**SUPPLEMENTARY DATA**

**Table S1** Dependence of the number of orthologs detected between species pairs on the stringency of ortholog definition. Orthologs were detected as best bidirectional blast hits with additional conditions, including %identity. Here, we show statistics of orthologs detected at different %identity tresholds for the D\_radiodurans dataset. 40% identity threshold is used for defining orthologs throughout the paper.

|  |  |  |  |
| --- | --- | --- | --- |
| % identity used for ortholog definition | Max number of orthologs | Min number of orthologs | Average number of orthologs |
| 20% | 2208 | 1029 | 1467 |
| 30% | 2157 | 976 | 1419 |
| 40% | 2044 | 758 | 1235 |
| 50% | 1947 | 442 | 959 |

**Table S2** List of all the species used for analysis, organized by the datasets they belong to. Also listed are genome stability indices for each species, calculated using model (1) fitted to the pooled GOC250 vs. phylogenetic distance points of all the datasets (“modelAll” shown in Figure 2a) or calculated using within-dataset models (models shown in Figure 2c and in the inset of Figure 3). Also given are the positions of origins of replication from DoriC (Gao and Zhang 2007; Gao *et al.* 2013) used for calculations of genomic indicators of selection, and D10 values found in the literature (the D10 value was estimated from radiation survival curve if not explicitly stated in the reference, not available for all the species of known radiation-resistance because even though all have been found to survive large doses of ionizing radiation, for some of them no survival curves were measured). Names of known radiation-resistant species are marked with an asterisk (\*), of known radiation-sensitive species with an ampersand (&); the rest are of unknown radiation resistance (conservatively classified for the analysis as non-resistant, see Methods).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Dataset name | GenBank species name (radiation resistant species are shown in red) | Stability index (calculated to the within-dataset model) | Stability index (calculated to the model describing all the datasets together) | Position of origin of replication (from DoriC) | D10 value for survival of gamma radiation and references |
| C\_thermalis | Anabaena\_90\_uid30803 | 0.0327 | -0.0950 |  |  |
|  | Anabaena\_cylindrica\_PCC\_7122\_uid43355 | 0.0196 | -0.1185 |  |  |
|  | Arthrospira\_platensis\_NIES\_39\_uid42161 (\*) | -0.0127 | -0.1274 |  | >1200 for Spirulina platensis (Zhiping *et al.* 1998) |
|  | Anabaena\_variabilis\_ATCC\_29413\_uid10642 | -0.0175 | -0.1528 |  |  |
|  | Chamaesiphon\_PCC\_6605\_uid158825 | -0.0341 | -0.1500 |  |  |
|  | Cyanothece\_PCC\_7425\_uid28337 | -0.0336 | -0.1509 |  |  |
