SOUTHWEST FISHERIES SCIENCE CENTER

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DATA AVAILABILITY, LANDINGS, AND LENGTH TRENDS OF CALIFORNIA'S ROCKFISH

by

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INTRODUCTION

Rockfish are an important component of California's commercial and sportfish fisheries. Fifty-three species of *Sebastes* have been identified in California's commercial and sport fisheries since 1980 (Appendix A). Under the current implementation of the Magnusson Act, all species are required to be assessed. This paper was prepared to help fisheries managers and stock assessment professionals determine data availability and illustrate general trends in landings and mean length for rockfish in California.

Sources of Data Used in This Paper

There is a large number of sources of data which could be used in stock assessments of California rockfish. It is not feasible to list all potential sources. This paper covers the major sources of data that would likely be used in stock assessments. It should be noted that the availability of the data does not necessarily mean that the data are suitable for inclusion in a stock assessment.

RECREATIONAL DATA:

There are two main sources of recreational data for California rockfish: the Marine Recreational Fisheries Statistical Survey (MRFSS) and the California Cooperative Recreational Survey (CCRS).

The MRFSS has been conducted since 1980 and includes estimates of landings by species and length data. A major concern with the length data is the lack of sex information. Since many rockfish exhibit sex-based length dimorphism, there is a potential for bias. Another problem with this dataset is the lack of age structures. From 1980-1989 fish were measured using total length. From 1990-1992 the program was discontinued due to a lack of funding. When the program resumed in 1993, fish were measured using fork length. In this paper, I converted the 1980-1989 data to fork length using standard conversion factors from Echeverria and Lenarz (1984). For those species which did not have conversion factors, conversion factors from a similarly shaped species were used. The MRFSS data includes observations from Commercial Passenger Fishing Vessels (CPFVs), skiff, and shore fishing.

The CCRS data were collected from 1977 through 1985 when the program was discontinued. The principal strengths of this dataset are that sex was recorded and age structures were

collected for most fish, both of which are important assessment information. The principal drawback of this dataset is that it was discontinued in 1985. The data were originally collected as total length. For comparison to the MRFSS data these measurements were converted to fork length using standard conversion factors from Echeverria and Lenarz (1984). For the few species where conversions were not available, the conversion factors from a similar shaped species were used. The CCRS data include observations from CPFVs only.

RESEARCH DATA:

The best source of research data for adult rockfish data in California is the RACEbase database. This dataset was collected by the Alaska Fisheries Science Center (AFSC) during triennial and various other surveys off the west coast of California, Oregon, and Washington. In many cases the data were collected with age structures; however, there is no ready way to determine the number of age structures collected. In nearly all cases, the data are separate by sex. The data are readily available through their network-based relational database. Length measurements have always been fork length.

A good source of pelagic juvenile abundance data is the midwater trawl rockfish database maintained by the Groundfish Analysis group at the National Marine Fisheries Service's Tiburon laboratory. Abundance indices are available for twenty three species. These abundance indices were developed based on annual midwater trawl surveys from 1983 through the present, conducted between Monterey and San Francisco.

COMMERCIAL DATA:

The single best source of data on the California commercial rockfish fishery is the California Cooperative Commercial Survey (CCCS). This survey began in the late 1970s and continues through the present time. This survey is the source of landings presented in the PacFIN database. The data contain commercial market sample data and expansions for all species of rockfish occurring in California's commercial fishery. During the early years of the survey, otoliths were collected for all species. After 1986, the number of species from which otoliths were collected was reduced as a cost saving measure. Sex is recorded for most fish observed. Over the years a number of changes have been made to the survey. These data are readily available from the CALCOM database maintained by the National Marine Fisheries Service's Tiburon laboratory. Recently these data have been made accessible via the Internet to users with a demonstrated need.

Total length was measured until 1991, at which time fork length began to be used. In this paper, all fish were converted to fork length using the standard conversions from Echeverria and Lenarz (1984). For the few species where conversions were not available, a similarly shaped species was used.

RESULTS

DATA AVAILABILITY

A great deal of length data are available from the commercial and sportfish fisheries. These data are summarized in Appendix B for all species by year. In addition, the number of otoliths from the CCCS and CCRS are listed. Otoliths may be available from the RACEbase dataset; however, there is no ready way to ascertain the exact numbers.

A total of 14 species have had, or will have by the end of 2000, full or partial stock assessments (Table 1). A partial stock assessment is one in which modeling is limited or nonexistent, or one which does not include all areas of the state where they are important.

COMMON NAME	SPECIES	MOST RECENT	NEXT
Pacific Ocean Perch	*S. alutus*	1996*	
Darkblotched	*S. crameri*	1996*	2000
Splitnose	*S. diploproa*	1996*	
Widow	*S. entomelas*	1997	2000
Yellowtail	*S. flavidus*	1996*	2000
Chilipepper	*S. goodei*	1998	
Shortbelly	*S. jordani*	1989*	
Cowcod	*S. levis*	1999	
Blackgill	*S. melanostomus*	1998	
Black	*S. melanops*		2000
Boccacio	*S. paucispinus*	1999	
Canary	*S. pinniger*	1999	
Red Stripe	*S. proriger*	1996*	
Bank	*S. rufus*	1996*	2000

Table 1. List of rockfish species which have had, or are scheduled to have stock assessments for the California portion of their range. An * indicates a partial assessment. All stock assessments can be found in Status of the Pacific Coast Groundfish Fishery documents produced annually by the Pacific Fishery Management Council.

There are three types of abundance indices available for many of the species (Table 2). RACE division (AFSC) has

abundance indices based on triennial shelf surveys (Wilkins et al. 1998). The National Marine Fisheries Service's Tiburon Laboratory has juvenile abundance indices available for 23 species (Ralston Pers Comm). Ralston (1999) produced a set of trawl logbook abundance indices for several species.

COMMON NAME	SPECIES	INDICES AVAILABLE
Pacific Ocean Perch	*S. alutus*	RACE
Brown rockfish	*S. auriculatus*	Juvenile
Silvergray rockfish	*S. brevispinus*	RACE
Darkblotched rockfish	*S. crameri*	RACE, Juvenile, Logbook
Splitnose rockfish	*S. diploproa*	RACE, Logbook
Greenstriped rockfish	*S. elongatus*	RACE
Widow rockfish	*S. entomelas*	RACE, Juvenile, Logbook
Yellowtail rockfish	*S. flavidus*	RACE, Juvenile, Logbook
Chilipepper	*S. goodei*	RACE, Juvenile, Logbook
Squarespot rockfish	*S. hopkinsi*	Juvenile
Shortbelly rockfish	*S. jordani*	RACE, Juvenile
Cowcod	*S. levis*	Juvenile
Black rockfish	*S. melanops*	Juvenile
Blackgill rockfish	*S. melanostomus*	Logbook
Blue rockfish	*S. mystinus*	Juvenile
Boccacio	*S. paucispinus*	RACE, Juvenile, Logbook
Canary rockfish	*S. pinniger*	RACE, Juvenile, Logbook
Redstripe rockfish	*S. proriger*	RACE
Yelloweye rockfish	*S. ruberrimus*	RACE
Bank rockfish	*S. rufus*	RACE, Juvenile, Logbook
Stripetail rockfish	*S. saxicola*	RACE, Juvenile
Pygmy rockfish	*S. wilsoni*	Juvenile
Sharpchin rockfish	*S. zacentrus*	RACE

Table 2. List of species for which abundance indices are available. RACE = Triennial abundance indices produced by the Alaska Fisheries Science Center, Juvenile = Juvenile abundance indices produced by the Southwest Fisheries Science Center's Tiburon Laboratory, Logbook = Trawl logbook indices (Ralston 1999).

LANDINGS

General Trends

The overall landings of rockfish peaked in the early 1980s, declined sharply through 1985, held steady through 1989, declined again in 1990, and have remained comparatively steady since then (Figure 1). Rockfish landings have decreased in the sportfish fishery since 1980. The gillnet fishery was important through the early 1990s but is now almost nonexistent. The line gear

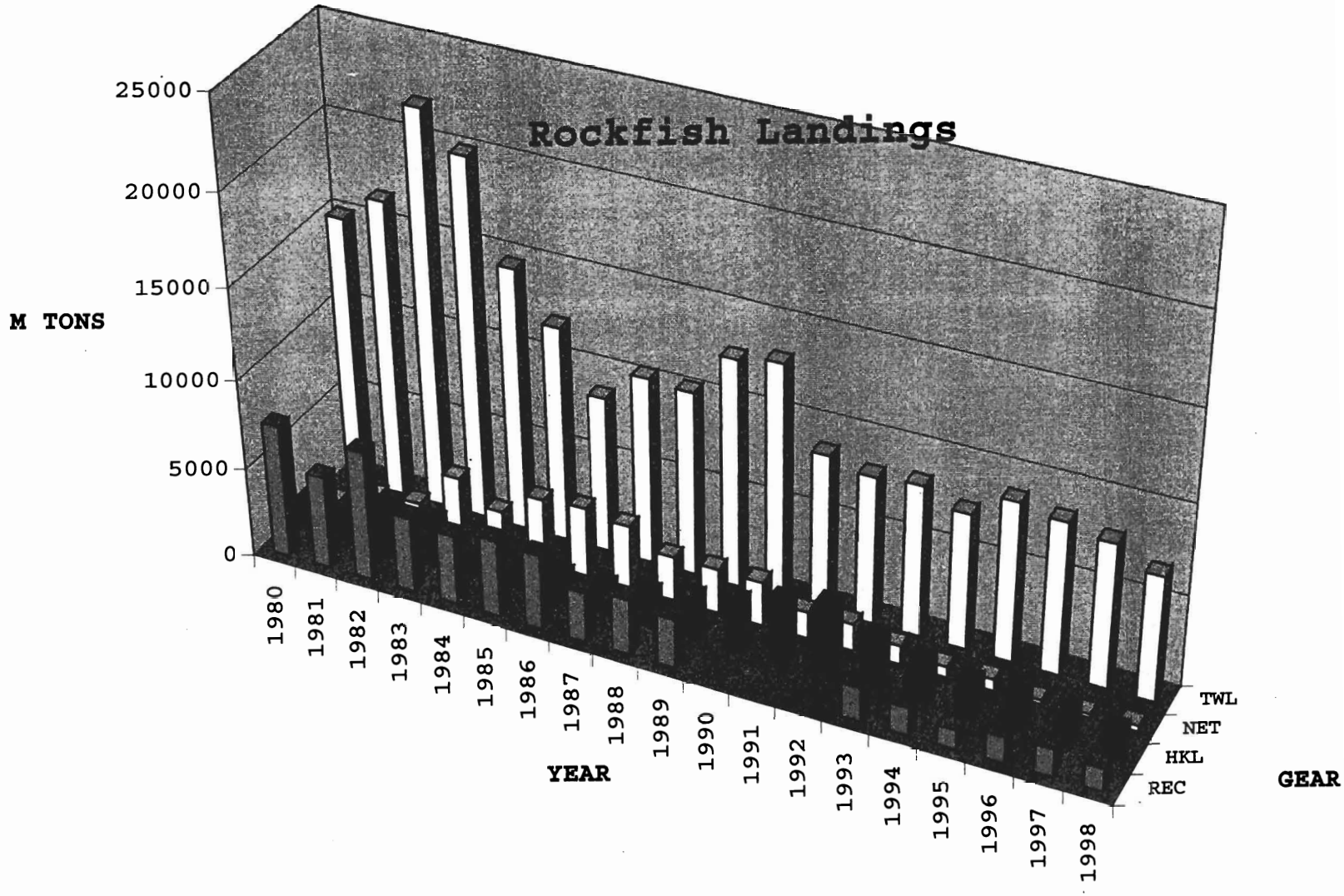

Figure 1. Annual rockfish landings by gear type for California

fishery increased in importance through the early 1990s and has gradually declined since then. The trawl fishery is currently less than a third of its peak in 1982; however, it still accounts for the majority of rockfish landings.

Trends Among Species

Using the ratio of pounds of recreational to pounds of commercial by year, I classified species as primarily commercial, primarily recreational or both. I used a cutoff of 25% and 75%; therefore, recreational landings constituted only 15% of the landings for a species, it would have been classified as commercial, if 30%, it would have been both, and if 80% if would have been recreational. By this standard, 21 species are primarily commercial, 12 species are primarily recreational, and 20 species are both (Table 3).

Mean lengths by species, year, data source, and sex are shown in Appendix C. Only those species for which a sufficient number of lengths are available are included. Many species have shown a decline in mean length over time.

Commercial Trends

A total of 53 species have been identified in the commercial fishery (Table 4). Of the 53 species, 18 species accounted for less than 100 metric tons (mt) for 1980 through 1998 combined and 32 species accounted for less than 500 mt.

Sport Trends

A total of 48 species have been identified in the sport fishery (Table 5). Of the 48 species, 19 species accounted for less than 100 mt from 1980 through 1998 (no landings were available for 1990, 1991, and 1992).

Individual Species

S. aleutianus (Rougheye rockfish)

This species is classified as being primarily commercial. Landings have never exceeded 13 mt. It was not reported in the landings for nine of the 19 years included in this report. There has never been an assessment for this species and there are no abundance indices available.

SPECIES	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1993	1994	1995	1996	1997	1998	TYPE
S. aleutianus								12	100			14	0	0	0	21	C
S. alutus	0	0	0	0	0	0	4	0	0	0	0	0	0	0	3	0	C
S. atrovirens	100	100	100	100	100	100	100	74	100	100	73	69	75	82	81	38	R
S. auriculatus	51	34	55	78	83	97	98	99	96	95	56	38	60	45	42	53	B
S. aurora	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	C
S. babcocki	28	0	43	0	0	0	0	0	4	0	8	6	0	0	0	0	C
S. borealis				0										0	0		C
S. brevispinus	100				0	0	0		0	0	0		0	0			C
S. carnatus	44	20	23	70	97	100	100	100	100	100	64	50	30	35	51	51	B
S. caurinus	94	98	96	84	95	97	98	93	77	91	64	67	46	66	37	43	R
S. chlorostictus	52	35	43	46	62	67	69	25	41	31	31	36	41	23	27	19	B
S. chrysomelas	100	100	100	100	100	100	100	24	100	100	86	53	26	13	15	18	B
S. constellatus	92	81	81	81	86	83	90	77	75	55	57	46	38	75	52	55	B
S. crameri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C
S. dalli	100	100			100		100		100	100		100	100				B
S. diploproa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C
S. elongatus	25	54	24	43	72	31	73	31	26	6	12	18	24	21	7	8	B
S. ensifer	100	100	93	100	100		100			100	100	100	100	0			R
S. entomelas	2	0	2	1	3	2	3	1	2	2	0	0	0	2	3	6	C
S. eos	100	100	100	100	76	60	100	61				0	0				R
S. flavidus	61	47	57	26	29	40	34	28	47	24	12	11	8	28	45	25	B
S. gilli	0	0	0	0	8	6	2	21	0	0			0	0	0	57	C
S. goodei	11	10	15	5	6	13	17	10	16	10	1	1	1	2	4	1	C
S. helvomaculatus	100	100	76	57	0	15	18	23	36	53	0	0	0	0	0	29	B
S. hopkinsi	100	100	100	100	100	100	100	100	100	100	100	89	100	100	100	88	R
S. jordani			0	0	0	0	9	0	0	0	0	0	0	0	0	0	C
S. levis	73	37	69	23	14	29	21	56	26	24	6	35	3	12	3	16	B
S. macdonaldi	13	0	0	0	0	34	77	66	47	48			0	100			C
S. maliger	100	100	100	100	100	100	100	100	100	100	89	20	34	32	13	61	R
S. melanops	83	64	56	42	85	66	95	73	79	63	67	63	50	56	37	59	B
S. melanostomus	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	C
S. miniatus	62	61	72	40	65	64	71	64	75	62	48	46	50	51	34	50	B
S. mystinus	96	95	95	93	98	76	94	98	98	92	78	70	72	81	81	88	R
S. nebulosus	57	42	71	70	72	91	96	91	82	96	78	49	51	47	19	36	B
S. nigrocinctus	100	28	100	100	100	100	100					100		0			B
S. ovalis	73	39	39	38	65	35	42	0	0	6	16	64	31	44	31	45	B
S. paucispinis	31	20	24	8	5	15	22	7	7	9	8	16	4	18	26	31	C
S. phillipsi	0	0	0	0	0	50	0	0	0	0	0	0	0				C
S. pinniger	39	31	25	15	20	25	50	53	47	26	28	18	26	19	30	14	B
S. proriger	62		0	0	0	0	0	0	0	49	0	0	0	0	0	0	C
S. rastrelliger			0			100	100	97	100	100	63	20	12	15	15	15	B
S. reedi				0	0	0	0	0		0	0	0		0	0		C
S. rosaceus	83	28	41	48	85	77	98	94	66	91	66	30	57	59	78	76	B
S. rosenblatti	0	0	0	0	28	68	83	19	94	89	0	0	16	39	35	19	B
S. ruberrimus	67	13	34	43	65	92	77	67	51	59	13	17	15	14	20	25	B
S. rubrivinctus	98	94	72	83	86	90	77	63	87	76	48	60	57	86	74	75	R
S. rufus	25	3	1	4	3	2	4	0	0	1	0	6	0	2	3	0	C
S. saxicola	1	0	0	2	3	0	0	0	0	0	0	0	0	0	0	0	C
S. semicinctus				100	100	100	100					100		100	72	100	R
S. serranoides	96	94	90	77	98	95	85	86	91	92	70	63	42	67	98	93	R
S. serriceps	100	100				100	100	100	100	100	100	100	100	100	100	100	R
S. umbrosus	100	66	76	51	84	91	96	100	100	100	100	100	100	100	100	100	R
S. zacentrus			0	0	0	0	0	0	0	0	0	0	0	0	0	0	C

Table 3. Percent of landings which are recreational and type of fishery classification. R=Recreational, C=Commercial, B=Both.

SPECIES	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
S. aleutianus								8			2	1	3		13	6	3	1	2
S. alutus	20	11	167	119	48	73	35	84	59	38	15	8	14	11	7	9	18	16	19
S. atrovirens								5				1		7	12	8	3	3	10
S. auriculatus	189	176	95	35	37	6	5	2	11	8	13	55	49	54	44	28	57	81	46
S. aurora	5	6	17	67	24	52	71	12	92	88	103	15	100	97	79	59	57	38	24
S. babcocki	26	61	10	125	177	93	22	11	18	24	14	24	20	7	23	16	37	5	14
S. borealis				4													5	1	
S. brevispinus					10	6	1		3	2	3		1	4		2	1		
S. carnatus	69	54	39	34	4								64	58	78	89	72	37	37
S. caurinus	28	9	18	45	13	11	6	7	45	15	26	49	60	52	43	55	48	70	63
S. chlorostictus	132	174	222	168	106	123	76	79	94	148	108	306	134	106	99	115	143	65	58
S. chrysomelas								29					10	3	12	30	29	20	29
S. constellatus	10	13	20	17	16	18	11	8	11	37	19	41	59	31	52	32	21	29	21
S. crameri	250	574	206	504	615	817	405	1586	758	457	640	355	190	293	307	361	393	441	512
S. diploproa	190	417	335	679	729	762	451	210	366	307	297	429	301	394	318	358	420	461	1437
S. elongatus	133	12	54	30	19	51	11	25	52	83	53	32	16	21	45	27	21	50	47
S. ensifer			5														1		
S. entomelas	5416	6217	10774	6281	2899	3171	2282	2586	1356	1993	2140	1311	1093	1191	918	1744	1336	1349	902
S. eos					1	4		4							6	8			
S. flavidus	273	483	932	1646	886	605	549	663	258	1016	1100	760	698	512	332	310	254	436	443
S. gilli	14	20	18	36	30	32	40	12	4	9						1	19	1	1
S. goodei	2904	2474	2201	2788	2292	2648	1976	1823	2182	2908	2910	3156	2434	2238	1840	1965	1789	2015	1422
S. helvomaculatus			3	4	4	11	3	2	4	10	12	10	4	5	5	10	5	3	4
S. jordani	3		7	6	2	29	18	1		3	9	4	1	2	5	12	33	65	18
S. levis	34	58	49	89	141	89	110	79	67	35	35	24	86	47	37	61	38	55	14
S. macdonaldi	8	1	1	3	15	2	1	1	5	3			7			1			
S. maliger												91	5	5	17	6	6	17	2
S. melanops	66	282	379	299	74	254	22	85	80	143	125	143	249	137	128	165	121	154	89
S. melanostomus	429	675	923	1273	437	512	816	653	1033	469	601	379	713	276	385	356	360	262	224
S. miniatus	177	149	156	258	173	142	145	167	102	151	208	133	274	254	275	229	214	160	123
S. mystinus	54	64	61	68	11	134	18	8	9	28	28	32	173	127	78	50	46	70	46
S. nebulosus	27	22	15	7	7	3	2	6	8	2	5	8	22	7	28	22	21	31	16
S. nigrocinctus		11									1		1				1		
S. ovalis	33	64	87	146	38	40	46	20	12	55	9	12	29	11	15	23	17	21	14
S. paucispinis	4303	4203	4762	6551	4299	2191	2035	2373	1976	2533	2344	1311	1467	1357	1002	728	478	316	151
S. phillipsi	12	38	31	29	11	18	4	5	3	1			2	1	1	6			
S. pinniger	516	358	839	605	420	495	226	202	223	350	562	302	364	169	235	209	282	223	194
S. proriger	2		3	61	5	9	5	1	1	3	4	7	1	2	5	6	2	6	4
S. rastrelliger			1					1				1	6	10	39	52	50	51	47
S. reedi				2	10	10	16	7		1	3		2	3	5		6	1	
S. rosaceus	16	61	69	51	8	13	1	1	10	3	10	11	12	4	20	4	12	5	4
S. rosenblatti	7	11	8	11	14	8	4	23	2	4	16		5	8	11	14	12	2	6
S. ruberrimus	41	304	204	67	44	11	20	38	54	41	70	130	112	55	72	58	78	63	21
S. rubrivinctus	1	1	14	4	4	3	8	5	1	5	1	1	5	9	8	5	3	3	3
S. rufus	83	1056	1091	1613	1794	1260	1625	1218	1150	768	645	831	625	288	335	438	554	409	591
S. saxicola	53	29	30	36	22	47	15	16	15	26	53	19	3	36	103	48	16	18	41
S. serranoides	21	10	29	84	4	7	22	12	6	5	9	79	38	35	27	49	22	2	5
S. umbrosus		1	1	2	1	1	1												
S. zacentrus			4	28	20	62	15	61	119	33	170	55	24	29	154	90	92	111	38

Table 4. Annual commercial landings (metric tons) for rockfish in California.

SPECIES	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
S. aleutianus								1	4						2				1
S. alutus							1											1	
S. atrovirens	43	26	8	34	44	35	29	15	11	18				20	28	23	12	12	6
S. auriculatus	195	92	118	124	176	213	205	171	308	148				67	27	43	47	59	51
S. babcocki	10		7						1					1	1				
S. brevispinus	1							2											
S. carnatus	54	13	11	79	131	141	168	129	82	69				101	79	37	40	38	39
S. caurinus	475	515	430	230	233	299	253	98	156	148				93	88	47	94	41	48
S. chlorostictus	143	94	170	141	177	254	170	27	65	65				49	56	81	42	24	14
S. chrysomelas	28	5	9	15	28	33	14	9	14	12				20	13	10	4	3	6
S. constellatus	118	54	83	72	93	93	107	26	32	44				41	44	19	61	31	25
S. dalli	1	1			1		1		1	1					1	1			
S. diploproa			1		1	1	1	1	2	1									
S. elongatus	45	14	17	22	47	23	31	11	19	5				3	10	8	5	4	4
S. ensifer	220	49	66	40	92		1			1				1	3	1			
S. entomelas	106	22	183	64	77	52	60	22	34	42				3	2	3	23	39	53
S. eos	47	7	8	4	4	6	2	6											
S. flavidus	426	430	1213	590	371	397	289	254	231	319				71	40	27	99	364	149
S. gilli					2	2	1	3							1				1
S. goodei	356	272	389	162	156	395	395	203	415	308				17	23	11	37	74	12
S. helvomaculatus	8	2	8	6		2	1	1	2	11									2
S. hopkinsi	18	8	7	18	22	6	13	1	6	4				3	6	1	20	14	6
S. levis	91	34	110	26	23	36	29	102	23	11				3	20	2	5	2	3
S. macdonaldi	1					1	2	2	4	3							1		
S. maliger	4	6	5	40	10	12	13	6	2	10				36	4	3	3	3	3
S. melanops	319	508	474	220	435	498	418	231	297	248				281	214	166	156	92	129
S. melanostomus						1	9		7							1			
S. miniatus	287	231	400	175	316	251	357	295	306	248				239	237	225	225	82	125
S. mystinus	1288	1183	1168	888	609	416	279	420	420	333				457	178	127	202	297	332
S. nebulosus	36	16	36	17	17	29	42	55	37	36				26	26	23	19	7	9
S. nigrocinctus	2	4	1	8	1	2	2								1				
S. ovalis	88	40	56	88	72	22	32			3				2	28	11	13	10	11
S. paucispinus	1935	1072	1511	566	238	385	584	190	156	247				121	192	32	103	112	67
S. phillipsi						18													
S. pinniger	327	158	276	106	107	168	227	231	196	124				65	50	72	64	95	31
S. proriger	3									3									
S. rastrelliger						82	42	47	45	15				17	9	7	9	9	9
S. rosaceus	73	24	49	46	45	42	54	21	20	28				8	9	5	18	18	14
S. rosenblatti					5	16	22	5	22	33						3	8	1	1
S. ruberrimus	84	47	104	51	81	124	65	76	55	60				8	14	10	13	16	7
S. rubrivinctus	61	23	37	21	22	24	26	9	9	16				9	13	7	17	9	10
S. rufus	28	37	8	59	47	31	61	2		7					20		11	12	2
S. saxicola	1			1	1														
S. semicinctus				1	1	1	1								2		3	8	2
S. serranoides	464	150	261	288	170	141	123	72	61	56				82	46	36	44	68	68
S. serriceps	27	12				10	18	4	7	13				16	13	18	21	6	10
S. umbrosus	4	2	4	2	3	6	15	1	7	7				3	3	5	12	4	5

Table 5. Annual recreational landings (metric tons) for rockfish in California.

There are very few length data available for this species and the trends over time are probably not meaningful. Otoliths exist for only two fish.

S. alutus (Pacific Ocean Perch)

This species as classified a primarily commercial. Landings peaked in 1982 at 167 mt and have declined to less than 20 mt in recent years. There was a partial assessment in 1996. There is an abundance index available based on the RACE division's triennial survey.

There is a fair amount of length data available for this species. There are also many otoliths from the early 1980s. Almost certainly, RACE division has additional otoliths from the triennial surveys. There are no clear trends in mean length, which appears to have remained stable.

S. atrovirens (Kelp rockfish)

This species is classified as primarily recreational; however, in recent years it is gaining in importance in the commercial fishery. Sport landings are probably declining. This species has never been assessed and there are no abundance indices available.

Many fish were measured by the MRFSS program. There is no evidence of a change in the mean length over time.

S. auriculatus (Brown rockfish)

This species is important in both the sport and commercial fisheries. Sport landings have declined in recent years. Commercial landings declined sharply after 1981 and then increased after 1990. There has never been a stock assessment for this species. The midwater trawl survey has produced an abundance index for this species.

There is a great deal of length data available for this species. There are many otoliths available from the CCRS from 1980 to 1985. The pattern in mean length is unclear; however, it is possible that there has been no real change.

S. aurora (Aurora rockfish)

This species is classified as primarily commercial. Commercial landings steadily increased through the early 1990s

and have declined sharply since. There has never been an assessment of this species and there are no abundance indices available.

There is a very good time series of length data from the CCCS and there are quite a few otoliths available from 1980-1986. Mean length of this species has shown a gradual decline.

S. babcocki (Redbanded rockfish)

This species is primarily commercial. Commercial landings increased through 1984 and have declined since then. There has never been a stock assessment and there are no abundance indices available.

There is a fair amount of length data available from the CCCS. There are some otoliths available from 1980-1986. Mean length has declined since the early 1980s. The mean length trend suggests that strong cohorts are present due to periodic drops in the mean length.

S. borealis (Shortraker rockfish)

This is primarily a commercial species. Commercial landings for this species are trivial, never exceeding 5 mt. There has never been an assessment of this species and there are no abundance indices available.

There are very few lengths and no otoliths for this species. There are insufficient data to determine a trend in mean length.

S. brevispinus (Silvergray rockfish)

This species is classified as primarily commercial. Commercial landings for this species are trivial, never having exceeded 10 mt. It has never been assessed. RACE division has an abundance index available.

There are very few length data for this species. Only a few otoliths have been collected. The quantity of length data is not sufficient to examine long-term trends in mean length.

S. carnatus (Gopher rockfish)

This species occurs in both sport and commercial fisheries. Commercial landings declined to nothing in the mid 1980s and have since rebounded. In the sport fishery, the landings increased in the mid-1980s and have declined somewhat in recent years. This

species has never been assessed and there are no abundance indices available.

There is a large number of length measurements available from the MRFSS program and there are otoliths available from the CCRS for 1980-1985. Examination of the long-term mean length data shows no significant changes.

S. caurinus (Copper rockfish)

This species is classified as primarily recreational. Commercial landings have been fairly constant; however, sport landings have sharply declined. There are no abundance indices available and there has never been an assessment for this species.

There is a substantial number of length measurements for this species in the MRFSS data set and a fair number of otoliths collected by the CCRS program. Long-term length trends suggest a dramatic reduction in mean length.

S. chlorostictus (Greenspotted rockfish)

This species is important in both the recreational and commercial fisheries. Landings in the commercial fishery remained fairly constant through 1996 and have since declined. The same pattern is true for the recreational fishery. There has never been an assessment of this species and there are no abundance indices available.

There is a great deal of length data available in the CCCS, CCRS, and MRFSS data sets. There are a large number of otoliths available from both the CCRS and CCCS programs from 1980-1986. Examination of the long-term trends in mean length show a steady decrease.

S. chrysomelas (Black and yellow rockfish)

This species is important in both the recreational and commercial fisheries. Landings for this species have never exceeded 35 mt per year in either the sport or commercial fisheries. This species has never been assessed and there are no abundance indices available.

