



Western Washington University
Western CEDAR

Salish Sea Ecosystem Conference

2014 Salish Sea Ecosystem Conference
(Seattle, Wash.)

May 2nd, 10:30 AM - 12:00 PM

Observations on abundance of bluntnose sixgill sharks, *Hexanchus griseus*, in an urban waterway in the Salish Sea, 2003-2012

Shawn Larson
Seattle Aquarium, s.larson@seattleaquarium.org

Denise Griffing
Seattle Aquarium

Jeff Christiansen
Seattle Aquarium

Joel Hollander
Seattle Aquarium

Tim Carpenter
Seattle Aquarium

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<https://cedar.wwu.edu/ssec/2014ssec/Day3/74>

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Denise Griffing¹, Shawn Larson¹, Joel Hollander¹, Tim Carpenter¹, Jeff Christiansen¹, Charles Doss²

1 Seattle Aquarium

2 University of Minnesota

Sixgills in the Salish Sea

- This rarely studied “deep water” shark is found in the relatively shallow, inland waters of the Salish Sea.
- Its presence was known in local waters by scientists, local divers and commercial fishing communities.
- General public was mostly unaware of this large shark.
- Seattle Aquarium began studying sixgills in Puget Sound in 2003.



Where?



Elliott Bay, Georgia basin
localities sighting &
catch areas

Project goals: To identify individual animals, movement patterns, gender ratio, local abundance, and population boundaries in Puget Sound.

1. visual tagging
2. genetic fingerprinting
3. acoustic monitoring

Research Partners

- Washington
Department of Fish
and Wildlife
(WDFW)
- National Marine
Fisheries Service
(NMFS), NOAA

Methods

- Bait attracts sixgills to the research site.
- Divers insert visual marker tags and take tissue samples.
- Video is recorded for 12 hours per night.
- Individual sixgills are identified by visual marker tag or natural markings.

Methods

- 2003 – 2005: Bi-monthly effort.
 - 2005 – 2007: Aquarium renovations.
- 2008 – 2012: Bi-monthly data collection.
 - 2012 : Aquarium renovations.

