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SPERM WHALE (*Physeter macrocephalus*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Sperm whales are found throughout the world's oceans in deep waters to the edge of the ice at both poles (Leatherwood and Reeves 1983; Rice 1989; Whitehead 2002). Seasonal aerial surveys confirm that sperm whales are present in the northern Gulf of Mexico in all seasons (Mullin *et al.* 1994; Hansen *et al.* 1996; Mullin and Hoggard 2000).

There has been speculation, based on year-round occurrence of strandings, opportunistic sightings and whaling catches, that sperm whales in the Gulf of Mexico may constitute a distinct stock (Schmidly 1981). The Gulf of Mexico population is provisionally being considered a separate stock for management purposes, although there is currently no information to differentiate this stock from the Atlantic Ocean stock(s). Additional morphological, genetic and behavioral data have been collected during Minerals Management Service led field studies (2000-2005). Preliminary analyses of data (unpublished annual reports and presentations at review meetings) indicate Gulf of Mexico sperm whales are smaller in size and likely exhibit distinct genetic and acoustic traits relative to other sperm whale populations. When published, results will likely support Schmidly (1981).

Disturbance by anthropogenic noise may prove to be an important habitat issue in some areas of this population's range, notably in areas of oil and gas activities and/or where shipping activity is high. Limited studies are currently being conducted to address this issue and its impact, if any, on this and other marine species. The potential impact, if any, of coastal pollution may be an issue for this species in portions of its habitat, though little is known on this to date.

POPULATION SIZE

Estimates of abundance were derived through the application of distance sampling analysis (Buckland *et al.* 2001) and the computer program DISTANCE (Thomas *et al.* 1998) to sighting data. From 1991 through 1994, line-transect vessel surveys were conducted in conjunction with bluefin tuna ichthyoplankton surveys during spring in the northern Gulf of Mexico from the 200m isobath to the seaward extent of the U.S. Exclusive Economic Zone (EEZ) (Hansen *et al.* 1995). Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of sperm whales for all surveys combined was 530 (CV=0.31) (Hansen *et al.* 1995).

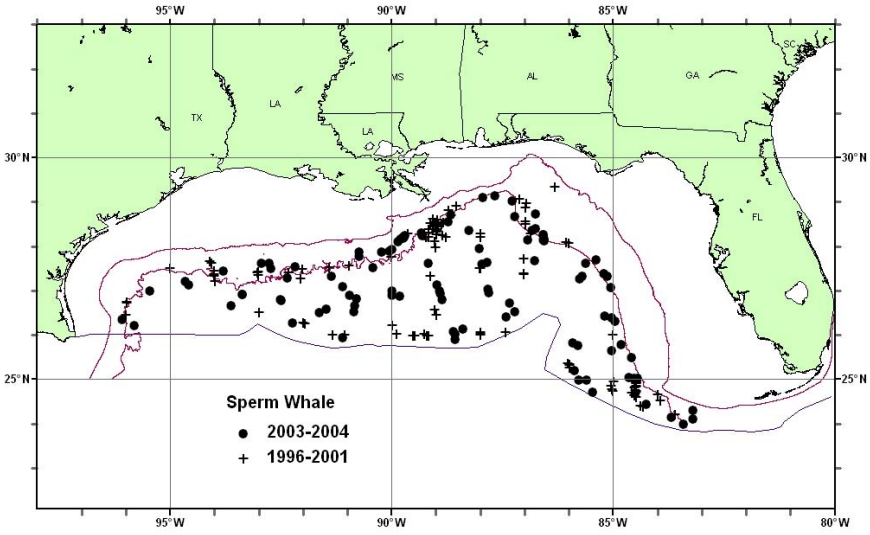

Figure 1. *Distribution of sperm whale sightings from SEFSC spring vessel surveys during 1996-2001 and from summer 2003 and spring 2004 surveys. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100m and 1,000m isobaths and the offshore extent of the U.S. EEZ.*

Similar surveys were conducted during spring from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico. Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate. The estimate of abundance for sperm whales in oceanic waters, pooled from 1996 to 2001, is 1,349 (CV=0.23) (Mullin and Fulling 2004).

During summer 2003 and spring 2004, line-transect surveys dedicated to estimating the abundance of oceanic cetaceans were conducted in the northern Gulf of Mexico. During each year, a grid of uniformly-spaced transect lines from a random start were surveyed from the 200m isobath to the seaward extent of the U.S. EEZ using NOAA Ship *Gordon Gunter* (Mullin 2007).

