

Table C1a. Commercial landings (metric tons) of northern shrimp in the Gulf of Maine.

Year	Maine	Massachusetts	New Hampshire	Total	\$/Lb				
1958	2.3	0.0	0.0	2.3	0.32				
1959	5.4	2.3	0.0	7.7	0.29				
1960	40.4	0.5	0.0	40.9	0.23				
1961	30.4	0.5	0.0	30.9	0.20				
1962	159.7	16.3	0.0	176.0	0.15				
1963	244.0	10.4	0.0	254.4	0.12				
1964	419.4	3.1	0.0	422.5	0.12				
1965	947.0	8.0	0.0	955.0	0.12				
1966	1,737.8	10.5	18.1	1,766.4	0.14				
1967	3,141.1	10.0	20.0	3,171.1	0.12				
1968	6,515.0	51.9	43.1	6,610.0	0.11				
1969	10,992.9	1,772.9	58.1	12,823.9	0.12				
1970	7,712.8	2,902.1	54.4	10,669.3	0.20				
1971	8,354.7	2,723.8	50.8	11,129.3	0.19				
1972	7,515.6	3,504.5	74.8	11,094.9	0.19				
1973	5,476.7	3,868.2	59.9	9,404.8	0.27				
1974	4,430.7	3,477.3	36.7	7,944.7	0.32				
1975	3,177.0	2,080.2	29.5	5,286.7	0.26				
1976	617.2	397.8	7.3	1,022.3	0.34				
1977	148.0	236.9	2.3	387.2	0.55				
1978	0.0	0.0	0.0	0.0	0.24				
1979	32.9	451.3	2.3	486.5	0.33				
1980	71.4	260.3	7.4	339.1	0.65				
1981	528.6	538.1	4.5	1,071.2	0.64				
1982	883.2	*(853.3)	658.5	*(655.3)	32.8	*(21.6)	1,574.5	*(1,530.2)	0.60
1983	1,022.0	(892.5)	508.0	(458.4)	36.5	(46.2)	1,566.5	(1,397.1)	0.67
1984	2,564.7	(2,394.9)	565.3	(525.1)	96.8	(30.7)	3,226.8	(2,950.7)	0.49
1985	2,956.9	(2,946.4)	1,030.6	(968.0)	207.4	(216.5)	4,194.9	(4,130.9)	0.44
1986	3,407.3	(3,268.2)	1,085.6	(1,136.3)	191.1	(230.5)	4,684.0	(4,635.0)	0.63
1987	3,534.2	(3,673.2)	1,338.7	(1,422.2)	152.5	(157.8)	5,025.4	(5,253.2)	1.10
1988	2,272.4	(2,257.2)	631.5	(619.6)	173.1	(154.5)	3,077.0	(3,031.3)	1.10
1989	2,542.6	(2,384.0)	749.6	(699.9)	314.3	(231.5)	3,606.5	(3,315.4)	0.98
1990	2,961.5	(3,236.1)	993.2	(974.3)	447.3	(451.2)	4,402.0	(4,661.6)	0.72
1991	2,431.1	(2,488.1)	727.6	(801.1)	208.2	(282.2)	3,366.9	(3,571.4)	0.93
1992	2,973.9	(3,054.1)	291.6	(289.1)	100.1	(100.0)	3,365.6	(3,443.6)	0.99
1993	1,562.8	(1,492.2)	300.3	(292.8)	441.1	(357.4)	2,304.7	(2,142.9)	1.03
1994	2,815.5	(2,239.3)	374.4	(247.5)	520.9	(428.0)	3,710.8	(2,914.8)	0.79
1995		(5,022.7)		(678.8)		(764.9)		(6,466.4)	0.88
1996		(7,737.0)		(658.0)		(771.0)		(9,166.1)	0.72
1997		(6,050.0)		(362.8)		(666.3)		(7,079.1)	0.82
1998		(3482.0)		(247.2)		(445.2)		(4,174.4)	0.94
1999		(1523.4)		(75.7)		(217.0)		(1,816.1)	0.93
2000		(2067.3)		(109.9)		(212.3)		(2,389.5)	0.79
2001		** (1071.8)		** (49.1)		** (205.8)		** (1326.7)	0.90
2002		** (322.1)		** (5.8)		** (47.2)		** (375.0)	

*Numbers in parentheses are computed on a seasonal basis.

**Preliminary.

Table Clb. Distribution of landings (metric tons) in the Gulf of Maine northern shrimp fishery by state and month.

