

Divergence between sea urchins and their microbiota under speciation

Tyler J. Carrier^{1,2,*}, Guillaume Schwob^{3,4,5}, Remi N. Ketchum⁶, Harilaos A. Lessios⁷, and Adam M. Reitzel⁸

1 GEOMAR Helmholtz Centre for Ocean Research, Germany

2 Zoological Institute, Christian-Albrechts University of Kiel, Germany

3 Millennium Institute Biodiversity of Antarctic and Subantarctic Ecosystems (BASE), Santiago, Chile

4 Department of Ecological Sciences, Faculty of Sciences, University of Chile, Chile

5 Institute of Ecology and Biodiversity, Santiago, Chile.

6 Whitney Laboratory for Marine Bioscience, University of Florida, United States

7 Smithsonian Tropical Research Institute, Panama

8 Department of Biological Sciences, University of North Carolina at Charlotte, United States

* Corresponding author: tcarrier@geomar.de

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Table S1 to S10

Table S1. Primers, recipes, and thermal conditions for amplifying a part of the 16S rRNA gene.

Primers for assaying the bacterial community

Primer	Gene	Location	Primer sequence	Primer length	Product size
16S_F	16S rDNA	V3	CCTACGGGNGGCWGCAG	17	464
16S_R	16S rDNA	V4	GACTACHVGGGTATCTAATCC	21	
Primer with Illumina-specific adaptor (with primer underlined)					
TCGTCGGCAGCGTCAGATGTGTATAAGAGACAG <u>CCTACGGGNGGCWGCAG</u>					
GTCCTCGTGGGCTCGGAGATGTGTATAAGAGACAG <u>GACTACHVGGGTATCTAATCC</u>					

PCR recipe		PCR 1 conditions		
Ingredients	Volume (ul)	Step	Time	Temperature
Kapa Ready Mix (2x)	12.5	Initial denaturation	3 min	95 °C
F Primer	0.75	Denaturation	30 s	95 °C
R Primer	0.75	Annealing	30 s	55 °C
gDNA	2	Extension	30 s	72 °C
DNase-, RNase-free water	9	Final extension	5 min	72 °C
Total:	25			
25 cycles				
		PCR 2 conditions		
		Step	Time	Temperature
		Initial denaturation	3 min	95 °C
		Denaturation	30 s	95 °C
		Annealing	30 s	55 °C
		Extension	30 s	72 °C
		Final extension	5 min	72 °C
8 cycles				

Table S2. Number of biological replicates for each sea urchin species before and after quality control of 16S rRNA sequences.

<i>Species</i>	<i>n before</i>	<i>n after</i>
<i>Echinometra</i> sp. A	3	3
<i>Echinometra</i> sp. B	4	4
<i>Echinometra lucunter</i>	15	15
<i>Echinometra vanbrunti</i>	15	11
<i>Echinometra viridis</i>	15	15

Table S3. Summary of one-way ANOVA and post-hoc test results comparing alpha diversity species.

