

State of California  
THE RESOURCES AGENCY  
Department of Fish and Game  
Bay-Delta Division

Revised and Updated Estimates of Fish Entrainment Losses  
Associated with the State Water Project  
and Federal Central Valley Project Facilities  
in the South Delta

June 1992



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INTRODUCTION

In July of 1987 the California Department of Fish and Game (DFG) submitted Exhibit 17 to the State Water Resources Control Board (SWRCB) Bay-Delta hearings. The purpose of Exhibit 17 was to provide estimates of striped bass and chinook salmon entrainment losses at State Water Project (SWP) and federal Central Valley Project (CVP) export facilities in the southern Delta. Exhibit 17 also contained a description of the SWP and CVP fish protective facilities and documentation of the methodology used to calculate entrainment losses.

The purpose of this exhibit (WRINT-DFG-Exhibit-#1) is to provide updated and revised estimates of chinook salmon and striped bass entrainment losses. Exhibit 17 provided loss estimates through 1986. Exhibit 1 updates these estimates through 1990. The methodologies used here to estimate entrainment losses are, with one exception, the same as those used in preparing and described in Exhibit 17 and for this reason we have not repeated the description of the methodologies here. The effects of these entrainment losses will be discussed in other DFG exhibits and testimony.

The one change in methodology referred to above addresses the assumed pre-screening loss rate at the SWP export facility in the year 1970. In preparing Tables 12 and 13 for Exhibit 17 SWP pre-screening loss rates were assumed to be 15% in the years 1968 and 1969. In subsequent years pre-screening loss rates were

assumed to be 82% for striped bass (Table 12) and 75% for chinook salmon (Table 13). The assumption of lower SWP pre-screening loss rates in 1968 and 1969 was made because Clifton Court Forebay was not yet in use and consequently the predation component of pre-screening loss rate was low in 1968 and 1969. Clifton Court Forebay was in use in 1970, but our recent review of early SWP fish salvage data indicates the 1970 salvage levels were high in comparison to subsequent years, suggesting the predation component of pre-screening loss rates had not yet reached high levels in 1970. For this reason the preparation of Tables 12A and 13A for the present exhibit assumes a pre-screening loss rate of 15% in the years 1968, 1969, and 1970.

#### UPDATED/REVISED EXHIBIT 17 TABLES

Exhibit 1 is primarily comprised of tables. The tables included here are updated versions of the key tables from Exhibit 17. We have numbered the tables similarly to the Tables in Exhibit 17 for ease of reference (e.g. Exhibit 17 Table 10 = Table 10A (Revised)). The following updated tables from Exhibit 17 are appended:

1) Table 8A

Table 8A contains estimates of striped bass egg and larval entrainment at the SWP from 1987 through 1991, based on egg and larval sampling near the intake to Clifton Court Forebay. Exhibit 17 contains the estimates for the years 1985 and 1986.

2) Table 9A

Table 9A contains estimates of striped bass egg and larval entrainment at the CVP from 1987 through 1991, based on egg and larval sampling near the CVP intake. Exhibit 17 contains the estimates for the years 1985 and 1986.

3) Table 10A

Table 10A contains estimates of the loss of 21 - 150 mm striped bass for the years 1957 through 1990 at the SWP and CVP, assuming 15% pre-screening losses at both facilities. Exhibit 17 contained estimates only through 1986.

4) Table 11A

Table 11A contains estimates of the loss of chinook salmon for the years 1957 through 1990 at the SWP and CVP, assuming 15% pre-screening losses at both facilities. Exhibit 17 contained estimates only through 1986.

5) Table 12A

Table 12A contains estimates of the loss of 21 - 150 mm striped bass for the years 1957 through 1990 at the SWP and CVP, assuming 15% pre-screening losses at the CVP and 82% at the SWP (except for the years 1968 through 1970, when the SWP pre-screening loss rate was assumed to be 15%). Exhibit 17 contained estimates only through 1986 and 1970 pre-screening loss rates were assumed to be 82%.

6) Table 13A

Table 13A contains estimates of the loss chinook salmon for the years 1957 through 1990 at the SWP and CVP, assuming 15% pre-screening losses at the CVP and 75% at the SWP (except for the years 1968 through 1970, when the SWP pre-screening loss rate was assumed to be 15%). Exhibit 17 contained estimates only through 1986 and 1970 pre-screening loss rates were assumed to be 75%.

7) Appendix Table 1A

Appendix Table 1A contains monthly estimates of the loss of 21 - 150 mm striped bass for the years 1987 through 1990 at the SWP, assuming 15% pre-screening losses. Exhibit 17 contains the estimates through 1986.

8) Appendix Table 2A

Appendix Table 2A contains monthly estimates of the loss of chinook salmon for the years 1987 through 1990 at the SWP, assuming 15% pre-screening losses. Exhibit 17 contains the estimates through 1986.

9) Appendix Table 3A

Appendix Table 3A contains monthly estimates of the loss of 21 - 150 mm striped bass for the years 1987 through 1990 at the SWP, assuming 82% pre-screening losses. Exhibit 17 contains the estimates through 1986.

10) Appendix Table 4A

Appendix Table 4A contains monthly estimates of the loss of chinook salmon for the years 1987 through 1990 at the SWP, assuming 75% pre-screening losses. Exhibit 17 contains the estimates through 1986.

