



NOAA

Science for Coastal Communities

Center for Coastal Fisheries and Habitat Research
CCFHR



**Marine Debris Characterization in Coastal North Carolina
Saltmarsh and Subtidal Habitats**

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North Carolina coastal habitats

- Primary and secondary nursery areas – intertidal saltmarshes
- Hard bottom ledges, jetties, wrecks - subtidal habitat
- Habitat for commercially and recreationally important species and prey
- >68 million lbs seafood commercially caught in NC in 2006
over \$70 million value





Research Objectives



- **Characterization of marine debris in coastal North Carolina habitats: intertidal saltmarshes, subtidal hard bottom ledges, jetties, wrecks**
- **What types and quantities of marine debris occur?**
- **What are accumulation rates?**
- **Are there patterns between marine debris and human uses?**
- **What environmental impacts do marine debris have in these habitats?**

Coastal North Carolina marine debris characterization, assessment, and impact studies

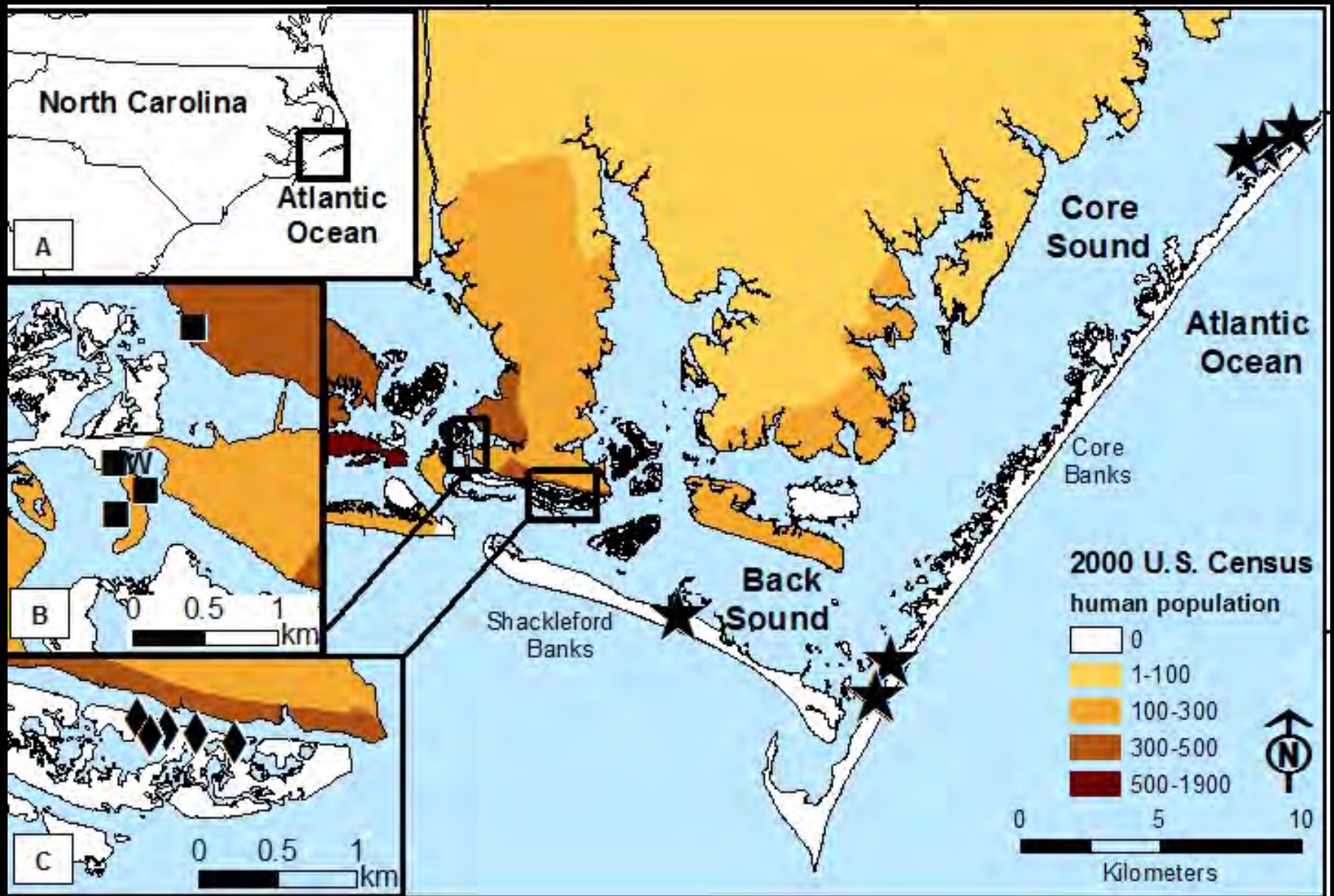
PART I:
intertidal saltmarshes



PART II:
subtidal rock ledges, wrecks, jetties



Study Areas—Beaufort, RCNERR, Core Sound, Onslow Bay



Coastal saltmarshes – Methods

Collections/ debris removal

- re-accumulation studies & quantification

Debris quantification

- weight
- quantity
- Categorization: Ocean Conservancy categories

Mapping

- High accuracy GPS
 - Area of collections
 - Debris footprints for impact studies

