

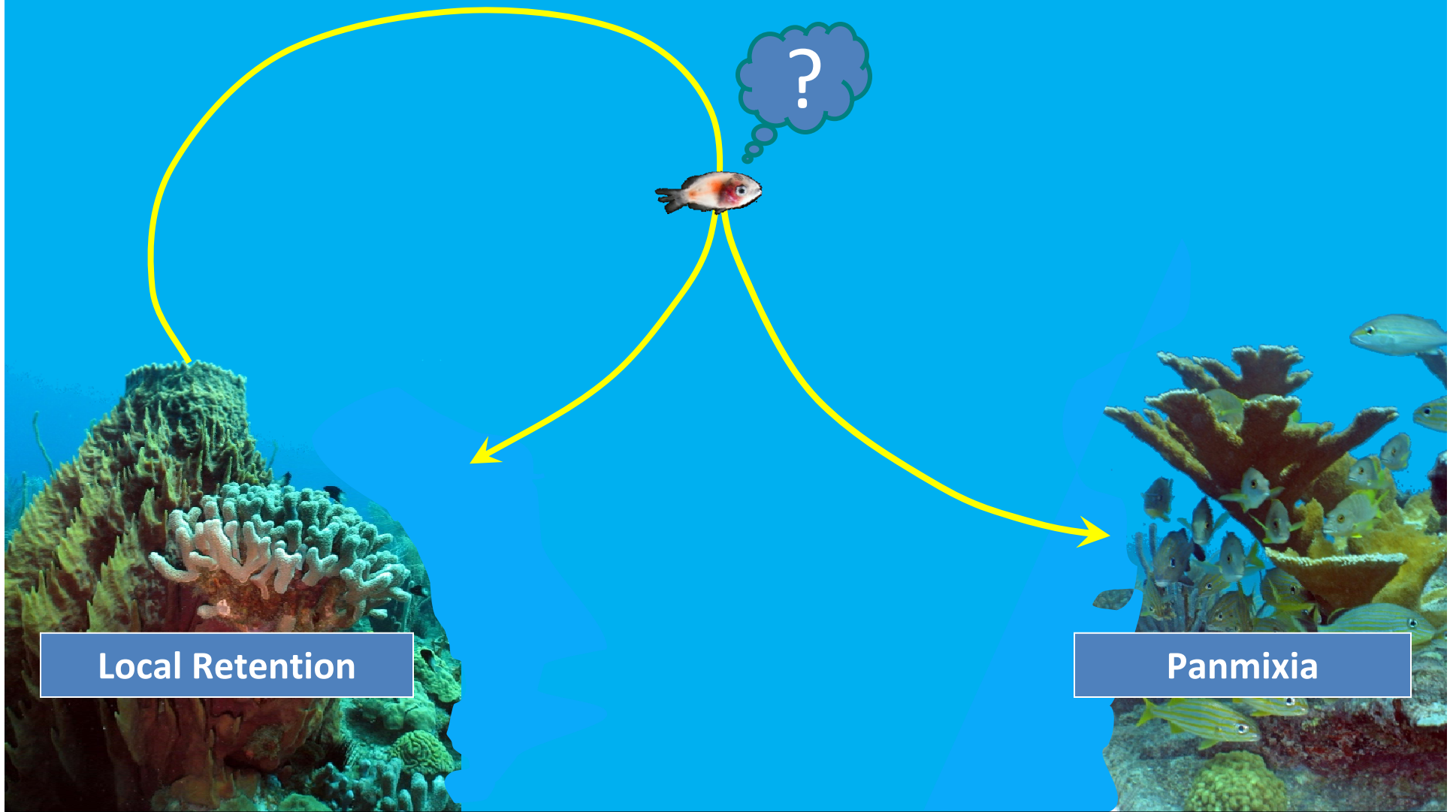


**Condition of coral reef fish larvae
along the Florida Keys shelf:**

Implications for connectivity

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University of Miami

Are reef fish populations open or closed?



Larval condition affects:

- Larval survival
- Juvenile survival
- Population connectivity

So . . .



. . . Do larvae
with different
dispersal
histories have
different
condition?

Sampling Logistics

Three 18-day cruises on R/V Walton Smith
June 2007 and August 2007, July 2008

Paired MOCNESS and paired frame net
Sample discrete 20m depth bins
(0-20, 20-40, 40-60, 60-80m)

