

# Post-stocking survival and movement of telemetered bonytail *Gila elegans* in Lake Havasu



Christine M. Adelsberger, Abraham P. Karam, and Paul C. Marsh

# Goals

- Areas where bonytail congregate within Lake Havasu
- Post-stocking dispersal
- Post-stocking survival





# Surgical Procedure

- 20 Fish were:
  - Weighed
  - Measured
  - Anesthetized
  - Tags were sterilized and implanted abdominally
  - 3 non-absorbable sutures closed the incision
  - Allowed to recover



# Acoustic Telemetry



- Sonotronics PT-4 transmitter
  - 90 d battery life
  - 27 mm x 9 mm
  - 4.2 g (in air)
- DH-4 Directional Hydrophone
- USR-08 Receiver
- Manual Tracking
  - Mapped waypoints ArcGIS
  - Every 1000 m

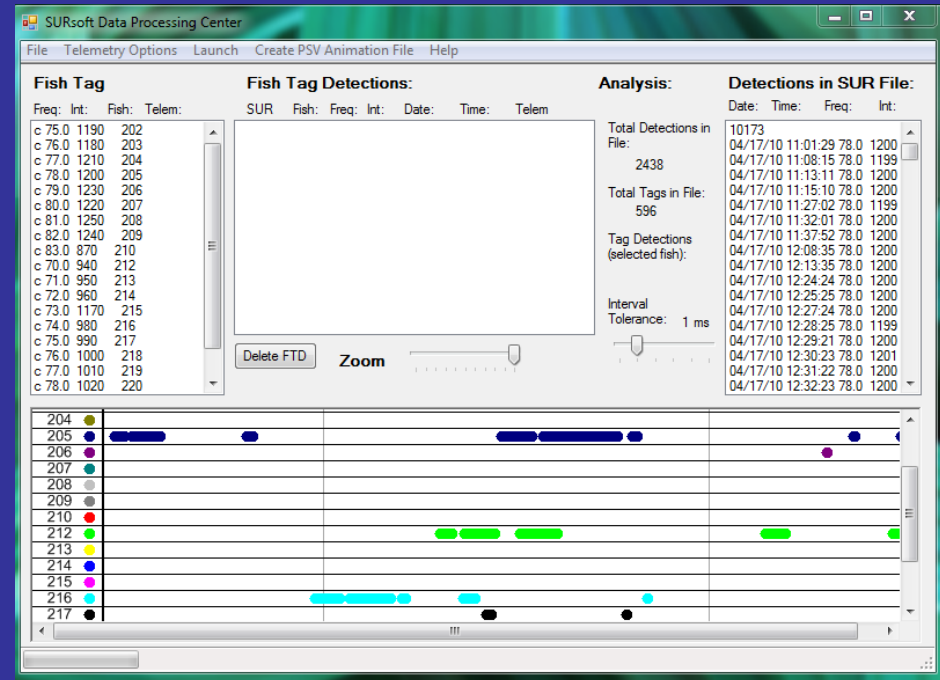
# Submersible Ultrasonic Receiver

- SUR
  - Waterproof
  - Battery powered
  - 24-hour sampling
  - Downloaded weekly

