

# Performance Evaluation of the Western Sambo Ecological Reserve



## A Presentation to the FKNMS Marine Zoning and Regulatory Review's Ecosystem Protection Working Group

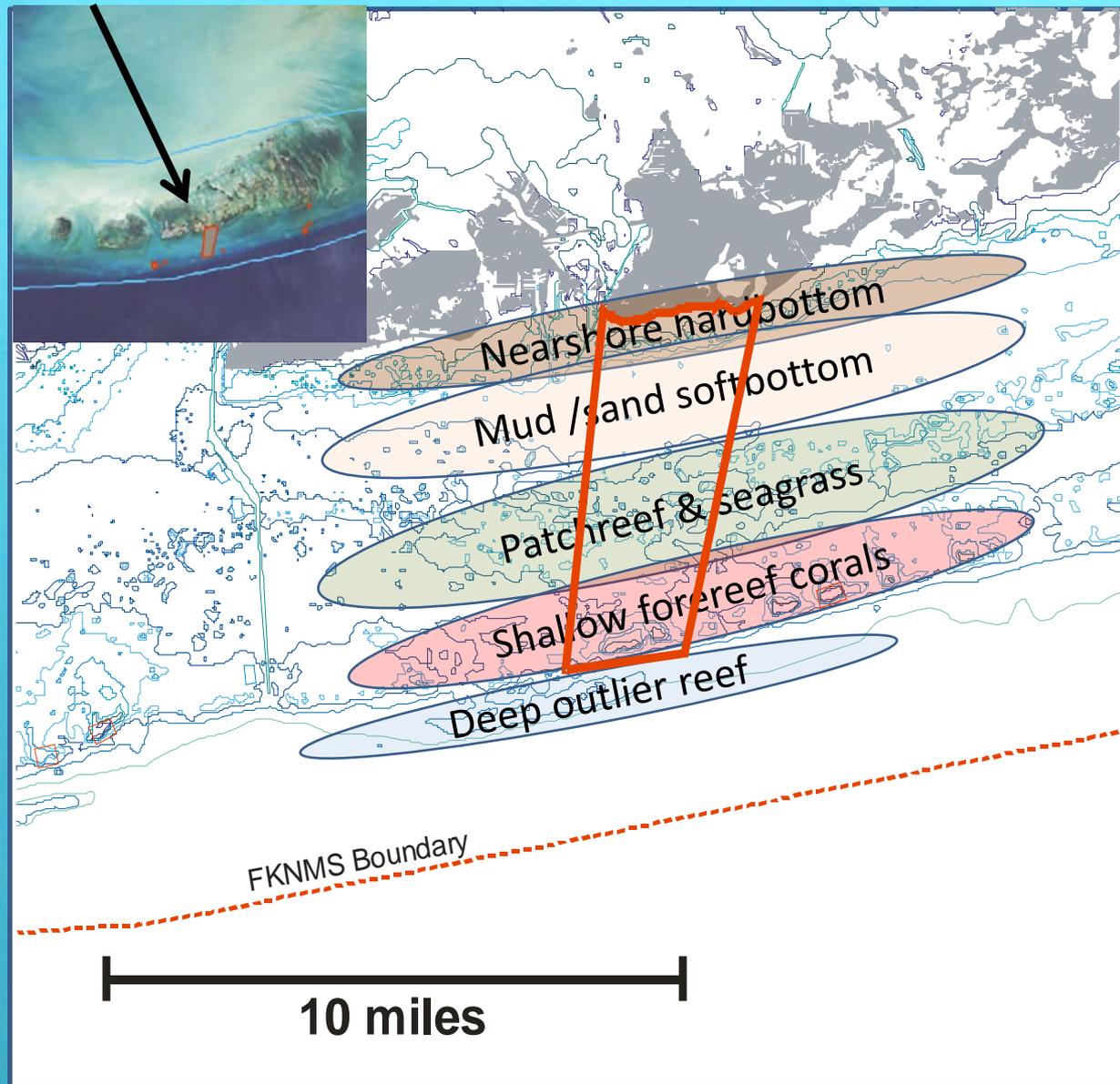
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Florida Fish and Wildlife Conservation Commission  
Fish and Wildlife Research Institute



# Western Sambo Ecological Reserve

- Established in 1997
- 11.6 square miles
- Intended to protect large areas of contiguous and diverse habitats
- Intended to protect permanent-residence areas needed for sustainable populations of fish and other marine life



# Study Organisms

Caribbean Spiny Lobster



Finfish

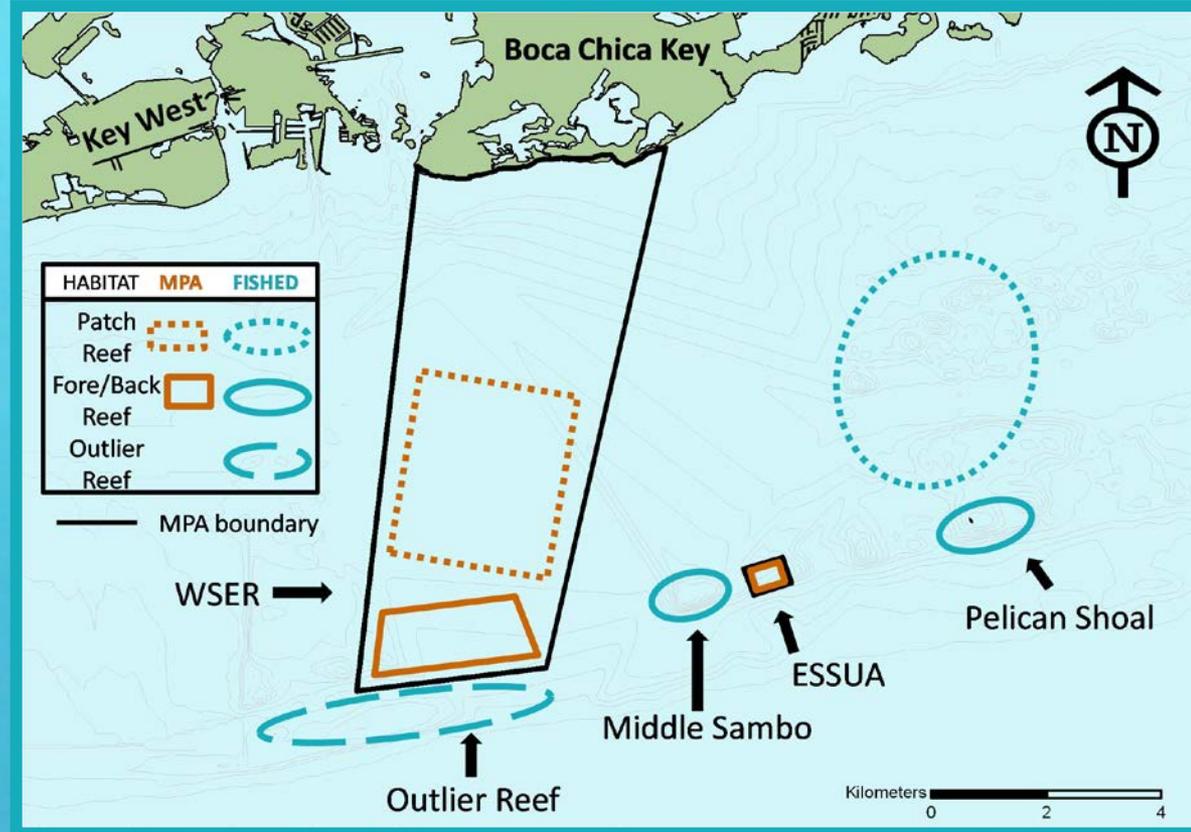


# Spiny lobster

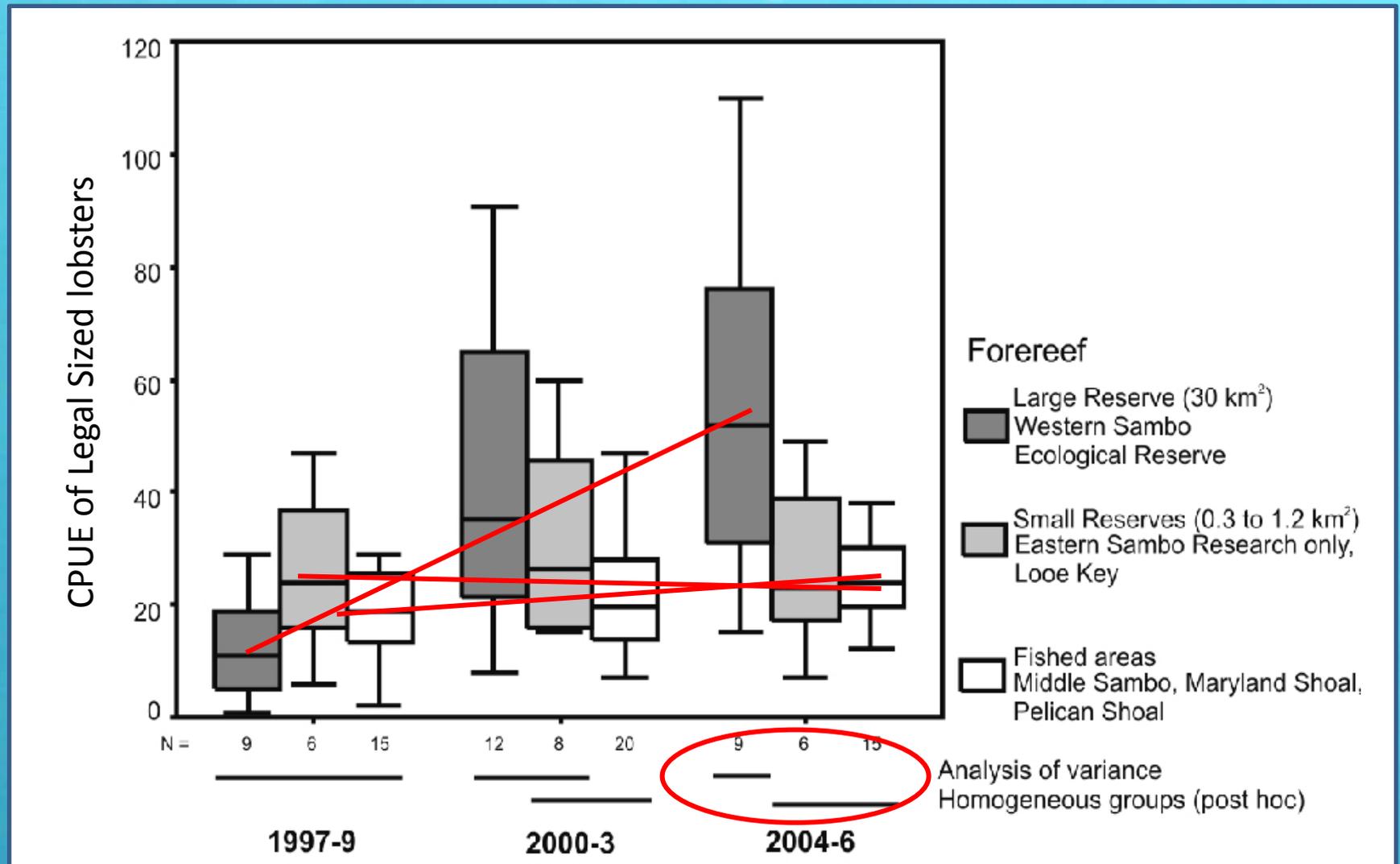


# Spiny Lobster Surveys

- Compared spiny lobster abundance and size structure in WSER to adjacent MPAs and fished areas



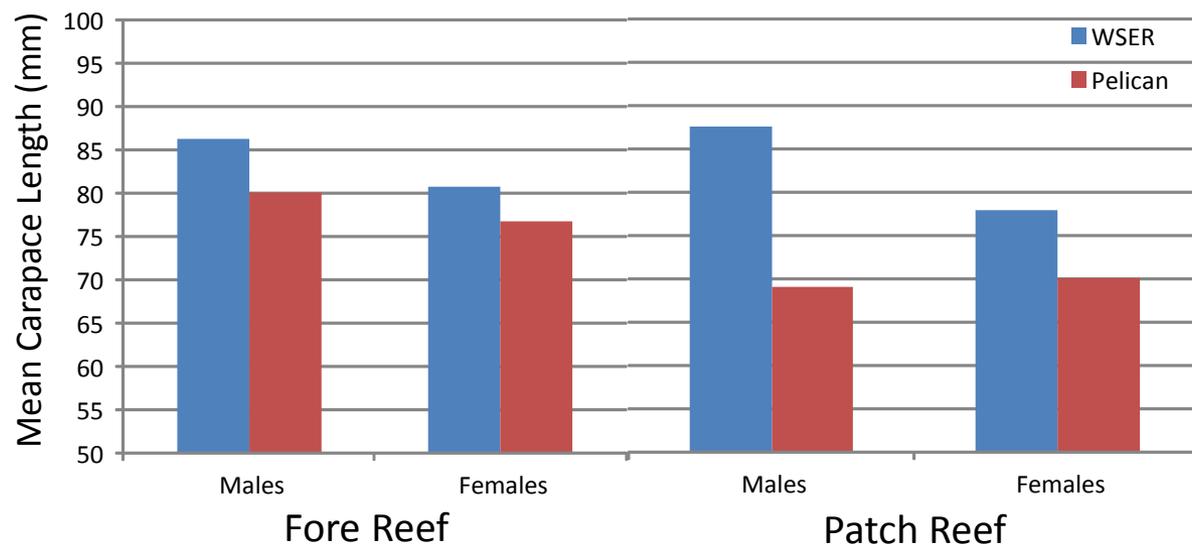
# Relative abundance of legal sized Caribbean spiny lobsters within WSER, nearby smaller reserves, and fished areas: 1997 - 2006



