

Table S1. Fishes recorded during underwater visual surveys of reef habitats of the Jurien Bay Marine Park, on the west coast of Australia, in all seasons between Autumn 2005 and Autumn 2007. Displayed are the biogeographical distributions of each species in Australian waters (Distn; T, temperate; S, subtropical; Tr, tropical, *endemic to west Aust.; Hutchins, 1994), the total numbers of individuals recorded of each species (n), and their percent contribution to the total numbers of individuals recorded.

Family	Species	Distn	n	%
Labridae	<i>Coris auricularis</i>	S*	56521	27.46
Pempheridae	<i>Pempheris klunzingeri</i>	T	17206	8.36
Clupeidae	<i>Spratelloides robustus</i>	T	15340	7.45
Pomacentridae	<i>Parma mccullochi</i>	T	12809	6.22
Labridae	<i>Notolabrus parilus</i>	T	10898	5.30
Kyphosidae	<i>Kyphosus cornelii</i>	S*	10843	5.27
Pomacentridae	<i>Pomacentrus milleri</i>	Tr	10248	4.98
Serranidae	<i>Caesiocorpsis theagenes</i>	S*	7491	3.64
Apogonidae	<i>Ostorhinchus victoriae</i>	S*	7157	3.48
Labridae	<i>Halichoeres brownfieldi</i>	S*	6754	3.28
Labridae	<i>Austrolabrus maculatus</i>	T	5541	2.69
Pomacentridae	<i>Chromis westaustralis</i>	S*	3293	1.60
Monodactylidae	<i>Schuettea woodwardi</i>	S*	3256	1.58
Pempheridae	<i>Parapriacanthus elongatus</i>	T	2816	1.37
Kyphosidae	<i>Kyphosus sydneyanus</i>	T	2771	1.35
Labridae	<i>Pseudolabrus biserialis</i>	T*	2738	1.33
Plesiopidae	<i>Trachinops noarlungae</i>	T	2283	1.11
Pseudochromidae	<i>Labracinus lineatus</i>	Tr	1658	0.81
Chaetodontidae	<i>Chelmonops curiosus</i>	T	1533	0.74
Pomacentridae	<i>Parma occidentalis</i>	S*	1430	0.69
Arripidae	<i>Arripis georgianus</i>	T	1397	0.68
Sphyraenidae	<i>Sphyraena obtusata</i>	S	1299	0.63
Kyphosidae	<i>Neotypus obliquus</i>	T*	1250	0.61
Labridae	<i>Olisthops cyanomelas</i>	T	991	0.48
Enoplosidae	<i>Enoplosus armatus</i>	T	947	0.46
Pomacentridae	<i>Chromis klunzingeri</i>	T*	941	0.46
Labridae	<i>Choerodon rubescens</i>	S*	921	0.45
Pempheridae	<i>Pempheris multiradiata</i>	T	909	0.44
Carangidae	<i>Pseudocaranx spp.</i>	T	903	0.44
Labridae	<i>Ophthalmolepis lineolata</i>	T	857	0.42
Labridae	<i>Dotalabrus alleni</i>	T*	824	0.40
Labridae	<i>Thalassoma lutescens</i>	Tr	710	0.34
Labridae	<i>Pictilabrus laticlavus</i>	T	695	0.34
Siganidae	<i>Siganus sp.</i>	Tr	671	0.33
Labridae	<i>Siphonognathus beddomei</i>	T	653	0.32
Labridae	<i>Pictilabrus viridis</i>	T*	599	0.29
Labridae	<i>Bodianus frenchii</i>	T	552	0.27
Serranidae	<i>Epinephelides armatus</i>	S*	505	0.25
Haemulidae	<i>Plectorhinchus flavomaculatus</i>	Tr	472	0.23
Apogonidae	<i>Siphamia cephalotes</i>	T	452	0.22
Kyphosidae	<i>Scorpius georgianus</i>	T	452	0.22
Kyphosidae	<i>Microcanthus strigatus</i>	S	446	0.22
Mullidae	<i>Parupeneus spilurus</i>	Tr	433	0.21
Plotosidae	<i>Plotosus lineatus</i>	Tr	432	0.21
Pomacentridae	<i>Stegastes obreptus</i>	Tr	426	0.21

