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IT and MT, were grouped on the right. The covers of bare rock and *Xenostrobus* were negatively correlated with PC1, while a number of algal groups were positively correlated. Similarly, there was a clear gradient in habitats along PC2, with IT samples at the bottom of the ordination, MT in the middle, and large brown algal habitats at the top (Fig. 3A). Sediment and invertebrate groups (e.g. tube worms and ascidians) were negatively correlated with PC2, while *Ecklonia*, *Durvillaea* and other large brown algae were positively correlated. Despite some overlap among samples from different habitats, ANOSIM revealed significant differences in benthic communities between the nine habitats (Global $R = 0.729$, $P = 0.001$). However, pair-wise tests revealed no significant

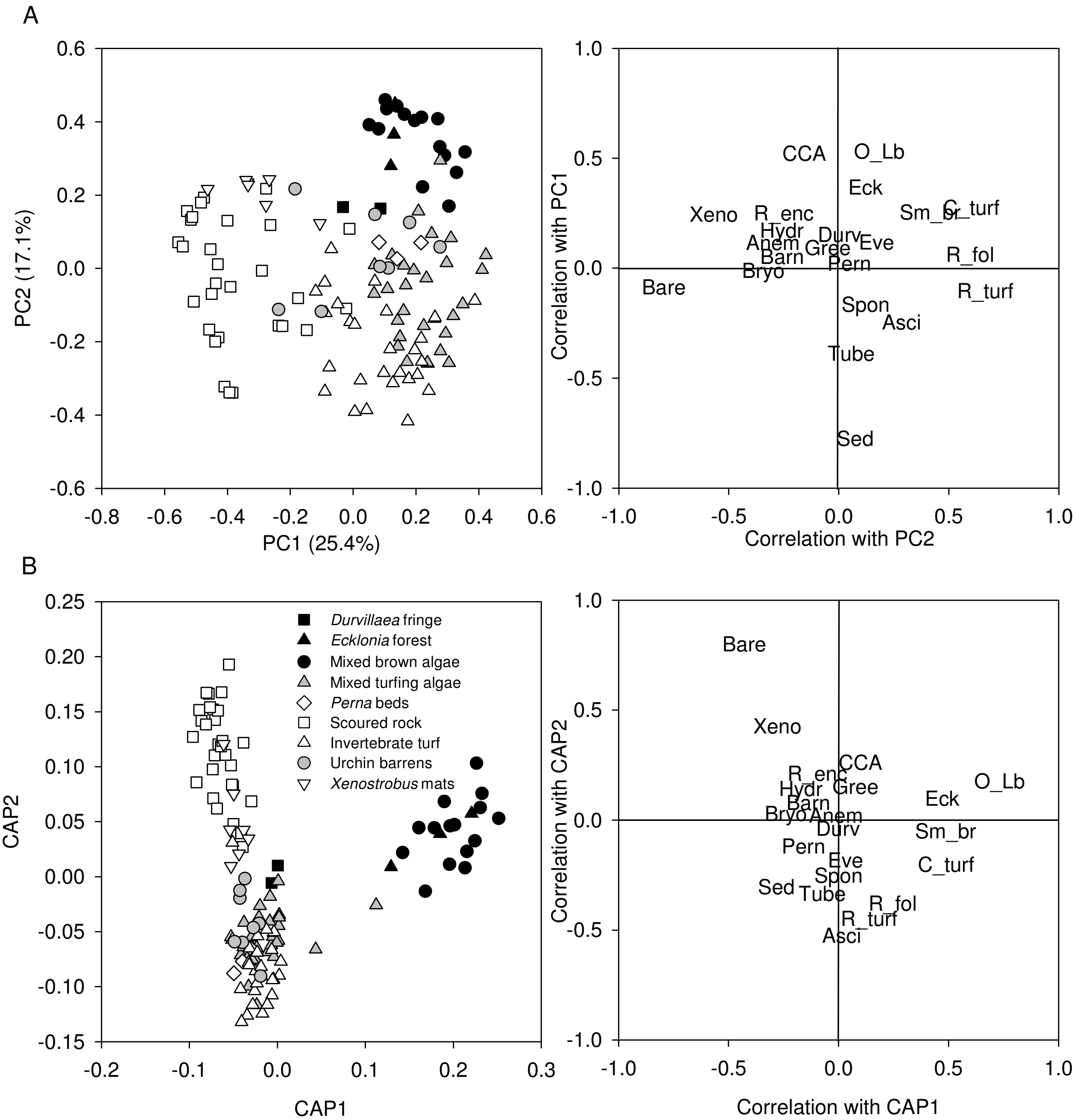


Figure 3. Habitat classification for West Coast reefs. A—Unconstrained (principal coordinates analysis) of benthic assemblages from quadrat sampling. B—Constrained (CAP) ordination of benthic assemblages from quadrat sampling. Each symbol represents one quadrat and indicates the habitat type it was assigned to in the field. Bi-plots show correlations between the benthic species group variables, and (A) the two principal coordinate axes, and (B) the two CAP axes. See Table 2 for variable codes.

differences between *Durvillaea* fringe and *Ecklonia* forest, *Durvillaea* fringe and *Perna* beds, and *Ecklonia* forest and *Perna* beds, most likely because of the low numbers of samples from each of those habitats.

Constrained ordination revealed clearer groupings of samples from the different habitats (Fig. 3B) and CAP analysis found a highly significant difference between the nine habitats ($P \leq 0.001$), with an overall classification success of 75.6%; i.e. 93 of the 123 quadrats analysed were correctly classified by CAP as the original habitat assigned in the field. The classification success for each habitat ranged from 0% for '*Ecklonia* forest' to 90% for 'scoured rock' (Appendix 1, Table A1.3). All '*Ecklonia* forest' quadrats were misclassified as 'mixed brown algae', suggesting there wasn't a clear distinction between these habitat types; however, only three quadrats were classified as '*Ecklonia* forest'. In general, the habitats with low numbers of samples had a low classification success, e.g. *Durvillaea* fringe, *Ecklonia* forest, *Perna* beds and *Xenostrobus* mats (Appendix 1, Table A1.3). There was a general gradient in benthic communities among IT, MT and UB and a high degree of overlap among samples based on CAP axis 1 and 2 (Fig. 3B). Subsequently, five of the IT samples were misclassified as MT (one as UB), while five of the MT samples were classified as IT and two as UB. Despite this gradient, the distinction between these habitats was clearly supported by the classification analysis, each scoring approximately 75%.

