Supplementary Materials

Parasitic Copepods as Biochemical Tracers of Foraging Patterns and Dietary Shifts in Whale Sharks (*Rhincodon typus* Smith, 1828)

Brendon James Osorio [1,*], Grzegorz Skrzypek [1] and Mark Meekan [2,*]

[1] Western Australian Biogeochemistry Centre, School of Biological Sciences, The University of Western Australia, Perth 6009, Australia
[2] The Oceans Institute, The University of Western Australia, Perth 6009, Australia
* Correspondence: brendon_osorio@outlook.com (B.J.O.); m.meekan@gmail.com (M.M.)

Table S1. $\delta^{13}C$ and $\delta^{15}N$ values and C/N ratios of whale shark dermal tissue and their host-specific parasitic copepod *Pandarus rhincodonicus* collected at Ningaloo Reef between 2016 and 2022. $\delta^{13}C_U$ in *P. rhincodonicus* indicates the unacidified $\delta^{13}C$ values obtained from *P. rhincodonicus* tissue, whereas $\delta^{13}C_A$ indicates the $\delta^{13}C$ values adjusted for acidification to remove carbonates. C/N_U indicates the C/N ratios obtained directly from *P. rhincodonicus tissue*. Latitude and longitude of sample collections are in degree decimals (WGS 84), NA are used where latitude and longitude values could not be recorded.

Shark	Sex	Length (m)	Year	Latitude	Longitude	Host			Parasite			
						$\delta^{15}N$ [‰]	$\delta^{13}C$ [‰]	C/N [wt]	$\delta^{15}N$ [‰]	$\delta^{13}C_U$ [‰]	$\delta^{13}C_A$ [‰]	C/N_U [wt]
1	F	7.0	2016	−22.692	113.599	8.83	−14.60	2.8	9.83	−16.68	−16.98	2.8
2	F	6.3	2016	−22.675	113.545	8.69	−14.72	2.8	10.29	−16.43	−16.73	2.8
3	M	5.8	2016	−22.673	113.536	9.23	−14.45	2.8	8.80	−16.70	−17.00	2.8
4	M	6.0	2016	−22.629	113.577	9.08	−14.92	2.9	9.64	−16.80	−17.10	2.9
5	M	5.7	2016	−22.621	113.613	9.80	−14.55	2.8	10.63	−15.97	−16.27	2.8
6	M	7.2	2016	−22.700	113.578	9.38	−14.74	2.8	9.68	−16.69	−16.99	2.8
7	F	5.7	2016	−22.570	113.633	8.00	−15.10	3.0	9.14	−17.01	−17.31	3.0
8	M	6.3	2016	−22.577	113.623	9.02	−14.71	2.8	8.06	−16.80	−17.10	2.8
9	F	5.0	2016	−22.683	113.603	8.98	−15.07	2.9	9.95	−16.60	−16.90	2.9
10	M	5.7	2016	−22.664	113.604	9.23	−15.05	3.0	9.53	−17.06	−17.36	3.0
11	F	4.0	2016	−22.551	113.628	7.57	−15.58	2.9	8.66	−17.30	−17.60	2.9
12	M	6.4	2016	−22.741	113.620	9.45	−14.95	2.9	10.27	−16.41	−16.71	2.9
13	F	4.0	2018	−22.763	113.622	9.34	−14.84	2.9	8.72	−16.23	−16.53	2.9
14	F	4.9	2018	−22.810	113.646	7.75	−15.19	2.8	9.44	−16.38	−16.68	2.8
15	M	6.0	2018	−22.816	113.663	9.12	−15.29	3.0	9.54	−17.22	−17.52	3.0
16	M	5.1	2018	−22.823	113.666	8.13	−15.63	2.8	8.81	−16.83	−17.13	2.8
17	M	3.0	2018	−22.817	113.682	7.41	−15.86	3.1	7.86	−16.35	−16.65	3.1
18	M	8.2	2018	−22.809	113.668	9.52	−15.29	2.9	9.85	−18.02	−18.32	2.9
19	F	4.5	2018	−22.813	113.665	7.50	−16.22	3.0	9.16	−16.72	−17.02	3.0
20	M	6.0	2018	−22.799	113.662	8.07	−15.55	3.0	9.54	−17.02	−17.32	3.0
21	M	8.0	2018	−22.783	113.642	9.40	−14.62	2.8	9.97	−16.76	−17.06	2.8
22	M	5.0	2018	−22.832	113.651	8.73	−15.76	3.0	9.74	−16.96	−17.26	3.0
23	F	3.8	2019	−22.816	113.659	7.83	−15.98	3.0	8.55	−17.10	−17.40	3.0
24	M	5.3	2019	−22.838	113.668	9.22	−15.45	3.0	9.77	−16.87	−17.17	3.0
25	M	8.0	2019	−22.838	113.673	9.50	−15.28	3.0	9.90	−17.10	−17.40	3.0
26	M	5.3	2019	−22.837	113.674	9.04	−15.57	3.0	10.01	−16.63	−16.93	3.0
27	M	4.8	2019	−22.836	113.674	8.18	−15.85	2.9	8.87	−17.22	−17.52	2.9