Larvae sorted onboard
Target species cursorily
identified and flash frozen

Environmental Data Collection

CTD

ADCP

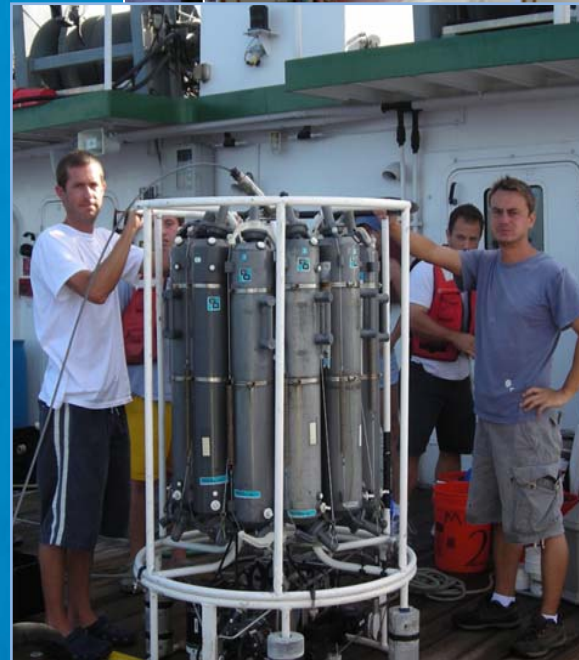
Fluorescence

Transmittance

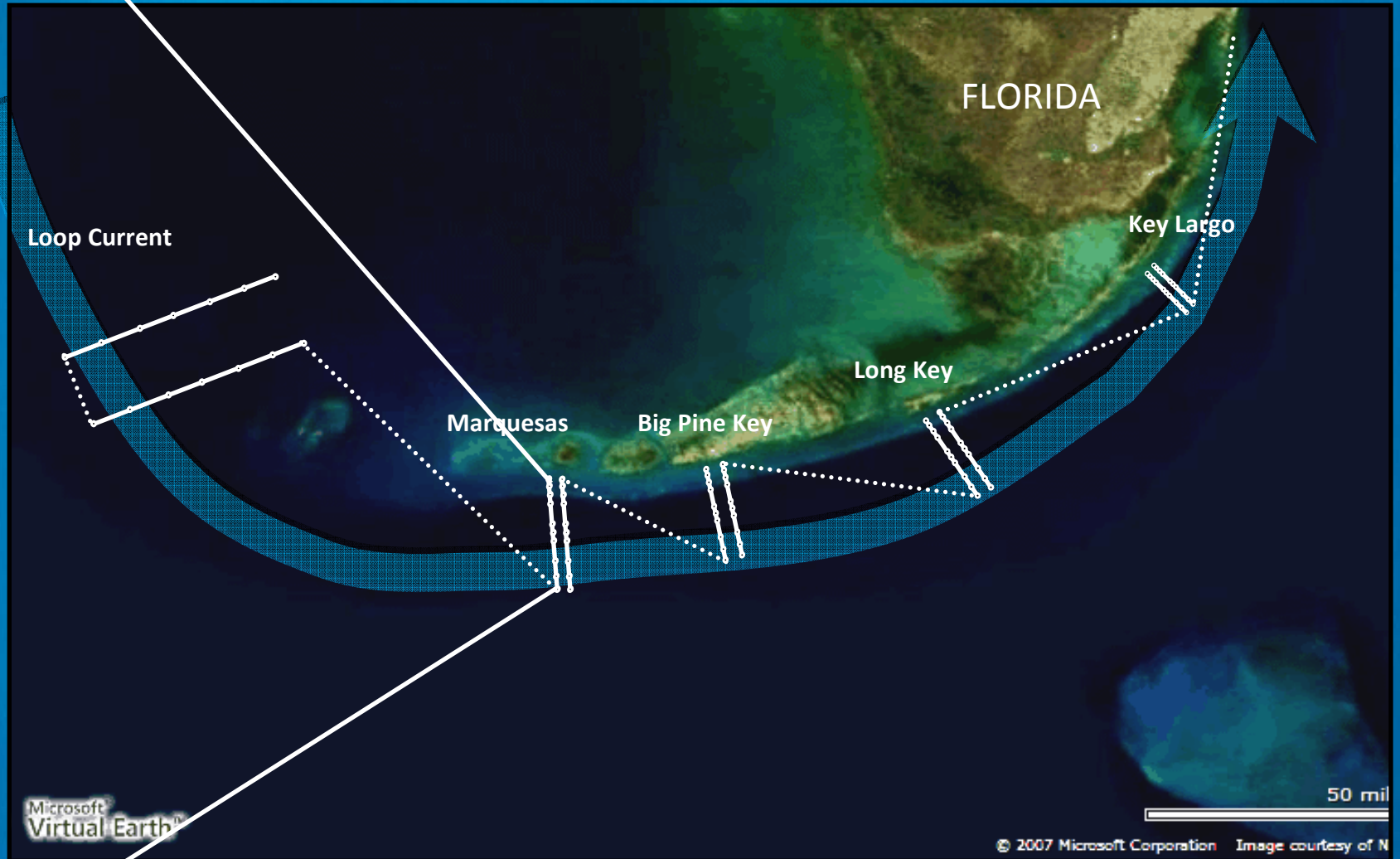
Dissolved oxygen

ARGOS drifters

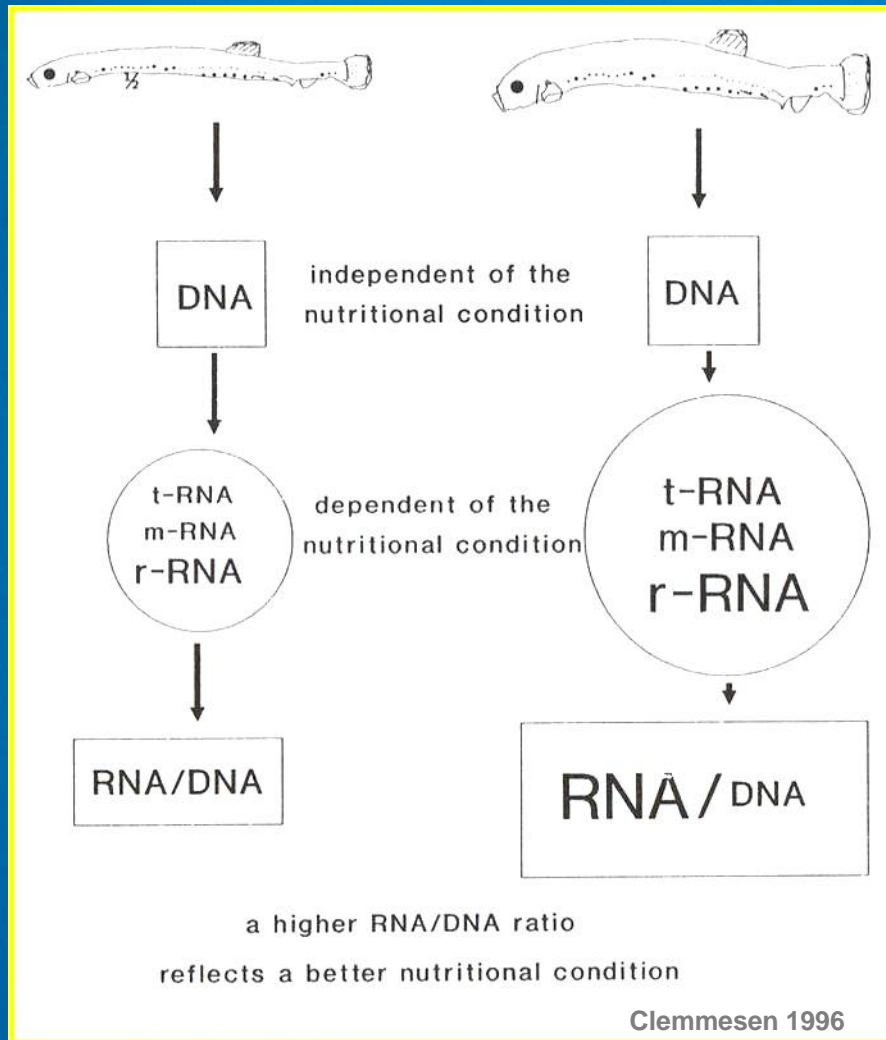
Satellite imagery (SSH, ocean color)



Sampling Scheme



Measuring Condition



- ID and measure individual larvae, remove heads and guts and homogenize