3.2 HABITAT DISTRIBUTIONS AND REEF PROFILES

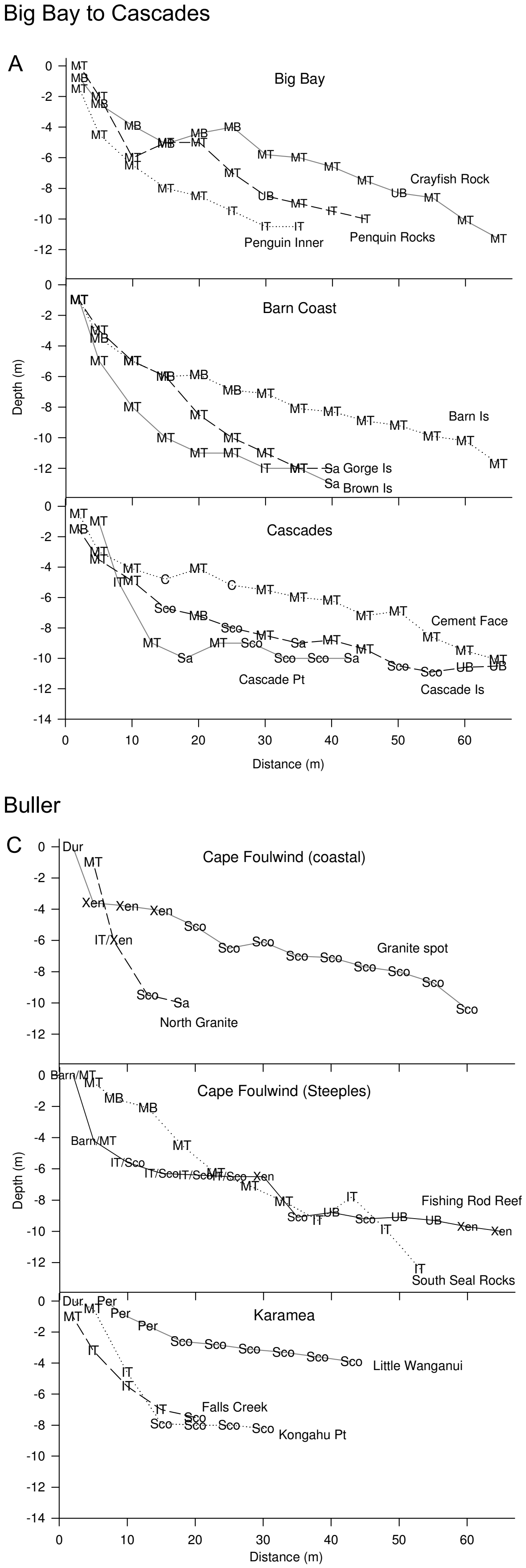
3.2.1 South Westland

Big Bay—There was a clear difference in the distribution of habitats between Crayfish Rock on the northern side of the bay compared with Penguin Inner and Penguin Rocks on the southern side (Fig. 4A). At Crayfish Rock, shallow depths (< 6 m) were dominated by mixed brown algal habitat (MB), while mixed turfing algal habitat (MT) dominated deeper areas, with some patches of urchin barrens (Fig. 2F). In contrast, the southern sites were both dominated by MT at shallow depths, and invertebrate turf habitat (IT) below 8 m depth.

Barn Islands—The three sites in this area all had a similar depth distribution of habitats, with MT dominating across all depths, but with patches of MB (generally in shallow water, < 7 m). MB was not recorded at the steeper Browne Island site, but the large brown alga *Landsburgia* was present in low numbers.

Cascades—The reef profiles and habitat distributions were variable among the sites sampled in this area. The reef at Cascade Point was a near vertical wall classified as IT and MT to c. 9 m depth, below which it levelled out and was highly scoured and interspersed with sand (Fig. 4A). In contrast, Cement Face sloped gradually and MT dominated across all depths. The Cascade Island site was intermediate to the other sites in this area and was covered in a mosaic of habitats including Sco, MB, MT and patches of urchin barrens in the deeper areas.

Jackson Head and Jackson Bay—The sites in both these areas had similar reef profiles and depth distribution of habitats with MT dominating at all depths (Fig. 4B). One exception was Frog Rocks where the reef dropped steeply to 12 m and then levelled out. At this site the reef below 10 m depth was classified as IT.



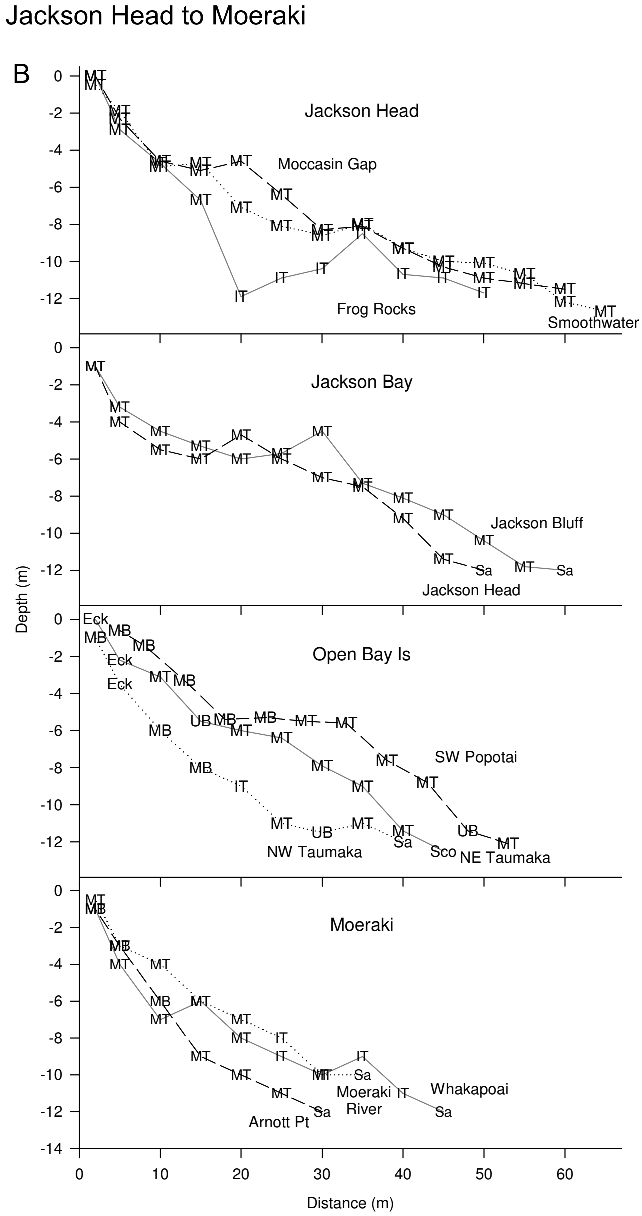


Figure 4. Depth profiles and habitat distributions at each site within each location: A. Big Bay to Cascades; B. Jackson Head to Moeraki; C. Buller. See Table 1 for habitat abbreviations. Sa = Sand, C = cobbles.

Open Bay Islands—The sites sampled at Open Bay Islands had considerably different habitat distributions to the other SIWC sites, because of the dominance of large brown algal habitat types (*Ecklonia* forest and MB) in shallow water (< 8 m). Mixed turfing algae dominated the deeper water areas and patches of urchin barrens were common.

Moeraki—The Moeraki River and Whakapohai sites had similar habitat distributions with shallow quadrats (< 8 m) classified as MT while deeper quadrats were IT. The Arnott Point site was considerably steeper and MB dominated shallower depths (< 6 m).

3.2.2 Buller

Cape Foulwind—There was considerable variation among the Cape Foulwind sites (Fig. 4C) and the habitat distributions are presented separately for the coastal sites (North Granite and Granite Spot) and sites located offshore at an area known as Three Steeples (South Seal Rocks and Fishing Rod Reef). Granite Spot was a relatively gradually sloping boulder reef which was highly scoured below 4 m. *Durvillaea* fringe dominated shallow subtidal areas and '*Xenostrobus* mats' covered the reef at 2–4 m depth. The reef at North Granite was near vertical, and IT and Xen covered the rock wall at 2–8 m, below which the reef was scoured and inundated by sand at 10 m. The shallow zone at Fishing Rod Reef was dominated by barnacles and MB, while the reef at greater depths was classified as a mix of IT, Sco, Xen and UB. The South Seal Rocks site was considerably different and more typical of South Westland sites, with MT and MB in shallow water (< 8 m), and deeper areas of the reef were classified as IT.

Karamea—The Falls Creek and Kongahu Point sites were both steep sloping reefs that levelled out at c. 8 m depth and were highly scoured (Fig. 4C). *Durvillaea* fringe and MT dominated the shallow zone (< 2 m), while IT covered the steep reef areas. The shallow reef at Little Wanganui was quite distinct from the other West Coast sites with *Perna* beds dominating the shallow zone (< 2 m), while deeper areas were scoured.

3.3 BENTHIC COMMUNITY STRUCTURE

There was a relatively clear division in benthic community structure between Buller and South Westland sites along PC1 (Fig. 5A). ANOSIM revealed a highly significant difference in benthic community structure between sites from both regions (Global R = 0.885; P = 0.001); although, based on hierarchical cluster analysis, South Seal Rocks (Cape Foulwind) was clustered with the South Westland sites, which were separated from the other Buller sites at the 48% dissimilarity level. A number of macroalgal groups (red turf, red foliose, small brown, large brown and coralline turf) were positively correlated with PC1 (Fig. 5B) and these tended to have higher covers at the South Westland sites (Fig. 6A). In contrast, a number of sessile invertebrate groups (Bryozoans, Hydroids, Barnacles, Anemones and *Xenostrobus pulex*; Fig. 6B) and bare rock (Fig. 6C) were negatively correlated with PC1 and had higher covers at Buller sites.

