

Table S1 Output of emmeans pairwise comparison for the total phenolic concentration (TPC, $\mu\text{mol g DTW}^{-1}$) from fifteen macroalgal species from sheltered and wave-exposed macroalgal communities inside and outside the Otago Harbour. Marginal mean estimates are represented by the ‘estimate’ value. Asymptomatic confidence intervals (‘asympt.LCL’ and ‘asympt.UCL’) are reflected of 95% confidence and degrees of freedom (df) are the result of a z confidence interval in reference to asymptotic results.

| Species | estimate | Standard error | df | asympt.LCL | asympt.UCL |
|---------------------------------|-----------------|-----------------------|-----------|-------------------|-------------------|
| <i>Carpophyllum flexuosum</i> | 212.60 | 24.77 | Inf | 169.20 | 267.13 |
| <i>Cystophora retroflexa</i> | 166.74 | 15.49 | Inf | 138.97 | 200.05 |
| <i>Cystophora torulosa</i> | 67.54 | 12.02 | Inf | 47.65 | 95.72 |
| <i>Desmarestia ligulata</i> | 14.79 | 2.94 | Inf | 10.02 | 21.85 |
| <i>Durvillaea</i> spp. | 26.07 | 5.68 | Inf | 17.01 | 39.97 |
| <i>Ecklonia radiata</i> | 164.40 | 35.83 | Inf | 107.25 | 252.01 |
| <i>Hormosira banksii</i> | 29.84 | 6.50 | Inf | 19.47 | 45.75 |
| <i>Lessonia variegata</i> | 10.88 | 2.84 | Inf | 6.53 | 18.14 |
| <i>Macrocystis pyrifera</i> | 20.21 | 1.70 | Inf | 17.14 | 23.84 |
| <i>Marginariella boryana</i> | 62.76 | 7.31 | Inf | 49.95 | 78.86 |
| <i>Marginariella urvilliana</i> | 38.41 | 6.83 | Inf | 27.10 | 54.43 |
| <i>Sargassum sinclairii</i> | 72.68 | 9.14 | Inf | 56.79 | 93.00 |
| <i>Ulva</i> spp. | 6.75 | 0.78 | Inf | 5.39 | 8.46 |
| <i>Undaria pinnatifida</i> | 11.90 | 1.27 | Inf | 9.66 | 14.66 |
| <i>Xiphophora gladiata</i> | 79.46 | 24.49 | Inf | 43.43 | 145.37 |

Table S2 Output of emmeans pairwise comparison for the total phenolic concentration (TPC, $\mu\text{mol g DTW}^{-1}$) from fifteen macroalgal species from sheltered and wave-exposed macroalgal communities inside and outside the Otago Harbour. ‘Ratio’ refers to the estimated ratio between marginal mean estimates within the ‘contrast’. Significant values ($p \leq 0.05$) are bolded.