- Use fluorometry to determine RNA/DNA

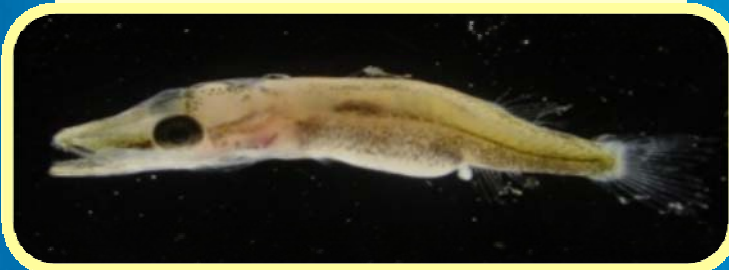




Thalassoma bifasciatum
Bluehead wrasse



Pseudogramma gregoryi
Reef bass



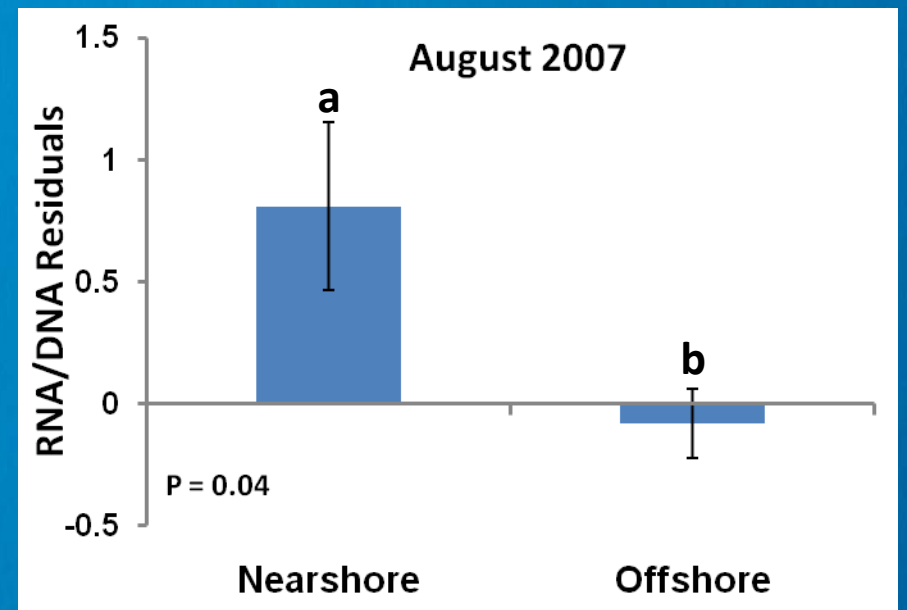
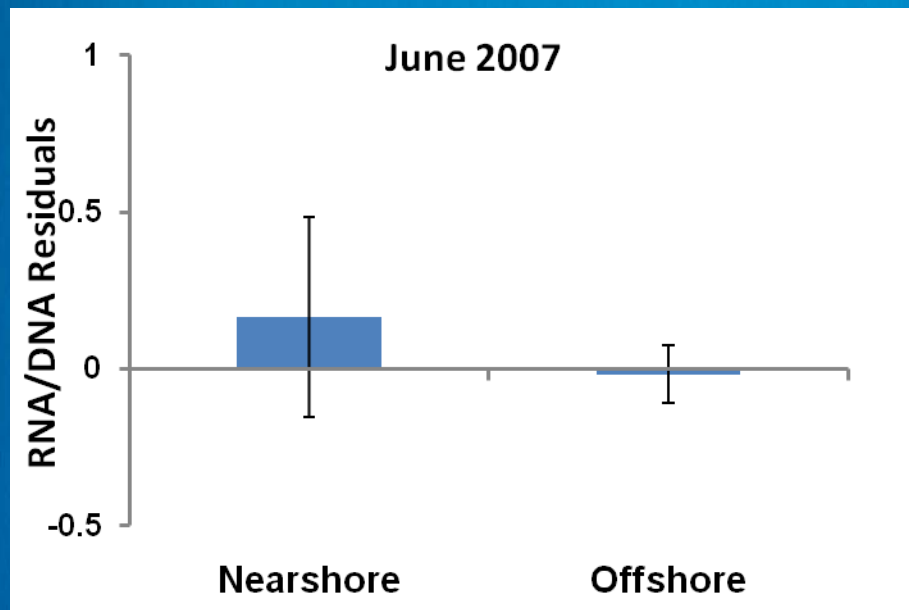
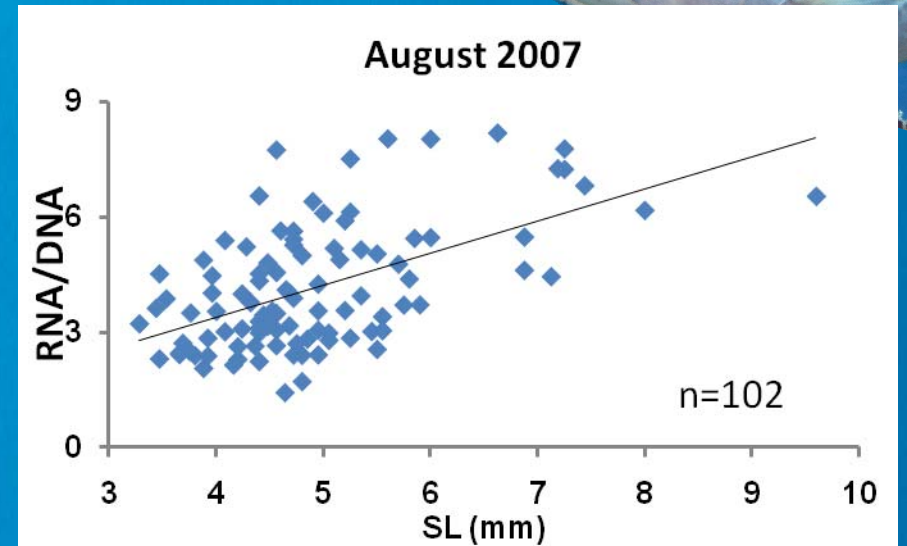
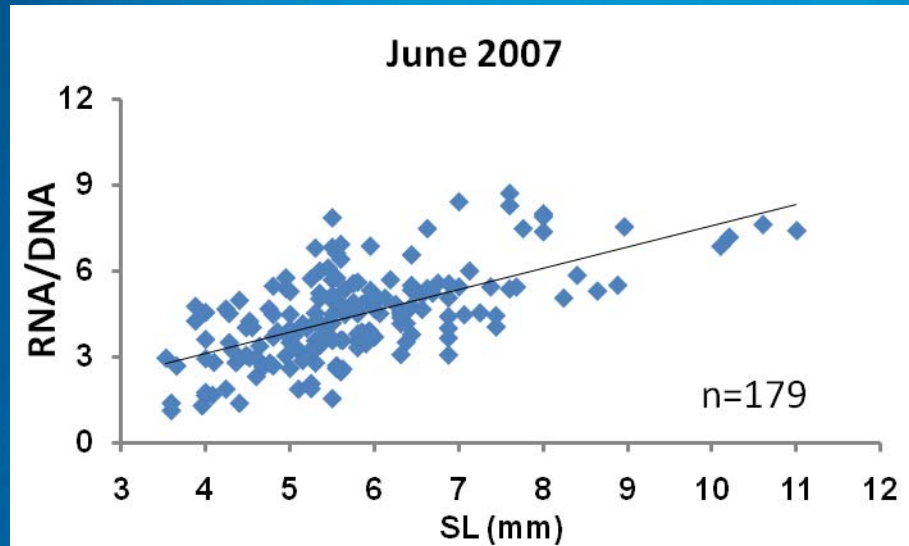
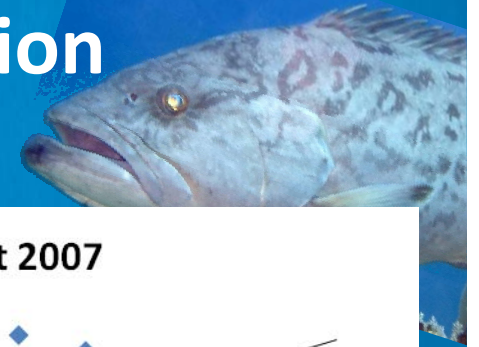
Sphyraena barracuda
Great barracuda



