Mote Marine Laboratory smalltooth sawfish research

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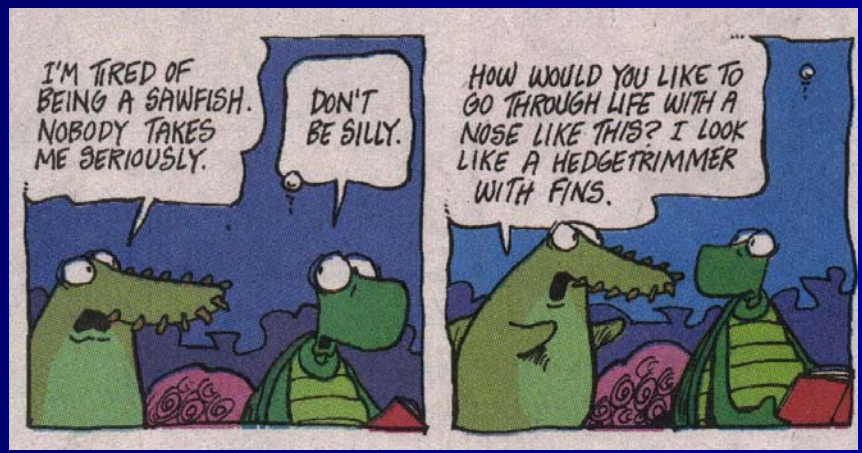
Research Purpose

To provide science-based information to assist in the develop of conservation plans for smalltooth sawfish.



Research topics

- Distribution and abundance
- Fishery interactions
- Life history and demographics
- Movement, migration and habitat use
- Conservation genetics
- Population and habitat modelling

Research methods

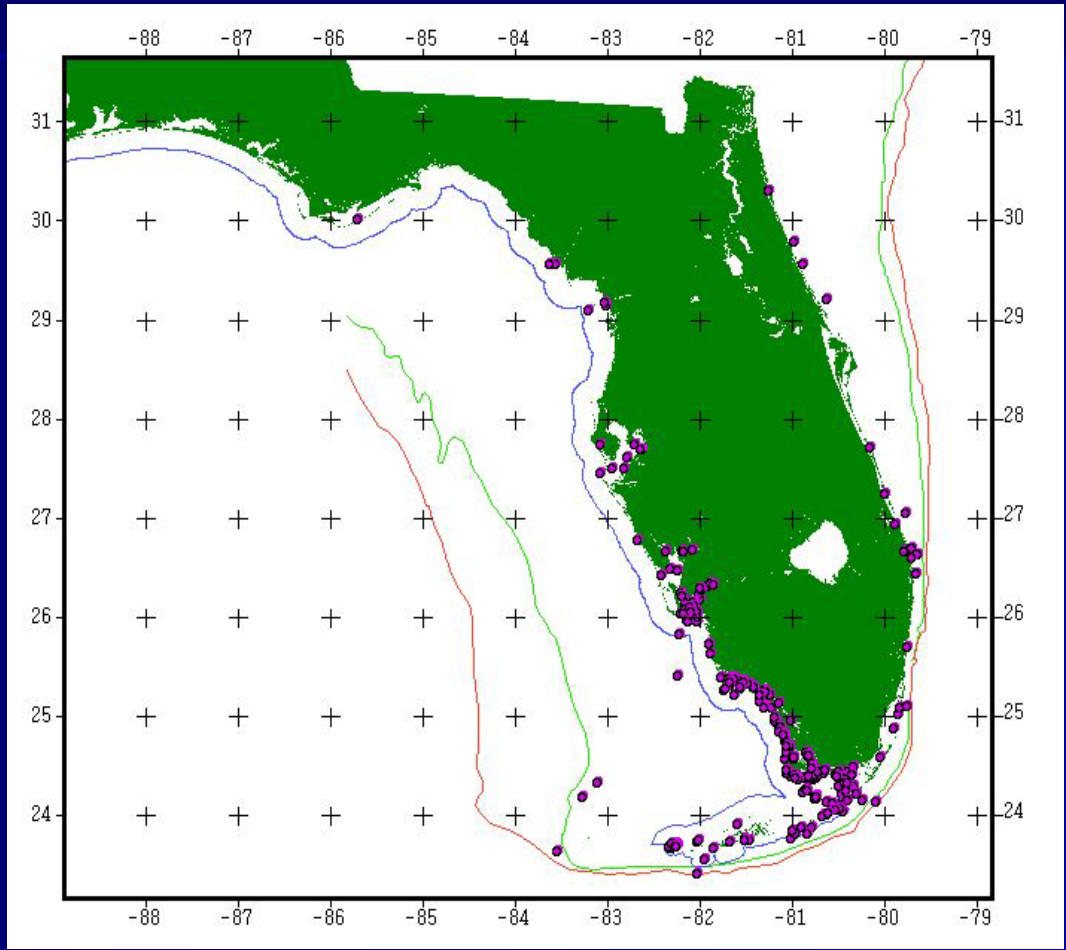
- Public sightings database
- Field surveys
- Acoustic tracking and monitoring
- Archival tagging
- Satellite telemetry
- mtDNA sequencing
- Demographic modelling
- Population viability analysis

Public sightings database - methods

- Florida-wide distribution of posters, articles, press releases, interviews and website.
- Reporters asked a standard set of questions to yield information on location, identification, size, habitat, etc.
- Data verified.
- Data stored in Access.