Benthic community structure was strongly correlated with the environmental variables, which explained 54.8% of the variation among sites (Table 2A). Reefs sampled at the northern Buller sites tended to be shallower and more turbid than

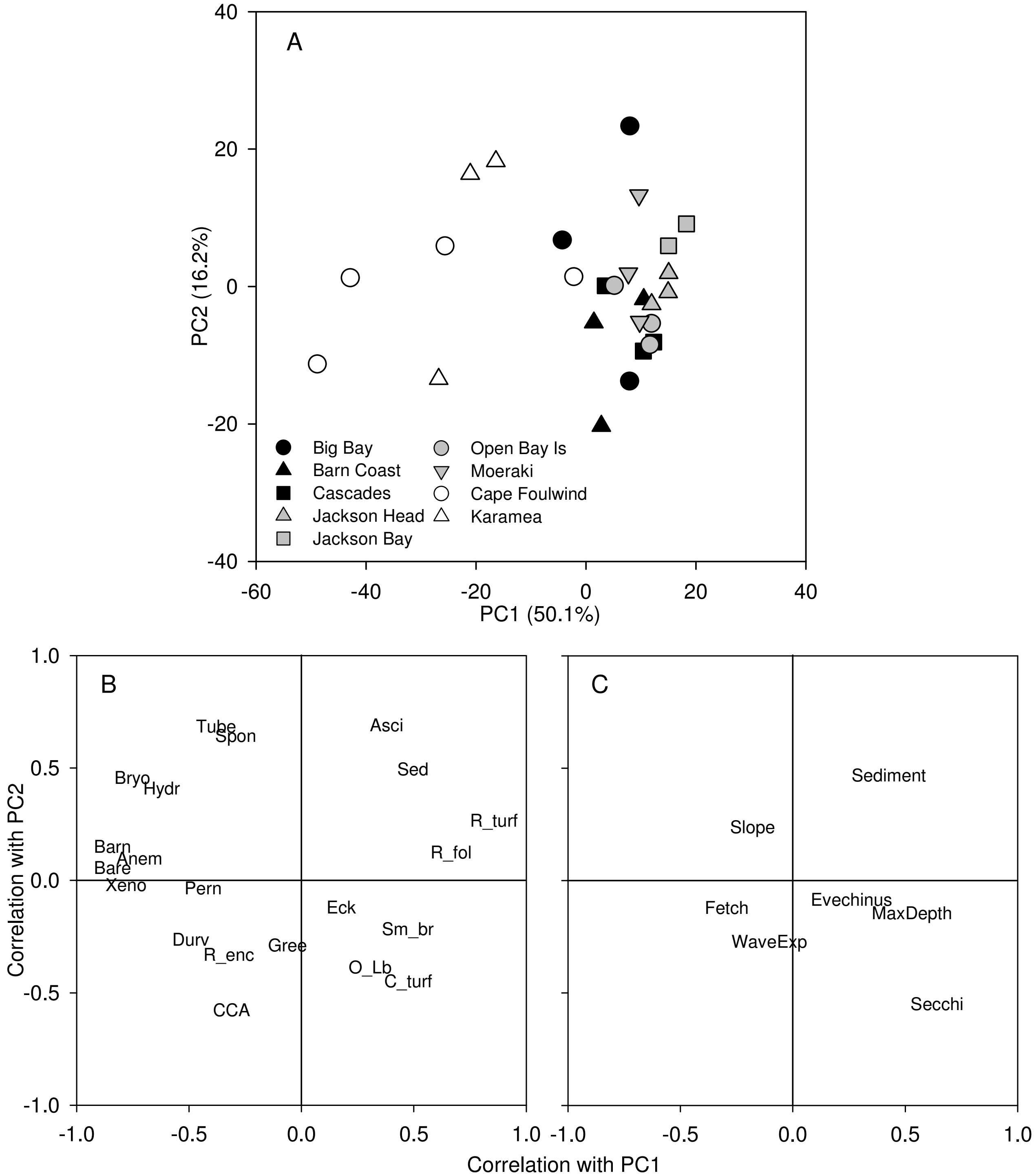


Figure 5. A—Principal coordinates analysis of benthic community structure (log(x+1) transformed percent cover data) for West Coast sites. B—Bi-plot showing correlations between principal coordinate axes and benthic group variables. C—Biplot showing correlations between principal coordinate axes and environmental variables. See Table 2 for variable codes. Buller sites—open symbols; South Westland sites—black or grey symbols (grey indicates sites in Roberts et al.'s (2005) 'Transition zone').

the South Westland sites. This was reflected by a strongly negative correlation among sites between latitude (Northing, New Zealand Map Grid) and both MaxDepth (–0.60) and Secchi (–0.64). Of the seven environmental variables, Secchi (27%) and MaxDepth (19.9%) explained the greatest variation (Table 2A). However, these two variables were also strongly correlated with each other (0.56) and when factors were fitted sequentially, Secchi (27.4%) and Sediment (15.6%)

Figure 6A. Percentage cover of dominant benthic groups for macroalgae. Horizontal lines indicate global means across all sites and vertical line indicates division between South Westland (left) and Buller (right) sites.