Xyrichtys spp.
Razorfish (pearly, rosy, green)

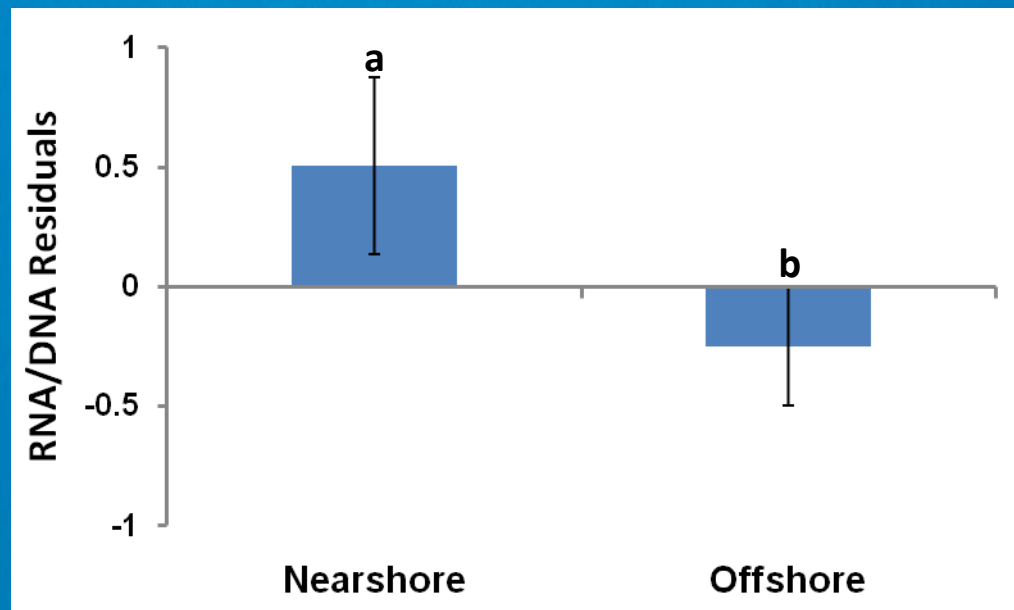
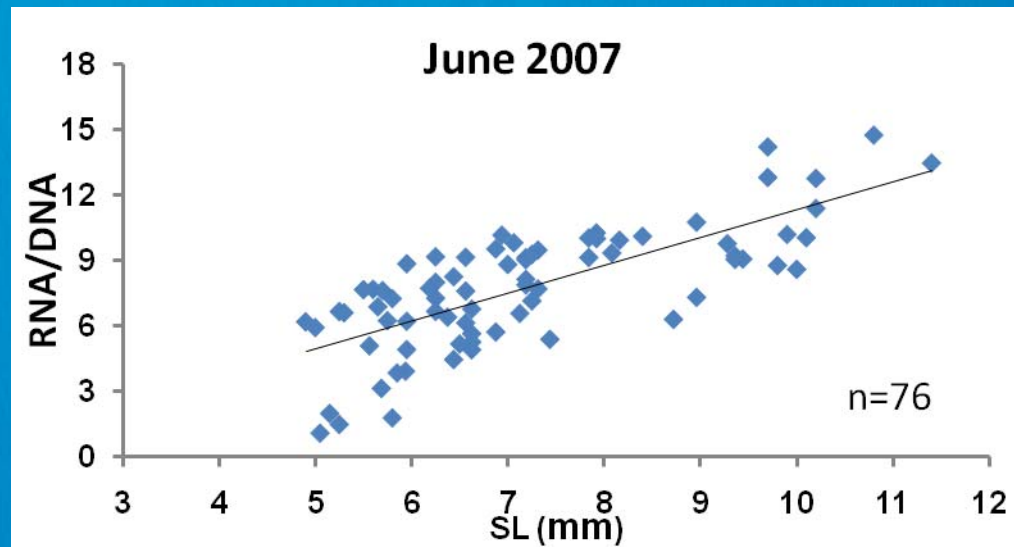
Nearshore vs. Offshore Condition

Thalassoma bifasciatum



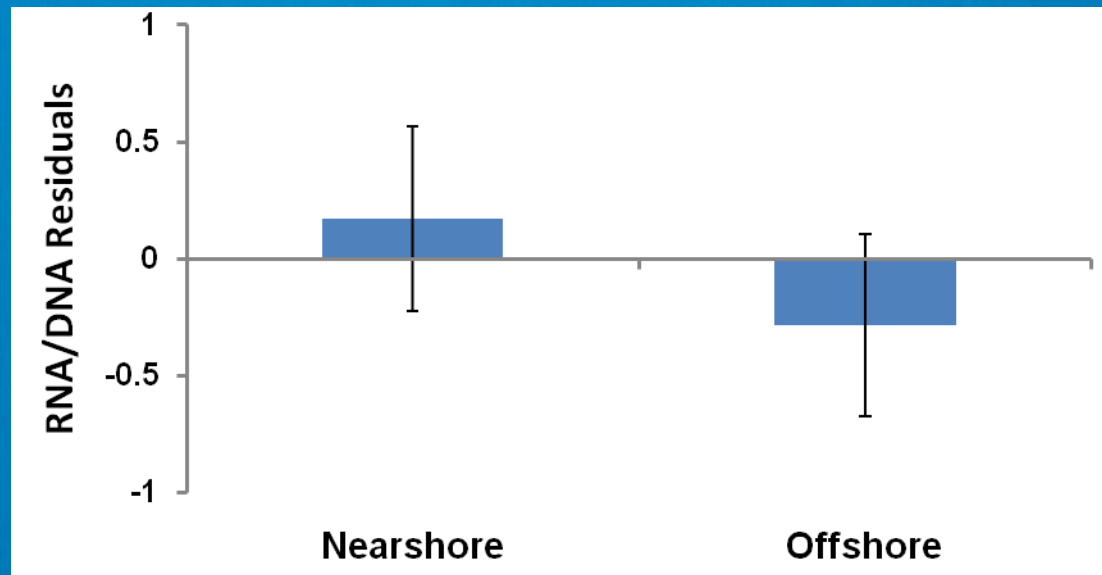
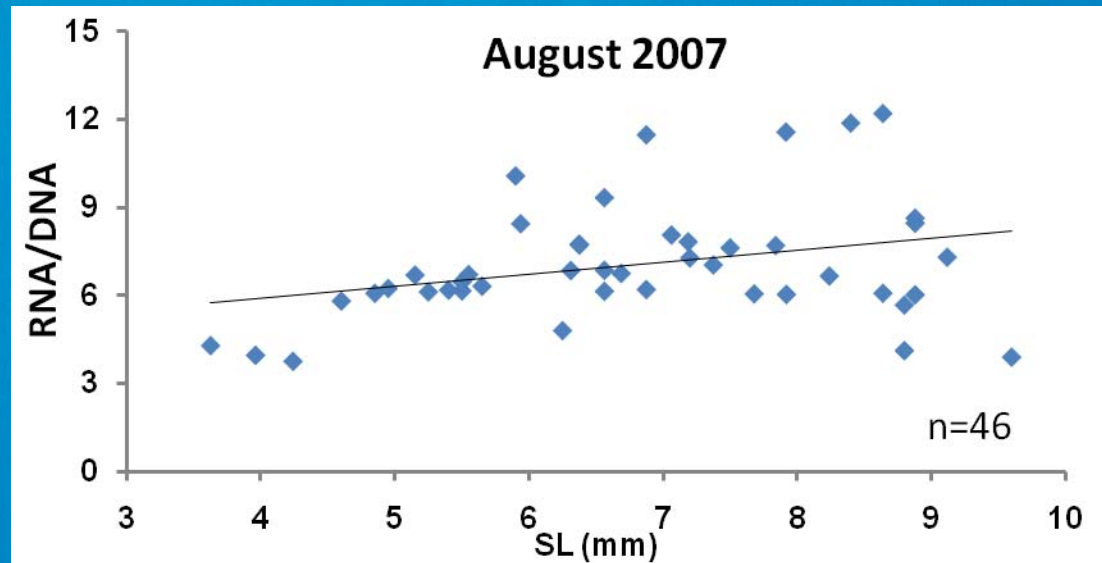
Nearshore vs. Offshore Condition