|  | Calothrix\_PCC\_7507\_uid158683 | -0.0014 | -0.1446 |  |  |
|  | Crinalium\_epipsammum\_PCC\_9333\_uid158835 | 0.0217 | -0.0944 |  |  |
|  | Cylindrospermum\_stagnale\_PCC\_7417\_uid158809 | 0.0125 | -0.1294 |  |  |
|  | Chroococcidiopsis\_thermalis\_PCC\_7203\_uid38119 (\*) | 0.0042 | -0.1094 |  | 3750-5000 for Chroococcidiopsis spp. (Billi *et al.* 2000) |
|  | Geitlerinema\_PCC\_7407\_uid158833 | 0.0133 | -0.1047 |  |  |
|  | Gloeocapsa\_PCC\_7428\_uid158831 | 0.0261 | -0.0951 |  |  |
|  | Microcoleus\_PCC\_7113\_uid158839 | -0.0008 | -0.1217 |  |  |
|  | Nostoc\_PCC\_7524\_uid158707 | 0.0025 | -0.1347 |  |  |
|  | \_Nostoc\_azollae\_\_0708\_uid30807 | 0.0355 | -0.1046 |  |  |
|  | Nostoc\_punctiforme\_PCC\_73102\_uid216 | 0.0219 | -0.1095 |  |  |
|  | Nostoc\_sp\_uid244 | -0.0265 | -0.1627 |  |  |
|  | Oscillatoria\_PCC\_7112\_uid158711 | -0.0093 | -0.1250 |  |  |
|  | Synechocystis\_PCC6803\_uid60 | -0.0436 | -0.1584 |  |  |
|  | Stanieria\_cyanosphaera\_PCC\_7437\_uid158877 | -0.0288 | -0.1456 |  |  |
| E\_faecium | Bacillus\_anthracis\_H9401\_uid49361 | 0.0205 | 0.1278 | 1836 |  |
|  | Bacillus\_cereus\_cytotoxis\_NVH\_391-98\_uid13624 (&) | 0.0572 | 0.1766 | 1952 | 173-400 for B. cereus (Grant and Patterson 1992, Kotiranta *et al.* 1999) |
|  | Bacillus\_halodurans\_uid235 | 0.0471 | 0.1743 | 285 |  |
|  | Bacillus\_thuringiensis\_serovar\_finitimus\_YBT\_020\_uid60447 | 0.0181 | 0.1261 | 1837 |  |
|  | Bacillus\_toyonensis\_BCT\_7112\_uid225857 | 0.0241 | 0.1310 |  |  |
|  | Bacillus\_weihenstephanensis\_KBAB4\_uid13623 | 0.0324 | 0.1427 | 1537 |  |
|  | Carnobacterium\_17\_4\_uid60607 | -0.0043 | 0.1202 | 1530 |  |
|  | Carnobacterium\_WN1359\_uid222287 | 0.0114 | 0.1359 |  |  |
|  | Enterococcus\_7L76\_uid39181 | -0.0828 | 0.0362 |  |  |
|  | Enterococcus\_faecalis\_OG1RF\_uid20843 (\*) | -0.0791 | 0.0400 | 1503 | 1566 for Streptococcus faecalis (Garcia *et al.* 1987) |
|  | Enterococcus\_faecium\_DO\_uid30627 (\*) | -0.0623 | 0.0596 | 1504 | 900-2000 (Daly *et al.* 2004, Annelis *et al.* 1973) |
|  | Enterococcus\_mundtii\_QU\_25\_uid192584 | -0.0691 | 0.0534 |  |  |
|  | Listeria\_innocua\_uid86 (&) | 0.0058 | 0.1114 |  | 660-720 for Listeria innocua irradiated in gelatin (Rodriguez *et al.* 2006) |
|  | Listeria\_ivanovii\_uid13441 | 0.0064 | 0.1134 | 1770 |  |
|  | Listeria\_monocytogenes\_N53\_1\_uid177090 (&) | 0.0319 | 0.1412 |  | 160-650 (Patterson 1989, Grant and Patterson 1992, Saroj *et al.* 2006, Brandāo Areal *et al.* 1993) |
|  | Lactobacillus\_sakei\_23K\_uid13435 | 0.0379 | 0.1611 | 1645 |  |
|  | Listeria\_seeligeri\_serovar\_1\_2b\_SLCC3954\_uid41123 | 0.0117 | 0.1191 | 1771 |  |
|  | Listeria\_welshimeri\_serovar\_6b\_SLCC5334\_uid13443 | 0.0116 | 0.1187 | 1770 |  |
