Development of Habitat Suitability Models for the Biscayne Bay Area Fishes: Assessing Salinity Affinity from Abundance Data
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Objectives

Habitat suitability index (HSI) models were developed using existing empirical fish abundance data.

Emphasis was on revealing abundance-salinity relationships for selected fish taxa via the analysis of multiple datasets collected from Biscayne Bay and adjacent systems.

Relationships between salinity and community-level indices were investigated.

Habitat Suitability Indices

Definition:
Hypotheses of species-habitat relationships (not statements of proven cause and effect).

Purpose:
For evaluating impacts on fish and wildlife habitat resulting from water or land use changes.

Value:
To assist with decision-making and to increase understanding of habitat relationships which may be tested and improved.

Data Sets

Biscayne Bay Studies

Researcher	Affiliation	Time frame	Sampling method
Joseph Serafy	SEFRC/NMFS	1998-2007	Visual census
Joseph Serafy	University of Miami[1]	1993-1994	Trawl
Joan Browder	SEFRC/NMFS	2002-2004	Shrimp trawl
Joan Browder	SEFRC/NMFS	2005-2006	Throw-trap
Guillermo Diaz	University of Miami[1]	1996-1997	Trawl
Michael Robblee	USGS	2002-2005	Throw-trap

Florida Bay Studies

| Researcher	Affiliation	Time frame	Sampling method
Michael Robblee	USGS	1984-2002	Throw-trap
Richard Matheson	FMRI, State of Florida	1994-1996	Throw-trap
Susan Sogard	Audubon Society	1984-1986	Throw-trap
Thomas Schmidt	Everglades National Park	1974-1976	Trawl
Thomas Schmidt	Everglades National Park	1974-1976	Seine
James Colvocoresses	FMRI, State of Florida	1994-1997	Trawl
James Colvocoresses	FMRI, State of Florida	1994-1997	Seine
Allyn Powell	NOS/NOAA	1984-1985; 1994-2001	Trawl
Jerry Lorenz	Audubon Society	1990-2004	Drop net
Craig Faunce	FMRI, State of Florida	1996-1999	Visual census

Methods

Delta approach

Recognizes two components operating:

(1) a probability of encounter (e.g., binomial);

(2) in the event of positive encounter, a distribution of "catch" quantities (e.g., normal, log-normal, Poisson).

Delta-density
Occurrence * Concentration

Generate baseline levels & examine trends and correlations (e.g., using regression)
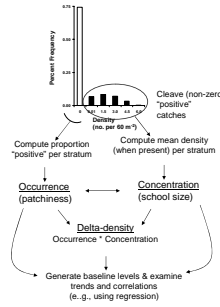
Significant Models

Trends in the one or more abundance metrics along salinity gradients were found for 11 of the 12 fish taxa and pink shrimp and found 61 significant relationships across 150 species/gear/bay/metric combinations.

Occurrence

Concentration

Delta density
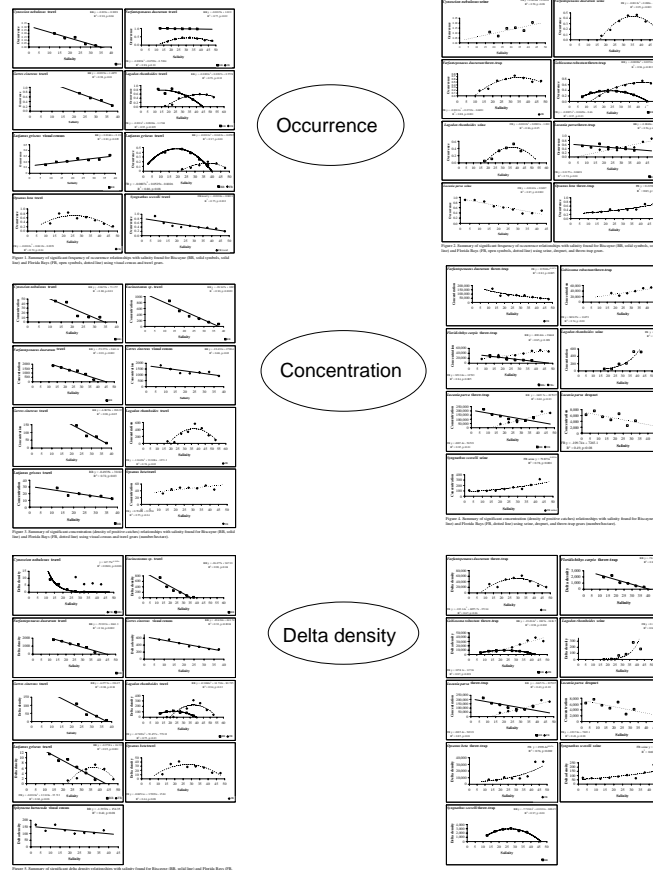
Community Analysis

Species composition in Biscayne Bay was found to cluster into two main groups, those less than 20 psu and those greater than 20 psu.
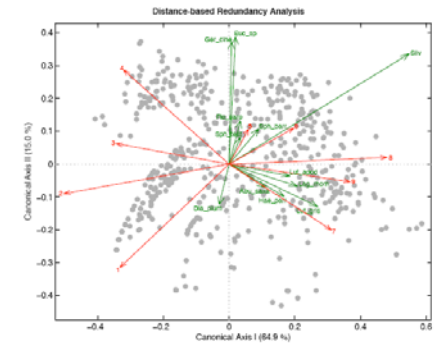
Visual census similarity by salinity bin based on frequency
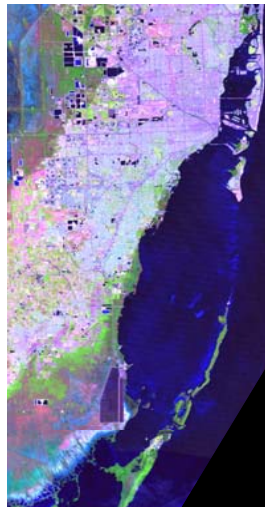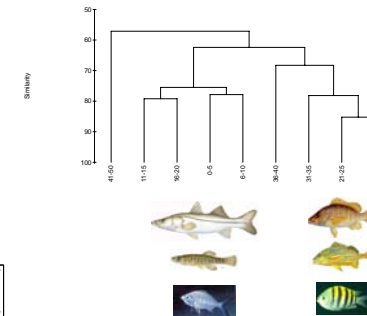
Cluster analysis of species composition (frequency of occurrence) by salinity bin for Biscayne Bay visual census data for the wet season mainland shoreline.

Salinity bin

1: 0-5
2: 5-10
3: 10-15
4: 15-20
5: 20-25
6: 25-30
7: 30-35
8: 40-45
9: >45

Distance-based redundancy ordination biplot (F=2.14, p=0.001) of wet season Biscayne Bay mainland shoreline species composition dissimilarity by salinity bins with most important species influencing species dissimilarity overlaid on plot. Species centroids (green text) represent abundance maxima for each taxa and are defined as follows: Abu_saxa = sergeant major, Dia_plum = striped mojarra, Euc_sp = *Eucinostomus* mojarras, Flo_carp = goldspotted killifish, Ger_cine = yellowfin mojarra, Hae_parr = Sailor's choice, Hae_sciu = bluestriped grunt, Lag_rhom = pinfish, Lut_apod = schoolmaster, Lut_gris = gray snapper, Sph_test = checkered puffer, and Sph_barr = great barracuda.