

Supplementary Material

Ecological Factors and Anthropogenic Disturbance May Restructure the Skin Microbiota of the Maoershan Hynobiids (*Hynobius maoershanensis*)

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Supplementary Table

Table S1. Data of ecological factors and anthropogenic disturbance in Maoershan hynobiids habitats (the values of each factor are the mean).

Date	Sample code	Tourist number	Habitat	Air temperature/°C	Humidity	Water temperature/°C	Water pH	Water depth/cm	Stage
2021.01	sample 1-5	219	HADD	3.8	0.59	-0.3	7.6	5.9	adult
2021.04	sample 6-19	245	HADD	13.6	0.99	12.9	5.79	16.5	forelimb bud stage
2021.04	sample 20-29	1	LADD	14.2	0.99	11.9	5.69	21	forelimb bud stage
2021.07	sample 30-32	407	HADD	17.9	0.99	16.1	5.61	24	hindlimb bud stage
2021.07	sample 33-35	1	LADD	20.3	0.94	15.4	6.09	20	hindlimb bud stage
2022.01	sample 36-40	1	LADD	8.4	0.99	6.2	6.97	20.9	adult
2022.01	sample 41-55	222	HADD	9.5	0.86	6.1	6.19	23.5	adult
2022.04	sample 56-59	16	HADD	33.5	0.42	10.1	6.06	10	forelimb bud stage
2022.04	sample 60	1	LADD	17.7	0.60	14.8	5.93	15.5	forelimb bud stage
2022.07	sample 61-64	1	LADD	34.4	0.67	19	5.91	13.5	hindlimb bud stage
2022.07	sample 65-67	240	HADD	21.5	0.85	16	6.23	12.5	hindlimb bud stage

Table S2. Results of the Spearman's rank test between skin microbiota of adult and ecological factors and anthropogenic disturbance

		Anthropogenic disturbance	Air temperature	Water temperature	Humidity	Water pH	Water depth	Different habitats
ACE	r	-0.541**	-0.708**	-0.317	-0.317	0.708**	-0.708**	-0.141
	p	0.006	<0.001	0.131	0.131	<0.001	<0.001	0.512
Chao	r	-0.541**	-0.708**	-0.317	-0.317	0.708**	-0.708**	-0.141
	p	0.006	<0.001	0.131	0.131	<0.001	<0.001	0.512
Shannon	r	-0.347	-0.548**	-0.382	-0.382	0.548**	-0.548**	0.022
	p	0.097	0.006	0.065	0.065	0.006	0.006	0.918
Simpson	r	0.172	0.417*	0.466*	0.466*	-0.417*	0.417*	-0.185
	p	0.422	0.043	0.022	0.022	0.043	0.043	0.386
Actinobacteriota	r	0.594**	0.442*	-0.289	-0.289	-0.442*	0.442*	0.556**
	p	0.002	0.03	0.171	0.171	0.03	0.03	0.005
Bacteroidota	r	-0.621**	-0.557**	0.121	0.121	0.557**	-0.557**	-0.467*
	p	0.001	0.005	0.572	0.572	0.005	0.005	0.021
Firmicutes	r	-0.538**	-0.616**	-0.149	-0.149	0.616**	-0.616**	-0.245
	p	0.007	0.001	0.487	0.487	0.001	0.001	0.249
Proteobacteria	r	0.629**	0.408*	-0.420*	-0.420*	-0.408*	0.408*	0.660**
	p	0.001	0.048	0.041	0.041	0.048	0.048	<0.001
Pseudomonadaceae	r	0.815**	0.693**	-0.233	-0.233	-0.693**	0.693**	0.660**
	p	<0.001	<0.001	0.273	0.273	<0.001	<0.001	<0.001
Aeromonadaceae	r	-0.432*	-0.369	0.121	0.121	0.369	-0.369	-0.348
	p	0.035	0.076	0.573	0.573	0.076	0.076	0.095
Comamonadaceae	r	0.401	0.356	-0.084	-0.084	-0.356	0.356	0.305
	p	0.052	0.087	0.695	0.695	0.087	0.087	0.147
Burkholderiaceae	r	0.623**	0.461*	-0.308	-0.308	-0.461*	0.461*	0.585**
	p	0.001	0.023	0.144	0.144	0.023	0.023	0.003

Table S3. Results of the Spearman's rank test between skin microbiota of hindlimb bud stage tadpoles and ecological factors and anthropogenic disturbance

