

# The invasive kelp *Undaria pinnatifida* hosts an epifaunal assemblage similar to native seaweeds with comparable morphologies

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## Supplement 1

(A) PERMANOVA results from the analysis of differences between months and species at Aramoana in February/March 2012 and December 2012 (Table S1), pair-wise test among seaweed species (Table S2), and MDS plots of ordination of epifaunal composition by time (Fig. S1) and seaweed species (Fig. S2)

Table S1. PERMANOVA table of results (Feb–Mar and Dec 2012)

Source	df	SS	MS	Pseudo- <i>F</i>	P(perm)
Mo	1	7645.5	7645.5	7.5177	0.0001*
Se	5	58248	11650	11.455	0.0001*
MoxSe	5	16451	3290.2	3.2352	0.0001*
Res	48	48816	1017		
Total	59	1.3116E5			

Table S2. Pair-wise tests

Groups	<i>t</i>	P(perm)
U, Mu	1.8882	0.0002*
U, X	2.3495	0.0001*
U, Ca	3.888	0.0001*
U, Cy	4.6699	0.0001*
U, S	4.9175	0.0002*
Mu, X	2.3369	0.0001*
Mu, Ca	3.4118	0.0001*
Mu, Cy	4.0939	0.0001*
Mu, S	4.1788	0.0001*
X, Ca	3.2791	0.0001*
X, Cy	3.3552	0.0001*
X, S	3.6988	0.0001*
Ca, Cy	3.047	0.0001*
Ca, S	2.0828	0.0004*
Cy, S	3.846	0.0001*