| Contrast | ratio | Standard error | df | z.ratio | p-value |
|---|--------------|----------------|------------|--------------|-----------------|
| <i>Carpophyllum flexuosum</i> / <i>Cystophora retroflexa</i> | 1.28 | 0.19 | Inf | 1.63 | 0.95 |
| <i>Carpophyllum flexuosum</i> / <i>Cystophora torulosa</i> | 3.15 | 0.67 | Inf | 5.39 | <0.01 |
| <i>Carpophyllum flexuosum</i> / <i>Desmarestia ligulata</i> | 14.37 | 3.31 | Inf | 11.56 | <0.01 |
| <i>Carpophyllum flexuosum</i> / <i>Durvillaea</i> spp. | 8.15 | 2.01 | Inf | 8.49 | <0.01 |
| <i>Carpophyllum flexuosum</i> / <i>Ecklonia radiata</i> | 1.29 | 0.32 | Inf | 1.04 | 1.00 |
| <i>Carpophyllum flexuosum</i> / <i>Hormosira banksii</i> | 7.12 | 1.76 | Inf | 7.95 | <0.01 |
| <i>Carpophyllum flexuosum</i> / <i>Lessonia variegata</i> | 19.53 | 5.57 | Inf | 10.42 | <0.01 |
| <i>Carpophyllum flexuosum</i> / <i>Macrocystis pyrifera</i> | 10.52 | 1.51 | Inf | 16.37 | <0.01 |
| <i>Carpophyllum flexuosum</i> / <i>Marginariella boryana</i> | 3.39 | 0.56 | Inf | 7.41 | <0.01 |
| <i>Carpophyllum flexuosum</i> / <i>Marginariella urvilliana</i> | 5.54 | 1.18 | Inf | 8.05 | <0.01 |
| <i>Carpophyllum flexuosum</i> / <i>Sargassum sinclairii</i> | 2.93 | 0.50 | Inf | 6.26 | <0.01 |
| <i>Carpophyllum flexuosum</i> / <i>Ulva</i> spp. | 31.49 | 5.15 | Inf | 21.09 | <0.01 |
| <i>Carpophyllum flexuosum</i> / <i>Undaria pinnatifida</i> | 17.86 | 2.82 | Inf | 18.28 | <0.01 |
| <i>Carpophyllum flexuosum</i> / <i>Xiphophora gladiata</i> | 2.68 | 0.88 | Inf | 2.99 | 0.16 |
| <i>Cystophora retroflexa</i> / <i>Cystophora torulosa</i> | 2.47 | 0.50 | Inf | 4.50 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Desmarestia ligulata</i> | 11.27 | 2.47 | Inf | 11.03 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Durvillaea</i> spp. | 6.39 | 1.52 | Inf | 7.83 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Ecklonia radiata</i> | 1.01 | 0.24 | Inf | 0.06 | 1.00 |
| <i>Cystophora retroflexa</i> / <i>Hormosira banksii</i> | 5.59 | 1.32 | Inf | 7.26 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Lessonia variegata</i> | 15.32 | 4.24 | Inf | 9.87 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | 8.25 | 1.03 | Inf | 16.83 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Marginariella boryana</i> | 2.66 | 0.40 | Inf | 6.56 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Marginariella urvilliana</i> | 4.34 | 0.87 | Inf | 7.31 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Sargassum sinclairii</i> | 2.29 | 0.36 | Inf | 5.31 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | 24.70 | 3.65 | Inf | 21.70 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | 14.01 | 1.98 | Inf | 18.69 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Xiphophora gladiata</i> | 2.10 | 0.68 | Inf | 2.30 | 0.59 |
| <i>Cystophora torulosa</i> / <i>Desmarestia ligulata</i> | 4.57 | 1.22 | Inf | 5.69 | <0.01 |

