

Monitoring Population Dynamics of the Florida Manatee

Presentation for Gulf of Mexico Marine Mammal Research and Monitoring Meeting

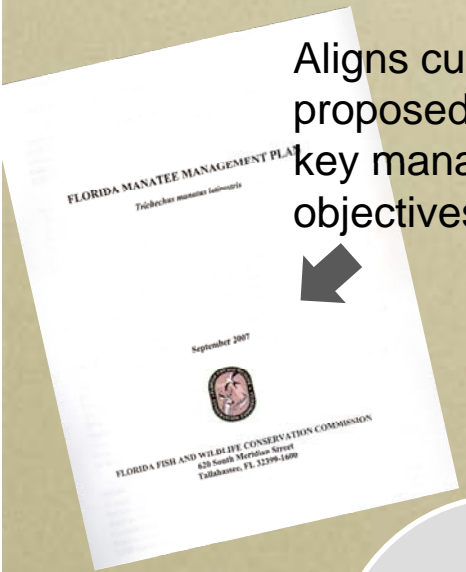
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Florida Fish and Wildlife Conservation Commission
Fish and Wildlife Research Institute
April 7, 2015

MMP Goal - “effectively manage the (manatee) population in perpetuity throughout Florida by securing habitat and minimizing threats”



FWRI Mission Statement

Through effective research and technical knowledge, we provide timely information and guidance; to protect, conserve and manage Florida's fish and wildlife resources



Aligns current and proposed research with key management objectives



Population Dynamics

Threats

Sustainable, Healthy Population Above level of QE

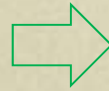
Habitat Needs

Response to Management Actions, Measuring Progress



Current focus: Operational research strategy that supports timely collaborative updates of a manatee population model (“core biological model”) used to predict manatee abundance in the long term (Runge et al 2007)

Program Planning



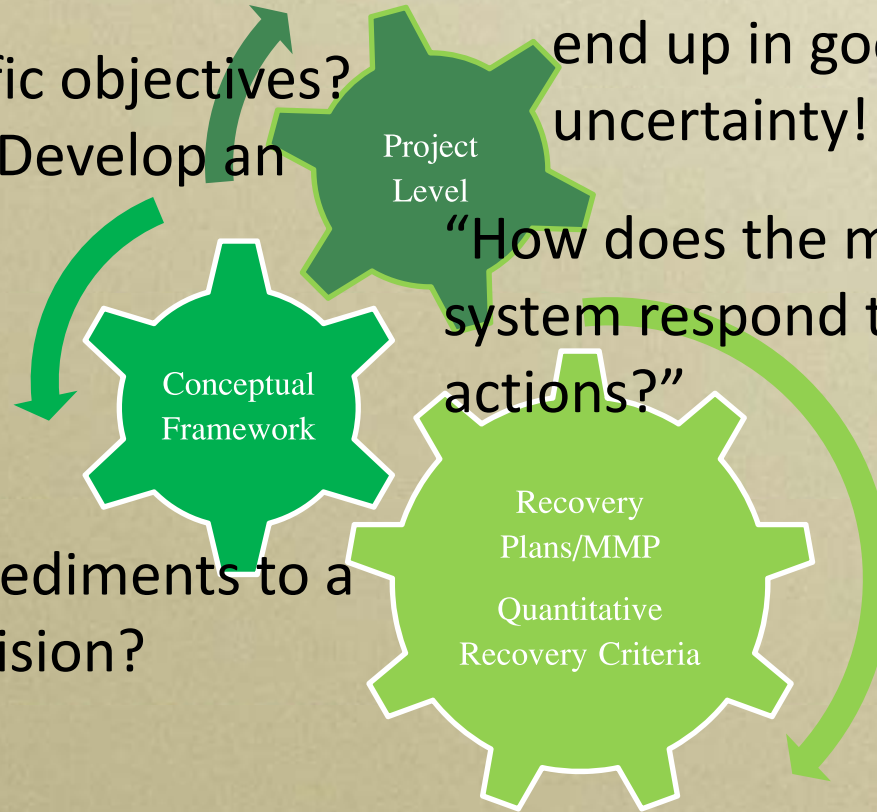
Objectives drive the process

What are the specific objectives?
Is it “answerable”? Develop an
appropriate design.

