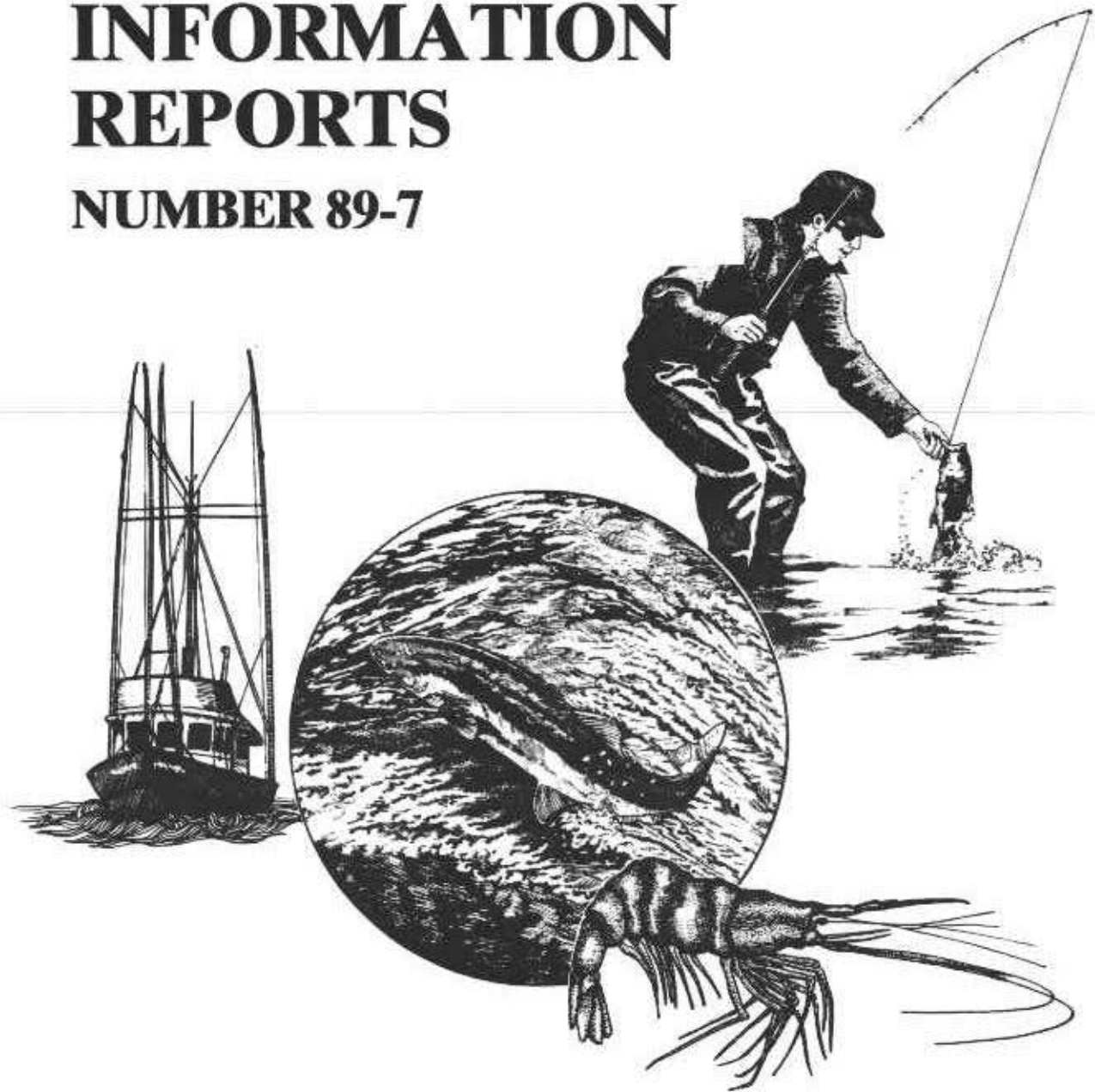


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**Maturity and Reproductive Cycle for 35 Species
from the Family Scorpaenidae Found off Oregon**

**Maturity and Reproductive Cycle for 35 Species
from the Family Scorpaenidae Found off Oregon**

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ABSTRACT

Some scorpionfishes from the genera *Sebastes* and *Sebastes* were sampled to determine length at maturity, reproductive cycle, and composition of samples with regard to maturity and length. We examined 5,967 fish from 35 species in 1985-86. Most of the fish were obtained from trawl catches off of Oregon. Spawning appeared to occur earlier in the southern range of many species. Length at 50% maturity was often greater for fish taken off Oregon when compared with the same species sampled off California.

INTRODUCTION

This study was undertaken because of the importance of and the apparent deterioration in the abundance and size of some stocks of the family Scorpaenidae off Oregon. Scorpionfishes provide an important portion of Oregon's commercial and recreational catch of marine fishes. In recent years fisheries for several species, such as *Sebastes alutus*, *Sebastes entomelas* and *Sebastes flavidus*, have experienced reduced yearly catch and smaller fish. These signs have concerned fishery managers, and, as a consequence, catch restrictions have been placed upon these species. Understanding the reproductive biology of a species is a basic characteristic required to determine an appropriate estimate of yield. At best, knowledge of reproductive biology has been incomplete for scorpionfishes located off Oregon.

The purpose of this study was to provide baseline data on length at maturity, reproductive cycle, and composition of the catch with regard to maturity of scorpionfishes that occur off of Oregon. This study complements a study recently conducted on 34 species of scorpionfishes that occur off California (Echeverria 1987).

COMMON AND SCIENTIFIC NOMENCLATURE FOR SCORPAENIDAE

The family Scorpaenidae comprises eight genera that are found in the United States and Canada, four of which occur in the Pacific Ocean. Two genera, *Sebastes* and *Sebastolobus*, are important in the commercial and recreational fisheries off Oregon. A list of the common and scientific names for the 35 species of Scorpaenidae sampled in this study is provided in Appendix A.

Species of the genus *Sebastes* are commonly referred to as "rockfishes" even though Pacific ocean perch, cowcod, and bocaccio are included in the genus. Some specimens of *Sebastes rufus* (bank rockfish) occur without spots. These are commonly referred to as red widow rockfish (Miller and Lea 1972; Eschmeyer et al. 1983). Fertilization of eggs in the genus *Sebastes* occurs inside the body of the female. Species of the genus *Sebastolobus* are known as "thornyheads." Fertilization of thornyhead eggs is external.

METHODS

Most data were collected from trawl landings at Newport and Charleston, Oregon (Figure 1). Additional specimens were obtained from trawl catches sampled at sea off Oregon and from recreational hook-and-line catches sampled at Garibaldi, Oregon.

Random samples were usually taken, but uncommon species and uncommonly small- or large-sized fish were sampled whenever possible. Samples were taken in every month but not necessarily for every species. Effort was made to sample immature and mature fish. Field data for each fish sampled included species, sex, fork length, and stage of maturity. Fork length was measured to the nearest centimeter. I used seven maturity stages for each sex of each