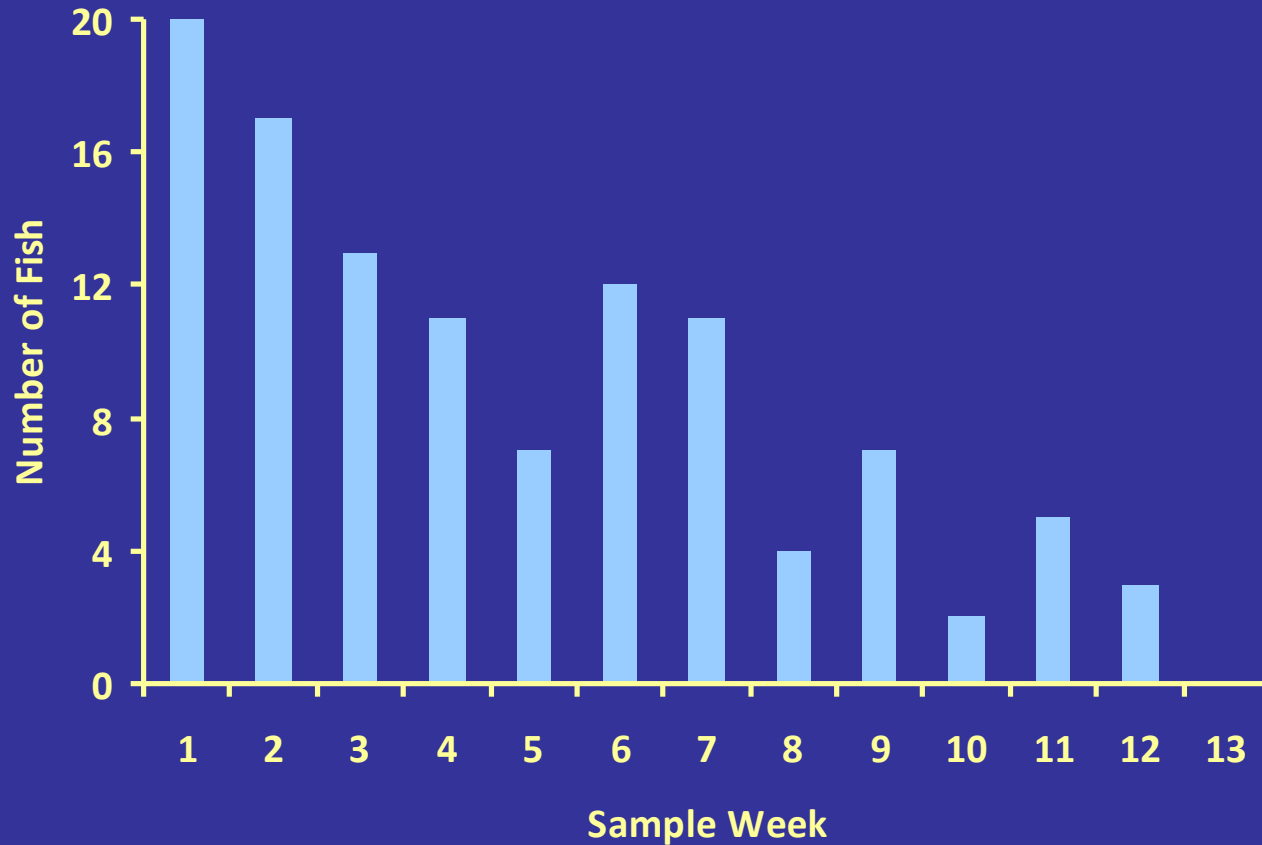


# Data Analysis

- SUR data
  - Contacts every 2 h were “unique”
  - Day, Night, Crepuscular
  - “Sample Weeks”
- General Linear Model
  - Independent variable
    - Diel Period
  - Dependent variable
    - Contacts per hour
  - Tukey HSD post-hoc