“Smart choices don’t always
end up in good outcomes” –
uncertainty!

“How does the management
system respond to management
actions?”

What are the impediments to a
management decision?



What do we want to
accomplish? What are the future
management decisions?

Population assessment and monitoring: necropsy and rescue, aerial surveys, recaptures of marked individuals (photo-id, genetics, PIT tags), health assessments, behavioral ecology



FWC Marine Mammal Field Laboratories



Marine Mammal Pathobiology Laboratory and FWRI Headquarters
St. Petersburg, FL



Charlotte Harbor Field Laboratory
Port Charlotte, FL



Jacksonville Field Laboratory
Jacksonville, FL



Indian River Field Laboratory
Melbourne, FL



Tequesta Field Laboratory
Tequesta, FL



Carcass salvage, necropsy and rescue

Respond to injured or distressed manatees in need of rescue and all manatee carcasses reported in FL

Determine cause of death and obtain information on life history, health, and emerging threats

Manatee mortality and rescue databases (*mortality database overhauled)

Used by managers to identify and mitigate human-related causes of death

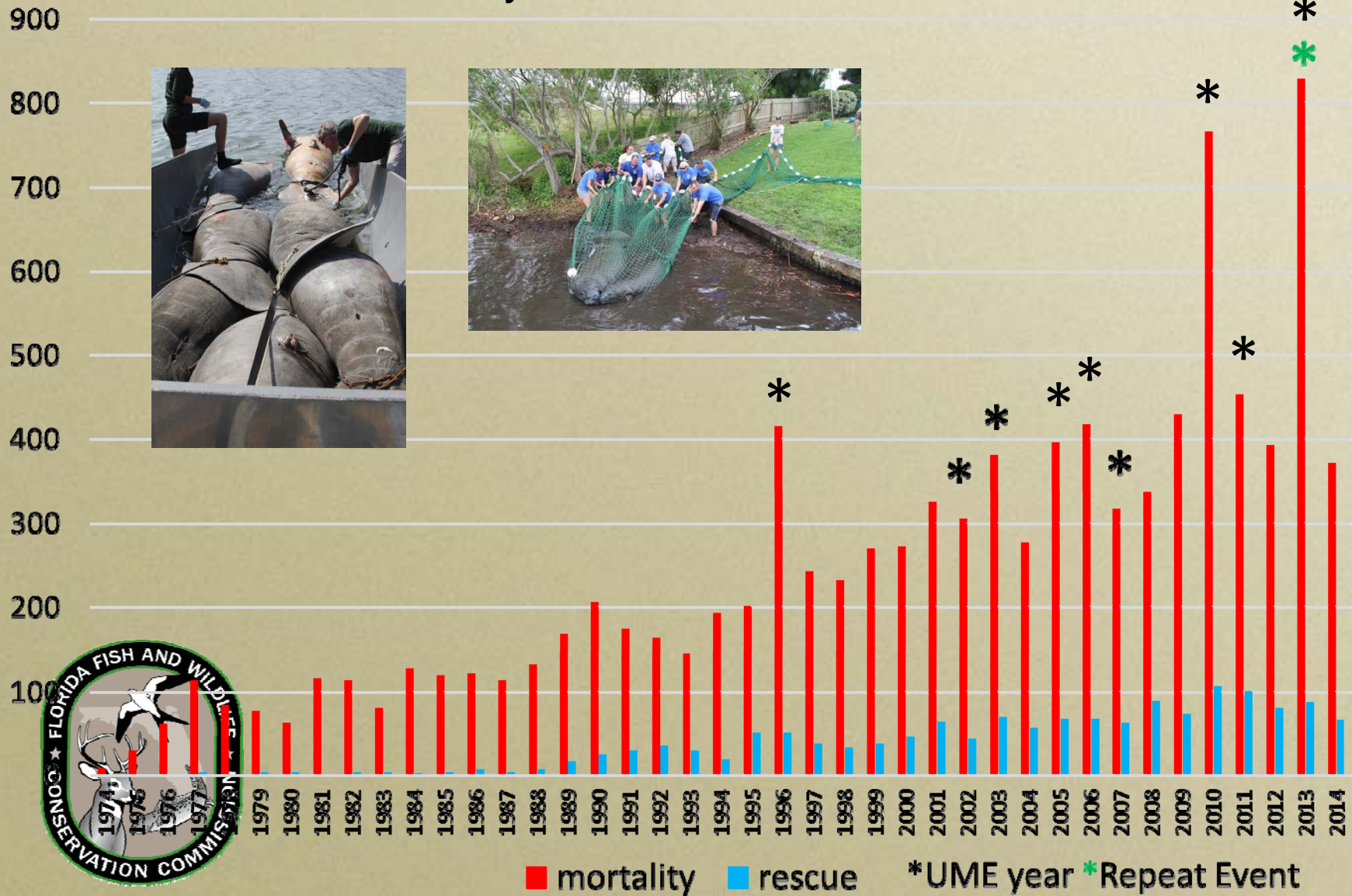
- Fractions of mortality analysis – Bayesian models used to account for uncertainty and estimate proportions of death due to each cause