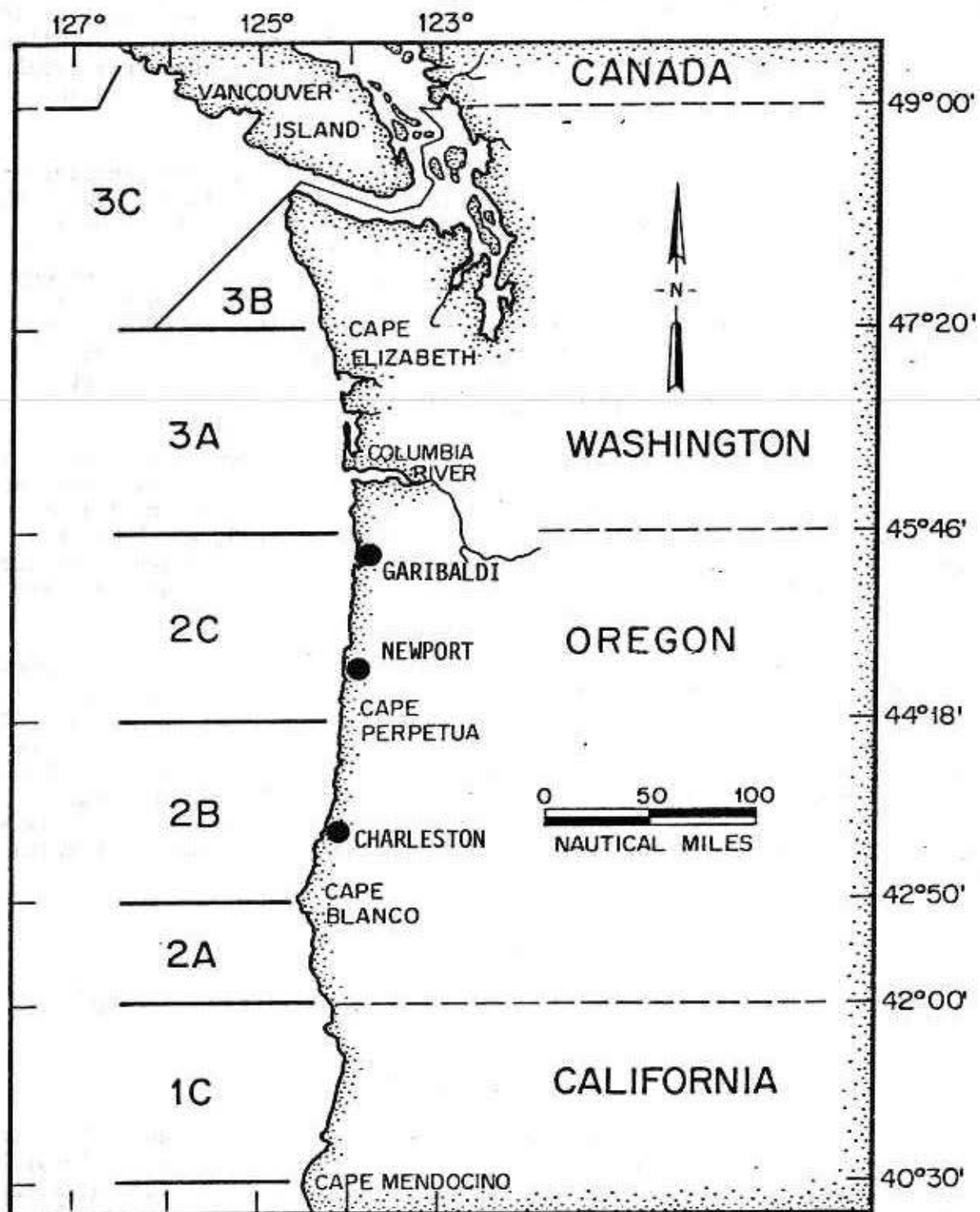


Figure 1. Pacific Coast from Vancouver Island, Canada, to Cape Mendocino, California, showing maturity sampling stations for this study and Pacific Marine Fisheries Commission International Statistical Areas 3C to 1C.

species (only six maturity stages for female *Sebastolobus*) to reflect the major changes in gonad development. Stages 1 and 2 were for immature fish. Stages 3 through 7 describe major differences in appearance and function of the mature gonads. Maturity stage of the gonads for *Sebastes* was determined in the field according to criteria described by Barss and Echeverria (1987). Maturity stage for *Sebastolobus* was determined according to criteria in Table 1.

Because the genus *Sebastolobus* has external fertilization, females do not have the developing stage 4 of *Sebastes*. Also, their stage 5 represents the period just preceding and during extrusion of eggs. At this time a gelatinous material is found in association with the ovaries and eggs. This clear gelatin has the consistency of the uncooked albumen of a chicken egg. During this stage some females of *Sebastolobus* may be found with gelatin extruding several inches out of the urogenital pore. This gelatin becomes very sticky with prolonged exposure to air, and it contains small opaque, white, or translucent eggs. *Sebastolobus* eggs are extruded as a bilobed floating egg mass as described by Percy (1962).

Some samplers have become confused trying to differentiate between male stages 4, 5, and 6 for scorpionfishes. The important fact is that these are all mature males. Stage 4 testes usually are very large and a brilliant white. When milt starts to flow, the teste enters stage 5, which is the spawning stage, and the teste will begin to shrink and turn brown. The stage 6 teste is usually quite brown, but white is seen in the area of the sperm duct which contains some thick white milt.

Samples were obtained from 5,967 scorpionfishes representing 35 species. Over 100 fish were examined from each of 22 of these species. Data were summarized by species and sex to show the smallest length at which fish mature (first maturity), the length where half are mature (50% maturity), and the length where all are mature (100% maturity). Reproductive stage for mature fish was summarized by month to determine principal months for mating, fertilization, and larvae or ova extrusion for each species. Seasonality was approximated when sample size was small or where a species was not sampled in every month.

RESULTS

A summary of the Scorpaenidae sampled is given in Tables 2 and 3.

Length at Maturity

Fork length at maturity was determined for 26 species (Table 4). For species where no mature fish were sampled, I report length at maturity as less or smaller than the smallest length sampled. Females of most species were large enough to be marketable (at least 35 cm in length) prior to reaching 50% maturity. Immature specimens of both sexes were frequently found in catches. Species that reach 50% maturity prior to reaching market size and that are frequently landed in volume are *Sebastolobus alascanus*, *Sebastes diploproa*, *Sebastes elongatus*, *Sebastes proriger*, and *Sebastes zacentrus*.

Table 1. Criteria used to determine gonad condition and maturity stage of *Sebastes* from samples collected in Oregon, 1979-86.

Sex	Maturity stage	Gonad condition	Criteria
Females:	1	Immature	Very small, translucent, pink
	2	Maturing	Small, translucent, pink
	3	Mature- ova developing	Large, translucent or opaque, pink, ova are small white and opaque
	4	Mature- with jelly	Large, white eggs surrounded by jelly and jelly often partially extruded
	6	Mature- spent	Large, flaccid, red, often with a few eggs being absorbed at the posterior end
	7	Mature- resting	Moderate, pink, no visible eggs
	Males:	1	Immature
2		Maturing	Small, slight swelling, translucent, white
3		Mature- developing	Medium, ribbon-like, swollen, brown to white
4		Mature- developed	Large, swollen, easily broken, milt in sperm duct, white
5		Mature- spawning	Large, swollen, flowing milt when pressure applied, white
6		Mature- spent	Large-medium, swollen, milt in sperm duct, brown with white center
7		Mature- resting	Medium, ribbon-like, flat, tan or brown

Table 2. Length and maturity of female Scorpaenidae from samples collected in Oregon, 1985-86. Values in parentheses are from samples taken in 1979-82.

Species	Length (cm)		Number of Fish	
	Minimum	Maximum	Immature	Mature
<i>Sebastolobus alascanus</i>	17	76	6 (26)	136 (579)
<i>Sebastolobus altivelis</i>	24	33	0	20
<i>Sebastes aleutianus</i>	15	90	40	111
<i>Sebastes alutus</i>	31	47	6	185
<i>Sebastes aurora</i>	28	39	0	54
<i>Sebastes babcocki</i>	27	61	18	55
<i>Sebastes borealis</i>	60	99	0	78
<i>Sebastes brevispinis</i>	36	65	20	100
<i>Sebastes caurinus</i>	41	51	0	3
<i>Sebastes chlorostictus</i>	33	42	0	4
<i>Sebastes crameri</i>	28	52	29	176
<i>Sebastes diploproa</i>	23	39	0	194
<i>Sebastes elongatus</i>	22	38	6	207
<i>Sebastes emphaeus</i>	16	21	0	14
<i>Sebastes entomelas</i>	31	53	54	365
<i>Sebastes flavidus</i>	35	57	32	239
<i>Sebastes helvomaculatus</i>	16	32	10	81
<i>Sebastes jordani</i>	22	29	1	100
<i>Sebastes maliger</i>	38	45	0	4
<i>Sebastes melanops</i>	39	49	1	15
<i>Sebastes mystinus</i>	32	43	2	12
<i>Sebastes nebulosus</i>	31	37	1	5
<i>Sebastes nigrocinctus</i>	28	47	0	5
<i>Sebastes paucispinis</i>	49	86	2	79
<i>Sebastes pinniger</i>	42	66	42	97
<i>Sebastes proriger</i>	21 (20)	43	3 (9)	158 (1,635)
<i>Sebastes rastrelliger</i>	36	36	0	1
<i>Sebastes reedi</i>	32 (22)	54	6 (62)	152 (399)
<i>Sebastes ruberrimus</i>	23	74	30	152
<i>Sebastes rufus</i> (bank)	51	51	0	1
<i>Sebastes rufus</i> (red widow)	25	54	10	69
<i>Sebastes saxicola</i>	28	32	0	24
<i>Sebastes wilsoni</i>	17	24	1	130
<i>Sebastes zacentrus</i>	20	37	6	228

Table 3. Length and maturity of male Scorpaenidae from samples collected in Oregon, 1985-86. Values in parentheses are from samples taken in 1979-82.

Species	Length (cm)		Number of Fish	
	Minimum	Maximum	Immature	Mature
<i>Sebastolobus alascanus</i>	27 (16)	63 (67)	0 (4)	122 (495)
<i>Sebastolobus altivelis</i>	21	31	2	21
<i>Sebastes aleutianus</i>	18	81	7	154
<i>Sebastes alutus</i>	30	44	3	144
<i>Sebastes aurora</i>	23	40	1	68
<i>Sebastes babcocki</i>	25	69	6	62
<i>Sebastes borealis</i>	70	96	0	55
<i>Sebastes brevispinis</i>	36	62	3	88
<i>Sebastes caurinus</i>	48	48	0	1
<i>Sebastes chlorostictus</i>	39	45	0	4
<i>Sebastes crameri</i>	28	44	1	140
<i>Sebastes diploproa</i>	19	35	0	139
<i>Sebastes elongatus</i>	22	34	2	38
<i>Sebastes emphaeus</i>	14	17	0	3
<i>Sebastes entomelas</i>	32	50	25	192
<i>Sebastes flavidus</i>	30	56	3	223
<i>Sebastes helvomaculatus</i>	19	33	4	95
<i>Sebastes jordani</i>	14	27	1	71
<i>Sebastes levis</i>	27	27	1	0
<i>Sebastes maliger</i>	38	48	0	4
<i>Sebastes melanops</i>	35	41	0	7
<i>Sebastes melanostomus</i>	47	47	0	1
<i>Sebastes mystinus</i>	30	42	0	3
<i>Sebastes nebulosus</i>	40	40	0	2
<i>Sebastes nigrocinctus</i>	36	49	0	8
<i>Sebastes paucispinis</i>	50	73	0	111
<i>Sebastes pinniger</i>	43	55	0	89
<i>Sebastes proriger</i>	20	36	1 (1)	37 (144)
<i>Sebastes reedi</i>	34 (23)	51	0 (44)	106 (346)
<i>Sebastes ruberrimus</i>	21	75	43	121
<i>Sebastes rufus</i> (red widow)	24	50	4	61
<i>Sebastes wilsoni</i>	14	22	0	28
<i>Sebastes zacentrus</i>	18	32	2	80

Table 4. Length (cm) at first, fifty percent, and one hundred percent maturity for Scorpaenidae from samples collected in Oregon, 1985-86. Values in parentheses are from samples taken in 1979-82.

