

**Interspecific Hybridization in *Acropora*  
(Cnidaria: Scleractinia): Mechanisms and Evolutionary  
Consequences**

Thesis submitted by  
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## Abstract

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This thesis addresses several aspects of the genetics and reproductive biology of cross-fertile, mass-spawning scleractinian corals, specifically in the genus *Acropora*, and the results presented contribute to our understanding of the evolutionary consequences of hybridization in this animal group.

The rDNA ITS1-5.8S-ITS2 region has been used for phylogenetic analysis of cross-fertile coral species in the genus *Acropora*, and has shown patterns of variation consistent with reticulate evolution. However, results from a number of analyses in this thesis, including the occurrence of deamination-like substitutions at methylation sites; differences in evolutionary rates among clades of a 5.8S phylogeny; and occurrence of non-compensatory mutations that may affect the rRNA secondary structure, suggest that at least part of rDNA diversity in *Acropora* is due to pseudogenes.

Natural hybridization in coral genera may cause taxa to merge through homogenization of gene pools or may create new hybrid species. Here I demonstrate that high cross-fertilization *in vitro* does not guarantee the merging of species. Data from eight polymorphic allozyme loci indicate small but significant differentiation between sympatric populations of *A. cytherea* and *A. hyacinthus*, a pair of acroporid corals with very high interspecific fertilization rates *in vitro*. The biological significance of differences between the species in sympatry is highlighted by the absence of genetic differentiation between widely allopatric populations within each species. Moreover, a Nested Clade Analysis using sequence data from a nuclear intron indicates that these two species constitute distinct evolutionary lineages. I conclude that *A. cytherea* and *A. hyacinthus* are neither merging nor constitute morphs within a single species, but rather conform distinct cohesion species.

Cross-fertilization trials may overestimate the rate of hybridization that occurs under natural conditions, because they are non-competitive, involving the exclusive combination of sperm from one species with eggs from another. I designed breeding trials using acroporid corals to test whether the mixture of conspecific and heterospecific sperm inhibits interspecific fertilization, promoting conspecific sperm precedence. However, spawning failure and low cross-

fertilization rate between the study species did not allow evaluating this hypothesis properly.

Integrins are proteins involved in cell adhesion that play major roles in gamete binding and fusion in mammals. A cDNA sequence encoding for a  $\beta 1$ -class integrin has been identified in the scleractinian coral *Acropora millepora*. Given that the integrin mRNA is present in unfertilized eggs, the corresponding protein may have a potential role in coral fertilization. As a first attempt to elucidate the molecular basis of gamete specificity in corals, I studied the role of the *Acropora millepora*  $\beta_{Cn1}$  integrin in fertilization. I examined the effect of polyclonal antiserum raised against a substantial part of the  $\beta_{Cn1}$  integrin on fertilization rates of *A. millepora* eggs. The results indicate that *Acropora*  $\beta_{Cn1}$  integrin is involved in sperm-egg binding but does not confer reproductive specificity. The implication of a disintegrin-integrin binding in the fertilization process in *Acropora* suggests that some functions of these molecules may have been conserved in corals and humans.

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## STATEMENT OF SOURCES

### DECLARATION

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## Contents

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Title Page	i
Abstract	ii
Statement of Access	iv
Statement of Sources	v
Acknowledgements	vi
Contents	viii
List of Figures	xii
List of Tables	xiv
<b>Chapter 1 General Introduction</b>	<b>1</b>
Approaches to the study of natural hybridization	1
Hybridization and reticulate evolution in scleractinian corals	3
The genus <i>Acropora</i> as a system to study coral evolution and the species selected for this study	4
Chromosome numbers and molecular phylogenies agree with the reticulate evolution model	5
Species concepts in hybridizing corals	6
Interspecific sperm competition as a mechanism to maintain cross-fertile coral species as distinct genetic entities	7
The molecular basis of gamete specificity in <i>Acropora</i>	8
Aims of this thesis	8
<b>Chapter 2 The origin of extreme nuclear ribosomal DNA diversity in <i>Acropora</i></b>	<b>11</b>
Abstract	11
Materials and Methods	14
Sample collection .....	14
Laboratory Techniques .....	14
Alignment.....	14
Phylogenetic Analyses .....	15
Recombination.....	16
Relative-Rate Test.....	16

