Table S1. Summary of physical and periphyton data for chamber incubations in the light.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pair** | **Site** | **Date** | **Start** | **Finish** | **PAR** | **pH** | **DO** | **Temp** | **ER** | **GPP** | **Chla** | **Phaeo** | **PP** | **PN** | **PC** | **DM** | **AFDM** |
|  |  |  |  |  | **uE/m2/s** |  | **%sat** | **oC** | **mgO/m2/h** | **mgO/m2/h** | **mg/m2** | **mg/m2** | **mg/m2** | **mg/m2** | **g/m2** | **g/m2** | **g/m2** |
| 1 | T6 | 12/02/2013 | 1130 | 1440 | 661 |  | 115 | 18.2 | -61 | 117 | 40 | 15 | 35 | 494 | 3.3 | 22 | 6 |
| 2 | T6 | 13/02/2013 | 1151 | 1450 | 703 |  | 119 | 18.4 | -73 | 228 | 45 | 26 | 50 | 723 | 4.8 | 24 | 8 |
| 3 | T9 | 13/02/2013 | 1025 | 1252 | 644 |  | 113 | 19.0 | -31 | 147 | 44 | 23 | 60 | 665 | 4.6 | 36 | 9 |
| 4 | T9 | 14/02/2013 | 1048 | 1300 | 671 |  | 100 | 19.1 | -105 | 251 | 24 | 7 | 33 | 368 | 2.4 | 16 | 4 |
| 5 | W2 | 14/02/2013 | 1103 | 1414 | 449 |  | 115 | 17.4 | -92 | 214 | 80 | 95 | 62 | 912 | 7.5 | 27 | 18 |
| 6 | W2 | 10/02/2015 | 1058 | 1405 | 454 |  | 119 | 18.0 | -70 | 252 | 69 | 95 | 67 | 1124 | 9.0 | 34 | 16 |
| 7 | T4/5 | 10/02/2015 | 953 | 1218 | 1034 | 8.8 | 125 | 21.1 | -60 | 263 | 111 | 0 | 162 | 1527 | 9.3 | 87 | 21 |
| 8 | T4/5 | 16/02/2011 | 942 | 1235 | 1034 | 9.0 | 143 | 21.0 | -279 | 688 | 313 | 0 | 397 | 3699 | 17.3 | 63 | 34 |
| 9 | T5 | 17/02/2011 | 1050 | 1310 | 772 | 9.2 | 144 | 19.8 | -95 | 371 | 179 | 23 | 154 | 1442 | 10.3 | 48 | 22 |
| 10 | T5 | 17/02/2011 | 1512 | 1706 | 1138 | 9.5 | 163 | 22.0 | -95 | 342 | 179 | 23 | 154 | 1442 | 10.3 | 48 | 22 |