There is a large number of length measurements available in the MRFSS data set; however, there are very few otoliths available. Examination of the long-term trends in mean length show no apparent trend.

S. constellatus (Starry rockfish)

This species is important in both the recreational and commercial fisheries. Landings have been fairly constant in both the commercial and recreational fisheries. This species has never been assessed and there are no abundance indices available.

There is a large number of length measurements available in the MRFSS data set and there are some otoliths available from the CCRS program. Examination of the long-term trend in mean lengths suggests a slight decline over time.

S. crameri (Darkblotched rockfish)

This species is primarily commercial. Commercial landings of this species peaked in 1987, declined through 1992, and have increased since then. There was a partial assessment of this species in 1996, and it is scheduled for a full assessment in 2000. There are logbook, juvenile abundance, and triennial survey abundance indices available for this species.

There is a large number of length measurements available from both the CCCS and RACE datasets. In addition, there are a large number of otoliths available from the CCCS program. Examination of the long-term trends in mean lengths suggests a slight decline over time.

S. dalli (Calico rockfish)

This species is primarily recreational since it has never been reported in the commercial fishery. Landings have never exceeded one tonne in the sport fishery. It has never been assessed and there are no abundance indices available.

There are some length measurements available in the MRFSS data set. Examination of mean lengths over time shows no detectable trend. This is a small species (mean length less than 200 mm) and is probably subject to a high rate of discard.

S. diploproa (Splitnose rockfish)

This species is primarily commercial. Commercial landings of this species peaked in 1985, declined and remained steady until 1998, when landings more than tripled the 1997 values and were nearly double the highest landings before. There was a partial assessment of this species in 1996. There are logbook and triennial survey abundance indices available.

There are a large number of length measurements for this species in both the CCCS and RACE data sets. There are a large number of otoliths available in the CCCS program through 1986. The long-term trends in mean lengths suggest a slight decline over time.

S. elongatus (Greenstriped rockfish)

This species is important in both the recreational and commercial fisheries. Landings in the commercial fishery have been fairly constant; however, they have declined substantially in the recreational fishery. This species has never been assessed. There is an abundance index available from the RACE triennial survey.

There are a large amount of length data available for this species from the CCCS, CCRS, MRFSS, and RACE data sets. In addition, there are a fair number of otoliths available from the CCCS and CCRS programs through the mid 1980s. Examination of the long-term trends in mean lengths shows a steady decline over time.

S. ensifer (Swordspine rockfish)

This species is primarily important in the recreational fishery. Recreational landings of this species declined from 220 mt in 1980 to none in 1985 and have since been rare. This species has never been assessed, and there are no abundance indices available.

There are some lengths available in the MRFSS system. Long-term trends in mean length show a sharp decline.

S. entomelas (Widow rockfish)

This species is primarily commercial; however, it is an important component of the recreational fishery as well. Commercial landings peaked in 1982 and have declined since, reaching an all time low in 1998. Recreational landings declined from a high in 1982 of 183 mt to a low of only 2 mt in 1994 and have rebounded to 53 mt in 1998. This species was last assessed in 1997 and is scheduled for an assessment in 2000. There are logbook, juvenile, and triennial survey abundance indices available.

There is a large number of length measurements available from all sources and there is a large number of otoliths available. The long-term trends in mean length show a steady

decline in the CCCS. In both the MRFSS and RACE data, there is an increase in the mean length.

S. eos (Pink rockfish)

This species is primarily recreational. Recreational landings went from a high of 44 mt in 1980 to none after 1987. Landings in the commercial fishery have been spotty. This species has never been assessed and there are no abundance indices available.

There is very little length data and no otoliths available.

S. flavidus (Yellowtail rockfish)

This species is important in both the recreational and commercial fisheries. Commercial landings peaked in the late 1980s, declined, and then leveled off by the late 1990s. Sport landings peaked in 1982, declined sharply after that, and have rebounded somewhat since 1995. This species has never been assessed in California; however, an assessment is expected in 2000. There are logbook, juvenile and triennial abundance indices available.

There is a large amount of data available for this species, both otoliths and length measurements. Examination of the long-term trends in mean lengths shows a steady decline.

S. gilli (Bronzespotted rockfish)

This species is primarily commercial. Commercial landings have never exceeded 40 mt. Commercial landings increased through 1986 and then declined to almost none by the early 1990s. This species has never been assessed and there are no abundance indices available.

There are very few measurements available and fewer otoliths.

S. goodei (Chilipepper)

This species is primarily commercial; however, it is an important component of the sport fishery as well. Commercial landings have been steady over time; however, it appears that they are beginning to decline. Sport landings were very high through 1989; however, they have declined sharply since that time. This species was last assessed in 1998. There are logbook, juvenile, and triennial abundance indices available for

this species.

There are large numbers of measurements and otoliths from all sources for this species. There is no clear pattern to long-term trends in mean length.

S. helvomaculatus (Rosethorn rockfish)

This species is classified as being both commercial and recreational. It is not an important component in either with annual landings never exceeding 15 mt. There are no clear trends to the landings. This species has never been assessed and there are no abundance indices available.

There are some measurements and a few otoliths available. The long-term trends in mean lengths suggest a slight decline. This species is often mistaken for *S. rosaceus*.

S. hopkinsi (Squarespot rockfish)

This species is primarily recreational. Recreational landings have varied without pattern and have never exceeded 25 mt. This species has never been assessed. There is a juvenile abundance index available.

There is a fair amount of length data available from the MRFSS system. Mean length appears to have declined over time.

S. jordani (Shortbelly rockfish)

This species is primarily commercial. Commercial landings are low; however, they appear to be increasing in recent years. This species was partially assessed in 1989. There are triennial and juvenile abundance estimates available.

There are many measurements available in the RACE data set and many otoliths are available from research cruises. There is no evidence of change in mean length of this species over time.

S. levis (Cowcod)

This species is classified as both commercial and recreational. Commercial landings peaked in the mid 1980s and have declined since. Sport landings varied substantially among years in the 1980s and then declined dramatically in the 1990s. There is a juvenile abundance index available. This species was last assessed in 1999, when it was classified as overfished.

There are few length measurements available and almost no otoliths. Examination of long-term trends in mean lengths suggests a decrease in mean size.

S. macdonaldi (Mexican rockfish)

This species is classified as primarily commercial. Commercial landings of this species have never exceeded 15 mt. This species has never been assessed and there are no abundance indices available.

There are very few length data available and very few otoliths. There are no detectable trends in mean length.

S. maliger (Quillback rockfish)

This species is classified as primarily recreational; however, in recent years commercial landings have been the most important. Recreational landings have been highly variable but never exceeded 40 mt. There were no commercial landings until 1991 when they became a small but persistent component. This species has never been assessed and there are no abundance indices available.

There are some length data available from the MRFSS data set. There are very few otoliths available for this species. Mean length over time has declined.

S. melanops (Black rockfish)

This species is important in both the commercial and sport fisheries. Commercial landings peaked in 1982, declined through 1988, and then began to increase. Sport landings were high through 1986, then declined to the lowest levels in 1997 and 1998. This species has never been assessed in California; however, it is scheduled to be assessed in 2000. There is a juvenile abundance index available for this species.

There are many measurements available from the CCCS, CCRS, and MRFSS data sets. There are many otoliths available through 1985. Mean length has declined over time.

S. melanostomus (Blackgill rockfish)

This species is primarily commercial. Commercial landings for this species peaked in 1983, remained high through 1986, and have since declined substantially. A logbook abundance index is available. The species was last assessed in 1998.

There is large amount of length data available in the CCCS and otoliths are available through 1986. Mean length has declined substantially over time.

S. miniatus (Vermillion rockfish)

This species is important in both recreational and commercial fisheries. Commercial landings have remained relatively constant, averaging around 175 mt. Sport landings generally exceeded commercial landings and have been relatively constant until 1997, when there was a sharp decline. This species has never been assessed and there are no abundance indices available.

There is a large amount of length data available from the MRFSS system and a lesser amount available in the CCCS system. Otoliths are available through 1985 from the CCCS and CCRS programs. Mean length has declined dramatically over time.

S. mystinus (Blue rockfish)

This species is primarily important in the recreational fishery. Sport landings declined rapidly from 1980 through 1986, leveled off through 1993, declined again, and began increasing in 1996. Commercial landings have fluctuated without any clear pattern. This species has never been assessed. There is a juvenile abundance index available.

There is a large amount of data in the MRFSS system and a some CCCS and CCRS data available. There are many otoliths available from 1980-1986. There is evidence of a slight decline in mean length over time.

S. nebulosus (China rockfish)

This is both a commercial and recreational species. Commercial landings have never exceeded 31 mt and recreational landings have never exceeded 55 mt. Sport landings are somewhat reduced in recent years. There has never been an assessment of this species and there are no abundance indices available.

There are a substantial number of lengths in the MRFSS data set and a few otoliths in the CCRS data set. There is evidence of a decline in mean length over time for this species.

S. nigrocinctus (Tiger rockfish)

This species is both a recreational and commercial species. Landings in either of the fisheries has never exceeded eleven mt. This species has never been assessed and there are no abundance indices available.

There is very little length data and no otoliths available for this species.

S. ovalis (Speckled rockfish)

This is both a recreational and commercial species. Commercial landings of this species increased through 1983, then declined through 1988, and then stabilized somewhat. Sport landings were comparatively high through 1986 and then declined substantially. This species has never been assessed and there are no abundance indices available.

There are a large number of measurements in the MRFSS system, some in the CCCS system, and a few otoliths in the CCCS and CCRS data system. There is no clear pattern to mean length for this species.

S. paucispinus (Boccacio)

This species is classified as primarily commercial; however, it is an important component of the recreational fishery. Commercial landings increased steadily through 1983 and have declined substantially since then. Recreational landings have declined dramatically and steadily since 1980. It was last assessed in 1999 when it was found to be overfished. There are logbook, juvenile, and triennial abundance indices available.

There is a huge amount of length data for this species from all sources. In addition there are a large number of otoliths available for the species. Mean length has been very dynamic due to a propensity for strong cohorts.

S. phillipsi (Chameleon rockfish)

This species is primarily commercial. Commercial landings have never exceeded 38 mt. Commercial landings peaked in 1981 and declined to almost zero by 1988.

There are no abundance indices available and it has never been assessed.

There are very few lengths for this species.

S. pinniger (Canary rockfish)

This species is present in both commercial and sport fisheries. Commercial landings peaked in 1982 and have declined substantially since then. Sport landings have declined steadily since. It was last assessed in 1999 when it was declared overfished. There are logbook, juvenile, and triennial abundance indices available.

There is a large amount of length data available for this species from all sources and many otoliths from the CCCS and CCRS programs through 1985. There is strong evidence of a decline in mean length in the commercial fishery. This pattern is not evident in the MRFSS data.

S. proriger (Redstripe rockfish)

This species is primarily commercial. In 1983 61 mt were landed by the commercial fishery; in no other year did the landings exceed nine mt. A partial assessment occurred in 1996. There is a triennial abundance index.

There is very little length data available for this species and only a few otoliths.

S. rastrelliger (Grass rockfish)

This species is both commercial and recreational. This species was first reported in the sport fishery in 1985 and declined in importance after that. In the commercial fishery, landings began in 1991 and have gradually increased. It has never been assessed and there are no abundance indices available.

There are a substantial number of length measurements available in the MRFSS data set. There is apparent change in the mean length over time for this species.

S. reedi (Yellowmouth rockfish)

This species is primarily commercial. Commercial landings have never exceeded 16 mt. There has never been an assessment and there are no abundance indices available.

There is very little length data available.

S. rosaceus (Rosy rockfish)

This is present in both the commercial and recreational

fisheries. Commercial landings peaked in 1983 at 69 mt; it has declined to about four mt in 1998. Sport landings have declined from 1980 of 73 mt to 14 mt in 1998. There has never been an assessment and there are no abundance indices available. This species is often mistaken for *S. helvomaculatus*.

There is a large amount of length data available in the MRFSS system and both lengths and otoliths are available in the CCRS system. There is evidence of a decline in mean length over time.

S. rosenblatti (Greenblotched rockfish)

This species is present in both the recreational and commercial fisheries. Annual landings in either the recreational or commercial fisheries have never exceeded 33 mt. Landings in both fisheries have varied without any detectable pattern. It has never been assessed and there are no abundance indices available.

There are some length data available in the MRFSS system and in 1984, 266 otoliths were collected by the CCCS program. The MRFSS data shows a decline in mean length over time.

S. ruberrimus (Yelloweye rockfish)

This species is present in both the recreational and commercial fisheries. Commercial landings peaked in 1981, declined through 1989, increased through 1991, and have since declined. Recreational landings were relatively high though 1989 and have since declined sharply. There is a triennial abundance index available. This species has never been assessed.

There is a fair amount of length data available from the MRFSS system, some length and otolith data available from both the CCRS and CCCS data sets. Mean length may have declined over time.

S. rubrivinctus (Flag rockfish)

This is primarily a recreational species. Annual commercial landings have never exceeded nine mt. Recreational landings of this species were highest in 1980 and have declined since then. This species has never been assessed and there are no abundance indices available.

There is quite a bit of length data available from the MRFSS

data system and a few otoliths available from the CCRS and CCCS datasets. Mean length appears to have declined over time.

S. rufus (Bank rockfish)

This is primarily a commercial species although as many as 61 mt have been reported in the recreational fishery. Commercial landings peaked in 1984-1986, declined sharply through 1992, and have since remained somewhat steady. A partial assessment was done in 1996 and a full assessment is planned in 2000. There are triennial, logbook, and juvenile abundance indices available.

There is a large amount of length data available for this species from the CCCS, MRFSS, and RACE data sets. In addition, there are a large number of otoliths available form the CCCS system. There is evidence of a decline in mean length over time.

S. saxicola (Stripetail rockfish)

This is primarily a commercial species. Recreational landings have never exceeded one tonne. While present in most years, the largest annual landing for this species was three mt, suggesting that it is a truly incidental species. This species has never been assessed. There are triennial and juvenile abundance indices available.

There is a large amount of length data from both the CCCS and RACE data systems. In addition, there are quite a few otoliths available in the CCCS system through 1985. There is evidence of a decline in mean length over time for this species.

S. semicinctus (Halfbanded rockfish)

This species is classified as primarily recreational. Recreational landings have never exceeded eight mt. It has never been assessed and there are no abundance indices available.

There are some length data available in the MRFSS and RACE systems. There is some evidence of a decline in mean length over time. This species has a mean length less than 200mm and probably has a high rate of discard.

S. serranoides (Olive rockfish)

This species is classified as primarily recreational. It was quite important in the recreational fishery through 1986; however, landings have dropped substantially since. This species

has never been assessed and there are no abundance indices available.

There is quite a bit of length data available in the MRFSS system and some in the CCRS system. There are some otoliths available in the CCRS system. There is evidence of an increase in mean length over time in the MRFSS system.

S. serriceps (Treefish)

This species is classified as primarily recreational. Annual landings have never exceeded 27 mt and have varied without any clear trend. It has never been assessed and there are no abundance indices available.

There are some length data available in the MRFSS system. There is no clear pattern to changes in mean length over time.

S. umbrosus (Honeycomb rockfish)

This species is classified as primarily recreational. Annual recreational landings have never exceeded 15 mt and there is no pattern to the landings. There has never been an assessment and there are no abundance indices available.

There are some length data available in the MRFSS system. This species has a mean length less than 200 mm and probably has a high rate of discard. There is a slight suggestion of a decline in mean length over time but this is neither clear nor reliable.

S. zacentrus (Sharpchin rockfish)

This species is primarily commercial. Landings increased through 1988 and have fluctuated substantially since. It has never been assessed. There is a triennial abundance index available.

There is a fair amount of length data available in both the CCCS and RACE systems. There are some otoliths available in the CCCS system. There is a suggestion of a decline in mean length over time.

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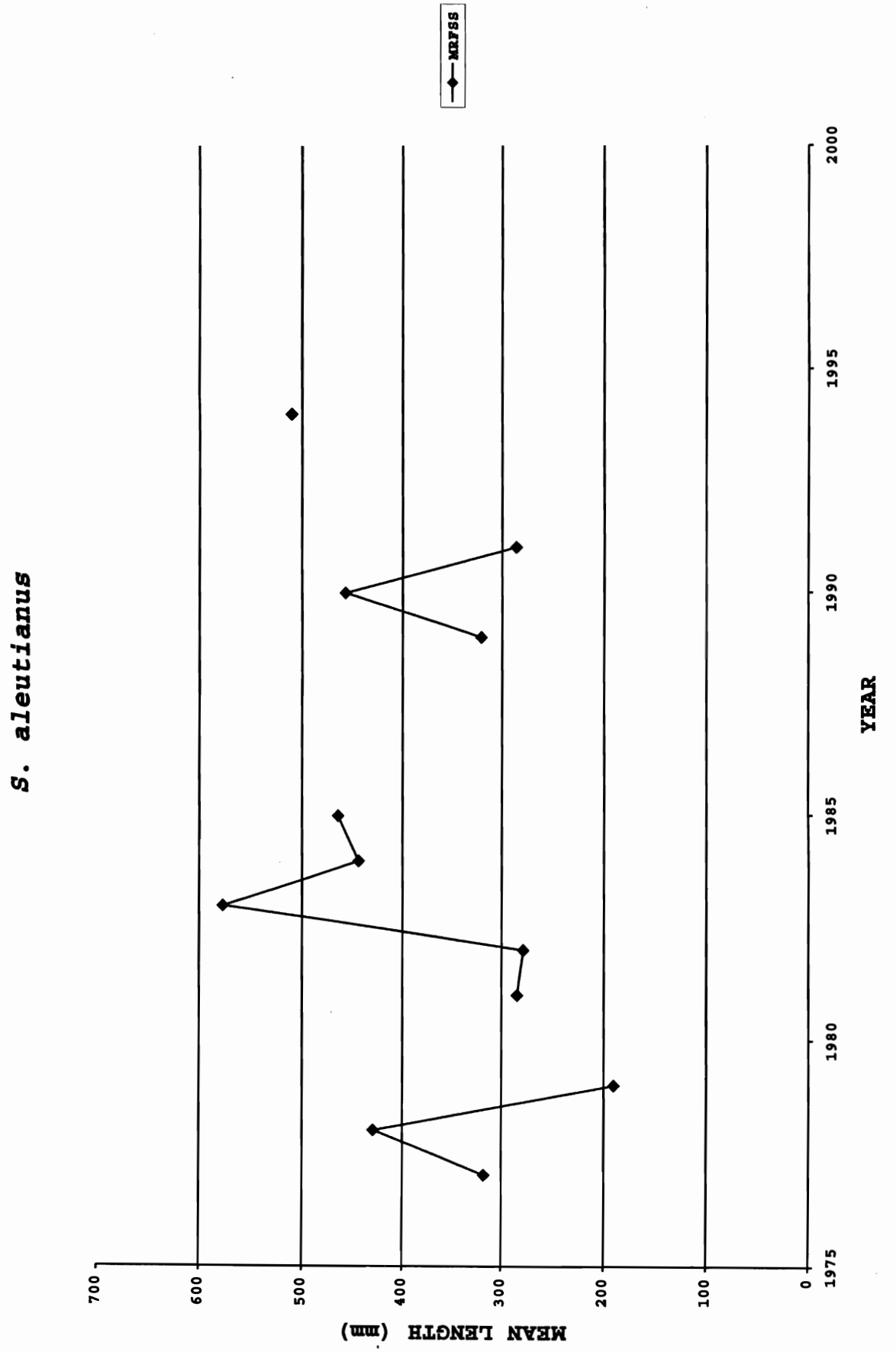
APPENDIX A - Common and Scientific Names of Rockfish in California Fisheries

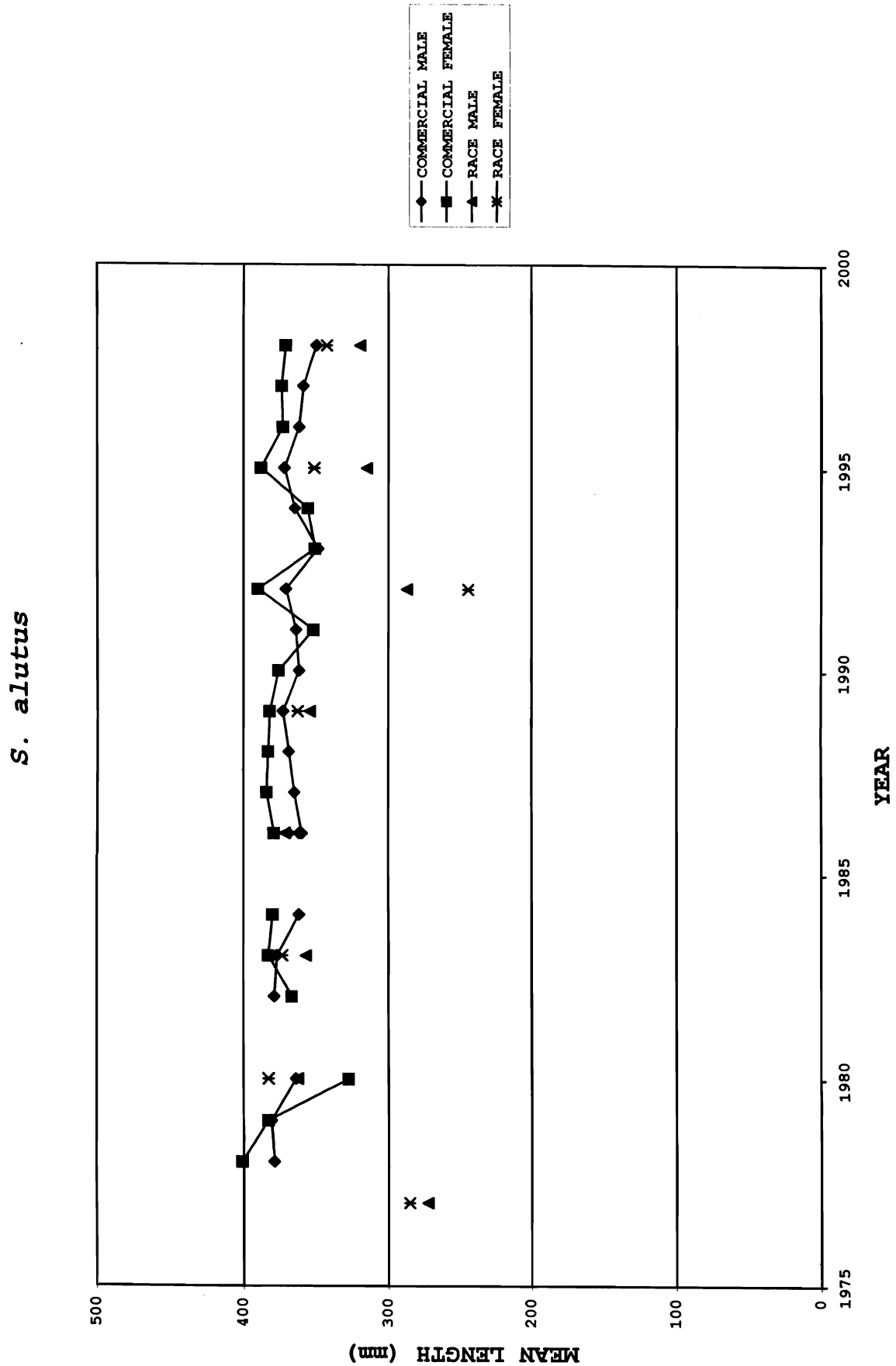
SCIENTIFIC NAME	COMMON NAME
S. aleutianus	rougheye rockfish
S. alutus	pacific ocean perch
S. atrovirens	kelp rockfish
S. auriculatus	brown rockfish
S. aurora	aurora rockfish
S. babcocki	redbanded rockfish
S. borealis	shortraker rockfish
S. brevispinus	silvergray rockfish
S. carnatus	gopher rockfish
S. caurinus	copper rockfish
S. chlorostictus	greenspotted rockfish
S. chrysomelas	black-and-yellow rockfish
S. constellatus	starry rockfish
S. crameri	darkblotched rockfish
S. dalli	calico rockfish
S. diploproa	splitnose rockfish
S. elongatus	greenstriped rockfish
S. ensifer	swordspine rockfish
S. entomelas	widow rockfish
S. eos	pink rockfish
S. flavidus	yellowtail rockfish
S. gilli	bronzespotted rockfish
S. goodei	chilipepper
S. helvomaculatus	rosethorn rockfish
S. hopkinsi	squarespot rockfish
S. jordani	shortbelly rockfish
S. levis	cowcod
S. macdonaldi	mexican rockfish
S. maliger	quillback rockfish
S. melanops	black rockfish
S. melanostomus	blackgill rockfish
S. miniatus	vermillion rockfish
S. mystinus	blue rockfish
S. nebulosus	china rockfish
S. nigrocinctus	tiger rockfish
s. ovalis	speckled rockfish
S. paucispinus	bocaccio
S. phillipsi	chameleon rockfish
S. pinniger	canary rockfish
S. proriger	redstripe rockfish
S. rastrelliger	grass rockfish
S. reedi	yellowmouth rockfish
S. rosaceus	rosy rockfish

SCIENTIFIC NAME	COMMON NAME
S. rosenblatti	greenblotched rockfish
S. rubberimus	yelloweye rockfish
S. rubrivinctus	flag rockfish
S. rufus	bank rockfish
S. saxicola	stripetail rockfish
S. semicinctus	half-banded rockfish
S. serranoides	olive rockfish
S. serriceps	treefish
S. simulator	pinkrose rockfish
S. umbrosus	honeycomb rockfish
S. wilsoni	pygmy rockfish
S. zacentrus	sharpchin rockfish

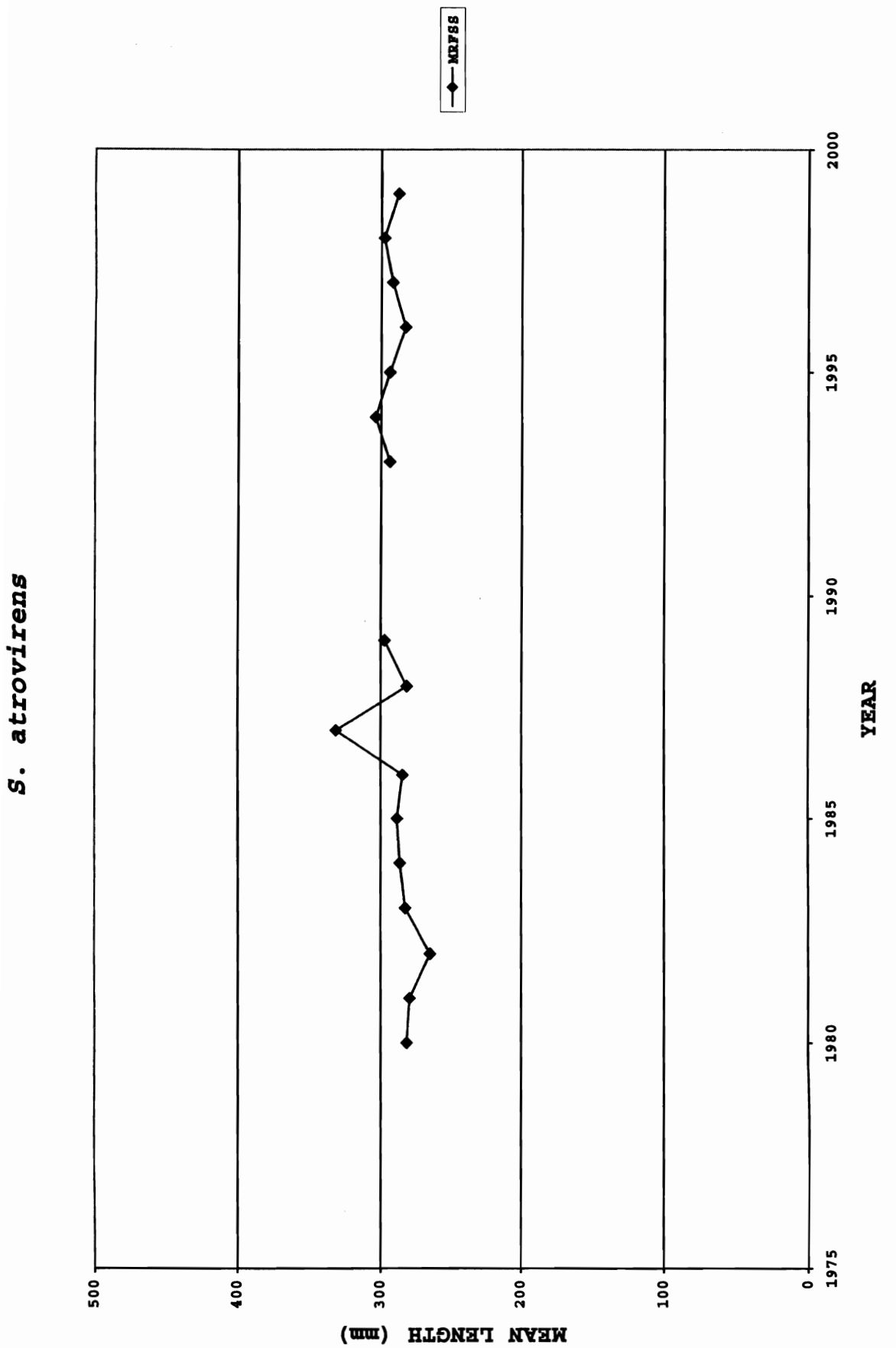
Appendix B. Mean length trends of rockfish

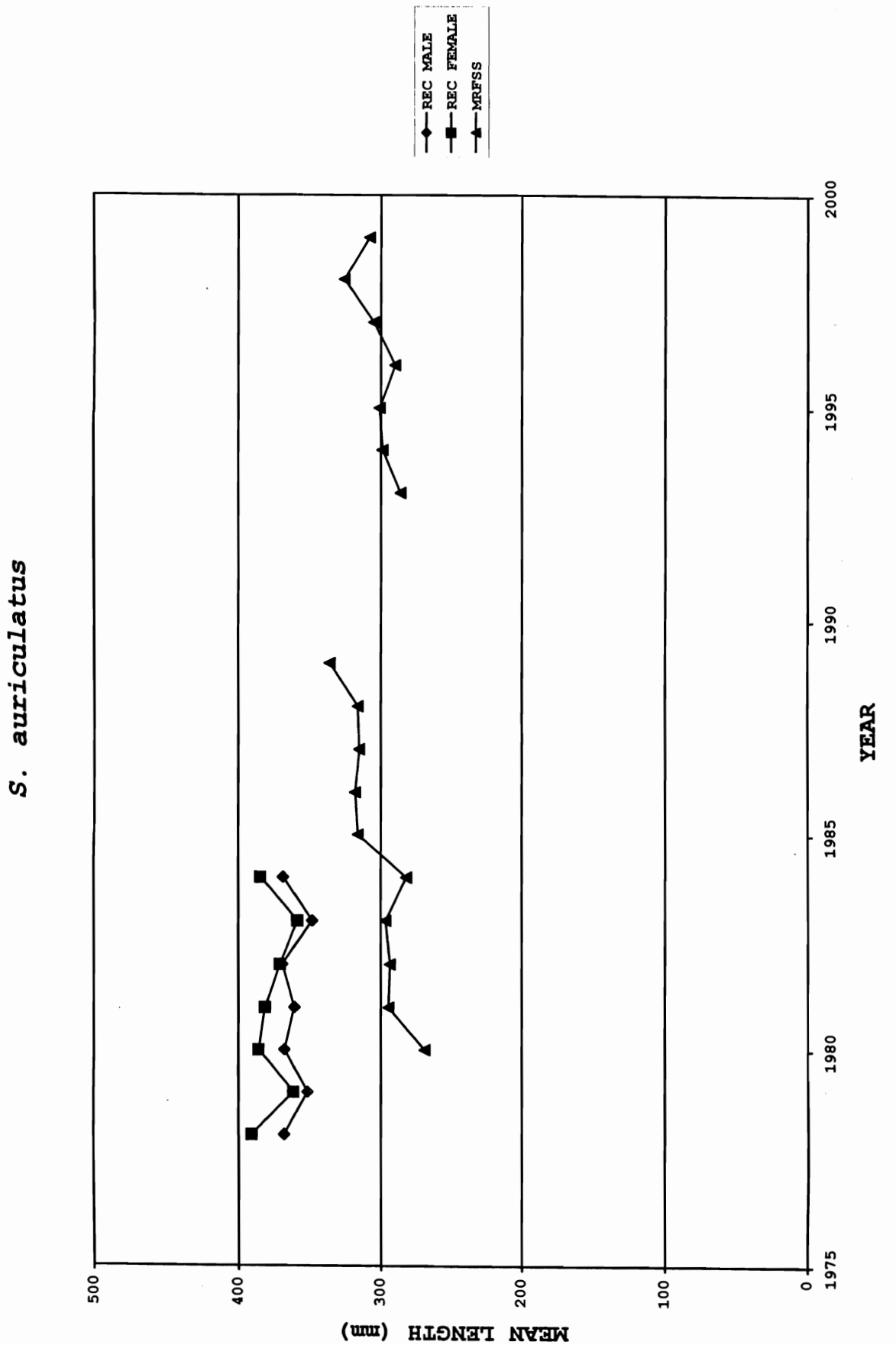


Appendix B cont.