|  | Melissococcus\_plutonius\_ATCC\_35311\_uid61383 | 0.0373 | 0.1633 |  |  |
|  | Tetragenococcus\_halophilus\_uid41613 | -0.0082 | 0.1151 | 1414 |  |
| D\_radiodurans | Deinococcus\_deserti\_VCD115\_uid16691 (\*) | -0.0389 | -0.0512 | 1617 | 7500 (Dulermo *et al.* 2009) |
|  | Deinococcus\_geothermalis\_DSM\_11300\_uid13423 (\*) | -0.0051 | -0.0366 | 1829 | 5100-16000 (Ferreira *et al.* 1997, Daly *et al.* 2004, Makarova *et al.* 2007) |
|  | Deinococcus\_gobiensis\_I\_0\_uid46605 (\*) | -0.0625 | -0.0715 | 1572 | 12700 (Yuan *et al.* 2009) |
|  | Deinococcus\_maricopensis\_DSM\_21211\_uid43461 (\*) | -0.0225 | -0.0521 | 1759 |  |
|  | Deinococcus\_peraridilitoris\_DSM\_19664\_uid61295 (\*) | -0.0123 | -0.0421 | 1940539 |  |
|  | Deinococcus\_proteolyticus\_MRP\_uid41911 (\*) | -0.0481 | -0.0703 | 1968 | 10300 (Shashidhar *et al.* 2010) |
|  | Deinococcus\_radiodurans\_R1\_uid65 (\*) | -0.0743 | -0.0907 | 1543 | 5500-16000 (Shashidhar *et al.* 2010, Battista 1997, Daly *et al.* 2004, Makarova *et al.* 2007) |
|  | Marinithermus\_hydrothermalis\_DSM\_14884\_uid50827 | 0.0262 | 0.0024 | 1526 |  |
|  | Meiothermus\_ruber\_DSM\_1279\_uid196343 | -0.0020 | -0.0457 |  |  |
|  | Meiothermus\_silvanus\_DSM\_9946\_uid29551 | 0.0431 | -0.0027 | 1590 |  |
|  | Oceanithermus\_profundus\_DSM\_14977\_uid40223 | 0.0326 | 0.0026 | 1518 |  |
|  | Thermus\_CCB\_US3\_UF1\_uid76491 | 0.0509 | 0.0403 | 1537 |  |
|  | Thermus\_oshimai\_JL\_2\_uid63181 | 0.0553 | 0.0382 | 1501 |  |
|  | Truepera\_radiovictrix\_DSM\_17093\_uid38371 (\*) | -0.0145 | -0.0689 | 1665 | >5000 (Albuquerque *et al.* 2005) |
|  | Thermus\_scotoductus\_SA\_01\_uid46293 | 0.0510 | 0.0386 | 1514 |  |
|  | Thermus\_thermophilus\_HB8\_uid13202 (&) | 0.0293 | 0.0231 | 1849646 |  |
| K\_radiotolerans | Arthrobacter\_FB24\_uid12640 (\*) | -0.0271 | 0.0842 | 1697 |  |
|  | Arthrobacter\_aurescens\_TC1\_uid12512 (\*) | -0.0422 | 0.0664 | 1707 |  |
|  | Arthrobacter\_chlorophenolicus\_A6\_uid20011 | -0.0553 | 0.0565 | 1862 |  |
|  | Arthrobacter\_nitroguajacolicus\_Rue61a\_uid78011 | -0.0522 | 0.0578 | 1807 |  |
|  | Arthrobacter\_phenanthrenivorans\_Sphe3\_uid20087 | -0.0357 | 0.0741 | 2083 |  |
|  | Beutenbergia\_cavernae\_DSM\_12333\_uid20827 | 0.0001 | 0.1139 | 2061 |  |
|  | Blastococcus\_saxobsidens\_uid82915 (&) | 0.0137 | 0.1047 | 4875227 | 900 (Gtari *et al.* 2012) |
|  | Cellulomonas\_fimi\_ATCC\_484\_uid33691 | 0.0148 | 0.1233 | 1986 |  |
|  | Cellulomonas\_flavigena\_DSM\_20109\_uid19707 | 0.0143 | 0.1227 | 2049 |  |
|  | Cellvibrio\_gilvus\_ATCC\_13127\_uid33853 | 0.0163 | 0.1356 | 3492158 |  |
|  | Geodermatophilus\_obscurus\_DSM\_43160\_uid29547 (\*) | 0.0015 | 0.0869 | 2427 | 9000 (Gtari *et al.* 2012) |
