

**Striped Bass Egg and Larval Monitoring  
Near the Proposed  
Montezuma Slough Control Structure,  
1987**

**Paul F. Raquel  
Department of Fish and Game**

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# ABSTRACT

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Striped bass egg and larval monitoring was conducted in Montezuma Slough near the proposed salinity control structure site during spring 1987. Densities of striped bass larvae downstream of the structure site were higher than those upstream. Highest densities at the downstream site were for the 11-14 mm group and at the upstream site were for the 3-6 mm group.

The striped bass egg and larvae abundance index for the downstream site ( $244 \times 10^4$ ) was 57 percent higher than for the upstream site ( $139 \times 10^4$ ). The calculated Montezuma Slough abundance index for 1987 ( $1354 \times 10^4$ ) was the lowest measured since 1984.



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# INTRODUCTION

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The California Department of Water Resources plans to place a salinity control structure in the eastern end of Montezuma Slough as part of the Suisun Marsh Plan of Protection. The purpose of the structure is to improve water quality in Montezuma Slough during periods of low to moderate Delta outflow.

There is concern that the structure will create problems for larval and juvenile striped bass that use Montezuma Slough as a migration route or rearing area.

To determine baseline conditions from which effects of the salinity control structure could be assessed, a striped bass egg and larval survey was conducted during April through June 1987 to measure abundance of eggs and larvae upstream and downstream of the site of the proposed structure. This survey was undertaken at DWR's request in partial fulfillment of the U.S. Army Corps of Engineers permit for the Montezuma Slough Control Structure.

## MATERIALS AND METHODS

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Sampling was conducted with an egg and larva net from April 15 to June 16, 1987, at three locations in the eastern end of Montezuma Slough (Figure 1). Two of the sampling locations are used by the California Department of Fish and Game during its regular striped bass egg and larval surveys. A third station (MZ2) was added to allow a better abundance estimate immediately downstream of the proposed control structure. Sampling locations were:

<u>Station</u>	<u>STORET RKI Designation</u>	<u>Location</u>
67	SLMZU22	Montezuma Slough, 22 km upstream from its mouth
68	SLMZU30	Montezuma Slough, 30 km upstream from its mouth
MZ2	SLMZU27	Montezuma Slough, 27 km upstream from its mouth

Samples were taken once a week from April 15 to June 16, 1987. Samples were taken by making a single 10-minute oblique tow at each station with an egg and larva net mounted on a ski frame. A digital flowmeter was used to measure water flow through the net so volume of water sampled (in cubic meters) could be computed. Raquel (1987) presents a detailed account of materials, methods, and laboratory procedures.

Surface water temperature, water transparency (secchi disc), and surface electrical conductivity were measured at each sampling site.

Data were divided into size groups: eggs and 3-6 mm, 7-10 mm, 11-14 mm, 15-18 mm, and 19-20 mm larvae. Densities per cubic meter for each group were calculated for each weekly sample for all stations. For weeks when no samples were taken, the previous and subsequent densities taken were averaged.

