

TRENDS IN LENGTH COMPOSITION AND LANDINGS IN THE CALIFORNIA  
COMMERCIAL ROCKFISH FISHERY FROM 1978-1988

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In this document we summarize, for 11 species of rockfish (genus Sebastes), the changes in mean length and landings which have occurred in the California trawl fishery from 1978 through 1988. A detailed description of the methods and results of this study, including results for the individual ports, has been published elsewhere (Pearson and Ralston, 1990). The data were obtained through a port sampling program run jointly by the National Marine Fisheries Service and the California Department of Fish and Game. The port sample data were expanded using a method developed by Sen (1986) to estimate the length composition, species composition, total landings, and sex ratio of the fishery.

Total landings for the 11 rockfish species generally have declined since the peak years of 1980-82. The decline however, is not equally evident at all ports nor for all species of rockfish (Table 1). Peak landing years for S. entomelas (the single most important species) were quite similar among ports. Other species, particularly S. rufus and S. melanostomus show no similarity in peak landing years among ports and no discernible pattern among years. Species composition has varied substantially among years. Sebastes entomelas and S. paucispinus constitute a smaller fraction of the total landings in recent years than during 1978-82. Sebastes goodei and S. crameri have increased in relative importance in recent years.

Using a simple linear regression of length over time most species showed a reduction in mean length during the 11 year study period, with both sexes of S. flavidus, S. pinniger, and female S. goodei showing the sharpest declines (Fig. 1). Strong declines in mean length were also observed for S. crameri and S. entomelas. Changes in mean length were not uniform at all ports or between sexes and were sometimes due to recruitment fluctuations (Pearson and Ralston, 1990).

Comparison of the 1978 and 1988 length distributions shows that changes in mean length were due not only to relatively fewer large fish in the landings, but also a decrease in the minimum size landed (Fig. 2). The latter change may reflect increased market acceptance of small fish and could be due to changes in areas fished or discard practices. Both changes in length distributions are suggestive of significant fishing pressure. Ralston et al. (1990) related changes in mean length to simulated levels of fishing mortality and concluded that California rockfish stocks were likely to have experienced substantial fishing pressure. We recommend that management of the California rockfish fishery be reexamined in light of these results.

### Literature Cited

- Pearson, D.E. and S. Ralston. 1990. Trends in landings, species composition, length-frequency distributions, and sex ratios of 11 rockfish species (genus Sebastes) from central and northern California ports (1978-88). U.S. Dept. Comm., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-145, 65p.
- Ralston, S., A.D. MacCall, D.E. Pearson. 1990. Reduction in mean length and exploitation of central and northern California. IN Status of the Pacific Coast Groundfish Fishery Through 1990 and Recommended Acceptable Biological Catches for 1991.
- Sen, A.R. 1986. Methodological problems in sampling commercial rockfish landings. Fish. Bull., U.S. 84(2): 409-421.

Table 1. Estimated landing weight (metric tons) of rockfish (*Sebastes* spp.) at six ports as estimated by the California cooperative groundfish survey. - indicates not sampled

S. aurora

Year	Morro Bay	Monterey	San Francisco	Bodega Bay	Fort Bragg	Eureka	Total
1978	-	1.8	0	-	1.8	0	3.6
1979	-	0	1.9	-	0	0.2	2.1
1980	2.9	0	0.6	-	0.2	1.3	5.0
1981	0	0	0	0	0	0.2	0.2
1982	0.9	5.4	0	3.1	0.1	6.9	16.3
1983	0	7.3	0	0	36.0	5.5	48.8
1984	0.3	0.7	0	0	9.6	9.1	19.7
1985	20.5	4.0	0	0	7.5	16.1	48.2
1986	9.9	5.5	0	0	6.2	24.9	46.5
1987	0	0	0	0.2	1.2	6.4	7.8
1988	0.9	11.2	0	1.4	1.3	5.9	20.7

