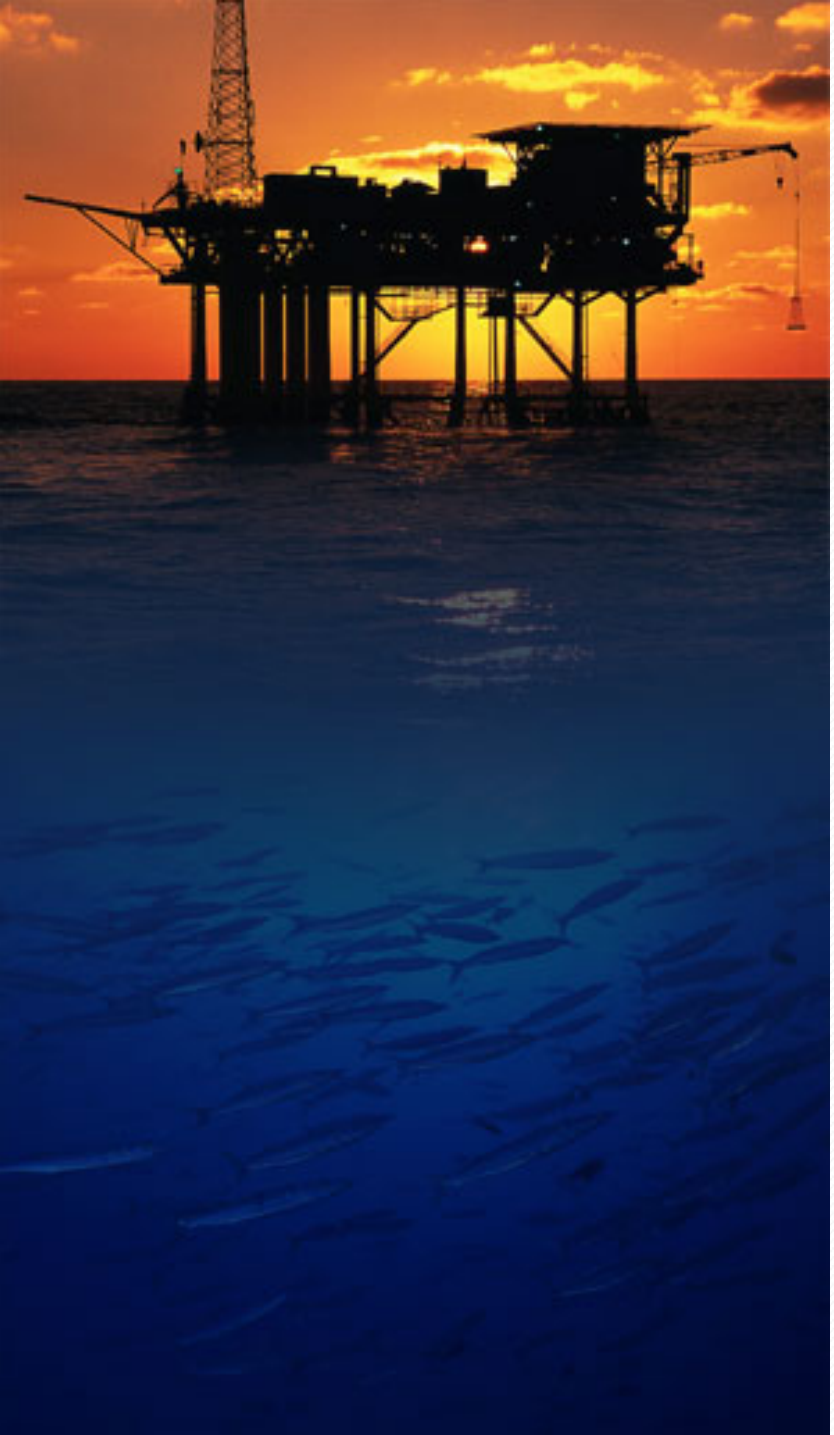

Platform Recruited Reef Fish Phase II: Do Platforms Provide Habitat that Increases the Survival of Reef Fishes?