Species	Females			Males		
	1st	50%	100%	1st	50%	100%
<i>Sebastolobus alascanus</i>	26(17)	30(21)	34(44)	--(<16)	--(<16)	27(26)
<i>Sebastolobus altivelis</i>	--	--	24 ^a	--	21	24
<i>Sebastes aleutianus</i>	44	47	53	30	31	50
<i>Sebastes alutus</i>	32	34	36	30	32	36
<i>Sebastes aurora</i>	--	--	28 ^a	--	23	25
<i>Sebastes babcocki</i>	42	43	47	31	34	39
<i>Sebastes borealis</i>	--	--	60 ^a	--	--	70 ^a
<i>Sebastes brevispinis</i>	40	47	50	38	42	42
<i>Sebastes crameri</i>	33	35	39	28	30	30
<i>Sebastes diploproa</i>	--	--	23 ^a	--	--	19 ^a
<i>Sebastes elongatus</i>	<22	<22	33	<22	<22	27
<i>Sebastes emphaeus</i>	--	--	16 ^a	--	--	14 ^a
<i>Sebastes entomelas</i>	34	36	43	32	33	37
<i>Sebastes flavidus</i>	36	42	47	35	35	41
<i>Sebastes helvomaculatus</i>	18	19	30	19	21	27
<i>Sebastes jordani</i>	22	22	27	19	20	20
<i>Sebastes melanostomus</i>	39	40	41	36	36	37
<i>Sebastes paucispinis</i>	54	--	61	--	--	50 ^a
<i>Sebastes pinniger</i>	43	50	55	--	--	42 ^a
<i>Sebastes proriger</i>	28(<23)	28(>23)	33	<20	≥21	23
<i>Sebastes reedi</i> ^b	36	37	45	31	36	37
<i>Sebastes ruberrimus</i>	36	41	44	39	45	48
<i>Sebastes rufus</i> (red widow)	36	36	36	28	35	35
<i>Sebastes saxicola</i>	--	--	28 ^a	--	--	--
<i>Sebastes wilsoni</i>	17	17	20	--	--	14 ^a
<i>Sebastes zacentrus</i>	22	24	30	18	20	24

^a All samples were mature.

^b Includes samples collected in 1979-82.

Reproductive Cycles

Months for mating, fertilization, and parturition or ova extrusion were determined for 31 species (Table 5). About half of the species were observed to spawn primarily in late winter. *Sebastes brevispinis* was the only summer spawner observed. Rarely were eyed eggs observed from any species during the fall months. Only *Sebastes jordani* apparently spawned twice a year; that is, ovaries were observed containing both eyed eggs and large opaque eggs. I believe that two stages of maturity were being observed rather than the result of incomplete fertilization.

The months when eyed eggs or larvae in *Sebastes* and jellied ovaries in *Sebastolobus* were observed are summarized by species in Table 6. Most species appeared to have a prolonged period of parturition or ova extrusion ranging from several weeks to months. *Sebastes diploproa* was observed to have the longest spawning period, although most spawning was accomplished in the month of June. Appendix B provides the database for reproductive cycles by species.

Length Composition

Length-frequency distributions are summarized in Appendix C. I separated my tabular summary of length composition into three tables because of the large number of species. I reported length frequency separately by sex. Species were also grouped by size. "Small-sized" species are those whose body lengths usually do not exceed 40 cm (Appendix Table C-1). "Medium-sized" species are those whose body lengths usually between range 35 and 55 cm (Appendix Table C-2). "Large-sized" species are those that commonly attain lengths over 50 cm (Appendix Table C-3).

Most of the small-sized species found in the landings were mature, but few fish under 30 cm in length are used for human consumption.

DISCUSSION

I compared Oregon data with those reported by Echeverria (1987) for other areas in the Pacific Northwest. In general, spawning periodicity appeared to be similar but earlier in the southern range of a species (Table 7). More winter spawners were found off California than off areas to the north. The best indications of geographical trends for spawning by individual species were shown by *Sebastes alutus*, *Sebastes crameri*, and *Sebastes entomelas*.

Oregon Scorpaenidae often reached a greater length at 50% maturity than rockfish off central California (Table 8). Because California data were reported in total length whereas Oregon data were reported in fork length, the difference in length at 50% maturity between Oregon and California fish is even greater than indicated in the table.

Table 5. Reproductive seasonality for Scorpaenidae from samples collected in Oregon, 1985-86. Information in parentheses from samples taken in 1979-83.

Species	Principal months for--		
	Mating	Fertili- zation	Parturition or ova extrusion
<i>Sebastolobus alascanus</i>	Mar-May (Feb-May)	--	May-June
<i>Sebastolobus altivelis</i>	Mar	--	Mar, May
<i>Sebastes aleutianus</i>	Dec-Jan	Feb-Mar	Mar
<i>Sebastes alutus</i>	Sep-Nov	Dec-Feb	Feb-Mar
<i>Sebastes aurora</i>	Dec-Feb	Mar	May
<i>Sebastes babcocki</i>	May	--	Jun
<i>Sebastes borealis</i>	Jan-Feb	Mar	May
<i>Sebastes brevispinis</i>	Feb-Apr	Jun-Jul	Jul ^b
<i>Sebastes caurinus</i> ^a	--	--	May ^b
<i>Sebastes chlorostictus</i> ^a	May	--	May
<i>Sebastes crameri</i>	Oct	Dec-Jan	Feb
<i>Sebastes diploproa</i>	Feb-Apr	Mar, Jun	Jun
<i>Sebastes elongatus</i>	Apr	Apr-May	May-Jun
<i>Sebastes emphaeus</i> ^a	Mar	--	--
<i>Sebastes entomelas</i>	Nov-Dec	Jan-Feb	Jan-Mar
<i>Sebastes flavidus</i>	Oct-Dec	Jan-Feb	Feb-Mar
<i>Sebastes helvomaculatus</i>	Feb	Apr	May
<i>Sebastes jordani</i> ^c	Jan	Dec, Jan	Jan-Apr
<i>Sebastes maliger</i> ^a	--	--	June
<i>Sebastes melanops</i>	--	--	Not summer
<i>Sebastes melanostomus</i> ^a	Dec, Feb	Mar	--
<i>Sebastes nigrocinctus</i> ^a	--	May-Jun	May-Jun
<i>Sebastes paucispinis</i>	Nov-Feb	--	Feb
<i>Sebastes pinniger</i>	Oct-Jan	--	Feb
<i>Sebastes proriger</i>	Nov-Jan (Feb-Mar)	Apr-May	May (May-Jun)
<i>Sebastes reedi</i>	Oct-Nov (Oct-Dec)	Feb-Apr	Feb-Apr
<i>Sebastes ruberrimus</i>	Jan-May	Apr-May	Apr-Jun
<i>Sebastes rufus</i> (red widow)	Nov	Jan	Feb, Apr
<i>Sebastes saxicola</i>	--	--	Feb
<i>Sebastes wilsoni</i>	Dec, Apr	Apr, Aug	--
<i>Sebastes zacentrus</i>	Nov-Jan	Mar-Apr	Apr-May

^a Few fish in sample.

^b Estimated.

^c Two maturity stages of eggs observed in some females.

Table 6. Timing of occurrence of jellied ovaries in *Sebastolobus* and eyed eggs or larvae in ovaries of *Sebastes* from samples collected in Oregon, 1985-86. X means jellied ovaries, eyed eggs, or larvae were present.

Species	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
<i>Sebastolobus alascanus</i>	X ^a					X	X					
<i>Sebastolobus altivelis</i>			X			X						
<i>Sebastes aleutianus</i>			X	X		X						
<i>Sebastes alutus</i>	X	X	X									
<i>Sebastes aurora</i>						X						
<i>Sebastes babcocki</i>			X				X					
<i>Sebastes borealis</i>			X			X	X					
<i>Sebastes brevispinis</i>						X	X	X				
<i>Sebastes caurinus</i>					(b)			(b)				
<i>Sebastes chlorostictus</i>					X							
<i>Sebastes cramerii</i>	X	X	X	X								
<i>Sebastes diploproa</i>			X	X		X	X	X	X			
<i>Sebastes elongatus</i>			X	X								
<i>Sebastes entomelas</i>	X	X	X									
<i>Sebastes flavidus</i>		X	X									
<i>Sebastes helvomaculatus</i>				X	X	X	X	X				
<i>Sebastes jordani</i>	X	X ^a	X	X	X							
<i>Sebastes maliger</i>							(b)					
<i>Sebastes melanostomus</i>			X ^a									
<i>Sebastes mystimus</i>				(b)								
<i>Sebastes nebulosus</i>						X						
<i>Sebastes nigrocinctus</i>						X						
<i>Sebastes paucispinis</i>		X										
<i>Sebastes pinniger</i>	X	X									X	X
<i>Sebastes proriger</i>				X	X	X	X					
<i>Sebastes reedi</i>		X	X	X								
<i>Sebastes ruberrimus</i>			X	X	X	X	X					
<i>Sebastes rufus</i> (bank)				X								
<i>Sebastes rufus</i> (red widow)	X	X		X								
<i>Sebastes saxicola</i>		X										
<i>Sebastes zacentrus</i>			X	X	X	X						

^a Samples collected in 1981-83.