	Season								Season Total	Season								Season Total	
	Dec	Jan	Feb	Mar	Apr	May	Other	Dec		Jan	Feb	Mar	Apr	May	Other				
1986 Season, 203 days, Dec 1 - May 31, extended to June 21										1995 Season, 128 days, Dec 1 - Apr 30, 1 day per week off									
Maine	346.9	747.8	1,405.3	415.4	104.2	149.2	99.4	3,268.2	Maine	747.6	1,397.7	1,338.2	912.0	627.2		5,022.7			
Mass.	154.3	213.4	221.2	200.7	111.2	84.8	150.7	1,136.3	Mass.	210.7	154.0	104.1	111.0	99.0		678.8			
N.H.	57.7	75.9	70.8	14.2	1.3	0.0	10.6	230.5	N.H.	160.6	186.8	118.3	158.5	140.7		764.9			
Total	558.9	1,037.1	1,697.3	630.3	216.7	234.0	260.7	4,635.0	Total	1,118.9	1,738.5	1,560.6	1,181.5	866.9		6,466.4			
1987 Season, 182 days, Dec 1 - May 31										1996 Season, 152 days, Dec 1 - May 31, 1 day per week off									
Maine	485.9	906.2	1,192.7	672.9	287.6	127.9	7.0	3,680.2	Maine	1,124.1	1,678.3	3,004.6	785.2	350.4	794.5	7,737.1			
Mass.	103.5	260.0	384.9	310.2	180.8	182.8	5.7	1,427.9	Mass.	167.9	106.7	188.7	67.8	66.5	60.3	657.9			
N.H.	18.4	53.6	62.8	15.7	7.3	0.0	0.1	157.9	N.H.	189.8	169.5	234.0	81.9	78.8	17.1	771.1			
Total	607.8	1,219.8	1,640.4	998.8	475.7	310.7	12.8	5,266.0	Total	1,481.8	1,954.5	3,427.3	934.9	495.7	871.9	9,166.1			
1988 Season, 183 days, Dec 1 - May 31										1997 Season, 156 days, Dec 1 - May 27, two 5-day and four 4-day blocks off									
Maine	339.7	793.9	788.1	243.6	24.6	67.3	1.2	2,258.4	Maine	1,178.5	1,114.9	1,713.1	758.4	754.8	530.3	6,050.0			
Mass.	14.4	225.8	255.0	104.9	8.6	10.9	0.0	619.6	Mass.	90.2	110.4	111.4	49.0	1.2	0.5	362.7			
N.H.	13.0	72.6	53.7	14.9	0.3	0.0	3.1	157.6	N.H.	185.6	104.1	140.1	108.6	85.8	42.2	666.4			
Total	367.1	1,092.3	1,096.8	363.4	33.5	78.2	4.3	3,035.6	Total	1,454.3	1,329.4	1,964.6	916.0	841.8	573.0	7,079.1			
1989 Season, 182 days, Dec 1 - May 31										1998 Season, 105 days, Dec 8-May 22, weekends off except Mar 14-15, Dec 25-31 and Mar 16-31 off.									
Maine	353.6	770.5	700.6	246.4	218.7	94.2		2,384.0	Maine	511.1	926.8	1,211.1	401.7	228.7	202.6	3,482.0			
Mass.	26.2	197.5	154.9	104.8	160.9	55.6		699.9	Mass.	49.1	78.0	90.5	14.3	15.3	0.0	247.2			
N.H.	28.5	106.9	77.0	15.4	3.7	0.0		231.5	N.H.	89.4	106.9	143.5	54.3	49.0	2.1	445.2			
Total	408.3	1,074.9	932.5	366.6	383.3	149.8		3,315.4	Total	649.6	1,111.7	1,445.1	470.3	293.0	204.7	4,174.4			
1990 Season, 182 days, Dec 1 - May 31										1999 Season, 90 days, Dec 15 - May 25, weekends, Dec 24 - Jan 3, Jan 27-31, Feb 24-28, Mar 16-31, and Apr 29 - May 2 off.									
Maine	512.4	778.2	509.7	638.5	514.0	282.8	0.1	3,235.7	Maine	79.9	192.7	590.8	240.6	204.5	214.9	1,523.4			
Mass.	75.6	344.4	184.8	100.2	158.9	110.0	4.3	978.2	Mass.	25.0	23.8	16.0	2.5	8.4		75.7			
N.H.	111.3	191.7	116.1	30.7	1.4			451.2	N.H.	46.5	63.2	52.2	10.0	36.5	8.6	217.0			
Total	699.3	1,314.3	810.6	769.4	674.3	392.8	4.4	4,665.1	Total	151.4	279.7	659.0	253.1	249.4	223.5	1,816.1			
1991 Season, 182 days, Dec 1 - May 31										2000 Season, 51 days, Jan 17 - Mar 15, Sundays off									
Maine	238.2	509.1	884.0	454.9	251.7	148.2	2.0	2,488.1	Maine	607.4	1,271.4	188.5				2,067.3			
Mass.	90.5	174.7	175.9	131.2	93.3	133.8	1.6	801.0	Mass.	17.4	78.7	13.8				109.9			
N.H.	107.3	104.4	33.8	27.8	7.8	1.0		282.1	N.H.	39.6	131.1	41.6				212.3			
Total	436.0	788.2	1,093.7	613.9	352.8	283.0	3.6	3,571.2	Total	664.4	1,481.2	243.9				2,389.5			
1992 Season, 153 days, Dec 15 - May 15										*2001 Season, 83 days, Jan 9 - Apr 30, Mar 18 - Apr 16 off, experimental offshore fishery in May									
Maine	181.1	880.9	1,278.9	462.5	163.6	87.2		3,054.2	Maine	573.0	436.1	35.9	26.5	0.3		1,071.8			
Mass.	17.1	148.2	73.3	47.5	2.9		0.1	289.1	Mass.	38.5	8.8	1.9	0.0	0		49.1			
N.H.	33.4	47.0	11.9	6.8	1.0			100.1	N.H.	127.4	37.2	12.1	29.0	0		205.8			
Total	231.6	1,076.1	1,364.1	516.8	167.5	87.2	0.4	3,443.7	Total	738.9	482.2	49.8	55.5	0.3		1,326.7			
1993 Season, 138 days, Dec 14 - April 30										*2002 Season, 25 days, Feb 15 - Mar 11									
Maine	100.9	369.0	597.0	297.5	127.8			1,492.2	Maine		253.6	68.5				322.1			
Mass.	19.6	82.0	81.9	62.3	42.0	5.0		292.8	Mass.		3.7	2.1				5.8			
N.H.	33.5	85.4	101.7	77.0	59.8			357.4	N.H.		35.6	11.6				47.2			
Total	154.0	536.4	780.6	436.8	229.6	5.0	0.4	2,142.8	Total		292.8	82.2				375.0			
1994 Season, 122 days, Dec 15 - Apr 15										* Preliminary data									
Maine	171.5	647.7	971.9	399.5	48.7			2,239.3											
Mass.	27.1	68.0	100.8	38.8	12.8			247.5											
N.H.	117.2	124.3	128.7	49.6	8.2			428.0											
Total	315.8	840.0	1,201.4	487.9	69.7			2,914.8											

Table C2. Sample size (number of shrimp lengths measured) of Gulf of Maine northern shrimp port samples.