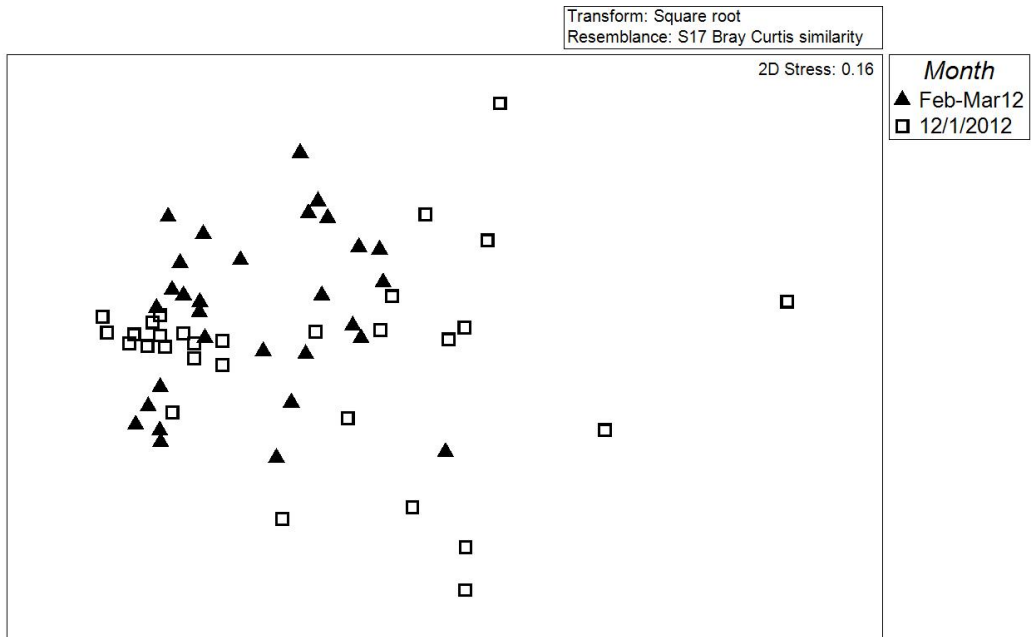


Fig. S1. nMDS plot of epifaunal composition by time at Aramoana

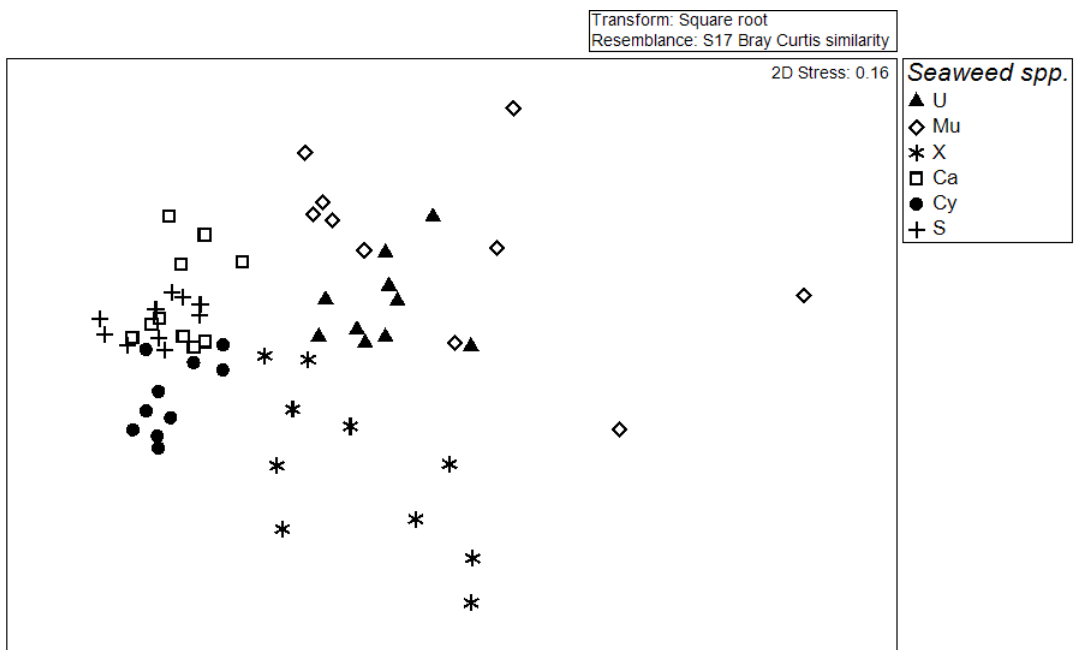


Fig. S2. nMDS plot of epifaunal composition by seaweed species from Aramoana

(B) PERMANOVA results from the analysis of differences (Table S3) and pair-wise test among seaweed species (Table S4) at Aramoana in February/March 2012 and MDS plot (Fig. S3)

Table S3. PERMANOVA table of results (Feb–Mar 2012)

Source	df	SS	MS	Pseudo- <i>F</i>	P(perm)
Se	5	32807	6561.5	7.9108	0.0001
Res	24	19906	829.43		
Total	29	52714			

Table S4. Pair-wise tests

Groups	<i>t</i>	P(perm)
U, Mu	2.1804	0.0076*
U, X	1.6446	0.0083*
U, Ca	2.3396	0.0086*
U, Cy	4.2771	0.0094*
U, S	3.3543	0.0083*
Mu, X	2.1075	0.0077*
Mu, Ca	2.5492	0.0095*
Mu, Cy	5.1917	0.0074*
Mu, S	4.0429	0.0072*
X, Ca	2.1506	0.0083*
X, Cy	2.7859	0.0068*
X, S	2.405	0.0093*
Ca, Cy	3.1201	0.007*
Ca, S	1.6109	0.0155
Cy, S	4.6235	0.0081*