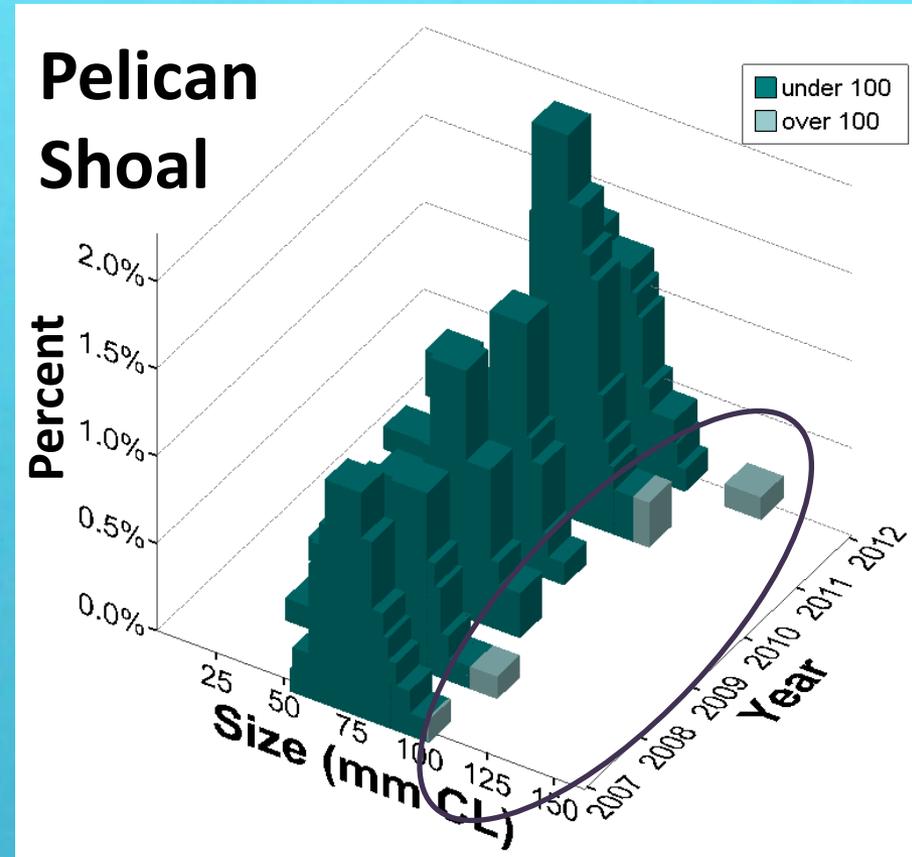
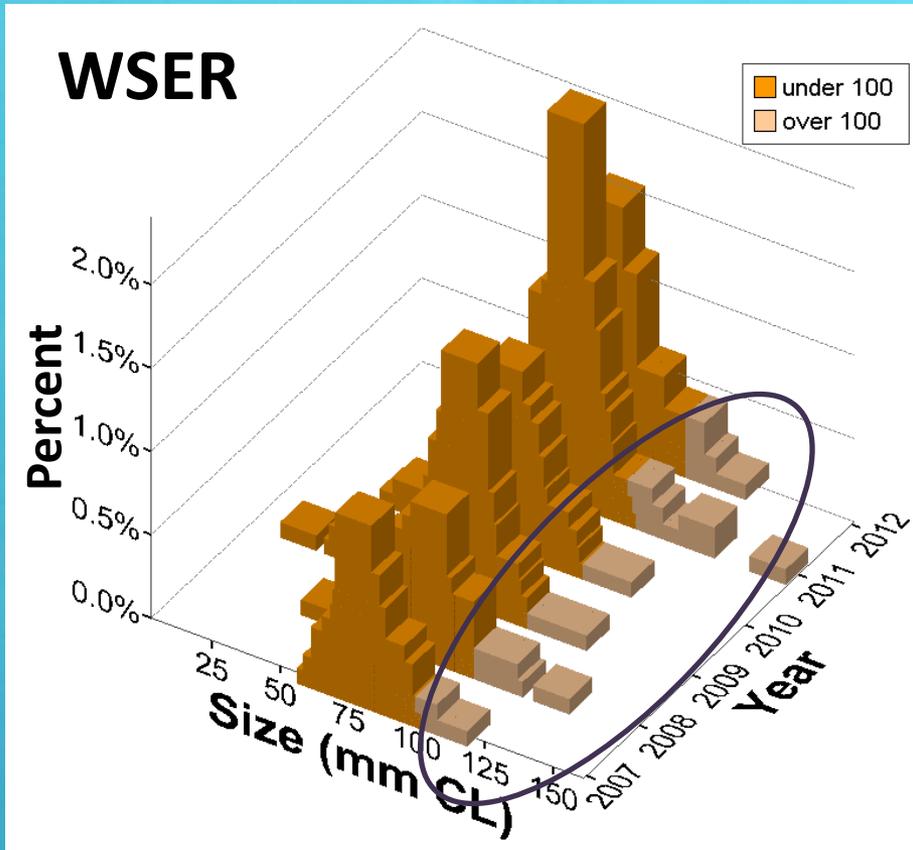
# Comparison of Lobster Size Structure WSER and Pelican Shoal 2004 - 2012



- Lobsters of both sexes larger within WSER compared to Pelican Shoal
- Within WSER, largest male lobsters typically observed on the patch reefs



# Comparison of Lobster Size Structure WSER and Pelican Shoal 2007 - 2012



- Lobsters larger than 100-mm carapace length more common in WSER compared to Pelican Shoal

# What do these data tell us?...

- Some lobsters are resident within WSER
  - Age/growth study found lobsters that were composed of many year classes; those in unprotected areas of FKNMS were largely only 1-2 years post-settlement; some lobster within WSER same age as the reserve
  - Males larger than females of the same age

Maxwell, K.E. et al., 2013 *Fisheries Research* 144: 84-90

- Presence of large males very important
  - Females preferentially mate with larger males
  - Females with large males produce more viable eggs compare to females that mate with smaller males

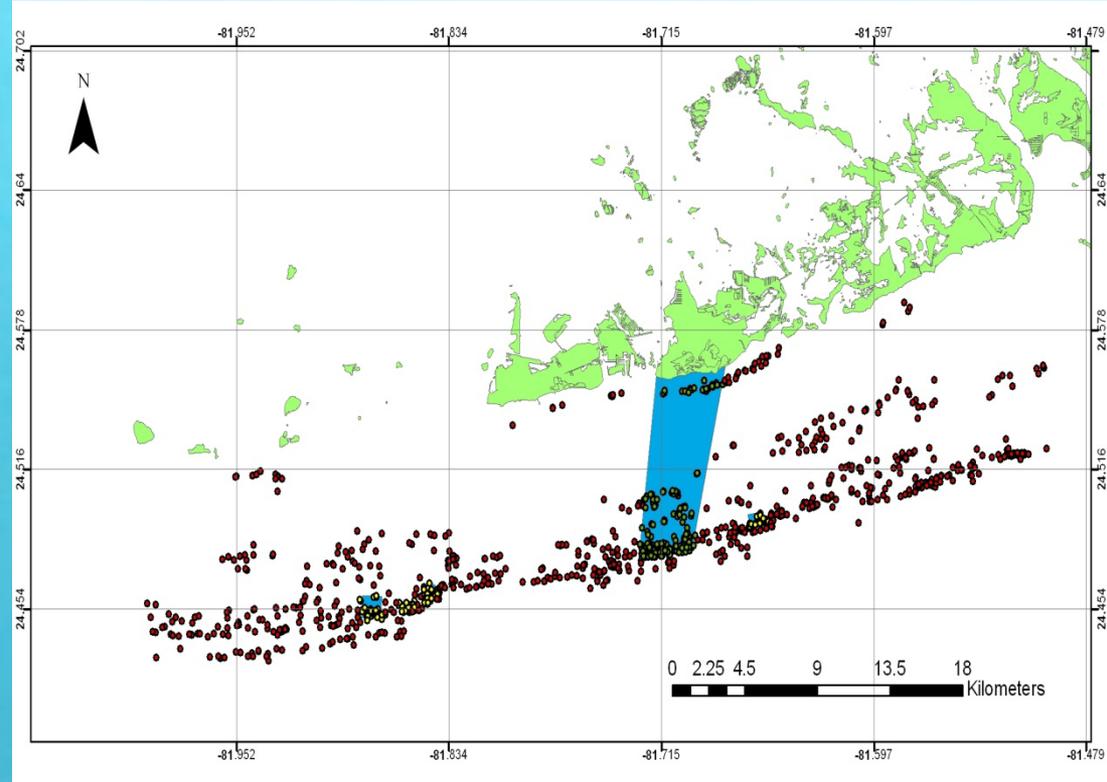
MacDiarmid and Butler. 1999. *Behavioral Ecology and Sociobiology*. 46: 14-24

# Finfish



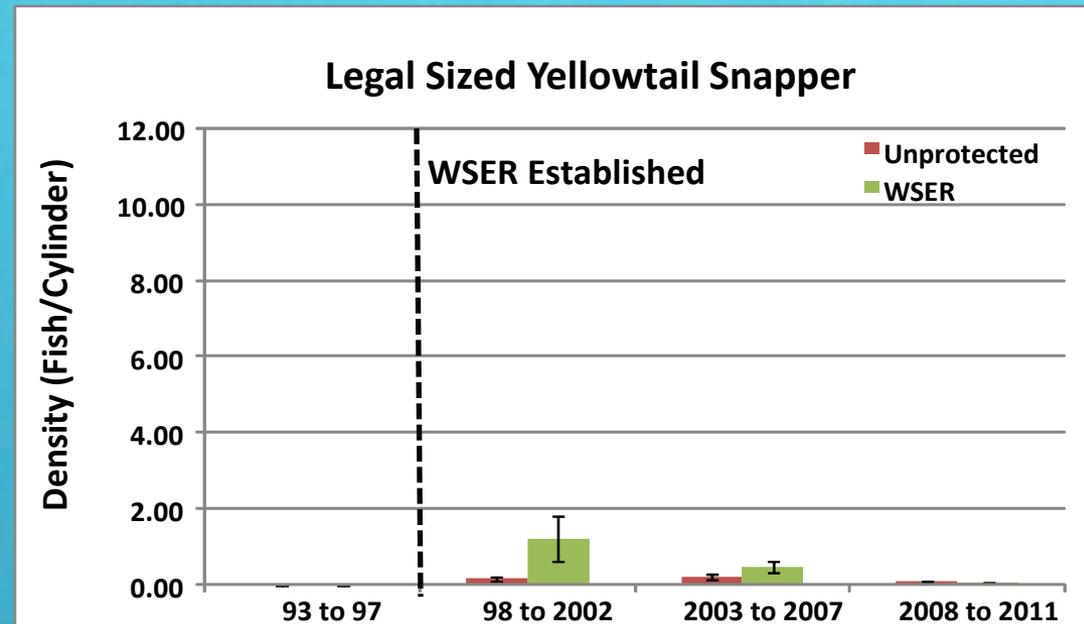
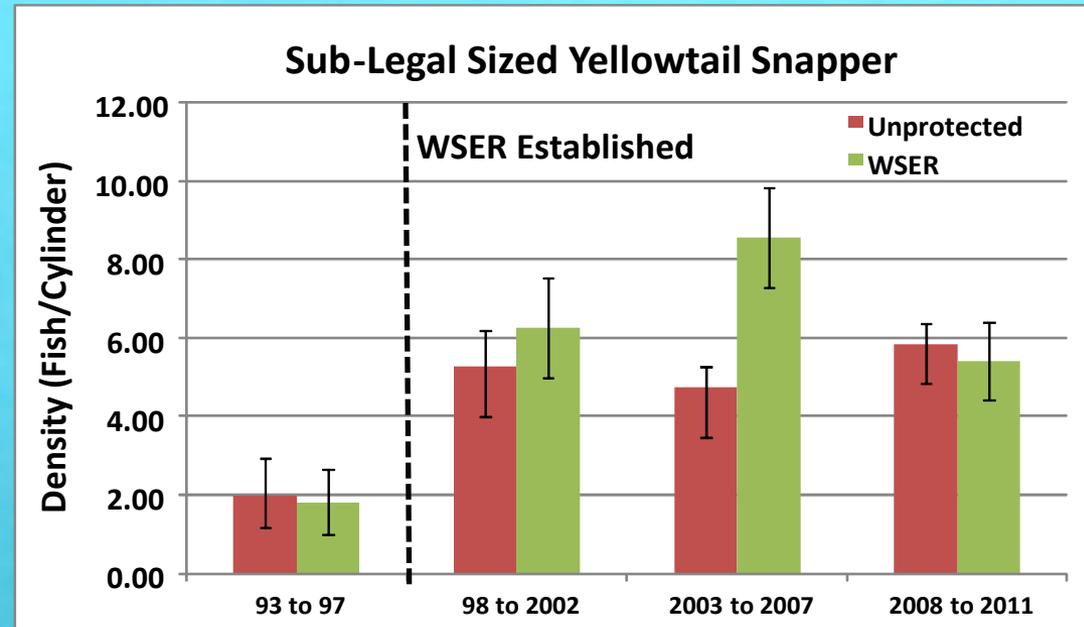
# Finfish Surveys

- Multi-agency program that surveys finfish throughout Florida Keys
- Compared fish density and size in WSER to nearby fished areas



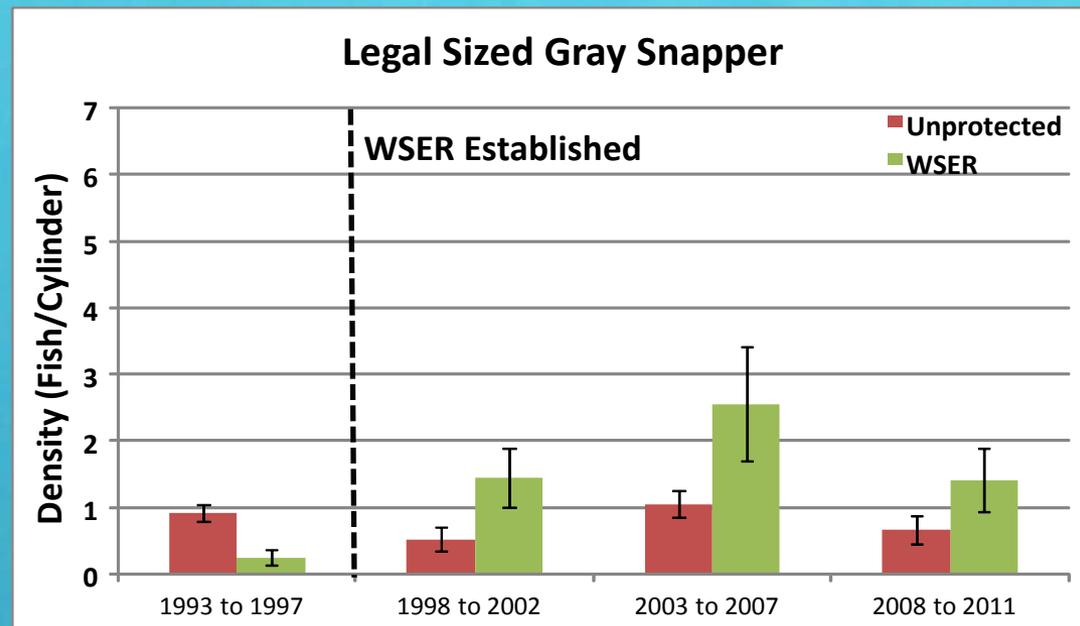
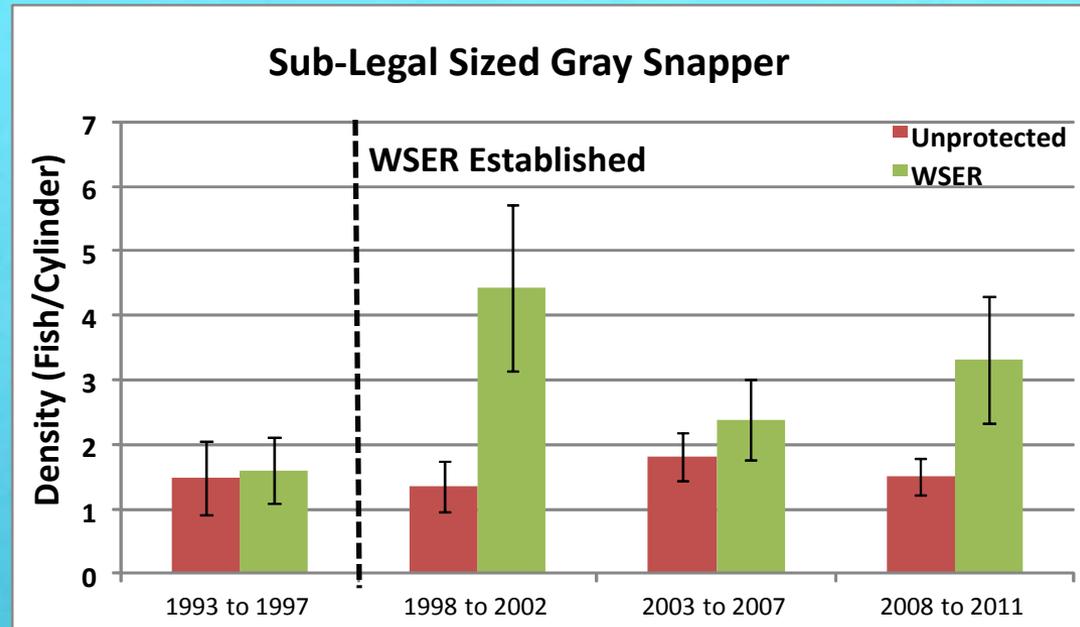
# Yellowtail Snapper

- No detectable reserve effect
- WSER patch reefs and seagrass beds provide high-quality sub-adult habitat
- Adults typically farther offshore than boundary of WSER