28	F	4.6	2019	−22.769	113.651	7.71	−15.55	3.0	7.81	−16.81	−17.11	3.0
29	F	6.2	2019	−22.803	113.651	9.19	−15.41	2.9	10.08	−17.09	−17.39	2.9
30	F	4.8	2019	−22.779	113.648	8.92	−15.62	3.0	9.50	−17.53	−17.83	3.0
31	F	4.6	2019	−22.803	113.665	8.80	−15.71	3.0	9.50	−17.05	−17.35	3.0
32	M	6.5	2019	−22.794	113.641	9.08	−15.28	2.9	9.57	−17.27	−17.57	2.9
33	M	4.9	2019	−22.786	113.632	9.09	−15.34	2.9	9.51	−17.38	−17.68	2.9
34	M	4.0	2019	−22.780	113.637	8.12	−15.93	2.9	9.27	−17.11	−17.41	2.9
35	M	5.1	2020	−22.751	113.627	9.17	−16.17	2.8	9.63	−16.77	−17.07	2.8
36	M	3.9	2020	−22.702	113.629	9.34	−15.29	2.8	9.49	−16.05	−16.35	2.8
37	M	7.7	2020	−22.806	113.654	9.81	−15.05	2.9	10.25	−17.01	−17.31	2.9
38	M	5.8	2020	−22.753	113.622	8.80	−15.99	2.8	9.03	−16.78	−17.08	2.8
39	M	7.0	2021	−22.781	113.648	8.68	−15.94	3.0	9.81	−17.71	−18.01	3.0
40	M	4.8	2021	−22.774	113.640	7.78	−15.69	3.0	9.03	−17.48	−17.78	3.0
41	F	6.2	2021	−22.800	113.651	7.68	−15.68	2.9	8.95	−16.92	−17.22	2.9
42	F	3.9	2021	−22.806	113.648	8.12	−15.47	3.0	9.95	−16.53	−16.83	3.0
43	F	7.4	2021	−22.828	113.548	8.93	−15.45	3.0	9.74	−16.68	−16.98	3.0
44	M	6.0	2021	−22.798	113.655	9.02	−15.33	3.2	10.03	−16.47	−16.77	3.2
45	F	4.2	2021	−22.816	113.569	7.21	−15.28	3.0	8.26	−17.03	−17.33	3.0
46	M	5.6	2021	−22.773	113.625	7.80	−15.74	2.9	8.87	−16.78	−17.08	2.9
47	M	6.3	2021	−22.762	113.625	8.52	−15.57	3.0	9.94	−16.93	−17.23	3.0
48	F	6.0	2021	−22.755	113.628	8.27	−14.95	3.0	9.30	−16.38	−16.68	3.0
49	M	6.4	2021	−22.756	113.622	8.68	−15.09	2.9	9.41	−15.95	−16.25	2.9
50	F	3.5	2021	−22.800	113.646	7.80	−15.89	4.6	9.08	−16.30	−16.60	4.6
51	F	4.5	2021	−22.815	113.625	6.11	−14.82	2.9	6.87	−16.62	−16.92	2.9
52	M	7.8	2021	−22.767	113.641	8.76	−15.26	2.9	10.29	−16.52	−16.82	2.9
53	M	4.5	2021	−22.783	113.642	7.36	−15.58	3.0	8.82	−17.22	−17.52	3.0
54	F	3.9	2022	−22.779	113.641	9.17	−15.99	2.8	9.15	−16.93	−17.23	2.8
55	M	3.9	2022	−22.777	113.639	9.09	−15.99	3.0	9.93	−16.98	−17.28	3.0
56	M	6.1	2022	−22.825	113.660	8.87	−15.59	2.8	9.46	−17.17	−17.47	2.8
57	M	4.8	2022	−22.821	113.663	10.41	−15.01	2.9	9.86	−15.65	−15.95	2.9
58	M	4.0	2022	−22.795	113.651	7.42	−16.09	2.9	9.56	−17.29	−17.59	2.9
59	F	5.8	2022	−22.796	113.648	9.09	−15.26	2.8	9.56	−16.68	−16.98	2.8
60	M	5.5	2022	−22.791	113.642	9.24	−15.68	2.9	10.70	−16.89	−17.19	2.9
61	M	5.5	2022	−22.805	113.656	9.60	−14.99	2.8	10.23	−17.43	−17.73	2.8
62	F	4.5	2022	NA	NA	9.16	−15.90	2.9	9.23	−17.69	−17.99	2.9
63	M	6.7	2022	NA	NA	9.05	−15.23	2.8	10.09	−16.66	−16.96	2.8
64	M	5.0	2022	NA	NA	8.39	−16.16	2.9	9.02	−17.44	−17.74	2.9
65	F	4.6	2022	−22.790	113.664	10.03	−14.91	2.8	10.56	−16.35	−16.65	2.8
66	M	5.1	2022	−22.793	113.660	8.80	−15.84	3.0	10.24	−16.65	−16.95	3.0
67	M	4.9	2022	−22.782	113.636	8.87	−15.96	2.9	9.82	−17.06	−17.36	2.9
68	F	3.7	2022	−22.799	113.663	8.97	−15.44	3.0	9.03	−16.95	−17.25	3.0
69	M	4.8	2022	−22.775	113.626	8.39	−16.29	2.9	9.53	−16.61	−16.91	2.9
70	M	6.8	2022	−22.775	113.633	9.90	−15.42	2.9	10.22	−17.50	−17.80	2.9
71	F	3.8	2022	−22.775	113.632	9.90	−15.40	2.9	10.10	−16.62	−16.92	2.9
72	M	8.1	2022	−22.777	113.634	9.73	−15.37	2.8	10.23	−16.98	−17.28	2.8

