### Species composition

| Phylum                      | 2 years | 3 years |
|-----------------------------|---------|---------|
| Actinobacteria              | 0.30%   | 0.60%   |
| Bacteroidetes               | 4%      | 4%      |
| Euryarchaeota               | 13%     | 9%      |
| Fibrobacteres               | 19%     | 23%     |
| Firmicutes                  | 48%     | 46%     |
| Proteobacteria              | 1%      | 4%      |
| Spirochaetes                | 0.90%   | 2%      |

| Class                       | 2 years | 3 years |
|-----------------------------|---------|---------|
| Actinobacteria              | 0.20%   | 0.50%   |
| Bacilli                     | 0.09%   | 0%      |
| Bacteroidia                 | 3%      | 3%      |
| Clostridia                  | 41%     | 40%     |
| Erysipelotrichia            | 0.10%   | 0%      |
| Fibrobacteria               | 16%     | 19%     |
| Gammaproteobacteria         | 1%      | 3%      |
| Methanobacteria             | 11%     | 8%      |
| Negativicutes               | 0       | 0.03%   |
| Spirochaetia                | 0.80%   | 1%      |

| Order                       | 2 years | 3 years |
|-----------------------------|---------|---------|
| Actinomycetales             | 0.20%   | 0.30%   |
| Aeromonadales               | 0.60%   | 2%      |
| Bacteroidales               | 3%      | 2%      |
| Clostridiales               | 34%     | 33%     |
| Coriobacteriales            | 0.04%   | 0.08%   |
| Erysipelotrichales          | 0.10%   | 0%      |
| Fibrobacteriales            | 13%     | 15%     |
| Methanobacteriales          | 9%      | 6%      |
| Oceanospirillales           | 0.10%   | 0%      |
| others                      | 13%     |         |
| Spirochaetales              | 0.60%   | 1%      |

| Family                      | 2 years | 3 years |
|-----------------------------|---------|---------|
| Coriobacteriaceae           | 0.03%   | 0.06%   |
| Corynebacteriaceae          | 0.10%   | 0.20%   |
| Fibrobacteriaceae           | 10%     | 11%     |
| Halomonadaceae              | 0.09%   | 0%      |
| Lachnospiraceae             | 24%     | 23%     |
| Methanobacteriaceae         | 7%      | 5%      |
| others                      | 2%      | 2%      |
| Prevotellaceae              | 3%      | 3%      |
| Ruminococcaceae             |         |         |
| Genus                  | Species                      |
|-----------------------|------------------------------|
| Spirochaetaceae       | Butyrivibrio-fibrisolvens    |
|                       | Butyrivibrio-unclassified     |
|                       | Corynebacterium-maris        |
|                       | Fibrobacter                  |
|                       | Halomonas                    |
|                       | Methanobrevibacter           |
|                       | others                       |
|                       | Prevotella                   |
|                       | Ruminococcus                 |
|                       | Subdoligranulum              |
|                       | Succinivibrionacea-uncla     |
|                       | Treponema                    |
| Succinivibrionaceae   | Butyrivibrio-fibrisolvens    |
|                       | Butyrivibrio-unclassified     |
|                       | Corynebacterium-maris        |
|                       | Fibrobacter                  |