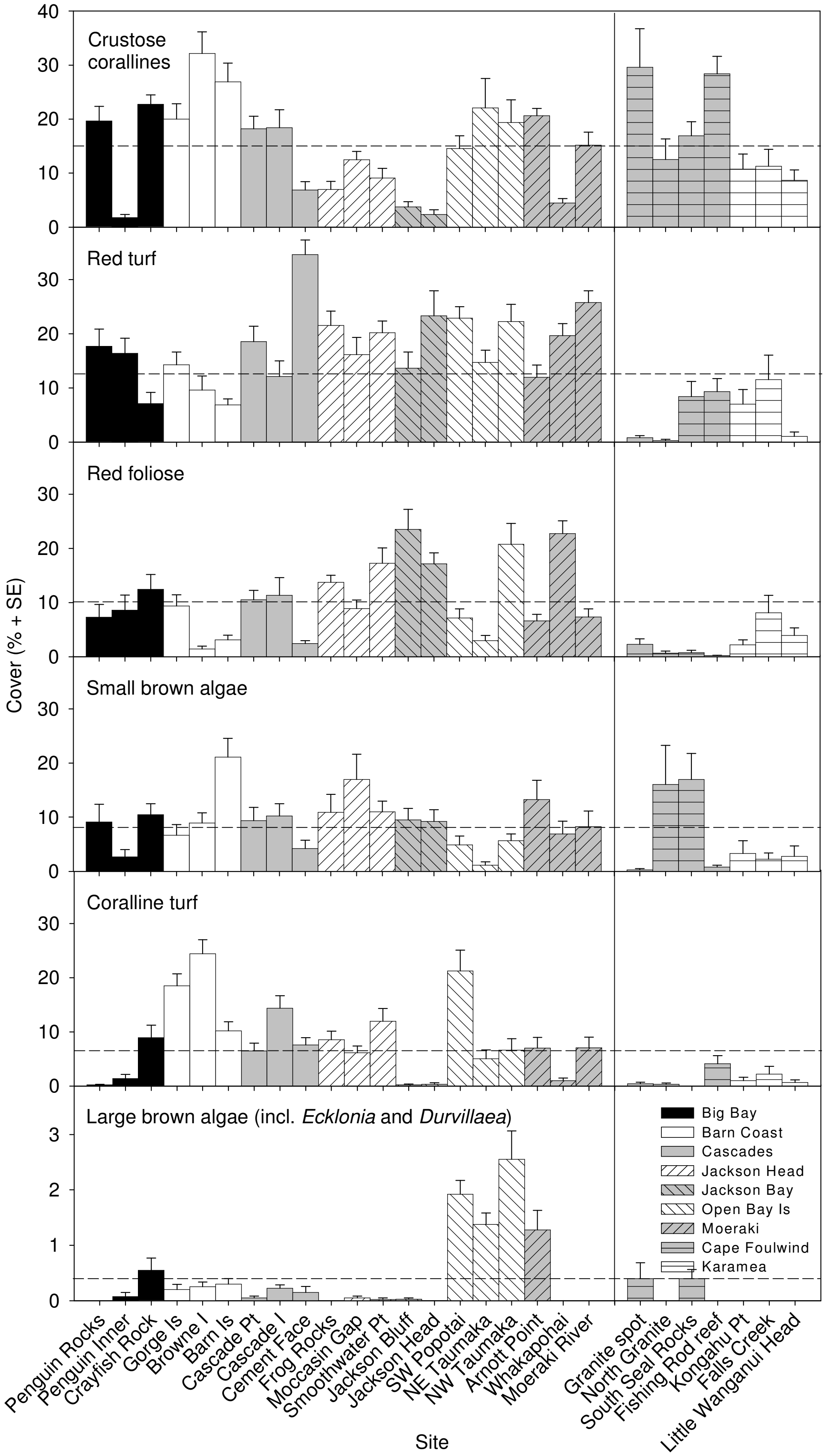
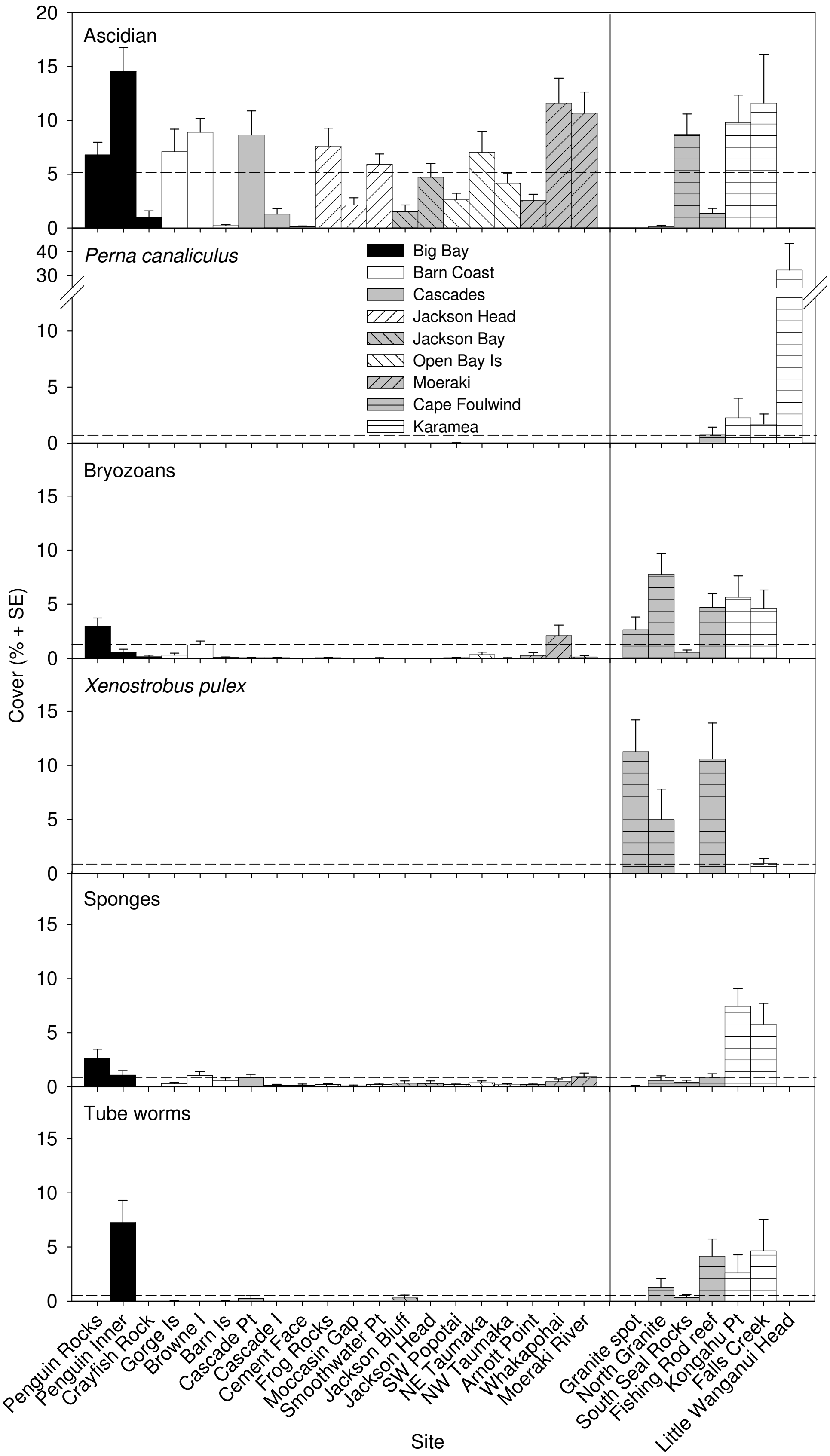


Figure 6B. Percentage cover of dominant benthic groups for sessile invertebrates. Horizontal lines indicate global means across all sites and vertical line indicates division between South Westland (left) and Buller (right) sites.



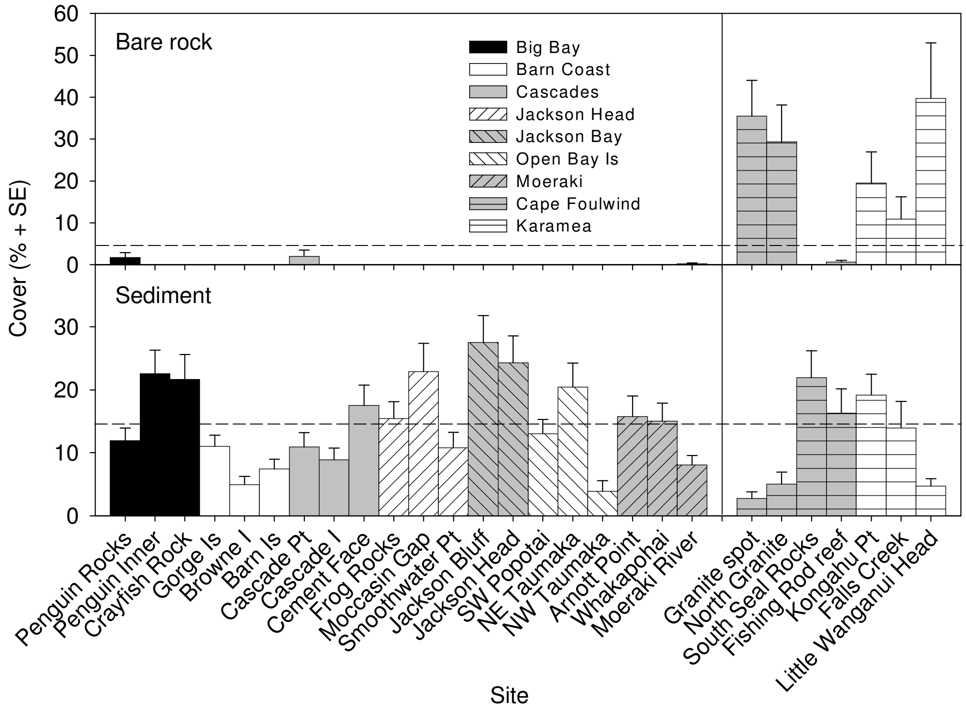


Figure 6C. Percentage cover of dominant benthic groups for bare rock and sediment. Horizontal lines indicate global means across all sites and vertical line indicates division between South Westland (left) and Buller (right) sites.

were found to be significantly related to community structure. The relationship between benthic community structure and these two variables is reflected by their correlations with PC1 and PC2, respectively (Fig. 5C).

Within the Buller and South Westland regions there was no clear location-level grouping of sites; instead, variation in community structure (Fig. 5A) and key benthic groups (Fig. 6) within regions appeared to be related to differences in environmental conditions among sites. For example, the South Westland sites were spread along PC2 and this reflected a gradient from turbid sites with high sediment and ascidian cover (e.g. Penguin Inner, Penguin Rocks, Jackson Bluff, Jackson Head and Moeraki River) to sites at offshore rock-stacks or islands (e.g. Open Bay Islands sites, Barn Islands, Browne Island, Cascade Island and Crayfish Rocks) with clearer water and higher covers of large brown algae and coralline turf (Figs 5B and 6C).

The Buller sites were all highly wave exposed and the variation among sites was less clearly related to the environmental factors measured. Bare rock was a common feature at all Buller sites except for the two sites at offshore rock-stacks with moderately sloping reefs (South Seal Rocks and Fishing Rod Reef) (Fig. 6C). Benthic community structure at South Seal Rocks was more similar to South Westland sites with some large brown algae (*Sargassum sinclairii* and *Landsburgia quercifolia*) and a high cover of small brown algae, particularly *Halopteris* spp. The Kongahu Point and Falls Creek sites were distinct from the other Buller sites. These both had relatively steep sloping reefs to c. 8 m depth, with a particularly low cover of algal groups and dominance by ascidians, bryozoans, sponges and tube worms. Benthic community structure at the Little Wanganui Head site was also highly distinctive because of the dominance of *Perna canaliculus* (Fig. 6B) and bare rock (Fig. 6C).