Labridae	<i>Anampses geographicus</i>	Tr	346	0.17
Labridae	<i>Thalassoma lunare</i>	Tr	289	0.14
Pinguipedidae	<i>Parapercis haackei</i>	T	278	0.14
Labridae	<i>Heteroscarus acroptilus</i>	T	274	0.13
Plesiopidae	<i>Paraplesiops meleagris</i>	T	267	0.13
Latidae	<i>Psammoperca waigiensis</i>	Tr	238	0.12
Atherinidae	<i>Atherinid sp.</i>	-	200	0.10
Terapontidae	<i>Pelates octolineatus</i>	T	200	0.10
Apogonidae	<i>Ostorhinchus rueppellii</i>	Tr	167	0.08
Cheilodactylidae	<i>Cheilodactylus rubrolabiatus</i>	S*	143	0.07
Labridae	<i>Suezichthys cyanolaemus</i>	S*	137	0.07
Nemipteridae	<i>Pentapodus vitta</i>	S*	129	0.06
Blenniidae	<i>Cirripectes hutchinsi</i>	S*	127	0.06
Chaetodontidae	<i>Chaetodon assarius</i>	S*	123	0.06
Trypterigidae	<i>Helcogramma decurrens</i>	T	122	0.06
Labridae	<i>Thalassoma septemfasciata</i>	S*	109	0.05
Labridae	<i>Scarus ghobban</i>	Tr	109	0.05
Monacanthidae	<i>Meuschenia hippocrepis</i>	T	97	0.05
Urolophidae	<i>Trygonoptera ovalis</i>	T	88	0.04
Glaucosomatidae	<i>Glaucosoma hebraicum</i>	S*	79	0.04
Monacanthidae	<i>Meuschenia galii</i>	T	79	0.04
Ostraciidae	<i>Anoplocapros amygdaloides</i>	T	75	0.04
Tetraodontidae	<i>Torquigener pleurogramma</i>	T	70	0.03
Monacanthidae	<i>Meuschenia flavolineata</i>	T	64	0.03
Sparidae	<i>Rhabdosargus sarba</i>	S	62	0.03
Cheilodactylidae	<i>Cheilodactylus gibbosus</i>	S*	45	0.02
Mullidae	<i>Parupeneus chrysopleuron</i>	Tr	42	0.02
Cheilodactylidae	<i>Dactylophora nigricans</i>	T	37	0.02
Labridae	<i>Siphonognathus caninus</i>	T	36	0.02
Ostraciidae	<i>Anoplocapros lenticularis</i>	T	33	0.02
Carangidae	<i>Seriola hippos</i>	T	32	0.02
Serranidae	<i>Hypoplectrodes nigroruber</i>	T	28	0.01
Mullidae	<i>Upeneichthys vlamingii</i>	T	28	0.01
Epinephelidae	<i>Epinephelus rivulatus</i>	Tr	27	0.01
Monacanthidae	<i>Scobinichthys granulatus</i>	T	25	0.01
Serranidae	<i>Othos dentex</i>	T	23	0.01
Pomacentridae	<i>Parma victoriae</i>	T	21	0.01
Carangidae	<i>Trachurus novaezelandiae</i>	T	17	0.01
Kyphosidae	<i>Girella tephraeops</i>	T*	17	0.01
Sparidae	<i>Chrysophrys auratus</i>	T	17	0.01
Kyphosidae	<i>Girella zebra</i>	T	16	0.01
Lethrinidae	<i>Lethrinus nebulosus</i>	Tr	14	0.01
Monacanthidae	<i>Acanthaluteres sp.</i>	T	14	0.01
Labridae	<i>Stethojulis bandanensis</i>	Tr	11	0.01
Ostraciidae	<i>Aracana aurita</i>	T	9	0.004
Labridae	<i>Achoerodus gouldii</i>	T	9	0.004
Diodontidae	<i>Diodon nictemerus</i>	T	9	0.004
Pempheridae	<i>Pempheris schwenkii</i>	Tr	8	0.004
Labridae	<i>Leptoscarus vaigiensis</i>	Tr	8	0.004
Monacanthidae	<i>Monacanthus chinensis</i>	Tr	7	0.003
Apogonidae	<i>Ostorhinchus aureus</i>	Tr	6	0.003

