Salton Sea Fisheries Long-term Monitoring

Draft Quarterly Report: Fall 2004

Salton Sea Program
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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 future comparisons of CPUE that we make 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 Fall 2004 sampling session took place from October 13 through December 1. We sampled a total of 614 net-hours at 11 sites.

Table 2. shows the numbers of fishes sampled at each site. Total numbers of fish sampled, with CPUE in parentheses, were: 630 tilapia (1.026). No other fish were caught.

As with the Summer sampling results, three size classes of tilapia were apparent. We netted 4 fish (<1%) in the largest size group, from 265 to 290 mm. Most tilapia (615 or 98%) were in a middle size class composed of fish from 120 to 197 mm long. The smallest size class was from 64 to 79 mm and comprised 2% of our catch (11 fish).

Consistent with tilapia sampled during the last year, these fish were in very good to excellent condition, and apparently not food-limited. The individuals in the middle and large size classes were sexually mature. Many of the larger males were strongly colored. All females examined had mature ovaries, and many were clearly in a post-reproductive state.

Discussion:

There was a marked change in the weather immediately after our first sampling run on October 13, resulting in a 6° C drop in water temperature (Table 3). After seeing how far the number of fish sampled on October 13 was out of the range of results at subsequent sites, we felt this drop in water temperatures justified resampling the two October 13 sites. The results were added to the total to compute a CPUE.

We originally selected the months of October and November to enclose a putative "Fall" season, following the convention of Costa-Pierce and Riedel's study at the Salton Sea in 1999-2000. This approach assumes a biologically significant change in water temperatures between sampling seasons. We have become more hesitant about assuming that the "seasons" at the Salton Sea fall within their assigned calendar months, and are so clearly discrete. As we saw during this Fall sampling period, water temperature changes **within** a sampling period may be as great or greater than those between sampling periods.

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.

In our Spring report, we called attention to the early signs of a rebound in the tilapia population, which was borne out by a Summer 2004 CPUE for tilapia about 3.6 times that of the Summer 2003 sampling period. The results from our Fall sampling indicate that levels remain elevated, since the Fall CPUE is about 4.7 times that of last Fall. Such elevated levels, coupled with an unusually wet winter to date, portend a relatively robust tilapia fishery in 2005, barring large fish kills from any exceptionally cold winter weather.

No Gulf croaker, orangemouth corvina, or sargo were sampled this period. This is the sixth consecutive sampling period in which these marine species have been absent from our nets.

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.

Date	Site	Net-hours	Tilapia	Croaker	Corvina	Sargo	Other	Total Fish	CPUE
10/13/2004	Alamo River	47	209	0	0	0	0	209	4.45
10/13/2004	North Wister	47	271	0	0	0	0	271	5.77
11/2/2004	The Cliffs	48	41	0	0	0	0	41	0.86
11/2/2004	Bat Caves	48	29	0	0	0	0	29	0.61
11/4/2004	White Water River	48	0	0	0	0	0	0	0.00
11/4/2004	North Shore	48	31	0	0	0	0	31	0.65
11/9/2004	North Desert Shores	47	2	0	0	0	0	2	0.04
11/9/2004	The Dome	47	13	0	0	0	0	13	0.28
11/16/2004	New River	48	2	0	0	0	0	2	0.04
11/18/2004	South Salton City	48	5	0	0	0	0	5	0.11
11/18/2004	Test Base	48	25	0	0	0	0	25	0.53
11/30/2004	Alamo River	47	2	0	0	0	0	2	0.04
11/30/2004	North Wister	46	0	0	0	0	0	0	0.00
Totals		**614**	**630**	**0**	**0**	**0**	**0**	**630**	**1.026**

Table 3.

DATE	SET TEMP.	PULL TEMP.	AVE.	FISH
13-Oct	25.3	25.0	25.2	271
13-Oct	26.2	25.3	25.8	209
2-Nov	20.2	20.5	20.4	41
2-Nov	19.5	19.6	19.6	29
4-Nov	18.0	17.2	17.6	0
4-Nov	20.5	19.6	20.1	31
9-Nov	19.9	19.6	19.8	2
9-Nov	20.0	19.7	19.9	13
16-Nov	19.1	19.4	19.3	2
16-Nov	18.7	NA	18.7	5
16-Nov	19.7	NA	19.7	2
30-Nov	14.0	13.9	14.0	0
30-Nov	13.7	14.1	13.9	2

