

SUMMARY MINUTES

Broward County Local Rule Review Committee Meeting

Thursday, July 8, 2010
10:00AM
Government Center West
2nd Floor Hearing Room

Voting Members

Lisa Baumbach – Present
Allan Burrows – Present
George Cavros – Absent
Gordon Connell – Absent
Mark Ercolin - Absent
Gary Hecker – Present
Ed Keith - Present
Karl Roeder – Present
Barry Webber – via Teleconference
Daniel Yaffe – Present

County Staff

Pat Quinn, BCNRPMD
Eric Myers, BCEPGMD
Ryan Goldman, DERD
David Stout, BCNRPMD
John Fiore, Parks and Rec
Jaclynn Conner, BCNRPMD

The meeting was called to order at 10:18am by Committee Chair Dan Yaffe. A sign-in sheet was circulated. Roll was called and noted for the record. No minutes were reviewed and approved.

Dr. Ed Gerstein gave a presentation titled “Of Manatees and Men Sound Science for Sound Decisions.” which discussed manatees and bioacoustics. The highlights of the presentation included:

- Why are individual manatees hit repeatedly by boats?
- After they have been hit once, twice, or three times, why don't they learn to avoid boats better?
- Are manatees aware danger is present?
- Can they hear the boat approaching, and if so, from how far away and from which direction?
- What is the overall hearing range and capability of manatees?
- What frequencies and amplitudes can they hear best?
- How is their hearing affected by background noise?
- How well can they localize sounds underwater?
- How is their hearing sensitivity in the real world? The audiogram measures hearing in quiet conditions. However, manatees and other animals do not live in quiet environments. They live in relatively noisy habitats. Their hearing and directional abilities were tested against various background noise conditions to simulate natural habitat levels and measured auditory masking effects.
- Five Psychoacoustic Tests were done: Masked Thresholds, pulsed and continuous pure tones with q/3 octave noise; Masked Thresholds, pulse repetition, pure tones with broadband noise; Masked Thresholds, complex FM tones with broadband noise;

Masked Thresholds, environmental sounds with broadband noise and Directional Hearing, clicks with broadband noise.

- Acoustic consequences of reducing speed lessens cavitation noise and overall acoustic energy (lower sound intensity, quieter propeller noise)
- Lowers the frequency content of the noise which reduces the audibility of the sound as well as its directivity
- In shallow water these lower frequencies do not propagate effectively due to boundary effects of environment. Additional low frequency attenuation and cancellation can occur near the surface as well (Lloyd's mirror effect)
- These acoustic and subsequent propagation effects, increases the likelihood of acoustic masking by the prevailing ambient levels including noise of distant faster moving vessels and loud slow moving ships.
- Slower speeds increasing boat transect times and thus the time traversing through manatees habitats and subsequent opportunities for collisions.
- The growing number of surviving manatees with increasing multiple propeller scars may be the result of acoustical masking.
- The video of manatees being approached by slow boats helps to demonstrate the impact on manatee awareness.
- While slow speed zones may reduce the chance of mortalities in turbid waters it does not mitigate the occurrence collisions that can still mortally injure individuals and reduce their fitness.
- The blanket application of speed regulations in turbid waters without mitigating the acoustic consequences for the manatee can actually exacerbate the risk of collisions by reducing the audibility of approaching watercraft while conversely increasing the transect and the opportunities for collisions.
- Manatees are at a sensory disadvantage and in many instances have reduced awareness and less time to react.
- After nearly two decades of slow speed regulations and significant expansion and increased enforcement over the last decade manatee mortalities and injuries are at record highs. Even after reduced boat registrations following a succession of hurricanes, manatee mortalities still increased in Brevard County.
- The growing number of surviving manatees with increasing multiple propeller scars (up to 50 different encounters) may be a result of reduced speeds and increased acoustical masking.
- Blanket speed restrictions without mitigating the associated acoustic consequences can exacerbate the risks of collisions through masking and increased transect times through populated areas.
- Each year manatees are killed by barges and large vessels that lumber at speeds of 6 mph or less. Their tremendous mass can result in significant momentum impacts even at such slow speeds. These encounters can sometimes be indistinguishable from high speed impacts with smaller boats. Slow speed zones do not impact the operation of these large vessels nor do they reduce mortalities with these commercial vessels.
- Lloyds Mirror Effect and Acoustic Shadows ahead of large vessels may be responsible for many mortalities.
- An acoustic array designed to selectively fill in these shadows with a highly directional alarm could help alert manatees of an approaching vessel and reduce the ambiguity of the quiet zone ahead of these vessels. Such a strategy may be helpful for both manatees and whales that face similar challenges from ships near the surface.
- A manatee warning device has been developed to project a low intensity, highly directional narrow band of sound in front of approaching boats. The selected signals