	DF	Sum of Squares	F Ratio	Prob > F	Observed ASVs		
Observed ASVs	4	27,624.000	6.052	<0.001		Summary	P Value
Phylogenetic diversity	4	172.800	6.896	<0.001	<i>E. sp. A</i> vs <i>E. sp. B</i>	ns	0.997
Dominance	4	0.054	1.553	0.204	<i>E. sp. A</i> vs <i>E. lucunter</i>	**	0.004
Evenness	4	0.057	1.249	0.305	<i>E. sp. A</i> vs <i>E. vanbrunti</i>	ns	0.152
					<i>E. sp. A</i> vs <i>E. viridis</i>	ns	0.051
					<i>E. sp. B</i> vs <i>E. lucunter</i>	**	0.005
					<i>E. sp. B</i> vs <i>E. vanbrunti</i>	ns	0.218
					<i>E. sp. B</i> vs <i>E. viridis</i>	ns	0.068
					<i>E. lucunter</i> vs <i>E. vanbrunti</i>	ns	0.219
					<i>E. lucunter</i> vs <i>E. viridis</i>	ns	0.509
					<i>E. vanbrunti</i> vs <i>E. viridis</i>	ns	0.959
Phylogenetic diversity							
						Summary	P Value
					<i>E. sp. A</i> vs <i>E. sp. B</i>	ns	0.994
					<i>E. sp. A</i> vs <i>E. lucunter</i>	**	0.002
					<i>E. sp. A</i> vs <i>E. vanbrunti</i>	*	0.045
					<i>E. sp. A</i> vs <i>E. viridis</i>	ns	0.082
					<i>E. sp. B</i> vs <i>E. lucunter</i>	**	0.002
					<i>E. sp. B</i> vs <i>E. vanbrunti</i>	ns	0.071
					<i>E. sp. B</i> vs <i>E. viridis</i>	ns	0.131
					<i>E. lucunter</i> vs <i>E. vanbrunti</i>	ns	0.440
					<i>E. lucunter</i> vs <i>E. viridis</i>	ns	0.123
					<i>E. vanbrunti</i> vs <i>E. viridis</i>	ns	0.982
Dominance							
						Summary	P Value
					<i>E. sp. A</i> vs <i>E. sp. B</i>	ns	0.562
					<i>E. sp. A</i> vs <i>E. lucunter</i>	ns	0.377
					<i>E. sp. A</i> vs <i>E. vanbrunti</i>	ns	0.117
					<i>E. sp. A</i> vs <i>E. viridis</i>	ns	0.317
					<i>E. sp. B</i> vs <i>E. lucunter</i>	ns	>0.999
					<i>E. sp. B</i> vs <i>E. vanbrunti</i>	ns	0.935
					<i>E. sp. B</i> vs <i>E. viridis</i>	ns	>0.999
					<i>E. lucunter</i> vs <i>E. vanbrunti</i>	ns	0.774
					<i>E. lucunter</i> vs <i>E. viridis</i>	ns	1.000
					<i>E. vanbrunti</i> vs <i>E. viridis</i>	ns	0.864
Evenness							
						Summary	P Value
					<i>E. sp. A</i> vs <i>E. sp. B</i>	ns	0.661
					<i>E. sp. A</i> vs <i>E. lucunter</i>	ns	0.853
					<i>E. sp. A</i> vs <i>E. vanbrunti</i>	ns	0.304
					<i>E. sp. A</i> vs <i>E. viridis</i>	ns	0.704
					<i>E. sp. B</i> vs <i>E. lucunter</i>	ns	0.953
					<i>E. sp. B</i> vs <i>E. vanbrunti</i>	ns	0.994
					<i>E. sp. B</i> vs <i>E. viridis</i>	ns	0.995
					<i>E. lucunter</i> vs <i>E. vanbrunti</i>	ns	0.495
					<i>E. lucunter</i> vs <i>E. viridis</i>	ns	0.989
					<i>E. vanbrunti</i> vs <i>E. viridis</i>	ns	0.767

Table S4. PERMANOVA results and pairwise comparisons for unweighted and weighted UniFrac for *Echinometra*.

UNWEIGHTED UNIFRAC							
method name	PERMANOVA	Group 1	Group 2	Sample size	Permutations	pseudo-F	p-value
test statistic name	pseudo-F	<i>Echinometra</i> sp. A	<i>Echinometra</i> sp. B	7	999	1.653	0.030
sample size	48	<i>Echinometra</i> sp. A	<i>Echinometra</i> <i>lucunter</i>	18	999	1.906	0.002
number of groups	5	<i>Echinometra</i> sp. A	<i>Echinometra</i> <i>vanbrunti</i>	14	999	2.052	0.006
test statistic	2.562	<i>Echinometra</i> sp. A	<i>Echinometra</i> <i>viridis</i>	18	999	1.932	0.002
p-value	0.001	<i>Echinometra</i> sp. B	<i>Echinometra</i> <i>lucunter</i>	19	999	3.290	0.001
number of permutations	999	<i>Echinometra</i> sp. B	<i>Echinometra</i> <i>vanbrunti</i>	15	999	3.342	0.003
		<i>Echinometra</i> sp. B	<i>Echinometra</i> <i>viridis</i>	19	999	3.225	0.002
		<i>Echinometra</i> <i>lucunter</i>	<i>Echinometra</i> <i>vanbrunti</i>	26	999	3.003	0.001
		<i>Echinometra</i> <i>lucunter</i>	<i>Echinometra</i> <i>viridis</i>	30	999	1.153	0.100
		<i>Echinometra</i> <i>vanbrunti</i>	<i>Echinometra</i> <i>viridis</i>	26	999	3.884	0.001
WEIGHTED UNIFRAC							
method name	PERMANOVA	Group 1	Group 2	Sample size	Permutations	pseudo-F	p-value
test statistic name	pseudo-F	<i>Echinometra</i> sp. A	<i>Echinometra</i> sp. B	7	999	2.520	0.024
sample size	48	<i>Echinometra</i> sp. A	<i>Echinometra</i> <i>lucunter</i>	18	999	2.658	0.015
number of groups	5	<i>Echinometra</i> sp. A	<i>Echinometra</i> <i>vanbrunti</i>	14	999	2.237	0.012
test statistic	5.350	<i>Echinometra</i> sp. A	<i>Echinometra</i> <i>viridis</i>	18	999	5.487	0.002
p-value	0.001	<i>Echinometra</i> sp. B	<i>Echinometra</i> <i>lucunter</i>	19	999	3.816	0.001
number of permutations	999	<i>Echinometra</i> sp. B	<i>Echinometra</i> <i>vanbrunti</i>	15	999	3.632	0.002
		<i>Echinometra</i> sp. B	<i>Echinometra</i> <i>viridis</i>	19	999	7.382	0.001
		<i>Echinometra</i> <i>lucunter</i>	<i>Echinometra</i> <i>vanbrunti</i>	26	999	6.873	0.001
		<i>Echinometra</i> <i>lucunter</i>	<i>Echinometra</i> <i>viridis</i>	30	999	1.600	0.088
		<i>Echinometra</i> <i>vanbrunti</i>	<i>Echinometra</i> <i>viridis</i>	26	999	14.444	0.001

Table S4. PERMDISP results and pairwise comparisons for unweighted and weighted UniFrac for *Echinometra*.

