

# Statewide Monitoring of the Florida Manatee

***Presentation for the Marine Mammal Commission 2015 Annual Meeting***

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**Florida Fish and Wildlife Conservation Commission**

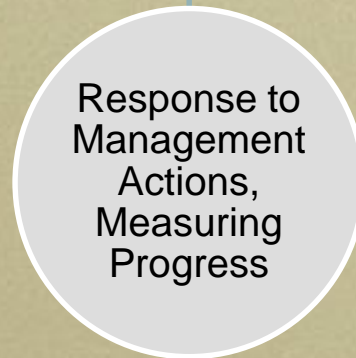
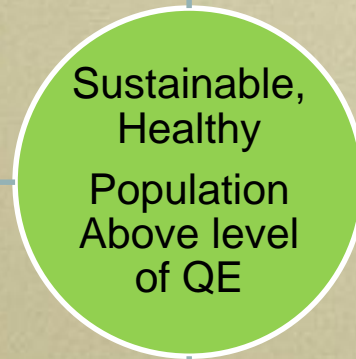
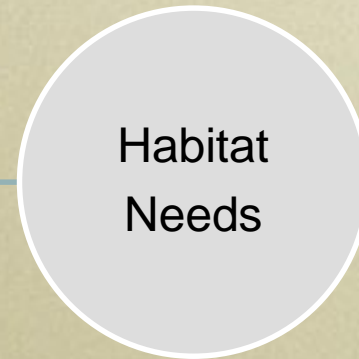
**Fish and Wildlife Research Institute**

**May 7, 2015**



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







# 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





**516** rescues performed between 2009 – 2014  
ranging from **107** rescues in 2010 to **67** in 2014

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



- 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 FL Manatee Rescue, Rehabilitation, and Release Reimbursement Program
- Participating in cooperative partnership called the Manatee Rescue & Rehabilitation Partnership (MRP)



Photo Credit: USGS Sirenia Project

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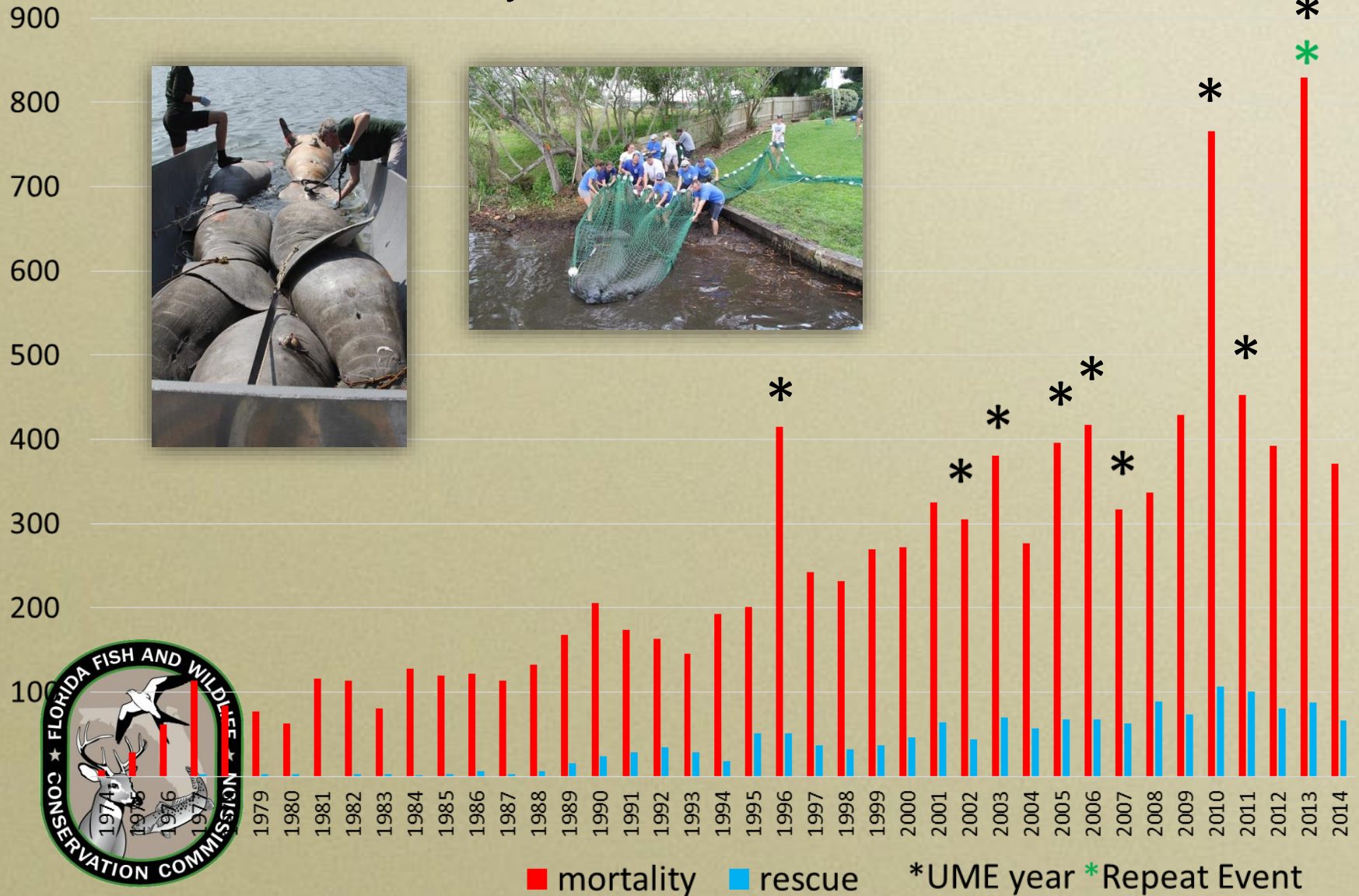


