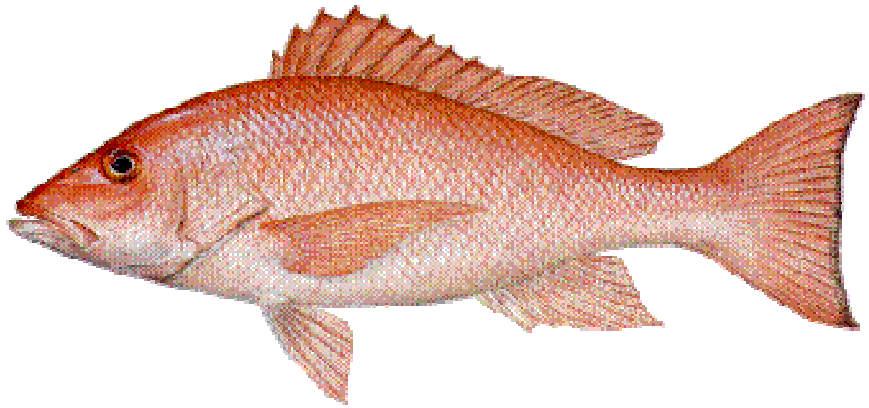
# Oil Platforms and Red Snapper Movement



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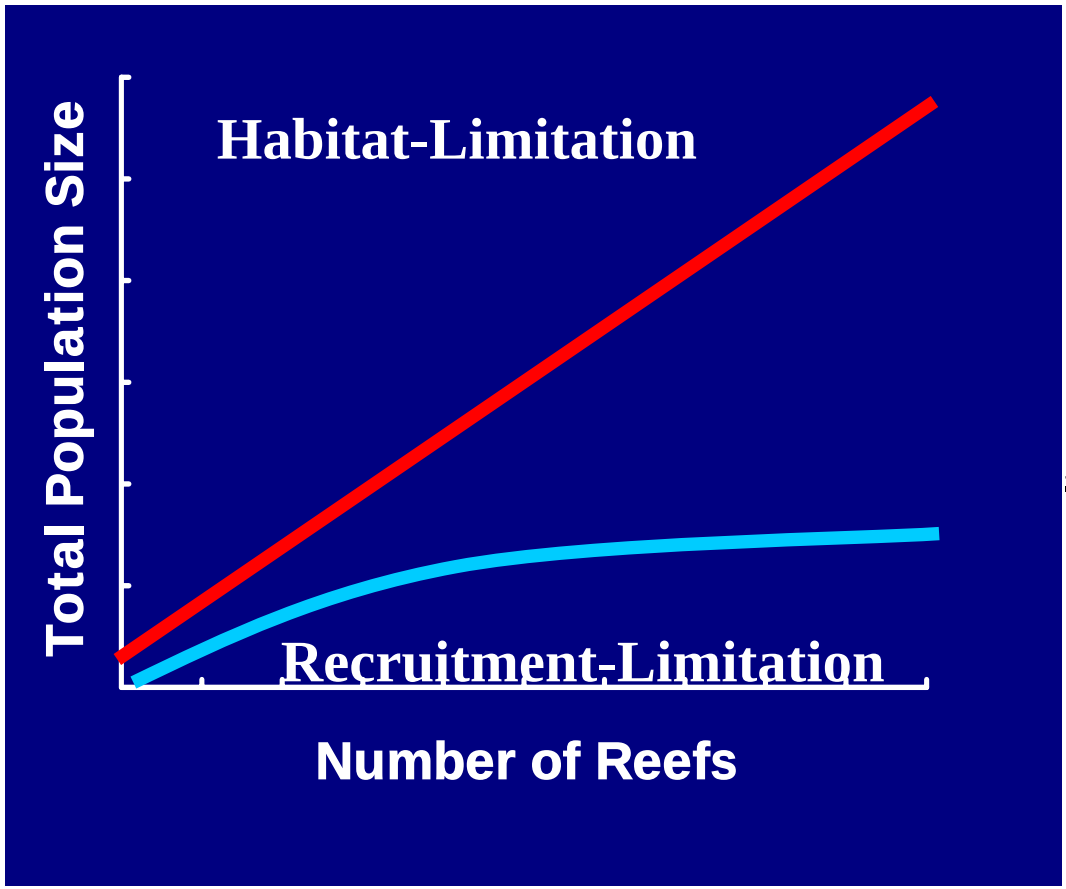
# Introduction

- Oil platforms/artificial reefs =

  excellent fishing
- Studies: fish aggregate around platforms in large numbers
  - Red snapper aggregate around platforms
  - Recovery of some stocks?

# Attraction vs. Production



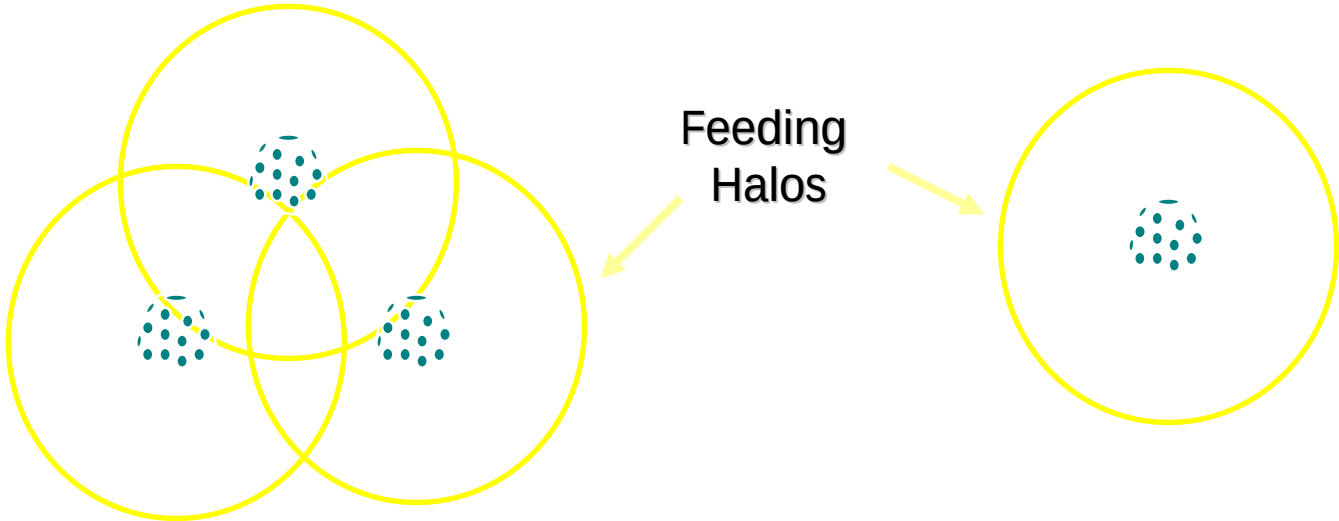

**Production Hypothesis:**

- **Fish are habitat limited**
- **Increased fish abundance and biomass**

**Attraction Hypothesis:**

- **ARs only attract fish from other environments**
- **Fish are attracted to ARs as a result of behavioral preference**

