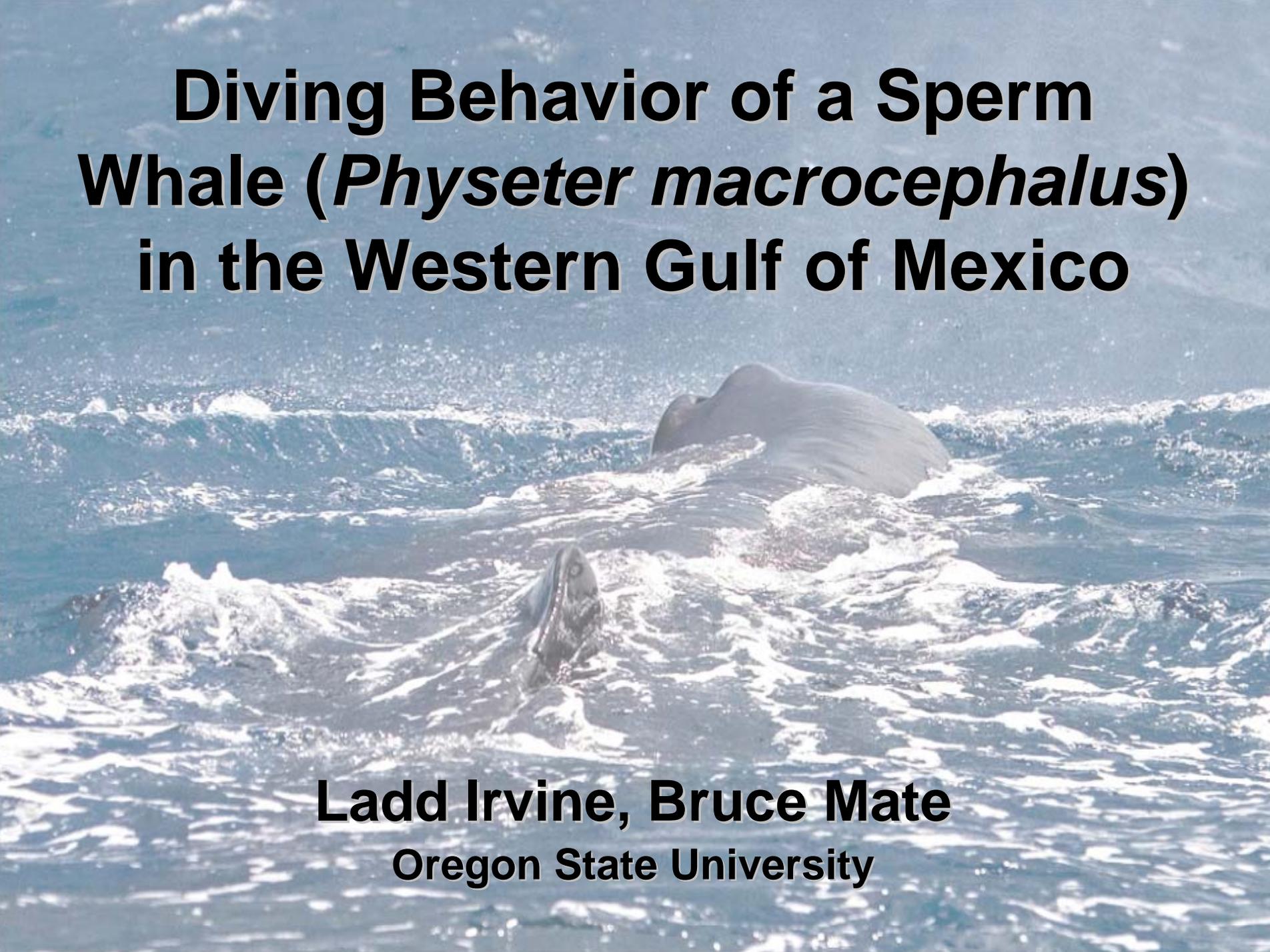


# **Diving Behavior of a Sperm Whale (*Physeter macrocephalus*) in the Western Gulf of Mexico**



**Ladd Irvine, Bruce Mate**  
**Oregon State University**

- **Commonly dive from 400 – 1200m for 40 – 50min (Watwood et al. 2006, Drout et al. 2004, Amano and Yoshioka 2003, Zimmer et al. 2003)**

### **Project Objectives:**

- **Long duration dive depth recorder**
- **Monitor diving behavior over longer spatial and temporal scales**



# Telonics ST-21 Depth Tag

- Same tag housing and deployment method as location only tags
- On-board pressure transducer recorded depth continuously
- Transmitted four 1- hour periods each day
- Locations through Service Argos



# Telonics ST-21 Depth Tag

**For four 6-hour summary periods, the tags recorded:**

- **maximum dive duration**
- **total number of dives**
- **% time spent in eight different depth ranges**
- **(bins: 0–10m, 10–100m, 100–400m, 400–700m, 700–1,000m, 1,000–1,300m, 1,300–1,600m, 1,600+)**

# Telonics ST-21 Depth Tag

Calculated from binned data:

**% time at the surface:**  
 **$100 - (\Sigma \text{ bins})$**

sumPer	1	2
bin10	3.91	21.88
bin100	24.22	40.63
bin400	8.59	1.56
bin700	36.72	2.34
bin1000	8.59	2.34
bin1300	0.00	6.25
bin1600	0.00	0.00
bin1900	0.00	0.00
bin4095	0.00	0.00
SumBins	82.03	75.00
% at Surface	17.97	25.00
AveDiveDepth	377.90	176.04

