

# **INFORMATIONAL LEAFLET NO. 263**

REPRODUCTIVE SEASONS FOR SOME SEBASTES SPECIES IN

SOUTHEASTERN ALASKA

By

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August 1987

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Informational Leaflet No. 263  
Alaska Department of Fish and Game  
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## ABSTRACT

Information on the stages of maturity and parturition seasons of 23 species of *Sebastes* landed in the Sitka, Alaska commercial catch were collected from dockside samples during March 1983 through May 1987. Stage of maturity was recorded only when the stage was easily discernible externally, as most fish were marketed in the round. Ripe male *Sebastes* were present in all months, with peak numbers of ripe males occurring in mid-winter, December through January. Parturition commenced in February and continued through September with the majority of fishes extruding larvae in the spring, April through May. *Sebastes helvomaculatus* had the most protracted parturition season with eyed embryos present from February through mid-September. The two predominant species in the catch have overlapping parturition seasons; extrusion of larvae peaked in April and early May for *S. maliger*, while the peak for *S. ruberrimus* occurred from April through June. In general parturition seasons for northern area *Sebastes* did not appear to occur later than those from more southern latitudes. For most species parturiting females were present in the catch for 3 to 7 months, longer than previously reported. Extended periods of parturition seems to be common for these species and peak periods of parturition may vary annually. There were only two occurrences of mature *S. pinniger* with eyed embryos and one occurrence of *S. melanops* with eyed embryos, even though these species were common in the commercial catch and displayed other stages of maturity. This lends support to Dunn and Hitz's theory (1969) that *S. melanops* move offshore to release larvae and may indicate that *S. pinniger* do so as well.

KEY WORDS:       Rockfish, *Sebastes*, reproductive stages, reproductive seasons, parturition, Southeast Alaska.

## INTRODUCTION

Over 40 species of *Sebastes* (rockfishes) inhabit the waters of the Gulf of Alaska (Quast and Hall 1972). Twenty-three of these species are landed in the nearshore longline fishery for *Sebastes* in Southeastern Alaska (Table 1). *Sebastes* are ovoviparous, although recent work indicates that some species may be viviparous (Boehlert and Yaklavich 1984; Boehlert et al. 1986). A number of researchers have investigated the spawning seasons and reproductive biology of *Sebastes* in the eastern Pacific (Delacy et al. 1964; Echeverria 1987; Gunderson et al. 1980; Harling et al. 1971; MacGregor 1970; Moser 1967; Westrheim et al. 1968; and Westrheim 1975). *Sebastes* have internal fertilization and an extended gestation period with several months separating copulation, fertilization, and parturition. Parturition timing differs geographically, generally occurring later in northern latitudes. Little information is available on the nearshore *Sebastes* species inhabiting Southeastern Alaska. Most of the information published on parturition seasons of *Sebastes* in Southeastern Alaska has been directed to species inhabiting the outer continental shelf and upper slope that are available to trawl gear (Harling et al. 1971; Westrheim et al. 1968; Westrheim 1975). The only information available on nearshore species in this area is based on information collected during the summer seasons of 1980, 1981, and 1982 (Rosenthal et al. 1982; Field 1984).

During 1982 a port sampling program was initiated by the Alaska Department of Fish and Game (ADF&G) to collect fisheries statistics and biological information on the developing longline fishery for nearshore *Sebastes* in Southeastern Alaska. In 1983 we began recording observations on stages of gonadal maturity for *Sebastes* species landed in the commercial catch.

## MATERIALS AND METHODS

### Port Sampling

Observations on annual gonadal cycles (stages) were recorded opportunistically in conjunction with port sampling of the longline catch for species composition and size distribution. These observations were mainly limited to stages of mature fish that were easily discernible externally. Since the port sampling program utilized dockside samples which are primarily sold in the round, evisceration to inspect the gonads was not generally possible. Samples were taken from March 1983 through May 1987. Distribution of sampling effort, expressed as landings inspected per month, is presented in Appendix A. Primary fishing grounds were in waters less than 90 fathoms off the west coast of central Southeast Alaska from Khaz Head, Chichagof Island to Cape Ommaney (Figure 1).

If the gonadal stage was checked but not determined the maturity stage was recorded as 9 (unknown). Mature *Sebastes* are easily sexed externally due to differences in the urogenital papillae. Likewise, the three ovarian stages between copulation and parturition are easily determined in females without dissection. Ovary condition was determined using the criteria developed by Westrheim (1968) (Table 2). To determine gonadal condition slight pressure was applied to the sides of the body cavity, over the gonads, to extrude ova

Table 1. List of *Sebastes* species that occur in the Southeast Alaska nearshore longline fishery.

| Scientific Name          | Common Name |
|--------------------------|-------------|
| <i>S. aleutianus</i>     | rougheye    |
| <i>S. babcocki</i>       | redbanded   |
| <i>S. borealis</i> +     | shortraker  |
| <i>S. brevispinis</i>    | silvergray  |
| <i>S. caurinus</i>       | copper      |
| <i>S. ciliatus</i>       | dusky       |
| <i>S. crameri</i>        | darkblotch  |
| <i>S. elongatus</i>      | greenstripe |
| <i>S. entomelas</i> +    | widow       |
| <i>S. flavidus</i>       | yellowtail  |
| <i>S. helvomaculatus</i> | rosethorn   |
| <i>S. maliger</i>        | quillback   |
| <i>S. melanops</i>       | black       |
| <i>S. mystinus?</i> +    | blue        |
| <i>S. nebulosus</i>      | China       |
| <i>S. nigrocinctus</i>   | tiger       |
| <i>S. paucispinis</i> +  | bocaccio    |
| <i>S. pinniger</i>       | canary      |
| <i>S. proriger</i>       | redstripe   |
| <i>S. reedi</i>          | yellowmouth |
| <i>S. ruberrimus</i>     | yelloweye   |
| <i>S. variegatus</i> +   | harlequin   |
| <i>S. zacentrus</i> +    | sharpchin   |

+ infrequent occurrences

? tentatively identified by R. Lea, California Department of Fish and Game.