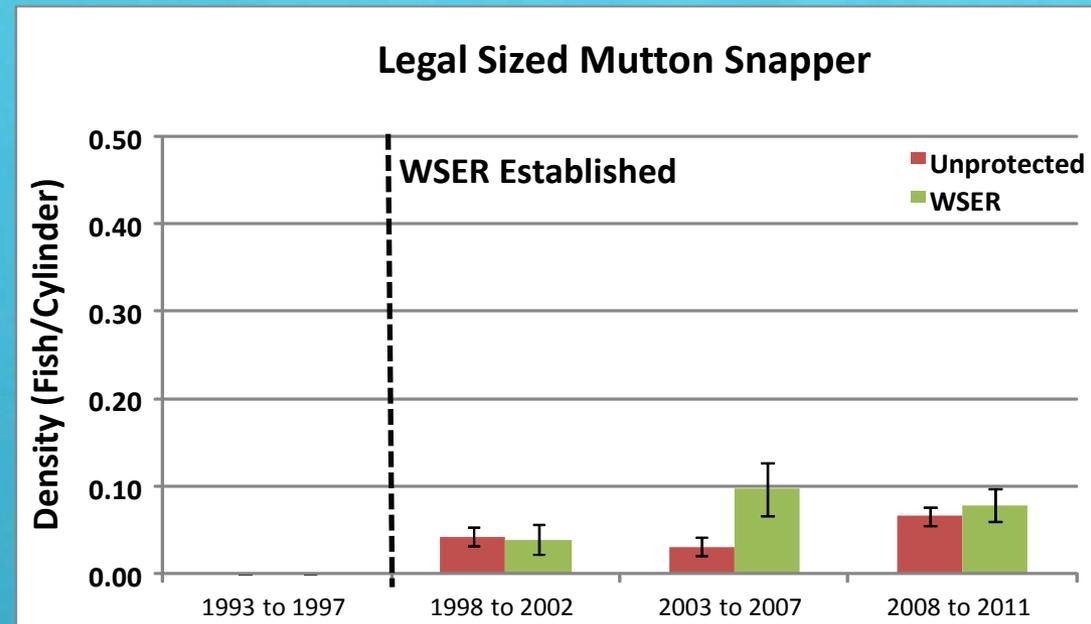
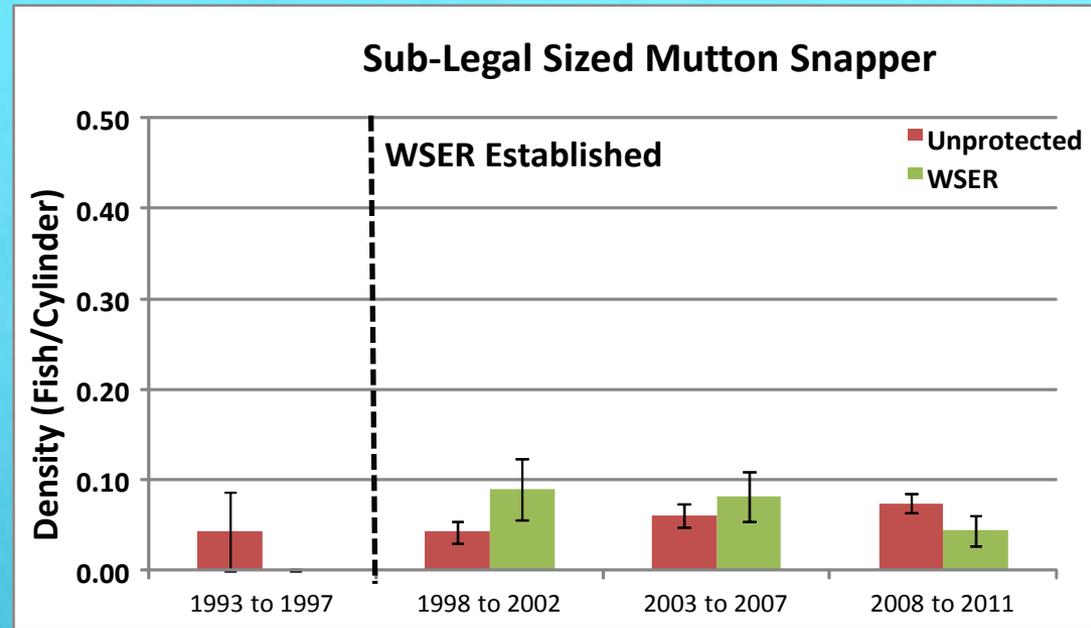
# Gray Snapper

- Substantial reserve effect
- WSER habitats provide protection for entire gray snapper life history



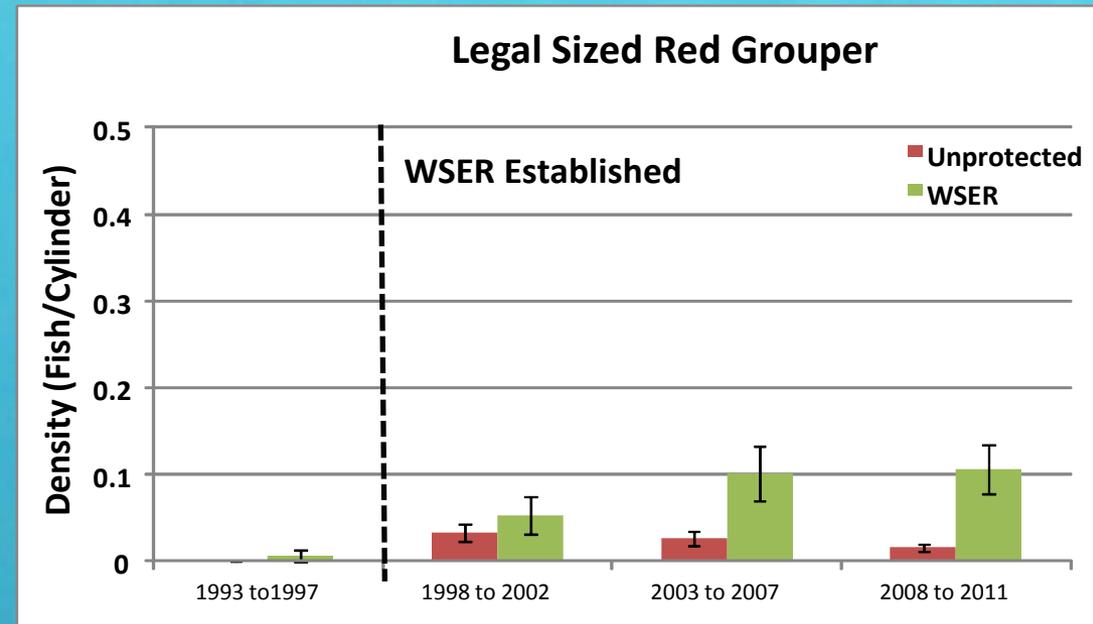
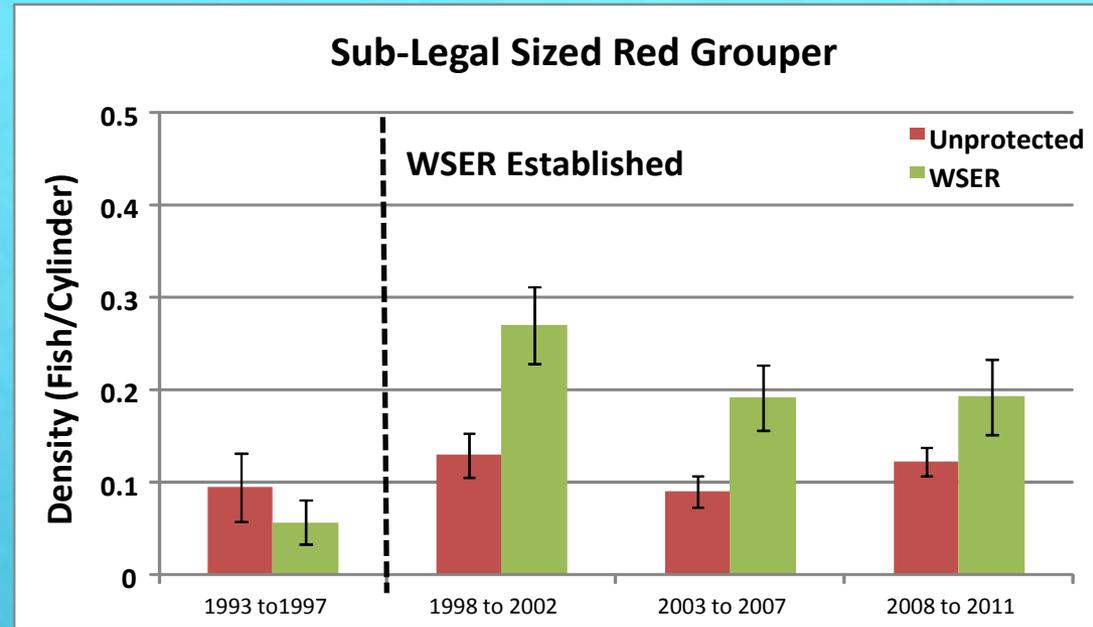
# Mutton Snapper

- No detectable reserve effect
- Do not form large groups except during spawning
- Mutton snapper use WSER as a residence area
- Adults transient from residence areas to spawning sites



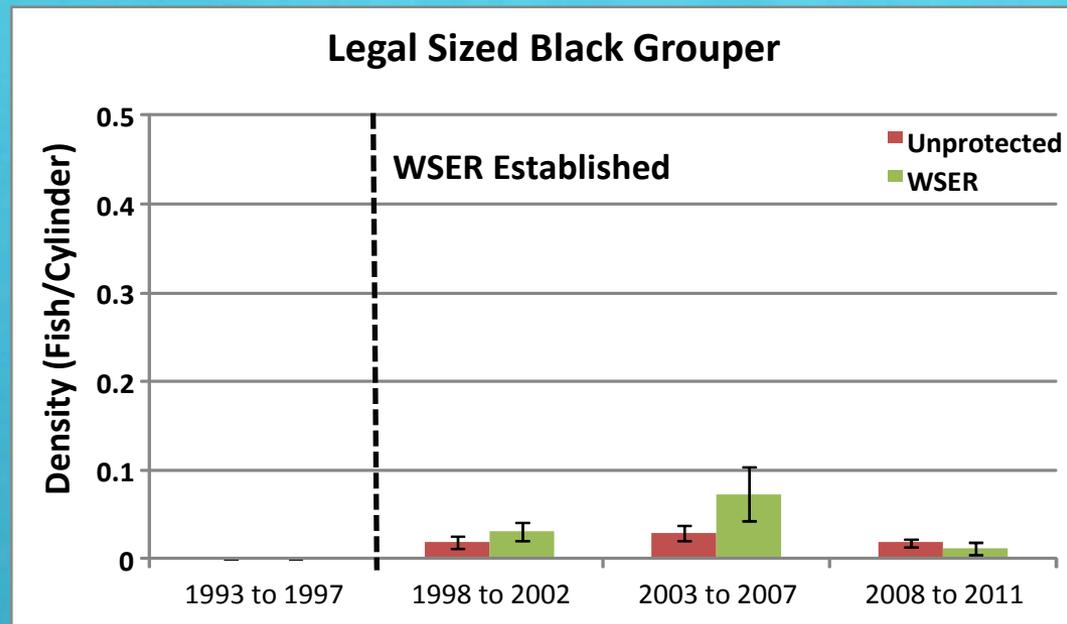
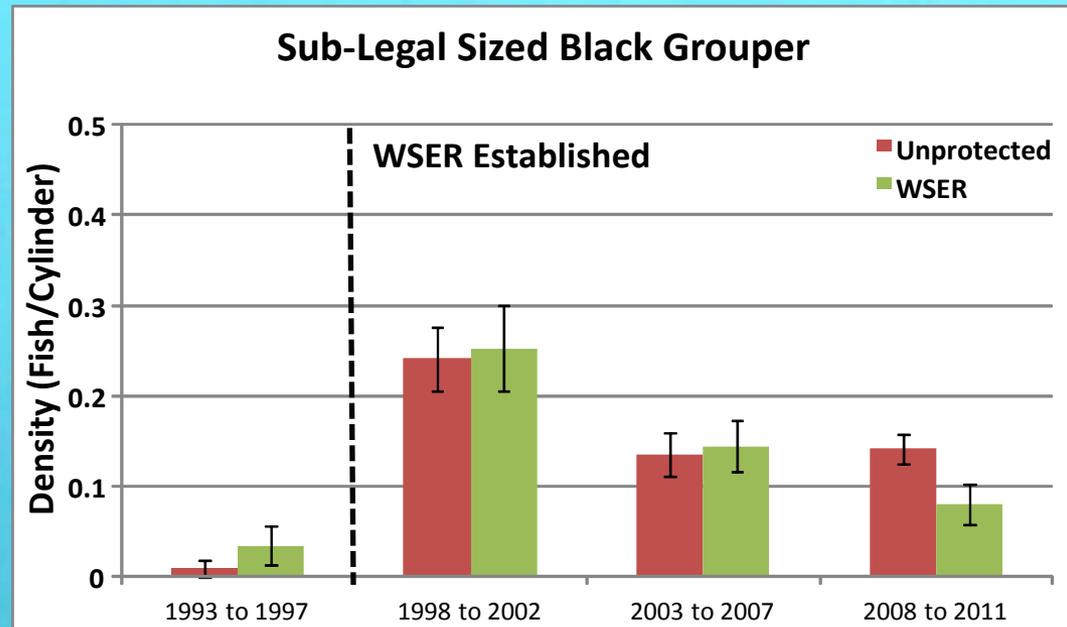
# Red Grouper

- Substantial reserve effect
- WSER habitats provide protection for sub-adult and adult red grouper
- Red grouper exhibit high degree of site fidelity



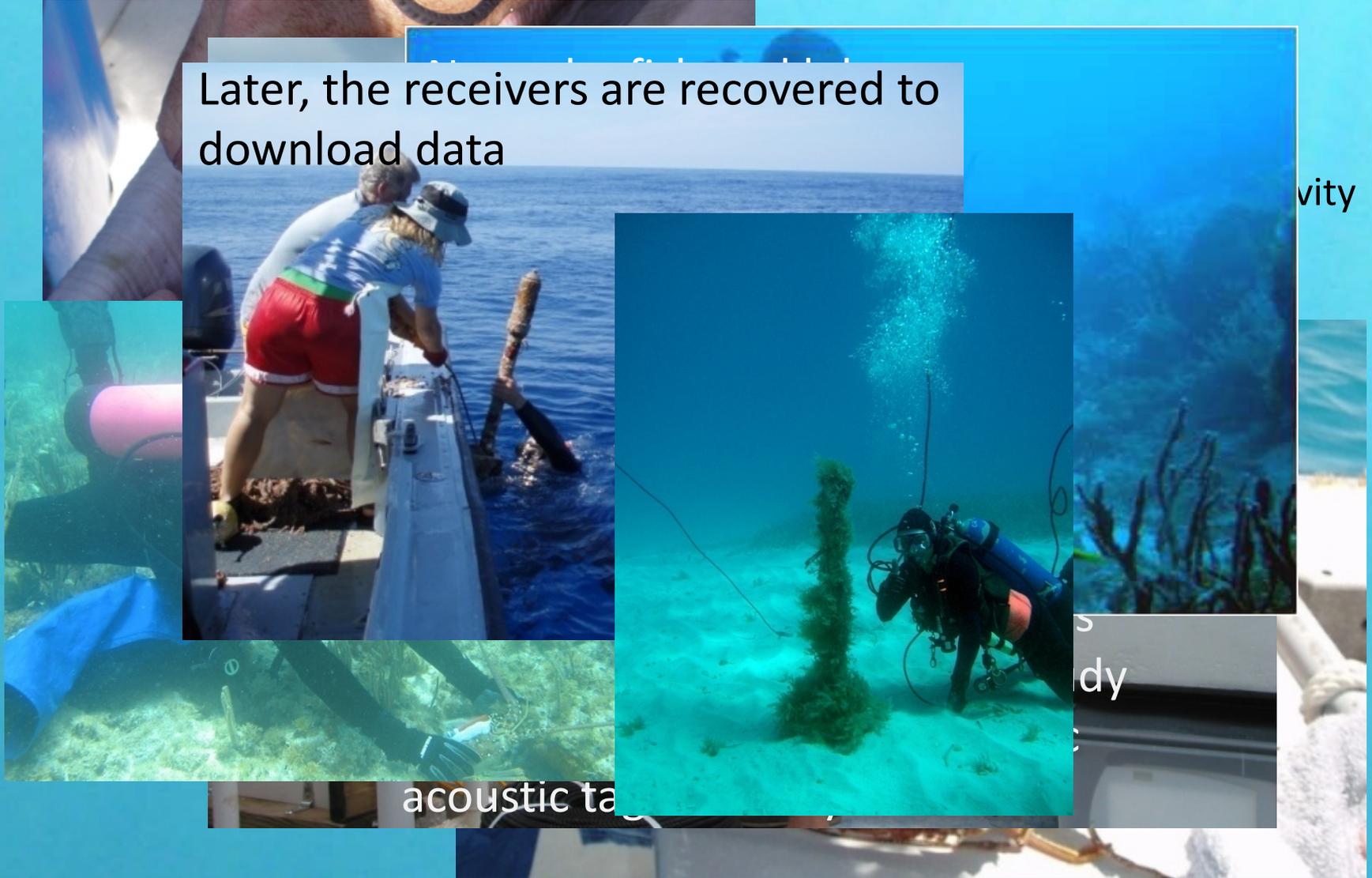
# Black Grouper

- No detectable reserve effect
- Black grouper more transient than red grouper as sub-adults and adults
- Adult black grouper typically found in deeper water beyond the boundary of WSER