- Over a 20 year period (1993-2012): entanglement/ingestion of foreign objects is top human-related reason for rescue (25% of all documented reports or on average 16 cases annually)
- A resource intense (24/7) statewide rescue program has lessened the impact of the entanglement threat through successful interventions, however cases likely go undetected and the problem may be more prevalent
- Watercraft collision remains the leading human-related cause of death
- Sub-lethal interactions ongoing as evidenced through statewide photo-identification efforts





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



## Reported Manatee Deaths within Florida

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	<b>830</b>
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	<b>766</b>
2009	87 ( 23%)	5	7	114	56	37	10	90	13	429
5-year average (09-13)	84 (17%)	5	6	97	104	70	39	117	48	<b>574</b>



From 2009 - 2013 2,870 total deaths reported, avg 574/year  
 Previous 5 year period (2004 – 2008), avg 349/year

\* Preliminary

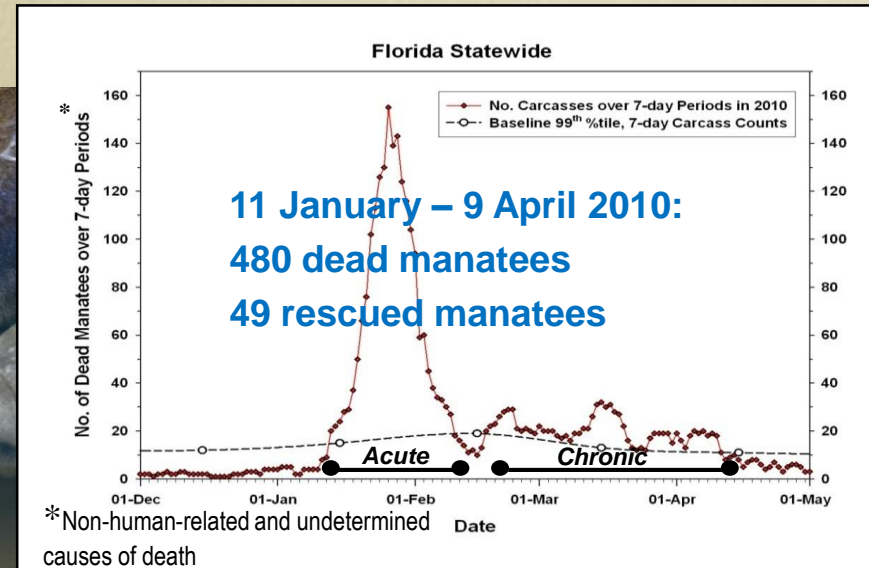
<http://myfwc.com/research/manatee/rescue-mortality-response/mortality-statistics/>