11) Appendix Table 5A

Appendix Table 5A contains estimates of striped bass entrainment losses by year and 5mm length group at the SWP for the years 1987 through 1990, assuming a pre-screening loss rate of 15%. Exhibit 17 contains the estimates through 1986.

12) Appendix Table 6A

Appendix Table 6A contains estimates of chinook salmon entrainment losses by year and length group at the SWP for the years 1987 through 1990, assuming a pre-screening loss rate of 15%. Exhibit 17 contains the estimates through 1986.

13) Appendix Table 7A

Appendix Table 7A contains estimates of striped bass entrainment losses by year and 5mm length group at the SWP for the years 1987 through 1990, assuming a pre-screening loss rate of 82%. Exhibit 17 contains the estimates through 1986.

12) Appendix Table 8A

Appendix Table 8A contains estimates of chinook salmon entrainment losses by year and length group at the SWP for the years 1987 through 1990, assuming a pre-screening loss rate of 75%. Exhibit 17 contains the estimates through 1986.

LITERATURE CITED

The following references were used to update Tables 8R and 9R:

- Raquel, P.F. 1988. Estimated entrainment of striped bass eggs and larvae at State Water Project and Central Valley Project facilities in the Sacramento-San Joaquin Delta 1987. Interagency Ecological Study Program for the Sacramento-San Joaquin Estuary. Technical Report 15 (FF/BIO-4ATR/88-18). 15 pp.
- Spaar, S.A. 1990. Results of 1988 striped bass egg and larva study near the State Water Project and Central Valley Project facilities in the Sacramento-San Joaquin Estuary. Interagency Ecological Study Program for the Sacramento-San Joaquin Estuary. Technical Report 25 (FF/BIO-4ATR/90-25). 32 pp.
- IESP. 1990. 1989 annual report, Interagency Ecological Study Program for the Sacramento-San Joaquin Estuary. P. L. Herrgesell, Compiler. 112 pp.
- IESP. 1991. 1990 annual report, Interagency Ecological Study Program for the Sacramento-San Joaquin Estuary. P. L. Herrgesell, Compiler. 123 pp.



IESP. MS. 1991 annual report, Interagency Ecological Study  
Program for the Sacramento-San Joaquin Estuary. P. L.  
Herrgesell, Compiler.

**APPENDIX**

**REVISED AND UPDATED EXHIBIT 17 TABLES**

TABLE 8A. STRIPED BASS EGG AND LARVAL 1987 THROUGH 1991 ENTRAINMENT ESTIMATES FOR THE SWP INTAKE

1987 ENTRAINMENT

Bi-Monthly Period	SIZE GROUPS					
	EGGS	3-6 mm	7-10 mm	11-14 mm	15-18 mm	19-20 mm
April 7	217105	382409	0	0	0	0
8	1485989	19025702	5804062	72789	0	0
May 9	276285	24807668	26616500	3041846	213830	0
10	105414	1749903	2220499	1925339	512823	0
June 11	0	592376	1473853	882657	259889	0
12	0	706085	1508766	109736	163443	0
July 13	0	0	79691	0	79691	0
14	0	0	0	0	0	0
Total	2084793	47264143	37703371	6032367	1229676	0
Grand Total						94,314,350

1988 ENTRAINMENT

Bi-Monthly Period	SIZE GROUPS					
	EGGS	3-6 mm	7-10 mm	11-14 mm	15-18 mm	19-20 mm
April 7	0	0	0	0	0	0
8	2895531	12087295	299905	0	0	0
May 9	1911548	10034861	305142	0	0	0
10	1909129	39279651	2853006	0	0	0
June 11	0	21413865	12254135	628793	0	0
12	0	3995426	4559908	1925982	689834	286413
July 13	0	1041281	1361603	513644	438588	146055
14	0	0	0	0	0	0
Total	6716208	87852379	21633699	3068419	1128422	432468
Grand Total						120,831,595

TABLE 8A. Continued

1989 ENTRAINMENT

Bi-Monthly Period	SIZE GROUPS					
	EGGS	3-6 mm	7-10 mm	11-14 mm	15-18 mm	19-20 mm
April 7	0	377580	37755	0	0	0
8	156184	35307234	2302687	0	0	0
May 9	233469	9800988	9776635	1064370	0	0
10	0	28426393	25460883	3728970	399707	0
June 11	0	2827461	6597859	875808	271003	0
12	0	805218	6364220	2274717	265975	0
July 13	0	0	3158898	997640	0	0
14	0	0	27500	27500	0	0
Total	389653	77544874	53726437	8969005	936685	0
Grand Total						141,566,654

1990 ENTRAINMENT

Bi-Monthly Period	SIZE GROUPS					
	EGGS	3-6 mm	7-10 mm	11-14 mm	15-18 mm	19-20 mm
April 7	152307	1086598	325064	0	0	0
8	3157580	13654408	6027787	0	0	0
May 9	2783624	349987	636940	15326	0	0
10	280462	1379816	4121547	216972	590	0
June 11	0	22253	345584	120870	2742	13541
12	0	0	247496	87497	1202	0
July 13	0	0	14644	0	0	0
14	0	0	0	0	0	0
Total	6373973	16493062	11719062	440665	4534	13541
Grand Total						35,044,837