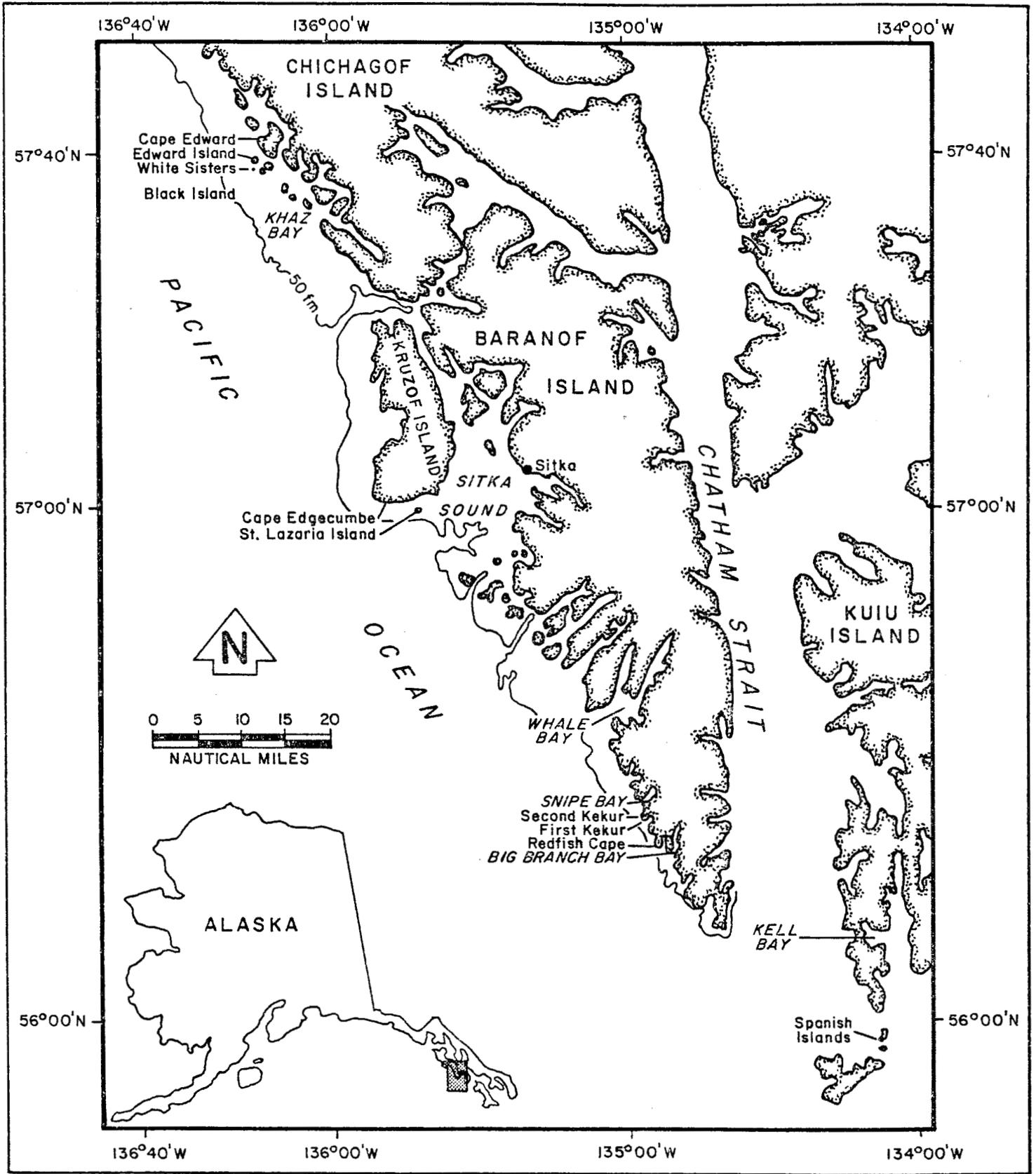


Figure 1. Major study area in the outside waters of Southeastern Alaska.

Table 2. Gonad condition criteria for female *Sebastes* (Westrheim 1975).

| Code | Condition  | Description                                  |
|------|------------|--|
| 1    | immature   | small ovaries, translucent                   |
| 2    | maturing   | small ovaries, yellow, opaque or translucent |
| 3    | mature     | large ovaries, opaque, yellow                |
| 4    | fertilized | large ovaries, orange, translucent           |
| 5    | ripe       | large ovaries, black dots (embryos)          |
| 6    | spent      | large ovaries, flaccid, red                  |
| 7    | resting    | moderate, firm, red-gray                     |
| 9    | unknown    | externally undiscernible                     |

or milt. Directly preceding fertilization, vitellogenesis has occurred and ovaries will be large and firm with a thin wall. Ova extruded at this stage will be bright yellow and opaque (Stage 3). After fertilization the ova are orange-yellow and translucent due to yolk clearing (Stage 4). Ripe ovaries contain embryos which are golden to dark in color due to formation of eye and melanophore pigmentation (Stage 5). For male fish only the ripe stage was recorded. Males were considered ripe when milt could be expressed by applying pressure on the body (Gunderson et al. 1980).

Species that occurred infrequently and first occurrences of Stage 3 females for all species were examined internally for verification when samples were available. Because externally indiscernible gonadal stages in females may indicate any one of four stages (immature, maturing, spent, or resting) no attempt was made to determine peak occurrences of these stages.

Field notes were also used to strengthen reproductive season of definitions. Often due to time or personnel constraints a skipper interview was obtained but no biological sample taken. In these cases, species, sex, and gonadal stage were noted in a field notebook but no formal sample taken. Additionally, gonadal stage was noted for sport caught fishes when examined by the author.

## RESULTS

Twenty-three species totaling 8,794 fish were examined for stage of gonadal maturity during the port sampling program from March 1983 - May 1987 and maturity stages were determined for 2,679 of these (Table 3). Additionally, field notes on gonadal stages contributed to season definitions. Females of 12 species contained eyed larvae or embryos; five species occurred as mature females in the samples but did not occur in a ripe condition (Stage 5). Ripe males of 17 species were present in the samples. No ripe males were present in the samples for the six other species. A breakdown of samples by species, sex, and stage of maturity is listed in Appendix B.