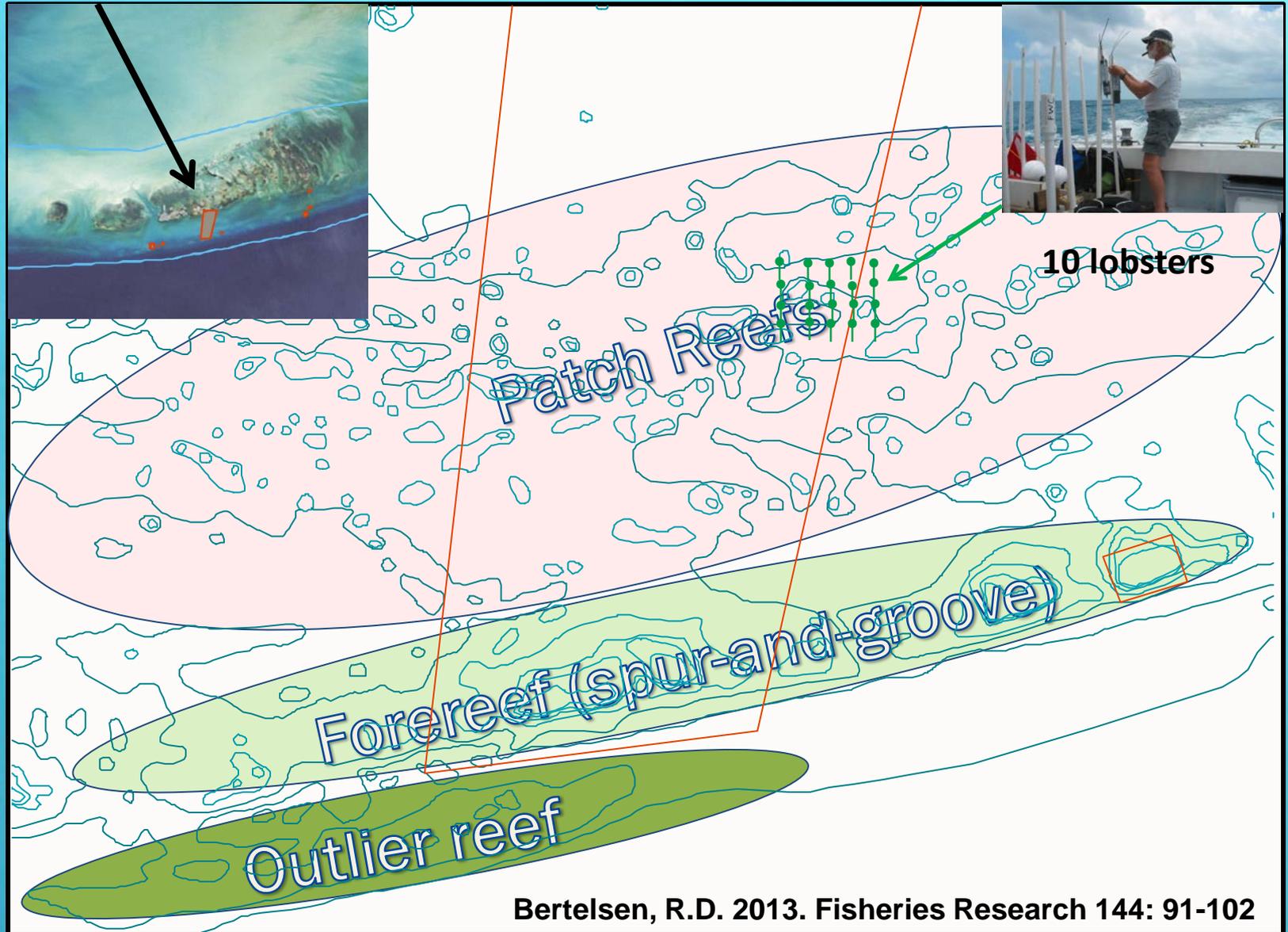


# Acoustic tracking of Caribbean Spiny Lobsters and Groupers within WSER

Later, the receivers are recovered to download data



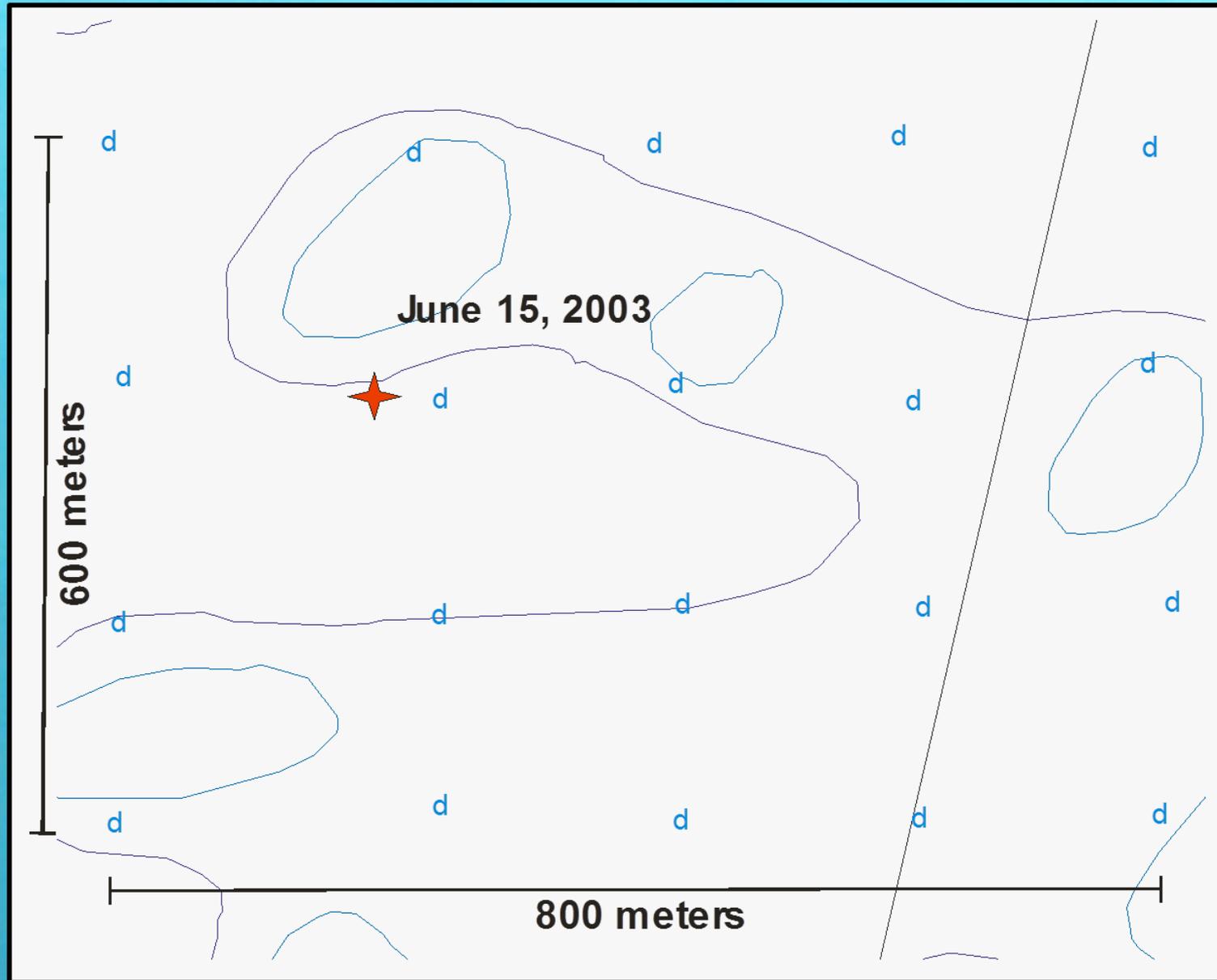
# Acoustic tracking lobsters – Summer 2003