TABLE 8A. Continued

1991 ENTRAINMENT

Bi-Monthly Period	SIZE GROUPS					
	EGGS	3-6 mm	7-10 mm	11-14 mm	15-18 mm	19-20 mm
April 7	0	0	0	0	0	0
8	1812	13578	3511	30	0	0
May 9	4263	6398	9251	800	56	0
10	204	5121	4421	554	83	0
June 11	0	19	258	178	26	26
12	0	0	123	105	0	0
July 13	0	0	0	0	0	0
14	0	0	0	0	0	0
Total	6279	25116	17564	1667	165	26
Grand Total						50,817

TABLE 9A. STRIPED BASS EGG AND LARVAL 1987 THROUGH 1991 ENTRAINMENT ESTIMATES FOR THE CVP INTAKE

1987 ENTRAINMENT

Bi-Monthly Period	SIZE GROUPS					
	EGGS	3-6 mm	7-10 mm	11-14 mm	15-18 mm	19-20 mm
April 7	1158419	185347	0	0	0	0
8	2677561	42630816	5376264	0	0	0
May 9	2999796	25329521	31620150	5517454	527846	69581
10	0	2836988	5270705	3114451	1022756	163824
June 11	0	1369541	2117356	1115767	415672	0
12	0	1036849	1400455	260783	0	50780
July 13	0	83100	135804	0	0	0
14	0	0	0	0	0	0
Total	6835776	73472162	45920734	10008455	1966274	284185
Grand Total						138,487,586

1988 ENTRAINMENT

Bi-Monthly Period	SIZE GROUPS					
	EGGS	3-6 mm	7-10 mm	11-14 mm	15-18 mm	19-20 mm
April 7	0	89799	0	0	0	0
8	1963163	6039378	213661	0	0	0
May 9	5889709	4405918	1465247	0	0	0
10	11026832	45216688	11940158	0	0	0
June 11	0	9068477	8497931	1798964	92468	25989
12	0	1928881	4920558	2055786	1301913	295300
July 13	0	883130	2777064	685740	62531	159036
14	0	0	0	0	0	0
Total	18879704	67632271	29814619	4540490	1456912	480325
Grand Total						122,804,321



TABLE 9A. Continued

1991 ENTRAINMENT

Bi-Monthly Period	SIZE GROUPS					
	EGGS	3-6 mm	7-10 mm	11-14 mm	15-18 mm	19-20 mm
April 7	0	0	0	0	0	0
8	813	4691	523	0	0	0
May 9	2784	3512	3722	586	63	9
10	1951	5184	3052	294	72	12
June 11	0	0	616	183	23	0
12	0	0	51	53	0	0
July 13	0	0	0	0	0	0
14	0	0	0	0	0	0
Total	5548	13387	7964	1116	158	21
Grand Total						28,194



TABLE 10A. CASE 1: STRIPED BASS (21-150 mm) LOSS ESTIMATES FOR THE SWP AND CVP. \*

Year	SWP Loss Estimate	CVP Loss Estimate	Total Estimate
1957	0	1,620,478	1,620,478
1958	0	595,613	595,613
1959	0	7,588,877	7,588,877
1960	0	9,544,050	9,544,050
1961	0	14,914,306	14,914,306
1962	0	14,557,701	14,557,701
1963	0	22,821,857	22,821,857
1964	0	25,964,189	25,964,189
1965	0	12,595,389	12,595,389
1966	0	33,905,326	33,905,326
1967	0	5,001,887	5,001,887
1968	1,518,640	14,009,334	15,527,974
1969	1,509,202	8,329,794	9,838,996
1970	10,996,834	18,717,177	29,714,011
1971	7,635,924	8,459,477	16,095,401
1972	5,721,871	9,133,657	14,855,528
1973	9,906,979	8,547,806	18,454,785
1974	16,884,849	5,935,344	22,820,193
1975	4,405,373	6,192,385	10,597,758
1976	1,651,017	4,403,134	6,054,151
1977	516,665	613,848	1,130,513
1978	3,507,951	3,332,958	6,840,909
1979	2,845,227	2,399,012	5,244,239
1980	2,786,574	1,278,896	4,065,470
1981	857,229	5,746,387	6,603,616
1982	815,078	1,368,322	2,183,400
1983	99,554	160,702	260,256
1984	8,491,434	5,640,468	14,131,902
1985	4,181,702	1,699,641	5,881,343
1986	15,061,909	4,932,410	19,994,319
1987	14,596,798	2,674,519	17,271,317
1988	12,759,277	716,615	13,475,892
1989	9,016,015	1,435,483	10,451,498
1990	1,994,140	1,721,905	3,716,045

\* SWP losses are based on a 15% pre-screening loss rate.  
 CVP losses are based on a 15% pre-screening loss rate.