Methylation-Related Substitutions .....	16
Base substitutions at conserved sites .....	17
Evaluation of secondary structure .....	17
Results .....	18
Phylogenetic analysis .....	19
Recombination.....	20
Relative-rate test .....	20
Methylation mutation analysis .....	20
Analysis of conserved sites .....	21
Evaluation of secondary structure .....	21
Discussion .....	21
Characteristics of the rDNA region in <i>Acropora</i> .....	21
Phylogeny .....	22
Recombination.....	23
Identification of pseudogenes.....	24
 Chapter 3 Sympatric populations of the highly cross-fertile coral species <i>Acropora hyacinthus</i> and <i>A. cytherea</i> are genetically distinct .....	 48
Abstract .....	48
Introduction .....	49
Materials and Methods .....	50
Sample collection .....	50
Electrophoresis .....	50
Data Analyses .....	51
Results .....	51
Discussion .....	52
<i>A. hyacinthus</i> and <i>A. cytherea</i> are distinct genetic entities .....	52
Incipient species or secondary contact? .....	53
Larval competence and allopatric genetic differences within species.....	54
Conclusions .....	55
 Chapter 4 The highly cross-fertile coral species <i>Acropora hyacinthus</i> and <i>A.</i> <i>cytherea</i> constitute distinct evolutionary lineages .....	 63
Abstract .....	63
Introduction .....	64
Materials and Methods .....	65
Sample collection .....	65

DNA Extraction, PCR Conditions, Cloning and Sequencing Procedures .....	66
Data Analyses .....	66
Results .....	68
Base Composition and Genetic Distances .....	68
Phylogenetic and Nested Clade Analyses .....	68
mtDNA Intergenic Region.....	70
Discussion .....	70
<i>A. cytherea</i> and <i>A. hyacinthus</i> are not monophyletic .....	70
There is no geographic pattern in phylogenies .....	71
<i>A. hyacinthus</i> and <i>A. cytherea</i> constitute distinct evolutionary lineages.....	71
Lack of genealogical concordance between the phylogenies.....	72
Conclusions .....	74
 Chapter 5 Interspecific sperm competition as a mechanism to maintain cross- fertile species as distinct lineages .....	 84
Abstract .....	84
Introduction .....	85
Materials and Methods .....	86
Coral collections .....	86
Gamete preparation.....	87
Fertilization trials.....	87
Development of microsatellites by affinity chromatography.....	87
DNA extractions and amplification from single embryos.....	88
Determination of paternity using one microsatellite and two nuclear introns .....	88
Results .....	89
Spawning failure at Orpheus Island .....	89
Patterns in fertilization data from the Coral Bay 2000 spawning period .....	89
Genotyping of Embryos .....	90
Discussion .....	90
Microsatellites .....	90
Spawning failure .....	91
Fertilization Patterns.....	91
 Chapter 6 In search of the molecular basis of hybridization in <i>Acropora</i> : the role of the coral egg integrin $\beta_{Cn1}$ in fertilization .....	 99
Abstract .....	99
Introduction .....	99