### Male Gonadal Condition

Based on port sampling and field notes, ripe males were present during all sampling months with an apparent peak in winter (Table 4). Some *S. pinniger* males were observed in ripe condition in all months except June and July. Many species appeared to have protracted insemination periods (ripe males present more than half the year). First occurrences of ripe males for five species were observed in the autumn (*S. babcocki*, *S. melanops*, *S. nigrocinctus*, *S. pinniger*, *S. ruberrimus*). Eight species first appeared as ripe males in the winter (*S. brevispinis*, *S. cilliatus*, *S. flavidus*, *S. malliger*, *S. nebulosus*, *S. helvomaculatus*, *S. paucispinis*) and one species (*S. caurinus*) was observed to have ripe males primarily occurring in spring.

### Female Gonadal Condition

#### Parturition:

Port sampling results were supported by field notes. Ripe females occurred during eight months, February through September with the peak period for most

Table 3. Numbers of *Sebastes* specimens examined externally for gonad condition, March 1983 through May 1987.

| Species                  | Number Examined | Number Staged |
|--------------------------|-----------------|---------------|
| <i>S. aleutianus</i>     | 34              | 3             |
| <i>S. babcocki</i>       | 130             | 50            |
| <i>S. borealis</i>       | 13              | 3             |
| <i>S. brevispinis</i>    | 125             | 20            |
| <i>S. caurinus</i>       | 59              | 34            |
| <i>S. ciliatus</i>       | 182             | 59            |
| <i>S. crameri</i>        | 1               | 1             |
| <i>S. elongatus</i>      | 8               | 5             |
| <i>S. entomelas</i>      | 9               | 5             |
| <i>S. flavidus</i>       | 54              | 10            |
| <i>S. halvomaculatus</i> | 509             | 236           |
| <i>S. maliger</i>        | 1,620           | 488           |
| <i>S. melanops</i>       | 341             | 26            |
| <i>S. mystinus?</i>      | 19              | 10            |
| <i>S. nebulosus</i>      | 193             | 63            |
| <i>S. nigrocinctus</i>   | 225             | 82            |
| <i>S. paucispinis</i>    | 28              | 4             |
| <i>S. pinniger</i>       | 488             | 148           |
| <i>S. proriger</i>       | 29              | 15            |
| <i>S. reedi</i>          | 9               | 5             |
| <i>S. ruberrimus</i>     | 4,703           | 1,407         |
| <i>S. variegatus</i>     | 12              | 8             |
| <i>S. zacentrus</i>      | 3               | 1             |
| Total                    | 8,794           | 2,679         |

? These specimens were tentatively identified as *S. mystinus* (Bob Lea, California Fish and Game, pers. comm.).

Table 4. Observed occurrences of ripe male *Sebastes* specimens by month, March 1983 - May 1987.

| Species                  | Months            |
|--------------------------|-------------------|
| <i>S. babcocki</i>       | Sept-Oct, Jan-Feb |
| <i>S. brevispinis</i>    | Jan-Apr           |
| <i>S. borealis</i>       | Oct *             |
| <i>S. caurinus</i>       | Feb-May           |
| <i>S. ciliatus</i>       | Jan-Mar, Sep      |
| <i>S. flavidus</i>       | Jan-Mar           |
| <i>S. helvomaculatus</i> | Feb-Jul, Sep      |
| <i>S. maliger</i>        | Jan-May, Jul      |
| <i>S. melanops</i>       | Feb, Aug-Dec      |
| <i>S. mystinus</i>       | Jan, Mar          |
| <i>S. nebulosus</i>      | Mar, Jun          |
| <i>S. nigrocinctus</i>   | Jan-Mar, May, Nov |
| <i>S. paucispinis</i>    | Feb-Mar           |
| <i>S. pinniger</i>       | Jan-May, Aug-Dec  |
| <i>S. proriger</i>       | May *             |
| <i>S. reedi</i>          | Jan *             |
| <i>S. ruberrimus</i>     | Jan-Jul, Nov-Dec  |

\* one occurrence

species occurring in April and May. *S. helvomaculatus* had the most extended parturition season with some parturiting females occurring from February through September (Table 5). *S. pinniger*, *S. melanops*, *S. ruberrimus* and *S. nigrocinctus* commenced larval extrusion the earliest, in February, with the one observed parturiting female of *S. melanops* occurring during this month exclusively. Parturiting *S. caurinus* were observed in March, May, and July.

#### Peak Parturition Seasons:

Peak parturition season (greatest relative numbers observed) for *S. ruberrimus* occurred in April-June; *S. nigrocinctus* peaked in March-April; *S. nebulosus* and *S. ciliatus* in April; *S. maliger* and *S. helvomaculatus* in April-May; *S. brevispinis* in May-June; and *S. caurinus* in July. Although *S. pinniger*, *S. melanops*, and *S. brevispinis* occurred frequently in the commercial catch, ripe females of this species were rarely observed. No ripe females were observed for *S. flavidus* or *S. paucispinis* although other stages of mature females for these species were observed.

#### Other Gonadal Stages:

Observed occurrences of maturing, fertilized, and parturiting females are listed in Table 5. Overlap of these stages indicate that reproductive seasons are extended (several months) for some species. The presence of maturing and fertilized females in winter indicates that *S. flavidus* and *S. paucispinis* extrude larvae in the spring. Infrequent in the catch, only five mature female *S. elongatus* were observed: four maturing (March-April) and one fertilized (February).

## DISCUSSION

*Sebastes brevispinis* had the lowest percentage of sexually mature fish of any *Sebastes* species sampled from the nearshore waters off Southeast Alaska during earlier surveys conducted in the area (Rosenthal et al. 1982), therefore it is not surprising that relatively few ripe females were encountered in the commercial landings. However, mature *S. melanops* and *S. pinniger* occurred frequently in the samples, yet ripe (Stage 5) females were rarely encountered. Oceanic occurrences of spent and gravid *S. melanops* have been reported by other researchers (Dunn and Hitz 1969). While several explanations are possible, it seems likely that *S. melanops* and *S. pinniger* may move into deeper waters prior to parturition, thereby becoming less available to the nearshore fishery.

Parturition periods differ by area and study for many species, and geographic trends are not always consistent. Comparisons between studies on California rockfish and this study show more tendency toward later parturition seasons in northern latitudes than do comparisons with Washington and British Columbia rockfish studies (Table 6). Six species appeared to have parturition seasons earlier in California than in Southeast Alaska, three species began parturition later in California than in Southeast Alaska, and two species had similar parturition seasons. By contrast, six species were reported parturiting later in Washington and British Columbia than in this study and only two species were reported to parturate earlier (Table 6).