# Resource Mosaic Hypothesis




**Less Isolated Artificial Reef** **Isolated Artificial Reef**

**Energetic Costs**

**Higher** ← **Lower**

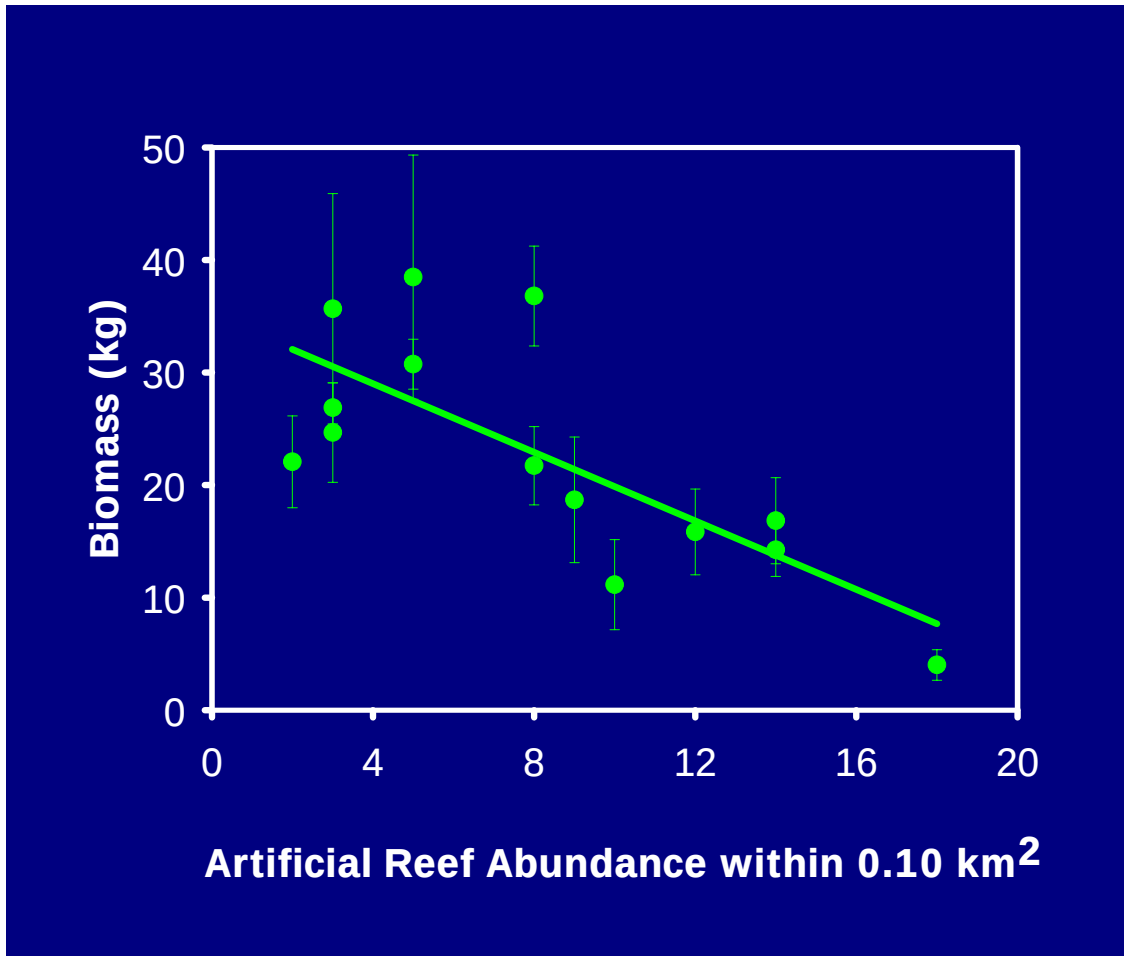
**Site Fidelity**

**Lower** → **Higher**

**Fish Abundance**

**Lower** → **Higher**

# Strelchek et al. 2005



# McCawley and Cowan 2007

- 24-hour diet analysis
  - Red snapper were feeding upon non-reef associated prey
  - Nocturnal pattern
- RMH inferred, not observed
- Can we observe behavior consisent with fish foraging away from the platform?

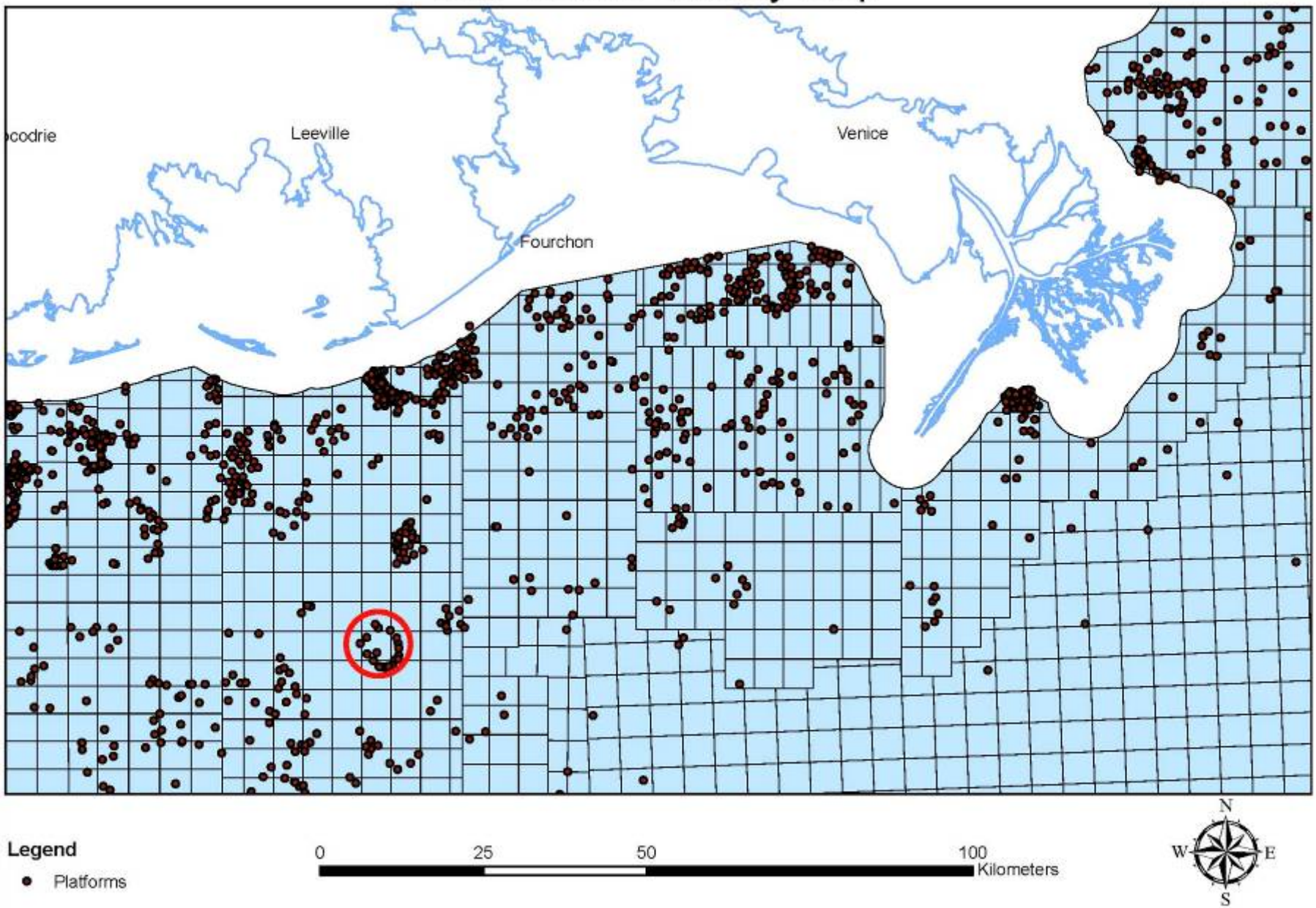
# Westmeyer et al. 2007

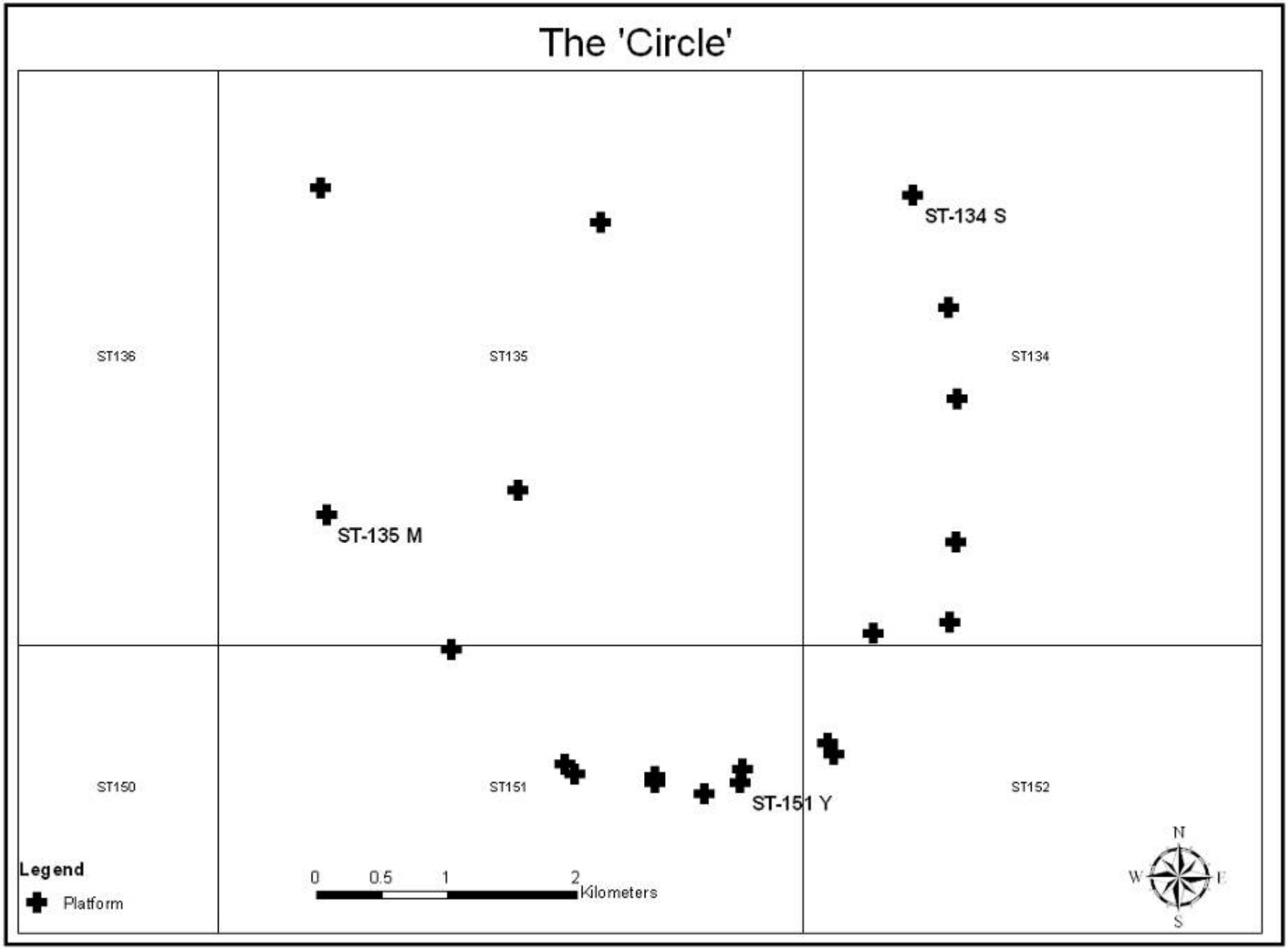
- Red snapper exhibited *very* low site fidelity to oil platforms (<1%/year)

# Methods

- 2 experiments: 2005 and 2006
  - 2 weeks in the spring/summer
  - 2005: 26–30 May, 6–12 August (crew boat)
  - 2006: 17–30 May