Month	State	Fishing Season											1985-96		2002
		1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	mean	
Dec	ME	212	67	318	497		502	820	417	278	394	1149	904	505	
	MA	92	441	287	101		446	205		310	269	1611	1528	529	
	NH		602	884	370	639	761	760	306	331	541	560	389	559	
Jan	ME	326	519	849	825	1204	460	2191	2327	2136	1717	1498	2718	1,398	
	MA	1108		426	354	741	1137	819	642	789	903	1342	1231	863	
	NH	283	876	672	674	631	990	953	551	427	418	499	450	619	
Feb	ME	642	283	187	667	898	190	2816	2058	1915	2722	1420	4862	1,555	2618
	MA	776	195	161	512	900	515	726	198	714	277	835	1709	627	573
	NH	585	788	459	517	551	513	336	480	422	439	370	355	485	455
Mar	ME	368	205	127	506	571	1407	1419	1570	1502	1572	944	3378	1,131	927
	MA	830	388	414	149		232	358	652	1133	607		633	540	138
	NH	91	298	499	75		639	508	97	375	550	598	392	375	532
Apr	ME	38	58			303		1076	526	108	563	2789	2882	927	
	MA	647	236	245	81	313	103	377		1009	104			346	
	NH									107		362	186	218	
May	ME				751	1218	226	1031	287				5638	1,525	
	MA		429	75		1382	127	216					648	480	
	NH														
Jun	ME														
	MA		436											436	
	NH		438											438	
Total		5997	6260	5603	6080	9352	8246	14611	10113	11557	11075	13978	27904	13554	3241

Table C3. Sampling intensity (number of lengths per million landed) of Gulf of Maine northern shrimp port samples.

Month	State	Fishing Season												mean
		1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Dec	ME	7.64	2.66	9.11	13.64	--	9.60	44.14	35.76	32.42	24.94	18.66	11.10	19.06
	MA	11.12	31.81	32.95	65.28	--	52.99	25.41	--	160.71	80.81	88.57	96.13	64.58
	NH	--	128.06	569.24	313.23	292.63	72.31	86.60	102.54	85.04	28.01	25.96	19.59	156.66
Jan	ME	4.93	10.22	12.72	15.95	19.75	7.33	55.47	38.06	61.70	30.24	14.16	20.38	24.24
	MA	38.85	--	16.42	23.38	34.63	28.57	42.70	51.82	83.54	108.72	76.62	122.53	57.07
	NH	40.65	150.33	148.04	110.90	85.21	53.83	106.93	133.62	52.92	28.06	26.46	27.29	80.35
Feb	ME	7.30	2.86	2.22	13.06	20.68	3.39	44.76	23.06	45.95	38.63	13.67	19.83	19.62
	MA	35.42	10.67	5.95	28.55	36.86	30.84	30.98	32.37	86.69	29.05	72.24	112.38	42.67
	NH	132.22	147.73	96.69	128.16	105.84	52.33	118.73	388.23	39.22	28.67	25.80	16.88	106.71
Mar	ME	7.93	5.83	2.01	21.01	31.69	27.76	38.63	37.42	53.93	39.46	9.31	43.90	26.57
	MA	37.90	21.47	14.73	18.97	--	20.36	19.28	141.89	174.96	159.56	--	107.30	65.13
	NH	93.53	222.54	311.40	68.12	--	200.26	217.01	150.15	39.88	96.50	31.96	41.47	133.89
Apr	ME	3.03	6.13	--	--	11.10	--	44.35	35.42	10.40	104.25	35.23	75.31	32.52
	MA	118.51	20.50	12.00	98.84	23.24	6.99	36.33	--	198.57	107.81	--	--	69.20
	NH	--	--	--	--	--	--	--	--	13.63	--	95.16	26.22	45.00
May	ME	--	--	--	124.49	106.27	8.37	80.98	30.43	--	--	--	67.16	69.61
	MA	--	36.09	4.21	--	217.45	11.09	9.94	--	--	--	--	64.06	57.14
	NH	--	--	--	--	--	--	--	--	--	--	--	--	--
Jun	ME	--	--	--	--	--	--	--	--	--	--	--	--	--
	MA	--	35.36	--	--	--	--	--	--	--	--	--	--	35.36
	NH	--	567.36	--	--	--	--	--	--	--	--	--	--	567.36
Total		17.00	17.33	13.17	26.61	32.97	18.64	45.62	38.53	59.33	40.96	23.14	34.91	35.78

Table C4. Mean weight (g) of Gulf of Maine northern shrimp from port samples.

Month	State	Fishing Season											mean	
		1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995		1996
Dec	ME	12.120	13.761	13.913	9.327		9.798	12.825	15.531	11.756		12.142	13.793	12.497
	MA	11.087	11.130	11.900	9.307		8.982	11.228		10.161	8.141	8.830	10.560	10.133
	NH		12.276	11.849	11.009	13.042	10.578	12.223	11.189	8.598	6.071	9.759	9.555	10.559
Jan	ME	12.881	14.734	13.568	15.340	12.639	12.401	12.887	14.406	10.658	11.409	13.214	12.582	13.060
	MA	9.959		10.018	14.905	9.228	8.652	9.109	11.962	8.677	8.184	8.790	10.624	10.010
	NH	12.395	13.024	11.815	11.944	14.439	10.425	11.718	11.396	10.591	8.349	9.905	10.278	11.357
Feb	ME	12.456	14.185	14.161	15.421	16.134	9.086	14.050	14.324	14.328	13.793	12.886	12.256	13.590
	MA	10.871	12.076	14.232	14.217	6.346	11.077	7.507	11.962	9.939	10.552	9.007	12.408	10.850
	NH	11.383	13.265	13.219	13.322	14.781	11.850	11.927	9.627	9.456	8.412	8.247	11.133	11.385
Mar	ME	11.323	11.836	10.651	10.113	13.678	12.596	12.387	11.021	10.684	10.029	8.992	10.204	11.126
	MA	10.922	11.103	11.037	13.338		8.808	7.060	10.340	9.617	10.199		11.502	10.393
	NH	11.923	10.600	9.790	13.533		9.629	11.886	10.526	8.190	8.704	8.468	8.654	10.173
Apr	ME	9.321	11.010			8.020		10.376	11.011	12.318	9.021	8.058	9.157	9.810
	MA	10.592	9.670	8.870	10.494	11.948	10.777	8.984		8.263	13.269			10.319
	NH									7.617		7.989	11.111	8.905
May	ME				11.156	8.215	10.469	11.637	9.241				9.465	10.031
	MA		7.133	10.267		8.749	9.606	6.157					5.960	7.979
	NH													9.005
Jun	ME													12.973
	MA		12.223											12.223
	NH		13.723											13.723
mean		11.326	11.984	11.806	12.387	11.435	10.316	10.748	11.734	10.057	9.703	9.714	10.578	10.982

Table C5. Observed northern shrimp discards from the shrimp trawl fishery and finfish trawl fisheries.