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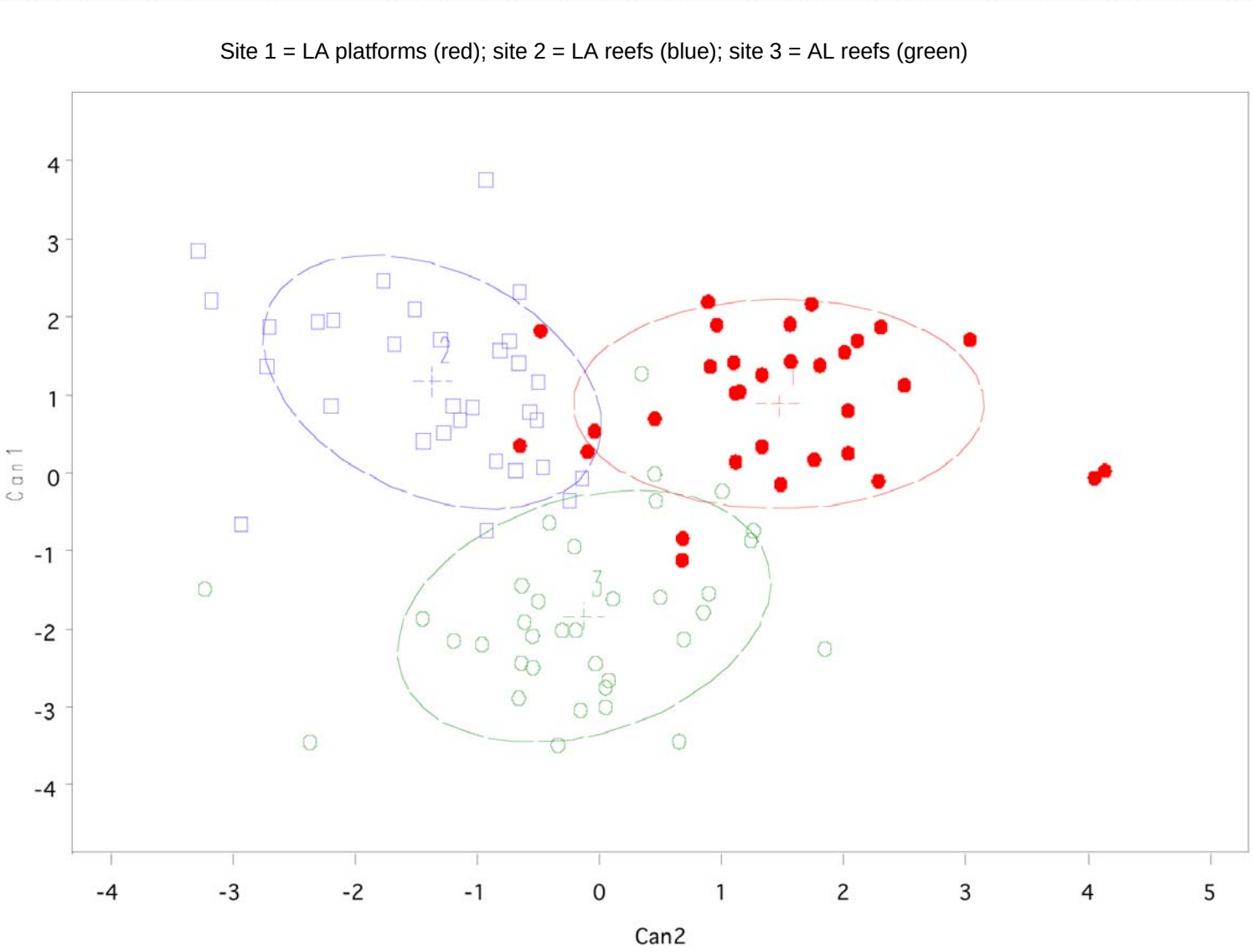
Phase I

- In the pilot study, L. Nowling (2005) determined that LA oil and gas platforms impart detectable signatures in otoliths.
  - Unique signatures for artificial reefs east and west of the River
  - LA platforms had higher concentrations of V^{51}, Pb^{206}, Pb^{207}, and Pb^{208}
  - Concentrations of Cu^{65}, Ag^{107}, Ag^{109}, Cd^{114}, and U^{238} were found at higher levels in otoliths of fish collected from both LA platforms and artificial reefs
    - Mississippi River Runoff?
  - Higher concentrations of Co^{59} and Ni^{62} were found east of the River
  - Despite numerous attempts, samples were not collected from platforms east of the river



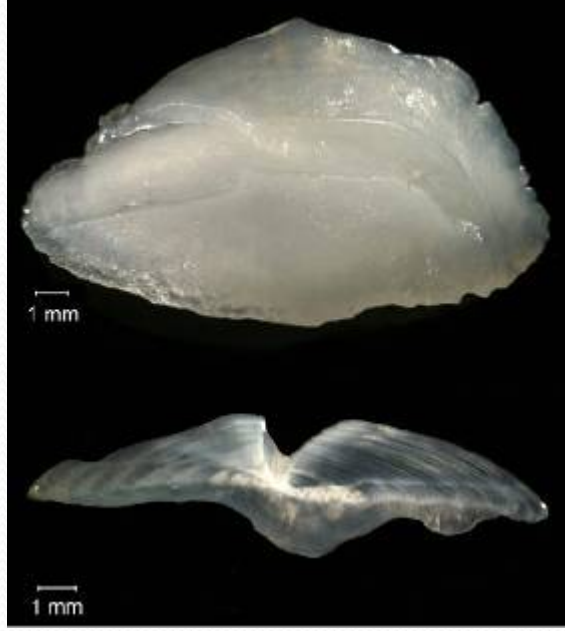
From Nowling (2005). A scatter plot of canonical variable 1 versus canonical variable 2, with observations separated by site, for a comparison of elemental concentration of otoliths collected from all three study sites.

Discriminant function also had 90% classification success!

Phase II

- Goals:
  - Determine whether oil and gas platform elemental signatures are geographically and temporally stable.
  - Examine the source of platform element incorporation into the otolith.
  - Establish whether platforms contribute disproportionately to production of red snapper.