# The 'Circle': Vicinity Map

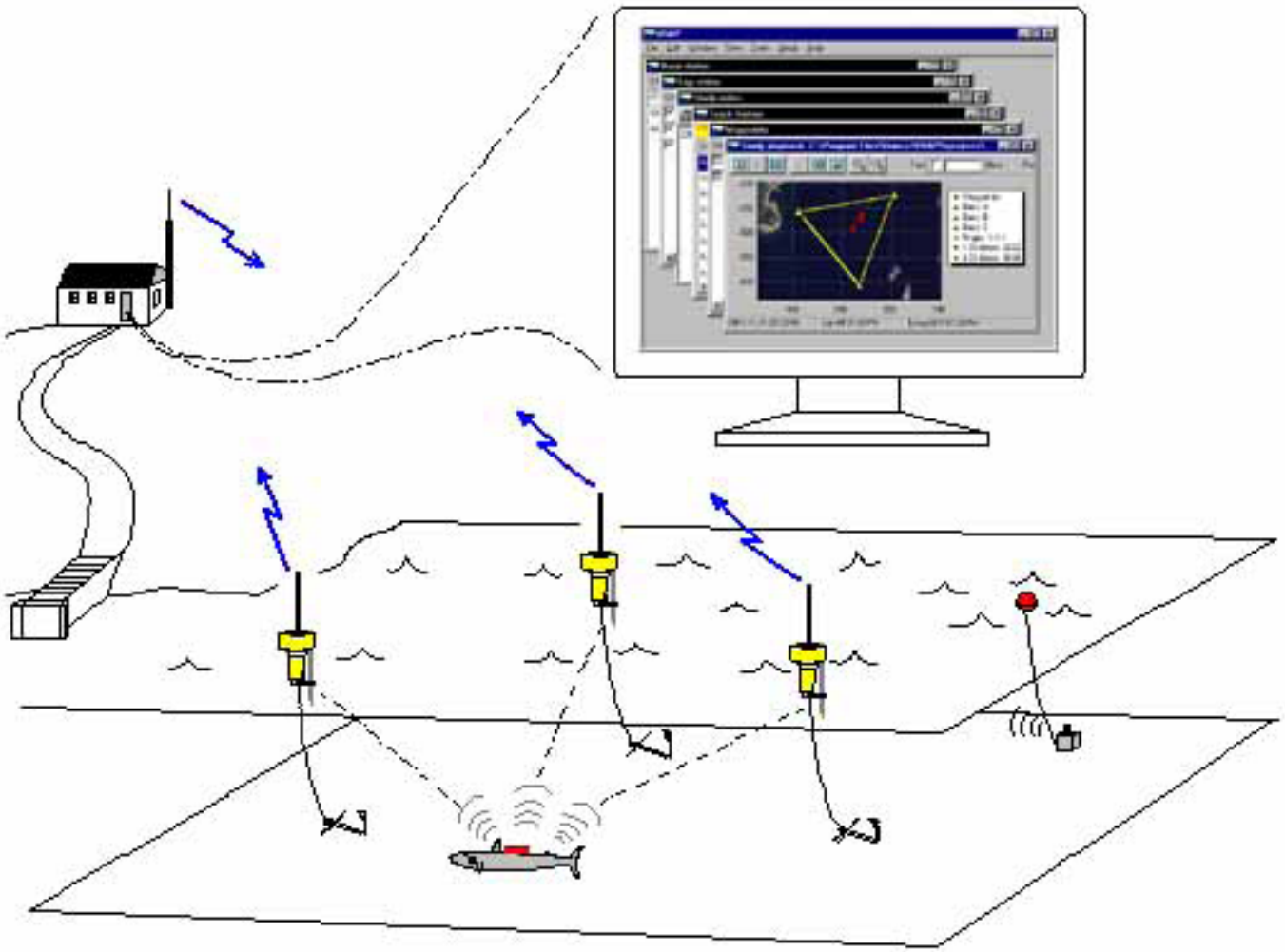



The 'Circle'
ST136
ST135
ST134
ST150
ST151
ST152
ST-134 S
ST-135 M
ST-151 Y
Legend
Platform
0
0.5
1
2
Kilometers
N
W
E
S

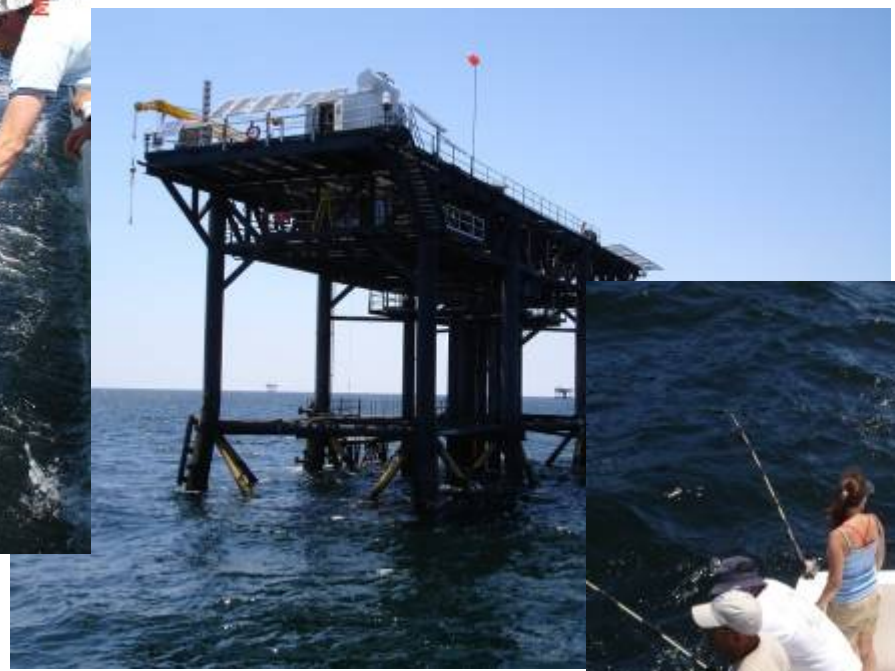
# Methods

- VEMCO Radio-acoustic positioning and telemetry system (VRAP)
  - Real time tracking
    - Hydroacoustic transmitters (depth)
    - Independent receivers, buoys
    - Base station

