

Salton Sea Fisheries Long-term Monitoring

Draft Quarterly Report: Spring 2004

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Introduction:

The California Department of Fish and Game (CDFG) is monitoring the status and trends of the Salton Sea fisheries. This will require a compilation of sampling results over several years. In the spring of 2003, Department personnel started quarterly sampling at fourteen stations around the sea, as the basis of a long term monitoring program. To allow comparison of current and future monitoring efforts by CDFG to past results, the following protocol was adapted from those previously used by researchers at the Salton Sea.

Each quarter, if conditions allow, this protocol will produce about 816 net-hours of sampling. After each quarter's sampling is completed this draft report will be prepared, summarizing the numbers and species of fish netted, and calculating the overall and species-based catch-per-unit-effort (CPUE). This report will also offer qualitative comments on the condition and breeding status of each species. After annual repetitions of seasonal sampling, enough data will be collected to allow statistical tests for significant differences in numbers, seasonality, and site use, by and among the four species of fish.

Methods:

The sampling sites comprise three broad habitat types: pelagic (3 sites), near-shore (8 sites), and estuarine (3 sites). The pelagic sites are in the approximate middles of the north basin, south basin and inter-basin areas of the Sea. The near-shore sites are spaced widely apart, four each, near the west and east shores, to capture as much breadth of habitat as possible. The estuarine sites are in the body of the Sea, close enough to the mouths of the New, Alamo, and Whitewater Rivers, to be under the influence of their outflows. See Table 1. for the exact locations of all sites.

Sampling takes place during each of the putative seasons, as follows: spring- April and May; summer- July and August; fall- October and November; winter- January and February. We will attempt to compress the total sampling period into as few days as possible, to the extent that the weather, equipment maintenance, and personnel scheduling constraints allow. Nets are typically set at one or two sites in the morning, and hauled in after approximately 24 hours. The exact number of hours set is recorded for each net, to the nearest quarter-hour.

Fish are sampled by deploying multi-panel monofilament gill nets with 6 X 30 foot panels of 0.5, 1, 2, 3, and 4 inch mesh. Two nets are set at all sites at the water's surface. The nets are set far enough apart to allow room for maneuvering a boat during setting and retrieval, usually 100-200 meters. The nets at near-shore and estuarine sites are set in 2.5 to 4.5 meters of water, typically 200-300 meters from the shore.

Two additional nets are set at the bottom of water column at the three pelagic sites. The conditions fish experience at the bottom in deep water is different enough from the surface water,

in dissolved oxygen, light, food availability and temperature, that this can be considered a discrete habitat, and thus we sample it as though it were a separate site.

At the time of each set and retrieval, water depth, water temperature, conductivity, salinity, and dissolved oxygen are measured and recorded.

When nets are pulled in the following day, all fish are removed and immediately stored on ice. Data are collected from these fish as soon as possible, almost always the same day they are hauled in.

All fish are identified to species level and counted. For the four sport fish in the Salton Sea, (tilapia, Gulf croaker, orangemouth corvina and sargo) weights, lengths (fork length), sex, physical condition, and reproductive status are recorded. Fish above five pounds are weighed to the nearest ounce. Fish below five pounds are weighed to the nearest half ounce. Lengths of fish under 50 centimeters are recorded to the nearest millimeter. Lengths of fish over 50 centimeters are recorded to the nearest centimeter. The sex of all adult fish is determined by dissection. A sample of at least ten fish of each species is also dissected to determine physical condition and breeding status.

Changes to Protocol for Year Two:

Our protocol is designed to elucidate long-term trends in the fisheries. Until very recently, deep water habitats have provided some low level of productivity for the fisheries, and were important habitat components to sample. Since we began sampling, however, our three deep water sites have been completely unproductive, a costly element of our efforts, and the least probable site for fish use, given the severe reduction in population size which we have discovered.

We have therefore temporarily eliminated sampling at the three deep water sites, which reduces our efforts by 288 net-hours, to a quarterly total effort of 528 net-hours. We leave these sites in the protocol, since they will likely provide useful information about population trends and habitat use, should the fisheries rebound to levels which allow robust comparisons among these and the other sampling sites.

All comparisons of CPUE that we make going forward will be among quarterly data sets that exclude previously sampled deep-water sites from the calculations. The CPUE values for our first year will then be higher overall, but the comparison between years will be valid. Our data are not designed to determine absolute numbers, but to show trends.

Results:

The Spring 2004 sampling session took place from April 5 to 27. Omitting the deep water sites, we sampled a total of 510 net-hours at 11 sites. Table 2. shows the totals of fishes sampled at each site. Total numbers of fishes sampled, with CPUE in parentheses, were: 18 tilapia (.04), 0 Gulf croaker (.00), 0 orangemouth corvina (.00), 0 sargo (.00). A single threadfin shad was also netted. The overall CPUE (.04) was the same as for tilapia, since they comprised virtually the entire sample for the period.

Two size classes of tilapia were apparent. We netted 4 fish that were 67 to 70 mm ($x = 68.8$), and 14 that were 135 to 173 mm ($x = 150.6$).