TABLE 2. RESULTS OF NON-PARAMETRIC MULTIVARIATE REGRESSION OF BIOLOGICAL DATASETS AGAINST ENVIRONMENTAL VARIABLES.
A—BENTHIC COMMUNITY STRUCTURE. B—ALGAL SPECIES COMPOSITION.
C—MOBILE MACROINVERTEBRATE ASSEMBLAGES.

Note: The test statistics and percentage variance explained for each variable (or set) are given where variables are fitted individually (left) and for significant variables following forward selection (right) (ns = not significant).

A

	INDIVIDUAL			SEQUENTIAL		
	PSEUDO-*F*	*P*	%	PSEUDO-*F*	*P*	%
Set of variables						
Environmental	3.29	0.0002	54.8	3.29	0.0002	54.8
Individual variable						
Evechinus	1.50	0.1734	5.67	–	ns	–
Fetch	1.74	0.1364	6.5	–	ns	–
MaxDepth	6.20	0.0036	19.88	–	ns	–
Slope	1.00	0.3786	3.83	–	ns	–
Secchi	9.41	0.0002	27.35	9.4113	0.0002	27.4
Sediment	4.51	0.0048	15.28	6.5544	0.0006	15.6
WaveExp	1.07	0.3372	4.09	–	ns	–

B

	INDIVIDUAL			SEQUENTIAL		
	PSEUDO-*F*	*P*	%	PSEUDO-*F*	*P*	%
Set of variables						
Environmental	2.40	0.0032	46.9	2.40	0.0032	46.9
Individual variable						
Evechinus	3.98	0.0088	13.73	–	ns	–
Fetch	1.87	0.1224	6.94	–	ns	–
MaxDepth	7.35	0.0014	22.71	2.31	0.056	6.4
Slope	0.19	0.962	0.75	–	ns	–
Secchi	9.46	0.0002	27.45	9.46	0.0002	27.5
Sediment	1.20	0.28	4.57	–	ns	–
WaveExp	0.55	0.703	2.17	–	ns	–

C

	INDIVIDUAL			SEQUENTIAL		
	PSEUDO-*F*	*P*	%	PSEUDO-*F*	*P*	%
Set of variables						
Environmental	1.53	0.0488	31.5	1.53	0.0488	31.5
Individual variable						
Fetch	1.27	0.2564	4.83	–	ns	–
MaxDepth	2.69	0.0178	9.7	–	ns	–
Slope	1.39	0.2098	5.26	–	ns	–
Secchi	4.87	0.001	16.3	4.8674	0.001	16.3
Sediment	1.34	0.2196	5.08	–	ns	–
WaveExp	0.90	0.4868	3.49	–	ns	–

3.4 MACROALGAL ASSEMBLAGES

A total of 48 macroalgal taxa were recorded during quadrat sampling across the 27 West Coast sites (Table 3A; Appendix 2). Crustose corallines were the most commonly recorded group and on average were the dominant substratum cover among the sites sampled, followed by the red turfing algal species complex and articulated coralline turf. The majority of species recorded were typically short turfing or foliose species, and large brown macroalgae were generally rare and at low abundances ($< 1/m^2$) (Table 2A). *Landsburgia quercifolia* and *Sargassum sinclairii* were the most common large brown algal species and were recorded in 13.9% and 10.4% of quadrats respectively.

There was a clear division in algal species composition between Buller and South Westland sites (Fig. 7A). While the South Seal Rocks site at Cape Foulwind had some similarities with South Westland sites, hierarchical cluster analysis separated all sites from the two regions at the 50% dissimilarity level, and there was a highly significant difference in algal species composition between sites from the two regions (ANOSIM, Global $R = 0.901$; $P = 0.001$).

The abundance of large brown algal species (Fig. 8) and cover of most other algal species (Fig. 9) was typically lower at the Buller sites compared with South Westland sites and this was reflected by the correlations between PC1 and the species variables (Fig. 7B). The majority of algal species were more common at South Westland sites and positively correlated with PC1, e.g. most large brown algal species (*Ecklonia radiata*, *Landsburgia quercifolia*, *Carpophyllum flexuosum* and *Cystophora scalaris*; Fig. 8), the small brown algae *Dictyota* spp. and *Zonaria* spp. (Fig. 9A), and a number of red algal species including *Plocamium* spp., *Anotrichium crinitum* and *Asparagopsis armata* (Fig. 9B). The green alga *Caulerpa brownii* was common at a few South Westland sites, particularly Crayfish Rocks (Fig. 9C). A low number of species were more common at the Buller sites, e.g. *Endarachne binghamiae*, *Gigartina* spp., *Gymnogongrus furcatus* (Fig. 9A, B), while others were relatively common at sites in both regions, e.g. *Halopteris* spp. (predominantly *Halopteris congesta*, which is a common component of the 'mixed turfing algal' habitat in the immediate subtidal zone), *Glossophora kunthii*, and a number of other species that commonly occur at shallow depths—*Microzonia velutina*, *Echinothamnion* spp. and *Lophurella hookeriana*. *Durvillaea willana* was recorded at one site from each region (Fig. 8).

The environmental variables explained 46.9% of the variation in algal species composition among sites (Table 2B). As for benthic community structure, Secchi (27.5%) and MaxDepth (22.7%) were the variables most strongly related to algal species composition and these were positively correlated with PC1 (Fig. 7C). When variables were fitted sequentially, Secchi was the only significant variable, although MaxDepth was marginally significant ($P = 0.056$). Unlike the benthic community structure analysis, sediment was not significantly related to algal species composition but Evechinus was (Table 2B).

There was no clear location-level grouping of sites within each region (Fig. 7A). All Buller sites had similar species composition, except South Seal Rocks where *Landsburgia* and *Sargassum* were present (Fig. 8), and there was a high cover of *Codium convolutum* (Fig. 9C). South Westland sites were spread out along PC2, but this did not correlate strongly with any of the physical variables measured. *Evechinus* abundance was weakly correlated with PC2 (Fig. 7C). Sites at the top

TABLE 3. MACROALGAL (A) AND MOBILE MACROINVERTEBRATE (B) TAXA RECORDED DURING QUADRAT SAMPLING.

Note: % occ. = percent occurrence, i.e. percentage of quadrats each species was recorded in ($n = 517$).
% count = percentage of the total number of mobile macroinvertebrates recorded. Text in parentheses indicates species codes used in Figs 7 and 11.