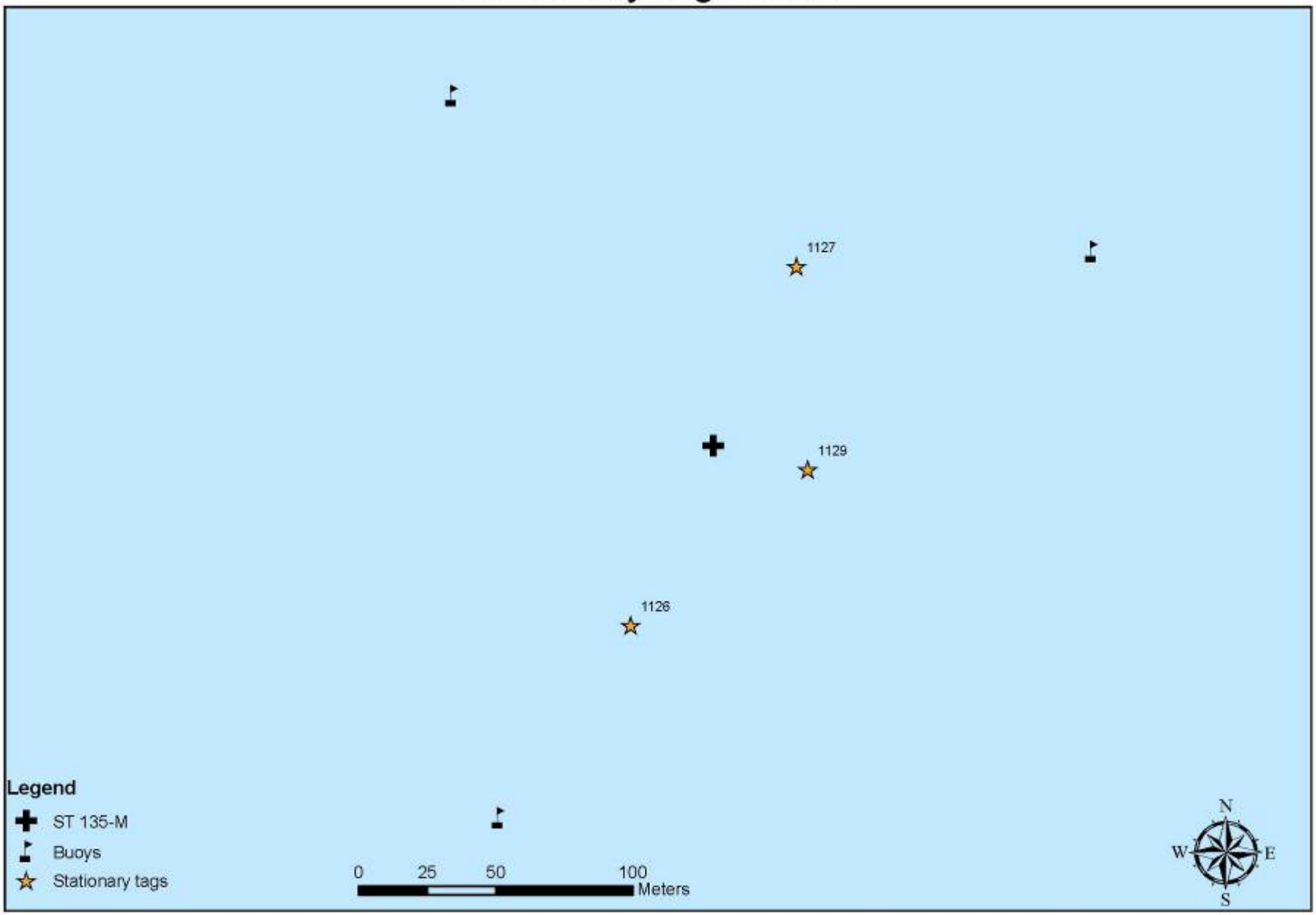
# VRAP



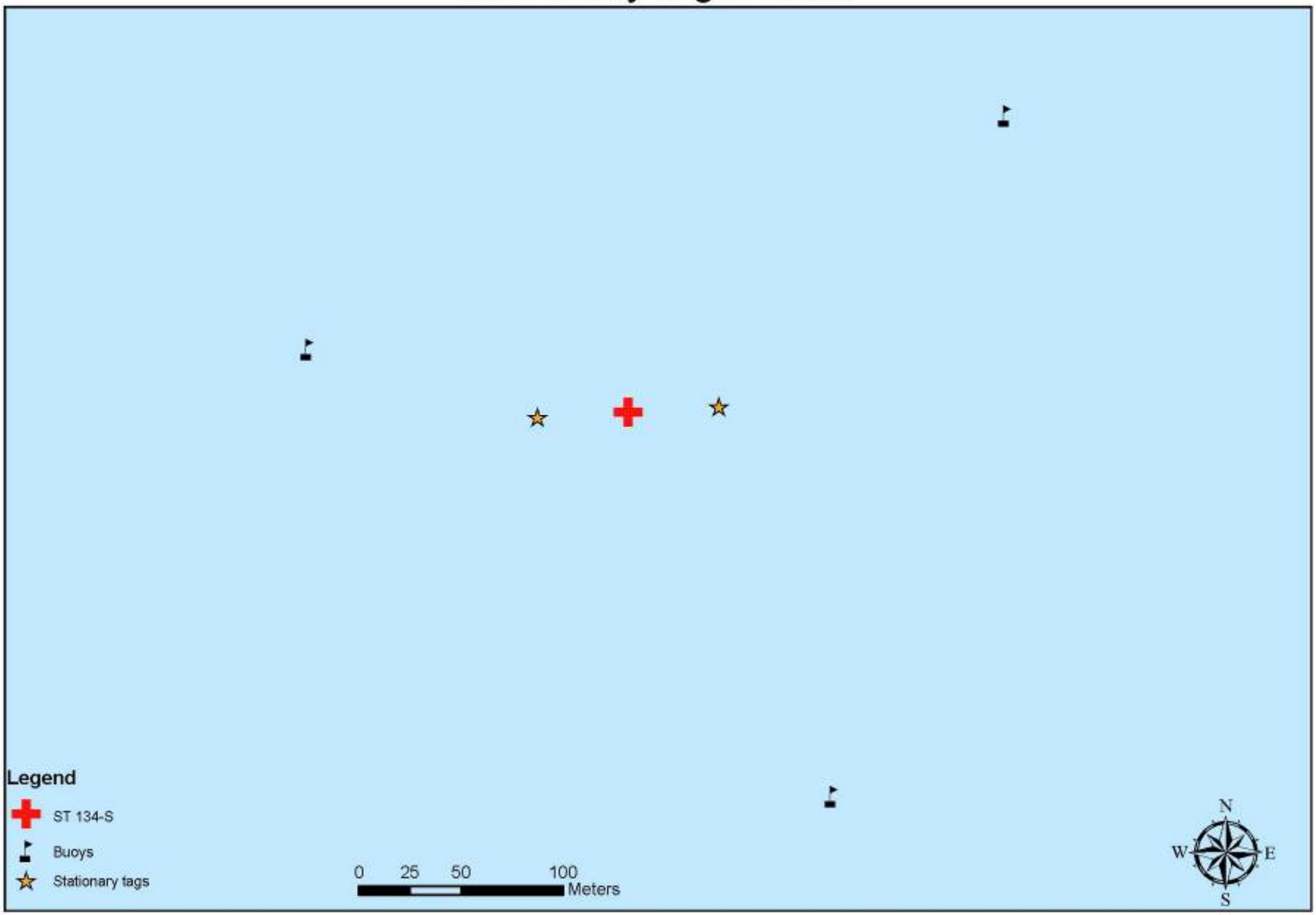
# Methods



# Stationary tags: 2005



# Stationary tags: 2006



# Methods

- Plot positions
  - Distance from platform
    - Mean by time of day
- Fish detections = positions + unresolved tags (unit of time = 1 hour)
  - Fish detected vs. hour of study
  - Spectral analysis (periodicity)
    - Input hour of study and number of fish detected
    - Output period (hrs) and relative power
  - Probability of detection (GLMM)

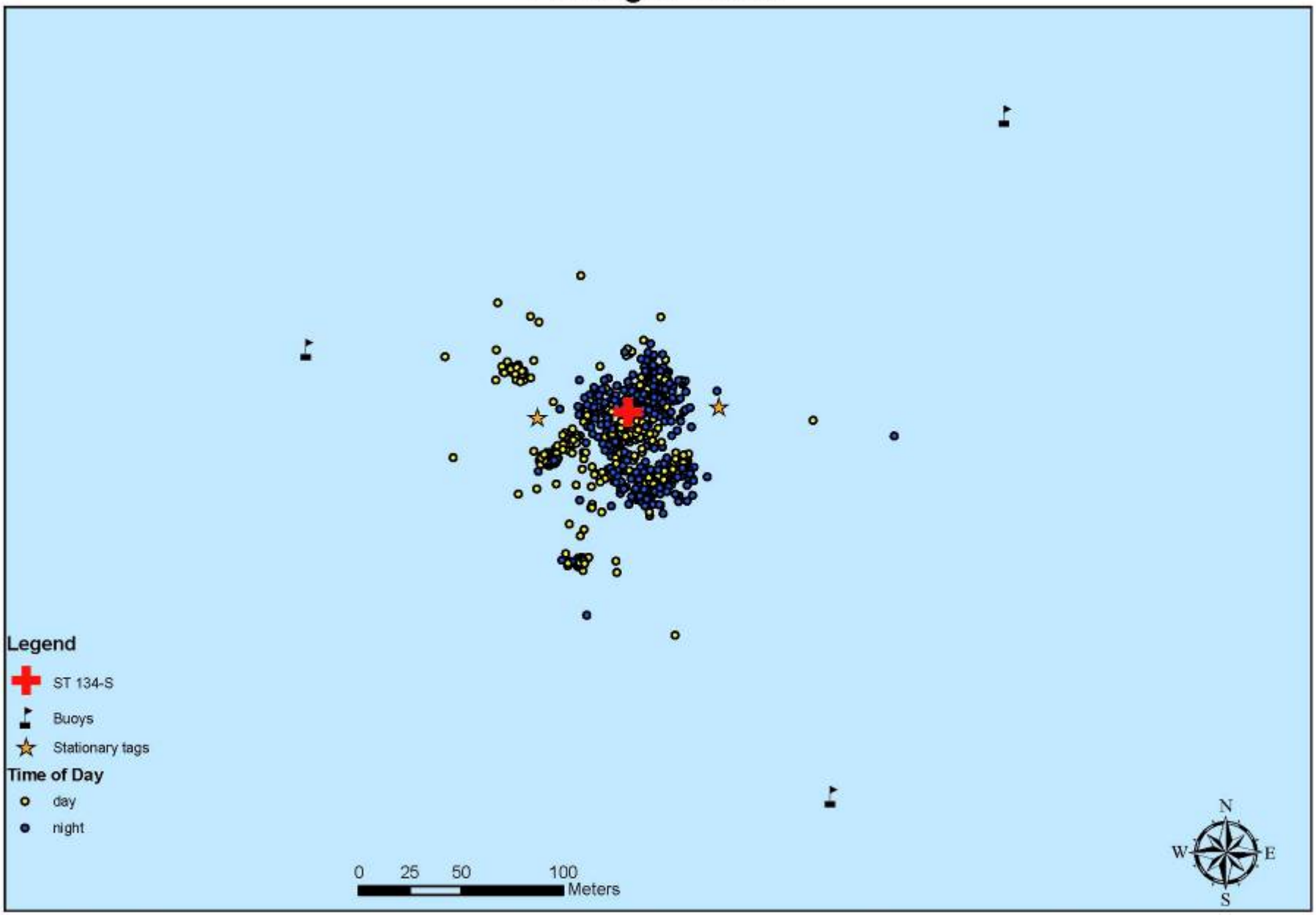
# Survival Analysis

- Time to ‘event’; permanent absence
- Sometimes time of event is unknown
  - Want to account for these data: censor
  - Survivor function:
    - $S(t) = Pr(T>t)$
    - Median and mean survival times