Table S2. Isotope values of whale shark dermis and *P. rhincodonicus* used for acidification treatment. Untreated *P. rhincodonicus* $\delta^{13}C$, $\delta^{15}N$ values and C/N ratios are $Parasite_{Untrt}$, whereas acidified $\delta^{13}C$, $\delta^{15}N$ values and C/N ratios are indicated as $Parasite_{Acid}$. Samples from female (F) and male (M) whale sharks are identified. N/A values occurred where $\delta^{13}C$, $\delta^{15}N$ or C/N ratios could not be obtained from *P. rhincodonicus* samples. *P. rhincodonicus* samples that contained missing $\delta^{13}C$, $\delta^{15}N$ or C/N ratios in either $Parasite_{Untrt}$ or $Parasite_{Acid}$ were removed for $\Delta^{13}C_{Acid\text{-}Untrt}$, $\Delta^{15}N_{Acid\text{-}Untrt}$ and $\Delta C/N_{Acid\text{-}Untrt}$ calculations.

Shark	Sex	Length (m)	Year	Host			$Parasite_{Untrt}$			$Parasite_{Acid}$		
				$\delta^{13}C$ [‰]	$\delta^{15}N$ [‰]	C/N [wt]	$\delta^{13}C$ [‰]	$\delta^{15}N$ [‰]	C/N [wt]	$\delta^{13}C$ [‰]	$\delta^{15}N$ [‰]	C/N [wt]
1	F	3.65	2019	−15.43	9.40	3.1	−16.97	9.39	4.7	−16.94	9.90	4.7
1	F	3.65	2019	−15.43	9.40	3.1	−16.20	9.08	4.4	−16.62	9.29	4.3
1	F	3.65	2019	−15.43	9.40	3.1	−16.38	9.28	4.1	−16.64	9.33	4.2
1	F	3.65	2019	−15.43	9.40	3.1	N/A	N/A	N/A	−16.87	9.34	4.4
1	F	3.65	2019	−15.43	9.40	3.1	−16.41	9.73	4.2	−16.74	9.23	4.2
2	M	4.89	2019	−15.32	9.15	3.1	−16.27	9.64	4.4	N/A	N/A	N/A
2	M	4.89	2019	−15.32	9.15	3.1	−16.60	9.22	4.4	−16.78	9.32	4.5
2	M	4.89	2019	−15.32	9.15	3.1	−16.32	9.72	4.3	−16.72	9.58	4.4
2	M	4.89	2019	−15.32	9.15	3.1	−16.97	9.17	5.1	N/A	N/A	N/A
2	M	4.89	2019	−15.32	9.15	3.1	−16.49	9.20	4.3	−16.54	9.13	4.2
3	F	3.11	2020	−15.61	7.77	2.9	−16.99	8.29	4.0	−17.3	8.55	4.3
3	F	3.11	2020	−15.61	7.77	2.9	−16.95	8.55	4.6	−17.41	8.44	4.4
