Supplementary materials

Functional Trait	Trait type	Categories	Link to ecosystem functions.
1) Morphology	Categorical	(a) Boring; (b) Encrusting; (c) Filaments; (d) Stolonial; (e) Foliose Erect; (f) Articulated; (g) Coarsely branched; (h) Cup-like; (i) Mass.-Encr.; (j) Mass.-Erect; (k) Mass.-Hem.; (l), Tree-like; (m) Globose-lobate	Indicator of three-dimensional spatial complexity and habitat provision.
2) Coloniality	Ordinal	(1) Solitary; (2) Gregarious; (3) Colonial	Modifies mortality risk and spatial competition dynamics, thus influencing ecosystem resistance and resilience.
3) Maximum longevity	Ordinal	(1) Very low (weeks); (2) Low (months; < 12); (3) Medium (1–3 years); (4) High (3–20 years); (5) Very High (>20 years)	Indicator of community stability and long-term maintenance of ecosystem functions.
4) Size	Ordinal	(1) Very low (< 1 cm / 1cm); (2) Low (2–5 cm); (3) Medium (5–20 cm); (4) High (20–50 cm); (5) Very High (>50 cm)	Influences competition for space and resources, predation risk, and energy requirements.
5) Epibiosis	Ordinal	(1) Never; (2) Facultative; (3) Obligate	Indicator of stress to the basibiont due to natural or anthropogenic pressures.
6) Energetic resource	Ordinal	(1) Autotroph; (2) Auto-heterotroph; (3) Heterotroph	Describes the energy fluxes within food webs.
7) Major photos. pigment	Categorical	(a) None; (b) Chl a/b (e.g. green algae); (c) Chl a/c, Fucoxanthin, (e.g. brown algae); (d) Chl a, Phycocyanin, Phycoerythrin (e.g. red algae); (e) Chl a, Phycocyanin (Cyanobacteria); (f) Dinoflagellathed; (g) Mix. (e.g. turf)	Defines the light harvesting capability and influences the primary production of the ecosystem.
8) Feeding strategy	Categorical	(a) Primary producer; (b) Active filter feeder w. cilia; (c) Active filter feeder by pumping; (d) Passive filter feeder; (e) Mixture; (f) Saprophytic	Describes trophic interactions, benthic-pelagic coupling, nutrient cycling, and energy transfer within food webs.
9) Potential of asexual reproduction	Ordinal	(1) No; (2) Yes	Implications to energy investment and population resilience. Affects genetic variability and dispersal strategies.
10) Growth rates	Ordinal	(1) Slow (≤ 1cm/year); (2) Moderate (1–5 cm/year); (3) High (5–10 cm/year); (4) Very High (> 10 cm/year)	Influences the biomass production, the habitat resilience and its long-term stability.
11) Defences	Categorical	(a) None; (b) Physical; (c) Chemical; (d) Physical and chemical	Determines the stability of assemblages by preventing predation.
12) Propagules	Categorical	(a) Spores; (b) Planktotrophic; (c) Lecitotrophic	Indicator of community connectivity and resilience of ecosystems to environmental changes.

Table S1: Description of the 12 traits used to measure functional diversity of benthic species. For each trait, the type (*i.e.* categorical/ordinal), category and link to ecosystem functions are reported.

Location	Site	Density (colonies/m^2)	Biomass (g dw/m²)	Height (cm)	Skewness	Kurtosis	Skew. Sig.	Kurt. Sig.
Ischia	A	27.3 ± 5.9	228.8 ± 198.2	15.6 ± 6.9	2.2 ± 0.4	5 ± 0.7	5.9	6.9
	B	30.0 ± 15.9	188.7 ± 163.9	12.1 ± 6.4	2.1 ± 0.4	4.8 ± 0.7	6.0	6.8
Procida	A	53.3 ± 19.4	208.3 ± 127.2	10.1 ± 2.3	2.2 ± 0.3	5.2 ± 0.5	8.3	9.8
	B	34.7 ± 9.6	251.9 ± 194.9	14.7 ± 5.0	2 ± 0.3	4.4 ± 0.7	6.1	6.8
Penna	A	29.3 ± 6.0	121.1 ± 72.0	12.8 ± 3.5	1.9 ± 0.4	3.9 ± 0.7	5.3	5.6
	B	30.7 ± 26.6	107.1 ± 75.7	12.1 ± 3.8	1.2 ± 0.4	1.3 ± 0.7	3.6	1.9
Capri	A	42.7 ± 20.5	100.1 ± 89.7	9.1 ± 2.2	2.1 ± 0.3	4.4 ± 0.6	6.9	7.4
	B	36.0 ± 13.1	505.4 ± 367.7	16.9 ± 6.7	2.3 ± 0.3	5.6 ± 0.6	7.2	8.7
Vervece	A	30.7 ± 14.5	338.6 ± 246.7	13.2 ± 12.7	2.3 ± 0.4	5.4 ± 0.7	6.5	7.8
	B	33.3 ± 25.9	198.2 ± 149.6	10.5 ± 13.5	2.4 ± 0.3	5.7 ± 0.7	7.1	8.6
Banco	A	65.3 ± 27.1	488.5 ± 141.8	13.7 ± 4.0	2.3 ± 0.2	5.4 ± 0.5	9.4	11.1
	B	34.7 ± 14.9	355.0 ± 181.1	18.5 ± 5.2	0.6 ± 0.3	-1.2 ± 0.7	1.9	-1.8