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|--|------------------|-------------|------------|--------------|-----------------|
| <i>Cystophora torulosa</i> / <i>Durvillaea</i> spp. | 2.59 | 0.73 | Inf | 3.38 | 0.05 |
| <i>Cystophora torulosa</i> / <i>Ecklonia radiata</i> | 0.41 | 0.12 | Inf | -3.16 | 0.10 |
| <i>Cystophora torulosa</i> / <i>Hormosira banksii</i> | 2.26 | 0.64 | Inf | 2.90 | 0.19 |
| <i>Cystophora torulosa</i> / <i>Lessonia variegata</i> | 6.20 | 1.96 | Inf | 5.79 | <0.01 |
| <i>Cystophora torulosa</i> / <i>Macrocystis pyrifera</i> | 3.34 | 0.66 | Inf | 6.13 | <0.01 |
| <i>Cystophora torulosa</i> / <i>Marginariella boryana</i> | 1.08 | 0.23 | Inf | 0.34 | 1.00 |
| <i>Cystophora torulosa</i> / <i>Marginariella urvilliana</i> | 1.76 | 0.44 | Inf | 2.24 | 0.63 |
| <i>Cystophora torulosa</i> / <i>Sargassum sinclairii</i> | 0.93 | 0.20 | Inf | -0.34 | 1.00 |
| <i>Cystophora torulosa</i> / <i>Ulva</i> spp. | 1<0.01 | 2.12 | Inf | 10.87 | <0.01 |
| <i>Cystophora torulosa</i> / <i>Undaria pinnatifida</i> | 5.68 | 1.18 | Inf | 8.37 | <0.01 |
| <i>Cystophora torulosa</i> / <i>Xiphophora gladiata</i> | 0.85 | 0.30 | Inf | -0.46 | 1.00 |
| <i>Desmarestia ligulata</i> / <i>Durvillaea</i> spp. | 0.57 | 0.17 | Inf | -1.92 | 0.84 |
| <i>Desmarestia ligulata</i> / <i>Ecklonia radiata</i> | 0.09 | 0.03 | Inf | -8.16 | <0.01 |
| <i>Desmarestia ligulata</i> / <i>Hormosira banksii</i> | 0.50 | 0.15 | Inf | -2.38 | 0.53 |
| <i>Desmarestia ligulata</i> / <i>Lessonia variegata</i> | 1.36 | 0.45 | Inf | 0.94 | 1.00 |
| <i>Desmarestia ligulata</i> / <i>Macrocystis pyrifera</i> | 0.73 | 0.16 | Inf | -1.44 | 0.98 |
| <i>Desmarestia ligulata</i> / <i>Marginariella boryana</i> | 0.24 | 0.05 | Inf | -6.27 | <0.01 |
| <i>Desmarestia ligulata</i> / <i>Marginariella urvilliana</i> | 0.39 | 0.10 | Inf | -3.57 | 0.03 |
| <i>Desmarestia ligulata</i> / <i>Sargassum sinclairii</i> | 0.20 | 0.05 | Inf | -6.76 | <0.01 |
| <i>Desmarestia ligulata</i> / <i>Ulva</i> spp. | 2.19 | 0.50 | Inf | 3.41 | 0.05 |
| <i>Desmarestia ligulata</i> / <i>Undaria pinnatifida</i> | 1.24 | 0.28 | Inf | 0.96 | 1.00 |
| <i>Desmarestia ligulata</i> / <i>Xiphophora gladiata</i> | 0.19 | 0.07 | Inf | -4.58 | <0.01 |
| <i>Durvillaea</i> spp. / <i>Ecklonia radiata</i> | 0.16 | 0.05 | Inf | -5.97 | <0.01 |
| <i>Durvillaea</i> spp. / <i>Hormosira banksii</i> | 0.87 | 0.27 | Inf | -0.44 | 1.00 |
| <i>Durvillaea</i> spp. / <i>Lessonia variegata</i> | 2.40 | 0.81 | Inf | 2.57 | 0.39 |
| <i>Durvillaea</i> spp. / <i>Macrocystis pyrifera</i> | 1.29 | 0.30 | Inf | 1.09 | 1.00 |
| <i>Durvillaea</i> spp. / <i>Marginariella boryana</i> | 0.42 | 0.10 | Inf | -3.55 | 0.03 |
| <i>Durvillaea</i> spp. / <i>Marginariella urvilliana</i> | 0.68 | 0.19 | Inf | -1.38 | 0.99 |
| <i>Durvillaea</i> spp. / <i>Sargassum sinclairii</i> | 0.36 | 0.09 | Inf | -4.07 | <0.01 |
| <i>Durvillaea</i> spp. / <i>Ulva</i> spp. | 3.86 | 0.95 | Inf | 5.48 | <0.01 |
| <i>Durvillaea</i> spp. / <i>Undaria pinnatifida</i> | 2.19 | 0.53 | Inf | 3.23 | 0.08 |
| <i>Durvillaea</i> spp. / <i>Xiphophora gladiata</i> | 0.33 | 0.12 | Inf | -2.95 | 0.17 |
| <i>Ecklonia radiata</i> / <i>Hormosira banksii</i> | 5.51 | 1.70 | Inf | 5.54 | <0.01 |