# Unusual Mortality Events

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

Severe cold event of 2010:



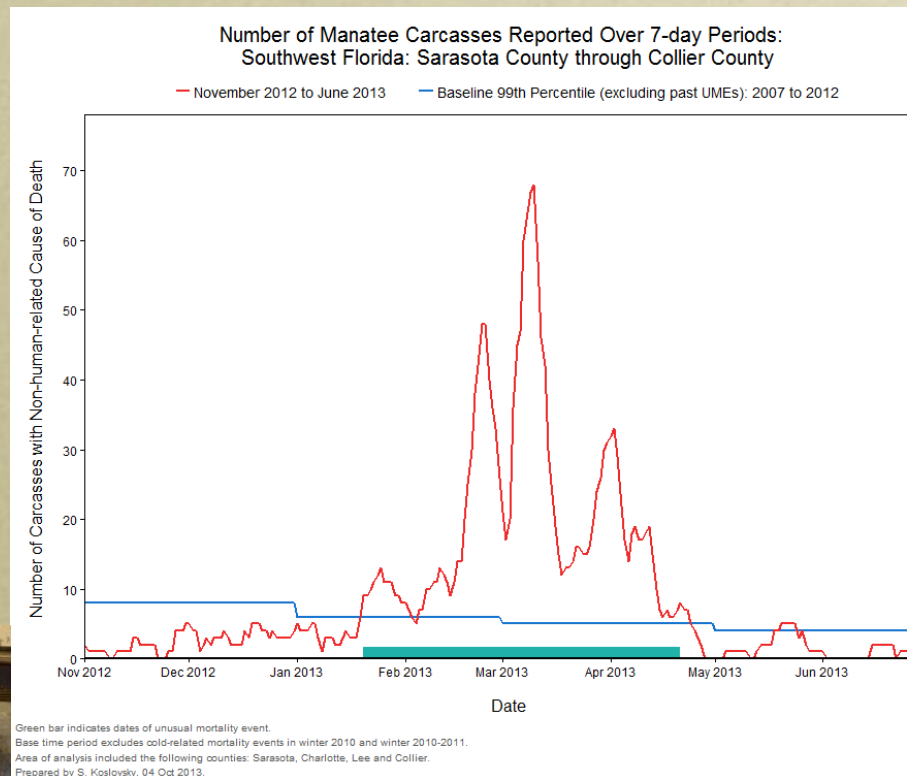
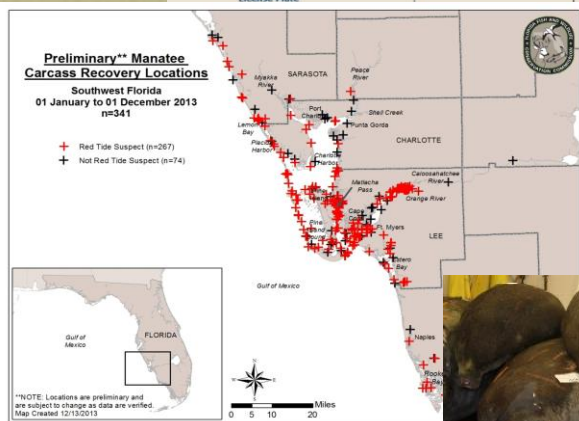
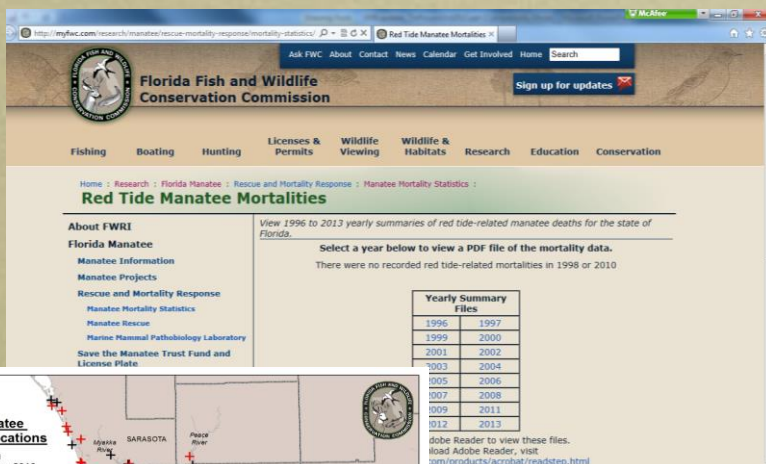
# Severe SW Florida Red Tide Repeat Event Winter/Spring 2013