Otoliths

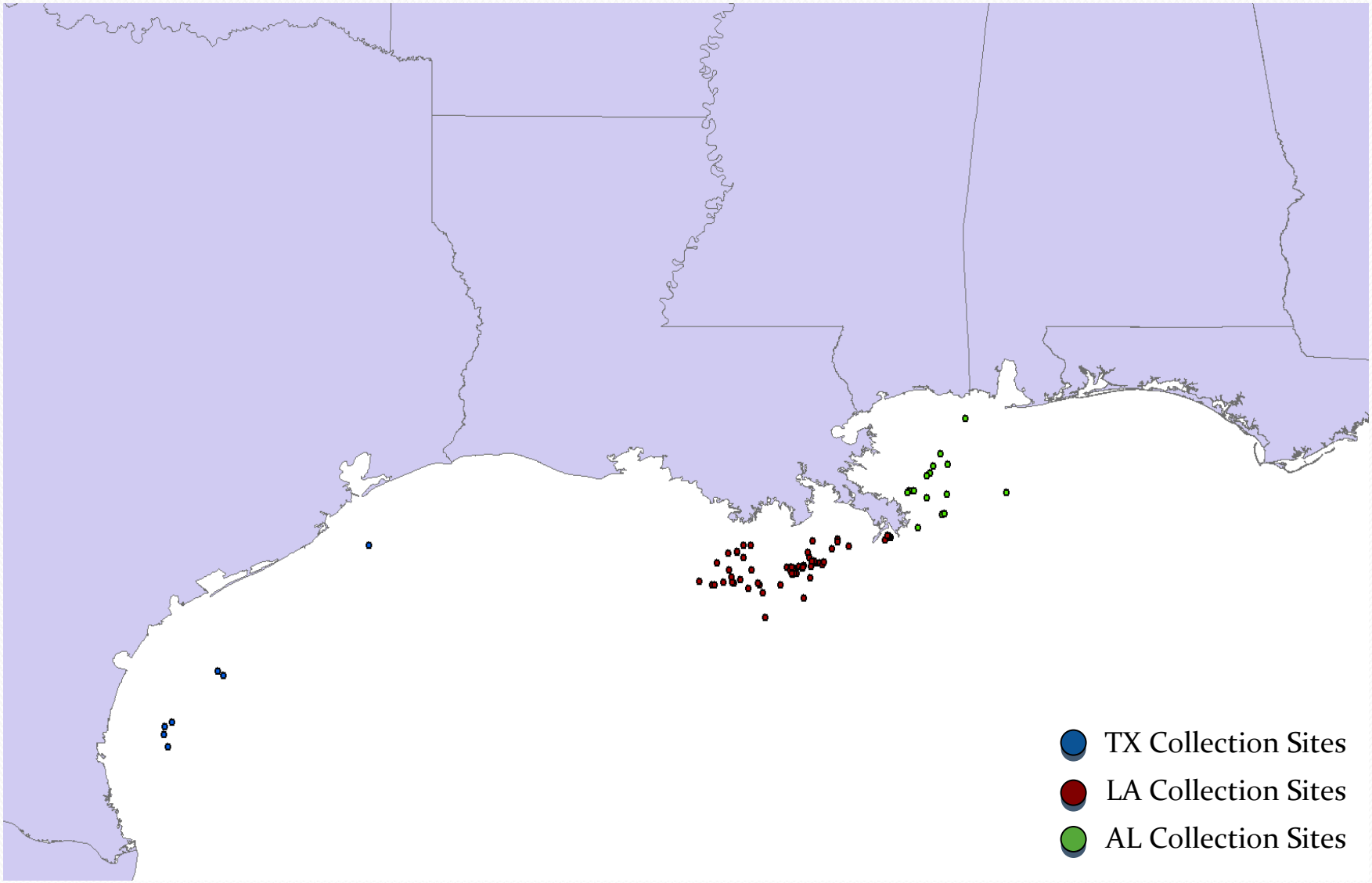


- Otoliths
  - Calcium carbonate earstones and metabolically inert
    - Hearing and balance
    - Life history
  - Water > Gills/Intestines > Blood > Endolymph > Otolith
  - Heavy trace metals replace Ca in the $CaCO_3$ matrix

Phase II

- Red Snapper have been opportunistically collected during the 2007 and 2008 fishing seasons
  - 1,000 samples each year (from platform and other habitats)
  - 500 LA, 300 TX, and 200 AL
- Snapper have been collected from recreational fisheries, fishing rodeos, and the NFMS Vertical Longline Survey

