MOLECULAR ECOLOGY

**Supplemental Information for:**

# Altitudinal variation of the gut microbiota in wild house mice

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**Table S1.** Sample information.

| MVZ ID | Altitude (m) | Latitude | Longitude | Country | Locality | Sex | Reproductive state | Sample storage | Weight (g) | BMI | $\delta^{13}C$ | $\delta^{15}N$ | Climate PC1 | Climate PC2 | Barcode Sequence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mamm:230332 | 2973 | -0.8736 | -78.6071 | Ecuador | Latacunga | F | non-pregnant | RNAlater | 11.5 | 0.00171 | -17.9 | 9.2 | -1.9704 | -2.5255 | GTGCACGATAAT |
| Mamm:230336 | 2973 | -0.8736 | -78.6071 | Ecuador | Latacunga | M | na | RNAlater | 14.0 | 0.00219 | -17.0 | 8.2 | -1.9704 | -2.5255 | GTCGCTTGCACA |
| Mamm:230338 | 2867 | -0.8633 | -78.6119 | Ecuador | Latacunga | F | pregnant | RNAlater | 13.5 | 0.00183 | -9.5 | 9.6 | -1.9704 | -2.5255 | GGTCTAGGTCTA |
| Mamm:230339 | 2818 | -0.8561 | -78.6132 | Ecuador | Latacunga | F | non-pregnant | RNAlater | 13.5 | 0.00216 | -16.7 | 6.3 | -1.9704 | -2.5255 | TCTACCACGAAG |
| Mamm:230340 | 2865 | -0.8697 | -78.6214 | Ecuador | Latacunga | F | non-pregnant | RNAlater | 11.0 | 0.00168 | -12.4 | 8.6 | -1.9704 | -2.5255 | TCAGGACGTATC |
| Mamm:230342 | 2951 | -0.8268 | -78.6670 | Ecuador | Latacunga | M | na | RNAlater | 21.5 | 0.00260 | -20.2 | 7.8 | -2.3168 | -3.3796 | GAATATACCTGG |
| Mamm:230346 | 2927 | -0.8366 | -78.6632 | Ecuador | Latacunga | M | na | RNAlater | 6.5 | 0.00141 | -20.5 | 8.8 | -1.9704 | -2.5255 | GAAAGGTGAGAA |
| Mamm:230347 | 10 | -0.8461 | -80.1649 | Ecuador | Portoviejo | M | na | RNAlater | 13.0 | 0.00219 | -21.7 | 7.2 | 2.6167 | 2.0851 | ACCACCGTAACC |
| Mamm:230348 | 14 | -0.9254 | -80.4793 | Ecuador | Portoviejo | F | non-pregnant | RNAlater | 9.5 | 0.00152 | -13.2 | 8.5 | 1.4929 | 2.7912 | TCCGTTCGTTTA |
| Mamm:230349 | 18 | -0.8830 | -80.1341 | Ecuador | Portoviejo | M | na | RNAlater | 14.0 | 0.00249 | -11.8 | 8.7 | 2.6167 | 2.0851 | ATGTTTAGACGG |
| Mamm:230352 | 33 | -0.8567 | -80.1646 | Ecuador | Portoviejo | F | non-pregnant | RNAlater | 11.0 | 0.00238 | -13.7 | 21.1 | 2.6167 | 2.0851 | ACATGTCACGTG |
| Mamm:230353 | 15 | -0.8549 | -80.1629 | Ecuador | Portoviejo | F | non-pregnant | RNAlater | 13.0 | 0.00144 | -10.7 | 9.0 | 2.6167 | 2.0851 | CTTTAGCGCTGG |
| Mamm:230355 | 16 | -0.8503 | -80.1640 | Ecuador | Portoviejo | F | pregnant | RNAlater | 13.5 | 0.00240 | -24.7 | 6.0 | 2.6167 | 2.0851 | GCAAGTGTGAGG |
| Mamm:230357 | 16 | -0.8483 | -80.1634 | Ecuador | Portoviejo | M | na | RNAlater | 7.5 | 0.00123 | -21.8 | 4.6 | 2.6167 | 2.0851 | CTCGGTCAACCA |
| Mamm:230361 | 100 | -1.0794 | -80.5399 | Ecuador | Portoviejo | M | na | RNAlater | 11.0 | 0.00176 | -16.2 | 8.4 | 1.1397 | 2.6476 | CGTACCAGATCC |
| Mamm:230363 | 73 | -1.0808 | -80.5233 | Ecuador | Portoviejo | F | non-pregnant | RNAlater | 17.3 | 0.00208 | -10.3 | 11.9 | 1.1397 | 2.6476 | CTGGTCTTACGG |
| Mamm:230365 | 43 | -1.0554 | -80.4901 | Ecuador | Portoviejo | M | na | RNAlater | 9.8 | 0.00164 | -18.1 | 8.7 | 1.5210 | 2.6725 | CAAGTCGAATAC |
| Mamm:230366 | 16 | -0.8503 | -80.1640 | Ecuador | Portoviejo | M | na | RNAlater | 9.3 | 0.00178 | -8.6 | 7.6 | 2.6167 | 2.0851 | ACCCTATTGCGG |
| Mamm:230368 | 1832 | 0.0369 | -78.6968 | Ecuador | Nanegalito | F | pregnant | RNAlater | no data | no data | -16.6 | 7.4 | 2.4807 | -2.8582 | TGAATCGAAGCT |
| Mamm:230369 | 1832 | 0.0369 | -78.6968 | Ecuador | Nanegalito | M | na | RNAlater | 4.0 | 0.00087 | -17.1 | 7.3 | 2.4807 | -2.8582 | GTTATGACGGAT |
| Mamm:230373 | 1747 | 0.0760 | -78.6960 | Ecuador | Nanegalito | M | na | RNAlater | 12.3 | 0.00113 | -14.9 | 8.6 | 2.4807 | -2.8582 | GTGTATCGCCAC |
| Mamm:230375 | 1577 | 0.0118 | -78.6725 | Ecuador | Nanegalito | M | na | RNAlater | 13.5 | 0.00153 | -20.9 | 8.6 | 2.4807 | -2.8582 | CCAAACTCGTCG |
| Mamm:230376 | 1577 | 0.0118 | -78.6681 | Ecuador | Nanegalito | M | na | RNAlater | 13.3 | 0.00147 | -21.8 | 8.7 | 2.4807 | -2.8582 | ACGTGAGGAACG |
| Mamm:230377 | 1470 | 0.0330 | -78.6814 | Ecuador | Nanegalito | M | na | RNAlater | 11.5 | 0.00171 | -17.5 | 7.0 | 2.4807 | -2.8582 | AGACGTTGCTAC |
| Mamm:230379 | 1599 | 0.0622 | -78.6820 | Ecuador | Nanegalito | F | pregnant | RNAlater | 22.0 | 0.00266 | -18.1 | 8.3 | 2.4807 | -2.8582 | AAGCGTACATTG |
| Mamm:230382 | 1774 | 0.0649 | -78.6893 | Ecuador | Nanegalito | M | na | RNAlater | 10.3 | 0.00127 | -19.2 | 7.0 | 2.4807 | -2.8582 | AGCCTCATGATG |
| Mamm:230383 | 1377 | 0.0908 | -78.6978 | Ecuador | Nanegalito | F | pregnant | RNAlater | 20.0 | 0.00247 | -16.8 | 6.4 | no data | no data | AGAATAGCGCTT |
| Mamm:230388 | 3050 | -0.4292 | -78.4315 | Ecuador | Tumbaco | F | pregnant | RNAlater | 19.0 | 0.00276 | -17.1 | 9.3 | -0.9376 | -3.6268 | AATATCGGGATC |
| Mamm:230397 | 2589 | -0.2479 | -78.3570 | Ecuador | Tumbaco | F | pregnant | RNAlater | 12.0 | 0.00192 | -21.0 | 7.3 | -0.6617 | -1.5530 | TATAGGCTCCGC |
| Mamm:230400 | 2381 | -0.2116 | -78.3870 | Ecuador | Tumbaco | F | pregnant | RNAlater | 13.0 | 0.00198 | -15.0 | 6.8 | -0.6617 | -1.5530 | TCTGGGCATTGA |
| Mamm:230401 | 2875 | -0.2162 | -78.4057 | Ecuador | Tumbaco | M | na | RNAlater | 13.5 | 0.00187 | -10.5 | 7.6 | -1.9704 | -2.5255 | TAGTGCATTCGG |
| Mamm:230402 | 2363 | -0.1975 | -78.3941 | Ecuador | Tumbaco | M | na | RNAlater | 15.0 | 0.00213 | -13.0 | 6.4 | -0.6617 | -1.5530 | CTGCAGTAAGTA |
| Mamm:230403 | 2653 | -0.2528 | -78.3387 | Ecuador | Tumbaco | F | non-pregnant | RNAlater | 13.3 | 0.00188 | -10.8 | 8.3 | -0.6617 | -1.5530 | GCACTATACGCA |
| Mamm:230404 | 2614 | -0.2482 | -78.3552 | Ecuador | Tumbaco | M | na | RNAlater | 15.0 | 0.00306 | -11.0 | 7.6 | -0.6617 | -1.5530 | ATCGTGTGTTGG |
| Mamm:230405 | 2973 | -0.8736 | -78.6071 | Ecuador | Latacunga | M | na | RNAlater | 12.5 | 0.00177 | -21.5 | 11.4 | -1.9704 | -2.5255 | TCAATGACCGCA |
| Mamm:230406 | 2653 | -0.2415 | -78.3350 | Ecuador | Tumbaco | M | na | RNAlater | 13.8 | 0.00204 | -9.4 | 8.7 | -0.6617 | -1.5530 | CTTCCGCAGACA |
| Mamm:230407 | 2421 | -0.1959 | -78.3677 | Ecuador | Tumbaco | F | pregnant | RNAlater | 10.5 | 0.00177 | -9.0 | 7.7 | -1.9704 | -2.5255 | TTAAACCGCGCC |