^b A spent female was sampled.

Table 7. Months of parturition for *Sebastes* by geographical area along the Pacific coast. Alaska information from O'Connell (1987); British Columbia, Washington, and California information from Echeverria (1987); and Oregon information from this study except where noted. AK = Alaska, BC = British Columbia, WA = Washington, OR = Oregon, NCA = northern and central California, SCA = southern California.

Species	AK	BC	WA	OR	NCA	SCA
<i>aleutianus</i>	--	--	--	Mar-May	--	--
<i>alutus</i>	May	Apr-May	Mar	Jan-Mar	Feb-May	--
<i>aurora</i>	--	--	--	May	May-Aug	--
<i>babcocki</i>	Apr-May	Apr-May	--	Mar-Jun	Apr-Jun	--
<i>borealis</i>	--	--	--	Mar-Jun	--	--
<i>brevispinis</i>	May-Jun	--	--	May-Jul	--	--
<i>caurinus</i>	Mar-May, Jul	--	Mar-Apr	May	Jan-Feb	--
<i>chlorostictus</i>	--	--	--	May	Apr-Sep	Apr-Jul
<i>crameri</i>	Jun ^a	Feb	--	Jan-Apr	Nov-Mar	--
<i>diploproa</i>	--	Feb	Jul	Mar-Sep	Feb-Jul	--
<i>elongatus</i>	--	--	--	Jan-Mar, Apr ^a	May-Aug	--
<i>entomelas</i>	--	Apr	--	Jan-Mar	Nov-Apr	--
<i>flavidus</i>	--	Mar	Jan-Apr	Feb-Mar	Nov-Jul	--
<i>helvomaculatus</i>	Feb-Sep	Jul	--	Apr-Jul	May	--
<i>jordani</i>	--	--	--	Jan-May	Nov-Apr	--
<i>maliger</i>	Mar-Jul	Apr, May	--	before Jun	Feb-Jun	--
<i>melanops</i>	Feb	Jan, Apr ^b	--	Jan ^a	Jun-Apr	--
<i>melanostomus</i>	--	--	--	Apr	Jan-Feb	--
<i>nebulosus</i>	Apr-Jul	--	--	Apr	Jan-Feb	--
<i>nigrocinctus</i>	Feb-Jun	--	--	May	--	--
<i>paucispinis</i>	after Feb	--	--	Feb	Nov-Jul	Jan-Mar
<i>pinniger</i>	Feb-Mar	Feb	Jan-Apr	Nov-Feb	Nov-Apr	--
<i>proriger</i>	May-Jun	--	--	Apr-Jul	--	--
<i>reedi</i>	--	--	--	Feb-Apr	--	--
<i>ruberrimus</i>	Feb-Sep	--	Jul	Mar-Jul	Apr-Jul	--
<i>rufus</i>	--	--	--	Jan-Apr	Jan-May	--
<i>saxicola</i>	--	Feb	--	Feb	Jul, Nov-Mar	--
<i>zacentrus</i>	Jun ^a	--	--	Mar-Jun	--	--

^a Echeverria (1987).

^b Before April.

Table 8. Lengths at 50% maturity for Scorpaenidae from samples collected in Oregon compared with lengths for Scorpaenidae off central California reported by Echeverria (1987).

Species	Males		Females	
	Oregon (fork length, cm)	California (total length, cm)	Oregon (fork length, cm)	California (total length, cm)
<i>Sebastes alutus</i>	32	28	34	26
<i>Sebastes aurora</i>	23	<28	<28	<28
<i>Sebastes babcocki</i>	34	31	43	34
<i>Sebastes crameri</i>	30	27	35	27
<i>Sebastes diploproa</i>	<19	22	23	19
<i>Sebastes elongatus</i>	<22	23	<22	23
<i>Sebastes entomelas</i>	33(36 ^a)	36	36(40 ^a)	34
<i>Sebastes flavidus</i>	35	34	42	37
<i>Sebastes helvomaculatus</i>	21	22	19	23
<i>Sebastes jordani</i>	20	14	22	14
<i>Sebastes melanostomus</i>	36	33	40	35
<i>Sebastes paucispinis</i>	<50	43	61	<44
<i>Sebastes pinniger</i>	<42(37 ^b)	38	50(46 ^b)	45
<i>Sebastes ruberrimus</i>	45	40	41	40
<i>Sebastes rufus</i> (red widow)	35	31	36	34
<i>Sebastes saxicola</i>	--	16	<28	17

^a Obtained from random market samples of 576 *Sebastes entomelas* taken at Charleston and Newport, Oregon, 1982-83.

^b Obtained from random market samples of 1,300 *Sebastes pinniger* taken at Charleston and Newport, Oregon, 1982-83.

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APPENDIX A

List of Scientific and Common Names for Scorpaenidae Sampled During the 1985-86 Oregon Maturity Study

Genus, species	Common name
<i>Sebastolobus:</i>	
<i>alascanus</i>	shortspine thornyhead
<i>altivelis</i>	longspine thornyhead
<i>Sebastes:</i>	
<i>aleutianus</i>	rougeye rockfish
<i>alutus</i>	Pacific ocean perch
<i>aurora</i>	aurora rockfish
<i>babcocki</i>	redbanded rockfish
<i>borealis</i>	shortraker rockfish
<i>brevispinis</i>	silvergray rockfish
<i>caurinus</i>	copper rockfish
<i>chlorostictus</i>	greenspotted rockfish
<i>crameri</i>	darkblotched rockfish
<i>diplopr</i>	splitnose rockfish
<i>elongatus</i>	greenstriped rockfish
<i>emphaeus</i>	Puget Sound rockfish
<i>entomelas</i>	widow rockfish
<i>flavidus</i>	yellowtail rockfish
<i>helvomaculatus</i>	rosethorn rockfish
<i>jordani</i>	shortbelly rockfish
<i>levis</i>	cowcod
<i>maliger</i>	quillback rockfish
<i>melanops</i>	black rockfish
<i>melanostomus</i>	blackgill rockfish
<i>mystinus</i>	blue rockfish
<i>nebulosu</i>	China rockfish
<i>nigrocinctus</i>	tiger rockfish
<i>paucispinis</i>	bocaccio
<i>pinniger</i>	canary rockfish
<i>proriger</i>	redstripe rockfish
<i>rastrelliger</i>	grass rockfish
<i>reedi</i>	yellowmouth rockfish
<i>ruberrimus</i>	yelloweye rockfish
<i>rufus^a</i>	bank rockfish
<i>saxicola</i>	stripetail rockfish
<i>wilsoni</i>	pygmy rockfish
<i>zacentrus</i>	sharpchin rockfish

^a Includes unspotted specimens that are commonly called red widow rockfish.

APPENDIX B

Tables of Gonad Stage by Species

Appendix Table B-1. Number of shortspine thornyhead *Sebastes alascanus* by gonad stage and month in Oregon samples, 1979-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	6	7	
Jan	0	0	54	3	4	2	1	2	2	21	1	0	24	
Feb	0	0	6	15	11	0	0	2	1	39	0	0	4	
Mar	0	0	56	14	36	1	0	0	4	69	0	1	9	
Apr	0	0	17	1	6	0	0	3	2	35	0	1	0	
May	1	0	26	1	36	7	2	1	1	40	37	1	10	
Jun	1	0	1	0	36	17	16	4	0	14	6	81	50	
Jul	0	0	0	0	0	25	27	2	0	9	0	5	52	
Aug	0	0	0	0	0	4	49	0	0	7	0	7	14	
Sep	1	0	0	0	0	0	25	2	1	2	0	0	21	
Oct	1	0	4	0	0	0	46	1	3	3	0	0	67	
Nov	0	0	9	0	0	0	36	0	0	11	0	0	45	
Dec	0	0	23	0	0	0	1	1	0	8	0	0	15	

Appendix Table B-2. Number of longspine thornyhead *Sebastes altivelis* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	6	7	
Jan	--	--	--	--	--	--	--	--	--	--	--	--	--	
Feb	--	--	--	--	--	--	--	--	--	--	--	--	--	
Mar	0	0	0	0	4	2	3	0	0	5	1	0	2	
Apr	2	0	0	0	13	(a)	(a)	2	3	0	0	(b)	(b)	
May	--	--	--	--	--	--	--	0	0	0	2	0	0	
Jun	--	--	--	--	--	--	--	--	--	--	--	--	--	
Jul	1	1	0	0	1	8	3	0	0	0	0	1	9	
Aug	--	--	--	--	--	--	--	--	--	--	--	--	--	
Sep	--	--	--	--	--	--	--	--	--	--	--	--	--	
Oct	--	--	--	--	--	--	--	--	--	--	--	--	--	
Nov	--	--	--	--	--	--	--	--	--	--	--	--	--	
Dec	--	--	--	--	--	--	--	--	--	--	--	--	--	

^a Thirty-three spent or resting males from Coos Bay samples 04/30/85.

^b Twenty-one spent or resting females from Coos Bay samples 04/30/85.