# Fish Contacts/Week



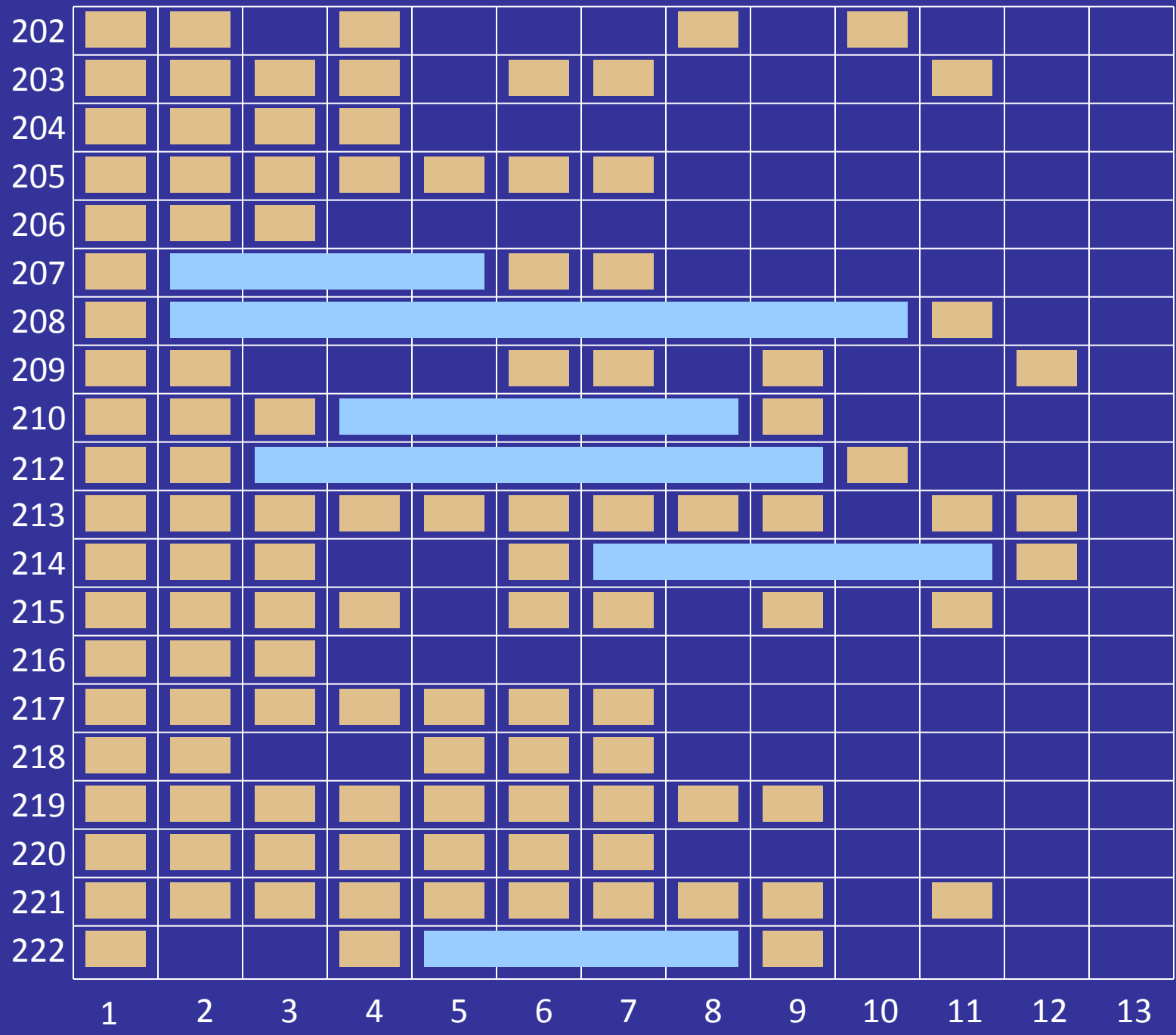
- 2668 contacts were made
  - 93% of those were from SUR data



# Contact Frequency

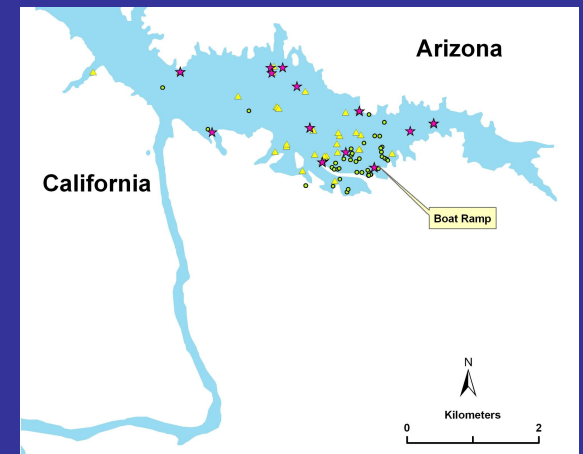
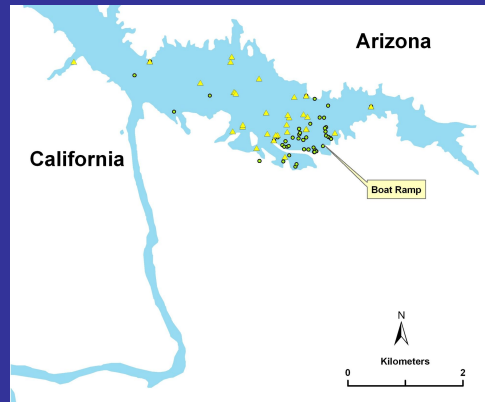
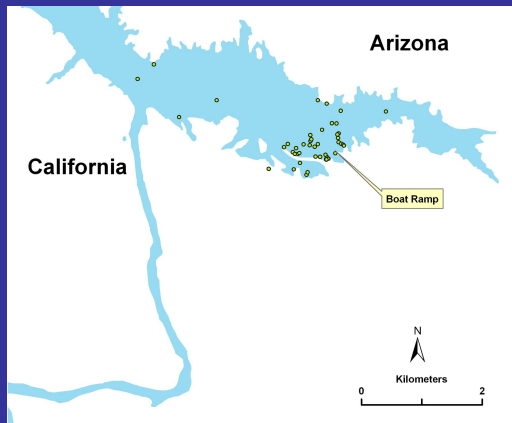
- 10% contacted for the first 3 weeks, then never again
- Periods of non-contact
  - 4 weeks - 45%
  - 5 weeks - 30%
  - 6 weeks - 20%
  - 7 weeks - 15%
  - 9 weeks - 5%