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**Table S1.** Sample information. (continued)

| MVZ ID | Altitude (m) | Latitude | Longitude | Country | Locality | Sex | Reproductive state | Sample storage | Weight (g) | BMI | $\delta^{13}C$ | $\delta^{15}N$ | Climate PC1 | Climate PC2 | Barcode Sequence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mamm:230408 | 2421 | -0.1959 | -78.3677 | Ecuador | Tumbaco | F | pregnant | RNAlater | no data | no data | -8.8 | 7.8 | -1.9704 | -2.5255 | CTTGCATACCGG |
| Mamm:230409 | 2557 | -0.1764 | -78.3289 | Ecuador | Tumbaco | M | na | RNAlater | 17.0 | 0.00192 | -16.2 | 9.0 | -1.0209 | -5.7600 | CCAATGATAAGC |
| Mamm:230413 | 525 | -0.3910 | -79.2102 | Ecuador | Santo_Domingo | M | na | RNAlater | 7.0 | 0.00112 | -11.9 | 6.6 | 4.9440 | -0.3546 | ATTCCCAGAACG |
| Mamm:230414 | 369 | -0.1249 | -79.2584 | Ecuador | Santo_Domingo | F | pregnant | RNAlater | 25.0 | 0.00372 | -22.1 | 8.7 | 6.1043 | -0.9465 | TGCGGGATTCAT |
| Mamm:230417 | 429 | -0.2440 | -79.2613 | Ecuador | Santo_Domingo | F | non-pregnant | RNAlater | 10.3 | 0.00093 | -22.4 | 8.0 | 5.3163 | -0.4507 | TTAGACTCGGAA |
| Mamm:230418 | 320 | -0.2439 | -79.3369 | Ecuador | Santo_Domingo | F | non-pregnant | RNAlater | 4.0 | 0.00119 | -15.0 | 7.9 | 5.3097 | -0.0480 | CAAACTGCGTTG |
| Mamm:230421 | 335 | -0.2442 | -79.3385 | Ecuador | Santo_Domingo | M | na | RNAlater | 9.5 | 0.00148 | -18.0 | 7.7 | 5.3097 | -0.0480 | CGGCACTATCAC |
| Mamm:230423 | 361 | -0.2443 | -79.3274 | Ecuador | Santo_Domingo | F | non-pregnant | RNAlater | 15.0 | 0.00185 | -18.4 | 5.6 | 5.3163 | -0.4507 | GACCGATAGGGA |
| Mamm:230425 | 465 | -0.2068 | -79.1809 | Ecuador | Santo_Domingo | F | pregnant | RNAlater | 9.0 | 0.00131 | -21.1 | 8.2 | 5.3163 | -0.4507 | CATTTCGCACTT |
| Mamm:230428 | 388 | -0.1173 | -79.2591 | Ecuador | Santo_Domingo | M | na | RNAlater | 9.8 | 0.00164 | -15.8 | 9.0 | 6.1043 | -0.9465 | TTAAGCGCCTGA |
| Mamm:230430 | 477 | -0.1897 | -79.3184 | Ecuador | Santo_Domingo | M | na | RNAlater | 13.5 | 0.00196 | -20.1 | 7.5 | 5.3163 | -0.4507 | GGCGAACTGAAG |
| Mamm:230434 | 487 | -0.2796 | -79.2118 | Ecuador | Santo_Domingo | M | na | RNAlater | 12.8 | 0.00161 | -14.7 | 7.6 | 5.3163 | -0.4507 | AGGTGGTGGAGT |
| Mamm:231381 | 94 | -8.7841 | -63.8416 | Brazil | Porto_Velho | M | na | Flash frozen | 10.0 | 0.00145 | -20.1 | 9.8 | 3.7955 | 1.0665 | GCAATCCTTGCG |
| Mamm:231382 | 97 | -8.7716 | -63.7976 | Brazil | Porto_Velho | M | na | Flash frozen | 12.3 | 0.00178 | -20.0 | 9.5 | 3.5010 | 1.3392 | CCTGCTTCCTTC |
| Mamm:231383 | 83 | -8.7825 | -63.8457 | Brazil | Porto_Velho | F | pregnant | Flash frozen | 13.8 | 0.00166 | -20.0 | 10.1 | 3.7955 | 1.0665 | CAAGGCACAAGG |
| Mamm:231384 | 72 | -8.7779 | -63.8415 | Brazil | Porto_Velho | F | pregnant | Flash frozen | 15.0 | 0.00163 | -16.3 | 8.1 | 3.7955 | 1.0665 | GGCCTATAAGTC |
| Mamm:231385 | 77 | -8.7645 | -63.8398 | Brazil | Porto_Velho | F | non-pregnant | Flash frozen | 12.3 | 0.00162 | -24.0 | 9.9 | 3.7955 | 1.0665 | TCCATTTCATGC |
| Mamm:231389 | 88 | -8.7828 | -63.8520 | Brazil | Porto_Velho | M | na | Flash frozen | 7.0 | 0.00115 | -16.9 | 8.4 | 3.7955 | 1.0665 | GTTTCACGCGAA |
| Mamm:231392 | 92 | -8.7715 | -63.8029 | Brazil | Porto_Velho | F | non-pregnant | Flash frozen | 12.5 | 0.00158 | -18.4 | 9.4 | 3.5010 | 1.3392 | CCAGGGACTTCT |