2007 Otolith Collection Sites

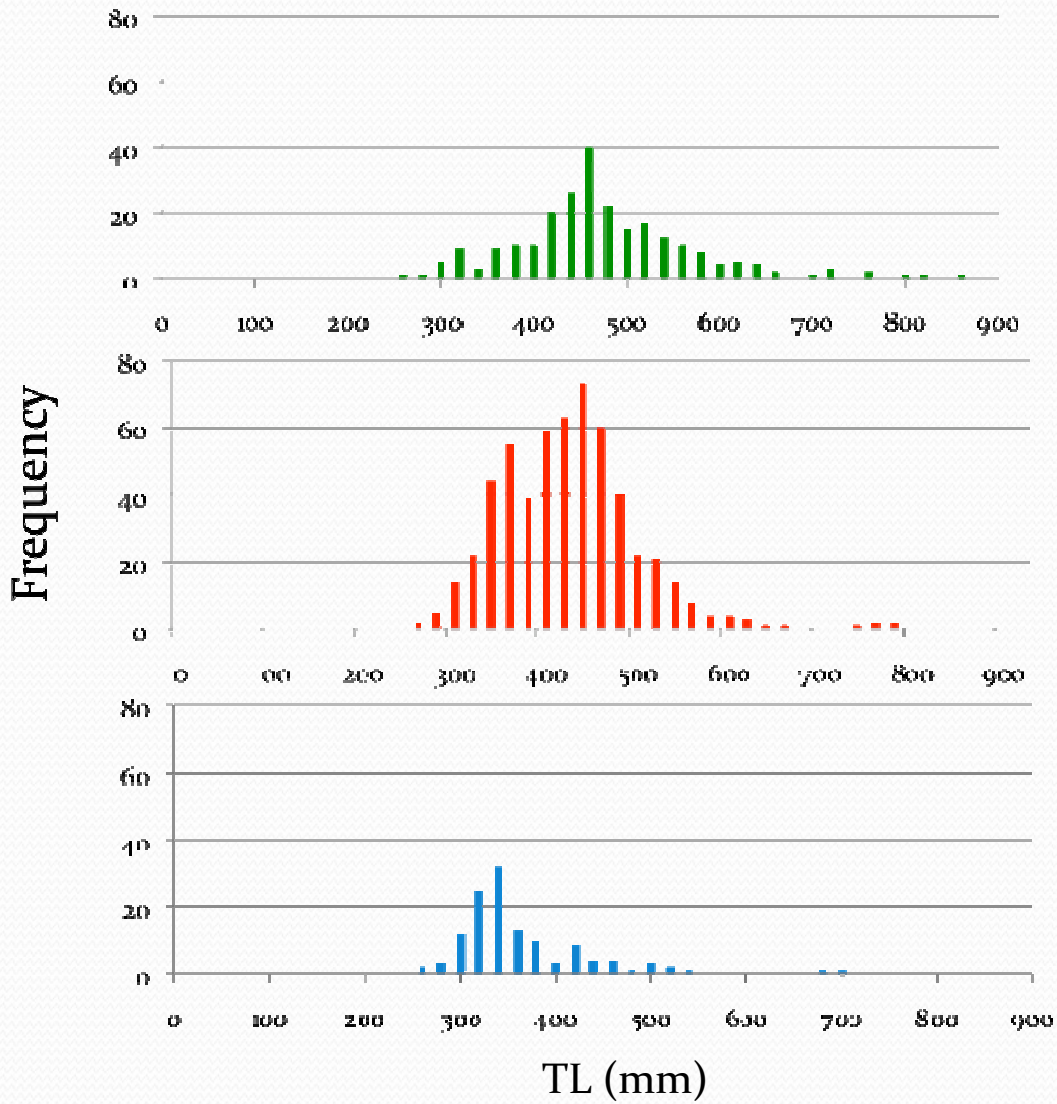


2007 Otolith Samples

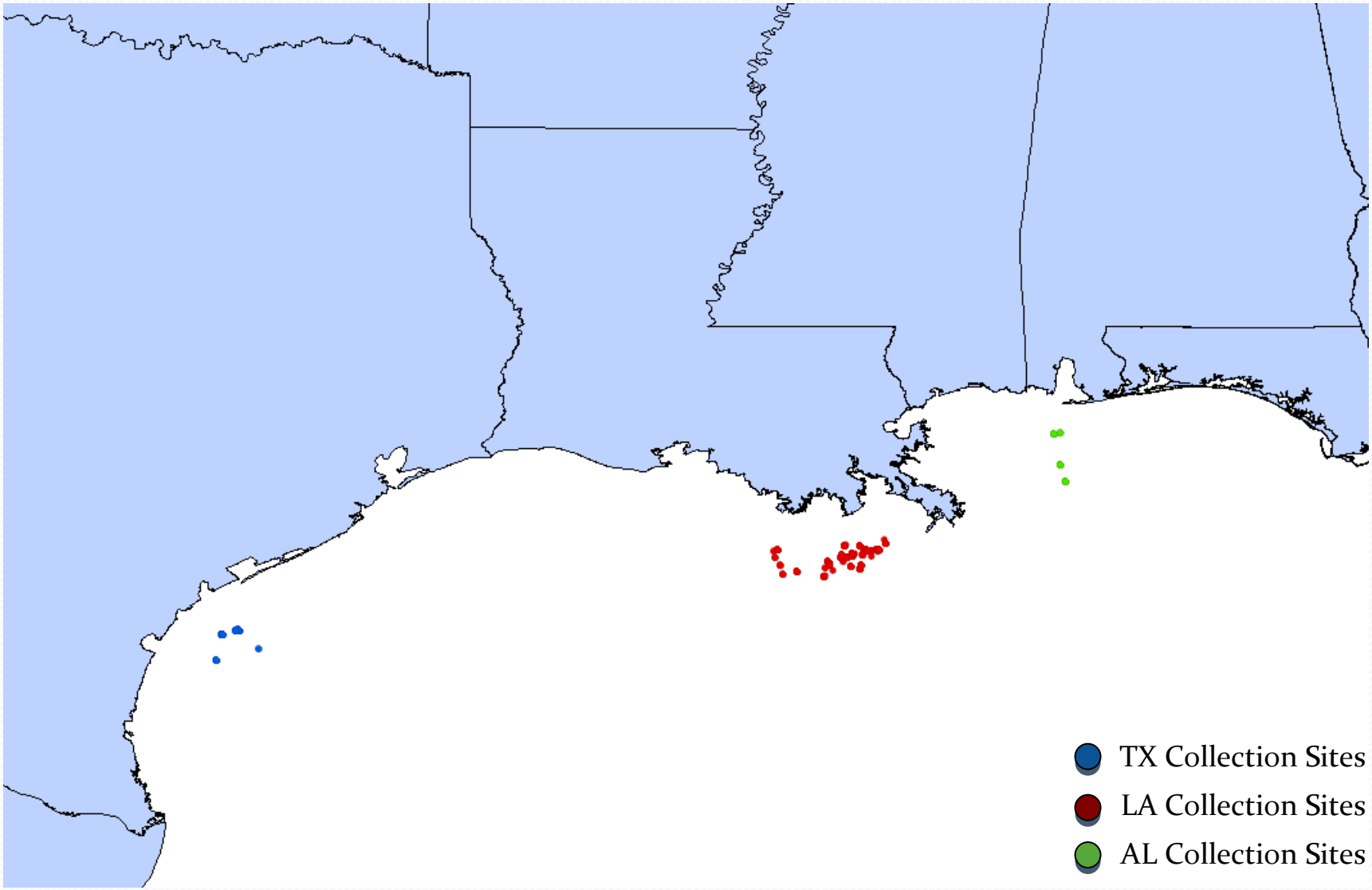
Alabama	
Rig	105
Non-Rig	138
Total	243

Louisiana	
Rig	392
Non-Rig	168
Total	560

Texas*	
Rig	299
Non-Rig	72
Total	371



2008 Otolith Collection Sites

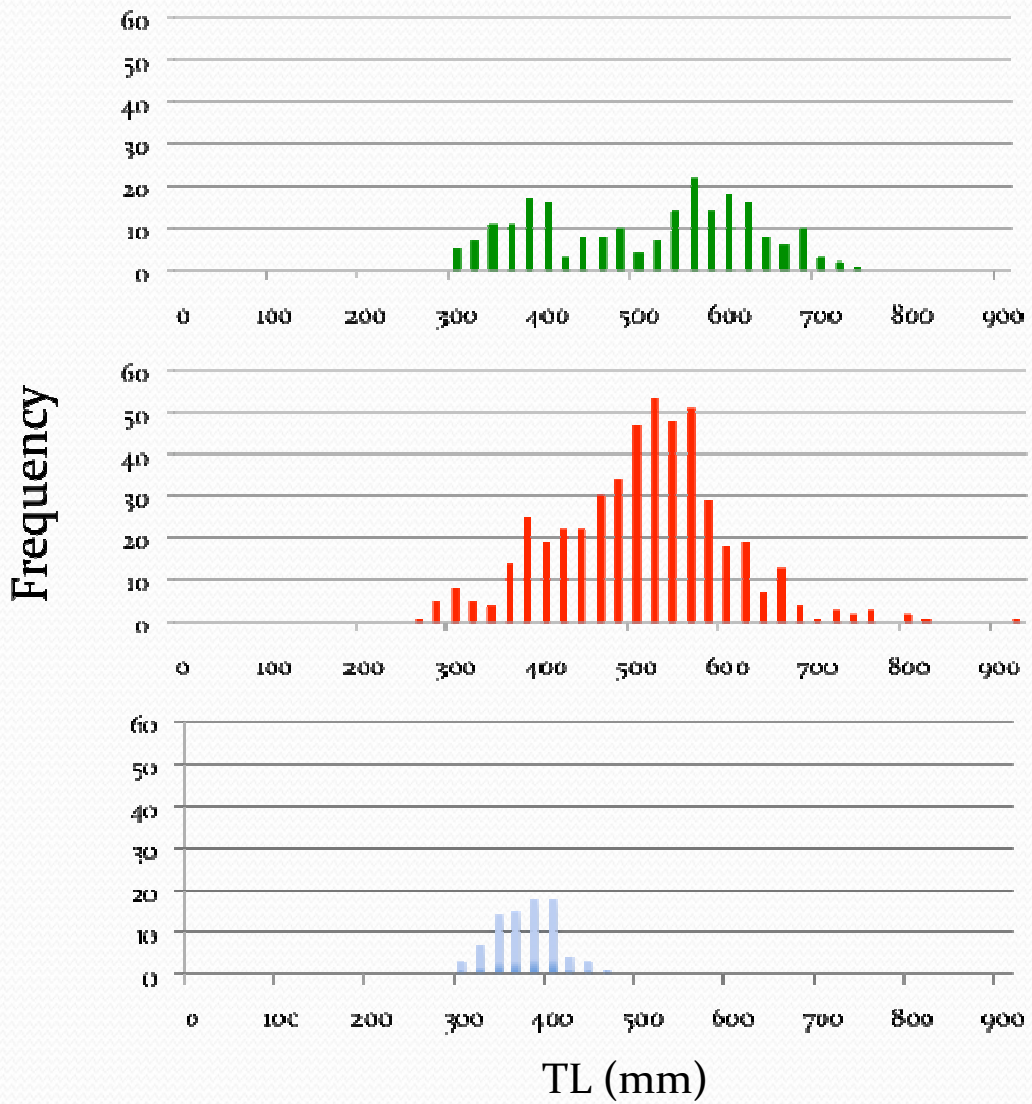


2008 Otolith Samples

Alabama	
Rig	87
Non-Rig	134
Total	221

Louisiana	
Rig	347
Non-Rig	145
Total	492

Texas*	
Rig	283
Non-Rig	33
Total	316



Otolith Samples

- Originally planned to clean in a class-100 clean room
  - Soak in a tube of 3% hydrogen peroxide in a sonic bath
  - Rinse with ultra-pure water