Materials and Methods	103
Recombinant protein and antibody production.....	103
Coral collections .....	104
Gamete preparation.....	104
Fertilization trials.....	104
Data analyses .....	105
RGD-containing peptides .....	105
Results	106
Anti-integrin antibodies inhibit sperm binding.....	106
Anti-integrin antibodies inhibit fertilization in <i>A. millepora</i> .....	106
The inhibitory effect of anti-integrin antibodies is not species specific.....	107
RGD- and RGE-containing peptides completely blocked fertilization .....	107
Discussion	107
$\beta_{cn1}$ integrin is involved in sperm binding and fertilization in <i>A. millepora</i> .....	107
$\beta 1$ integrin subunits are involved in binding and fusion of coral and mammal gametes.....	108
Specificity of <i>Acropora</i> sperm-egg interactions must depend on proteins other than $\beta_{cn1}$ integrin .....	109
Results regarding the role of the RGD binding motive are inconclusive.....	109
Conclusions .....	110
<b>Chapter 7 General Conclusions</b>	<b>118</b>
Introgression, pseudogenes and the phylogenetic utility of rDNA in <i>Acropora</i>	118
Introgression versus ancestral polymorphism in <i>Acropora</i>	119
Why do highly cross-fertile corals remain distinct?	120
Future of coral systematics	121
Towards a molecular understanding of coral fertilization and hybridization	122
Final Summary	122
References	123

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## List of Figures

---

Figure 1.1	<i>A. hyacinthus</i> and <i>A. cytherea</i> colony morphology.	10
Figure 2.1	Alignment of representative sequences of the <i>Acropora</i> ITS1-5.8S-ITS2 region.	27
Figure 2.2	Rooted maximum-likelihood tree of the 5.8S in <i>Acropora</i> .	31
Figure 2.3	Rooted maximum-likelihood tree of the ITS2 region of the <i>Acropora</i> samples from sub-clade IVB in the 5.8S phylogeny.	32
Figure 2.4	Phylogenetic profiles of 5.8S and ITS2 regions of selected <i>Acropora</i> sequences.	33
Figure 2.5	Alignment of 5.8S from a broad range of taxa and representative <i>Acropora</i> sequences to evaluate mutations at conserved sites.	34
Figure 2.6	Alignment of 5.8S gene of a wide range of metazoans and of representative sequences from each clade in the ML phylogeny with indications of secondary structure.	37
Figure 2.7	Folding of 5.8S rRNA sequences from <i>A. hyacinthus</i> (from clade IVB in Figure 2.2) and <i>A. cerealis</i> (from clade IVC in Figure 2.2).	41
Figure 3.1	Dendrogram of genetic distances between sympatric and allopatric populations of <i>Acropora cytherea</i> , <i>A. hyacinthus</i> , and <i>A. tenuis</i> in the Great Barrier Reef and Western Australia.	56
Figure 3.2	Ordination produced by the categorical principal components analysis of genotypic data of sympatric and allopatric populations of <i>Acropora cytherea</i> , <i>A. hyacinthus</i> , and <i>A. tenuis</i> in the Great Barrier Reef and Western Australia.	57
Figure 3.3	Dendrogram (UPGMA) of genetic distances (Nei, 1978) between populations of <i>Acropora cytherea</i> and <i>A. hyacinthus</i> in the Great Barrier Reef, reanalyzed from Ayre and Hughes (2000).	58
Figure 4.1	Rooted maximum-likelihood trees of <i>Acropora</i> species using the HKY85 model of sequence evolution for (A) the <i>Pax-C</i> intron and (B) the mtDNA intergenic region.	76
Figure 4.2	Haplotype tree and nested clade design for the <i>Pax-C</i> intron of <i>Acropora cytherea</i> , <i>A. hyacinthus</i> and <i>A. spicifera</i> .	79
Figure 5.1	Fertilization rate of <i>Acropora nasuta</i> eggs using mixtures of conspecific sperm and <i>A. cerealis</i> sperm.	93