Appendix Table B-3. Number of rougheye rockfish *Sebastes aleutianus* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	1	0	0	3	8	3	1	0	5	0	0	0	0
Feb	0	1	0	0	0	8	4	0	4	16	5	0	0	0
Mar	0	0	0	0	0	4	16	1	0	0	7	15	0	0
Apr	0	0	0	0	0	0	6	0	0	0	0	1	1	1
May	3	1	0	0	0	0	67	21	7	0	0	3	7	21
Jun	0	0	2	0	0	0	11	2	0	0	0	0	6	3
Jul	--	--	--	--	--	--	--	0	0	0	0	0	0	2
Aug	0	0	3	0	0	0	7	2	0	0	0	0	0	5
Sep	--	--	--	--	--	--	--	0	0	0	0	0	0	1
Oct	0	1	1	1	0	6	1	0	1	5	0	0	0	1
Nov	--	--	--	--	--	--	--	0	0	2	0	0	0	0
Dec	0	0	0	0	2	0	1	0	0	4	0	0	0	0

Appendix Table B-4. Number of Pacific ocean perch *Sebastes alutus* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	0	0	0	0	5	0	0	0	10	1	0	0
Feb	0	0	0	0	0	0	27	0	0	0	12	26	7	3
Mar	0	0	0	0	0	0	13	0	1	0	0	4	17	0
Apr	2	1	0	0	0	0	9	0	4	0	0	0	5	4
May	0	0	9	0	0	0	10	0	0	3	0	0	0	7
Jun	0	0	10	0	0	0	0	0	0	0	0	0	2	9
Jul	0	0	7	10	0	0	0	0	0	20	0	0	0	0
Aug	0	0	0	5	0	0	0	1	0	6	0	0	0	5
Sep	0	0	0	2	5	2	0	0	0	5	0	0	0	0
Oct	0	0	0	0	3	4	0	0	0	9	0	0	0	1
Nov	0	0	0	1	2	4	2	0	0	10	0	0	0	0
Dec	0	0	0	0	1	1	12	0	0	14	4	0	1	0

Appendix Table B-5. Number of aurora rockfish *Sebastes aurora* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	1	0	0	2	1	0	0	0	3	1	0	0	0
Feb	0	0	3	3	4	2	0	0	0	9	1	0	0	0
Mar	0	0	0	0	0	5	10	0	0	2	5	0	0	1
Apr	0	0	0	0	1	0	2	0	0	1	0	0	4	0
May	0	0	0	0	0	8	4	0	0	8	0	2	8	0
Jun	0	0	0	0	0	3	3	0	0	0	0	0	0	2
Jul	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep	0	0	1	0	0	0	4	0	0	0	0	0	1	2
Oct	0	0	1	0	0	0	2	0	0	0	0	0	0	3
Nov	0	0	0	0	0	1	0	0	0	1	0	0	0	0
Dec	0	0	0	0	3	0	0	--	--	--	--	--	--	--

Appendix Table B-6. Number of redbanded rockfish *Sebastes babcocki* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	--	--	--	--	--	--	--	0	0	6	1	0	0	2
Feb	0	1	1	0	0	0	0	1	0	0	0	0	0	0
Mar	0	0	0	2	1	1	3	4	2	6	0	1	0	0
Apr	0	2	0	1	0	2	5	6	1	0	0	0	0	0
May	1	0	1	1	4	7	5	1	2	2	0	0	0	2
Jun	0	0	2	0	0	3	5	0	0	0	0	3	6	7
Jul	0	0	0	0	0	0	1	0	0	0	0	0	1	1
Aug	0	1	4	0	0	0	5	0	0	0	0	0	4	6
Sep	0	1	1	0	0	0	1	0	1	0	0	0	0	6
Oct	0	0	3	1	0	0	1	--	--	--	--	--	--	--
Nov	--	--	--	--	--	--	--	0	0	1	0	0	0	0
Dec	0	0	0	0	0	1	0	--	--	--	--	--	--	--

Appendix Table B-7. Number of shorttraker rockfish *Sebastes borealis* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	0	0	4	2	0	0	0	2	0	0	0	0
Feb	0	0	0	0	4	19	0	0	0	18	0	0	0	0
Mar	0	0	0	0	0	3	2	0	0	0	2	1	0	0
Apr	--	--	--	--	--	--	--	0	0	0	1	0	0	0
May	0	0	0	0	0	1	3	0	0	0	1	4	9	0
Jun	0	0	0	0	0	0	2	0	0	1	0	2	10	0
Jul	0	0	0	0	0	0	0	--	--	--	--	--	--	--
Aug	0	0	0	0	0	0	0	--	--	--	--	--	--	--
Sep	0	0	0	0	0	0	0	--	--	--	--	--	--	--
Oct	0	0	0	0	0	3	0	0	0	1	0	0	0	0
Nov	0	0	0	0	0	3	0	0	0	6	0	0	0	0
Dec	0	0	0	0	0	11	0	0	0	19	0	0	1	0

Appendix Table B-8. Number of silvergray rockfish *Sebastes brevispinis* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	2	2	1	0	0	3	1	7	0	0	0	0
Feb	0	1	1	11	7	0	1	0	6	15	0	0	0	0
Mar	0	0	0	1	5	0	0	0	4	5	0	0	0	0
Apr	0	0	0	4	10	1	0	0	0	26	1	0	0	0
May	0	1	1	0	8	2	2	0	1	8	1	1	0	1
Jun	0	0	0	0	0	0	4	0	0	0	2	1	0	2
Jul	0	0	0	0	0	0	1	1	1	0	2	4	0	1
Aug	0	0	0	0	0	0	3	1	0	0	0	0	0	2
Sep	0	0	1	0	0	0	4	1	0	0	0	0	0	1
Oct	1	0	2	0	0	0	5	0	0	1	0	0	0	6
Nov	0	0	1	0	0	0	2	0	1	0	0	0	0	7
Dec	0	0	1	5	0	0	0	0	0	2	0	0	0	4

Appendix Table B-9. Number of darkblotched rockfish *Sebastes crameri* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	0	0	0	1	13	2	0	0	3	1	1	0
Feb	0	0	2	0	0	0	26	9	0	0	1	29	22	4
Mar	0	1	0	0	0	0	17	0	6	0	0	2	13	1
Apr	0	0	11	0	0	0	25	1	2	0	0	1	8	14
May	0	0	9	0	1	0	1	2	1	0	0	0	3	5
Jun	0	0	4	1	0	0	0	1	2	0	0	0	3	6
Jul	0	0	3	0	0	0	1	0	0	0	0	0	0	5
Aug	0	0	1	0	0	0	2	0	0	0	0	0	0	4
Sep	0	0	0	1	0	1	0	0	0	12	0	0	0	0
Oct	0	0	1	0	2	3	0	0	3	10	0	0	0	1
Nov	0	0	0	0	0	5	2	0	0	13	0	0	0	0
Dec	0	0	0	1	1	0	5	0	0	5	9	0	0	0

Appendix Table B-10. Number of splitnose rockfish *Sebastes diploproa* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	2	4	0	0	0	0	0	7	0	0	1	2
Feb	0	0	0	7	9	4	2	0	0	18	0	0	0	1
Mar	0	0	1	5	20	7	0	0	0	37	6	1	4	1
Apr	0	0	0	1	9	3	1	0	0	22	2	1	1	0
May	0	0	0	0	0	2	3	0	0	4	0	0	0	0
Jun	0	0	1	0	0	3	7	0	0	0	4	6	13	0
Jul	0	0	0	0	0	0	6	0	0	0	0	2	5	0
Aug	0	0	0	0	0	0	9	0	0	1	0	1	4	11
Sep	0	0	1	0	0	0	2	0	0	1	1	1	0	3
Oct	0	0	9	0	0	0	2	0	0	1	0	0	4	6
Nov	0	0	5	1	1	0	3	0	0	3	0	0	0	6
Dec	0	0	6	2	0	0	1	0	0	12	0	0	0	1

Appendix Table B-11. Number of greenstripe rockfish *Sebastes elongatus* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	0	0	0	0	1	0	0	2	0	0	0	0
Feb	--	--	--	--	--	--	--	0	0	15	0	0	0	1
Mar	--	--	--	--	--	--	--	0	0	2	0	0	0	0
Apr	0	0	0	0	2	2	2	0	2	43	21	0	0	1
May	0	1	0	0	0	2	5	0	0	20	15	9	3	0
Jun	0	1	0	0	0	0	6	0	0	1	0	6	0	1
Jul	0	0	0	0	0	0	16	1	3	0	0	0	7	32
Aug	--	--	--	--	--	--	--	0	0	0	0	0	0	1
Sep	--	--	--	--	--	--	--	0	0	0	0	0	0	5
Oct	--	--	--	--	--	--	--	0	0	0	0	0	0	19
Nov	0	0	1	1	0	0	0	0	0	0	0	0	0	3
Dec	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix Table B-12. Number of widow rockfish *Sebastes entomelas* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	0	0	1	12	8	4	7	27	35	8	0	0
Feb	0	2	0	0	0	12	36	2	8	4	67	35	1	1
Mar	21	2	0	0	0	1	68	3	15	0	5	24	26	30
Apr	0	0	0	0	0	0	5	0	1	0	0	0	3	11
May	0	0	0	0	0	0	11	1	1	0	0	0	0	12
Jun	0	0	2	0	0	0	0	0	0	0	0	0	0	6
Jul	0	0	2	0	0	0	4	0	0	0	0	0	1	14
Aug	0	0	0	2	0	0	0	0	0	1	0	0	0	7
Sep	0	0	2	2	0	0	0	0	1	13	0	0	0	2
Oct	0	0	1	4	0	0	0	0	1	7	0	0	0	1
Nov	0	0	0	1	7	0	0	0	0	16	0	0	0	0
Dec	0	0	0	1	9	1	0	0	0	18	0	0	0	0

