3.3.8 Ecological interactions in coastal marine ecosystems: The fish communities and main fish populations of the Jurien Bay Marine Park

Principal investigators

Professor Ian C. Potter — Centre for Fish and Fisheries Research, Biological Sciences, Murdoch University, South Street, Murdoch, Western Australia 6150.

Dr David Fairclough

Co-investigator

Dr Russ Babcock — CSIRO Marine and Atmospheric Research, Underwood Ave, Floreat, Western Australia 6014.

PhD Candidate

Elaine Lek — Centre for Fish and Fisheries Research, Biological Sciences, Murdoch University, South Street, Murdoch, Western Australia 6150.

Executive summary

Quantitative data on the diversity, densities and species compositions of assemblages of fish in reef, seagrass and unvegetated sand habitats in three management zones of the Jurien Bay Marine Park have been obtained for each season during the first year of this project. The three management zones are (1) general use zones, which are open to all types of fishing, (2) scientific reference zones, which are open to commercial and recreational rock lobster fishing and selected shore based fishing, and (3) sanctuary zones, which are closed to all types of fishing. The study has used both traditional sampling methods, such as seine netting and trawling, and underwater visual censuses. The results will act as baseline data for analysing whether there is evidence that, in the Jurien Bay Marine Park, the closing of areas to fishing influences the characteristics of the fish fauna. The size and age compositions, growth, reproductive biology and diets of three abundant species of labrid are also being studied.

The most abundant fish species over reefs were the western king wrasse *Coris auricularis* and McCulloch's scalyfin *Parma mccullochi*. Preliminary multivariate analyses demonstrate that the species compositions of the fish faunas of reefs in the Jurien Bay Marine Park are strongly influenced by their distance from shore and thus degree of exposure to wave action. At present, there is little evidence that the type of management zone has a conspicuous influence on the species composition of its reef faunas.

The number of fish caught by trawling in seagrass far exceeded the small number of fish caught by trawling over bare sand. The most abundant species by far over seagrass were the rough leatherjacket *Scobinichthys granulatus* and the brownspotted wrasse *Notolabrus parilus* followed by the rainbow cale *Odax acroptilus* and the western gobbleguts *Apogon rueppellii*. The fauna over neashore bare sand was dominated by the weeping toadfish *Torquigener pleurogramma*.

There are strong indications that the three species of labrid selected for biological study, *i.e. Notolabrus parilus*, *Ophthalmolepis lineolatus* and *Coris auricularus*, are protogynous hermaphrodites, *i.e.* change from female to male at some stage in life. The trends exhibited throughout the year by gonadal data, such as the gonadosomatic index, demonstrate that the three labrid species spawn at different times. Thus *N. parilus* breeds in late winter and early spring, whereas *O. lineolatus* spawns in spring and summer and *C. auricularus* in late summer and autumn.

Introduction

The Jurien Bay Marine Park, which extends along the west coast of Australia between approximately Green Head (30º 4.13'S) and Wedge Island (30º20.33'S), was declared a Class A marine park in August 2003 and contains a number of management zones (see Fig. 3.24). The major zones are (1) general use zones, which are open to all types of fishing, (2) scientific reference zones, which are open to rock-lobster fishing and other selected shore based fishing (see Fig. 3.24), and (3) sanctuary zones, which are closed to all types of fishing.

The establishment of the Jurien Bay Marine Park provides the opportunity to obtain baseline data on the diversity, densities and compositions of the fish faunas in different habitats in the above zones of a marine park during the early stages of the development of that park. Comparisons between the data obtained for these three biotic variables in these zones in the future and the baseline data acquired at the

present time will facilitate an examination of the impact of the establishment of management zones in the Jurien Bay Marine Park on the characteristics of the fish faunas of that park.

This collaborative project has only been underway for approximately one year and is scheduled to last for three years. Thus, this report provides the results of preliminary analyses of the data collected during the initial period of the project.

Objectives

The fish faunas and selected fish species are being sampled at sites in zones in the Jurien Bay Marine Park, which are (1) open to all types of fishing, (2) only open to rock-lobster fishing and selected shore based fishing and (3) closed to all types of fishing. The data resulting from this sampling regime will be able to be used to determine the impact of different levels of protection on fish communities and selected fish species in the future. The sampling of different habitats in each zone, *e.g.* reefs, seagrass and unvegetated sand, and in different depths will facilitate an understanding of the ways in which ichthyofaunal composition is influenced by habitat type and/or water depth.