Sightings data - overview

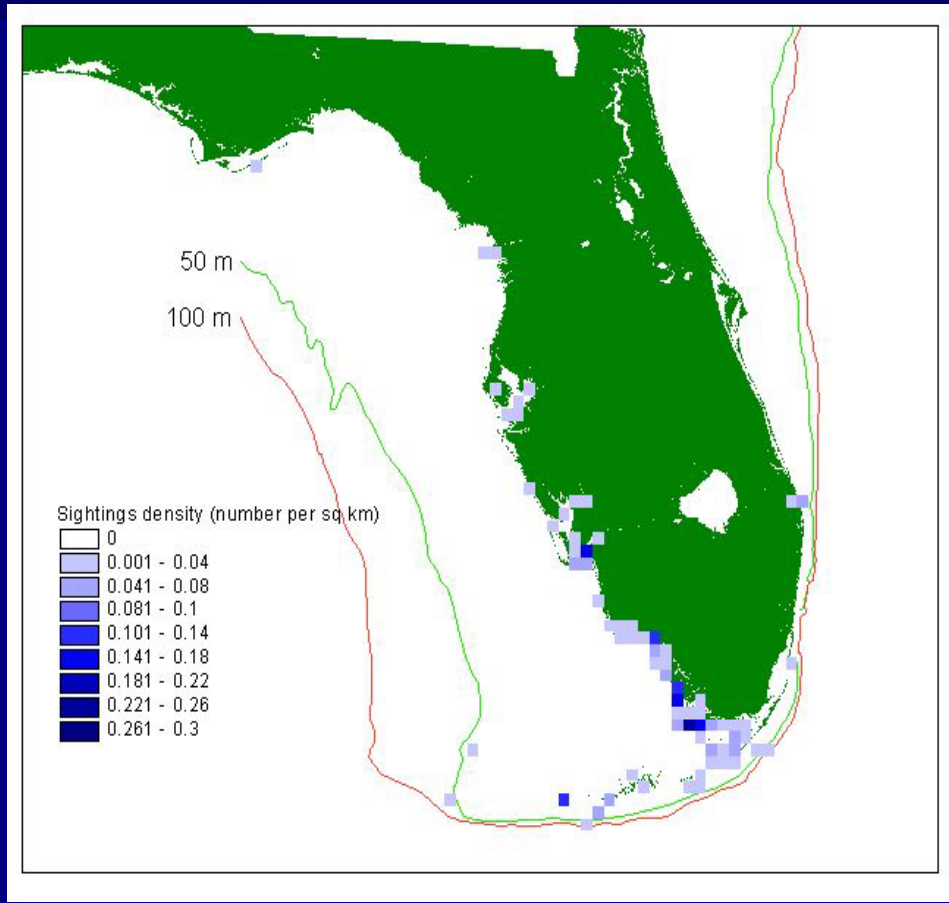
- 394 verified records covering approximately 650 individuals.
- Data collection ongoing.



Distribution of all Florida sawfish records in Mote Marine Laboratory sawfish sightings database.

Sightings data - density

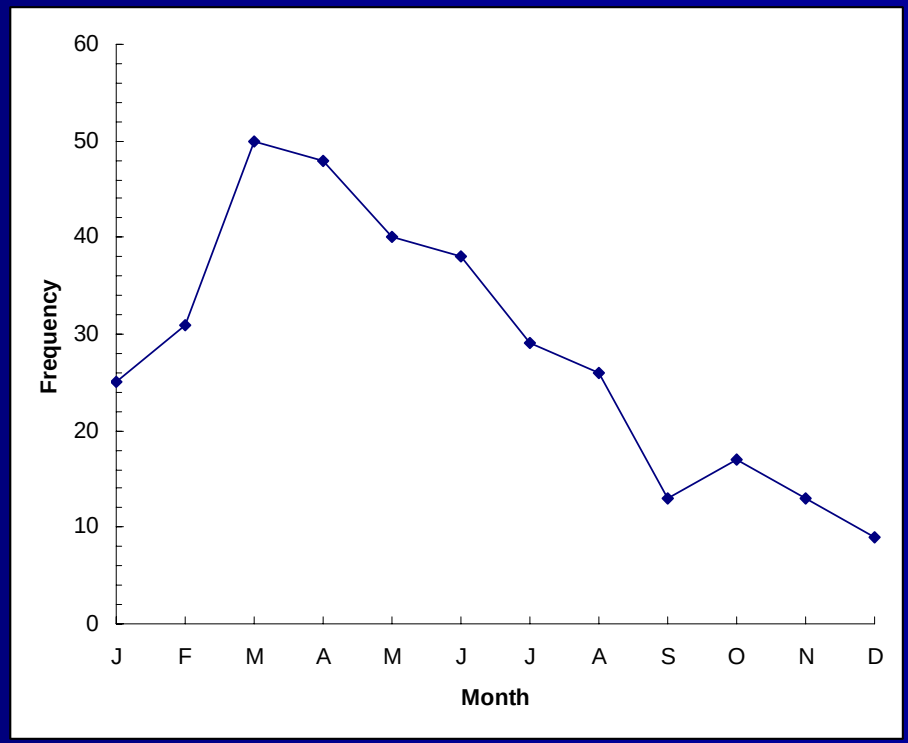
- Individual sighting reports converted to density using ArcView Spatial Analyst.
- Identifies reporting hotspots.
  - Concentration of sightings effort? Or concentration of sawfish?
  - Focus for research surveys?



Sightings density 1998-2003

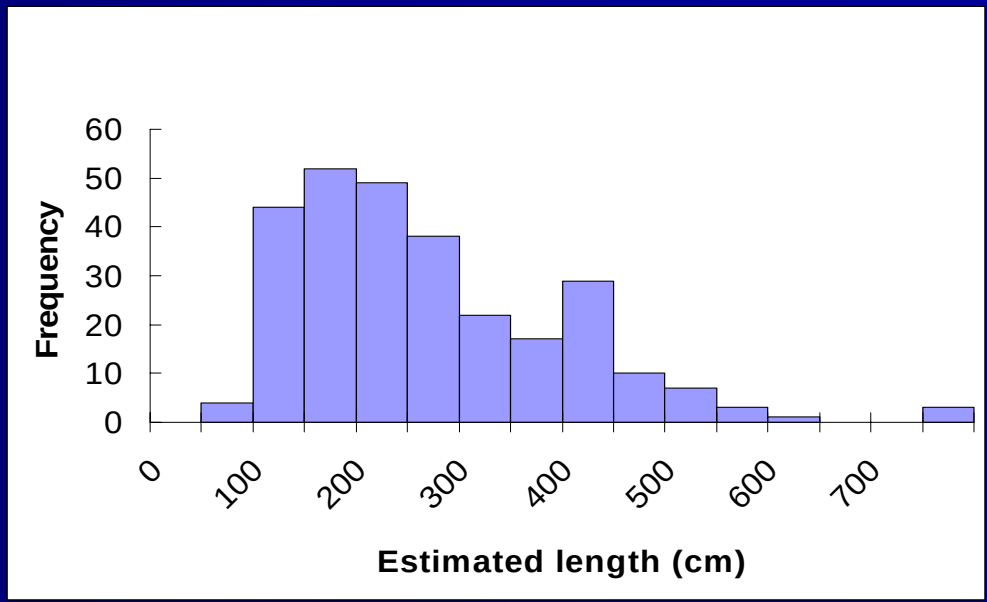
Sightings data - seasonality

- Strong seasonal relationship, with peak sightings March to June.
  - Vulnerability of sawfish?
  - Recreational fishing effort?