| 11 | T5 | 17/02/2011 | 1050 | 1321 | 772 | 9.2 | 144 | 19.9 | -225 | 542 | 295 | 0 | 360 | 4583 | 21.2 | 57 | 33 |
| 12 | T5 | 15/02/2012 | 1512 | 1704 | 1138 | 9.6 | 169 | 22.4 | -225 | 438 | 295 | 0 | 360 | 4583 | 21.2 | 57 | 33 |
| 13 | T5 | 15/02/2012 | 905 | 1055 | 1164 | 8.9 | 131 | 19.2 | -122 | 270 | 326 | 0 | 386 | 3453 | 16.3 | 49 | 33 |
| 14 | T5 | 16/02/2011 | 905 | 1045 | 1164 | 8.9 | 131 | 19.2 | -173 | 517 | 326 | 0 | 386 | 3453 | 16.3 | 49 | 33 |
| 15 | T5 | 17/02/2011 | 902 | 1055 | 1164 | 8.7 | 121 | 19.7 | -173 | 517 | 22 | 4 | 40 | 414 | 2.6 | 11 | 4 |
| 16 | T6 | 14/02/2012 | 1552 | 1730 | 480 | 9.2 | 177 | 20.2 |  |  | 47 | 0 | 70 | 737 | 5.1 | 21 | 9 |
| 17 | T6 | 14/02/2012 | 1540 | 1730 | 468 | 9.2 | 164 | 20.2 |  |  | 78 | 0 | 31 | 456 | 3.4 | 14 | 6 |
| 18 | T6 | 16/02/2012 | 1113 | 1252 | 657 | 9.4 | 156 | 19.1 | -208 | 472 | 58 | 0 | 55 | 471 | 3.4 | 13 | 6 |
| 19 | T6 | 16/02/2012 | 907 | 1111 | 313 | 9.2 | 146 | 18.5 | -167 | 539 | 150 | 63 | 63 | 794 | 5.9 | 24 | 10 |
| 20 | T6 | 12/02/2013 | 1324 | 1524 | 850 | 10.0 | 183 | 20.4 | -294 | 708 | 275 | 549 | 91 | 2181 | 18.0 | 30 | 19 |
| 21 | T6 | 13/02/2013 | 1455 | 1607 | 794 | 9.8 | 151 | 20.5 | -116 | 599 | 339 | 0 | 44 | 822 | 6.1 | 67 | 13 |
| 22 | T4/5 | 13/02/2013 | 1003 | 1148 | 569 | 8.0 | 103 | 17.0 | -96 | 332 | 115 | 0 | 142 | 1551 | 9.2 | 48 | 16 |
| 23 | T4/5 | 14/02/2013 | 1157 | 1409 | 557 | 8.6 | 118 | 17.9 | -96 | 292 | 115 | 0 | 142 | 1551 | 9.2 | 48 | 16 |
| 24 | T4 | 13/02/2014 | 933 | 1115 | 1100 | 8.2 | 107 | 18.2 | -94 | 464 | 38 | 8 | 23 | 381 | 3.2 | 12 | 6 |
| 25 | T4 | 13/02/2014 | 933 | 1122 | 1100 | 8.2 | 106 | 18.1 | -82 | 357 | 40 | 12 | 25 | 382 | 2.5 | 17 | 7 |