Individual identification methods

Floy VM69
Visible Marker Tag



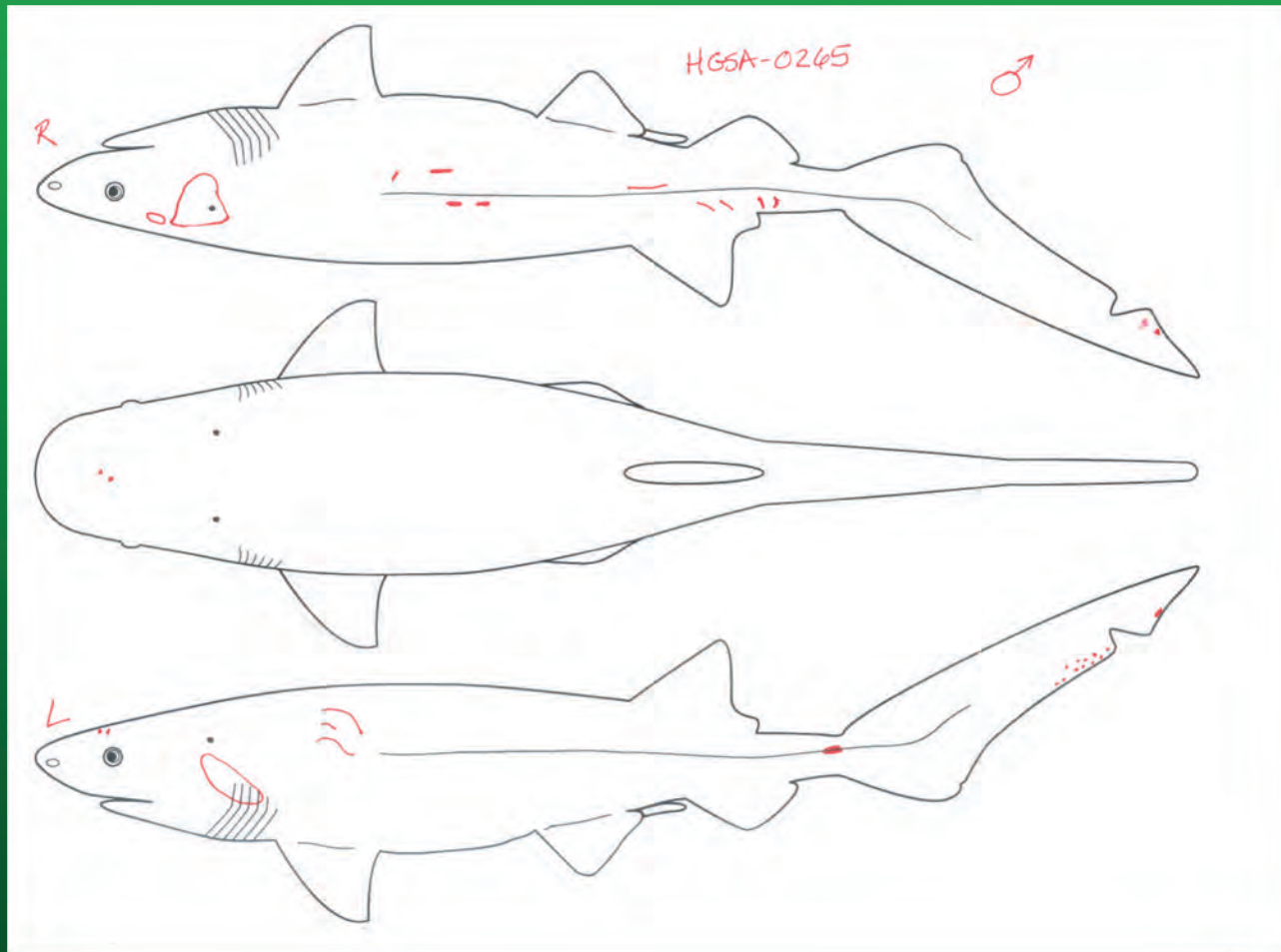
VEMCO V32P