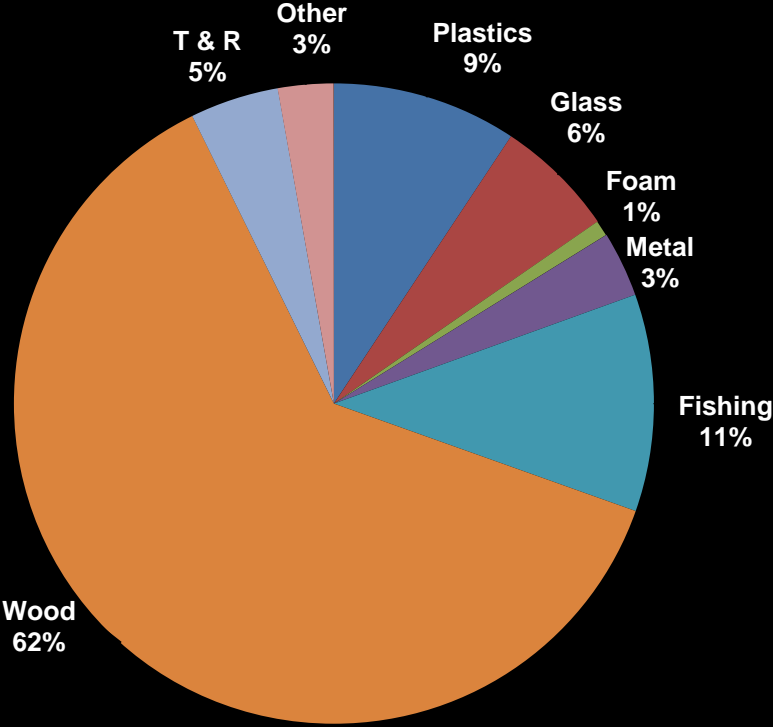
Time Frame

- Spring '08, Summer '08, Winter '08-'09, Spring '09



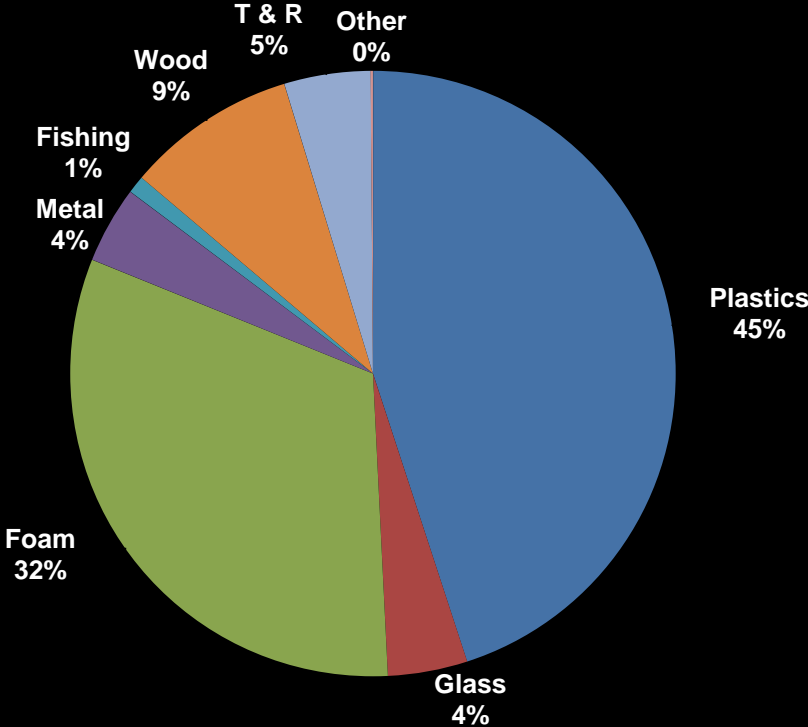
Results: Characterization of debris

Debris type by weight



Total: 2850 kg

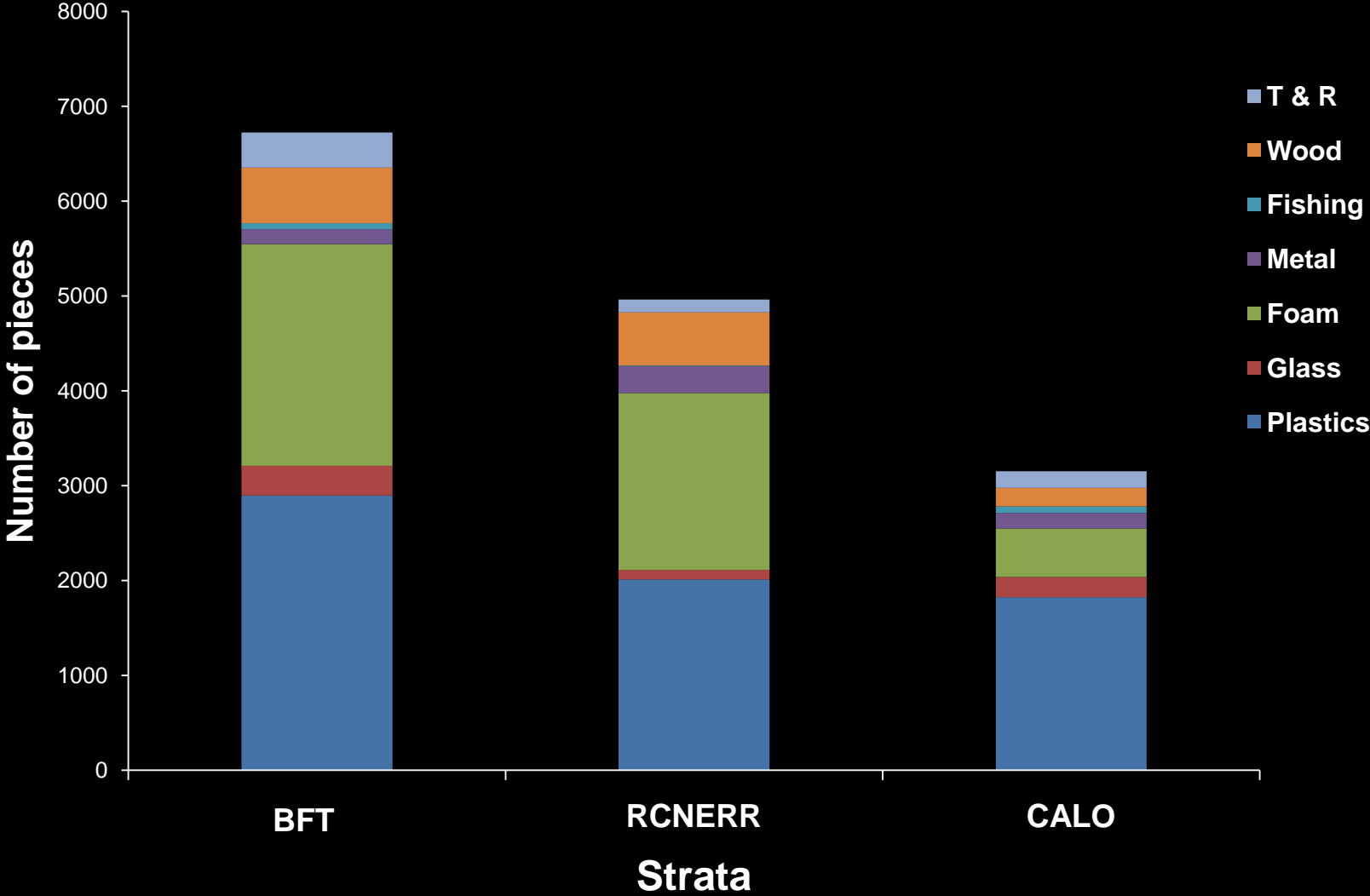
Debris type by count



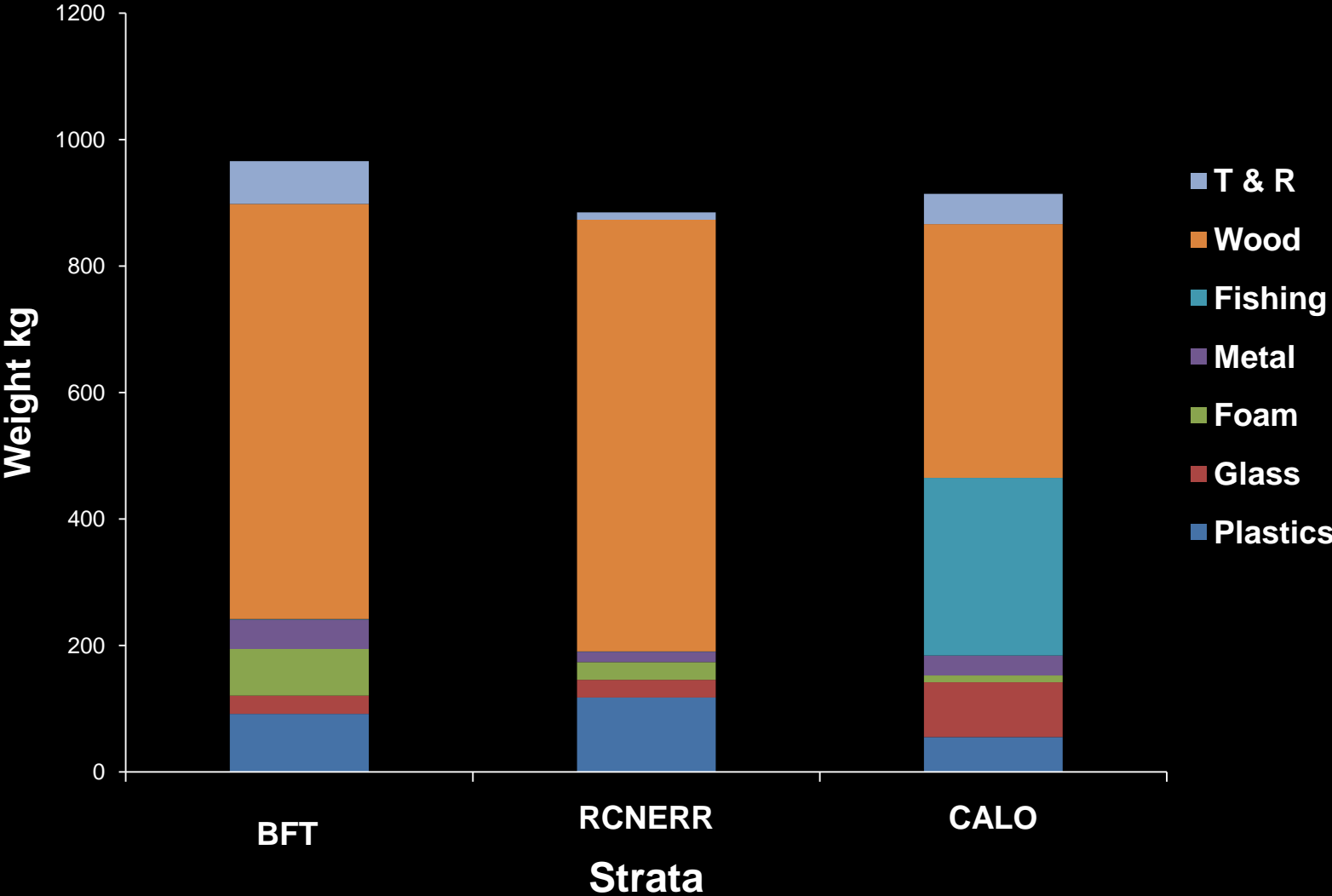
Total: 14,747 pieces

Area sampled: 11 acres/52,000+ total

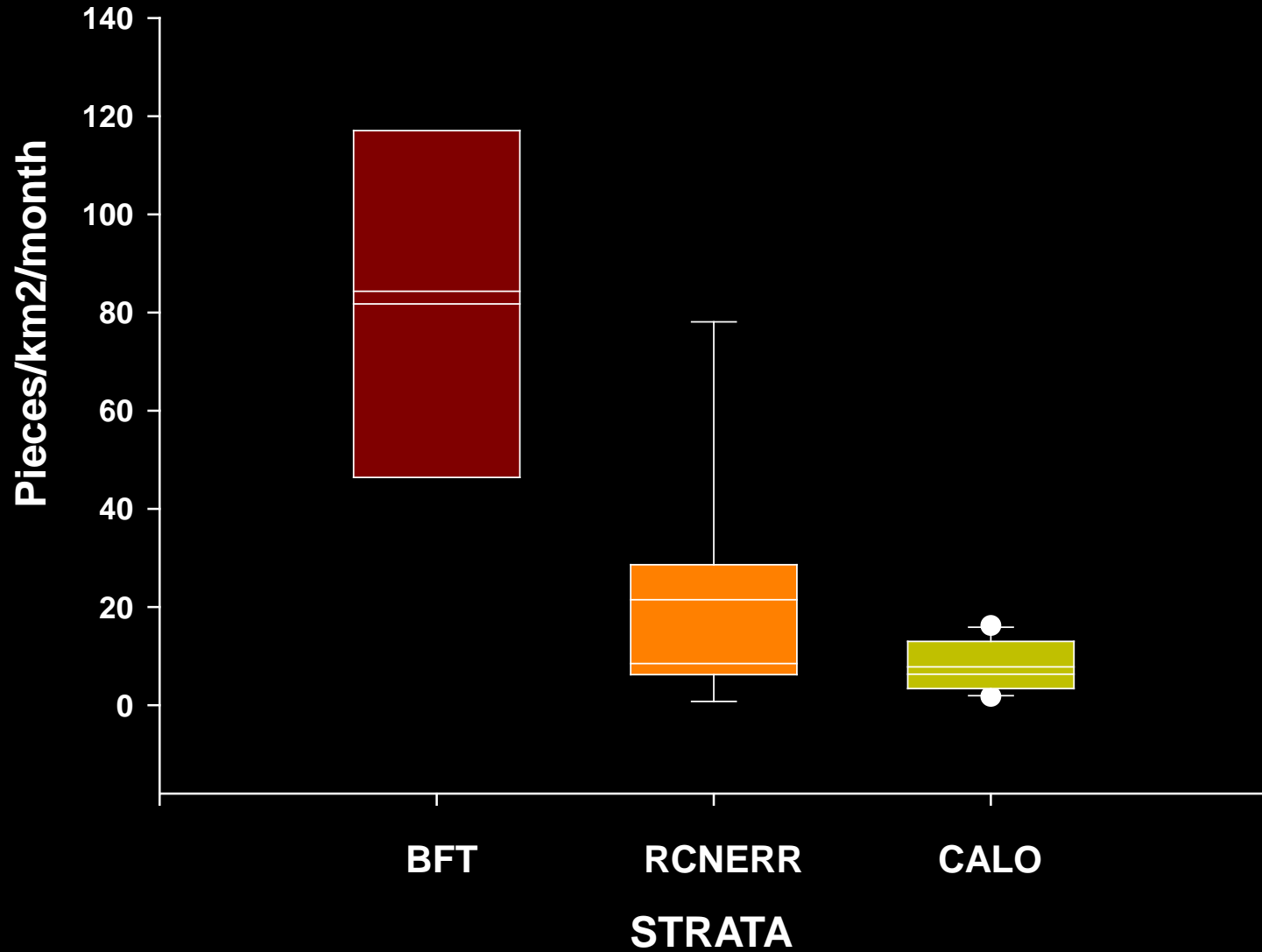
Results: Characterization of debris by Strata



Results: Characterization of debris by Strata



Results: Accumulation rate by Strata



Top 10 items found in the marsh

Debris Item	Number of debris items				% of debris total
	BFT	RCNERR	CALO	Total	
Foam Pieces	1857	1292	288	3437	33.14
Plastic Pieces	1112	493	577	2182	21.04
Wood Pieces	305	194	89	588	5.67
Cigarettes/Filters	488	69	19	576	5.55
Food Wrappers (Plastic)	270	158	106	534	5.15
Bottle/Jar	94	84	190	368	3.55
