Supplementary data

Spatial variation in spawning timing for multi-species Acropora assemblages in the Red Sea

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Table S1. Summary of historical thermal profile of sites where *in situ* observations have been observed frequently along the Red Sea. Remote sensing data were obtained for the period of six weeks prior to the past spawning date to understand the minimum SST required for spawning at each site, and whether rapid change in SST (warming rate and ΔSST) differs among sites and whether they are correlated with spawning time. Uncertainty of exact spawning day was denoted with "*" and excluded from correlation analysis to avoid bias.

Site	Year	Day/Month	Absolute SST	Warming rate	ΔT	+\- FM	Lat	Lon	Ref
Dahab	2014	13 June	24.5±0.3	0.1	0.5	NA	28.50506	34.52208	(Bouwmeester & Berumen, 2015)
Shushah	2023	5 May	23.9±0.8	0.4	2.2	0	27.93799	34.91289	This study
Hurghada	2008	26 April	22.9±0.6	0.2	1.6	+6*	27.29914	33.83194	(Hanafy et al., 2010)
Hurghada	2009	8 May	22.3±0.5	0.2	1.2	-5*	27.29914	33.83194	(Hanafy et al., 2010)
Hurghada	2012	3 May	22.8±1.2	0.6	3.5	-3	27.29914	33.83194	(Kotb et al., 2018)
Hurghada	2013	20 April	22.7±0.2	0.1	0.3	-4	27.29914	33.83194	(Kotb et al., 2018)
Hurghada	2022	29 April	22.0±1.1	0.5	2.3	-14	27.29914	33.83194	slicks personal obsv.
Hurghada	2023	27 April	22.9±0.5	0.2	1.3	-8	27.29914	33.83194	This study
Marsa Alam	2008	27 April	23.5±0.8	0.35	1.5	+7*	24.67608	35.09391	(Hanafy et al., 2010)
Thuwal	2011	16 April	25.1±0.3	0.0	0.3	-2	22.30507	38.96448	(Bouwmeester et al., 2015)
Thuwal	2012	6 April	24.8±0.6	0.2	0.6	0	22.30507	38.96448	(Bouwmeester et al., 2015)
Thuwal	2013	25 April	26.9±0.3	0.0	0.3	4	22.30507	38.96448	(Bouwmeester et al., 2015)
Thuwal	2023	5 April	26.0±0.5	-0.1	0.5	0	22.30507	38.96448	This study

Table S2. List of *Acropora* species and the number of surveyed colonies for gametogenesis at the three studied sites in the central and Northern Red Sea. It is important to note that *in situ* spawning was not observed for all of these species during our *in situ* spawning surveys. Specifically, 11 species were observed and photographed during in situ spawning, while the remaining 12 species, despite showing maturity and having their gravidity checked, were not observed during in situ spawning.

Species/site	**# of observed colonies**	***In situ* spawning**
Hurghada	**47**	
Acropora cf. *arabensis* Hodgson & Carpenter, 1995	2	No
Acropora cf. *samoensis* (Brook, 1891)	8	No
Acropora cf. *subulata* (Dana, 1846)	1	No
Acropora downingi Wallace, 1999	1	No
Acropora eurystoma (Klunzinger, 1879)	10	No
Acropora hemprichi (Ehrenberg, 1834)	5	No
Acropora secale (Studer, 1878)	2	No
Acropora humilis (Dana, 1846)	1	No

Acropora cf. *humilis* (Dana, 1846)	3	No
Acropora sp 4	3	No
Acropora cf. sp1 *sensu* Al Tawaha et al. 2019	1	No
Acropora sp1 *sensu* Al Tawaha et al. 2019	9	No
Acropora sp3	1	No
Thuwal	**58**	
Acropora cf. *cytherea* (Dana, 1846)	1	No
Acropora cf. *downingi* Wallace, 1999	1	yes
Acropora cf. *hemprichi* (Ehrenberg, 1834)	1	yes
Acropora cf. *hyacynthus* (Dana, 1846)	1	No
Acropora downingi Wallace, 1999	1	No
Acropora hemprichi (Ehrenberg, 1834)	17	yes
Acropora maryae Veron, 2002	1	No
Acropora pharaonis (Milne Edwards, 1860)	1	No
Acropora sp2	13	yes
Acropora humilis (Dana, 1846)	10	No
Acropora cf. sp1 *sensu* Al Tawaha et al. 2019	1	yes
Acropora sp1 *sensu* Al Tawaha et al. 2019	10	yes
Shushah Island	**15**	
Acropora cf. *arabensis* Hodgson & Carpenter, 1995	1	No
Acropora cf. *cytherea* (Dana, 1846)	63	yes
Acropora cf. *downingi* Wallace, 1999	20	yes
Acropora cf. *hyacynthus* (Dana, 1846)	3	No
Acropora cf. *samoensis* (Brook, 1891)	16	No
Acropora cf. *secale* (Studer, 1878)	3	yes
Acropora eurystoma (Klunzinger, 1879)	27	yes
Acropora hemprichi (Ehrenberg, 1834)	37	No
Acropora maryae Veron, 2002	9	yes
Acropora pharaonis (Milne Edwards, 1860)	5	yes
Acropora secale (Studer, 1878)	16	yes
Acropora cf. *humilis* (Dana, 1846)	93	yes
Acropora sp1 *sensu* Al Tawaha et al. 2019	174	yes
Total	**467**	

Table S3. Summary of sampling effort and proportion of observed mature colonies for *Acropora* species sampled in Shushah Island during the April-May 2023 for gametogenesis investigations respective to the heatmap in manuscript in Figure 5.