A

TAXA	% OCC.	MEAN COVER	MEAN COUNT
Crustose corallines	87.81	15.576	–
Red turf	72.73	13.277	–
Coralline turf (C_turf)	56.09	6.722	–
Plocamium spp. (Ploc)	55.71	3.031	–
Halopteris spp. (Halop)	44.68	4.930	–
Microzonia velutina (Microz)	36.56	2.088	–
Lophurella hookeriana (Loph)	26.89	1.764	–
Anotrichium crinitum (Ano)	25.73	1.825	–
Asparagopsis armata (Asp)	25.15	0.854	–
Echinothamnion spp. (Echino)	20.70	1.015	–
Red encrusting (R_enc)	19.92	0.760	–
Glossophora kunthii (Gloss)	18.76	0.392	–
Euptilota formosissima (Eup)	17.99	0.616	–
Landsburgia quercifolia (Lands)	13.93	0.155	0.739
Dictyota spp. (Dicty)	13.15	0.217	–
Sargassum sinclairii (Sarg)	10.44	0.068	0.470
Carpomitra costata (Carpom)	10.06	0.051	–
Rhodophyllis gunnii (Rgun)	7.93	0.164	–
Zonaria spp. (Zon)	7.16	0.202	–
Ecklonia radiata (Eck)	6.96	0.073	0.588
Gymnogongrus furcatus (Gymno)	6.96	0.199	–
Carpophyllum flexuosum (Flex)	4.26	0.046	0.356
Ballia callitrichia (Ballia)	3.87	0.263	–
Gigartina spp. (Gig)	3.68	0.158	–
Spatoglossum chapmanii (Spat)	3.68	0.052	–
Colpomenia sinuosa (Colp)	3.48	0.046	–
Caulerpa brownii (Cbrow)	3.29	0.175	–
Dictyota papenfussii	3.29	0.305	–
Codium convolutum (Cconv)	3.09	0.416	–
Hymenena durvillaei (Hdurv)	2.71	0.040	–
Ptilonia willana (Ptil)	2.71	0.015	–
Endarachne binghamiae (Endar)	2.13	0.040	–
Heterosiphonia concinna (Hetero)	2.13	0.165	–
Platythamnion sp. (Platy)	1.93	0.031	–
Pterocladiella capillacea (Pcap)	1.74	0.041	–
Cystophora scalaris (Cscal)	1.35	0.011	0.046
Ceramium spp.	1.16	0.020	–
Cladophoropsis herpestica	1.16	0.009	–
Plocamium cirrhosum	0.97	0.010	–
Pterocladia lucida (Ptero)	0.77	0.005	–
Durvillaea willana (Dwill)	0.58	0.019	0.044
Ulva spp.	0.58	0.042	–
Bryopsis pinnata (Bryop)	0.39	0.002	–
Desmarestia ligulata (Desm)	0.39	0.002	–
Scoparia hirsuta (Scop)	0.19	0.001	–
Lessonia variegata	0.19	0.002	0.058
Sporochnus sp.	0.19	0.008	–
Xiphophora gladiata	0.19	0.002	0.010

B

TAXA	% OCC.	MEAN COUNT	% COUNT
Patiriella spp. (Pati)	37.7	1.188	37.8
Evechinus chloroticus (Eve)	21.9	0.841	26.8
Stichaster australis (Stichas)	15.3	0.317	10.1
Diplodontias spp. (Dipl)	10.6	0.120	3.8
Haliotis australis (H_aus)	6.0	0.095	3.0
Cookia sulcata (Cook)	3.1	0.041	1.3
Pentagonaster pulchellus (Pent)	2.9	0.029	0.9
Stichopus mollis (Sticho)	2.5	0.031	1.0
Cryptoconchus porosus (Cryp)	1.9	0.023	0.7
Astrostole scaber (Astro)	1.9	0.019	0.6
Cellana stellifera (Cell)	1.7	0.031	1.0
Calliostoma punctulatum (Cpun)	1.7	0.019	0.6
Micrelenchus spp. (Micr)	1.5	0.112	3.6
Maoricolpus roseus (Maor)	1.4	0.037	1.2
Trochus viridis (Troc)	1.4	0.029	0.9
Haliotis iris (H_iris)	1.2	0.122	3.9
Argobuccinulum pustulosum (Argo)	1.0	0.010	0.3
Plagusia chabrus (Plag)	0.8	0.010	0.3
Modelia granosus (Mode)	0.8	0.008	0.2
Ophiopsammus maculata (Ophi)	0.6	0.006	0.2
Allostichaster sp. (Allo)	0.6	0.006	0.2
Pycnogonid sp. (Pycn)	0.6	0.006	0.2
Turbo smaragdus (Turb)	0.4	0.023	0.7
Eudoxochiton nobilis (Eudo)	0.4	0.004	0.1
Calliostoma tigris (Ctig)	0.4	0.004	0.1
Dicathais orbita (Dica)	0.4	0.004	0.1
Buccinulum lineum (Bucc)	0.2	0.004	0.1
Cominella adspersa (C_ads)	0.2	0.004	0.1
Coscinasterias muricata (Cosc)	0.2	0.002	0.1
Scutus breviculus (Scut)	0.2	0.002	0.1

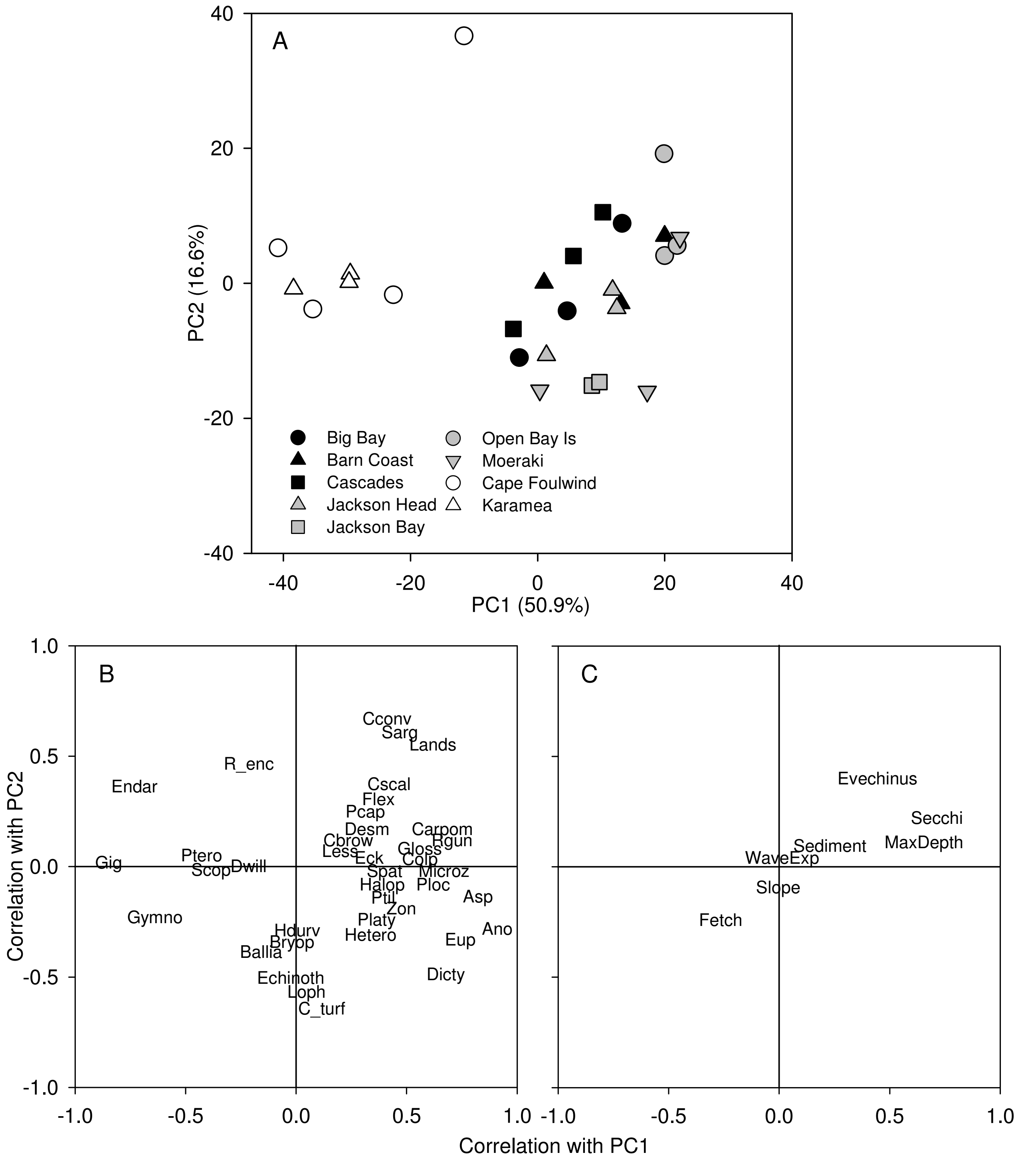


Figure 7. A—Principal coordinates analysis of macroalgal species composition (presence-absence data) for West Coast sites. B—Bi-plot showing correlations between principal coordinate axes and species variables. C— Bi-plot showing correlations between principal coordinate axes and environmental variables. See Table 2A for species codes (note: species that were weakly correlated (coefficient <0.20) with both PC1 and PC2 are not presented in C to make species codes legible). Buller sites—open symbols; South Westland sites—black or grey symbols (grey indicates sites in the 'Transition zone' of Roberts et al. 2005).

of the ordination (e.g. Open Bay Islands sites, Crayfish Rocks, Barn Islands and Arnott Point) tended to have higher abundances of large brown algal species such as *Sargassum* and *Landsburgia* (Fig. 8). *Ecklonia radiata* and *Carpophyllum flexuosum* were also common at Open Bay Islands only. Large brown algae were rare at the remaining sites and the algal assemblages were dominated by a variety of turfing and foliose algal species, e.g. *Plocamium*, *Echinothamnion* and *Lophurella*.