Biological data is being collected for the most abundant labrid species, *i.e.* Western King Wrasse *Coris auricularis*, and two other abundant labrids, *i.e.* Brownspotted wrasse *Notolabrus parilus* and Maori Wrasse *Ophthalmolepis lineolatus*, and these will include the size and age compositions, reproductive biology and diets of those species. The data on reproductive biology will be used to determine whether these labrid species are protogynous hermaphrodites, like many other labrids, and if they have determinate or indeterminate fecundity and when and where they spawn. We will also obtain data on the dietary compositions of each labrid species to elucidate the ways in which the prey of those species change with increasing body size and also the extent to which dietary composition is influenced by depth and time of year.

Individuals of selected species will be tracked by using acoustic tagging techniques to assess the extent to which the species move between habitats and thus how different levels of protection can benefit such species.

Attention will also be focused on obtaining sound data on the fish faunas over bare sand and seagrass in nearshore waters to establish whether any species use that type of habitat as a nursery area and later move onto reefs as they increase in size and reach maturity.

Our data will be considered in the context of the results obtained from other studies in the Jurien Bay Marine Park to refine our interpretations of the factors that influence the characteristics of the fish communities in that park.

Methods

The study is focusing on sampling sites in (1) general use zones, (2) scientific reference zones and (3) sanctuary zones. Within each zone, sampling is being conducted in each season in nearshore shallow, lagoonal/mid-depth and offshore deeper waters using techniques that are appropriate for sampling the different habitat types, *i.e.* reefs, seagrass and sand. A preliminary sampling trip was conducted in summer 2004/05 to establish appropriate representative sampling sites. Sampling trips are now being conducted seasonally for two years using the following regime.

Reef habitats

The reefs in the study area are categorised as follows. (1) Outer reefs, which are located in deeper waters and are exposed. (2) Mid reefs, which lie between outer and nearshore reefs and are less exposed and in shallower waters than outer reefs. (3) Nearshore reefs, which are located in shallow waters and are close to shore. Sites in each of the three reef categories in the three major management zones in two regions of the marine park, *i.e.* Green Head to Sandy Point and Jurien Bay to Hill River, are sampled using underwater visual census (UVC) (Fig. 3.47). Seven 25 x 5 m strip-transect surveys are conducted at each site on each sampling occasion and the number of individuals of each fish species and the lengths of selected commercial, recreational and abundant species are estimated and assigned to 50 mm total length categories. Whenever possible, the sex of individual fish is identified using known morphological or colour phase (juvenile, intermediate, terminal) characteristics. The approximate percentage coverage of algae in five 5×1 m blocks in each transect is recorded. Baited underwater video are used, whenever possible, in conjunction with visual census, to determine the relative abundance of predatory species that, due to their high mobility, are usually underestimated by visual census (for full description of methodology see Willis and Babcock, 2000). For this purpose, 30 min of baited underwater video is being recorded at each UVC site.

Nearshore sand and seagrass habitats

Nearshore unvegetated sites in each of the three zones in each of the three main regions, *i.e.* Green Head to Sandy Point, Jurien Bay to Hill River and Cervantes to Wedge Island, are sampled using a 21.5 m long seine net, comprising two 10 m long wings, each with 6 m of 9 mm mesh and 4 m of 3 mm mesh, and a 1.5 m bunt made of 3 mm mesh (Fig. 3.47). In contrast, seagrass and unvegetated sand sites in lagoonal waters in the three zones in the Green Head to Sandy Point and Jurien Bay to Hill River regions are sampled using a small tri-net (otter trawl) (Fig. 3.47). The tri-net, which is 5 m long, has a 2.6 m wide and 0.5 m high mouth, 50 and 13 m warp and bridle lengths and contains stretched mesh of 51 and 25 mm in the wings and bunt, respectively. The net is towed at a speed of *ca* 3 – 4 km h^{-1} and for a distance of *ca* 150 m. The distance trawled during each replicate is measured using a Garmin GPS Map 178c global positioning system, which, together with the width of the mouth of the net, enables the area of substrate trawled to be determined. This, in turn, enables the density of each fish species to be estimated. Four replicate seine net samples and trawl net samples will be obtained during the day in each season from each site using those two methods.

Analysis of fish community data

The number of each fish species and the total number of fish observed or caught at each site on each sampling occasion will be converted to a density. After appropriate transformation, these data and the corresponding values for the number of species will be analysed using ANOVA to determine whether the above biotic variables are significantly influenced by region, zone, season and, in the case of underwater visual censuses over reefs, the reef category (Underwood, 1997).