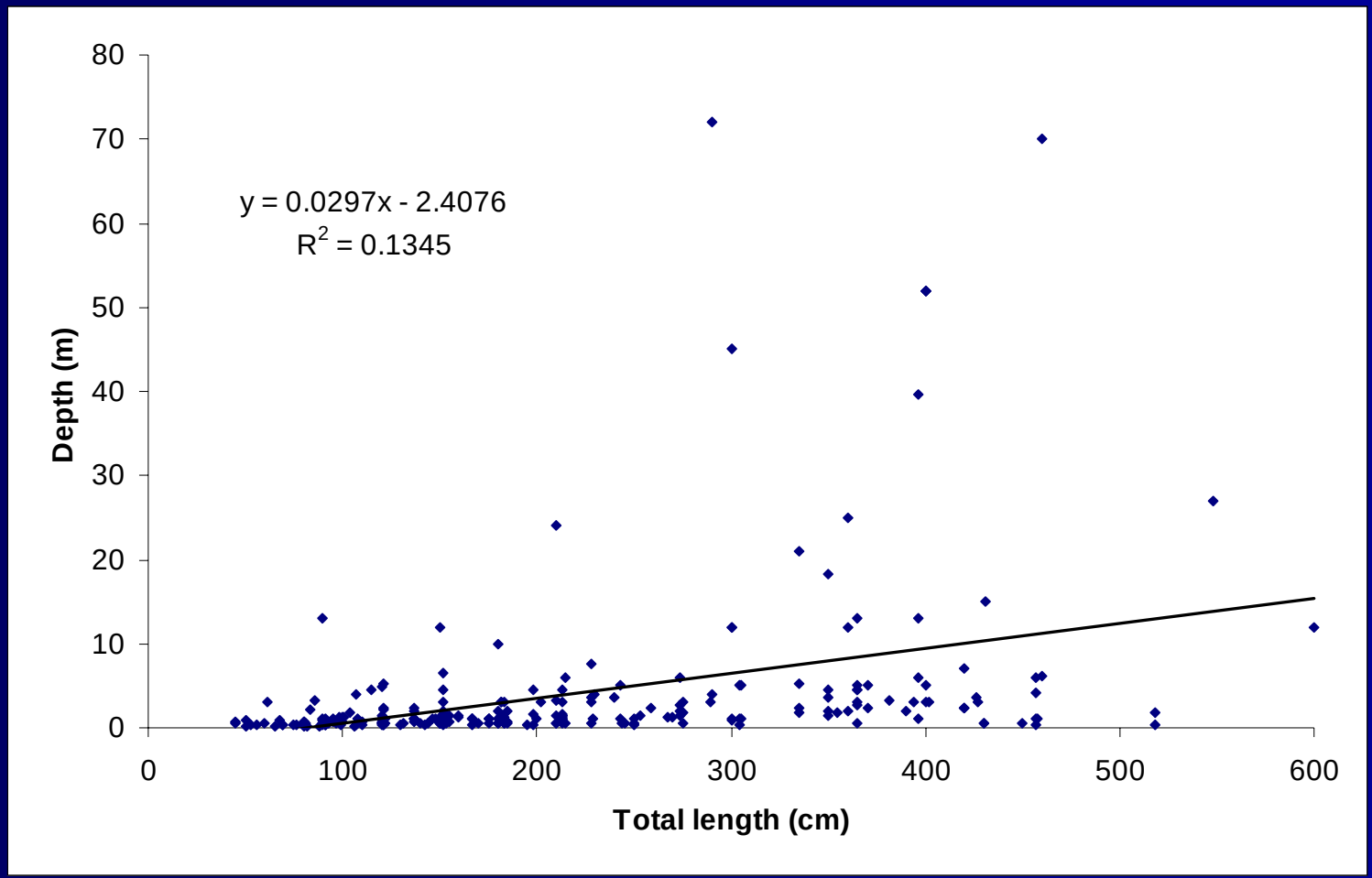


Sightings data – size

- Full size range of animals reported, with most from 100 to 300 cm (i.e. juvenile).
- No apparent “holes” in the population.
- Reported sizes are only estimates and probably contain a high degree of error.



Sightings data – size & depth.



Fishery interactions - overview

- Identify potential fisheries with which smalltooth sawfish interact.
- Determine:
  - Size classes
  - Locations
  - Mortality level

