATAGA TACAG Cyanothece sp. PCC 8802; Cyan8802_3768; 10
TTTTAAATGATTTTTTTTTTCTTATATAAGAATAAAAAT GTAAAAATTTGA TACAG Cyanothece sp. PCC 7424; PCC7424_1285; 11
GCAAAGGTTTACCAATGCACGATTGCCAGATCAAACG GTATCATATAA TACAG Cyanothece sp. PCC 7425_1; Cyan7425_1393; 12
ACAAATAAATCAGAGGTTGCTGACAAACTAGGGAAACC GTATAATTAGA TACAG Cyanothece sp. PCC 7425_2; Cyan7425_4644; 7
AAACAAAATATTAAGTTTTATAGACAAAACATCATTTT GTAGCAATGT TACAG Cyanothece sp. CCY0110; CY0110_12762; 13
TAATTTTTGTTAACTTTGGCCATTCATTTCAAAAAAT GTAAAAATAGA TACAG Cyanothece sp. PCC 7822; Cyan7822DRAFT_4909; 10
AAATTTTTATAAAGTTTTTTCAATTTCCCTAACAAAAT GTAAAAATAGA TACAG Microcystis aeruginosa; MAE_26330; 10
TAAATTTTTATGAAGTCTGACATTTTCTCAAAAAAGT GTAAACAATAGA TACAG Crocosphaera watsonii; CwatDRAFT_1910; 10
ACAACAAGTGGCGTTTACCCTATGAATATTGAAAAATC GTATAATAGAA TACAG Thermosynechococcus elongatus; tlr0313; 11

Oscillatoriales:

AAAAAAGTGAGAGATACTTGACATTTTTCTGAAAAAGC GTAAACAATAGA TACAG Lyngbya sp. PCC 8106; L8106_24935; 8
AAAGTTTTGTAATAATTTGGGGATCACCCGAAAAAAT GTAAACAATGAA TACAG Arthrospira maxima; AmaxDRAFT_0891; 12
AGAAATCCCATAGACCSTTGACATTTATTTGGGAAACG GTAAACAATAGA TACAG Arthrospira platensis; AplaP_010100005119; 8
TTAAATTTTGTCAACGAACCCTGTTATTTGGCAAAACA GTAAAAATACA TACAG Oscillatoria sp. PCC 6506; OSCI_3750001; 11

Nostocales:

CACTGAAACATAAAGTTTTATTACAAAATTTGCAATTCT GTAACTTTAGC TACAG Nodularia spumigena; N9414_03593; 12
TACAATAATATTAATAAATTTGTAACAGATGCTCAATTTCT GTAGCATAAGA TACAG Anabaena variabilis ATCC 29413; Ava_0148; 8
TACATAAGTATTACAATTTATAACAAATCTTCAATTTCC GTAGCATAAGA TACAG Nostoc sp. PCC 7120 (Anabaena sp.); asl2329; 6
CACTTAAGTGTGAAGTTTTGTGATGAAATTTGCTATTTCT GTAGCTTACGA TACAG Nostoc azollae (Anabaena azollae); AazoDRAFT_1774; 11
ATATTGTCAGCAAAGCAAAACATAAATTTATGTA AAAA GTAGCTTATGT TACAG Nostoc punctiforme; Npun_F5386; 11

Неклассифицированный род Acaryochloris:

TTATCGGGTTTTGTAGGCCGATCTTTAATTTGAAAAGG GTATTATTAGA TACAG Acaryochloris marina; AM1_3215; 12