

Ecography

ECOG-04868

Berkström, C., Eggertsen, L., Godell, W., Cordeiro, C. A. M. M., Lucena, M. B., Gustafsson, R., Bandeira, S., Jiddawi, N. and Ferreira, C. 2020. Thresholds in seascape connectivity: the spatial arrangement of nursery habitats structure fish communities on nearby reefs. – Ecography doi: 10.1111/ecog.04868

Supplementary material

Appendix 1

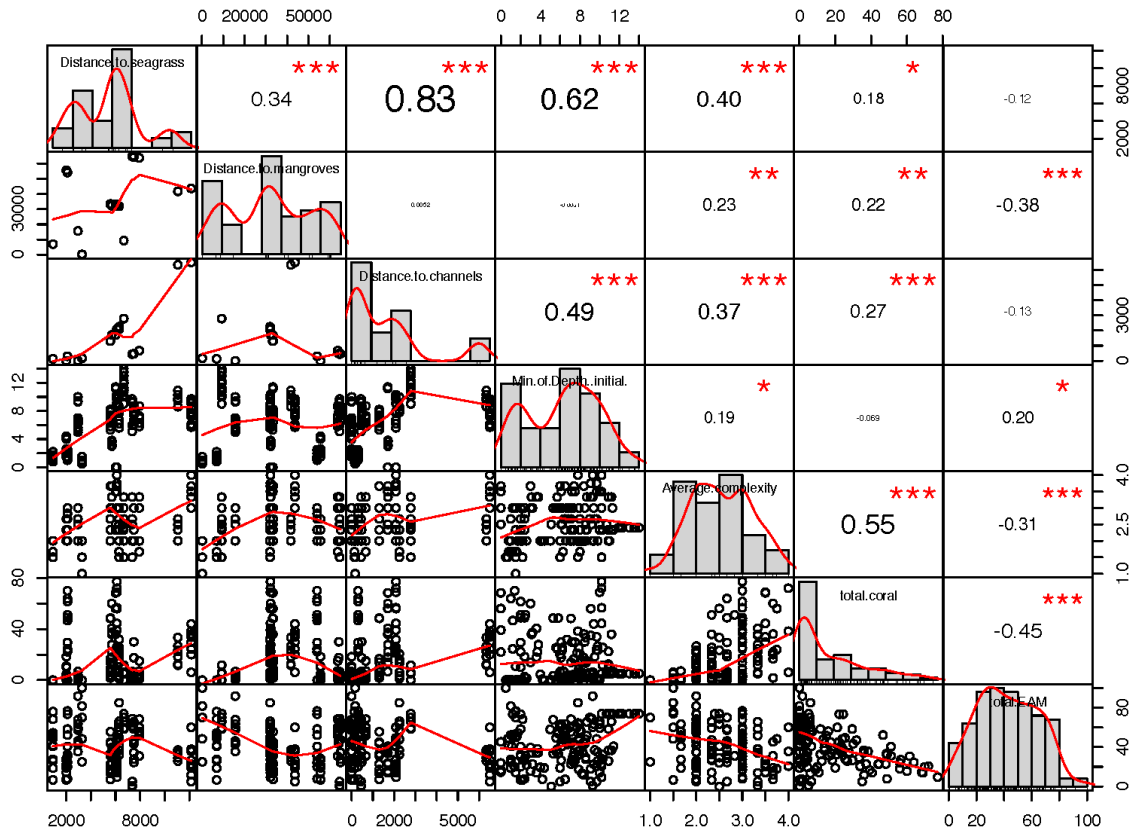


Figure A1. Correlation coefficient charts for seascape and microhabitat variables used in the present study. No variables, but distance to seagrass and distance to channels were correlated. Total coral = total % live coral cover and Total EAM = total % cover of epilithic algal matrix.