Table 5. Months of occurrence for female *Sebastes* stages of maturity, nearshore commercial catch, Southeast Alaska, March 1983 - May 1987.

| Species                  | Opaque(3)    | Fertilized(4) | Ripe(5)        | Numerical Peak |
|--------------------------|--------------|---------------|----------------|----------------|
| <i>S. babcocki</i>       | Jan-May      | Feb-Mar       | Apr-May        |                |
| <i>S. brevispinis</i>    | Feb-Apr      | Mar-May       | May-Jun*       |                |
| <i>S. caurinus</i>       | Feb-Apr      | Mar-May       | Mar-May++, Jul | Jul            |
| <i>S. ciliatus</i>       | Feb-May      | Feb-Apr       | Mar-May        | Apr            |
| <i>S. flavidus</i>       | Oct, Jan-Mar | Feb           | ? >Feb         |                |
| <i>S. elongatus</i>      | Mar-Apr      | Feb, May ++   |                |                |
| <i>S. helvomaculatus</i> | Jan-Jun      | Feb-Jul, Sep  | Feb-Sep        | Apr-May        |
| <i>S. maliger</i>        | Jan-May      | Jan-Jul       | Mar-Jul        | Apr-May        |
| <i>S. melanops</i>       | Sep-Oct      |               | Feb++          |                |
| <i>S. nebulosus</i>      | Feb-Mar      | Mar-May       | Apr-Jul        | May            |
| <i>S. nigrocinctus</i>   | Jan-Mar      | Feb-May       | Feb-Jun        | Apr            |
| <i>S. pinniger</i>       | Jan-Feb      | Feb-Apr       | Feb-Mar        | Feb?           |
| <i>S. proriger</i>       | Feb-May      | Apr-May       | May-Jun        |                |
| <i>S. ruberrimus</i>     | Feb-Jun      | Mar-Jun       | Feb-Jul, Sep   | Apr-Jun        |
| <i>S. variegatus</i>     | Jan-Mar      | Mar           |                |                |

\* two occurrences

+ landed in Ketchikan

++ one occurrence

Table 6. Months of parturition for *Sebastes* species in the N.E. Pacific, 1963-1987.

| Species                  | California                                  | Oregon-British Columbia              | Southeast                                   |
|--------------------------|---|--------------------------------------|---|
| <i>S. babcocki</i>       | May <sup>m</sup>                            |                                      | Apr-May <sup>a,b</sup>                      |
| <i>S. brevispinis</i>    | Nov-Feb <sup>c</sup>                        |                                      | May-Jul <sup>a,b</sup>                      |
| <i>S. caurinus</i>       | Feb <sup>m</sup>                            |                                      | Mar-May <sup>+</sup> , Jul <sup>b</sup>     |
| <i>S. ciliatus</i>       |   |                                      | Apr-Jun <sup>a,b,c,d</sup>                  |
| <i>S. flavidus</i>       | Nov-Mar <sup>g</sup> , Jan-Jul <sup>m</sup> | Mar <sup>a</sup>                     | >Feb <sup>b</sup>                           |
| <i>S. helvomaculatus</i> | May-Jun <sup>m</sup>                        | Jun <sup>a</sup>                     | Feb-Sep <sup>a,b</sup>                      |
| <i>S. maliger</i>        | Apr-Jul <sup>m</sup>                        | Apr <sup>a</sup>                     | Mar-Jul <sup>b</sup>                        |
| <i>S. melanops</i>       | Jan-May <sup>m</sup>                        | Jan, Apr <sup>a</sup>                | Feb? <sup>b</sup>                           |
| <i>S. nebulosus</i>      | Jan-Feb, Apr-Jun <sup>m</sup>               |                                      | Mar-May <sup>b</sup>                        |
| <i>S. nigrocinctus</i>   |   | May <sup>a</sup>                     | Feb-Jun <sup>b</sup>                        |
| <i>S. paucispinis</i>    | Oct-Apr <sup>c,g,h,j</sup>                  | <Feb <sup>a</sup> , Mar <sup>j</sup> | >Feb <sup>b</sup>                           |
| <i>S. pinniger</i>       | Nov-Mar <sup>g</sup>                        | Jan-Mar <sup>a,k,l</sup>             | Feb-Mar <sup>b</sup>                        |
| <i>S. proriger</i>       |   | Jul <sup>a</sup>                     | May-Jun <sup>b</sup>                        |
| <i>S. ruberrimus</i>     | Jul-Aug <sup>h</sup>                        | May <sup>a</sup> , Jul <sup>h</sup>  | Feb-Sep <sup>b</sup> , Jun-Aug <sup>d</sup> |

- a Westrheim 1975
- b This study
- c Moser 1967
- d Rosenthal et al. 1983
- e Field 1984
- f Dunn and Hitz 1969
- g Phillips 1964
- h Eigenmann 1893
- i DeLacy et al. 1964
- j Morris 1956
- k Fraser 1923
- l Waldron 1968
- m Echeverria 1987

In this study *S. brevispinis*, *S. helvomaculatus*, *S. maliger*, *S. nigrocinctus*, *S. proriger*, and *S. ruberrimus* began parturition earlier than reported for Washington and British Columbia (Westrheim 1975). *Sebastes helvomaculatus*, *S. maliger*, and *S. ruberrimus* also began parturition earlier in Southeast Alaska than reported in California (Echeverria 1987). Peak periods of parturition for many nearshore species as shown in Table 7 tended to be earlier in this study than previously reported for Southeast Alaska (Rosenthal et al. 1982; Westrheim 1975). Bottom temperature data were not available, but it is possible that the 1983 El Nino phenomena affected parturition timing. The extended periods of insemination and parturition exhibited by many Southeast Alaska *Sebastes* may be related to differences in timing by depth although this has not been documented for any species other than *S. alutus* (Westrheim 1975). It is not known how regional location effects parturition timing, but it is possible that some spatial differences may be encountered within the central Southeast Alaska fishing grounds.

When comparing data for geographic trends, long-term studies will more accurately reflect peak parturition periods since parturition may occur over an extended period of time and vary annually. This plasticity in timing may result in increased reproductive success by delaying larval release to coincide with optimum environmental conditions and, in some cases, may indicate multiple matings by males (Echeverria 1987) and biannual parturition in females (Moser 1967).