		Anthropogenic disturbance	Air temperature	Water temperature	Humidity	Water pH	Water depth	Different habitats
ACE	r	0.642*	-0.465	0.011	0.465	-0.283	0.283	0.577*
	p	0.018	0.11	0.971	0.11	0.348	0.348	0.039
Chao	r	0.642*	-0.465	0.011	0.465	-0.283	0.283	0.577*
	p	0.018	0.11	0.971	0.11	0.348	0.348	0.039
Shannon	r	0.369	-0.249	0.397	0.249	-0.635*	0.442	0.206
	p	0.214	0.411	0.179	0.411	0.020	0.130	0.499
Simpson	r	-0.399	0.122	-0.575*	-0.122	0.677*	-0.343	-0.247
	p	0.176	0.692	0.040	0.692	0.011	0.251	0.415
Actinobacteriota	r	0.133	0.598*	0.411	-0.598*	0.337	-0.796**	0.33
	p	0.665	0.031	0.163	0.031	0.26	0.001	0.271
Bacteroidota	r	-0.623*	0.247	0.094	-0.247	-0.128	0.156	-0.701**
	p	0.023	0.417	0.761	0.417	0.678	0.611	0.008
Campilobacterota	r	0.685**	-0.391	0.379	0.391	-0.630*	0.415	0.543
	p	0.01	0.186	0.201	0.186	0.021	0.158	0.055
Proteobacteria	r	-0.163	0.196	-0.315	-0.196	0.570*	-0.451	0
	p	0.594	0.522	0.295	0.522	0.042	0.122	1
Pseudomonadaceae	r	0.284	0.13	0.045	-0.13	0.266	-0.414	0.412
	p	0.346	0.671	0.883	0.671	0.379	0.16	0.161
Aeromonadaceae	r	0.589*	-0.05	0.419	0.05	-0.283	-0.055	0.579*
	p	0.034	0.872	0.154	0.872	0.349	0.857	0.038
Comamonadaceae	r	0.357	-0.19	0.201	0.19	-0.315	0.196	0.289
	p	0.231	0.534	0.51	0.534	0.295	0.522	0.339
Burkholderiaceae	r	-0.157	-0.516	-0.499	0.516	-0.13	0.607*	-0.289
	p	0.608	0.071	0.083	0.071	0.671	0.028	0.339

Table S4. Results of the Spearman's rank test between skin microbiota of forelimb bud stage tadpoles and ecological factors and anthropogenic disturbance

		Anthropogenic disturbance	Air temperature	Water temperature	Humidity	Water pH	Water depth	Different habitats
ACE	r	0.141	−0.456*	0.286	0.625**	−0.429*	0.429*	−0.084
	p	0.458	0.011	0.125	<0.001	0.018	0.018	0.659
Chao	r	0.17	−0.484**	0.314	0.635**	−0.416*	0.416*	−0.06
	p	0.368	0.007	0.091	<0.001	0.022	0.022	0.753
Shannon	r	0.460*	−0.572**	0.374*	0.449*	−0.064	0.064	0.308
	p	0.010	0.001	0.042	0.013	0.738	0.738	0.098
Simpson	r	−0.592**	0.642**	−0.446*	−0.406*	−0.066	0.066	−0.452*
	p	0.001	<0.001	0.014	0.026	0.728	0.728	0.012
Actinobacteriota	r	0.104	0.295	−0.136	−0.648**	0.623**	0.623**	0.332
	p	0.585	0.114	0.473	<0.001	<0.001	<0.001	0.073
Firmicutes	r	0.129	−0.133	−0.05	0.13	−0.05	0.05	0.124
	p	0.496	0.483	0.792	0.495	0.792	0.792	0.514
Fusobacteriota	r	0.096	−0.305	0.155	0.430*	−0.304	0.304	−0.049
	p	0.615	0.101	0.414	0.018	0.103	0.103	0.799
Proteobacteria	r	0.108	−0.187	0.198	0.168	−0.051	0.051	0.028
	p	0.569	0.323	0.295	0.376	0.791	0.791	0.883
Pseudomonadaceae	r	0.541**	−0.710**	0.506**	0.577**	0.107	0.107	0.332
	p	0.002	< 0.001	0.004	0.001	0.574	0.574	0.073
Comamonadaceae	r	−0.739**	0.710**	−0.516**	−0.343	0.225	0.225	−0.619**
	p	<0.001	<0.001	0.003	0.064	0.233	0.233	<0.001
Burkholderiaceae	r	0.871**	−0.790**	0.611**	0.312	0.348	−0.348	0.755**
	p	<0.001	<0.001	<0.001	0.093	0.059	0.059	<0.001
Clostridiaceae	r	0.169	−0.143	0.067	0.059	0.059	0.059	0.16
	p	0.372	0.452	0.727	0.757	0.756	0.756	0.399