Shrimp Trawl Fishery

Fishing Season	Sampled Trips	lb Kept	lb Discarded	Proportion Discarded
1985	1	2400	0	0.000
1986	3	4300	3	0.001
1987	4	3575	0	0.000
1988	9	18935	0	0.000
1989	17	23260	24	0.001
1990	17	22004	0	0.000
1991	37	66936	159	0.002
1992	57	67433	56	0.001
1993	80	91636	32	0.000
1994	80	101625	795	0.008
1995	57	77346	20	0.000
1996	31	49362.5	0	0.000
average				0.001

Large-mesh Fish Trawl Fishery

Year	Sampled Trips	lb Discard	Discard/ Trip (lb)	Discard/ Trip (mt)
1989	63	5	0.08	0.000
1990	36	1	0.03	0.000
1991	71	35	0.49	0.000
1992	56	5	0.09	0.000
1993	25	9	0.36	0.000
1994	15	0	0.00	0.000
1995	43	22	0.51	0.000
1996	22	0	0.00	0.000
1997	10	0	0.01	0.000
average		9	0.17	0.000

Small-mesh Fish Trawl Fishery

Sampled Trips	lb Discard	Discard/ Trip (lb)	Discard/ Trip (mt)
32	30	0.94	0.000
16	0	0.00	0.000
38	43	1.13	0.001
28	11	0.39	0.000
17	0	0.00	0.000
4	0	0.00	0.000
37	1,084	29.30	0.013
47	5,355	113.94	0.052
34	33	0.96	0.000
	728	16.30	0.007

Table C6. Distribution of fishing effort (number of trawl trips) in the Gulf of Maine northern shrimp fishery by state and month.

	Dec	Jan	Feb	Mar	Apr	May	Other	Season Total		Dec	Jan	Feb	Mar	Apr	May	Other	Season Total
1986 Season, 203 days, Dec 1 - May 31, extended to June 21									1995 Season, 128 days, Dec 1 - Apr 30, 1 day per week off								
Maine	590.0	1,309.0	2,798.0	831.0	224.0	133.0	68.0	5,953.0	Maine	879.0	2,341.0	2,641.0	1,337.0	694.0			7,892.0
Mass.	128.0	235.0	225.0	320.0	194.0	133.0	159.0	1,394.0	Mass.	145.0	385.0	275.0	157.0	109.0			1,071.0
N.H.	156.0	163.0	165.0	51.0	3.0		17.0	555.0	N.H.	189.0	331.0	279.0	359.0	344.0			1,502.0
Total	874.0	1,707.0	3,188.0	1,202.0	421.0	266.0	244.0	7,902.0	Total	1,213.0	3,057.0	3,195.0	1,853.0	1,147.0			10,465.0
1987 Season, 182 days, Dec 1 - May 31									1996 Season, 152 days, Dec 1 - May 31, 1 day per week off								
Maine	993.0	2,373.0	3,073.0	2,241.0	617.0	340.0	16.0	9,653.0	Maine	1,341.0	2,030.0	3,190.0	1,461.0	444.0	457.0		8,923.0
Mass.	325.0	354.0	414.0	426.0	283.0	317.0	164.0	2,283.0	Mass.	299.0	248.0	325.0	269.0	106.0	126.0		1,373.0
N.H.	67.0	164.0	175.0	95.0	28.0		32.0	561.0	N.H.	331.0	311.0	389.0	248.0	155.0	61.0		1,495.0
Total	1,385.0	2,891.0	3,662.0	2,762.0	928.0	657.0		12,285.0	Total	1,971.0	2,589.0	3,904.0	1,978.0	705.0	644.0		11,791.0
1988 Season, 183 days, Dec 1 - May 31									1997 Season, 156 days, Dec 1 - May 27, two 5-day and four 4-day blocks off								
Maine	972.0	2,183.0	2,720.0	1,231.0	193.0	122.0		7,421.0	Maine	1,674.0	1,753.0	2,737.0	1,178.0	793.0	530.0		8,665.0
Mass.	28.0	326.0	426.0	315.0	26.0	57.0		1,178.0	Mass.	184.0	226.0	245.0	114.0	7.0	1.0		777.0
N.H.	72.0	231.0	236.0	99.0	3.0			641.0	N.H.	277.0	245.0	301.0	218.0	189.0	62.0		1,292.0
Total	1,072.0	2,740.0	3,382.0	1,645.0	222.0	179.0		9,240.0	Total	2,135.0	2,224.0	3,283.0	1,510.0	989.0	593.0		10,734.0
1989 Season, 182 days, Dec 1 - May 31									1998 Season, 105 days, Dec 8-May 22, weekends off except Mar 14-15, Dec 25-31 and Mar 16-31 off.								
Maine	958.0	2,479.0	2,332.0	936.0	249.0	84.0		7,038.0	Maine	852.0	1,548.0	1,653.0	725.0	346.0	189.0		5,313.0
Mass.	103.0	479.0	402.0	254.0	297.0	102.0		1,637.0	Mass.	94.0	200.0	148.0	70.0	3.0	1.0		515.0
N.H.	120.0	369.0	312.0	69.0	16.0			886.0	N.H.	141.0	216.0	182.0	134.0	83.0	22.0		778.0
Total	1,181.0	3,327.0	3,046.0	1,259.0	562.0	186.0		9,561.0	Total	1,086.0	1,964.0	1,983.0	929.0	432.0	212.0		6,606.0
1990 Season, 182 days, Dec 1 - May 31									1999 Season, 90 days, Dec 15 - May 25, weekends, Dec 24 - Jan 3, Jan 27-31, Feb 24-28, Mar 16-31, and Apr 29 - May 2 off.								
Maine	1,036.0	1,710.0	1,529.0	1,986.0	897.0	238.0		7,396.0	Maine	190.0	556.0	1,125.0	553.0	324.0	172.0		2,920.0
Mass.	147.0	459.0	273.0	202.0	175.0	118.0		1,374.0	Mass.	39.0	57.0	71.0	9.0	40.0			216.0
N.H.	178.0	363.0	284.0	157.0	6.0			988.0	N.H.	82.0	192.0	213.0	44.0	123.0	21.0		675.0
Total	1,361.0	2,532.0	2,086.0	2,345.0	1,078.0	356.0		9,758.0	Total	311.0	805.0	1,409.0	606.0	487.0	193.0		3,811.0
1991 Season, 182 days, Dec 1 - May 31									2000 Season, 51 days, Jan 17 - Mar 15, Sundays off								
Maine	568.0	1,286.0	2,070.0	1,050.0	438.0	139.0		5,551.0	Maine	653.0	1,838.0	401.0					2,892.0
Mass.	264.0	416.0	401.0	231.0	154.0	147.0		1,613.0	Mass.	23.0	100.0	27.0					150.0
N.H.	279.0	285.0	135.0	82.0	22.0	1.0		804.0	N.H.	36.0	179.0	78.0					293.0
Total	1,111.0	1,987.0	2,606.0	1,363.0	614.0	287.0		7,968.0	Total	712.0	2,117.0	506.0					3,335.0
1992 Season, 153 days, Dec 15 - May 15									*2001 Season, 83 days, Jan 9 - Apr 30, Mar 18 - Apr 16 off, experimental offshore fishery in May								
Maine	411.0	1,966.0	2,700.0	1,222.0	318.0	141.0		6,758.0	Maine	1491.0	1209.0	112.0	39.0	6.0			2,857.0
Mass.	59.0	337.0	145.0	101.0	41.0			683.0	Mass.	111.0	46.0	10.0	1.0				168.0
N.H.	96.0	153.0	76.0	29.0	3.0			357.0	N.H.	302.0	142.0	27.0	31.0				502.0
Total	566.0	2,456.0	2,921.0	1,352.0	362.0	141.0		7,798.0	Total	1904.0	1397.0	149.0	71.0	6.0			3,527.0
1993 Season, 138 days, Dec 14 - April 30									*2002 Season, 25 days, Feb 15 - Mar 11								
Maine	249.0	1,102.0	1,777.0	1,032.0	227.0			4,387.0	Maine			502.0	195.0				697.0
Mass.	60.0	200.0	250.0	185.0	72.0			767.0	Mass.			13.0	8.0				21.0
N.H.	76.0	246.0	275.0	256.0	151.0			1,004.0	N.H.			108.0	44.0				152.0
Total	385.0	1,548.0	2,302.0	1,473.0	450.0			6,158.0	Total			623.0	247.0				870.0
1994 Season, 122 days, Dec 15 - Apr 15									* Preliminary data								
Maine	265.0	1,340.0	1,889.0	1,065.0	122.0			4,681.0									
Mass.	58.0	152.0	147.0	83.0	15.0			455.0									
N.H.	169.0	228.0	266.0	173.0	18.0			854.0									
Total	492.0	1,720.0	2,302.0	1,321.0	155.0			5,990.0									