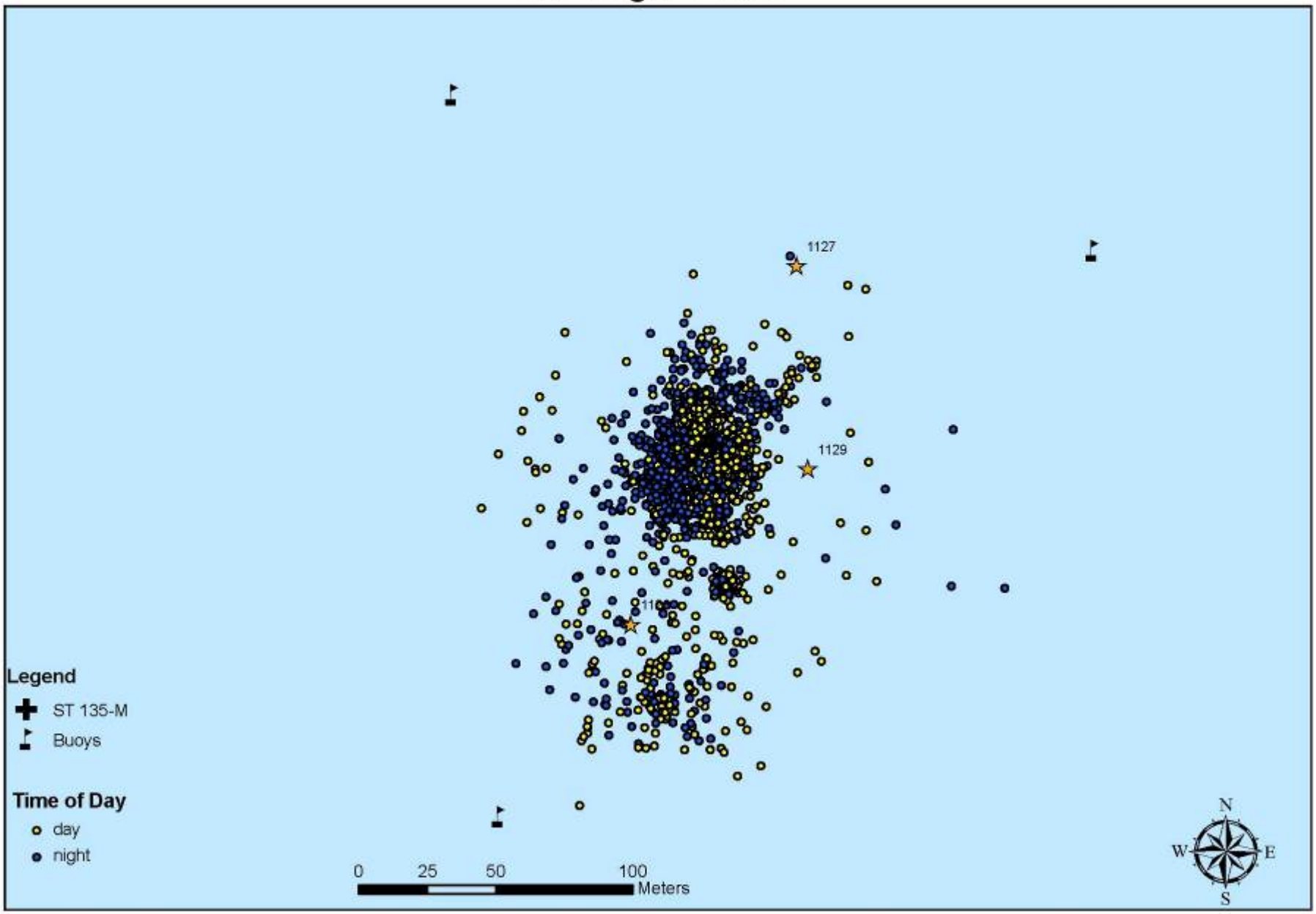
# Results

- All implanted snapper swam down and were assumed to have survived surgery
- 2006 – complete dataset
- 2005 – complements and supports

