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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 USA 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; Anon 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 including 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 NW Atlantic stock (Anon. 2001a). The estimate of 2,000 was similar to the previous published 1990 estimate (Hammill *et al*. 1992; Anon. 2001a). The impact of the lack of ice in the Gulf in recent years on pup production is unknown (Anon. 2001a). There are no current estimates of pup production for the Davis Strait or the Front breeding groups. The Joint ICES/NAFO Working Group on Harp and Hooded Seals recommended that new surveys be conducted to obtain a current assessment of the Northwest Atlantic stock (Anon. 2001a).

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 (Anon. 2001a).

Current population trend

There are no current data to assess the status of the population in either Canadian or USA. 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 recover 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 1997 to 2001, the total estimated human caused mortality and serious injury to hooded seals was 10,393. This is derived from two components: 1) 10,377 from 1997-2001 (1997=14,558; 1998=16,476; 1999[1]= 7,287; 2000[2]= 6,717; and 2001[2]= 6,847) average catches of Northwest Atlantic population of hooded seals by Canada and Greenland; and 2) 16 hooded seals (CV=1.14) from the observed USA fisheries (Table 2).
[[1] 1999 Greenland catches are provisional; [2] 1998-1999 average Greenland catches]

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; Anon 1998). From 1991- 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 (Anon 1998). The high catch was attributable to good ice conditions and strong market demand. Catches in 1997 were 7,058, slightly below the TAC.

Hunting in the Gulf of St. Lawrence (below 50^0N) has been prohibited since 1964. No commercial hunting of hooded seals is permitted in the Davis Strait.

Total annual estimated average fishery-related mortality or serious injury to this stock in U.S. waters during 1997-2001 was 16 hooded seals (CV = 1.14) Table 1.

Fishery Information

USA

Data on current incidental takes in USA fisheries are available from several sources. In 1986, NMFS established a mandatory self-reported fishery information system for large pelagic fisheries. Data files are maintained at the Southeast Fisheries Science Center (SEFSC). The Northeast Fisheries Science Center (NEFSC) Fisheries Observer Observer Program was initiated in 1989, and since that year several fisheries have been covered by the program. In late 1992 and in 1993, the SEFSC provided observer coverage of pelagic longline vessels fishing off the Grand Banks (Tail of the Banks) and provides observer coverage of vessels fishing south of Cape Hatteras.

Recent by-catch has been observed by NMFS Sea Samplers in the New England multispecies sink gillnet fisheries, but no mortalities have been documented in the mid-Atlantic coastal gillnet, Atlantic drift gillnet, pelagic pair trawl or pelagic longline fisheries.

In 1993, there were approximately 349 full- and part-time vessels in the New England multispecies sink gillnet fishery, which covered the Gulf of Maine and southern New England (Table 2). An additional 187 vessels were reported to occasionally fish in the Gulf of Maine with gillnets for bait or personal use; however, these vessels were not covered by the observer program (Walden 1996) and their fishing effort was not used in estimating mortality. Observer coverage in terms of trips has been 1%, 6%, 7%, 5%, 7%, 5%, 4%, 6%, 5%, 6%, 6% and 4% for 1990 to 2001, respectively. The fishery has been observed in the Gulf of Maine and in southern New England. There were 2 hooded seal mortalities observed in the New England multispecies sink gillnet fishery between 1990 and 2001. Annual estimates of hooded seal by-catch in the New England multispecies sink gillnet fishery reflect seasonal distribution of the species and of fishing effort. Estimated annual mortalities (CV in parentheses) from this fishery during 1990-2001 was 0 in 1990-1994, 28 in 1995 (0.96), 0 in 1996-2000 and 82 in 2001 (1.14). The 1995 by-catch 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 by-catch of harbor seals, gray seals, harp seals, and hooded seals. 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. There were 0, 1, 5 and 8 unidentified seals observed during 1998 through 2001, respectively. Average annual estimated fishery-related mortality and serious injury to this stock attributable to this fishery during 1992-2001 was 16 hooded seals (CV = 1.14). The stratification design used is the same as that for harbor porpoise (Bravington and Bisack 1996). The by-catch in 1995 occurred in winter (January-May), and the 2001 bycatch 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.

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	Vessels	Data Type [1]	Observer Coverage [2]	Observed Mortality	Estimated Mortality	Estimated CVs	Mean Annual Mortality
Northeast Multispecies Sink Gillnet	97-01	1993=349 1998=301	Obs. Data Weighout, Logbooks	.06, .05, .06,.06, .04	0, 0, 0, 0, 1	0, 0, 0, 0, 82	0, 0, 0, 0, 1.14	16 (1.14)
TOTAL								16 (1.14)

[1] Observer data (Obs. Data) are used to measure by-catch rates, and the data are collected within the Northeast Fisheries Science Center (NEFSC) Fisheries Observer 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 New England multispecies sink gillnet fishery.

[2] The observer coverage for the New England multispecies sink gillnet fishery is measured in trips.

[3] Only mortalities observed on marine mammal trips were used to estimate total harbor 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; Anon 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 (Anon 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 seals in 2000; Anon. 2001b). 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 (Anon. 2001a). A series of management regulations have been implemented since 1960. For example, hunting in the Gulf of St. Lawrence (below 50^0N) 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 (Anon. 2001a).

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 1997 to 2001, (1997=41; 1998=108; 1999=36; 2000=30, and 2001=86), 301 hooded seal strandings were reported to NOAA Fisheries Northeast Region Stranding Program. Strandings were recorded from Maine to Virginia, and highest numbers were in Maine (101/36%), Massachusetts (92/31%), New York (53/18%), and New Jersey (27/9%). Extralimital strandings have also been reported off the southeast USA, North Carolina to Florida, and in the Caribbean (McAlpine *et al*. 1999; Mignucci-Giannoni and Odell 2001; NMFS, unpubl. data). Many were live strandings and some were euthanized due to the animal's condition. Some sick and injured seals were transported to rehabilitation facilities, and some subsequently died. Few hooded seals showed signs of human interactions. The increased number of strandings since the early 1990's may indicate a possible seasonal shift in distribution or range expansion southward into U.S. waters; if so, fishery interactions may increase.

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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