The mean densities of each species at each site on each sampling occasion, determined from data derived using the different sampling methods, were log transformed and used to construct Bray-Curtis similarity matrices employing the PRIMER *v* 6 package (Clarke and Gorley, 2004). The matrix was then subjected to non-metric multidimensional scaling ordination (MDS). One-way analysis of

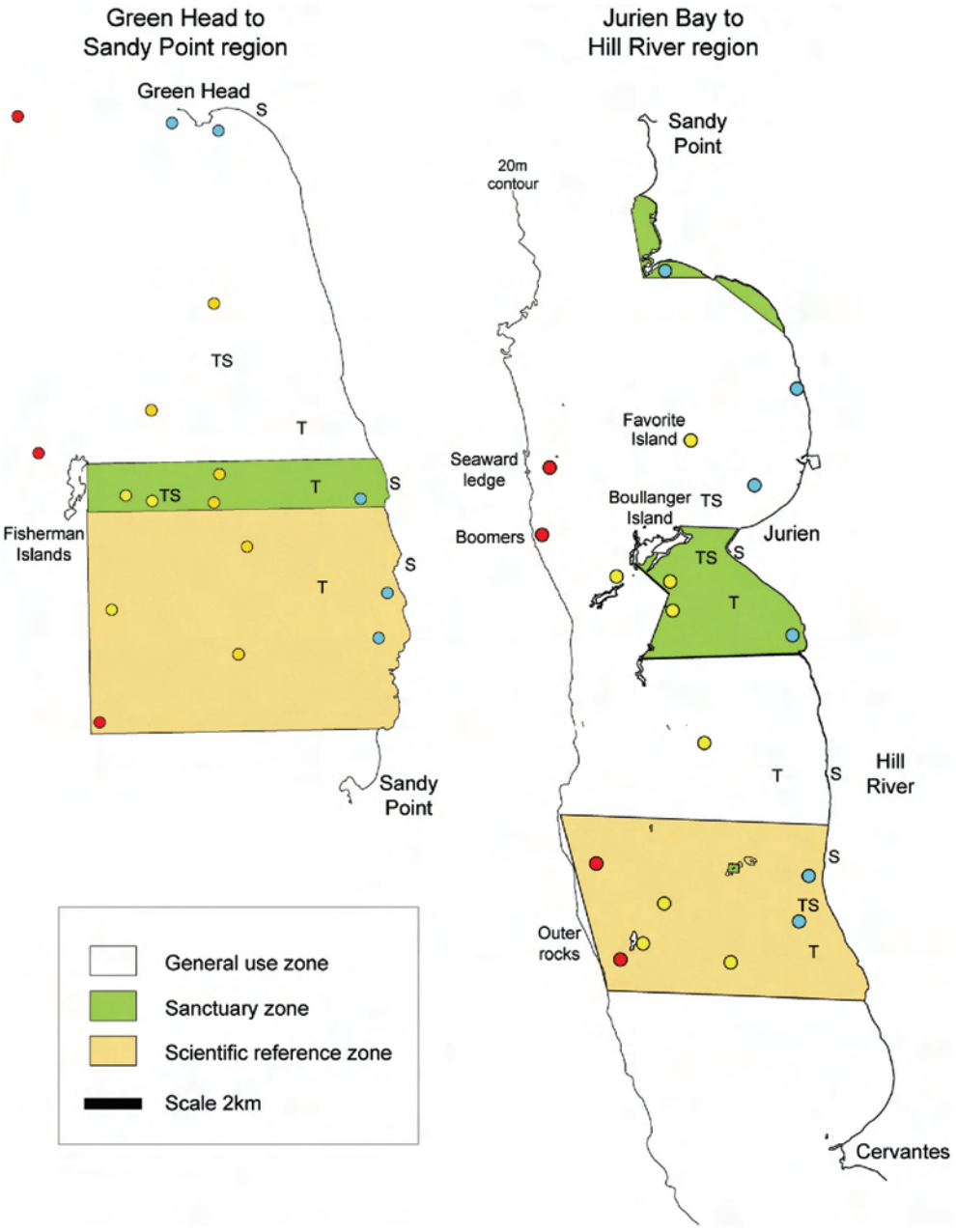

Figure 3.47: Map of sites sampled in the Green Head to Sandy Point and Jurien Bay to Hill River regions. Sites sampled are underwater visual census sites in outer reef habitat (●), mid-reef habitat (●) and nearshore reef habitat (●), trawl sites in seagrass (T) and sand (TS) and seine sites (S).

similarities (ANOSIM) was employed to test whether the compositions of fish species in each habitat type, *i.e.* reefs, seagrass and unvegetated sand, differed between region, season and zone and, in the case of underwater visual censuses over reefs, between reef category (Clarke, 1993). The null hypothesis that there was no significant difference between species composition for each of those factors was rejected when the significance level (*p*) was > 5%.

