

# Salton Sea Fisheries Long-term Monitoring

## Draft Quarterly Report: Fall 2003

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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.

### **Results:**

The Fall 2003 sampling session took place from October 1 to October 29. Table 2. shows the totals of fishes sampled at each site. Total numbers of fishes sampled, with CPUE in parentheses, were: 110 tilapia (.14), 0 Gulf croaker (.00), 0 orangemouth corvina (.00), 0 sargo (.00). The overall CPUE (.14) was the same as for tilapia, since they comprised virtually the entire sample for the period: 110 of 111 fish. One threadfin shad was also netted.

The two discrete size classes of tilapia from our Summer sampling period were still evident: fish which were young from this year's reproduction (8 fish, from 62 to 74 mm), and a larger class which we believe to be from last year's reproductive efforts (108 fish, from 130-182 mm).

Tilapia were generally in very good condition. Stomach contents frequently could not be examined due to autolysis, but barnacle nauplii were common items when examination was possible. We rarely saw corixid beetles in tilapia stomachs, in spite of their remarkable abundance in the areas where we sampled.

Most of the tilapia in the larger size class were in advanced stages of breeding coloration. Some females had ova larger than the largest seen last season (1.5-2.0 mm), but none showed evidence of post-breeding condition yet. The testes of all males, although some were well developed, were not yet at the same stage of development seen in males collected from nests in the agricultural drains at the same time we sampled the Sea.

The putative tapeworms identified in the last report were examined by Dr. Victoria Matey of SDSU, and found to be worm-like fat bodies, not parasites. In spite of this somewhat embarrassing misidentification, we remain vigilant for the detection of tapeworms in the Salton Sea fishes. Asian fish tapeworms (*Bothriocephalus acheilognathi*) have been collected from fish in drains at the southwest edge of the Sea. We don't yet know the extent of their distribution or which other fish species may susceptible to infection. We are currently collecting fish from habitats around the Sea for examination by Dr. Matey.

## **Discussion:**

Chart 1. shows a comparison of CPUEs from this and the previous sampling sessions. Our Fall CPUE is an 84% reduction from our Summer results.

No Gulf croaker or orangemouth corvina were sampled this period. The recent lack of angler success with these species, and the absence of fish kills containing them, support our results. Although some undersampling bias could be an artifact of our collection protocol, it is hard to argue against the idea that their populations have been decimated. We have not caught an individual of either species since mid-May, in spite of our sampling for a total of 1,746 net-hours since then.

The last corvina we sampled were in very poor condition, and it was obvious that the lack of prey-sized fish would be instrumental in retarding the population's recovery. It is reasonable (and theoretically sound) that there will be a lag time of several years before we observe higher corvina population levels in response to increased tilapia reproduction.

The case of the Gulf croaker is more perplexing. The individuals we assessed in the spring were fat, healthy, and at peak reproductive readiness. Yet, since that time, we have seen nothing of these fish, or their expected offspring.

A brief comment on the sargo population is also appropriate. It is difficult to make a case for their population being sustainable. We have netted six sargo during all our sampling efforts at the Salton Sea. The last time we caught one was September, 2002.

The pattern of tilapia distribution among our habitat types was similar to what we described in our last report, although absolute numbers were much reduced. Combined CPUEs for the three habitats types were: near shore .27 (101 fish / 373 net-hours), estuarine .07 (9 fish / 139 net-hours), and pelagic .00 (0 fish / 285 net-hours). Comparing east side and west side near-shore habitats shows the same trend (higher numbers on the west side) as in our last report, although the difference is not large. The CPUE for the four east side sites was .23 (43 fish / 188 net-hours), and for the four west side sites it was .31 (58 fish / 185 net-hours).

In our previous two reports, we called attention to the exclusion of fish from habitats with low oxygen levels, and speculated that some fish-limiting threshold of dissolved oxygen might be determined. We added this quarter's data to the previous two seasons' data, presented in Table 3. These data did not help resolve the relationship between oxygen and sampling success. (See Chart 2.) As with the previous data, some fishless sites were very well oxygenated, and some poorly oxygenated sites had good numbers of fish. Nevertheless, we will continue to update this analysis with each season's data, unless and until it becomes clear that oxygen levels have no predictive value for the presence of fish.