**Average dive depth:**

**$\Sigma (\text{binMiddle}_i * (\text{percent time}_i / \Sigma \text{ bins}))$**

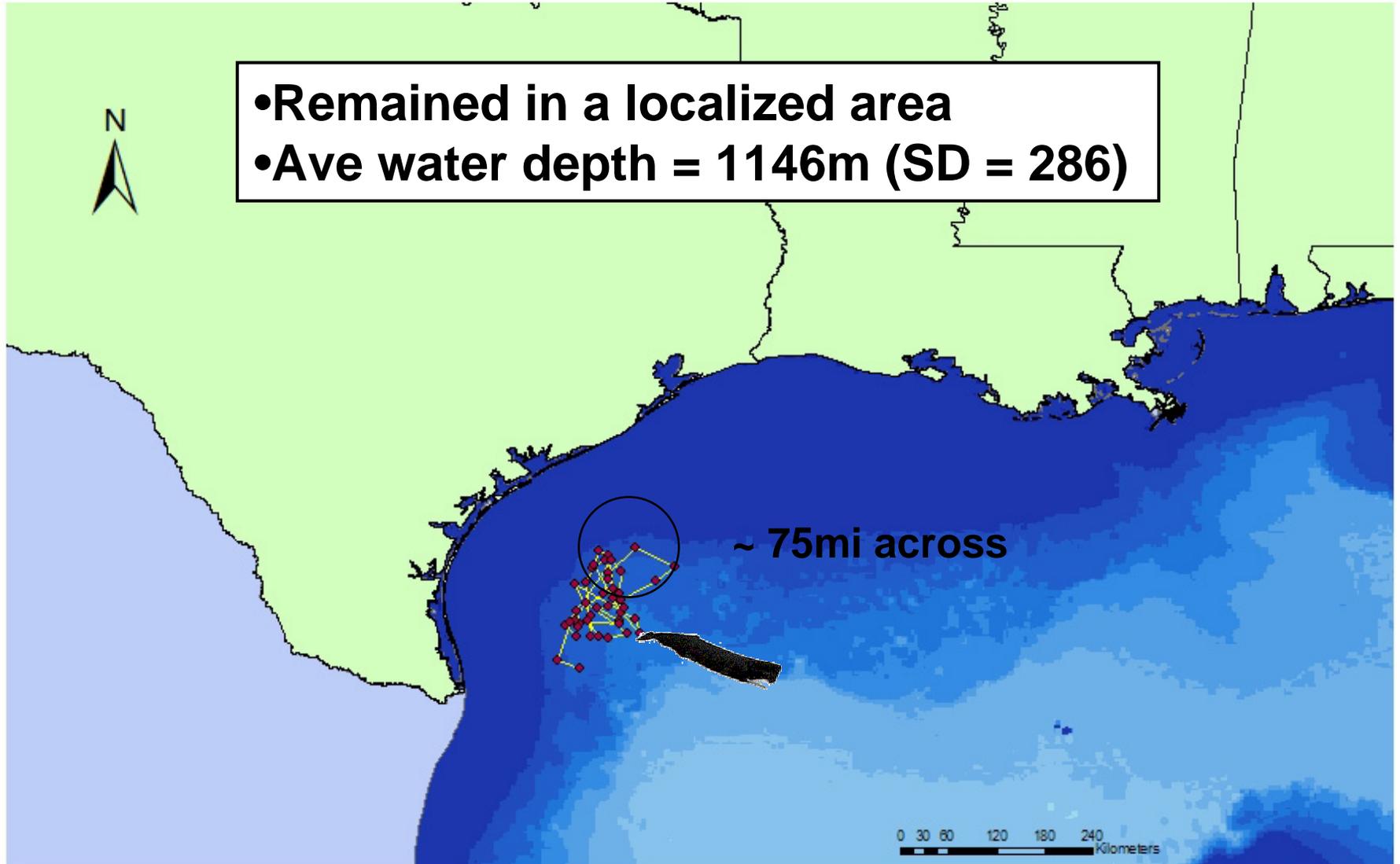
**$i = 1-8$**

# Results

- **Data from 66 summary periods received for the dates 6/15–6/18 and 7/1–7/17**
- **First four days excluded from analysis**
  - **Still the longest continuous monitoring of sperm whale diving behavior**