Advanced forensic investigations (trauma wounds) and diagnostics in undocumented and/or emerging diseases

- In recent years, detected several cases of neoplasia and infectious disease (e.g. parasitic enteritis, bacterial-, protozoal disease)



Numbers of documented manatee deaths and rescues in FL per year, 1974-2014



Year	Water craft	Flood Gate/ Lock	Other Human	Peri-natal	Cold Stress	Natural	No necropsy Or Not Recovered	Undeterm. Too Decomp	Undet. Other	Total
2014	68 (18%)	3	9	99	26	26	16	88	36	371
2013	62 (8%)	5	10	129	39	196	100	129	149	830
2012	72 (24%)	12	8	70	30	58	8	87	37	392
2011	74 (19%)	2	4	78	114	40	12	99	16	453
2010	66 (10%)	1	5	97	282	23	67	183	25	766
2009	87 (23%)	5	7	114	56	37	10	90	13	429
5-year average	84 (17%)	5	6	97	104	70	39	117	48	574



<http://myfwc.com/research/manatee/rescue-mortality-response/mortality-statistics/>

* Preliminary

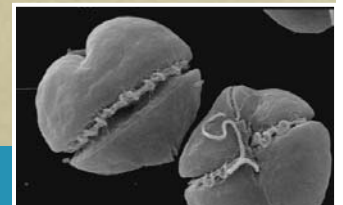
Unusual Mortality Events

“a stranding that is unexpected; involves a significant die-off of any marine mammal population; and demands immediate response.” <http://www.nmfs.noaa.gov/pr/health/mmume/>

Since 1996, 9 Unusual Mortality Events (6 red tide-, 2 cold-related, 1 unknown) and 1 Repeat Event (red tide)



- Feb 2013 “Manatee Brevetoxicosis Repeat Event” declared (n = 277) ... 6 previous declared mortality events related to red tide in SW FL since 1996.



SW Florida Red Tide Repeat Event Winter/Spring 2013

Event dates (based on algorithm): 1/20 – 4/21 (92 days)