The associated *R*-statistic values in the ANOSIM test range largely from 1, *i.e.* the compositions of all samples in a group are more similar to each other than to those in the samples for any other group, down to *c.* 0, *i.e.* all samples in all groups are similar in composition (Clarke, 1993). When ANOSIM detected a significant difference between groups, Similarity Percentages (SIMPER) was used to determine which species typified the samples in a group and distinguished between the samples from different groups (Clarke, 1993).

Fish movement

Tagging, using acoustic tags and receivers, will be used to trace the movements of individual fish of selected species. Up to 20 fish of different species, particularly species which are likely to demonstrate territoriality and or home range behaviour, will be tagged using acoustic tags (VEMCO VR2) that are surgically inserted into the fish. This will allow larger scale movements of animals to be tracked with an accuracy of approximately ±100 m using an array of receivers.

Biological studies

(1) Size and age compositions and reproductive biology: Samples of the three labrid species selected for biological study are being collected from a range of sites. Fish are being aged using the number of opaque annuli in otoliths, a technique that has been successfully used for many species in our laboratory, *e.g.* Australian herring and dhufish (see Fairclough *et al.*, 2000a; Hesp *et al*., 2002). The von Bertalanffy growth curve will be fitted to the lengths at age of the individuals of each species.

The patterns of gonadal development and determination of the spawning period of the three labrid species and, where applicable the type of hermaphroditism, will be ascertained using traditional methods, *e.g.* trends exhibited by gonadal and oocyte stages and gonadosomatic indices, an approach that we have also employed successfully on many previous occasions (see Fairclough *et al*., 2000b, 2004; Hesp and Potter, 2003; Hesp *et al*., 2004).

(2) Dietary composition: Samples covering the full size range of the three labrid species are being collected seasonally by line fishing at sites representing the three main zones of the marine park. Stomachs are removed and stored in 70% ethanol. The diets are being analysed using traditional methodology that will enable the size-related changes in the diets of those species to be elucidated, *e.g.* Platell and Potter (2001). Comparisons between the dietary compositions of the three labrid species in different habitats will be made using nonmetric multidimensional scaling ordination and associated tests (see Clarke and Gorley, 2004; Platell and Potter, 2001).

Results and discussion

Fish community studies

A total of 101 fish species have been recorded during underwater visual censuses of reefs in the Green Head to Sandy Point and Jurien Bay to Hill River regions (Table 3.9). The most abundant twenty species contained six labrid species and five pomacentrid species. The most abundant labrid species were the western king wrasse *Coris auricularis* and the brownspotted wrasse *Notolabrus parilus*, while McCulloch's scalyfin, *Parma mccullochi*, and Miller's damselfish, *Pomacentrus milleri*, were the two most abundant pomacentrids (Table 3.9). Among recreationally and/or commercially important species, the Australian herring *Arripis georgiana* was the most abundant, ranking twentieth in the overall species list. However, the majority of individuals of that species was recorded at one site. Other important recreational and/or commercial fish species were not numerous and thus ranked low in the abundance list, *e.g.* breaksea cod *Epinephelides armatus*, western foxfish *Bodianus frenchii*, pink snapper *Pagrus auratus*, West Australian dhufish *Glaucosoma hebraicum* and samson fish *Seriola hippos* (Table 3.9).

Table 3.9. Numbers of individuals of each species recorded during underwater visual censuses of reef sites in each zone in each region of the Jurien Bay Marine Park during autumn, winter and spring 2005.

	Region						
	Green Head to Sandy Point			Jurien Bay to Hill River			
Species	Open	Sanctuary	Scientific reference	Open	Sanctuary	Scientific reference	Total
Abudefduf vaigiensis	0	0	0	0	0	2	2
Acanthaluteres vittiger	3	0	2	1	0	3	9
Acanthistius pardalotus	1	1	0	0	0	0	2
Anampses geographicus	8	0	57	11	6	26	108
Anoplocapros lenticularis	1	1	3	3	1	0	9
Anoplocapros robustus	5	2	4	4	4	4	23
Apogon rueppellii	8	0	0	18	0	0	26
Apogon victoriae	182	110	418	254	52	590	1606
Arripis georgiana	400	2	0	0	33	24	459
Austrolabrus maculatus	333	298	147	312	197	174	1461
Bodianus frenchii	22	15	13	36	51	19	156
Brachaluteres jacksonianus	0	0	0	0	1	0	1
Chaetodon assarius	5	1	15	10	4	20	55
Cheilodactylus gibbosus	4	0	3	3	2	2	14
Cheilodactylus rubrolabiatus	3	3	8	18	5	4	41
Chelmonops curiosus	147	55	59	96	63	65	485
Choerodon rubescens	62	34	84	69	21	44	314
Chromis klunzingeri	73	0	22	254	145	14	508
Chromis westaustralis	9	0	4	440	457	56	966
Cirripectes hutchinsi	3	2	14	1	2	1	23
Coris auricularis	3408	2532	2472	2640	2720	2009	15781
Dactylophora nigricans	5	0	1	2	4	7	19
Dasyatis brevicaudata	1	1	0	0	0	0	2
Diodon nicthemerus	0	0	1	0	1	2	4
Dotalabrus alleni	106	143	36	56	70	65	476
Enoplosus armatus	46	8	34	29	18	50	185
Epinephelides armatus	38	29	39	22	25	4	157
Epinephelus rivulatus	1	1	2	0	0	9	13
Eupetrichthys angustipes	2	0	0	2	0	0	4
Girella tephraeops	3	0	0	0	3	0	6
Girella zebra	1	0	0	0	0	0	1
Glaucosoma hebraicum	4	1	0	14	5	0	24
Gymnothorax woodwardi	0	0	1	0	0	0	1
Halichoeres brownfieldi	721	410	461	736	591	943	3862
Helcogramma decurrens	4	5	1	1	0	2	13
Hypoplectrodes nigrorubrum	0	1	3	0	0	2	6
Hypoplectrodes wilsoni	0	0	0	0	1	0	1
Kyphosus cornelii	833	507	1050	125	469	147	3131