**Table 1. Locations of Sampling Sites**

<b>SITE NAME</b>	<b>HABITAT TYPE</b>	<b>UTM COORDINATES</b>
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 fall 2003 sampling period

Date	Site	Net-hours	Tilapia	Croaker	Corvina	Sargo	Other	Total Fish	CPUE
10/1/2003	North Wister	46	2	0	0	0	0	2	0.04
10/1/2003	Alamo River	46	4	0	0	0	1	5	0.11
10/6/2003	North Shore	46	14	0	0	0	0	14	0.30
10/6/2003	White Water River	46	1	0	0	0	0	1	0.02
10/8/2003	South Basin, Bottom	47	0	0	0	0	0	0	0.00
10/8/2003	South Basin, Surface	46	0	0	0	0	0	0	0.00
10/8/2003	New River	47	4	0	0	0	0	4	0.08
10/14/2003	The Cliffs	48	19	0	0	0	0	19	0.40
10/14/2003	Interbasin, Bottom	47	0	0	0	0	0	0	0.00
10/14/2003	Interbasin, Surface	49	0	0	0	0	0	0	0.00
10/16/2003	Bat Caves	48	8	0	0	0	0	8	0.17
10/16/2003	North Basin, Bottom	48	0	0	0	0	0	0	0.00
10/16/2003	North Basin, Surface	48	0	0	0	0	0	0	0.00
10/21/2003	North Desert Shores	46	0	0	0	0	0	0	0.00
10/21/2003	The Dome	46	17	0	0	0	0	17	0.37
10/28/2003	South Salton City	48	5	0	0	0	0	5	0.10
10/28/2003	Test Base	45	36	0	0	0	0	36	0.81
<b>TOTALS</b>		<b>794</b>	<b>110</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>111</b>	<b>0.14</b>

Table 3. CPUE and dissolved oxygen (mg/L)

Date	Site	Net-hours	Total Fish	CPUE	DO In	DO Out	Ave. DO
4/7/2003	Alamo River	46	12	0.26	9.7	NA	9.70
4/9/2003	North Shore	49	27	0.55	3.8	3.9	3.85
4/9/2003	Whitewater River	48	15	0.31	7.6	10.5	9.05
4/24/2003	New River	48	11	0.23	7.1	9.0	8.05
4/24/2003	North Wister	49	86	1.76	9.1	9.8	9.45
5/12/2003	North Desert Shores	47	22	0.47	9.4	7.4	8.40
5/12/2003	The Dome	47	28	0.60	10.6	11.9	11.25
5/28/2003	Bat Caves	46	0	0.00	1.4	NA	1.40
6/3/2003	South Salton City	46	0	0.00	0.4	0.7	0.56
6/3/2003	Test Base	46	0	0.00	0.6	0.6	0.61
6/12/2003	The Cliffs	24	0	0.00	0.8	0.7	0.74
7/15/2003	North Basin, Bottom	46	0	0.00	0.7	3.9	2.30
7/15/2003	North Basin, Surface	46	0	0.00	10.8	5.8	8.30
7/17/2003	New River	45	8	0.18	0.8	0.5	0.65
7/21/2003	North Shore	47	99	2.12	1.4	3.5	2.45
7/21/2003	Whitewater River	47	2	0.04	3.1	0.6	1.85
7/23/2003	Bat Caves	47	114	2.43	1.3	NA	1.34
7/23/2003	The Cliffs	48	3	0.06	3.0	NA	3.03
7/31/2003	Alamo River	48	18	0.38	7.2	4.8	6.00
7/31/2003	North Wister	47	22	0.47	7.4	7.6	7.50
8/6/2003	North Desert Shores	47	117	2.48	1.7	2.0	1.85
8/6/2003	The Dome	43	97	2.27	5.0	1.3	3.13
8/11/2003	South Basin, Bottom	44	0	0.00	0.4	0.5	0.45
8/11/2003	South Basin, Surface	44	0	0.00	3.6	2.2	2.88
8/13/2003	Inter-Basin, Bottom	47	0	0.00	0.5	NA	0.46
8/13/2003	Inter-Basin, Surface	48	0	0.00	2.9	NA	2.86
8/18/2003	South Salton City	48	125	2.60	5.0	NA	5.00
8/18/2003	Test Base	48	83	1.73	8.3	NA	8.28
10/1/2003	Alamo River	46	4	0.11	4.5	6.9	5.70
10/1/2003	North Wister	46	2	0.04	13.5	7.9	10.70
10/6/2003	North Shore	46	14	0.30	8.3	6.2	7.25
10/6/2003	Whitewater River	46	1	0.02	4.4	5.5	4.95
10/8/2003	New River	47	4	0.08	9.8	4.9	7.35
10/8/2003	South Basin, Bottom	0	0	0.00	0.7	0.7	0.70
10/8/2003	South Basin, Surface	46	0	0.00	7.2	9.0	8.10
10/14/2003	Inter-Basin, Bottom	47	0	0.00	0.6	3.0	1.80
10/14/2003	Inter-Basin, Surface	49	0	0.00	3.9	3.7	3.80
10/14/2003	The Cliffs	48	19	0.40	9.1	12.7	10.90
10/16/2003	Bat Caves	48	8	0.17	4.3	3.3	3.80
10/16/2003	North Basin, Bottom	48	0	0.00	0.9	NA	0.90
10/16/2003	North Basin, Surface	48	0	0.00	4.3	NA	4.30