Figure 8. Mean density of dominant large brown algal species at each site. Horizontal lines indicate global means across all sites and vertical line indicates division between South Westland (left) and Buller (right) sites.

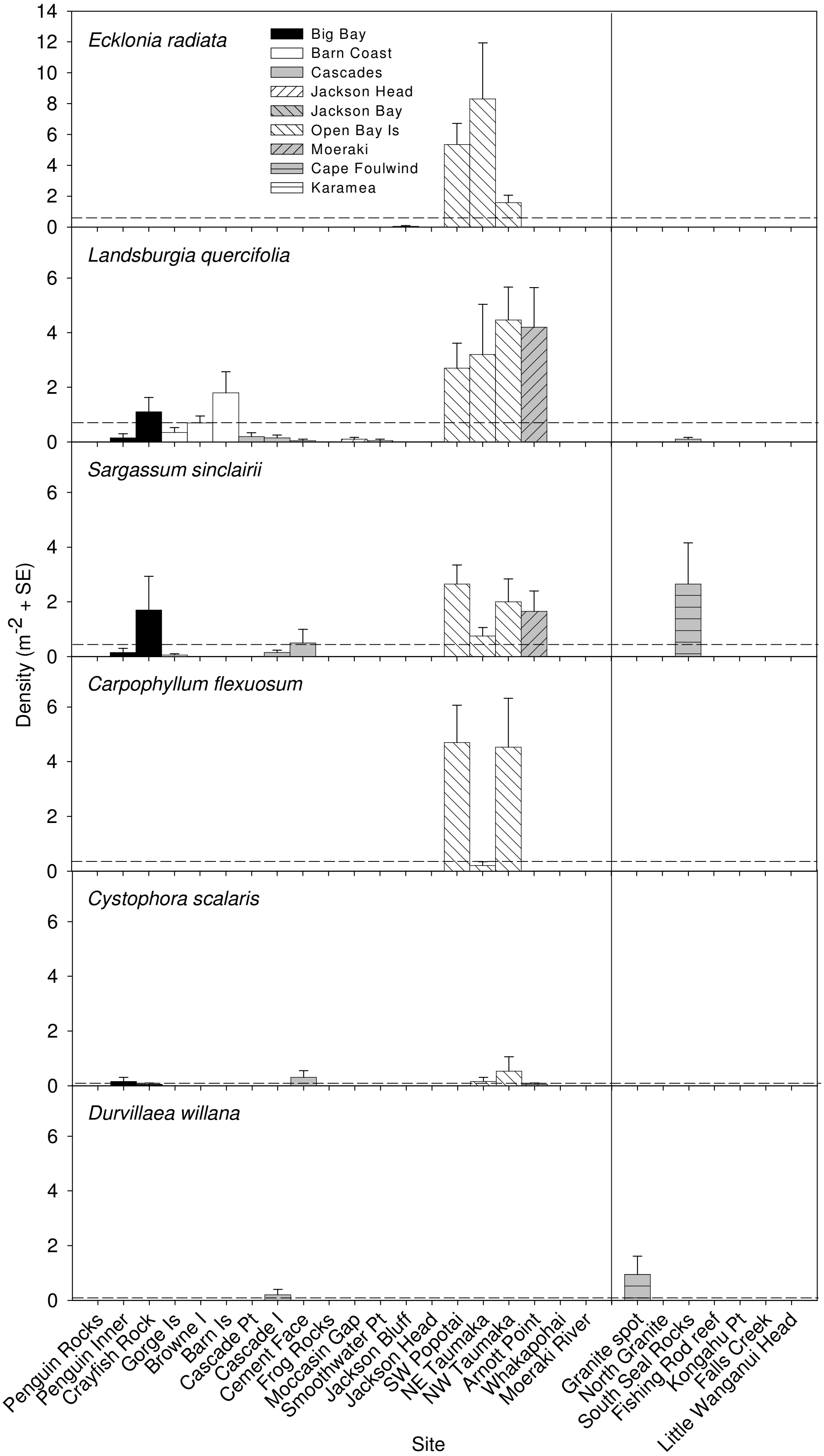


Figure 9A. Mean cover of dominant small brown algal species. Horizontal lines indicate global means across all sites and vertical line indicates division between South Westland (left) and Buller (right) sites.

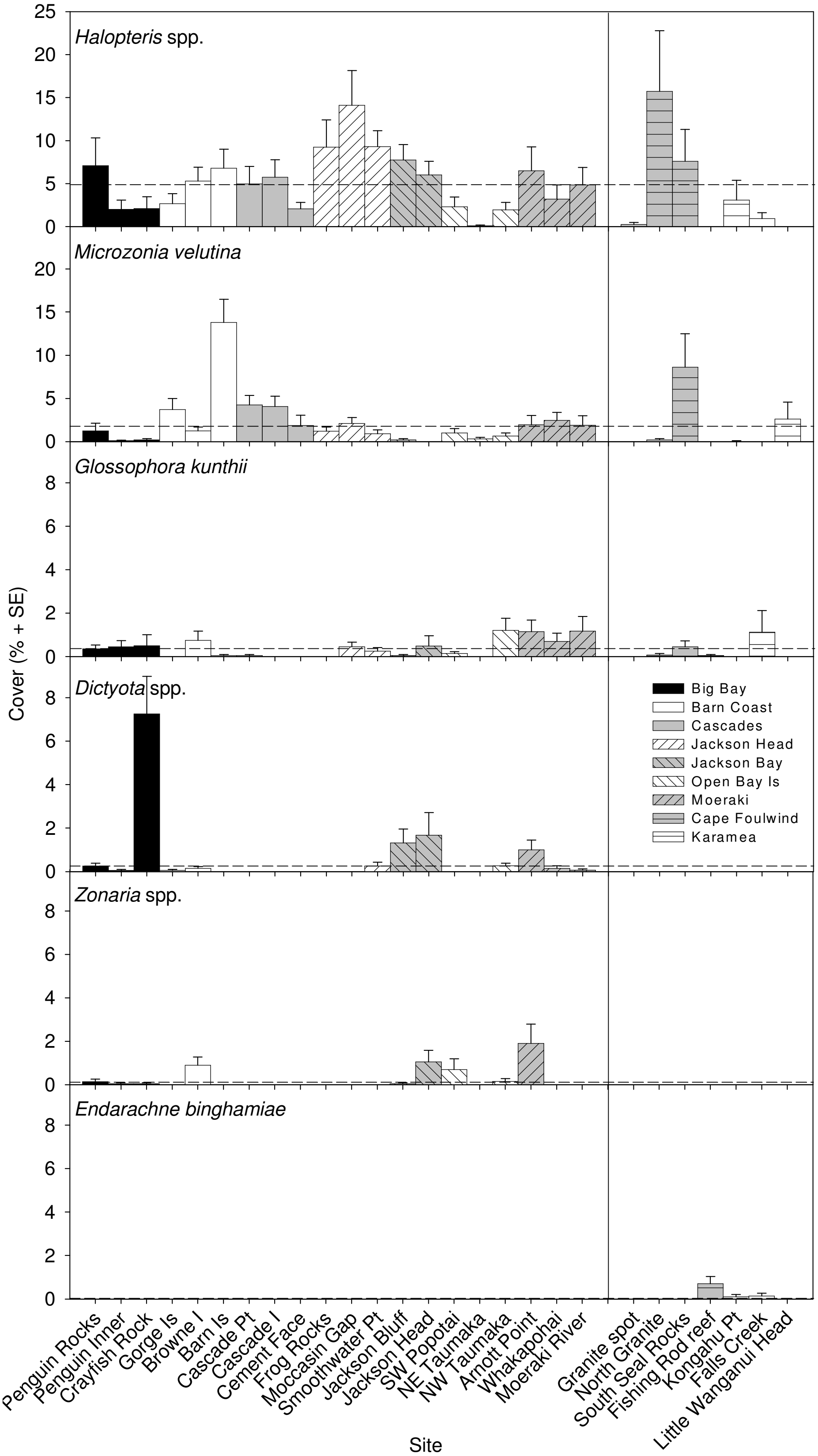


Figure 9B. Mean cover of dominant red algal species. Horizontal lines indicate global means across all sites and vertical line indicates division between South Westland (left) and Buller (right) sites.