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|--|--------------|-------------|------------|--------------|-----------------|
| <i>Ecklonia radiata</i> / <i>Lessonia variegata</i> | 15.10 | 5.13 | Inf | 7.99 | <0.01 |
| <i>Ecklonia radiata</i> / <i>Macrocystis pyrifera</i> | 8.13 | 1.90 | Inf | 8.97 | <0.01 |
| <i>Ecklonia radiata</i> / <i>Marginariella boryana</i> | 2.62 | 0.65 | Inf | 3.90 | 0.01 |
| <i>Ecklonia radiata</i> / <i>Marginariella urvilliana</i> | 4.28 | 1.20 | Inf | 5.17 | <0.01 |
| <i>Ecklonia radiata</i> / <i>Sargassum sinclairii</i> | 2.26 | 0.57 | Inf | 3.24 | 0.08 |
| <i>Ecklonia radiata</i> / <i>Ulva</i> spp. | 24.35 | 6.00 | Inf | 12.96 | <0.01 |
| <i>Ecklonia radiata</i> / <i>Undaria pinnatifida</i> | 13.81 | 3.35 | Inf | 10.83 | <0.01 |
| <i>Ecklonia radiata</i> / <i>Xiphophora gladiata</i> | 2.07 | 0.78 | Inf | 1.93 | 0.84 |
| <i>Hormosira banksii</i> / <i>Lessonia variegata</i> | 2.74 | 0.93 | Inf | 2.97 | 0.17 |
| <i>Hormosira banksii</i> / <i>Macrocystis pyrifera</i> | 1.48 | 0.35 | Inf | 1.67 | 0.94 |
| <i>Hormosira banksii</i> / <i>Marginariella boryana</i> | 0.48 | 0.12 | Inf | -3.01 | 0.15 |
| <i>Hormosira banksii</i> / <i>Marginariella urvilliana</i> | 0.78 | 0.22 | Inf | -0.90 | 1.00 |
| <i>Hormosira banksii</i> / <i>Sargassum sinclairii</i> | 0.41 | 0.10 | Inf | -3.54 | 0.03 |
| <i>Hormosira banksii</i> / <i>Ulva</i> spp. | 4.42 | 1.09 | Inf | 6.03 | <0.01 |
| <i>Hormosira banksii</i> / <i>Undaria pinnatifida</i> | 2.51 | 0.61 | Inf | 3.79 | 0.01 |
| <i>Hormosira banksii</i> / <i>Xiphophora gladiata</i> | 0.38 | 0.14 | Inf | -2.59 | 0.37 |
| <i>Lessonia variegata</i> / <i>Macrocystis pyrifera</i> | 0.54 | 0.15 | Inf | -2.26 | 0.62 |
| <i>Lessonia variegata</i> / <i>Marginariella boryana</i> | 0.17 | 0.05 | Inf | -6.14 | <0.01 |
| <i>Lessonia variegata</i> / <i>Marginariella urvilliana</i> | 0.28 | 0.09 | Inf | -4.00 | 0.01 |
| <i>Lessonia variegata</i> / <i>Sargassum sinclairii</i> | 0.15 | 0.04 | Inf | -6.56 | <0.01 |
| <i>Lessonia variegata</i> / <i>Ulva</i> spp. | 1.61 | 0.46 | Inf | 1.68 | 0.94 |
| <i>Lessonia variegata</i> / <i>Undaria pinnatifida</i> | 0.91 | 0.26 | Inf | -0.32 | 1.00 |
| <i>Lessonia variegata</i> / <i>Xiphophora gladiata</i> | 0.14 | 0.06 | Inf | -4.93 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Marginariella boryana</i> | 0.32 | 0.05 | Inf | -7.88 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Marginariella urvilliana</i> | 0.53 | 0.10 | Inf | -3.26 | 0.07 |
| <i>Macrocystis pyrifera</i> / <i>Sargassum sinclairii</i> | 0.28 | 0.04 | Inf | -8.45 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | 2.99 | 0.43 | Inf | 7.70 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | 1.70 | 0.23 | Inf | 3.90 | 0.01 |
| <i>Macrocystis pyrifera</i> / <i>Xiphophora gladiata</i> | 0.25 | 0.08 | Inf | -4.28 | <0.01 |
| <i>Marginariella boryana</i> / <i>Marginariella urvilliana</i> | 1.63 | 0.35 | Inf | 2.31 | 0.58 |
| <i>Marginariella boryana</i> / <i>Sargassum sinclairii</i> | 0.86 | 0.15 | Inf | -0.86 | 1.00 |
| <i>Marginariella boryana</i> / <i>Ulva</i> spp. | 9.30 | 1.52 | Inf | 13.63 | <0.01 |
| <i>Marginariella boryana</i> / <i>Undaria pinnatifida</i> | 5.27 | 0.83 | Inf | 10.54 | <0.01 |