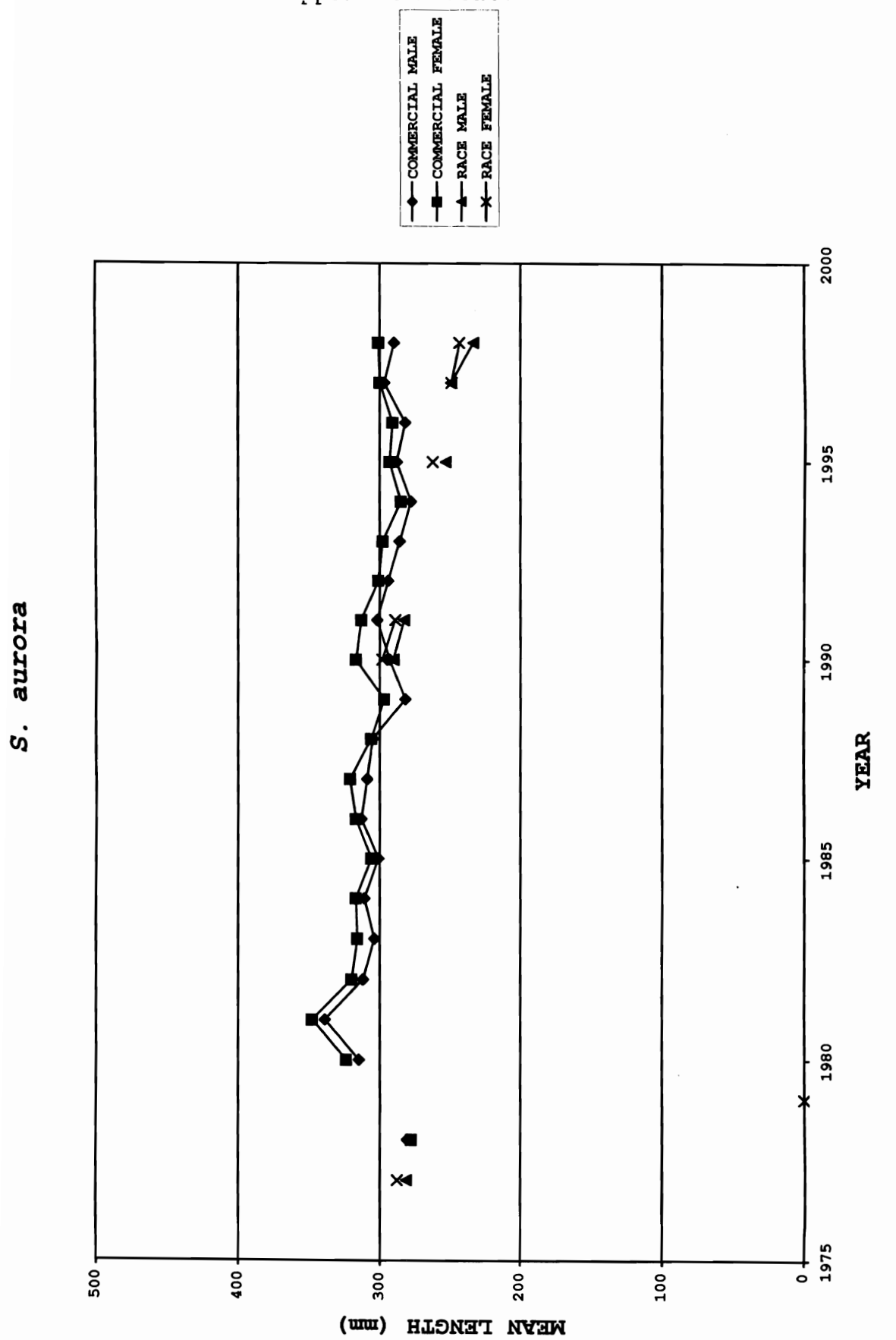


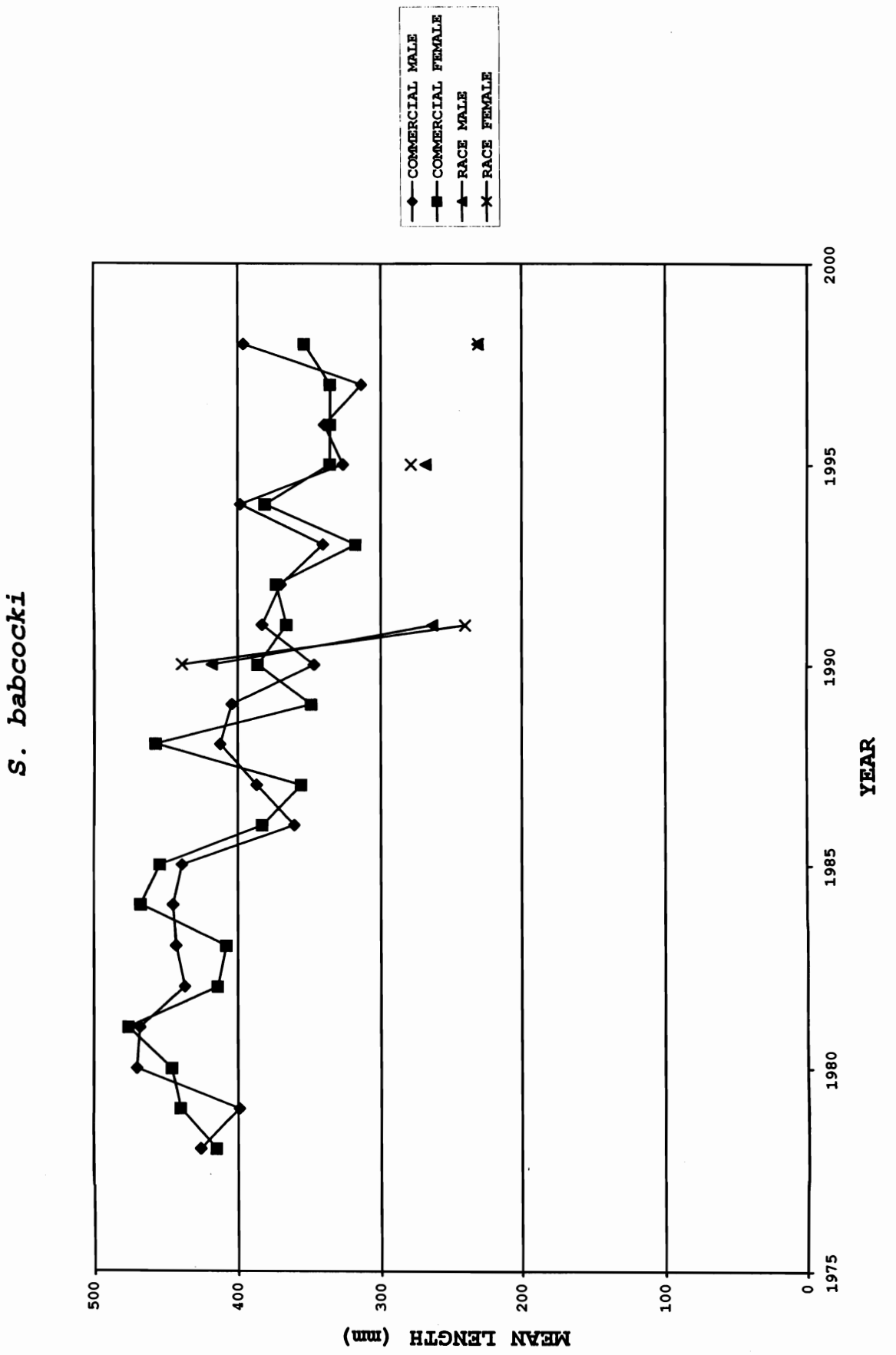
ppendix B. Cont.




S. auriculatus
REC MALE
REC FEMALE
MRFSS
MEAN LENGTH (mm)
0
100
200
300
400
500
1975
1980
1985
1990
1995
2000
YEAR

Appendix B cont.

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COMMERCIAL FEMALE
RACE MALE
RACE FEMALE
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MEAN LENGTH (mm)
YEAR
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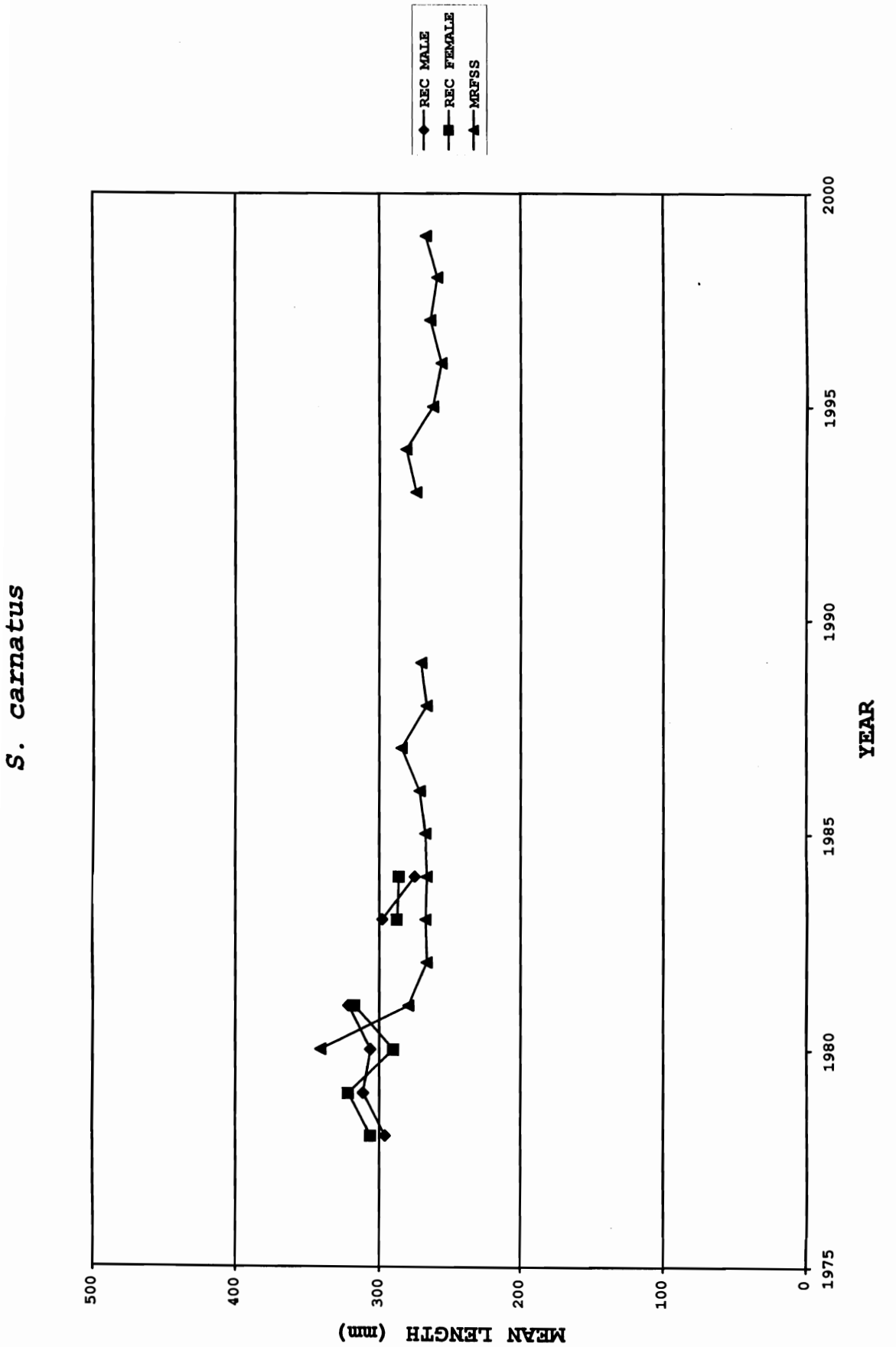
400
500
1975
1980
1985
1990
1995
2000


S. carnatus
REC MALE
REC FEMALE
MRFSS
MEAN LENGTH (mm)
YEAR
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400
500
1975
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1985
1990
1995
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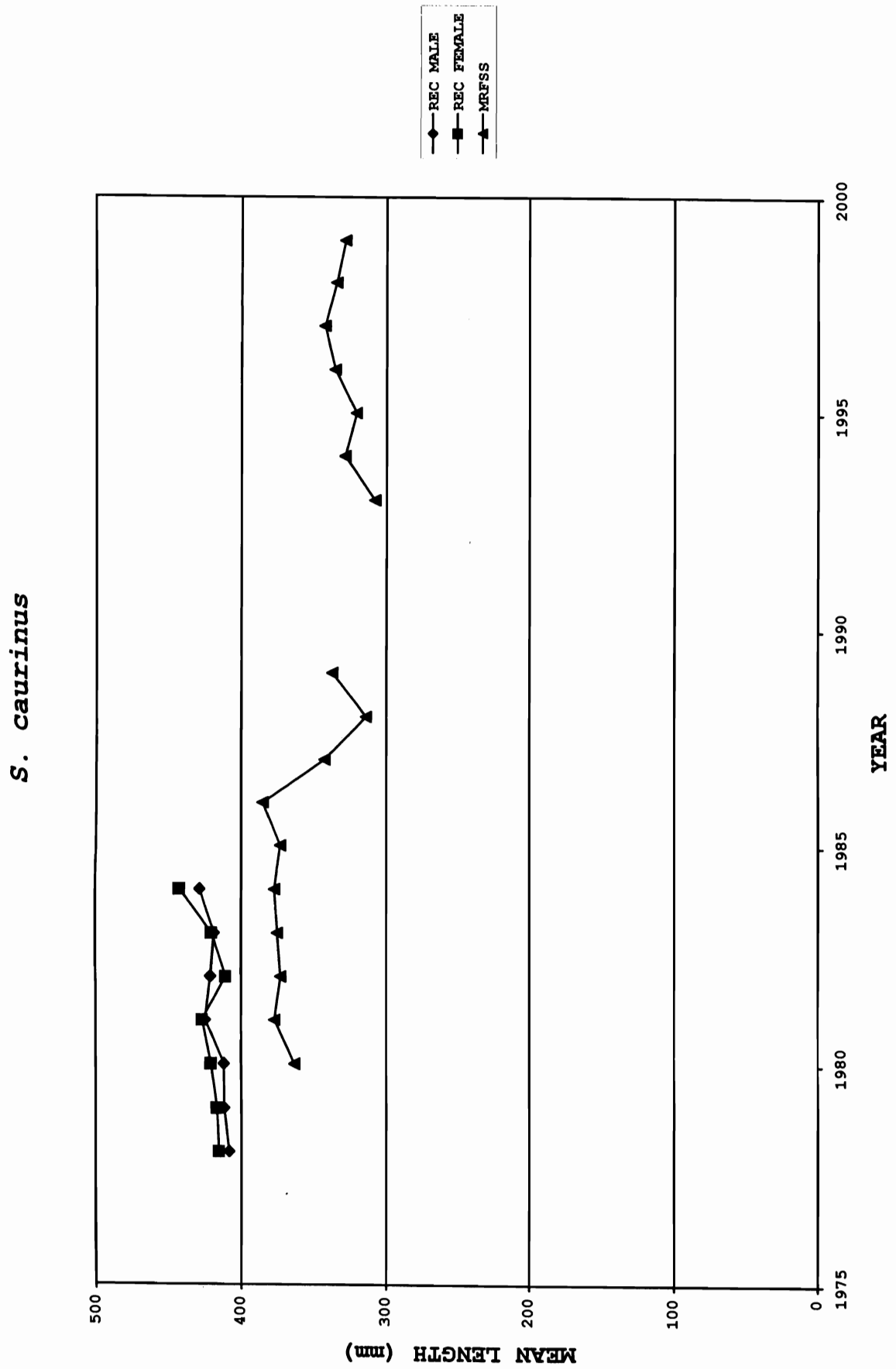
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REC FEMALE
MRFSS
S. caurinus
MEAN LENGTH (mm)
YEAR
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1985
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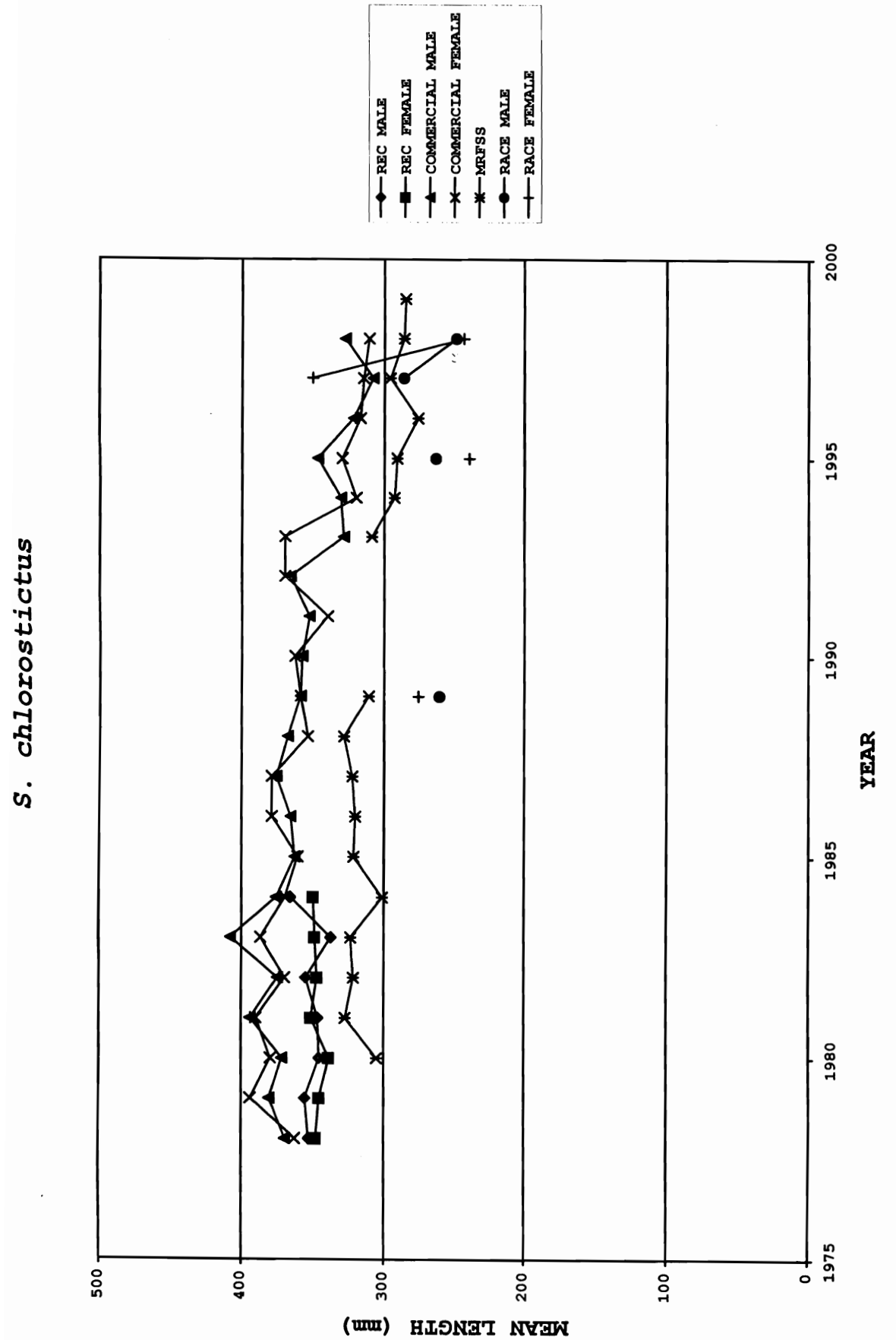
1995
2000


S. chlorostictus
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REC FEMALE
COMMERCIAL MALE
COMMERCIAL FEMALE
MRFSS
RACE MALE
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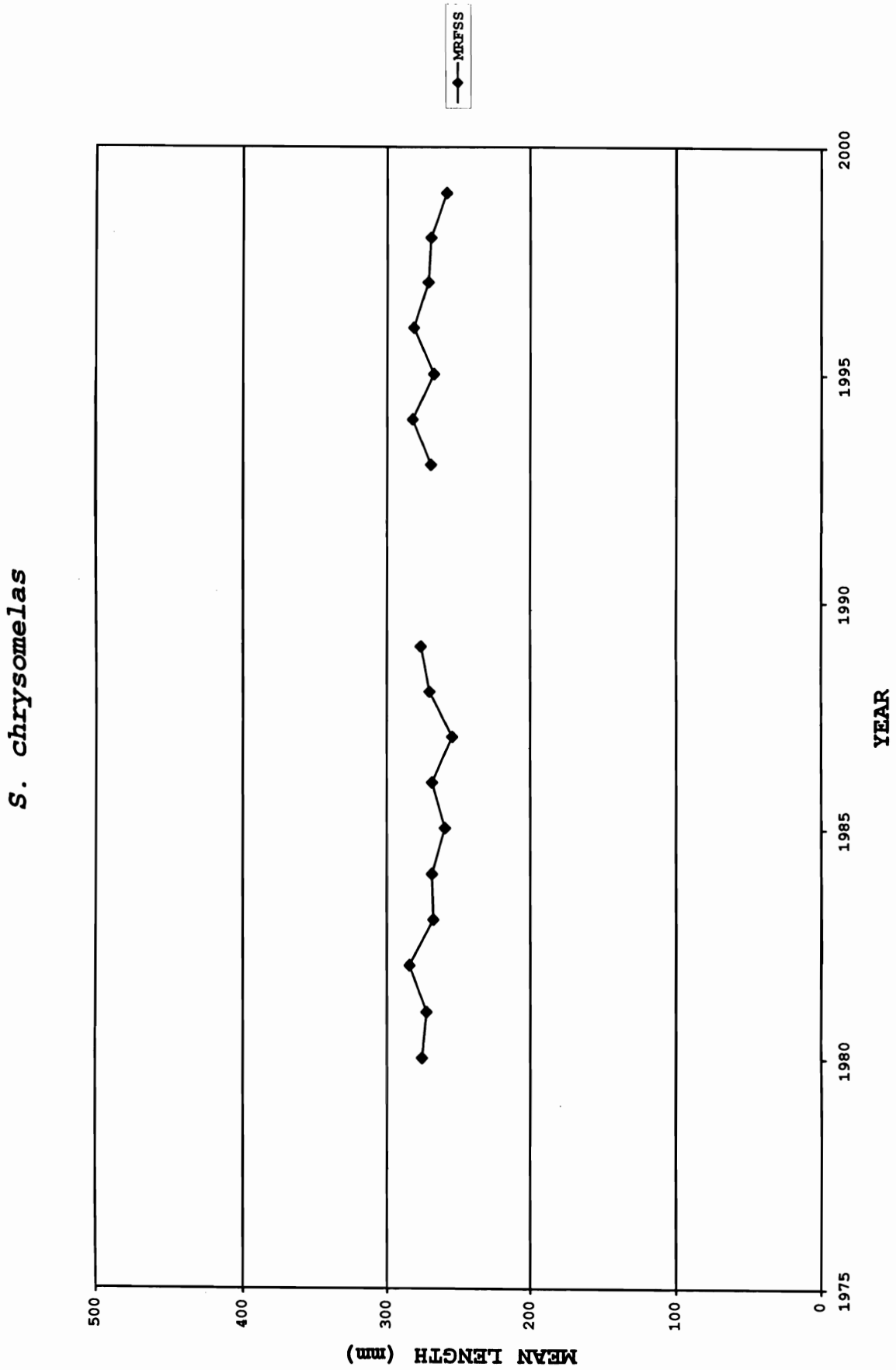
2000
YEAR


MRFSS
S. chrysomelas
MEAN LENGTH (mm)
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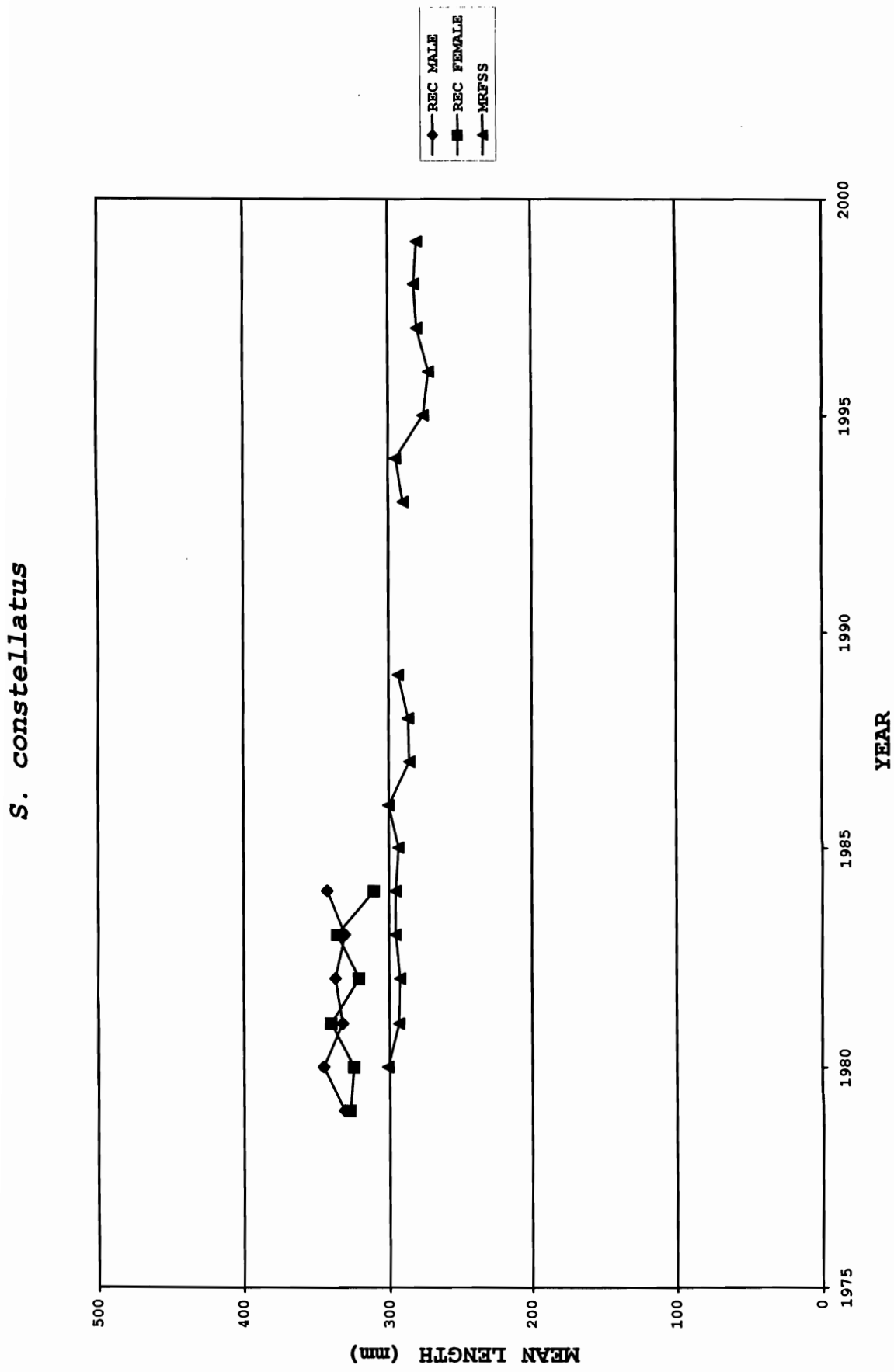
YEAR