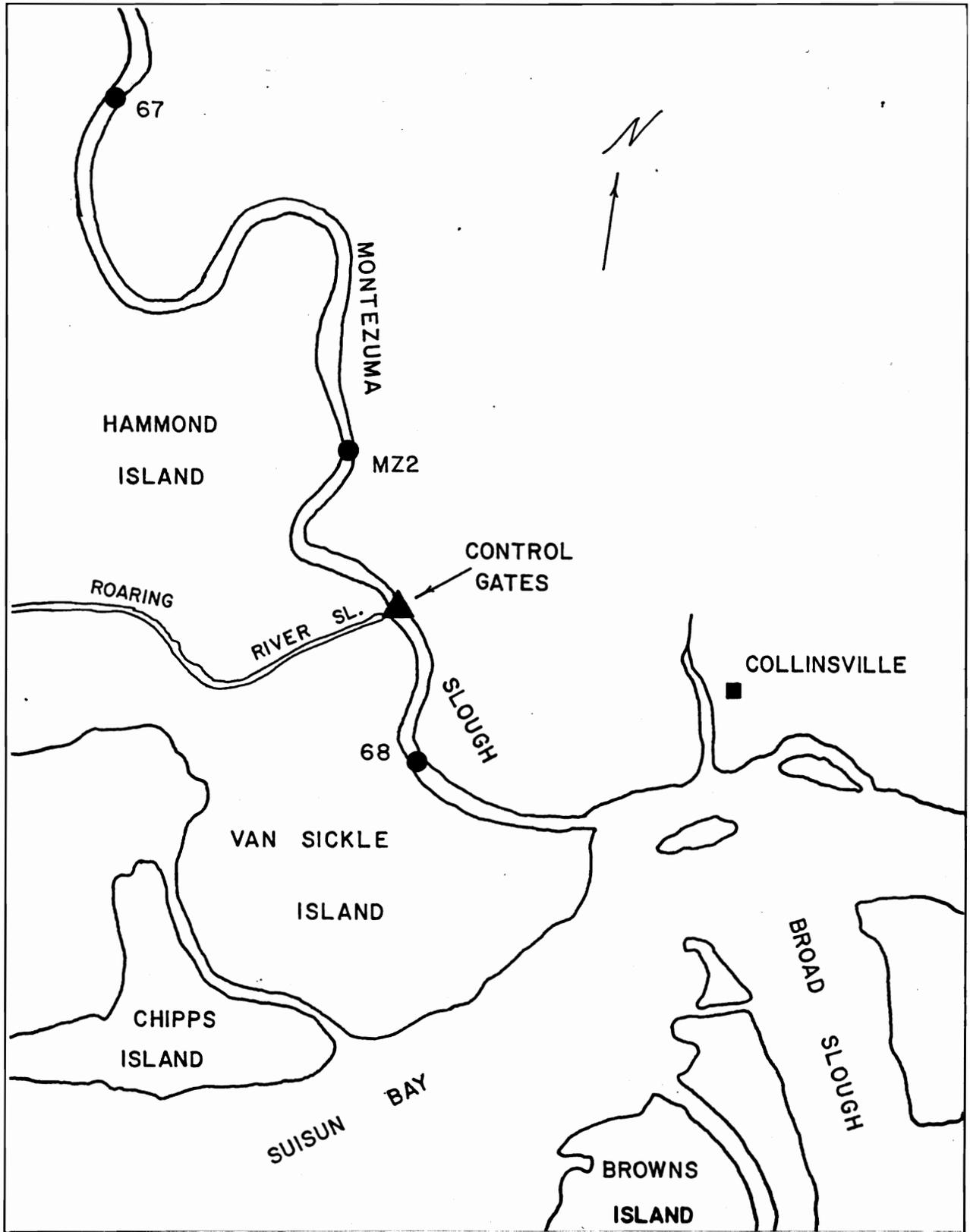


Figure 1  
 STRIPED BASS EGG AND LARVAL SAMPLING STATIONS NEAR THE  
 PROPOSED MONTEZUMA SLOUGH CONTROL STRUCTURE, 1987

Abundance indices for each group, by week, were calculated for Stations 67 and 68 by multiplying the volume of water sampled by the density of each size group. Volumes of water were  $233 \times 10^4 \text{m}^3$  for Station 67 and  $151 \times 10^4 \text{m}^3$  for Station 68 (*L. Miller, DFG, pers comm*). An abundance index could not be calculated for Station MZ2, because the volume of water represented by this station has not been calculated.

To calculate abundance indices comparable to previous DFG studies, abundance indices for Stations 67 and 68 were adjusted to account for the different sampling schedules (i.e., once a week in this study and every other day in the regular egg and larval study). This was achieved by dividing the total number of days during the sampling period by 2 to give the number of days that would have been sampled on an every-other-day basis. This quotient was then divided by the number of days actually sampled. The resulting adjustment factor was multiplied by the weekly number of eggs or larvae in each size group. These adjusted abundances were totaled to estimate an every-other-day abundance index.