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

Total red tide-related deaths for 2013 is **277**

15 rescued manatees brought to captivity

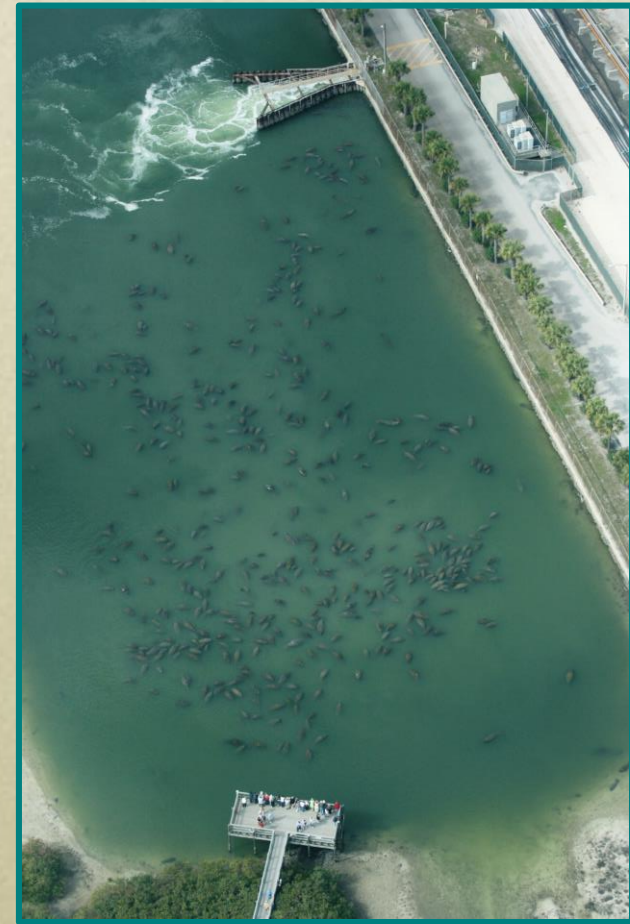
<http://myfwc.com/research/manatee/rescue-mortality-response/mortality-statistics/red-tide/>





# 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 in the state*”. From 1991 through 2015, the counts have been conducted 29 times.
- Represents a count of manatees viewed at the time of the survey in likely winter habitats
- Not a population estimate—uncorrected counts used as a proxy for abundance
- Weather and manatee behavior can have a large effect on counts
- Lacks statistical properties, estimates of variance or bias are not available for these counts
- Total counted Statewide: **6,063**
- East Coast **3,333**      West Coast **2,730**



Aerial Surveys

Traditional synoptic survey methods are inadequate for providing reliable information about abundance or changes in abundance over time and space—utility is limited due to incomplete, variable detection, and sampling frame

However, survey information should be an important component of any monitoring program, providing statistically sound and acceptably accurate estimates of population size, which may be compared across years and regions to provide inference on population dynamics

Additionally, an adequate survey can provide an independent means of validating model-based estimates of population size and rates of growth as well as included within population projection models

Therefore, developing improved survey methodology to estimate manatee abundance was a key objective of the State Management Plan