S. chlorostictus

Year	Morro Bay	Monterey	San Francisco	Bodega Bay	Fort Bragg	Eureka	Total
1978	-	6.6	8.3	-	9.3	8.7	33.0
1979	-	0	9.5	-	13.4	8.4	31.4
1980	1.8	3.9	2.7	-	7.6	5.5	21.6
1981	12.2	4.1	0.7	0	10.9	109.1	137.0
1982	0	1.0	8.1	0	26.6	19.1	54.7
1983	1.4	1.2	0.5	0	27.3	27.2	57.6
1984	2.1	6.0	3.4	5.9	25.3	14.5	57.2
1985	3.4	7.3	2.4	0.9	46.1	19.5	79.6
1986	1.4	2.6	0	0	14.9	5.8	24.7
1987	2.3	0	0.5	10.1	30.2	10.6	53.7
1988	0.9	2.4	0.5	93.4	30.1	5.7	133.1

S. crameri

Year	Morro Bay	Monterey	San Francisco	Bodega Bay	Fort Bragg	Eureka	Total
1978	-	4.4	0	-	37.7	0	42.1
1979	-	0.2	1.7	-	13.2	74.6	89.7
1980	0	0	13.8	-	10.2	26.9	50.8
1981	0	0.4	0	0	173.7	109.1	283.2
1982	29.0	121.0	3.0	0	13.5	236.9	403.4
1983	20.9	16.4	0	0	220.3	187.5	445.1
1984	8.3	68.7	0	54.1	215.3	219.7	566.0
1985	14.8	52.2	13.2	108.4	219.7	484.3	892.6
1986	31.0	43.5	0	21.5	74.7	167.8	338.5
1987	9.4	5.4	15.7	61.9	28.6	1444.2	1565.1
1988	13.1	2.2	1.6	7.2	118.7	567.5	710.2

S. diploproa

Year	Morro Bay	Monterey	San Francisco	Bodega Bay	Fort Bragg	Eureka	Total
1978	-	108.6	0.1	-	18.6	7.3	134.6
1979	-	2.6	4.7	-	33.5	13.0	53.8
1980	6.4	0.8	531.3	-	8.5	3.4	550.4
1981	11.9	16.4	154.6	0	43.9	4.4	231.2
1982	12.0	157.1	39.9	0	3.8	13.3	226.2
1983	89.7	200.0	62.3	0	37.8	23.9	413.9
1984	43.5	138.2	90.4	35.1	94.6	82.5	484.2
1985	96.8	124.8	164.4	35.5	76.5	79.3	577.2
1986	27.8	73.3	6.5	2.9	31.0	37.7	179.3
1987	2.2	4.1	9.3	4.5	35.8	24.6	80.6
1988	3.0	9.9	0	8.3	20.1	15.8	57.1

Table 1 cont.

S. entomelas

Year	Morro Bay	Monterey	San Francisco	Bodega Bay	Fort Bragg	Eureka	Total
1978	-	9.3	18.3	-	109.2	365.1	501.9
1979	-	28.5	86.3	-	15.1	2195.0	2324.9
1980	112.9	140.1	4.9	-	28.7	5314.3	5600.8
1981	110.1	316.4	777.6	1001.5	149.0	3402.1	5756.6
1982	85.2	821.5	2118.5	3286.2	280.1	3547.6	10139.0
1983	23.0	145.5	50.4	972.3	140.4	2418.6	3750.2
1984	49.9	55.2	75.7	483.3	206.5	1790.0	2660.4
1985	5.7	59.3	44.6	278.0	128.2	2021.2	2537.1
1986	7.1	6.7	0.2	182.7	280.1	1435.6	1912.4
1987	2.4	10.1	8.1	162.6	536.0	1300.9	2020.0
1988	17.5	17.1	12.1	195.9	126.7	633.7	1003.0

S. flavidus

Year	Morro Bay	Monterey	San Francisco	Bodega Bay	Fort Bragg	Eureka	Total
1978	-	1.2	10.3	-	1.6	292.5	305.6
1979	-	0.7	92.2	-	0.1	53.9	146.9
1980	0.4	64.3	2.4	-	2.5	24.9	94.5
1981	15.2	98.3	109.0	0	104.5	218.9	545.9
1982	17.2	43.1	2.0	63.9	95.1	85.5	306.8
1983	26.2	10.2	5.4	0	84.3	282.9	409.0
1984	0.4	3.5	48.4	70.9	37.9	333.9	495.0
1985	1.2	1.8	22.0	4.9	3.2	155.8	188.8
1986	0	0.1	12.1	20.1	16.0	85.9	134.2
1987	0	0	0	2.8	31.2	141.1	175.1
1988	0	5.4	0	11.8	50.8	11.2	79.2

