The following supplement accompanies the article

Global biogeography of coral recruitment: tropical decline and subtropical increase

Nichole N. Price*, Soyoka Muko, Louis Legendre, Robert Steneck, Madeleine J. H. van Oppen, Rebecca Albright, Put Ang Jr., Robert C. Carpenter, Apple Pui Yi Chui, Tung-Yung Fan, Ruth D. Gates, Saki Harii, Hiroaki Kitano, Haruko Kurihara, Satoshi Mitarai, Jacqueline L. Padilla-Gamiño, Kazuhiko Sakai, Go Suzuki, Peter J. Edmunds

*Corresponding author: nprice@bigelow.org

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Supplement 2

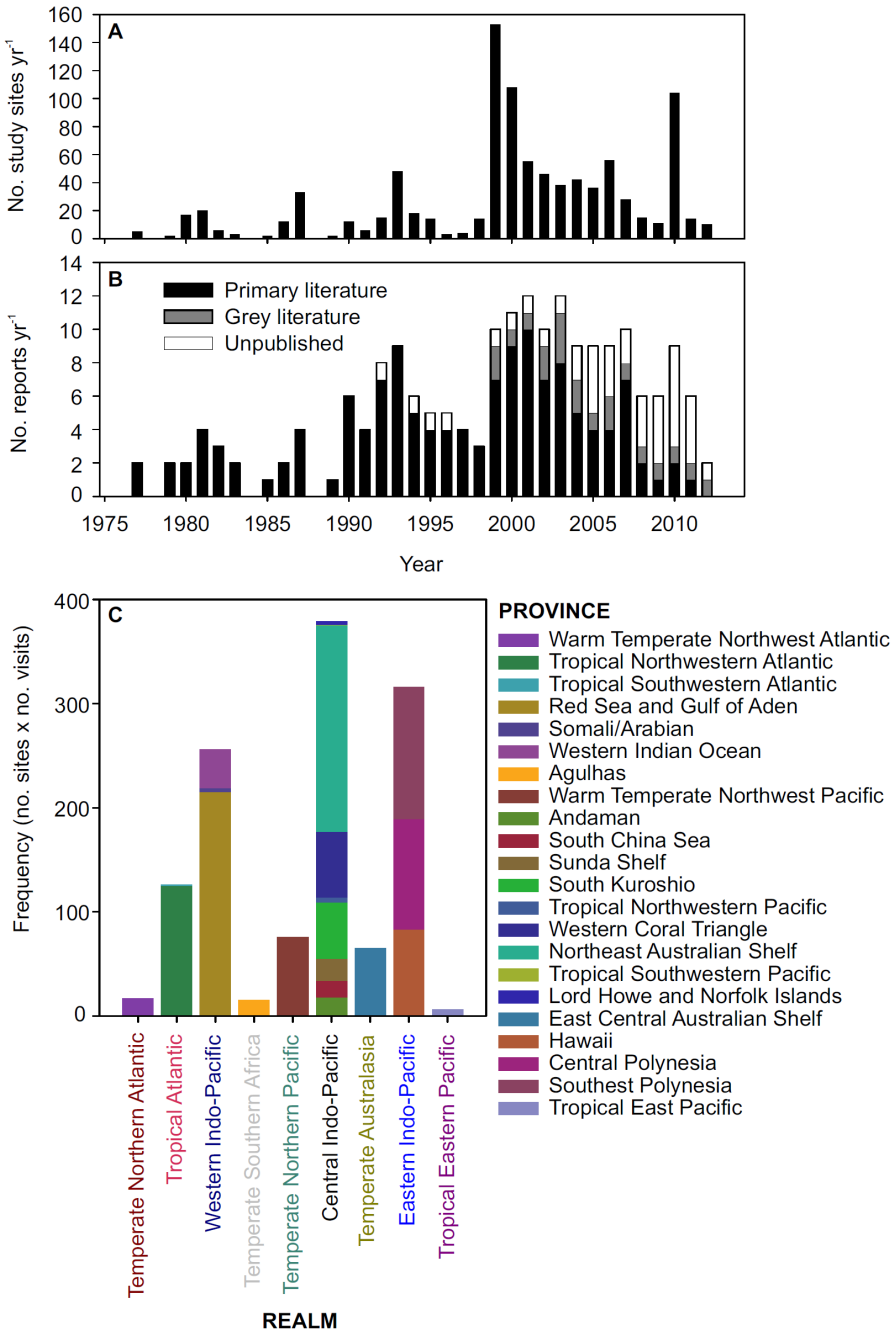

Fig. S1. Frequency distributions of information by collection date (A,B) and realm (C) in the studies compiled for the present analysis. (A) Number of study sites where coral recruitment tiles had been deployed over nearly four decades. (B) Number of studies reporting coral recruitment since 1974 in peer reviewed studies (primary literature), in unpublished reports (grey literature), and from unpublished studies of the authors of the current paper. (C) Number of sites in each 'province' and 'realm', as defined in the biogeographic scheme Marine Ecoregions of the World (MEOW, Spalding et al. 2007).