	Region						
	Green Head to Sandy Point			Jurien Bay to Hill River			
Species	Open	Sanctuary	Scientific reference	Open	Sanctuary	Scientific reference	Total
Kyphosus sydneyanus	346	128	1	253	35	30	793
Labracinus lineata	103	65	42	106	51	62	429
Leptoscarus vaigiensis	0	0	4	0	0	1	5
Lethrinus nebulosus	5	0	2	3	0	0	10
Meuschenia flavolineata	6	2	1	10	1	0	20
Meuschenia galii	1	2	0	15	9	1	28
Meuschenia hippocrepis	11	7	1	3	1	10	33
Microcanthus strigatus	11	0	0	191	0	0	202
Neatypus obliquus	41	50	17	250	36	9	403
Notolabrus parilus	938	710	447	489	462	829	3875
Odax acroptilus	17	19	7	18	11	14	86
Odax cyanomelas	23	35	8	79	66	57	268
Ophthalmolepis lineolatus	66	65	2	72	53	24	282
Othos dentex	2	0	0	0	2	0	4
Pagrus auratus	0	0	5	0	1	0	6
Parapercis haackei	15	7	7	39	2	17	87
Paraplesiops meleagris	22	11	12	14	18	4	81
Parapriacanthus elongatus	90	1105	0	955	140	56	2346
Parma mccullochi	1190	730	776	577	861	464	4598
Parma occidentalis	86	25	69	79	69	214	542
Parma victoriae	0	0	0	5	0	0	5
Parupeneus chrysopleuron	0	0	5	2	0	0	7
Parupeneus spilurus	25	11	69	15	2	31	153
Pempheris klunzingeri	849	130	637	1529	641	737	4523
Pempheris multiradiata	12	86	177	9	93	11	388
Pempheris ornata	1	0	0	0	0	0	1
Pentapodus vitta	2	0	0	22	11	16	51
Phyllopteryx taeniolatus	0	1	0	0	0	0	1
Pictilabrus laticlavius	42	55	16	81	79	26	299
Pictilabrus viridis	43	25	9	12	64	60	213
Plectorhincus flavomaculatus	27	20	19	15	18	52	151
Plotosus lineatus	0	0	100	0	130	0	230
Pomacentrus milleri	633	440	282	722	73	602	2752
Psammoperca waigensis	2	0	11	11	6	8	38
Pseudocaranx dentex	179	80	8	23	14	23	327
Pseudojuloides elongatus	0	0	0	2	0	0	2
Pseudolabrus biserialis	96	107	131	224	162	26	746
Rhabdosargus sarba	0	0	1	0	0	0	1
Scarus sp.	12	6	1	19	1	1	40
Schuettea woodwardi	201	42	0	78	517	6	844
Scobinichthys granulatus	0	0	8	3	1	7	19