PAR, pH, DO and Temp are average values for the incubation; ER and GPP = ecosystem respiration and gross primary production; Chla and Phaeo = chlorophyll a and phaeophytin per unit ESA; PP, PN and PC = particulate P, N and C per unit ESA; DM and AFDM = dry mass and ash free dry mass per unit ESA.

Table S2. Summary of physical and periphyton data for chamber incubations in the dark.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pair** | **Site** | **Date** | **Start** | **Finish** | **Av PAR** | **pH** | **DO** | **Temp** | **ER** | **GPP** | **Chla** | **Phaeo** | **PP** | **PN** | **PC** | **DM** | **AFDM** |
|  |  |  |  |  | **uE/m2/s** |  | **%sat** | **oC** | **mgO/m2/h** | **mgO/m2/h** | **mg/m2** | **mg/m2** | **mg/m2** | **mg/m2** | **g/m2** | **g/m2** | **g/m2** |
| 1 | T6 | 12/02/2013 | 1503 | 1810 | 0 |  | 106 | 18.8 | -61 | 0 | 40 | 15 | 35 | 494 | 3.3 | 22 | 6 |
| 2 | T6 | 13/02/2013 | 1505 | 1810 | 0 |  | 99 | 19.7 | -73 | 0 | 45 | 26 | 50 | 723 | 4.8 | 24 | 8 |
| 3 | T9 | 14/02/2013 | 1315 | 1613 | 0 |  | 97 | 18.0 | -31 | 0 | 44 | 23 | 60 | 676 | 4.6 | 36 | 9 |
| 4 | T9 | 14/02/2013 | 1320 | 1620 | 0 |  | 99 | 18.0 | -105 | 0 | 24 | 7 | 33 | 367 | 2.4 | 16 | 4 |
| 5 | W2 | 10/02/2015 | 1425 | 1740 | 0 |  | 119 | 18.0 | -92 | 0 | 80 | 95 | 62 | 912 | 7.5 | 27 | 18 |
| 6 | W2 | 17/02/2011 | 1425 | 1732 | 0 |  | 97 | 18.2 | -70 | 0 | 69 | 95 | 67 | 1124 | 9.0 | 34 | 16 |
| 7 | T4/5 | 17/02/2011 | 1230 | 1600 | 0 | 9.0 | 126 | 24.3 | -60 | 0 | 111 | 0 | 162 | 1527 | 9.3 | 87 | 21 |
| 8 | T4/5 | 17/02/2011 | 1225 | 1610 | 0 | 9.4 | 134 | 23.1 | -279 | 0 | 313 | 0 | 397 | 3699 | 17.3 | 63 | 34 |
| 9 | T5 | 15/02/2012 | 1315 | 1510 | 0 | 9.4 | 145 | 20.3 | -95 | 0 | 179 | 23 | 154 | 1442 | 10.3 | 48 | 22 |
| 11 | T5 | 15/02/2012 | 1320 | 1520 | 0 | 9.0 | 128 | 21.4 | -225 | 0 | 295 | 0 | 360 | 4583 | 21.2 | 57 | 33 |
| 13 | T5 | 17/02/2011 | 1047 | 1320 | 0 | 8.8 | 125 | 21.2 | -122 | 0 | 326 | 0 | 386 | 3453 | 16.3 | 49 | 33 |
| 14 | T5 | 14/02/2012 | 1054 | 1320 | 0 | 8.8 | 125 | 21.2 | -173 | 0 | 224 | 42 | 401 | 4137 | 26.4 | 110 | 39 |
| 15 | T5 | 14/02/2012 | 1047 | 1327 | 0 | 8.7 | 121 | 21.3 | -173 | 0 | 22 | 4 | 40 | 414 | 2.6 | 11 | 4 |
| 18 | T6 | 16/02/2012 | 905 | 1106 | 0 | 8.5 | 114 | 18.3 | -208 | 0 | 58 | 0 | 55 | 471 | 3.4 | 13 | 6 |
| 19 | T6 | 16/02/2012 | 1125 | 1330 | 0 | 9.1 | 133 | 19.3 | -167 | 0 | 150 | 63 | 63 | 794 | 5.9 | 24 | 10 |
| 20 | T6 | 12/02/2013 | 1532 | 1724 | 0 | 9.7 | 139 | 20.5 | -294 | 0 | 298 | 596 | 99 | 2364 | 19.5 | 33 | 21 |
| 21 | T6 | 13/02/2013 | 1619 | 1757 | 0 | 9.7 | 132 | 20.4 | -116 | 0 | 339 | 0 | 44 | 822 | 6.1 | 67 | 13 |
| 22 | T4/5 | 14/02/2013 | 1416 | 1541 | 0 | 8.2 | 106 | 18.6 | -96 | 0 | 115 | 0 | 142 | 1551 | 9.2 | 48 | 16 |
| 24 | T4 | 13/02/2014 | 1123 | 1201 | 0 | 7.9 | 100 | 18.8 | -94 | 0 | 38 | 8 | 23 | 381 | 3.2 | 12 | 6 |
| 25 | T4 | 13/02/2014 | 1123 | 1224 | 0 | 7.9 | 102 | 19.1 | -82 | 0 | 40 | 12 | 25 | 382 | 2.5 | 17 | 7 |

PAR, pH, DO and Temp are average values for the incubation; ER and GPP = ecosystem respiration and gross primary production; Chla and Phaeo = chlorophyll a and phaeophytin per unit ESA; PP, PN and PC = particulate P, N and C per unit ESA; DM and AFDM = dry mass and ash free dry mass per unit ESA.