| Mamm:231393 | 88 | -8.7843 | -63.8033 | Brazil | Porto_Velho | F | non-pregnant | Flash frozen | 13.0 | 0.00180 | -16.2 | 7.7 | 3.5010 | 1.3392 | ACAAGAACCTTG |
| Mamm:231394 | 86 | -8.7763 | -63.8004 | Brazil | Porto_Velho | F | pregnant | Flash frozen | 14.0 | 0.00158 | -23.6 | 10.6 | 3.5010 | 1.3392 | TACTCTCTTAGC |
| Mamm:232981 | 2615 | -17.3738 | -66.1528 | Bolivia | Cochabamba | M | na | RNAlater | 16.7 | 0.00185 | -15.6 | 7.5 | -2.8342 | 2.1588 | TGACTAATGGCC |
| Mamm:232984 | 2815 | -17.6442 | -65.9884 | Bolivia | Cochabamba | M | na | RNAlater | 11.8 | 0.00176 | -21.1 | 9.1 | -2.8650 | 2.6275 | ACCGGAGTAGGA |
| Mamm:232985 | 2783 | -17.6170 | -66.0169 | Bolivia | Cochabamba | M | na | RNAlater | 15.6 | 0.00201 | -19.2 | 10.7 | -2.9026 | 2.3024 | TGAGGACTACCT |
| Mamm:232986 | 2740 | -17.5397 | -66.0132 | Bolivia | Cochabamba | M | na | RNAlater | 17.1 | 0.00207 | -10.9 | 8.8 | -2.9026 | 2.3024 | CAATCGGCTTGC |
| Mamm:232987 | 2551 | -17.4365 | -66.1618 | Bolivia | Cochabamba | M | na | RNAlater | 17.0 | 0.00197 | -18.6 | 10.4 | -2.8342 | 2.1588 | AACACTCGATCG |
| Mamm:232988 | 2571 | -17.4464 | -66.1680 | Bolivia | Cochabamba | F | non-pregnant | RNAlater | 17.8 | 0.00168 | -10.9 | 16.1 | -2.6533 | 3.0717 | TGACCGGCTGTT |
| Mamm:232989 | 2569 | -17.3911 | -66.2303 | Bolivia | Cochabamba | F | pregnant | RNAlater | 15.2 | 0.00210 | -12.7 | 9.6 | -2.6533 | 3.0717 | CTCTCTCACTTG |
| Mamm:232991 | 2530 | -17.4705 | -66.3413 | Bolivia | Cochabamba | F | pregnant | RNAlater | 25.5 | 0.00245 | -10.6 | 12.8 | -3.2274 | 1.3266 | ATTGCAAGCAAC |
| Mamm:232992 | 2542 | -17.4371 | -66.3341 | Bolivia | Cochabamba | M | na | RNAlater | 18.6 | 0.00215 | -16.7 | 9.2 | -3.2274 | 1.3266 | CACGTGACATGT |
| Mamm:232993 | 2542 | -17.4276 | -66.3312 | Bolivia | Cochabamba | F | non-pregnant | RNAlater | 18.2 | 0.00215 | -20.9 | 13.8 | -2.6533 | 3.0717 | CACAGTTGAAGT |
| Mamm:232994 | 2552 | -17.3956 | -66.3123 | Bolivia | Cochabamba | M | na | RNAlater | 18.2 | 0.00210 | -16.9 | 11.1 | -2.6533 | 3.0717 | CTAGGATCACTG |
| Mamm:232996 | 2575 | -17.3795 | -66.3066 | Bolivia | Cochabamba | F | non-pregnant | RNAlater | 15.6 | 0.00197 | -15.2 | 12.3 | -2.6533 | 3.0717 | GATGACCCAAAT |
| Mamm:232997 | 3388 | -16.5391 | -68.0710 | Bolivia | La_Paz | F | non-pregnant | RNAlater | 17.0 | 0.00227 | -20.5 | 8.9 | -4.1017 | 0.3649 | GGAATTATCGGT |
| Mamm:232998 | 3866 | -16.5477 | -68.0251 | Bolivia | La_Paz | M | na | RNAlater | 14.6 | 0.00193 | -21.1 | 8.8 | -4.1017 | 0.3649 | CATCAAGCATAG |
| Mamm:233003 | 3855 | -16.1716 | -68.8284 | Bolivia | Lake_Titikaka | F | pregnant | RNAlater | 15.8 | 0.00209 | -24.1 | 7.1 | -4.3249 | -0.0515 | GCTAGACACTAC |
| Mamm:233004 | 3845 | -16.3326 | -68.8250 | Bolivia | Lake_Titikaka | M | na | RNAlater | 13.8 | 0.00191 | -22.4 | 8.3 | -4.3249 | -0.0515 | TTGGATTGAACG |
| Mamm:233005 | 3838 | -16.1902 | -68.6007 | Bolivia | Lake_Titikaka | M | na | RNAlater | 20.1 | 0.00238 | -23.6 | 6.2 | -4.5448 | -0.1081 | GATATACCAGTG |
| Mamm:233006 | 3906 | -16.2200 | -68.5830 | Bolivia | Lake_Titikaka | F | non-pregnant | RNAlater | 17.6 | 0.00215 | -22.0 | 9.0 | -4.5448 | -0.1081 | AACAAACTGCCA |

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**Table S1.** Sample information. (continued)