UNWEIGHTED UNIFRAC							
method name	PERMDISP	Group 1	Group 2	Sample size	Permutations	pseudo-F	p-value
test statistic name	F-value	<i>Echinometra</i> sp. A	<i>Echinometra</i> sp. B	7	999	1.243	0.397
sample size	48	<i>Echinometra</i> sp. A	<i>Echinometra</i> <i>lucunter</i>	18	999	11.811	0.686
number of groups	5	<i>Echinometra</i> sp. A	<i>Echinometra</i> <i>vanbrunti</i>	14	999	2.846	0.675
test statistic	22.326	<i>Echinometra</i> sp. A	<i>Echinometra</i> <i>viridis</i>	18	999	12.405	0.731
p-value	0.018	<i>Echinometra</i> sp. B	<i>Echinometra</i> <i>lucunter</i>	19	999	135.038	0.001
number of permutations	999	<i>Echinometra</i> sp. B	<i>Echinometra</i> <i>vanbrunti</i>	15	999	38.337	0.001
		<i>Echinometra</i> sp. B	<i>Echinometra</i> <i>viridis</i>	19	999	145.967	0.001
		<i>Echinometra</i> <i>lucunter</i>	<i>Echinometra</i> <i>vanbrunti</i>	26	999	10.476	0.003
		<i>Echinometra</i> <i>lucunter</i>	<i>Echinometra</i> <i>viridis</i>	30	999	0.036	0.827
		<i>Echinometra</i> <i>vanbrunti</i>	<i>Echinometra</i> <i>viridis</i>	26	999	11.731	0.008
WEIGHTED UNIFRAC							
method name	PERMDISP	Group 1	Group 2	Sample size	Permutations	pseudo-F	p-value
test statistic name	F-value	<i>Echinometra</i> sp. A	<i>Echinometra</i> sp. B	7	999	0.500	0.561
sample size	48	<i>Echinometra</i> sp. A	<i>Echinometra</i> <i>lucunter</i>	18	999	9.448	0.145
number of groups	5	<i>Echinometra</i> sp. A	<i>Echinometra</i> <i>vanbrunti</i>	14	999	3.851	0.173
test statistic	9.340	<i>Echinometra</i> sp. A	<i>Echinometra</i> <i>viridis</i>	18	999	4.264	0.172
p-value	0.001	<i>Echinometra</i> sp. B	<i>Echinometra</i> <i>lucunter</i>	19	999	31.391	0.001
number of permutations	999	<i>Echinometra</i> sp. B	<i>Echinometra</i> <i>vanbrunti</i>	15	999	23.981	0.001
		<i>Echinometra</i> sp. B	<i>Echinometra</i> <i>viridis</i>	19	999	20.105	0.012
		<i>Echinometra</i> <i>lucunter</i>	<i>Echinometra</i> <i>vanbrunti</i>	26	999	6.222	0.007
		<i>Echinometra</i> <i>lucunter</i>	<i>Echinometra</i> <i>viridis</i>	30	999	6.143	0.028
		<i>Echinometra</i> <i>vanbrunti</i>	<i>Echinometra</i> <i>viridis</i>	26	999	0.022	0.861

Table S6. Statistical tables for testing phylosymbiosis across the five *Echinometra* species.

Unrooted Robinson-Foulds

Host-Microbe Score: 0.0

Max Stochastic Metric: 2.0

Normalized Score: 0.0

Random Trees with Equivalent or More Congruent Score: 692

Total Trees: 10,000

P-Value: 0.0692

Unrooted Matching Split

Host-Microbe Score: 0.0

Max Stochastic Metric: 4.0

Normalized Score: 0.0

Random Trees with Equivalent or More Congruent Score: 692

Total Trees: 10,000

P-Value: 0.0692

Table S7. Statistical tables for testing phyllosymbiosis across the ten echinoid species.