## RESULTS

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No striped bass eggs were found in the weekly samples during April 15 through June 16, 1987, except for the first week at Station 68, which had a density of 0.7655 eggs per cubic meter. Table 1 shows densities for each size at each station for each weekly sampling period.

Total abundance indices, based on weekly sampling were estimated to be  $244 \times 10^4$  at Station 67 and  $139 \times 10^4$  at Station 68 (Table 2). The 11-14 mm group at Station 67 was the most abundant group ( $145 \times 10^4$ ) during the survey; the peak was during the fifth week of sampling.

To obtain abundance indices for an every-other-day sampling schedule, the weekly abundance indices were multiplied by an adjustment factor of 3.56 for Station 67 and 3.5 for Station 68. Adjusted abundance indices were  $868 \times 10^4$  for Station 67 and  $486 \times 10^4$  for Station 68. The sum of these two indices gave a Montezuma Slough index of  $1354 \times 10^4$ .

Table 3 shows environmental parameters for the three stations during the survey. The electrical conductivity meter was calibrated at the end of the survey and found to be out of calibration, especially at the higher ranges of conductivity. However, the low electrical conductivity readings measured should be reasonably accurate.

Table 1  
**STRIPED BASS EGG AND LARVAL AVERAGE DENSITY NEAR THE PROPOSED  
 MONTEZUMA SLOUGH CONTROL STRUCTURE,  
 APRIL 15 THROUGH JUNE 16, 1987**  
*(Fish per Cubic Meter)*

Weekly Period	Size Groups					
	Eggs	3-6 mm	7-10 mm	11-14 mm	15-18 mm	19-20 mm
<u>Station 67 (Downstream of Control Structure and MZ2)</u>						
1	0	0	0	0	0	0
2	0	0	0	0	0	0
5	0	0	0.01202	0.24451	0.09620	0.01202
7	0	0	0	0.00393	0.03925	0.02355
8	0	0	0.00327	0.00327	0.01308	0.01308
9	0	0	0.00355	0	0	0
<u>Station MZ2 (Downstream of Control Structure)</u>						
1	0	0.15643	0	0	0	0
2	0	0.03208	0	0	0	0
5	0	0.01148	0.00765	0.01913	0.00383	0
7	0	0	0	0	0.01574	0.01574
8	0	0	0.00329	0	0.00659	0.00329
9	0	0	0	0.01459	0	0.00365
<u>Station 68 (Upstream of Control Structure)</u>						
1	0.07655	0.33537	0.00365	0	0	0
2	0	0.10763	0.00414	0	0	0
5	0	0	0.00817	0.00817	0.02451	0
7	0	0	0.00345	0.01724	0.02414	0.01724
8	0	0	0.00620	0.00310	0.00310	0.00310
9	0	0	0.01450	0.04712	0.00362	0.00362
10	0	0	0	0	0	0

## DISCUSSION

A monitoring survey was conducted in spring 1987 to determine the abundance of striped bass eggs and larvae near the proposed salinity control structure in Montezuma Slough. Absence of striped bass eggs except for one sampling run at the most upstream station and absence of 3-6 mm striped bass at the downstream station suggest that spawning occurs well upstream of the mouth of Montezuma Slough. Therefore, the control structure would have minimal effect on striped bass eggs and 3-6 mm larvae.

Table 2  
**STRIPED BASS EGG AND LARVAL ABUNDANCE INDEX NEAR THE  
 PROPOSED MONTEZUMA SLOUGH CONTROL STRUCTURE,  
 APRIL 15 THROUGH JUNE 16, 1987**