# Results (cont.)

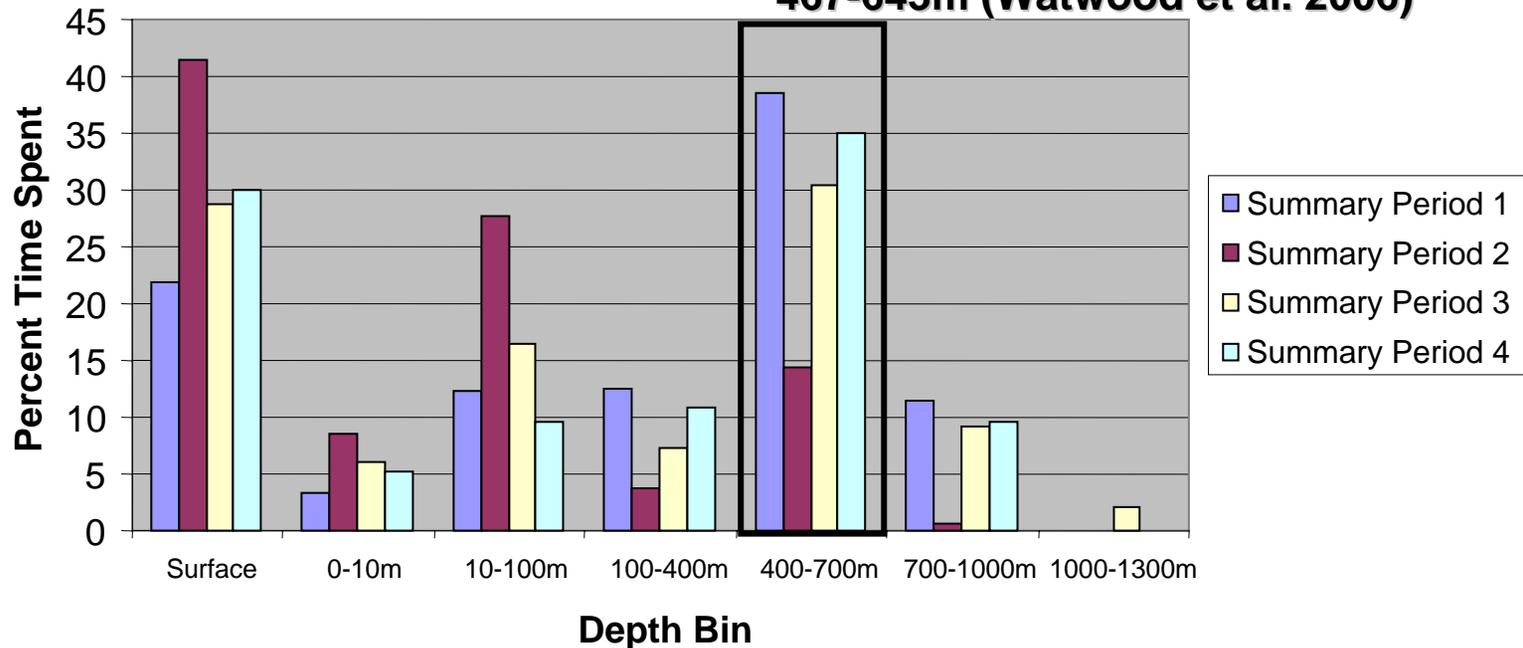
- Remained in a localized area
- Ave water depth = 1146m (SD = 286)



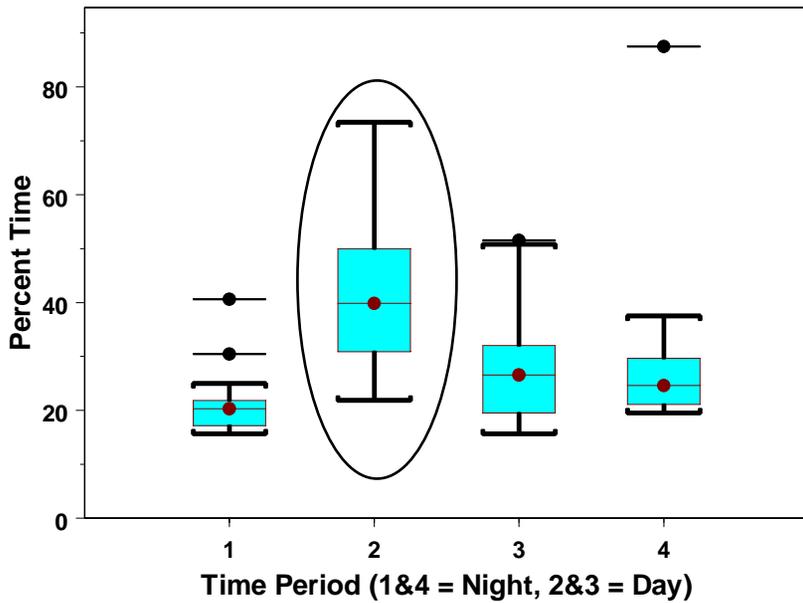
- Largest portion of time spent at the surface (mean = 30%)
- During dives, most time was spent between 400–700m (mean = 26%)
- Time in other bins down to 1,000m approximately equal
- 9 records between 1,000–1,300m

## Average time spent per depth range

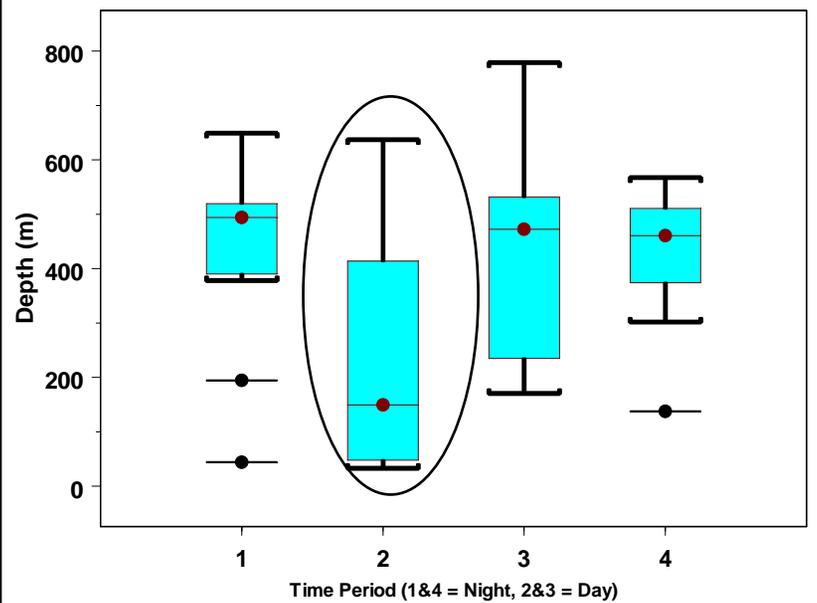
467-643m (Watwood et al. 2006)