Table 3. CPUE and dissolved oxygen (mg/L)

10/21/2003	North Desert Shores	46	0	0.00	0.5	0.5	0.50
10/21/2003	The Dome	46	17	0.37	0.9	1.7	1.30
10/28/2003	South Salton City	48	5	0.10	5.0	3.8	4.40
10/28/2003	Test Base	45	36	0.81	1.6	3.2	2.40

Chart 1.

## Comparison of CPUEs

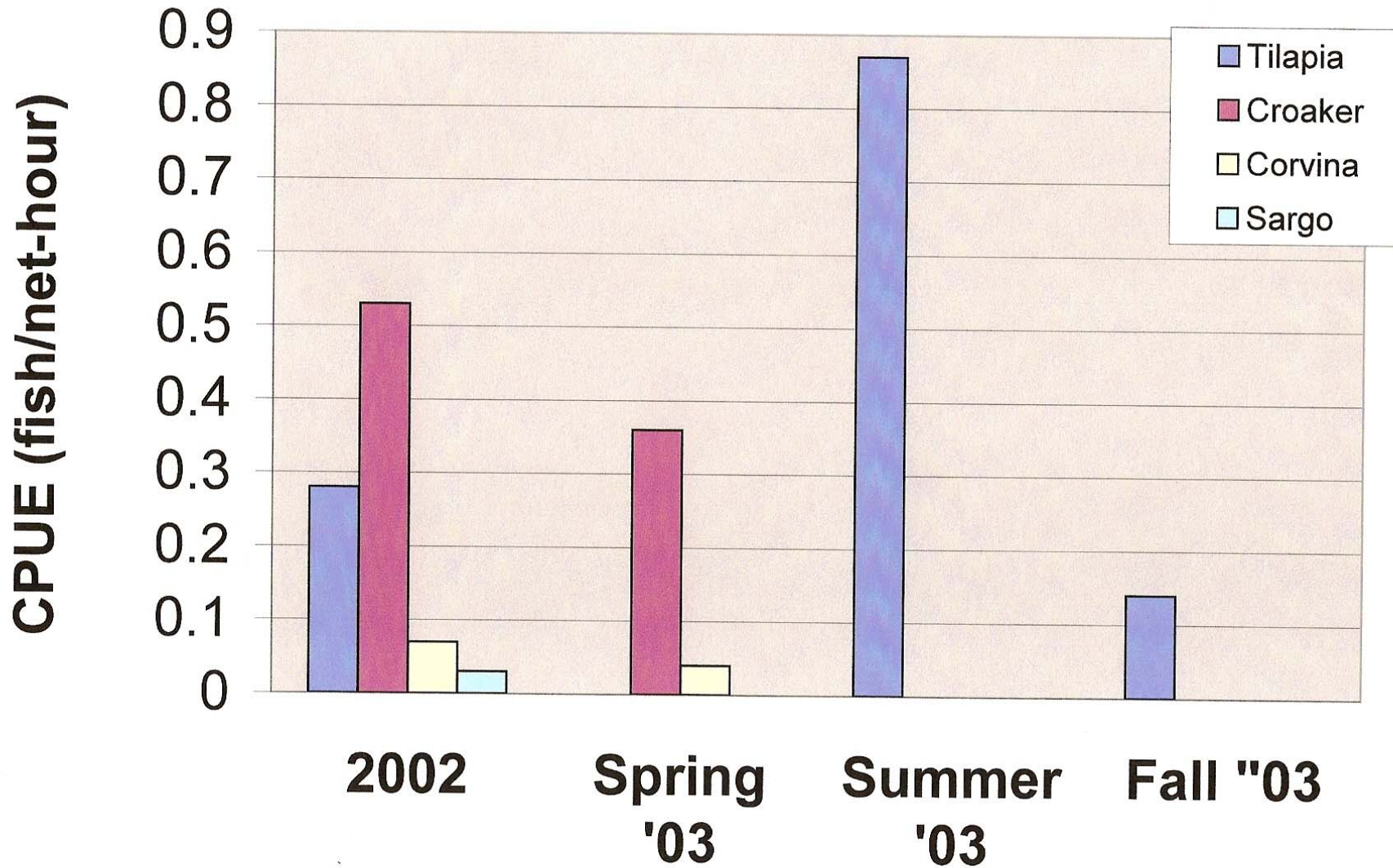




Chart 2.

### CPUE as a function of DO