Xyrichtys spp.



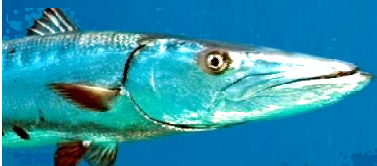
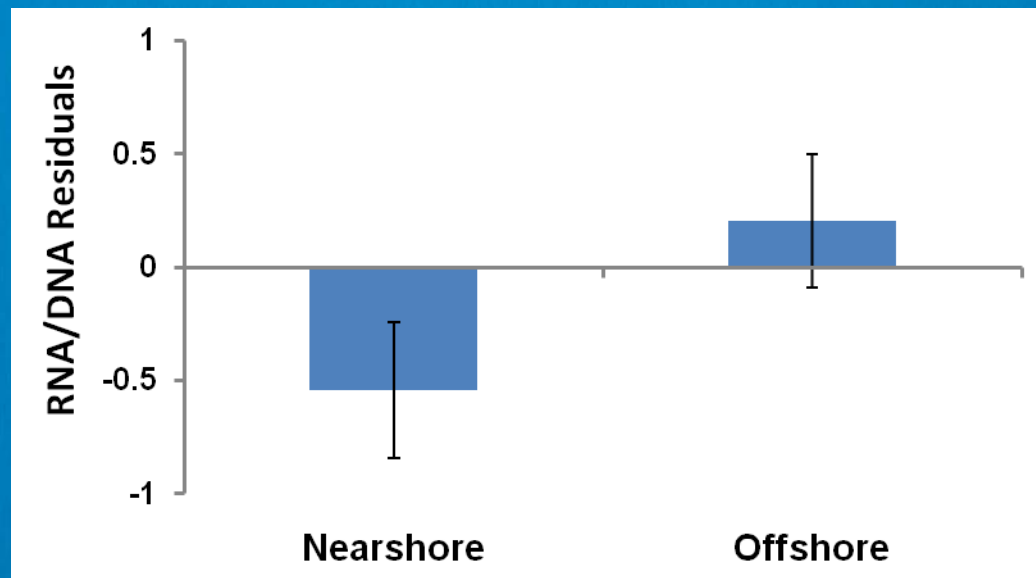
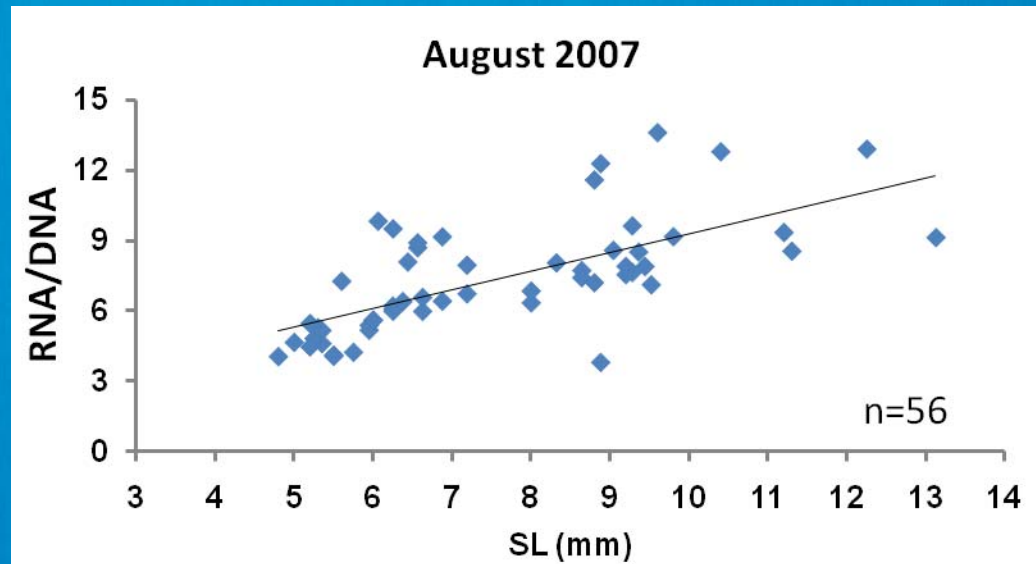
Nearshore vs. Offshore Condition

Pseudogramma gregoryi

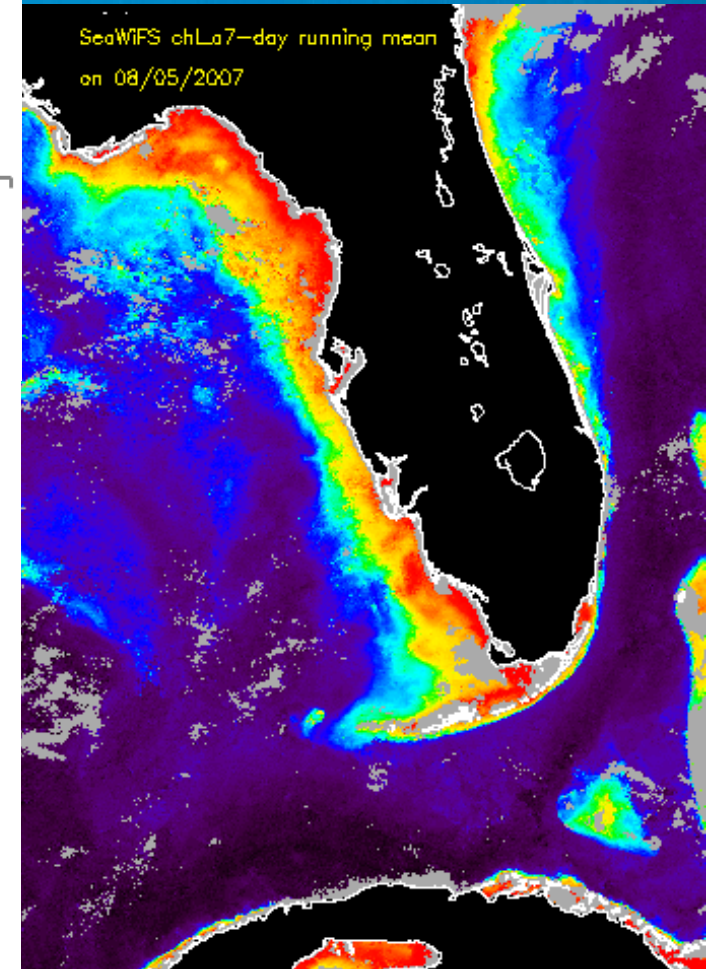
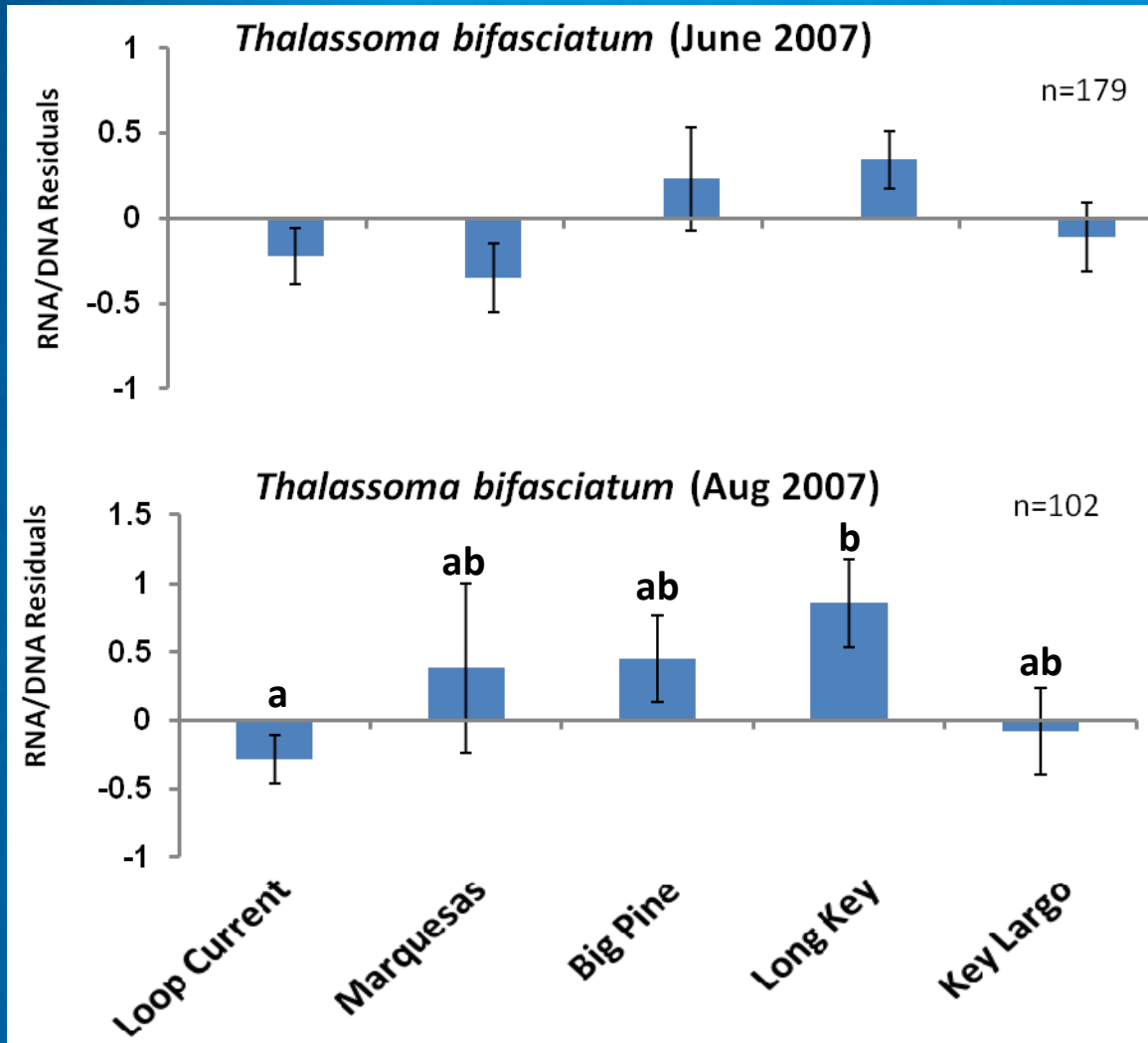