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|---|--------------|-------------|------------|--------------|-----------------|
| <i>Marginariella boryana</i> / <i>Xiphophora gladiata</i> | 0.79 | 0.26 | Inf | -0.72 | 1.00 |
| <i>Marginariella urvilliana</i> / <i>Sargassum sinclairii</i> | 0.53 | 0.12 | Inf | -2.93 | 0.18 |
| <i>Marginariella urvilliana</i> / <i>Ulva</i> spp. | 5.69 | 1.20 | Inf | 8.21 | <0.01 |
| <i>Marginariella urvilliana</i> / <i>Undaria pinnatifida</i> | 3.23 | 0.67 | Inf | 5.65 | <0.01 |
| <i>Marginariella urvilliana</i> / <i>Xiphophora gladiata</i> | 0.48 | 0.17 | Inf | -2.04 | 0.77 |
| <i>Sargassum sinclairii</i> / <i>Ulva</i> spp. | 10.76 | 1.83 | Inf | 13.95 | <0.01 |
| <i>Sargassum sinclairii</i> / <i>Undaria pinnatifida</i> | 6.11 | 1.01 | Inf | 10.98 | <0.01 |
| <i>Sargassum sinclairii</i> / <i>Xiphophora gladiata</i> | 0.91 | 0.30 | Inf | -0.27 | 1.00 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | 0.57 | 0.09 | Inf | -3.62 | 0.02 |
| <i>Ulva</i> spp. / <i>Xiphophora gladiata</i> | 0.08 | 0.03 | Inf | -7.50 | <0.01 |
| <i>Undaria pinnatifida</i> / <i>Xiphophora gladiata</i> | 0.15 | 0.05 | Inf | -5.82 | <0.01 |

Table S3 Output of emmeans pairwise comparison for the total phenolic concentration (TPC, $\mu\text{mol g DTW}^{-1}$) from four macroalgal species observed across all seasons (spring, summer, autumn, and winter) from Harington Point (HP), the Portobello Marine Lab (PML), and Te Umukuri, Weller’s Rock (WR) inside the Otago Harbour. ‘Ratio’ refers to the estimated ratio between marginal mean estimates. Asymptomatic confidence intervals (‘asypm.LCL’ and ‘asypm.UCL’) are reflected of 95% confidence and degrees of freedom (df) are the result of a z confidence interval in reference to asymptotic results.

| Contrast | Site | Season | ratio | Standard error | df | asypm. LCL | asypm. UCL |
|--|------|--------|--------|----------------|-----|---------------|---------------|
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | HP | Autumn | 14.44 | 2.93 | Inf | 8.57 | 24.32 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 33.25 | 5.74 | Inf | 21.34 | 51.81 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 26.24 | 3.34 | Inf | 18.93 | 36.39 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 2.30 | 0.60 | Inf | 1.18 | 4.50 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.82 | 0.41 | Inf | 1.01 | 3.26 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.79 | 0.16 | Inf | 0.47 | 1.32 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | PML | Autumn | 12.34 | 3.10 | Inf | 6.48 | 23.50 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 6.30 | 1.75 | Inf | 3.09 | 12.86 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 20.26 | 5.81 | Inf | 9.70 | 42.31 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 0.51 | 0.18 | Inf | 0.21 | 1.25 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.64 | 0.57 | Inf | 0.68 | 3.99 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 3.21 | 1.21 | Inf | 1.22 | 8.48 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | WR | Autumn | 9.44 | 2.69 | Inf | 4.54 | 19.63 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 8.59 | 0.93 | Inf | 6.50 | 11.35 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 15.35 | 1.93 | Inf | 11.12 | 21.19 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 0.91 | 0.27 | Inf | 0.42 | 1.97 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.63 | 0.48 | Inf | 0.76 | 3.46 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 1.79 | 0.29 | Inf | 1.19 | 2.69 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | HP | Spring | 18.39 | 4.03 | Inf | 10.47 | 32.30 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 165.92 | 45.86 | Inf | 81.57 | 337.53 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 33.53 | 9.58 | Inf | 16.10 | 69.84 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 9.02 | 2.52 | Inf | 4.40 | 18.48 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.82 | 0.44 | Inf | 0.98 | 3.39 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.20 | 0.06 | Inf | 0.09 | 0.45 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | PML | Spring | 15.72 | 2.36 | Inf | 10.68 | 23.13 |