S. goodei

Year	Morro Bay	Monterey	San Francisco	Bodega Bay	Fort Bragg	Eureka	Total
1978	-	255.9	391.4	-	485.4	169.5	1275.2
1979	-	518.2	327.6	-	396.3	175.3	1417.3
1980	370.7	875.4	693.0	-	1196.0	26.4	3161.5
1981	371.0	413.0	894.1	0.4	479.5	204.2	2362.2
1982	292.5	233.4	399.9	103.0	390.5	188.3	1607.6
1983	160.7	307.2	249.3	740.3	356.0	180.0	1993.4
1984	233.6	423.4	825.1	408.5	466.8	91.2	2448.5
1985	224.0	516.9	454.5	250.7	268.9	92.8	1807.9
1986	156.9	453.1	139.7	105.0	133.9	85.0	1073.6
1987	132.6	391.5	400.3	53.3	414.7	75.7	1468.1
1988	326.5	271.3	139.3	476.6	409.1	71.1	1694.0

S. melanostomus

Year	Morro Bay	Monterey	San Francisco	Bodega Bay	Fort Bragg	Eureka	Total
1978	-	57.7	0	-	2.6	0	60.3
1979	-	0	0	-	3.4	0	3.4
1980	16.4	38.4	0	-	2.2	0	57.0
1981	6.1	2.1	60.5	0	4.3	0	72.9
1982	5.4	153.8	5.7	9.0	12.7	0	186.6
1983	44.2	35.9	23.1	0	85.6	4.0	192.9
1984	8.3	13.7	9.0	11.2	7.4	0.5	50.1
1985	38.6	35.5	4.2	1.6	66.5	0	146.1
1986	60.8	53.7	0	19.4	10.8	0.8	145.5
1987	20.8	3.5	1.7	20.0	7.1	10.5	63.6
1988	153.8	9.6	0	9.7	5.8	42.2	221.1

Table 1 cont.

S. paucispinis

Year	Morro Bay	Monterey	San Francisco	Bodega Bay	Fort Bragg	Eureka	Total
1978	-	576.1	652.3	-	497.0	120.8	1846.1
1979	-	909.3	908.7	-	86.6	57.2	1961.9
1980	947.9	1383.3	909.5	-	307.4	103.0	3651.1
1981	573.5	694.1	520.6	86.1	870.4	1848.9	4593.6
1982	697.9	540.6	1006.0	316.1	700.2	494.8	3755.5
1983	430.6	571.8	468.1	1071.4	937.2	404.6	3883.7
1984	219.1	532.6	940.9	1081.8	479.3	175.8	3429.5
1985	67.9	172.0	298.6	176.1	192.9	207.7	1115.2
1986	117.0	436.9	110.7	74.2	161.7	88.5	989.2
1987	185.5	246.8	345.7	44.5	293.0	96.0	1211.6
1988	192.0	211.5	88.2	301.6	264.1	73.9	1131.3

S. pinniger

Year	Morro Bay	Monterey	San Francisco	Bodega Bay	Fort Bragg	Eureka	Total
1978	-	6.9	48.9	-	209.8	379.8	645.4
1979	-	0.1	3.7	-	202.6	89.2	295.6
1980	5.7	6.3	61.2	-	125.0	133.4	331.7
1981	25.3	11.8	0	0	108.3	887.1	1032.5
1982	1.4	0	5.5	17.1	199.4	362.9	586.3
1983	15.1	2.0	1.0	41.3	225.3	324.4	609.0
1984	0.5	1.5	20.7	88.1	32.7	210.9	354.4
1985	1.6	4.2	7.5	99.3	77.3	146.3	336.3
1986	0	0.8	0	30.8	37.3	88.3	157.2
1987	0	0	0	17.3	99.2	90.5	207.1
1988	0.1	0.3	0	55.6	55.2	66.2	177.4