Total red tide number for 2013 is **277**

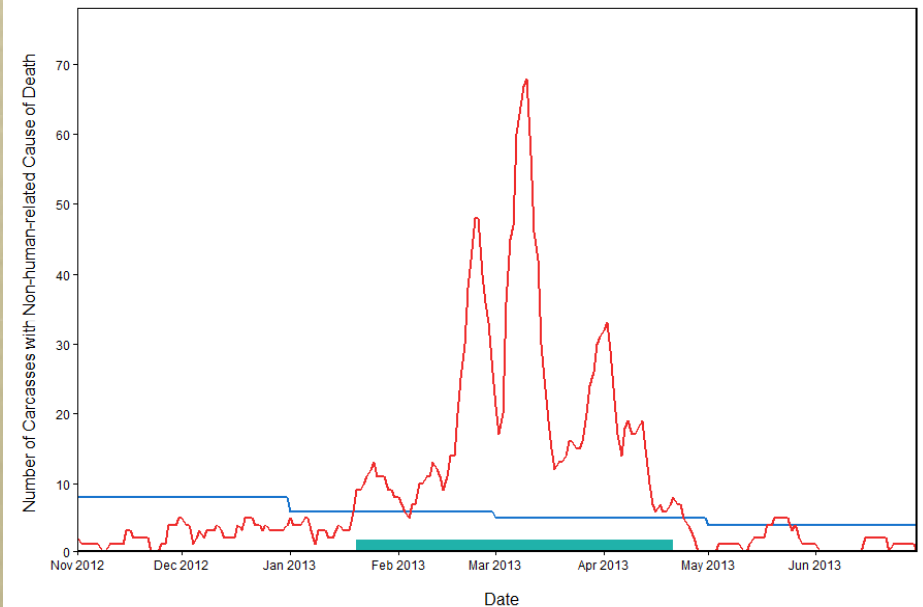
15 rescued manatees brought to captivity

<http://myfwc.com/research/manatee/rescue-mortality-response/mortality-statistics/red-tide/>

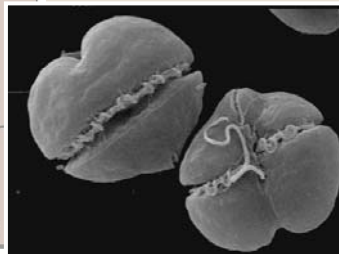
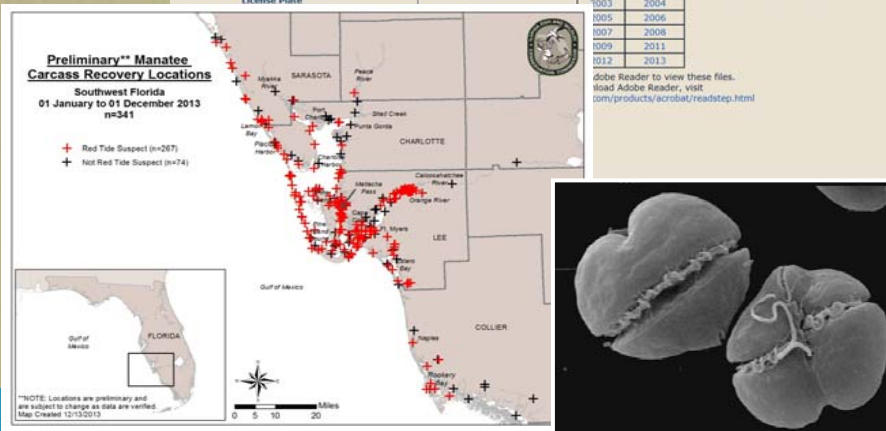


Number of Manatee Carcasses Reported Over 7-day Periods: Southwest Florida: Sarasota County through Collier County

— November 2012 to June 2013 — Baseline 99th Percentile (excluding past UMEs): 2007 to 2012



Green bar indicates dates of unusual mortality event.
 Base time period excludes cold-related mortality events in winter 2010 and winter 2010-2011.
 Area of analysis included the following counties: Sarasota, Charlotte, Lee and Collier.
 Prepared by S. Koslovsky, 04 Oct 2013.