TABLE 11A. CASE 1: CHINOOK SALMON LOSS ESTIMATES  
FOR THE SWP AND CVP. \*

Year	SWP Loss Estimate	CVP Loss Estimate	Total Estimate
1957	0	133,583	133,583
1958	0	327	327
1959	0	61,569	61,569
1960	0	44,206	44,206
1961	0	44,313	44,313
1962	0	57,745	57,745
1963	0	14,438	14,438
1964	0	82,727	82,727
1965	0	209,633	209,633
1966	0	72,985	72,985
1967	0	36,221	36,221
1968	21,587	106,014	127,601
1969	30,317	42,225	72,542
1970	33,082	295,085	328,167
1971	12,187	280,505	292,692
1972	61,351	183,002	244,353
1973	25,712	140,973	166,685
1974	91,295	168,417	259,712
1975	23,736	70,226	93,962
1976	20,045	74,142	94,187
1977	16,651	8,059	24,710
1978	63,278	26,732	90,010
1979	69,529	60,217	129,746
1980	51,990	111,163	163,153
1981	55,657	42,029	97,686
1982	165,136	128,813	293,949
1983	39,936	156,848	196,784
1984	73,320	104,086	177,406
1985	87,232	83,456	170,688
1986	250,572	451,631	702,203
1987	96,694	50,901	147,595
1988	84,868	28,879	113,747
1989	59,372	24,649	84,021
1990	11,437	1,829	13,265

\* SWP losses are based on a 15% pre-screening loss rate.  
CVP losses are based on a 15% pre-screening loss rate.

TABLE 12A. CASE 2: STRIPED BASS (21-150 mm) LOSS ESTIMATES FOR THE SWP AND CVP. \*

Year	SWP Loss Estimate	CVP Loss Estimate	Total Estimate
1957	0	1,620,478	1,620,478
1958	0	595,613	595,613
1959	0	7,588,877	7,588,877
1960	0	9,544,050	9,544,050
1961	0	14,914,306	14,914,306
1962	0	14,557,701	14,557,701
1963	0	22,821,857	22,821,857
1964	0	25,964,189	25,964,189
1965	0	12,595,389	12,595,389
1966	0	33,905,326	33,905,326
1967	0	5,001,887	5,001,887
1968	1,518,640	14,009,334	15,527,974
1969	1,509,202	8,329,794	9,838,996
1970	10,966,834	18,717,177	29,684,011
1971	48,184,312	8,459,477	56,643,789
1972	39,204,045	9,133,657	48,337,702
1973	64,119,555	8,547,806	72,667,361
1974	107,357,174	5,935,344	113,292,518
1975	30,287,231	6,192,385	36,479,616
1976	11,086,639	4,403,134	15,489,773
1977	3,701,322	613,848	4,315,170
1978	24,358,333	3,332,958	27,691,291
1979	18,640,005	2,399,012	21,039,017
1980	17,890,370	1,278,896	19,169,266
1981	6,337,892	5,746,387	12,084,279
1982	6,001,195	1,368,322	7,369,517
1983	781,438	160,702	942,140
1984	51,916,076	5,640,468	57,556,544
1985	26,371,523	1,699,641	28,071,164
1986	92,705,392	4,932,410	97,637,802
1987	88,480,625	2,674,519	91,155,144
1988	77,770,704	716,615	78,487,319
1989	56,192,155	1,435,483	57,627,638
1990	10,882,035	1,721,905	12,603,940

\* SWP losses are based on a 82% pre-screening loss rate (1968 through 1970 are based on a 15% pre-screening loss rate).  
CVP losses are based on a 15% pre-screening loss rate.

TABLE 13A. CASE 2: CHINOOK SALMON LOSS ESTIMATES  
FOR THE SWP AND CVP. \*

Year	SWP Loss Estimate	CVP Loss Estimate	Total Estimate
1957	0	133,583	133,583
1958	0	327	327
1959	0	61,569	61,569
1960	0	44,206	44,206
1961	0	44,313	44,313
1962	0	57,745	57,745
1963	0	14,438	14,438
1964	0	82,727	82,727
1965	0	209,633	209,633
1966	0	72,985	72,985
1967	0	36,221	36,221
1968	21,587	106,014	127,601
1969	30,317	42,225	72,542
1970	33,082	295,085	328,167
1971	85,592	280,505	366,097
1972	439,369	183,002	622,370
1973	187,182	140,973	328,155
1974	645,525	168,417	813,942
1975	171,980	70,226	242,207
1976	144,081	74,142	218,223
1977	124,266	8,059	132,325
1978	489,475	26,732	516,207
1979	526,364	60,217	586,582
1980	368,325	111,163	479,488
1981	430,191	42,029	472,219
1982	1,252,042	128,813	1,380,855
1983	300,436	156,848	457,284
1984	593,897	104,086	697,983
1985	629,220	83,456	712,676
1986	1,883,526	451,631	2,335,157
1987	749,635	50,901	800,536
1988	648,448	28,879	677,327
1989	452,642	24,649	477,291
1990	50,554	1,829	52,383

\* SWP losses are based on a 75% pre-screening loss rate (1968 through 1970 are based on a 15% pre-screening loss rate).  
CVP losses are based on a 15% pre-screening loss rate.

APPENDIX TABLE 1A. continued.