3	F	3.11	2020	−15.61	7.77	2.9	N/A	N/A	N/A	−17.42	8.29	4.2
3	F	3.11	2020	−15.61	7.77	2.9	−17.26	8.64	4.1	−17.53	8.80	4.3
3	F	3.11	2020	−15.61	7.77	2.9	−16.76	8.61	4.2	−17.57	8.28	4.4
4	M	3.49	2020	−15.69	8.03	2.9	−17.45	8.52	4.0	−17.72	8.42	4.1
4	M	3.49	2020	−15.69	8.03	2.9	−17.21	8.57	4.1	−17.55	8.38	4.4
4	M	3.49	2020	−15.69	8.03	2.9	−17.47	8.28	4.5	−17.71	8.69	4.2
4	M	3.49	2020	−15.69	8.03	2.9	−17.58	8.16	4.1	−17.81	7.85	4.2
4	M	3.49	2020	−15.69	8.03	2.9	−17.24	7.96	4.0	−17.51	8.51	4.1
5	F	8.24	2021	−15.31	8.80	2.9	−16.72	9.77	4.1	−16.94	9.61	4.1
5	F	8.24	2021	−15.31	8.80	2.9	−16.74	9.41	3.9	−16.97	8.99	4.0
5	F	8.24	2021	−15.31	8.80	2.9	−16.89	9.31	3.9	−17.32	8.97	4.1
5	F	8.24	2021	−15.31	8.80	2.9	−16.90	10.11	4.0	−17.40	9.66	4.2
5	F	8.24	2021	−15.31	8.80	2.9	−17.09	9.34	4.1	−17.23	9.38	4.3
6	M	5.65	2021	−15.84	7.87	4.1	−17.75	9.65	4.0	−18.24	10.10	4.2
6	M	5.65	2021	−15.84	7.87	4.1	−17.78	9.65	4.0	−18.26	9.74	4.3
6	M	5.65	2021	−15.84	7.87	4.1	−17.54	9.66	3.9	−17.78	9.57	4.2
6	M	5.65	2021	−15.84	7.87	4.1	−17.92	9.49	3.9	−18.25	9.70	4.3
6	M	5.65	2021	−15.84	7.87	4.1	−17.51	9.59	3.9	−18.17	9.69	4.2
7	M	5.19	2022	−16.10	8.69	2.8	−17.46	9.50	3.8	−17.53	9.67	4.0
7	M	5.19	2022	−16.10	8.69	2.8	−17.54	9.53	3.8	−17.66	9.62	4.0
7	M	5.19	2022	−16.10	8.69	2.8	−17.24	9.80	3.9	−17.57	9.74	4.1
7	M	5.19	2022	−16.10	8.69	2.8	−17.52	9.70	3.8	−17.84	9.80	4.4
7	M	5.19	2022	−16.10	8.69	2.8	−17.69	9.82	3.9	−17.69	9.47	4.0
8	M	5.55	2022	−15.82	9.26	2.9	−16.94	10.08	4.0	−17.12	10.06	4.2
8	M	5.55	2022	−15.82	9.26	2.9	−17.06	10.26	4.1	−17.22	10.21	4.2
8	M	5.55	2022	−15.82	9.26	2.9	−16.72	10.27	4.1	−17.49	10.51	4.6
8	M	5.55	2022	−15.82	9.26	2.9	−16.69	10.34	3.9	−17.00	10.45	4.2
8	M	5.55	2022	−15.82	9.26	2.9	−17.03	9.84	4.0	−17.37	10.00	4.7