Ave. temp. 25.5°

6.1° change

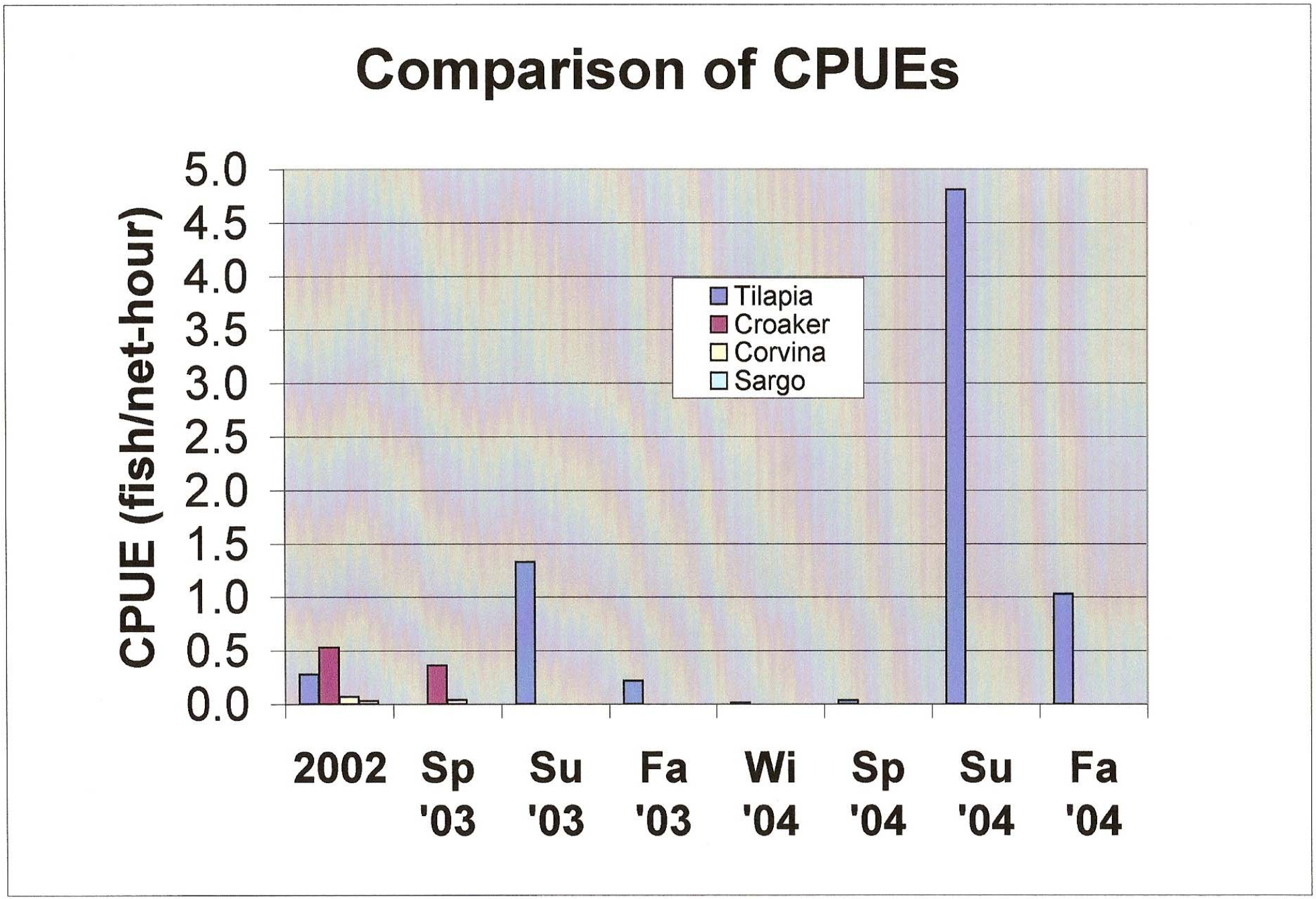
Ave. temp. 19.4°

5.5° change

Ave. temp. 14.0°

Temperatures are in degrees Celsius

Chart 1.


Comparison of CPUEs
CPUE (fish/net-hour)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Tilapia
Croaker
Corvina
Sargo
2002
Sp '03
Su '03
Fa '03
Wi '04
Sp '04
Su '04
Fa '04