Table S2: Characteristics of *P. clavata* forests. Skewness and kurtosis are significant if the absolute value of coefficient/standard error (s.e.m.) is greater than 2.

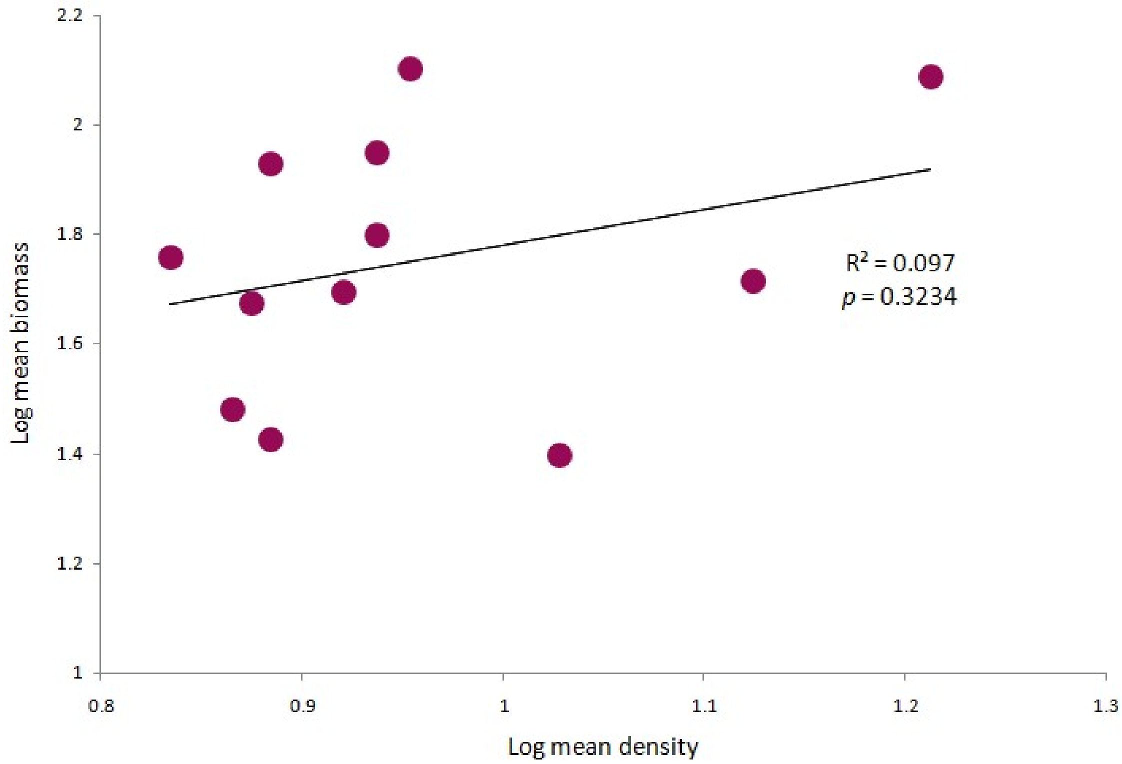

Fig. S1: Self-thinning process. Relationship between the log mean density and log mean biomass across all sites.

	Source	df	SS	MS	Pseudo-F	P(perm)	Unique perms
	Lo	5	219.18	43.837	2.1964	0.217	818
	Co	1	135	135	19.424	0.012*	997
	Si(Lo)	6	119.75	19.958	3.2704	0.002**	998
Sp	Lo×Co	5	34.75	6.95	0.56313	0.746	999
	Si(Lo)×Co	6	74.05	12.342	2.0223	0.06	998
	Res	216	1318.2	6.1028			
	Total	239	1900.9				
	Lo	5	225.47	45.094	2.4469	0.165	840
	Co	1	105.34	105.34	24.569	0.009**	991
	Si(Lo)	6	110.58	18.429	3.5143	0.004**	999
FEs	Lo×Co	5	21.437	4.2875	0.36502	0.841	998
	Si(Lo)×Co	6	70.475	11.746	2.2399	0.058	996
	Res	216	1132.7	5.244			
	Total	239	1666				
	Lo	5	0.5336	0.10672	0.6986	0.596	950
	Co	1	0.32264	0.32264	5.1653	0.042*	995
	Si(Lo)	6	0.91657	0.15276	2.818	0.002**	999
FRic	Lo×Co	5	0.31232	0.062463	1.115	0.416	999
	Si(Lo)×Co	6	0.33613	0.056021	1.0334	0.423	999
	Res	216	11.709	0.054209			
	Total	239	14.13				