Very challenging goal, manatees occur over large landscapes and typically near shore (in narrow or irregularly shaped areas--estuaries, rivers, creeks) making it difficult to apply traditional survey methods

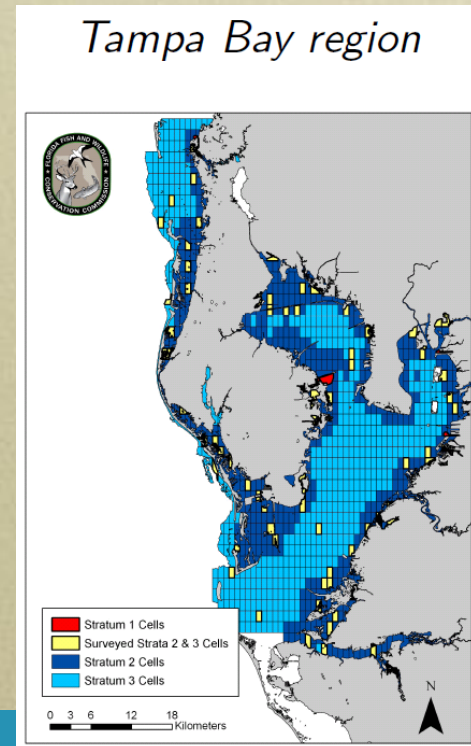


To meet this challenge, an innovative approach was designed, tested, and vetted with experts. FWC convened a meeting of experts to propose, discuss and evaluate candidate survey methods (2006), developed draft methodology, tested & revisions, training sessions (requires more observers), data management plan...implementation in winters 2011, 2012, and subsequent assessment and improvements of analytical steps



The new survey method uses an innovative approach that integrates multiple sources of information to monitor abundance at large scales

- A stratified random sampling design—all potential habitat was included in sampling frame w/in 3 strata:
  - Stratum #1- Primary aggregation sites  
(power plants and natural springs, \*timed to avoid large aggregations)
  - Stratum #2- Primary non-aggregation sites  
(areas where manatees are likely to be seen, e.g., seagrass beds, transit routes, etc.)
  - Stratum #3- Areas less likely to yield manatees, but used occasionally (deep water)
- Combining multiple sources of information from dual observers, repeated passes, and manatee dive behavior (within a Bayesian framework) to consider:
  - Spatial variation in distribution
  - Imperfect detection of manatees
  - Estimates more comparable in space/time...provides an estimate of uncertainty