Field surveys - gear

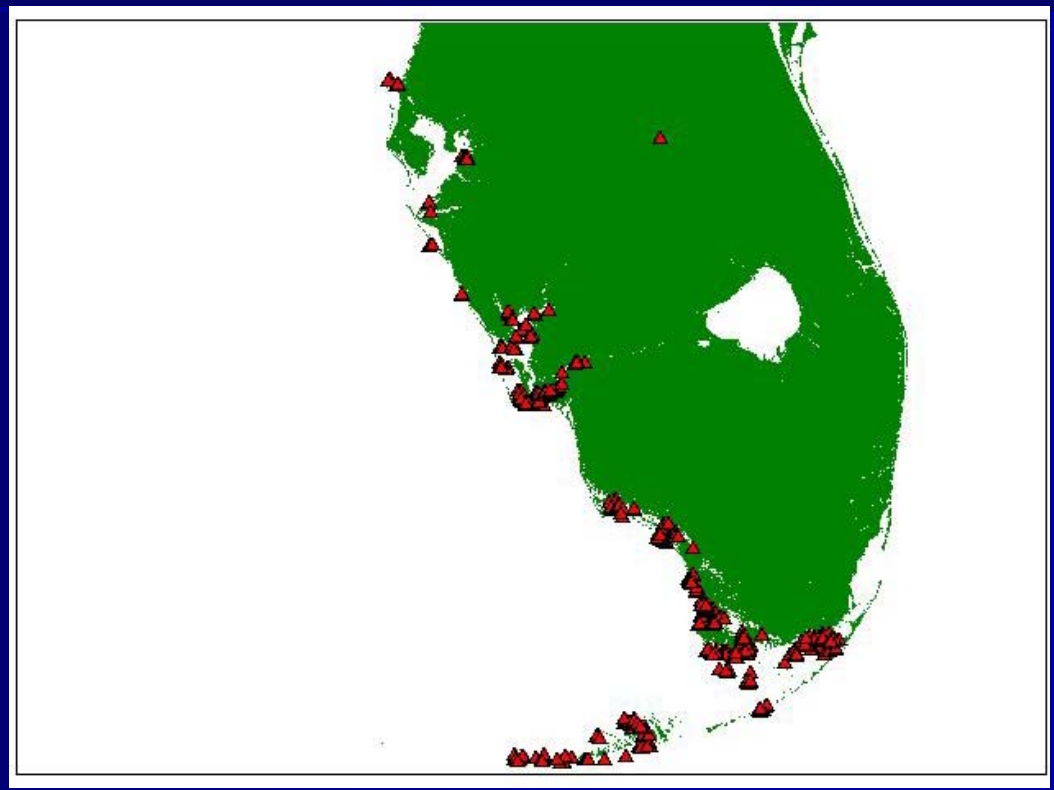
Gillnet and seine

Rod and reel

Longline

Field surveys - locations

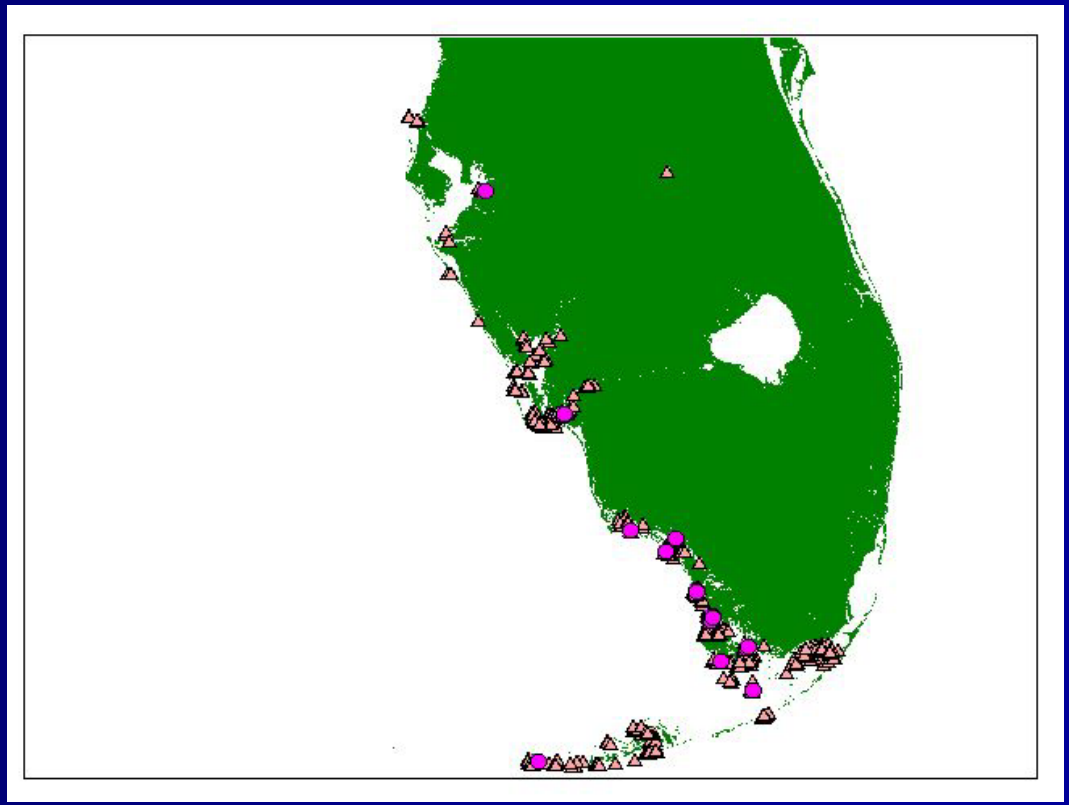
- 776 sets
  - 630 longline
  - 62 rod and reel
  - 32 gillnet
  - 27 visual
  - 16 set line
  - 9 seine
- Tampa Bay to outer Keys



Red triangles indicate sampling locations

Field surveys - sawfish

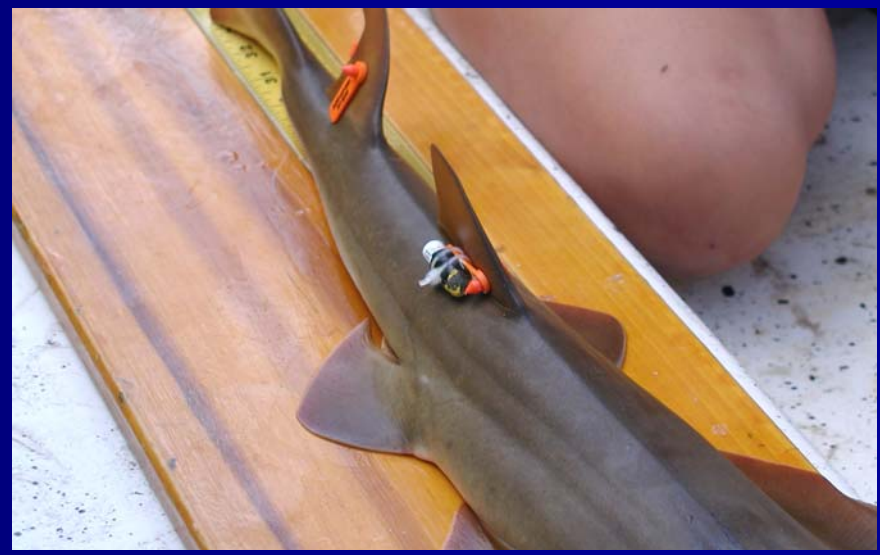
- 34 sawfish captured
  - 13 longline
  - 10 rod and reel
  - 6 gillnet
  - 5 seine
- Size range 80 to 450 cm.