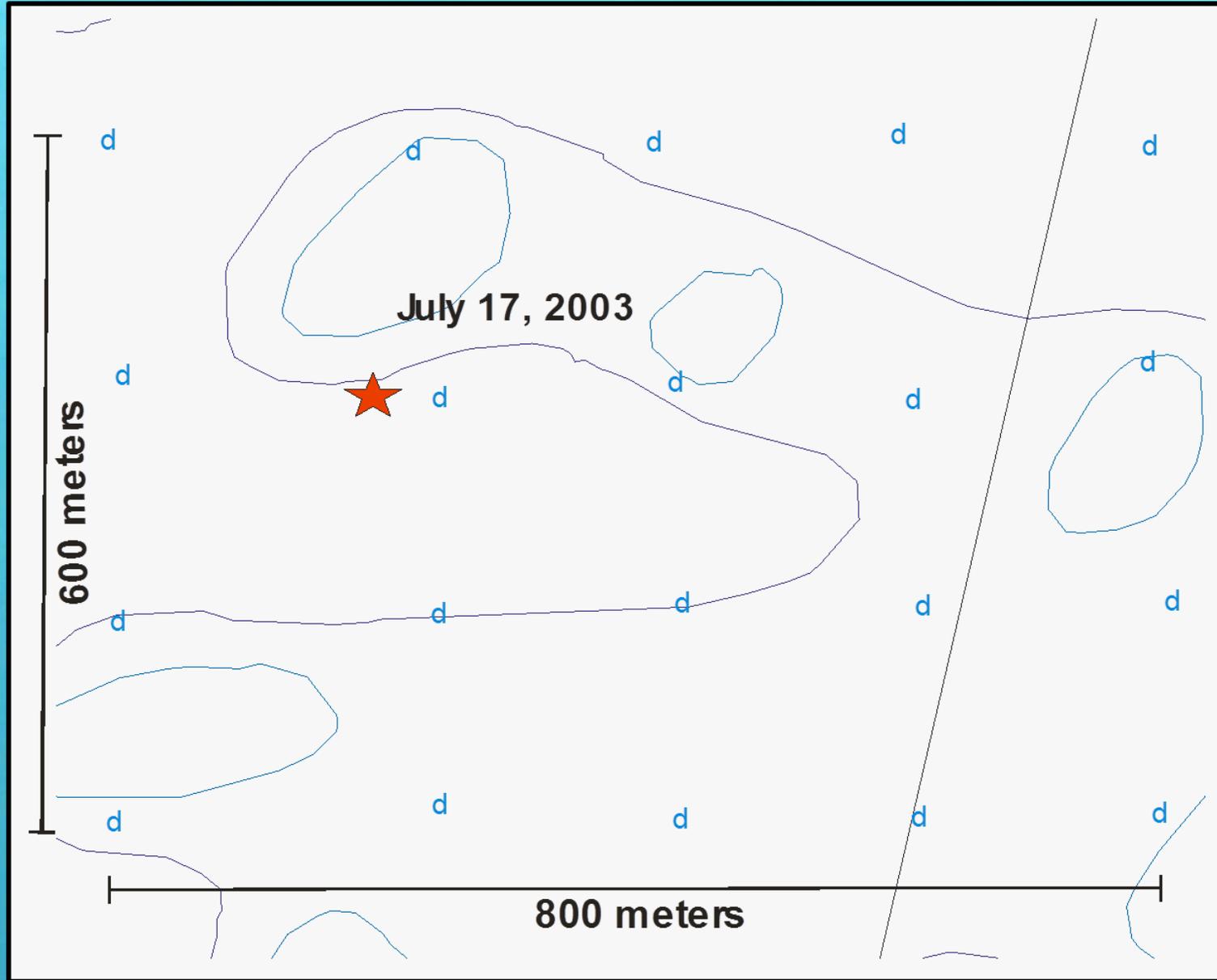
0 2 4 6 Kilometers

Bertelsen, R.D. 2013. Fisheries Research 144: 91-102

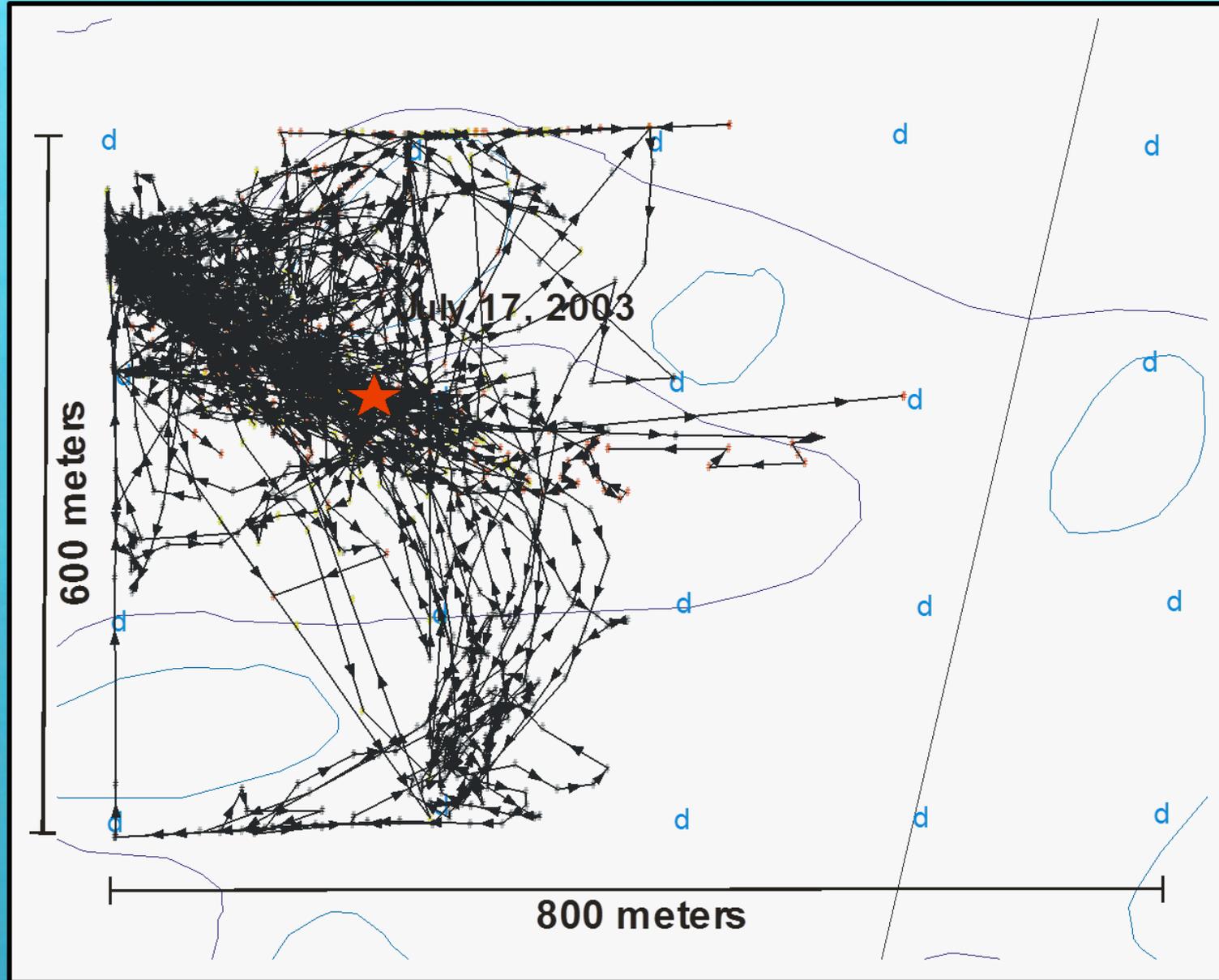
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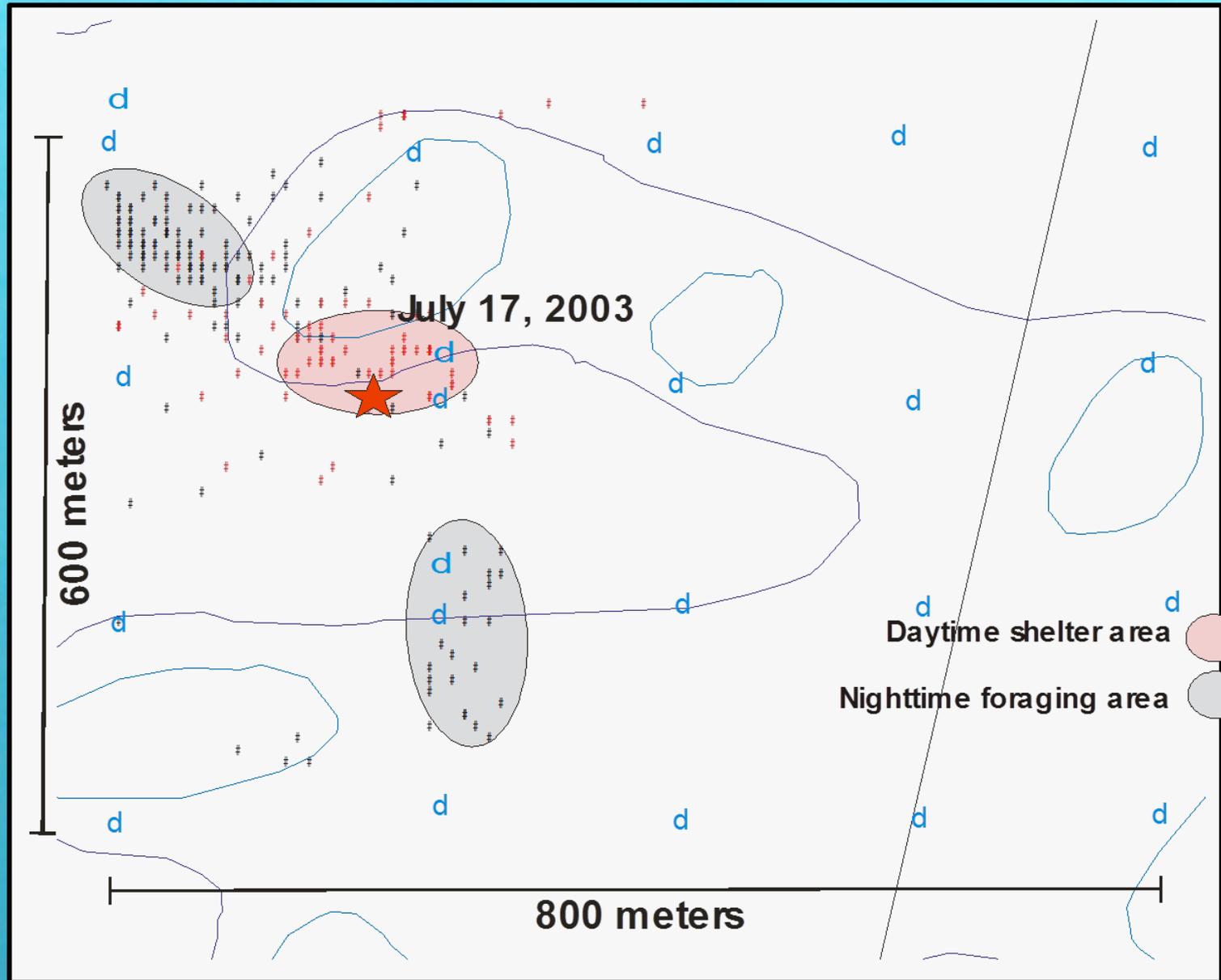
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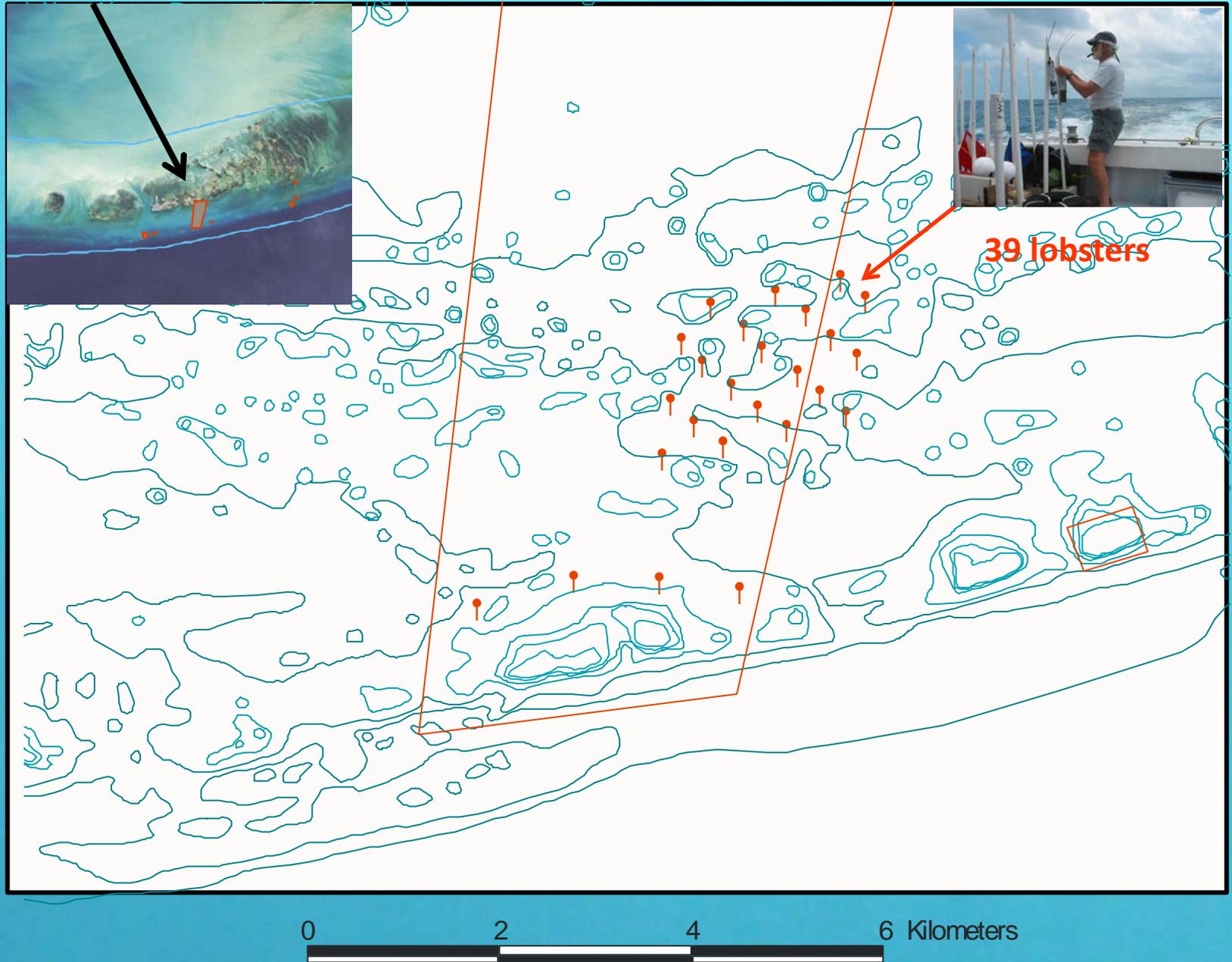
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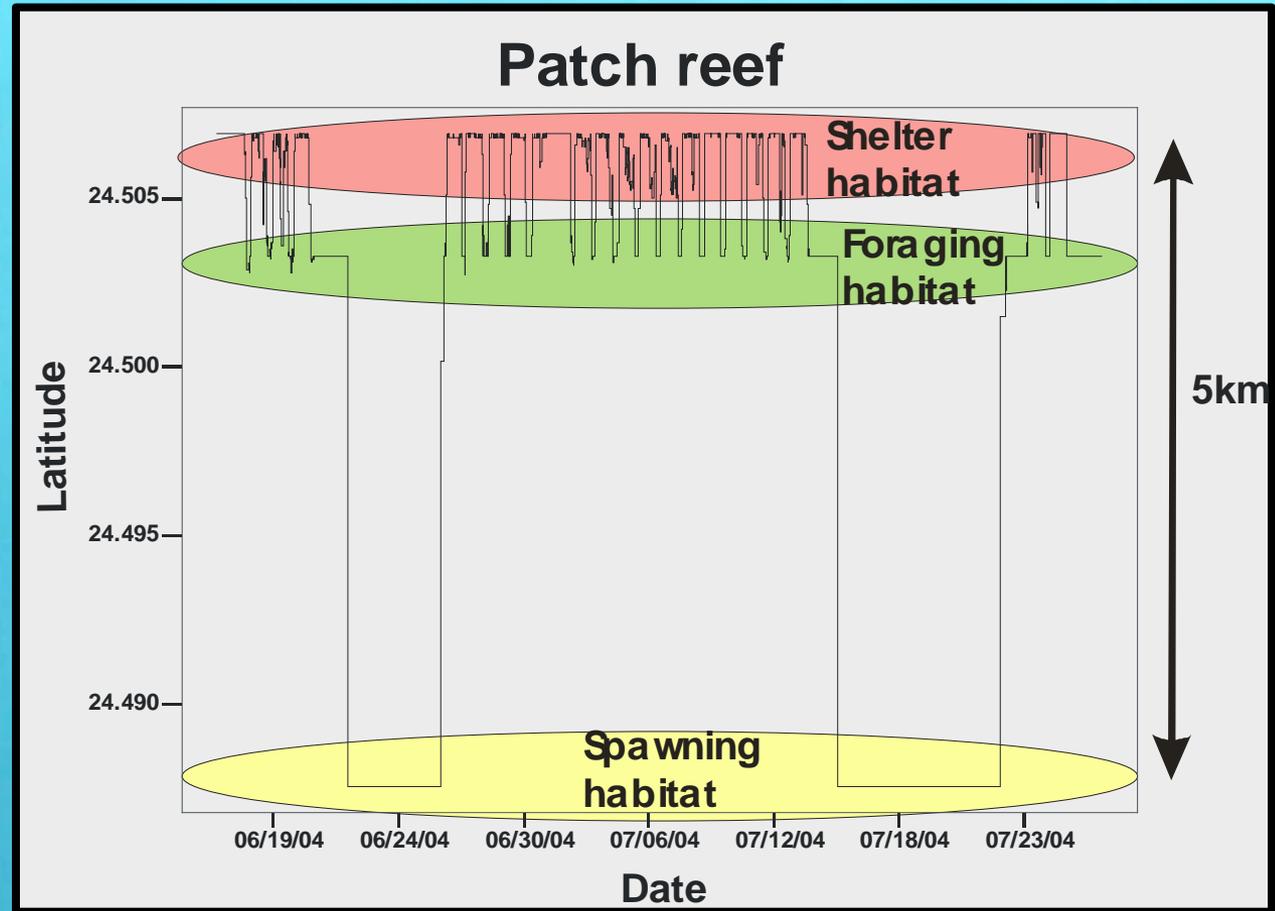
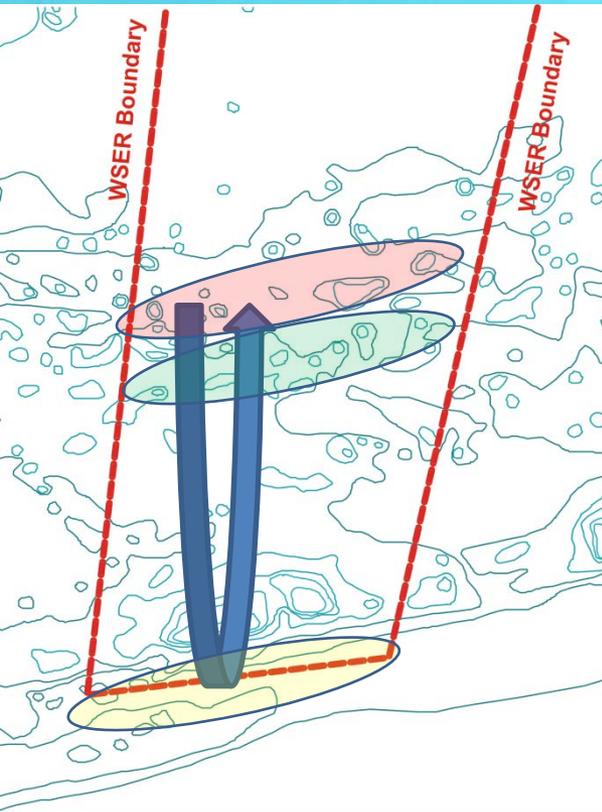
# Acoustic tracking lobsters – Summer 2003