CORE ACROSS 5 (ALL) SPECIES	
Feature ID	Taxa
dafa77d657c599c392d561c799176cb6	d_Bacteria; p_Bacteroidota; c_Bacteroidia; o_Bacteroidales; f_Prolixibacteraceae; g_Roseimarinus; s_uncultured_Bacteroidetes
8899a7dce652e746def070a7c9381ea5	d_Bacteria; p_Bacteroidota; c_Bacteroidia; o_Cytophagales; f_Cyclobacteriaceae; g_Cyclobacteriaceae; s_Persicobacter_sp.
fe041cfc7a2a6545118dce0de59f183	d_Bacteria; p_Firmicutes; c_Bacilli; o_Erysipelotrichales; f_Erysipelotrichaceae; g_ZOR0006; s_uncultured_bacterium
2332b465eff1143235435198748ec5c6	d_Bacteria; p_Firmicutes; c_Clostridia; o_Peptostreptococcales-Tissierellales; f_Fusibacteraceae; g_Fusibacter; s_uncultured_bacterium
308fe632b17e9b5b62c519b1f1c87217	d_Bacteria; p_Fusobacteriota; c_Fusobacteriia; o_Fusobacteriales; f_Fusobacteriaceae; g_Propionigenium; s_uncultured_bacterium
da6f0581a28883c37acf8cf289bb2	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Alteromonadales; f_Pseudoalteromonadaceae; g_Pseudoalteromonas; s_Pseudoalteromonas_phenolica
6a4c26a9cc5329a09a10b6fb99280ce2	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Oceanospirillales; f_Oceanospirillaceae; g_Oceanospirillum; s_uncultured_Oceanospirillum
12adca950c0372b400a868b17f1381d6	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Photobacterium; s_Photobacterium_sp.
9a323c8701f432c95c8daa1420c5f18e	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Photobacterium; s_uncultured_gamma
7b3020cddb6904a30467c9c9d83deec6	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Vibrio; s_Vibrio_fortis
888b1d47bd50a4ef51473dba0747439e	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Vibrio; s_Vibrio_fortis
0a036ff15a48082e02530ad1f8a0ae7d	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Vibrio; s_Vibrio_fortis
2a80f6c9e312f753f00c91951db1420c	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Vibrio; s_Vibrio_harveyi
CORE ACROSS 4 SPECIES	
Feature ID	Taxa
1c3b8b063d5569d904da33d1a804d2fa	d_Bacteria; p_Bacteroidota; c_Bacteroidia; o_Bacteroidales; f_Prolixibacteraceae; g_Roseimarinus; s_uncultured_Bacteroidetes
6260123d4fb528390fbc6dde8f89113b	d_Bacteria; p_Bacteroidota; c_Bacteroidia; o_Bacteroidales; f_Prolixibacteraceae; g_Roseimarinus; s_uncultured_Bacteroidetes
dafa77d657c599c392d561c799176cb6	d_Bacteria; p_Bacteroidota; c_Bacteroidia; o_Bacteroidales; f_Prolixibacteraceae; g_Roseimarinus; s_uncultured_Bacteroidetes
8899a7dce652e746def070a7c9381ea5	d_Bacteria; p_Bacteroidota; c_Bacteroidia; o_Cytophagales; f_Cyclobacteriaceae; g_Cyclobacteriaceae; s_Persicobacter_sp.
58ba9440017ec932cc3672edf6ea1a87	d_Bacteria; p_Bacteroidota; c_Bacteroidia; o_Flavobacteriales; f_Cryomorphaceae; g_NS10_marine_group; s_uncultured_Bacteroidetes
dfe7264c3cc48a0dc1011aa23b24f9d	d_Bacteria; p_Desulfobacterota; c_Desulfovibrionia; o_Desulfovibrionales; f_Desulfovibrionaceae; g_Desulfovibrio; s_uncultured_bacterium
fe041cfc7a2a6545118dce0de59f183	d_Bacteria; p_Firmicutes; c_Bacilli; o_Erysipelotrichales; f_Erysipelotrichaceae; g_ZOR0006; s_uncultured_bacterium
2332b465eff1143235435198748ec5c6	d_Bacteria; p_Firmicutes; c_Clostridia; o_Peptostreptococcales-Tissierellales; f_Fusibacteraceae; g_Fusibacter; s_uncultured_bacterium
308fe632b17e9b5b62c519b1f1c87217	d_Bacteria; p_Fusobacteriota; c_Fusobacteriia; o_Fusobacteriales; f_Fusobacteriaceae; g_Propionigenium; s_uncultured_bacterium
b8bad31f0eb9a09d08dc009f7efbedb	d_Bacteria; p_Fusobacteriota; c_Fusobacteriia; o_Fusobacteriales; f_Fusobacteriaceae; g_Propionigenium; s_uncultured_bacterium
73126afdb0cb98600e0b38b4565f1618	d_Bacteria; p_Proteobacteria; c_Alphaproteobacteria; o_Rhodospirillales; f_uncultured; g_uncultured; s_gut_metagenome
c2dfcc6996c42ec5cf58ce3c1c25af43	d_Bacteria; p_Proteobacteria; c_Alphaproteobacteria; o_Rhodospirillales; f_uncultured; g_uncultured; s_gut_metagenome
8543f46415d7d6015b9bdeb384582979	d_Bacteria; p_Proteobacteria; c_Alphaproteobacteria; o_Rhodospirillales; f_uncultured; g_uncultured; s_marine_metagenome
93b1285c0082d809592d975f996a364c	d_Bacteria; p_Proteobacteria; c_Alphaproteobacteria; o_Sphingomonadales; f_Sphingomonadaceae; g_Altererythrobracter; s_uncultured_organism
d30c9da98da847aa2806339934d88a14	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Alteromonadales; f_Colwelliaceae; g_uncultured; s_uncultured_bacterium
c15d998182389c2f51265c06d14b2119	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Alteromonadales; f_Idiomarinaceae; g_Idiomarina; s_Idiomarina_baltica
da6f0581a28883c37acf8cf289bb2	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Alteromonadales; f_Pseudoalteromonadaceae; g_Pseudoalteromonas; s_Pseudoalteromonas_phenolica
f244f84d22f69034ebcb310d8c77b300	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Alteromonadales; f_Pseudoalteromonadaceae; g_Pseudoalteromonas; s_Pseudoalteromonas_spongica
4d5978186d50ff0f3672d2d2f85981f7	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Alteromonadales; f_Shewanellaceae; g_Ferrimonas; s_Ferrimonas_marina
e4d19fcefbb5ac6db21742c1cb98bb9	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Alteromonadales; f_Shewanellaceae; g_Ferrimonas; s_Ferrimonas_marina
84d61818a5d9de2906d756a5b644c5bd	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Alteromonadales; f_Shewanellaceae; g_Ferrimonas; s_Ferrimonas_sp.
6a4c26a9cc5329a09a10b6fb99280ce2	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Oceanospirillales; f_Oceanospirillaceae; g_Oceanospirillum; s_uncultured_Oceanospirillum
12adca950c0372b400a868b17f1381d6	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Photobacterium; s_Photobacterium_sp.
61d8fb75d0b4dd14f626330890eca33	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Photobacterium; s_Photobacterium_sp.
888b1d47bd50a4ef51473dba0747439e	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Photobacterium; s_Photobacterium_sp.
14f27bc908080422c7fc1bc9787d6714	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Photobacterium; s_uncultured_gamma
5cd1218f1eda793df494ed2a08cfd97	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Photobacterium; s_uncultured_gamma
9a323c8701f432c95c8daa1420c5f18e	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Photobacterium; s_uncultured_gamma
a4c344ffe514a93c043773f2f2f27a0a8	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Photobacterium; s_uncultured_gamma
b852b218a47711da0b6f227c467db6c70	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Vibrio; s_Vibrio_brasilienis
6c20c8be9fdd03f2b84552c44791ec	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Vibrio; s_Vibrio_corallilyticus
0a036ff15a48082e02530ad1f8a0ae7d	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Vibrio; s_Vibrio_fortis
7b3020cddb6904a30467c9c9d83deec6	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Vibrio; s_Vibrio_fortis
2a80f6c9e312f753f00c91951db1420c	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Vibrio; s_Vibrio_harveyi
58ea6a84f201c37b00ffdec7c630eb2	d_Bacteria; p_Proteobacteria; c_Gammaproteobacteria; o_Vibrionales; f_Vibrionaceae; g_Vibrio; s_Vibrio_xuui