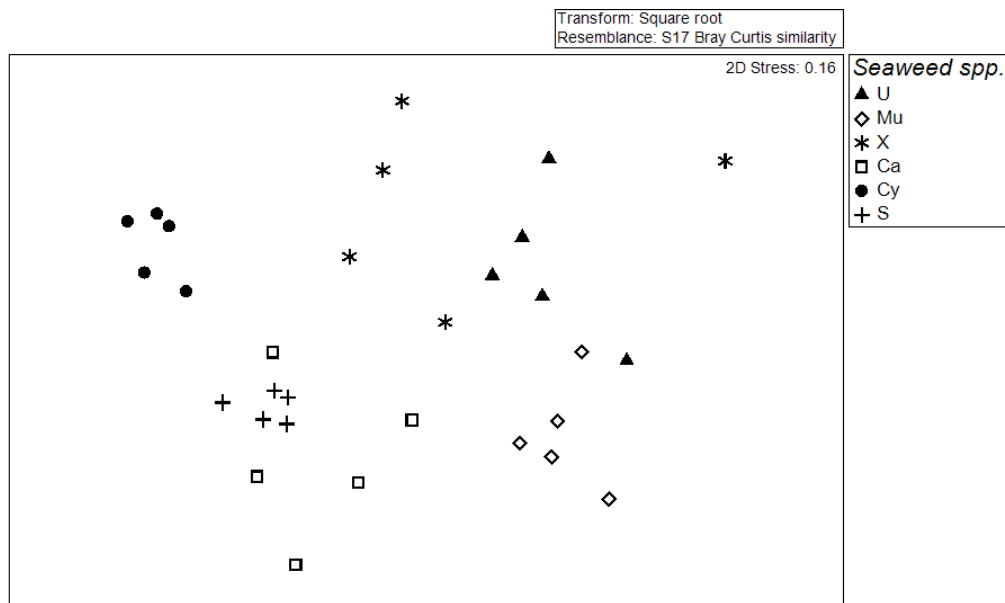


Fig. S3. nMDS plot of epifaunal composition by seaweed species at Aramoana in February/March 2012

(C) PERMANOVA results from the analysis of differences (Table S5) and pair-wise test among seaweed species (Table S6) at Aramoana in December 2012 and MDS plot (Fig. S4)

Table S5. PERMANOVA table of results (Dec 2012)

Source	df	SS	MS	Pseudo- $F$	P(perm)
Se	5	41892	8378.3	6.9555	0.0001*
Res	24	28910	1204.6		
Total	29	70801			

Table S6. Pair-wise tests

Groups	$t$	P(perm)
U, Mu	1.6785	0.0079*
U, X	2.0363	0.0065*
U, Ca	3.6103	0.0083*
U, Cy	2.9494	0.0083*
U, S	4.0351	0.0094*
Mu, X	1.7292	0.0088*
Mu, Ca	2.8579	0.0083*
Mu, Cy	2.6509	0.0074*
Mu, S	3.039	0.0076*
X, Ca	3.0644	0.0096*
X, Cy	2.5893	0.009*
X, S	3.3651	0.0084*
Ca, Cy	1.7064	0.0067*
Ca, S	2.1377	0.008*
Cy, S	2.0138	0.0091*