|  | Intrasporangium\_calvum\_DSM\_43043\_uid43527 | -0.0305 | 0.0913 | 2250 |  |
|  | Isoptericola\_variabilis\_225\_uid49657 | 0.0015 | 0.1204 | 1906 |  |
|  | Kineococcus\_radiotolerans\_SRS30216\_uid10689 (\*) | 0.0016 | 0.0949 | 2027 | 7000 (Bagwell *et al.* 2008) |
|  | Kocuria\_rhizophila\_DC2201\_uid27833 | 0.0378 | 0.1507 | 1999 |  |
|  | Kytococcus\_sedentarius\_DSM\_20547\_uid21067 | 0.0268 | 0.1277 | 2023 |  |
|  | Nakamurella\_multipartita\_DSM\_44233\_uid29537 | -0.0689 | 0.0166 | 2142 |  |
|  | Rothia\_dentocariosa\_ATCC\_17931\_uid48447 | 0.1164 | 0.2198 | 955933 |  |
|  | Sanguibacter\_keddieii\_DSM\_10542\_uid19711 | 0.0301 | 0.1432 | 1973 |  |
|  | Xylanimonas\_cellulosilytica\_DSM\_15894\_uid19715 | 0.0204 | 0.1318 | 1833 |  |
| P\_arcticum | Acinetobacter\_DR1\_uid46105 | -0.0398 | -0.0017 | 4152526 |  |
|  | Acinetobacter\_baumannii\_BJAB0715\_uid74423 (&) | -0.0300 | 0.0202 |  | 150-311 for Acinetobacter baumanii (Saha et Chopade 2009) |
|  | Alcanivorax\_borkumensis\_SK2\_uid13005 | 0.0488 | 0.0799 | 3119889 |  |
|  | Acinetobacter\_calcoaceticus\_PHEA\_2\_uid51267 (&) | -0.0364 | 0.0016 | 2627250 | 150-170 (Saha et Chopade 2009, Nishimura *et al.* 1994) |
|  | Alcanivorax\_dieselolei\_B5\_uid60443 | 0.0097 | 0.0560 | 4927892 |  |
|  | Acinetobacter\_sp\_ADP1\_uid12352 | -0.0562 | -0.0162 | 3598489 |  |
|  | Halomonas\_elongata\_DSM\_2581\_uid49333 | 0.0104 | 0.0329 | 4061266 |  |
|  | Kangiella\_koreensis\_DSM\_16069\_uid29443 | 0.0674 | 0.0747 | 2852005 |  |
|  | Marinobacter\_BSs20148\_uid170720 | 0.0233 | 0.0833 | 4063630 |  |
|  | Marinomonas\_MWYL1\_uid17445 | 0.0045 | 0.0377 |  |  |
|  | Marinobacter\_aquaeolei\_VT8\_uid13239 | 0.0118 | 0.0645 | 144 |  |
|  | Marinobacter\_hydrocarbonoclasticus\_uid91119 | 0.0141 | 0.0659 | 109 |  |
|  | Marinomonas\_mediterranea\_MMB\_1\_uid51765 | -0.0002 | 0.0396 | 4684111 |  |
|  | Marinomonas\_posidonica\_IVIA\_Po\_181\_uid52545 | 0.0166 | 0.0508 | 3899854 |  |
|  | Psychrobacter\_PRwf-1\_uid15759 (\*) | -0.0694 | -0.0263 | 752 | 800-2000 for Psychrobacter spp. (Rodriguez-Calleja *et al.* 2005) |
|  | Psychrobacter\_arcticum\_273-4\_uid9633 (\*) | -0.0388 | -0.0101 | 185 | 800-2000 for Psychrobacter spp. (Rodriguez-Calleja *et al.* 2005) |
|  | Psychrobacter\_cryohalolentis\_K5\_uid13920 (\*) | -0.0496 | -0.0227 | 1036 | 800-2000 for Psychrobacter spp. (Rodriguez-Calleja *et al.* 2005) |
|  | Pseudomonas\_syringae\_tomato\_DC3000\_uid359 (&) | 0.0164 | 0.0430 | 47 | 200-430 for Pseudomonas (Singh *et al.* 2006) |
|  | Thioflavicoccus\_mobilis\_8321\_uid60883 | 0.0313 | 0.0237 |  |  |
|  | marine\_bacterium\_HP15\_uid46089 | 0.0249 | 0.0848 | 3905679 |  |
| M\_radiotolerans | Azorhizobium\_caulinodans\_ORS\_571\_uid19267 | -0.0106 | -0.0332 |  |  |