Year = 1987

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
1	20327	17278	12791	12148	8179
2	25064	21304	14888	13700	11364
3	2662	2263	1634	1536	1126
4	802	682	505	469	333
5	8320954	7072811	4617851	2032186	6288768
6	9131849	7762072	4883272	2340613	6791236
7	1927145	1638073	1082467	612159	1314986
8	39535	33605	23123	16294	23241
9	24402	20742	14644	12791	11612
10	361	307	241	224	137
11	37899	32214	24620	24057	13842
12	318386	270628	190426	186411	131975
<b>Total</b>	<b>19,849,387</b>	<b>16,871,979</b>	<b>10,866,462</b>	<b>5,252,589</b>	<b>14,596,798</b>

Year = 1988

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
1	37489	31866	21534	20943	16547
2	81254	69066	47195	45618	35636
3	6894	5860	4185	4104	2790
4	245	208	149	108	137
5	68378	58121	42695	20916	47462
6	10487579	8914442	5717628	2556765	7930815
7	5811331	4939632	3296658	1593253	4218079
8	588094	499880	374494	230617	357478
9	6066	5156	3940	3341	2725
10	7000	5950	4472	4048	2952
11	214831	182606	130780	128964	85866
12	156595	133106	99653	97805	58790
<b>Total</b>	<b>17,465,756</b>	<b>14,845,893</b>	<b>9,743,383</b>	<b>4,706,481</b>	<b>12,759,277</b>

APPENDIX TABLE 1A. continued.

Year = 1989

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
1	32784	27866	21797	20171	12612
2	15873	13492	10089	9489	6384
3	10560	8976	6121	5845	4715
4	638	542	379	366	272
5	2062010	1752709	1181227	511291	1550720
6	7488698	6365393	4552350	2111665	5377032
7	2766260	2351321	1715777	850492	1915768
8	208071	176860	135963	97623	110448
9	6173	5247	4121	3125	3048
10	6075	5164	4093	3825	2251
11	59558	50624	34690	34298	25260
12	17489	14866	10115	9983	7507
Total	12,674,188	10,773,060	7,676,722	3,658,173	9,016,015

Year = 1990

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
1	83555	71022	49566	49231	34325
2	59308	50412	20592	20388	38920
3	24420	20757	17404	17150	7270
4	585	497	406	381	204
5	276895	235361	4386	1877	275018
6	275091	233827	85738	39866	235225
7	1227153	1043080	108320	62478	1164675
8	343282	291790	204470	156862	186421
9	7700	6545	4000	3753	3947
10	3842	3266	840	821	3021
11	59706	50750	26312	25676	34030
12	26255	22317	15827	15172	11084
Total	2,387,793	2,029,624	537,861	393,653	1,994,140

APPENDIX TABLE 2A. continued.

Year = 1987

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
1	100	85	63	63	37
2	628	534	405	405	223
3	6927	5888	4318	4290	2637
4	62633	53238	40806	40111	22522
5	144981	123234	95002	93334	51648
6	15315	13018	9783	9677	5638
7	302	257	191	191	111
8	113	96	69	69	44
9	125	106	83	83	42
10	0	0	0	0	0
11	7	6	4	4	3
12	40349	34297	26763	26763	13586
Total	271,481	230,759	177,487	174,991	96,490

Year = 1988

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
1	4402	3742	2943	2940	1462
2	6373	5417	4236	4234	2139
3	6138	5217	3903	3901	2236
4	67612	57470	44736	44214	23398
5	108974	92628	71008	69857	39117
6	35319	30021	21454	21194	14125
7	2009	1708	1188	1188	821
8	451	383	276	276	175
9	41	35	24	24	17
10	65	55	39	39	26
11	761	647	461	461	300
12	1686	1433	1015	1015	671
Total	233,831	198,756	151,283	149,344	84,487

APPENDIX TABLE 2A. continued.

Year = 1989

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
-----	-----	-----	-----	-----	-----
1	4339	3688	2591	2591	1748
2	271	230	166	166	105
3	12420	10557	8319	8272	4149
4	72688	61785	49525	48618	24070
5	69831	59356	42858	42060	27770
6	965	820	602	590	375
7	0	0	0	0	0
8	206	175	122	122	84
9	0	0	0	0	0
10	65	55	38	38	27
11	1151	978	756	756	395
12	1928	1639	1277	1277	651
<b>Total</b>	<b>163,862</b>	<b>139,283</b>	<b>106,254</b>	<b>104,490</b>	<b>59,372</b>

Year = 1990

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
-----	-----	-----	-----	-----	-----
1	0	0	0	0	0
2	0	0	0	0	0
3	6672	5671	2026	2026	4646
4	5933	5043	1292	1292	4641
5	2765	2350	1038	1038	1727
6	929	790	506	506	423
7	0	0	0	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
<b>Total</b>	<b>16,299</b>	<b>13,854</b>	<b>4,862</b>	<b>4,862</b>	<b>11,437</b>



APPENDIX TABLE 3A. continued.