S. rufus

Year	Morro Bay	Monterey	San Francisco	Bodega Bay	Fort Bragg	Eureka	Total
1978	-	106.6	0.5	-	33.4	0	140.4
1979	-	0	0	-	0.5	54.4	54.9
1980	8.6	5.3	0	-	8.4	0	22.3
1981	114.0	115.6	0	0	200.1	0	429.7
1982	243.6	548.7	42.7	0	1.8	3.9	840.7
1983	207.4	73.3	50.2	0.3	384.7	29.2	745.1
1984	127.0	229.5	73.4	562.8	378.8	9.1	1380.6
1985	47.4	101.5	214.6	384.0	29.8	11.5	788.9
1986	582.7	42.4	16.1	16.4	71.0	1.5	730.2
1987	155.9	40.8	41.2	79.7	16.1	65.5	399.2
1988	212.7	5.1	14.9	10.3	80.6	103.1	426.7

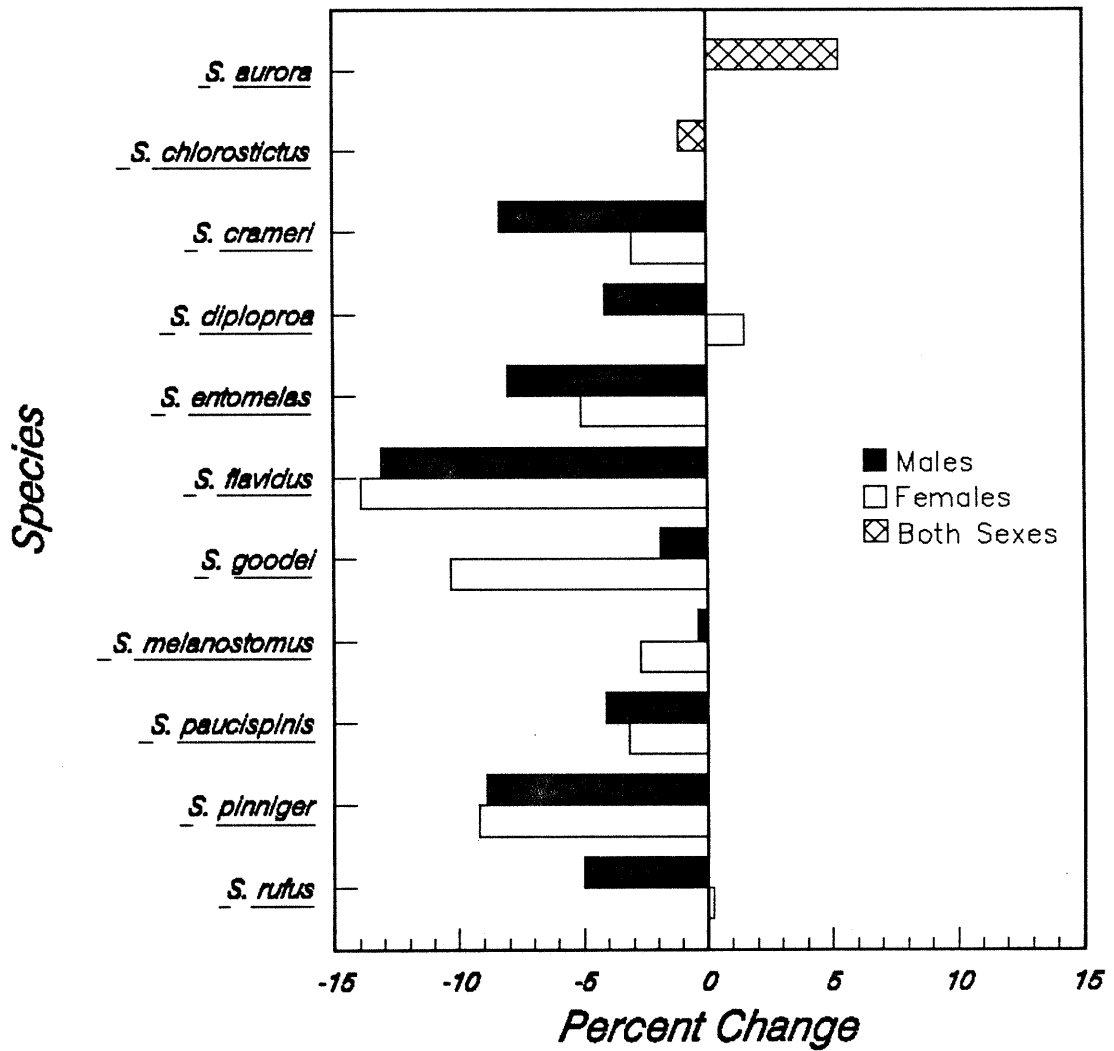


Figure 1. Percent reduction in mean total length from 1978 to 1988 for 11 species of rockfish. Data for all ports combined. Male and female lengths were combined for *S. aurora* and *S. chlorostictus* since lengths were found to be similar.

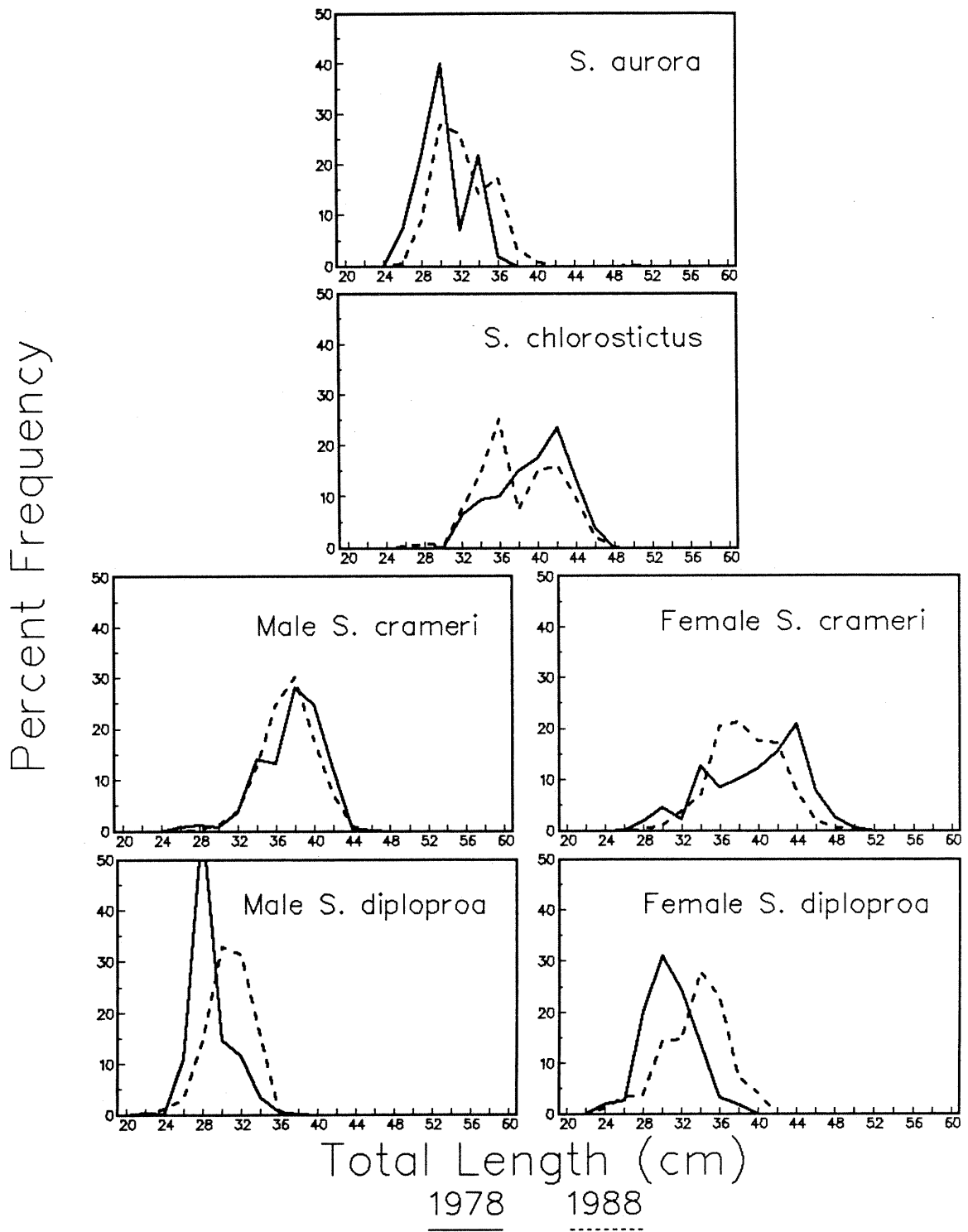


Figure 2. Length frequency distributions for eleven species of rockfish (genus *Sebastes*) from the California commercial landings for 1978 and 1988.