	Region						
	Green Head to Sandy Point			Jurien Bay to Hill River			
Species	Open	Sanctuary	Scientific reference	Open	Sanctuary	Scientific reference	Total
Scorpis aequipinnis	0	0	0	0	1	0	1
Scorpis georgianus	19	58	0	68	32	18	195
Seriola hippos	2	2	0	10	1	0	15
Siganus fuscescens	0	6	0	422	0	0	428
Siphamia cephalotes	0	13	4	11	31	0	59
Siphonognathus beddomei	69	60	0	30	6	0	165
Siphonognathus caninus	1	3	2	6	0	0	12
Sphyraena obtusata	3	133	0	183	67	0	386
Spratelloides robustus	20	250	0	0	0	0	270
Stegastes obreptus	16	3	131	0	0	2	152
Stethojulis strigiventer	0	0	3	0	0	0	3
Stethojulis bandanensis	1	0	0	0	0	0	1
Suezichthys cyanolaemus	0	0	6	7	0	4	17
Thalassoma lunare	29	5	74	0	5	0	113
Thalassoma lutescens	55	26	122	30	26	13	272
Thalassoma septemfasciata	10	9	6	0	0	2	27
Torquigener pleurogramma	1	6	2	6	5	5	25
Trachinops noarlungae	74	305	0	695	0	1	1075
Trygonoptera ovalis	4	3	5	7	0	4	23
Trygonorhina fasciata	1	0	0	0	0	0	1
Upeneichthys vlamingii	0	1	5	1	3	0	10
Urolophus circularis	0	0	0	1	0	0	1
Total number of fish	**11846**	**9011**	**8192**	**12562**	**8760**	**7738**	**58094**

Following MDS ordination of the mean densities of each fish species at each of the 35 sampling sites in spring 2005, the samples form essentially a progression from left to right on the ordination plot according to distance offshore (Fig. 3.48). Thus, the samples from the outer reefs, which formed the tightest group, lay on the left side of the plot and did not overlap those from the nearshore reefs on the right. The samples from mid-reefs occupied an intermediate position, but overlapped more markedly those from nearshore reefs than outer reefs. ANOSIM demonstrated that the compositions of the fish faunas of the three reef categories were significantly different (Global R = 0.37, $p = 0.001$). When the data were coded for marine park zone, the compositions of the fish faunas in the different zones were not found to be significantly different (Global R = 0.047, $p > 0.1$).

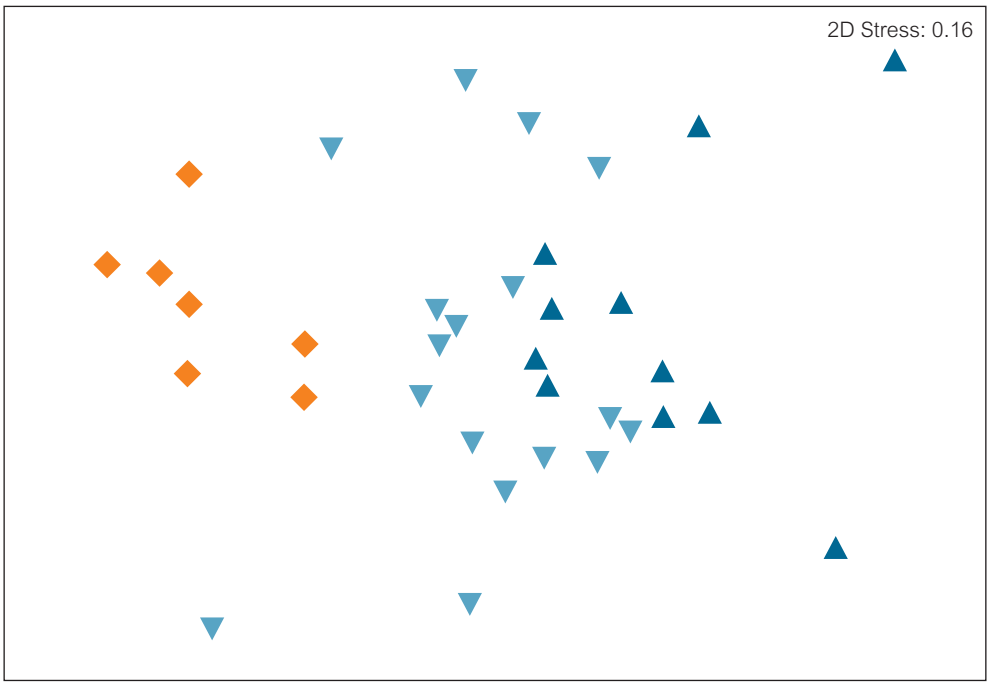

Figure 3.48: Nonmetric multidimensional scaling ordination plot of the mean densities of each fish species recorded during underwater visual census of 35 reef sites in outer reefs (◆), mid-reefs (▼) and nearshore reefs (▲) in the Jurien Bay Marine Park in spring 2005.