  - Soak in 1% nitric acid
  - Rinse with ultra-pure water
  - Dry, place in clean tubes, place in double ziploc bags
  - Send to A. Shiller at USM for total digestion and HR-ICP-MS analysis
    - V^{51}, Co^{59}, Ni^{62}, Zn^{64}, Zn^{66}, Cu^{65}, Ag^{107}, Ag^{109}, Cd^{110}, Cd^{111}, Cd^{114}, Pb^{206}, Pb^{207}, Pb^{208}, and U^{238}
    - Same used in Phase I due to association with platforms

Otolith Samples

- 20 initial AL samples sent for analysis
  - All samples at or below detection limits
- Decided new methods were needed
  - An ICP-MS cannot tolerate high levels of calcium
  - Total digestion only allows ~1% of sample to be analyzed
    - Trace elements = 1% of the otolith
  - Extract method needed
    - Remove Ca can then analyze all of sample
- Details are still being worked out
  - Delays = hurricanes, machine break downs, backed-up

Elemental Incorporation Pathways

- Summers of 2007 and 2008, 50 barnacle and 50 sediment samples have been collected each year
  - Barnacles removed from platform legs at water surface
  - Sediment samples collected with Ponar grab (Teflon)

Barnacle Samples

- Shells to be analyzed the same as otolith samples.
  - Both otolith and barnacle shells composed of $CaCO_3$
  - Trace metals replace Ca in matrix