Species/date	4/3/2023		07-08 04/2023		14-16 04/2023		5/3/2023		12-25 5/2023		6/13/2023	
Number vs percentage	#	%	#	%	#	%	#	%	#	%	#	%
Acropora secale	9	56	1	100	0	0	2	100	3	33	1	0
Acropora cf. *secale*	1	100	0	0	0	0	0	0	0	0	2	0
Acropora sp. 1	40	78	39	74	28	82	27	89	31	0	9	0
Acropora cf. *arabensis*	1	100	0	0	0	0	0	0	0	0	0	0
Acropora cf. *humilis*	20	20	23	35	10	60	15	73	19	47	6	0
Acropora cf. *cytherea*	12	75	12	58	4	75	20	90	8	0	7	0
Acropora hemprichi (beige)	5	60	4	75	0	0	1	100	0	0	2	0
Acropora eurystoma	0	0	11	36	2	50	10	80	2	0	2	0
Acropora cf. *downingi*	5	40	0	0	3	67	10	90	1	100	1	0
Acropora hemprichi (blue)	12	50	3	100	0	0	4	75	0	0	1	0
Acropora maryae	7	29	0	0	1	0	1	0	0	0	0	0
Acropora hemprichi (brown)	5	60	0	0	0	0	0	0	0	0	0	0
Acropora pharaonis	2	50	2	50	0	0	0	0	0	0	1	0
Acropora cf. *samoensis*	6	33	1	0	1	0	4	100	4	0	0	0
Acropora cf. *hyacinthus*	1	100	2	100	0	0	0	0	0	0	0	0

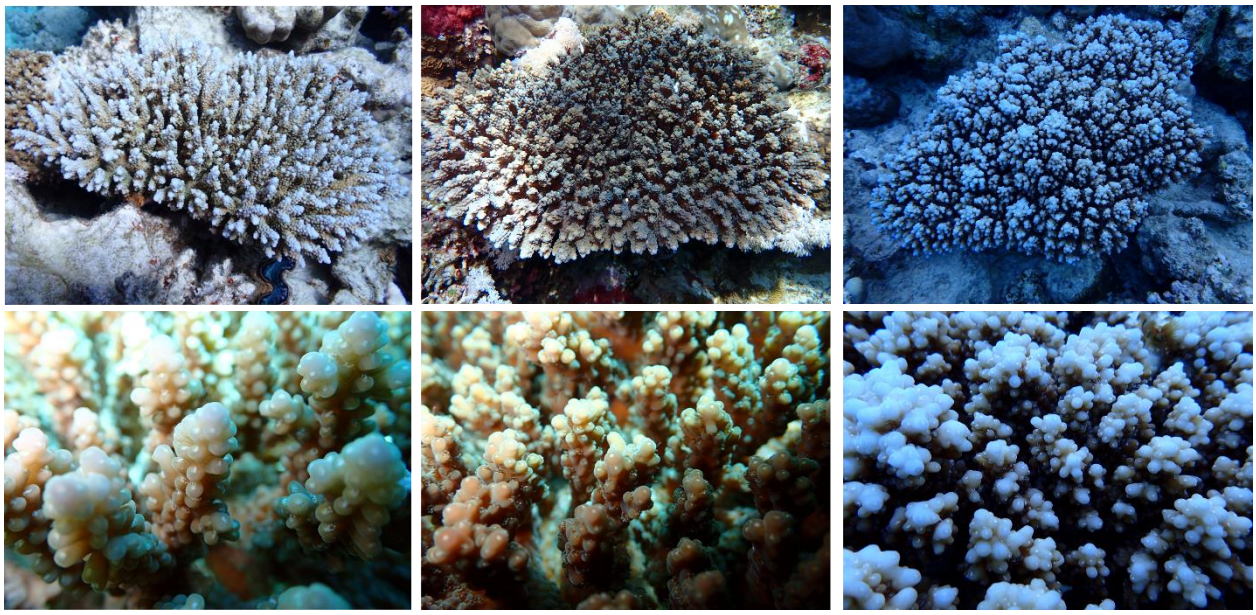

Figure S1. Image panel showing (top) colony and (bottom) branch photographs of species all considered "*Acropora* sp. 1" for Shushah Island sampling. The left-hand image represents the most common variant encountered (and is "*Acropora* sp. 1 in the main text – Figure 5 Panel C), with the middle and right-hand panels apparent growth morphs.