Figure 5.2	Fertilization rate of <i>Acropora cerealis</i> eggs using mixtures of self-sperm and <i>A. nasuta</i> sperm (a), and of <i>A. nasuta</i> eggs using mixtures of self-sperm and <i>A. cerealis</i> sperm (b).	94
Figure 5.3	Fertilization rate of <i>Acropora nasuta</i> eggs using mixtures of self-sperm and conspecific sperm.	95
Figure 5.4	Single stranded conformational polymorphisms (SSCP) of Mini-collagen from the parental <i>Acropora</i> colonies employed in sperm competition trials.	96
Figure 6.1	Phase-contrast microscopic images of <i>A. millepora</i> eggs treated with a control serum (a, b) and with antiserum anti- $\beta_{Cn1}$ integrin (c, d).	111
Figure 6.2	Fertilization rates (%) of <i>Acropora millepora</i> eggs treated with antiserum anti- $\beta_{Cn1}$ integrin and controls.	112
Figure 6.3	Fertilization rates (%) of <i>Acropora millepora</i> eggs treated with different doses of antiserum anti- $\beta_{Cn1}$ integrin.	113
Figure 6.4	Fertilization rates (%) of <i>Acropora millepora</i> eggs treated with antiserum anti- $\beta_{Cn1}$ integrin and controls, involving two different sperm concentrations.	114
Figure 6.5	Fertilization rates (%) of <i>Acropora tenuis</i> eggs treated with antiserum anti- $\beta_{Cn1}$ integrin and controls.	115

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## List of Tables

---

Table 2.1	Samples and rDNA sequence codes.	42
Table 2.2	Identical 5.8S sequences in the original data set of 420 <i>Acropora</i> sequences.	44
Table 2.3	Mean base compositions (%) and ranges of Kimura Two-Parameter pairwise sequence distances (%) for the 5.8S and the ITS2 region of <i>Acropora</i> .	45
Table 2.4	AMOVA between <i>Acropora</i> species and <i>Acropora</i> clades in the ML phylogeny.	45
Table 2.5	<i>Acropora</i> 5.8S and ITS2 sequences with the highest recombination in the phylogenetics profile generated by Phylpro in Figure 2.4.	46
Table 2.6	Relative-rate test for <i>Acropora</i> 5.8S clades in ML phylogeny and particular sequences.	46
Table 2.7	Deamination-like substitutions in 68 methylation and 21 non-methylation sites of the 5.8S in <i>Acropora</i> .	47
Table 2.8	Number of mutations in 45 conserved positions of the 5.8S gene.	47
Table 3.1	Number of samples analyzed and allele frequencies at eight allozyme loci in the acroporid corals <i>Acropora cytherea</i> , <i>A. hyacinthus</i> and <i>A. tenuis</i> .	59
Table 3.3	D-values [(Ho-He)/He] indicating heterozygote deficit or excess for each locus and population of <i>Acropora cytherea</i> , <i>A. hyacinthus</i> and <i>A. tenuis</i> .	61
Table 3.4	Linkage disequilibrium among loci for each locus and population of <i>Acropora cytherea</i> , <i>A. hyacinthus</i> and <i>A. tenuis</i> .	62
Table 3.5	Pairwise genetic differentiation among populations of three <i>Acropora</i> species. Nei's (1978) distance below diagonal, $F_{st}$ above diagonal.	62
Table 4.1	Sample codes and collection locations for analysis on <i>Pax-C</i> intron and the mtDNA intergenic region.	80
Table 4.2	Mean base compositions (%) and ranges of Kimura Two-Parameter pairwise sequence distances (%) for the <i>Pax-C</i> intron and the mtDNA intergenic region in <i>A. cytherea</i> , <i>A. hyacinthus</i> and <i>A. spicifera</i> .	82
Table 4.3	Analysis of genetic variance of the <i>Pax-C</i> intron and an intergenic region of the mtDNA within and among <i>A. cytherea</i> , <i>A. hyacinthus</i> and <i>A. spicifera</i> , using AMOVA.	82

Table 4.5	Nested exact contingency analysis of species with clades of the <i>Pax-C</i> intron.	83
Table 5.1	Treatments employed to test for sperm competition in <i>Acropora</i> .	97
Table 5.2	List of primers, the length of the amplified regions and their respective melting temperatures for markers used in genotyping of embryos of acroporid corals.	98
Table 6.1	Treatments employed to test fertilization inhibition by antibodies against $\beta_{cn1}$ integrin of <i>Acropora millepora</i> .	116
Table 6.2	ANOVA table for breeding trials using <i>Acropora millepora</i> eggs incubated with antibodies against $\beta_{cn1}$ integrin with arcsine transformed data.	117