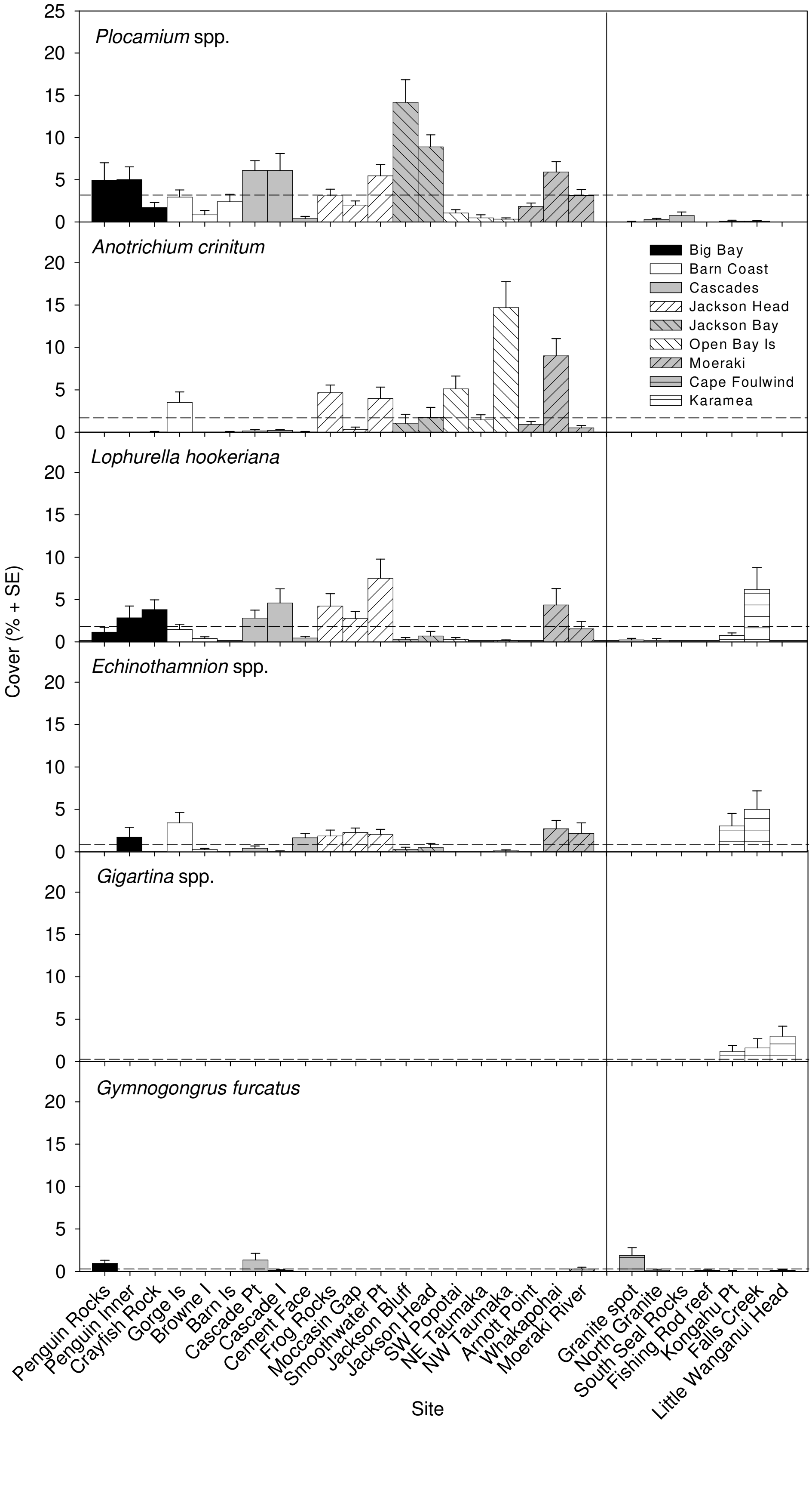
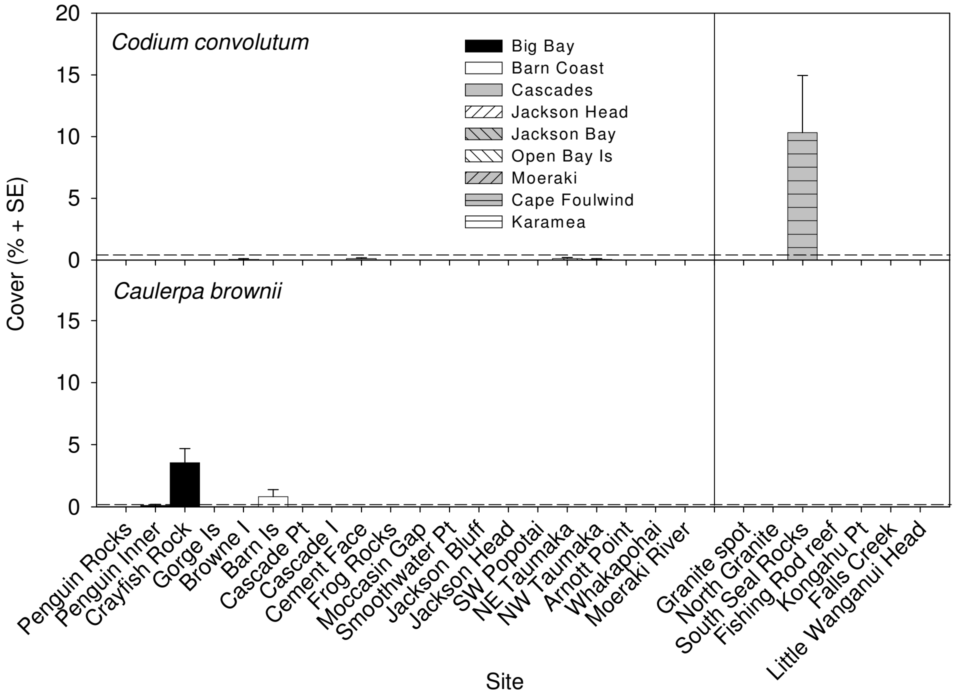


Figure 9C. Mean cover of dominant green algal species. Horizontal lines indicate global means across all sites and vertical line indicates division between South Westland (left) and Buller (right) sites.



Algal species richness (total number of species recorded at each site) also varied considerably between the two regions (Fig. 10). The mean number of species recorded at South Westland sites (21.2 ± 0.8) was almost double the mean number recorded at Buller sites (11.9 ± 0.6). Consequently, species richness was strongly negatively correlated with latitude (NZ Map Grid, Northing = –0.77) and positively correlated with Secchi (0.69). Evechinus abundance (0.40) and MaxDepth (0.40) were also weakly positively correlated with algal species richness. The highest macroalgal species richness was recorded at Open Bay Islands sites, Arnott Point and Crayfish Rocks.

3.5 MOBILE MACROINVERTEBRATE ASSEMBLAGES

Mobile macroinvertebrate assemblages did not exhibit a clear division between Buller and South Westland sites (Fig. 11A). While ANOSIM suggested a significant difference between regions (Global R = 0.547; P = 0.001), this difference was less distinct compared with that seen for benthic community structure and algal species composition (as indicated by lower Global R). Furthermore, hierarchical cluster analysis revealed no clear groupings of sites from the two regions. Environmental variables explained 31.5% of the variation in mobile invertebrate assemblages; however, the relationship was only marginally significant (P = 0.049, Table 2C). As for the other community analyses, Secchi explained the largest amount of variation (16.3%) and was positively correlated with PC1 (Fig. 11C). None of the other environmental variables were strongly correlated with PC2.

Mobile macroinvertebrate species generally occurred in low numbers on West Coast reefs with the mean abundance being < 1/m^2 for all species except *Patiriella* spp. (Table 3B). In total, 24 of the 30 species recorded occurred in less than 3% of the quadrats sampled. *Patiriella* was the most common and numerically abundant species (Table 3B), and was found at all sites except Smoothwater

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