Bag (Plastic)	159	111	83	353	3.40
Packaging (Plastic)	165	58	40	263	2.54
Glass Pieces	218	18	20	256	2.47
Caps/Lids (Plastic)	134	69	51	254	2.45

Conclusions

Clean-ups effective tool to reduce debris, but can impact resource

- Winter most pieces & weight removed

Proximity to population density –outreach and community clean-ups

11 acres surveyed vs. 52,000 + acres – 2800 kg

Outreach for debris reduction

- Municipalities for trash receptacle design, construction clean-up
- Fisherman for greater awareness of trash and gear disposal
- Tourist and local resource users awareness of trash disposal



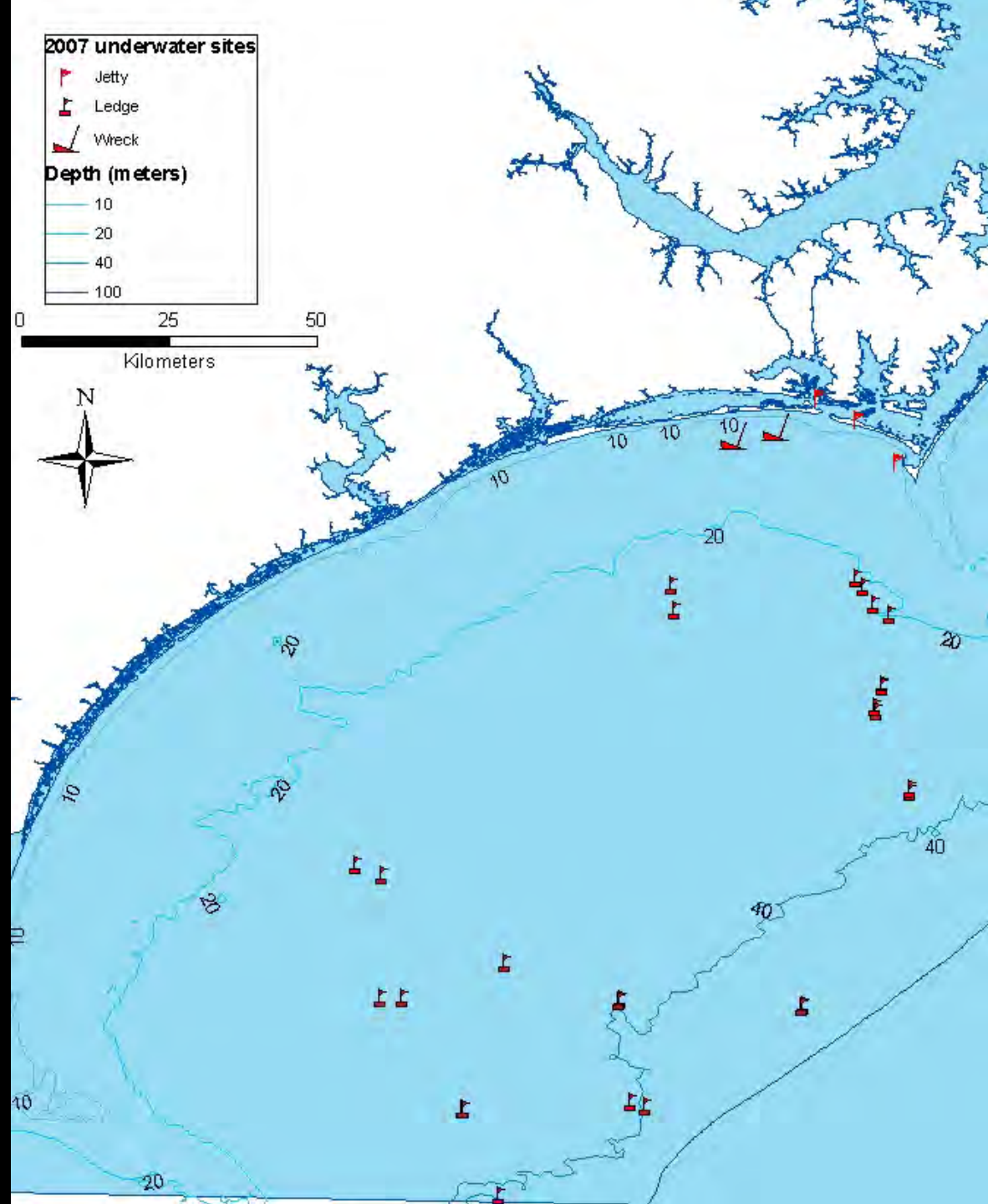
A diver is seen from behind, swimming through a dense school of fish. The diver is wearing a black wetsuit, blue fins, and a yellow air tank. The water is a deep blue, and the fish are silvery with yellow fins. The diver's bubbles are visible in the water.