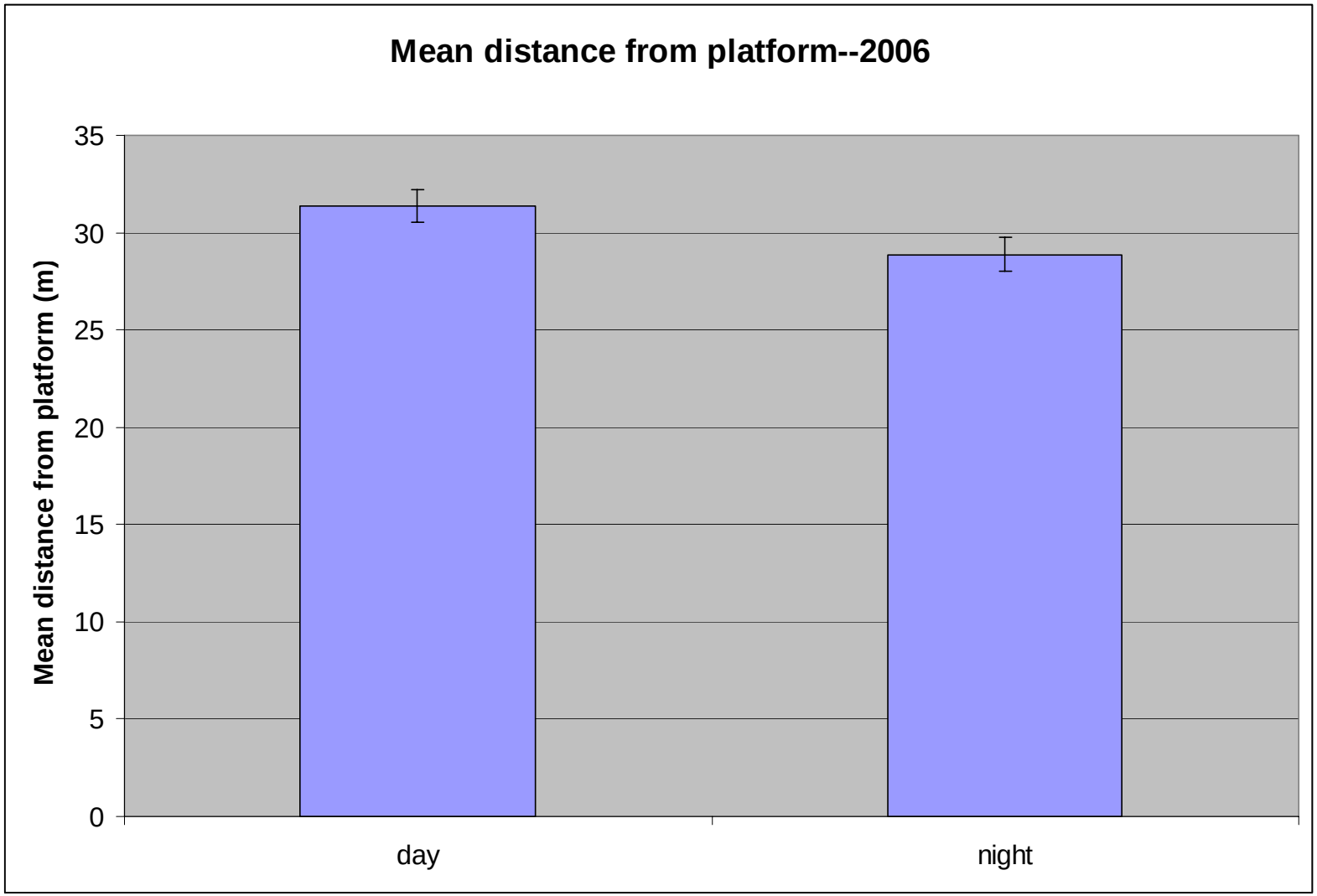
# All tags: 2006



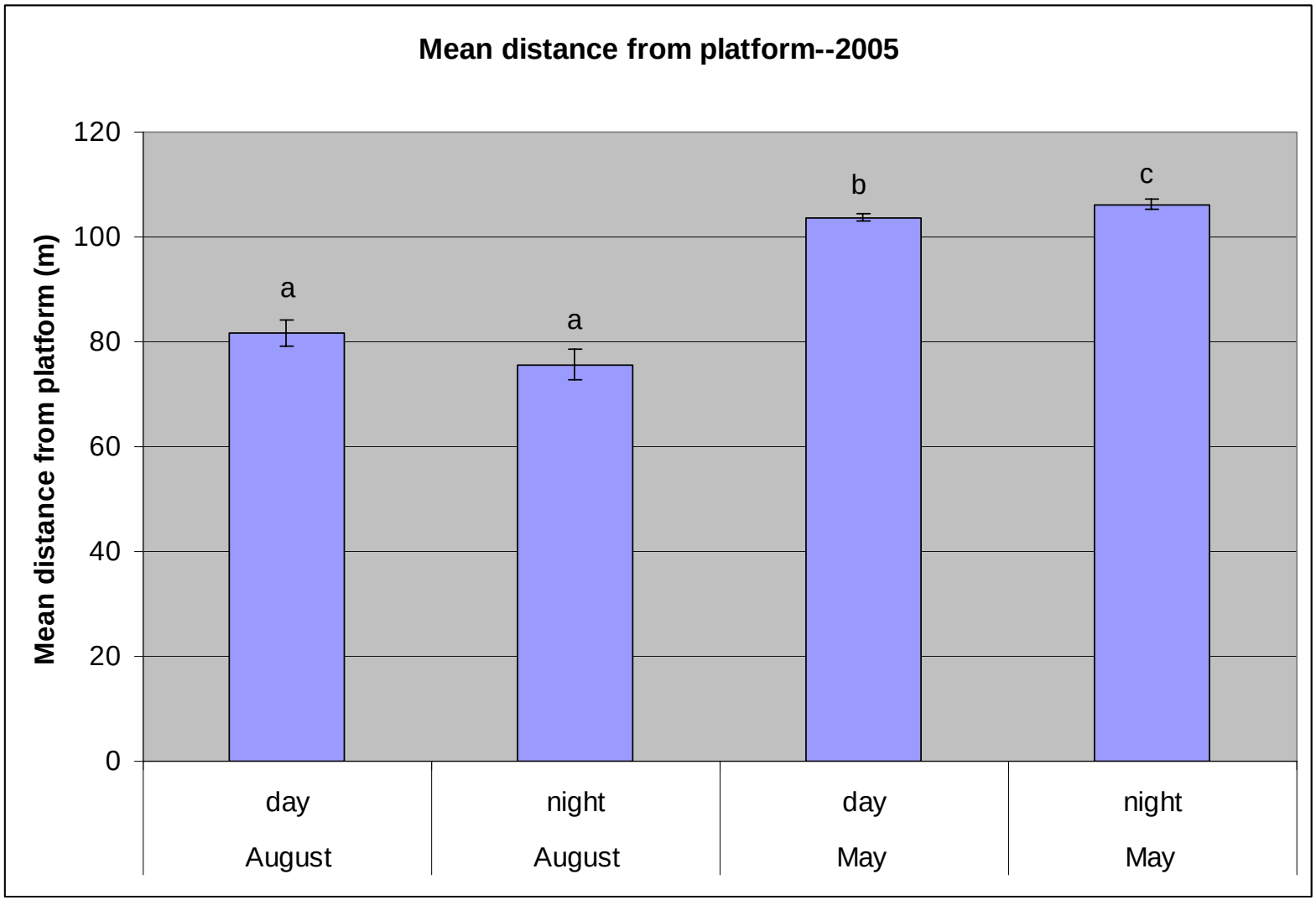
# All Tags: 2005



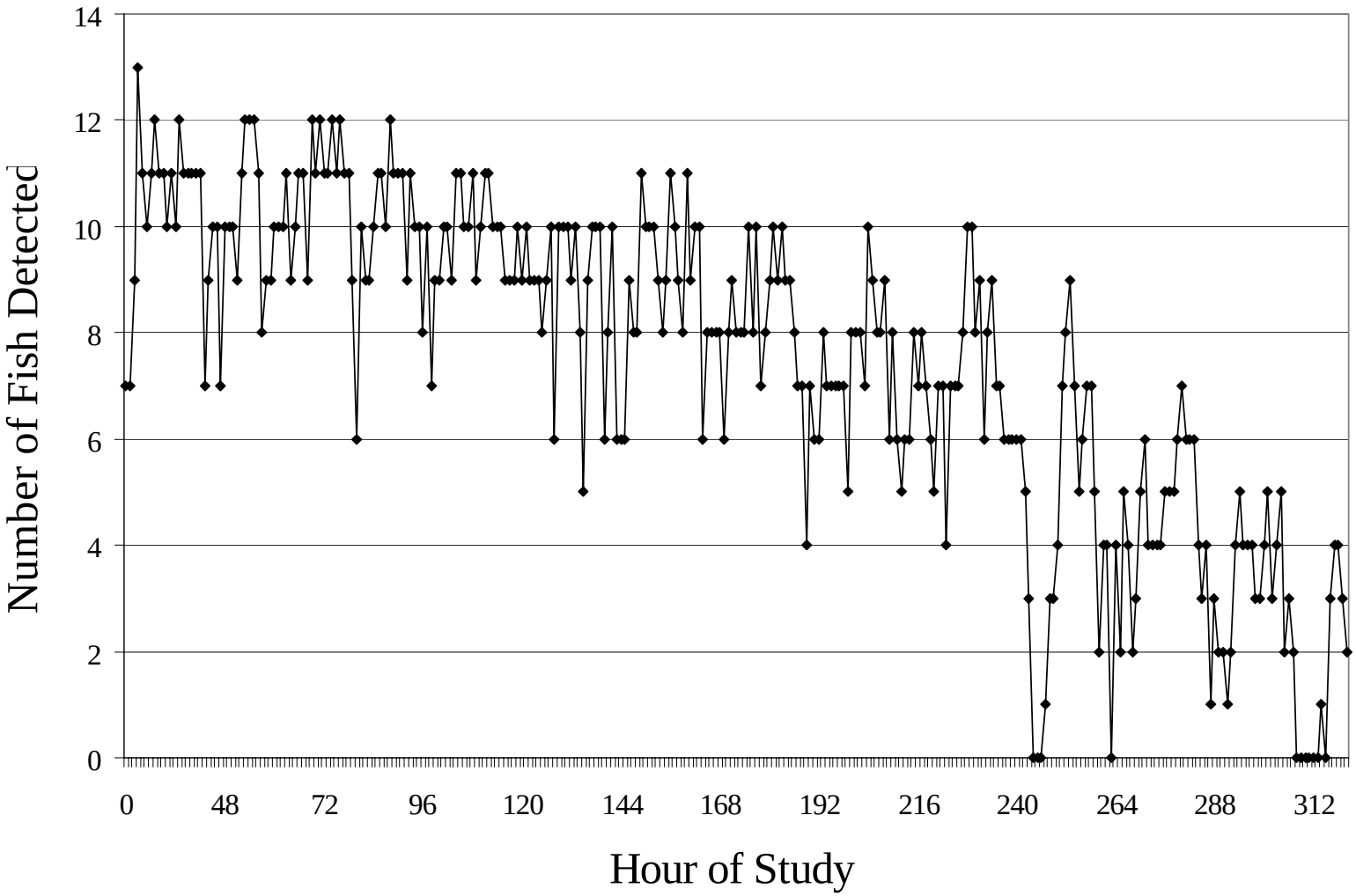
# Mean Distance – 2006



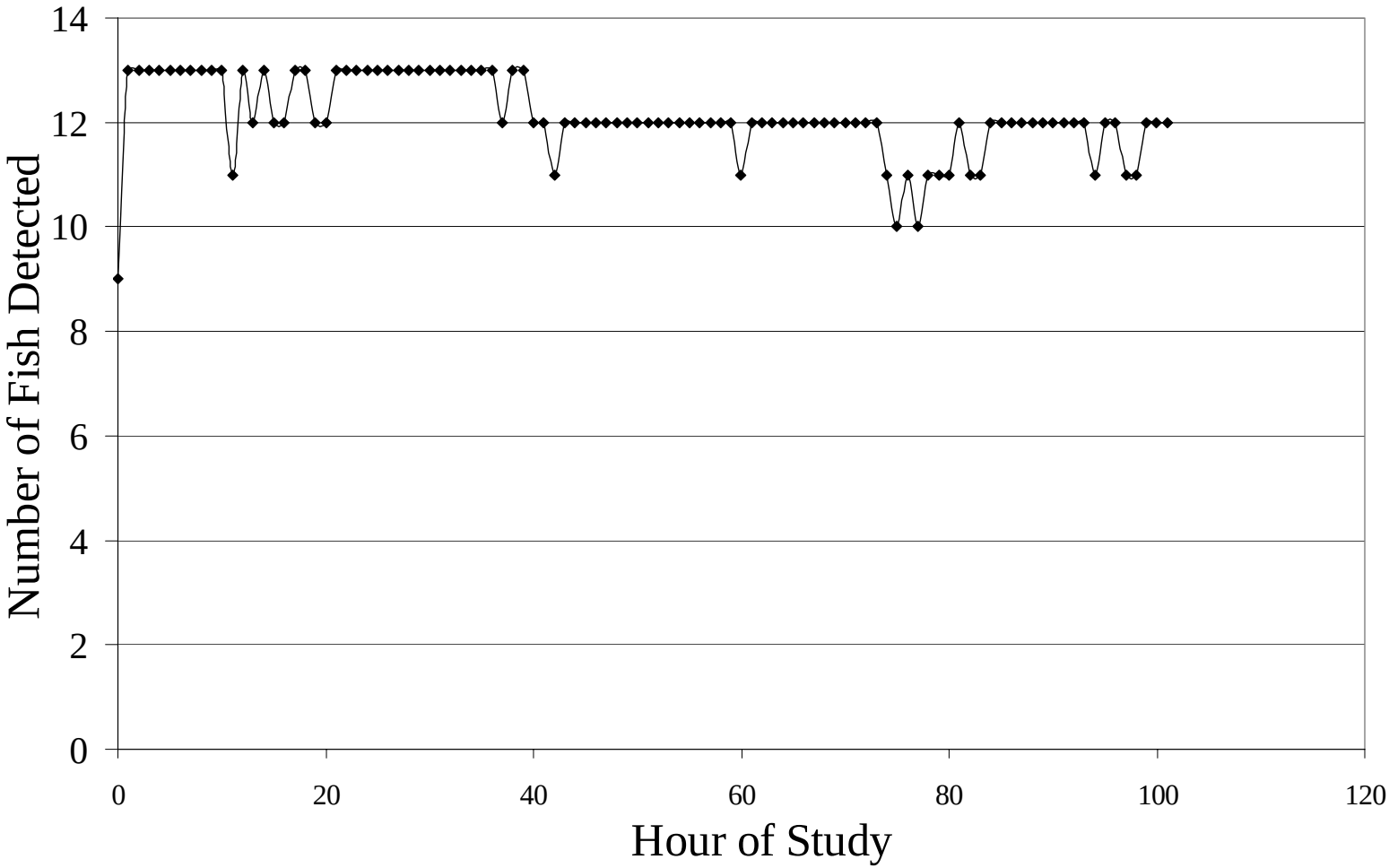
# Mean Distance – 2005



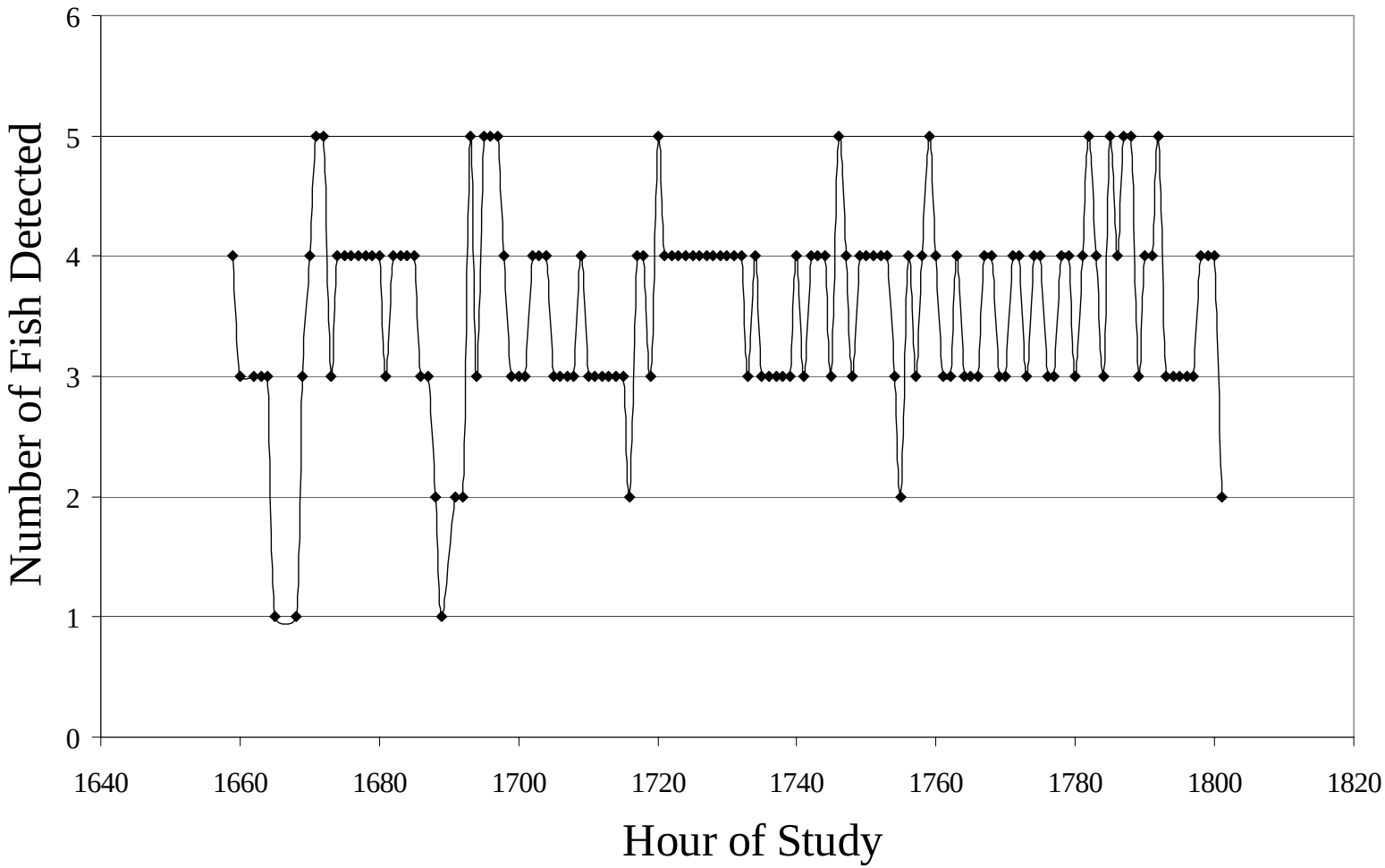
# Number of Fish Detected – 2006



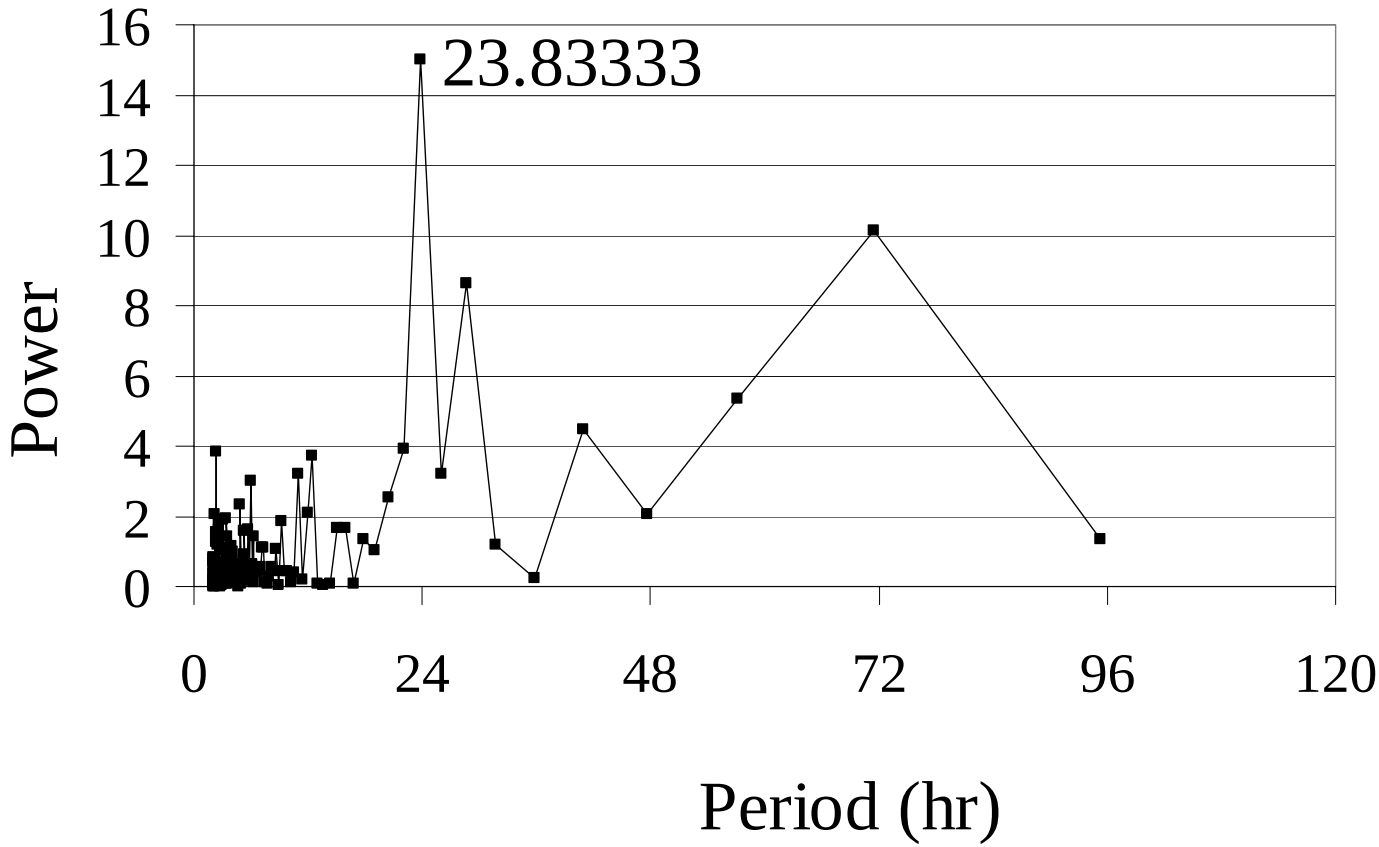
# Number of Fish Detected – May 2005



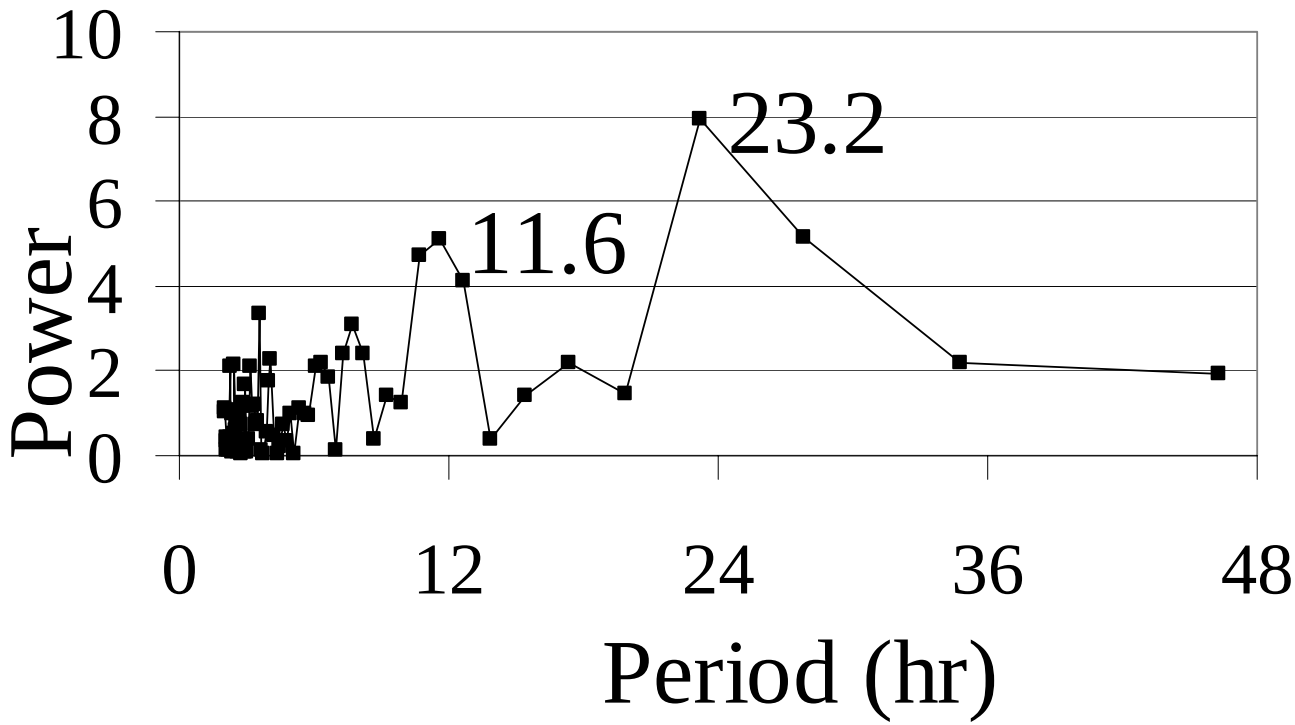
# Number of Fish Detected – August 2005



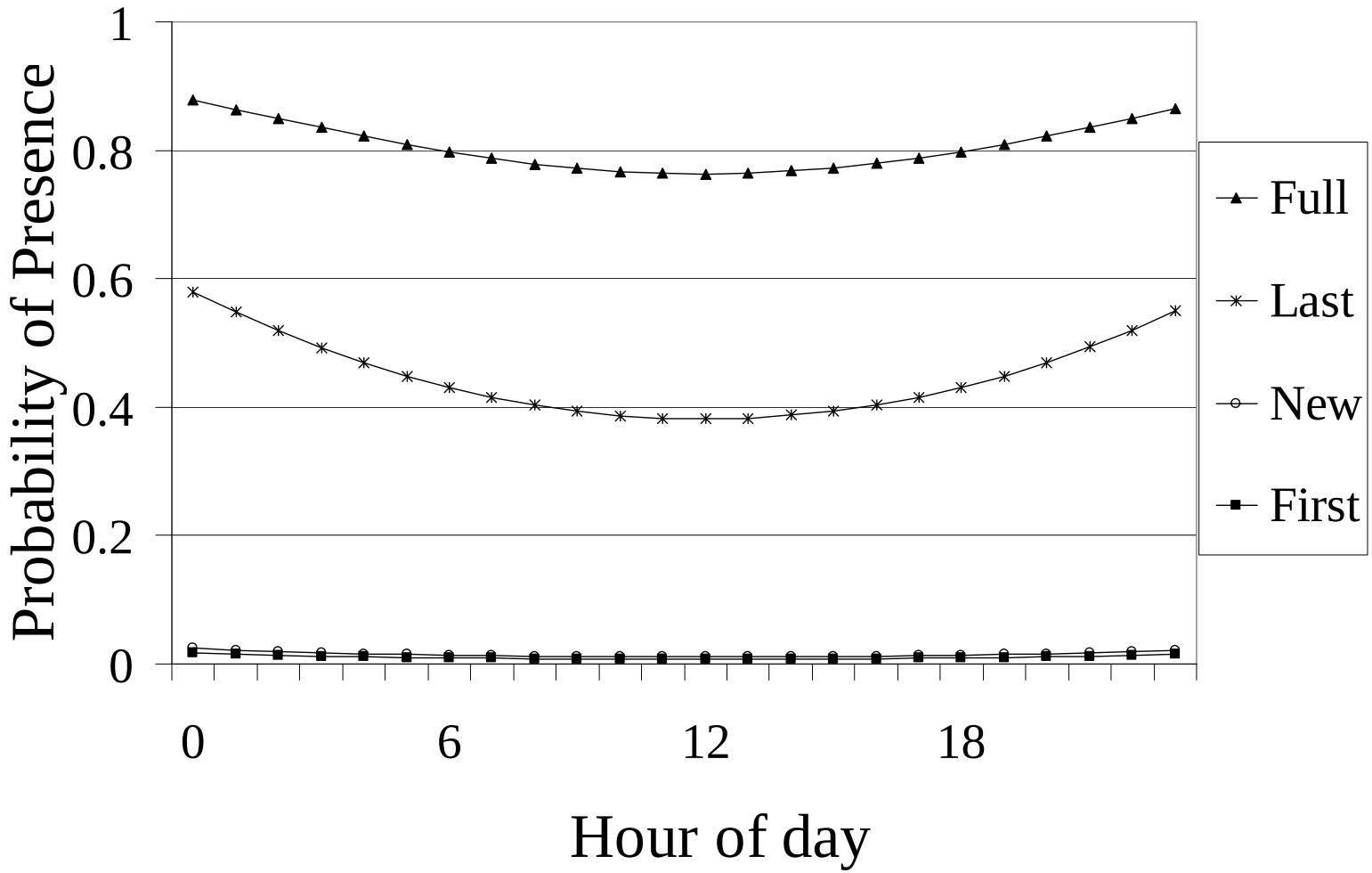
# Periodogram – 2006



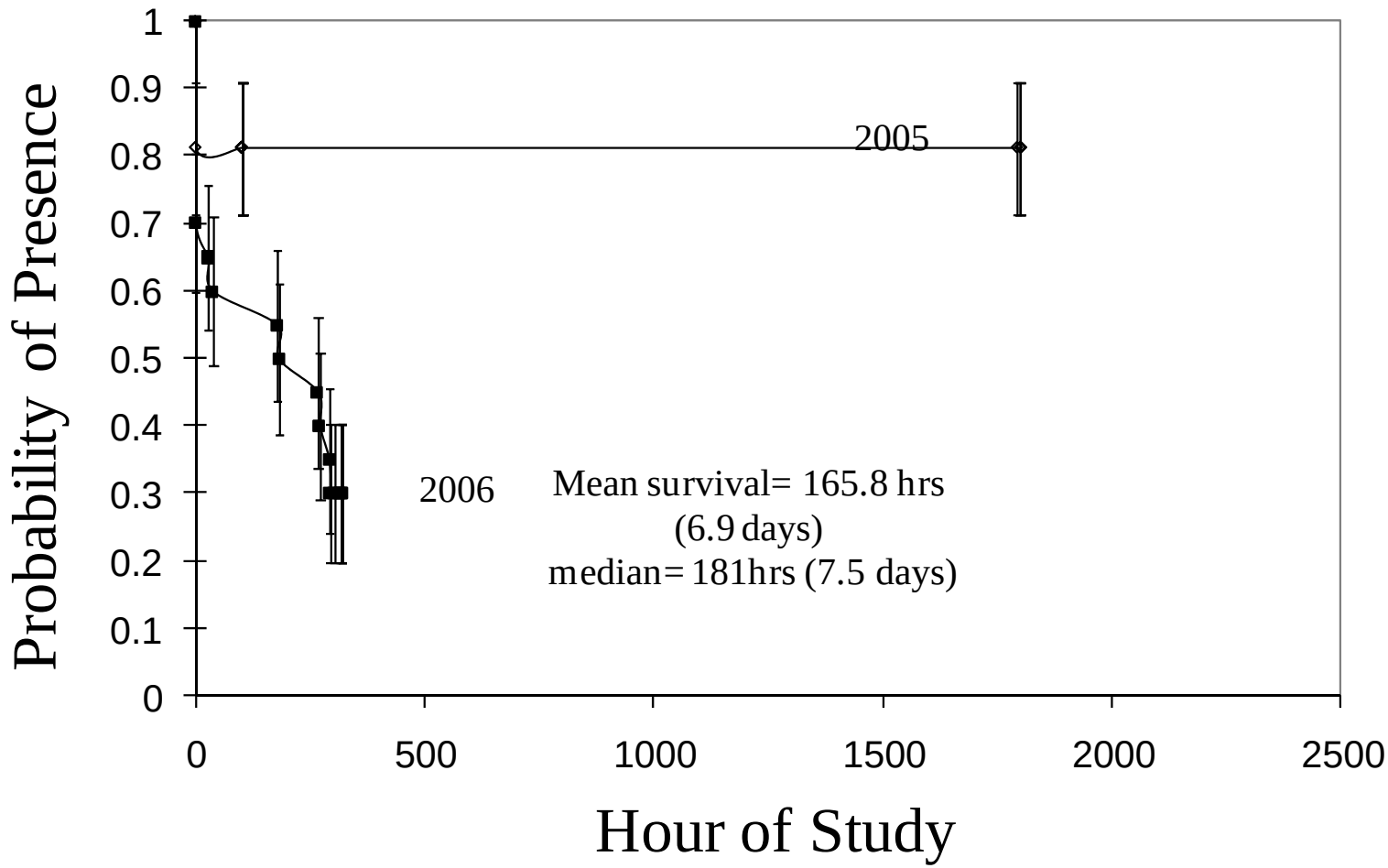
# Periodogram – August 2005



# Probability of Detection



# Survivor Function



# Conclusions

- 2006: complete dataset, good short-term data
- 2005: interruption – longer-term perspective