Acoustic Tag



Pneudart Biopsy Dart

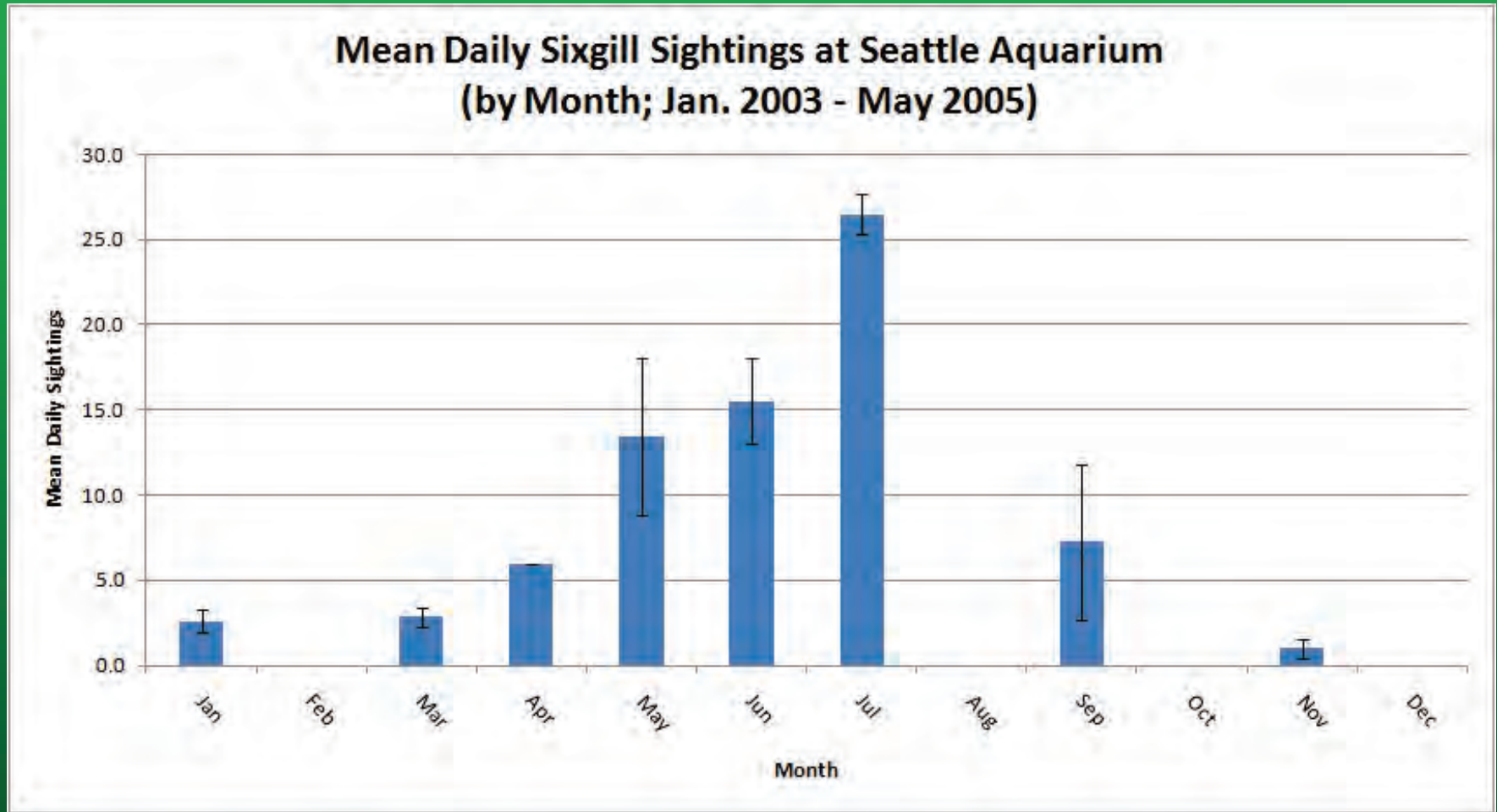


Identification via markings



RESULTS:

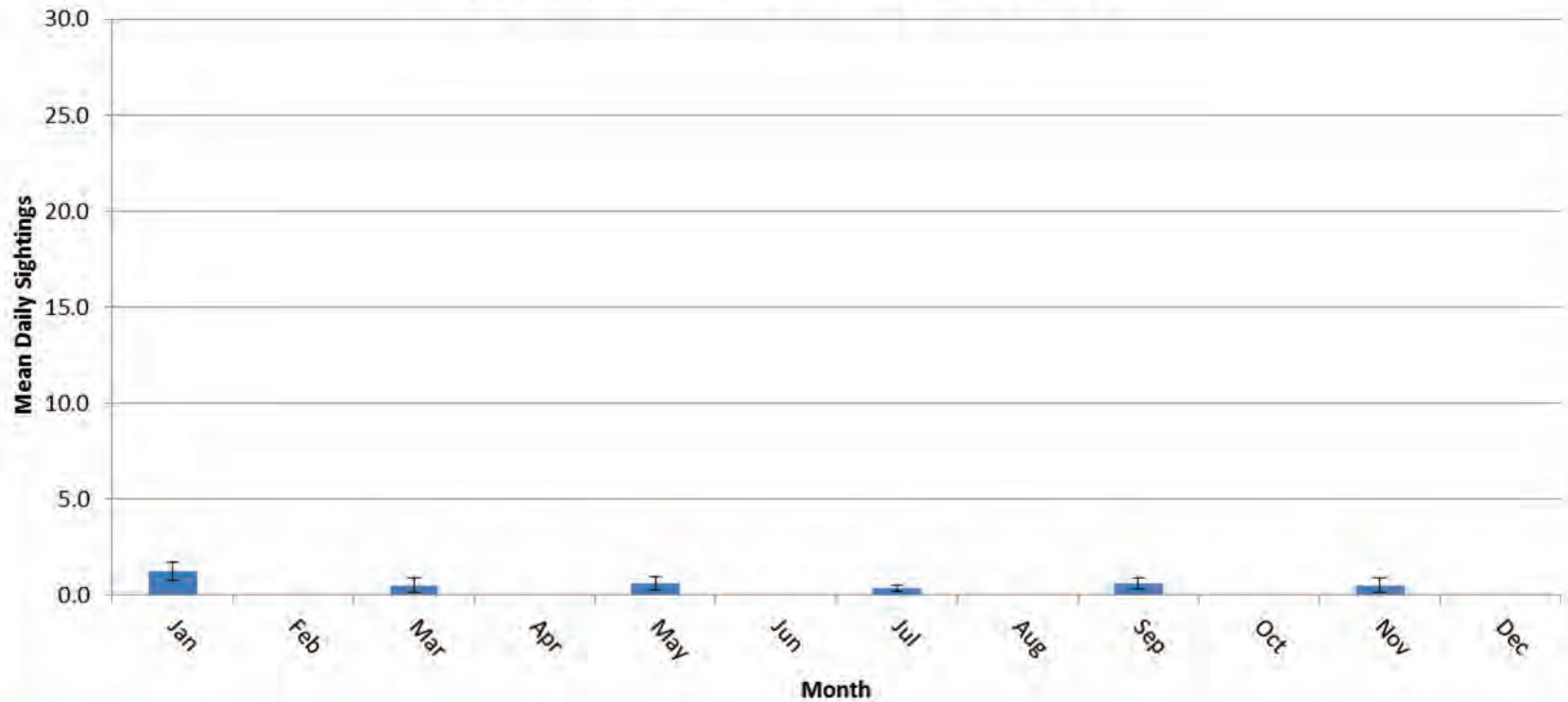
Observations 2003-2005



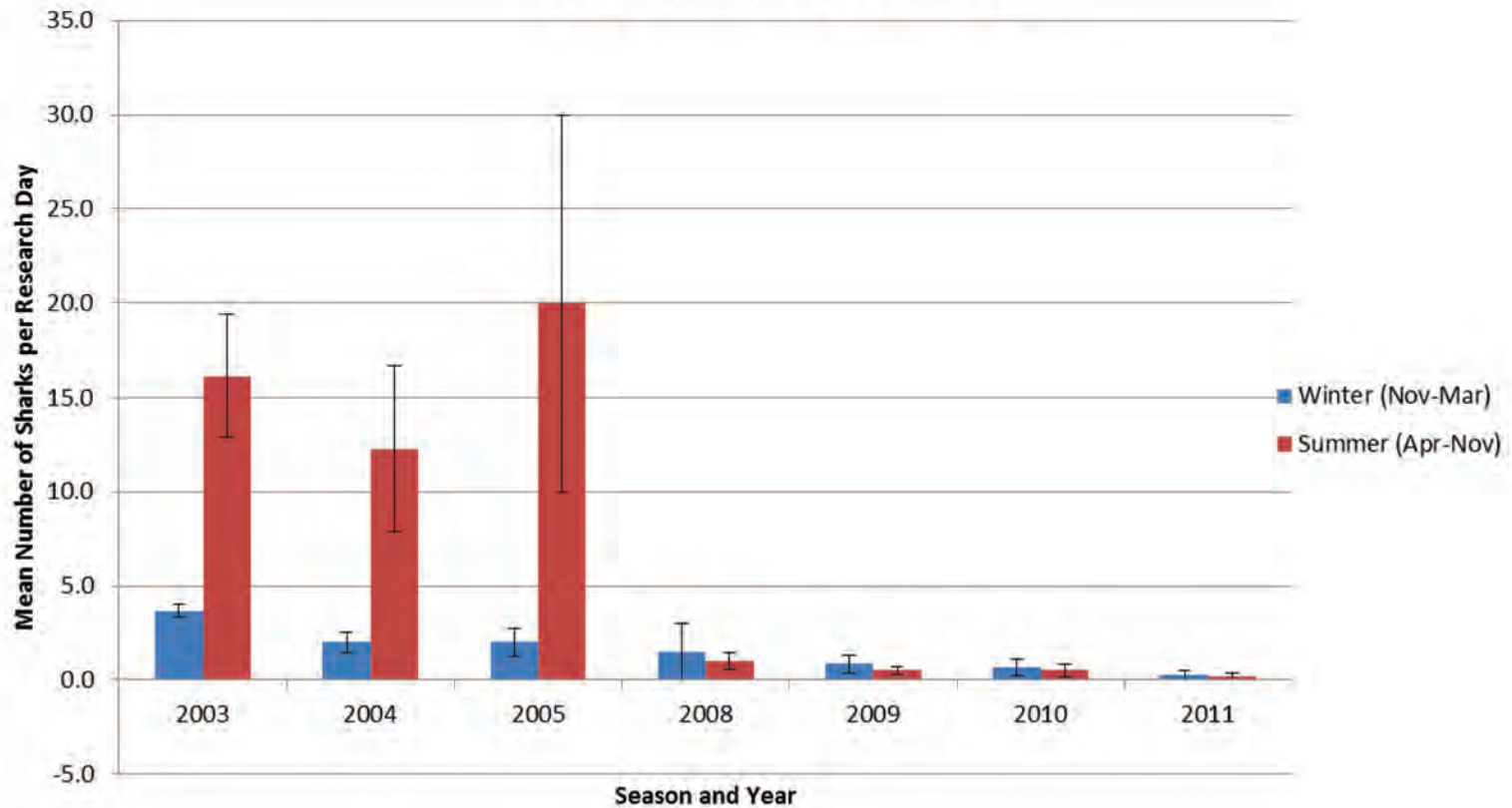
Then research was halted for Aquarium renovations (2006-2007) ...

Observations 2008-2011

**Mean Daily Sixgill Sightings at Seattle Aquarium
(by Month; Mar. 2008 - Nov. 2011)**



Mean Daily Sixgill Sightings at Seattle Aquarium (by Season; 2003-2011)



Sixgill observations

2003-2005

- 45 sixgills received visual tags. 17 of those sharks returned 31 times.
- 197 sightings of untagged sixgills; some may be resightings.
- Total observations = 273

- Daily counts: 0-30 identifiable sharks.
- Mark/recapture statistical software: estimated 27-98 identifiable sharks/event.

Sixgill observations

2008-2011

- None of the previously tagged sixgills returned (with a tag).
- Only one opportunity to implant a new visual marker tag (failed).
- Some days we had a single, “clean” shark.
- Daily counts ranged from 0-3 identifiable sharks.

Summary - Abundance

2003-2005: high abundance of identifiable sharks sighted at SA research station.