Table S8. One-way ANOVA results comparing evolutionary divergence.

	DF	Sum of Squares	F Ratio	Prob > F		Adjusted P Value
Species age vs microbiome divergence per million years	3	33.12	244.9	<0.0001	<i>Echinometra vanbrunti</i> , <i>Echinometra lucunter</i> vs. <i>Echinometra vanbrunti</i> , <i>Echinometra viridis</i>	0.155
					<i>Echinometra vanbrunti</i> , <i>Echinometra lucunter</i> vs. <i>Echinometra lucunter</i> , <i>Echinometra viridis</i>	<0.0001
					<i>Echinometra vanbrunti</i> , <i>Echinometra lucunter</i> vs. <i>Echinometra</i> sp. A, <i>Echinometra</i> sp. B	<0.0001
					<i>Echinometra vanbrunti</i> , <i>Echinometra viridis</i> vs. <i>Echinometra lucunter</i> , <i>Echinometra viridis</i>	<0.0001
					<i>Echinometra vanbrunti</i> , <i>Echinometra viridis</i> vs. <i>Echinometra</i> sp. A, <i>Echinometra</i> sp. B	<0.0001
					<i>Echinometra lucunter</i> , <i>Echinometra viridis</i> vs. <i>Echinometra</i> sp. A, <i>Echinometra</i> sp. B	<0.0001

Table S9. Means of adjusted p-values for each individual link among *Echinometa* spp. and core ASVs assigned to *Photobacterium*.