  - 2006: steady decline in fish detected
  - 2005: decline *between* deployments, steady within

# Conclusions

- Survival analysis: curve declines quickly
  - Mean survival: 6.9 days (2006)
  - Median: 7.5 days (2006)
  - Much faster than we expected
    - Emigration?
    - Predation?

# Conclusions

- Number of fish detected oscillates
  - Probability of detection (day vs. night)
- Spectral analysis→ 24-hour periodicity
- Distance from platform
- Feeding behavior
  - School while inactive, disperse to feed
  - Diet studies: non-reef-associated prey

# Does low site fidelity = high predation?

- Platforms:
  - Red snapper are abundant, but low % of assemblage
  - Piscivores abundant (platforms = FADs?)
  - VERSAR 2008
- Smaller reefs:
  - Red snapper comprise 75% of biomass
  - Very few piscivores seen during visual surveys
  - Strelchek et al. 2005

# Management Implications

- LDWF has one of the most extensive artificial reef programs in the world
- Both LDWF and MMS want to know implications
- Resource Mosaic Hypothesis implies that spacing is an important issue
- Ongoing work: diet studies foraging haloes

# Acknowledgments


- Committee members: Jim Cowan, Mark Benfield, and Larry Rouse
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  Dave Nieland, Aaron Podey, Mike McDonough (the elder), Andy Fischer, and Aaron Adamack and all of the people who helped me catch red snapper

  Dave Wells and Kevin Boswell gave excellent advice regarding analyses


MMS

Louisiana State University
Coastal Fisheries Institute

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