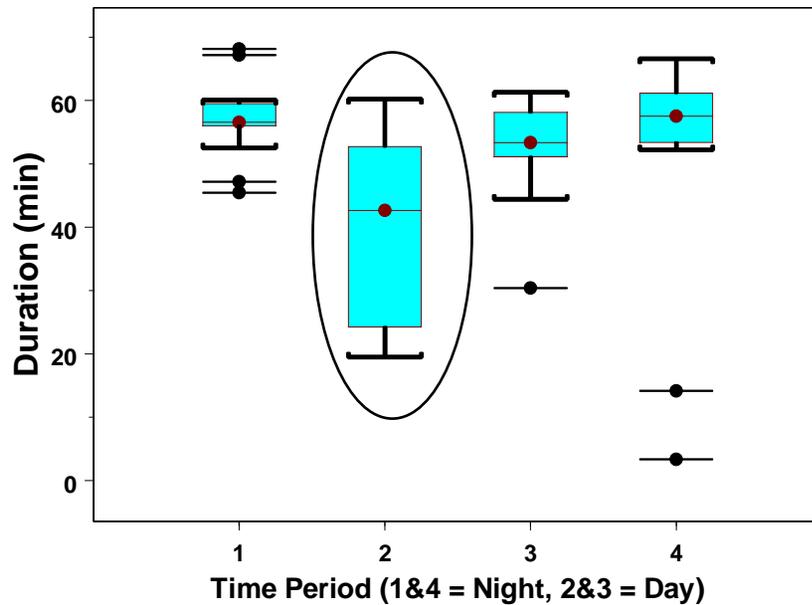
### Percent Time Spent at the Surface vs Time of Day