Species	Bacterial ASV	Adjusted mean p-value
<i>Echinometa</i> sp. A	622daaf3b69666b143c8f5a06fc2650c	0.128
<i>Echinometa</i> sp. A	dc6d970a62679a149c1c7beac773737f	0.034
<i>Echinometa</i> sp. A	9a232a5701f432a95c8daa1420c5f18e	0.112
<i>Echinometa</i> sp. A	5cd1218ffda793df494a2a08fc497	0.082
<i>Echinometa</i> sp. A	e4a82d761d07d239b1c2a7f4bf6c27	0.022
<i>Echinometa</i> sp. A	242c19946c14a3baefb6c25a2b8a41c1	0.052
<i>Echinometa</i> sp. A	292c491e0a9175bf1423c1b3ab8c385	0.007
<i>Echinometa</i> sp. A	ef0a04217d0a3c9858fce1942c0adb	0.995
<i>Echinometa</i> sp. A	12adca950a0372b400a868b17f1381d6	0.026
<i>Echinometa</i> sp. B	888b1d47b050a4c51473dbad747439e	0.016
<i>Echinometa</i> sp. B	622daaf3b69666b143c8f5a06fc2650c	0.128
<i>Echinometa</i> sp. B	5f08f266c17d14d628267253a291474	0.220
<i>Echinometa</i> sp. B	61d8b875d0b4d146c26330890ea33	0.059
<i>Echinometa</i> sp. B	9e41020d4a8ace62a3583503b61253	0.310
<i>Echinometa</i> sp. B	27c72a5701f432a95c8daa1420c5f18e	0.115
<i>Echinometa</i> sp. B	a4c344ffc514a93c043773732f27a08	0.478
<i>Echinometa</i> sp. B	5cd1218ffda793df494a2a08fc497	0.082
<i>Echinometa</i> sp. B	27c72a5701f432a95c8daa1420c5f18e	0.052
<i>Echinometa</i> sp. B	e4a82d761d07d239b1c2a7f4bf6c27	0.021
<i>Echinometa</i> sp. B	44b40a0296a1a7ef1465a4a918802b	0.057
<i>Echinometa</i> sp. B	5c7032394d20067c2b95ca0686d2ab	0.350
<i>Echinometa</i> sp. B	1427bc908080422c761bc9787d6714	0.529
<i>Echinometa</i> sp. B	292c491e0a9175bf1423c1b3ab8c385	0.008
<i>Echinometa</i> sp. B	238c5a372600cb0f02613380c41e52	0.137
<i>Echinometa</i> sp. B	12adca950a0372b400a868b17f1381d6	0.024
<i>Echinometa</i> sp. B	888b1d47b050a4c51473dbad747439e	0.017
<i>Echinometa</i> lucinter	494d18c3084b1cd42d6f8875034daa	0.332
<i>Echinometa</i> lucinter	61d8b875d0b4d146c26330890ea33	0.942
<i>Echinometa</i> lucinter	e9a0a6572903930ce9733988310ac	0.114
<i>Echinometa</i> lucinter	c1782a81768b5c21276561faec7c75	0.982
<i>Echinometa</i> lucinter	27c72a5701f432a95c8daa1420c5f18e	0.824
<i>Echinometa</i> lucinter	d8c7a968cc8cc7787934643e5d3202	0.756
<i>Echinometa</i> lucinter	6490b2a09908c89ca78697dbf0b360	0.705
<i>Echinometa</i> lucinter	030b4714a4341a9c14a2a1647d88fd	0.063
<i>Echinometa</i> lucinter	579a4874807b5d21c1c16d0b6c9067	0.415
<i>Echinometa</i> lucinter	a4c344ffc514a93c043773732f27a08	0.664
<i>Echinometa</i> lucinter	c2d1081ce9ccc2d6b467c89c7d019	0.942
<i>Echinometa</i> lucinter	5cd1218ffda793df494a2a08fc497	0.921
<i>Echinometa</i> lucinter	b43984d80474767da399a51ed714	0.110
<i>Echinometa</i> lucinter	d915a97efca9a6744301f7734f6c93	0.948
<i>Echinometa</i> lucinter	44b40a0296a1a7ef1465a4a918802b	0.957
<i>Echinometa</i> lucinter	8b44045a4d649d0cf312632a5c9a3a3	0.079
<i>Echinometa</i> lucinter	dc5f49592236d28c2061a97ced31a18	0.350
<i>Echinometa</i> lucinter	9a8f5656b694d250a813d63f58380d	0.078
<i>Echinometa</i> lucinter	de48ac66b7d6bba138a9a3ecf736c	0.083
<i>Echinometa</i> lucinter	5c7032394d20067c2b95ca0686d2ab	0.819
<i>Echinometa</i> lucinter	d7c45c6d384823615b24db6dbad3867	0.322
<i>Echinometa</i> lucinter	1427bc908080422c761bc9787d6714	0.675