PART II: UNDERWATER
subtidal rock ledges, wrecks, jetties

2007 subtidal sites

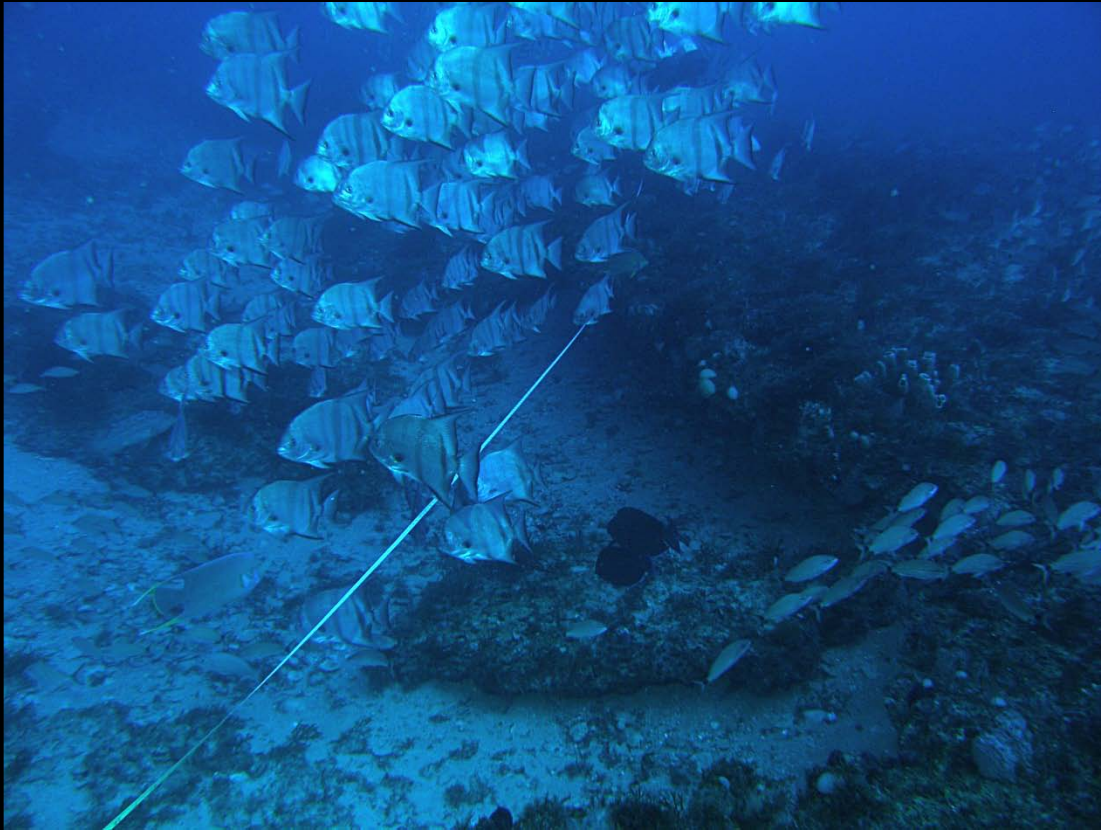
Site Selection

- Nearshore rock jetties
 - 10-30ft depth
- Nearshore wrecks
 - 45-70ft depth
- Hard bottom rock ledges
 - 2007: 70-150ft depth
 - 2008 (planned): 100-250 ft depth
 - combined with Invasive Lionfish & NC offshore ecosystem research
 - multibeam sonar surveys for 3D complexity
 - NOAA Ship NANCY FOSTER and NURC R/V Cape Fear



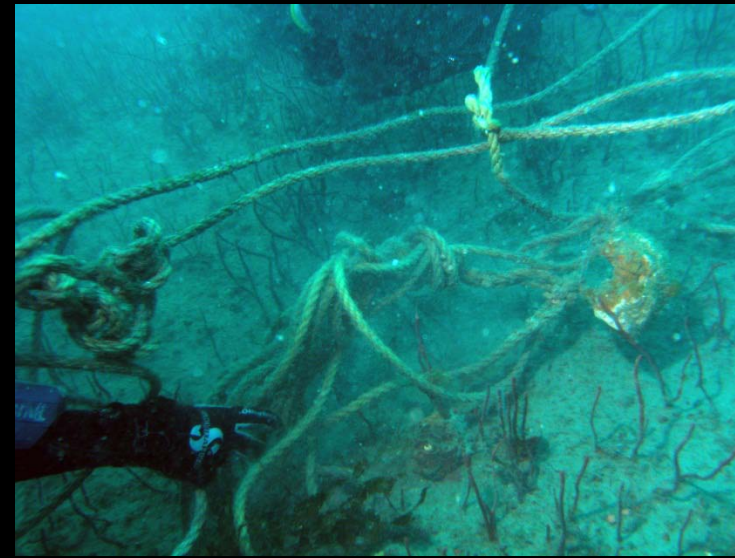
Subtidal habitats - Methods

- Transect surveys along edges and/or across-shelf
 - Photo / Video of debris and habitat
 - Fish counts