exploit the manatees best hearing and localization abilities and are designed to enhance the manatees' sensory awareness of approaching boats and ships.

- Experimental Treatments: Slow approaches without an alarm; slow approaches with the alarm; Controls 30 + min before and after runs and Controlled site, no public boating, few variables and quiet conditions.
- Controlled approach trials with wild manatees were only run when water visibility was clear enough to view focal animals and track their positions throughout approach sequences.
- A total of 111 trials have been run to date. Only four (5%) of the no-alarm approach trials have resulted in a measurable avoidance reaction or change in behavior. For 95% of these no-alarm trials manatees did not react to the approaching boat. During these no-alarm trials some avoidance reactions were observed but only after the boat passed the animal and was forced to veer in order to avoid hitting the manatee. In contrast, (97%) of the alarm trials elicited overt avoidance responses (a change from resting or feeding to swimming away or diving). These changes were exhibited at distances ranging from 12 m to 35 m ahead of the bow. The mean response change in behavior was significantly greater during alarm trials ($F=198$, $df=1$, $p< 0.01$). The mean distance at which focal manatees responded was also significantly greater during alarm trials ($F= 46.46$, $df=1$, $p< 0.01$). During no-alarm trials behavioral changes significantly increased only at the moment the bow passed or when the boat was forced to veer away (t - statistic = 5.348, $p<0.05$). This result indicates that these manatees would have responded during these boat approaches had they been able to detect the boat sooner.
- Manatees do not react to, and are unable to effectively detect the sounds of approaching boats traveling at slow speeds at distances greater than 8 m away. The manatees' low frequency hearing constraints, along with measured shallow water and near surface propagation factors, render these sounds inaudible against the prevailing ambient noise.
- The tests significantly demonstrate the parametric alarm's efficacy for reliably alerting manatees of approaching boats at safe distances (12 to 35 m) and how manatees remain vulnerable to collisions without it.
- Manatees are able to effectively avoid approaching boats provided they have the sensory awareness to do so.
- In Jacksonville, there was a spike in deaths due to dredging.

The committee will accumulate data and decide what to put in the report. The entire report and recommendations are on the website.

Questions and comments followed the presentation.

The presentation by David Roach, Executive Director Florida Inland Navigation District was cancelled and will be rescheduled at a future meeting.

Dr. Keith has obtained the FWC website mortality rates in Broward County. This will be discussed at next week's meeting.

Mr. Hecker would like a chart showing where people are waterskiing. The data will be available at next week's meeting.

What is the number of manatees that use power plants or other areas as a refuge? How much vegetation is available and how much is needed? The data will be available at next week's meeting.

The next meeting is July 15, 2010 at 2:00pm at Secret Woods Nature Center. The committee will check to see if next week's meeting can be moved to the Government Center West and be held from 10:00am to 12:00 Noon.

With there being no further business, the meeting adjourned at 12:35PM.

Prepared by Jaclynn Conner

Review and approved by Ek Date 7/13/14