December 2005

HOODED SEAL (*Cystophora cristata*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The hooded seal occurs throughout much of the North Atlantic and Arctic Oceans (King 1983) preferring deeper water and occurring farther offshore than harp seals (Sergeant 1976a; Campbell 1987; Lavigne and Kovacs 1988; Stenson *et al.* 1996). Hooded seals tend to wander far out of their range and have been seen as far south as Puerto Rico (Mignucci-Giannoni and Odell 2001), with increased occurrences from Maine to Florida. These appearances usually occur between January and May in New England waters, and in summer and autumn off the southeast U.S. coast and in the Caribbean (McAlpine *et al.* 1999; Harris *et al.* 2001; Mignucci-Giannoni and Odell 2001). Although it is not known which stock these seals come from, it is known that during spring, the northwest Atlantic stock of hooded seals are at their southern most point of migration in the Gulf of St. Lawrence. The world's hooded seal population is divided into three separate stocks, each identified with a specific breeding site (Lavigne and Kovacs 1988; Stenson *et al.* 1996). One stock, which whelps off the coast of eastern Canada, is divided into two breeding herds (Front and Gulf) which breed on the pack ice. The Front herd (largest) breeds off the coast of Newfoundland and Labrador and the Gulf herd breeds in the Gulf of St. Lawrence. The second stock breeds in the Davis Strait, and the third stock occurs on the West Ice off eastern Greenland.

Hooded seals are a highly migratory species. Hooded seals remain on the Newfoundland continental shelf during winter/spring (Stenson *et al.* 1996). Breeding occurs at about the same time in March for each stock. Adults from all stocks then assemble in the Denmark Strait to molt between late June and August (King 1983; Anonymous 1995), and following this, the seals disperse widely. Some move south and west around the southern tip of Greenland, and then north along the west coast of Greenland. Others move to the east and north between Greenland and Svalbard during late summer and early fall (Lavigne and Kovacs 1988). Little else is known about the activities of hooded seals during the rest of the year until they assemble again in February for breeding.

POPULATION SIZE

The number of hooded seals in the western North Atlantic is unknown. Seasonal abundance estimates are available based on a variety of analytical methods based on commercial catch data, and also includes aerial surveys. These methods often include surveying the whelping concentrations and modeling the pup production. Several estimates of pup production at the Front are available. Hooded seal pup production between 1966 and 1977 was estimated at 25,000 - 32,000 annually (Benjaminsen and Oritsland 1975; Sergeant 1976b; Lett 1977; Winters and Bergflodt 1978; Stenson *et al.* 1996). Estimated pup production dropped to 26,000 hooded seal pups in 1978 (Winters and Bergflodt 1978). Pup production estimates began to increase after 1978, reaching 62,000 (95% CI. 43,700 - 89,400) by 1984 (Bowen *et al.* 1987). Bowen *et al.* (1987) also estimated pup production in the Davis Strait at 18,600 (95% C.I. 14,000 - 23,000). A 1985 survey at the Front (Hay *et al.* 1985) produced an estimate of 61,400 (95% C.I. 16,500 - 119,450). Hammill *et al.* (1992) estimated pup production to be 82,000 (SE=12,636) in 1990. Assuming a ratio of pups to total population of 1:5, pup production in the Gulf and Front herds would represent a total population of approximately 400,000-450,000 hooded seals (Stenson 1993). Based on the 1990 survey, Stenson *et al.* (1996) suggested that pup production may have increased at about 5% per year since 1984. However, because of exchange between the Front and the Davis Strait stocks, the possibility of a stable or slightly declining level of pup production is also likely (Stenson 1993; Stenson *et al.* 1996). In 1998 and 1999, surveys were conducted to estimate pup production in the southern Gulf of St. Lawrence, which is the smallest component of the northwest Atlantic stock (Anonymous 2001). The estimate of 2,000 was similar to the previous published 1990 estimate (Hammill *et al.* 1992; Anonymous 2001). There are no current estimates of pup production for the Davis Strait or the Front breeding groups. The stock has not been surveyed since 1990, but a pup survey was planned for March 2005 (Anonymous 2003).

Minimum population estimate

Present data are insufficient to calculate the minimum population estimate for U.S. waters. Since there are no recent comprehensive pup production counts it is not possible to assess current population size (Anonymous 2001).

Current population trend

There are no current data to assess the status of the population in either Canadian or U.S. waters.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The most appropriate data are based on Canadian studies. The most recent comprehensive pup production survey (1990) is nearly 13 years old, which exceeds the GAMMS (Wade and Angliss 1997) criterion (e.g., >8 years) for reliable abundance data.

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 (MMPA Sec. 3. 16 U.S.C. 1362; 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 (F_R) for this stock is 0.5, the value for stocks with unknown population status. PBR for the western North Atlantic hooded seal in U.S. waters is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

For the period 1999-2003, the total estimated human caused mortality and serious injury to hooded seals was 5,594. This is derived from two components: 1) 5,578 from 1999-2003 (1999 = 3,375; 2000 = 5,988; 2001 6,414; 2002 = 6,0561; and 2003 = 6,056[1]) average catches of Northwest Atlantic population of hooded seals by Canada and Greenland; and 2) 16 hooded seals (CV=1.14) from the observed U.S. fisheries (Table 1)

Total annual estimated average fishery-related mortality or serious injury to this stock in U.S. waters during 1999-2003 was 16 hooded seals (CV=1.14; Table 1).

Fishery Information

Detailed fishery information is reported in Appendix III.

U.S.