Conclusion Discussion Results Methods Introduction



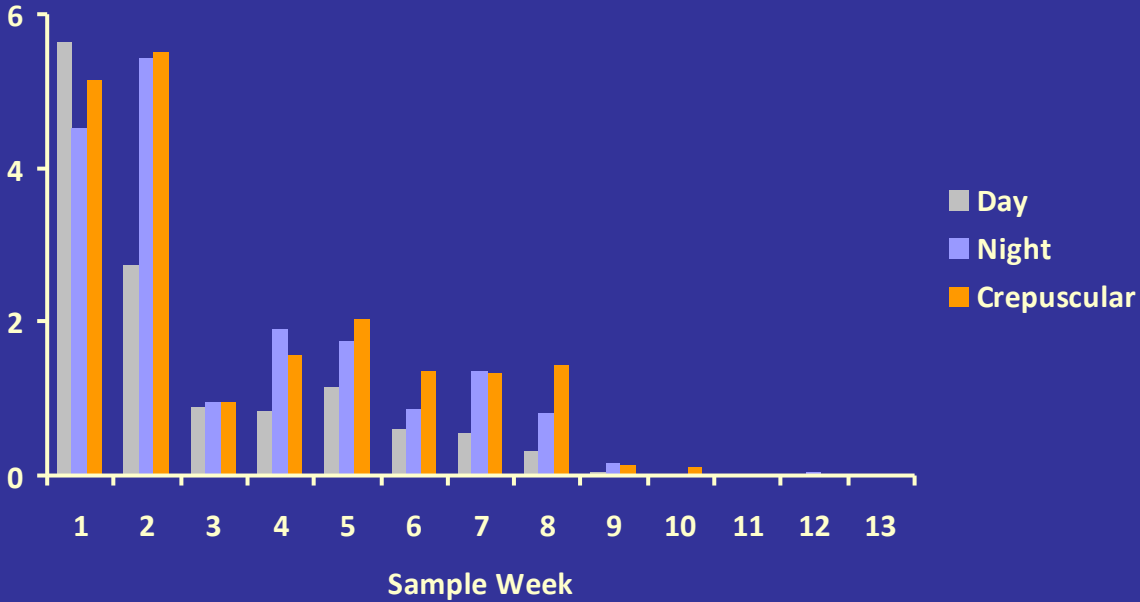
# Dispersal

- Total detected movements: 1,719 km
- Average movements: 0.6 (1.1) km
- Range: 0 to 22.3 km