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|--|-----|--------|--------|-------|-----|--------|--------|
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 31.45 | 7.77 | Inf | 16.68 | 59.32 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 25.89 | 9.16 | Inf | 10.43 | 64.28 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 2.00 | 0.55 | Inf | 0.99 | 4.05 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.65 | 0.57 | Inf | 0.67 | 4.03 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.82 | 0.34 | Inf | 0.29 | 2.36 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | WR | Spring | 12.02 | 2.66 | Inf | 6.82 | 21.21 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 42.85 | 10.96 | Inf | 22.21 | 82.69 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 19.62 | 5.52 | Inf | 9.53 | 40.40 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 3.56 | 1.14 | Inf | 1.57 | 8.11 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.63 | 0.52 | Inf | 0.72 | 3.68 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.46 | 0.15 | Inf | 0.19 | 1.08 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | HP | Summer | 15.21 | 2.79 | Inf | 9.50 | 24.36 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 253.92 | 69.48 | Inf | 125.71 | 512.86 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 23.15 | 4.44 | Inf | 14.14 | 37.89 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 16.69 | 4.52 | Inf | 8.32 | 33.49 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.52 | 0.23 | Inf | 1.03 | 2.25 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.09 | 0.02 | Inf | 0.05 | 0.18 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | PML | Summer | 13.00 | 1.17 | Inf | 10.31 | 16.38 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 48.13 | 12.28 | Inf | 25.00 | 92.69 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 17.87 | 4.14 | Inf | 9.86 | 32.42 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 3.70 | 0.98 | Inf | 1.87 | 7.32 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.38 | 0.34 | Inf | 0.73 | 2.58 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.37 | 0.13 | Inf | 0.15 | 0.89 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | WR | Summer | 9.94 | 1.79 | Inf | 6.25 | 15.81 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 65.58 | 17.01 | Inf | 33.68 | 127.69 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 13.54 | 2.20 | Inf | 8.92 | 20.56 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 6.59 | 2.04 | Inf | 2.98 | 14.60 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.36 | 0.32 | Inf | 0.75 | 2.49 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.21 | 0.06 | Inf | 0.10 | 0.43 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | HP | Winter | 8.95 | 1.29 | Inf | 6.18 | 12.95 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 61.71 | 19.15 | Inf | 27.81 | 136.95 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 36.78 | 11.12 | Inf | 16.92 | 79.96 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 6.90 | 2.23 | Inf | 3.01 | 15.81 |

| | | | | | | | |
|--|-----|--------|-------|------|-----|-------|-------|
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 4.11 | 1.31 | Inf | 1.81 | 9.34 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.60 | 0.24 | Inf | 0.21 | 1.71 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | PML | Winter | 7.65 | 1.23 | Inf | 5.06 | 11.56 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 11.70 | 2.82 | Inf | 6.29 | 21.74 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 28.40 | 9.84 | Inf | 11.66 | 69.15 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 1.53 | 0.40 | Inf | 0.78 | 2.99 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 3.71 | 1.38 | Inf | 1.43 | 9.62 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 2.43 | 1.01 | Inf | 0.84 | 7.03 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | WR | Winter | 5.85 | 1.40 | Inf | 3.16 | 10.84 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 15.94 | 4.40 | Inf | 7.84 | 32.39 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 21.51 | 5.54 | Inf | 11.10 | 41.71 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 2.72 | 0.97 | Inf | 1.09 | 6.80 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 3.68 | 1.31 | Inf | 1.47 | 9.22 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 1.35 | 0.50 | Inf | 0.52 | 3.48 |

Table S4 Output of emmeans pairwise comparison for the total phenolic concentration (TPC, $\mu\text{mol g DTW}^{-1}$) from four macroalgal species observed across all seasons (spring, summer, autumn, and winter) from Harington Point (HP), the Portobello Marine Lab (PML), and Te Umukuri, Weller’s Rock (WR) inside the Otago Harbour. ‘Ratio’ refers to the estimated ratio between marginal mean estimates within the ‘contrast’. Significant values ($p \leq 0.05$) are bolded.