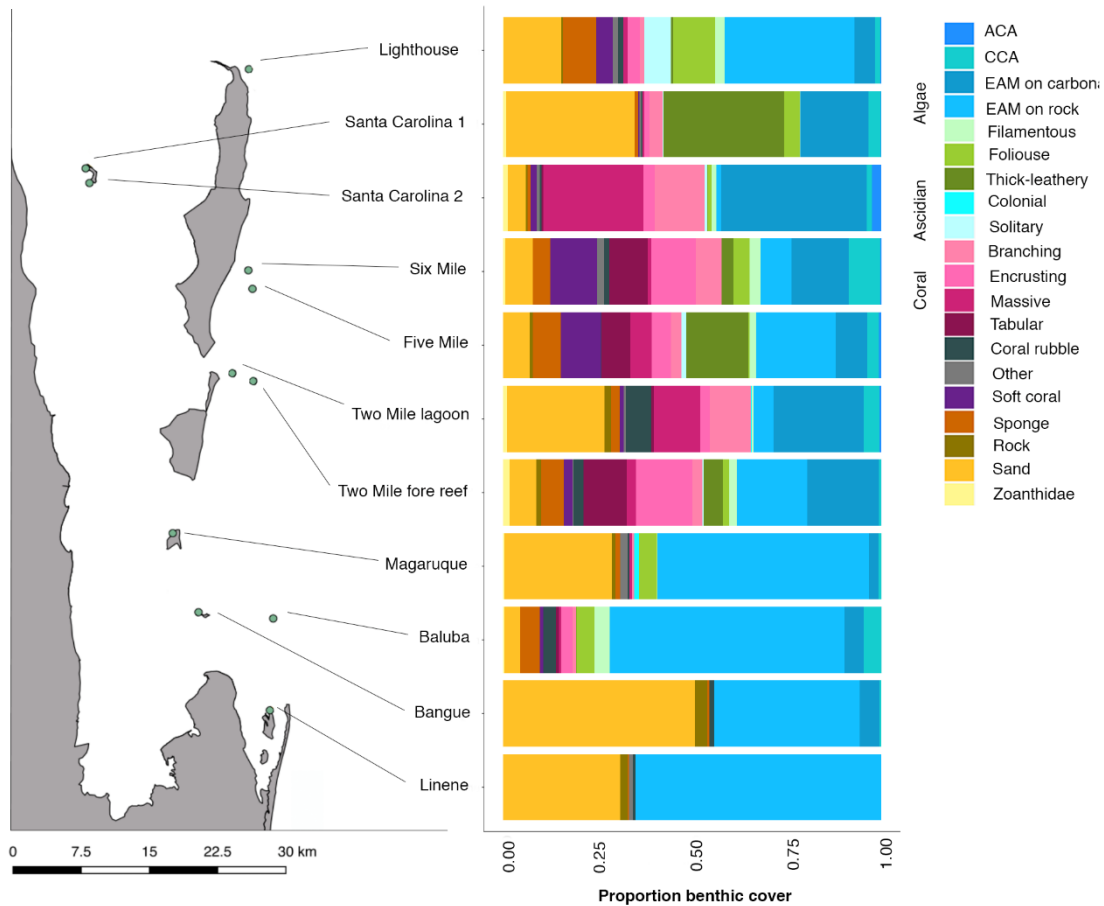


Figure A2. Average % benthic cover at each reef site surveyed in the Bazaruto Archipelago, Mozambique, recorded during underwater visual surveys 2016-2017. ACA = articulated coralline algae, CCA = crustose coralline algae, EAM = epilithic algal matrix, Filamentous = filamentous algae, Foliose = foliose algae, Thick-leathery = thick-leathery algae, Colonial = colonial ascidians, Solitary = solitary ascidians, Branching = branching coral, Encrusting = encrusting coral, Massive = massive coral, Tabular = tabular coral.