# Acoustic tracking lobsters – Summer 2004

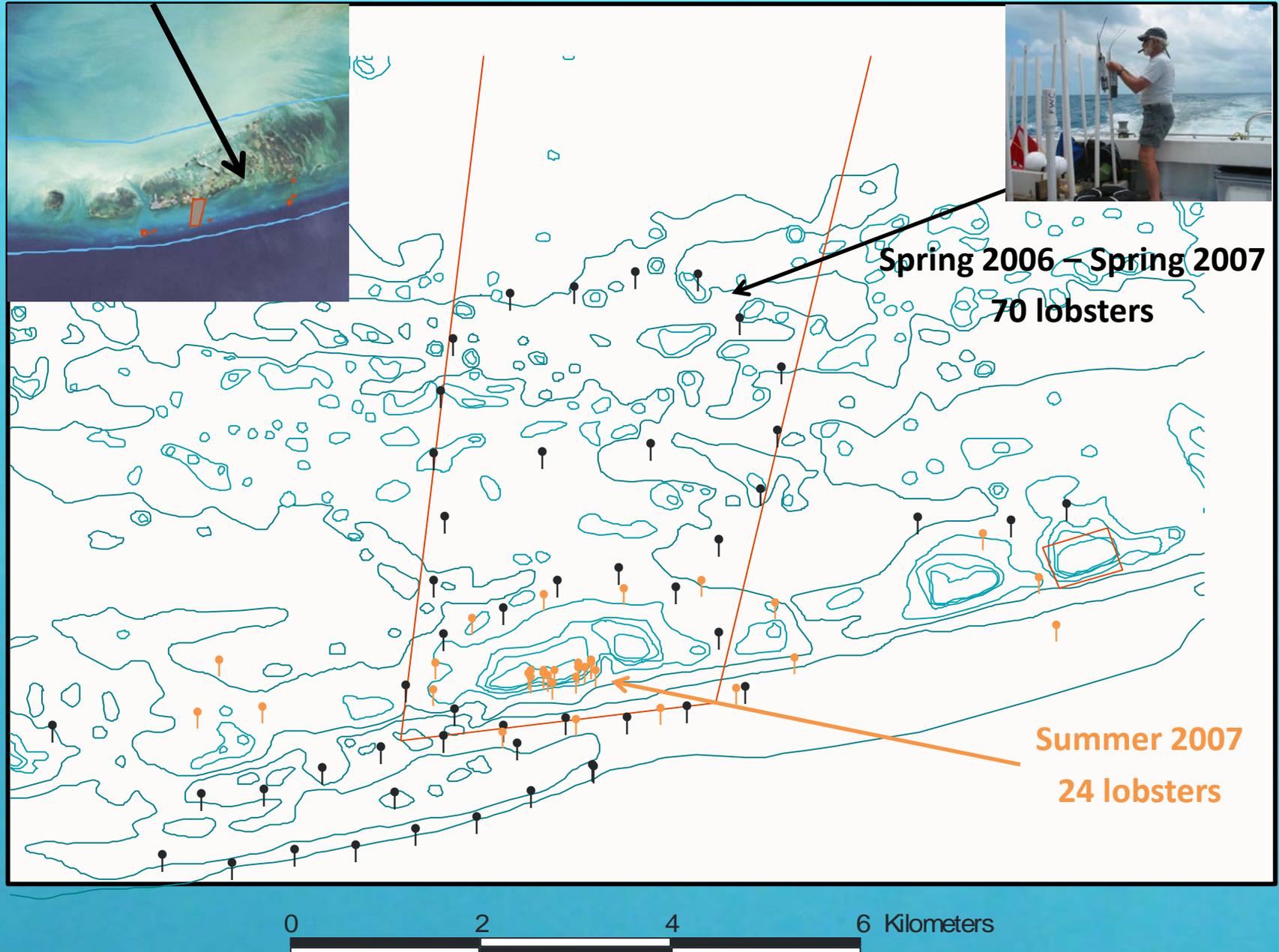


# Acoustic tracking lobsters – Summer 2004

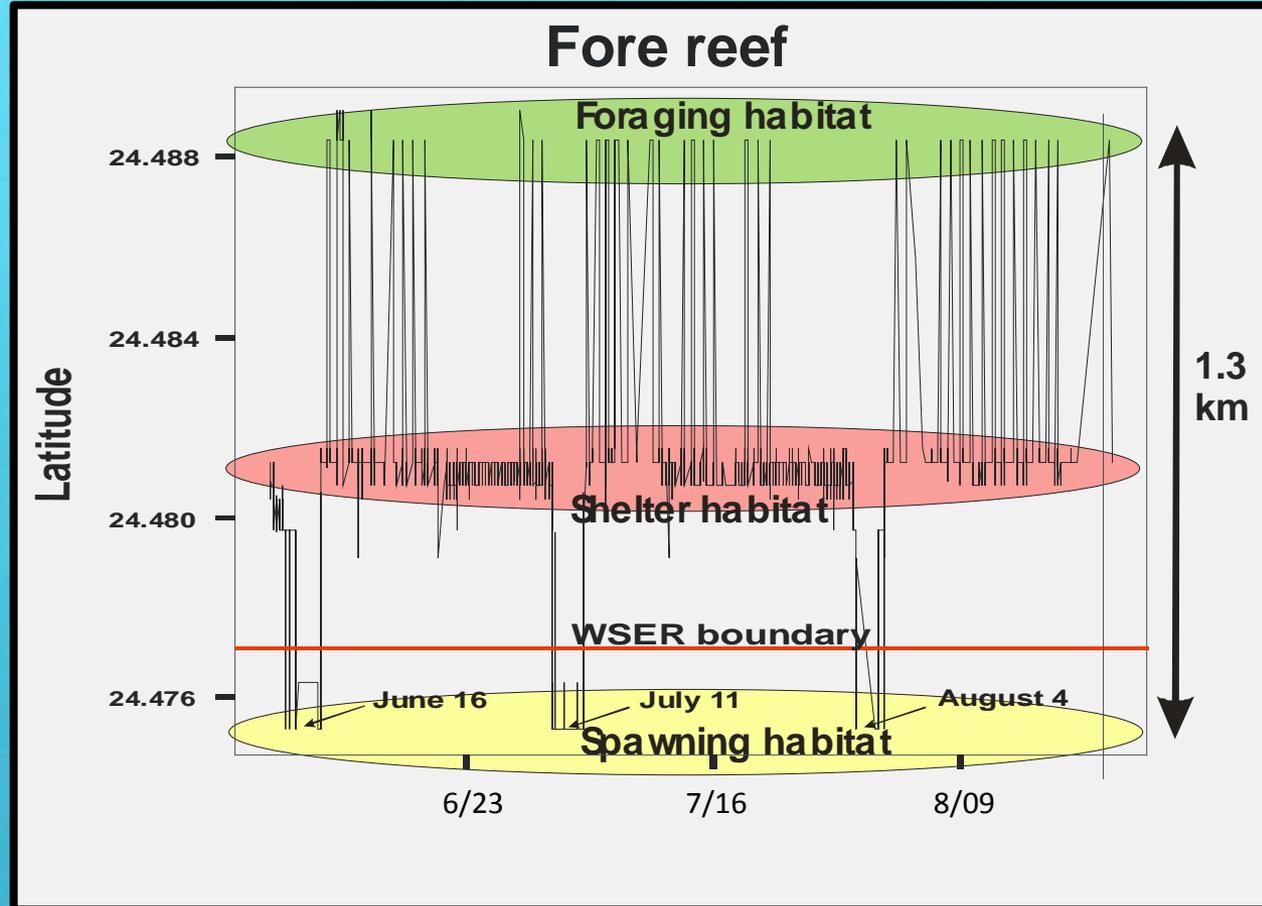
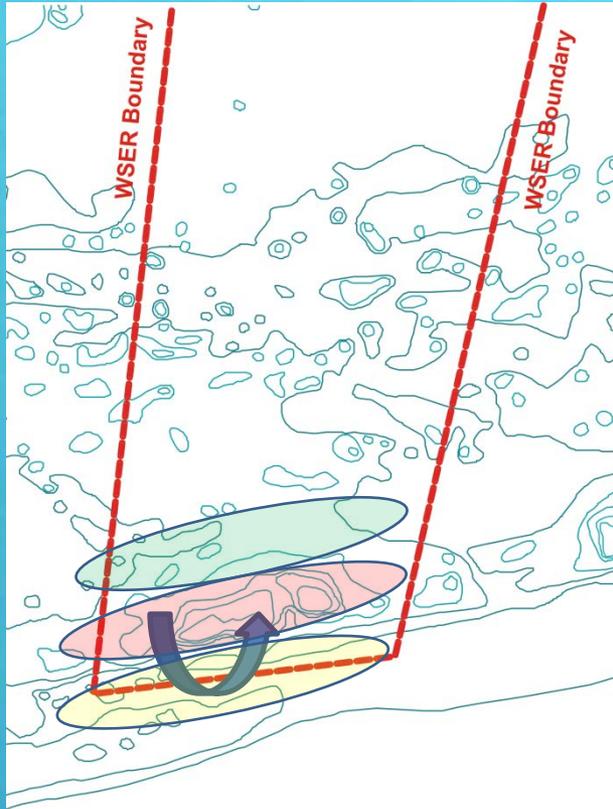


Egg-bearing female lobsters commonly tracked moving to and from sheltering and foraging habitat and periodically offshore where they spawn

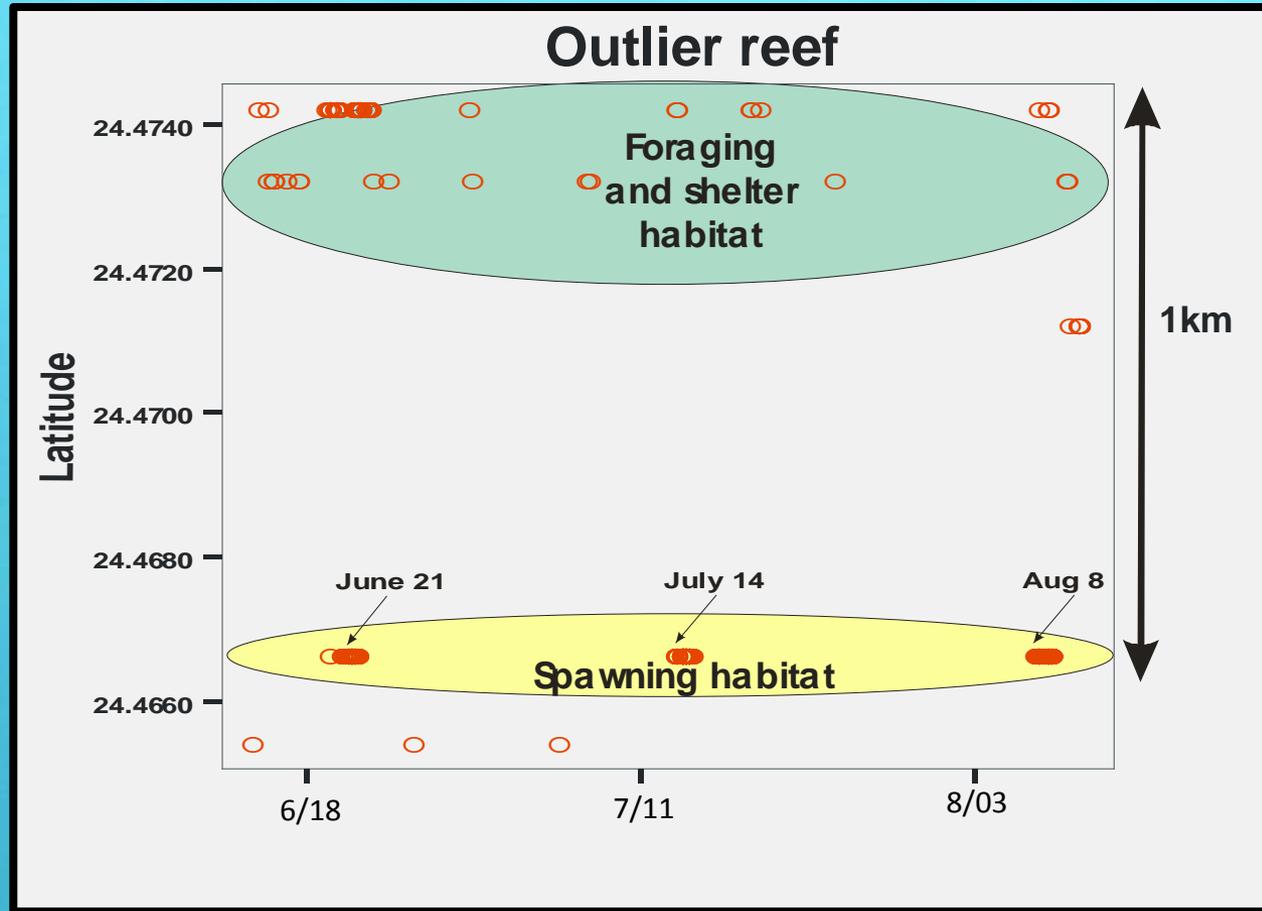
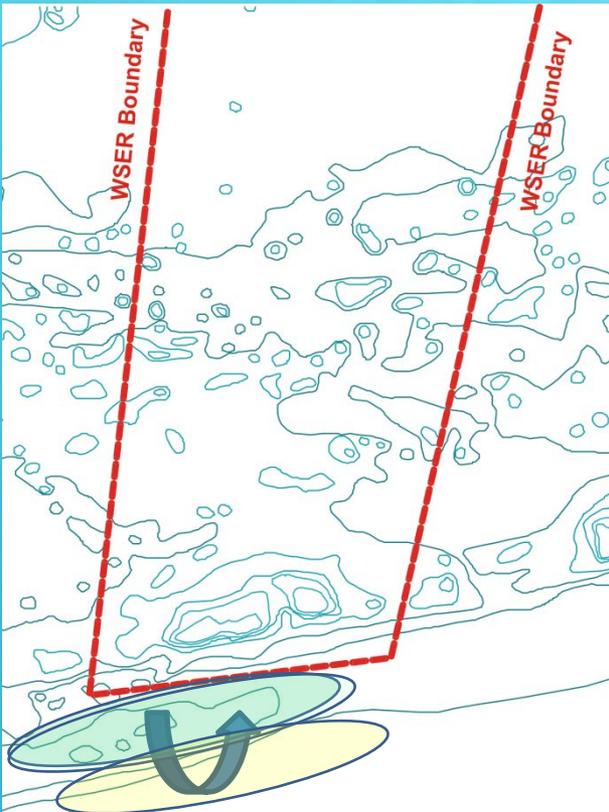
# Acoustic tracking lobsters – 2006-2007