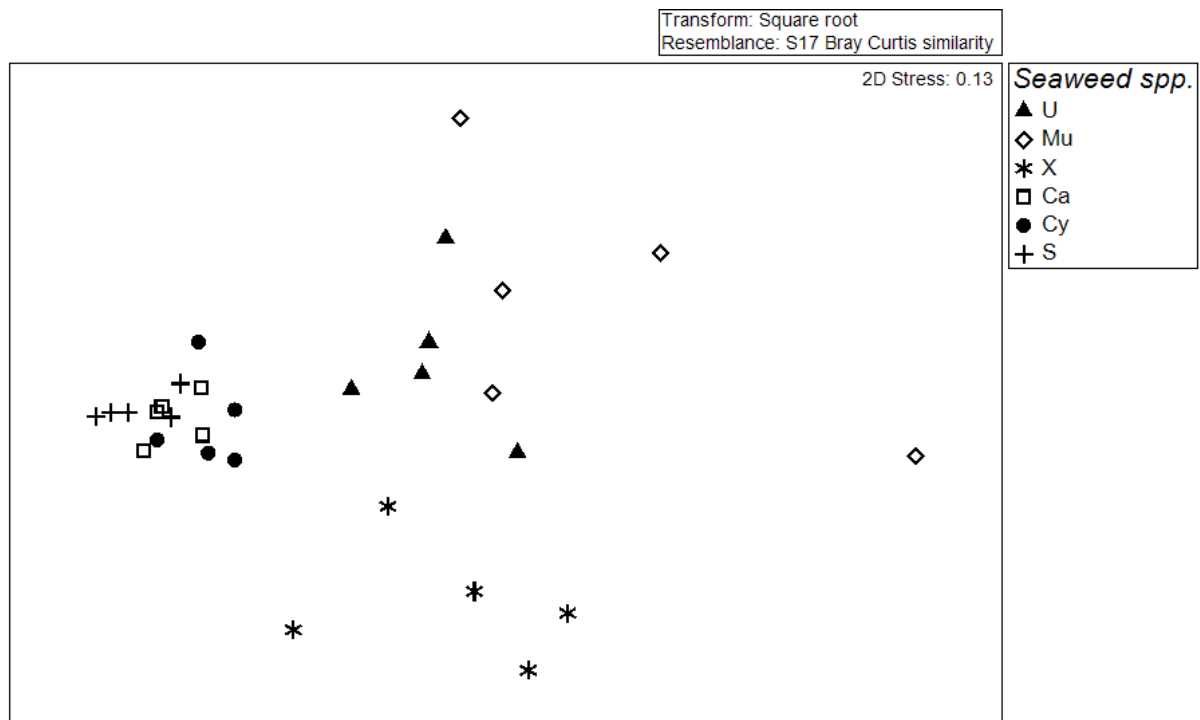


Fig. S4. nMDS plot of epifaunal composition by seaweed species at Aramoana in December 2012

## Supplement 2

The following Orders/Superfamilies/Families from Table 1 include: Order Harpacticoida = Harpacticoid copepods; Family Caprellidae = *Caprellina longicollis* and *Caprella equilibra*; Family Aoridae = *Aora typica*; Family Hyalidae = *Protohyale rubra*; Family Stegocephalidae = *Tetradeion crassum*; Family Photidae = *Gammaropsis* spp.; Family Melitidae = *Elasmopus wahine* and *Parapherusa crassipes*; Family Ampithoidae = *Peramphithoe aorangi*; Family Amphiloichidae = *Neocyproidea otakensis*; Family Idoteidae = *Batedotea elongata*; Family Limnoriidae = *Limnoria* spp.; Family Plakarthriidae = *Plakarthrium typicum*; Family Sphaeromatidae = *Scutuloidea maculata*, *Amphoroidea falcifer* and *A. longipes*; Family Paranthuridae = *Colanthura* spp.; Family Jaeropsidae = *Jaeropsis coralicola* and *Jaeropsis* spp.; Family Trochidae = *Cantharidus* spp.; Family Scissurellidae = *Incisura lytteltonensis*; Family Eatoniellidae = *Eatoniella limbata* and *Eatoniella* spp.; Family Muricidae = *Xymene* spp.; Superfamily Seguenzioidea = *Lissotesta* spp.; Family Gobiesocidae = *Haplocylix littoreus* and *Gastrocyathus gracilis*; Family Hippolytidae = *Hippolyte multicolorata*.