Labridae	<i>Eupetrichthys angustipes</i>	T	6	0.003
Blenniidae	<i>Plagiotremus rhinorhynchus</i>	Tr	5	0.002
Labridae	<i>Thalassoma amblycephalum</i>	Tr	5	0.002
Dasyatidae	<i>Dasyatis brevicaudata</i>	T	4	0.002
Serranidae	<i>Acanthistius pardalotus</i>	S*	3	0.001
Monacanthidae	<i>Chaetodermis penicilligera</i>	Tr	3	0.001
Muraenidae	<i>Gymnothorax woodwardi</i>	S*	3	0.001
Labridae	<i>Thalassoma purpurum</i>	Tr	3	0.001
Pomacentridae	<i>Abudefduf bengalensis</i>	Tr	2	0.001
Serranidae	<i>Acanthistius serratus</i>	T*	2	0.001
Aplodactylidae	<i>Aplodactylus westralis</i>	T	2	0.001
Serranidae	<i>Callanthias australis</i>	T	2	0.001
Plotosidae	<i>Plotosid sp.</i>	S, T	2	0.001
Pomatomidae	<i>Pomatomus saltatrix</i>	S	2	0.001
Labridae	<i>Pseudojuloides elongatus</i>	Tr	2	0.001
Plesiopidae	<i>Trachinops brauni</i>	T*	2	0.001
Rhinobatidae	<i>Trygonorrhina dumerilii</i>	T	2	0.001
Syngnathidae	<i>Phyllopteryx taeniolatus</i>	T	2	0.001
Kyphosidae	<i>Scorpius aequipinnis</i>	T	2	0.001
Carangidae	<i>Seriola lalandi</i>	T	2	0.001
Pomacentridae	<i>Abudefduf vaigiensis</i>	Tr	2	0.001
Acanthuridae	<i>Acanthurus dussumieri</i>	Tr	1	0.0005
Pleuronectidae	<i>Ammotretis elongatus</i>	T	1	0.0005
Scyliorhinidae	<i>Aulohalaelurus labiosus</i>	T*	1	0.0005
Clinidae	<i>Cristiceps australis</i>	T	1	0.0005
Monacanthidae	<i>Eubalichthys cyanoura</i>	T	1	0.0005
Heterodontidae	<i>Heterodontus portusjacksoni</i>	T	1	0.0005
Serranidae	<i>Hypoplectrodes wilsoni</i>	T*	1	0.0005
Labridae	<i>Labroides dimidiatus</i>	Tr	1	0.0005
Tetraodontidae	<i>Lagocephalus sceleratus</i>	Tr	1	0.0005
Platycephalidae	<i>Leviprora inops</i>	T	1	0.0005
Myliobatidae	<i>Myliobatus australis</i>	T	1	0.0005
Terapontidae	<i>Pelsartia humeralis</i>	T	1	0.0005
Pempheridae	<i>Pempheris ornata</i>	T	1	0.0005
Blenniidae	<i>Plagiotremus tapeinosoma</i>	Tr	1	0.0005
Ehippididae	<i>Platax teira</i>	Tr	1	0.0005
Scorpaenidae	<i>Pterois volitans</i>	Tr	1	0.0005
Microcanthidae	<i>Tilodon sexfasciatum</i>	T	1	0.0005
Urolophidae	<i>Urolophus circularis</i>	T	1	0.0005
Monacanthidae	<i>Brachaluteres jacksonianus</i>	T	1	0.0005

Table S2. Identifiable species and major morphological groups (according to standardized methods of CATAMI; Althaus et al., 2014) used for recording percent cover of macrophytes (and for analyses) in each replicate at each reef site.

CATAMI category	Typical genera/species
Brown algae (Heterokontophyta)	
Large canopy forming	<i>Ecklonia radiata</i>
Erect coarse branching macroalgae	<i>Sargassum</i> spp. <i>Scytothalia doryocarpa</i> <i>Scaberia agardhii</i> <i>Cystophora</i> sp. <i>Platythalia</i> sp.
Laminate macroalgae	<i>Padina</i> sp., <i>Dictyopteris</i> sp.
Filamentous macroalgae	<i>Hincksia</i> sp.
Erect fine branching macroalgae	
Globose macroalgae	<i>Colpomenia</i> sp.
Green algae (Chlorophyta)	
Erect coarse branching macroalgae	<i>Caulerpa obscura</i> , <i>Caulerpa racemosa</i> , <i>Codium spongiosum</i>
Filamentous macroalgae	<i>Cladophora</i> sp.
Sheet-like macroalgae	<i>Ulva</i> sp.
Red algae (Rhodophyta)	
Erect fine branching macroalgae	<i>Asparagopsis</i> sp., <i>Callophycus</i> sp., <i>Curdiea</i> sp., <i>Osmundaria prolifera</i> , <i>Plocamium</i> sp., <i>Pterocladia</i> sp.
Encrusting macroalgae	
Articulated calcareous	<i>Metamastophora flabellata</i> , <i>Metagniolithon</i> sp., <i>Amphiroa gracilis</i> , <i>Amphiroa anceps</i> <i>Hydrolithon</i> sp., <i>Lithophyllum</i> sp., <i>Jania micrarthrodia</i>
Filamentous macroalgae	<i>Ceramium</i> sp.
Seagrasses	
Elliptical leaves	Hydrocharitaceans (<i>Halophila</i> sp.)
Strap-like leaves	Cymodoceans (<i>Amphibolis antarctica</i> , <i>Amphibolis griffithii</i> , <i>Syringodium isoetifolium</i> Posidonians (<i>Posidonia australis</i>), <i>Posidonia sinuosa</i> , <i>Zosteraceans</i> (<i>Heterozostera tasmanica</i>)
Corals	Includes all corals, predominantly stony corals e.g. <i>Pocillopora damicornis</i>
Sponges	Includes all sponges
Turf	Includes brown, green and red turfs
Unconsolidated substrate	Sand