Magenta dots indicate locations of sawfish captures

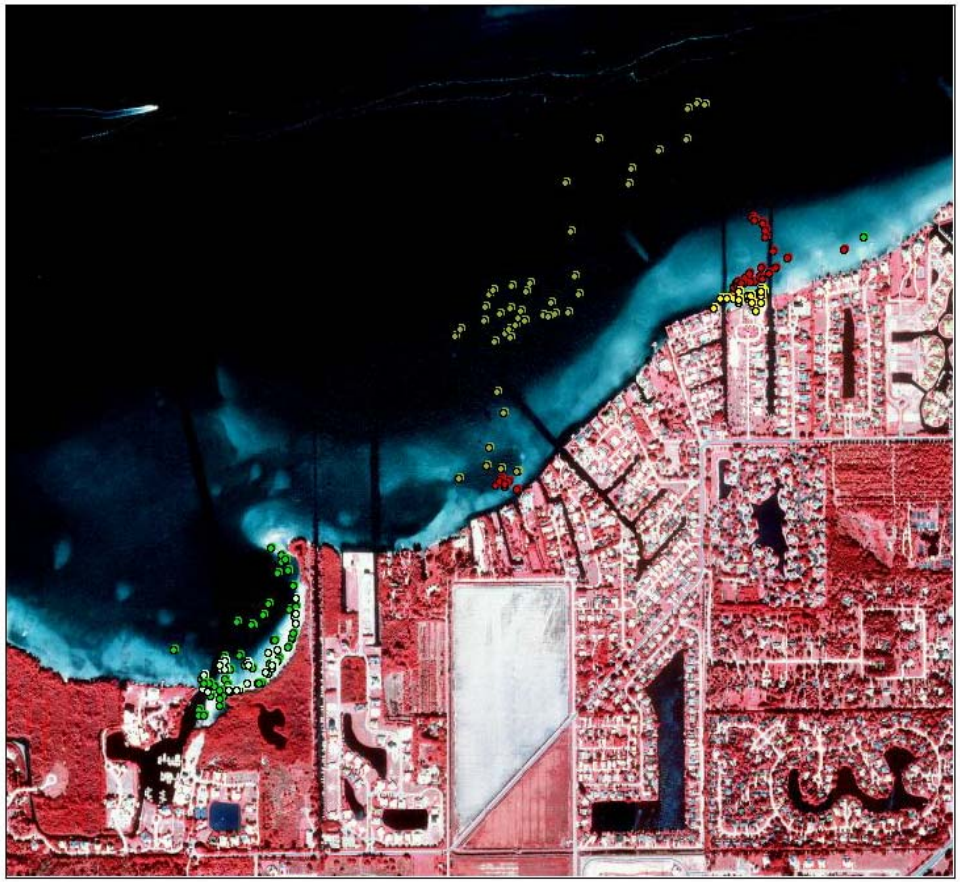
Acoustic tracking - methods

- Vemco V8 or V16 acoustic tags.
- Mounted on fin using rototag.
- Animals followed using a directional hydrophone.
- Analyzed for home range, site fidelity, etc.
- 10 juveniles tracked.



Acoustic tracking - results

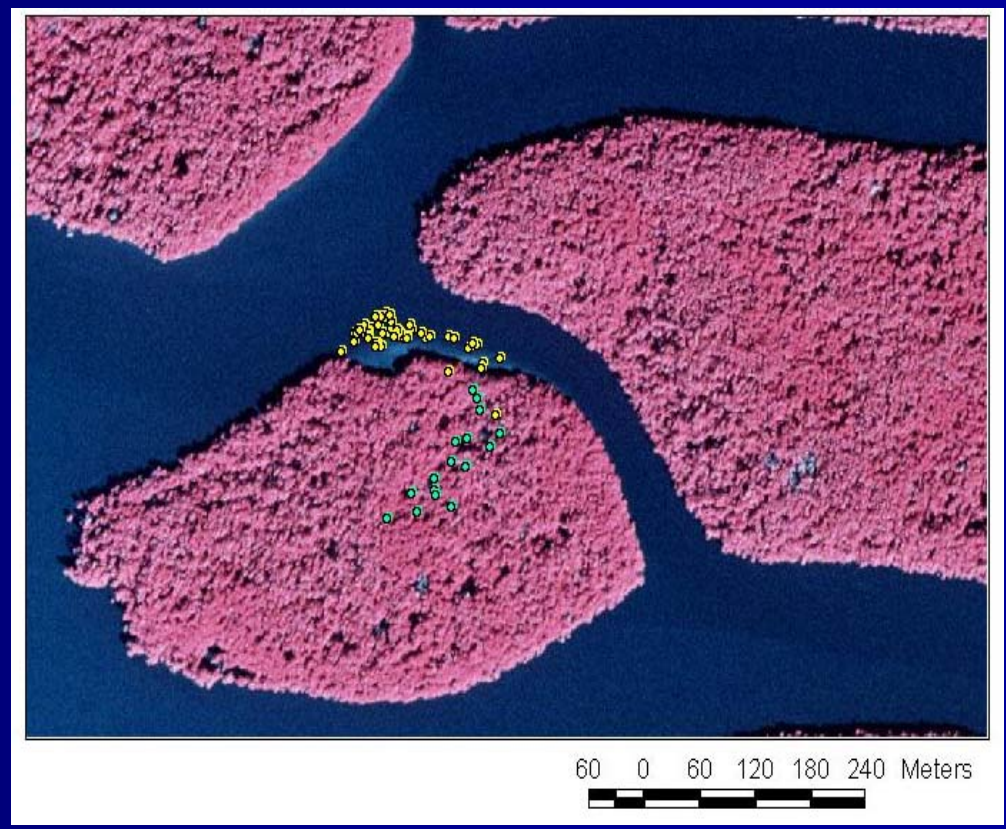
- 153 cm STL.
- Captured July 17, 2002.
- Tracked on several different days over 3 months.
- Home range overall 1.2 km^2, 0.036 – 0.35 km^2 each day.



Caloosahatchee River

Acoustic tracking - results

- 82 cm STL.
- Captured November 11, 2002.
- Tracked over 3 consecutive days.
- Strong tidal pattern, using a narrow mangrove drainage at high tide.