| MVZ ID | Altitude (m) | Latitude | Longitude | Country | Locality | Sex | Reproductive state | Sample storage | Weight (g) | BMI | $\delta^{13}C$ | $\delta^{15}N$ | Climate PC1 | Climate PC2 | Barcode Sequence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mamm:233007 | 3835 | -16.2021 | -68.5888 | Bolivia | Lake_Titikaka | F | non-pregnant | RNAlater | 10.8 | 0.00165 | -22.8 | 8.6 | -4.5448 | -0.1081 | GTAGACATGTGT |
| Mamm:233008 | 3816 | -16.2531 | -68.5672 | Bolivia | Lake_Titikaka | M | na | RNAlater | 16.6 | 0.00188 | -22.4 | 7.4 | -4.5448 | -0.1081 | TACAGTTACGCG |
| Mamm:233009 | 3839 | -16.2757 | -68.5511 | Bolivia | Lake_Titikaka | M | na | RNAlater | 10.9 | 0.00179 | -21.8 | 9.6 | -4.5448 | -0.1081 | CAAGCCCTAGTA |
| Mamm:233010 | 3835 | -16.1836 | -68.7684 | Bolivia | Lake_Titikaka | M | na | RNAlater | 17.5 | 0.00219 | -25.4 | 5.4 | -4.3249 | -0.0515 | TAGTGTCGGATC |
| Mamm:233012 | 3060 | -16.6022 | -68.0651 | Bolivia | La_Paz | F | non-pregnant | RNAlater | 9.3 | 0.00179 | -21.9 | 16.0 | -4.1017 | 0.3649 | CATCGCGTTGAC |
| Mamm:233013 | 3276 | -16.5742 | -68.0786 | Bolivia | La_Paz | M | na | RNAlater | 17.8 | 0.00220 | -20.3 | 8.2 | -4.1017 | 0.3649 | GCACATAGTCGT |
| Mamm:233015 | 3097 | -16.5892 | -68.0691 | Bolivia | La_Paz | M | na | RNAlater | 24.3 | 0.00243 | -20.2 | 10.7 | -4.1017 | 0.3649 | GGCAAATACACT |
| Mamm:233017 | 3011 | -16.6281 | -68.0517 | Bolivia | La_Paz | F | non-pregnant | RNAlater | 11.3 | 0.00177 | -21.7 | 8.7 | -4.1017 | 0.3649 | TTACCTTACACC |
| Mamm:233019 | 3728 | -16.5842 | -68.1513 | Bolivia | La_Paz | M | na | RNAlater | 19.0 | 0.00213 | -22.4 | 10.4 | -4.1017 | 0.3649 | GTCATGCTCCAG |
| Mamm:233020 | 3731 | -16.5880 | -68.1521 | Bolivia | La_Paz | F | non-pregnant | RNAlater | 12.3 | 0.00202 | -20.5 | 7.8 | -4.1017 | 0.3649 | CCTAGTAAGCTG |
| Mamm:233022 | 3607 | -16.5841 | -68.1308 | Bolivia | La_Paz | F | non-pregnant | RNAlater | 16.3 | 0.00220 | -17.4 | 7.6 | -4.1017 | 0.3649 | GCTTAGATGTAG |
| Mamm:233023 | 3583 | -16.5806 | -68.1274 | Bolivia | La_Paz | M | na | RNAlater | 13.6 | 0.00164 | -15.5 | 15.3 | -4.1017 | 0.3649 | AAGACGTAGCGG |
| Mamm:233024 | 282 | -17.3268 | -63.2571 | Bolivia | Santa_Cruz | F | non-pregnant | RNAlater | 13.8 | 0.00191 | no | no | 1.9403 | 1.6863 | AGCGACGAAGAC |
| Mamm:233025 | 281 | -17.3280 | -63.2565 | Bolivia | Santa_Cruz | M | na | RNAlater | 12.9 | 0.00187 | -26.0 | 12.8 | 1.9403 | 1.6863 | CTTCCCTAACTC |
| Mamm:233027 | 306 | -17.3306 | -63.2491 | Bolivia | Santa_Cruz | F | pregnant | RNAlater | 14.5 | 0.00181 | -25.9 | 13.7 | 1.9403 | 1.6863 | TGGAAGAACGGC |
| Mamm:233029 | 409 | -17.7348 | -63.1696 | Bolivia | Santa_Cruz | F | non-pregnant | RNAlater | 14.2 | 0.00192 | -25.3 | 13.3 | 2.1125 | 1.1836 | GGAGGAGCAATA |

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**Table S2.** Correlations between Bray-Curtis dissimilarity and predictor variables using ADONIS.

| Variables[a] | All samples | | | Ecuador | | | Bolivia-Brazil | | |
|---|---|---|---|---|---|---|---|---|---|
| | n | $R^2$ | p-value[b] | n | $R^2$ | p-value* | n | $R^2$ | p-value* |
| Altitude | 92 | **0.038** | **<.0001** | 49 | 0.032 | 0.021 | 43 | **0.081** | **<.0001** |
| Body weight | 90 | 0.017 | 0.021 | 47 | 0.025 | 0.192 | 43 | 0.035 | 0.022 |
| BMI | 90 | 0.015 | 0.057 | 47 | 0.023 | 0.357 | 43 | **0.049** | **0.0002** |
| Diet (Carbon) | 91 | 0.018 | 0.003 | 49 | 0.033 | 0.014 | 42 | 0.032 | 0.054 |
| Diet (Nitrogen) | 91 | 0.013 | 0.135 | 49 | 0.017 | 0.817 | 42 | 0.027 | 0.232 |
| Population[1] | 92 | **0.183** | **<.0001** | 49 | 0.116 | 0.003 | 43 | **0.194** | **<.0001** |
| Pregnancy[2] | 45 | 0.020 | 0.721 | 23 | 0.046 | 0.409 | 22 | 0.042 | 0.694 |
| Sex | 92 | 0.009 | 0.821 | 49 | 0.019 | 0.671 | 43 | 0.021 | 0.691 |

[a] Altitude, Body weight, Body mass index (BMI), and Carbon and Nitrogen stable isotope diet measurements are continuous variables. Population (five populations for each altitudinal transect), Pregnancy (pregnant vs non-pregnant), and Sex (female vs male) are categorical variables.

* Significant p-values after Bonferroni correction are bolded (alpha = 0.05/24 = 0.0021)

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**Table S3.** Correlations between altitude and metadata.

| Metadata | All samples (n=92) | | Ecuador (n=49) | | Bolivia-Brazil (n=43) | |
|---|---|---|---|---|---|---|
| | rho | p-value | rho | p-value | rho | p-value |
| Body weight | **0.345** | **0.0009** | 0.2716 | 0.0648 | 0.243 | 0.1163 |
| BMI | **0.335** | **0.0014** | 0.1729 | 0.2451 | **0.477** | **0.0012** |
| Carbon | -0.189 | 0.0731 | 0.0982 | 0.5021 | -0.288 | 0.0648 |
| Nitrogen | 0.031 | 0.7678 | 0.1392 | 0.3402 | -0.371 | 0.0157 |

Raw p-values are shown. Significant p-values after Bonferroni correction are bolded (alpha = 0.05/12 = 0.0042)

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**Table S4.** Correlations between Bray-Curtis dissimilarity and predictor variables using ADONIS with and without flash frozen samples (Porto Velho).

| Variables[a] | All samples | | | | | | Bolivia-Brazil | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | with flash frozen samples | | | without flash frozen samples | | | with flash frozen samples | | | without flash frozen samples | | |
| | n | $R^2$ | p-value* | n | $R^2$ | p-value* | n | $R^2$ | p-value* | n | $R^2$ | p-value* |
| Altitude | 92 | **0.038** | **<.0001** | 81 | **0.035** | **<.0001** | 43 | **0.081** | **<.0001** | 34 | **0.064** | **<0.001** |
| Body weight | 90 | 0.017 | 0.021 | 79 | 0.017 | 0.040 | 43 | 0.035 | 0.022 | 34 | 0.029 | 0.610 |
| BMI | 90 | 0.015 | 0.057 | 79 | 0.013 | 0.329 | 43 | **0.049** | **0.0002** | 34 | 0.026 | 0.8444 |
| Diet (Carbon) | 91 | 0.018 | 0.003 | 80 | 0.021 | 0.006 | 42 | 0.032 | 0.054 | 33 | 0.044 | 0.009 |
| Diet (Nitrogen) | 91 | 0.013 | 0.135 | 80 | 0.015 | 0.138 | 42 | 0.027 | 0.232 | 33 | 0.036 | 0.146 |
| Population | 92 | **0.183** | **<.0001** | 81 | **0.168** | **<0.0001** | 43 | **0.194** | **<.0001** | 34 | **0.144** | **<0.001** |
| Pregnancy | 45 | 0.020 | 0.721 | 39 | 0.021 | 0.884 | 22 | 0.042 | 0.694 | 16 | 0.075 | 0.205 |
| Sex | 92 | 0.009 | 0.821 | 81 | 0.009 | 0.950 | 43 | 0.021 | 0.691 | 34 | 0.025 | 0.904 |

[a] Altitude, Body weight, Body mass index (BMI), and Carbon and Nitrogen stable isotope diet measurements are continuous variables. Population (five populations for each altitudinal transect), Pregnancy (pregnant vs non-pregnant), and Sex (female vs male) are categorical variables.

