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Juvenile fish in Cystoseira forests: influence of habitat complexity and depth on fish behaviour and assemblage composition

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Supplementary Data

Juvenile fish in macroalgae *Cystoseira forests*: influence of habitat complexity and depth on fish behaviour and assemblage composition

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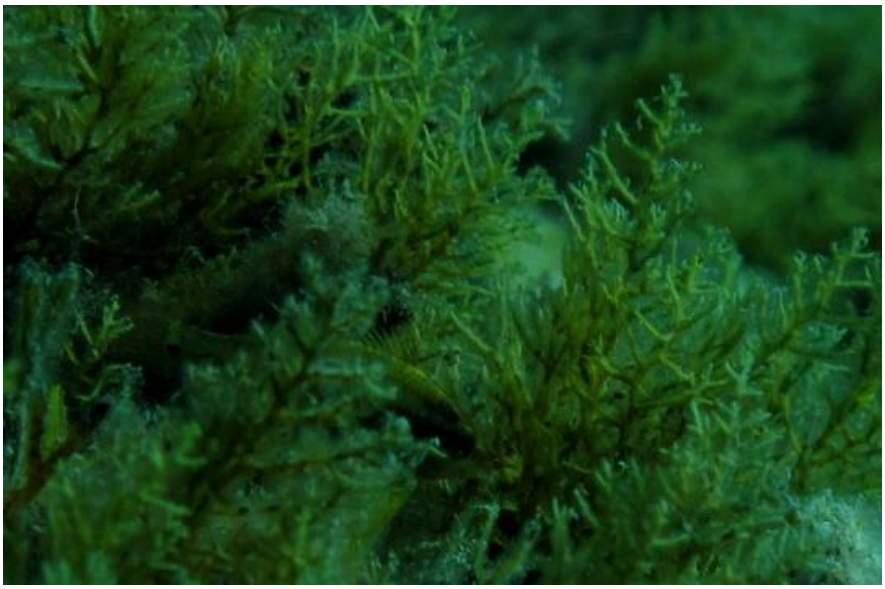

Fig. S1a: **Cryptic behavior** of a juvenile of *Symphodus ocellatus* (45 mm TL, September 2013). Photo: Amalia Cuadros.

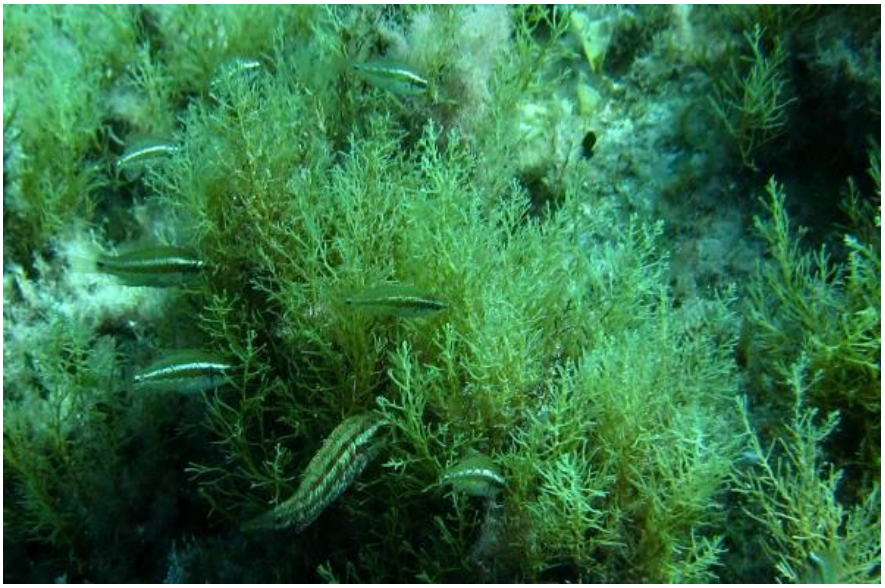

Fig. S1b: **Wandering behavior** of *Symphodus ocellatus* juveniles (30-35 mm TL) and a *Symphodus roissali* (50 mm TL) juvenile (September 2012). Photo: Eva Vidal.

Fig. S1c: **Transitory behavior** of a juvenile of *Serranus scriba* (40 mm TL, July 2010). Photo: Adrien Cheminée.