<i>Echinometa</i> lucinter	b72ca2a0f5a0c9acc0485160ca91b36	0.450
<i>Echinometa</i> lucinter	1408d17347dfac2bdc4f0a8b6c20976	0.722
<i>Echinometa</i> lucinter	12b26d67b36812868d5b6ec83829ab	0.069
<i>Echinometa</i> lucinter	992ac0b28a7578ad966d6c18525c71	0.410
<i>Echinometa</i> lucinter	f02c96a146509da164aad26aac76d	0.473
<i>Echinometa</i> lucinter	43d4a2825dc2b0c2e409ad47baf622	0.108
<i>Echinometa</i> lucinter	3d6f6ea325ad3306b23c2793149999	0.078
<i>Echinometa</i> lucinter	7f67840038dcefc173384b0c51c	0.079
<i>Echinometa</i> lucinter	ef0a04217d0a3c9858fce1942c0adb	0.080
<i>Echinometa</i> lucinter	12adca950a0372b400a868b17f1381d6	0.956
<i>Echinometa</i> lucinter	40cb3a080d132c5c791277f8726ab	0.930
<i>Echinometa</i> lucinter	4887d2c3a91af8824143bec1ba808db	0.085
<i>Echinometa</i> lucinter	888b1d47b050a4c51473dbad747439e	0.969
<i>Echinometa</i> lucinter	734d322ca5a7f1e2407f8b18648c3	0.598
<i>Echinometa</i> lucinter	475achad0ff7ada80d313511313a68	0.762
<i>Echinometa</i> lucinter	219676e60119c2f33e881a27f63a96c	0.928
<i>Echinometa</i> vanbrunt	622daaf3b69666b143c8f5a06fc2650c	0.880
<i>Echinometa</i> vanbrunt	61d8b875d0b4d146c26330890ea33	0.859
<i>Echinometa</i> vanbrunt	9a232a5701f432a95c8daa1420c5f18e	0.814
<i>Echinometa</i> vanbrunt	030b4714a4341a9c14a2a1647d88fd	0.128
<i>Echinometa</i> vanbrunt	a4c344ffc514a93c043773732f27a08	0.688
<i>Echinometa</i> vanbrunt	266d7b9a8f6b77f11d61ce898b6c8	0.883
<i>Echinometa</i> vanbrunt	5cd1218ffda793df494a2a08fc497	0.884
<i>Echinometa</i> vanbrunt	27c72a5701f432a95c8daa1420c5f18e	0.918
<i>Echinometa</i> vanbrunt	95f7e72d23893c96c30a42e058512f	0.941
<i>Echinometa</i> vanbrunt	12adca950a0372b400a868b17f1381d6	0.646
<i>Echinometa</i> vanbrunt	c50485c1c23804a0f8b6c5d3dadd8	0.999
<i>Echinometa</i> vanbrunt	12b26d67b36812868d5b6ec83829ab	0.140
<i>Echinometa</i> vanbrunt	242c19946c14a3baefb6c25a2b8a41c1	0.897
<i>Echinometa</i> vanbrunt	292c491e0a9175bf1423c1b3ab8c385	0.984
<i>Echinometa</i> vanbrunt	12adca950a0372b400a868b17f1381d6	0.888
<i>Echinometa</i> vanbrunt	888b1d47b050a4c51473dbad747439e	0.913
<i>Echinometa</i> vanbrunt	17631ed189b410ad3f44128769c54d	0.701
<i>Echinometa</i> vanbrunt	734d322ca5a7f1e2407f8b18648c3	0.587
<i>Echinometa</i> vanbrunt	89adbf1c74daa5515454949af5d91	0.940
<i>Echinometa</i> viridis	494d18c3084b1cd42d6f8875034daa	0.335
<i>Echinometa</i> viridis	517737b556934cc2d484b7a1b1ad8c7	0.994
<i>Echinometa</i> viridis	472c9a912ca026c242d7494dd329	0.109
<i>Echinometa</i> viridis	5f08f266c17d14d628267253a291474	0.942
<i>Echinometa</i> viridis	61d8b875d0b4d146c26330890ea33	0.940
<i>Echinometa</i> viridis	9e41020d4a8ace62a3583503b61253	0.899
<i>Echinometa</i> viridis	9a232a5701f432a95c8daa1420c5f18e	0.824
<i>Echinometa</i> viridis	d8c7a968cc8cc7787934643e5d3202	0.740
<i>Echinometa</i> viridis	6490b2a09908c89ca78697dbf0b360	0.712
<i>Echinometa</i> viridis	030b4714a4341a9c14a2a1647d88fd	0.080
<i>Echinometa</i> viridis	266d7b9a8f6b77f11d61ce898b6c8	0.391
<i>Echinometa</i> viridis	47a4914954995f0a9340abab6377	0.911
<i>Echinometa</i> viridis	a4c344ffc514a93c043773732f27a08	0.681
