Rapid, low-cost technique for population structure analysis of reef fishes

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Centropyge potteri

Dascyllus albisella

Parupeneus multifasciatus
Proposed benefits of marine protected areas

- Species conservation
- Preserve cultural resources
- Support local economies (e.g., tourism)
- Scientific investigation
- Fisheries management
The Issue

• Some measure of fish production inside marine protected areas must double that outside protected areas to compensate for the loss of fishing grounds.

• Some measure of fish production must more than double to enhance fisheries.
Marine protected areas are touted as low-effort solutions to coral reef fisheries management problems.

- Many coral reefs are located in developing countries without the expertise or resources to accurately describe the biological parameters used in fishery yield models.
- Enforcement of size and catch limits is difficult.
- The sheer diversity of reef fishes harvested for human use makes it difficult for management techniques to appear over analysis.

United States

export points
Potential Catch

Yield

Mortality    Abundance

Age Structure

Size Structure    Age & Growth
Size Structure

Distance between lasers = Estimated fish length
Image interlaser distance = Image fish length

photos courtesy of Nick Whitney, UH Zoology
Size Structure & Abundance
Age & Growth

\[ SL = 40.84 [1 - e^{-0.014 \text{(age in days - 22.45)}}] \]
de facto reserve
Reproductive Output

Egg Production

- Abundance
- Size Structure
- Batch Fecundity
Batch Fecundity

Longenecker & Langston, 2006

Batch Fecundity

Longenecker & Langston, 2005
Pre-maturational growth

Age at Maturity

Size at Maturity

Otolith “Radius” vs Fish Length
Pre-maturational growth

Longenecker & Langston, 2005
Progress

• Coordinated with Alan Hong for access to Hanauma Bay
• Collected 15 *D. albisella*, obtained morphometrics & removed otoliths
• Collected 56 *C. potteri*, obtained morphometrics & removed otoliths
• Collected 45 *P. multifasciatus*, obtained morphometrics & removed otoliths
• Obtained gonads from 3 *D. albisella*
• Obtained gonads from 10 *P. multifasciatus*
• Received all laser videogrammetry equipment
• Set up otolith processing lab at Windward Community College
• Prepared 7 *P. multifasciatus* otoliths for scanning electron microscopy
• Hired one undergraduate assistant, trained same for morphometry & otolith prep
• Hired graduate intern
• Set up training course on WebCT
• Designed database to manage and archive information
Near-term Plans

• Begin laser videogrammetry
• Test accuracy of videogrammetry measurements
• Complete age and growth analysis
• Describe relationships between otolith dimensions and fish size
• Begin batch fecundity analysis
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