Nearshore vs. Offshore Condition

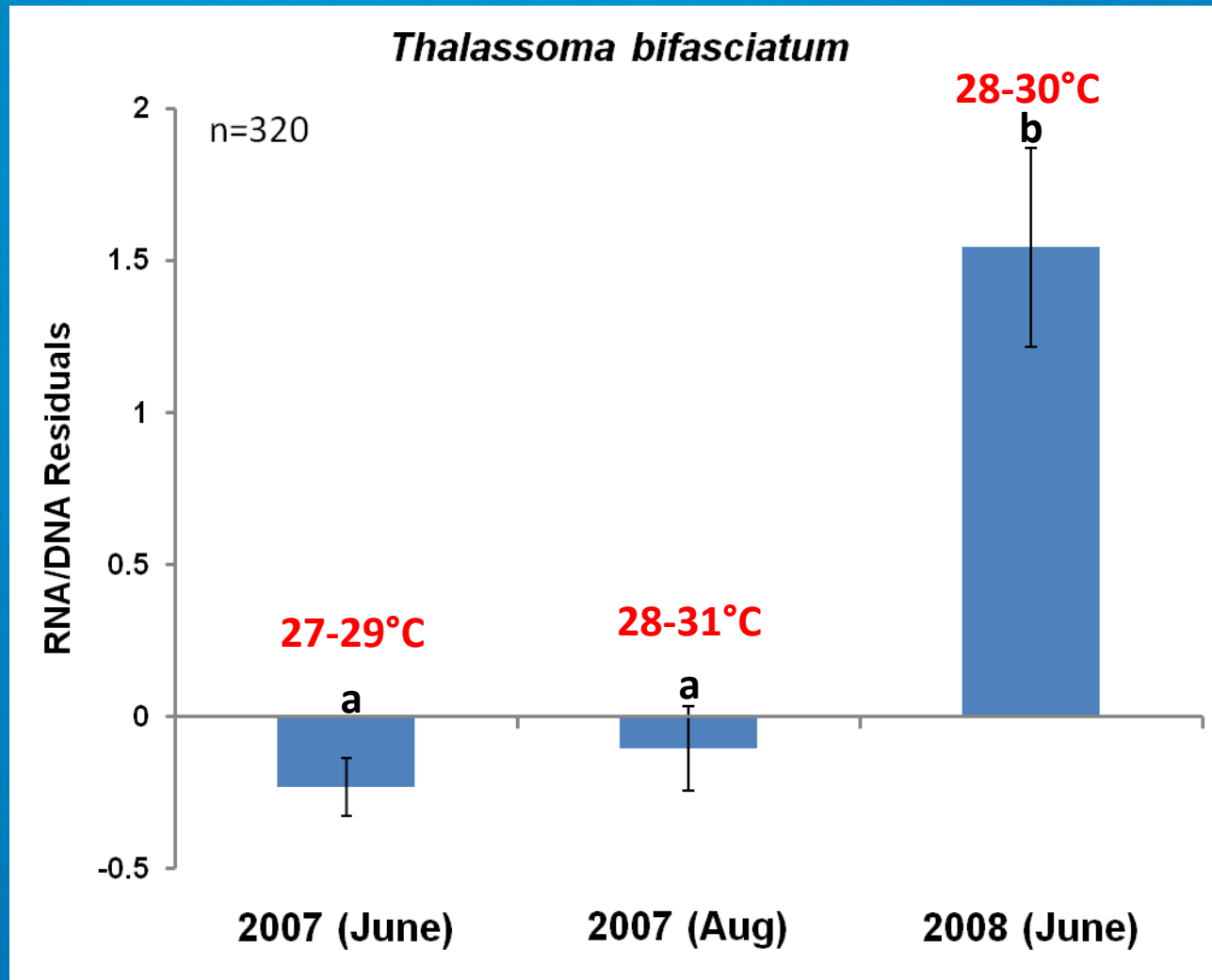
Sphyraena barracuda



Condition Among Transects

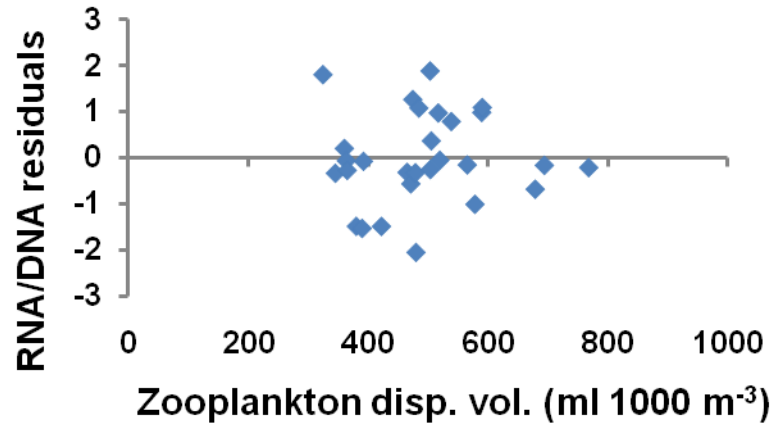


Temporal Variability

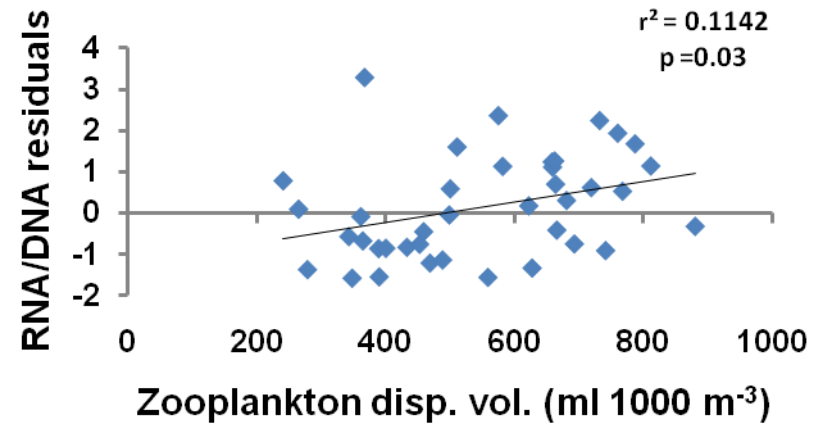


Condition vs. Plankton Abundance

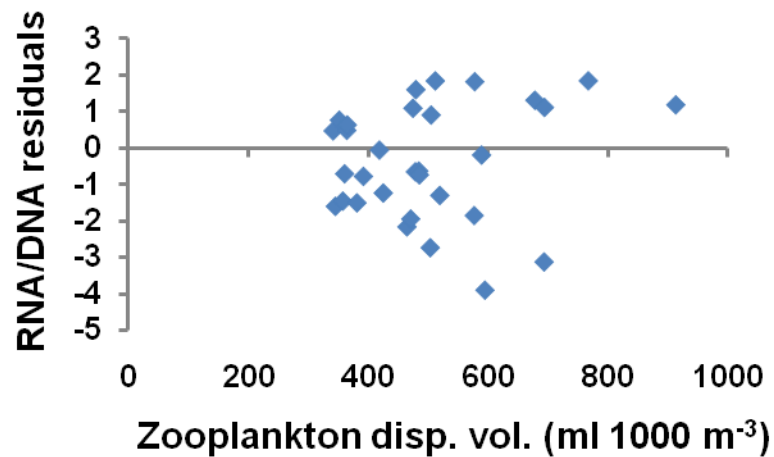
Thalassoma bifasciatum, June 2007



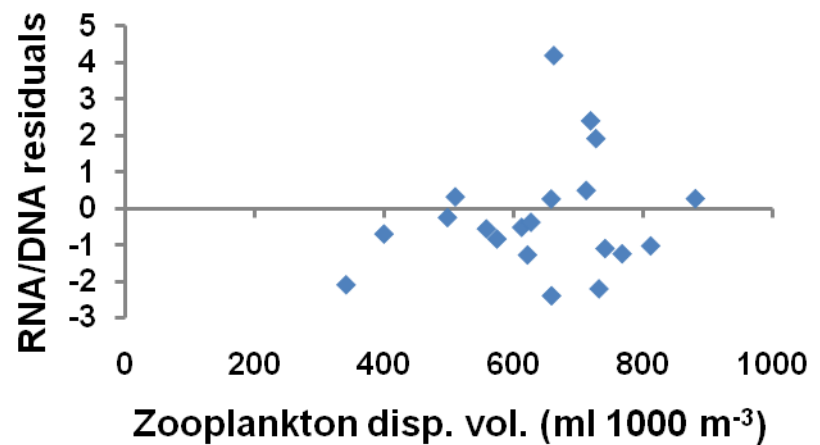
Thalassoma bifasciatum, Aug 2007



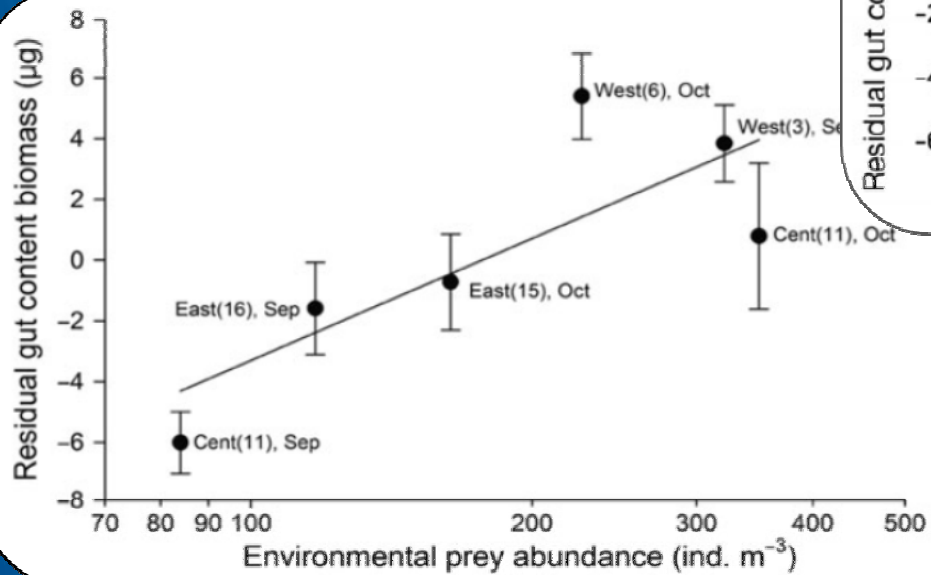
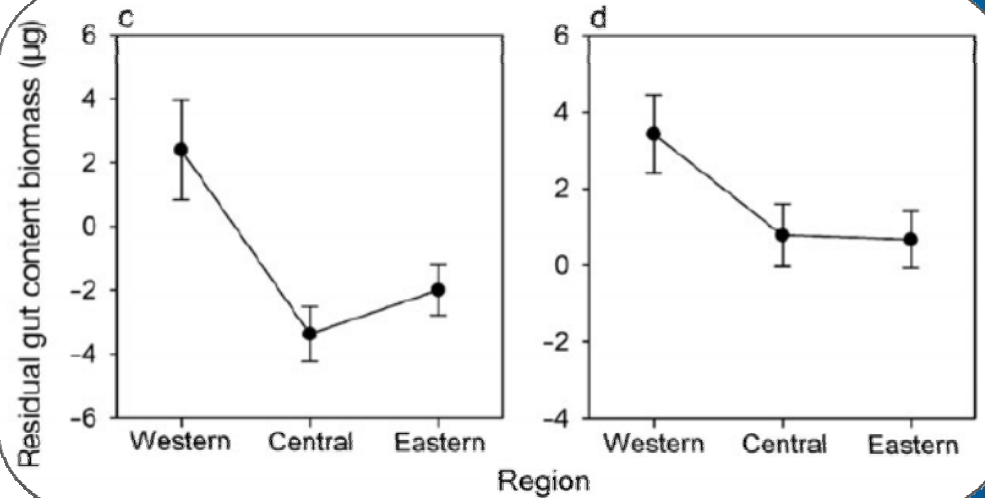
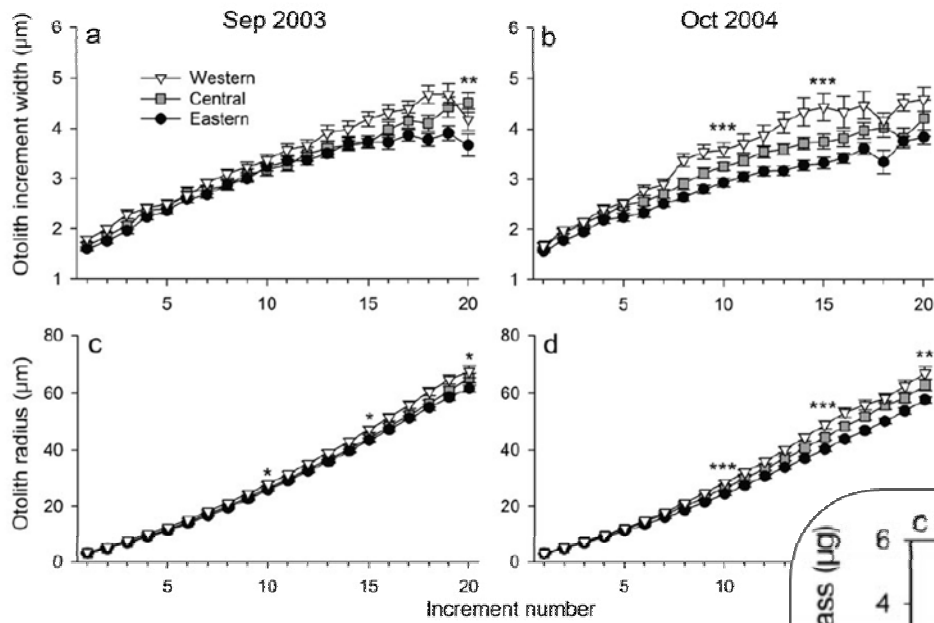
Xyrichtys spp., June 2007



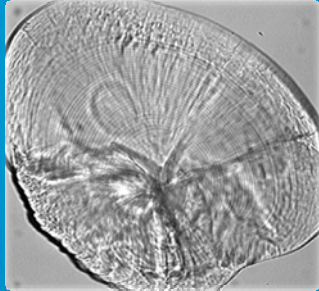
Xyrichtys spp., Aug 2007



Sponaugle et al. 2009



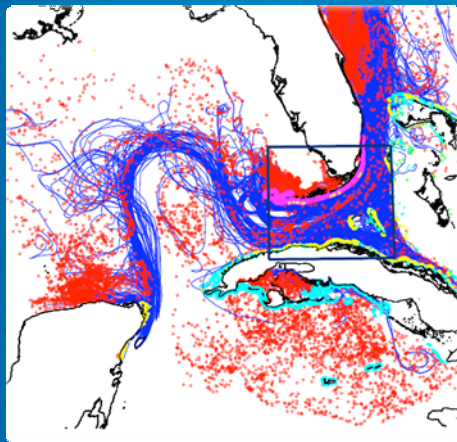
**OTOLITH-DERIVED
GROWTH DATA**



**SPECIFIC PREY
ABUNDANCES**



RNA/DNA



**BIOPHYSICAL
MODELING**

GUT CONTENTS



Conclusions

Lower condition in offshore larvae

Lower larval condition in Loop Current and off of Key Largo, higher larval condition off of the middle and lower Keys

Higher condition in 2008 than 2007

Larval dispersal trajectory may affect condition and thus, patterns of population replenishment



Thank You:

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Doug Crawford

Cedric Guigand

Claire Paris

Evan D'Alessandro

Dave Richardson

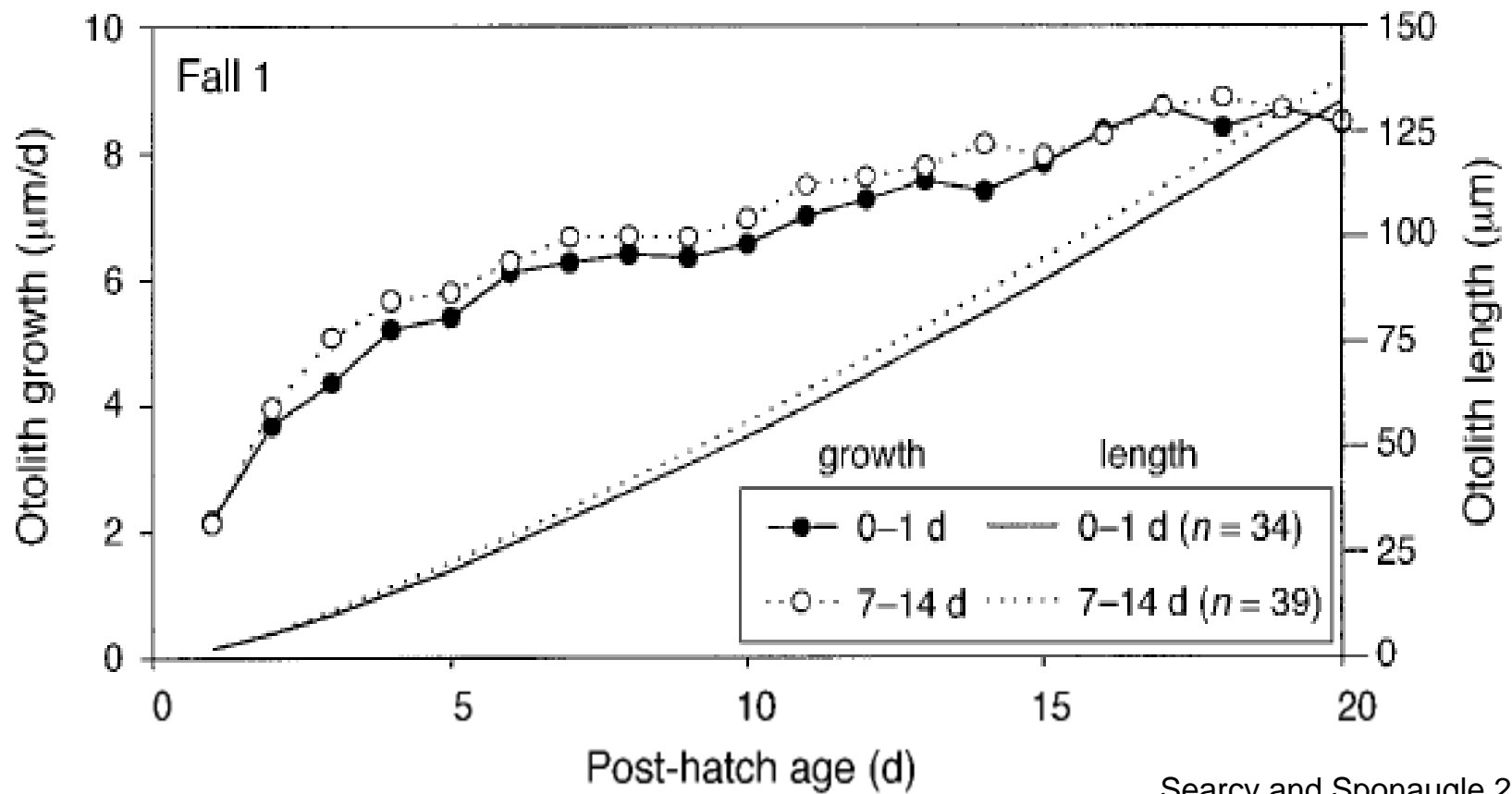
Adam Greer

Carie Bickson
Tom Murphy
Jason Downing

Capt. Shawn Lake
and the crew of the
R/V F.G. Walton
Smith

Rowlands Fellowship



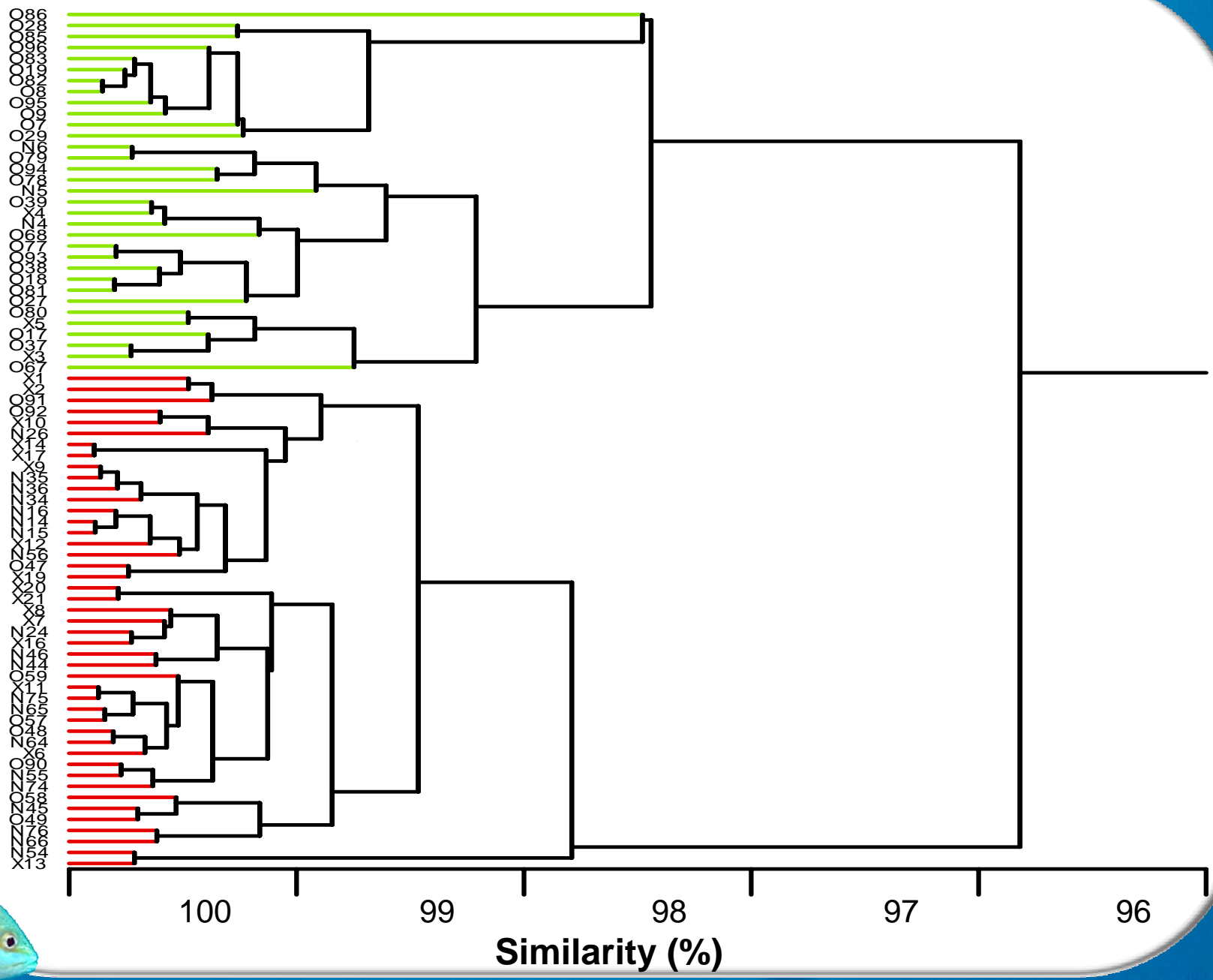


Next Steps

- **Analyze additional taxa**
 - Data for five other taxa, and many more samples from all three cruises
- **Look at R/D ratio in relation to other environmental variables**
 - Prey field
 - Multivariate environmental analysis
 - Gut contents
- **Compare R/D to other indices of condition**
 - Growth rates (otoliths)
 - Lipid components analysis (TAG:sterol)
- **Look at condition in relation to modeled larval origins**



Cluster Analysis (August 2007)