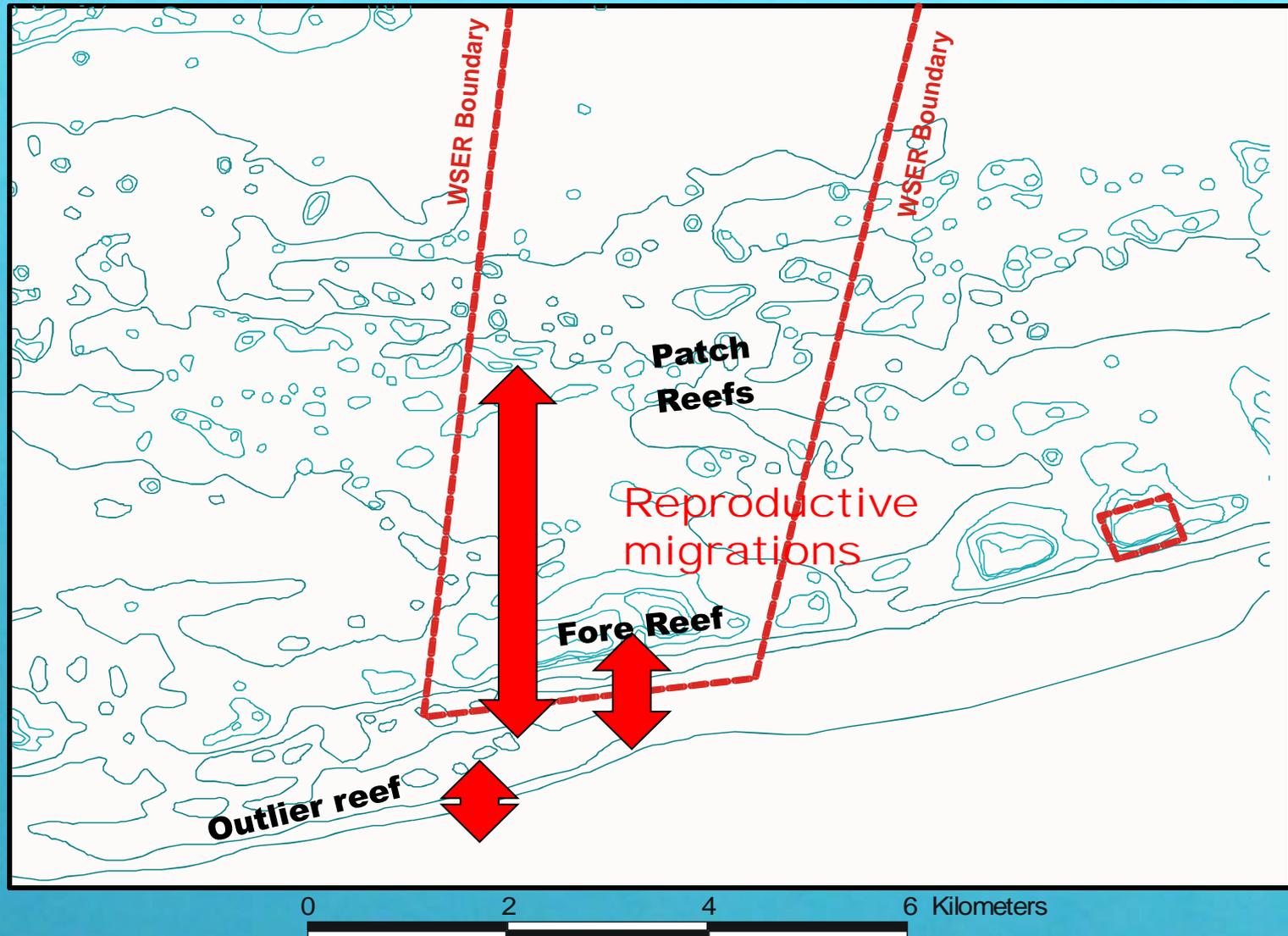
# Acoustic tracking lobsters



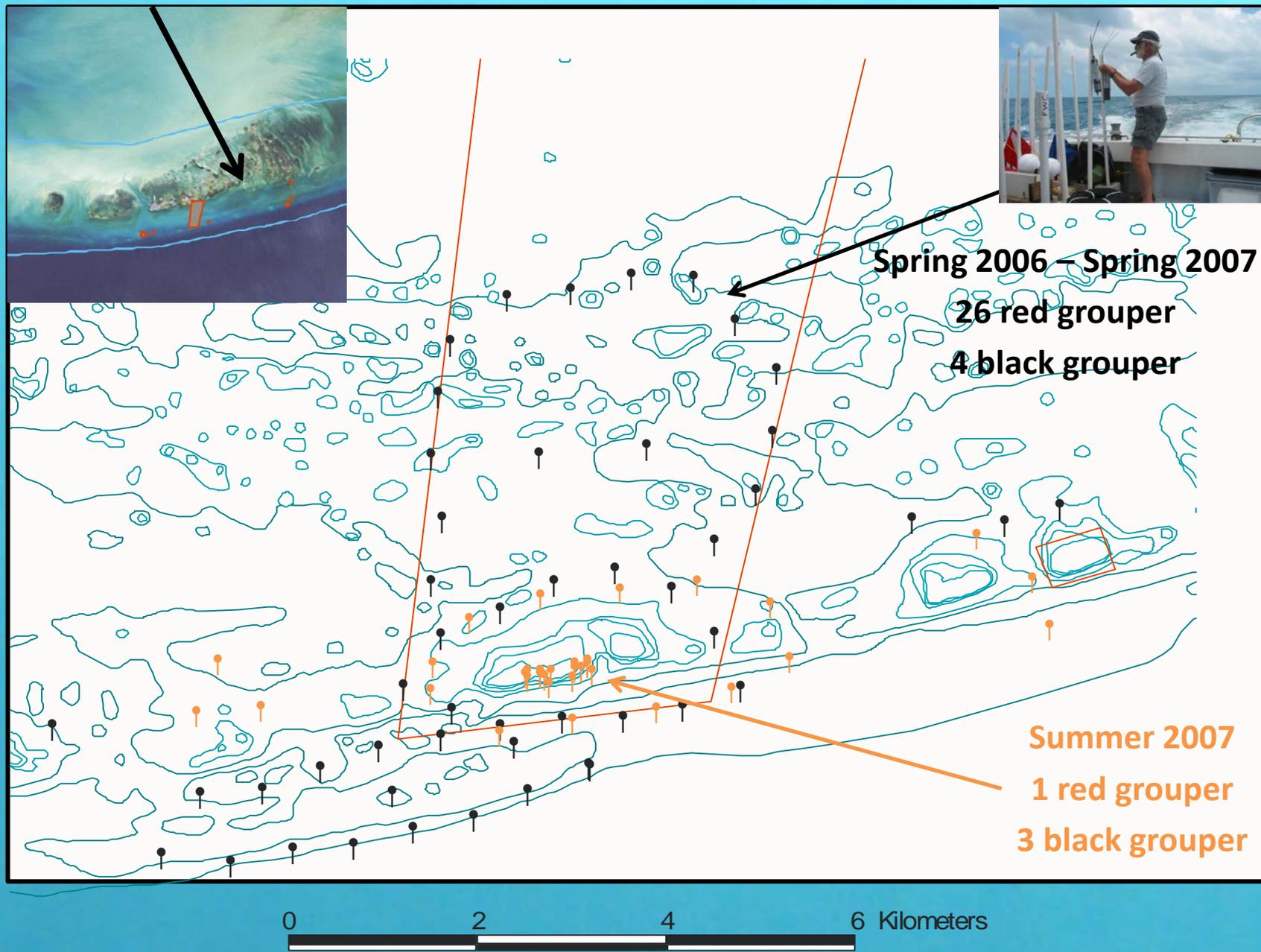
# Acoustic tracking lobsters



# Summary of reproductive movement patterns of Caribbean spiny lobsters acoustically tagged within WSER

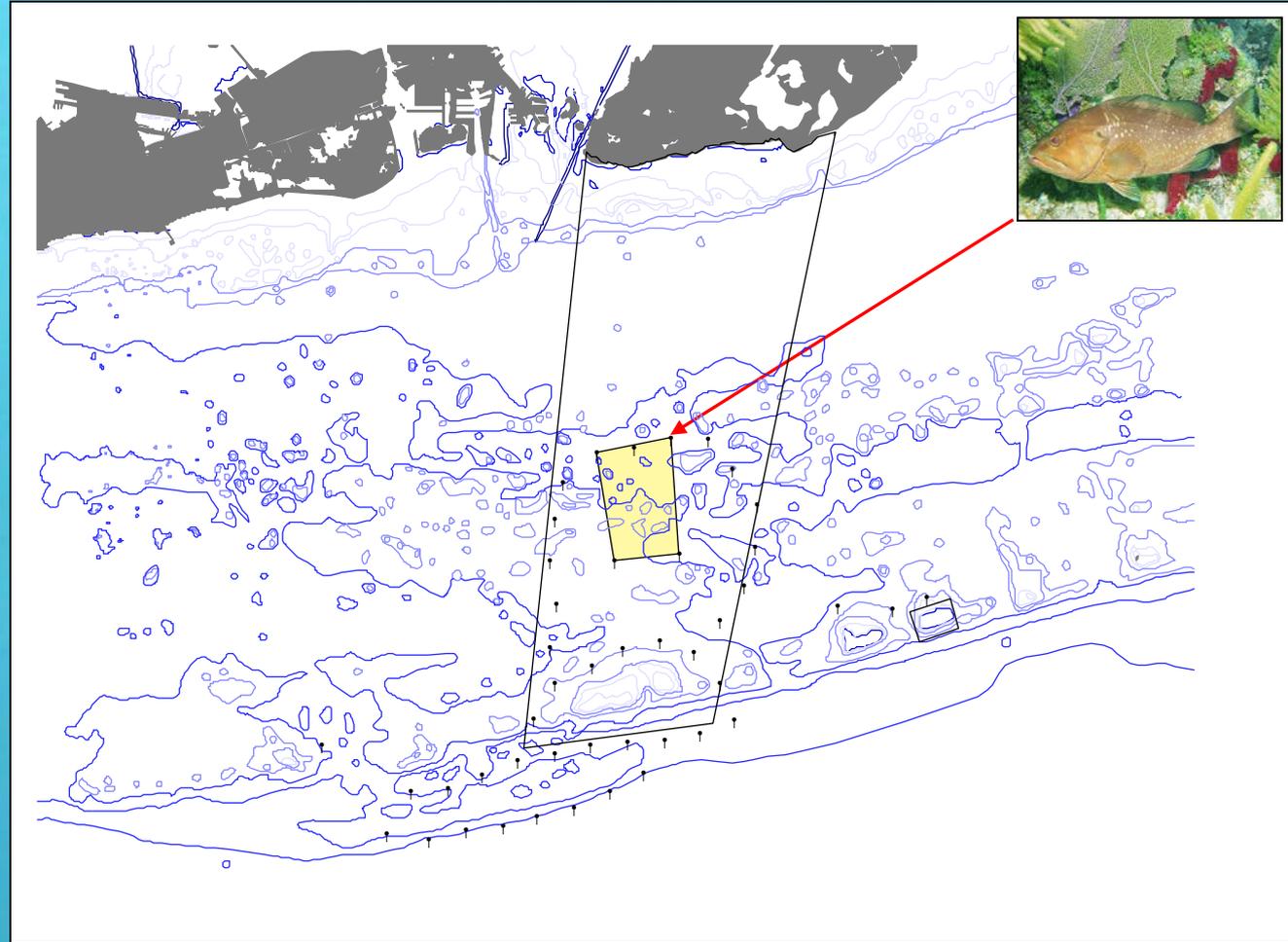


# Acoustic tracking of groupers – 2006-2007



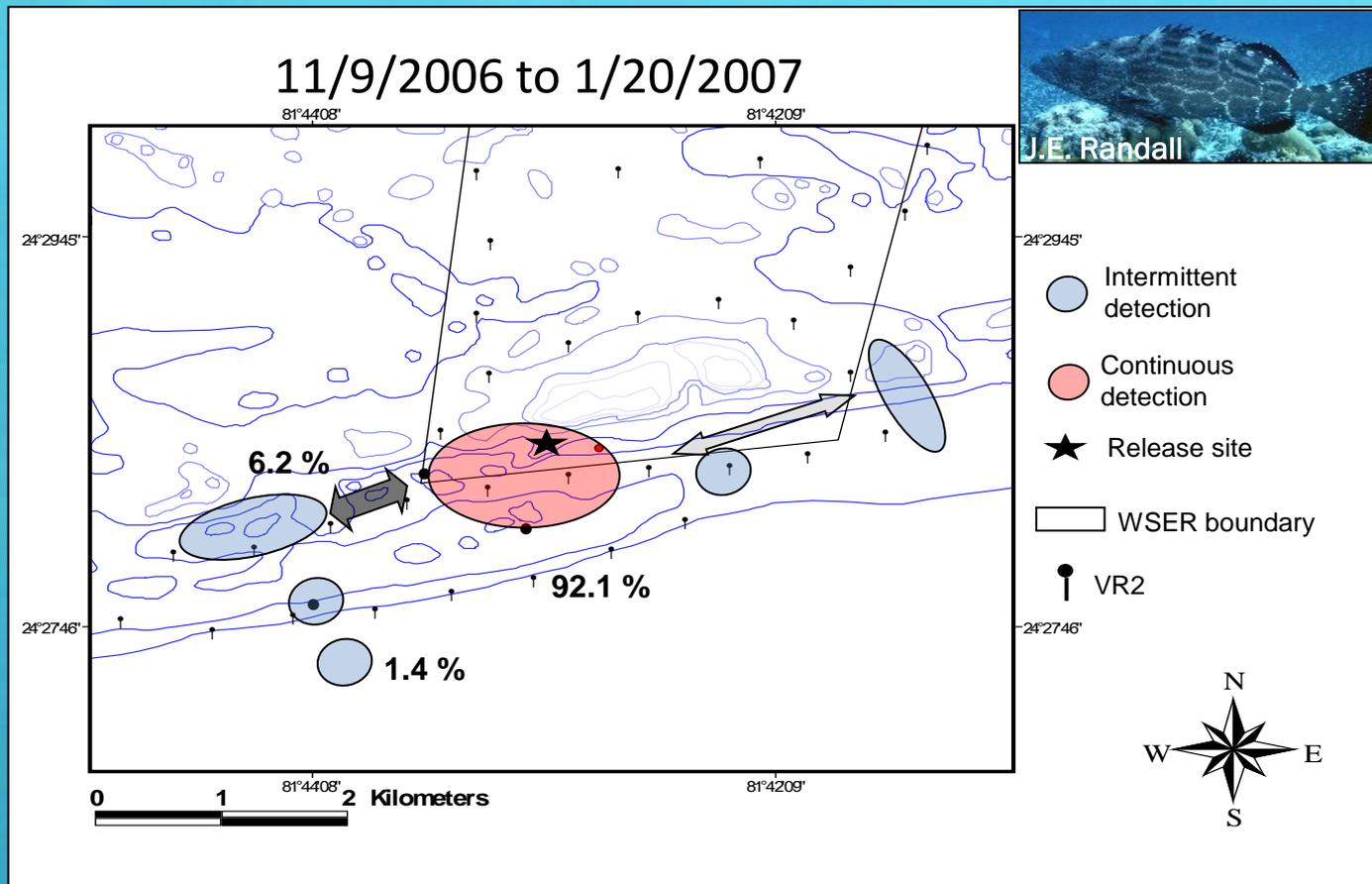
# Acoustic Tracking – Red Grouper

- Red grouper exhibit high degree of site fidelity
- Home range  $\sim 2$  km<sup>2</sup>
- WSER encompasses the estimated home range for red grouper



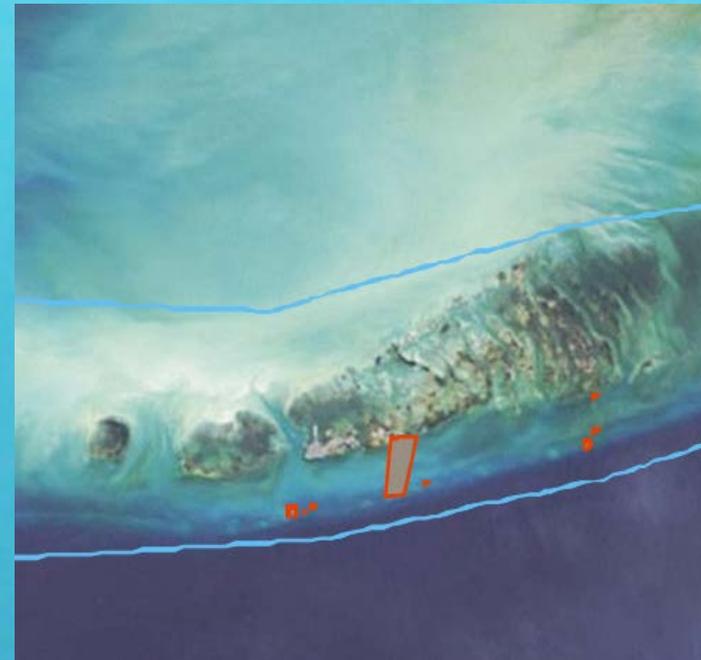
# Acoustic Tracking – Black Grouper

- Black grouper exhibit less site fidelity than red grouper
- Adult black grouper typically found in deeper water beyond the boundary of WSER



# Management Goal of WSER

- Intended to protect large areas of contiguous and diverse habitats
- WSER was intended to protect permanent-residence areas needed for sustainable populations of fish and other marine life