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Table 7. Reported parturition seasons for nearshore *Sebastes* species from Southeast Alaska (peak periods listed first, entire season in parentheses).

| Species                  | SE <1971 <sup>a,b</sup> | SE <1982 <sup>c</sup> | SE 1982-1985 <sup>e</sup> |
|--------------------------|-------------------------|-----------------------|---------------------------|
| <i>S. babcocki</i>       | May                     |                       | Apr-May                   |
| <i>S. brevispinis</i>    | >May                    | Jul                   | Jun                       |
| <i>S. caurinus</i>       |                         |                       | May*, Jul                 |
| <i>S. ciliatus</i>       | >May                    | May <sup>d</sup>      | Apr (Mar-May)             |
| <i>S. flavidus</i>       |                         |                       | >Feb?                     |
| <i>S. helvomaculatus</i> | >May                    |                       | Apr-May (Feb-Sep)         |
| <i>S. maliger</i>        |                         | May-Jul               | Apr-May                   |
| <i>S. melanops</i>       |                         |                       | Feb+                      |
| <i>S. nebulosus</i>      |                         |                       | Apr-May (Apr-Jul)         |
| <i>S. nigrocinctus</i>   |                         |                       | Apr (Feb-May)             |
| <i>S. paucispinis</i>    |                         |                       | >Feb?                     |
| <i>S. pinniger</i>       |                         |                       | Feb++                     |
| <i>S. proriger</i>       |                         |                       | May                       |
| <i>S. ruberrimus</i>     |                         | June-Aug              | Apr-Jun (Mar-Sep)         |

- a Westrheim 1975  
 b Harling et al. 1971  
 c Rosenthal et al. 1982  
 d Field 1984  
 e This study  
 \* Ketchikan  
 + One occurrence  
 ++ Two occurrences

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APPENDICES

Appendix A. Number of rockfish landings port sampled, March 1983 - May 1987.

| YEAR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | TOTAL |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1983 | -   | -   | 10  | 6   | 4   | 1   | 1   | 2   | 1   | 5   | 4   | -   | 34    |
| 1984 | -   | 12  | 13  | 13  | 9   | 6   | 3   | 1   | 4   | 4   | 4   | -   | 69    |
| 1985 | 7   | 5   | 9   | 6   | 3   | -   | 2   | 3   | 1   | 3   | -   | -   | 39    |
| 1986 | 2   | 5   | 8   | 1   | 10  | 1   | 8   | 6   | 4   | 6   | 8   | -   | 59    |
| 1987 | -   | 7   | 5   | 7   | 5   | -   |     |     |     |     |     |     | 201   |

Appendix B. Numbers of male and female staged by month for *Sebastes* species examined in the port sampling program. Zeros indicate months when no samples of that species could be staged. Blanks (-) indicate months when port samples were taken but no representatives of that species occurred, except for December when no port samples were taken.

| SPECIES                  | SEX | GONADAL<br>CONDITION | NUMBERS OF FISH BY MONTH (ALL YEARS COMBINED) |     |     |     |     |     |     |     |     |     |     |     | TOTAL |
|--------------------------|-----|----------------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
|                          |     |                      | JAN   | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |       |
| <i>S. ruberrimus</i>     | M   | RIFE (5)             | 25  | 64  | 94  | 80  | 94  | 1   | 5   | 0   | 0   | 0   | 3   | -   | 366   |
|                          | M   | OTHER                | 46  | 115 | 236 | 205 | 272 | 92  | 122 | 119 | 113 | 105 | 75  | -   | 1500  |
|                          | F   | STAGE 3              | 1   | 91  | 187 | 97  | 53  | 1   | 0   | 0   | 0   | 0   | 0   | -   | 430   |
|                          | F   | STAGE 4              | 0   | 0   | 42  | 111 | 153 | 13  | 0   | 0   | 0   | 0   | 0   | -   | 319   |
|                          | F   | STAGE 5              | 0   | 2   | 2   | 42  | 184 | 39  | 21  | 0   | 2   | 0   | 0   | -   | 292   |
|                          | F   | OTHER                | 83  | 240 | 315 | 141 | 76  | 86  | 213 | 142 | 168 | 200 | 132 | -   | 1796  |
|                          |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 4703  |
| <i>S. maliger</i>        | M   | RIFE (5)             | 10  | 39  | 30  | 6   | 12  | 0   | 1   | 0   | 0   | 0   | 0   | -   | 98    |
|                          | M   | OTHER                | 40  | 74  | 94  | 118 | 101 | 76  | 45  | 24  | 30  | 29  | 52  | -   | 683   |
|                          | F   | STAGE 3              | 4   | 41  | 20  | 3   | 3   | 0   | 0   | 0   | 0   | 0   | 0   | -   | 71    |
|                          | F   | STAGE 4              | 2   | 24  | 86  | 17  | 17  | 0   | 0   | 0   | 0   | 0   | 0   | -   | 146   |
|                          | F   | STAGE 5              | 0   | 0   | 2   | 81  | 89  | 0   | 1   | 0   | 0   | 0   | 0   | -   | 173   |
|                          | F   | OTHER                | 39  | 51  | 52  | 18  | 64  | 2   | 52  | 31  | 50  | 25  | 65  | -   | 449   |
|                          |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 1620  |
| <i>S. pinniger</i>       | M   | RIFE (5)             | 4   | 30  | 19  | 9   | 6   | 0   | 0   | 8   | 11  | 11  | 24  | -   | 122   |
|                          | M   | OTHER                | 6   | 31  | 49  | 53  | 32  | 10  | 19  | 8   | 4   | 6   | 1   | -   | 219   |
|                          | F   | STAGE 3              | 3   | 6   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | -   | 9     |
|                          | F   | STAGE 4              | 4   | 6   | 3   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | -   | 14    |
|                          | F   | STAGE 5              | 0   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 0   | -   | 3     |
|                          | F   | OTHER                | 6   | 15  | 8   | 12  | 16  | 6   | 9   | 4   | 16  | 11  | 18  | -   | 121   |
|                          |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 488   |
| <i>S. helvomaculatus</i> | M   | RIFE (5)             | 0   | 8   | 11  | 10  | 8   | 3   | 1   | 0   | 2   | 0   | 0   | -   | 43    |
|                          | M   | OTHER                | 1   | 14  | 12  | 16  | 31  | 7   | 9   | 11  | 11  | 21  | 24  | -   | 157   |
|                          | F   | STAGE 3              | 3   | 27  | 12  | 9   | 7   | 1   | 0   | 0   | 0   | 0   | 0   | -   | 59    |
|                          | F   | STAGE 4              | 0   | 3   | 27  | 17  | 20  | 2   | 1   | 0   | 1   | 0   | 0   | -   | 71    |
|                          | F   | STAGE 5              | 0   | 0   | 2   | 20  | 30  | 2   | 5   | 2   | 2   | 0   | 0   | -   | 63    |
|                          | F   | OTHER                | 20  | 19  | 9   | 1   | 5   | 3   | 6   | 15  | 3   | 17  | 18  | -   | 116   |
|                          |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 509   |