S. constellatus
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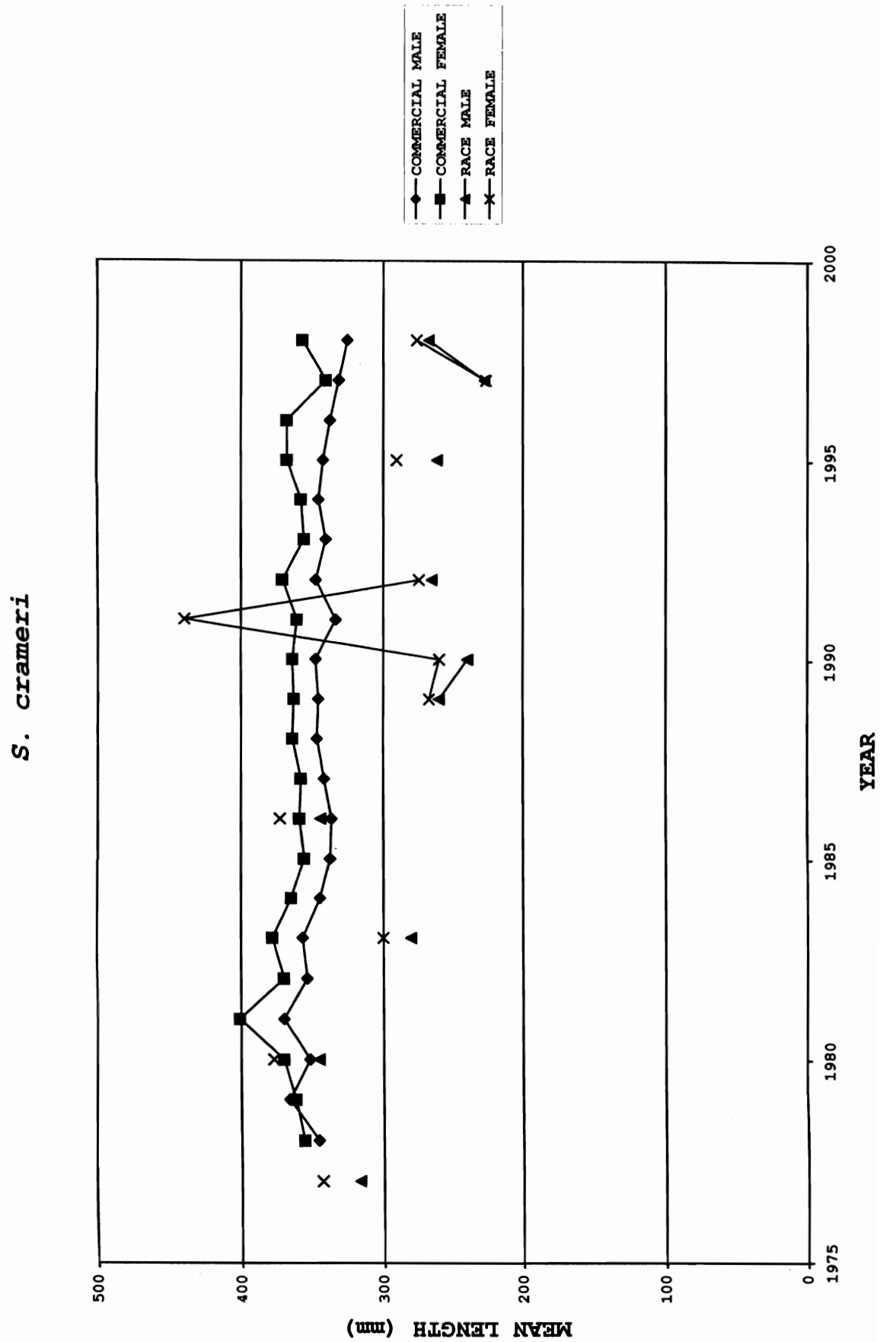
2000
YEAR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COMMERCIAL FEMALE
RACE MALE
RACE FEMALE
S. crameri
MEAN LENGTH (mm)
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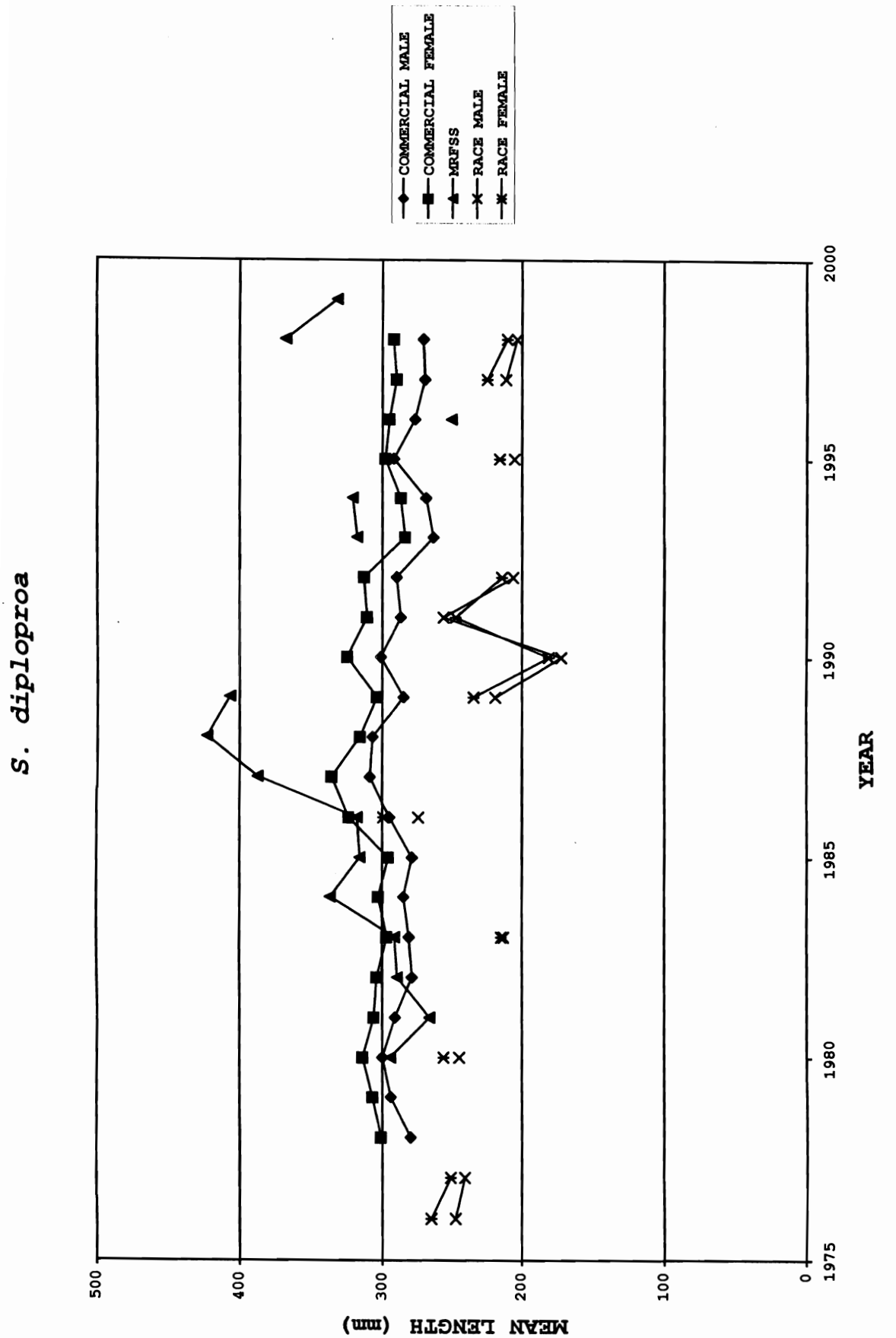
S. diploproa
COMMERCIAL MALE
COMMERCIAL FEMALE
MRFSS
RACE MALE
RACE FEMALE
MEAN LENGTH (mm)
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YEAR
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1995
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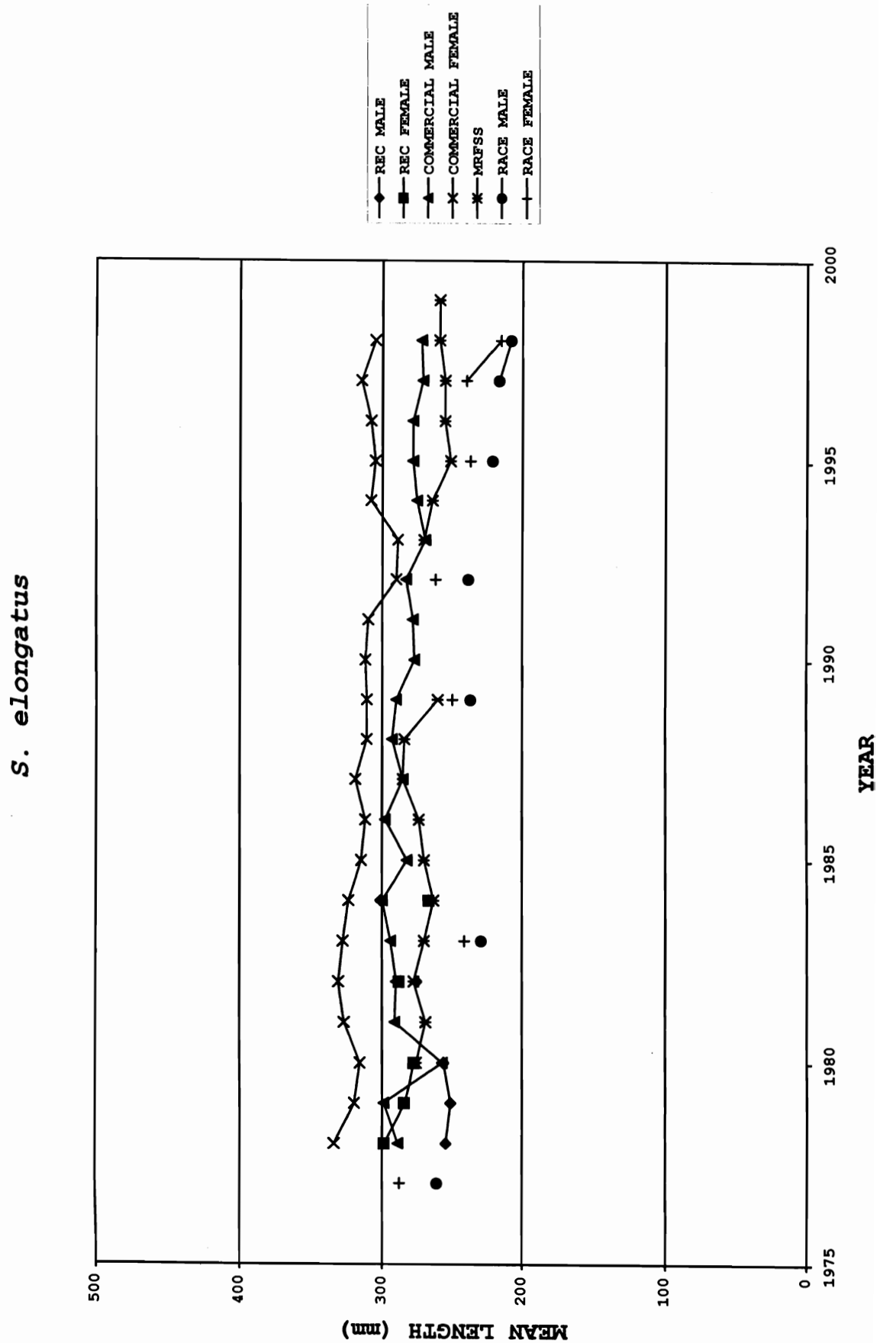
S. elongatus
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REC FEMALE
COMMERCIAL MALE
COMMERCIAL FEMALE
MRFSS
RACE MALE
RACE FEMALE
MEAN LENGTH (mm)
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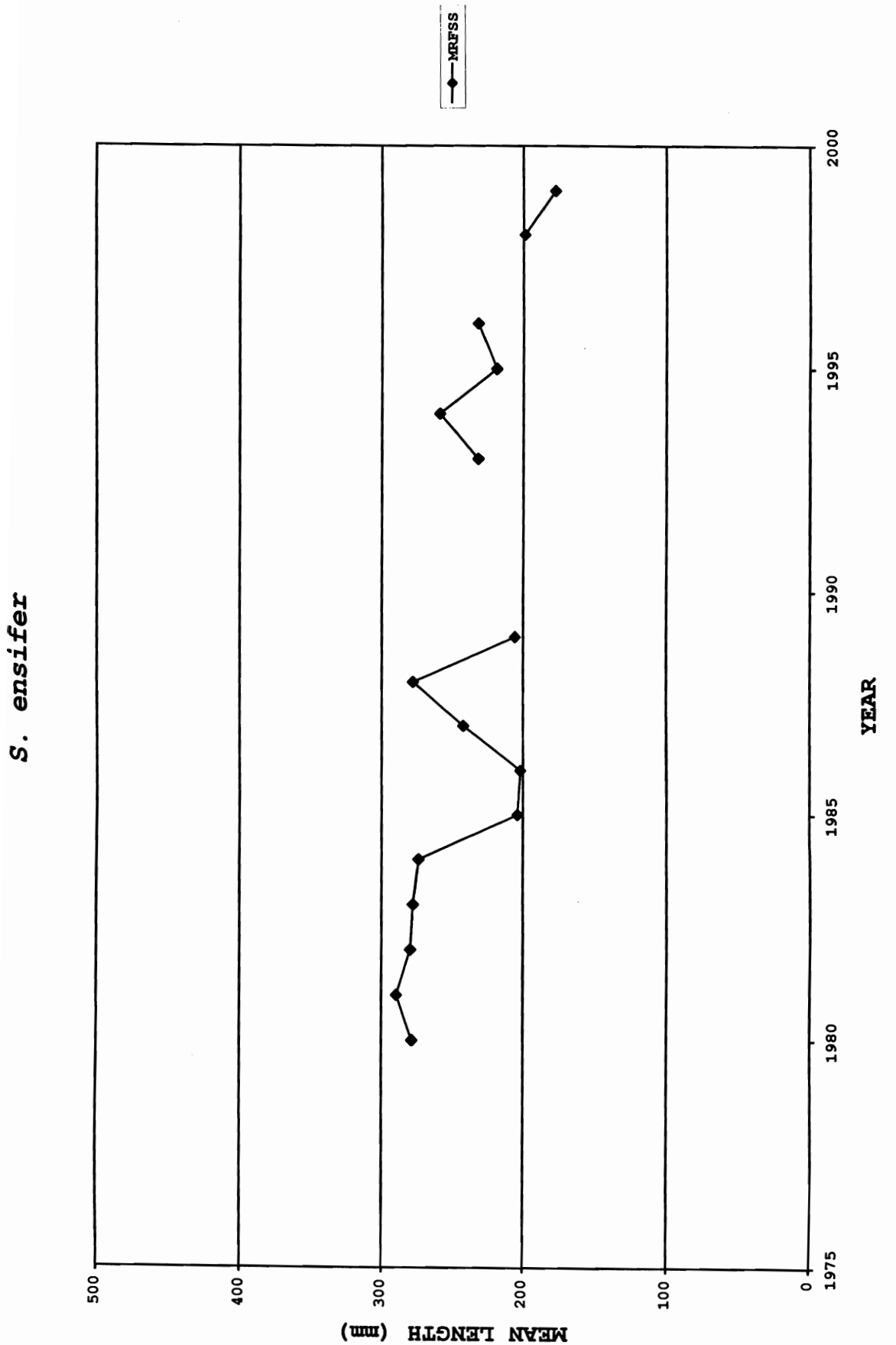
1975
1980
1985
1990
1995
2000
YEAR


S. ensifer
MRFSS
MEAN LENGTH (mm)
YEAR
0
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500
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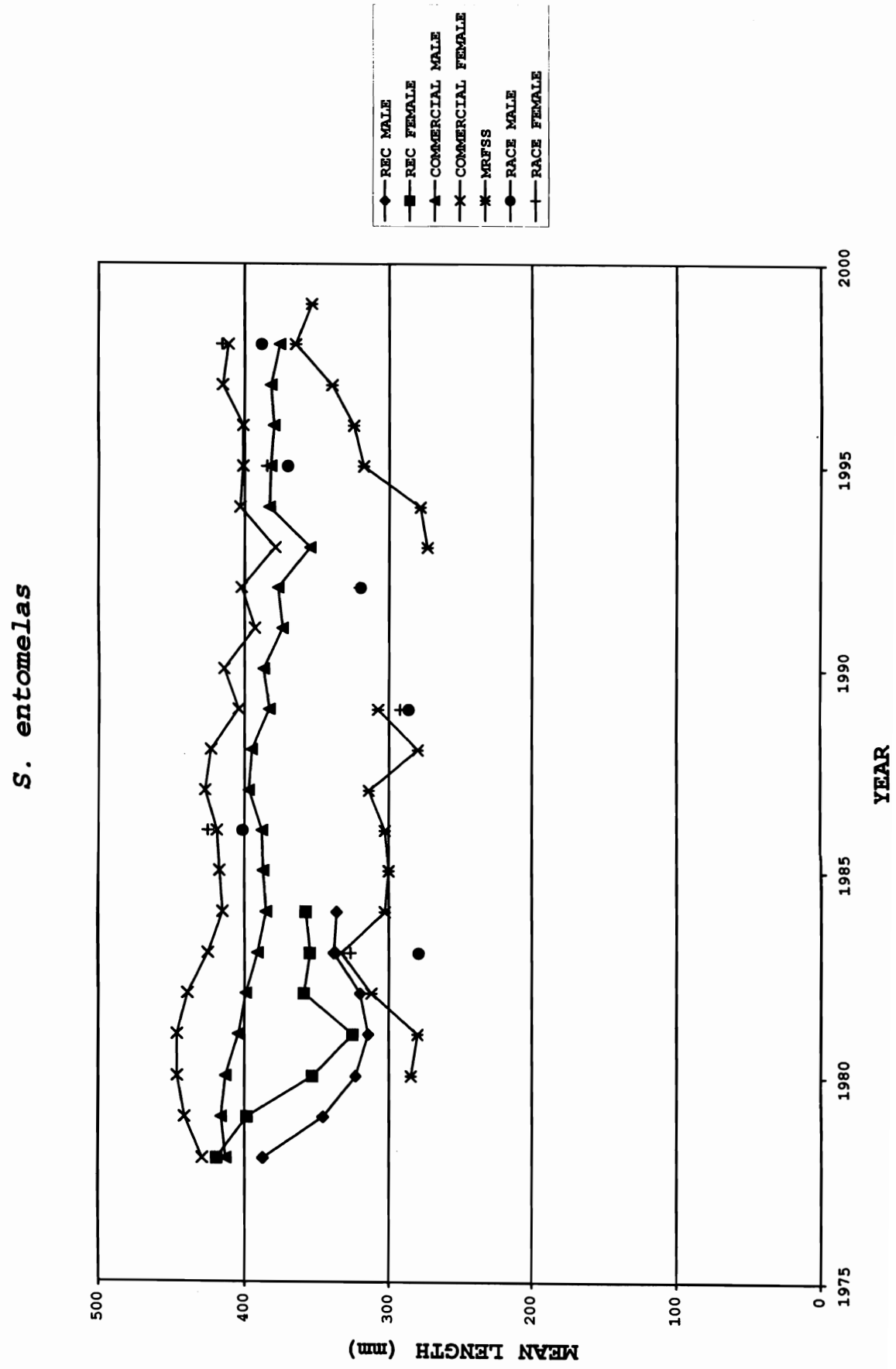
REC MALE
REC FEMALE
COMMERCIAL MALE
COMMERCIAL FEMALE
MRFSS
RACE MALE
RACE FEMALE
S. entomelas
MEAN LENGTH (mm)
YEAR
0
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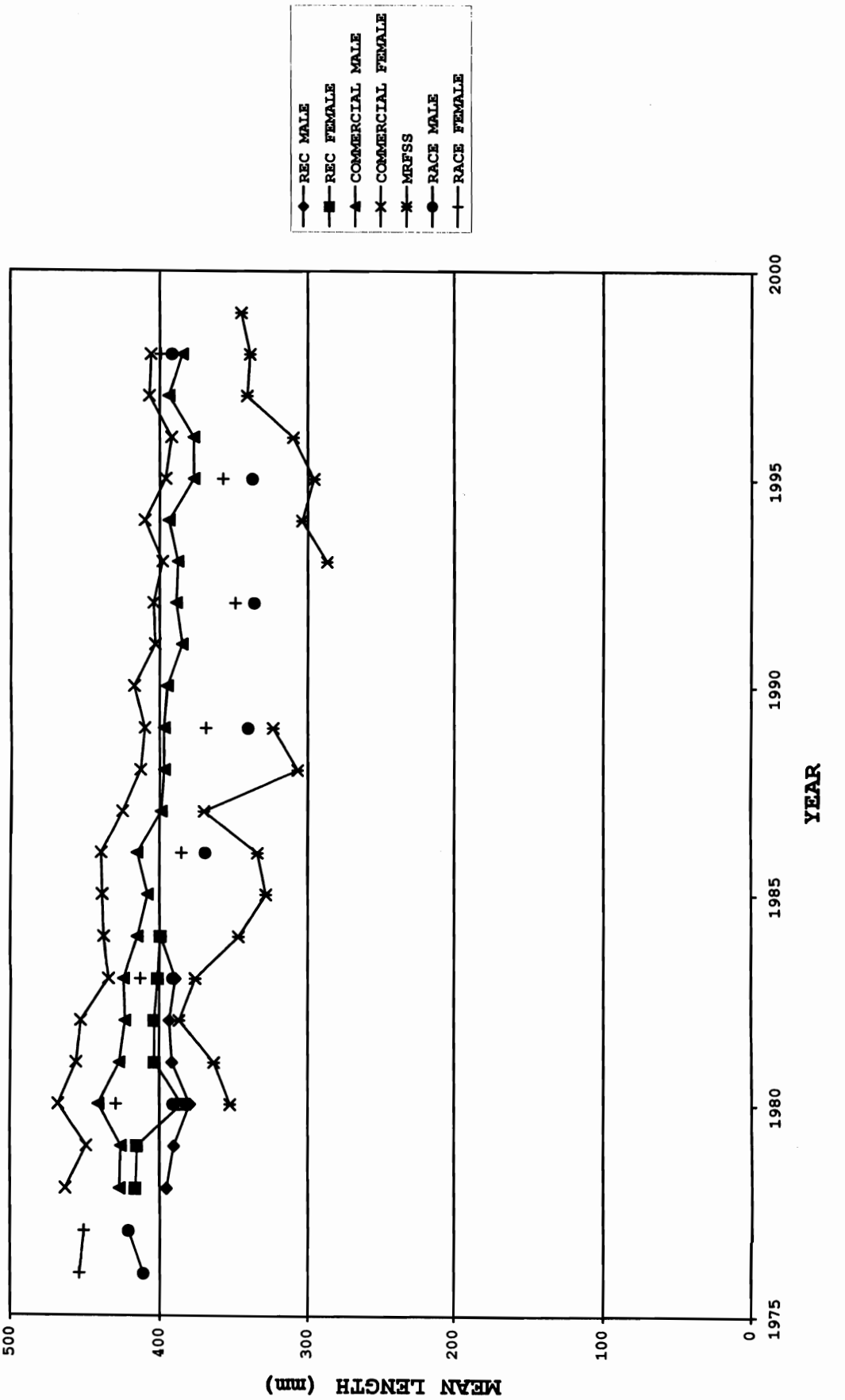
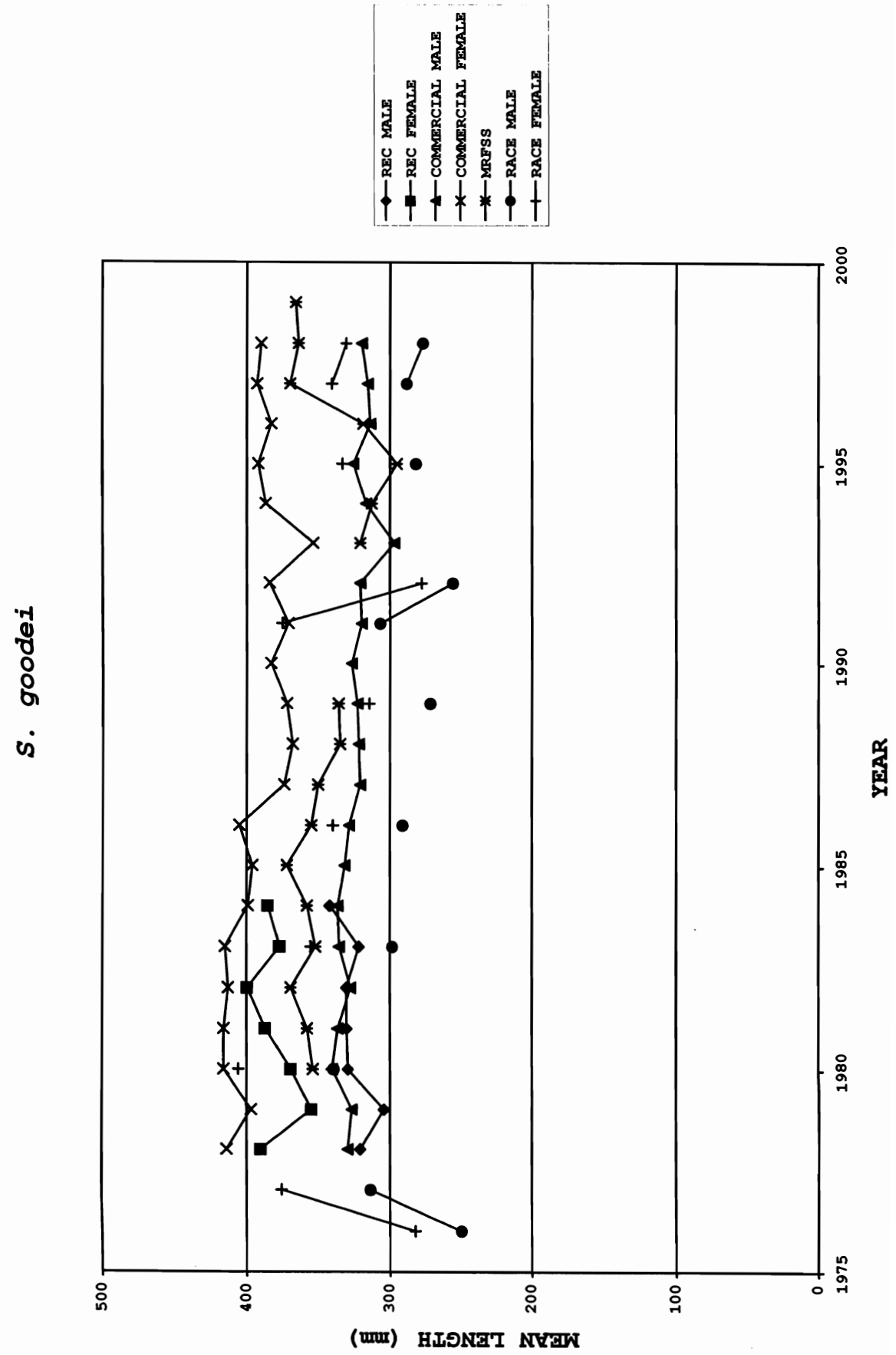
500
1975
1980
1985
1990
1995
2000


REC MALE
REC FEMALE
COMMERCIAL MALE
COMMERCIAL FEMALE
MRFSS
RACE MALE
RACE FEMALE
MEAN LENGTH (mm)
0
100
200
300
400
500
1975
1980
1985
1990
1995
2000
YEAR