The compositions of species collected by trawling in seagrass and sand habitats in the first three seasons of sampling are listed in Tables 3.10 and 3.11. A total of 496 fish representing 32 species were caught by trawling over seagrass, whereas only 42 fish representing 20 species were caught by trawling over sand. The most abundant species by far over seagrass were the rough leatherjacket *Scobinichthys granulatus* and the brown-spotted Wrasse *Notolabrus parilus* followed by the rainbow cale *Odax acroptilus* and the gobbleguts *Apogon rueppellii* (Table 3.10). Seine netting of nearshore habitats yielded 2998 fish representing 33 species (Table 3.12). The most numerous of these species by far was the banded toadfish *Torquigener pleurogramma*. However, the catches of two species of hardyhead, *Atherinomorus ogilbyi* and *Leptatherina presbyteroides*, and the yelloweye mullet *Aldrichetta forsteri* were ≥ 100 fish.

Biological studies

Emphasis is being placed on obtaining sufficient numbers of the three labrid species, *i.e.* western king wrasse *Coris auricularis*, brown spotted wrasse *Notolabrus parilus* and maori wrasse *Ophthalmolepis lineolatus*, that were selected for detailed biological studies. The largest individuals of each of these species were males. These indications that each of these labrids is a protogynous hermaphrodite is supported by a preliminary examination of histological sections of their gonads. Thus, the gonads of the large fish could be categorised as secondary testes *sensu* Sadovy and Shapiro (1987), *i.e.* these testes retained the membrane-lined lumen and lamellar structure, characteristic of the ovaries found in smaller fish.

The trends exhibited throughout the year by preliminary gonadal data, such as gonadosomatic indices, demonstrate that the three labrid species are likely to spawn at different times (Fig. 3.49). Thus *Coris auricularus* is likely to spawn in autumn and early winter, whereas *Notolabrus parilus* breeds in late winter and early spring and *Ophthalmolepis lineolatus* spawns in spring and summer.

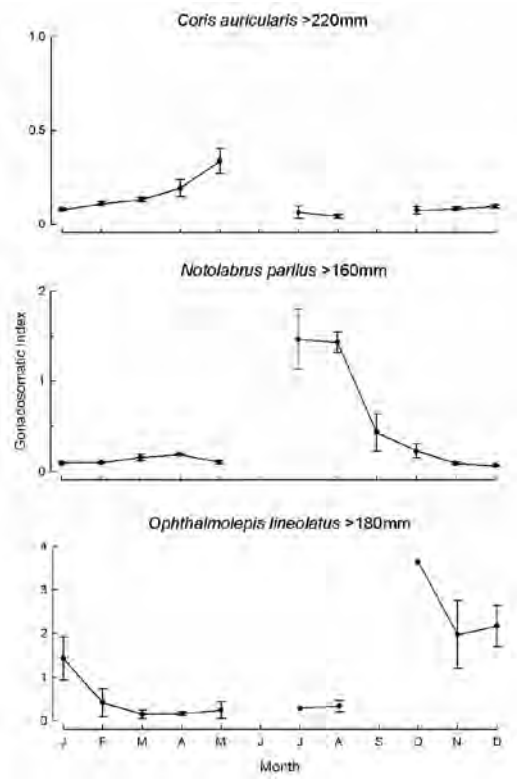

Figure 3.49: Mean monthly gonadosomatic indices for female *Coris auricularis*, *Notolabrus parilus* and *Ophthalmolepis lineolatus* for fish collected between January 2005 and March 2006.

Table 3.10. Numbers of individuals of each fish species collected during trawling of seagrass habitats in each zone in each region of the Jurien Bay Marine Park during autumn, winter and spring 2005.

	Region						
	Green Head to Sandy Point			Jurien Bay to Hill River			
Species	Open	Sanctuary	Scientific reference	Open	Sanctuary	Scientific reference	Total
Acanthaluteres spilomelanurus	3			3	3		9
Acanthaluteres vittiger	4			3		1	8
Aploactisoma milesii	1				2		3
Apogon ruepellii	4				34		38
Apogon victoriae	5	1			7		13
Aracana aurita		2					2
Brachaluteres jacksonianus	2						2
Centropogon latifrons					1		1
Choerodon rubescens		1					1
Cnidoglanis macrocephalus	4	6	1	4	1	2	18
Cristiceps australis		3					3
Cynoglossus broadhursti	1						1
Diodon nicthemerus	3	4	1		1		9
Enoplosus armatus	1		1				2
Epinephelus rivulatus						1	1
Haletta semifasciata	2	4	1	1	1		9
Hypopterus macropterus	3		2		2		7
Leviprora inops	6	2	2	1	11	2	24

Monacanthus chinensis	3	2	1		9		15
Notolabrus parilus	42	27	7	4	11	5	96
Odax acroptilus	13	11	7	8		6	46
Paraplotosus albilabris	1	1					2
Platycephalus laevigatus						1	1
Psammoperca waigiensis	1						1
Scobinichthys granulatus	49	19	15	1	51	21	165
Scorpaena sumptuosa	1				4		5
Siganus fuscescens	8	2	1				11
Siphonognathus argyrophanes					1		1
Siphonognathus radiatus	1	2	1		2		6
Torquigener pleurogramma	1					1	2
Trygonoptera ovalis	1						1
Upeneichthys vlamingii	2	1					3
Total number of fish	**162**	**88**	**40**	**25**	**141**	**40**	**496**

Table 3.11. Numbers of individuals of each fish species collected during trawling of sand habitats in the three different zones in each region of the Jurien Bay Marine Park during autumn, winter and spring 2005.