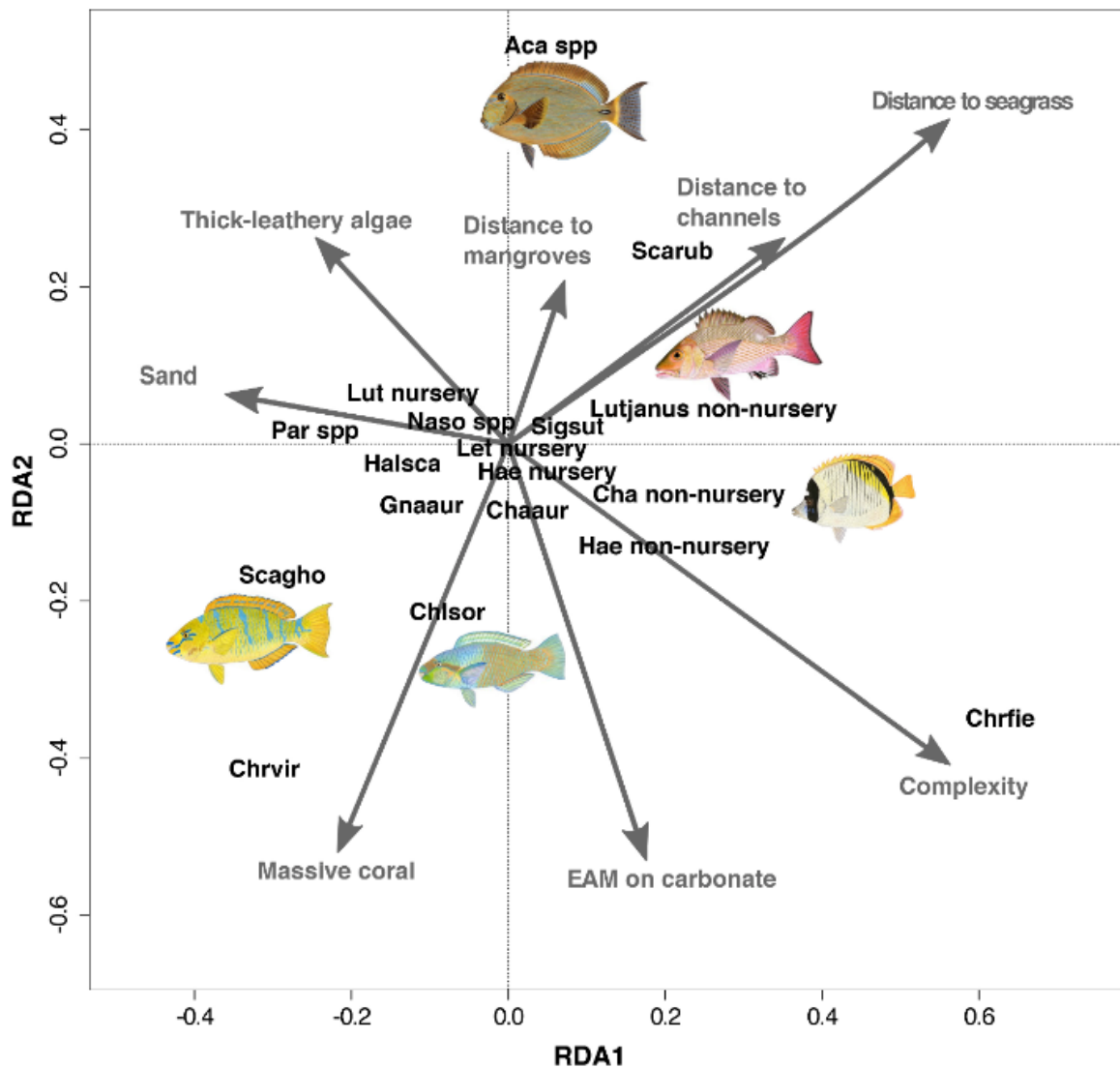