FWC-FWRI's Role in Manatee Rescue-Rehab Program

1-888-404-FWCC

- Contributes to improved understanding of threats, health, and emerging issues
- Investigate/verify reports of distressed manatees (Wildlife alert #, 24/7 response support)
- Coordinate and conduct rescues of distressed manatees in Florida
- Transport distressed manatees to critical care facilities
- Administer the FI Manatee Rescue, Rehabilitation, and Release Reimbursement Program
- Participating in cooperative partnership called the Manatee Rescue & Rehabilitation Partnership (MRP)



Photo Credit: USGS Sirenia Project



Participation in statewide live manatee health assessments with partner organizations to collect baseline health information

- Between 2008 and 2015, 263 organized health exams in Crystal River (Gulf coast) and Brevard Co. (Atlantic coast)
- Sample collection for health and biological research



Crystal River Manatee Assessment, USGS photo

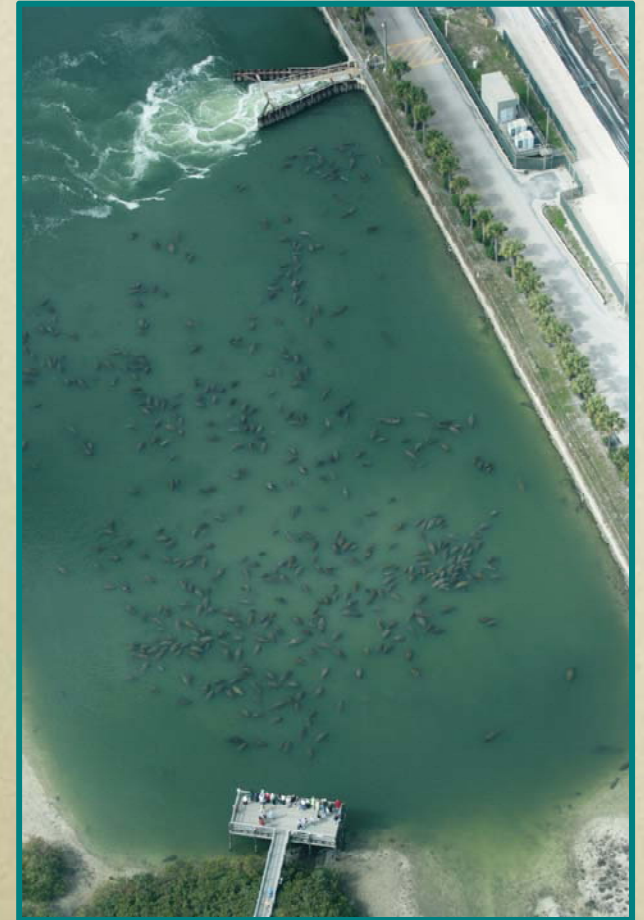


- Body Condition
- Photo-documentation of lesions and wounds
- Heart/Pulse Rate
- Respiratory Rate
- Temperature
- Body weight
- Complete body measurements (body length and girths)
- Eye exam
- Implantation of PIT tag
- Subcutaneous fat layer exam
- Analysis of blood, feces, urine and skin
- Reproductive parameters

Aerial Surveys

2015 Synoptic Survey Results

- The survey is conducted to meet Florida state statute 370.12 (4), which requires an annual, impartial, scientific benchmark census of the manatee population. From 1991 through 2015, the counts have been conducted 29 times.
- Represents a count of manatees viewed at the time of the survey-snapshot of distribution
- Not a population estimate—uncorrected counts used as a proxy for abundance
- Total counted Statewide: 6,063 (preliminary)
- East Coast 3,333 West Coast 2,730



First statewide abundance estimate of the Florida manatee

- A primary conservation goal of the MMP plan was to “implement peer-reviewed and statistically sound methods to estimate the manatee population and monitor trends”
- In 2011-2012 FWC initiated a new aerial survey design and recently published the first statewide estimate of abundance for Florida manatees in *Biological Conservation*.
- The new survey method used an innovative approach which included:
 - A stratified random sampling design
 - Combining multiple sources of information from dual observers, repeat passes, and manatee dive behavior (in a Bayesian framework) to consider:
 - Spatial variation in distribution
 - Imperfect detection of manatees
 - Estimates more comparable in space/time...provides an estimate of uncertainty

Results will be incorporated in next population model



J. Martin et al. / *Biological Conservation* 186 (2015)

44–51

Manatee Abundance Survey Results

2790 (95%CI: 2160–3540) west coast (2011)