Year = 1987

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
1	95989	17278	12791	12148	83841
2	118356	21304	14888	13700	104656
3	12572	2263	1634	1536	11036
4	3789	682	505	469	3320
5	39293398	7072811	4617851	2032186	37261209
6	43122625	7762072	4883272	2340613	40782004
7	9100405	1638073	1082467	612159	8488248
8	186694	33605	23123	16294	170400
9	115233	20742	14644	12791	102443
10	1706	307	241	224	1481
11	178967	32214	24620	24057	154910
12	1503489	270628	190426	186411	1317078
Total	93,733,223	16,871,979	10,866,462	5,252,589	88,480,625

Year = 1988

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
1	177033	31866	21534	20943	156091
2	383700	69066	47195	45618	338082
3	32556	5860	4185	4104	28452
4	1156	208	149	108	1048
5	322894	58121	42695	20916	301979
6	49524672	8914442	5717628	2556765	46967915
7	27442400	4939632	3296658	1593253	25849146
8	2777111	499880	374494	230617	2546494
9	28644	5156	3940	3341	25303
10	33056	5950	4472	4048	29007
11	1014478	182606	130780	128964	885513
12	739478	133106	99653	97805	641673
Total	82,477,178	14,845,893	9,743,383	4,706,481	77,770,704

APPENDIX TABLE 3A. continued.

Year = 1989

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
-----	-----	-----	-----	-----	-----
1	154811	27866	21797	20171	134640
2	74956	13492	10089	9489	65467
3	49867	8976	6121	5845	44021
4	3011	542	379	366	2645
5	9737272	1752709	1181227	511291	9225981
6	35363299	6365393	4552350	2111665	33251624
7	13062895	2351321	1715777	850492	12212403
8	982556	176860	135963	97623	884933
9	29150	5247	4121	3125	26025
10	28689	5164	4093	3825	24864
11	281244	50624	34690	34298	246947
12	82589	14866	10115	9983	72606
Total	59,850,337	10,773,060	7,676,722	3,658,173	56,192,155

Year = 1990

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
-----	-----	-----	-----	-----	-----
1	394567	71022	49566	49231	345336
2	280067	50412	20592	20388	259679
3	115317	20757	17404	17150	98167
4	2761	497	406	381	2380
5	1307561	235361	4386	1877	1305684
6	1299039	233827	85738	39866	1259173
7	5794889	1043080	108320	62478	5732411
8	1621056	291790	204470	156862	1464194
9	36361	6545	4000	3753	32608
10	18144	3266	840	821	17323
11	281944	50750	26312	25676	256269
12	123983	22317	15827	15172	108812
Total	11,275,689	2,029,624	537,861	393,653	10,882,035

APPENDIX TABLE 4A. continued.

Year = 1987

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
1	340	85	63	63	277
2	2136	534	405	405	1731
3	23552	5888	4318	4290	19262
4	212952	53238	40806	40111	172841
5	492936	123234	95002	93334	399602
6	52072	13018	9783	9677	42395
7	1028	257	191	191	837
8	384	96	69	69	315
9	424	106	83	83	341
10	0	0	0	0	0
11	24	6	4	4	20
12	137188	34297	26763	26763	110425
Total	923,036	230,759	177,487	174,991	748,045

Year = 1988

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
1	14968	3742	2943	2940	12028
2	21668	5417	4236	4234	17434
3	20868	5217	3903	3901	16967
4	229880	57470	44736	44214	185666
5	370512	92628	71008	69857	300655
6	120084	30021	21454	21194	98890
7	6832	1708	1188	1188	5644
8	1532	383	276	276	1256
9	140	35	24	24	116
10	220	55	39	39	181
11	2588	647	461	461	2127
12	5732	1433	1015	1015	4717
Total	795,024	198,756	151,283	149,344	645,680

APPENDIX TABLE 4A. continued.

Year = 1989

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
1	14752	3688	2591	2591	12161
2	920	230	166	166	754
3	42228	10557	8319	8272	33957
4	247140	61785	49525	48618	198522
5	237424	59356	42858	42060	195364
6	3280	820	602	590	2690
7	0	0	0	0	0
8	700	175	122	122	578
9	0	0	0	0	0
10	220	55	38	38	182
11	3912	978	756	756	3156
12	6556	1639	1277	1277	5279
Total	557,132	139,283	106,254	104,490	452,642

Year = 1990

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
1	0	0	0	0	0
2	0	0	0	0	0
3	22684	5671	2026	2026	20658
4	20172	5043	1292	1292	18880
5	9400	2350	1038	1038	8362
6	3160	790	506	506	2654
7	0	0	0	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
Total	55,416	13,854	4,862	4,862	50,554

APPENDIX TABLE 5A. continued.

Year = 1987

Length Group	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
5	0	0	0	0	0
10	0	0	0	0	0
15	661,209	562,028	33,481	11,846	649,364
20	4,040,986	3,434,838	1,126,229	432,472	3,608,514
25	6,372,802	5,416,881	3,194,489	1,328,268	5,044,533
30	6,079,418	5,167,506	2,997,537	1,344,395	4,735,023
35	3,077,767	2,616,102	1,974,050	953,071	2,124,695
40	1,907,231	1,621,146	1,204,973	624,176	1,283,055
50	1,493,453	1,269,435	932,008	531,058	962,395
60	286,192	243,263	176,050	114,045	172,147
70	98,131	83,411	60,634	44,311	53,819
80	69,341	58,940	43,325	35,475	33,867
90	94,106	79,990	59,263	54,036	40,070
100	61,687	52,434	38,018	37,638	24,049
110	73,360	62,356	44,483	44,483	28,877
120	88,907	75,571	53,585	53,585	35,322
130	67,298	57,203	40,414	40,414	26,884
140	53,325	45,326	31,830	31,830	21,495
150	26,371	22,415	15,803	15,803	10,568
Total	24,551,583	20,868,845	12,026,172	5,696,907	18,854,676