| Contrast | Site | Season | ratio | Standard error | df | z.ratio | p-value |
|--|------|--------|---------------|----------------|-----|--------------|-----------------|
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | HP | Autumn | 14.44 | 2.93 | Inf | 13.16 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 33.25 | 5.74 | Inf | 20.30 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 26.24 | 3.34 | Inf | 25.68 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 2.30 | 0.60 | Inf | 3.20 | 0.01 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.82 | 0.41 | Inf | 2.63 | 0.04 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.79 | 0.16 | Inf | -1.18 | 0.64 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | PML | Autumn | 12.34 | 3.10 | Inf | 10.01 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 6.30 | 1.75 | Inf | 6.63 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 20.26 | 5.81 | Inf | 10.50 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 0.51 | 0.18 | Inf | -1.93 | 0.22 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.64 | 0.57 | Inf | 1.43 | 0.48 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 3.21 | 1.21 | Inf | 3.09 | 0.01 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | WR | Autumn | 9.44 | 2.69 | Inf | 7.87 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 8.59 | 0.93 | Inf | 19.81 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 15.35 | 1.93 | Inf | 21.76 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 0.91 | 0.27 | Inf | -0.31 | 0.99 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.63 | 0.48 | Inf | 1.65 | 0.35 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 1.79 | 0.29 | Inf | 3.64 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | HP | Spring | 18.39 | 4.03 | Inf | 13.28 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 165.92 | 45.86 | Inf | 18.49 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 33.53 | 9.58 | Inf | 12.30 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 9.02 | 2.52 | Inf | 7.88 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.82 | 0.44 | Inf | 2.48 | 0.06 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.20 | 0.06 | Inf | -5.18 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | PML | Spring | 15.72 | 2.36 | Inf | 18.31 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 31.45 | 7.77 | Inf | 13.96 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 25.89 | 9.16 | Inf | 9.19 | <0.01 |

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|---|-----|--------|---------------|--------------|------------|--------------|-----------------|
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 2.00 | 0.55 | Inf | 2.53 | 0.06 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.65 | 0.57 | Inf | 1.43 | 0.48 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.82 | 0.34 | Inf | -0.48 | 0.96 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | WR | Spring | 12.02 | 2.66 | Inf | 11.26 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 42.85 | 10.96 | Inf | 14.69 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 19.62 | 5.52 | Inf | 10.58 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 3.56 | 1.14 | Inf | 3.97 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.63 | 0.52 | Inf | 1.55 | 0.41 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.46 | 0.15 | Inf | -2.33 | 0.09 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | HP | Summer | 15.21 | 2.79 | Inf | 14.85 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 253.92 | 69.48 | Inf | 20.23 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 23.15 | 4.44 | Inf | 16.38 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 16.69 | 4.52 | Inf | 10.39 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.52 | 0.23 | Inf | 2.76 | 0.03 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.09 | 0.02 | Inf | -8.84 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | PML | Summer | 13.00 | 1.17 | Inf | 28.45 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 48.13 | 12.28 | Inf | 15.19 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 17.87 | 4.14 | Inf | 12.44 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 3.70 | 0.98 | Inf | 4.94 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.38 | 0.34 | Inf | 1.30 | 0.56 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.37 | 0.13 | Inf | -2.90 | 0.02 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | WR | Summer | 9.94 | 1.79 | Inf | 12.73 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 65.58 | 17.01 | Inf | 16.13 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 13.54 | 2.20 | Inf | 16.02 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 6.59 | 2.04 | Inf | 6.10 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 1.36 | 0.32 | Inf | 1.32 | 0.55 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.21 | 0.06 | Inf | -5.54 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | HP | Winter | 8.95 | 1.29 | Inf | 15.24 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 61.71 | 19.15 | Inf | 13.29 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 36.78 | 11.12 | Inf | 11.93 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 6.90 | 2.23 | Inf | 5.98 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 4.11 | 1.31 | Inf | 4.43 | <0.01 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 0.60 | 0.24 | Inf | -1.26 | 0.59 |