Shark River

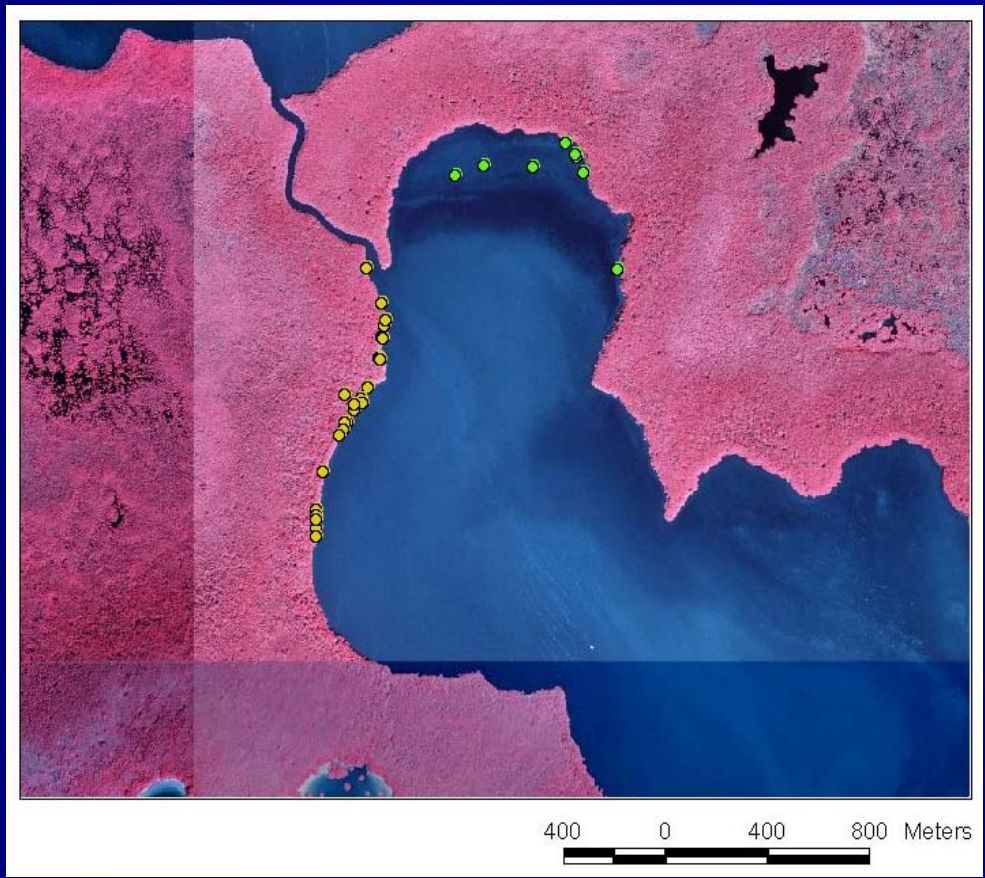
Acoustic tracking - results

Low tide habitat

High tide habitat

Acoustic tracking - results

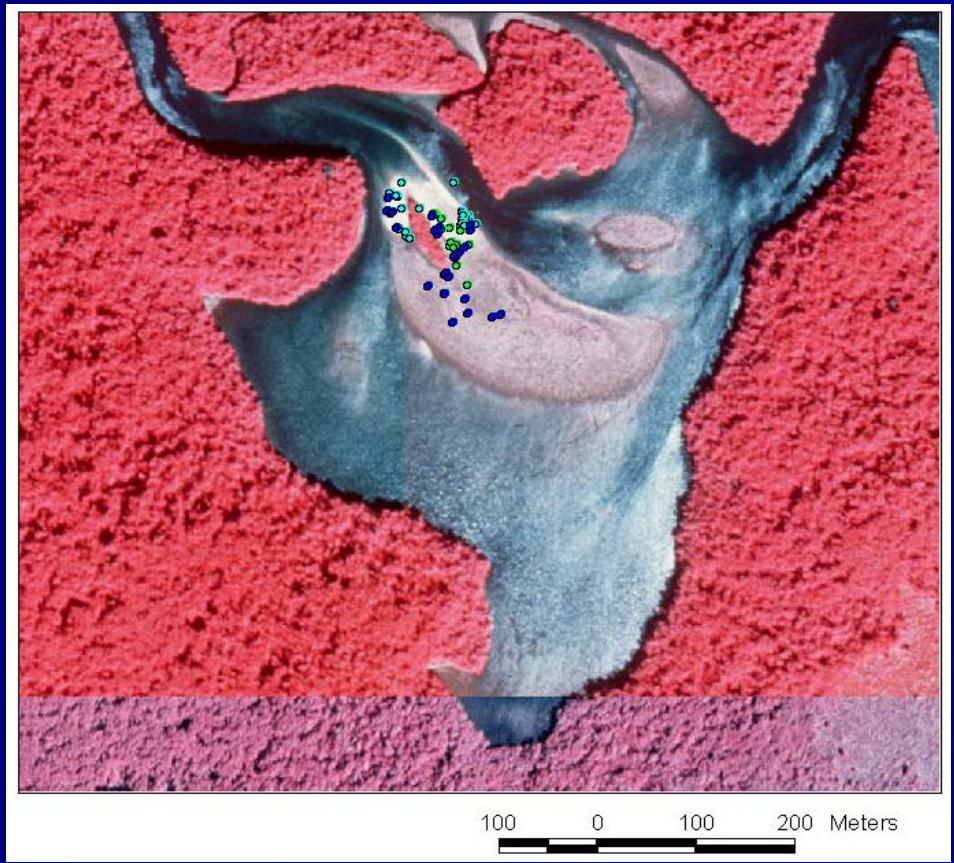
- 150 cm STL.
- Captured February 17, 2003.
- Tracked over 3 consecutive days.
- Always associated with mangrove roots along edge of bay.
- Home range 0.08 km^2.



Coot Bay

Acoustic tracking - results

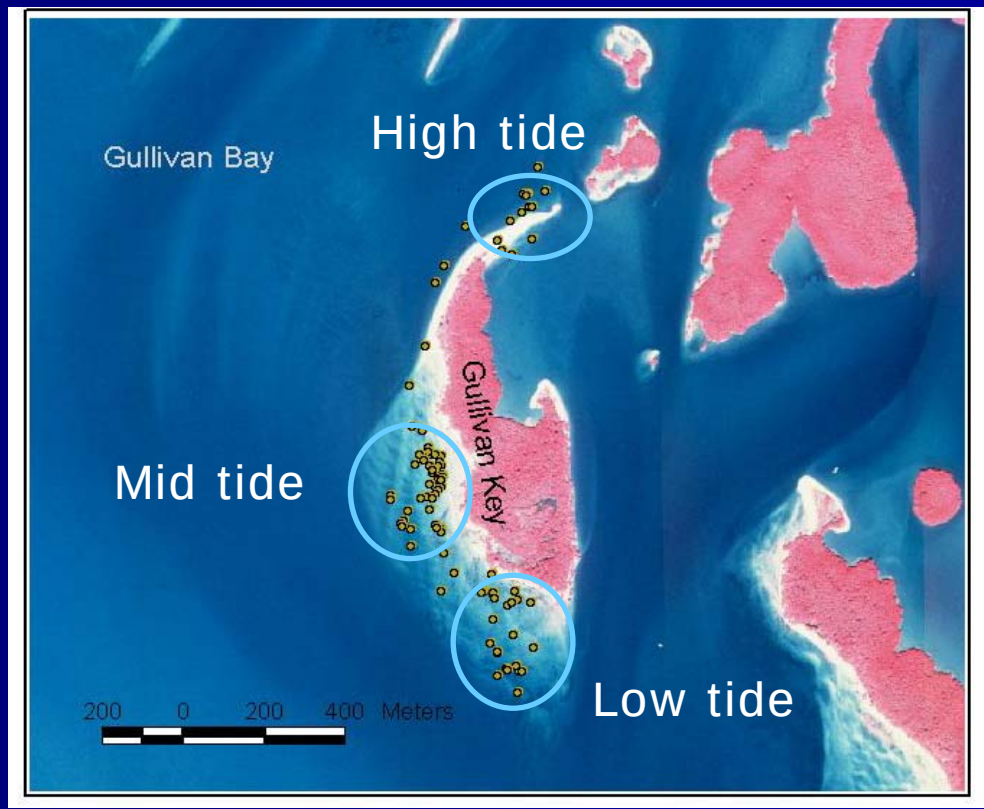
- 89 cm STL.
- Captured April 15, 2003.
- Tracked on 3 consecutive days.
- Home range 0.01 km^2.
- Repeated use of shallow mud bank



Hurddles Creek

Acoustic tracking - results

- 200 cm STL.
- Captured September 3, 2003.
- Tracked on 2 consecutive days.
- Strong tidally driven pattern.