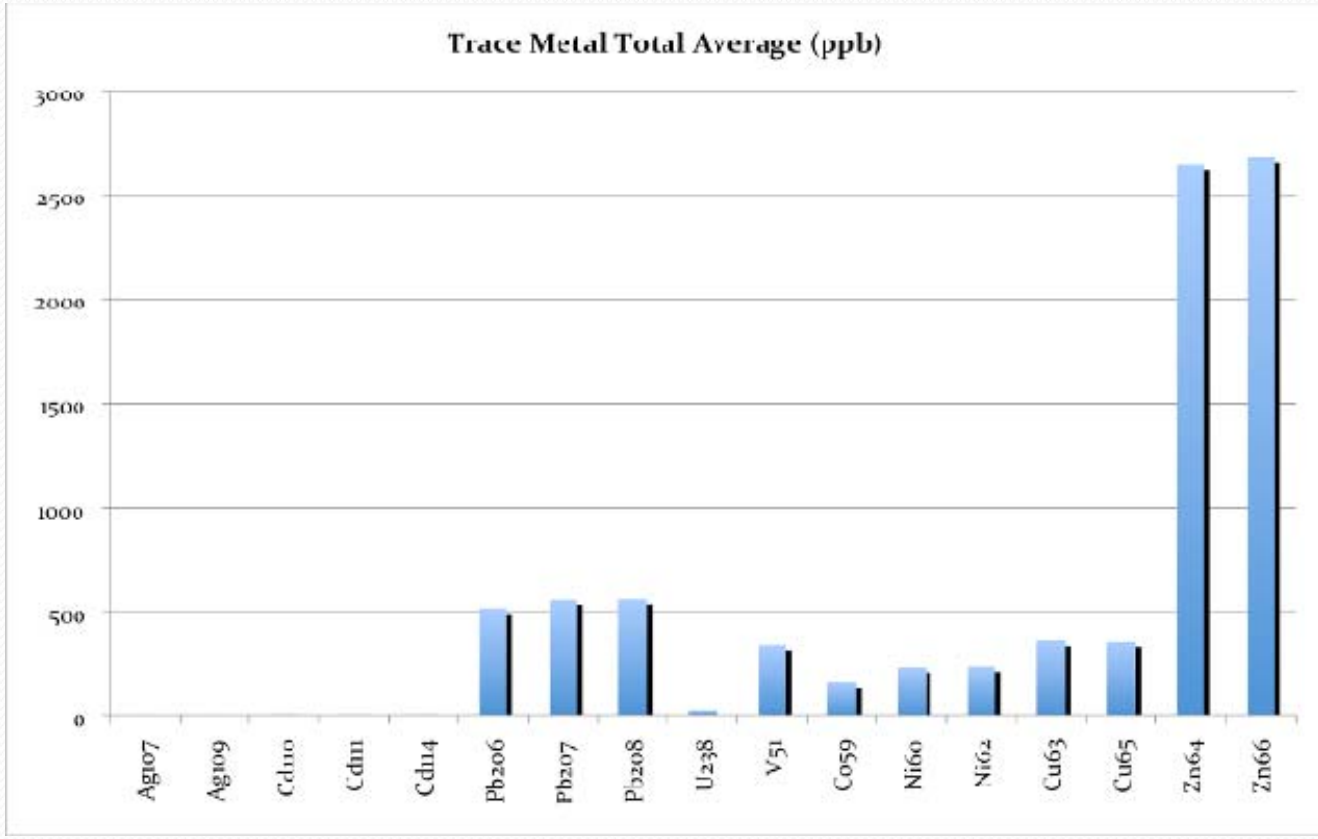
Sediment Samples

- 5g (wet weight) of sediment were dried at 105°C for 24 hours
- Dry sediment was pulverized with an agate mortar and pestle
- 1g of dry sediment was added to 20mL of 1M HCl, and placed on an orbital platform shaker at 30°C for 1 hour
- Centrifuged at 3,500 rpm for 5 minutes
- Supernatant was filtered through 0.45µm polypropylene syringe filters
- 1mL of the filtered supernatant sent to A. Shiller

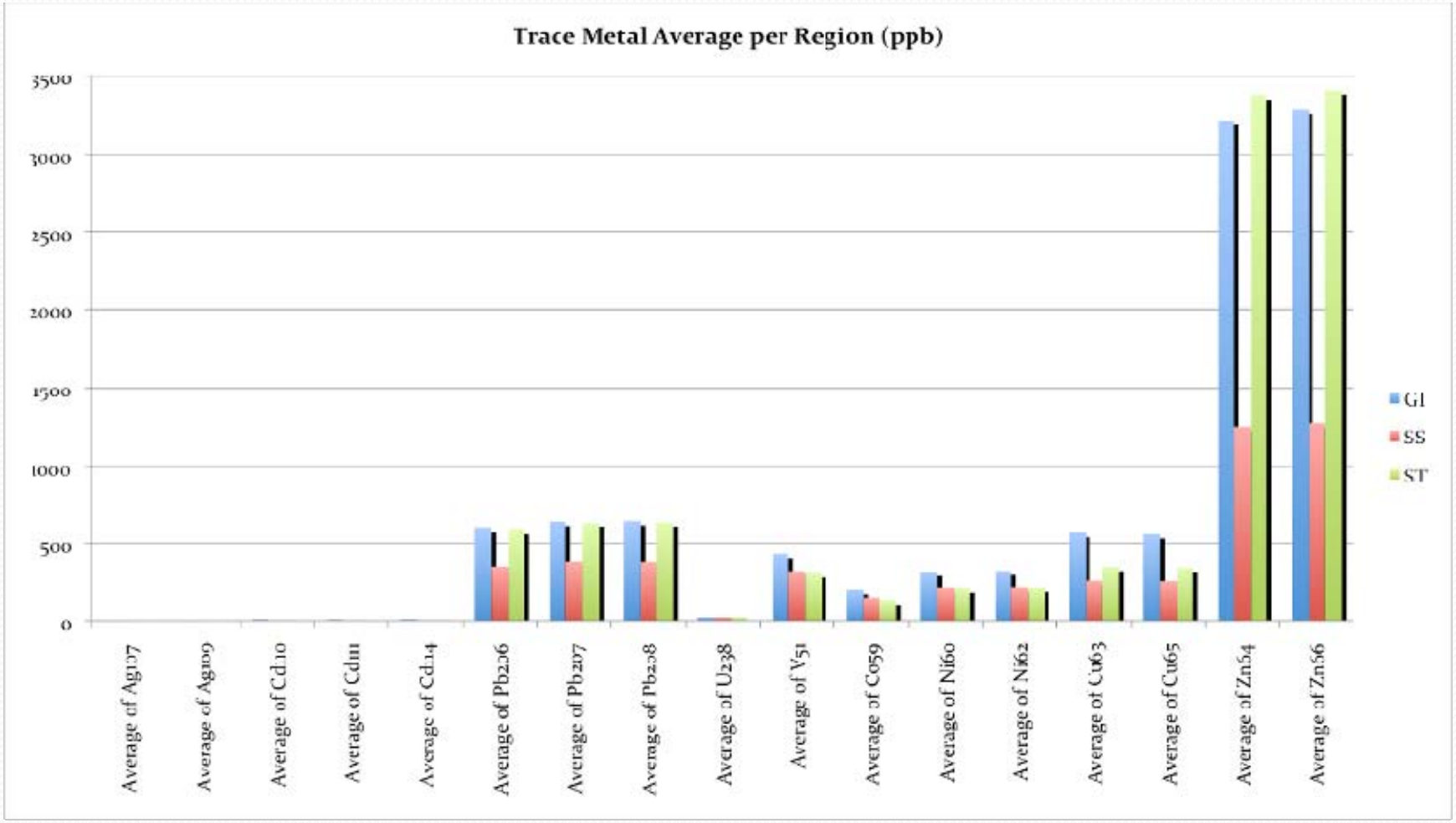
2007 Sediment Samples

Remember from Phase I:

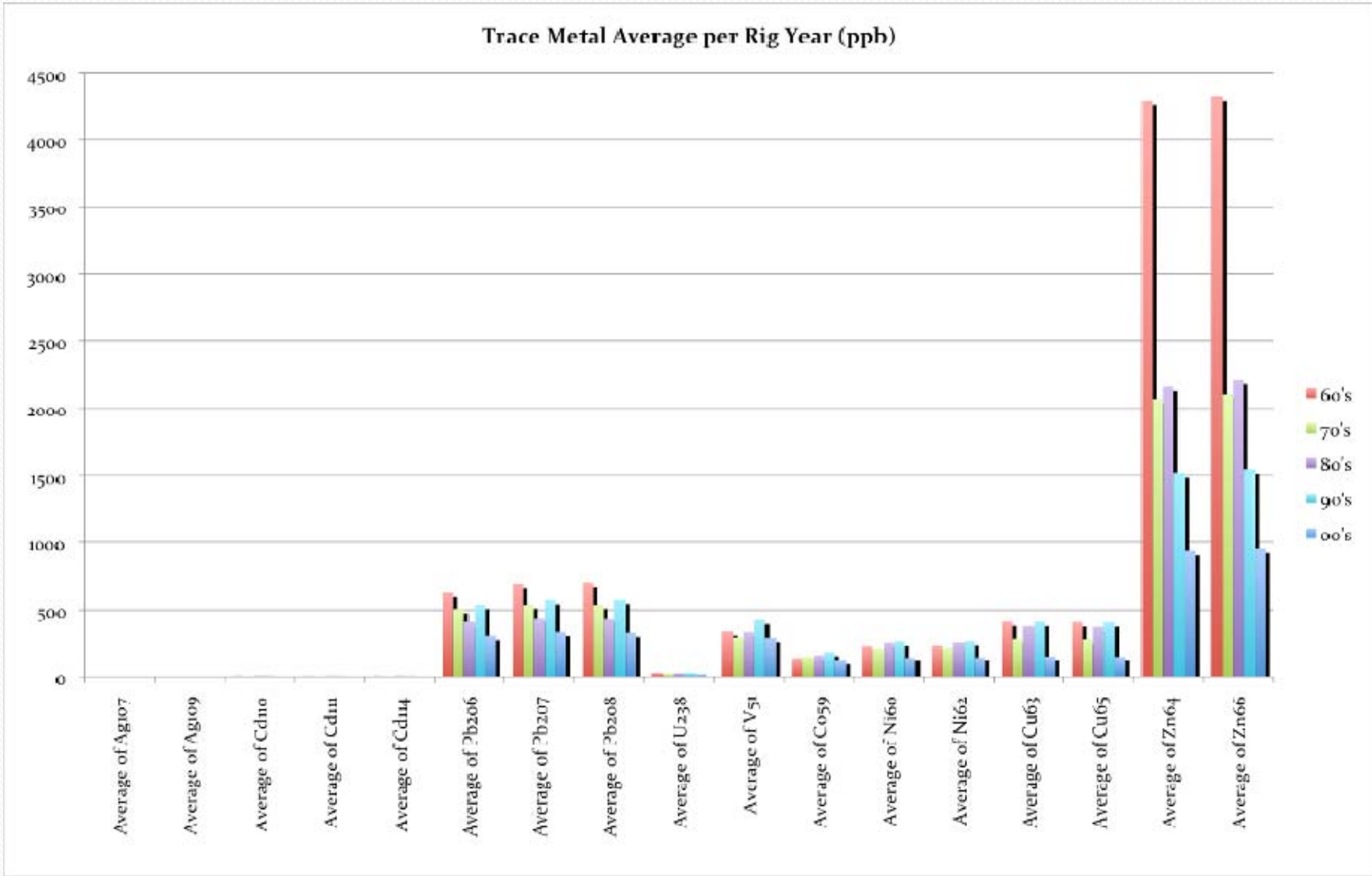
- LA Platforms = V^{51}, $Pb^{206, 207, 208}$
- West River = Cu^{65}, $Ag^{107, 109}$, Cd^{114}, U^{238}
- East River = Co^{59}, Ni^{62}



2007 Sediment Samples



2007 Sediment Samples



2009 – Year 3

- Otoliths will be collected from natural habitats from FL (middle grounds), LA and TX.
  - 300 FL, 200 LA/TX
- Otoliths will be sectioned, cored and prepared for HR-ICP-MS to determine if reared on platforms.
- If platform signals are detected, a subsample of the opposite otoliths will be used to examine individual annual increments
  - Age at migration
  - MicroMill vs LA-ICP-MS?

Relevance

- These results may contribute to the resolution of the attraction versus production debate by determining an estimate of percent contribution that platform-reared recruits provide to the total adult population.
  - Expected value estimates?
  - Collect any snapper with signature = Importance
- These results, combined with current and future studies, will provide further insight into the role of oil and gas platforms as fish habitat.

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- NMFS Pascagoula Lab

MMS

LSU

Reference

Nowling, L. 2005. Platform recruited reef fish, phase I: Do platforms provide habitat that increase the survival of juvenile reef fishes? Master's thesis, Department of Oceanography and Coastal Sciences, Louisiana State University, Baton Rouge, LA.