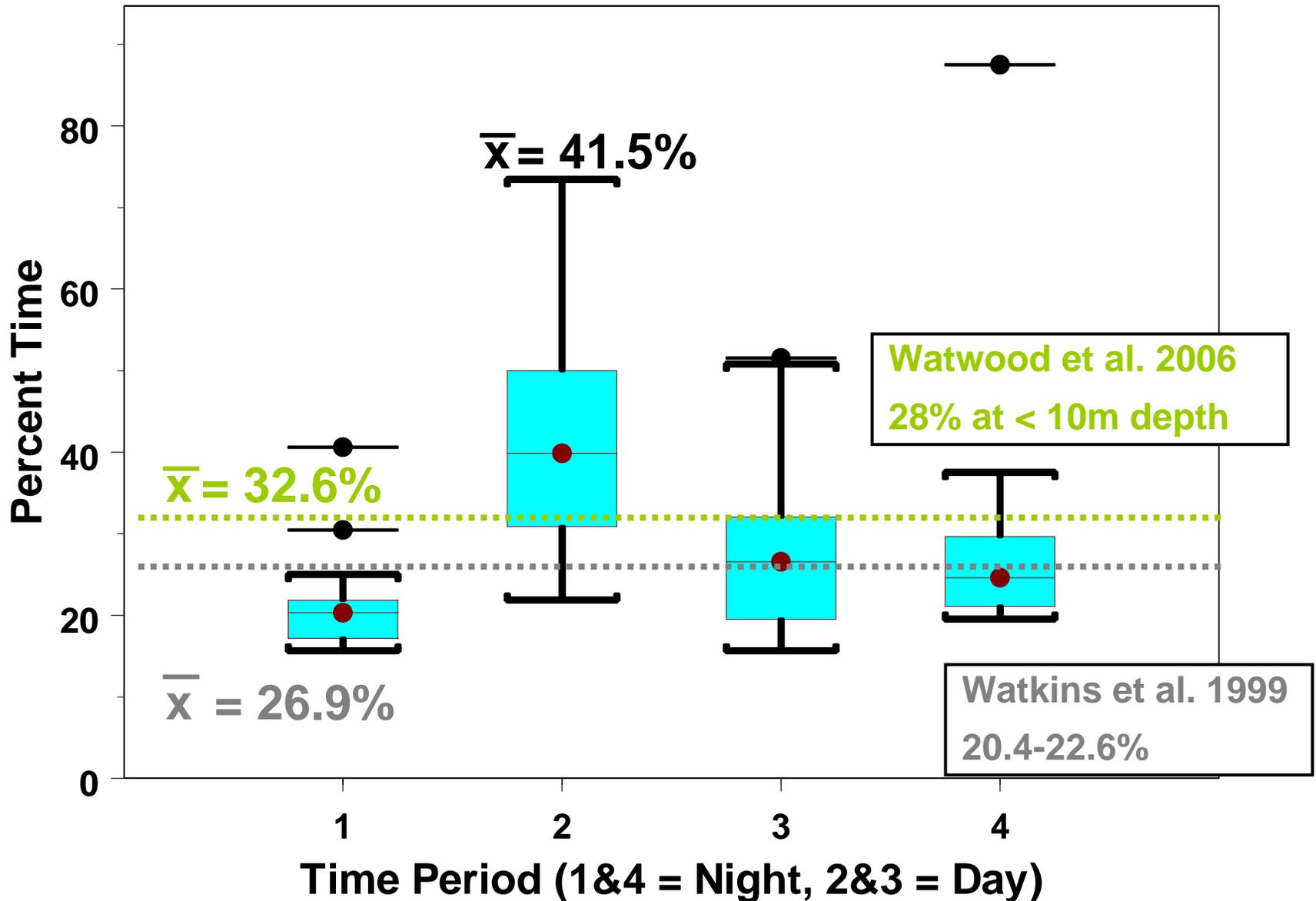
### Average Dive Depth vs Time of Day



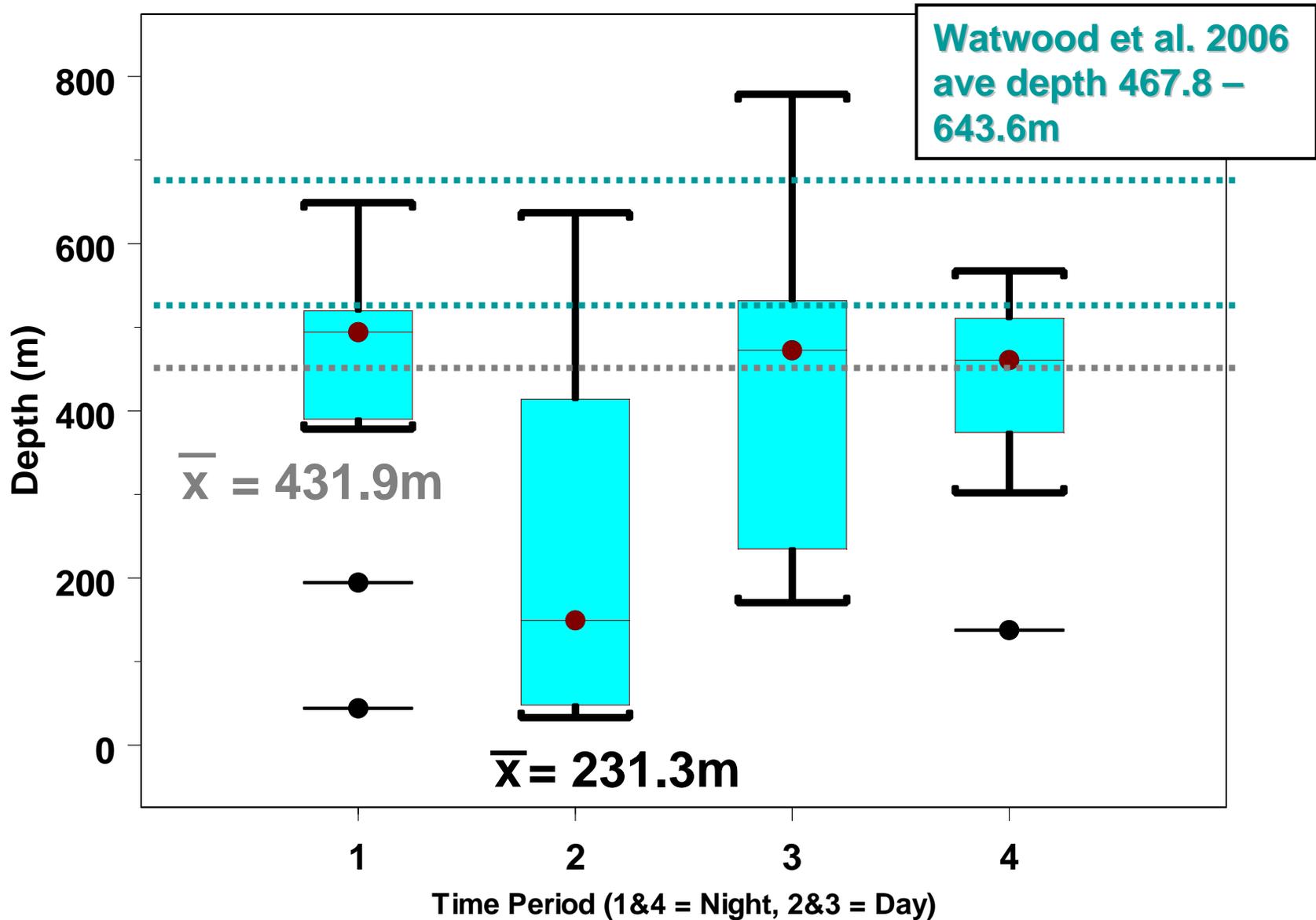
### Maximum Dive Duration vs Time of Day