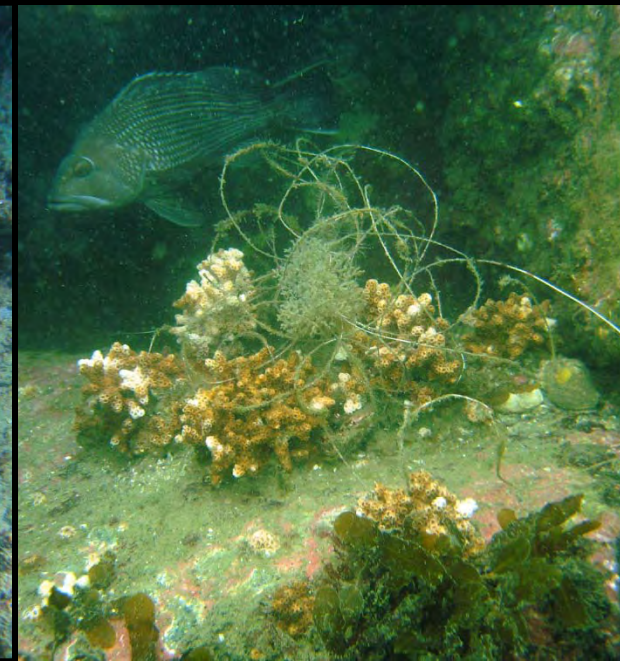
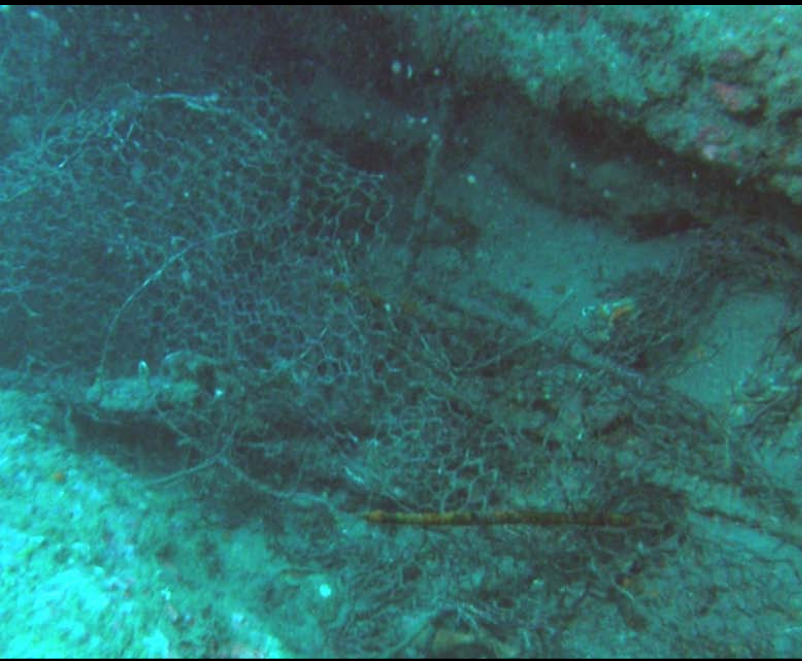
Subtidal habitats - Methods

- Collections/ Removal
 - Experimental re-accumulation studies
 - Developed local partnership with dive shop volunteers for clean-ups: private industry & resource users
- Quantification
 - Categorize and weigh
 - Monofilament extrapolation of weight to length



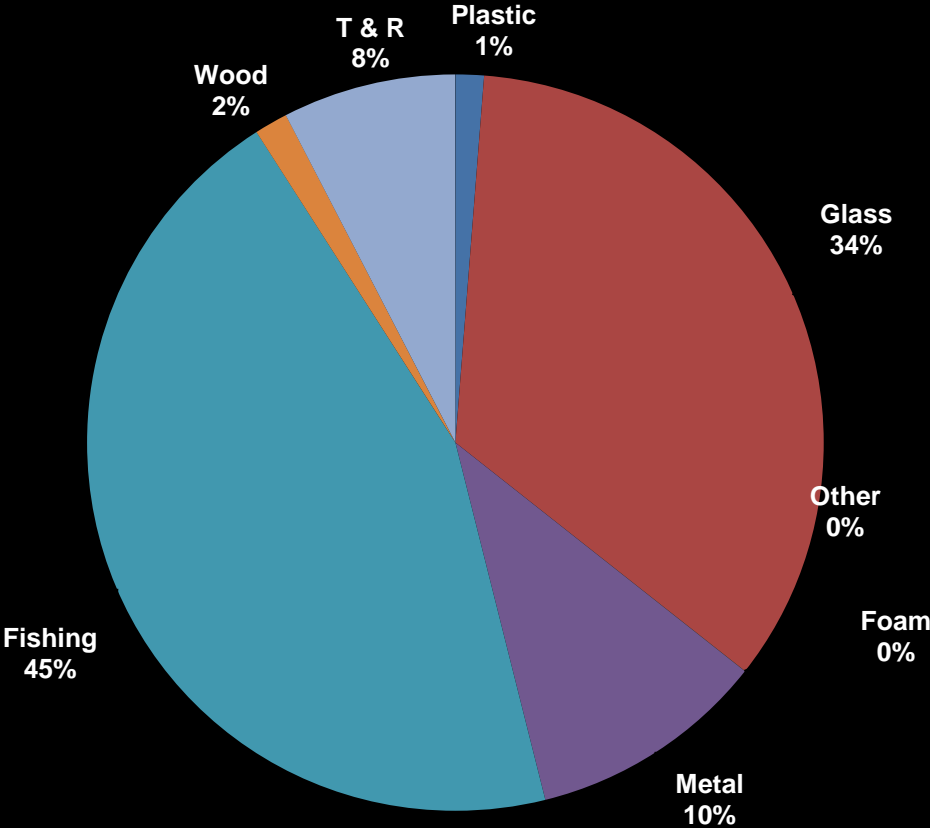
Subtidal Habitats –Results

- Over 239 kg debris removed to date & over 2 miles of monofilament
- Much debris related to recreational fishing & boating (monofilament, lures, anchors, anchor line, car batteries)
- Debris often snagged on ledges or *Oculina* coral
- More concentrated debris inshore - suggestive of correlation between site's fishing popularity and debris density?
- Patchy large debris on offshore sites



