Genetic Variability in *Acropora palmata* and *A. cervicornis*

Nikolaos V. Schizas

Department of Marine Sciences
University of Puerto Rico, Mayagüez
Evaluate the genetic variability of \textit{A. cervicorns} and \textit{A. palmata} at different levels of tissue organization

\textbf{Goal of this proposal}

- mtDNA

\textbf{A. palmata}

\textbf{A. cervicorns}
Hierarchical Design

We will evaluate levels of genetic diversity:

1) Within discrete patches of *Acropora*
2) Among discrete patches of *Acropora* within sampling locations
3) Among sampling locations within islands
4) Among different islands
Proposed Sampling Locations of Acropora
Course of Action

- Develop a reliable DNA extraction technique in *Acropora*
- Optimize PCR amplification conditions for 4-6 genes per specimen
- Expand collection of *Acropora* to other locations
- Analyze data
Proposed Schedule

- **January 2005-Summer 2005**
  - Training of graduate student
  - Primer ordering
  - Collection of fresh coral tissue (local)
  - DNA extraction
  - PCR optimization

- **Fall 2005-Summer 2006**
  - Collection of *Acropora* from all locations
  - Collection of data
  - Data Analysis
  - Manuscript Preparation
Joselyd Garcia (MS student) collecting polyps of *Acropora cervicornis*
DNA work in the lab
Sequenced Regions from both *Acropora* species

<table>
<thead>
<tr>
<th>Gene</th>
<th>Sequence Length</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Control Region</em></td>
<td>673 bp</td>
</tr>
<tr>
<td>ITS region</td>
<td>239 bp (<em>A. palmata</em>); 188 bp (<em>A. cervicornis</em>)</td>
</tr>
<tr>
<td><em>Calmodulin</em> intron</td>
<td>357 bp</td>
</tr>
<tr>
<td><em>PaxC</em> intron</td>
<td>507 bp</td>
</tr>
<tr>
<td>In Total</td>
<td>1776 bp</td>
</tr>
</tbody>
</table>

* Mitochondrial DNA
Collection site: Cayo Laurel, La Parguera

3 individuals of *A. palmata* and 1 individual of *A. cervicornis*
<table>
<thead>
<tr>
<th>Polymorphism (\textit{A. palmata}, n=3)</th>
<th>Divergence (palm vs cerv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>15.76% (106 mutations)</td>
</tr>
<tr>
<td>Polymorphism (A. palmata, n=3)</td>
<td>Divergence (palm vs cerv)</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>0</td>
<td>17.65% (63 mutations)</td>
</tr>
<tr>
<td>Polymorphism (\textit{A. palmata}, n=3)</td>
<td>Divergence (palm vs cerv)</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>0</td>
<td>0.39% (2 mutations)</td>
</tr>
</tbody>
</table>
ITS region (239 bp)

Polymorphism (*A. palmata*, n=2)  Divergence (palm vs cerv)

1  5.9% (11 mutations out of 188)

4 putative sequence gaps in the ITS alignment

<table>
<thead>
<tr>
<th></th>
<th>Sequence 1</th>
<th>Sequence 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A_palmata1ITS</td>
<td>TGATCACACATCTTTGTTACTTTAGTCAGTCGGACCTCGGCT</td>
<td>A_palmata2ITS</td>
</tr>
<tr>
<td>A_cerv1ITS</td>
<td>T-----------------------TTG--AATCAGTCAGTCGGACCTCGGTT</td>
<td>A_cerv1ITS</td>
</tr>
<tr>
<td></td>
<td>*</td>
<td>***</td>
</tr>
</tbody>
</table>
Sequence divergence in minicollagen, calmodulin, and PaxC (0.6% - 2.1%). In ITS-1 is up to 13.2%.
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Is this patch 1 individual?
Do these patches represent different individuals?
Genetic diversity of *Acropora* between sampling locations

*Acropora* patch
Genetic diversity of *Acropora* between islands
Sampling Locations

Disturbed: Media Luna, Turrumote, Laurel, Enrique, Margarita, Collado, Guanica, Ponce, Rincon.

Materials and Methods

Candidate Genes:

MtDNA: Cytochrome b, putative control region.

Nuclear DNA: ITS-1, and introns from Pax-C, calmodulin, and minicollagen