|  | Agromonas\_oligotrophica\_S58\_uid191613 | -0.0279 | -0.0619 | 175 |  |
|  | Bradyrhizobium\_BTAi1\_uid16137 | -0.0183 | -0.0522 | 169384 |  |
|  | Bradyrhizobium\_S23321\_uid72425 | 0.0005 | -0.0358 | 7231219 |  |
|  | Beijerinckia\_indica\_ATCC\_9039\_uid20841 | -0.0295 | -0.0538 | 4049770 |  |
|  | Bradyrhizobium\_japonicum\_uid17 | -0.0200 | -0.0546 | 680784 |  |
|  | Brucella\_suis\_ATCC\_23445\_uid20371 (&) | 0.1490 | 0.1284 | 1810018 | 152 for Brucella abortus (Garcia *et al.* 1987) |
|  | Methylobacterium\_4\_46\_uid18809 | -0.0523 | -0.0802 | 1153961 |  |
|  | Methylocystis\_SC2\_uid173412 | -0.0204 | -0.0430 | 2229694 |  |
|  | Methylobacterium\_chloromethanicum\_CM4\_uid19527 | -0.0358 | -0.0602 | 8944 |  |
|  | Methylobacterium\_extorquens\_PA1\_uid18637 (\*) | -0.0337 | -0.0581 | 5470792 | 2700 (Nogueira *et al.* 1998) |
|  | Methylobacterium\_nodulans\_ORS\_2060\_uid20477 | -0.0497 | -0.0774 | 1349967 |  |
|  | Methylobacterium\_populi\_BJ001\_uid19559 | -0.0277 | -0.0539 | 812 |  |
|  | Methylobacterium\_radiotolerans\_JCM\_2831\_uid18817 (\*) | -0.0519 | -0.0785 | 4549678 | 2000 (Nogueira *et al.* 1998) |
|  | Nitrobacter\_hamburgensis\_X14\_uid13473 | 0.0244 | -0.0136 | 120319 |  |
|  | Nitrobacter\_winogradskyi\_Nb-255\_uid13474 | 0.0331 | -0.0049 | 114333 |  |
|  | Ochrobactrum\_anthropi\_ATCC\_49188\_uid19485 | 0.0883 | 0.0666 | 991 |  |
|  | Oligotropha\_carboxidovorans\_OM4\_uid66839 | 0.0731 | 0.0340 | 3538916 |  |
|  | Rhodopseudomonas\_palustris\_BisA53\_uid15751 | 0.0239 | -0.0147 | 422569 |  |
|  | Xanthobacter\_autotrophicus\_Py2\_uid15756 | -0.0322 | -0.0554 | 2054010 |  |
| T\_gammatolerans | Archaeoglobus\_fulgidus\_uid104 | -0.0121 | -0.0801 | 1429943 |  |
|  | Archaeoglobus\_profundus\_DSM\_5631\_uid32583 | -0.0147 | -0.0853 | 1303658 |  |
|  | Archaeoglobus\_sulfaticallidus\_PM70\_1\_uid196460 | 0.0066 | -0.0536 |  |  |
|  | Ferroglobus\_placidus\_DSM\_10642\_uid33635 | -0.0091 | -0.0826 |  |  |
|  | Methanocaldococcus\_FS406\_22\_uid37943 | -0.0167 | -0.1050 | 1378754 |  |
|  | Methanocaldococcus\_fervens\_AG86\_uid32615 | -0.0148 | -0.1018 | 970395 |  |
|  | Methanothermus\_fervidus\_DSM\_2088\_uid33689 | 0.0281 | -0.0230 |  |  |
|  | Methanotorris\_igneus\_Kol\_5\_uid51821 | -0.0041 | -0.0674 |  |  |
|  | Methanocaldococcus\_infernus\_ME\_uid32611 | -0.0254 | -0.1101 | 298991 |  |
|  | Methanopyrus\_kandleri\_uid294 | 0.0173 | -0.0337 |  |  |
|  | Methanocaldococcus\_vulcanius\_M7\_uid33047 | -0.0159 | -0.1046 | 39373 |  |
|  | Pyrococcus\_NA2\_uid65431 (\*) | 0.0004 | -0.1360 | 579716 |  |
|  | Pyrococcus\_ST04\_uid162927 | -0.0123 | -0.1425 | 228332 |  |