-Continued-

Appendix B. Numbers of male and female staged by month for *Sebastes* species examined in the port sampling program. Zeros indicate months when no samples of that species could be staged. Blanks (-) indicate months when port samples were taken but no representatives of that species occurred, except for December when no port samples were taken (continued).

| SPECIES                | SEX | GONADAL<br>CONDITION | NUMBERS OF FISH BY MONTH (ALL YEARS COMBINED) |     |     |     |     |     |     |     |     |     |     |     | TOTAL |
|------------------------|-----|----------------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
|                        |     |                      | JAN   | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |       |
| <i>S. melanops</i>     | M   | RIPE (5)             | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 1   | 8   | 4   | -   | 14    |
|                        | M   | OTHER                | 19  | 31  | 50  | 22  | 25  | 4   | 4   | 6   | 8   | 8   | 6   | -   | 183   |
|                        | F   | STAGE 3              | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 3   | 8   | 0   | -   | 11    |
|                        | F   | STAGE 4              | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | -   | 0     |
|                        | F   | STAGE 5              | 0   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | -   | 1     |
|                        | F   | OTHER                | 8   | 25  | 27  | 9   | 9   | 6   | 9   | 4   | 9   | 10  | 16  | -   | 132   |
|                        |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 341   |
| <i>S. nigrocinctus</i> | M   | RIPE (5)             | 6   | 4   | 4   | 0   | 1   | 0   | 0   | 0   | 0   | 0   | 3   | -   | 18    |
|                        | M   | OTHER                | 0   | 7   | 8   | 6   | 23  | 7   | 9   | 6   | 5   | 7   | 4   | -   | 82    |
|                        | F   | STAGE 3              | 6   | 6   | 9   | 8   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | -   | 29    |
|                        | F   | STAGE 4              | 0   | 5   | 10  | 2   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | -   | 18    |
|                        | F   | STAGE 5              | 0   | 2   | 1   | 8   | 5   | 1   | 0   | 0   | 0   | 0   | 0   | -   | 17    |
|                        | F   | OTHER                | 0   | 1   | 2   | 6   | 7   | 5   | 9   | 3   | 8   | 8   | 12  | -   | 61    |
|                        |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 225   |
| <i>S. nebulosus</i>    | M   | RIPE (5)             | 0   | 0   | 9   | 4   | 1   | 3   | 0   | 0   | 0   | 0   | 0   | -   | 17    |
|                        | M   | OTHER                | 1   | 8   | 6   | 12  | 10  | 7   | 5   | 4   | 4   | 4   | 12  | -   | 73    |
|                        | F   | STAGE 3              | 0   | 5   | 11  | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | -   | 17    |
|                        | F   | STAGE 4              | 0   | 0   | 2   | 8   | 2   | 0   | 0   | 0   | 0   | 0   | 0   | -   | 12    |
|                        | F   | STAGE 5              | 0   | 0   | 1   | 6   | 10  | 0   | 0   | 0   | 0   | 0   | 0   | -   | 17    |
|                        | F   | OTHER                | 3   | 5   | 9   | 1   | 2   | 0   | 14  | 2   | 2   | 4   | 15  | -   | 57    |
|                        |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 193   |
| <i>S. ciliatus</i>     | M   | RIPE (5)             | 3   | 9   | 4   | 0   | 0   | -   | 0   | 0   | 1   | 0   | 0   | -   | 17    |
|                        | M   | OTHER                | 3   | 6   | 29  | 14  | 8   | -   | 1   | 0   | 4   | 2   | 0   | -   | 67    |
|                        | F   | STAGE 3              | 0   | 7   | 5   | 0   | 3   | -   | 0   | 0   | 0   | 0   | 0   | -   | 15    |
|                        | F   | STAGE 4              | 0   | 1   | 13  | 3   | 0   | -   | 0   | 0   | 0   | 0   | 1   | -   | 18    |
|                        | F   | STAGE 5              | 0   | 0   | 0   | 7   | 2   | -   | 0   | 0   | 0   | 0   | 0   | -   | 9     |
|                        | F   | OTHER                | 0   | 22  | 9   | 6   | 3   | -   | 0   | 1   | 6   | 7   | 2   | -   | 56    |
|                        |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 182   |

-Continued-

Appendix B. Numbers of male and female staged by month for *Sebastes* species examined in the port sampling program. Zeros indicate months when no samples of that species could be staged. Blanks (-) indicate months when port samples were taken but no representatives of that species occurred, except for December when no port samples were taken (continued).