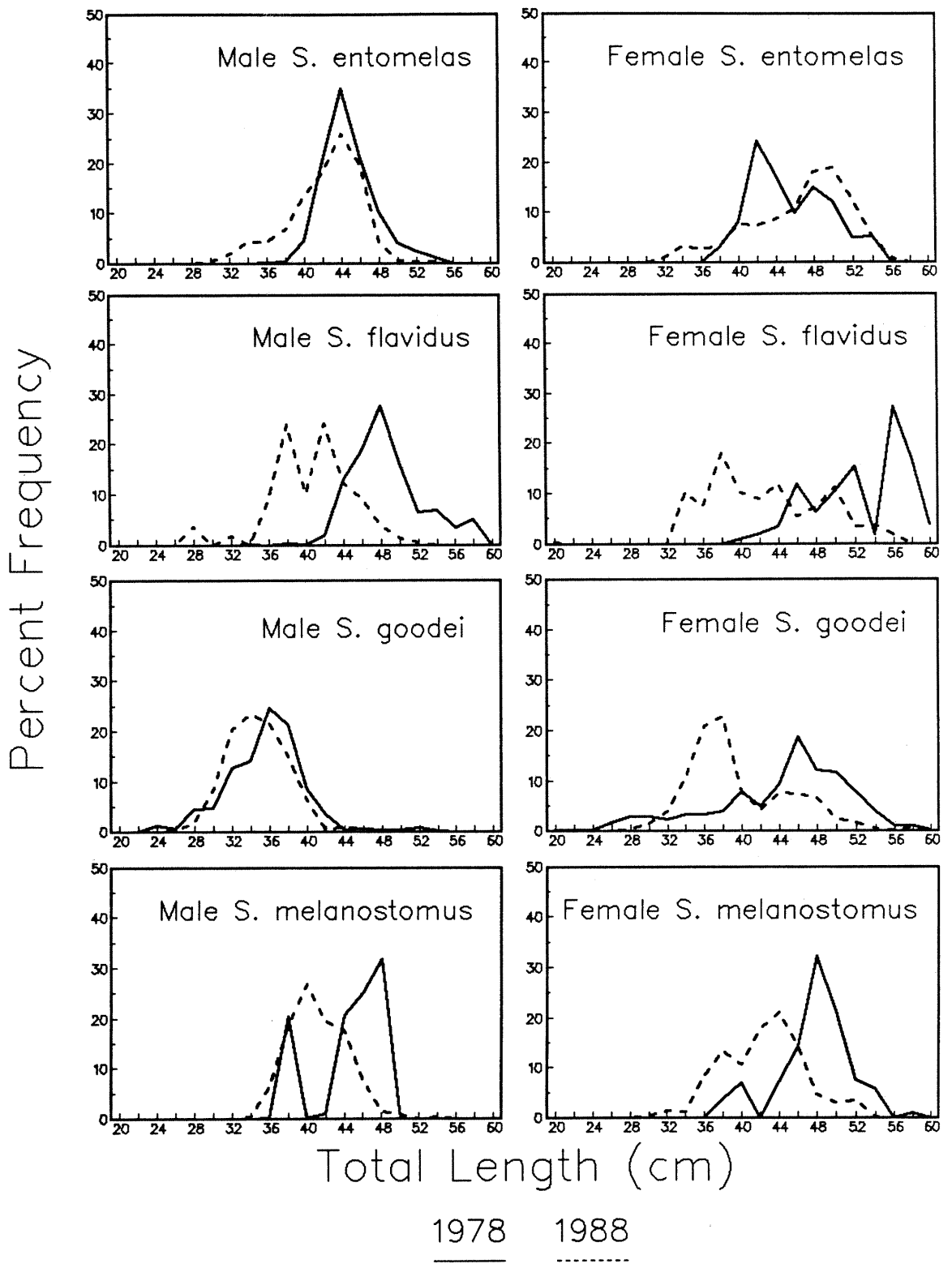


Figure 2 continued