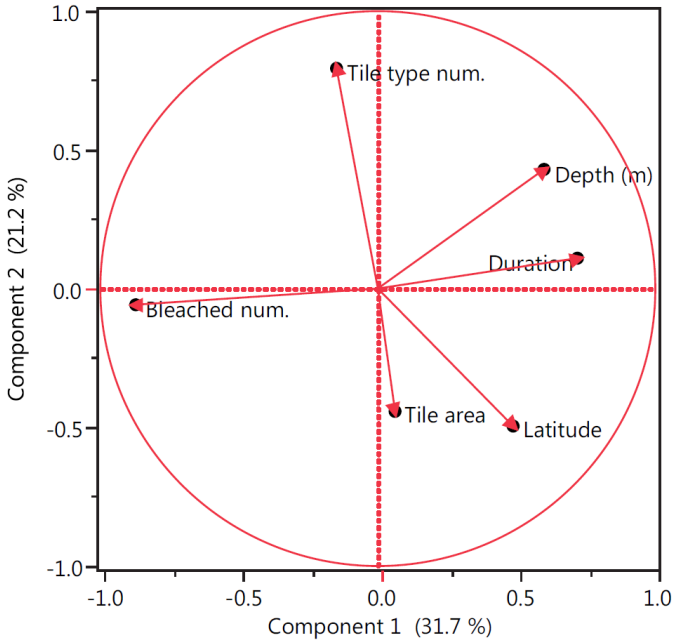

Fig. S2. Principal Component Analysis using depth, tile size and type (i.e., material from which tiles are made), post-processing method, duration of deployment, and latitude as loading variables. Because tile type and processing method are categorical, they were converted from nominal to ordinal scales with the highest value representing the optimal methodology (e.g., recruitment plates made of coral or bleaching tiles prior to viewing under a microscope). Plotted are the coefficients of the linear combination that transforms the responses to the principal components.