Table S3. Results of marginal tests of the DISTLM procedure demonstrating the relationship between each of the measured environmental predictor variables and fish compositions of the Jurien Bay Marine Park. Significant results are shown in bold (either $P < 0.05$ or 0.01).

Variable	SS(trace)	Pseudo-F	P	Prop.
depth	12361	14.999	0.001	0.31913
dist	11638	13.746	0.001	0.30048
Large canopy	7227	7.3406	0.001	0.18659
Strap-like	6346.4	6.2708	0.001	0.16385
Filamentous macroalgae	5567.1	5.3716	0.001	0.14373
Temp	5504.9	5.3017	0.001	0.14213
Laminate macroalgae	4948.7	4.6875	0.001	0.12777
Turf	4569.8	4.2806	0.002	0.11799
Articulated calcareous	3784.6	3.4654	0.006	0.097712
Corals	3033.2	2.719	0.017	0.078313
Erect fine branching macroalgae	2561.7	2.2664	0.044	0.06614
Sheet-like macroalgae	2465.2	2.1752	0.05	0.063649
rugosity	2306.2	2.026	0.07	0.059543
Elliptical	2301.8	2.0219	0.077	0.059428
Sand	2036.1	1.7755	0.099	0.052568
%mod	1978.7	1.7228	0.099	0.051088
%high	1964.4	1.7097	0.116	0.050717
%low	1957.9	1.7037	0.106	0.05055
Coarse branching	1810.1	1.5688	0.146	0.046734
Encrusting macroalgae	1747.9	1.5123	0.193	0.045128
Sponges	1580.1	1.361	0.235	0.040795

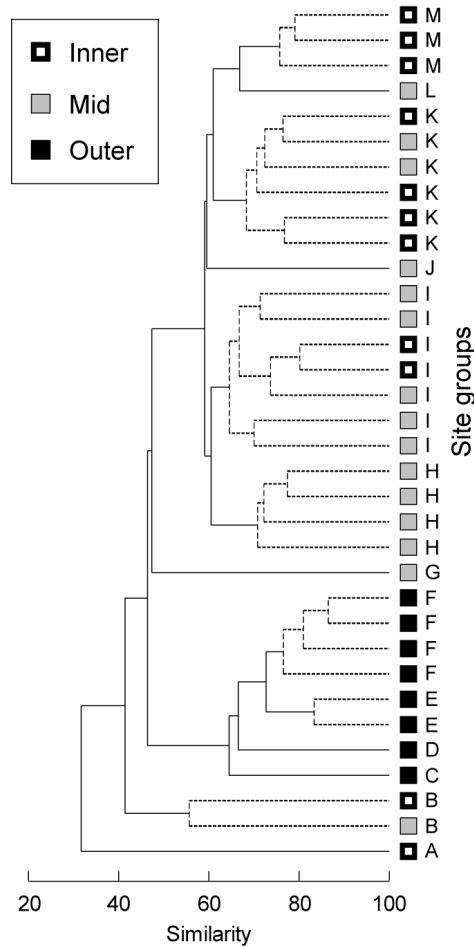


Figure S1. Dendrogram constructed from a Bray-Curtis similarity matrix derived from data for the composition of fishes over reef sites at inner, mid and outer reef locations in the Jurien Bay Marine Park. Significant groups of fish samples at individual sites identified by SIMPROF shown with dashed lines (groups B, E, F, H, I, K, M) and single sites shown by solid lines (A, C, D, G, J, L).

Literature cited

- Althaus F, Hill N, Ferrari R, Edwards L, Przeslawski R, Schönberg CHL, Stuart-Smith R, Barrett N, Edgar G, Colquhoun J, Tran M, Jordan A, Rees T, Gowlett-Holmes K (2015) A standardised vocabulary for identifying benthic biota and substrata from underwater imagery: the CATAMI classification scheme. *PLoS One* 10: e0141039.
- Hutchins, B (1994) A survey of the nearshore reef fish fauna of Western Australia’s west and south coasts – the Leeuwin Province. *Rec West Aust Mus Suppl.* No. 46.