Table C7. Stratified mean numbers and weights, per tow,* of northern shrimp collected during R/V Gloria Michelle summer surveys.

Untransformed					
<u>Year</u>	<u>Total Number</u>	<u>Age-1.5 Number</u>	<u>>22 mm** Number</u>	<u>Weight (kg)</u>	<u>Weight** >22 mm (kg)</u>
1984	3,005	48	826	22.6	8.9
1985	3,531	643	2,262	29.4	22.3
1986	3,327	703	1,688	29.7	19.6
1987	2,441	545	1,360	21.0	15.2
1988	4,310	2,812	1,012	26.6	11.7
1989	3,580	525	1,072	27.3	11.5
1990	3,021	264	2,097	29.4	22.2
1991	1,992	765	1,042	18.2	12.6
1992	1,503	443	625	12.9	7.6
1993	3,569	2,334	772	17.9	8.5
1994	3,435	1,285	849	21.1	9.3
1995	2,856	576	1,238	21.1	13.8
1996	2,651	793	1,223	20.2	13.8
1997	3,161	1,551	1,017	19.8	11.6
1998	2,319	533	676	15.1	7.4
1999	1,648	471	719	11.9	7.8
2000	1,843	997	647	11.9	7.2
2001	870	69	281	6.5	2.9
2002	3,157	2,313	571	15.0	6.3

Log _e Transformed					
<u>Year</u>	<u>Total Number</u>	<u>Age-1.5 Number</u>	<u>>22 mm** Number</u>	<u>Weight (kg)</u>	<u>Weight** >22 mm (kg)</u>
1984	1,152	18	316	10.5	3.4
1985	1,849	337	1,184	17.7	11.7
1986	1,695	358	860	19.6	10.0
1987	1,385	342	854	14.8	9.5
1988	1,269	828	298	12.8	3.4
1989	1,883	276	564	17.0	6.1
1990	1,624	142	1,127	18.1	12.0
1991	1,255	482	657	11.7	8.0
1992	955	282	397	9.4	4.8
1993	1,156	757	250	9.1	2.8
1994	984	368	243	8.7	2.7
1995	1,449	292	628	13.3	7.0
1996	776	232	358	8.8	4.0
1997	762	374	245	7.7	2.8
1998	583	134	170	6.3	1.9
1999	398	114	174	5.8	1.9
2000	807	437	283	6.4	3.2
2001	451	36	146	4.3	1.5
2002	1,446	1,059	261	9.2	2.9

*Based on strata 1, 3, 5, 6, 7 and 8.

**Will be fully recruited to the winter fishery.

Table C8a. Summary of results from Collie-Sissenwine analysis of Gulf of Maine shrimp.

<u>Fishing Season</u>	<u>New Recruits (millions)</u>	<u>Fully-Recruited (millions)</u>	<u>F (NR+FR)</u>	<u>Biomass (mt)</u>
1985	987	947	0.09	14,051
1986	1,179	1,370	0.28	21,719
1987	985	1,498	0.40	22,499
1988	757	1,299	0.48	18,799
1989	1,177	987	0.18	14,220
1990	1,313	1,403	0.33	20,637
1991	829	1,519	0.44	22,190
1992	608	1,177	0.46	16,962
1993	512	881	0.42	12,396
1994	711	713	0.32	9,199
1995	975	809	0.33	12,378
1996	883	1,003	0.65	15,516
1997	534	764	0.87	11,008
1998	510	425	0.62	6,728
1999	408	391	0.46	5,791
2000	303	393	0.28	5,658
2001	445	409	0.40	6,238
2002	358	448	-0.01	6,110
2003	1,001	634		9,244
1985-1995 average	912	1,146	0.34	16,823
2000-2003 average	527	471	0.22	6,812

Table C8b. Summary of input and output from Collie-Sissenwine analysis of Gulf of Maine shrimp.