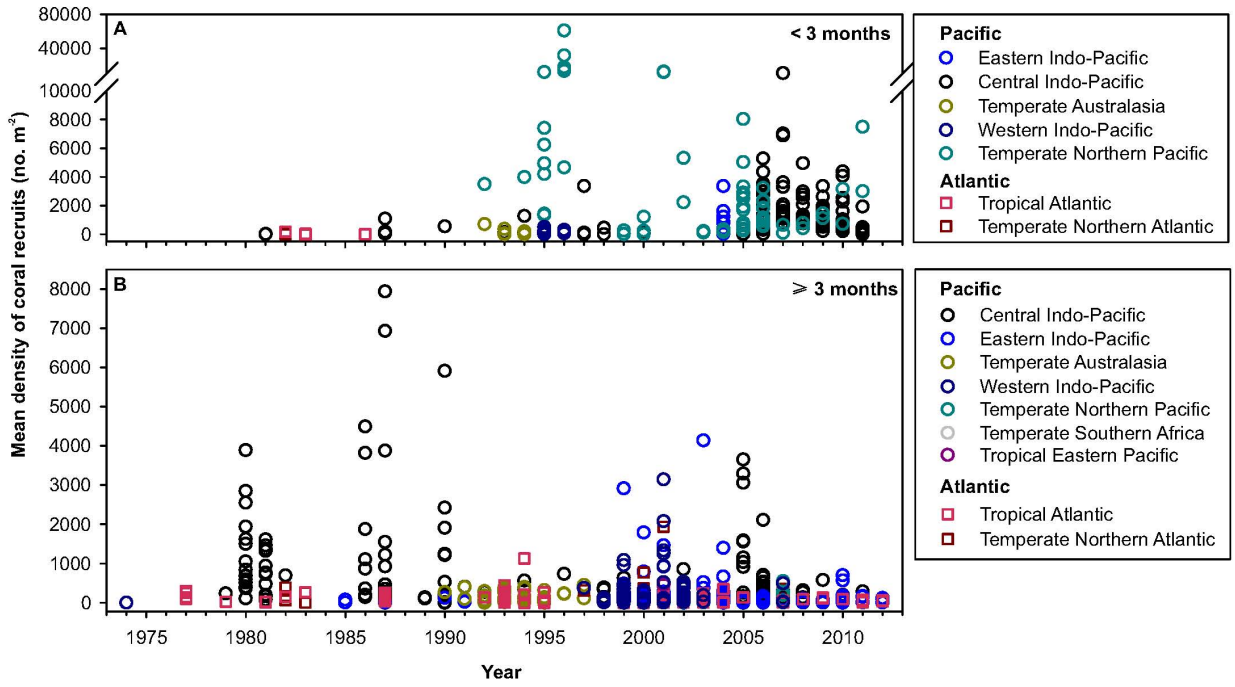

Fig. S3. Mean density of coral recruits on settlement tiles as a function of sampling year, for two immersion times: short immersion tiles (SITs) or long immersion tiles (LITs). (A) SITs <3 months immersion, and (B) LITs ≥3 months immersion. Symbols color-coded by MEOW realms (Table S2).

Table S1. CSV file containing the 1253 records of coral recruit density can be found in Supplement 1 as a separate Excel file at
http://www.int-res.com/articles/suppl/m621p001_supp1.xls

43 Table S2. Description of terms used to define biogeographic regions.

Geographic Unit	Definition	Source	Spatial Scale	Sample Size
Ocean basin	Western Atlantic and Indo-Pacific	This study	1,000,000 km^2	2
Realm	Large regions of coastal, benthic, or pelagic ocean across which biota are internally coherent at higher taxonomic levels, as a result of a shared and unique evolutionary history. Realms have high levels of endemism, including unique taxa at generic and family levels in some groups. Driving factors behind the development of biota include water temperature, historical and broadscale isolation, and proximity of the benthos.	MEOW (Spalding et al., 2007)	100,000s km^2	9 (out of 10)
Province	Large areas defined by the presence of distinct biota that have at least some cohesion over evolutionary time frames. Provinces will hold some level of endemism, principally at the level of species. Although historical isolation will play a role, many of these distinct biota have arisen as a result of distinctive abiotic features that circumscribe their boundaries. These may include geomorphological features (isolated island and shelf systems, semi-enclosed seas); hydrographic features (currents, upwellings, ice dynamics); or geochemical influences (broadest-scale elements of nutrient supply and salinity).	MEOW (Spalding et al., 2007)	10,000s km^2	22 (out of 38)
Precinct	A collection of sites defined by methodology (rather than ecology) within 0.25° radius of one another where tile deployments were repeatedly conducted independently, defined as sampling efforts in at least 4 different years over a ten-year period, at minimum; several precincts could be present within a province.	This study	100s km^2	12
Site	Smallest spatial unit representing a location where an independent deployment of settlement tiles took place, accessible on SCUBA	This study	100s m^2	1244

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Table S3. (A) GAM model selection for global trend in coral recruitment, using total deviance explained (AIC and BIC) for results obtained from tiles deployed between 1974 and 2012, and assuming a Tweedie distribution for the response mean coral recruit density on settlement tiles at n = 1,253 sites. Hierarchical models built to test separate and combined effects of the linear factors of duration of tile immersion (SITs versus LITs) and ocean (Indo Pacific versus Western Atlantic) and smoothing terms of year and immersion (as a factor). Model #1 is full, and models #2-6 are additive. (B) Summary of full GAM selected [*density = s(year, immersion) + immersion + ocean + (immersion × ocean)*]. GAM fitted with tile immersion time (two levels: <3 months and ≥3 months) introduced as a covariate and fixed effect, and ocean basin as a fixed effect (two levels: Western Atlantic and Indo-Pacific); the selected model explained 33.4% of the total deviance, and $p = 1.891$.

A) GAM model selection

Formula	df	% Total Deviance	AIC	BIC
1. *s(year, immersion) + immersion + ocean + (immersion × ocean)*	17.45	33.4	15634.57	15724.02
2. *s(year, immersion) + immersion + ocean*	16.17	32.4	15657.77	15740.66
3. *s(year, immersion) + immersion*	15.35	32.2	15663.04	15741.70
4. *s(year, immersion) + ocean*	15.10	22.3	15905.08	15982.47
5. *s(year, immersion)*	14.39	21.2	15928.87	16002.61
6. *s(year)*	9.51	11.6	16129.95	16178.71