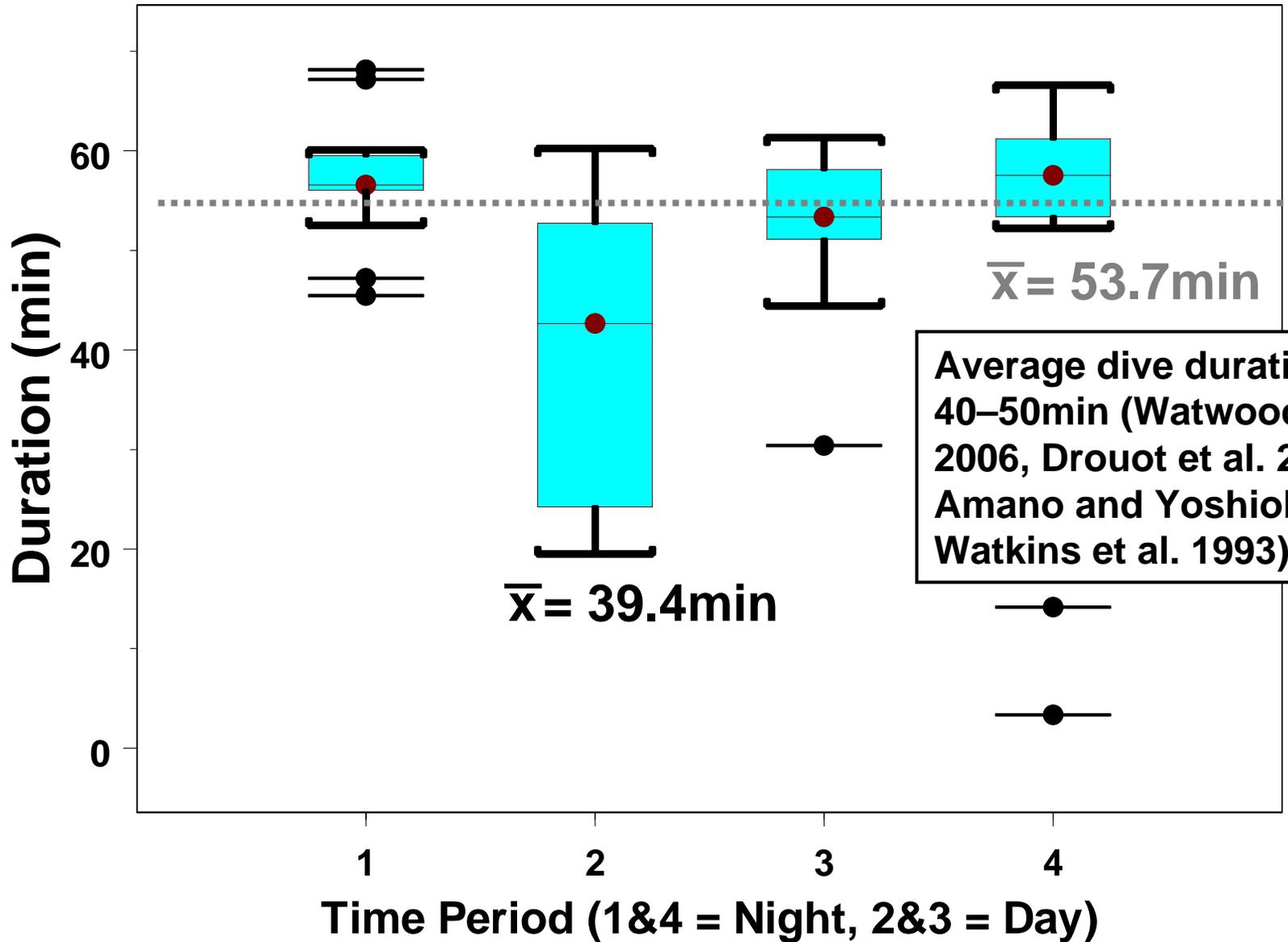
# Percent Time Spent at the Surface vs Time of Day