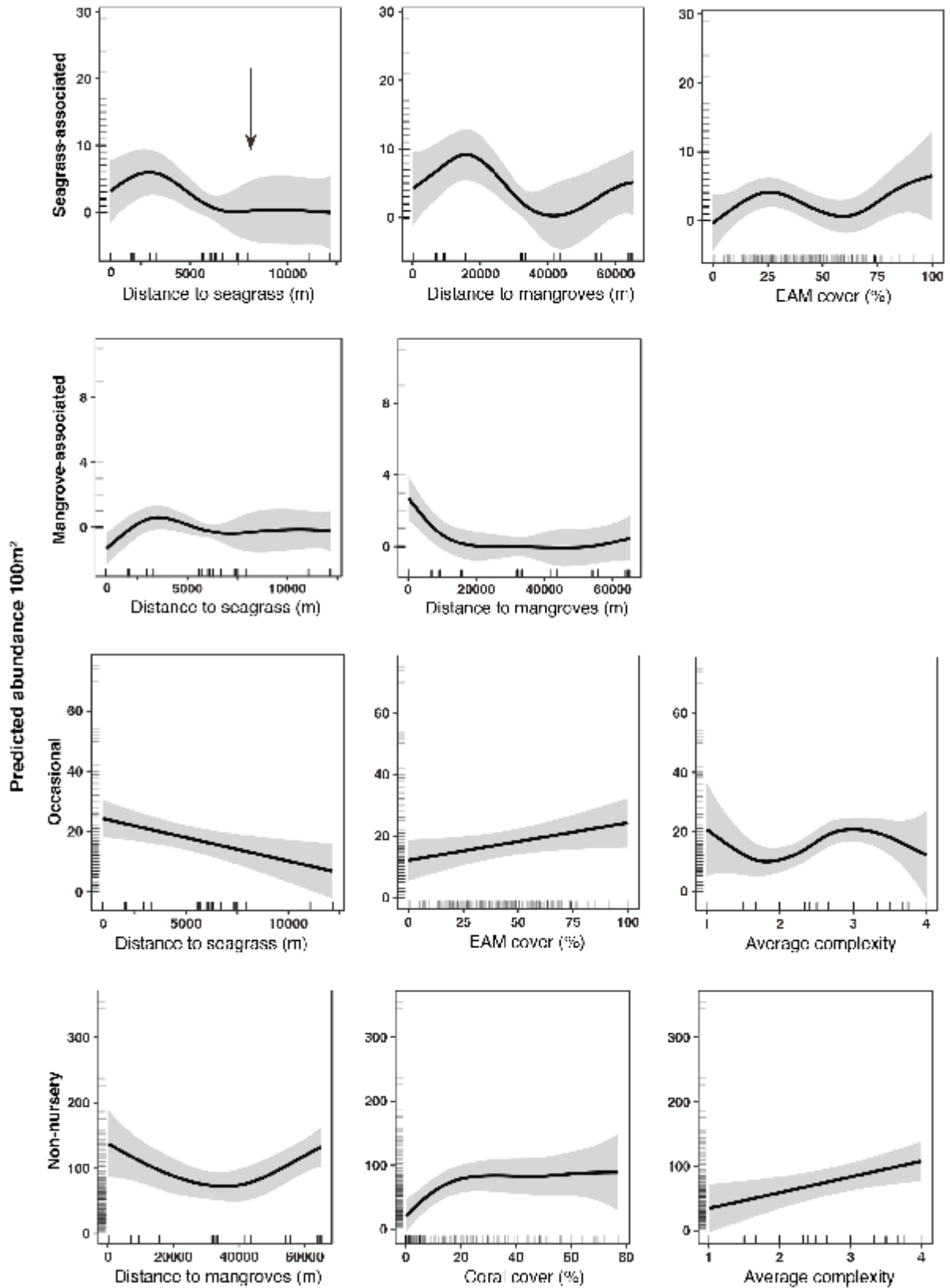