S. flavidus


REC MALE
REC FEMALE
COMMERCIAL MALE
COMMERCIAL FEMALE
MRFSS
RACE MALE
RACE FEMALE
S. goodei
MEAN LENGTH (mm)
YEAR
0
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200
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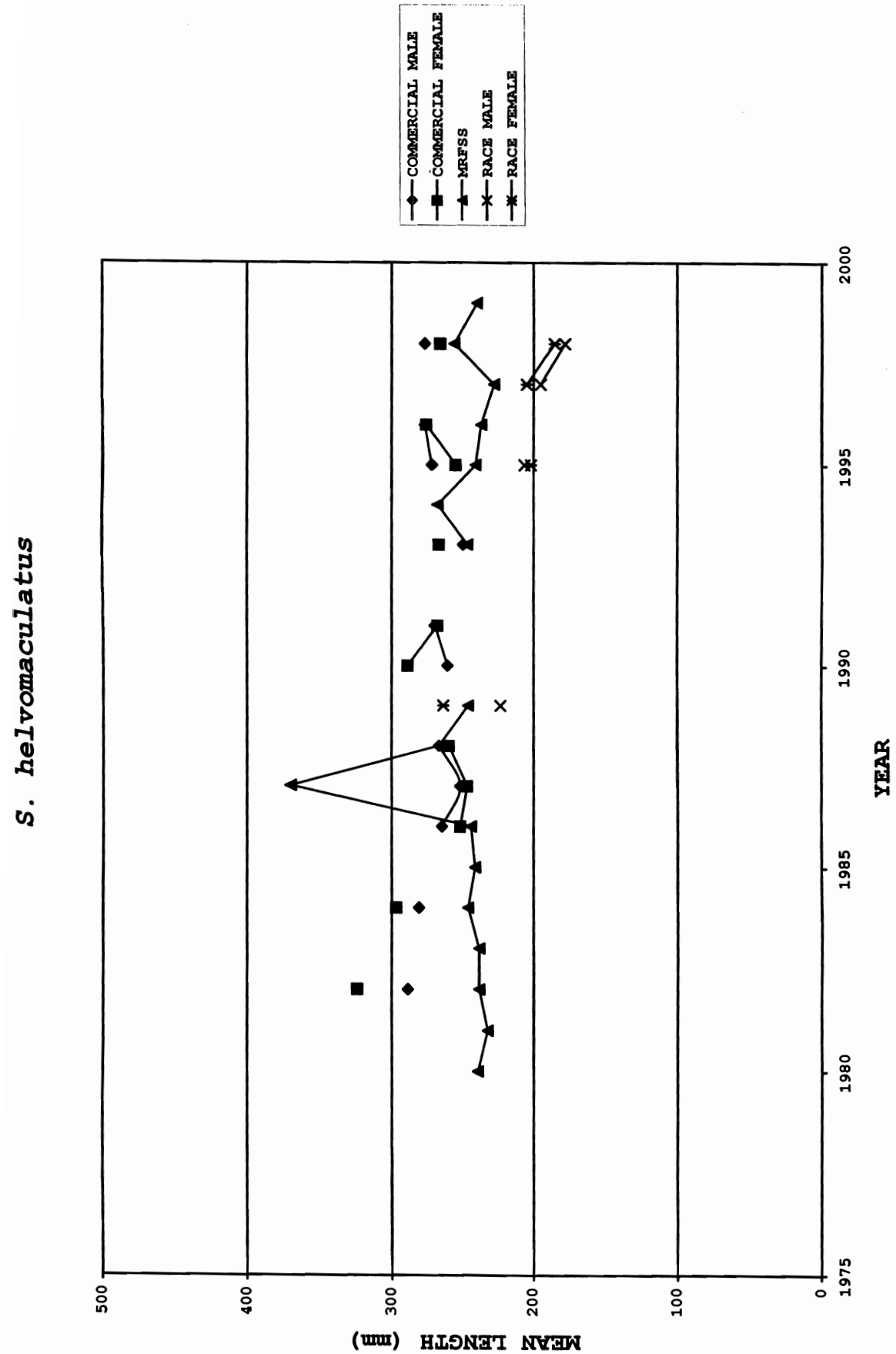
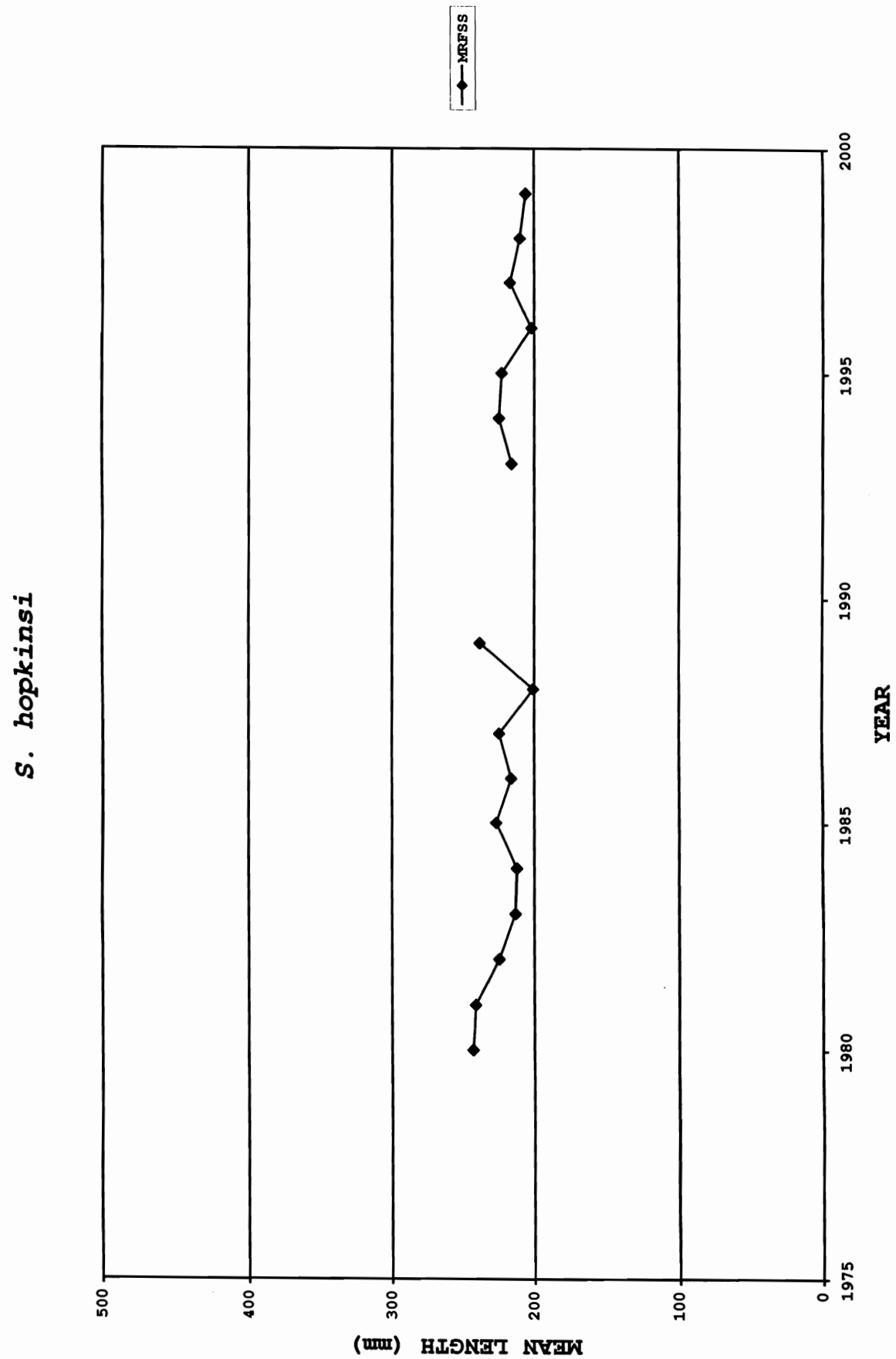
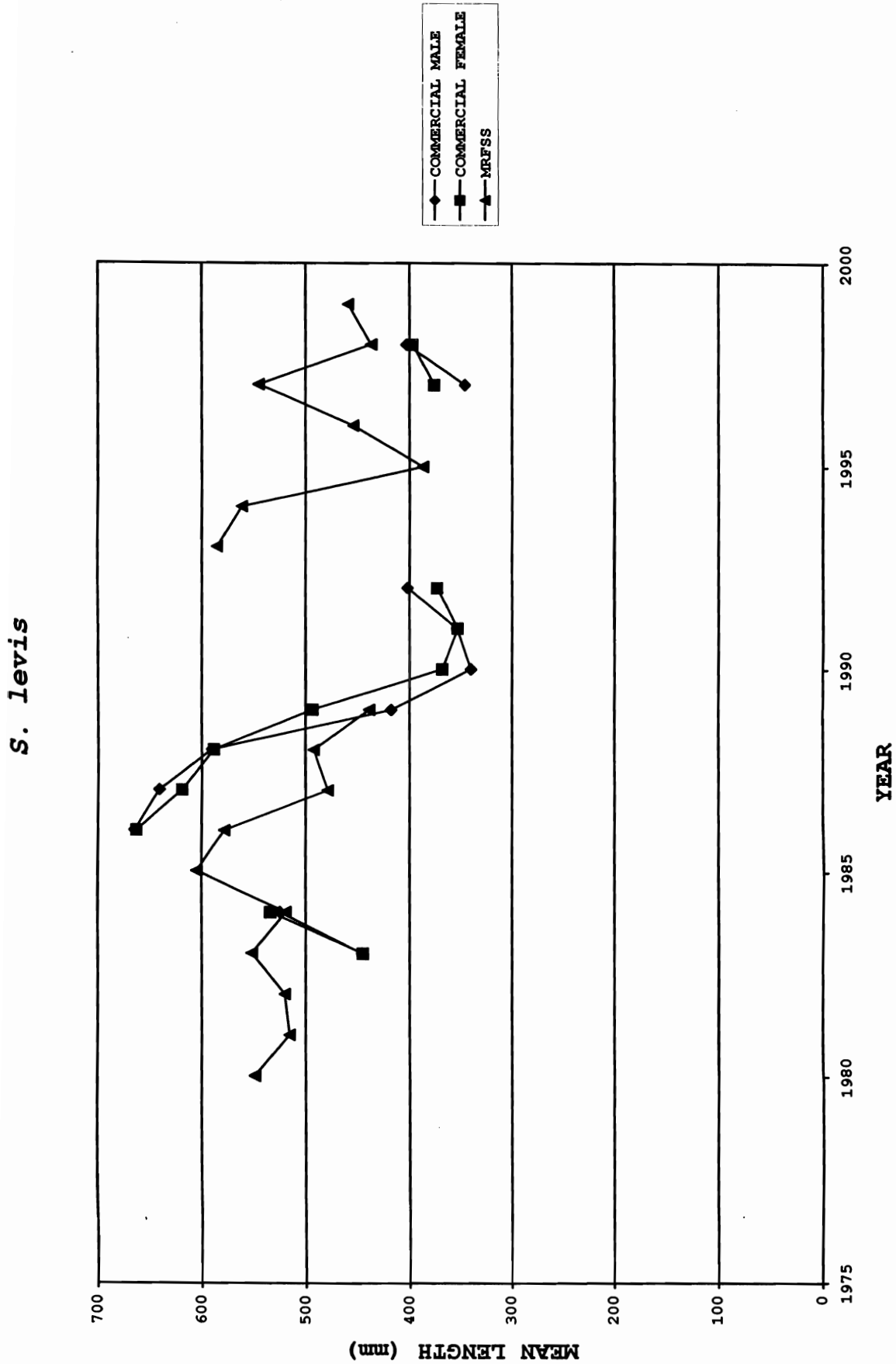
400
500
1975
1980
1985
1990
1995
2000

Appendix B cont.

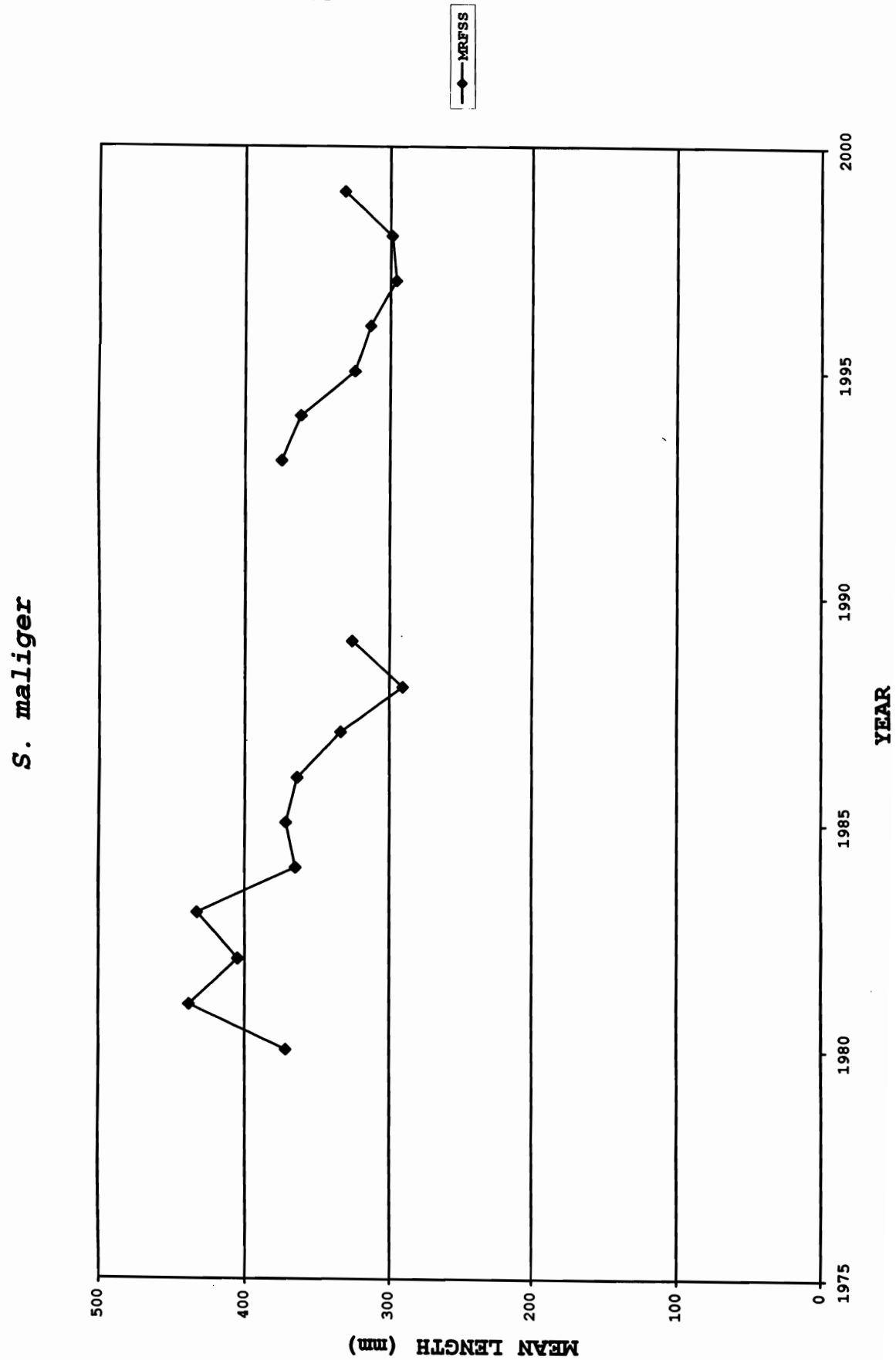



MRFSS
S. hopkinsi
MEAN LENGTH (mm)
YEAR
500
400
300
200
100
0
1975
1980
1985
1990
1995
2000

Appendix B cont.



S. levis


MRFSS
S. maliger
MEAN LENGTH (mm)
YEAR
500
400
300
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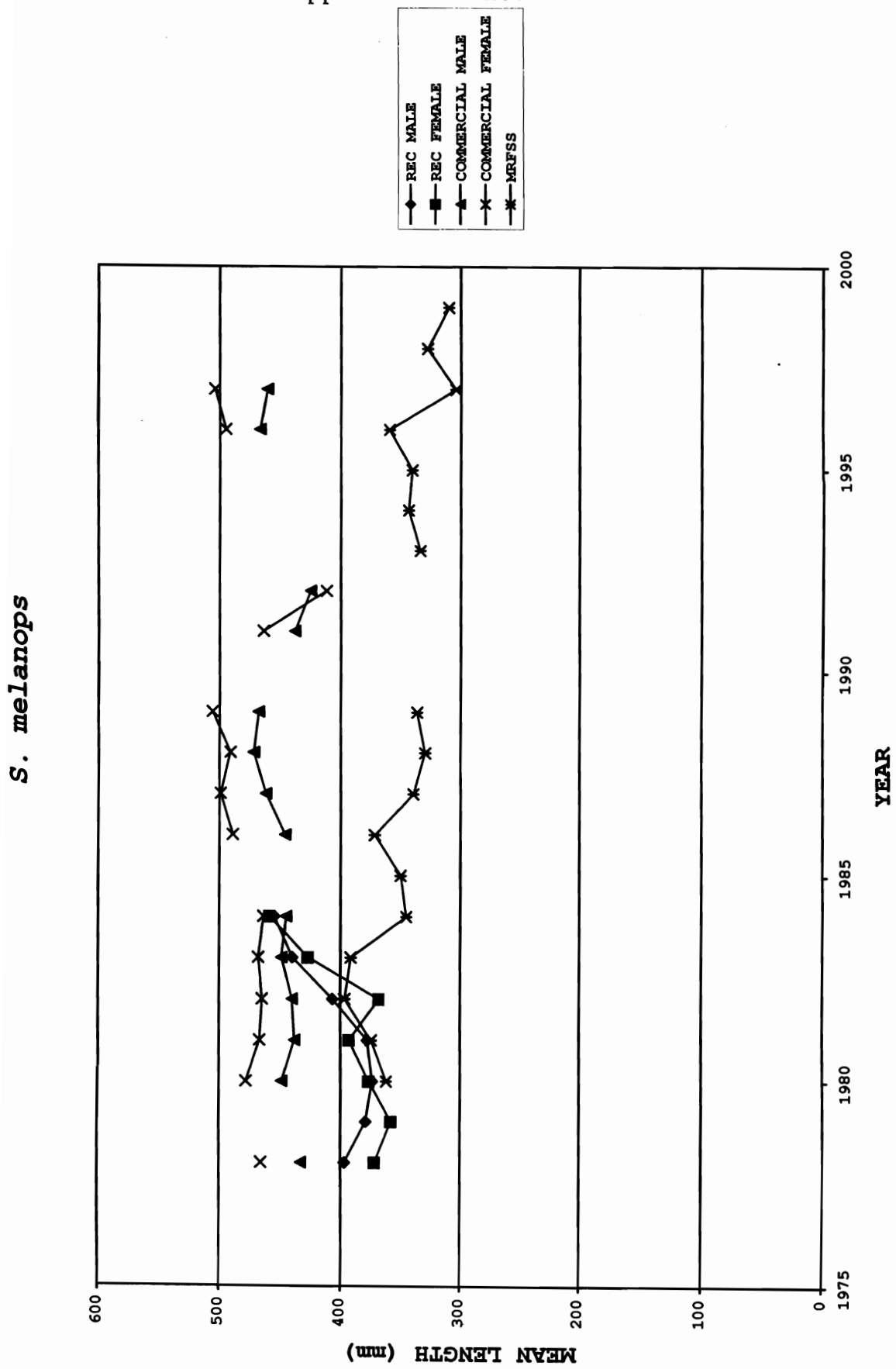
100
0
1975
1980
1985
1990
1995
2000

Appendix B cont.



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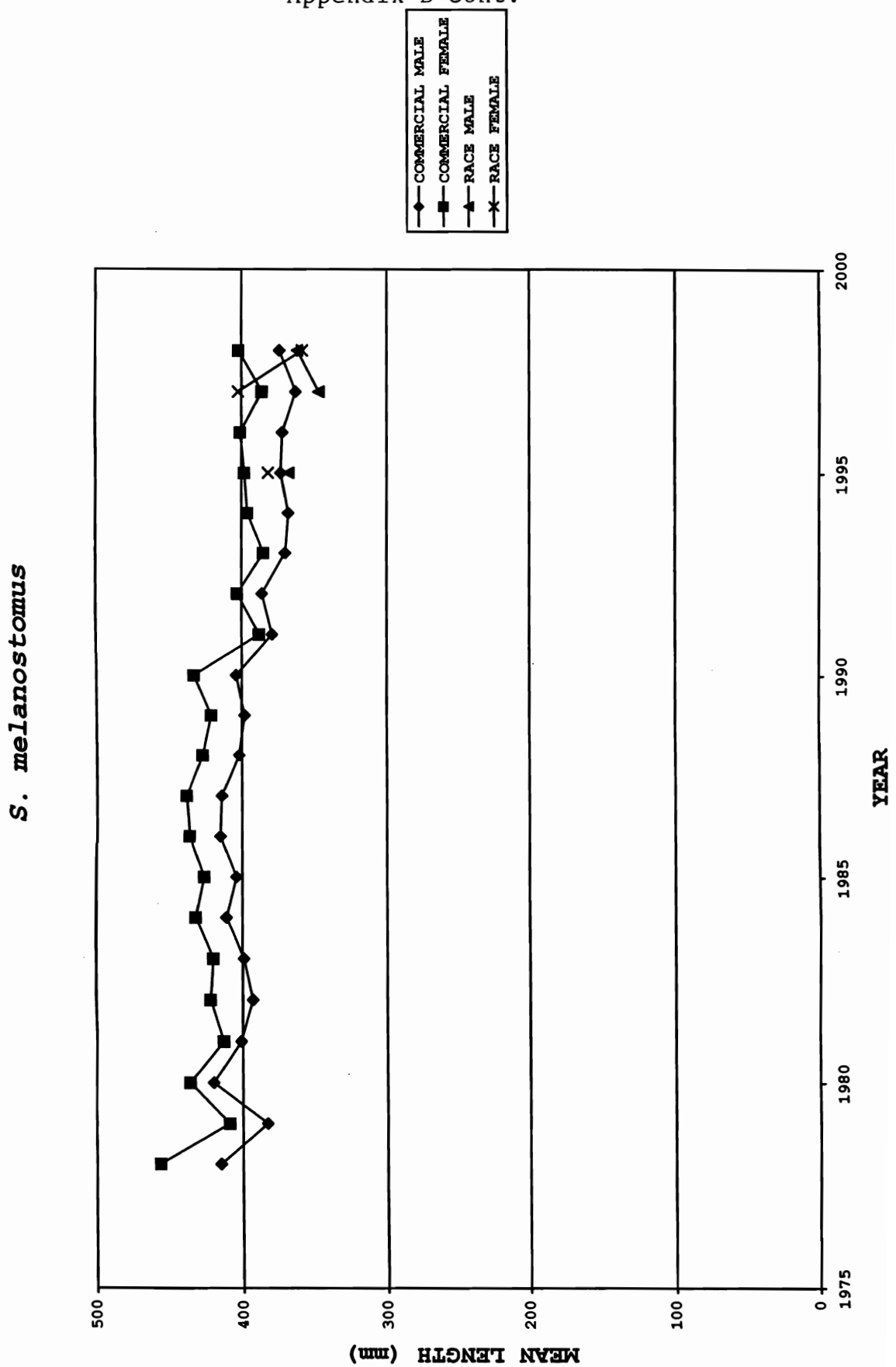

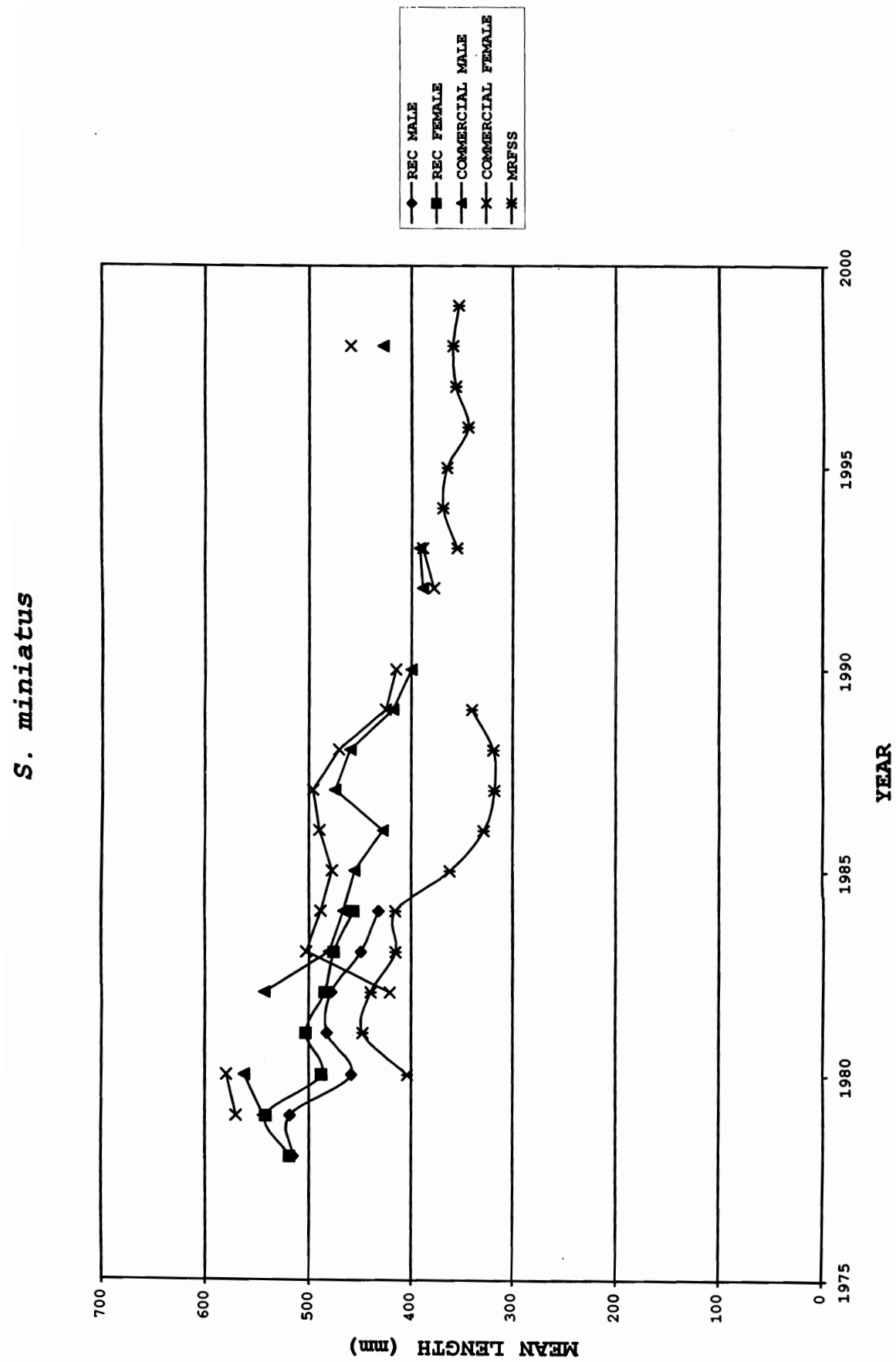
S. miniatus
REC MALE
REC FEMALE
COMMERCIAL MALE
COMMERCIAL FEMALE
MRFSS
MEAN LENGTH (mm)
YEAR
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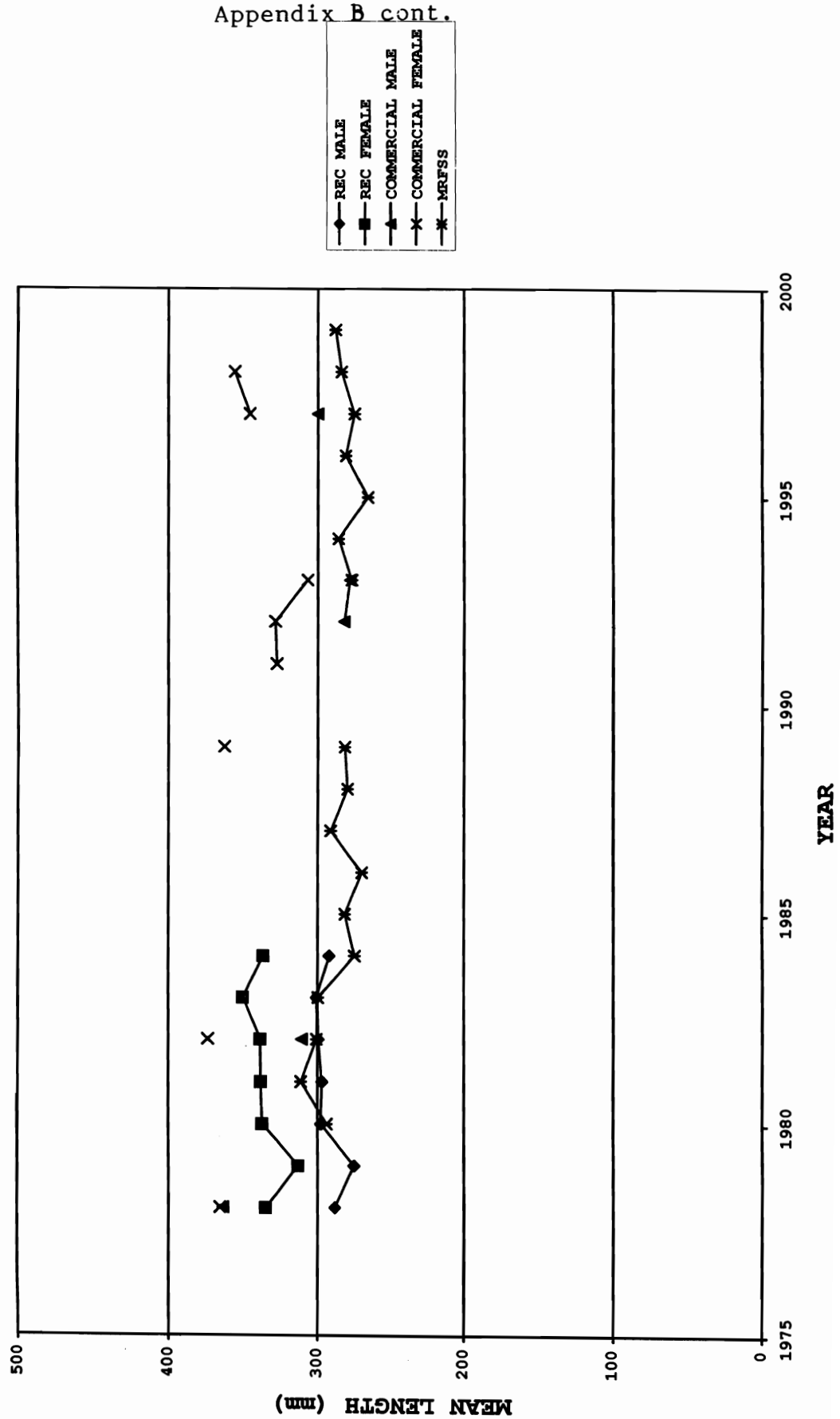
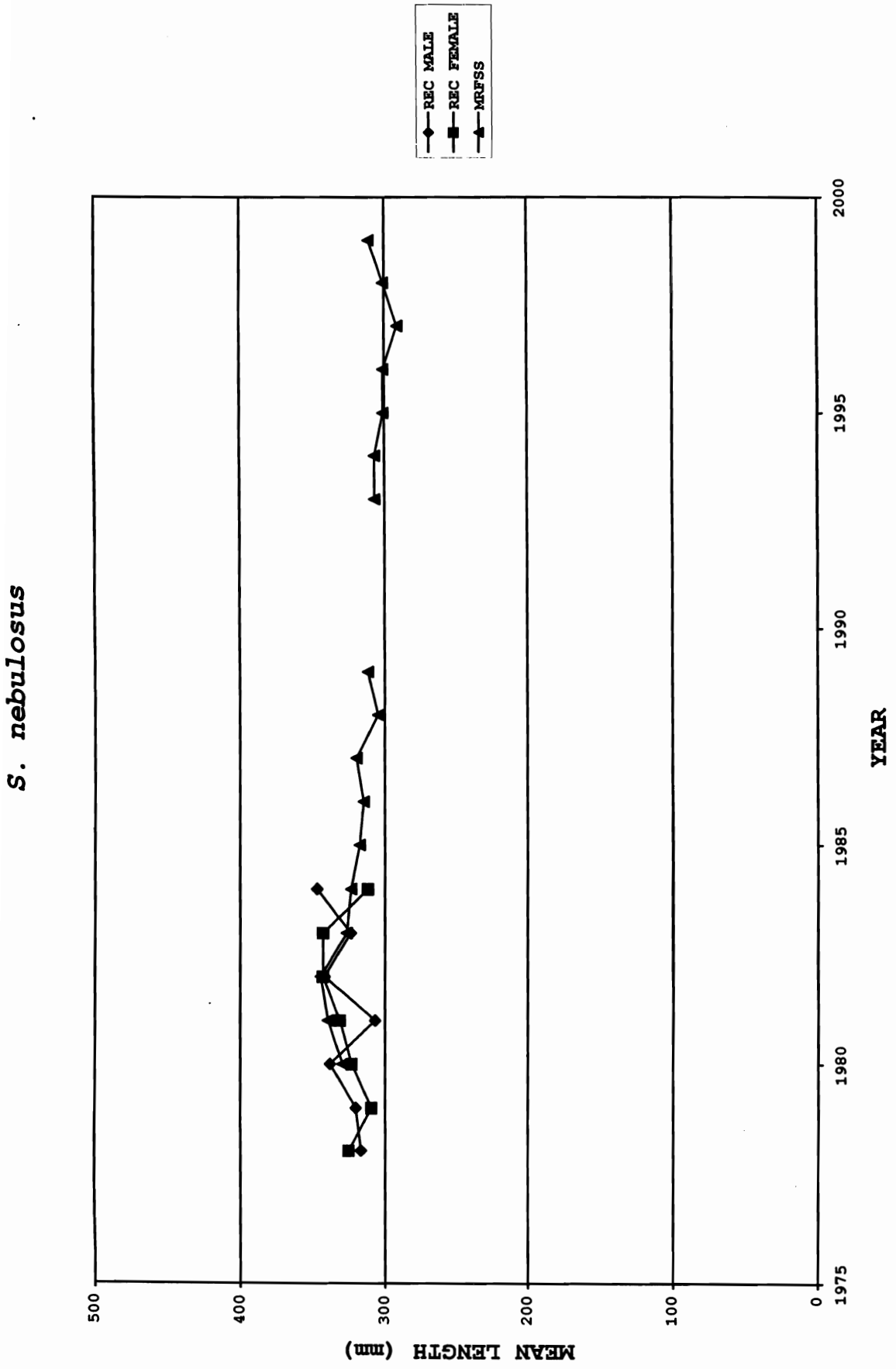
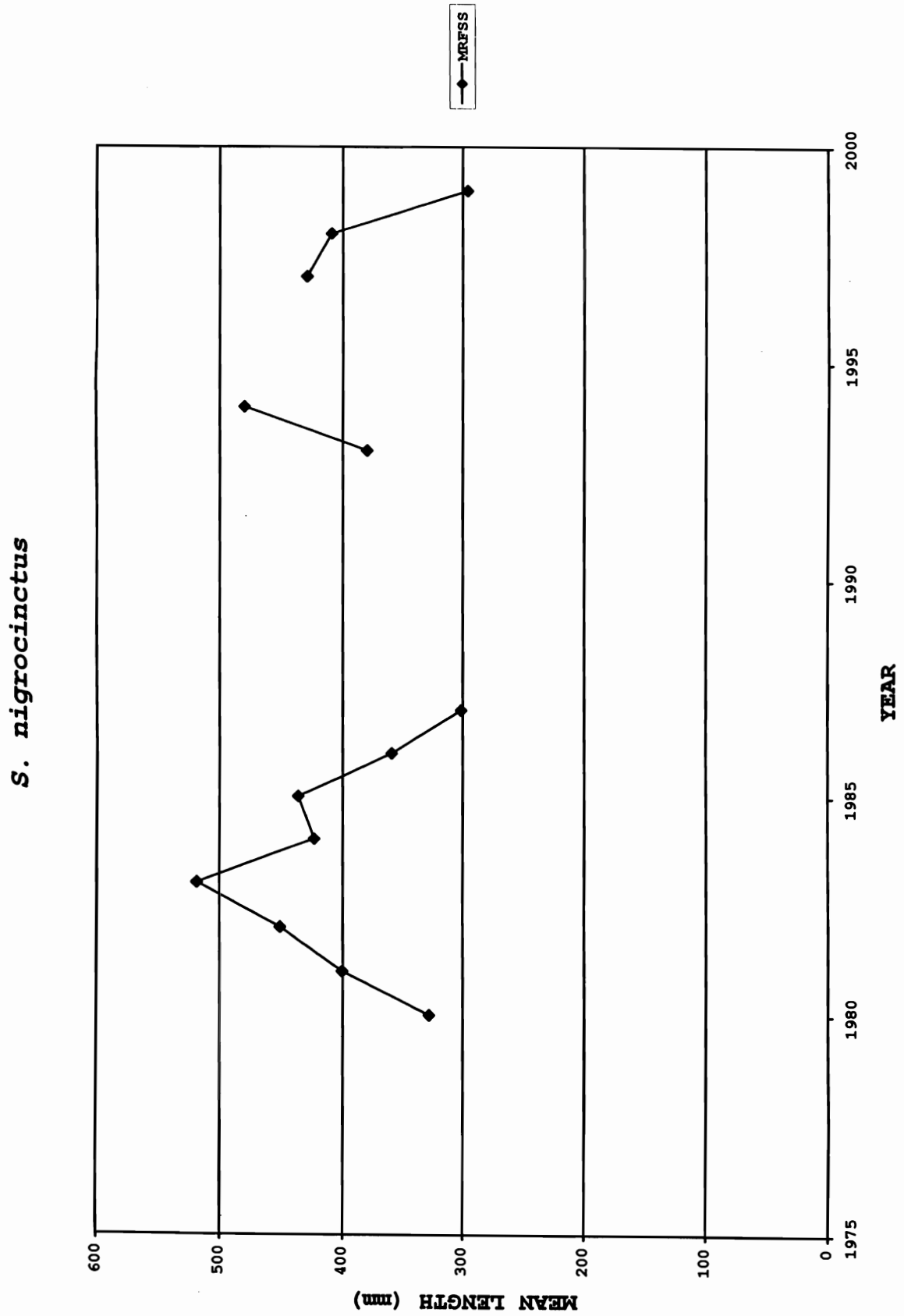
100
200
300
400
500
600
700
1975
1980
1985
1990
1995
2000

