

Impact of marine hitchhiker load on host energy intake

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Supplementary information

Figure S1	Remoras changing hosts in Marsa Abu Dabbab, Egyptian Red Sea
Videos S1	Remora shifting hosts, from dugong to green turtle
Video S2	Green turtle brushes remoras off its plastron
Video S3	Green turtle brushes carapace in response to a remora detaching
Table S1	Repeated observations of green turtles across varying time intervals
Table S2	Mean remora load across green turtle size range
Table S3	Global observations of remora-sea turtle association



Fig. S1 Remoras (*Echeneis naucrates*) are known to change hosts, for example, the lightest-coloured remora moved from the green turtle (*Chelonia mydas*) on the left to the one on the right whilst both turtles were stationary and grazing on seagrass in Marsa Abu Dabbab, Red Sea, Egypt

Video file name: VideoS1_Host_change.mp4

Video file name: VideoS2_Turtle_reaction.mp4

Video file name: VideoS3_Turtle_reaction.mp4

Video S1; S2; S3. A range of interactions and behavioural responses between the remora (*Echeneis naucrates*) and green turtle (*Chelonia mydas*) are shown in these videos recorded at Marsa Abu Dabbab in Red Sea, Egypt. Video S1: A single remora changes hosts across taxa, moving from a dugong to a green turtle; Video S2: Green turtle brushes off remoras attached to its plastron, as it ascends for surface breathing; Video S3: Green turtle pats its carapace in response to remora detaching

Table S1 14 of 40 green turtles (*Chelonia mydas*) were observed on more than one occasion during our study in Marsa Abu Dabbab, Egypt. For repeat observations of individuals, the change in size measurements varied by a maximum of ± 10 cm ($n = 4$) and remora load between -1 to 2 remoras ($n = 7$). Turtle size was estimated using a marked stick held along or above the carapace (straight carapace length; SCL_{max})

Turtle ID	Observation date and time (24 hr)	Turtle SCL_{max} (cm)	Remora load (n)
3	24/10/2023 06:30	95	2
	25/10/2023 11:30	95	1
	25/10/2023 11:30	95	1
	26/10/2023 06:30	95	0
	26/10/2023 11:30	95	1
6	24/10/2023 14:30	95	2
	25/10/2023 11:30	95	2
	25/10/2023 14:30	95	2
	26/10/2023 11:30	95	2
7	24/10/2023 14:30	105	1
	26/10/2023 14:30	105	2
	26/10/2023 14:30	105	2
9	25/10/2023 06:30	65	0
	25/10/2023 11:30	65	1
	25/10/2023 11:30	65	0
	25/10/2023 14:30	65	1
	26/10/2023 11:30	65	0
	26/10/2023 14:30	65	0
10	25/10/2023 06:30	75	1
	25/10/2023 11:30	75	1
	25/10/2023 14:30	75	3
	26/10/2023 06:30	75	4
	26/10/2023 11:30	75	4
11	25/10/2023 06:30	85	0
	25/10/2023 06:30	85	0
	25/10/2023 14:30	85	1
12	25/10/2023 06:30	95	2
	25/10/2023 14:30	95	2
13	25/10/2023 11:30	55	0
	26/10/2023 06:30	55	2
T01	09/10/2023 08:30	55	0
	15/10/2023 11:00	65	0
	16/10/2023 07:00	65	0
T02	09/10/2023 08:30	75	0
	09/10/2023 08:30	85	0
T05	09/10/2023 08:30	85	2
	14/10/2023 14:45	95	2
	15/10/2023 11:00	95	2

Turtle ID	Observation date and time (24 hr)	Turtle SCL_{max} (cm)	Remora load (n)
T15	15/10/2023 11:00	85	3
	25/10/2023 07:00	85	3
	26/10/2023 06:30	75	3
T16	15/10/2023 11:00	65	0
	18/10/2023 08:30	65	1
T57	25/10/2023 07:00	75	0
	25/10/2023 07:00	75	0

Table S2 A comparison of remora (*Echeneis naucrates*) load on green turtles (*Chelonia mydas*) across a range of turtle sizes estimated as straight carapace length (SCL_{max}) in Marsa Abu Dabbab, Egypt

Turtle SCL _{max} (cm)	Turtle count (n)	Mean (SD) number of remoras turtle ⁻¹
55.0	3	1.0 (1.0)
61.7	1	0
65.0	7	0.1 (0.2)
75.0	6	0.8 (1.2)
81.7	1	3.00
85.0	9	1.5 (0.9)
91.7	1	2.00
95.0	8	1.1 (1.1)
105.0	3	1.2 (1.1)
115.0	1	2.00

Table S3 Previously published observations of remora-sea turtle interactions are qualitative. Our study (in bold) is the first to report quantitative observations, and is also the first from the Indian Ocean region

Remora species	Ocean basin	Sea turtle species	Observation site(s)	Reference
<i>Echeneis naucrates</i>	Atlantic Ocean	<i>Chelonia mydas</i>	Fernando de Noronha and Rocas Atoll, Brazil	Sazima & Grossman 2006
		<i>Eretmochelys imbricata</i>		
		<i>Caretta caretta</i>		
		<i>Chelonia mydas</i>	Peter Island, British Virgin Islands	Overing 1996
		<i>Dermochelys coriacea</i>	County Mayo, Irish Sea	King & Berrow 2009
		Unspecified	St. Croix, US Virgin Islands	Eckert & Eckert 1988
<i>Remora remora</i>	Atlantic Ocean	Unspecified	Florida, US	Bachman et al. 2018
		<i>Chelonia mydas</i>	Marsa Abu Dabbab, Egyptian Red Sea	This study
	Atlantic Ocean	Hawksbill-green turtle hybrid	Fernando de Noronha and Rocas Atoll, Brazil	Sazima & Grossman 2006
		<i>Chelonia mydas</i>		
		<i>Lepidochelys olivacea</i>		
		<i>Dermochelys coriacea</i>		
		<i>Chelonia mydas</i>	Peter Island, British Virgin Islands	Overing 1996
	Pacific Ocean		Hattes and Kawana beaches, French Guiana	Fretey 1979
		<i>Dermochelys coriacea</i>	Sandy Point, St. Croix, US Virgin Islands	Eckert & Eckert 1988
			Beig Meil, France	Iglesias et al. 2021
			near Eagle and Achill Islands, County Mayo, Irish Sea	Quigley et al. 1994
			Hattes and Kawana beaches, French Guiana	Fretey 1979
		<i>Chelonia mydas</i>	Pisco, Peru	Quiñones et al. 2021
		<i>Lepidochelys olivacea</i>	Guerrero, Sinaloa and Jalisco, Mexico	Ramos-Rivera et al. 2021; Sosa-Cornejo et al. 2012; Lazo-Wasem et al. 2011
		<i>Eretmochelys imbricata</i>	Rose Atoll, American Samoa	Van Houtan et al. 2016

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