Northern Shrimp using Summer Survey	Survey Year*	Indices of Abundance		Total Catch Millions
		Recruits	Full Recruits	
	1984	447.5580	479.0570	352.7928
	1985	619.4560	925.4300	361.1710
	1986	533.2920	848.5440	425.2945
	1987	482.8980	766.9030	228.4345
	1988	459.7550	387.7140	283.6468
	1989	701.0930	817.9000	442.4292
	1990	511.5210	907.5220	320.2898
	1991	374.2770	612.0870	262.4338
	1992	313.5950	444.3580	194.7883
	1993	410.1960	320.7500	270.4058
	1994	368.5900	364.3020	615.3185
	1995	485.7860	653.3320	799.3678
	1996	257.6520	348.6160	718.4332
	1997	257.2980	267.1010	373.6801
	1998	217.1340	226.6420	215.1221
	1999	137.3900	174.6070	209.2793
	2000	276.2810	288.1930	141.4937
	2001	171.8090	196.3560	38.6779
	2002	550.6000	372.9300	

* Survey Year Data are applied to the following Fishing Year

Input File Name	R2002.dat
Tuning Dataset	Survey
Time of Survey (yr)	0
Time of Catch (yr)	0.5
Natural Mortality Rate	0.25
Relative Catchability: Recruits to Full Recruits s_r	0.7 - 1.0
Catchability Estimate and CV	0.550 0.16
Average Partial Recruitment Rate to Fishery	0.63
Average Z_all sizes (1999-2001)	0.59
Average Z_all sizes (2000-2001)	0.44

Survey Year*	Stock Size Estimates millions at time of Survey		Total Mortality Z all sizes	Fishing Mortality All Sizes
	Recruits	Full Recruits		
1984	986.8	947.3	0.34	0.09
1985	1179.3	1369.9	0.53	0.28
1986	984.7	1497.6	0.65	0.40
1987	757.5	1298.8	0.73	0.48
1988	1176.6	987.2	0.43	0.18
1989	1313.2	1402.9	0.58	0.33
1990	829.4	1519.4	0.69	0.44
1991	608.2	1177.1	0.71	0.46
1992	511.5	881.3	0.67	0.42
1993	711.4	712.6	0.57	0.32
1994	975.1	808.6	0.58	0.33
1995	883.4	1002.7	0.90	0.65
1996	534.0	764.1	1.12	0.87
1997	510.5	424.6	0.87	0.62
1998	408.2	391.5	0.71	0.46
1999	303.4	392.8	0.53	0.28
2000	445.1	409.4	0.65	0.40
2001	357.9	447.9	0.24	-0.01
2002	1000.6	634.2		

Note that the recruit abundance index for the last year is NOT used in the least squares estimation. It is, however, used in conjunction with the least squares estimate of q_n and the selectivity of the recruits to calculate recruit population size in 2001

* Survey Year Data are applied to the following Fishing Year

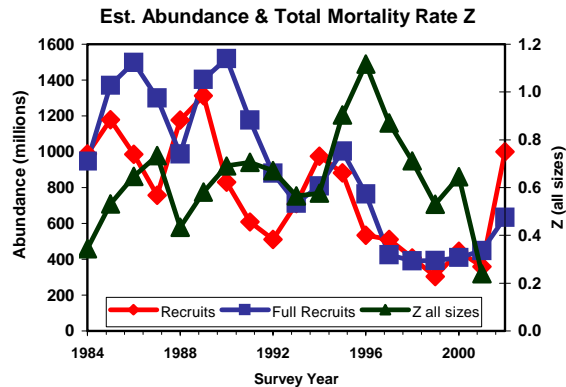
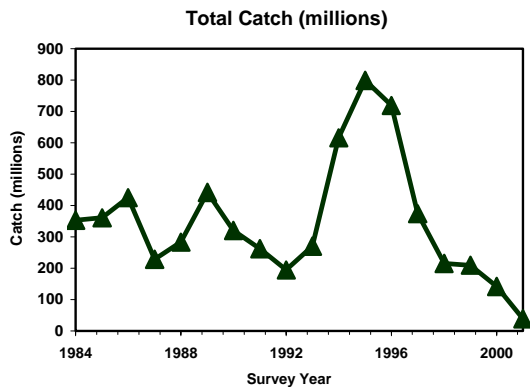


Table C9. Summary of CSA retrospective analyses.

Retrospective CSA Runs

BL	1984 - 2001
R1	1985 - 2001
R2	1986 - 2001
R3	1987 - 2001
R4	1988 - 2001
R5	1989 - 2001
R6	1984 - 2000
R7	1984 - 1999
R8	1984 - 1998
R9	1984 - 1997
R10	1984 - 1996

Fishing Mortality

Year	BL	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
1984	0.09						0.10	0.09	0.10	0.09	0.09
1985	0.28	0.31					0.28	0.28	0.28	0.28	0.28
1986	0.4	0.41	0.38				0.40	0.40	0.40	0.40	0.40
1987	0.48	0.18	0.18	0.17	0.13		0.18	0.18	0.18	0.18	0.18
1989	0.33	0.33	0.33	0.33	0.32	0.32	0.33	0.33	0.33	0.33	0.33
1990	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44
1991	0.46	0.46	0.46	0.46	0.45	0.45	0.46	0.45	0.46	0.46	0.46
1992	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
1993	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
1994	0.33	0.33	0.33	0.32	0.32	0.32	0.33	0.32	0.33	0.32	0.32
1995	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.66	0.65	0.65
1996	0.87	0.88	0.87	0.86	0.85	0.85	0.87	0.85	0.89	0.85	0.85
1997	0.62	0.63	0.62	0.62	0.61	0.61	0.62	0.61	0.64	0.58	
1998	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.44	0.52		
1999	0.28	0.29	0.28	0.28	0.27	0.27	0.29	0.22			
2000	0.40	0.40	0.40	0.39	0.39	0.39	0.41				
2001	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01					