B) Summary of full GAM selected

Source	Expected influence	Confidence	Test-statistic	P
Linear coefficients	*Estimate*	*Std. Error*	*t value*	
intercept	7.0015	0.1258	55.666	<0.0001
immersion time	-1.9377	0.1431	13.541	<0.0001
ocean	-4.3794	0.6044	7.246	<0.0001
immersion × ocean	4.0555	0.6344	6.392	<0.0001
Smooth terms	*edf*	*Ref.df*	*F value*	
year, immersion <3 months	6.82	7.536	5.647	<0.0001
year, immersion ≥3 months	6.63	7.642	18.268	<0.0001

Table S4. Results of 'location' GAM analysis, assuming a Tweedie distribution (p = 1.820), for precincts (Table S1) revisited over the years in the Indo-Pacific and Western Atlantic. The model, fitted with the smooth term 'year' by 'precinct', explained 48.1% of the total deviance [*density = s(year, precinct)*]. Results presented include: number of sites within a location × the number of visits (n), approximate significance of the smoothed terms (edf, Ref.df, F, and P), and coefficients of the linear predictors for each location (linear slope estimate of smoothing terms = mean annual trend in recruit density reported as corals m^{-2} y^{-1}, standard errors in parentheses). N = Northern, S = Southern, E = Eastern, W = Western, GBR = Great Barrier Reef. Province and basin designation for each precinct are provided in Fig. 4 and Table S1.

Precinct	Ecoregion	MEOW Realm	Latitude	n	edf	Ref.df	F	P	Slope estimate
Curacao, AN	S Caribbean	Tropical Atlantic	12.17 N	13	3.664	4.042	11.96	**< 0.0001**	-0.364 (0.14)
Bonaire, AN	S Caribbean	Tropical Atlantic	12.21 N	5	1.001	1.002	0.22	0.6370	-0.378 (0.001)
Wet Tropics, AU	Central and S GBR	Central Indo-Pacific	16.90 S	43	3.617	4.134	4.10	**0.0026**	-0.122 (0.034)
Tahiti, PF	Society Islands	E Indo-Pacific	17.52 S	100	4.656	5.311	7.81	**< 0.0001**	-0.069 (0.011)
St. John, UM	E Caribbean	Tropical Atlantic	18.34 N	10	1.554	1.918	1.88	0.1536	-0.071 (0.003)
Burdekin, AU	Central and S GBR	Central Indo-Pacific	18.72 S	34	1.001	1.001	20.57	**< 0.0001**	-0.082 (0.001)
Mackay Whitsunday, AU	Central and S GBR	Central Indo-Pacific	20.25 S	10	1.003	1.005	6.77	**0.0095**	0.174 (0.001)
Flower Garden Banks, US	N Gulf of Mexico	Temperate N Atlantic	27.98 N	14	1.217	1.394	1.24	0.2656	0.049 (0.001)
Midway, UM	Hawaii	E Indo-Pacific	28.20 N	9	1.905	2.090	4.47	**0.0110**	0.369 (0.067)
Eilat, EG	N and Central Red Sea	W Indo-Pacific	29.50 N	212	3.346	3.650	9.37	**< 0.0001**	0.267 (0.020)
Solitary Islands, AU	Tweed-Moreton	Temperate Australasia	30.08 S	40	1.425	1.681	3.63	**0.0355**	0.156 (0.001)
Shikoku, JP	Central Kuroshio Current	Temperate N Pacific	32.78 N	9	2.147	2.358	7.99	**0.0002**	0.587 (0.116)

Table S5. GAM model selection for latitudinally-binned data, using total deviance explained (AIC and BIC), for global trend in coral recruitment between 1974 and 2012, assuming a Tweedie distribution for the response of mean coral recruit density on LITs at n = 965 sites. Hierarchical models built to test separate and combined effects of the linear factors of latitude (above and below 20°, combining North and South of the equator) and ocean (Indo-Pacific versus Western Atlantic) and smooth term of year and latitude (as a factor). Model #1 is full, and models #2-6 are additive.

Model number and formula	df	% Total Deviance	AIC	BIC
1. *s(year, latitude) + latitude + ocean + (latitude × ocean)*	15.45	23.4	11276.79	11352.06
2. *s(year, latitude) + latitude + ocean*	15.64	23.1	11281.37	11357.58
3. *s(year, latitude) + latitude*	14.67	22.9	11284.49	11355.98
4. *s(year, latitude) + ocean*	14.77	23.1	11279.58	11351.53
5. *s(year, latitude)*	14.78	**23.5**	**11273.97**	**11345.96**
6. *s(year)*	9.34	20.6	11313.34	11358.88