The four smaller tilapia were about the same size as our first catches of last year's hatch, caught during July/August. Fish smaller than this will probably not be sampled efficiently by our methods, due to the mesh sizes of our nets, and a preference for shallow water by newly hatched tilapia fry.

The 14 larger tilapia were all of a size consistent with that of last year's cohorts. These were sexually mature fish, and the females exhibited ovarian condition ranging from granular appearance to containing 2 mm ova.

Discussion:

Chart 1. shows a comparison of CPUEs from this and last year's sampling sessions. The columns labeled 2002 are from an initial sampling period undertaken from June 10, 2002 through March 13, 2003. These data should be roughly comparable to later efforts, although they are not an exact replication of the sites included in our current protocol.

No Gulf croaker, orangemouth corvina, or sargo were sampled this period, and it's been a year since we last found these species. Their continuing absence in our samples is increasingly disturbing, and we will soon initiate focused surveys for these species, outside of our regular sampling protocol.

There are two trends which can be inferred from this quarter's data, although they are weakly supported since total numbers are so low. The first is the existence of a breeding class of tilapia, which was not detected in last Spring's survey. These are the fish which overwintered from the cohort we first saw in the Summer of 2003.

The second trend is the appearance of offspring from this cohort, three months earlier than their parents appeared last year. Several factors may explain this. First, low levels of detection or non-detection of these small size fish may be a probabilistic effect. That is, only a certain percentage of fish this size will be netted, and if their numbers are very low, they will likely escape detection altogether. Fish of this size are only caught by the smallest size mesh panel of our 5-panel nets, which means our nets are only 20% effective for sampling them. Thus our effective CPUE for this size fish is probably five times what we calculate.

Another consideration is the timing of reproduction. Tilapia breed throughout much of the warmer part of the year, in response to unknown environmental cues. This season's small fish may be the product of an earlier bout of reproduction than last year's. Therefore, we might be seeing this size class in the Spring because they are present sooner this year, rather than because they are present in greater numbers.

Although the number of fish we caught are too few to make strong inferences about the current population trend for tilapia, they do offer the first tentative support for expectations of a population upswing this year. As further anecdotal support, as of this date (early May, 2004), the first evidence of small fish mortality events has been noticed on the Sea. The absence of any fish mortality over the last several months has supported our contention that populations have been severely reduced. The return of fish kills, although not pleasant phenomena, may signal the beginning of a rebound from this severe reduction.

Table 1. Locations of Sampling Sites

| SITE NAME | HABITAT TYPE | UTM COORDINATES |
|---------------------|---------------------|------------------------|
| Whitewater River | Estuarine | 11S 0587948 |
| | | 3707343 |
| New River | Estuarine | 11S 0621567 |
| | | 3666958 |
| Alamo River | Estuarine | 11S 0628480 |
| | | 3675635 |
| North Shore | Near-shore | 11S 0598465 |
| | | 3709237 |
| North Wister | Near-shore | 11S 0628368 |
| | | 3685497 |
| Bat Caves | Near-shore | 11S 0607427 |
| | | 3699864 |
| South Salton City | Near-shore | 11S 0604971 |
| | | 3682198 |
| North Desert Shores | Near-shore | 11S 0589366 |
| | | 3699424 |
| The Dome | Near-shore | 11S 0596997 |
| | | 3690022 |
| The Cliffs | Near-shore | 11S 0615062 |
| | | 3691509 |
| Test Base | Near-shore | 11S 008813 |
| | | 3672196 |
| North Basin | Pelagic | 11S 0596156 |
| | | 3701218 |
| Inter-basin | Pelagic | 11S 0606837 |
| | | 3689452 |
| South Basin | Pelagic | 11S 0618275 |
| | | 3678697 |

Table 2. Results from Spring 2004 sampling period

| Date | Site | Net-hours | Tilapia | Croaker | Corvina | Sargo | Other | Total Fish | CPUE |
|---------------|---------------------|------------------|----------------|----------------|----------------|--------------|--------------|-------------------|--------------|
| 4/5/2004 | White Water River | 47 | 2 | 0 | 0 | 0 | 0 | 2 | 0.04 |
| 4/5/2004 | North Shore | 47 | 1 | 0 | 0 | 0 | 0 | 1 | 0.02 |
| 4/5/2004 | North Desert Shores | 47 | 2 | 0 | 0 | 0 | 0 | 2 | 0.04 |
| 4/8/2004 | Alamo River | 48 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| 4/8/2004 | North Wister | 47 | 5 | 0 | 0 | 0 | 1 | 6 | 0.13 |
| 4/12/2004 | New River | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| 4/12/2004 | Test Base | 48 | 6 | 0 | 0 | 0 | 0 | 6 | 0.13 |
| 4/14/2004 | The Dome | 46 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| 4/14/2004 | South Salton City | 45 | 2 | 0 | 0 | 0 | 0 | 2 | 0.04 |
| 4/26/2004 | The Cliffs | 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| 4/26/2004 | Bat Caves | 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Totals | | 510 | 18 | 0 | 0 | 0 | 1 | 19 | 0.037 |

Chart 1.

Comparison of CPUEs