Gullivan Key

Acoustic tracking – habitat use summary

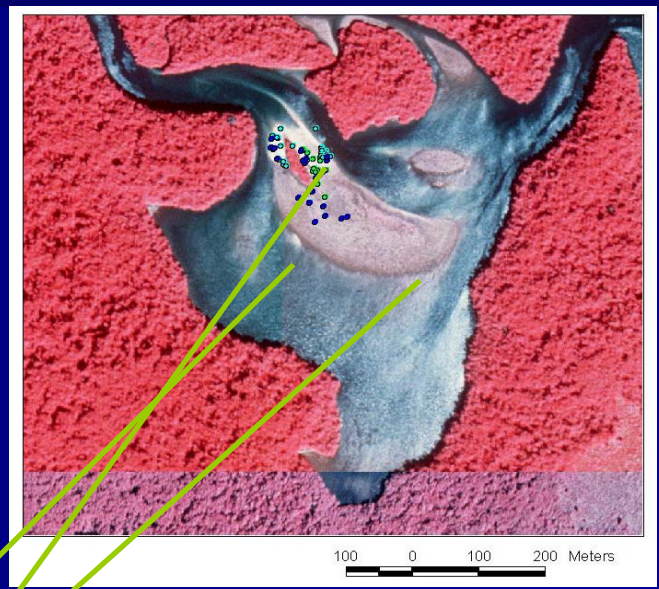
- Juveniles, especially the very small animals, have a strong preference for very shallow areas (<50 cm).
- In areas where shallows are not available, shelter around mangrove roots.
- Movements driven mostly by tide; keep up with changing water depth.

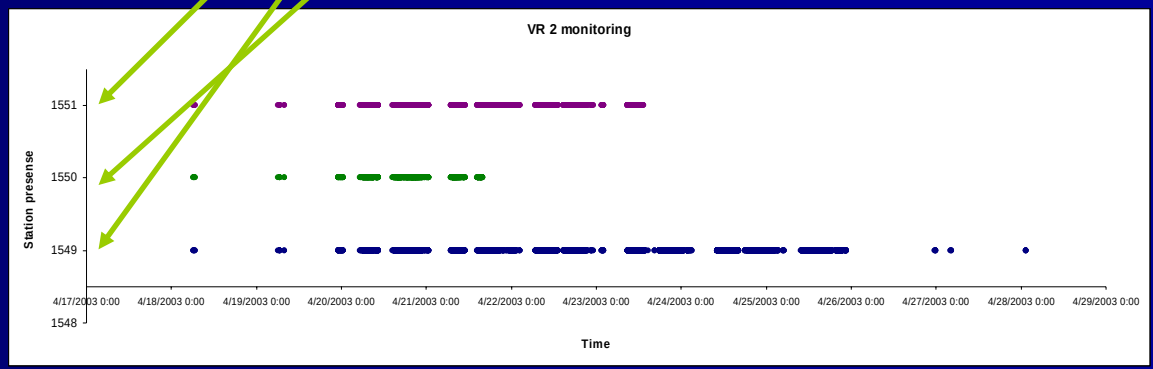
Acoustic monitoring - methods

- Vemco VR2 monitors moored long-term in nursery areas.
- Sawfish fitted with tags that last 12-24 months.
- Assessing site fidelity, residence patterns, effect of environmental changes (temperature, salinity, etc.).

Acoustic monitoring – prelim. results

- Single animal monitored in Hurddles Creek.
- Monitors present April through September.
- Present in range only 6 days.





Acoustic monitoring - the next step

- Monitoring 4 sites in 2004:
  - Caloosahatchee River (20)
  - Faka Union Bay (3)
  - Hurddles Creek (3)
  - Coot Bay (3)
- Results from other users in other areas if heard.

Archival tagging - overview

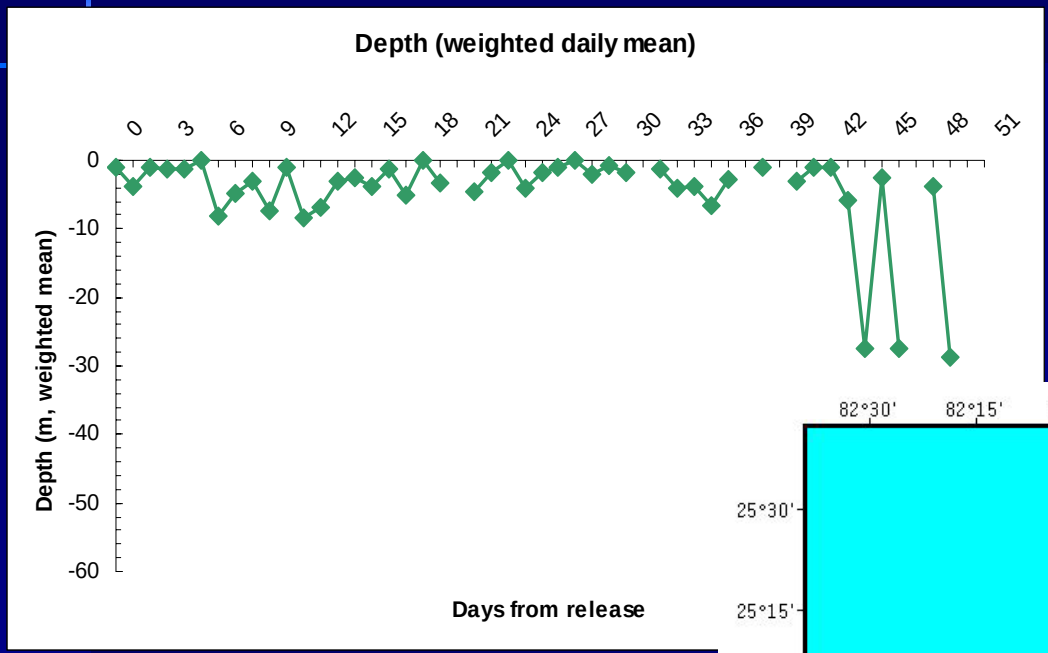
- Two types of tags:
  - Pop-up satellite tags (Wildlife Computers PAT tags).
  - Recoverable depth, temperature, salinity tags (Star-Odi CTD tags).