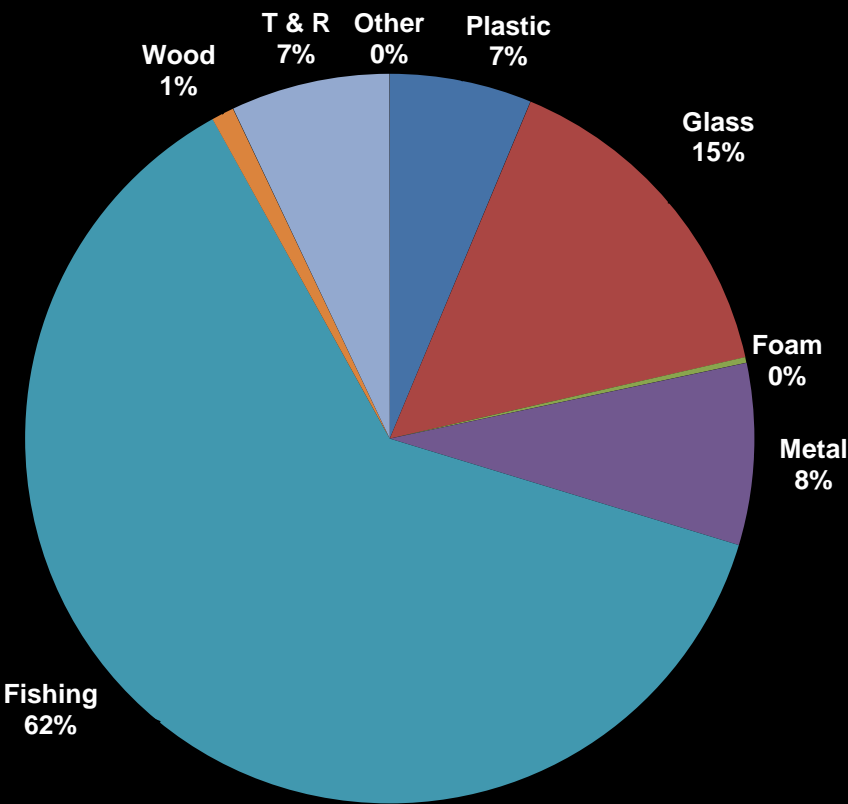
Results: Characterization of debris

Debris type by weight



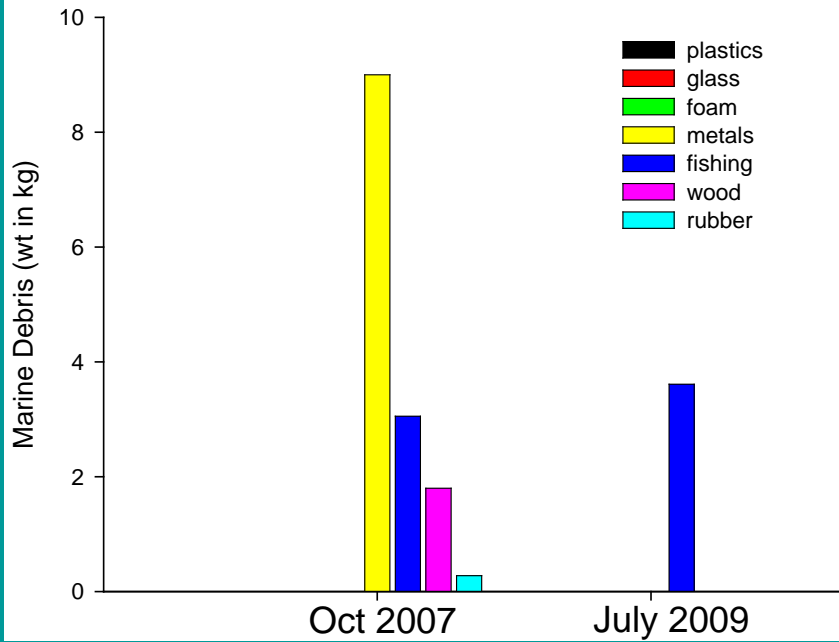
Total: 239 kg

Debris type by count

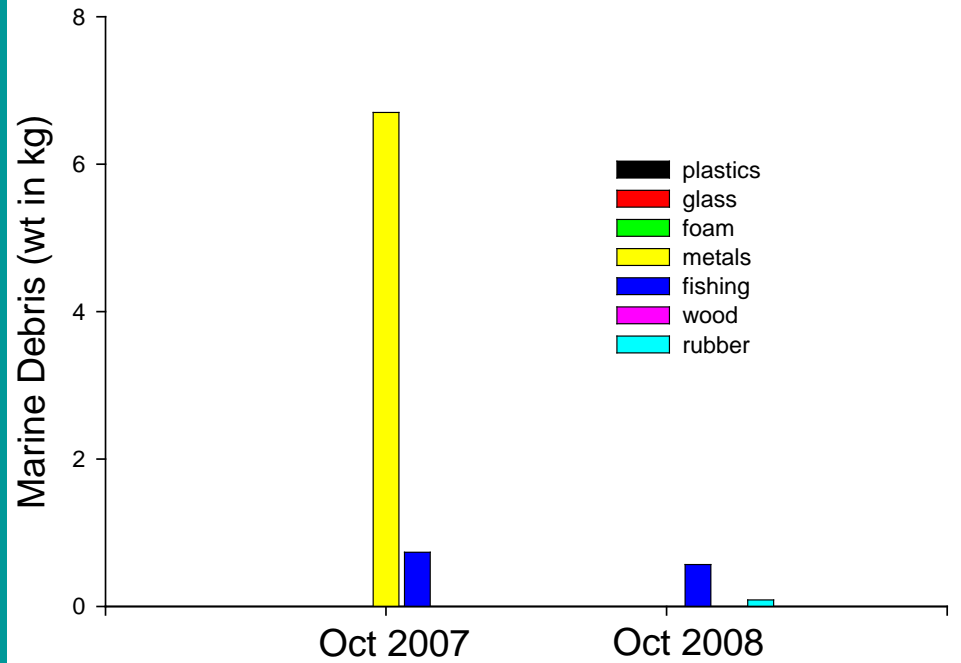


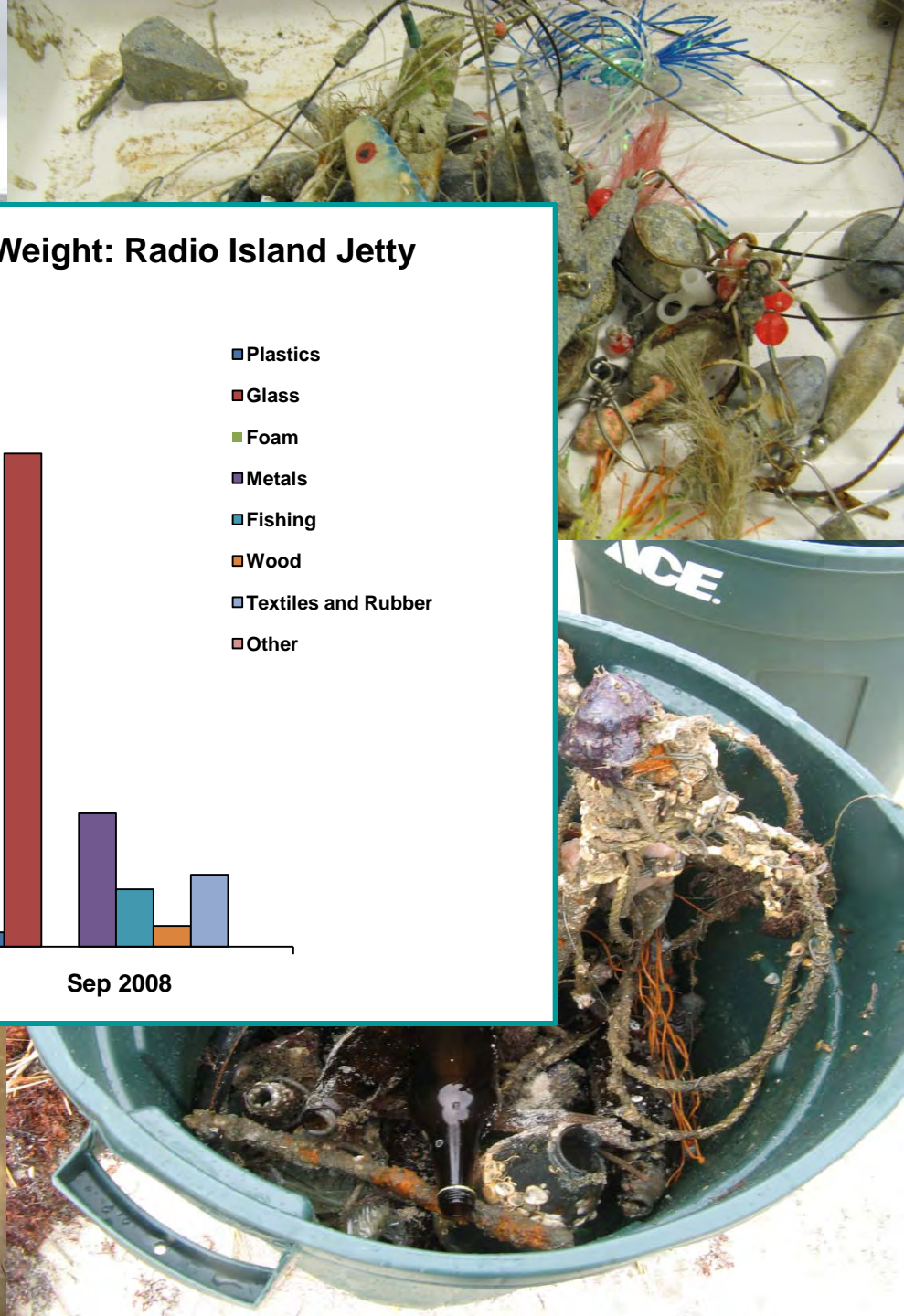
Total: 397 pieces

Marine Debris Type and Weight: SW Ledges

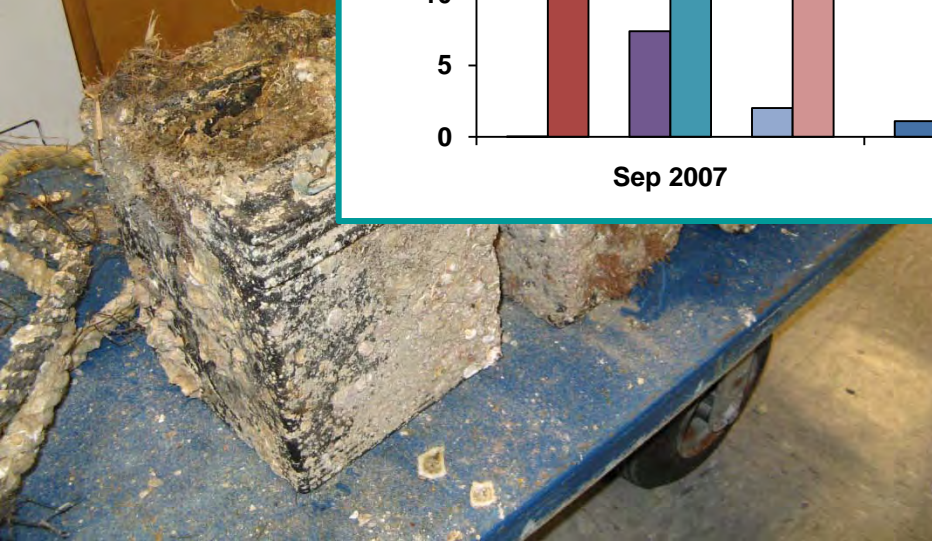
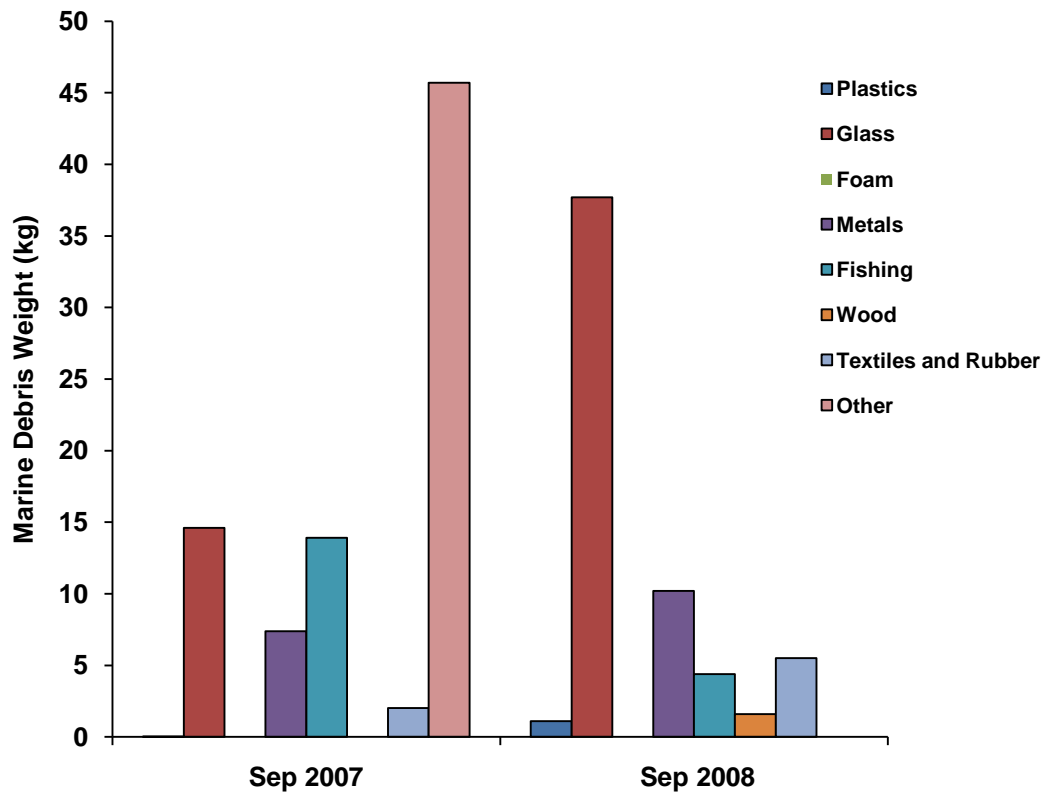


Marine Debris Type and Weight: Novelty





Marine Debris Type and Weight: Radio Island Jetty



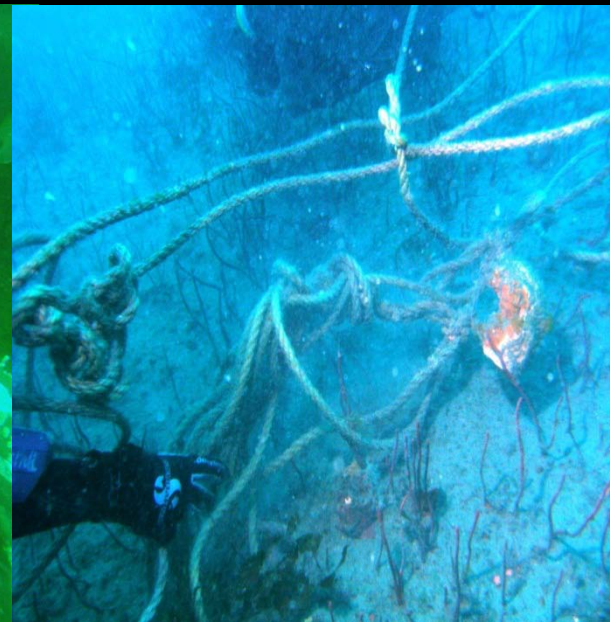
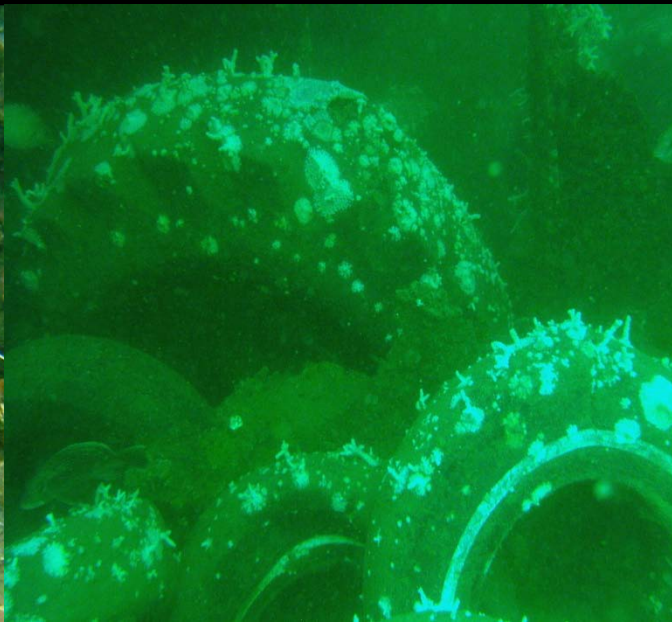
Conclusions

Proximity to populations a good predictor for debris