|  | Pyrococcus\_furiosus\_COM1\_uid163827 (\*) | -0.0197 | -0.1559 | 1480209 | 3000 (DiRuggiero *et al.* 1997) |
|  | Pyrococcus\_yayanosii\_CH1\_uid66055 | -0.0193 | -0.1571 | 1426784 |  |
|  | Thermococcus\_4557\_uid67883 | 0.0422 | -0.0970 | 1376025 |  |
|  | Thermococcus\_CL1\_uid167371 | 0.0162 | -0.1271 | 1020227 |  |
|  | Thermococcus\_gammatolerans\_EJ3\_uid33671 (\*) | -0.0217 | -0.1684 | 127165 | 6000 (Jolivet *et al.* 2003) |
|  | Thermococcus\_litoralis\_DSM\_5473\_uid81925 | 0.0325 | -0.1118 |  |  |
|  | Thermococcus\_sibiricus\_MM\_739\_uid34531 | 0.0501 | -0.0841 | 1783814 |  |
| H\_salinarum | Halogeometricum\_borinquense\_DSM\_11551\_uid20743 |  | 0.0989 |  |  |
|  | Haloarcula\_hispanica\_N601\_uid227070 |  | 0.0440 |  |  |
|  | Halorubrum\_lacusprofundi\_ATCC\_49239\_uid18455 |  | -0.0780 |  |  |
|  | Haloarcula\_marismortui\_ATCC\_43049\_uid105 |  | 0.0466 |  |  |
|  | Haloferax\_mediterranei\_ATCC\_33500\_uid43185 |  | 0.0777 |  |  |
|  | Halomicrobium\_mukohataei\_DSM\_12286\_uid27945 |  | 0.0137 |  |  |
|  | Halovivax\_ruber\_XH\_70\_uid59897 |  | 0.0341 |  |  |
|  | Halobacterium\_salinarum\_R1\_uid106 (\*) |  | 0.0877 |  |  |
|  | Haloterrigena\_turkmenica\_DSM\_5511\_uid30411 |  | 0.0494 |  |  |
|  | Halorhabdus\_utahensis\_DSM\_12940\_uid29305 |  | -0.0196 |  |  |
|  | Haloferax\_volcanii\_DS2\_uid12524 |  | 0.0782 |  |  |
|  | Halopiger\_xanaduensis\_SH\_6\_uid56049 |  | 0.0701 |  |  |
|  | Natrinema\_J7\_uid89473 |  | 0.0448 |  |  |
|  | Natronobacterium\_gregoryi\_SP2\_uid60135 |  | 0.0194 |  |  |
|  | Natrialba\_magadii\_ATCC\_43099\_uid30691 |  | 0.0782 |  |  |
|  | Natronococcus\_occultus\_SP4\_uid46985 |  | 0.0748 |  |  |
|  | Natrinema\_pellirubrum\_DSM\_15624\_uid52951 |  | 0.0444 |  |  |
|  | Natronomonas\_pharaonis\_uid15742 |  | -0.0377 |  |  |
|  | Salinarchaeum\_laminariae\_Harcht\_Bsk1\_uid202311 |  | -0.0720 |  |  |
|  | halophilic\_archaeon\_DL31\_uid52855 |  | -0.0162 |  |  |

**Table S3** Parameters *fi* and *p* and their 95% confidence intervals, for the model (1) fitted to the GOC250 vs. 16S rRNA data of different datasets. To improve readability, we report parameter *p* values as *a*, where, *a= -ln (p)* (and *p=e-a*). The confidence intervals for four parameter models were obtained in two steps – confidence interval for *fi* was estimated for the whole dataset and fixed at that estimation. This *fi* value was then used for the estimation of confidence intervals for the parameter *p* for the R-R, R-N and N-N categories of points. Therefore, confidence intervals for *fi* are the same for the two parameter and four parameter datasets.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Separate datasets (Two parameters per graph - all data on each graph pooled )** | | | | | | |
| Dataset | *a*  (Parameter *p=e-a*) | Confidence interval of *a* (lower bound) | Confidence interval of *a* (higher bound) | *fi* | Confidence interval of *fi*(lower bound) | Confidence interval of *fi* (higher bound) |