3560 (95%CI: 2850–4410) east coast (2012)

J. Martin et al. / Biological Conservation 186 (2015) 44–51 Also see.....

J. Martin et al. (2014) Estimating Upper Bounds for Occupancy and Number of Manatees in Areas Potentially Affected by Oil from the Deepwater Horizon Oil Spill. PLoS ONE 9(3): e91683. doi:10.1371/journal.pone.0091683

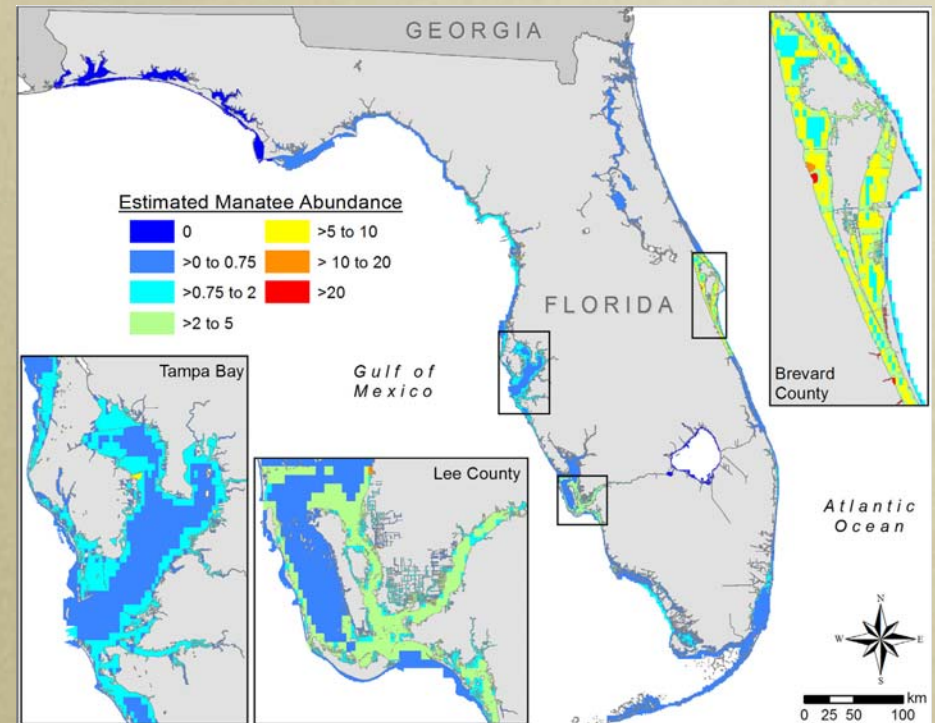
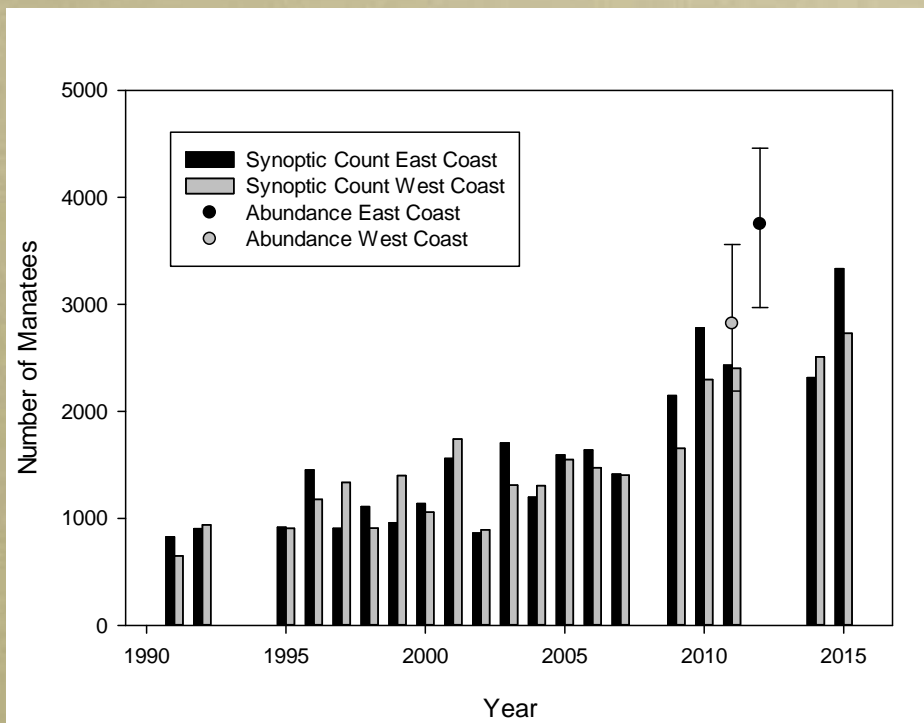