Table S3. Summary of measured nutrient concentrations at the start and end of incubations in the light.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pair** | **Site** | **L/D** | **ESA** | **Volume** | **Per** | **NH4** | **NOX** | **TDN** | **DRP** | **TDP** | **NH4** | **NOX** | **TDN** | **DRP** | **TDP** |
|  |  |  |  |  |  | **Start** | | | | | **End** | | | | |
|  |  |  | **cm2** | **L** |  | **mg/m3** | **mg/m3** | **mg/m3** | **mg/m3** | **mg/m3** | **mg/m3** | **mg/m3** | **mg/m3** | **mg/m3** | **mg/m3** |
| 1 | T6 | light | 822 | 12.9 | FGA | 16 | 447 | 598 | 7 | 14 | 13 | 407 | 557 | 9 | 29 |
| 2 | T6 | light | 814 | 13.0 | FGA | 41 | 460 | 680 | 4 | 33 | 8 | 404 | 633 | 9 | 36 |
| 3 | T9 | light | 923 | 12.7 | DIA | 32 | 481 | 701 | 10 | 33 | 14 | 495 | 658 | 14 | 39 |
| 4 | T9 | light | 912 | 12.9 | DIA | 32 | 481 | 701 | 10 | 33 | 16 | 492 | 710 | 14 | 34 |
| 5 | W2 | light | 822 | 12.1 | FGA | 11 | 363 | 478 | 12 | 17 | 0 | 328 | 480 | 11 | 22 |
| 6 | W2 | light | 907 | 12.1 | FGA | 17 | 363 | 501 | 12 | 16 | 0 | 316 | 546 | 10 | 20 |
| 7 | T4/5 | light | 788 | 13.0 | FGA | 56 | 866 | 1030 | 33 | 42 | 27 | 774 | 925 | 33 | 41 |
| 8 | T4/5 | light | 722 | 13.1 | CYN | 52 | 866 | 1000 | 31 | 41 | 26 | 631 | 902 | 45 | 64 |
| 9 | T5 | light | 887 | 13.1 | FGA | 5 | 628 | 719 | 21 | 26 | 3 | 428 | 538 | 11 | 17 |
| 10 | T5 | light | 887 | 12.9 | FGA | 6 | 532 | 691 | 22 | 32 | 22 | 463 | 634 | 25 | 34 |
| 11 | T5 | light | 823 | 13.1 | CYN | 5 | 628 | 719 | 21 | 26 | 20 | 436 | 608 | 22 | 30 |
| 12 | T5 | light | 887 | 12.9 | CYN | 6 | 532 | 691 | 22 | 32 | 5 | 425 | 576 | 14 | 21 |
| 13 | T5 | light | 823 | 12.9 | CYN | 30 | 796 | 914 | 26 | 31 | 16 | 687 | 806 | 24 | 31 |
| 14 | T5 | light | 823 | 12.9 | CYN | 30 | 796 | 914 | 26 | 31 | 13 | 546 | 716 | 24 | 31 |
| 15 | T5 | light | 823 | 13.5 | FGA | 30 | 796 | 914 | 26 | 31 | 16 | 687 | 806 | 24 | 31 |
| 16 | T6 | light | 768 | 13.1 | FGA | 5 | 333 | 449 | 6 | 14 | 10 | 280 | 481 | 6 | 17 |
| 17 | T6 | light | 926 | 13.1 | DIA | 5 | 333 | 449 | 6 | 14 | 6 | 305 | 428 | 6 | 15 |
| 18 | T6 | light | 1026 | 18.1 | DIA | 3 | 392 | 471 | 6 | 10 | 6 | 350 | 434 | 3 | 9 |
| 19 | T6 | light | 872 | 13.1 | DIA | 5 | 442 | 499 | 6 | 11 | 6 | 303 | 420 | 4 | 12 |
| 20 | T6 | light | 895 | 18.3 | FGA | 6 | 381 | 472 | 9 | 18 | 6 | 282 | 426 | 4 | 14 |
| 21 | T6 | light | 741 | 14.1 | DIA | 6 | 381 | 472 | 9 | 18 | 5 | 297 | 425 | 5 | 16 |
| 22 | T4/5 | light | 1049 | 12.5 | CYN | 28 | 523 | 653 | 22.9 | 30 | 19 | 415 | 636 | 19.2 | 33 |
| 23 | T4/5 | light | 1049 | 12.5 | CYN | 25 | 507 | 624 | 22.2 | 29 | 21 | 397 | 582 | 20.4 | 28 |
| 24 | T4 | light | 1751 | 13.5 | FGA | 93 | 1380 | 1690 | 26 | 34 | 40 | 1340 | 1590 | 20 | 31 |
| 25 | T4 | light | 1857 | 13.5 | FGA | 93 | 1380 | 1690 | 26 | 34 | 25 | 1330 | 1660 | 17 | 36 |

L/D = light/dark, ESA = exposed surface area of stones, Volume = volume of water in the chamber, PER = predominant algal phylum. Derived concentrations (DIN = TDN–NOX–NH4, DON = TDN–DIN and DOP = TDP–DRP) are omitted.