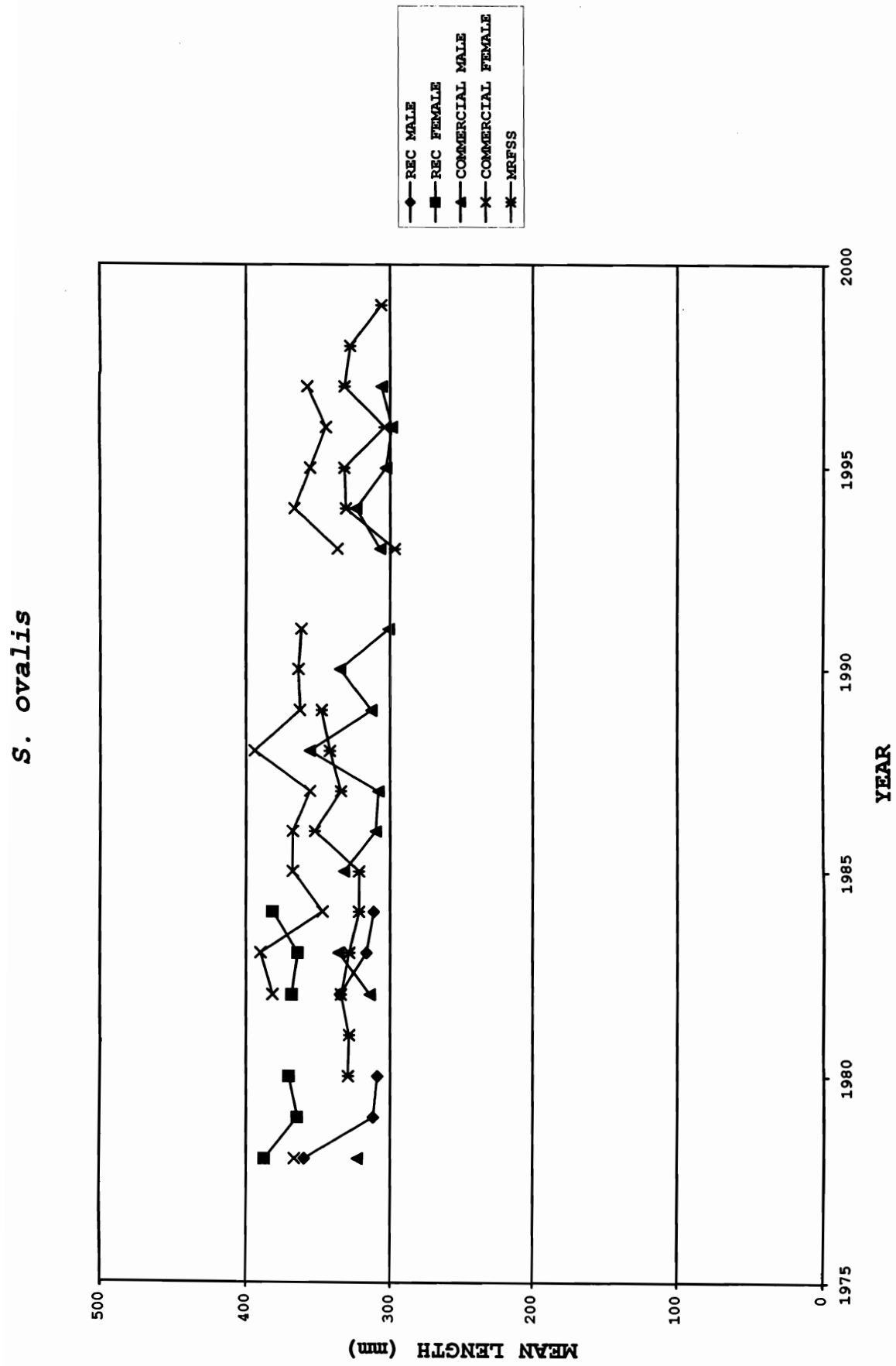
S. mystinus


REC MALE
REC FEMALE
COMMERCIAL MALE
COMMERCIAL FEMALE
MRFSS
MEAN LENGTH (mm)
0
100
200
300
400
500
YEAR
1975
1980
1985
1990
1995
2000

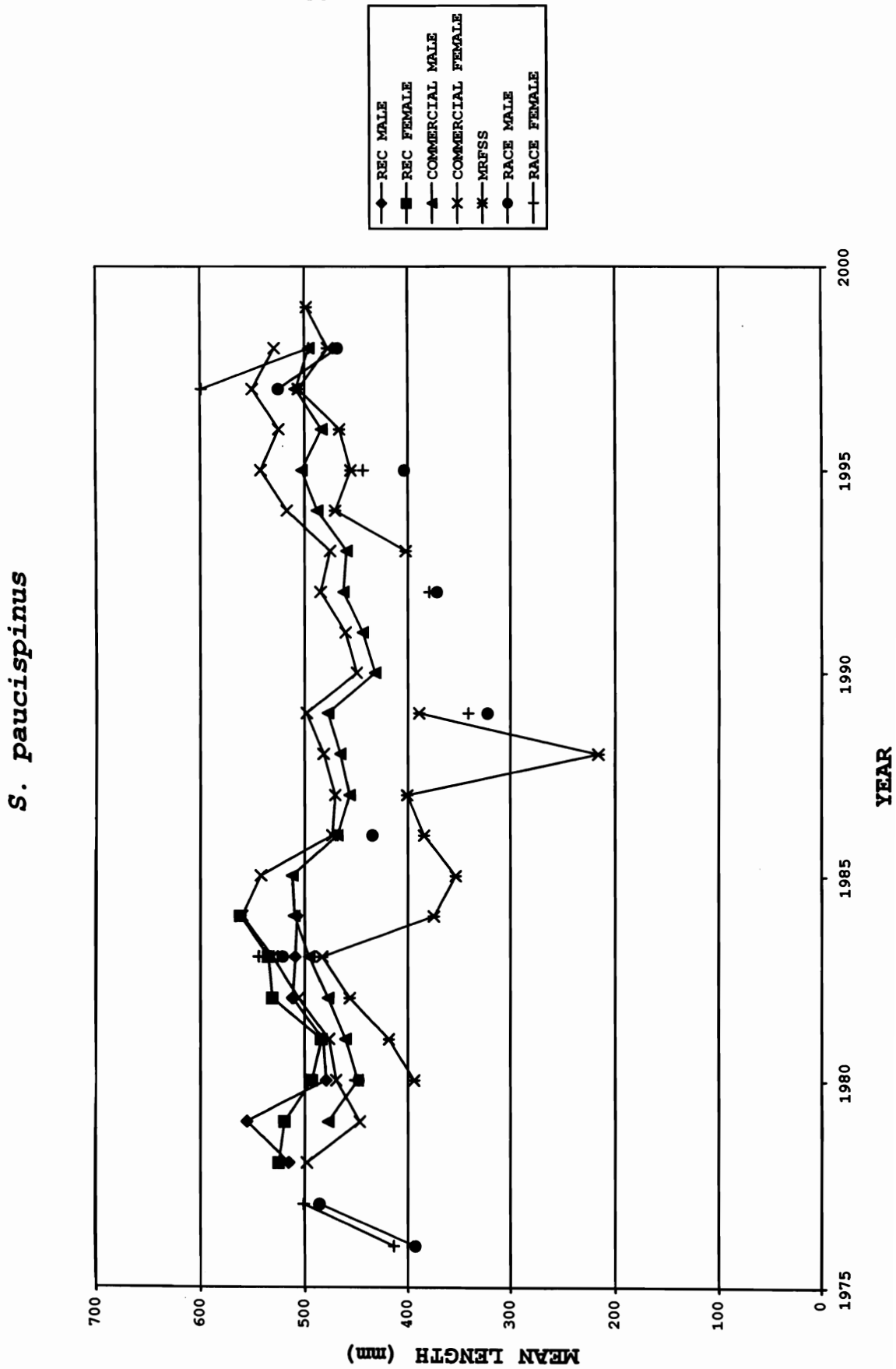
Appendix B cont.

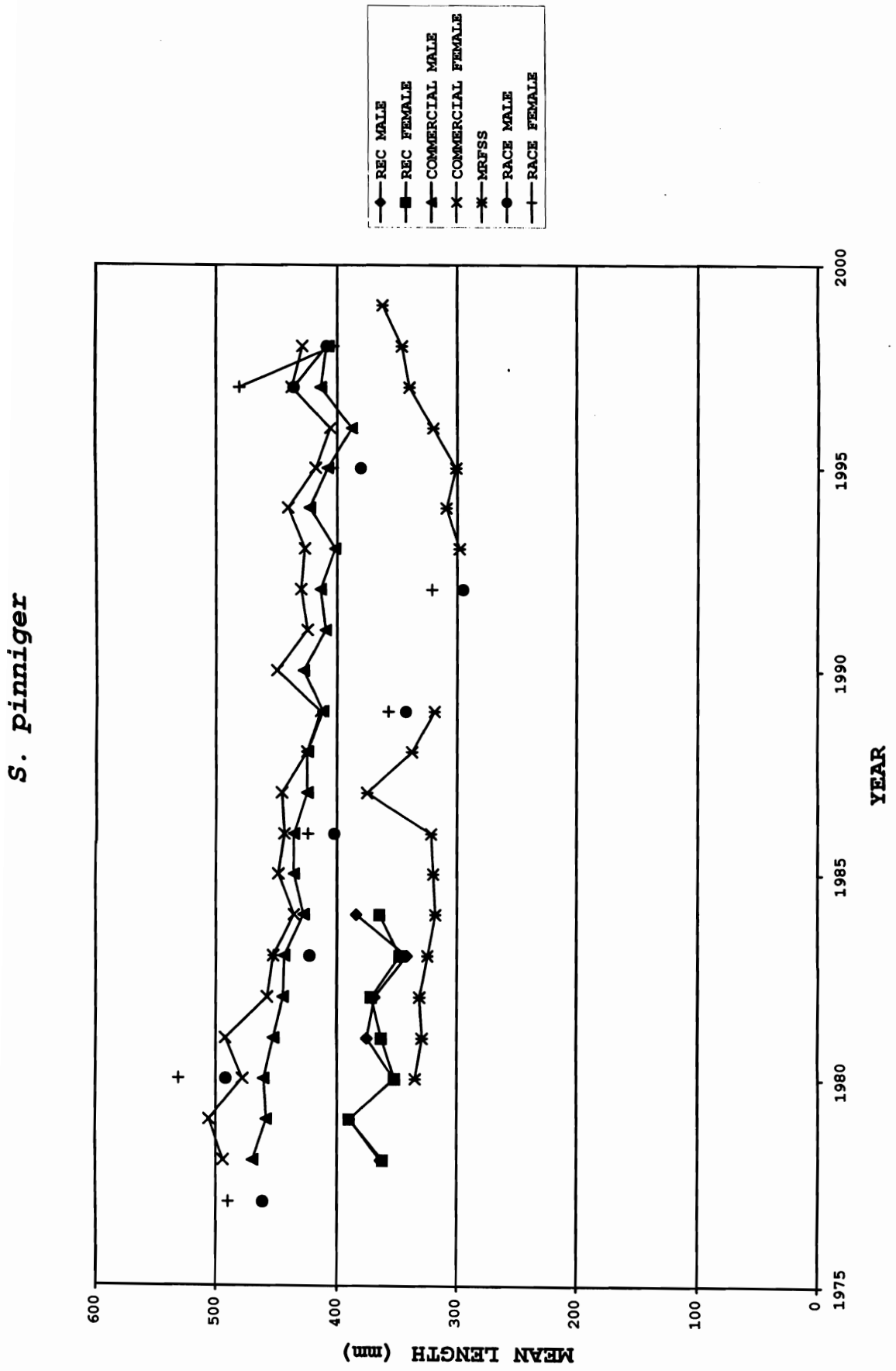



MRFSS
S. nigrocinctus
MEAN LENGTH (mm)
YEAR
600
500
400
300
200
100
0
1975
1980
1985
1990
1995
2000

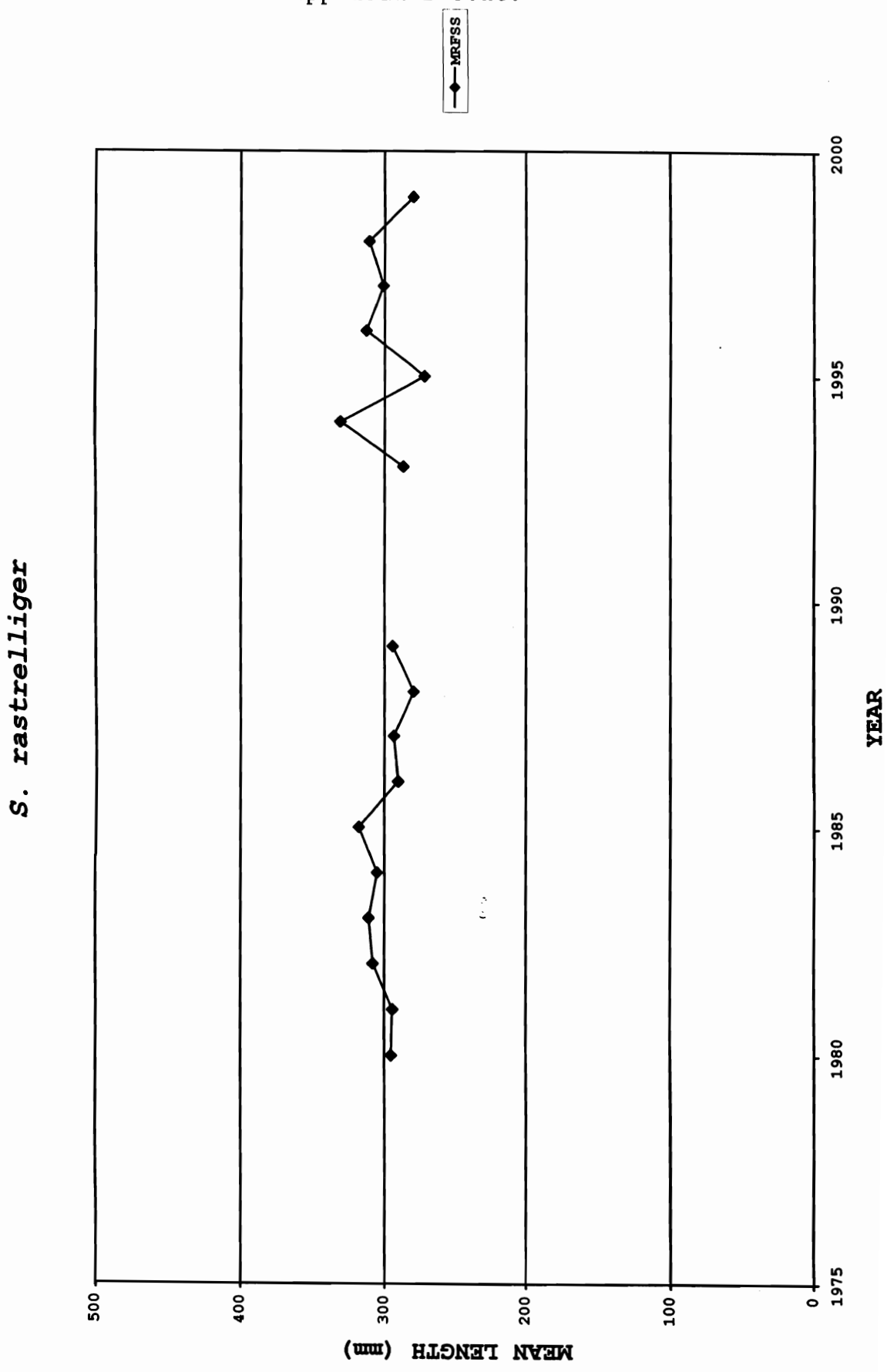

S. ovalis
REC MALE
REC FEMALE
COMMERCIAL MALE
COMMERCIAL FEMALE
MRFSS
MEAN LENGTH (mm)
0
100
200
300
400
500
YEAR
1975
1980
1985
1990
1995
2000

Appendix B cont.




REC MALE
REC FEMALE
COMMERCIAL MALE
COMMERCIAL FEMALE
MRFSS
RACE MALE
RACE FEMALE
MEAN LENGTH (mm)
0
100
200
300
400
500
600
YEAR
1975
1980
1985
1990
1995
2000

S. pinniger


MRFSS
S. rastrelliger
MEAN LENGTH (mm)
YEAR
500
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300
200
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0
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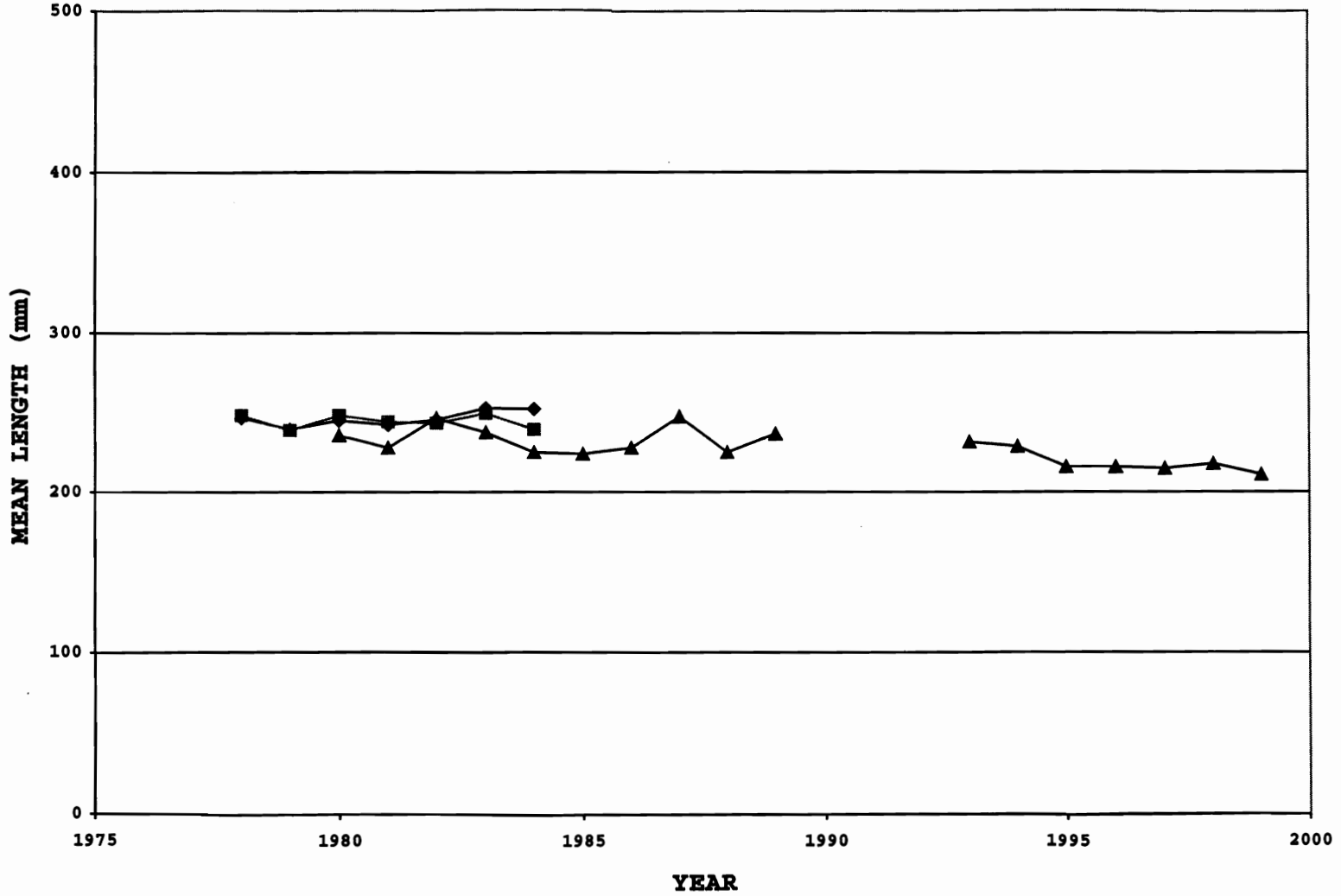
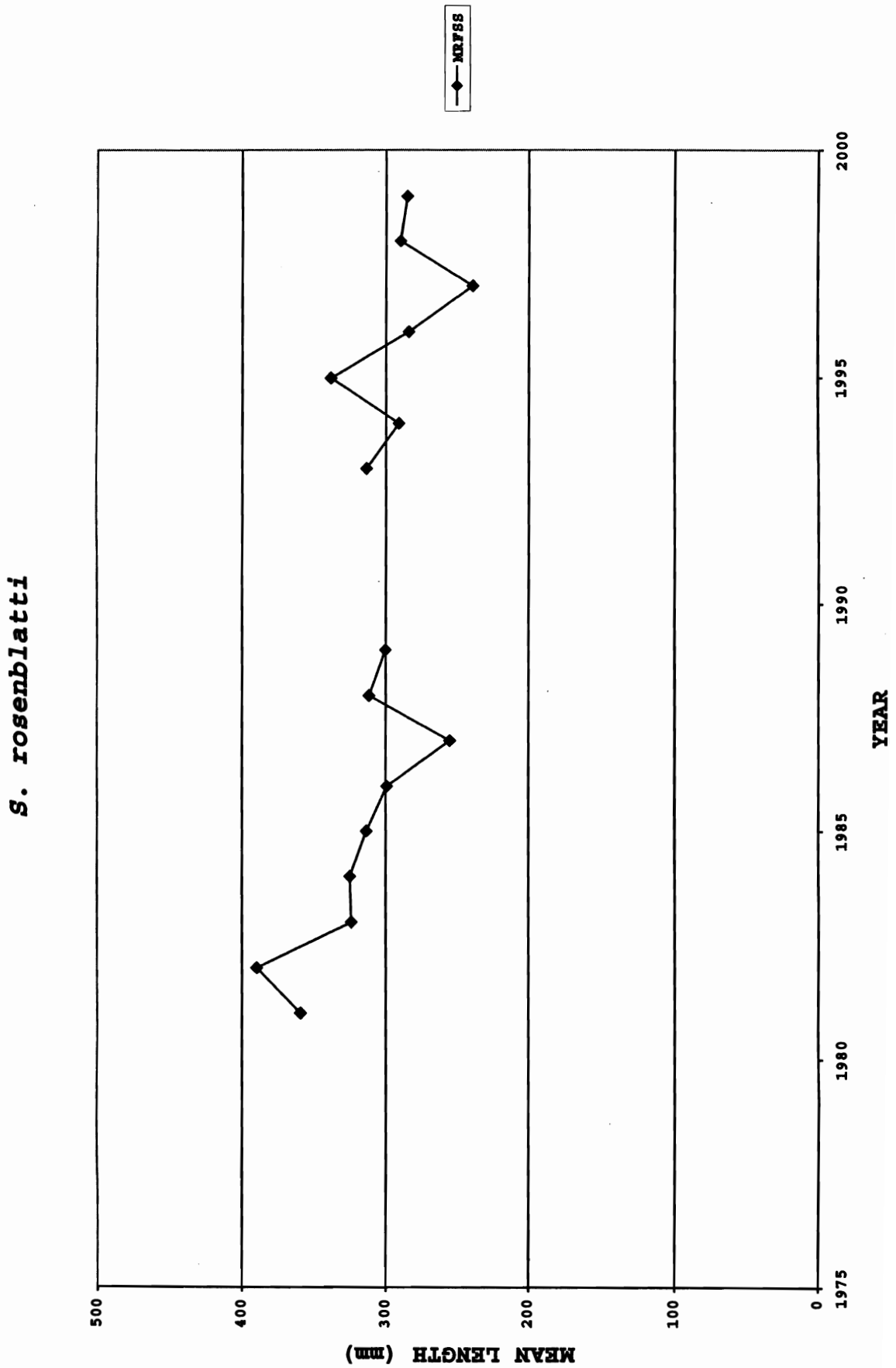
1980
1985
1990
1995
2000