Appendix Table B-13. Number of yellowtail rockfish *Sebastes flavidus* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	0	0	6	7	8	0	5	26	5	0	0	0
Feb	1	0	1	0	0	0	54	0	13	9	19	24	0	20
Mar	0	0	0	0	0	0	57	0	5	1	0	29	15	20
Apr	0	1	0	0	0	0	28	1	6	0	0	0	7	10
May	0	0	1	0	0	0	10	1	0	0	0	0	2	8
Jun	0	1	19	0	0	0	2	0	0	0	0	0	0	19
Jul	0	0	3	0	0	0	0	0	0	0	0	0	1	1
Aug	0	0	4	2	0	0	0	0	0	5	0	0	0	4
Sep	0	0	0	4	0	0	0	0	0	4	0	0	0	2
Oct	0	0	0	1	3	0	0	0	0	8	0	0	0	1
Nov	0	0	0	1	4	0	0	1	0	13	0	0	0	0
Dec	0	0	0	0	4	4	0	0	0	6	0	0	0	0

Appendix Table B-14. Number of rosethorn rockfish *Sebastes helvomaculatus* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	3	2	0	0	0	0	0	3	0	0	0	0
Feb	0	0	0	5	2	1	0	1	0	7	0	0	0	0
Mar	0	0	0	0	1	5	1	0	0	2	1	0	0	0
Apr	1	0	0	0	0	15	3	1	1	0	4	1	3	1
May	0	1	0	0	1	2	13	1	2	3	1	9	4	0
Jun	0	2	0	0	0	0	24	1	1	3	3	3	5	6
Jul	0	0	0	0	0	0	8	0	2	0	0	1	0	6
Aug	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Sep	---	---	---	---	---	---	---	0	0	0	0	0	0	2
Oct	0	0	2	0	0	0	0	0	0	0	0	0	0	2
Nov	0	0	4	0	0	0	0	0	0	7	0	0	0	0
Dec	0	0	0	1	1	0	1	0	0	2	1	0	0	0

Appendix Table B-15. Number of shortbelly rockfish *Sebastes jordani* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan ^a	0	0	0	0	1	4	9	9	0	14	14	11	0	1
Feb	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mar ^b	0	0	0	0	0	0	2	0	0	3	1	29	2	0
Apr	0	0	0	0	0	5	18	0	0	0	1	4	1	2
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jun	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jul	0	0	7	0	0	0	0	0	0	1	0	0	1	2
Aug	0	0	8	2	0	0	0	0	0	0	0	0	0	12
Sep	0	0	1	0	0	0	0	--	--	--	--	--	--	--
Oct	0	0	1	5	0	0	0	0	0	7	0	0	0	0
Nov	0	0	0	1	0	0	1	0	0	1	0	0	0	0
Dec	0	0	0	5	0	0	0	0	0	2	3	0	0	0

^a Nine females contained both stage 3 and stage 5 eggs and are listed under both stages.

^b Three females contained both stage 3 and stage 5 eggs and are listed under both stages.

Appendix Table B-16. Number of black rockfish *Sebastes melanops* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Feb	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mar	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Apr	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	0	9	0	0	0	0	0	0	1	0	0	0	22	46
Jun	0	11	27	1	0	0	0	0	0	0	0	0	12	81
Jul	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug	0	3	47	61	14	11	27	0	1	12	0	0	13	155
Sep	0	4	11	8	1	36	1	0	0	46	0	0	5	51
Oct	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nov	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dec	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix Table B-17. Number of blackgill rockfish *Sebastes melanostomus* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	--	--	--	--	--	--	--	0	0	2	0	0	0	0
Feb	1	0	0	0	1	1	0	0	0	2	0	0	0	0
Mar	2	0	0	0	0	6	1	0	1	3	6	1	0	0
Apr	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jun	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jul	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep	0	0	0	0	0	0	1	0	1	12	0	0	0	0
Oct	0	0	0	8	0	0	0	--	--	--	--	--	--	--
Nov	--	--	--	--	--	--	--	0	0	1	0	0	0	0
Dec	0	0	0	0	1	0	0	0	0	2	0	0	0	0

Appendix Table B-18. Number of bocaccio *Sebastes paucispinis* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	0	0	4	8	0	0	0	8	0	0	0	0
Feb	0	0	0	1	4	9	3	0	0	2	0	2	1	6
Mar	0	0	0	0	0	1	2	0	0	1	0	0	0	0
Apr	0	0	1	0	0	0	14	0	0	0	0	0	2	2
May	0	0	3	0	0	0	7	0	0	0	0	0	0	11
Jun	0	0	11	0	0	0	1	0	0	0	0	0	0	10
Jul	0	0	5	0	0	0	0	0	2	0	0	0	2	5
Aug	0	0	0	3	0	0	1	0	0	0	0	0	0	1
Sep	0	0	0	3	1	0	0	0	0	3	0	0	0	2
Oct	0	0	1	4	1	0	0	0	0	6	0	0	0	1
Nov	0	0	0	1	11	2	0	0	0	5	0	0	0	0
Dec	0	0	0	0	2	7	0	0	0	8	1	0	0	0

Appendix Table B-19. Number of canary rockfish *Sebastes pinniger* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	0	0	3	3	1	1	1	2	0	1	2	1
Feb	0	0	0	0	1	6	6	0	9	2	2	2	5	6
Mar	0	0	0	0	0	0	2	0	2	0	0	0	2	0
Apr	0	0	8	0	0	0	8	3	8	0	0	0	3	13
May	0	0	10	0	0	0	0	1	2	0	0	0	4	6
Jun	0	0	8	0	0	0	0	1	3	1	0	0	0	3
Jul	--	--	--	--	--	--	--	1	4	3	0	0	0	1
Aug	0	0	2	3	0	0	0	0	1	4	0	0	0	3
Sep	0	0	0	4	0	0	0	0	0	5	0	0	0	1
Oct	0	0	0	1	3	2	0	0	1	6	0	0	0	0
Nov	0	0	0	1	6	2	0	1	1	11	0	1	0	0
Dec	0	0	0	2	6	1	0	0	2	3	0	1	0	1

Appendix Table B-20. Number of redstripe rockfish *Sebastes proriger* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	0	3	2	1	0	0	0	10	0	0	0	0
Feb	0	0	0	2	8	1	0	0	0	258	0	0	1	0
Mar	0	0	0	0	9	7	4	0	1	511	0	0	0	0
Apr	0	0	3	0	1	43	6	3	2	140	92	3	1	0
May	1	0	4	0	0	0	14	0	0	23	169	43	3	1
Jun	0	0	8	0	0	0	39	3	2	7	15	219	116	15
Jul	0	0	8	0	0	0	0	0	1	0	0	4	73	48
Aug	--	--	--	--	--	--	--	0	0	0	0	0	0	10
Sep	--	--	--	--	--	--	--	0	0	0	0	0	0	11
Oct	0	0	1	3	1	0	0	0	0	0	0	0	0	10
Nov	0	0	0	1	3	1	0	0	0	8	0	0	0	2
Dec	0	0	1	1	5	1	0	0	0	19	0	0	0	1

Appendix Table B-21. Number of yellowmouth rockfish *Sebastes reedi* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	0	0	0	34	7	1	0	35	0	0	0	0
Feb	0	0	0	0	0	9	15	1	0	38	36	5	1	0
Mar	33	4	0	0	0	24	42	35	2	0	13	71	10	0
Apr	0	0	8	0	0	0	41	1	0	0	2	27	14	3
May	0	2	3	0	0	0	55	2	2	0	0	0	32	36
Jun	0	0	5	0	0	0	2	0	0	1	0	0	5	5
Jul	1	0	41	0	0	0	10	4	2	0	0	0	4	29
Aug	2	1	22	0	0	0	0	1	8	19	0	0	0	6
Sep	0	0	10	15	0	0	0	0	0	14	0	0	0	2
Oct	0	0	1	5	3	9	0	0	1	33	0	0	0	1
Nov	0	1	0	2	9	6	16	0	5	39	0	0	0	0
Dec	0	0	0	2	10	34	1	0	3	68	1	0	0	1

Appendix Table B-22. Number of yelloweye rockfish *Sebastes ruberrimus* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	1	0	0	3	4	1	0	0	0	6	0	0	0	0
Feb	0	0	1	0	6	1	1	0	2	7	0	0	0	0
Mar	0	0	0	1	1	0	0	0	0	2	1	1	0	0
Apr	2	0	0	0	1	0	0	1	0	2	3	3	1	0
May ^a	4	10	0	0	26	0	4	1	6	6	5	10	7	3
Jun	2	10	0	0	0	7	21	0	4	2	1	4	20	4
Jul	2	0	0	0	0	0	6	0	9	0	0	1	7	10
Aug	2	8	0	0	0	0	19	0	7	0	0	0	0	19
Sep	2	0	3	0	0	0	4	0	0	0	0	0	0	8
Oct	0	0	3	0	0	0	3	0	0	2	0	0	0	9
Nov	0	0	0	1	0	0	1	0	0	5	0	0	0	1
Dec	0	0	0	0	2	0	1	0	0	2	0	0	0	0

^a Unable to thoroughly examine 24 additional males and 5 females. The males were not stage 5 and the females were not stage 4 or stage 5.