Photo-identification

- Research technique used to follow individuals over time; including comparison to carcasses
- Over 3,400 animals in state-wide catalog (+ 77,000 sightings)



TB021 - 1993



TB021 - 2008

Photo-identification

Collaborative effort between USGS's Sirenia Project, FWC, and Mote Marine Laboratory

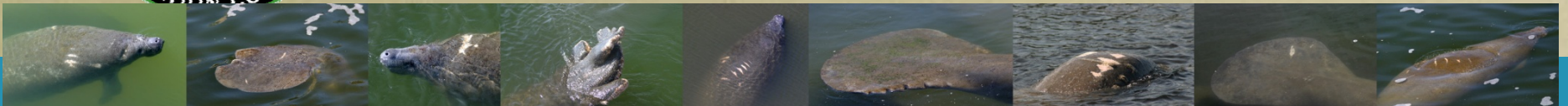
Purpose:

- Estimate adult survival rate
- Estimate reproductive rates
- Study movements, habitat use, site fidelity, behavior, and associations



Estimated population parameters are used to model population dynamics for state and federal assessments of status and recovery

W. Kendall et al (2013) Combining dead recovery, auxiliary observations and robust design data to estimate demographic parameters from marked individuals. *Methods in Ecology and Evolution* 2013, 4, 828–835