S. rosaceus


500
400
300
200
100
0
MEAN LENGTH (mm)
1975
1980
1985
1990
1995
2000
YEAR
REC MALE
REC FEMALE
MRFSS


MRFSS
S. rosenblatti
MEAN LENGTH (mm)
YEAR
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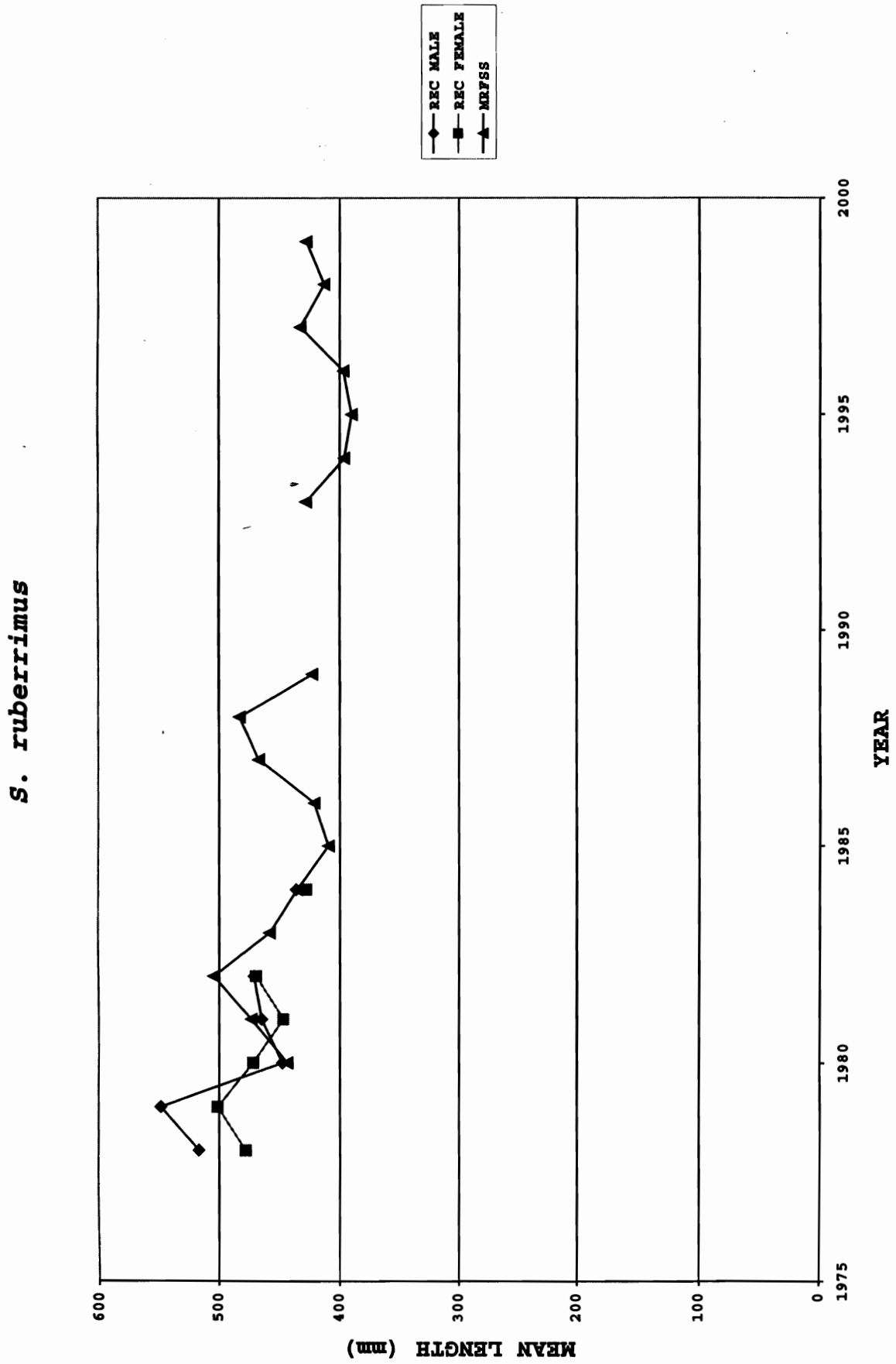
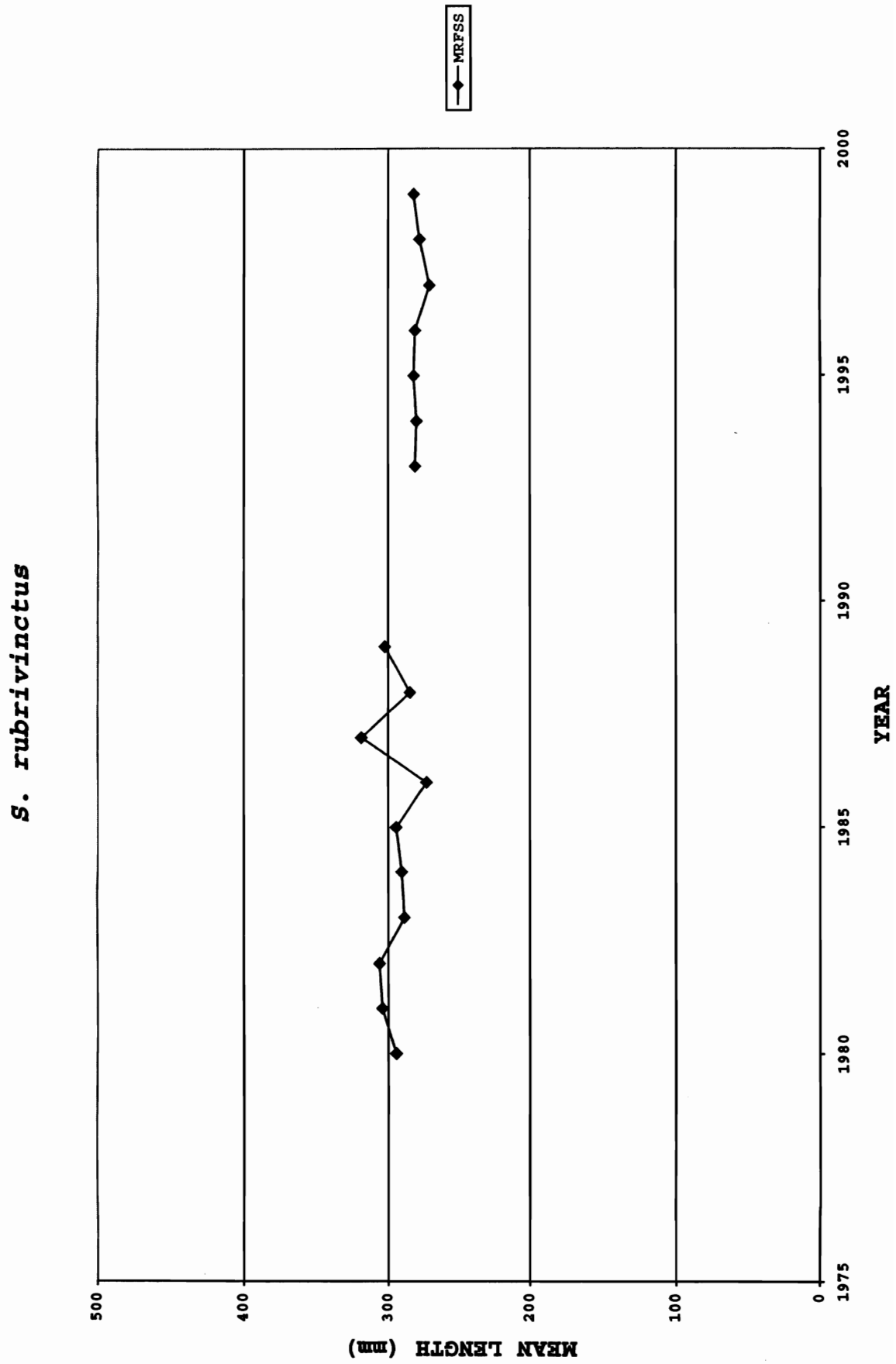
500
1975
1980
1985
1990
1995
2000


REC MALE
REC FEMALE
MRFSS
S. ruberrimus
MEAN LENGTH (mm)
YEAR
600
500
400
300
200
100
0
1975
1980
1985
1990
1995
2000


S. rubrivinctus
MRFSS
MEAN LENGTH (mm)
YEAR
0
100
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400
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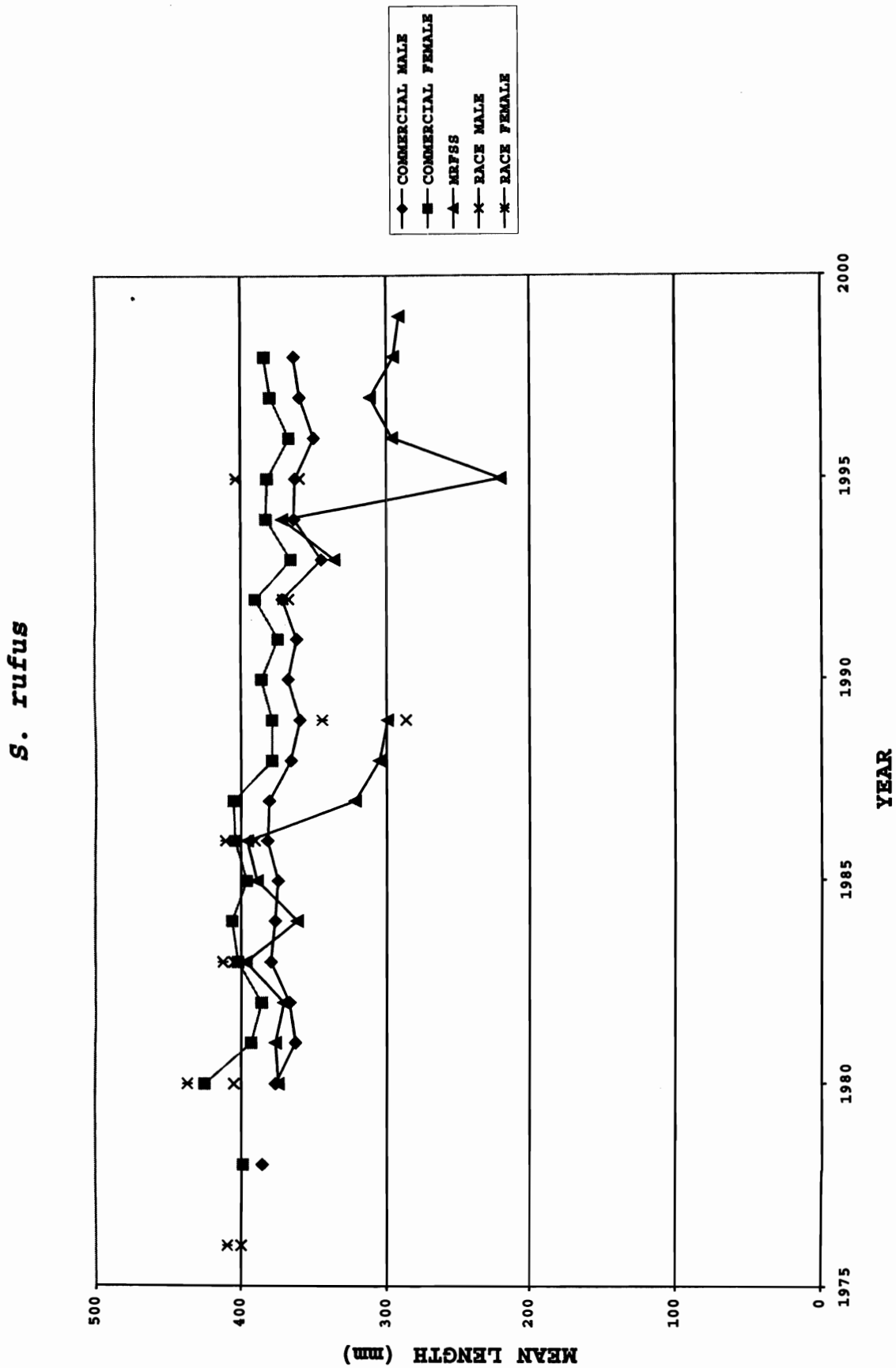
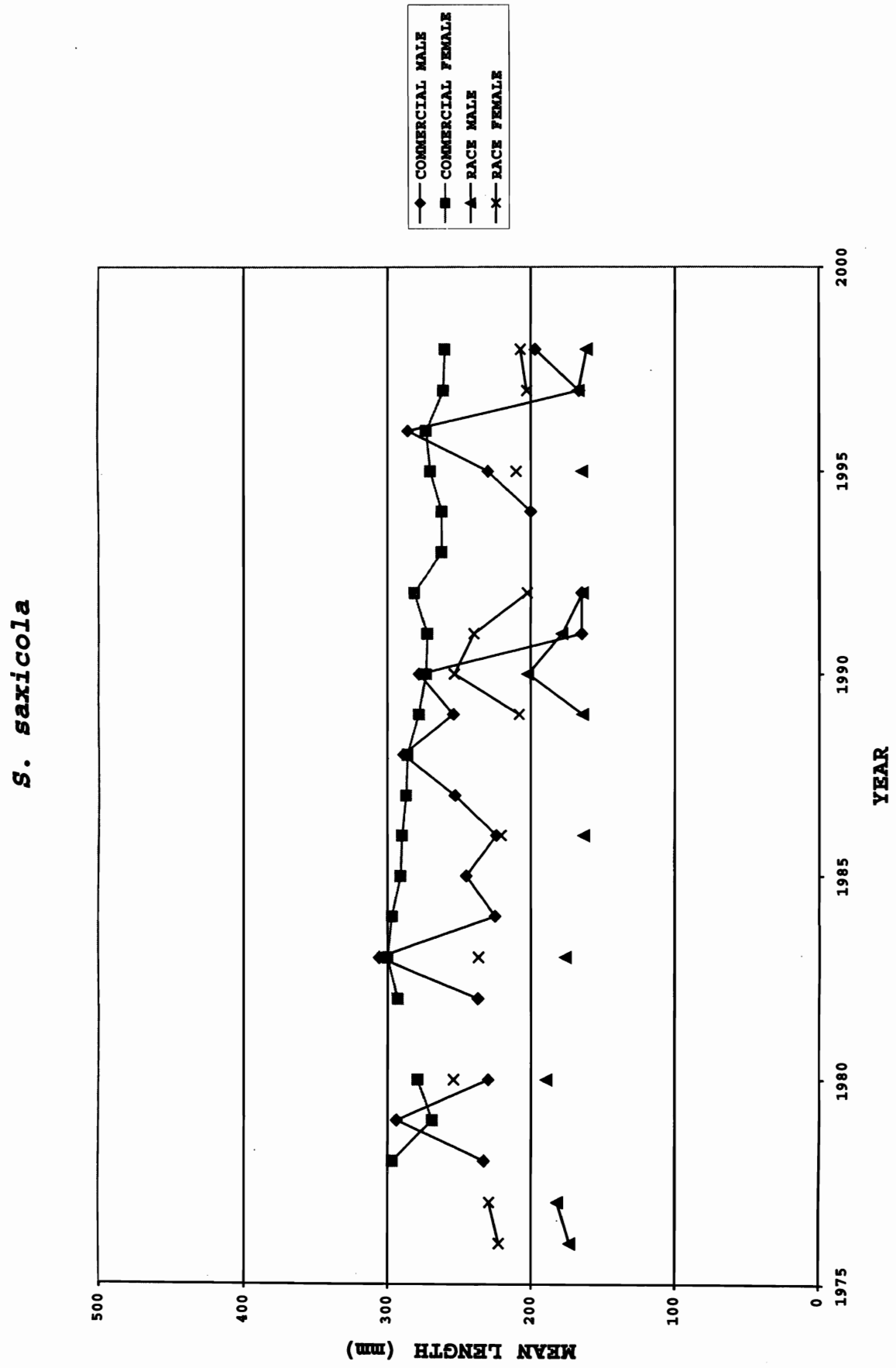
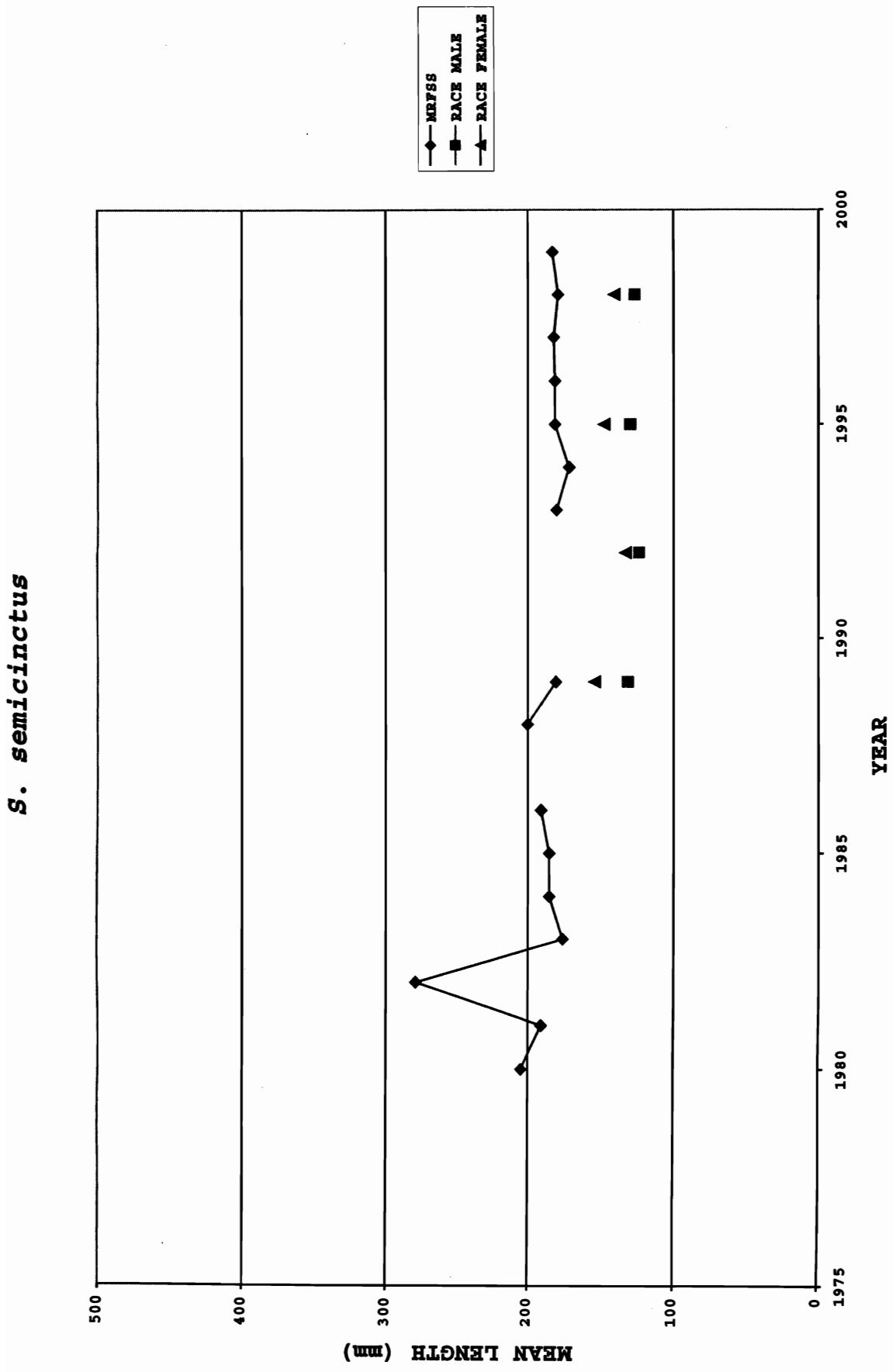
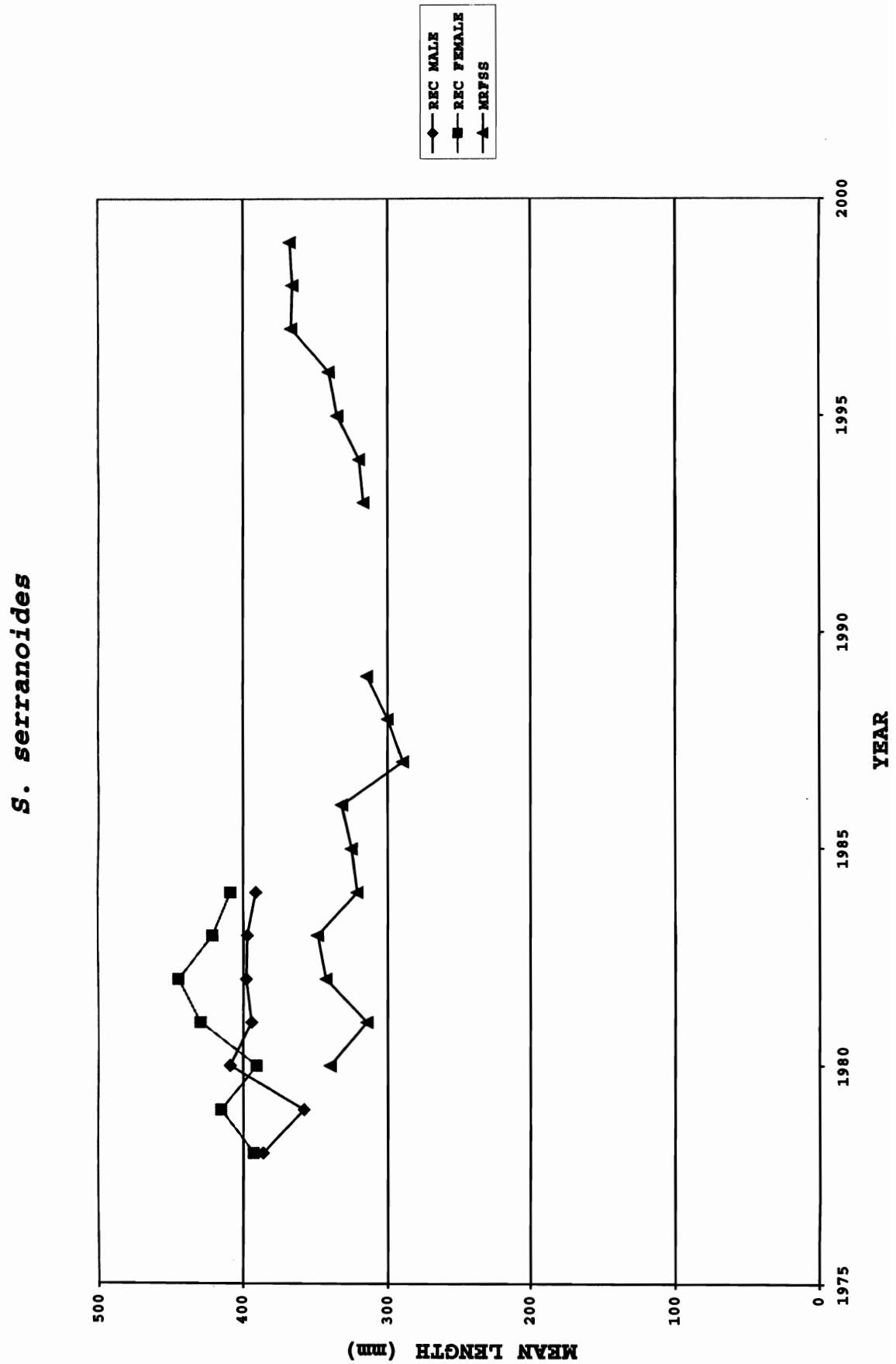
1975
1980
1985
1990
1995
2000


COMMERCIAL MALE
COMMERCIAL FEMALE
MRFSS
RACE MALE
RACE FEMALE
MEAN LENGTH (mm)
YEAR
0
100
200
300
400
500
1975
1980
1985
1990
1995
2000

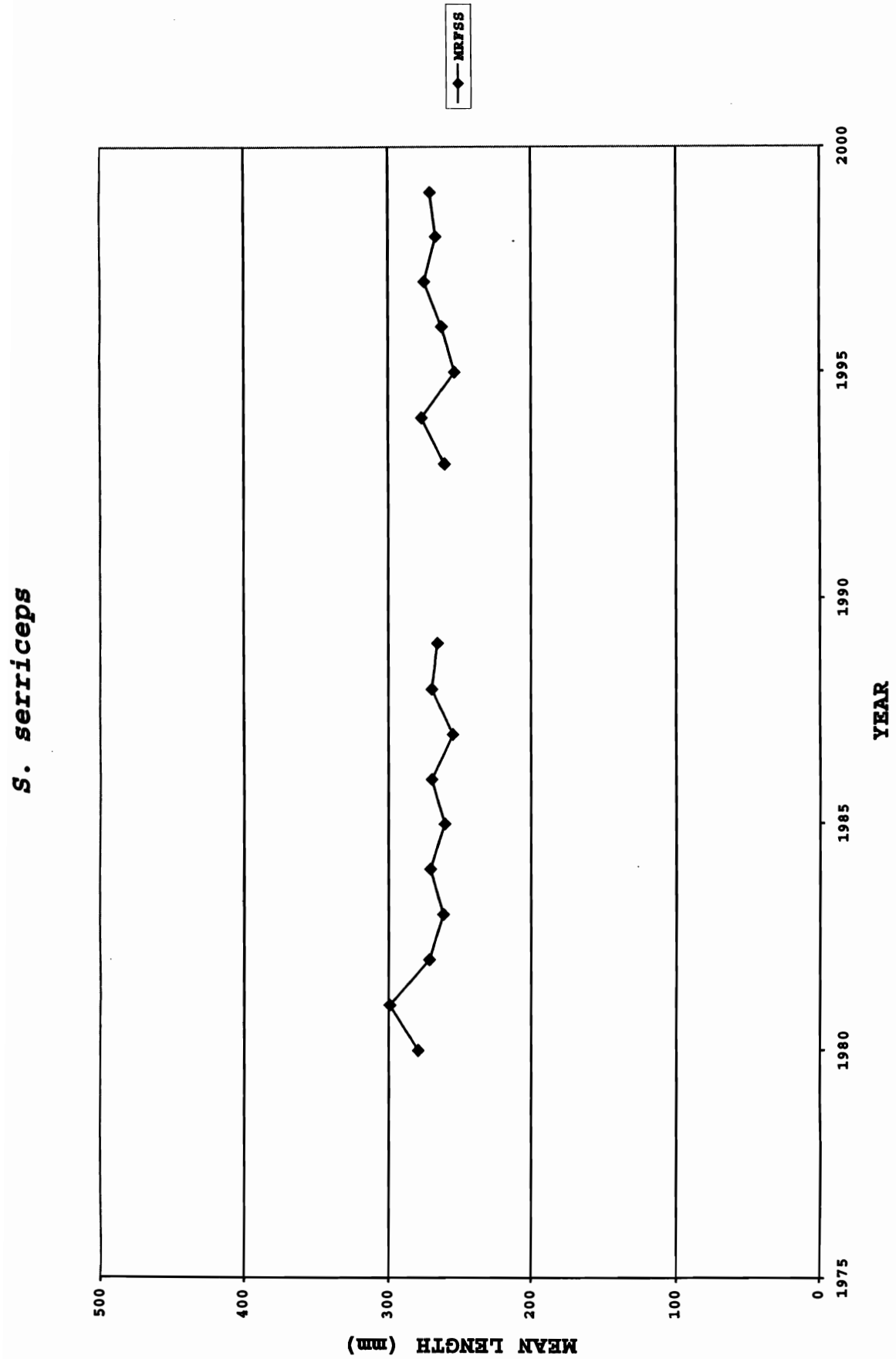
S. rufus

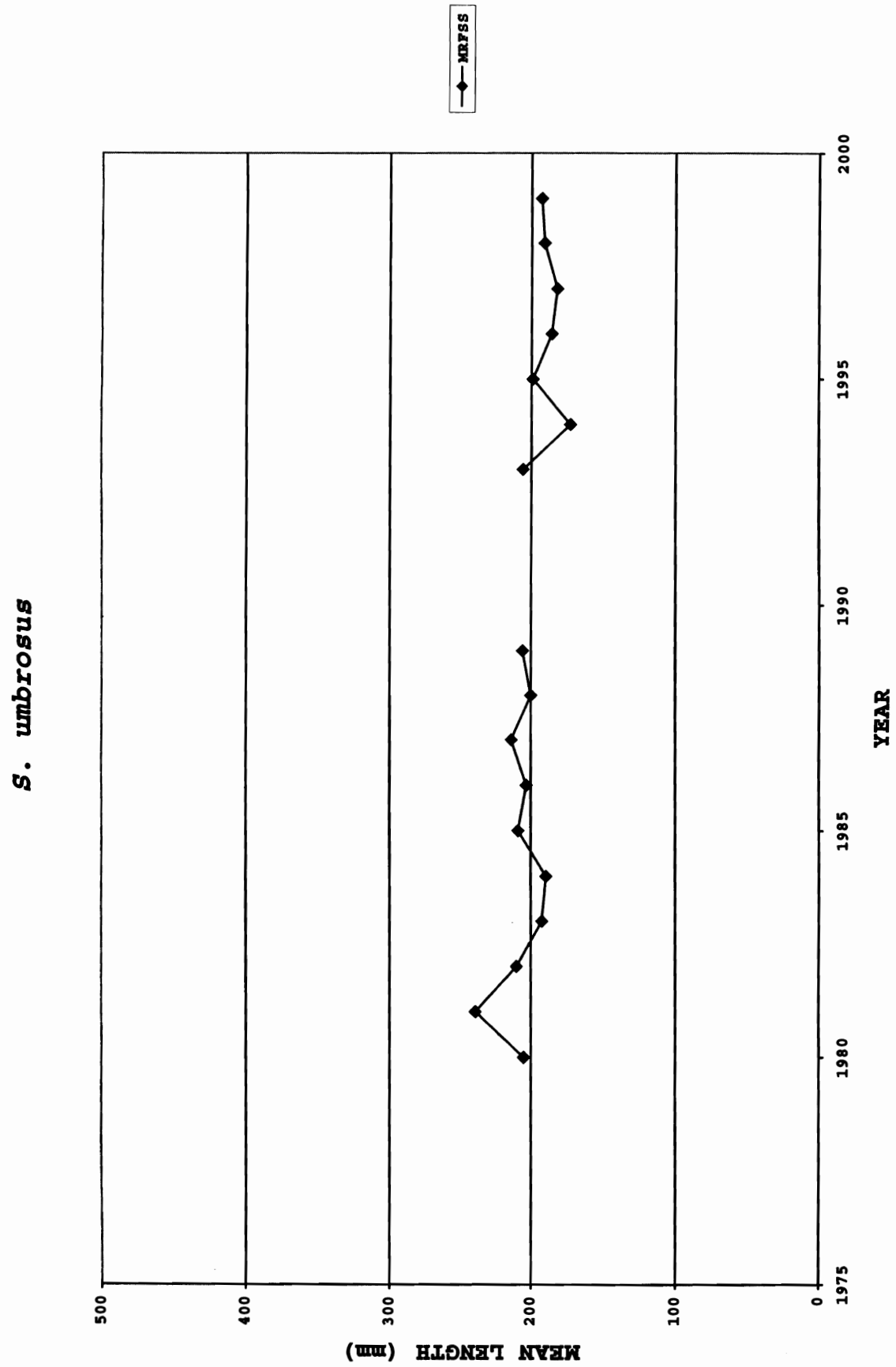

COMMERCIAL MALE
COMMERCIAL FEMALE
RACE MALE
RACE FEMALE
S. saxicola
MEAN LENGTH (mm)
YEAR
0
100
200
300
400
500
1975
1980
1985
1990
1995
2000