Figure A3. RDA showing selected fish taxa (black text) and their distribution in ordination space in relation to significant environmental variables (grey). Length of arrow is proportional to strength of variable. Aca spp = *Acanthurus spp*, Chaaur = *Chaetodon Auriga*, Cha non-nursery = *Chaetodon non-nursery species*, Chlsvr = *Chlorurus sordidus*, Chrfile = *Chromis fieldi*, Chrvir = *Chromis viridis*, Gnaaur = *Gnathodentex aurolineatus*, Halsca = *Halichoeres scapularis*, Let nursery = *Lethrinus nursery-species*, Lut nursery = *Lutjanus nursery species*, Lut non-nursery = *Lutjanus non-nursery species*, Hae nursery = *Haemulidae nursery species*, Hae non-nursery = *Haemulidae non-nursery species*, Scagho = *Scarus ghobban*, Scarub = *Scarus rubroviolaceus*, Sig sut = *Siganus sutor*. Image courtesy of www.efishalbum.com.



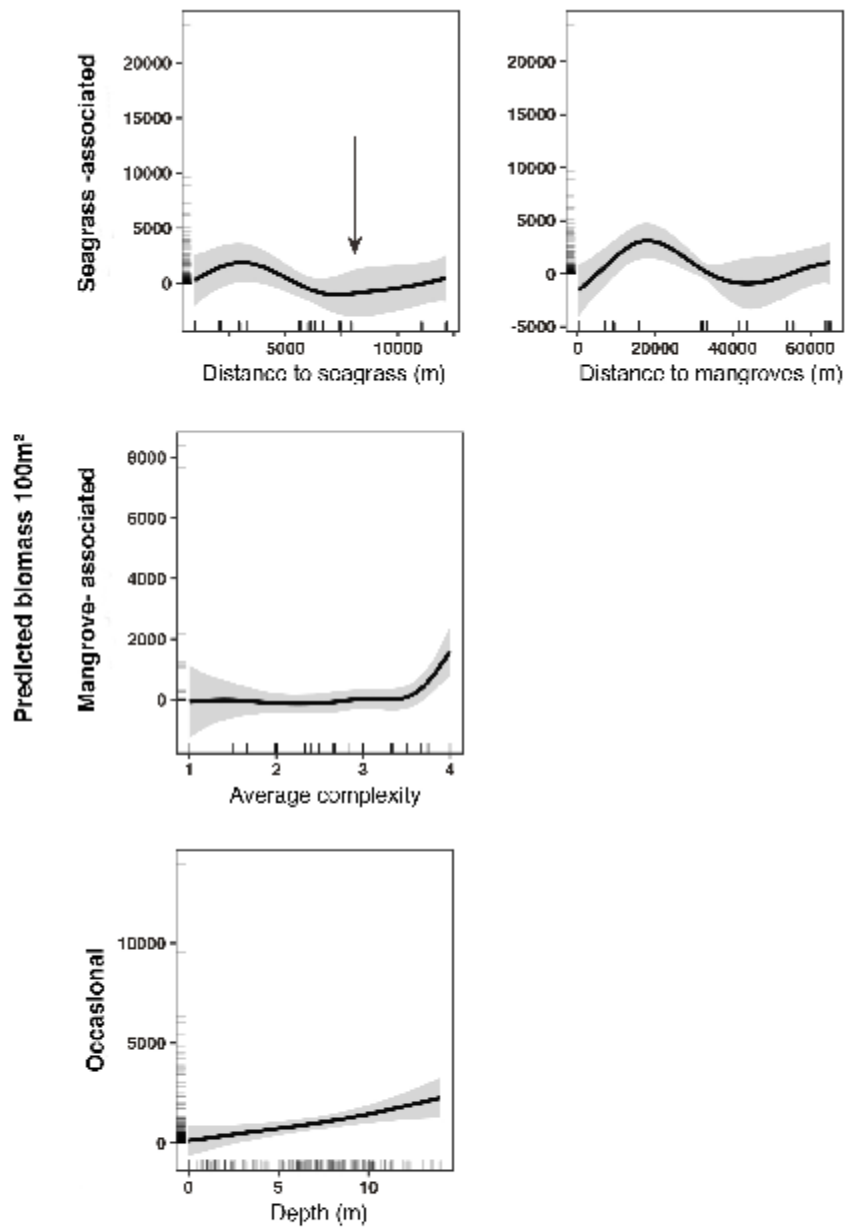


Figure A4. Partial dependence plots showing the relationship between abundance and biomass of seagrass- and mangrove-associated nursery species and non-nursery species (reef fishes using reefs as nurseries) and significant habitat variables modelled with generalized additive models (GAMs). Shaded areas indicate 95% confidence intervals. Arrows indicate a threshold distance (8 km) where abrupt changes in fish abundance occurred.

Table A1. Recorded species of reef fish in the study shown by their respective nursery habitat association. Definitions according to Froese & Pauly (2018), Lugendo et al (2007) and unpublished data from the Bazaruto Archipelago (Eggertsen et al.).