* Significant p-values after Bonferroni correction used in Table S2 are bolded (alpha = 0.0021)

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**Table S5**. Correlations between altitude and alpha-diversity measurements.

| | All samples | | Ecuador | | Bolivia-Brazil | |
|---|---|---|---|---|---|---|
| | rho | p-value* | rho | p-value* | rho | p-value* |
| OTU counts | 0.09 | 0.39 | 0.13 | 0.37 | -0.12 | 0.44 |
| Phylogenetic diversity | 0.19 | *0.07* | 0.12 | 0.42 | 0.14 | 0.37 |
| Simpson | 0.23 | *0.03* | 0.11 | 0.46 | 0.21 | 0.18 |

*Raw p-values are shown. None of the correlations are significant after Bonferroni correction (alpha = 0.05/9 = 0.006).

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**Table S6.** Correlations between altitude and relative abundances of bacterial phyla.

| Phyla[1] | Average relative abundance | Ecuador | | Bolivia-Brazil | | Fisher's combined p-value [2] |
|---|---|---|---|---|---|---|
| | | rho | p-value | rho | p-value | |
| Firmicutes | 0.44 | 0.13 | 0.36 | 0.17 | 0.29 | 0.34 |
| Bacteroidetes | 0.33 | -0.06 | 0.69 | 0.14 | 0.36 | - |
| Proteobacteria | 0.17 | -0.10 | 0.51 | -0.26 | *0.09* | 0.19 |
| Deferribacteres | 0.04 | -0.15 | 0.30 | -0.12 | 0.46 | 0.41 |
| Unclassified Phylum | 0.01 | 0.05 | 0.73 | 0.18 | 0.24 | 0.48 |
| Tenericutes | 0.004 | 0.01 | 0.95 | 0.11 | 0.49 | 0.82 |
| Verrucomicrobia | 0.003 | -0.05 | 0.73 | 0.15 | 0.35 | - |
| Fusobacteria | 0.002 | -0.11 | 0.44 | 0.15 | 0.32 | - |
| Cyanobacteria | 0.002 | **0.29** | **0.04** | **0.31** | **0.04** | 0.01 |
| Actinobacteria | 0.001 | 0.03 | 0.83 | 0.26 | 0.10 | 0.28 |

[1] Bacterial phyla that have average relative abundance >0.1% across all samples were included.

[2] None of the combined p-values are significant after Bonferroni correction (alpha = 0.05/7 = 0.007).

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**Table S7.** Correlations between altitude and the relative abundances of 23 bacterial genera with their oxygen requirements.

| Bacterial genera that correlated with altitude[1] | | | Ecuador | | Bolivia-Brazil | | Fisher's combined p-value | Oxygen requirements[2] | References |
|---|---|---|---|---|---|---|---|---|---|
| Phyla | Family | Genera | rho | p-value | rho | p-value | | | |
| Bacteroidetes | [Paraprevotellaceae] | *[Prevotella]* | **0.33** | **0.02** | **0.66** | **<.0001** | **<.0001** | Obligate anaerobes | Bergey's mannual |
| Bacteroidetes | Prevotellaceae | *Prevotella* | **0.43** | **0.002** | **0.54** | **0.0002** | **<.0001** | Obligate anaerobes | Bergey's mannual |
| Proteobacteria | Burkholderiales_unc | *Burkholderiales_unc* | 0.14 | 0.32 | **0.55** | **0.0001** | **0.0004** | *unclassified* | - |
| Verrucomicrobia | Verrucomicrobiaceae | *Akkermansia* | **-0.38** | **0.008** | -0.22 | 0.16 | **0.01** | Oxygen tolerant | Reunanen et al. 2015, Ouwerkerk et al. 2016 |
| Firmicutes | Lachnospiraceae | *Lachnospiraceae_unc* | 0.19 | 0.18 | 0.30 | 0.05 | 0.05 | Obligate anaerobes | Bergey's mannual |
| Proteobacteria | Helicobacteraceae | *Helicobacteraceae_unc* | -0.14 | 0.33 | -0.29 | 0.06 | 0.09 | Microaerobes* | Bergey's mannual |
| Cyanobacteria | YS2_unc | *YS2_unc* | 0.22 | 0.14 | 0.22 | 0.16 | 0.11 | *uncultured* | - |
| Firmicutes | Lactobacillaceae | *Lactobacillus* | -0.18 | 0.20 | -0.23 | 0.14 | 0.13 | Facultative anaerobes | Bergey's mannual |
| Firmicutes | Ruminococcaceae | *Ruminococcaceae_unc* | -0.20 | 0.18 | -0.18 | 0.26 | 0.19 | Obligate anaerobes | Bergey's mannual |
| Proteobacteria | Enterobacteriaceae | *Enterobacteriaceae_unc* | -0.12 | 0.40 | -0.22 | 0.15 | 0.23 | Facultative anaerobes | Bergey's mannual |
| Bacteroidetes | Bacteroidales_unc | *Bacteroidales_unc* | -0.08 | 0.59 | -0.22 | 0.15 | 0.30 | *unclassified* | - |
| Deferribacteres | Deferribacteraceae | *Mucispirillum* | -0.15 | 0.30 | -0.12 | 0.46 | 0.41 | Obligate anaerobes | Robertson et al. 2005 |

[1] Bacterial genera were included in the list when (1) the correlation between altitude and relative abundance of taxa was in the same direction across the two mountains based on Spearman's rho correlation and (2) average relative abundance >0.1% across all samples. The brackets [ ] indicate recommended taxonomy.

[2] Oxygen requirements were assigned based on Bergey's Manual of Systematics of Archaea and Bacteria and recent literature. When the genera were unclassified, we used the oxygen requirements of the family. When the family of the unclassified genera included obligate anaerobes and all other oxygen requirement types, we searched for all the recognized genera within the family and assigned oxygen requirement based on majority rule (i.e. two out of the three genera showed the same oxygen requirements) in all such cases indicated by *.

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**Table S7.** Correlations between altitude and the relative abundances of 23 bacterial genera with their oxygen requirements (continued).