| | | | | | | | |
|--|-----|--------|--------------|-------------|------------|--------------|-----------------|
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | PML | Winter | 7.65 | 1.23 | Inf | 12.63 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 11.70 | 2.82 | Inf | 10.19 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 28.40 | 9.84 | Inf | 9.66 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 1.53 | 0.40 | Inf | 1.63 | 0.36 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 3.71 | 1.38 | Inf | 3.54 | <0.01 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 2.43 | 1.01 | Inf | 2.14 | 0.14 |
| <i>Cystophora retroflexa</i> / <i>Macrocystis pyrifera</i> | WR | Winter | 5.85 | 1.40 | Inf | 7.36 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Ulva</i> spp. | | | 15.94 | 4.40 | Inf | 10.03 | <0.01 |
| <i>Cystophora retroflexa</i> / <i>Undaria pinnatifida</i> | | | 21.51 | 5.54 | Inf | 11.91 | <0.01 |
| <i>Macrocystis pyrifera</i> / <i>Ulva</i> spp. | | | 2.72 | 0.97 | Inf | 2.82 | 0.03 |
| <i>Macrocystis pyrifera</i> / <i>Undaria pinnatifida</i> | | | 3.68 | 1.31 | Inf | 3.64 | <0.01 |
| <i>Ulva</i> spp. / <i>Undaria pinnatifida</i> | | | 1.35 | 0.50 | Inf | 0.81 | 0.85 |

Table S5 Output of the pairwiseMedianTest for significant differences in the median total phenolic concentration (TPC, $\mu\text{mol g DTW}^{-1}$) from five macroalgal species observed in the spring within one outer harbour site (Purakaunui Bay; Mapoutahi Pa). P-values were adjusted using the Benjamini-Hochberg (“BH”) procedure and significant values ($p \leq 0.05$) are bolded.

| Comparison | p-value | Adjusted p-value |
|--|-------------------|------------------|
| <i>Desmarestia ligulata</i> - <i>Durvillaea</i> spp. | 0.5485 | 0.5485 |
| <i>Desmarestia ligulata</i> - <i>Macrocystis pyrifera</i> | <0.0127 | 0.0135 |
| <i>Desmarestia ligulata</i> - <i>Marginariella urvilliana</i> | 0.5485 | 0.5485 |
| <i>Desmarestia ligulata</i> - <i>Undaria pinnatifida</i> | 0.0404 | 0.0674 |
| <i>Durvillaea</i> spp. - <i>Macrocystis pyrifera</i> | <0.0127 | 0.0135 |
| <i>Durvillaea</i> spp. - <i>Marginariella urvilliana</i> | 0.5485 | 0.5485 |
| <i>Durvillaea</i> spp. - <i>Undaria pinnatifida</i> | 0.0404 | 0.0674 |
| <i>Macrocystis pyrifera</i> - <i>Marginariella urvilliana</i> | 0.0719 | 0.1027 |
| <i>Macrocystis pyrifera</i> - <i>Undaria pinnatifida</i> | 0.0404 | 0.0674 |
| <i>Marginariella urvilliana</i> - <i>Undaria pinnatifida</i> | 0.0404 | 0.0674 |

Table S6 Output of the pairwiseMedianTest for significant differences in the median total phenolic concentration (TPC, $\mu\text{mol g DTW}^{-1}$) from five macroalgal species observed in the summer within one outer harbour site (Purakaunui Bay; Mapoutahi Pa). P-values were adjusted using the Benjamini-Hochberg (“BH”) procedure and significant values ($p \leq 0.05$) are bolded.

| Comparison | p-value | Adjusted p-value |
|--|-------------------|------------------|
| <i>Desmarestia ligulata</i> - <i>Durvillaea</i> spp. | 0.1336 | 0.1909 |
| <i>Desmarestia ligulata</i> - <i>Macrocystis pyrifera</i> | <0.0127 | 0.0135 |
| <i>Desmarestia ligulata</i> - <i>Marginariella urvilliana</i> | <0.0127 | 0.0135 |
| <i>Desmarestia ligulata</i> - <i>Undaria pinnatifida</i> | 0.0495 | 0.1198 |
| <i>Durvillaea</i> spp. - <i>Macrocystis pyrifera</i> | 0.0719 | 0.1198 |
| <i>Durvillaea</i> spp. - <i>Marginariella urvilliana</i> | 0.0719 | 0.1198 |
| <i>Durvillaea</i> spp. - <i>Undaria pinnatifida</i> | 0.5485 | 0.5485 |
| <i>Macrocystis pyrifera</i> - <i>Marginariella urvilliana</i> | 0.5485 | 0.5485 |
| <i>Macrocystis pyrifera</i> - <i>Undaria pinnatifida</i> | 0.0719 | 0.1198 |
| <i>Marginariella urvilliana</i> - <i>Undaria pinnatifida</i> | 0.5485 | 0.5485 |