| SPECIES               | SEX | GONADAL<br>CONDITION | NUMBERS OF FISH BY MONTH (ALL YEARS COMBINED) |     |     |     |     |     |     |     |     |     |     |     | TOTAL |
|-----------------------|-----|----------------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
|                       |     |                      | JAN   | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |       |
| <i>S. caurinus</i>    | M   | RIFE (5)             | 0   | 1   | 1   | 7   | 1   | -   | 0   | 0   | 0   | -   | -   | -   | 10    |
|                       | M   | OTHER                | 0   | 3   | 1   | 4   | 0   | -   | 5   | 1   | 0   | -   | -   | -   | 14    |
|                       | F   | STAGE 3              | 0   | 2   | 4   | 1   | 0   | -   | 0   | 0   | 0   | -   | -   | -   | 7     |
|                       | F   | STAGE 4              | 0   | 0   | 2   | 3   | 1   | -   | 0   | 0   | 0   | -   | -   | -   | 6     |
|                       | F   | STAGE 5              | 0   | 0   | 1   | 0   | 1   | -   | 9   | 0   | 0   | -   | -   | -   | 11    |
|                       | F   | OTHER                | 1   | 3   | 2   | 0   | 0   | -   | 5   | 0   | 0   | -   | -   | -   | 11    |
|                       |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 59    |
| <i>S. flavidus</i>    | M   | RIFE (5)             | 2   | 2   | 1   | -   | 0   | 0   | 0   | 0   | 0   | 0   | -   | -   | 5     |
|                       | M   | OTHER                | 2   | 2   | 7   | 1   | 4   | 1   | 0   | 0   | 2   | 0   | -   | -   | 19    |
|                       | F   | STAGE 3              | 2   | 0   | 2   | -   | 0   | 0   | 0   | 0   | 0   | 0   | -   | -   | 4     |
|                       | F   | STAGE 4              | 0   | 1   | 0   | -   | 0   | 0   | 0   | 0   | 0   | 0   | -   | -   | 1     |
|                       | F   | STAGE 5              | 0   | 0   | 0   | -   | 0   | 0   | 0   | 0   | 0   | 0   | -   | -   | 0     |
|                       | F   | OTHER                | 1   | 5   | 5   | 2   | 2   | 1   | 2   | 1   | 4   | 2   | -   | -   | 25    |
|                       |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 54    |
| <i>S. brevispinis</i> | M   | RIFE (5)             | 5   | 0   | 1   | 1   | 0   | 0   | 0   | -   | 0   | 0   | 0   | -   | 7     |
|                       | M   | OTHER                | 3   | 7   | 13  | 3   | 6   | 1   | 0   | -   | 5   | 10  | 4   | -   | 52    |
|                       | F   | STAGE 3              | 0   | 0   | 4   | 3   | 0   | 0   | 0   | -   | 0   | 0   | 0   | -   | 7     |
|                       | F   | STAGE 4              | 0   | 0   | 1   | 0   | 3   | 0   | 0   | -   | 0   | 0   | 0   | -   | 4     |
|                       | F   | STAGE 5              | 0   | 0   | 0   | 0   | 1   | 1   | 0   | -   | 0   | 0   | 0   | -   | 2     |
|                       | F   | OTHER                | 7   | 5   | 14  | 1   | 3   | 1   | 3   | -   | 1   | 12  | 6   | -   | 53    |
|                       |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 125   |
| <i>S. babcocki</i>    | M   | RIFE (5)             | 2   | 2   | 6   | -   | 0   | 0   | -   | 0   | 1   | 1   | -   | -   | 12    |
|                       | M   | OTHER                | 0   | 1   | 20  | -   | 3   | 3   | -   | 9   | 5   | 9   | -   | -   | 50    |
|                       | F   | STAGE 3              | 1   | 1   | 7   | -   | 1   | 0   | -   | 0   | 0   | 0   | -   | -   | 10    |
|                       | F   | STAGE 4              | 0   | 3   | 18  | -   | 0   | 0   | -   | 0   | 0   | 0   | -   | -   | 21    |
|                       | F   | STAGE 5              | 0   | 0   | 6   | -   | 1   | 0   | -   | 0   | 0   | 0   | -   | -   | 7     |
|                       | F   | OTHER                | 1   | 1   | 4   | -   | 6   | 0   | -   | 7   | 9   | 2   | -   | -   | 30    |
|                       |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 130   |

-Continued-

Appendix B. Numbers of male and female staged by month for *Sebastes* species examined in the port sampling program. Zeros indicate months when no samples of that species could be staged. Blanks (-) indicate months when port samples were taken but no representatives of that species occurred, except for December when no port samples were taken (continued).

| SPECIES               | SEX | GONADAL<br>CONDITION | NUMBERS OF FISH BY MONTH (ALL YEARS COMBINED) |     |     |     |     |     |     |     |     |     |     |     | TOTAL |
|-----------------------|-----|----------------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
|                       |     |                      | JAN   | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |       |
| <i>S. mystinus</i>    | M   | RIPE (5)             | 1   | -   | 1   | -   | -   | -   | -   | -   | -   | -   | -   | -   | 2     |
|                       | M   | OTHER                | 0   | -   | 2   | -   | -   | -   | -   | -   | -   | -   | -   | -   | 2     |
|                       | F   | STAGE 3              | 0   | -   | 6   | -   | -   | -   | -   | -   | -   | -   | -   | -   | 6     |
|                       | F   | STAGE 4              | 0   | -   | 0   | -   | -   | -   | -   | -   | -   | -   | 1   | -   | 1     |
|                       | F   | STAGE 5              | 0   | -   | 1   | -   | -   | -   | -   | -   | -   | -   | -   | -   | 1     |
|                       | F   | OTHER                | 0   | -   | 5   | -   | 2   | -   | -   | -   | -   | -   | -   | -   | 7     |
|                       |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 19    |
| <i>S. paucispinis</i> | M   | RIPE (5)             | -   | 1   | 3   | -   | -   | -   | -   | -   | -   | -   | -   | -   | 4     |
|                       | M   | OTHER                | -   | 0   | 0   | -   | -   | -   | -   | -   | -   | -   | -   | -   | 0     |
|                       |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 32    |
| <i>S. proriger</i>    | M   | RIPE (5)             | 0   | 0   | 0   | 0   | 1   | 0   | -   | -   | 0   | 0   | 0   | -   | 1     |
|                       | M   | OTHER                | 1   | 0   | 1   | 0   | 0   | 1   | -   | -   | 0   | 2   | 0   | -   | 5     |
|                       | F   | STAGE 3              | 0   | 0   | 7   | 1   | 0   | 0   | -   | -   | 0   | 0   | 0   | -   | 8     |
|                       | F   | STAGE 4              | 0   | 0   | 0   | 2   | 2   | 0   | -   | -   | 0   | 0   | 0   | -   | 4     |
|                       | F   | STAGE 5              | 0   | 0   | 0   | 0   | 2   | 1   | -   | -   | 0   | 0   | 0   | -   | 3     |
|                       | F   | OTHER                | 2   | 1   | 1   | 0   | 1   | 0   | -   | -   | 1   | 2   | 1   | -   | 9     |
|                       |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 30    |
| <i>S. variegatus</i>  | M   | RIPE (5)             | 0   | 0   | 0   | -   | -   | -   | -   | -   | -   | -   | -   | -   | 0     |
|                       | M   | OTHER                | 0   | 1   | 0   | -   | -   | -   | -   | -   | -   | -   | -   | -   | 1     |
|                       | F   | STAGE 3              | 1   | 1   | 5   | -   | -   | -   | -   | -   | -   | -   | -   | -   | 7     |
|                       | F   | STAGE 4              | 0   | 0   | 1   | -   | -   | -   | -   | -   | -   | -   | -   | -   | 1     |
|                       | F   | STAGE 5              | 0   | 0   | 0   | -   | -   | -   | -   | -   | -   | -   | -   | -   | 0     |
|                       | F   | OTHER                | 0   | 1   | 2   | -   | -   | -   | -   | -   | -   | -   | -   | -   | 3     |
|                       |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 12    |
| <i>S. elongatus</i>   | M   | RIPE (5)             | -   | 0   | 0   | 0   | 0   | -   | -   | -   | 0   | 0   | -   | -   | 0     |
|                       | M   | OTHER                | -   | 0   | 0   | 0   | 0   | -   | -   | -   | 1   | 2   | -   | -   | 3     |
|                       | F   | STAGE 3              | -   | 0   | 3   | 1   | 0   | -   | -   | -   | 0   | 0   | -   | -   | 4     |
|                       | F   | STAGE 4              | -   | 1   | 0   | 0   | 1   | -   | -   | -   | 0   | 0   | -   | -   | 2     |
|                       | F   | STAGE 5              | -   | 0   | 0   | 0   | 0   | -   | -   | -   | 0   | 0   | -   | -   | 0     |
|                       | F   | OTHER                | -   | 0   | 0   | 0   | 0   | -   | -   | -   | 0   | 0   | -   | -   | 0     |
|                       |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 9     |