Northeast Sink Gillnet

The fishery has been observed in the Gulf of Maine and in southern New England. There were 2 hooded seal mortalities observed in the Northeast sink gillnet fishery between 1990 and 2003. Annual estimates of hooded seal bycatch in the Northeast sink gillnet fishery reflect seasonal distribution of the species and of fishing effort. Estimated annual mortalities (CV in parentheses) from this fishery during 1990-2003 were 0 in 1990-1994, 28 in 1995 (0.96), 0 in 1996-2000, 82 in 2001 (1.14), and 0 in 2002-2003. The 1995 bycatch includes 5 animals from the estimated number of unknown seals (based on observed mortalities of seals that could not be identified to species). The unknown seals were prorated, based on spatial/temporal patterns of bycatch of harbor seals, gray seals, harp seals, and hooded seals. There were 1, 5, 8, 2, and 2 unidentified seals observed during 1999-2003, respectively. Since 1997, unidentified seals have not been prorated to a species. This is consistent with the treatment of other unidentified mammals that do not get prorated to a specific species. Average annual estimated fishery-related mortality and serious injury to this stock attributable to this fishery during 1999-2003 was 16 hooded seals (CV=1.14). The stratification design used is the same as that for harbor porpoise (Bravington and Bisack 1996). The bycatch in 2001 occurred in summer (July-September). All bycatch was in waters between Cape Ann and New Hampshire.

CANADA

An unknown number of hooded seals have been taken in Newfoundland and Labrador groundfish gillnets (Read 1994).

Hooded seals are being taken in Canadian lumpfish and groundfish gillnets and trawls; however, estimates of total removals have not been calculated to date.

1 2000-2001 average Greenland catches.

Table 1. Summary of the incidental mortality of hooded seal (*Cystophora cristata*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years			Observer Coverage [b]	Observed Mortality			Mean Annual Mortality
Northeast Sink Gillnet	99-03	301	Obs. Data Weighout, Logbooks	.06,.06, .04, 02	0, 0,1[c], 0, 0	0, 0, 82, 0, 0	0, 0, 1.14, 0, 0	16 (1.14)
TOTAL								16 (1.14)

a Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. NEFSC collects Weighout (Weighout) landings data, and total landings are used as a measure of total effort for the sink gillnet fishery. Mandatory logbook (Logbook) data are used to determine the spatial distribution of some fishing effort in the Northeast sink gillnet fishery.

b The observer coverage for the Northeast sink gillnet fishery is measured in trips.

c Only mortalities observed on marine mammal trips were used to estimate total hooded seal bycatch. See Bisack (1997) for "trip" type definitions. The one hooded seal mortality observed in 2001 was taken in a net equipped with pingers.

Other Mortality

In Atlantic Canada, hooded seals have been commercially hunted at the Front since the late 1800's. In 1974 total allowable catch (TAC) was set at 15,000 and reduced to 12,000 in 1983 and to 2,340 in 1984 (Stenson 1993; Anonymous 1998). From 1991 to 1992 the TAC was increased to 15,000. A TAC of 8,000 was set for 1993, and held at that level through 1997. From 1974 through 1982, the average catch was 12,800 animals, mainly pups. Since 1983 catches ranged from 33 in 1986 to 6,425 in 1991, with a mean catch of 1,001 between 1983 and 1995. In 1996 catches (25,754) were more than three times the allowable quota (Anonymous 1998). The high catch was attributable to good ice conditions and strong market demand. The TAC has remained at 10,000 since 1998 but catches have been very low (e.g., 10 (2000) and 151 (2003); DFO 2001; Anonymous 2003; Stenson, unpublished data). Greenland catches remained below 5,000 during the period 1954-1975, but increased to 5,000-7,000 and 6,300-9,900, respectively, during the periods 1976-1992 and 1993-1998 (Anonymous 2001). A series of management regulations have been implemented since 1960. For example, hunting in the Gulf of St. Lawrence (below 50° N) has been prohibited since 1965, no commercial hunting of hooded seals is permitted in the Davis Strait, and in 2000, the taking of bluebacks was prohibited (Anonymous 2001).

In 1988-1993, strandings were fewer than 20 per year, and from 1994 to 1996 they increased to about 50 per year (Rubinstein 1994; Rubinstein, pers. comm). From 1999 to 2003, 200 hooded seal strandings were reported (1999=36; 2000=30, 2001=86, 2002=30, and 2003=18), in most states from Maine to Virginia (Table 2; NMFS unpublished data). Three (1.5%) of the seals stranded during this five year period showed signs of human interaction as a direct cause of mortality, (1 in 1999, 1 in 2000, and 1 in 2003). Extralimital strandings have also been reported off the southeast U.S., North Carolina to Florida, and in the Caribbean (McAlpine *et al.* 1999; Mignucci-Giannoni and Odell 2001; NMFS, unpublished data).

Table 2. Hooded seal (*Cystophora cristata*) reported strandings along the U.S. Atlantic coast (2002-2003).

STATE	2002	2003	TOTAL
Maine	14	10	24
New Hampshire	1	1	2
Massachusetts	10	4	14
Rhode Island	0	0	0
Connecticut	0	0	0
New York	2	2	4
New Jersey	2	2	4
Delaware	1	1	2
Total	30	20	50

STATUS OF STOCK

The status of hooded seals relative to OSP in U.S. Atlantic EEZ is unknown, but the population appears to be increasing in Canada. They are not listed as threatened or endangered under the Endangered Species Act. 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. This is not a strategic stock because the level of human-caused mortality and serious injury is believed to be very low relative to overall stock size.

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