| Bacterial genera that correlated with altitude[1] | | | Ecuador | | Bolivia-Brazil | | Fisher's combined p-value | Oxygen requirements[2] | References |
|---|---|---|---|---|---|---|---|---|---|
| Phyla | Family | Genera | rho | p-value | rho | p-value | | | |
| Firmicutes | Clostridiales_unc | *Clostridiales_unc* | 0.10 | 0.48 | 0.15 | 0.34 | 0.46 | *unclassified* | - |
| Tenericutes | Anaeroplasmataceae | *Anaeroplasma* | 0.17 | 0.25 | 0.05 | 0.75 | 0.51 | Obligate anaerobes | Bergey's mannual |
| Firmicutes | Lachnospiraceae | *Dorea* | 0.09 | 0.54 | 0.13 | 0.42 | 0.57 | Obligate anaerobes | Bergey's mannual |
| Proteobacteria | Desulfovibrionaceae | *Desulfovibrionaceae_unc1* | 0.07 | 0.62 | 0.10 | 0.51 | 0.68 | Obligate anaerobes* | Bergey's mannual |
| Firmicutes | Lachnospiraceae | *Coprococcus* | 0.14 | 0.34 | 0.00 | 1.00 | 0.70 | Obligate anaerobes | Bergey's mannual |
| Proteobacteria | Desulfovibrionaceae | *Desulfovibrionaceae_unc2* | 0.08 | 0.59 | 0.08 | 0.60 | 0.72 | Obligate anaerobes* | Bergey's mannual |
| Firmicutes | Clostridiales_unc | *Clostridiales_unc* | -0.10 | 0.49 | -0.05 | 0.73 | 0.73 | *unclassified* | - |
| Bacteroidetes | S24-7 | *S24-7_unc* | 0.08 | 0.58 | 0.06 | 0.70 | 0.77 | *uncultured* | - |
| Bacteroidetes | [Odoribacteraceae] | *Odoribacter* | 0.07 | 0.61 | 0.02 | 0.92 | 0.89 | Obligate anaerobes | Hardham et al. 2008 |
| Bacteroidetes | Rikenellaceae | *Rikenellaceae_unc* | 0.03 | 0.86 | 0.04 | 0.81 | 0.95 | Obligate anaerobes | Bergey's mannual |
| Bacteroidetes | Rikenellaceae | *AF12* | 0.03 | 0.83 | 0.02 | 0.90 | 0.97 | Obligate anaerobes | Bergey's mannual |

[1] Bacterial genera were included in the list when (1) the correlation between altitude and relative abundance of taxa was in the same direction across the two mountains based on Spearman's rho correlation and (2) average relative abundance >0.1% across all samples. The brackets [ ] indicate recommended taxonomy.

[2] Oxygen requirements were assigned based on Bergey's Manual of Systematics of Archaea and Bacteria and recent literature. When the genera were unclassified, we used the oxygen requirements of the family. When the family of the unclassified genera included obligate anaerobes and all other oxygen requirement types, we searched for all the recognized genera within the family and assigned oxygen requirement based on majority rule (i.e. two out of the three genera showed the same oxygen requirements) in all such cases indicated by *.

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**Table S8.** Effects of flash frozen samples (Porto Velho) on correlations between altitude and relative abundances of bacterial genera.

| Bacterial genera that correlated with altitude[1] | | | All samples | | Bolivia-Brazil transect | | | |
|---|---|---|---|---|---|---|---|---|
| | | | With flash frozen samples | Without flash frozen samples | With flash frozen samples | | Without flash frozen samples | |
| Phyla | Family | Genera | Fisher's combined p-value[2] | | rho | p-value | rho | p-value |
| Bacteroidetes | [Paraprevotellaceae] | *[Prevotella]* | **<.0001** | **<.0001** | **0.66** | **<.0001** | **0.68** | **<.0001** |
| Bacteroidetes | Prevotellaceae | *Prevotella* | **<.0001** | **0.002** | **0.54** | **0.0002** | 0.27 | 0.12 |
| Verrucomicrobia | Verrucomicrobiaceae | *Akkermansia* | **0.01** | **0.002** | -0.22 | 0.16 | **-0.50** | **0.002** |
| Firmicutes | Lachnospiraceae | *Lachnospiraceae_unc* | 0.05 | 0.42 | 0.30 | 0.05 | 0.05 | 0.79 |
| Proteobacteria | Helicobacteraceae | *Helicobacteraceae_unc* | 0.09 | 0.33 | -0.29 | 0.06 | 0.18 | 0.30 |

[1] Only the top five genera that showed the strongest correlations with altitude (Fisher's combined p-value < 0.1) were included in the analyses (see Figure 2 and Table S6).

[2] The Fisher's combined p-value was calculated when the correlation between altitude and relative abundance of bacterial genera was in the same direction across the two transects (Ecuador and Bolivia-Brazil) based on Spearman's rho correlation. P-values for Ecuador transects are shown in Table S6.

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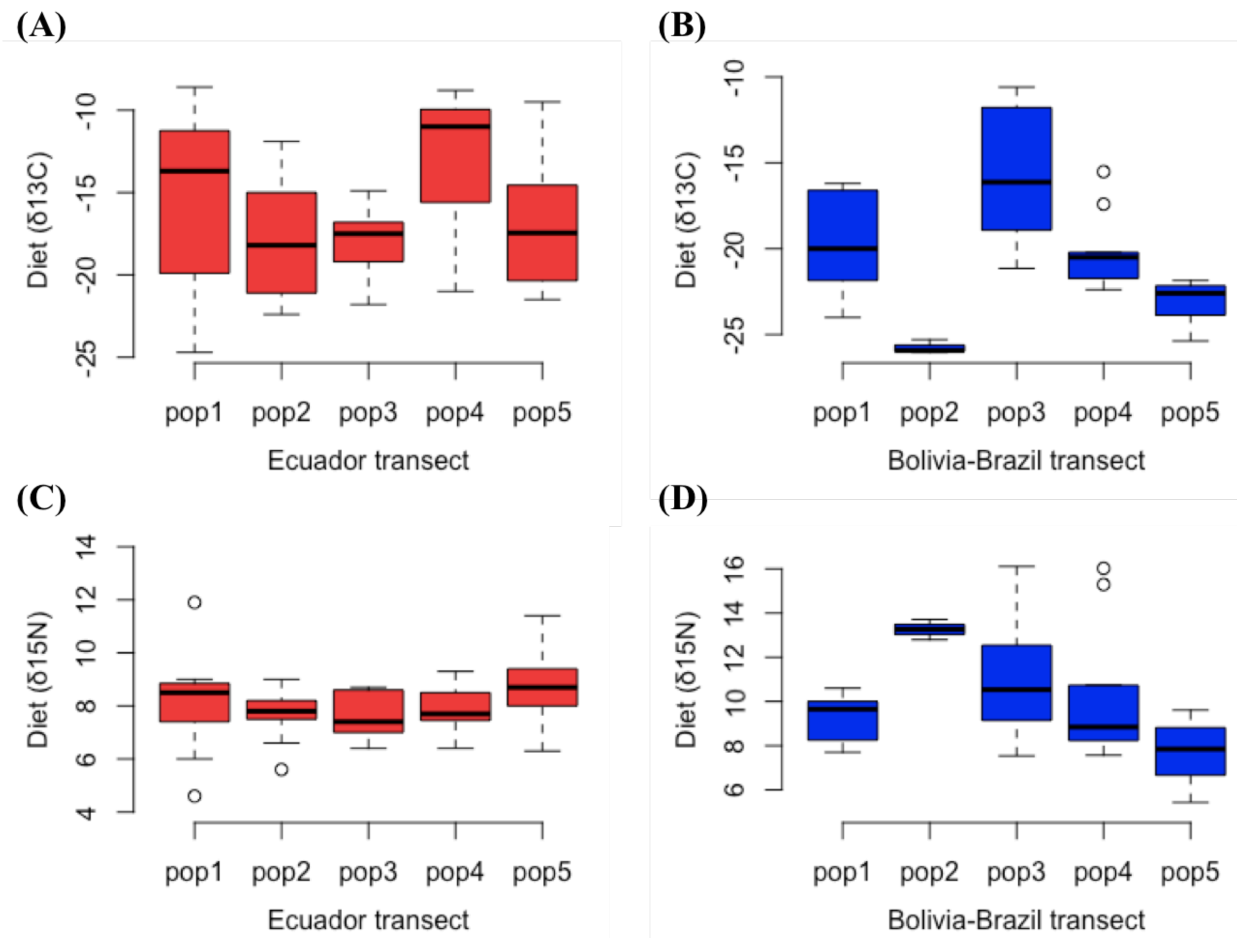


**Figure S1.** Box plots of carbon and nitrogen stable isotope diet measurements. Carbon isotope measurements differed by population in Ecuador transect (ANOVA $p = 0.04$) (A) and Bolivia-Brazil transect (ANOVA $p < 0.0001$) (B). Nitrogen isotope measurements did not differ by population in Ecuador transect (ANOVA $p = 0.4$) (C), but did vary in Bolivia-Brazil transect (ANOVA $p = 0.003$) (D). The two transects significantly differ in their carbon (ANOVA $p < 0.0001$) and nitrogen (ANOVA $p = 0.0009$) stable isotope measurements. See Figure 1A&B for population ID.