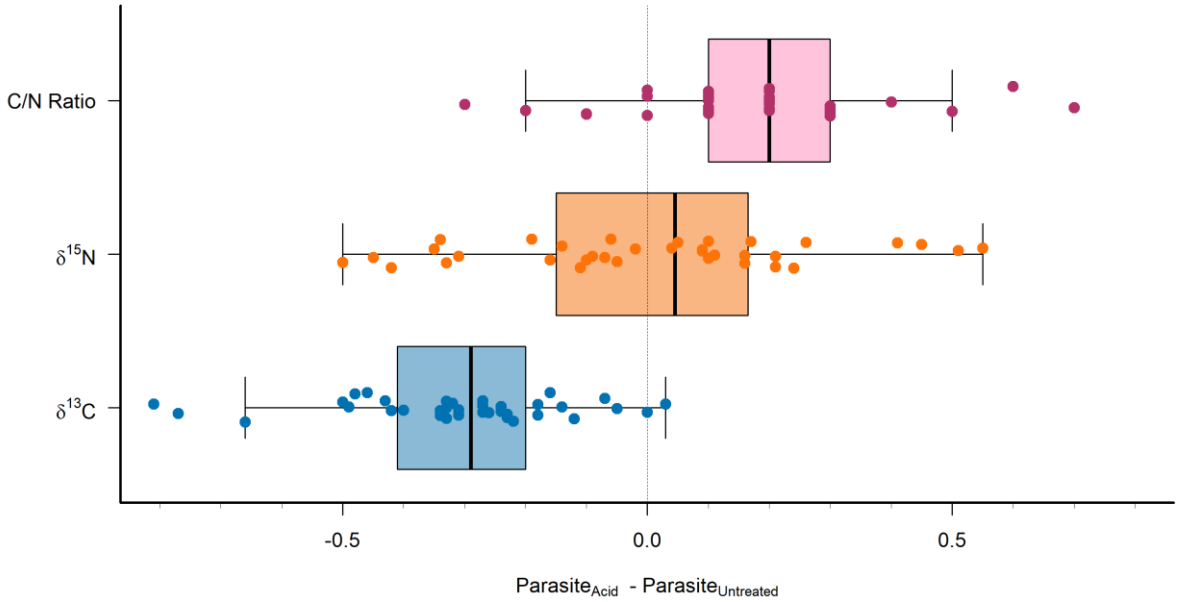

Figure S1. Differences between acidified ($Parasite_{Acid}$) and untreated ($Parasite_{Untreated}$) $\delta^{13}C$, $\delta^{15}N$ values and C/N ratios of *Pandarus rhincodonicus*.