As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than 8 years are

deemed unreliable, and therefore should not be used for PBR determinations. Because most of the data for estimates prior to 2003 were older than this 8-year limit and due to the different sampling strategies, estimates from the 2003 and 2004 surveys were considered most reliable. The estimate of abundance for sperm whales in oceanic waters, pooled from 2003 to 2004, was 1,665 (CV=0.20) (Mullin 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico.

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for sperm whales is 1,665 (CV=0.20). The minimum population estimate for the northern Gulf of Mexico is 1,409 sperm whales.

Current Population Trend

There are insufficient data to determine the population trends for this species. The pooled abundance estimate for 2003-2004 of 1,665 (CV=0.20) and that for 1996-2001 of 1,349 (CV=0.29) are not significantly different (P>0.05), but due to the precision of the estimates, the power to detect a difference is relatively low. These estimates are 2-3 times larger than that for 1991-1994 of 530 (CV=0.31). The 2003-2004 estimates were based on less negatively biased estimates of sperm whale group size and may account for part of the difference. Nevertheless, these temporal abundance estimates are difficult to interpret without a Gulf of Mexico-wide understanding of sperm whale abundance. The Gulf of Mexico is composed of waters belonging to the U.S., Mexico and Cuba. U.S. waters only comprise about 40% of the entire Gulf of Mexico, and 65% of oceanic waters are south of the U.S. EEZ. The oceanography of the Gulf of Mexico is quite dynamic, and the spatial scale of the Gulf is small relative to the ability of most cetacean species to travel. Studies based on abundance and distribution surveys restricted to U.S. waters are unable to detect temporal shifts in distribution beyond U.S. waters that might account for any changes in abundance.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal level (PBR) is the product of the minimum population size, one half the maximum net productivity rate and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 1,409. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP), is assumed to be 0.1 because the sperm whale is an endangered species. PBR for the northern Gulf of Mexico sperm whale is 2.8.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

There has been no reported fishing-related mortality of a sperm whale during 1998-2005 (Yeung 1999; Yeung 2001; Garrison 2003; Garrison and Richards 2004; Garrison 2005; Fairfield Walsh and Garrison 2006). Seismic vessel operations in the Gulf of Mexico (commercial and academic) now operate with marine mammal observers as part of required mitigation measures. There have been no reported seismic-related or industry ship-related mortalities or injuries to sperm whales.

A commercial fishery for sperm whales operated in the Gulf of Mexico in deep waters between the Mississippi River delta and DeSoto Canyon during the late 1700's to the early 1900's (Mullin *et al.* 1991), but the exact number of whales taken is not known (Townsend 1935; Lowery 1974). Townsend (1935) reported many records of sperm whales from April through July in the north-central Gulf (Petersen and Hoggard 1996).

Fisheries Information

The level of past or current, direct, human-caused mortality of sperm whales in the northern Gulf of Mexico is unknown. Pelagic swordfish, tunas and billfish are the targets of the longline fishery operating in the U.S. Gulf of Mexico. There were no reports of mortality or serious injury to sperm whales by this fishery.

Other Mortality

No sperm whale strandings were documented during 2004-2005. A total of 9 sperm whale strandings were

documented in the northern Gulf of Mexico during 1999-2003 (Table 1). There was no evidence of human interactions for these stranded animals. Stranding data probably underestimate the extent of fishery-related mortality and serious injury because not all of the marine mammals which die or are seriously injured in fishery interactions wash ashore, not all that wash ashore are discovered, reported or investigated, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interactions.

Table 1. Sperm whale (*Physeter macrocephalus*) strandings along the U.S. Gulf of Mexico coast, 1999-2003. No sperm whale strandings were documented during 2004-2005.

STATE	1999	2000	2001	2002	2003	TOTAL
Alabama	0	0	0	0	0	0
Florida	1	2	1	1	1	6
Louisiana	1	0	0	0	1	2
Mississippi	0	0	0	0	0	0
Texas	0	1	0	0	0	1
TOTAL	2	3	1	1	2	9

STATUS OF STOCK

The status of sperm whales in the northern Gulf of Mexico, relative to OSP, is unknown. This species is listed as endangered under the Endangered Species Act (ESA). There are insufficient data to determine the population trends for this species. The total level of U.S. Gulf of Mexico fishery-caused mortality and serious injury for this stock is unknown, but assumed to be less than 10% of the calculated PBR and can be considered to be insignificant and approaching zero mortality and serious injury rate. This is a strategic stock because the sperm whale is listed as an endangered species under the ESA.

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