Appendix Table B-23. Number of "red widow" rockfish *Sebastes rufus* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	0	0	1	5	1	0	0	5	5	2	1	0
Feb	1	1	0	0	3	6	6	1	0	6	2	8	1	0
Mar	0	0	0	0	0	0	2	0	0	0	0	0	1	0
Apr	1	0	0	0	0	0	14	2	0	0	0	3	4	0
May	0	0	0	0	0	0	1	--	--	--	--	--	--	--
Jun	0	0	6	0	0	0	3	4	0	0	0	0	3	11
Jul	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep	1	0	0	0	0	0	1	1	0	0	0	0	0	0
Oct	0	0	0	3	2	1	0	0	0	7	0	0	0	0
Nov	0	0	0	0	5	1	0	0	1	4	0	0	0	0
Dec	--	--	--	--	--	--	--	1	--	6	0	0	0	0

Appendix Table B-24. Number of pygmy rockfish *Sebastes wilsoni* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	0	1	0	0	0	0	0	6	0	0	0	0
Feb	0	0	0	0	1	0	1	0	0	14	0	0	0	0
Mar	0	0	0	0	1	0	0	0	0	26	0	0	0	0
Apr	0	0	1	0	6	4	0	0	0	26	1	0	1	0
May	--	--	--	--	--	--	--	0	0	0	0	0	0	0
Jun	0	0	0	0	0	1	0	--	--	--	--	--	--	--
Jul	0	0	3	0	0	0	0	0	0	0	0	0	0	1
Aug	--	--	--	--	--	--	--	0	0	0	1	0	2	4
Sep	0	0	2	1	0	0	0	0	1	0	0	0	0	12
Oct	0	0	1	0	0	0	0	0	0	0	0	0	0	11
Nov	0	0	0	1	0	0	0	0	0	0	0	0	0	10
Dec	0	0	0	0	4	0	0	0	0	8	0	0	0	6

Appendix Table B-25. Number of sharpchin rockfish *Sebastes zacentrus* by gonad stage and month in Oregon samples, 1985-86.

Month	Male gonad stage							Female gonad stage						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Jan	0	0	0	9	7	2	0	0	0	12	0	0	0	0
Feb	0	0	0	0	2	1	0	0	0	47	2	0	0	0
Mar	0	0	0	0	0	4	0	0	2	9	6	1	0	0
Apr	0	0	0	0	0	1	5	0	1	9	20	7	3	0
May	0	1	1	0	0	0	4	0	3	0	1	4	3	0
Jun	0	0	14	0	0	0	1	0	0	0	0	1	6	7
Jul	0	0	1	0	0	0	0	0	0	0	0	0	0	9
Aug	--	--	--	--	--	--	--	0	0	0	0	0	0	9
Sep	0	0	0	4	1	0	1	0	0	7	0	0	0	14
Oct	0	1	1	7	3	1	0	0	0	17	0	0	0	1
Nov	0	0	0	0	4	0	0	0	0	14	0	0	0	0
Dec	0	0	0	5	1	0	0	0	0	19	0	0	0	0

Appendix Table B-26. Number of mature *Sebastes* by gonad stage and month for infrequently sampled species in Oregon samples, 1985-86.

Species, month	Male gonad stage					Female gonad stage				
	3	4	5	6	7	3	4	5	6	7
<i>caurinus:</i>										
May	--	--	--	--	--	0	0	0	1	0
Jun	0	0	0	0	1	--	--	--	--	--
Jul	--	--	--	--	--	0	0	0	1	0
Aug	--	--	--	--	--	0	0	0	0	1
<i>chlorostictus:</i>										
Apr	--	--	--	--	--	1	0	0	0	0
May	0	0	1	0	0	0	1	1	0	0
Sep	0	0	0	0	1	0	0	0	0	1
Oct	1	0	0	0	0	--	--	--	--	--
<i>emphaeus:</i>										
Mar	2	1	0	0	0	0	0	0	0	11
Apr	--	--	--	--	--	3	0	0	0	0
<i>maliger:</i>										
Jun	0	0	0	0	3	0	0	0	2	0
Aug	0	0	0	0	1	0	0	0	0	2
<i>mystinus:</i>										
Apr	0	1	0	0	2	0	0	0	1	10
Jun	--	--	--	--	--	0	0	0	0	1
<i>nebulosus:</i>										
Apr	0	1	0	0	0	--	--	--	--	--
May	--	--	--	--	--	0	0	1	0	0
Jun	--	--	--	--	--	0	0	0	0	6
Aug	0	0	0	0	1	--	--	--	--	--
<i>nigrocinctus:</i>										
Mar	0	0	0	1	0	--	--	--	--	--
May	0	0	0	0	1	0	1	1	0	0
Jun	--	--	--	--	--	0	1	0	0	0
Jul	0	0	0	0	2	0	0	0	0	1
Aug	0	0	0	0	4	0	0	0	0	1
<i>rastrelliger:</i>										
Jul	--	--	--	--	--	0	0	0	0	1
<i>rufus^a</i>										
Apr	--	--	--	--	--	0	0	1	0	0
<i>saxicola</i>										
Feb	--	--	--	--	--	0	0	11	4	0
Apr	--	--	--	--	--	0	0	0	8	1

^a Bank rockfish.

APPENDIX C

Length-Frequency Distributions by Species

Appendix Table C-1. Length-frequency distributions for samples of "small-sized" Scorpaenidae in Oregon samples, 1985-86. F = female; M = male.

Fork length (cm)	<i>Sebastes</i>		<i>Sebastes</i>									
	<i>altivelis</i>		<i>aurora</i>		<i>diploproa</i>		<i>elongatus</i>		<i>emphaeus</i>		<i>helvomaculatus</i>	
	F	M	F	M	F	M	F	M	F	M	F	M
14	--	--	--	--	--	--	--	--	--	1	--	--
15	--	--	--	--	--	--	--	--	--	1	--	--
16	--	--	--	--	--	--	--	--	2	0	1	--
17	--	--	--	--	--	--	--	--	2	1	0	--
18	--	--	--	--	--	--	--	--	4	--	1	--
19	--	--	--	--	--	1	--	--	4	--	2	2
20	--	--	--	--	--	--	--	--	1	--	3	2
21	--	1	--	--	--	0	--	--	1	--	10	4
22	--	1	--	--	--	0	1	1	--	--	4	8
23	--	0	--	2	2	0	1	2	--	--	6	5
24	1	1	0	0	2	0	1	3	--	--	5	5
25	4	3	0	2	5	3	5	4	--	--	8	6
26	1	3	0	0	7	6	1	5	--	--	13	13
27	6	4	0	1	9	18	5	3	--	--	9	13
28	3	1	2	1	13	19	1	6	--	--	8	16
29	3	2	1	1	12	22	7	8	--	--	13	15
30	0	5	2	2	17	15	18	5	--	--	7	5
31	0	2	4	5	5	7	17	1	--	--	1	2
32	1	--	5	13	16	15	33	1	--	--	--	2
33	1	--	7	8	21	10	39	0	--	--	--	1
34	--	--	5	9	15	3	40	1	--	--	--	--
35	--	--	9	6	25	--	25	--	--	--	--	--
36	--	--	7	9	19	--	12	--	--	--	--	--
37	--	--	4	5	17	--	4	--	--	--	--	--
38	--	--	5	2	7	--	3	--	--	--	--	--
39	--	--	3	2	2	--	--	--	--	--	--	--
40	--	--	--	1	--	--	--	--	--	--	--	--

Appendix Table C-1. Continued

Fork length (cm)	<i>Sebastes</i>											
	<i>jordani</i>		<i>levis</i>		<i>proriger</i>		<i>saxicola</i>		<i>wilsoni</i>		<i>zacentrus</i>	
	F	M	F	M	F	M	F	M	F	M	F	M
14	--	1	--	--	--	--	--	--	--	1	--	--
15	--	0	--	--	--	--	--	--	--	4	--	--
16	--	0	--	--	--	--	--	--	--	7	--	--
17	--	--	--	--	--	--	--	--	4	12	--	--
18	--	0	--	--	--	--	--	--	2	1	--	2
19	--	1	--	--	--	--	--	--	14	0	--	3
20	--	1	--	--	--	1	--	--	30	0	1	3
21	--	2	--	--	--	3	--	--	43	1	1	1
22	2	3	--	--	1	0	1	--	13	2	1	7
23	0	18	--	--	0	1	0	--	17	--	2	9
24	1	26	--	--	0	0	0	--	8	--	2	9
25	8	16	--	--	0	0	0	--	--	--	2	13
26	40	3	--	--	0	2	0	--	--	--	7	18
27	31	1	--	1	0	4	0	--	--	--	10	10
28	16	--	--	--	1	2	4	--	--	--	33	3
29	3	--	--	--	4	8	3	--	--	--	59	3
30	--	--	--	--	7	6	8	--	--	--	34	0
31	--	--	--	--	6	4	7	--	--	--	26	0
32	--	--	--	--	10	3	1	--	--	--	21	1
33	--	--	--	--	16	0	--	--	--	--	16	--
34	--	--	--	--	22	1	--	--	--	--	10	--
35	--	--	--	--	23	2	--	--	--	--	4	--
36	--	--	--	--	27	1	--	--	--	--	2	--
37	--	--	--	--	17	--	--	--	--	--	3	--
38	--	--	--	--	13	--	--	--	--	--	--	--
39	--	--	--	--	6	--	--	--	--	--	--	--
40	--	--	--	--	1	--	--	--	--	--	--	--
41	--	--	--	--	0	--	--	--	--	--	--	--
42	--	--	--	--	4	--	--	--	--	--	--	--
43	--	--	--	--	2	--	--	--	--	--	--	--

Appendix Table C-2. Length-frequency distributions for samples of "medium-sized" Scorpaenidae in Oregon samples, 1985-86. F= female; M = male.