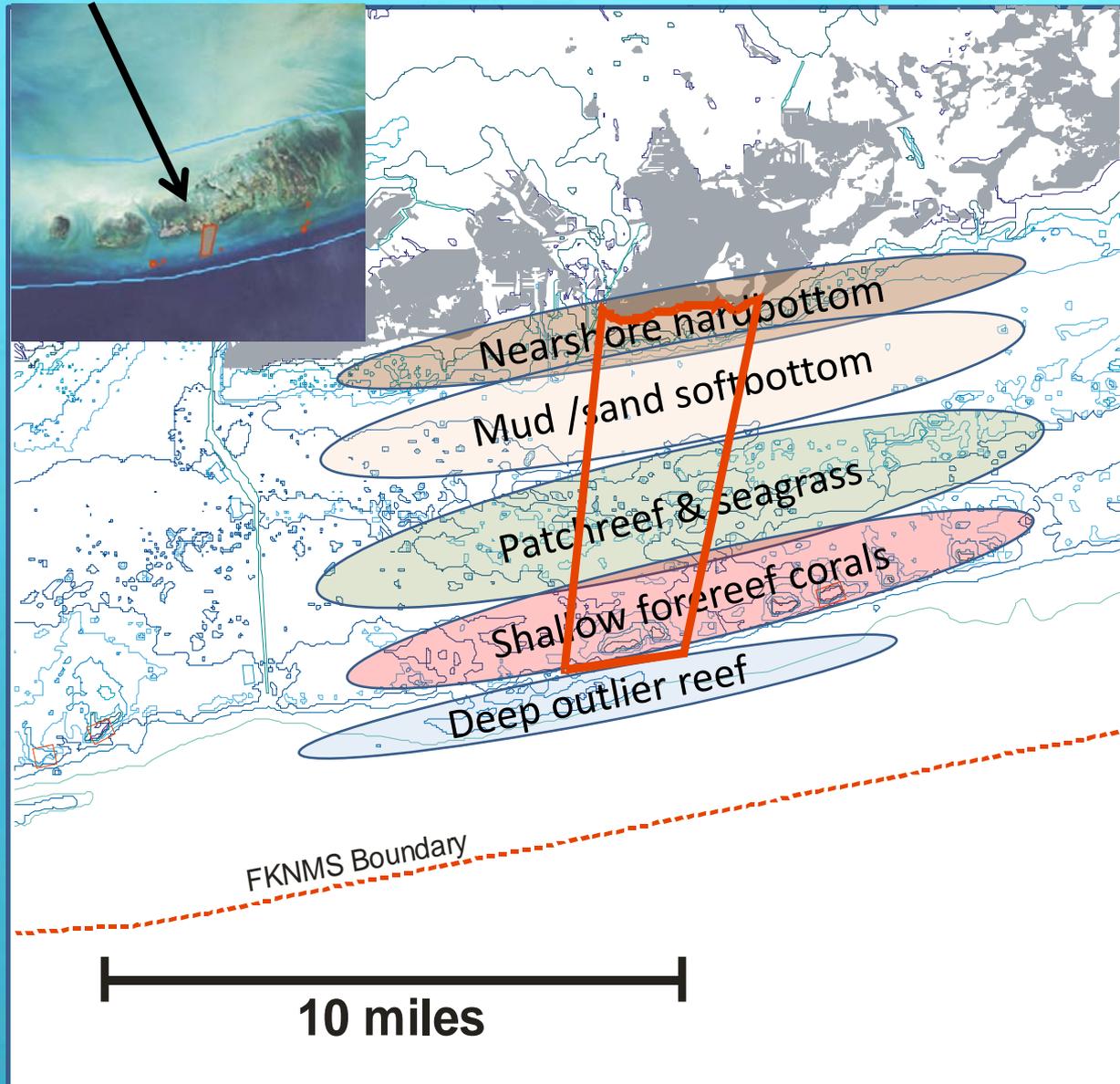


# SUMMARY

- No reserve effects detected for fish species that utilize deeper water habitats during their life history (yellowtail snapper, mutton snapper, and black grouper)
- Substantial reserve effects detected for those highly resident fish species that utilize the shallow water reef and seagrass habitats protected by the WSER (red grouper, and gray snapper)
- Reserve effects detected for spiny lobster; however, resident females do move beyond WSER offshore boundary to release eggs, some during the open lobster fishing season

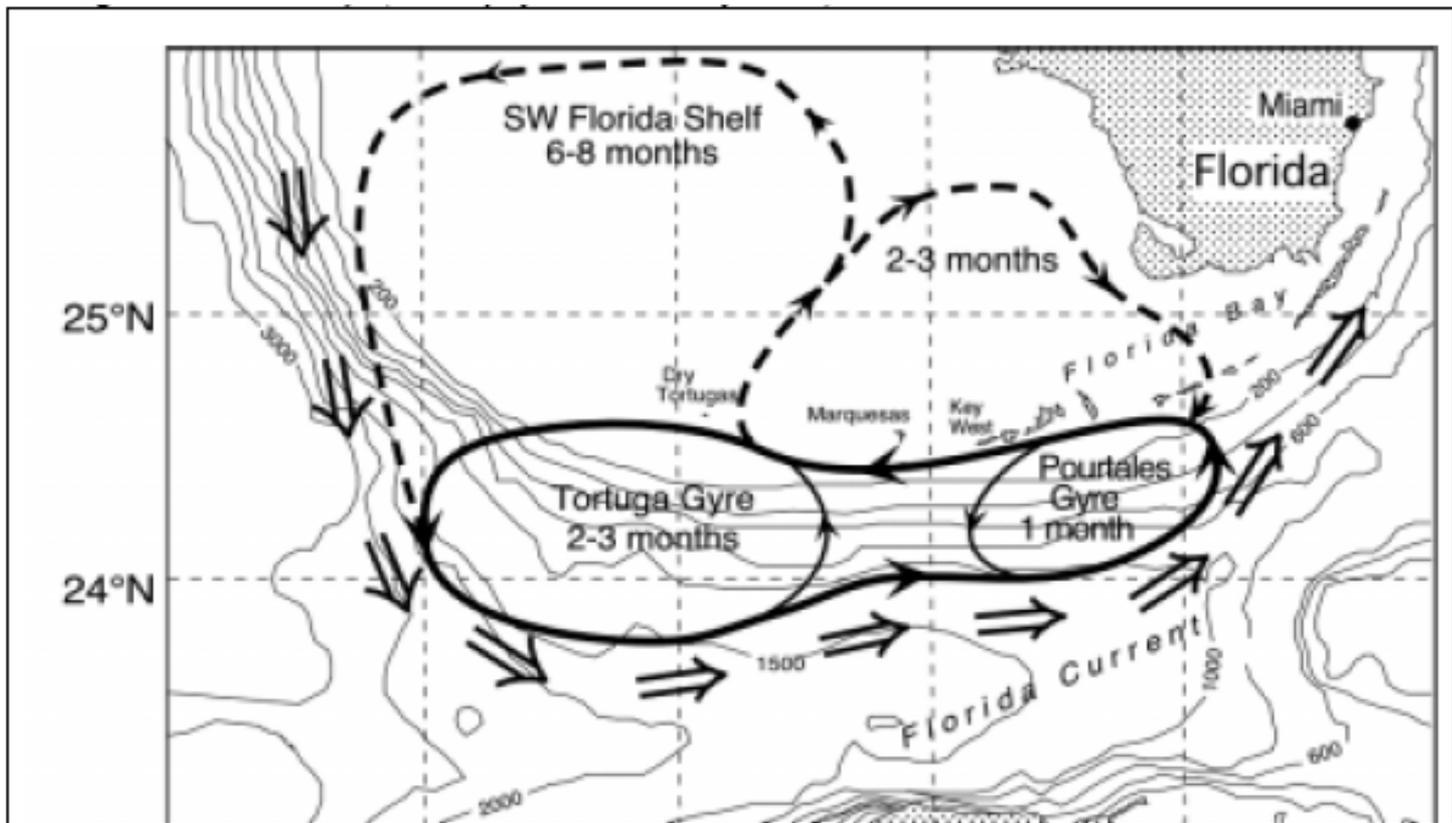
# Conclusions

- Level of protection provided by the WSER is directly related to its size, configuration, habitat, and the life history of the species
- Contiguous offshore habitats should be incorporated in order for the WSER to meet intended goals

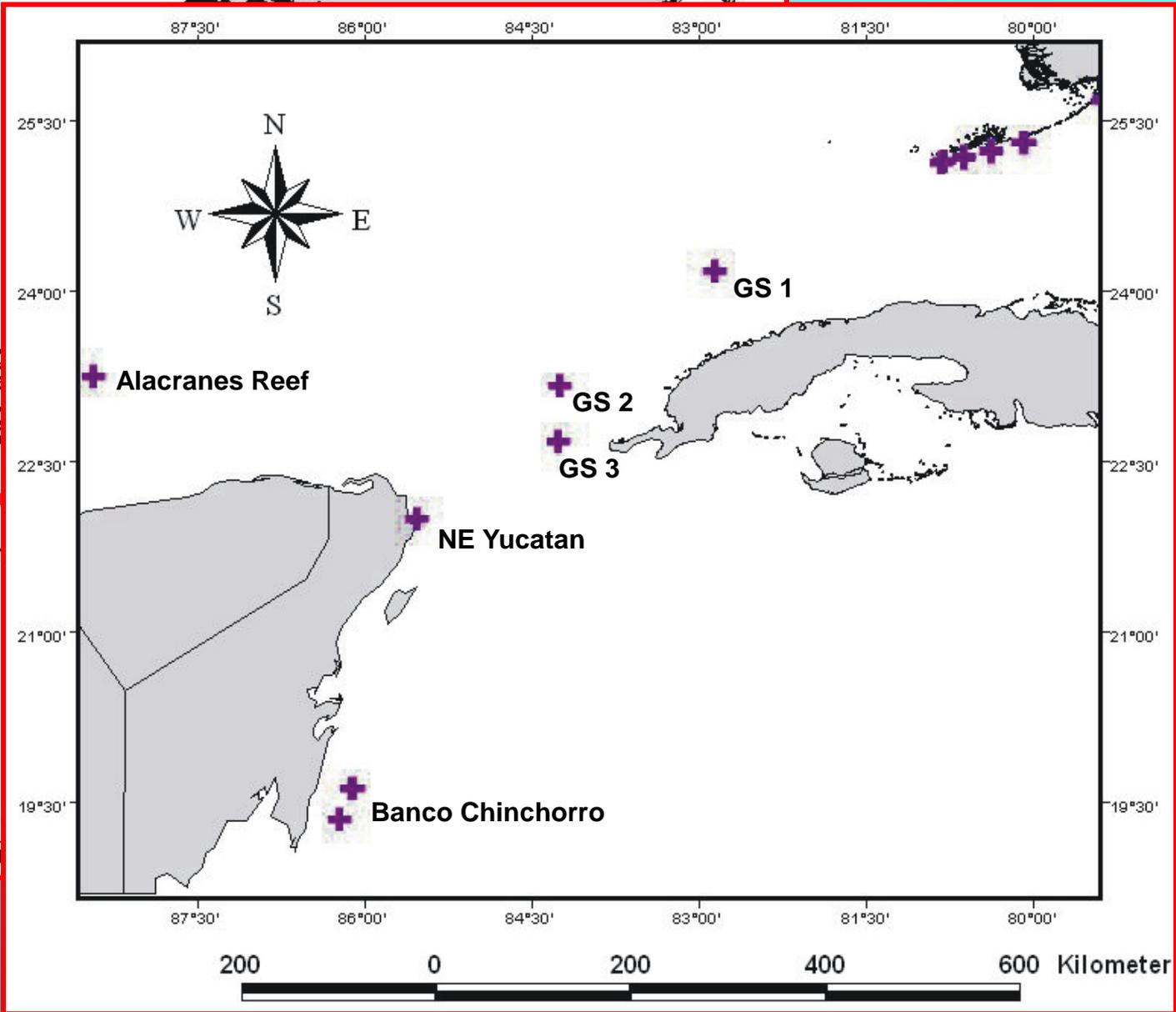
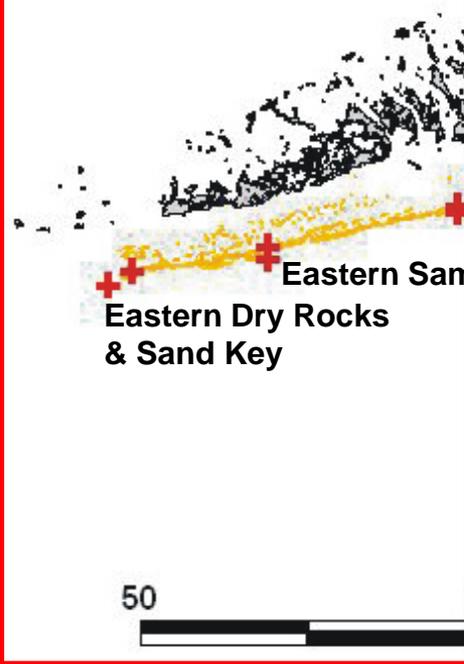
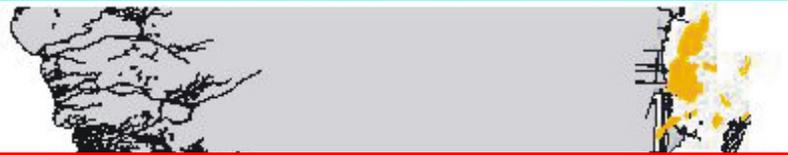


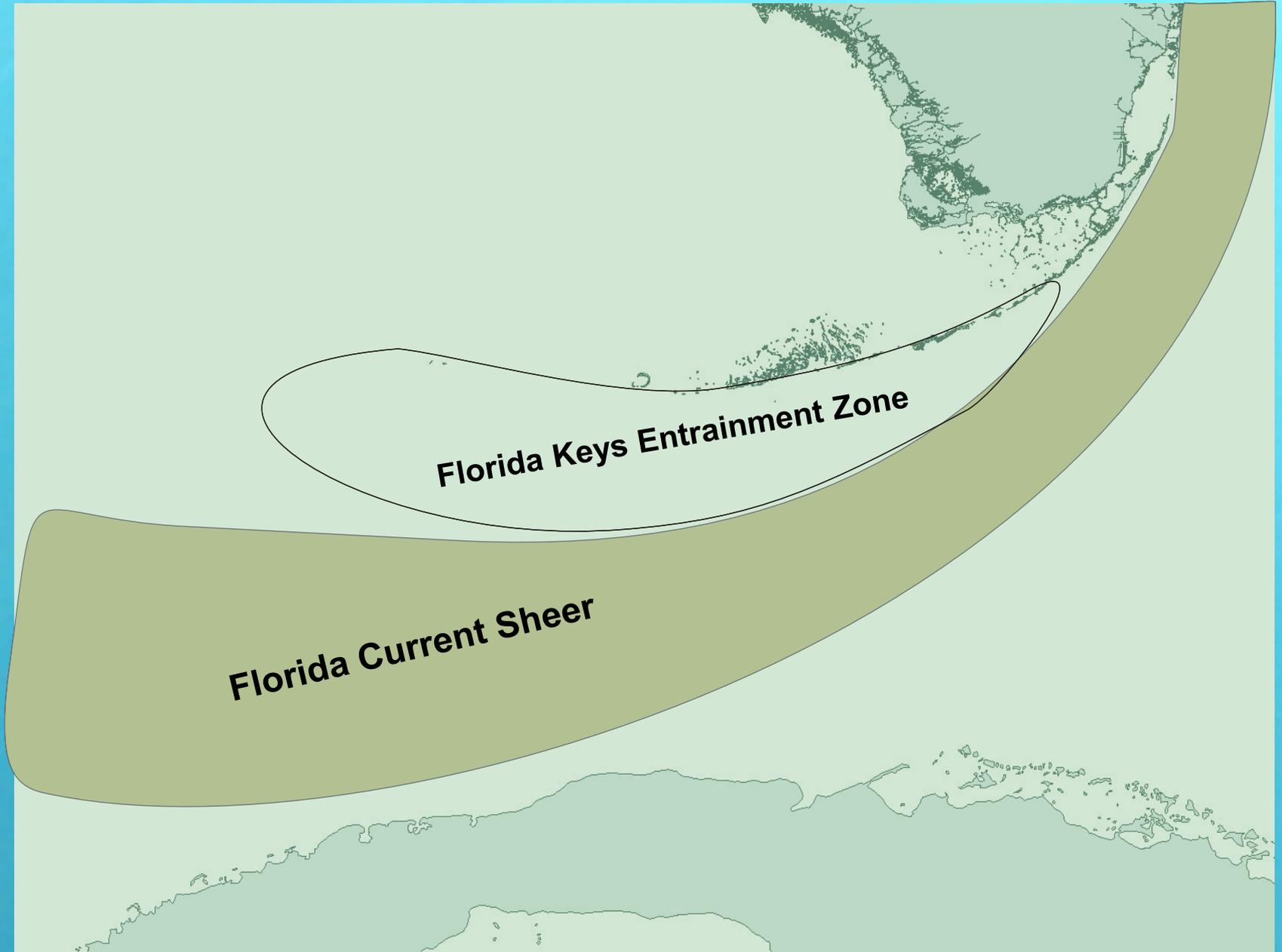
# Questions?





# Drift Vial Release Sites





# Comparison of lobster population dynamics

## Dry Tortugas and Florida Keys

	Dry Tortugas 1970	Dry Tortugas 1997	Florida Keys 1997
male female size difference	7 mm	21 mm	1-4 mm
large (> 110 mmCL) female fecundity	<20%	~100%	none
egg bearing season	March - August*	March - August	March - October

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