CARMEL LAGOON STRIPED BASS REMOVAL PROJECT REPORT 2010

The purpose of this pilot project is to help determine the impact of striped bass (*Morone saxatilis)* predation on juvenile steelhead (*Oncorhynchus mykiss),* in the Carmel River lagoon. Goals of the project are 1) to determine more about striped bass predation on steelhead, and 2) to provide additional protection for steelhead impacted by poor rearing conditions in the lagoon by removing predators from the lagoon. Designated samplers will capture striped bass using hook and line gear to remove the stomach for analysis of gut contents.

Methods and Materials

Field Protocol:

1. All samplers use gear selective for striped bass.
2. All samplers will carry a copy of the NOAA Permit #15278, and any additional modifications to the permit, such as adding additional anglers prior to December 31, 2010 when this permit expires. Another permit will be required for after December 2010, but in the past the existing permit has been extended until the permit for the new year is approved.
3. All samplers are DFG employees who will carry fishing license and display the DFG logo.
4. All samplers will complete data sheets and tags for striped bass stomachs. A simple CPUE will be calculated. These data sheets are attached.
5. Striped bass stomachs will be frozen in the Monterey office. The striped bass, minus the stomach will be also be frozen. These fish will be donated to a soup kitchen type organization. Places of donation will be recorded.
6. All striped bass fish stomachs will be analyzed for gut contents in the Monterey wet lab.
7. Fishing will continue until 40-100 hours of effort is reached, or until all striped bass are removed from the lagoon.
8. Morning sampling periods start at dawn and continue until about 10:30. Evening sampling periods start around 14:00 and continue till dark.
9. Samplers will report to lead biologist, Patricia Anderson.
10. Results of Pilot Survey will be evaluated for future planning and action, with recommendations reported to Margaret Paul and Headquarters.
11. Any capture of steelhead must be reported. We have permission for non-lethal "take" or handling should a steelhead get caught. The chances are highly unlikely that a steelhead will be caught.
12. Any lethal "take" must be reported immediately and the project must stop if and adult steelhead is killed. NOAA must then be notified, by the lead biologist, regarding how to proceed with project.

Other issues to be addressed:

1. Margaret Paul will handle the media calls.
2. SAFETY – All samplers are DFG employees and are professional anglers.

3. The only property issue is informing State Parks, Ken Gray, of our activities in the lagoon.
4. Dispatch will be informed of any sampling activity taking place, 24 hours prior to fishing. Wildlife Protection is aware of the proposed activity and may need to be informed about each sampling period.
5. Additional qualified samplers will be added to the list thru NOAA.
6. The Pilot Project will be conducted with sensitivity to biological, logistical, and public issues.

The project was conducted according to the above submitted protocol. The only change in protocol was that the striped bass and/or stomach was frozen as soon as possible after capture. These samples were kept frozen until right before analysis of stomach contents.

Results

The amount of effort expended for this project is much greater than previous years. There was a total of 35 days that anglers sampled the lagoon. The January 2011 date was included in this Report as it was part of the 'fishing season' for this sampling effort. One difficulty of this sampling effort was working around multiple artificial breaches that Monterey County Public Works created by bulldozing the sandbar and the mouth of the Carmel Lagoon. Graphs of these breaches and the impact on the lagoon are available. The only good thing about the artificial breach is that maybe some of the striped bass were washed out to the sea. The striped bass are stronger swimmers than the steelhead smolt and thus had a better chance of 'holding' during the breach. Two Access tables were created from the data. One labeled 'Striped Bass 2010 Table' from the data sheets, and one labeled 'Striped Bass Metrics' from each striped bass that was analyzed. These Tables are available upon request.

Catch Per Unit Effort. Most of the angling effort was conducted by three anglers who fished the lagoon from August 3, 2010 to January 4, 2011. The total number of fish captured was 112 fish, for 143 hours of effort. Therefore, the overall catch per unit effort (CPUE) was 0.79 striped bass captured per hour. . The highest CPUE's per sampling day are arranged from highest to lowest, with only CPUE's equal to or larger than 1.0 striped bass per hour: September 22nd was 2.25, October 25th was 2.17, September 28th and October 7th was 2, August 3rd was 1.91, September 30th was 1.78, November 3rd was 1.75, October 11th was 1.33, September 10th was 1.26, January 4th 2011 was 1.14, November 16th was 1.11, and August 17th was 1.

Captured Steelhead. There were 7 steelhead captured during by anglers during this Project. The approximate lengths ranged from 508 mm. (20 in.), 406 mm. (16 in.) 355 mm. (14 in.), three steelhead at 305 mm. (12 inches), and one small one at 152 mm (6 in.). All of the steelhead were released, unharmed, back into the lagoon. Only one of the captured steelhead was a juvenile.

Striped Bass Lengths. The captured striped bass ranged in total length from 309 mm. to 920 mm. Separating the sizes into categories provides the following summary: 20 fish in

the 300mm range, 55 fish in the 400 mm range, 17 fish in the 500 mm range, 13 fish in the 600 range, 2 fish in the 800 range, and 2 fish in the 900 range.