Nursery habitat association	Species	Nursery habitat association	Species
Mangrove	<i>Lutjanus argentimaculatus</i>	Reef	<i>Echidna nebulosa</i>
	<i>Monodactylus argenteus</i>		<i>Fistularia commersonii</i>
	<i>Platax orbicularis</i>		<i>Gnathodentex aurolineatus</i>
	<i>Platycephalus indicus</i>		<i>Halichoeres scapularis</i>
	<i>Plectorhinchus plagiodesmus</i>		<i>Lutjanus fulvus</i>
	<i>Sillago sihama</i>		<i>Lutjanus kasmira</i>
Seagrass/Mangrove	<i>Epinephelus malabaricus</i>		<i>Mulloidichthys flavolineatus</i>
	<i>Gerres longirostris</i>		<i>Mulloidichthys vanicolensis</i>
	<i>Gerres oyena</i>		<i>Naso annulatus</i>
	<i>Lethrinus harak</i>		<i>Naso brevirostris</i>
	<i>Lutjanus ehrenbergi</i>		<i>Naso unicornis</i>
	<i>Plectorhinchus gibbosus</i>		<i>Neoniphon sammara</i>
	<i>Rhabdosargus sarba</i>		<i>Parupeneus cyclostomus</i>
Seagrass	<i>Cheilio inermis</i>		<i>Parupeneus rubescens</i>
	<i>Chrysiptera annulata</i>		<i>Plectorhinchus gaterinus</i>
	<i>Diagramma centurio</i>		<i>Pterois sp</i>
	<i>Diagramma pictum</i>		<i>Scarus psittacus</i>
	<i>Lactoria cornuta</i>		<i>Siganus argenteus</i>
	<i>Lethrinus lentjan</i>		<i>Siganus luridus</i>
	<i>Lutjanus gibbus</i>		<i>Stethojulis albovittata</i>
	<i>Parupeneus barberinus</i>		<i>Stethojulis interrupta</i>
	<i>Parupeneus indicus</i>		<i>Stethojulis strigiventer</i>
	<i>Parupeneus macronema</i>	<i>Thalassoma hebraicum</i>	
	<i>Plectorhinchus chubbi</i>	<i>Thalassoma lunare</i>	
	<i>Plectorhinchus flavomaculatus</i>		
	<i>Plectorhinchus schotaf</i>		
	<i>Plectorhinchus sordidus</i>		
	<i>Scarus ghobban</i>		
<i>Scolopsis ghanam</i>			
<i>Siganus sutor</i>			
<i>Upeneus tragula</i>			
Seaweed	<i>Cheilinus trilobatus</i>	<i>Abudefduf natalensis</i>	
	<i>Novaculichthys taeniourus</i>	<i>Abudefduf notatus</i>	
	<i>Scarus niger</i>	<i>Abudefduf sexfasciatus</i>	
Generalist/estuaries	<i>Neopomacentrus cyanomos</i>	<i>Abudefduf sordidus</i>	
	<i>Ptereleotris evides</i>	<i>Abudefduf sparoides</i>	
	<i>Rhabdosargus thorpei</i>	<i>Abudefduf vaigiensis</i>	
		<i>Acanthurus dussumieri</i>	
Occasionally	<i>Acanthurus blochii</i>	<i>Acanthurus leucopareius</i>	
	<i>Acanthurus triostegus</i>	<i>Acanthurus leucosternon</i>	
	<i>Acanthurus xanthopterus</i>	<i>Acanthurus lineatus</i>	
	<i>Calotomus carolinus</i>	<i>Acanthurus mata</i>	
	<i>Caranx melampygus</i>	<i>Acanthurus nigricauda</i>	
	<i>Caranx sexfasciatus</i>	<i>Acanthurus nigrofuscus</i>	
	<i>Chaetodon auriga</i>	<i>Acanthurus tennenti</i>	
	<i>Chaetodon kleinii</i>	<i>Acanthurus thompsoni</i>	
	<i>Chaetodon lunula</i>	<i>Amanses scopas</i>	
	<i>Chaetodon vagabundus</i>	<i>Amblyeleotris sp</i>	
	<i>Chlorurus capistratoides</i>	<i>Amphiprion akallopisos</i>	
	<i>Chlorurus sordidus</i>	<i>Amphiprion allardi</i>	
	<i>Coris caudimacula</i>	<i>Anampses caeruleopunctatus</i>	
	<i>Ctenochaetus striatus</i>	<i>Anampses lineatus</i>	
		<i>Anampses melanurus</i>	
		<i>Anampses meleagrides</i>	
		<i>Anampses twistii</i>	
	<i>Apogon nigripinnis</i>		
	<i>Apolemichthys trimaculatus</i>		
	<i>Aprion virescens</i>		
	<i>Arothron hispidus</i>		
	<i>Arothron stellatus</i>		
	<i>Aspidontus dussumieri</i>		
	<i>Aulostomus chinensis</i>		
	<i>Balistapus undulatus</i>		
	<i>Balistoides conspicillum</i>		
	<i>Bodianus axillaris</i>		
	<i>Bodianus diana</i>		
	<i>Caesio caeruleaurea</i>		