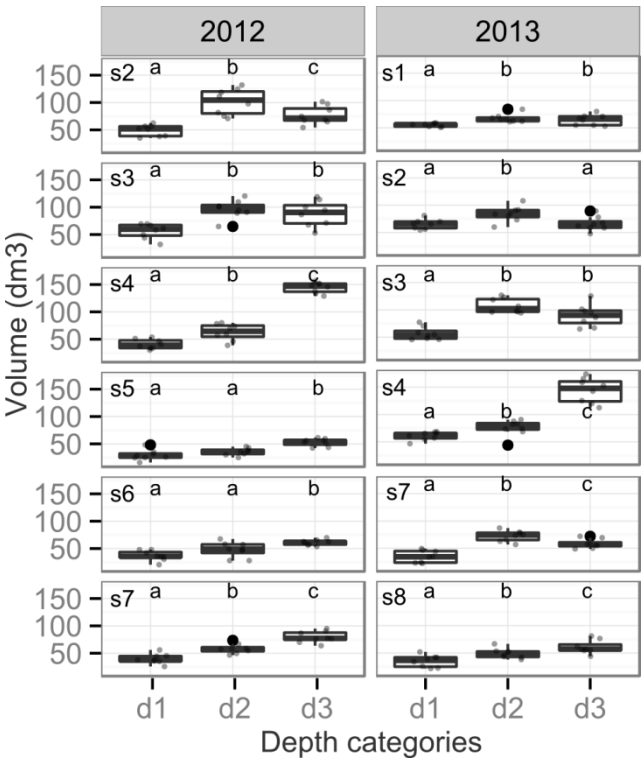

Fig. S2: **Boxplots of *Cystoseira* forest structure, i.e. volume, within samples according to years (2012, 2013), sites (s1 to s8) and depth categories (d1: 3-5 m, d2: 6-8 m, d3: 10-12 m)**. Box plots indicate the median (bold line near the center), the first and third quartile (the box), the extreme values whose distance from the box is at most 1.5 times the inter quartile range (whiskers), and remaining outliers (black dots). Pair-wise tests between treatments are given in box plots (different lower case characters indicate significant differences between treatments).

Table S1. Permutational ANOVA table of results: influence of year, site and depth on the univariate habitat structure descriptor (volume); main test.
Factor year (ye): 2 levels (2012 and 2013); Factor site (si): 6 levels; Factor depth (de): 3 levels (d1: 3-5 m, d2: 6-8 m, d3: 10-12 m). *P*-values were obtained by 9999 permutations of residuals under a reduced model. Significance: ·$P \leq 0.1$; * $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.001$.

Source of var.	Df	MS	Pseudo-F	P (perm)
Year (ye)	1	0.17597	0.24786	0.663
Site (si)	7	12.173	17.145	0.0194
Depth (de)	2	26.053	4.2431	0.0324
yexsi	3	0.70998	3.8062	0.0124
yexde	2	1.3168	1.7358	0.2523
sixde	14	4.9402	6.5123	0.0174
yexsixde	6	0.75859	4.0668	0.0011**
Residuals	252	0.18653		
Total	287			

Table S2. Results obtained with the similarity analysis (SIMPER) of *Cystoseira* forest juvenile assemblage data between groups of assemblage samples according to depth d1, d2 and d3.

Depth	Assemblage dissimilarity (%)	Contribution of species to dissimilarity (%)
d1-d3	78.46	*Thalassoma pavo* (26.59), *Coris julis* (23.15), *Symphodus* spp. (14.62), *Oblada melanura* (14.10)
d1-d2	63.04	*Thalassoma pavo* (29.88), *Coris julis* (17.14), *Oblada melanura* (16.01)
d3-d2	76.49	*Coris julis* (28.54), *Thalassoma pavo (27.20), Symphodus* spp (20.74)

Table S3. Permutational ANCOVAs table of results: effect of habitat structure (volume), year, site and depth on juvenile densities per taxa. Factor year (ye): 2 levels (2012 and 2013); Factor site (si): 6 levels; Factor depth (de): 3 levels (d1: 3-5 m, d2: 6-8 m, d3: 10-12 m). Significance: ·$P \leq 0.1$; * $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.001$.

Considered response variable	Source of var.	Df	MS	Pseudo-F	P (perm)
Coris julis densities	Volume (covariate)	1	82.099	12.935	0.0007***
	Year (ye)	1	3.5534	0.22339	0.6398
	Site (si)	7	13.375	0.82899	0.6282
	Depth (de)	2	42.285	2.4224	0.11
	yexsi	3	16.65	6.2518	0.0004***
	yexde	2	20.727	1.9544	0.1916
	sixde	14	4.5427	0.37185	0.9394
	yexsixde	6	12.441	4.6713	0.0001***
	Residuals	251	2.6632		
	Total	287			
Thalassoma pavo densities	Volume (covariate)	1	146.12	14.47	0.0005***
	Year (ye)	1	129.63	7.4198	0.0423*
	Site (si)	7	21.153	1.3541	0.4471
	Depth (de)	2	97.285	3.6054	0.0395*
	yexsi	3	16.107	5.513	0.0012**
	yexde	2	24.178	4.4792	0.0338*
	sixde	14	8.5632	2.0364	0.1976
	yexsixde	6	4.2351	1.4495	0.1997
	Residuals	251	2.9217		
	Total	287			
Symphodus spp. densities	Volume (covariate)	1	411.27	46.166	0.0001***
	Year (ye)	1	158.12	20.865	0.0042**
	Site (si)	7	7.4742	0.99263	0.5498
	Depth (de)	2	12.741	0.31733	0.9172
	yexsi	3	7.5222	0.97382	0.4157
	yexde	2	63.864	8.5971	0.0044**
	sixde	14	6.2142	0.80735	0.6516
	yexsixde	6	7.6964	0.99637	0.4266
	Residuals	251	7.7244		
	Total	287	2869.5		

Table S4. Permutational ANCOVAs table of results: influence of habitat structure (volume), year, site and depth on juvenile total length per taxa. Factor year (ye): 2 levels (2012 and 2013); Factor site (si): 6 levels; Factor depth (de): 3 levels (d1: 3-5 m, d2: 6-8 m, d3: 10-12 m). *P*-values were obtained by 9999 permutations of residuals under a reduced model. Significance: ·$P \leq 0.1$; * $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.001$.