Table C9 (cont.). Summary of CSA retrospective analyses

Abundance of Recruits

Year	BL	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
1984	986.79						983.33	1010.69	963.94	1001.53	1003.43
1985	1179.3	1143.61					1175.02	1208.87	1151.03	1197.53	1199.89
1986	984.66	965.48	991.53				981.05	1009.6	960.82	1000.04	1002.02
1987	757.48	744.57	755.68	773.71			754.62	777.23	738.59	769.66	771.23
1988	1176.59	1157.57	1174.01	1199.77	1280.87		1172.38	1205.65	1148.81	1194.51	1196.83
1989	1313.15	1292.19	1309.04	1331.99	1373.48	1361.49	1308.42	1345.83	1281.92	1333.3	1335.9
1990	829.43	815.8	826.6	840.84	862.94	858.72	826.34	850.76	809.04	842.58	844.28
1991	608.2	598.24	606.12	616.47	632.24	629.44	605.95	623.79	593.29	617.82	619.06
1992	511.52	503.25	509.78	518.37	531.37	529.1	509.64	524.46	499.14	519.51	520.54
1993	711.37	701.04	709.2	719.93	736.18	733.36	709.02	727.56	695.9	721.4	722.7
1994	975.13	965.95	973.2	982.85	997.74	995.13	973.03	989.84	961.26	984.54	985.79
1995	883.44	876.04	881.88	889.69	901.82	899.7	881.74	895.48	871.96	891.88	893.06
1996	534.01	530.71	533.31	536.83	542.41	541.43	533.23	539.64	528.33	539.19	539.99
1997	510.46	505.01	509.31	515.02	523.78	522.25	509.12	520.3	497.9	526.4	529.21
1998	408.2	402.66	407.04	412.8	421.57	420.05	406.67	420.31	387.43	445.67	
1999	303.41	299.43	302.58	306.73	313.03	311.94	301.9	317.48	270.35		
2000	445.05	437.94	443.56	450.94	462.1	460.17	439.25	515.49			
2001	357.93	352.02	356.69	362.81	372.06	370.46	345.59				
2002	1000.64	983.57	997.06	1014.75	1041.45	1036.85					

Abundance of Post-Recruits

Year	BL	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
1984	947.28						943.94	970.32	925.25	961.49	963.32
1985	1369.94	1503.03					1364.46	1407.76	1333.76	1393.26	1396.27
1986	1497.65	1512.24	1376.96				1491.6	1539.39	1457.72	1523.39	1526.72
1987	1298.84	1285.18	1264.24	1148.23			1293.37	1336.64	1262.68	1322.15	1325.16
1988	987.19	971.84	976.01	958.62	746.53		983.12	1015.31	960.28	1004.53	1006.77
1989	1402.9	1378.73	1395.6	1411.33	1383.83	1424.56	1397.25	1441.86	1365.62	1426.93	1430.03
1990	1519.36	1492.03	1513.07	1539.07	1565.46	1569.96	1513.13	1562.43	1478.17	1545.92	1549.35
1991	1177.07	1155.86	1172.49	1193.93	1223.27	1220.34	1172.25	1210.32	1145.26	1197.58	1200.23
1992	881.33	865.41	877.96	894.34	918.33	914.71	877.72	906.26	857.48	896.72	898.71
1993	712.55	700.08	709.93	722.83	742.12	738.93	709.73	732.08	693.86	724.63	726.19
1994	808.58	795.64	805.87	819.28	839.48	836.03	805.65	828.86	789.14	821.24	822.88
1995	1002.71	988.84	999.79	1014.24	1036.23	1032.43	999.55	1024.7	981.57	1017.18	1019.13
1996	764.06	754.71	762.1	771.88	786.87	784.27	761.91	779.23	748.98	775.97	777.7
1997	424.61	416.57	422.92	431.33	444.19	441.96	422.73	438.01	410.26	438.2	440.36
1998	391.46	383.69	389.83	397.93	410.25	408.12	389.52	406.03	371.42	420.06	
1999	392.76	385.58	391.26	398.72	410.04	408.08	390.47	412.56	352.2		
2000	409.36	401.18	407.64	416.14	428.98	426.77	405.07	454.33			
2001	447.86	439.23	446.05	454.99	468.5	466.17	435.15				
2002	634.18	622.73	631.78	643.65	661.58	658.49					

Table C9 (cont.). Summary of CSA retrospective analyses

Biomass of Recruits

Year	BL	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
1984	6.31						6.29	6.47	6.17	6.41	6.42
1985	8.85	8.58					8.82	9.07	8.64	8.99	9.00
1986	7.07	6.93	7.12				7.04	7.25	6.90	7.18	7.19
1987	5.48	5.39	5.47	5.60			5.46	5.62	5.35	5.57	5.58
1988	5.74	5.65	5.73	5.85	6.25		5.72	5.88	5.61	5.83	5.84
1989	8.71	8.57	8.69	8.84	9.11	9.03	8.68	8.93	8.51	8.85	8.86
1990	6.84	6.73	6.82	6.93	7.11	7.08	6.81	7.01	6.67	6.95	6.96
1991	4.08	4.02	4.07	4.14	4.25	4.23	4.07	4.19	3.98	4.15	4.16
1992	3.36	3.31	3.35	3.41	3.49	3.48	3.35	3.45	3.28	3.42	3.42
1993	3.31	3.26	3.30	3.35	3.42	3.41	3.29	3.38	3.23	3.35	3.36
1994	5.68	5.62	5.67	5.72	5.81	5.79	5.67	5.76	5.60	5.73	5.74
1995	5.98	5.93	5.97	6.02	6.10	6.09	5.97	6.06	5.90	6.04	6.04
1996	3.51	3.49	3.50	3.53	3.56	3.56	3.50	3.55	3.47	3.54	3.55
1997	2.75	2.72	2.75	2.78	2.83	2.82	2.75	2.81	2.69	2.84	2.86
1998	2.46	2.43	2.46	2.49	2.54	2.53	2.45	2.54	2.34	2.69	
1999	2.00	1.97	1.99	2.02	2.06	2.05	1.99	2.09	1.78		
2000	2.44	2.40	2.43	2.47	2.53	2.52	2.40	2.82			
2001	2.38	2.34	2.37	2.41	2.47	2.46	2.30				
2002	4.48	4.41	4.47	4.55	4.67	4.65					