Low volume of debris in offshore ledges

Need multifaceted approach for nearshore sites

- Community involvement/clean-ups somewhat effective
- Outreach to local fishing community



Saltmarsh Impacts: Manipulated study

- 3 Debris Types: crab traps, tires, wood pallets
- Debris deployed in random grid fashion in marsh with control plots included
- Debris monitored over weekly intervals to determine time to impact





Impact Habitat



Impact Animals



Impact Tourism



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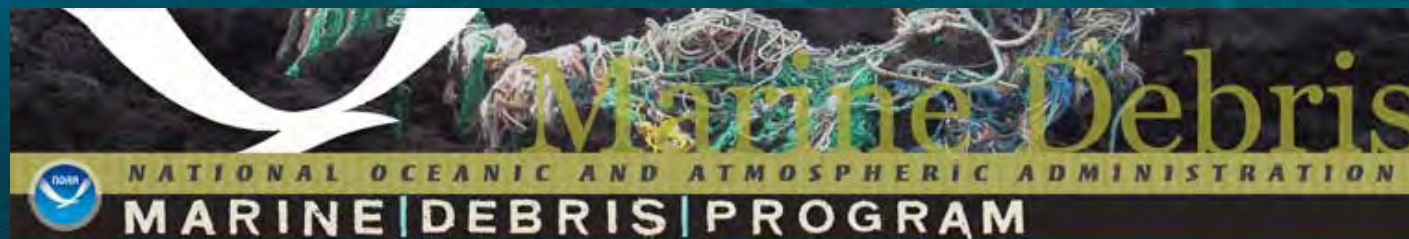
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Results: Environmental factors