Considered response variable	**Source of var.**	**Df**	**MS**	**Pseudo-F**	**P (perm)**
Coris julis TL	Volume (covariate)	1	844.97	3.9431	0.0621·
	Year (ye)	1	196.37	1.2972	0.3214
	Site (si)	7	281.41	5.3855	0.0859·
	Depth (de)	2	692.54	5.2761	0.0224*
	yexsi	3	45.823	0.55003	0.6464
	yexde	2	42.492	0.15886	0.8333
	sixde	12	217.9	0.4741	0.8346
	yexsixde	3	458.99	5.5094	0.0015**
	Residuals	397	83.31		
	Total	428			
Thalassoma pavo TL	Volume (covariate)	1	12173	9.5744	0.0026**
	Year (ye)	1	16545	13.22	0.0041**
	Site (si)	7	1533.3	1.3955	0.4175
	Depth (d)	2	846.51	3.6428	0.0272*
	yexsi	3	982.29	12.518	0.0001***
	yexde	2	56.617	0.62246	0.5656
	sixde	14	198.78	2.5222	0.1648
	yexsixde	6	67.214	0.85655	0.5162
	Residuals	674	78.47		
	Total	710			
Symphodus spp. TL	Volume (covariate)	1	46.155	0.36991	0.7616
	Year (y)	1	156.01	0.36543	0.5812
	Site (s)	6	470.11	0.6435	0.5875
	Depth (d)	2	558.77	0.53123	0.7373
	yexsi	3	334.71	4.5805	0.0053**
	yexde	1	188.79	4.3378	0.0961·
	sixde	9	246.91	9.4567	0.2166
	yexsixde	1	20.408	0.27929	0.5929
	Residuals	275	73.073		
	Total	299			

Table S5. Permutational MANCOVAs table of results: influence of fish total lenght (TL), habitat structure (volume), year, site and depth on juvenile multivariate behavior composition per taxa.
Factor year (ye): 2 levels (2012 and 2013); Factor site (si): 6 levels; Factor depth (de): 3 levels (d1: 3-5 m, d2: 6-8 m, d3: 10-12 m). P-values were obtained by 9999 permutations of residuals under a reduced model. Significance: •P≤0.1 ; * P ≤ 0.05 ; ** P ≤ 0.01 ; *** P ≤ 0.001.

Considered response variable	Source of var.	Df	MS	Pseudo-F	P (perm)
Coris julis behavior composition	TL (covariate)	1	97921	30.984	0.0001***
	Volume (covariate)	1	11530	1.5178	0.2245
	Year (ye)	1	30994	2.3533	0.1339
	Site (si)	7	9467.7	0.77047	0.6889
	Depth (de)	2	5295.7	0.74566	0.6263
	yexsi	3	10780	4.0902	0.0008***
	yexde	2	5765.6	1.8998	0.1612
	sixde	12	3179.4	1.5776	0.3192
	yexsixde	3	2012.8	0.7637	0.5992
	Residuals	396	2635.6		
	Total	428			
Thalassoma pavo behavior composition	TL (covariate)	1	4.79E+05	17.184	0.0001***
	Volume (covariate)	1	6291	1.7765	0.1743
	Year (ye)	1	89713	18.168	0.0002***
	Site (si)	7	8786.2	2.2958	0.168
	Depth (de)	2	6801.3	1.5349	0.1895
	yexsi	3	3476.9	2.1753	0.048*
	Yexde	2	1577.7	0.47967	0.7069
	Sixde	14	5177.8	1.6258	0.3255
	yexsixde	6	2656.1	1.6618	0.0846·
	Residuals	673	1598.4		
	Total	710			
Symphodus spp. behavior composition	TL (covariate)	1	8517.5	1.8392	0.1616
	Volume (covariate)	1	30780	1.0022	0.4331
	Year (ye)	1	5285.6	0.53525	0.5672
	Site (si)	6	25548	1.5202	0.3894
	Depth (de)	2	15161	0.73876	0.6575
	yexsi	3	7025.1	3.3003	0.0028**
	yexde	1	10883	1.2127	0.3236
	sixde	9	11244	0.81578	0.6703
	yexsixde	1	10546	4.9544	0.0087**
	Residuals	272	2128.6		
	Total	297			