Year = 1988

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
5	0	0	0	0	0
10	612,128	520,309	35,580	11,546	600,583
15	6,774,132	5,758,012	384,054	135,878	6,638,253
20	9,210,007	7,828,506	2,847,337	1,093,377	8,116,630
25	5,959,890	5,065,907	3,094,370	1,286,639	4,673,252
30	5,850,434	4,972,869	2,979,471	1,336,293	4,514,142
35	2,516,255	2,138,817	1,635,439	789,590	1,726,665
40	1,252,012	1,064,210	812,030	420,632	831,380
50	859,911	730,924	570,756	325,217	534,694
60	302,572	257,186	198,920	128,860	173,711
70	122,328	103,979	80,464	58,803	63,525
80	52,209	44,378	33,373	27,326	24,884
90	83,075	70,614	51,702	47,142	35,933
100	142,826	121,402	87,803	86,925	55,901
110	167,506	142,380	102,945	102,945	64,561
120	95,342	81,041	58,644	58,644	36,698
130	39,989	33,991	24,310	24,310	15,679
140	17,886	15,203	11,000	11,000	6,886
150	3,520	2,992	2,156	2,156	1,364
Total	34,062,023	28,952,720	13,010,354	5,947,283	28,114,742

APPENDIX TABLE 5A. continued.

Year = 1989

Length Group	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
5	0	0	0	0	0
10	75,251	63,963	5,393	1,750	73,501
15	1,122,371	954,015	80,701	28,552	1,093,819
20	3,413,514	2,901,487	1,214,929	466,533	2,946,982
25	4,544,500	3,862,825	2,576,771	1,071,421	3,473,079
30	3,477,237	2,955,652	1,977,052	886,708	2,590,529
35	2,141,337	1,820,136	1,426,859	688,888	1,452,449
40	1,191,080	1,012,418	793,500	411,033	780,047
50	711,221	604,538	494,831	281,955	429,267
60	238,532	202,752	165,263	107,057	131,474
70	109,926	93,437	75,282	55,016	54,910
80	62,747	53,335	42,235	34,582	28,165
90	53,964	45,869	35,518	32,385	21,578
100	44,364	37,709	28,355	28,071	16,292
110	33,106	28,140	20,439	20,439	12,667
120	33,751	28,688	20,815	20,815	12,936
130	16,544	14,062	9,917	9,917	6,627
140	9,088	7,725	5,511	5,511	3,577
150	6,793	5,774	4,374	4,374	2,419
Total	17,285,324	14,692,525	8,977,745	4,155,008	13,130,316

Year = 1990

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
5	0	0	0	0	0
10	0	0	0	0	0
15	83,089	70,626	950	336	82,753
20	86,827	73,803	16,361	6,283	80,544
25	192,368	163,513	37,036	15,400	176,969
30	161,505	137,279	43,667	19,585	141,920
35	98,634	83,839	20,391	9,845	88,789
40	88,467	75,197	21,401	11,086	77,381
50	224,720	191,012	59,487	33,896	190,824
60	314,899	267,664	61,475	39,824	275,075
70	474,856	403,628	71,995	52,614	422,243
80	312,264	265,424	41,297	33,814	278,450
90	186,365	158,410	34,952	31,869	154,495
100	133,960	113,866	43,809	43,371	90,589
110	97,514	82,887	45,803	45,803	51,711
120	57,099	48,534	30,526	30,526	26,573
130	26,634	22,639	15,073	15,073	11,561
140	10,238	8,702	5,479	5,479	4,759
150	8,271	7,030	5,470	5,470	2,801
Total	2,557,709	2,174,053	555,172	400,272	2,157,438

APPENDIX TABLE 6A. continued.

Length Group	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
-----	-----	-----	-----	-----	-----
Year = 1987					
1	190,372	161,816	125,191	122,687	67,685
2	81,687	69,434	52,678	52,678	29,009
Total	272,059	231,250	177,869	175,365	96,694
Year = 1988					
1	148,451	126,183	97,581	95,629	52,821
2	86,374	73,418	54,327	54,327	32,047
Total	234,825	199,601	151,908	149,956	84,868
Year = 1989					
1	135,339	115,038	88,199	86,435	48,904
2	28,524	24,245	18,055	18,055	10,469
Total	163,862	139,283	106,254	104,490	59,372
Year = 1990					
1	0	0	0	0	0
2	16,299	13,854	4,862	4,862	11,437
Total	16,299	13,854	4,862	4,862	11,437

APPENDIX TABLE 7A. continued.