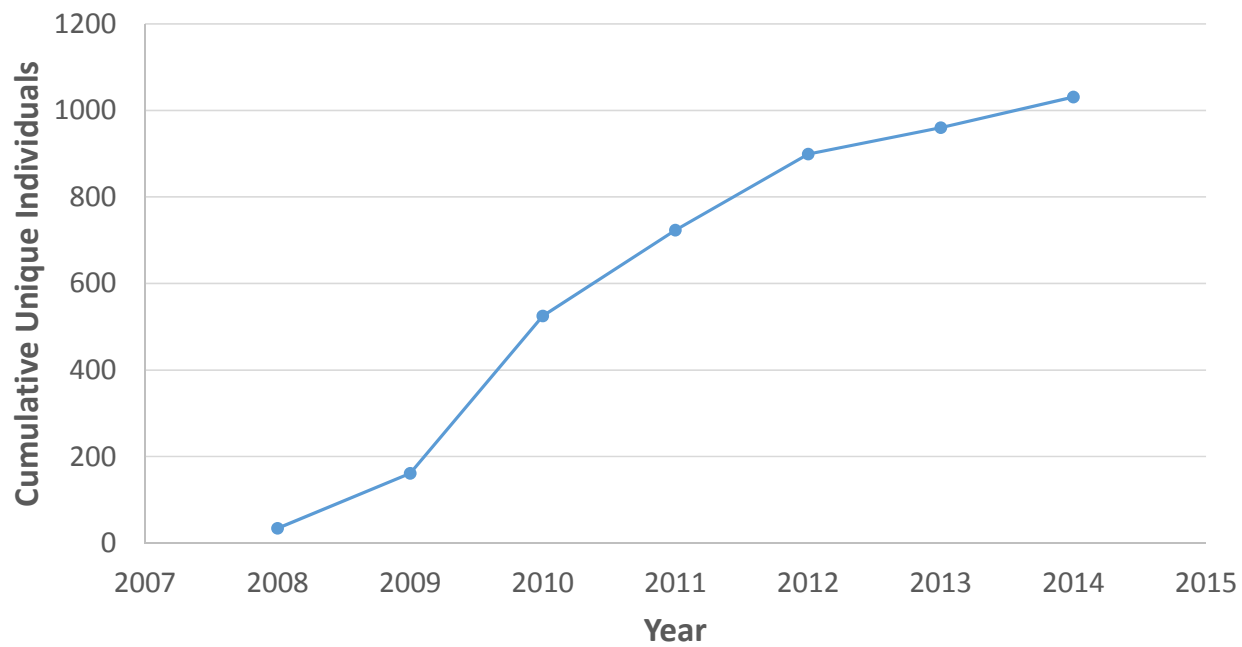


Genetics

- Unique ID of individuals
- Complements Photo-ID
 - Stage-specific survival, reproductive, movement, carcass recovery rates
 - Calves, juveniles, and non-scarred manatees
 - Habitats where Photo-ID conditions are poor
 - Identifying decomposed carcasses
- Determining sex
- Reproductive contribution of individuals
- Stock structure and gene flow



Genetics



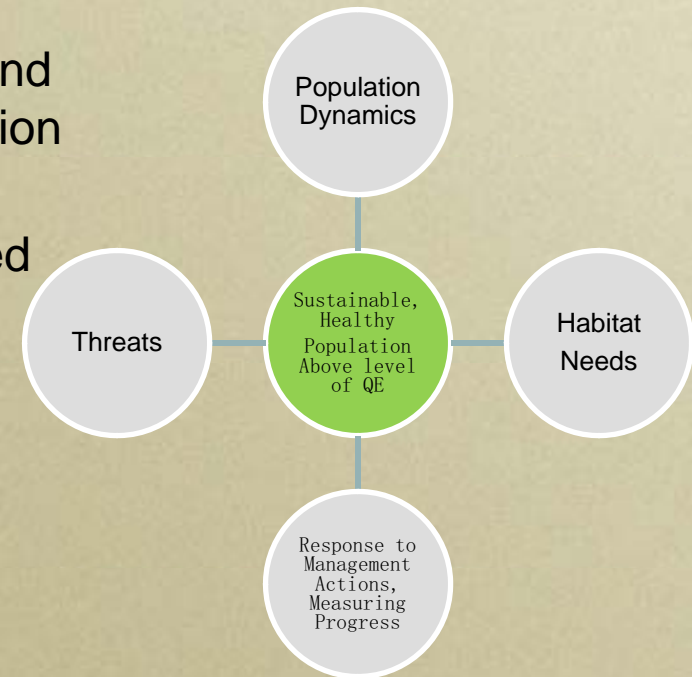
Warm-water Habitat Monitoring

- ❑ Temperature Monitoring
- ❑ Winter (Oct – Apr)
- ❑ Types of Sites:
 - ❖ Power Plant Effluents (red)
 - ❖ Passive Thermal Basins (orange)
 - ❖ Springs (purple)
- ❑ WW Quality & Reliability



Key future needs/goals

- Clarify objectives of carcass recovery/necropsy program and adopt a sampling approach in a non-stationary system that meets conservation objectives
- Focus data collection that supports timely population model parameter updates in coordination with partner organizations
- Assess sampling effort via routine analyses and adjust field operations as needed
- Evaluate effective integration of interdependent information components (photo-id, genetics etc) and invest in data management that supports information integration
- Derive annual estimates of abundance – integrated population modeling approach



Tuesday Evening Poster Session

USGS Manatee Research in the Gulf of Mexico:

Movement and Habitat Use in the Northern GOM to Assist BOEM with Management of Coastal Resources

Daniel H. Slone (dslone@usgs.gov), James P. Reid, Susan M. Butler

Cathy A. Beck, Robert K. Bonde

Sirenia Project, U.S. Geological Survey, Gainesville, FL

<http://fl.biology.usgs.gov/Manatees/manatees.html>

Thank you!
Any Questions? !!