Table S4. Summary of measured nutrient concentrations at the start and end of incubations in the dark.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pair** | **Site** | **L/D** | **ESA** | **Volume** | **PER** | **NH4** | **NOX** | **TDN** | **DRP** | **TDP** | **NH4** | **NOX** | **TDN** | **DRP** | **TDP** |
|  |  |  |  |  |  | **Start** | | | | | **End** | | | | |
|  |  |  | **cm2** | **L** |  | **mg/m3** | **mg/m3** | **mg/m3** | **mg/m3** | **mg/m3** | **mg/m3** | **mg/m3** | **mg/m3** | **mg/m3** | **mg/m3** |
| 1 | T6 | dark | 822 | 12.7 | FGA | 15 | 412 | 530 | 11 | 32 | 23 | 421 | 588 | 7 | 28 |
| 2 | T6 | dark | 814 | 12.9 | FGA | 17 | 409 | 534 | 10 | 49 | 37 | 423 | 705 | 4 | 37 |
| 3 | T9 | dark | 923 | 18.1 | DIA | 19 | 510 | 654 | 16 | 27 | 22 | 501 | 695 | 9 | 40 |
| 4 | T9 | dark | 912 | 14.1 | DIA | 19 | 510 | 654 | 16 | 27 | 26 | 509 | 713 | 9 | 39 |
| 5 | W2 | dark | 822 | 12.1 | FGA | 6 | 354 | 476 | 11 | 18 | 13 | 349 | 476 | 9 | 16 |
| 6 | W2 | dark | 907 | 18.3 | FGA | 6 | 354 | 476 | 11 | 18 | 13 | 349 | 494 | 10 | 20 |
| 7 | T4/5 | dark | 788 | 13.0 | FGA | 39 | 809 | 975 | 36 | 44 | 57 | 775 | 987 | 46 | 59 |
| 8 | T4/5 | dark | 788 | 13.1 | CYN | 39 | 809 | 975 | 36 | 44 | 57 | 775 | 987 | 46 | 59 |
| 9 | T5 | dark | 887 | 12.9 | FGA | 3 | 552 | 632 | 18 | 23 | 6 | 506 | 635 | 11 | 17 |
| 11 | T5 | dark | 887 | 13.1 | CYN | 7 | 614 | 711 | 22 | 27 | 54 | 611 | 795 | 25 | 33 |
| 13 | T5 | dark | 823 | 12.9 | CYN | 18 | 730 | 864 | 26 | 31 | 49 | 597 | 777 | 24 | 29 |
| 14 | T5 | dark | 823 | 13.3 | CYN | 18 | 730 | 864 | 26 | 31 | 49 | 597 | 777 | 24 | 29 |
| 15 | T5 | dark | 823 | 13.5 | FGA | 18 | 730 | 864 | 26 | 31 | 31 | 738 | 889 | 22 | 29 |
| 18 | T6 | dark | 1026 | 18.1 | DIA | 5 | 442 | 499 | 6 | 11 | 2 | 419 | 499 | 3 | 7 |
| 19 | T6 | dark | 872 | 13.1 | DIA | 6 | 381 | 472 | 9 | 18 | 20 | 398 | 523 | 5 | 10 |
| 20 | T6 | dark | 895 | 18.3 | FGA | 6 | 381 | 472 | 9 | 18 | 7 | 313 | 439 | 4 | 10 |
| 21 | T6 | dark | 741 | 12.7 | DIA |  |  |  |  |  | 5 | 355 | 456 | 6 | 12 |
| 22 | T4/5 | dark | 1049 | 12.5 | CYN | 32 | 506 | 644 | 26.4 | 31 | 41 | 506 | 677 | 23.6 | 29 |
| 24 | T4 | dark | 1751 | 13.3 | FGA | 78 | 1360 | 1610 | 25 | 34 | 81 | 1370 | 1620 | 24 | 32 |
| 25 | T4 | dark | 1857 | 13.3 | FGA | 78 | 1360 | 1610 | 25 | 34 | 84 | 1370 | 1630 | 25 | 34 |

L/D = light/dark, ESA = exposed surface area of stones, Volume = volume of water in the chamber, PER = predominant algal phylum. Derived concentrations (DIN = TDN–NOX–NH4, DON = TDN–DIN and DOP = TDP–DRP) are omitted.

Table S5. Detection limits for measured nutrient concentrations.

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Method** | **Detection Limit mg m-3** |
| Dissolved Reactive Phosphorus (DRP) | flow injection analyser | 1 |
| Total Dissolved Phosphorus (TDP) | Persulphate digest, molybdenum blue, FIA | 1 |
| Total Phosphorus (TP) | Persulphate digest, molybdenum blue FIA | 1 |
| Nitrate + Nitrite Nitrogen (NOX) | flow injection analyser | 1 |
| Ammonium Nitrogen (NH4) | flow injection analyser | 1 |
| Total Dissolved Nitrogen (TDN) | Persulphate digest, auto cadmium reduction, FIA | 10 |
| Total Nitrogen (TN) | Persulphate digest, auto cadmium reduction, FIA | 10 |