# Diel Contacts per Week



Introduction

Methods

Results

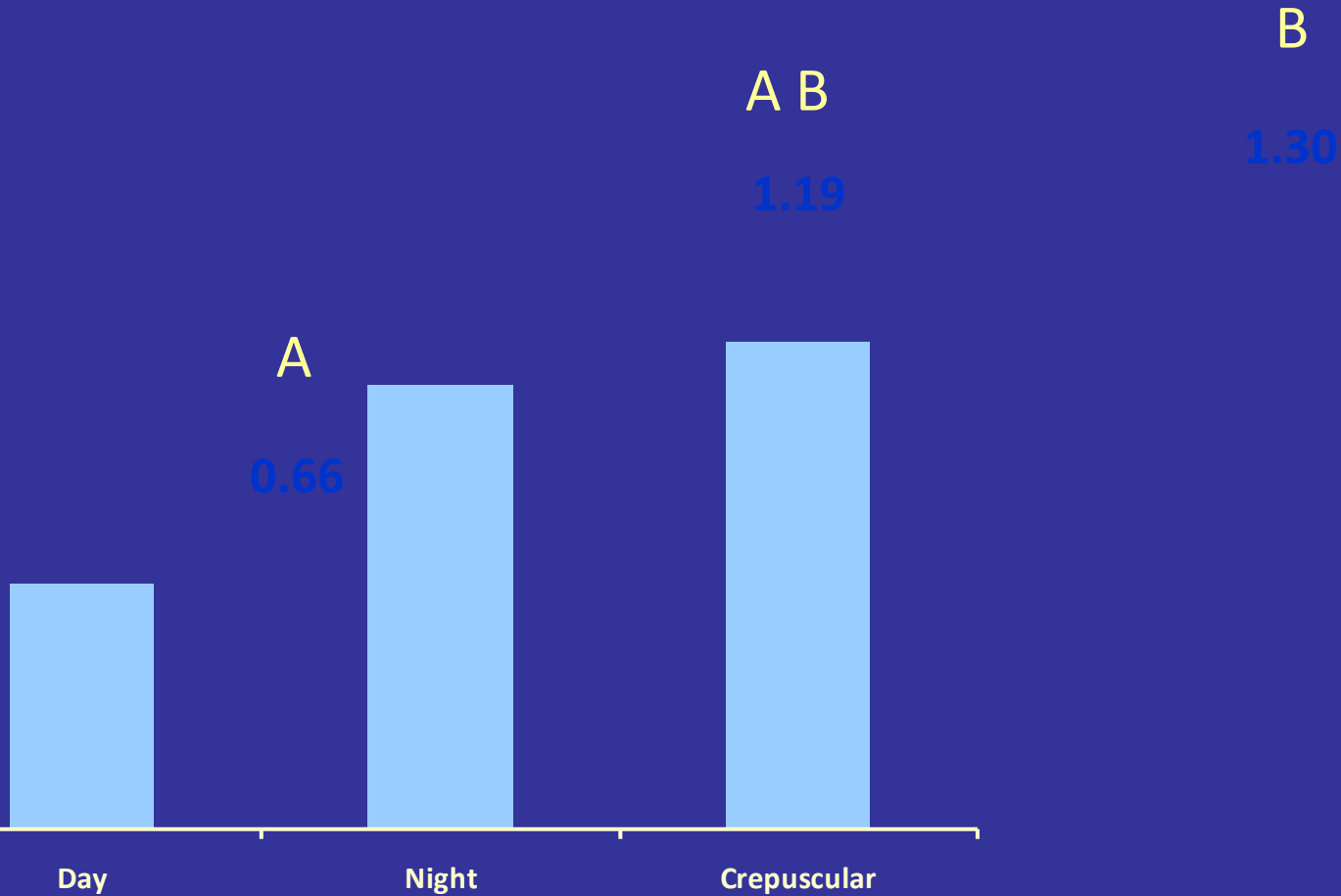
Discussion

Conclusion

# Diel Differences

$F = 4.64, df = 2, P = 0.01$

Introduction  
Methods  
Results  
Discussion  
Conclusion



# Measured Parameters

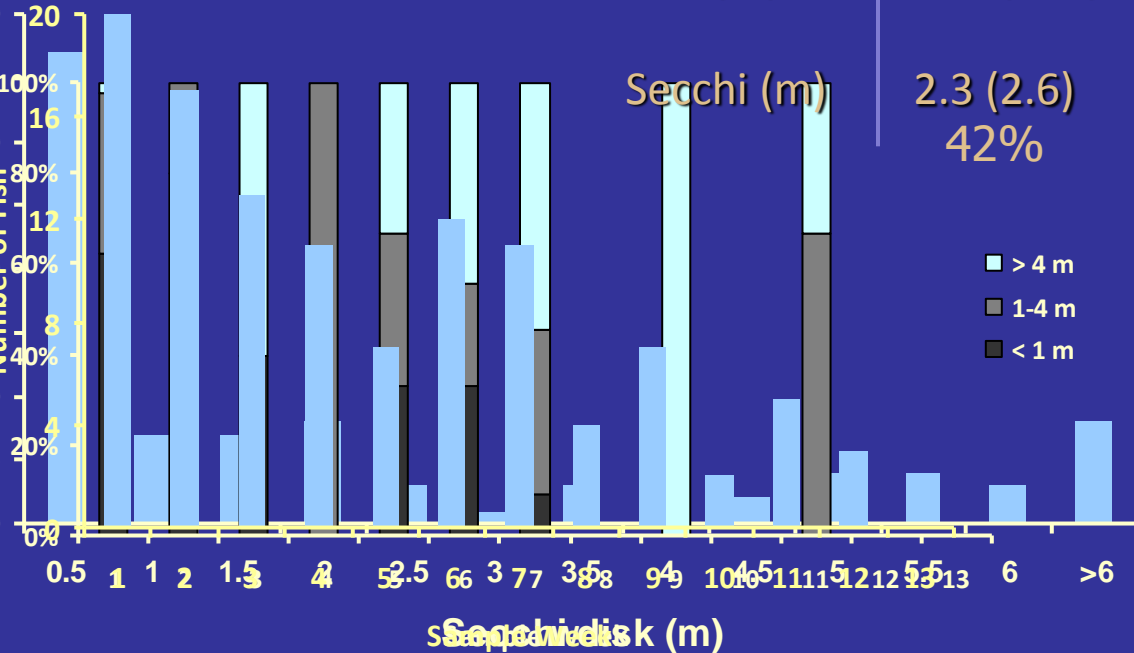
Parameter	Average (SD)
-----------	--------------

Temp °C	21.0 (1.8)
---------	------------

Depth (m)	5.2 (5.0)
-----------	-----------

DTS (m)	129 (135)
---------	-----------

Secchi (m)	2.3 (2.6) 42%
------------	------------------



# Diel and Distance

- Crepuscular periods yielded most contacts/hour for this study
  - Supported by (Marsh, P.C. 1997) who found that most contacts with bonytail in Mohave occurred during evening hours
- Distance to shore averaged 129 m
  - Differed from (Minkley, C.O. 1996) who found that 82% of contacts were along shorelines or in coves





# Survival

- Higher survival than previous studies
  - 5 tags recovered (Minkley, C.O. 1996)
- Large sized fish stocked during this study
  - Avoid predation (striped bass)