Figure S2. Photographs of the various digitate morphologies surveyed at Shushah Island, and for the purpose of this study synonymized as *Acropora* cf. *humilis*. The left-hand panels (top, colony; bottom, branch) are those shown in the main text – Figure 5 Panel E

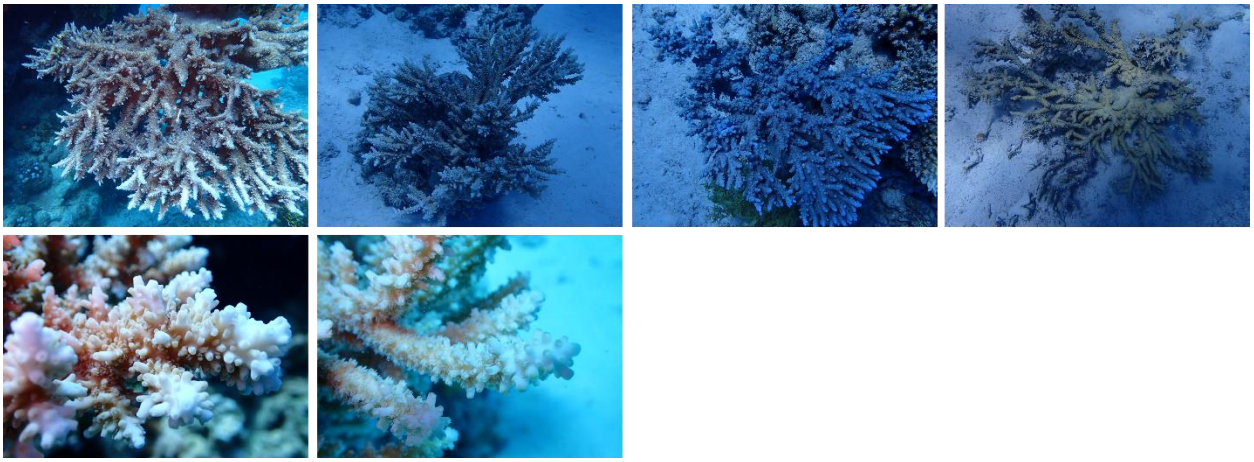

Figure S3. Photographs of complex branched arborescent morphologies encountered at Shushah Island, all of which were binned as Acropora cf. downingi for this investigation. The most common morph is that shown in the left-hand panel (top, colony; bottom, branch), and is represented in the main text Figure 5 as panel I.

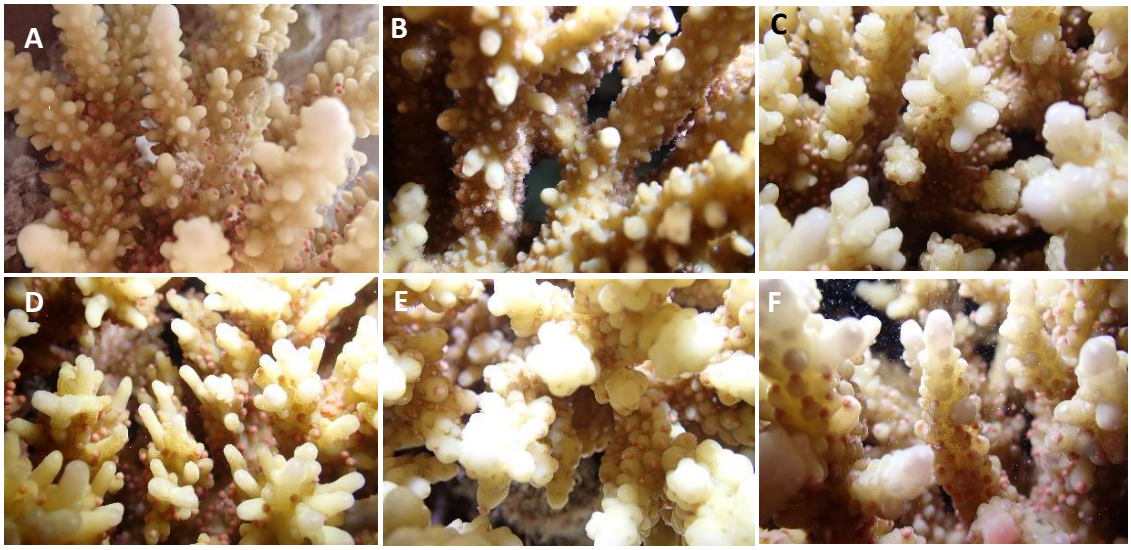

Figure S4. Photographs of in situ spawning of six *Acropora* species at Al Fahal reef (Thuwal) in the central Red Sea. Species were: A) *Acropora hemprichi*, B) *Acropora* cf. *downingi*, C) *Acropora* sp. 1, D) *Acropora* sp. 2, E) *Acropora* cf. *hemprichi*, F) *Acropora* cf. sp. 1

Figure S5. Slicks observed at Hurghada coast on 28th April 2023 highlighting mass spawning event at west-northern Red Sea approximately 7-9 days before the full moon on May 5th.

References

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