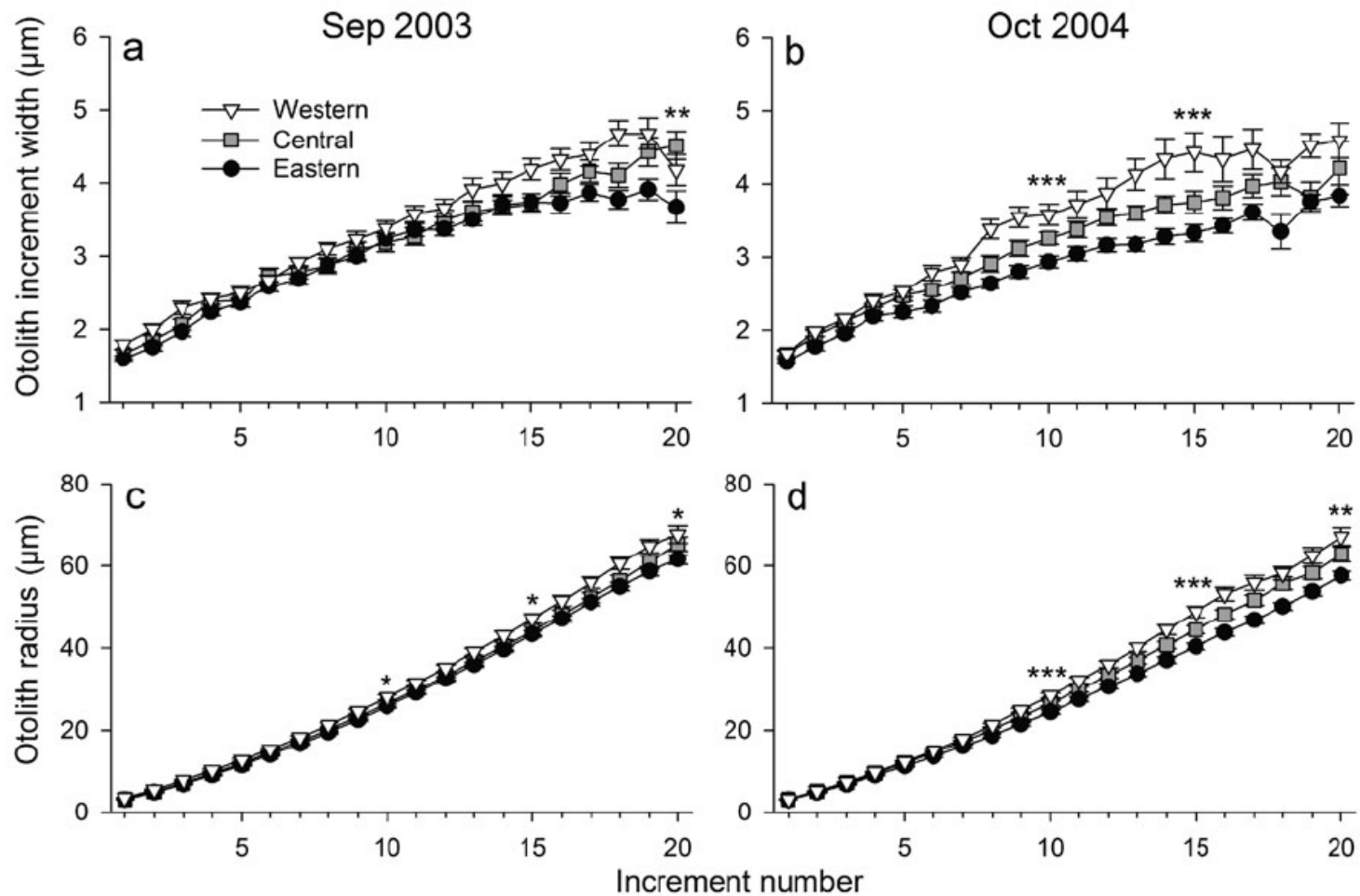
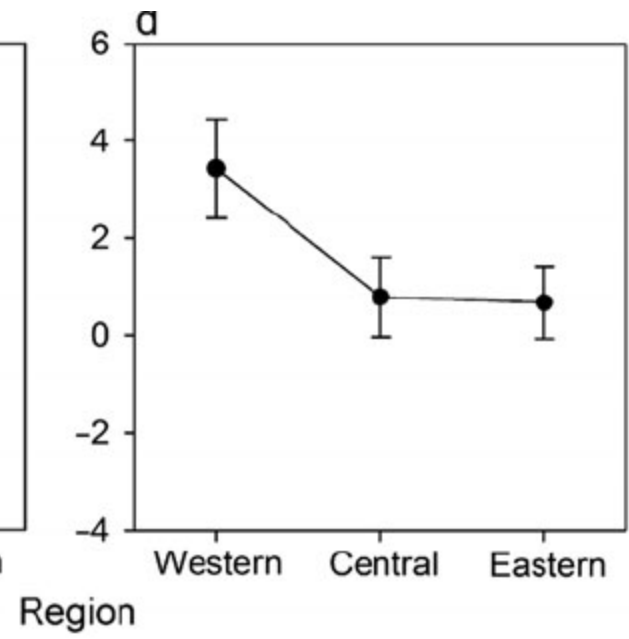
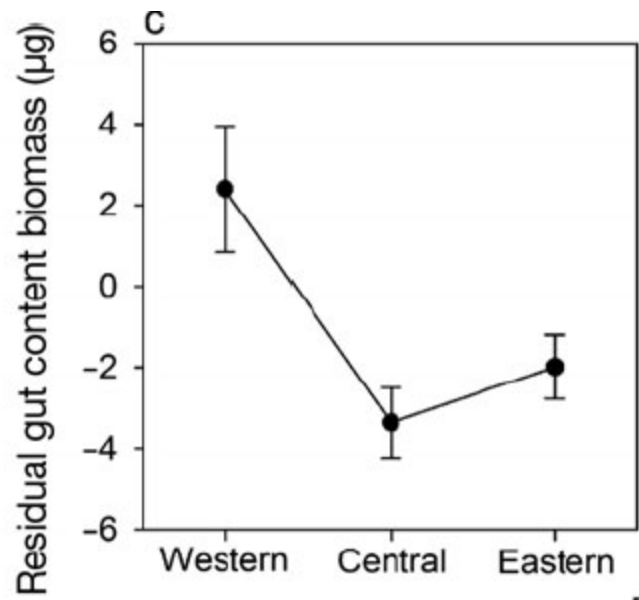


Fig. 3. *Thalassoma bifasciatum*. Mean (a,b) growth (\pm SE) and (c,d) otolith radius (\pm SE) during Days 1 to 20 of larval life for larvae ages 16 to 28 d collected at western, central, and eastern zone stations for (a,c) September 2003 and (b,d) October 2004. Mean growth (otolith increment width) and mean size (otolith radius) were compared at 3 points (Days 10, 15, and 20 of larval life). Significant difference between at least 2 regions is indicated: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. For details see Table 1





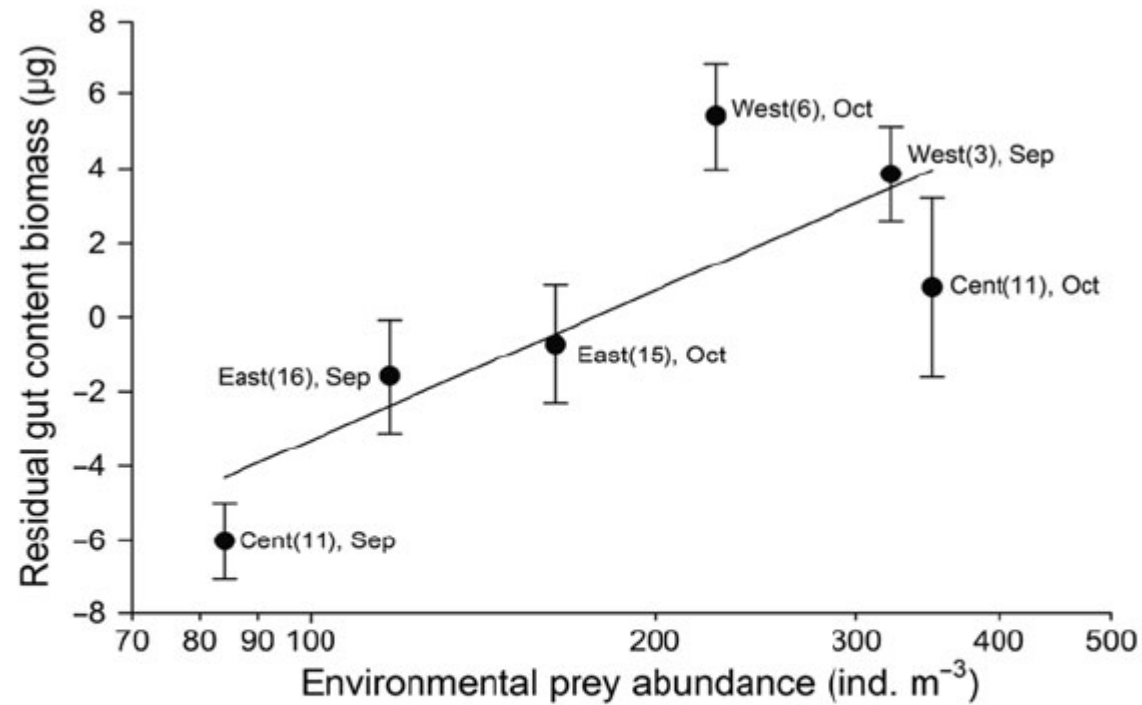


Fig. 5. *Thalassoma bifasciatum*. Linear regression between mean residual gut content biomass of larvae and total environmental abundance of *Farranula*, *Oncaea*, and harpacticoid copepods at 6 stations distributed among the 3 zones of the Straits of Florida during September 2003 (Sep) and October 2004 (Oct). Station number is indicated in parentheses. Relationship is $y = 5.80 \ln(x) - 29.99$, $r^2 = 0.65$

Environmental Data Collection

CTD

ADCP

Fluorescence

Transmittance

Dissolved oxygen

ARGOS drifters

Satellite imagery
(SSH, ocean color)



Are reef fish populations open or closed?

Adult Spawning
Larval Behavior/Swimming Ability
Larval Mortality
Physical Processes

Local Retention

Panmixia