| D\_radiodurans\_wholeDataset | 19.134 | 15.423 | 25.243 | 0.14 | 0.127 | 0.154 |
| E\_faecium\_wholeDataset | 31.963 | 24.863 | 44.929 | 0.322 | 0.298 | 0.343 |
| P\_arcticum\_wholeDataset | 14.488 | 11.764 | 19.795 | 0.172 | 0.137 | 0.204 |
| M\_radiotolerans\_wholeDataset | 46.217 | 40.647 | 53.132 | 0.186 | 0.175 | 0.201 |
| T\_gammatolerans\_wholeDataset | 94.066 | 78.261 | 114.74 | 0.152 | 0.147 | 0.158 |
| K\_radiotolerans\_wholeDataset | 24.269 | 20.935 | 27.993 | 0.248 | 0.214 | 0.276 |
| C\_thermalis\_wholeDataset | 53.05 | 44.451 | 67.22 | 0.091 | 0.084 | 0.098 |
| **Four parameter models (Parameter fi same within dataset for R-R, R-N and N-N categories of points)** | | | | | | |
| Dataset | *a*  (Parameter *p=e-a*) | Confidence interval of *a* (lower bound) | Confidence interval of *a* (higher bound) | Parameter fi taken from the two parameters model | Confidence interval of *fi* (lower bound) | Confidence interval of *fi* (higher bound) |
| D\_radiodurans\_R-R | 42.38 | 26.938 | 57.31 | 0.14 | 0.127 | 0.154 |
| D\_radiodurans\_R-N | 19.584 | 16.856 | 29.604 | 0.14 | 0.127 | 0.154 |
| D\_radiodurans\_N-N | 13.261 | 11.757 | 14.842 | 0.14 | 0.127 | 0.154 |
| E\_faecium\_R-R | 91.118 | N/A | N/A | 0.322 | N/A | N/A |
| E\_faecium\_R-N | 66.013 | 36.737 | 94.294 | 0.322 | 0.298 | 0.343 |
| E\_faecium\_N-N | 26.411 | 24.012 | 30.791 | 0.322 | 0.298 | 0.343 |
| P\_arcticum\_R-R | 32.994 | 31.805 | 33.48 | 0.172 | 0.137 | 0.204 |
| P\_arcticum\_R-N | 22.21 | 20.894 | 23.835 | 0.172 | 0.137 | 0.204 |
| P\_arcticum\_N-N | 12.886 | 12.085 | 14.03 | 0.172 | 0.137 | 0.204 |
| M\_radiotolerans\_R-R | 349.971 | N/A | N/A | 0.186 | N/A | N/A |
| M\_radiotolerans\_R-N | 60.582 | 40.534 | 639.143 | 0.186 | 0.175 | 0.201 |
| M\_radiotolerans\_N-N | 44.774 | 39.314 | 51.684 | 0.186 | 0.175 | 0.201 |
| T\_gammatolerans\_R-R | 93.983 | 61.488 | 206.467 | 0.152 | 0.147 | 0.158 |
| T\_gammatolerans\_R-N | 113.719 | 94.394 | 160.084 | 0.152 | 0.147 | 0.158 |
| T\_gammatolerans\_N-N | 82.1 | 63.66 | 105.735 | 0.152 | 0.147 | 0.158 |
| K\_radiotolerans\_R-R | 27.07 | 21.5 | 42.218 | 0.248 | 0.214 | 0.276 |
| K\_radiotolerans\_R-N | 26.503 | 23.587 | 29.561 | 0.248 | 0.214 | 0.276 |
| K\_radiotolerans\_N-N | 23.33 | 21.74 | 25.016 | 0.248 | 0.214 | 0.276 |
| C\_thermalis\_R-R | 135.846 | N/A | N/A | 0.091 | N/A | N/A |
| C\_thermalis\_R-N | 183.650 | N/A | N/A | 0.091 | N/A | N/A |
| C\_thermalis\_N-N | 53.033 | 45.608 | 64.872 | 0.091 | 0.084 | 0.098 |