S. semicinctus
MRFSS
RACE MALE
RACE FEMALE
MEAN LENGTH (mm)
YEAR
0
100
200
300
400
500
1975
1980
1985
1990
1995
2000

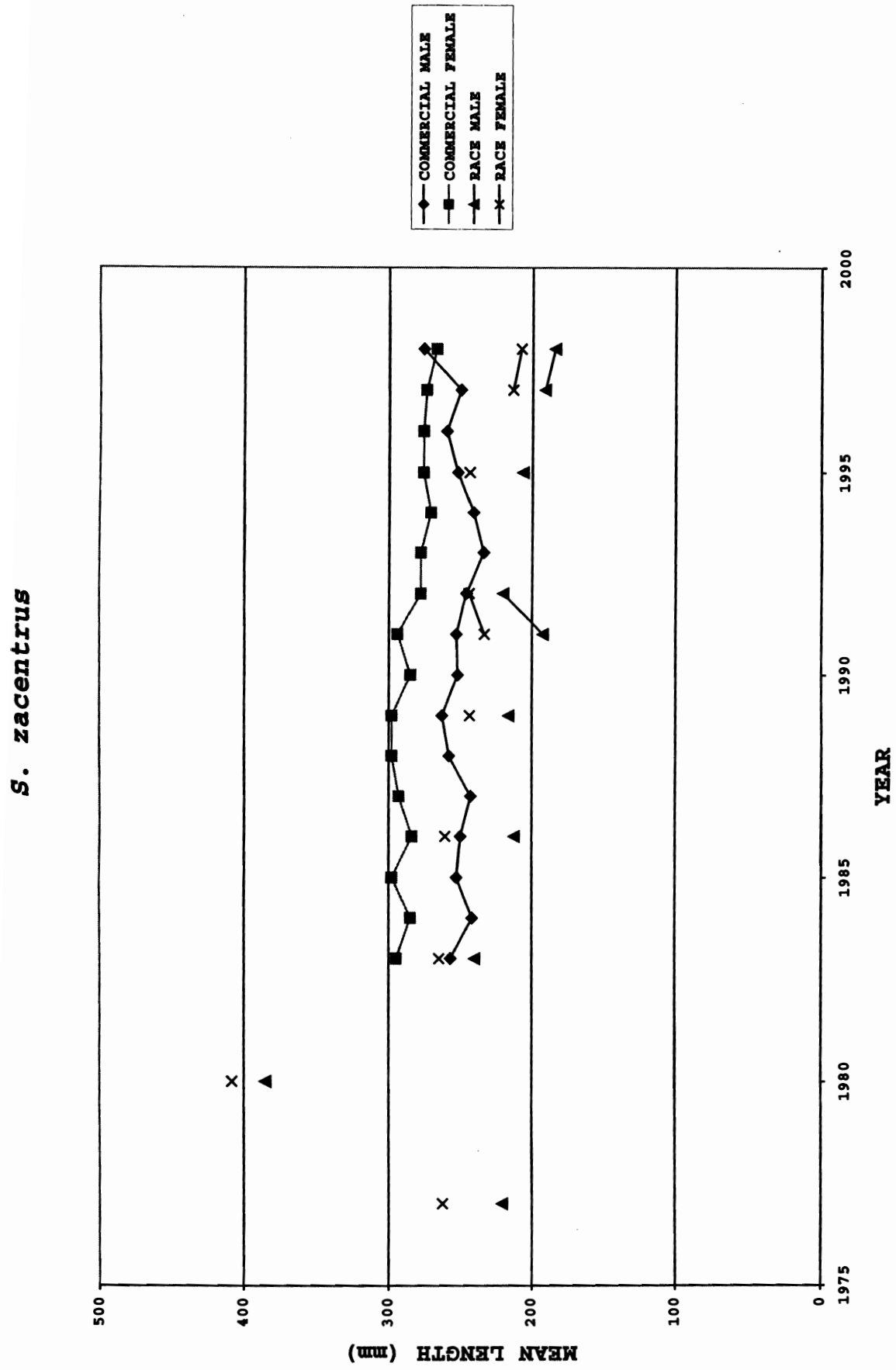


S. serranoides


MRFSS
S. serriceps
MEAN LENGTH (mm)
YEAR
0
100
200
300
400
500
1975
1980
1985
1990
1995
2000


MRFSS
S. umbrosus
MEAN LENGTH (mm)
YEAR
0
100
200
300
400
500
1975
1980
1985
1990
1995
2000

Appendix B cont.



Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes aleutianus	1981					145	
	1982					2	
	1983					3	
	1985		1			1	
	1986	1				1	
	1987	6	1			2	
	1988					8	
	1989					2	1
	1990	1					2
	1991	4					
	1992	2					
	1993					5	
	1994	15				11	
	1995	4				1	4
	1996	15					
	1997	1					
	1998					1	12

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes alutus	1975						84
	1977		265		32		44
	1978	209	211				
	1979	38	7				
	1980	29	43				41
	1981	2	2			2	
	1982	144	133				
	1983	403	341		1	6	142
	1984	188	186				
	1985	1	277			3	
	1986	252	5			6	37
	1987	193				1	
	1988	119					
	1989	79					52
	1990	55					13
	1991	35					
	1992	27					104
	1993	21					
	1994	18				13	
	1995	19					110
	1996	46				5	
	1997	36				8	1
	1998	30					26

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes atrovirens	1978			1	1		
	1980					237	
	1981					202	
	1982				1	65	
	1983			4	4	251	
	1984			2	2	262	
	1985					264	
	1986					191	
	1987					38	
	1988					42	
	1989					91	
	1993					201	
	1994					283	
	1995					166	
	1996					122	
	1997					133	
	1998					154	
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes auriculatus	1977		57		253		
	1978	27		234	230		
	1979			180	30		
	1980	20	25	198	200	998	
	1981	10	1	76	67	480	
	1982	17		125	101	428	
	1983	6	7	135	60	587	
	1984		2	206	175	1065	
	1985	2	34		77	1313	
	1986	2				1083	
	1987					651	
	1988					813	
	1989					579	47
	1990	1					
	1992	36					5
	1993					655	
	1994					292	
	1995	2				291	1
	1996	1				718	
	1997	2				649	
	1998					1137	1

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes aurora	1977		12				198
	1978	17	16				
	1980	34	33		1		
	1981	19	19				
	1982	96	43		14		
	1983	542	524		5		
	1984	415	414			1	
	1985	360	847				
	1986	574	66			5	
	1987	178				1	148
	1988	215				1	660
	1989	231					
	1990	282					270
	1991	115					350
	1992	105					
	1993	158					
	1994	344				3	
	1995	441					2366
	1996	421					
	1997	330					1109
	1998	235					2640

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes babcocki	1977		82		7		
	1978	31	30				
	1979	24	19				
	1980	34	34	1		24	
	1981	43	48				
	1982	36	27			1	
	1983	117	115	1	1	1	
	1984	253					
	1985	144	342			4	
	1986	102	5				
	1987	48					2
	1988	38				4	8
	1989	56					18
	1990	29					35
	1991	37					43
	1992	48					11
	1993	12				2	
	1994	46				1	
	1995	32				1	126
	1996	109					
	1997	32					11
	1998	37					30

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes borealis	1983	1					
	1995						1
	1996	4					
	1997	1					
	1998						4

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes brevispinis	1977		1				
	1979	1	1				
	1980			1		2	
	1984	3	3				
	1985		7				
	1986	4	1			1	
	1987	1				3	
	1988	2					
	1989	2					
	1990	2					
	1992	1					
	1993	5					
	1994	4					
	1997	1					
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes carnatus	1977				27		
	1978			14	10		
	1979			14	5		
	1980			41	39	161	
	1981		4	19	3	91	
	1982			7	8	74	
	1983		3	24	24	477	
	1984		35	41	10	984	
	1985		1		11	1101	
	1986				21	976	
	1987					448	
	1988	1				329	
	1989					388	
	1992	40					
	1993					1264	
	1994					1155	
	1995					501	
	1996					901	
	1997					1072	
	1998					1262	

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes caurinus	1977				237		
	1978			331	306		
	1979			232			
	1980	7	14	195	192	913	
	1981			88	76	1066	
	1982	6	7	147	110	789	
	1983	7	12	97	70	516	
	1984	25	28	99	66	595	
	1985		23		13	730	
	1986	5	2		5	685	
	1987	8	1			246	
	1988	2				338	
	1989					419	74
	1990	1			1		
	1991	1					
	1992	7			3		
	1993	15				655	
	1994					661	
	1995					260	4
	1996					551	
	1997					439	
	1998	1				531	6
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes chlorostictus	1977		13		296		
	1978	51	35	289	238		
	1979	29	23	563	233		
	1980	88	95	216	148	508	
	1981	72	83	97	66	299	
	1982	59	103	110	76	591	
	1983	114	112	42	39	695	
	1984	133	136	84	34	1100	
	1985	130	370		23	1690	
	1986	145	43			916	
	1987	223	1			144	10
	1988	164				214	
	1989	123				265	188
	1990	95					
	1991	102					5
	1992	68			26		11
	1993	29				349	
	1994	39				419	
	1995	24				395	146
	1996	35	1			390	
	1997	36				469	25
	1998	40				407	166

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes chrysomelas	1978			1	1		
	1980			1	5	142	
	1981					35	
	1982			3	2	58	
	1983					106	
	1984		1	2		171	
	1985		1		1	276	
	1986					110	
	1987					54	
	1988					39	
	1989					60	
	1993					238	
	1994					185	
	1995					146	
	1996					50	
	1997					38	
	1998					80	
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes constellatus	1977				95		
	1978				59		
	1979	1		101	58		
	1980	1	8	86	69	413	
	1981		3	37	25	292	
	1982			50	36	369	
	1983			44	35	387	
	1984	1	10	36	24	663	
	1985	1	46		7	675	
	1986	19	11		1	639	
	1987	45				111	
	1988	4				122	
	1989	29				233	
	1990	5					
	1991	1					
	1992	53					
	1993	4				399	
	1994					479	
	1995					215	
	1996					683	
	1997	1				683	
	1998	2				640	

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes crameri	1975						83
	1977		407		47		1589
	1978	262	308				
	1979	85	24				
	1980	206	121				200
	1981	195	197				
	1982	452	440		14		
	1983	792	765		2		501
	1984	1925	1796				
	1985	444	2985			1	
	1986	2436	2206				306
	1987	2644	1972				23
	1988	1339	1673				5
	1989	1098	1082				902
	1990	862	818				163
	1991	756	286				202
	1992	421					525
	1993	509	473			1	
	1994	436	423				
	1995	745	530				702
	1996	1003	781			1	
	1997	909	810				44
	1998	1232					188
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes dalli	1980					9	
	1981					21	
	1982					2	
	1983					16	
	1984					19	
	1985					52	
	1986					52	
	1987					4	
	1988					23	
	1989					31	
	1993					13	
	1994					15	
	1995					16	
	1996					10	
	1997					9	
	1998					37	

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes diploproa	1975						90
	1976						2101
	1977		363		44		17605
	1978	500	243				
	1979	319	237				
	1980	207	152		2	1	762
	1981	166	136		1	3	
	1982	477	368		12	3	
	1983	2112	2060			1	2156
	1984	3631	3527			10	
	1985	1313	2574			18	
	1986	2375	335			8	189
	1987	1605	3			5	614
	1988	602	4			2	1494
	1989	536				1	2773
	1990	651					796
	1991	481					669
	1992	373					3174
	1993	1575				1	
	1994	1051				3	
	1995	850					8204
	1996	929				2	
	1997	1365					1980
	1998	2257				2	7806
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes elongatus	1975						249
	1977		61		109		215
	1978	85	87	181	144		
	1979	57	40	108	57		
	1980	49	42	69	61	286	
	1981	23	26	10	9	131	
	1982	113	58	22	35	122	
	1983	196	193	9	10	234	115
	1984	163	155	10		909	
	1985	43	428		6	516	
	1986	147	58			337	
	1987	159	6			116	17
	1988	115				69	1
	1989	144	2			54	1505
	1990	139					24
	1991	135					9
	1992	45					523
	1993	62				50	
	1994	82				121	
	1995	149				81	2295
	1996	89				150	
	1997	263				135	207
	1998	246				109	1416

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes ensifer	1981					259	
	1982					357	
	1983					313	
	1984			6		403	
	1985					15	
	1986					5	
	1987					5	
	1988					2	
	1989	1				7	
	1993					15	
	1994					32	
	1995					7	
	1996					1	
	1998					3	

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes entomelas	1975						108
	1976						114
	1977		95		324		15
	1978	339	292	128	126		
	1979	416	369	318	8		
	1980	667	719	215	143	545	
	1981	1676	1622	111	162	108	
	1982	3928	2909	124	230	596	
	1983	2775	3047	229	2	230	122
	1984	3090	3299	214		728	
	1985	377	2409		29	653	
	1986	3053	3032		24	344	160
	1987	2997	2253		1	123	
	1988	2312	2232		15	254	
	1989	2739	76		10	301	301
	1990	3334	2727		1		2
	1991	2521	2218		109		11
	1992	1954	1513				583
	1993	1895	1548			31	
	1994	1081	1146			271	
	1995	1734	1534			137	253
	1996	1619	1203			576	
	1997	2230	2242			926	13
	1998	1740	500			1283	524

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes eos	1979	5		1			
	1980					38	
	1981					33	
	1982					8	
	1983	1	2	1		31	
	1984					17	
	1985	30	32			25	
	1986	3	3				
	1987	3				13	
	1993					2	
	1994					5	
	1998					1	

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes flavidus	1976						525
	1977		80		1932		371
	1978	235	135	1645	1542		
	1979	92	25	1676	268		
	1980	121	105	1143	507	1323	76
	1981	173	199	764	827	755	
	1982	315	265	1226	1022	1777	
	1983	529	392	1085	371	1239	258
	1984	895	1517	593		1942	
	1985	51	882		86	3808	
	1986	707	612		7	2232	449
	1987	250	781			1078	
	1988	315	302			722	
	1989	700	346			1685	274
	1990	425	248				
	1991	555	515		80		
	1992	790	537				795
	1993	257	233			1282	
	1994	364	432			967	
	1995	382				1134	248
	1996	638				2620	
	1997	385				5283	1
	1998	474				4762	422
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes gilli	1982					2	
	1983	1	1			50	
	1984	1	1			5	
	1985		26			5	
	1986	85	16			1	
	1987	30				3	
	1988	33					
	1989	3				2	
	1993					2	
	1994					13	
	1996	21					
	1997					27	
	1998	1				1	

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes goodei	1975						1235
	1976						4182
	1977		1053		1112		5629
	1978	1389	689	569	538		
	1979	1789	570	297	181		
	1980	1575		83	90	975	1417
	1981	952		227	196	1003	
	1982	1891	1366	123	181	780	
	1983	2703	2254	58	421	775	1476
	1984	5164	62	168		1081	
	1985	3925	16			2947	
	1986	5018	1		2	2939	1847
	1987	5078				695	321
	1988	5143	11			1321	279
	1989	5236				1529	6863
	1990	5925					1
	1991	9245	9				357
	1992	6081					4195
	1993	4778				145	
	1994	3025				124	
	1995	2541				380	4159
	1996	2801				1196	
	1997	3322				480	692
	1998	3440				183	4145
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes helvomaculatu	1977		3		3		
	1978	3	1	11	11		
	1979	3		8	12		
	1980			7	7	68	
	1981			4	6	18	
	1982	15	7	2	2	71	
	1983	10	56	3	4	67	
	1984	15	34	9		5	
	1985	1	46			46	
	1986	37	3			13	
	1987	18				1	1
	1988	19				16	
	1989	13				138	57
	1990	18					
	1991	15					2
	1992	7					
	1993	12				2	
	1994	9				5	
	1995	16				4	109
	1996	50				10	
	1997	9				22	26
	1998	14				23	112

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes hopkinsi	1977				6		
	1978			5	3		
	1979			17	2		
	1980			4	3	142	
	1981			1	2	110	
	1982			5	5	86	
	1983		1	1		788	
	1984			4		710	
	1985		1			215	
	1986	2	5			229	
	1987					17	
	1988					35	
	1989					48	211
	1992						12
	1993					69	
	1994					78	
	1995					32	34
	1996					240	
	1997					274	
	1998	4				331	

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes jordani	1976						3221
	1977						8632
	1978	12	2	1	1		
	1979	21	30		1		
	1980	1	1				539
	1981	1				3	
	1982	6	2		3		
	1983	8	8			2	906
	1984	1	1			4	
	1985	63	69			2	
	1986	5	1			53	996
	1987	13					126
	1988	3				5	595
	1989	7					3171
	1990	23					64
	1991	12					230
	1992	4					6379
	1993	11					
	1994	3					
	1995	10					3507
	1996	6				15	
	1997	103				8	327
	1998	36				2	2034

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes lentiginosus	1985					1	
	1994					3	

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes levis	1977				4		
	1978	2			3		
	1979	4					
	1980	1		6	5	45	
	1981	4		2	2	34	
	1982	6		1		31	
	1983	13			2	27	
	1984	56	2			31	
	1985	9				28	
	1986	172				15	
	1987	99				35	1
	1988	33				20	8
	1989	12				11	22
	1990	21					
	1991	80					
	1992	23					
	1993	8				16	
	1994	2				20	
	1995	1				7	20
	1996	6				11	
	1997	28				9	15
	1998	25				7	18

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes macdonaldi	1980	1				1	
	1981					1	
	1982					7	
	1984	2				1	
	1985					9	
	1986	8				14	
	1987	13				4	
	1988	59				9	
	1989	25				6	
	1990	1					
	1992	2					
	1993					2	
	1996					29	
	1998					4	

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes maliger	1977		6		3		
	1978	2		9	7		
	1979			2	1		
	1980		4	11		11	
	1981					7	
	1982			7	5	8	
	1983			7	2	62	
	1984	1		2		28	
	1985		5			36	
	1986					44	
	1987	1				10	
	1988					7	
	1989					53	
	1991	4					
	1992	1					
	1993					178	
	1994					29	
	1995	3				18	
	1996					43	
	1997					42	
	1998					48	
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes melanops	1977		130		215		
	1978	52	75	187	150		
	1979	1		196	1		
	1980	121	206	193	146	954	
	1981	130	130	75	77	1167	
	1982	390	285	179	180	1067	
	1983	283	284	117		563	
	1984	233	233	118	11	1372	
	1985		183		20	2157	
	1986	27				1564	
	1987	184				635	
	1988	125				505	
	1989	80				810	
	1990	5					
	1991	36					
	1992	141					
	1993	3				1999	
	1994					1558	
	1995					871	
	1996	25				1908	
	1997	52				1433	
	1998	6				1091	

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes melanostomus	1977		87		1		
	1978	53	3	7			
	1979	12	8				
	1980	36	31				
	1981	32	39			10	
	1982	129	70		3	9	
	1983	270	257		7		
	1984	342	342			1	
	1985	525	877			2	
	1986	4214	355			20	
	1987	2961	9				20
	1988	2327	42			13	78
	1989	628					
	1990	953					6
	1991	929					22
	1992	734					
	1993	509					
	1994	257					
	1995	653	23			3	186
	1996	778					
	1997	749					51
	1998	695				1	350
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes miniatus	1977		3		32		95
	1978	7	1	29	21		
	1979	21	14	82	23		
	1980	44	15	40	25	400	
	1981	11	13	17	8	352	
	1982	16	31	34	31	575	
	1983	40	61	19	9	378	
	1984	121	129	21	5	653	
	1985	40	66		10	683	
	1986	63	19		2	1057	
	1987	106				599	
	1988	21				591	1
	1989	19				612	210
	1990	13					
	1991	1					
	1992	27					142
	1993	33				1055	
	1994					958	
	1995	2				520	10
	1996	1				1042	
	1997	2				851	
	1998	50				1173	1

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes mystinus	1976						130
	1977		50		1179		
	1978	85		225	198		
	1979			1046	333		
	1980	3	14	1015	507	4821	
	1981	1	221	678	384	3813	
	1982	22	15	745	493	4205	
	1983	9	10	1541	8	3958	
	1984	3	236	783	1	4690	
	1985		62		156	5124	
	1986	17	19		25	1901	
	1987					1416	
	1988	3				1429	
	1989	17				1823	14
	1990	4					
	1991	35			2		
	1992	107					273
	1993	55				5945	
	1994					2732	
	1995					1788	21
	1996					4446	
	1997	71				11171	
	1998	32				13167	43
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes nebulosus	1977				14		
	1978			25	13		
	1979			19	1		
	1980		5	44	23	108	
	1981		3	11	5	57	
	1982			17	15	89	
	1983		9	14	1	65	
	1984		2	11	1	75	
	1985		1		3	159	
	1986				2	242	
	1987					182	
	1988					116	
	1989					170	
	1992	11					
	1993					193	
	1994					230	
	1995					156	
	1996	1				265	
	1997					151	
	1998					149	

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes nigrocinctus	1979			1			
	1980					4	
	1981	3				6	
	1982					1	
	1983					13	
	1984					2	
	1985					3	
	1986					7	
	1987					3	
	1990	2					
	1992	1					
	1993					3	
	1994					4	
	1996	1					
	1998	2				6	
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes ovalis	1976						361
	1977				32		162
	1978	15		13	7		
	1979	4		19	18		
	1980			12	3	271	
	1981	5	12	10	12	197	
	1982	18	7	19	17	174	
	1983	33	33	41	37	545	
	1984	15	16	17		537	
	1985	12	98		2	175	
	1986	128	46			157	
	1987	88	2			2	
	1988	22				2	
	1989	127				42	5
	1990	21					
	1991	51					
	1992	10					78
	1993	19				27	
	1994	30				271	
	1995	41				27	
	1996	48				109	
	1997	109				236	
	1998	9				256	7

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes paucispinus	1975						34
	1976						570
	1977		486		399		1419
	1978	1610	619	451	416		
	1979	1285	131	623	247		
	1980	1708	1526	277	220	3828	838
	1981	1350	1345	244	231	2926	
	1982	2463	1976	224	328	2419	
	1983	2860	1968	154	65	1109	478
	1984	2791	2371	89	3	1204	
	1985	913	117		40	2428	
	1986	3956	2093		3	2738	210
	1987	4092	1818			598	22
	1988	2902				1162	26
	1989	2663	5			694	1360
	1990	3034					7
	1991	2999					18
	1992	3110	684				488
	1993	2035				494	
	1994	1011				526	
	1995	688				119	174
	1996	847				478	
	1997	787				562	97
	1998	705				560	425
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes phillipsi	1981					8	
	1983					6	
	1985		50			91	
	1986	84	2				
	1987	76					
	1988	25					
	1989	12					
	1990	4					
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes pinniger	1977		202		348		97
	1978	362	451	525	523		
	1979	179	67	627	58		
	1980	315	331	490	241	952	553
	1981	190	202	151	141	470	
	1982	402	420	215	235	708	
	1983	426	498	150	70	446	407
	1984	377	376	115	1	553	
	1985	40	567		22	1157	
	1986	410	27		7	1438	92
	1987	420				696	
	1988	333				439	1
	1989	489				586	359
	1990	321					1
	1991	175					
	1992	192					96
	1993	45				720	
	1994	87				660	
	1995	213				650	242
	1996	218				1352	
	1997	165				1014	324
	1998	129				573	189

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes proriger	1977		1				
	1980	1	1			3	
	1981	1	1				
	1982	5	5				
	1983	42	42				
	1984	10	8				
	1985		28				
	1986	42	26				
	1987	5				1	
	1988	7					
	1989	8				14	
	1990	15					1
	1991	16					1
	1992	5					34
	1993	6					
	1994	13				2	
	1995	23					37
	1996	15				4	
	1997	14				6	1
	1998	35				5	1
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes rastrelliger	1980			1		283	
	1981					115	
	1982	3		2		134	
	1983					180	
	1984			1		207	
	1985					216	
	1986					127	
	1987					124	
	1988					102	
	1989					50	
	1993					164	
	1994					59	
	1995					63	
	1996					60	
	1997					45	
	1998					64	

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes reedi	1979	1					
	1983	5	6				
	1984	6	6				
	1985		12				
	1987	3					
	1989	1					
	1990	2					1
	1992	1					
	1993	2					
	1994	1					
	1996	5					
	1998	1					

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes rosaceus	1977				111		
	1978			192	142		
	1979			160	128		
	1980		4	219	245	538	
	1981		19	88	137	286	
	1982			63	173	395	
	1983			55	59	454	
	1984		14	27	20	737	
	1985		25		28	921	
	1986	4	3		5	870	
	1987	5				172	
	1988	6				163	
	1989	9				384	
	1990	3			1		
	1991	1					5
	1992	62			84		
	1993	1				288	
	1994					225	
	1995	1				255	
	1996	5				838	
	1997	6				917	
	1998	1				577	

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes rosenblatti	1980	1	1				
	1981	1				37	
	1982	1			1	97	
	1983					53	
	1984	7	266			45	
	1985		10			88	
	1986	31	8			63	
	1987	58	3			45	
	1988	17				66	
	1989	20				76	
	1990	5					
	1991	1					
	1993					14	
	1994	2				1	
	1995	40				9	
	1996					50	
	1997					5	
	1998	27				24	

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes ruberrimus	1977		2		47		
	1978	15	8	76	38		
	1979	7		117	18		
	1980	17	17	39	10	90	
	1981	5	11	38	28	42	
	1982	7	10	29	20	72	
	1983	22	12	18	5	82	
	1984	18	20	31	4	141	
	1985	2	34		5	346	
	1986	16	4			203	
	1987	26				79	
	1988	15				45	
	1989	9				107	10
	1990	9					
	1991	12					
	1992	18					
	1993	6				39	
	1994	8				81	
	1995	10				49	1
	1996	50				79	
	1997	3				63	
	1998	5				64	
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes rubrivinctus	1977				8		
	1978			5	7		
	1979	1		14	9		
	1980	1	1	12	7	183	
	1981	2	1	20	10	115	
	1982	2		19	16	142	
	1983	6	9	7	5	137	
	1984	3	8	9	1	175	
	1985	4	9		1	159	
	1986	20	3			165	
	1987	12				40	12
	1988	16				44	
	1989	8				77	1
	1990	4					
	1991	2					
	1992	1					1
	1993	1				74	
	1994	1				93	
	1995					45	3
	1996					107	
	1997					89	
	1998	1				150	

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes rufus	1976						256
	1977		33		41		
	1978	171	1				
	1979	8	6				
	1980	19	1			66	101
	1981	253		1	9	116	
	1982	565	4	1		20	
	1983	913	6			179	15
	1984	1978	15			350	
	1985	1067	2202			117	
	1986	5964	1169			161	221
	1987	3237				9	2
	1988	1904				1	
	1989	1486	461			21	28
	1990	1610	1260				
	1991	1715	1894				25
	1992	981					56
	1993	501	428			29	
	1994	508	435			141	
	1995	272	281			1	175
	1996	638	606			116	
	1997	1175	1063			45	1
	1998	821				53	15
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes saxicola	1975						683
	1976						395
	1977		140		24		2423
	1978	127	124	9	23		
	1979	131	42	12	6		
	1980	52	50	1	2	4	729
	1981	11	13	1	1		
	1982	151	136	1	6		
	1983	255	247		3	9	1086
	1984	293	298			10	
	1985	37	338			16	
	1986	246	9			16	416
	1987	207	1				539
	1988	71					1053
	1989	107					4886
	1990	97					639
	1991	78					526
	1992	32					5570
	1993	97				3	
	1994	245				3	
	1995	120					8136
	1996	101				6	
	1997	100					1641
	1998	220					5513

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes semicinctus	1980					6	
	1981					5	
	1982					1	
	1983					35	
	1984					41	
	1985					119	
	1986					35	
	1988					7	1
	1989					17	105
	1992						762
	1993					11	
	1994					44	
	1995					8	511
	1996					79	
	1997	27				124	
	1998					170	501
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes serranoides	1976						88
	1977				53		
	1978	44	3	59	38		
	1979			43	37		
	1980	1		73	76	1301	
	1981			143	141	629	
	1982	2	2	65	41	868	
	1983	6	4	282	230	1086	
	1984		6	36	17	919	
	1985		35		25	910	
	1986	68	23		2	848	
	1987	25	3			296	
	1988	9				303	
	1989					361	
	1991	12					
	1992	23			25		121
	1993	15				662	
	1994					503	
	1995	4				560	
	1996	1				730	
	1997	3				1183	
	1998	9				1408	
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes serriceps	1980					88	
	1981					49	
	1982					74	
	1983					155	
	1984					93	
	1985					102	
	1986	1				79	
	1987					22	
	1988					29	
	1989					45	
	1993					117	
	1994					89	
	1995					100	
	1996					134	
	1997					54	
	1998					175	

Appendix C. Counts of otoliths and lengths by survey

		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes umbrosus	1980					36	
	1981					13	
	1982					53	
	1983					77	
	1984					75	
	1985					145	
	1986					307	
	1987					8	
	1988					84	
	1989					77	
	1993					59	
	1994					44	
	1995					45	
	1996					225	
	1997					38	
	1998					235	
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes wilsoni	1989						2
	1992						49
	1995						1
	1998						8
		COMMERCIAL		RECREATIONAL		MRFSS	RACE
SPECIES	YEAR	LENGTHS	OTOLITH	LENGTHS	OTOLITH	LENGTH	LENGTHS
Sebastes zacentrus	1977		7				192
	1978			1	1		
	1979	3	3	3	1		
	1980						227
	1981					2	
	1982	13	13				
	1983	144	134				115
	1984	90	90				
	1985	19	224			2	
	1986	134	26			2	168
	1987	291					1
	1988	356					
	1989	101					401
	1990	280					144
	1991	188					208
	1992	130					544
	1993	111					
	1994	520					
	1995	368					839
	1996	410					
	1997	354					205
	1998	212					269