|                       | Halomonas                    |
|                       | Methanobrevibacter-rumina    |
|                       | Methanobrevibacter-unclas    |
|                       | others                       |
|                       | Prevotella-ruminicola        |
|                       | Ruminococcus-albus           |
|                       | Ruminococcus-flavefaciens    |
|                       | Treponema-bryantii           |
| Genes    | Number | Genes    | Number | Genes    | Number | Genes    | Number |
|----------|--------|----------|--------|----------|--------|----------|--------|
| cohesive hmm | 29     | GT1. hmm | 238    | CE1. hmm | 3018   | CBM10. hmm | 1      |
| dockerin. hmm | 415    | GT10. hmm | 54     | CE10. hmm | 2264   | CBM11. hmm | 21     |
| GH1. hmm  | 160    | GT101. hmm | 14     | CE11. hmm | 171    | CBM12. hmm | 61     |
| GH10. hmm | 611    | GT102. hmm | 10     | CE12. hmm | 427    | CBM13. hmm | 215    |
| GH100. hmm | 39     | GT103. hmm | 2      | CE13. hmm | 19     | CBM14. hmm | 8      |
| GH101. hmm | 9      | GT104. hmm | 5      | CE14. hmm | 165    | CBM16. hmm | 139    |
| GH102. hmm | 4      | GT11. hmm | 70     | CE15. hmm | 327    | CBM17. hmm | 1      |
| GH103. hmm | 22     | GT12. hmm | 675    | CE2. hmm  | 608    | CBM18. hmm | 1      |
| GH105. hmm | 352    | GT13. hmm | 153    | CE3. hmm  | 772    | CBM19. hmm | 2      |
| GH106. hmm | 966    | GT14. hmm | 43     | CE4. hmm  | 684    | CBM2. hmm  | 53     |
| GH107. hmm | 4      | GT17. hmm | 8      | CE5. hmm  | 4      | CBM20. hmm | 207    |
| GH108. hmm | 22     | GT19. hmm | 332    | CE6. hmm  | 341    | CBM22. hmm | 151    |
| GH109. hmm | 746    | GT2. hmm  | 4090   | CE7. hmm  | 1093   | CBM23. hmm | 37     |
| GH11. hmm  | 120    | GT2_Cellulose_synt. hmm | 107    | CE9. hmm  | 794    | CBM26. hmm | 146    |
| GH110. hmm | 86     | GT20. hmm | 1083   | CBM28. hmm | 1      |                  |
| GH112. hmm | 14     | GT21. hmm | 23     | CBM3. hmm | 42     |                  |
| GH113. hmm | 84     | GT22. hmm | 46     | CBM30. hmm | 69     |                  |
| GH114. hmm | 26     | GT23. hmm | 45     | CBM31. hmm | 1      |                  |
| GH115. hmm | 279    | GT24. hmm | 10     | CBM32. hmm | 714    |                  |
| GH116. hmm | 70     | GT25. hmm | 23     | CBM34. hmm | 44     |                  |
| GH117. hmm | 712    | GT26. hmm | 93     | CBM35. hmm | 579    |                  |
| GH118. hmm | 7      | GT27. hmm | 2477   | CBM36. hmm | 179    |                  |
| GH119. hmm | 120    | GT28. hmm | 485    | CBM37. hmm | 233    |                  |
| GH120. hmm | 98     | GT3. hmm  | 275    | CBM38. hmm | 26     |                  |
| GH121. hmm | 79     | GT30. hmm | 125    | CBM3. hmm | 42     |                  |
| GH123. hmm | 91     | GT31. hmm | 1      | CBM4. hmm  | 268    |                  |
| GH124. hmm | 182    | GT32. hmm | 181    | CBM40. hmm | 92     |                  |
| GH125. hmm | 77     | GT33. hmm | 74     | CBM41. hmm | 18     |                  |
| GH126. hmm | 34     | GT34. hmm | 1      | CBM42. hmm | 2      |                  |
| GH127. hmm | 410    | GT35. hmm | 514    | CBM44. hmm | 159    |                  |
| GH128. hmm | 81     | GT38. hmm | 7      | CBM45. hmm | 13     |                  |
| GH129. hmm | 81     | GT39. hmm | 158    | CBM46. hmm | 15     |                  |