<i>Echinometa</i> viridis	266d7b9a8f6b77f11d61ce898b6c8	0.952
<i>Echinometa</i> viridis	c2d1081ce9ccc2d6b467c89c7d019	0.925
<i>Echinometa</i> viridis	27c72a5701f432a95c8daa1420c5f18e	0.964
<i>Echinometa</i> viridis	e4a82d761d07d239b1c2a7f4bf6c27	0.980
<i>Echinometa</i> viridis	d915a97efca9a6744301f7734f6c93	0.942
<i>Echinometa</i> viridis	44b40a0296a1a7ef1465a4a918802b	0.958
<i>Echinometa</i> viridis	922c3a06024d8a5fec7555c5a2a9	0.873
<i>Echinometa</i> viridis	8b44045a4d649d0cf312632a5c9a3a3	0.093
<i>Echinometa</i> viridis	90597a1106c80c19699660814a86c1b	0.889
<i>Echinometa</i> viridis	31b0a73927706d7f1b6c968a7c7	0.413
<i>Echinometa</i> viridis	dc5f49592236d28c2061a97ced31a18	0.348
<i>Echinometa</i> viridis	f3a9176d803785516840670f9d4b2e	0.924
<i>Echinometa</i> viridis	9a8f5656b694d250a813d63f58380d	0.096
<i>Echinometa</i> viridis	ab838c26a684b6d4230b6c70930b	0.977
<i>Echinometa</i> viridis	de48ac66b7d6bba138a9a3ecf736c	0.087
<i>Echinometa</i> viridis	5c7032394d20067c2b95ca0686d2ab	0.821
<i>Echinometa</i> viridis	d7c45c6d384823615b24db6dbad3867	0.329
<i>Echinometa</i> viridis	4526ac486c6db93628502a08741a	0.988
<i>Echinometa</i> viridis	1a78a8b799c4d83d495495a69c307	0.999
<i>Echinometa</i> viridis	3d6f115a35241b6714347497adca29e	0.977
<i>Echinometa</i> viridis	62f142dd0415813f49510b1396dbac	0.923
<i>Echinometa</i> viridis	1427bc908080422c761bc9787d6714	0.659
<i>Echinometa</i> viridis	122c4e4c84a99a08330ac52bc2989	0.120
<i>Echinometa</i> viridis	b72ca2a0f5a0c9acc0485160ca91b36	0.449
<i>Echinometa</i> viridis	1408d17347dfac2bdc4f0a8b6c20976	0.712
<i>Echinometa</i> viridis	12b26d67b36812868d5b6ec83829ab	0.083
<i>Echinometa</i> viridis	b491340d521866c49baefb6967f4310	0.680
<i>Echinometa</i> viridis	242c19946c14a3baefb6c25a2b8a41c1	0.966
<i>Echinometa</i> viridis	4774ecd7f886d8c28757f7e48ab6751	0.886
<i>Echinometa</i> viridis	5b4f1b63369849f6c6c94242937c	0.400
<i>Echinometa</i> viridis	992ac0b28a7578ad966d6c18525c71	0.403
<i>Echinometa</i> viridis	f02c96a146509da164aad26aac76d	0.471
<i>Echinometa</i> viridis	85a59818c6ef1748188302be9627ed	0.977
<i>Echinometa</i> viridis	3d646a325ad3306b23c2793149999	0.088
<i>Echinometa</i> viridis	7f67840038dcefc173384b0c51c	0.089
<i>Echinometa</i> viridis	bcc110c34d0f2d9a7f5b6c3c574d1	0.105
<i>Echinometa</i> viridis	ef0a04217d0a3c9858fce1942c0adb	0.097
<i>Echinometa</i> viridis	12adca950a0372b400a868b17f1381d6	0.962
<i>Echinometa</i> viridis	40cb3a080d132c5c791277f8726ab	0.919
<i>Echinometa</i> viridis	4887d2c3a91af8824143bec1ba808db	0.089
<i>Echinometa</i> viridis	5d363819d26fb0d1283c7a1038f0af	0.098
<i>Echinometa</i> viridis	888b1d47b050a4c51473dbad747439e	0.965
<i>Echinometa</i> viridis	17631ed189b410ad3f44128769c54d	0.742
<i>Echinometa</i> viridis	734d322ca5a7f1e2407f8b18648c3	0.599
<i>Echinometa</i> viridis	475achad0ff7ada80d313511313a68	0.737
<i>Echinometa</i> viridis	219676e60119c2f33e881a27f63a96c	0.921

Table S10. Means of adjusted *p*-values for each individual link among *Leishmanota* spp. and non-ABCs assigned to Fibra

[illegible]