Table S3: Three-way univariate analyses of variance. PERMANOVA test based on Euclidean distance matrix of species richness (Sp), number of functional entities (FEs) and functional richness (FRic). Significant differences are shown as follow * $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.001$.

	Source	df	SS	MS	Pseudo-F	P(perm)	Unique perms
Taxonomic structure	Lo	5	74027	14805	3.7219	0.001***	959
	Co	1	9334.2	9334.2	3.0975	0.039*	976
	Si(Lo)	6	23868	3978	6.6403	0.001***	998
	Lo×Co	5	15067	3013.5	1.8164	0.043*	997
	Si(Lo)×Co	6	9954.3	1659.1	2.7694	0.001***	995
	Res	216	1.29E+05	599.07			
	Total	239	2.62E+05				
Functional structure	Lo	5	68803	13761	3.1305	0.001***	940
	Co	1	10504	10504	3.6706	0.045*	973
	Si(Lo)	6	26374	4395.7	6.9482	0.001***	996
	Lo×Co	5	14309	2861.7	1.8973	0.04*	997
	Si(Lo)×Co	6	9049.7	1508.3	2.3841	0.001***	997
	Res	216	1.37E+05	632.63			
	Total	239	2.66E+05				

Table S4: Multivariate analyses. PERMANOVA test on Bray-Curtis distance of fourth root data of the taxonomic structure and the functional structure in terms of composition and relative abundance of FEs.

			Taxonomic structure			Functional structure		
		Groups	t	P(perm)	Unique perms	t	P(perm)	Unique perms
Ischia	A	Out,In	1.4788	0.016*	994	1.3001	0.076	987
	B		2.3655	0.002**	992	2.3681	0.005**	993
Procida	A		3.2086	0.001***	997	2.984	0.001***	994
	B		1.9479	0.001***	993	1.9623	0.002**	991
Penna	A		2.7198	0.001***	992	3.0773	0.001***	992
	B		1.7278	0.001***	990	1.3792	0.018*	996
Capri	A		2.9452	0.001***	994	2.6357	0.001***	990
	B		2.8301	0.001***	994	2.9608	0.001***	989
Vervece	A		0.86616	0.667	992	0.82211	0.749	991
	B		1.5775	0.014*	995	1.4479	0.04*	995
Banco	A		1.8105	0.002**	992	1.9484	0.001***	994
	B		1.7738	0.006**	994	1.9515	0.003**	992

Table S5: *A posteriori* pairwise comparisons for the term 'Si(Lo)×Co' for pairs of levels of factor 'Co' on the taxonomic structure and the composition and relative abundance of FEs.

Source	df	SS	MS	Pseudo-F	P(perm)	Unique perms
Lo	5	1500.4	300.08	3.6647	0.005**	957
Co	1	149.23	149.23	2.9214	0.05*	982
Si(Lo)	6	491.31	81.884	5.1642	0.001***	999
Lo×Co	5	255.41	51.082	1.7258	0.102	999
Si(Lo)×Co	6	177.6	29.6	1.8668	0.012*	998
Res	216	3425	15.856			
Total	239	5998.9				

Table S6: multivariate analysis on CWM. PERMANOVA test on Bray-Curtis distance matrix of fourth root transformed data of CWM.

		Groups	t	P(perm)	Unique perms
Ischia	A	Out,In	1.151	0.254	992
	B		2.4209	0.003**	993
Procida	A		2.5797	0.001***	995
	B		1.4684	0.069	996
Penna	A		1.6767	0.019*	995
	B		1.4767	0.047*	991
Capri	A		1.8418	0.002**	997
	B		3.0066	0.001***	992
Vervece	A		1.8892	0.01**	992
	B		1.1637	0.221	995
Banco	A		1.3703	0.119	994
	B		1.1236	0.307	991

Table S7: *A posteriori* pairwise comparisons for the interaction term 'Si(Lo)×Co' for pairs of levels of factor 'Co'.

Fig. S2: Community-Weighted Mean across site. Non-metric multidimensional scaling ordinations on Bray-Curtis dissimilarity measure for the CWM inside (red) *vs.* outside (green) the forests for each site. Vectors indicate the functional categories that most drive differences between conditions.

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