| GH13. hmm  | 1623   | GT4. hmm  | 2881   | CBM47. hmm | 81     |                  |
| GH13_1. hmm | 1186   | GT40. hmm | 200    | CBM48. hmm | 521    |                  |
| GH13_10. hmm | 882   | GT41. hmm | 2120   | CBM49. hmm | 10     |                  |
| GH13_11. hmm | 797   | GT44. hmm | 65     | CBM5. hmm  | 25     |                  |
| GH13_12. hmm | 38    | GT45. hmm | 1471   | CBM50. hmm | 839    |                  |
| GH13_13. hmm | 164   | GT46. hmm | 11     | CBM51. hmm | 80     |                  |
| GH13_14. hmm | 199   | GT49. hmm | 1      | CBM52. hmm | 3      |                  |
| GH13_15. hmm | 396   | GT5. hmm  | 2325   | CBM53. hmm | 1      |                  |
| GH13_16. hmm | 1070  | GT50. hmm | 3      | CBM54. hmm | 5      |                  |
| GH13_17. hmm | 1076  | GT51. hmm | 480    | CBM56. hmm | 218    |                  |
| GH13_18. hmm | 272   | GT52. hmm | 1      | CBM57. hmm | 25     |                  |
| GH13_19. hmm | 1053  | GT54. hmm | 1      | CBM58. hmm | 22     |                  |
| GH13_2. hmm  | 1207   | GT56. hmm | 20     | CBM59. hmm | 2      |                  |
| GH13_20. hmm | 1258  | GT57. hmm | 10     | CBM6. hmm  | 782    |                  |
| GH13_21. hmm | 702    | GT58. hmm | 2      | CBM60. hmm | 9      |                  |
| GH13_22. hmm | 314    | GT59. hmm | 1      | CBM61. hmm | 185    |                  |
| H13.23. hmm | 974 | GT6. hmm | 7 | CBM62. hmm | 88 |
| H13.24. hmm | 214 | GT60. hmm | 6 | CBM63. hmm | 30 |
| H13.25. hmm | 137 | GT62. hmm | 20 | CBM65. hmm | 1 |
| H13.26. hmm | 697 | GT63. hmm | 2 | CBM66. hmm | 97 |
| H13.27. hmm | 527 | GT64. hmm | 4 | CBM67. hmm | 655 |
| H13.28. hmm | 37 | GT66. hmm | 73 | CBM69. hmm | 38 |
| H13.29. hmm | 1026 | GT69. hmm | 23 | CBM70. hmm | 18 |
| H13.3. hmm | 362 | GT7. hmm | 25 | CBM71. hmm | 12 |
| H13.30. hmm | 947 | GT70. hmm | 1 | CBM72. hmm | 29 |
| H13.31. hmm | 1072 | GT71. hmm | 8 | CBM73. hmm | 5 |
| H13.32. hmm | 670 | GT73. hmm | 13 | CBM74. hmm | 2 |
| H13.33. hmm | 73 | GT74. hmm | 82 | CBM75. hmm | 40 |
| H13.34. hmm | 593 | GT75. hmm | 4 | CBM76. hmm | 1 |
| H13.35. hmm | 718 | GT76. hmm | 25 | CBM77. hmm | 13 |
| H13.36. hmm | 1361 | GT77. hmm | 4 | CBM78. hmm | 4 |
| H13.37. hmm | 972 | GT8. hmm | 263 | CBM79. hmm | 17 |
| H13.38. hmm | 755 | GT81. hmm | 1547 | CBM8. hmm | 4 |
| H13.39. hmm | 327 | GT83. hmm | 314 | CBM80. hmm | 3 |
| H13.4. hmm | 922 | GT84. hmm | 22 | CBM9. hmm | 117 |
| H13.40. hmm | 1049 | GT87. hmm | 9 | CBM90. hmm | 1 |
| H13.41. hmm | 77 | GT89. hmm | 2 | CBM91. hmm | 1 |
| H13.42. hmm | 14 | GT9. hmm | 171 | CBM92. hmm | 1 |
| H13.5. hmm | 557 | GT90. hmm | 13 | CBM93. hmm | 1 |
| H13.6. hmm | 532 | GT92. hmm | 86 | CBM94. hmm | 1 |
| H13.7. hmm | 737 | GT93. hmm | 1 | CBM95. hmm | 1 |
| H13.8. hmm | 744 | GT94. hmm | 175 | CBM96. hmm | 1 |
| H13.9. hmm | 775 | GT95. hmm | 1 | CBM97. hmm | 1 |
| H13.10. hmm | 431 | GT97. hmm | 1 | CBM98. hmm | 1 |
| H13.11. hmm | 181 | GT98. hmm | 1 | CBM99. hmm | 1 |
| H13.12. hmm | 62 | GT99. hmm | 7 | CBM100. hmm | 1 |
| H13.13. hmm | 113 | | | |
| H13.14. hmm | 59 | | | |
| H13.15. hmm | 131 | | | |
| H13.16. hmm | 8 | | | |
| H13.17. hmm | 68 | | | |
| H13.18. hmm | 224 | | | |
| H13.19. hmm | 85 | | | |
| H13.20. hmm | 32 | | | |
| H13.21. hmm | 38 | | | |
| H13.22. hmm | 13 | | | |
| H13.23. hmm | 58 | | | |
| H13.24. hmm | 334 | | | |
| H13.25. hmm | 2 | | | |
| H13.26. hmm | 204 | | | |