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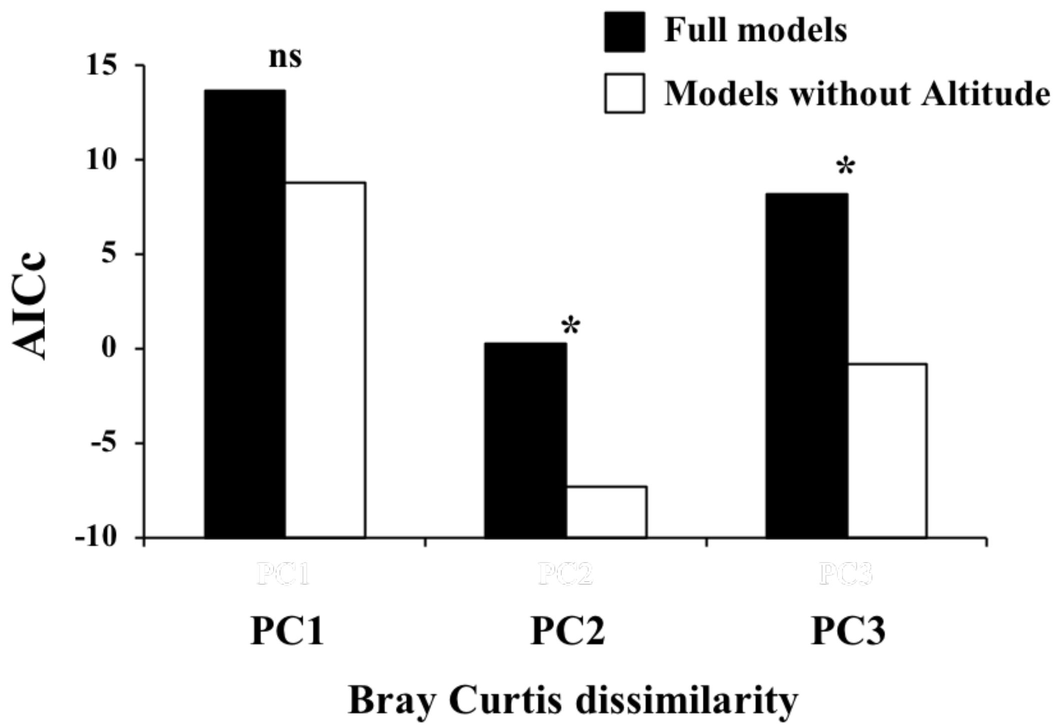


**Figure S2.** Model comparisons using Linear Mixed-Effects models. The response variables were Bray-Curtis dissimilarity PC1 (8.4%), PC2 (6.2%), and PC3 (5.3%). The full model included five fixed effects (altitude, body weight, BMI, carbon, and nitrogen) and three random effects (population, reproductive status, and sample storage method). The full models were compared to models without altitude using Akaike information criterion with sample size correction (AICc). Significance is based on likelihood ratio test p-values; * $p < 0.05$, [ns] $p > 0.05$.

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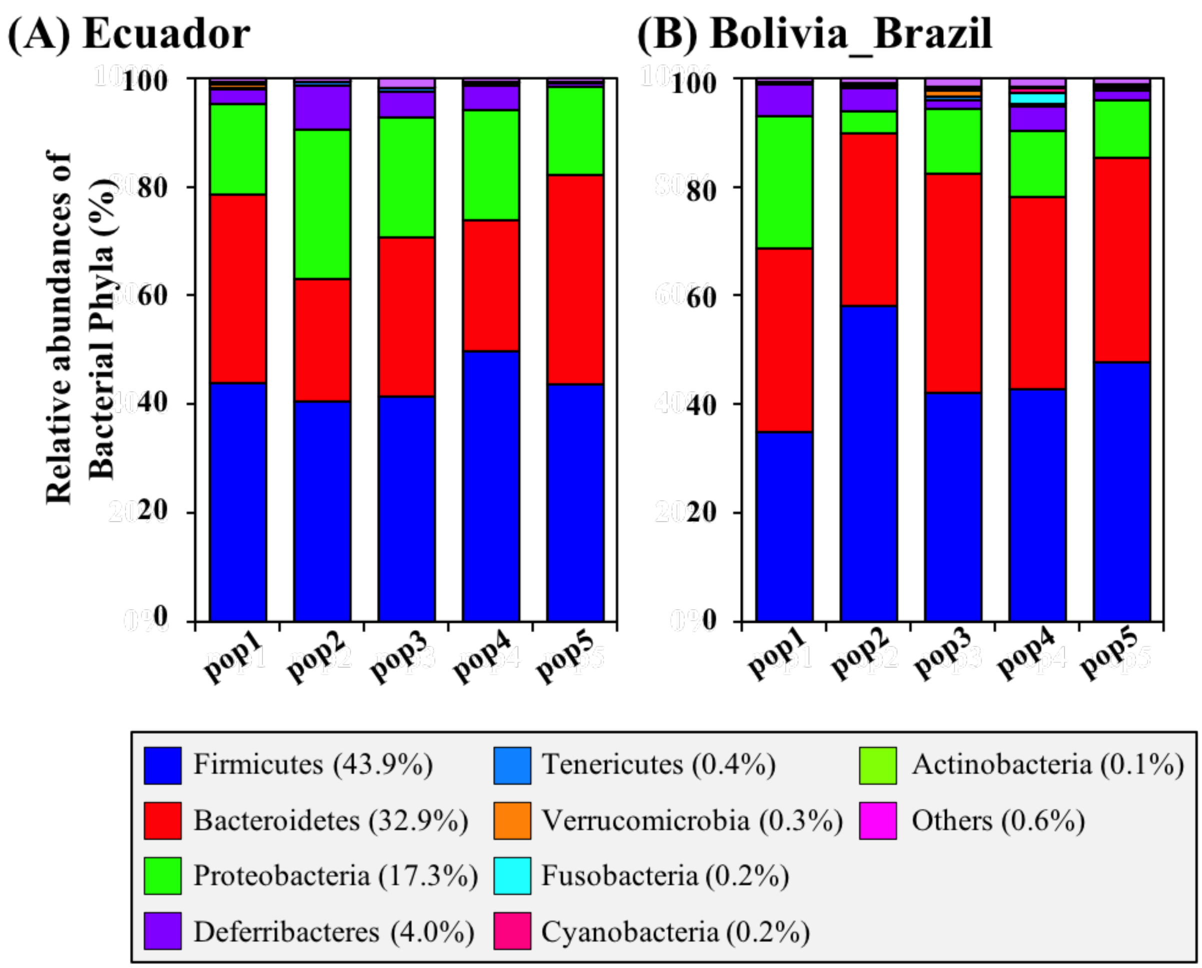


**Figure S3.** Average relative abundances of bacterial phyla per population. Pop1-5 are in the order of low to high altitude in Ecuador transect (A) and Bolivia-Brazil transect (B). The colors correspond to bacterial phyla that showed average relative abundance greater than 0.1% across all samples.