| **Six parameters per dataset (R-R, R-N, and N-N categories of points fitted independently from each other)** | | | | | | |
| Dataset | *a*  (Parameter *p=e-a*) | Confidence interval of *a* (lower bound) | Confidence interval of *a* (higher bound) | *fi* | Confidence interval of *fi*(lower bound) | Confidence interval of *fi* (higher bound) |
| D\_radiodurans\_R-R | 52.596 | 21.634 | 541.001 | 0.155 | 0.13 | 0.194 |
| D\_radiodurans\_R-N | 17.229 | 14.288 | 27.652 | 0.136 | 0.129 | 0.142 |
| D\_radiodurans\_N-N | 12.71 | 8.874 | 17.535 | 0.125 | -0.012 | 0.198 |
| E\_faecium\_R-R | N/A | N/A | N/A | N/A | N/A | N/A |
| E\_faecium\_R-N | 51.714 | 20.447 | 79.264 | 0.295 | 0.263 | 0.347 |
| E\_faecium\_N-N | 25.139 | 20.745 | 34.901 | 0.314 | 0.288 | 0.343 |
| P\_arcticum\_R-R | 28.918 | 17.756 | 30.659 | 0.108 | -0.228 | 0.142 |
| P\_arcticum\_R-N | 20.094 | 18.606 | 22.084 | 0.163 | 0.157 | 0.17 |
| P\_arcticum\_N-N | 12.635 | 10.379 | 17.094 | 0.167 | 0.123 | 0.209 |
| M\_radiotolerans\_R-R | N/A | N/A | N/A | N/A | N/A | N/A |
| M\_radiotolerans\_R-N | 53.334 | 36.288 | 622.675 | 0.147 | 0.132 | 0.16 |
| M\_radiotolerans\_N-N | 46.179 | 40.362 | 54.064 | 0.198 | 0.184 | 0.215 |
| T\_gammatolerans\_R-R | 36.385 | 0.186 | 289.015 | -0.443 | -0.768 | 0.163 |
| T\_gammatolerans\_R-N | 113.457 | 93.255 | 163.895 | 0.152 | 0.143 | 0.163 |
| T\_gammatolerans\_N-N | 82.192 | 64.17 | 107.41 | 0.153 | 0.147 | 0.159 |
| K\_radiotolerans\_R-R | 18.176 | 15.154 | 44.918 | 0.135 | 0.082 | 0.257 |
| K\_radiotolerans\_R-N | 27.832 | 21.22 | 34.936 | 0.258 | 0.21 | 0.288 |
| K\_radiotolerans\_N-N | 24.004 | 19.522 | 29.209 | 0.256 | 0.201 | 0.296 |
| C\_thermalis\_R-R | N/A | N/A | N/A | N/A | N/A | N/A |
| C\_thermalis\_R-N | 319.642 | 23.484 | 356.331 | 0.088 | 0.078 | 0.098 |
| C\_thermalis\_N-N | 53.473 | 44.676 | 68.054 | 0.092 | 0.084 | 0.102 |

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**Figure S1** 95% confidence intervals for parameter *p* for the model (1) fitted to the GOC250 vs. 16S rRNA data of the D\_radiodurans dataset, given an *fi* value fixed at the whole dataset estimate (i.e. shown are confidence intervals for *p* presented in the four parameter model in Table S3). Parameter *p* estimates the rate of decline of the model fits to the GOC250-16S rRNA distance points. Shown are fits (full line) and confidence intervals (dotted lines) for three different categories of data points. Each data point represented a genome pair; the three categories of points were defined by radiation resistance (R) or nonresistance (N) of species in the species pair. Model describing the R-R category is shown in black, the R-N category in red, and the N-N category in blue.

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