**Site total: Shoreline, + Expos
Area, Avg. Wave Height,
Max Wave Height, Avg. Wave Period**

**Plastic: Shoreline, + Expos
Area**

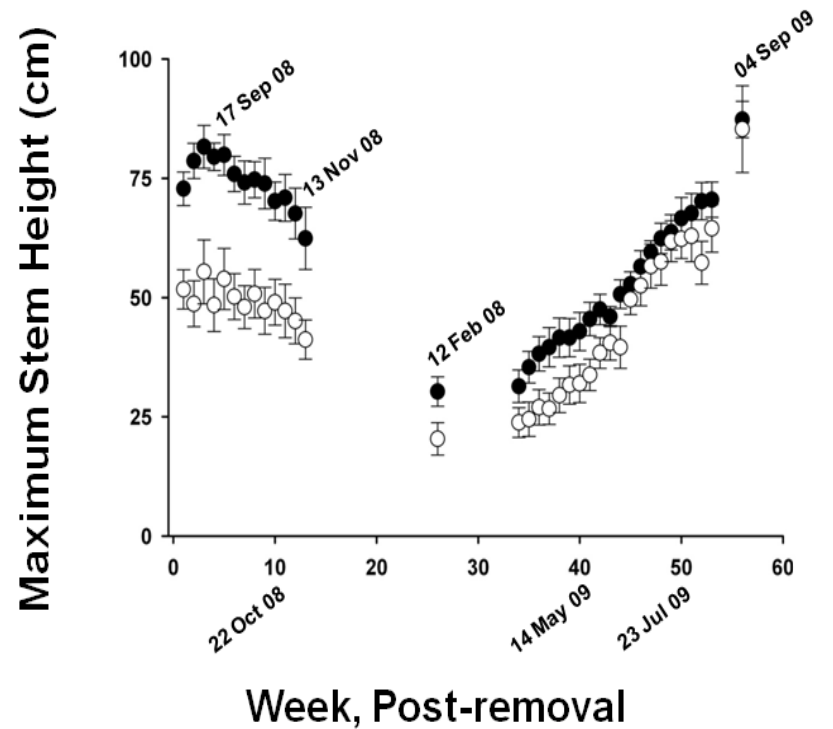
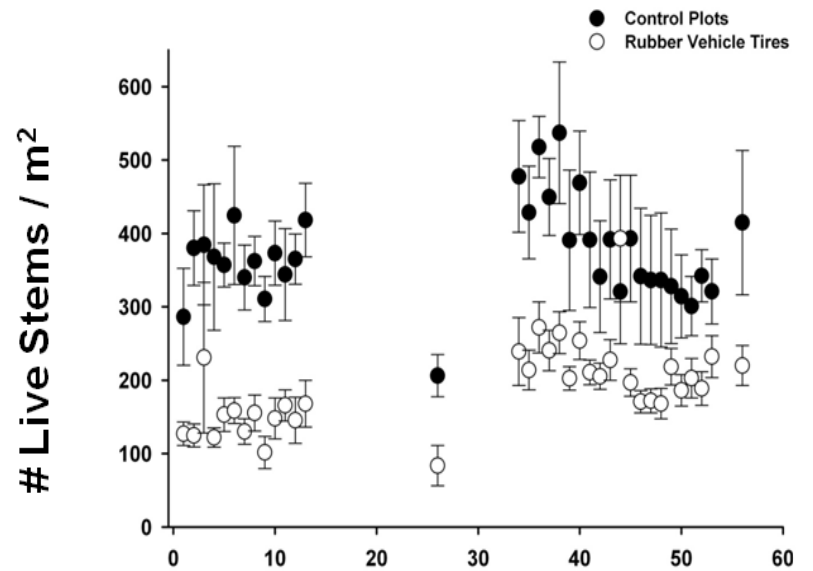
Glass (kg): Area + Mx Wv Dir

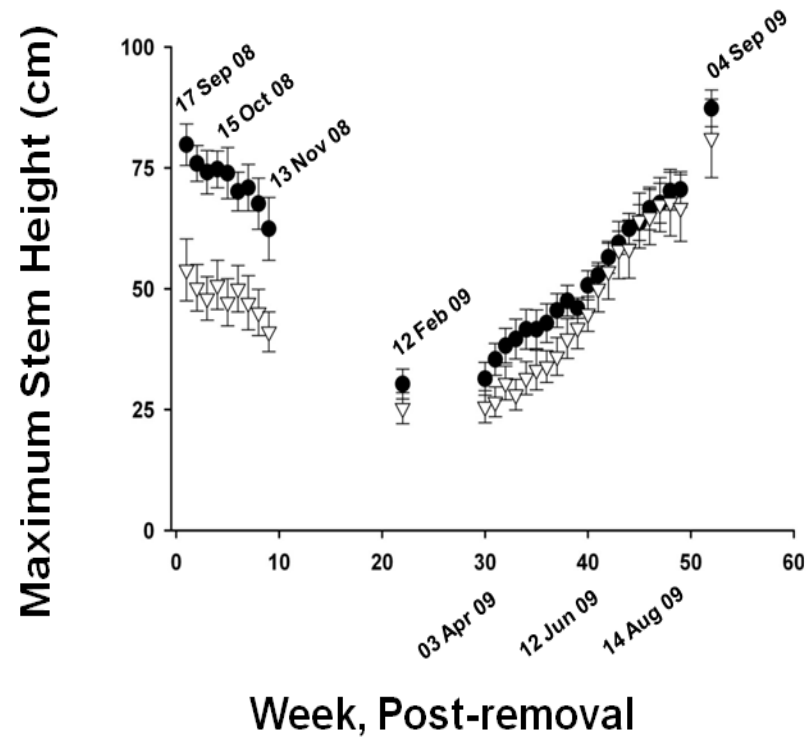
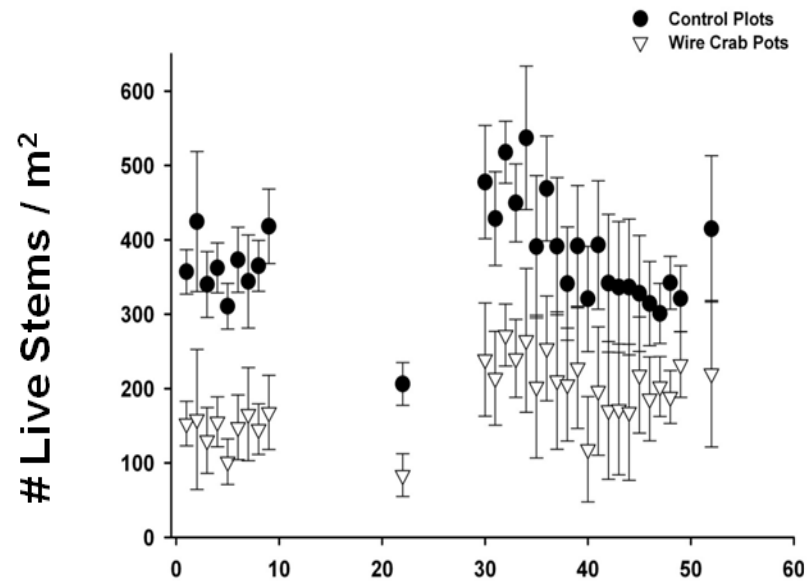
Foam: None

**Wood: Shoreline
Area**

Used WEMo







Summary Conclusions

Direct source for majority of debris

- Focus clean-up efforts in areas near populations or frequented by people

Some debris does have an impact on marsh habitat

- Heavy wood, tires, large nets

Nearshore subtidal habitats, particularly Radio Island Jetty, benefits from annual clean-up

Marsh habitats are sensitive to clean-ups, focus effort on wrack and large items

Management focus would decide type of clean-up (animals, habitat, aesthetics)

Recommendations: Outreach and education to heighten awareness for all users as most effective use of funds