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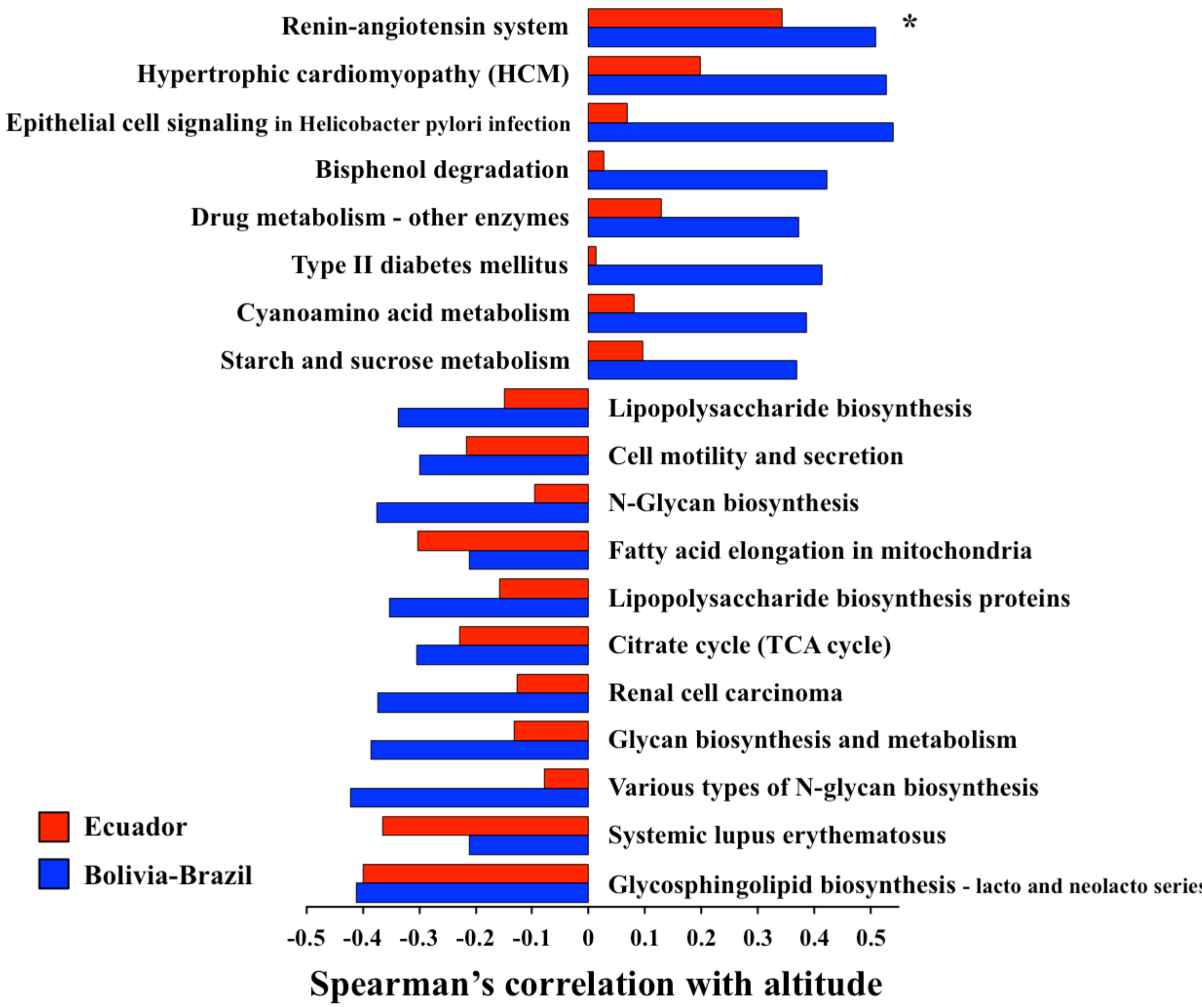


**Figure S4.** Correlations between altitude and predicted metagenomic functions. Spearman's rho correlation between altitude and 19 KEGG pathways (level 3) that show Fisher's combined p-value < 0.05 are shown. After correcting for multiple testing (Bonferroni correction; alpha = 0.05/183 = 0.0003) only Renin-angiotensin system remained significant (Ecuador; rho = 0.34, p = 0.0159. Bolivia-Brazil; rho = 0.51, p-value = 0.005. Fisher's combined p-value = 0.0001). Spearman's rho correlation for Ecuador transect is shown in red, and Bolivia-Brazil transect is shown in blue.

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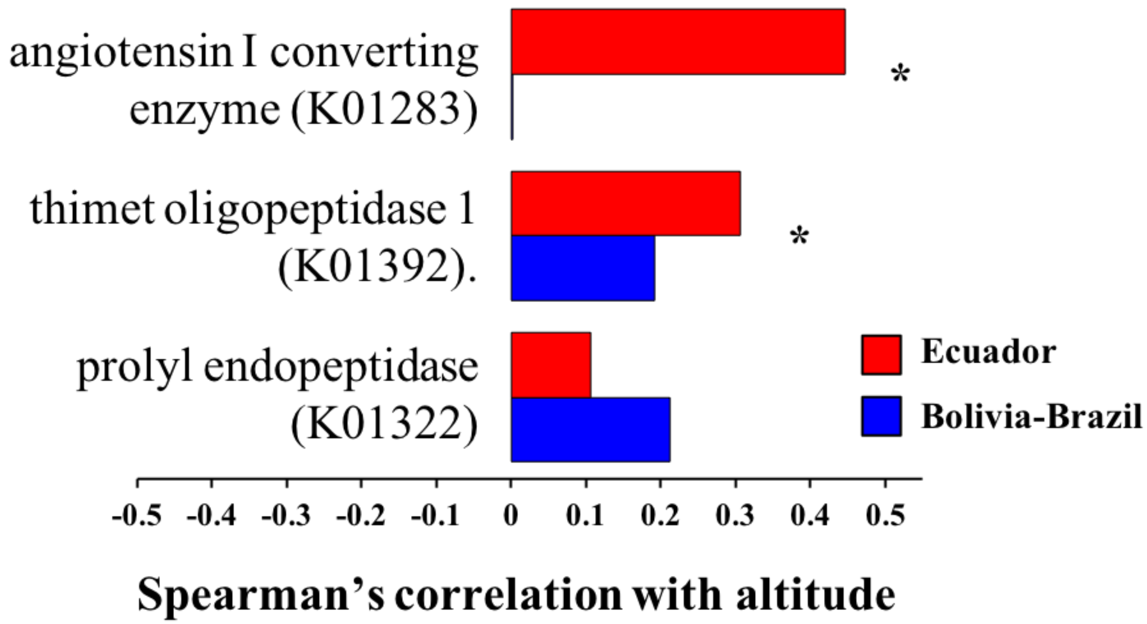


**Figure S5.** Correlations between altitude and predicted KEGG orthologs of renin-angiotensin system (ko04614). Spearman's rho correlations between altitude and three KEGG orthologs are shown for both Ecuador transect and Bolivia-Brazil transect. Spearman's rho correlations with Fisher's combined p-value $< 0.05$ are indicated by *.