## Supplement 3

Summary of PERMANOVA analyses on epifaunal composition using density data with seaweed species (Ma) as a fixed factor. *Undaria pinnatifida* (U), *Marginariella urvilliana* (Mu), *Marginariella boryana* (Mb), *Xiphophora gladiata* (X), *Desmarestia ligulata* (De), *Cystophora scalaris* (Cy), *Carpophyllum flexuosum* (Ca), and *Sargassum sinclairii* (S). The symbol (\*) indicates statistical significance of the correlation ( $p < 0.01$ , as a more stringent p-value was used instead of Bonferroni corrections)

Table S7. PERMANOVA table of results 1st subset

Source	df	SS	MS	Pseudo- <i>F</i>	p-value
Seaweed spp	7	34490	4927.1	7.1023	0.0001*
Res	32	22199	693.73		
Total	39	56689			

Table S8. Pair-wise tests

Groups	<i>t</i>	p-value
U, Mb	1.4029	0.08
U, Mu	1.1117	0.2361
U, X	1.0935	0.3112
U, De	1.812	0.0081*
U, Ca	2.8751	0.0094*
U, Cy	2.7153	0.0069*
U, S	3.8647	0.0079*
Mb, Mu	1.4762	0.0562
Mb, X	1.6892	0.0138
Mb, De	2.4325	0.0082*
Mb, Ca	3.5275	0.0079*
Mb, Cy	3.4237	0.0087*
Mb, S	4.5231	0.0087*
Mu, X	1.3607	0.101
Mu, De	2.5526	0.0077*
Mu, Ca	3.651	0.0067*
Mu, Cy	3.5476	0.007*
Mu, S	4.8802	0.0077*
X, De	1.5879	0.023
X, Ca	2.6622	0.0076*
X, Cy	2.3802	0.0073*
X, S	3.6942	0.0066*
De, Ca	2.5006	0.0088*
De, Cy	2.3247	0.0099*
De, S	4.118	0.0084*
Ca, Cy	1.0546	0.3273
Ca, S	2.2543	0.0084*
Cy, S	2.0717	0.0101

Table S9. PERMANOVA table of results 2nd subset

Source	df	SS	MS	Pseudo- <i>F</i>	p-value
Seaweed spp.	7	36472	5210.3	6.7425	0.0001*
Res	32	24728	772.75		
Total	39	61200			

Table S10. Pair-wise tests

Groups	<i>t</i>	p-value
U, Mb	1.7055	0.047
U, Mu	1.493	0.031
U, X	1.4232	0.1101
U, De	1.2276	0.1732
U, Ca	2.6425	0.0084*
U, Cy	2.0348	0.0089*
U, S	3.474	0.0083*
Mb, Mu	1.6534	0.0069*
Mb, X	1.206 8	0.1813
Mb, De	2.4325	0.0078*
Mb, Ca	3.6235	0.0091*
Mb, Cy	3.27	0.0088*
Mb, S	4.5231	0.0068*
Mu, X	1.6206	0.031
Mu, De	2.5804	0.007*
Mu, Ca	3.4737	0.0089*
Mu, Cy	3.149	0.0082*
Mu, S	4.1 618	0.0092*
X, De	2.1454	0.0082*
X, Ca	2.8478	0.008*
X, Cy	2.3566	0.0073*
X, S	3.6253	0.0077*
De, Ca	2.8214	0.0081*
De, Cy	2.2035	0.0085*
De, S	4.118	0.0058*
Ca, Cy	1.5667	0.031
Ca, S	1.4026	0.0233
Cy, S	2.7831	0.0091*

#### Supplement 4

Results from linear regressions studied between the mean values of epifaunal parameters (density and diversity) and seaweed traits (IV=Interstitial volume; TV=Total volume; SA=Surface area; W=wet weight). The symbol (\*) indicates statistical significance of the correlation ( $p < 0.05$ )

Correlations	R <sup>2</sup>	p-value
<b>Epifaunal density vs.:</b>		
IV/TV	0.76	0.01*
SA	4.99E-05	0.99
SA/TV	0.25	0.21
SA/W	0.51	0.05
<b>Epifaunal diversity vs.:</b>		
IV/TV	0.67	0.02*
SA	0.01	0.77
SA/TV	0.01	0.78
SA/W	0.05	0.61
<b>Amphipod density vs. IV/TV</b>	0.92	<0.001*
<b>Copepod density vs. IV/TV</b>	0.34	0.17