Fork length (cm)	<i>Sebastes</i>															
	<i>alutus</i>		<i>caurinus</i>		<i>chloro- stictus</i>		<i>crameri</i>		<i>entomelas</i>		<i>flavidus</i>		<i>maliger</i>		<i>melanops</i>	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
28	--	--	--	--	--	--	1	1	--	--	--	--	--	--	--	--
29	3	--	--	--	--	--	0	1	--	--	--	--	--	--	--	--
30	0	2	--	--	--	--	2	4	--	2	--	1	--	--	--	--
31	1	3	--	--	--	--	3	6	2	5	--	0	--	--	--	--
32	2	3	--	--	--	--	2	18	2	8	--	1	--	--	--	--
33	1	6	--	--	1	--	14	14	5	6	--	0	--	--	--	--
34	2	18	--	--	0	--	15	11	4	8	--	0	--	--	--	--
35	10	29	--	--	0	--	13	12	9	14	1	1	--	--	--	1
36	11	26	--	--	0	--	12	19	22	23	2	8	--	--	--	0
37	17	27	--	--	0	--	13	16	26	31	3	5	--	--	--	0
38	22	11	--	--	0	--	9	14	47	36	6	7	1	1	--	1
39	46	9	--	--	1	1	9	8	37	18	4	12	0	0	1	1
40	31	6	--	--	1	1	13	9	40	19	3	18	1	0	0	1
41	15	6	1	--	0	1	11	5	37	9	10	34	1	1	2	3
42	14	0	0	--	1	0	15	2	29	8	16	24	0	0	4	--
43	10	0	0	--	--	0	18	0	16	9	25	26	0	0	1	--
44	4	1	0	--	--	0	11	1	16	8	27	20	0	1	1	--
45	2	--	0	--	--	1	21	--	20	10	28	18	1	0	3	--
46	2	--	1	--	--	--	9	--	11	1	37	17	--	0	0	--
47	1	--	0	--	--	--	8	--	21	1	25	14	--	0	1	--
48	--	--	0	1	--	--	3	--	27	0	23	13	--	1	2	--
49	--	--	0	--	--	--	2	--	14	0	21	5	--	--	1	--
50	--	--	0	--	--	--	0	--	11	1	8	1	--	--	--	--
51	--	--	1	--	--	--	0	--	14	--	11	0	--	--	--	--
52	--	--	--	--	--	--	1	--	8	--	8	0	--	--	--	--
53	--	--	--	--	--	--	--	--	1	--	5	0	--	--	--	--
54	--	--	--	--	--	--	--	--	--	--	5	0	--	--	--	--
55	--	--	--	--	--	--	--	--	--	--	2	0	--	--	--	--
56	--	--	--	--	--	--	--	--	--	--	0	1	--	--	--	--
57	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--

Appendix Table C-2. Continued.

Fork length (cm)	<i>Sebastes</i>															
	<i>melan-</i> <i>ostomus</i>		<i>mystinus</i>		<i>nebulosus</i>		<i>nigro-</i> <i>cinctus</i>		<i>rast-</i> <i>relliger</i>		<i>reedi</i>		<i>rufus</i> ^a		<i>rufus</i> ^b	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
24	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1
25	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0
26	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0
27	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0
28	---	---	---	---	---	---	---	1	---	---	---	---	---	---	---	2
29	---	---	---	---	---	---	---	0	---	---	---	---	---	---	---	1
30	---	---	---	1	---	---	---	0	---	---	---	---	---	---	---	0
31	---	---	---	0	---	1	---	0	---	---	---	---	---	---	---	0
32	---	---	1	0	---	0	---	0	---	---	---	1	---	---	---	1
33	---	---	0	1	---	1	---	0	---	---	---	0	---	---	---	0
34	---	---	0	0	---	2	1	0	---	---	---	0	1	---	---	0
35	---	---	3	0	---	0	0	0	---	---	---	1	1	---	---	1
36	---	---	1	0	---	0	0	0	1	---	1	---	---	---	---	3
37	---	---	1	0	---	2	0	0	0	---	---	7	2	---	---	3
38	---	---	0	0	---	---	0	0	0	---	---	2	2	---	---	2
39	---	---	2	0	---	---	0	1	1	---	---	0	0	---	---	7
40	---	---	3	0	---	---	1	0	1	---	---	6	3	---	---	7
41	---	---	1	0	---	---	---	0	1	---	---	4	2	---	---	6
42	---	---	1	1	---	---	---	0	0	---	---	4	9	---	---	8
43	---	---	1	---	---	---	---	1	0	---	---	12	14	---	---	3
44	---	---	---	---	---	---	---	0	1	---	---	18	16	---	---	4
45	---	---	---	---	---	---	---	0	0	---	---	24	14	---	---	10
46	---	---	---	---	---	---	---	1	1	---	---	29	12	---	---	4
47	---	1	---	---	---	---	---	1	0	---	---	17	7	---	---	1
48	---	---	---	---	---	---	---	---	1	---	---	13	5	---	---	0
49	---	---	---	---	---	---	---	---	1	---	---	5	5	---	---	0
50	---	---	---	---	---	---	---	---	---	---	---	4	6	---	---	1
51	---	---	---	---	---	---	---	---	---	---	---	5	3	1	---	---
52	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---
53	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---
54	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---

^a Bank rockfish.^b Red widow rockfish.

Appendix Table C-3. Length-frequency distributions for samples of "large-sized" Scorpaenidae in Oregon samples in 1985-86. F = female; M = male.

Fork length (cm)	<i>Sebastolobus</i>				<i>Sebastes</i>											
	<i>ala-scanus</i>		<i>aleu-tianus</i>		<i>babcocki</i>		<i>borealis</i>		<i>brevi-spinis</i>		<i>pauci-spinis</i>		<i>pinniger</i>		<i>ruber-rimus</i>	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
15-16	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--
17-18	1	--	0	1	--	--	--	--	--	--	--	--	--	--	--	--
19-20	0	--	0	0	--	--	--	--	--	--	--	--	--	--	--	--
21-22	0	--	0	0	--	--	--	--	--	--	--	--	--	--	--	1
23-24	0	--	1	1	--	--	--	--	--	--	--	--	--	--	1	0
25-26	1	--	0	0	--	1	--	--	--	--	--	--	--	--	0	0
27-28	6	2	4	0	1	0	--	--	--	--	--	--	--	--	1	1
29-30	1	9	1	1	0	0	--	--	--	--	--	--	--	--	2	2
31-32	4	6	3	3	2	3	--	--	--	--	--	--	--	--	2	1
33-34	3	7	2	1	3	3	--	--	--	--	--	--	--	--	6	5
35-36	5	12	3	1	3	1	--	--	1	1	--	--	--	--	8	7
37-38	17	12	3	2	3	5	--	--	0	2	--	--	--	--	6	4
39-40	12	9	2	3	1	5	--	--	3	0	1	--	--	--	5	6
41-42	8	11	0	1	5	2	--	--	3	2	0	--	2	--	9	4
43-44	11	9	5	5	2	7	--	--	7	3	0	--	3	5	4	9
45-46	10	8	9	11	7	7	--	--	4	13	0	--	9	17	8	6
47-48	7	7	10	11	3	9	--	--	11	13	0	--	19	19	12	6
49-50	7	4	16	14	2	7	--	--	15	16	0	1	19	17	6	6
51-52	6	3	19	13	18	9	--	--	19	8	0	3	27	21	9	4
53-54	6	4	14	18	11	5	--	--	16	10	1	4	19	9	8	7
55-56	6	6	7	12	11	1	--	--	14	8	1	14	16	1	11	8
57-58	4	2	4	14	6	1	--	--	7	9	2	15	17	--	12	16
59-60	6	5	11	7	4	0	1	--	8	4	8	18	5	--	14	14
61-62	5	5	10	12	1	0	0	--	8	2	6	12	2	--	19	8
63-64	3	1	5	7	--	0	0	--	3	--	15	16	0	--	11	12
65-66	4	--	3	6	--	0	0	--	1	--	12	8	1	--	9	13
67-68	4	--	2	4	--	1	0	--	--	--	8	11	--	--	5	2
69-70	2	--	0	3	--	1	1	1	--	--	7	3	--	--	6	6
71-72	1	--	1	5	--	--	0	0	--	--	3	3	--	--	5	0
73-74	1	--	2	0	--	--	1	0	--	--	4	3	--	--	3	1
75-76	1	--	1	2	--	--	1	3	--	--	3	--	--	--	--	--
77-78	--	--	1	0	--	--	2	1	--	--	3	--	--	--	--	--
79-80	--	--	1	2	--	--	5	0	--	--	3	--	--	--	--	--
81-82	--	--	8	1	--	--	7	6	--	--	3	--	--	--	--	--
83-84	--	--	1	--	--	--	6	3	--	--	1	--	--	--	--	--
85-86	--	--	0	--	--	--	10	11	--	--	--	--	--	--	--	--
87-88	--	--	0	--	--	--	7	6	--	--	--	--	--	--	--	--
89-90	--	--	1	--	--	--	15	11	--	--	--	--	--	--	--	--
91-92	--	--	--	--	--	--	7	7	--	--	--	--	--	--	--	--
93-94	--	--	--	--	--	--	6	4	--	--	--	--	--	--	--	--
95-96	--	--	--	--	--	--	5	2	--	--	--	--	--	--	--	--
97-98	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--
99-100	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--