Biomass of Post-Recruits

Year	BL	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
1984	7.74						7.71	7.92	7.56	7.85	7.87
1985	12.87	14.12					12.82	13.22	12.53	13.09	13.12
1986	15.43	15.58	14.19				15.37	15.86	15.02	15.69	15.73
1987	13.32	13.18	12.96	11.77			13.26	13.70	12.95	13.56	13.59
1988	8.48	8.35	8.38	8.23	6.41		8.44	8.72	8.25	8.63	8.65
1989	11.92	11.72	11.86	12.00	11.76	12.11	11.88	12.26	11.61	12.13	12.16
1990	15.35	15.08	15.29	15.55	15.82	15.86	15.29	15.79	14.94	15.62	15.65
1991	12.88	12.65	12.83	13.06	13.38	13.35	12.83	13.24	12.53	13.10	13.13
1992	9.03	8.87	9.00	9.17	9.41	9.38	9.00	9.29	8.79	9.19	9.21
1993	5.89	5.79	5.87	5.98	6.14	6.11	5.87	6.06	5.74	5.99	6.01
1994	6.70	6.59	6.68	6.79	6.96	6.93	6.68	6.87	6.54	6.81	6.82
1995	9.54	9.40	9.51	9.65	9.86	9.82	9.51	9.75	9.34	9.67	9.69
1996	7.50	7.41	7.48	7.58	7.72	7.70	7.48	7.65	7.35	7.62	7.63
1997	3.97	3.90	3.96	4.04	4.16	4.14	3.96	4.10	3.84	4.10	4.12
1998	3.33	3.26	3.31	3.38	3.49	3.47	3.31	3.45	3.16	3.57	
1999	3.66	3.60	3.65	3.72	3.82	3.81	3.64	3.85	3.28		
2000	3.80	3.73	3.79	3.87	3.98	3.96	3.76	4.22			
2001	3.73	3.66	3.71	3.79	3.90	3.88	3.62				
2002	4.76	4.67	4.74	4.83	4.96	4.94					

Table C10. Summary of biomass dynamics model input data, results, and parameter estimates.

Fishing Season	Input				Results			
	Autumn	Maine	Summer	Catch (mt)	Biomass (mt)	F	Parameter	Estimate
1968	1.8	45.8		5,708	46,330	0.126	B1969	45,750
1969	4.5	31.2		12,140	44,520	0.3	K (mt)	59,850
1970	3.1	40.8		11,330	36,960	0.337	r	0.3345
1971	3.5	9.4		10,590	30,750	0.38	q autumn	0.0915
1972	3.4	7.0		11,220	25,300	0.514	q Maine	0.4831
1973	5.1	7.8		9,691	18,860	0.614	q summer	0.6866
1974	10.0	4.9		8,024	13,160	0.773		
1975	6.8	6.7		6,142	8,075	1.103	MSY	5,004
1976	2.3	4.8		1,387	3,660	0.392	Bmsy	29,920
1977	1.9	1.6		372	3,416	0.097	Fmsy	0.1672
1978	0.0	3.2		17	4,276	0.003	Ratio of B(2003) to Bmsy	0.4872
1979	1.0	4.4		487	5,838	0.074	Ratio of F(2002) to Fmsy	0.1722
1980	0.7	2.7		339	7,363	0.04	B2003	14,580
1981	0.7	3.0		1,071	9,505	0.103	F2002	0.029
1982	5.1	2.0		1,530	11,400	0.124		
1983	1.4	4.2		1,397	13,230	0.097		
1984	1.6		10.5	2,951	15,600	0.183		
1985	2.6		17.7	4,131	16,710	0.247		
1986	1.9		19.6	4,635	16,740	0.281		
1987	3.1		15.4	5,253	16,220	0.338		
1988	2.5		12.8	3,031	14,930	0.197		
1989	1.8		17.0	3,315	15,840	0.204		
1990	2.3		18.1	4,662	16,600	0.286		
1991	3.8		11.7	3,571	16,030	0.219		
1992	5.9		9.4	3,444	16,550	0.204		
1993	1.3		9.1	2,143	17,290	0.116		
1994	1.3		8.7	2,915	19,540	0.143		
1995	3.6		13.3	6,466	21,270	0.318		
1996	8.2		8.8	9,166	19,440	0.547		
1997	5.3		7.7	7,154	14,420	0.576		
1998	1.8		6.3	4,174	10,650	0.419		
1999	0.7		5.8	1,816	9,334	0.185		
2000	1.7		6.4	2,389	10,350	0.224		
2001	2.1		4.3	1,327	10,970	0.111		
2002			9.2	375	12,930	0.026		

Table C11. Yield and egg production per recruit of Gulf of Maine northern shrimp.

For an example fishing mortality $F = 0.20$, natural mortality $M = 0.25$, and 1,000 age 0 recruits.

Input Data							Results						
Age	Length (mm)	Transition Rate (% Fem)	Fishery Selectivity	Male wt (g)	Female wt (g)	Fecundity at length	Total N	Male N	Female N	Male Catch	Female Catch	Yield (g)	Egg Production
1	11.17	0	0.033	0.84	1.24	0	774	774	0	4	0	4	0
2	18.43	0	0.230	3.79	4.82	0	575	575	0	31	0	117	0
3	23.50	0.081	0.579	7.87	9.30	1,286	399	367	32	56	0	439	41,581
4	27.04	0.922	0.799	12.00	13.58	1,876	265	21	244	48	4	635	458,156
5	29.51	0.997	0.893	15.60	17.19	2,287	173	0	172	3	35	657	393,661
6	31.23	1.000	0.933	18.50	20.04	2,574	112	0	111	0	26	523	287,027
7	32.43	1.000	1.000	20.72	22.19	2,775	71	0	71	0	18	399	197,299
total												2,773	1,377,725
total/recruit												2.773	1,378
% of max													57.52

Ref. Point	F	YPR	%EPR	Count per pound		
				Age	Male	Female
F_{max}	0.77	4.25	14.77	1	540	366
$F_{0.1}$	0.46	3.99	29.83	2	120	94
$F_{example}$	0.20	2.77	57.52	3	58	49
$F_{50\%}$	0.25	3.14	50	4	38	33
$F_{40\%}$	0.34	3.62	40	5	29	26
$F_{30\%}$	0.45	3.97	30	6	25	23
$F_{20\%}$	0.63	4.21	20	7	22	20
$F_{10\%}$	0.95	4.21	10			