	Region						
	Green Head to Sandy Point			Jurien Bay to Hill River			
Species	Open	Sanctuary	Scientific reference	Open	Sanctuary	Scientific reference	Total
Species							
Acanthaluteres spilomelanurus						1	1
Anoplocapros robustus		1				1	2
Brachaluteres jacksonianus		1					1
Chaetodermis penicilligera						3	3
Cnidoglanis macrocephalus			1				1
Filicampus tigris		1					1
Halichoeres brownfieldi						1	1
Monacanthus chinensis			1				1
Nelusetta ayraudi					1		1
Notolabrus parilus		1					1
Odax acroptilus		4					4
Paraplagusia unicolor				1			1
Parequula melbournensis				1			1
Platycephalus speculator			1				1
Polyspina piosae		1					1
Pseudorhombus jenynsii					2	2	4
Scobinichthys granulatus		7			1	1	9
Torquigener pleurogramma	1	2			2		5
Trygonoptera mucosa	1						1
Upeneichthys vlamingii	2						2
Total number of fish	**4**	**18**	**3**	**2**	**6**	**9**	**42**

Table 3.12. Numbers of individuals of each fish species collected during seine netting on beaches in the three different zones in each region of the Jurien Bay Marine Park during autumn, winter and spring 2005. When very large samples were obtained, *e.g.* in the case of *Torquigener pleurogramma*, subsamples of approximately 50-100 fish were retained and the remainder returned to the water alive (Numbers returned alive are shown in parentheses).

Green Head to	Jurien Bay to Sandy Point			Cervantes to Hill River			Wedge Island			
Species	Open	Sanct.	Scien. ref.	Open	Sanct.	Scien. ref.	Open	Sanct.	Scien. ref.	Total
Acanthaluteres spilomelanurus	1									1
Aldrichetta forsteri	1	48		1	25		25			100
Apogon ruepellii	13	1	1							15
Arripis truttaceus				4						4
Atherinomorus ogilbyi		18	131		41	29				219
Cheilodactylus rubrolabiatus								1		1
Cnidoglanis macrocephalus		2	2		2	39		4		49
Cristiceps australis						1				1
Cynoglossus broadhursti					1					1
Enoplosus armatus	1	21					1	1		24
Hyperlophus vittatus			1							1
Leptatherina presbyteroides		129	13		12					154
Lesueurina platycephala	5		41	15	4	7			12	84
Microcanthus strigatus		2								2
Monacanthus chinensis	1	1	1					1		4
Mugil cephalus	22	3	1			1		2		29
Notolabrus parilus	1	1								2
Paraplagusia unicolor	3	5	1		3			8	1	21
Pelates sexlineatus								53		53
Pelsartia humeralis	2	8	27	3	2	28	2			72
Pentapodus vitta					1					1
Petroscirtes lupus		1								1
Platycephalus speculator	4	2			5		2	3		16
Platycephalus sp.1								1		1
Pomatomus saltatrix		2				2				4
Psammoperca waigiensis								1		1
Pseudorhombus jenynsii	2	2			8		1	1	1	15
Rhabdosargus sarba		6								6
Scobinichthys granulatus		1	1							2
Sillago bassensis	3	1	31		6	9	28	2	1	81
Sillago schomburgkii		7			1				1	9
Siphamia cephalotes	7	8			3	1				19
Torquigener pleurogramma	10	1123 (856)	353 (185)	6	397 (344)	22	1	90	3	2005 (1385)
Total number of fish	**76**	**1392 (856)**	**604 (185)**	**29**	**511 (344)**	**139**	**60**	**168**	**19**	**2998 (1385)**

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Conference attendance and presentations

Preliminary data on the fish fauna in reef habitats in the Jurien Bay Marine Park, which were recorded by underwater visual censuses in Autumn 2005, were presented to stakeholders and members of the scientific community involved in the collaborative SRFME project in Jurien Bay at a workshop at CSIRO on the 7th to 9th of June, which was co-ordinated by Dr Russ Babcock.

Publications and/or outcomes to date

No refereed publications have been produced at this stage. An article detailing the aims of the project and some preliminary results has been submitted to the magazine “West Coast Diver” for publication.