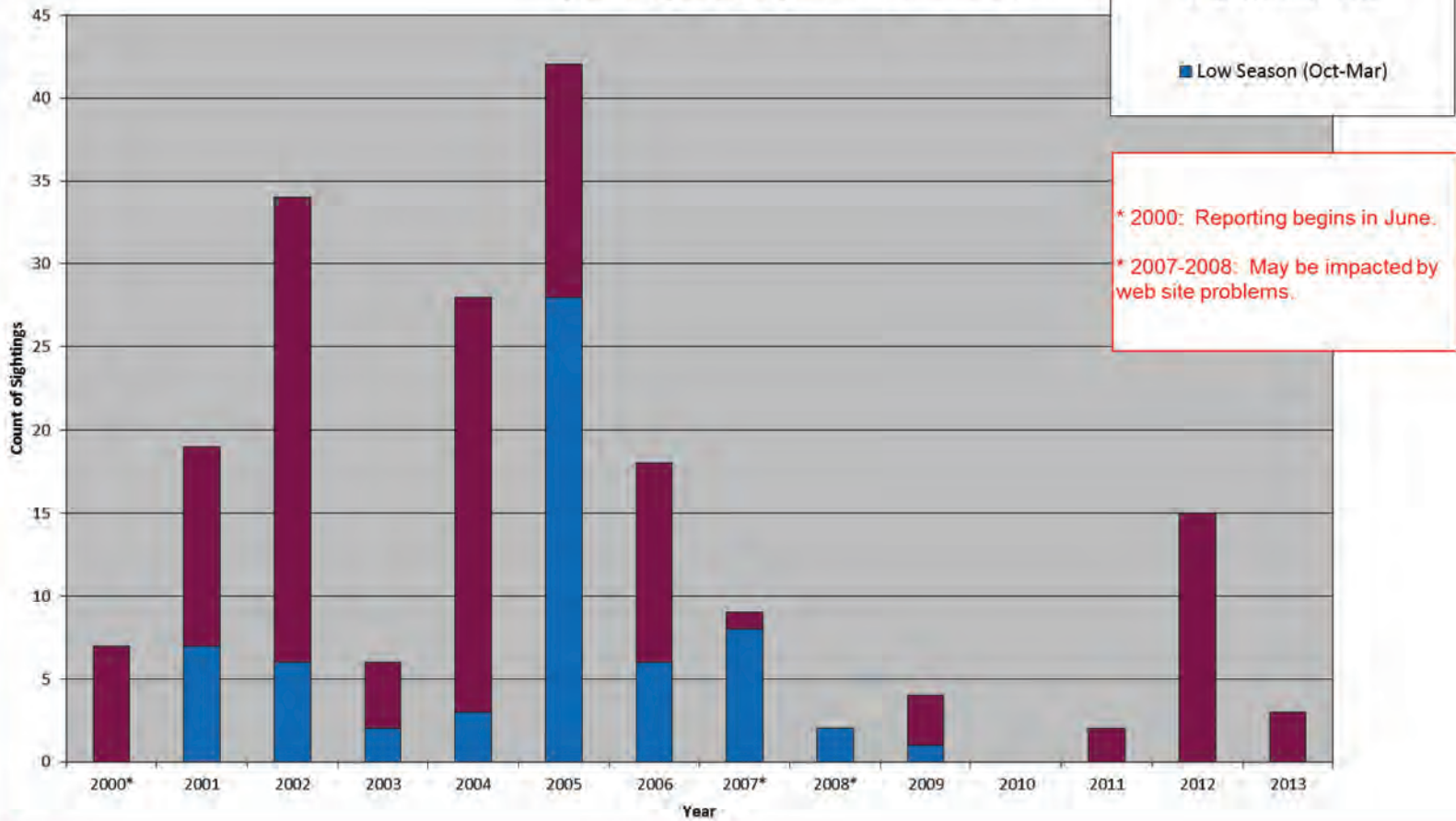
2008-2011: much lower abundance. (Mann Whitney: p -value=0; z =-5.5158 at p =.01)

What do we think happened? We think the majority of sixgills we were observing left.

2006-2009: NOAA observed 19 of 34 acoustically tagged sharks leaving Puget Sound. 3 females subsequently returned.

A corresponding decrease in recreational diver/shark sightings.

Sighting Reports by Year and Season (Citizen Sightings; Puget Sound; 2000-2013)



Why?

- We know that some sixgill females give birth in Puget Sound because more than 1 female washed ashore in the process.
- Majority of sixgills documented in Puget Sound were sub-adults.
- The subadults were found in cohort groups.
- Perhaps the cohort group that used Puget Sound as a nursery left during 2006-2008 for the open ocean as suggested by the acoustically tagged sharks.
- We continue to monitor for (but have yet to see) evidence of another successful recruitment in Puget Sound.
- Similar patterns of apparent high abundance followed by a large decline were reported in Barkley Sound, BC and Flora Islet, BC during earlier time periods.
- Why do we see these patterns?