Nursery habitat association	Species	Nursery habitat association	Species
Reef	<i>Caesio teres</i>		<i>Gomphosus caeruleus</i>
	<i>Caesio xanthonota</i>		<i>Grammistes sexlineatus</i>
	<i>Callechelys catostoma</i>		<i>Gymnothorax favagineus</i>
	<i>Cantherhines pardalis</i>		<i>Gymnothorax flavimarginatus</i>
	<i>Canthigaster compressa</i>		<i>Halichoeres cosmetus</i>
	<i>Canthigaster coronata</i>		<i>Halichoeres hortulanus</i>
	<i>Canthigaster rivulata</i>		<i>Halichoeres marginatus</i>
	<i>Canthigaster solandri</i>		<i>Halichoeres nebulosus</i>
	<i>Canthigaster valentini</i>		<i>Hemigymnus fasciatus</i>
	<i>Canthigastor bennetti</i>		<i>Hemitaurichthys zoster</i>
	<i>Canthigastor smithae</i>		<i>Heniochus acuminatus</i>
	<i>Centropyge multispinis</i>		<i>Hologymnosus annulatus</i>
	<i>Cephalopholis miniata</i>		<i>Hologymnosus doliatus</i>
	<i>Cephalopholis argus</i>		<i>Istiogobius decoratus</i>
	<i>Cephalopholis nigripinnis</i>		<i>Labroides bicolor</i>
	<i>Cephalopholis sexmaculata</i>		<i>Labroides dimidiatus</i>
	<i>Cephalopholis urodeta</i>		<i>Lutjanus bohar</i>
	<i>Chaetodon bennetti</i>		<i>Lutjanus lutjanus</i>
	<i>Chaetodon falcula</i>		<i>Lutjanus notatus</i>
	<i>Chaetodon fremblii</i>		<i>Macolor niger</i>
	<i>Chaetodon guttatissimus</i>		<i>Macropharyngodon bipartitus</i>
	<i>Chaetodon interruptus</i>		<i>Macropharyngodon cyanoguttatus</i>
	<i>Chaetodon lineolatus</i>		<i>Malacanthus latovittatus</i>
	<i>Chaetodon madagaskariensis</i>		<i>Monotaxis grandoculis</i>
	<i>Chaetodon melannotus</i>		<i>Myrichthys colubrinus</i>
	<i>Chaetodon meyeri</i>		<i>Myripristis kuntee</i>
	<i>Chaetodon trifascialis</i>		<i>Naso hexacanthus</i>
	<i>Chaetodon trifasciatus</i>		<i>Naso lituratus</i>
	<i>Chaetodon unimaculatus</i>		<i>Nemanthias carberryi</i>
	<i>Cheilinus fasciatus</i>		<i>Odonus niger</i>
	<i>Cheilodipterus macrodon</i>		<i>Ostorhinchus angustatus</i>
	<i>Cheilodipterus quinquelineatus</i>		<i>Ostorhinchus cookii</i>
	<i>Chlorurus atrilunula</i>		<i>Ostracion cubicus</i>
	<i>Chromis dimidiata</i>		<i>Ostracion meleagris</i>
	<i>Chromis fieldi</i>		<i>Pachymetopon grande</i>
	<i>Chromis lepidolepis</i>		<i>Paracanthurus hepatus</i>
	<i>Chromis nigrura</i>		<i>Paracirrhites arcatus</i>
	<i>Chromis viridis</i>		<i>Paracirrhites forsteri</i>
	<i>Chromis weberi</i>		<i>Parapercis hexophthalma</i>
	<i>Chrysiptera glauca</i>		<i>Parupeneus bifasciatus</i>
	<i>Cirrhilichthys oxycephalus</i>		<i>Pempheris oualensis</i>
	<i>Cirrhilabrus exquisitus</i>		<i>Pempheris vanicolensis</i>
	<i>Coris africana</i>		<i>Pervagor janthinosoma</i>
	<i>Coris aygula</i>		<i>Plagiotremus rhinorhynchus</i>
	<i>Coris formosa</i>		<i>Plectorhinchus playfairi</i>
	<i>Coris gaimard</i>		<i>Plectroglyphidodon dickii</i>
	<i>Ctenochaetus strigosus</i>		<i>Plectroglyphidodon lacrymatus</i>
	<i>Cylichthys orbicularis</i>		<i>Pomacanthus annularis</i>
	<i>Dascyllus aruanus</i>		<i>Pomacanthus imperator</i>
	<i>Dascyllus carneus</i>		<i>Pomacanthus rhomboides</i>
	<i>Dascyllus trimaculatus</i>		<i>Pomacanthus semicirculatus</i>
	<i>Dendrochirus brachypterus</i>		<i>Pomacentrus trichourus</i>
	<i>Epinephelus fasciatus</i>		<i>Pomacentrus caeruleus</i>
	<i>Epinephelus marginatus</i>		<i>Pomacentrus chrysurus</i>
	<i>Epinephelus merra</i>		<i>Pomadasyus furcatus</i>
	<i>Epinephelus spilotoceps</i>		<i>Pristiapogon kallopterus</i>
	<i>Forcipiger flavissimus</i>		<i>Pseudanthias squamipinnis</i>
	<i>Gobiidae sp</i>		<i>Pseudobalistes fuscus</i>
			<i>Pseudocheilinus hexataenia</i>