<b>Stocking Location</b>	<b>N</b>	<b>Average TL</b>
Topock Marsh	1,182	291
Campbell Cove	1	291
Pittsburgh Cove Point	4	262
L.H. Palms Marina	12	456
Partner's Point	15,322	289
Bulkhead Cove	43	264
Bill Williams River	6,949	269
Takeoff Point	704	239
Office Cove	7,207	275
Lake Havasu	222	246
Lake Havasu	716	255

**4/13/10**

**Avg TL = 374**

# Tag Retention

- Dexter National Fish Hatchery
  - 10 fish with 3 month transmitters
  - 10 fish with 6 month transmitters
  - No mortality
  - No difference between 3 and 6 month tags



# December 2010

- Better SUR coverage
- 20 fish tagged/stocked December 3, 2010
  - 6-month tags
- Currently contacting 17 fish
- Furthest upstream movement: 21.6 km



# Acknowledgements

- Multi-Species Conservation Program
- USBR: Andi Montony, Bonnie Contreras, Jeff Lantow
- USFWS: Mitch Thorson, Manuel Ulibarri, Mark Yost, Tammy Knecht, William Knight, Dexter NFH Employees
- ASU: Melody Saltzgiver, Tom Dowling
- BLM: Kirk Koch
- Ocean Associates, Inc.: Julie Day
- Sonotronics, Inc.: Marlin, Dale, Sue