Year = 1987

Length Group	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
5	0	0	0	0	0
10	0	0	0	0	0
15	3,122,378	562,028	33,481	11,846	3,110,532
20	19,082,436	3,434,838	1,126,229	432,472	18,649,959
25	30,093,786	5,416,881	3,194,489	1,328,268	28,765,515
30	28,708,371	5,167,506	2,997,537	1,344,395	27,363,968
35	14,533,900	2,616,102	1,974,050	953,071	13,580,828
40	9,006,366	1,621,146	1,204,973	624,176	8,382,190
50	7,052,416	1,269,435	932,008	531,058	6,521,359
60	1,351,461	243,263	176,050	114,045	1,237,416
70	463,394	83,411	60,634	44,311	419,083
80	327,444	58,940	43,325	35,475	291,970
90	444,389	79,990	59,263	54,036	390,353
100	291,300	52,434	38,018	37,638	253,662
110	346,422	62,356	44,483	44,483	301,939
120	419,839	75,571	53,585	53,585	366,254
130	317,794	57,203	40,414	40,414	277,381
140	251,811	45,326	31,830	31,830	219,981
150	124,528	22,415	15,803	15,803	108,725
Total	115,938,037	20,868,845	12,026,172	5,696,907	110,241,116

Year = 1988

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
5	0	0	0	0	0
10	2,890,606	520,309	35,580	11,546	2,879,061
15	31,988,952	5,758,012	384,054	135,878	31,853,082
20	43,491,697	7,828,506	2,847,337	1,093,377	42,398,318
25	28,143,924	5,065,907	3,094,370	1,286,639	26,857,292
30	27,627,049	4,972,869	2,979,471	1,336,293	26,290,756
35	11,882,316	2,138,817	1,635,439	789,590	11,092,726
40	5,912,278	1,064,210	812,030	420,632	5,491,646
50	4,060,689	730,924	570,756	325,217	3,735,472
60	1,428,811	257,186	198,920	128,860	1,299,951
70	577,661	103,979	80,464	58,803	518,858
80	246,544	44,378	33,373	27,326	219,219
90	392,300	70,614	51,702	47,142	345,158
100	674,455	121,402	87,803	86,925	587,531
110	791,000	142,380	102,945	102,945	688,055
120	450,228	81,041	58,644	58,644	391,584
130	188,839	33,991	24,310	24,310	164,529
140	84,461	15,203	11,000	11,000	73,461
150	16,622	2,992	2,156	2,156	14,466
Total	160,848,433	28,952,720	13,010,354	5,947,283	154,901,165



APPENDIX TABLE 7A. continued.

Year = 1989

Length Group	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
5	0	0	0	0	0
10	355,350	63,963	5,393	1,750	353,600
15	5,300,083	954,015	80,701	28,552	5,271,532
20	16,119,373	2,901,487	1,214,929	466,533	15,652,839
25	21,460,142	3,862,825	2,576,771	1,071,421	20,388,717
30	16,420,289	2,955,652	1,977,052	886,708	15,533,576
35	10,111,867	1,820,136	1,426,859	688,888	9,422,979
40	5,624,545	1,012,418	793,500	411,033	5,213,512
50	3,358,545	604,538	494,831	281,955	3,076,590
60	1,126,400	202,752	165,263	107,057	1,019,343
70	519,094	93,437	75,282	55,016	464,078
80	296,306	53,335	42,235	34,582	261,724
90	254,828	45,869	35,518	32,385	222,442
100	209,494	37,709	28,355	28,071	181,423
110	156,333	28,140	20,439	20,439	135,894
120	159,378	28,688	20,815	20,815	138,563
130	78,122	14,062	9,917	9,917	68,205
140	42,917	7,725	5,511	5,511	37,406
150	32,078	5,774	4,374	4,374	27,704
Total	81,625,144	14,692,525	8,977,745	4,155,008	77,470,126

Year = 1990

Month	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
5	0	0	0	0	0
10	0	0	0	0	0
15	392,367	70,626	950	336	392,031
20	410,017	73,803	16,361	6,283	403,734
25	908,406	163,513	37,036	15,400	893,006
30	762,661	137,279	43,667	19,585	743,076
35	465,772	83,839	20,391	9,845	455,928
40	417,761	75,197	21,401	11,086	406,675
50	1,061,178	191,012	59,487	33,896	1,027,282
60	1,487,022	267,664	61,475	39,824	1,447,199
70	2,242,378	403,628	71,995	52,614	2,189,764
80	1,474,578	265,424	41,297	33,814	1,440,763
90	880,056	158,410	34,952	31,869	848,186
100	632,589	113,866	43,809	43,371	589,218
110	460,483	82,887	45,803	45,803	414,680
120	269,633	48,534	30,526	30,526	239,107
130	125,772	22,639	15,073	15,073	110,699
140	48,344	8,702	5,479	5,479	42,865
150	39,056	7,030	5,470	5,470	33,586
Total	12,078,073	2,174,053	555,172	400,272	11,677,800

APPENDIX TABLE 8A. continued.

Length Group	Entrained into CCF	Encountering the Screens	Salvaged	Released Alive	System loss
-----	-----	-----	-----	-----	-----
Year = 1987					
1	647,264	161,816	125,191	122,687	524,577
2	277,736	69,434	52,678	52,678	225,058
Total	925,000	231,250	177,869	175,365	749,635
Year = 1988					
1	504,732	126,183	97,581	95,629	409,103
2	293,672	73,418	54,327	54,327	239,345
Total	798,404	199,601	151,908	149,956	648,448
Year = 1989					
1	460,152	115,038	88,199	86,435	373,717
2	96,980	24,245	18,055	18,055	78,925
Total	557,132	139,283	106,254	104,490	452,642
Year = 1990					
1	0	0	0	0	0
2	55,416	13,854	4,862	4,862	50,554