Nursery habitat association	Species	Nursery habitat association	Species
Reef	<i>Pseudochromis dutoiti</i>		
	<i>Pterocaesio marri</i>		
	<i>Rhinecanthus aculeatus</i>		
	<i>Sargocentron caudimaculatum</i>		
	<i>Sargocentron diadema</i>		
	<i>Sargocentron sammara</i>		
	<i>Scarus caudofasciatus</i>		
	<i>Scarus frenatus</i>		
	<i>Scarus rubroviolaceus</i>		
	<i>Scarus russelii</i>		
	<i>Scolopsis bimaculata</i>		
	<i>Siderea picta</i>		
	<i>Sufflamen chrysopterus</i>		
	<i>Synodus dermatogenys</i>		
	<i>Synodus jaculum</i>		
	<i>Thalassoma amblycephalum</i>		
	<i>Thalassoma hardwickii</i>		
	<i>Thalassoma lutescens</i>		
	<i>Torpedo sp</i>		
	<i>Zanclus cornutus</i>		
<i>Zebrasoma desjardini</i>			
<i>Zebrasoma flavescens</i>			
<i>Zebrasoma scopas</i>			
Pelagic	<i>Carangoides ferdau</i>		
	<i>Carangoides fulvoguttatus</i>		
	<i>Chilomycterus reticulatus</i>		
	<i>Diodon hystrix</i>		
	<i>Diodon liturosus</i>		
	<i>Heteropriacanthus cruentatus</i>		
	<i>Kyphosus cinerascens</i>		
	<i>Kyphosus vaigiensis</i>		
	<i>Priacanthus blochii</i>		
	<i>Priacanthus cruentatus</i>		
<i>Priacanthus hamrur</i>			