Striped Bass Weights. The captured striped bass ranged in weight from 500 grams to 8400 grams. Separating the weights into categories provides the following summary: 2 fish in 500 g. range, 11 fish in 600 g range, 18 fish in 700 g range, 21 fish in 800 g range, 9 fish in 900 g range, 13 fish in 1000 to 1999 g range, 16 fish in 2000 to 2999 g range, and 2 fish in 8000 g range. There were two large striped bass that were not weighed that by length and by observing photos, were in the 8000 g range.

Striped Bass Stomach Contents. The stomach contents of the captured striped bass were analyzed. The contents of the stomachs were variable and keyed into broad categories. Samples of the stomach contents were preserved in ethanol and placed in wet lab cabinet for future reference, and more detailed identification. There were four major categories for stomach contents. The majority of stomachs (51) were completely empty. The next most frequent stomach contents were crustaceans (19) such as mysids, amphipods, and isopods. The third most frequent stomach contents were fish. Most of the stomachs with fish (13) were too digested to identify to species. The fish we could identify were three-spine stickleback, lamprey, and goby. Some of the unidentified fish could have been small steelhead, but the condition of the fish made identification impossible. The fourth category of stomach contents was combined and included plants, rocks, and freshwater insects such as dragonfly larvae.

Discussion

The effort by the volunteer anglers was excellent this year. Without their help, this project would not be possible. The Catch PerUnit Effort was good, with three of the anglers capturing most of the striped bass.

The comparison of lengths and weights from Carmel Lagoon striped bass to the lengths and weights developed by Striper247.com shows that the Carmel striped bass are much lighter in weight than the marine striped bass. This is most likely due to being confined in a freshwater lagoon with limited productivity, versus larger less confined feeding areas such as the Delta or ocean. There may be a more local population of striped bass to compare the relationship of length to weight, but it hasn't turned up yet. In comparing the ages from the striped bass listed on Striper247.com chart to our samples from the Carmel Lagoon, the age structure of the striped bass in the lagoon ranges from Age 2 to Age 10 years. There were three large striped bass, similar in size to the largest ones captured, that were sampled but not included in data summary because they were captured by volunteers.

Stomachs contents of the captured striped bass show another significant impact resulting from stripers inhabiting the lagoon. They are feeding on the same prey items that the steelhead feed on, which potentially reduces the carrying capacity of the lagoon. A reduced carrying capacity results in smaller smolts entering the ocean which results in

less success in returning. Steelhead research shows that the bigger the steelhead when it enters the ocean, the greater the likelihood of survival.

The other significant impact, of course, is the predation of striped bass on steelhead, especially young or smolting steelhead. Although no steelhead were identified in the stomachs of bass captured by our anglers, many of the unidentified digested fish may have been steelhead. The softer tissue of the steelhead digests much quicker compared to other fish with firmer tissue and armoring. One interesting note is the stomach contents from a volunteer angler who was fishing for striped bass during the steelhead fishing season. The volunteer angler is a friend of one of our samplers. He found a relatively fresh steelhead smolt in the stomach of the large striper he captured. A photo of this fish with steelhead in stomach is attached at the end of this Report.

The number of striped bass removed from Carmel Lagoon is significant, but it is difficult to know what percentage was extracted from the lagoon population. It is also not known whether the striped bass are reproducing somewhere in the river. Discussions with Monterey Peninsula Water Management .District staff who have been doing research and observations on the Carmel this year, have seen no indication of spawning striped bass. It makes sense that most of the captured fish were hungry and thus had empty stomachs.

The fish samples from the striped bass stomachs that we analyzed may be steelhead, but there were not enough identifying features to determine whether the digested fish was a steelhead. Samples of the stomach contents were preserved in ethanol and stored in the cabinet in the wet lab at the Monterey Fish and Game Office. Next year we will prepare equipment and conduct training to empty the striped bass stomachs in the field, using a stomach pumping technique. This may provide us with less digested stomach contents.

The striped bass in the lagoon probably entered from the ocean and either couldn't leave when they wanted to or they didn't want to leave when they could. It is known that there are many more striped bass in the lagoon. It is also known, from direct observations and from watching fish shaking their line, that there are still many very larger striped bass in the lagoon. The metabolic requirements of these fish have not been calculated. But, it is known that striped bass are very predacious, and the large striped bass are massive eating machines.

Piscivorous striped bass are a significant impact to steelhead and coastal biodiversity. If growth in the lagoon is impacted by striped bass competing for the same food resources as juvenile and smolting steelhead, and if striped bass prey upon juvenile steelhead, future recruitment is affected. The striped bass population needs to be controlled. Elimination of striped bass from Carmel Lagoon and other central coast lagoons, such as the Pajaro and Salinas is desirable but would likely be unsuccessful. Control efforts need to continue and be augmented. Two of the more aggressive methods of control are gill-netting and underwater spear-fishing. Other more aggressive methods of removing the striped bass from the lagoon need to be explored and employed in addition to the angling effort. Last year, NOAA declined our request to gillnet striped bass out of the lagoon,

and we would like to re-open that discussion with a suggested steelhead-protective gill netting methodology It makes more sense to allow more aggressive methods of removal when one considers the potential steelhead impacts of piscivorous fish in the lagoon.

Attachment: photo of striped bass from Carmel Lagoon with steelhead smolt in stomach.