July 1995

HARP SEAL (*Phoca groenlandica*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The harp seal occurs throughout much of the North Atlantic and Arctic Oceans (Ronald and Healey 1981; Lavigne and Kovacs 1988); however, in recent years, numbers of sightings and strandings have been increasing off the east coast of the United States from Maine to New Jersey (Katona *et al*. 1993). These appearances usually occur in January-May, when the western North Atlantic stock of harp seals is at its southern most point of migration. The worlds' harp seal population is divided into three separate stocks, each identified with a specific breeding site (Bonner 1990; Lavigne and Kovacs 1988). The largest stock is located in the western North Atlantic off eastern Canada and is divided into two breeding herds which breed on the pack ice. The Front herd breeds off the coast of Newfoundland and Labrador, and the Gulf herd breeds near the Magdalen Islands in the middle of the Gulf of St. Lawrence (Lavigne and Kovacs 1988). The second stock breeds in the White Sea off the coast of the Soviet Union, and the third stock breeds on the West Ice off of eastern Greenland (Lavigne and Kovacs 1988).

Harp seals are highly migratory. Breeding occurs at different times between mid-February and April for each stock. Adults then assemble north of their whelping patches to undergo the annual moult. The migration then continues north to summer feeding grounds. In late September, after a summer of feeding, nearly all adults and some of the immature animals swim southward ahead of the advancing ice en route to winter breeding and pupping grounds.

The extreme southern limit of the harp seal's habitat extends into the U.S. Atlantic Exclusive Economic Zone (EEZ) during winter and spring. The Northeast Marine Mammal Stranding Network reported an annual average of eight harp seals stranded during 1989-92. Strandings increased to between 45-50 per year in 1993-94 and, in addition to Massachusetts, carcasses were recovered in Connecticut, New York, and New Jersey (Rubinstein 1994). The increased number of strandings may indicate a possible shift in distribution or expansion southward into U.S. waters; if so, fishery interactions may increase.

POPULATION SIZE

The total population size of harp seals is unknown; however, three seasonal abundance estimates are available which used a variety of methods including aerial surveys and mark-recapture (Table 1). Generally, these methods include surveying the whelping concentrations and mathematically modeling pup production. Harp seal pup production in the 1950s was estimated at 645,000 (Sergeant 1975), decreasing to 225,000 by 1970 (Sergeant 1975). Estimates began to increase at this time and have continued to rise, reaching 478,000 in 1979 (Bowen and Sergeant 1985) and 577,900 in 1990 (Stenson *et al*. 1993).

Roff and Bowen (1983) developed an estimation model to provide a more precise estimate of total population. This technique incorporates recent pregnancy rates and estimates of age-specific hunting mortality (CAFSAC 1992). Total population can be determined by multiplying pup production by a factor between 5.35 and 5.38, giving a total of approximately three million harp seals in 1990.

Shelton *et al*. (1992) applied a harp seal estimation model to the 1990 pup production and obtained an estimate of 3.1 million (range 2.7-3.5 million; Stenson 1993).

Table 1. Summary of abundance estimates for western North Atlantic harp seals. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV). Unk=unknown.

Month/Year	Area	N_{best}	CV
1990	North Atlantic	577,900	unk
1990	North Atlantic	3 million	unk
1990	North Atlantic	3.1 million	unk

Minimum population estimate

Present data are insufficient to calculate the minimum population estimate for U.S. waters. It is estimated there are at least 2.7 million harp seals in Canada.

Current population trend

The population appears to be increasing in U.S. waters, judging from the increased number of stranded harp seals, but the magnitude of the suspected increase is unknown. In Canada, the average annual growth rate has been estimated to be about 7% (Stenson 1993).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The best data are based on Canadian studies. Recent studies indicate that pup production has increased, but the rate of population increase cannot be quantified at this time (Stenson 1993).

For purposes of this assessment, the maximum net productivity rate was assumed to be 0.12. This value is based on theoretical modeling showing that pinniped populations may not grow at rates much greater than 12% given the constraints of their reproductive life history (Barlow *et al*. 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (Wade and Angliss 1997). The minimum population size is unknown. The maximum productivity rate is 0.12, the default value for pinnipeds. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) was set at 1.0 because it was believed that harp seals are within OSP. PBR for the western North Atlantic harp seal is unknown because the minimum population size in U.S. waters is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

There are no records of harp seals in the NEFSC 1989-1993 Sea Sampling by-catch database; however, 40-50 seals which identified by observers as harbor seals in spring 1994 may have, in fact, been harp seals. Biological and photographic data from takes are under review.

An unknown number of harp seals have been taken in Newfoundland and Labrador groundfish gillnets (Read 1994). Harp seals are being taken in Canadian lumpfish and groundfish gillnets, and trawls, but estimates of total removals have not been calculated to date (Anon. 1994). Harp seals have been commercially hunted since the mid-1800's in the Canadian Atlantic (Stenson 1993). A total allowable catch (TAC) of 200,000 harp seals was set for the large vessel hunt in 1971. The TAC varied until 1982 when it was set at the current level of 186,000 seals (Stenson 1993). Catches ranged from 53,000 to 95,000 between 1988-1992 (Stenson 1993).

Fishery Information

The Atlantic Canadian and Greenland salmon gillnet fishery is seasonal, with the peak from June to September, depending on location. During 1989, 2,196 nets 91 m in length were used in southern and eastern Newfoundland, and Labrador. There are no effort data available for the Greenland fishery and the fishery was terminated in 1993 under an agreement between Canada and North Atlantic Salmon Fund (Read 1994).

The Canadian Atlantic groundfish gillnet fishery is important and widespread. Many fisherman hold groundfish gillnet licenses but the number of active fishermen is unknown. In 1989, approximately 6,800 licenses were issued to fishermen along the southern coast of Labrador and the northeast and southern coasts of Newfoundland. In the Gulf of St. Lawrence, there were about 3,900 licenses issued in 1989, while in the Bay of Fundy and southwestern Nova Scotia 659 licenses were issued.

There were 3,121 cod traps operating in Newfoundland and Labrador during 1979, and about 7,500 in 1980 (Read 1994). This fishery was closed at the end of 1993 due to collapse of Canadian groundfish resources.

STATUS OF STOCK

The status of the harp seal stock, relative to OSP, in the U.S. Atlantic EEZ is unknown, but the population appears to be increasing in Canadian waters. The species is not listed as threatened or endangered under the Endangered Species Act. In Canada they are protected from harassment and intentional killing is controlled under the Marine

Mammal Regulations. The total fishery-related mortality and serious injury for this stock is believed to be very low relative to the population size in Canadian waters and can be considered insignificant and approaching zero mortality and serious injury rate. The level of human-caused mortality and serious injury in the U.S. Atlantic EEZ is unknown, but believed to be very low relative to the total stock size; therefore, this is not a strategic stock.

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