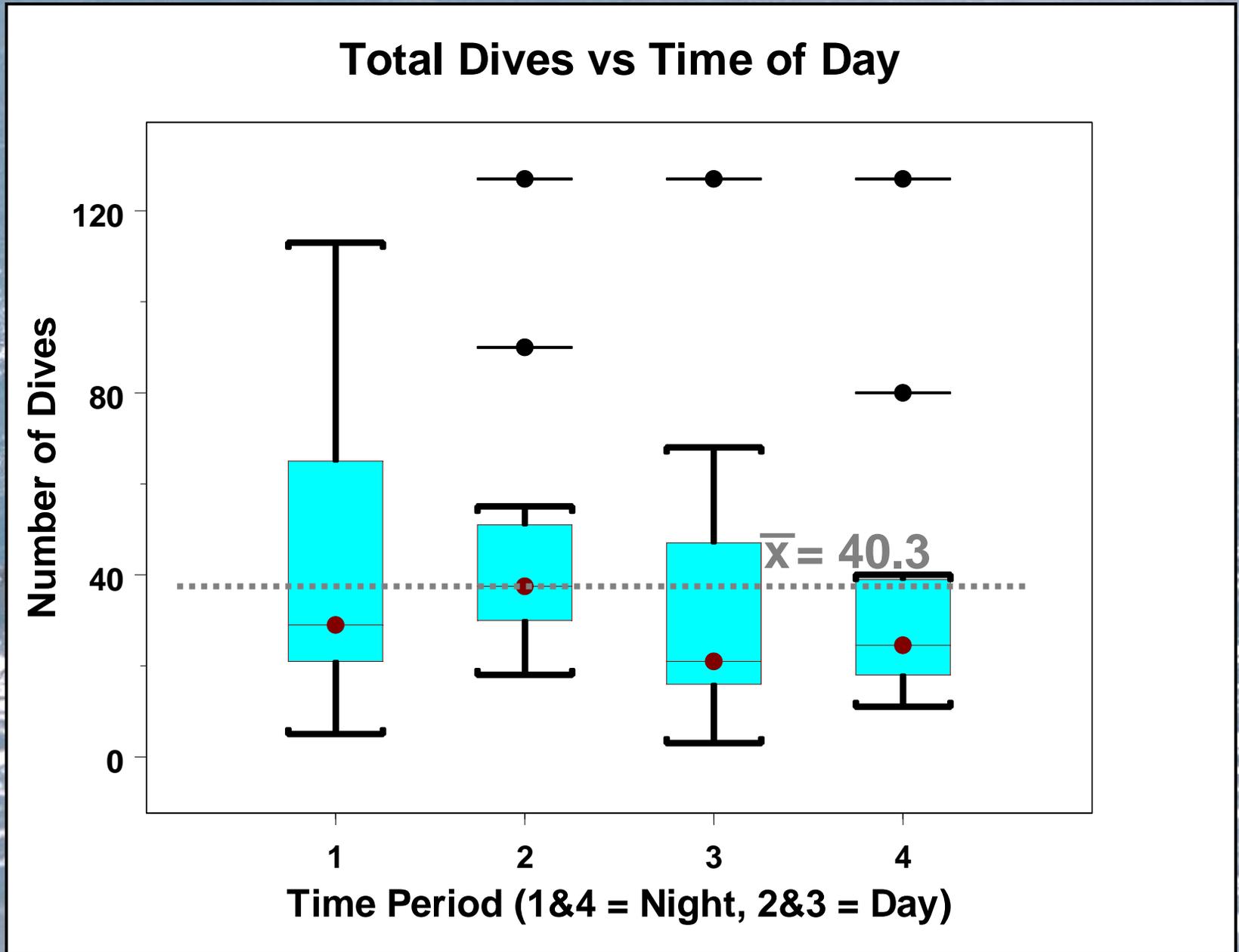
# Average Dive Depth vs Time of Day



# Maximum Dive Duration vs Time of Day

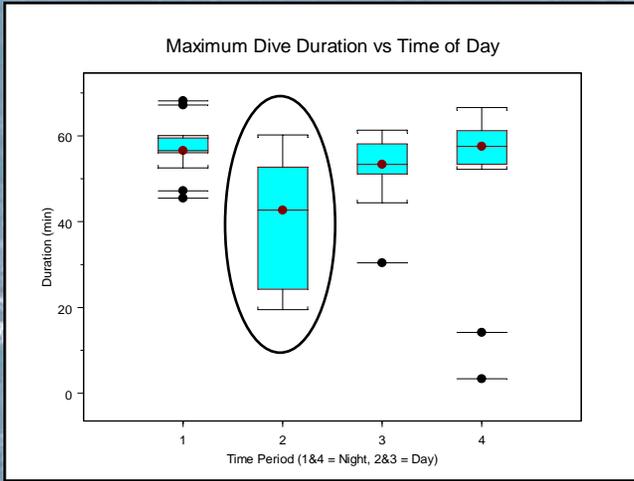


# Total Number of Dives Per Period

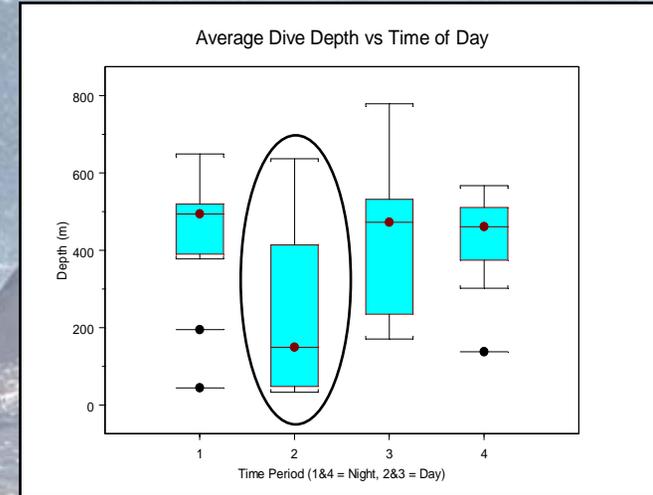


# What Is Going On?

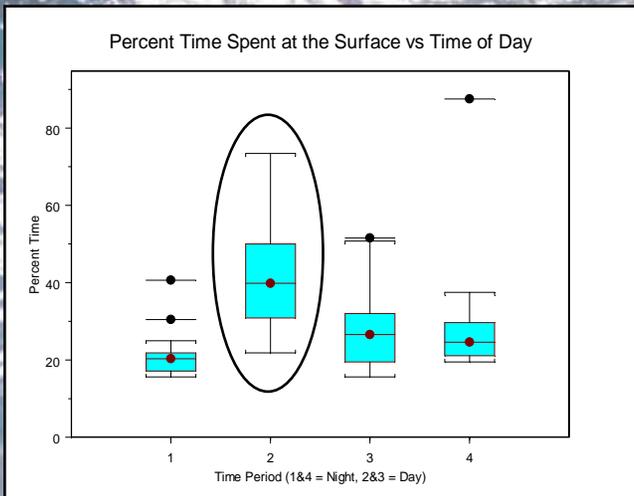
**Shorter maximum dive duration**



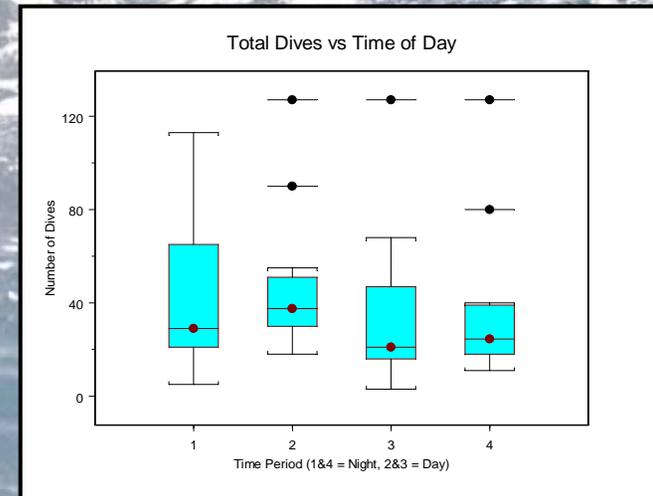
**Shallower average dive depth**

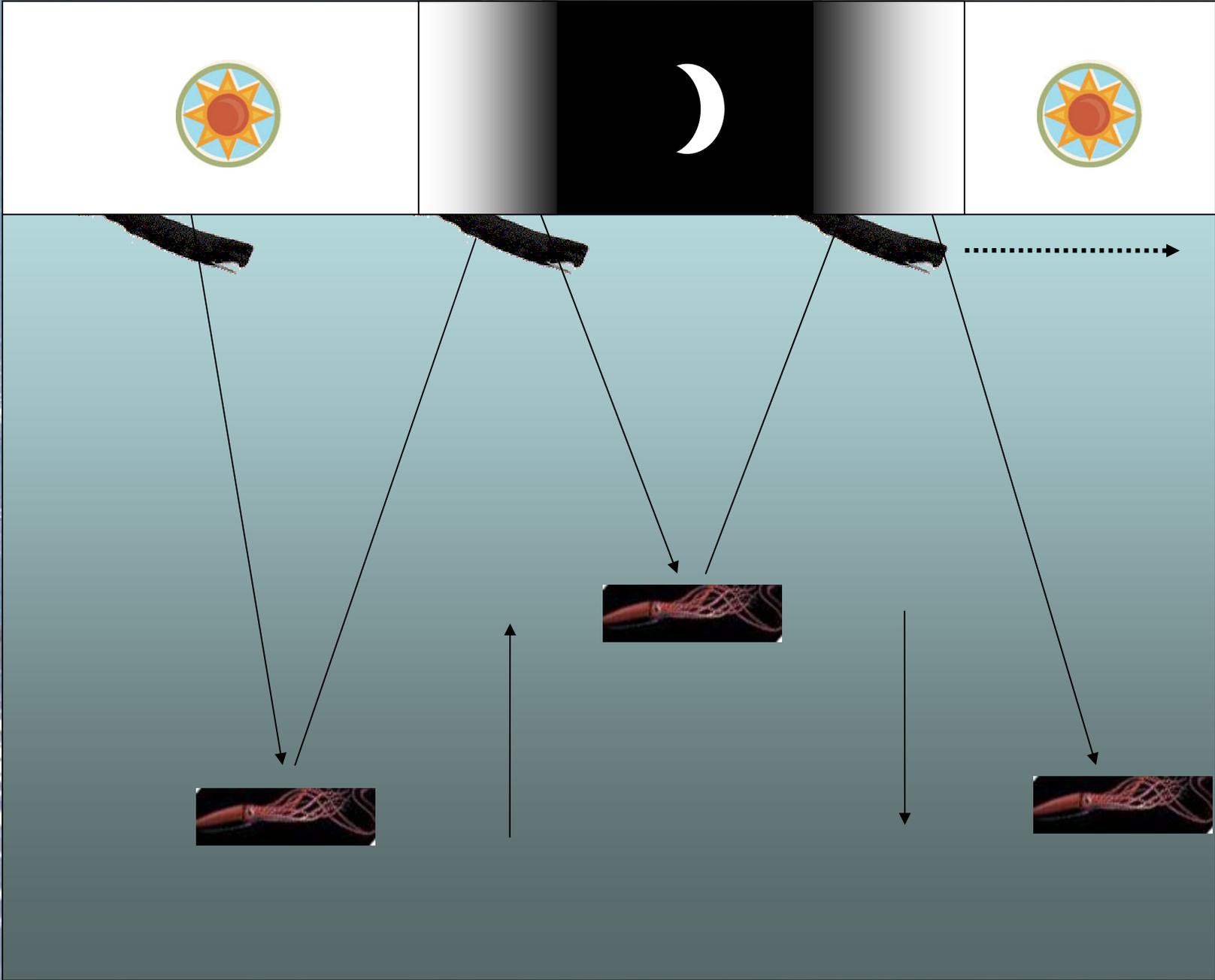


**Greater time spent at the surface**



**But no change in total number of dives**





# Summary

- **Commonly visited depths down to 1000m, most common in 400–700m depth**
- **Appeared to change behavior during morning hours**



# Summary (cont.)

- **Behavior change characteristics:**
  - Spent more time at the surface
  - Did not dive as deeply
  - Had shorter maximum dive durations
- **May have been resting behavior: less active**

# Acknowledgments

- **Minerals Management Service**
- **IFRC**
- **Tagging Crew: Joel Ortega, Craig Hayslip, Dan Engelhaupt, and Andy Szabo**
- **The rest of the SWSS 2005 participants**
- **The crew of the R/V Gyre**

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