-Continued-

Appendix B. Numbers of male and female staged by month for *Sebastes* species examined in the port sampling program. Zeros indicate months when no samples of that species could be staged. Blanks (-) indicate months when port samples were taken but no representatives of that species occurred, except for December when no port samples were taken (continued).

| SPECIES              | SEX | GONADAL<br>CONDITION | NUMBERS OF FISH BY MONTH (ALL YEARS COMBINED) |     |     |     |     |     |     |     |     |     |     |     | TOTAL |
|----------------------|-----|----------------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
|                      |     |                      | JAN   | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |       |
| <i>S. aleutianus</i> | M   | RIPE (5)             | 0   | -   | 0   | 0   | 0   | -   | -   | -   | -   | 0   | -   | -   | 0     |
|                      | M   | OTHER                | 4   | -   | 0   | 7   | 3   | -   | -   | -   | -   | 0   | -   | -   | 14    |
|                      | F   | STAGE 3              | 0   | -   | 0   | 3   | 0   | -   | -   | -   | -   | 0   | -   | -   | 3     |
|                      | F   | STAGE 4              | 0   | -   | 0   | 0   | 0   | -   | -   | -   | -   | 0   | -   | -   | 0     |
|                      | F   | STAGE 5              | 0   | -   | 0   | 0   | 0   | -   | -   | -   | -   | 0   | -   | -   | 0     |
|                      | F   | OTHER                | 7   | -   | 2   | 3   | 4   | -   | -   | -   | -   | 1   | -   | -   | 17    |
|                      |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 34    |
| <i>S. borealis</i>   | M   | RIPE (5)             | -   | -   | 0   | -   | -   | -   | 0   | -   | -   | 1   | -   | -   | 1     |
|                      | M   | OTHER                | -   | -   | 0   | -   | -   | -   | 2   | -   | -   | 1   | -   | -   | 3     |
|                      | F   | STAGE 3              | -   | -   | 1   | -   | -   | -   | 0   | -   | -   | 0   | -   | -   | 1     |
|                      | F   | STAGE 4              | -   | -   | 1   | -   | -   | -   | 0   | -   | -   | 0   | -   | -   | 1     |
|                      | F   | STAGE 5              | -   | -   | 0   | -   | -   | -   | 0   | -   | -   | 0   | -   | -   | 0     |
|                      | F   | OTHER                | -   | -   | 0   | -   | -   | -   | 7   | -   | -   | 0   | -   | -   | 7     |
|                      |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 13    |
| <i>S. reedi</i>      | M   | RIPE (5)             | 1   | -   | 0   | -   | -   | -   | -   | -   | -   | 0   | -   | -   | 1     |
|                      | M   | OTHER                | 0   | -   | 1   | -   | -   | -   | -   | -   | -   | 2   | -   | -   | 3     |
|                      | F   | STAGE 3              | 0   | -   | 2   | -   | -   | -   | -   | -   | -   | 0   | -   | -   | 2     |
|                      | F   | STAGE 4              | 0   | -   | 0   | -   | -   | -   | -   | -   | -   | 0   | -   | -   | 0     |
|                      | F   | STAGE 5              | 0   | -   | 2   | -   | -   | -   | -   | -   | -   | 0   | -   | -   | 2     |
|                      | F   | OTHER                | 0   | -   | 0   | -   | -   | -   | -   | -   | -   | 1   | -   | -   | 1     |
|                      |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 9     |
| <i>S. entomelas</i>  | M   | RIPE (5)             | -   | 0   | -   | 0   | 0   | -   | -   | -   | -   | 0   | -   | -   | 0     |
|                      | M   | OTHER                | -   | 0   | -   | 1   | 1   | -   | -   | -   | -   | 0   | -   | -   | 2     |
|                      | F   | STAGE 3              | -   | 0   | -   | 0   | 0   | -   | -   | -   | -   | 0   | -   | -   | 0     |
|                      | F   | STAGE 4              | -   | 0   | -   | 0   | 0   | -   | -   | -   | -   | 0   | -   | -   | 0     |
|                      | F   | STAGE 5              | -   | 0   | -   | 1   | 0   | -   | -   | -   | -   | 0   | -   | -   | 1     |
|                      | F   | OTHER                | -   | 4   | -   | 0   | 0   | -   | -   | -   | -   | 2   | -   | -   | 6     |
|                      |     |                      |   |     |     |     |     |     |     |     |     |     |     |     | 9     |

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