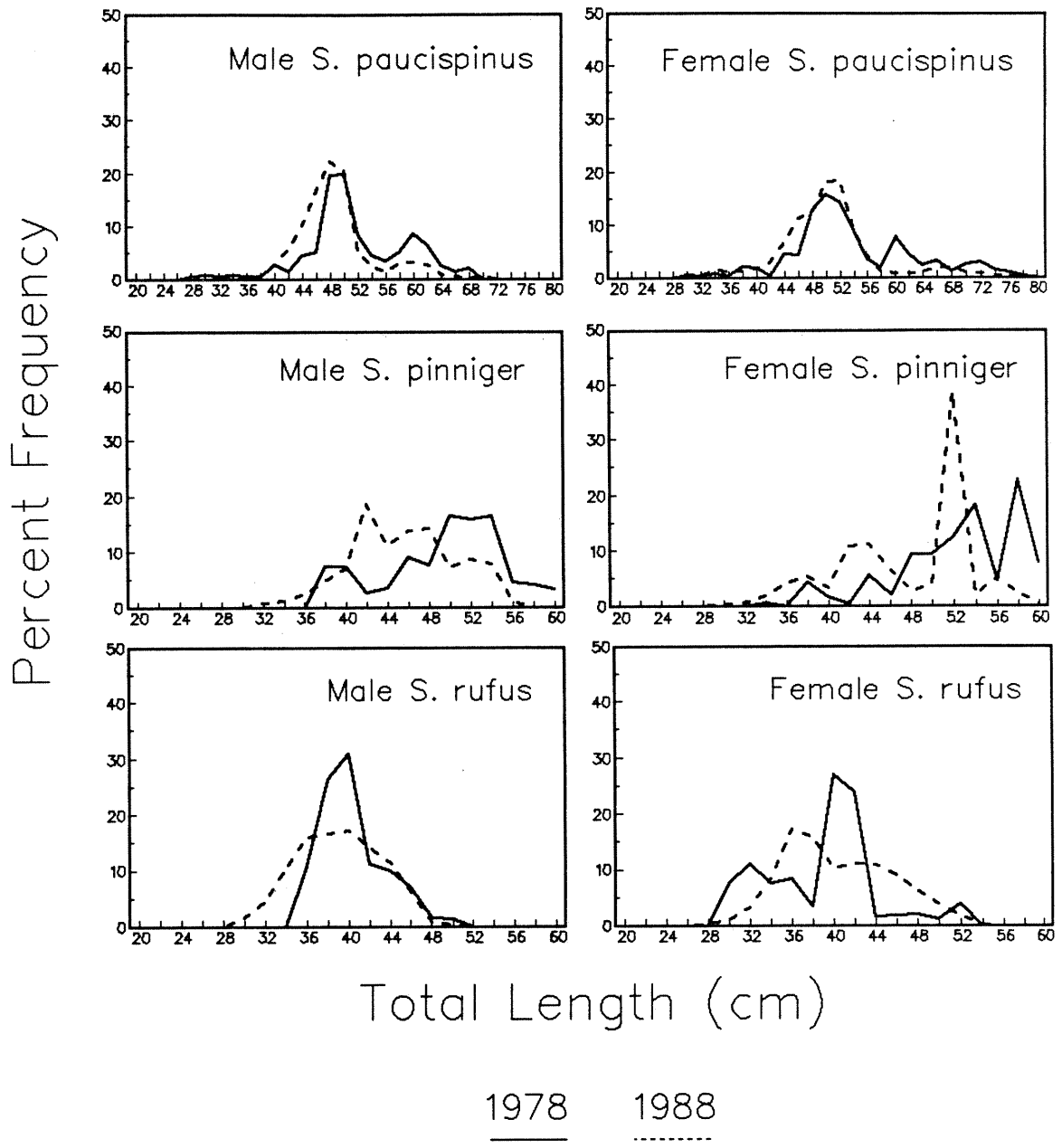


Figure 2 continued