Weekly Period	Size Groups					
	Eggs	3-6 mm	7-10 mm	11-14 mm	15-18 mm	19-20 mm
<u>Station 67 (Downstream of Control Structure and MZ2)</u>						
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3*	0	0	14,009	284,851	112,073	14,009
4*	0	0	14,009	284,851	112,073	14,009
5	0	0	28,018	569,703	224,145	28,018
6*	0	0	14,009	289,424	157,800	41,446
7	0	0	0	9,145	91,455	54,873
8	0	0	7,620	7,620	30,480	30,480
9	0	0	8,262	0	0	0
Total	0	0	85,927	1,445,595	728,026	182,835
Grand Total						2,442,384
Total**	0	0	300,746	5,059,583	2,548,091	639,923
Grand Total**						8,548,342
<u>Station 68 (Upstream of Control Structure)</u>						
1	115,594	506,412	5,504	0	0	0
2	0	162,519	6,251	0	0	0
3*	0	81,259	9,295	6,169	18,508	0
4*	0	81,259	9,295	6,169	18,508	0
5	0	0	12,338	12,338	37,015	0
6*	0	0	8,773	19,189	36,736	13,020
7	0	0	5,208	26,040	36,456	26,040
8	0	0	9,364	4,682	4,682	4,682
9	0	0	21,895	71,158	5,474	5,474
10	0	0	0	0	0	0
Total	115,594	831,450	87,923	145,746	157,378	49,216
Grand Total						1,387,306
Total**	404,579	2,910,074	307,730	510,111	550,822	172,255
Grand Total**						4,855,572

\* Abundance index estimated using estimated densities calculated in Table 1.  
 \*\* Abundance index adjusted to reflect an every-other-day sampling schedule.

The abundance index for Montezuma Slough, based on Stations 67 and 68, was slightly lower than in 1984, which was lower than either 1985 or 1986 (*Fusfeld and Miller, 1984; Low, July 1986; Low, November 1986*). In 1984 and 1986, only one station (68) was used to estimate abundance in Montezuma Slough. In 1985, five stations were used (606, 607, 609, 67, and 68). The 1987 data are consistent with previous data that indicate a minor proportion of striped bass larvae rear in Montezuma Slough. However, any area capable of rearing larval striped bass is important.

Table 3  
 ENVIRONMENTAL PARAMETERS NEAR THE  
 PROPOSED MONTEZUMA SLOUGH CONTROL STRUCTURE,  
 APRIL 15 THROUGH JUNE 16, 1987

<u>Week Ending</u>	<u>Weekly Period</u>	<u>EC (<math>\mu</math>mhos)</u>	<u>Secchi Depth (cm)</u>	<u>Temperature (<math>^{\circ}</math>F)</u>
<u>Station 67 (Downstream of Control Structure and MZ2)</u>				
April 15	1	4878	26	66
April 20	2		22	63
May 13	5	7028	29	72
May 26	7	1020	23	
June 2	8	1186	34	67.5
June 9	9	9692	37	70
<u>Station MZ2 (Downstream of Control Structure)</u>				
April 15	1	1977	23	65
April 20	2	779	24	63.5
May 13	5	6727	30	71
May 26	7	9261	29	
June 2	8	990	36	68.5
June 9	9	6573	33	68
<u>Station 68 (Upstream of Control Structure)</u>				
April 15	1	513	21	64
April 20	2		22	63.5
May 13	5	7229	35	70
May 26	7	6158	28	
June 2	8	743	28	69
June 9	9	3916	30	68.5
June 16	10	6881	55	68.2

Using only the abundance at Station 68, and comparing this to abundance indices in 1984 and 1986 (when only Station 68 was used to estimate abundance), we find abundance in 1987 was about 65.5 percent lower than in 1984 and 75.7 percent lower than in 1986. The 1987 index could be biased high, because it includes several length groups not used in the 1984-1986 indices. Another bias is that with the infrequent sampling (only once a week), a peak abundance could have been missed. Density patterns of the various size groups over the weekly sampling periods indicate that during weeks 3 and 4 (when there was no sampling<sup>1</sup>), the larger, 7-10 mm and 11-14 mm groups first entered the slough. Since these peaks were probably missed, the abundance estimates could be seriously underestimated.

1 Weeks 3 and 4 were not sampled because personnel were committed to other work. Week 6 was missed due to boat breakdown.

## REFERENCES

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