RIBBON SEAL (*Phoca fasciata*): Alaska Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Ribbon seals inhabit the North Pacific Ocean and adjacent fringes of the Arctic Ocean. In Alaska waters, ribbon seals are found in the open sea, on the pack ice, and only rarely on shorefast ice (Kelly 1988). They range northward from Bristol Bay in the Bering Sea into the Chukchi and western Beaufort Seas (Fig. 13). From late March to early May, ribbon seals inhabit the Bering Sea ice front (Burns 1970, Burns 1981, Braham et al. 1984). They are most abundant in the northern part of the ice front in the central and western parts of the Bering Sea (Burns 1970, Burns et al. 1981). As the ice recedes in May to mid-July the seals move farther to the north in the Bering Sea, where they haul out on the receding ice edge and remnant ice (Burns 1970, Burns 1981, Burns et al. 1981). There has been little agreement on the range of ribbon seals during the rest of the year. Recent sightings and a review of the literature suggest that many ribbon seals migrate into the Chukchi Sea for the summer (Kelly 1988).

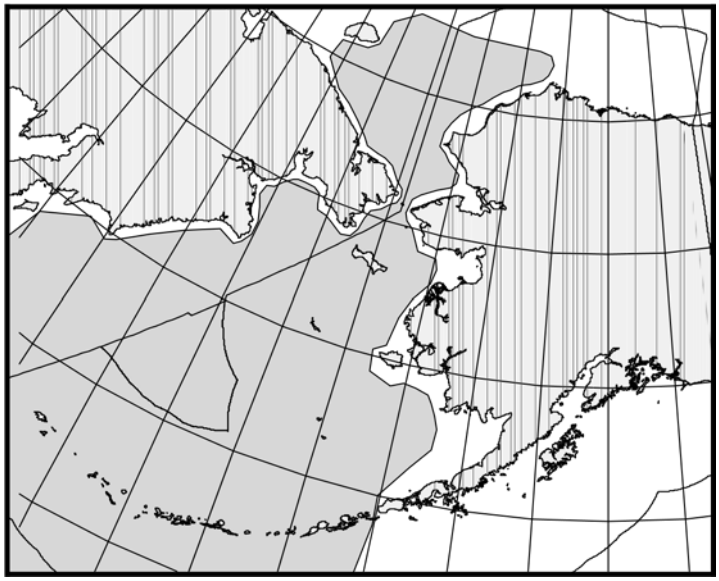

Figure 13. Approximate distribution of ribbon seals in Alaska waters (shaded area). The combined summer and winter distribution is depicted.

The following information was considered in classifying stock structure based on the Dizon et al. (1992) phylogeographic approach: 1) Distributional data: geographic distribution continuous, 2) Population response data: unknown; 3) Phenotypic data: unknown; 4) Genotypic data: unknown. Based on this limited information, and the absence of any significant fishery interactions, there is currently no strong evidence to suggest splitting the distribution of ribbon seals into more than one stock. Therefore, only the Alaska stock of ribbon seal is recognized in U. S. waters.

POPULATION SIZE

A reliable abundance estimate for the Alaska stock of ribbon seals is currently not available. Burns (1981) estimated the worldwide population of ribbon seals at 240,000 in the mid-1970s, with an estimate for the Bering Sea at 90,000-100,000.

Minimum Population Estimate

A reliable minimum population estimate (N_{MIN}) for this stock can not presently be determined because current reliable estimates of abundance are not available.

Current Population Trend

At present, reliable data on trends in population abundance for the Alaska stock of ribbon seals are unavailable, though there is no evidence population levels are declining.

An element of concern is the potential for Arctic climate change, which will probably affect high northern latitudes more than elsewhere. There is evidence that over the last 10-15 years, there has been a shift in regional weather patterns in the Arctic region (Tynan and DeMaster 1996). Ice-associated seals, such as the ribbon seal, are particularly sensitive to changes in weather and sea-surface temperatures in that these strongly affect their ice habitats.

There are insufficient data to make reliable predictions of the effects of Arctic climate change on the Alaska ribbon seal stock.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate is currently unavailable for the Alaska stock of ribbon seals. Hence, until additional data become available, it is recommended that the pinniped maximum theoretical net productivity rate (R_{MAX}) of 12% be employed for this stock (Wade and Angliss 1997).

POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.5, the value for pinniped stocks with unknown population status (Wade and Angliss 1997). However, because a reliable estimate of minimum abundance N_{MIN} is currently not available, the PBR for this stock is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY Fisheries Information

Three different commercial fisheries operating within the range of the Alaska stock of ribbon seals were monitored for incidental take by NMFS observers during 1990-99: Bering Sea (and Aleutian Islands) groundfish trawl, longline, and pot fisheries. The only fishery for which incidental kill was observed was the Bering Sea groundfish trawl fishery, with 1 mortality reported in 1990, 1991, and 1997. Averaging the estimated mortalities over the 1995-99 period results in a mean annual (total) mortality rate of 0.2 (CV = 1.0) ribbon seals per year. The range of observer coverage over the 10-year period, as well as the annual observed and estimated mortalities are presented in Table 12.

An additional source of information on the number of ribbon seals killed or injured incidental to commercial fishing operations is the logbook reports maintained by vessel operators as required by the MMPA interim exemption program. During the 4-year period between 1990 and 1993, logbook reports from all Alaska fisheries indicated no mortalities of ribbon seals. Logbook data are available for part of 1989-94, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide selfreports. Data for the 1994-95 phase-in period are fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 for details). There have been no logbook reports of ribbon seal mortalities or injuries.

Table 12. Summary of incidental mortality of ribbon seals (Alaska stock) due to commercial fisheries from 1990 through 1999 and calculation of the mean annual mortality rate. Data from 1995 to 1999 are used in the mortality calculation when more than 5 years of data are provided for a particular fishery.

Fishery name	Years	Data type	Range of observer coverage	Observed mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
Bering Sea/Aleutian Is. (BSAI) groundfish trawl	90-99	obs data	53-74%	1, 1, 0, 0, 0, 0, 0, 1, 0, 0	1, 1, 0, 0, 0, 0, 0, 2, 0, 0	0.2 (CV = 1.0)
Total estimated annual mortality						0.2

The estimated minimum mortality rate incidental to commercial fisheries is 1 ribbon seal per year (rounded up from 0.2), based exclusively on observer data. Because the PBR for this stock is unknown, it is currently not possible to determine what annual mortality level is considered to be insignificant and approaching zero mortality and serious injury rate. However, if there were 50,000 ribbon seals the PBR would equal 1,500 (50,000 × 0.06 × 0.5 =

1,500), and annual mortality levels less than 150 animals (i.e., 10% of PBR) would be considered insignificant. Currently, there is no reason to believe there are less than 50,000 ribbon seals in U. S. waters.

Subsistence/Native Harvest Information

Ribbon seals are an important species for Alaska Native subsistence hunters, primarily from villages in the vicinity of the Bering Strait and to a lesser extent at villages along the Chukchi Sea coast (Kelly 1988). The annual subsistence harvest was estimated to be less than 100 seals annually from 1968 to 1980 (Burns 1981). In the mid-1980s, the Alaska Eskimo Walrus Commission estimated the subsistence take to still be less than 100 seals annually (Kelly 1988).

The Division of Subsistence, Alaska Department of Fish and Game, maintains a database that provides additional information on the subsistence harvest of ice seals in different regions of Alaska (ADF&G 2000a, b). Information on subsistence harvest of ribbon seals has been compiled for 129 villages from reports from the Division of Subsistence (Coffing et al. 1998, Georgette et al. 1998, Wolfe and Hutchinson-Scarbrough 1999) and a report from the Eskimo Walrus Commission (Sherrod 1982). Data were lacking for 22 villages; their harvests were estimated using the annual per capita rates of subsistence harvest from a nearby village. Harvest levels were estimated from data gathered in the 1980s for 16 villages; otherwise, data gathered from 1990-98 were used. As of August 2000; the subsistence harvest database indicated that the the estimated number of ribbon seals harvested for subsistence use per year is 193.

A recent report on ice seal subsistence harvest in three Alaskan communities indicated that the number and species of ice seals harvested in a particular village may vary considerably between years (Coffing et al. 1999). These interannual differences are likely due differences in ice and wind conditions that change the hunters' access to different ice habitats frequented by different types of seals. Regardless of the extent to which the harvest may vary interannually, it is clear that the harvest level of 193 ribbon seals estimated by the Division of Subsistence is considerably higher than the previous minimum estimate. Although some of the more recent entries in the ADF&G database have associated measures of uncertainty (Coffing et al. 1999, Georgette et al. 1998), the overall total does not. The estimate of 193 ribbon seals represents a mean estimate rather than a minimum estimate of subsistence harvest.

STATUS OF STOCK

Ribbon seals are not listed as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act. Reliable estimates of the minimum population, PBR, and human-caused mortality and serious injury are currently not available. Due to a lack of information suggesting subsistence hunting is adversely affecting this stock and because of the minimal interactions between ribbon seals and any U. S. fishery, the Alaska stock of ribbon seals is not classified as a strategic stock. This classification is consistent with the recommendations of the Alaska Scientific Review Group (DeMaster 1995).

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