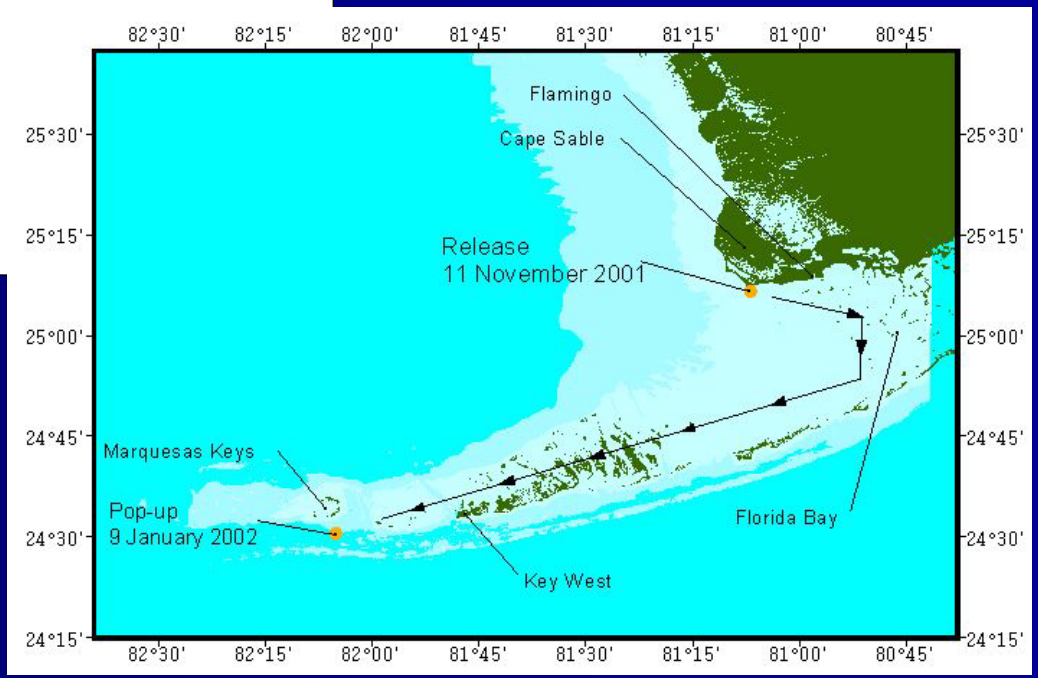
PAT tagging - summary

- PATs deployed on seven sawfish
  - 1 worked perfectly
  - 1 early release
  - 1 heard but no data
  - 4 not heard from
- Disappointing results to date.
- Working to resolve attachment issues.

11 foot sawfish with PAT tag

PAT tagging - results





- 450 cm adult female.

CTD tagging - overview

- Aim is to investigate salinity preferences of sawfish and how they react to changes.
- Deployed on sawfish for several weeks, with acoustic tag for relocation.

Satellite telemetry - overview

- Wildlife Computers SPOT2 and SPOT3 tags.
- Provide position estimate when out of water and satellite overhead.
- 2 SPOT2 released
  - One heard from occasionally but never gets position.
  - One recovered
- 6 SPOT3 tags to be released next year.

150 cm sawfish released with a SPOT2 tag

Sawfish genetics - overview

- Collaboration with Gavin Naylor (FSU) and Vicente Faria (Student, ISU/FSU).
- Sequencing mtDNA to investigate:
  - Genetic diversity (current and historic)
  - Relationship between different populations (esp. USA and Bahamas)
  - Relationship to other species of sawfish.

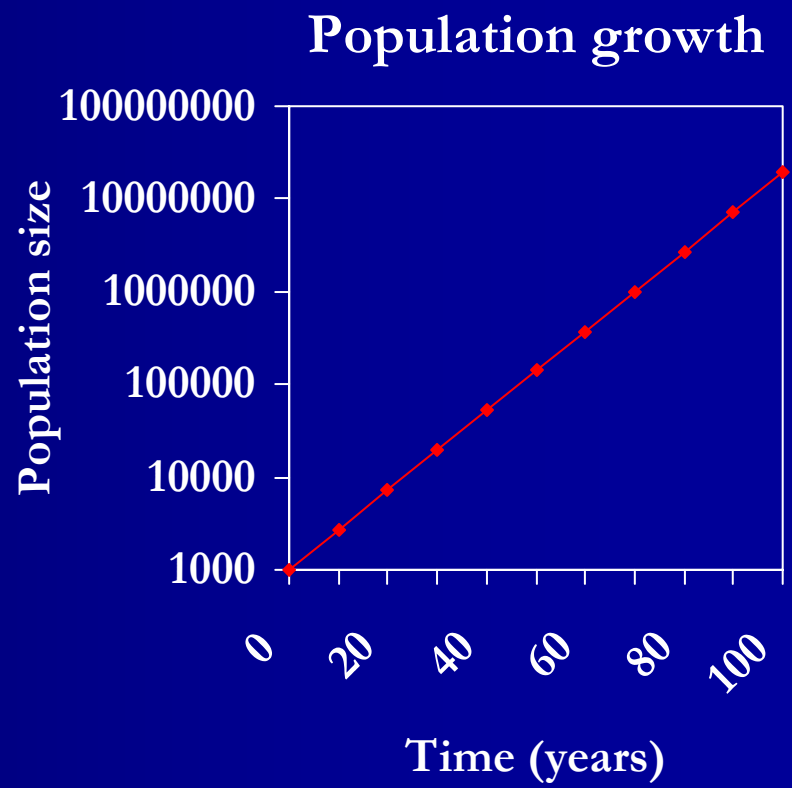
Demographic modelling - overview

- Uses life history data to look at rate of population increase.
  - Litter size 17.5
  - 2 year reprod. cycle
  - Max. age 30/50/70 yrs
  - Age mat. 10/17/24 yrs
  - Nat. mort. 0.059 to 0.139 $year^{-1}$

Simpfendorfer, CA. 2000. Predicting population recovery rates for endangered western Atlantic sawfishes using demographic analysis. *Environmental Biology of Fishes*, 58:371-377.

Demographic modelling - results

- Intrinsic rate of population increase (r) ~ 0.08 year^{-1}.
- Population doubling time ~ 8 years.
- Assumptions
  - Life history values OK
  - No extra mortality
  - No habitat limitation
  - No genetic effects



Population viability analysis

- Demographic analysis was a preliminary look at population growth rates.
- We are investigating the use of PVA for smalltooth sawfish to provide information relevant to the recovery process.

Long-term research strategy

- National sightings database -> Distribution
- Long-term population monitoring -> Abundance
- Habitat use assessment -> Critical habitat
- Physiological research -> Habitat changes
- Population Viability Analysis (or similar) -> Population status and recovery