| H13.27. hmm | 13 | | | |
| H13.28. hmm | 2181 | | | |
| H13.29. hmm | 408 | | | |
| H13.3. hmm | 444 | | | |
| H13.34. hmm | 85 | | | |
| H13.35. hmm | 442 | | | |
| H13.36. hmm | 260 | | | |
GH27. hmm 301
GH28. hmm 514
GH29. hmm 432
GH3. hmm 1347
GH30. hmm 256
GH30_1. hmm 200
GH30_2. hmm 157
GH30_3. hmm 122
GH30_4. hmm 154
GH30_5. hmm 157
GH30_6. hmm 159
GH30_7. hmm 197
GH30_8. hmm 135
GH31. hmm 896
GH32. hmm 560
GH33. hmm 323
GH35. hmm 155
GH36. hmm 697
GH37. hmm 120
GH38. hmm 75
GH39. hmm 332
GH4. hmm 105
GH42. hmm 287
GH43. hmm 1902
GH43_1. hmm 990
GH43_10. hmm 928
GH43_11. hmm 739
GH43_12. hmm 817
GH43_13. hmm 539
GH43_14. hmm 612
GH43_15. hmm 340
GH43_16. hmm 289
GH43_17. hmm 747
GH43_18. hmm 193
GH43_19. hmm 290
GH43_2. hmm 851
GH43_20. hmm 87
GH43_21. hmm 99
GH43_22. hmm 105
GH43_23. hmm 51
GH43_24. hmm 389
GH43_25. hmm 34
GH43_26. hmm 218
GH43_27. hmm 221
GH43_28. hmm 775
GH43_29. hmm 964
GH43_3. hmm 1395
GH43_30. hmm 1150
GH43_31. hmm 1217
GH43_32. hmm 730
GH43_33. hmm 1187
| Name      | Value |
|-----------|-------|
| GH43_34. hmn | 933   |
| GH43_35. hmn | 871   |
| GH43_36. hmn | 442   |
| GH43_37. hmn | 421   |
| GH43_4. hmn  | 1041  |
| GH43_5. hmn  | 962   |
| GH43_6. hmn  | 563   |
| GH43_7. hmn  | 246   |
| GH43_8. hmn  | 1034  |
| GH43_9. hmn  | 829   |
| GH44. hmn    | 61    |
| GH45. hmn    | 85    |
| GH47. hmn    | 1     |
| GH48. hmn    | 7     |
| GH49. hmn    | 20    |
| GH5. hmn     | 1553  |
| GH5_1. hmn   | 364   |
| GH5_10. hmn  | 58    |
| GH5_11. hmn  | 46    |
| GH5_12. hmn  | 155   |
| GH5_13. hmn  | 61    |
| GH5_14. hmn  | 205   |
| GH5_15. hmn  | 174   |
| GH5_16. hmn  | 28    |
| GH5_17. hmn  | 14    |
| GH5_18. hmn  | 35    |
| GH5_19. hmn  | 540   |
| GH5_2. hmn   | 163   |
| GH5_20. hmn  | 45    |
| GH5_21. hmn  | 139   |
| GH5_22. hmn  | 635   |
| GH5_23. hmn  | 38    |
| GH5_24. hmn  | 106   |
| GH5_25. hmn  | 748   |
| GH5_26. hmn  | 408   |
| GH5_27. hmn  | 212   |
| GH5_28. hmn  | 304   |
| GH5_29. hmn  | 389   |
| GH5_30. hmn  | 56    |
| GH5_31. hmn  | 27    |
| GH5_32. hmn  | 44    |
| GH5_33. hmn  | 14    |
| GH5_34. hmn  | 18    |
| GH5_35. hmn  | 90    |
| GH5_36. hmn  | 507   |
| GH5_37. hmn  | 622   |
| GH5_38. hmn  | 490   |
| GH5_39. hmn  | 626   |
| GH5_4. hmn   | 664   |
| GH5_40. hmn  | 268   |
| GH5_41. hmn  | 44    |
GH5.42. hmm 152
GH5.43. hmm 39
GH5.44. hmm 177
GH5.45. hmm 159
GH5.46. hmm 657
GH5.47. hmm 49
GH5.48. hmm 256
GH5.49. hmm 96
GH5.5. hmm 553
GH5.50. hmm 155
GH5.51. hmm 93
GH5.52. hmm 463
GH5.53. hmm 52
GH5.57. hmm 226
GH5.8. hmm 14
GH5.9. hmm 277
GH5.10. hmm 68
GH5.11. hmm 685
GH5.13. hmm 242
GH5.14. hmm 35
GH5.15. hmm 128
GH5.17. hmm 204
GH5.18. hmm 81
GH5.19. hmm 4
GH5.23. hmm 98
GH5.24. hmm 13
GH5.25. hmm 67
GH5.26. hmm 24
GH5.27. hmm 183
GH5.28. hmm 5
GH5.29. hmm 100
GH5.30. hmm 4
GH5.31. hmm 53
GH5.32. hmm 227
GH5.33. hmm 308
GH5.34. hmm 217
GH5.35. hmm 456
GH5.36. hmm 970
GH5.37. hmm 91
GH5.38. hmm 214
GH5.39. hmm 11
GH5.40. hmm 44
GH5.41. hmm 16
GH5.42. hmm 17
GH5.43. hmm 58
GH5.44. hmm 96
GH5.45. hmm 130
GH5.46. hmm 138
GH5.47. hmm 659
GH5.48. hmm 7
GH5.49. hmm 523
| GH93. hmm | 210 |
| GH94. hmm | 562 |
| GH95. hmm | 502 |
| GH96. hmm | 1  |
| GH97. hmm | 724 |
| GH98. hmm | 7  |
| GH99. hmm | 122 |
Fig S1 Functional abundance of CAZy at different ages
Fig S2 Functional abundance of eggNOG in different age groups
Fig S3 KEGG functional abundance in different age groups