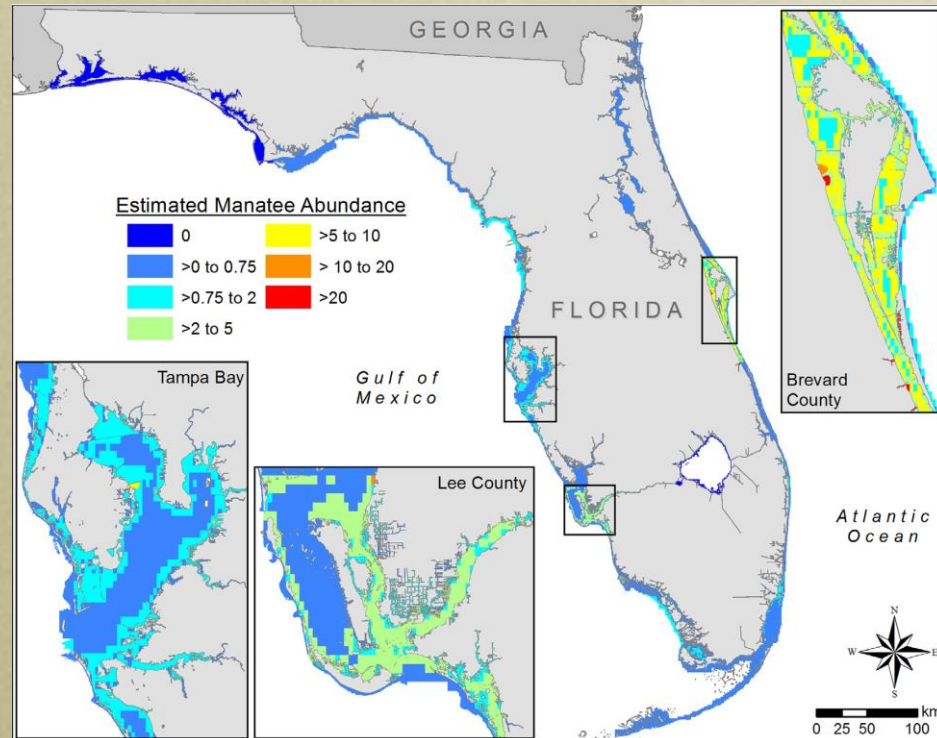
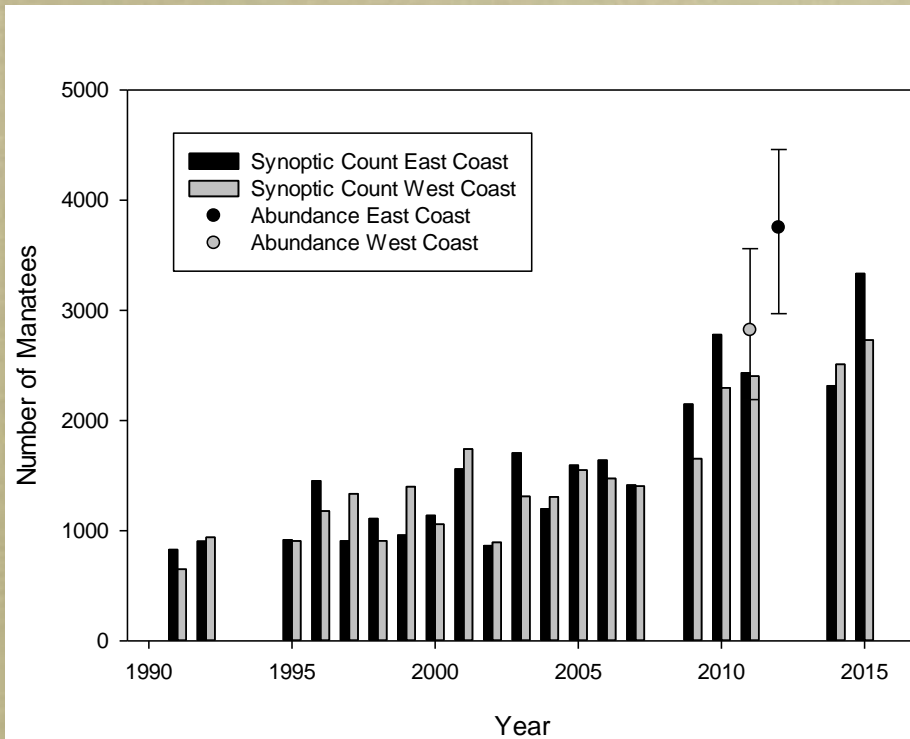
# First statewide abundance estimate of the Florida manatee

Estimate of abundance for the period 2011(west)-2012(east) with 95% confidence (CI) was **6,350 (95% 5,310 - 7,390)**

west: 2,790 (95% 2,160 - 3,540)

east: 3,560 (95% 2,850 - 4,410)

Martin, J., H.H. Edwards, C.J. Fonnesebeck, S.M. Kolovsky, C.W. Harmak, T.M. Dane. 2015. Combining information for monitoring at large spatial scales: First statewide abundance estimate of the Florida manatee. *Biological Conservation* 186:44-51.



# Key future needs/goals

- Clarify objectives of carcass recovery/necropsy program and adopt a sampling approach for a non-stationary system that meets conservation objectives
- The surveys to estimate abundance are ~ four times more expensive than the traditional synoptic surveys and are more challenging logistically because they require more aircraft and pilots, more time to coordinate and implement and more trained observers. Therefore we are assessing the potential of deriving annual estimates of abundance using an integrated population modeling approach (prior abundance estimate and annual vital rates). Short term derived forecasts could inform managers in years that surveys are not flown and help inform frequency or intensity of monitoring effort over time





Thank you....  
Any Questions? !!

