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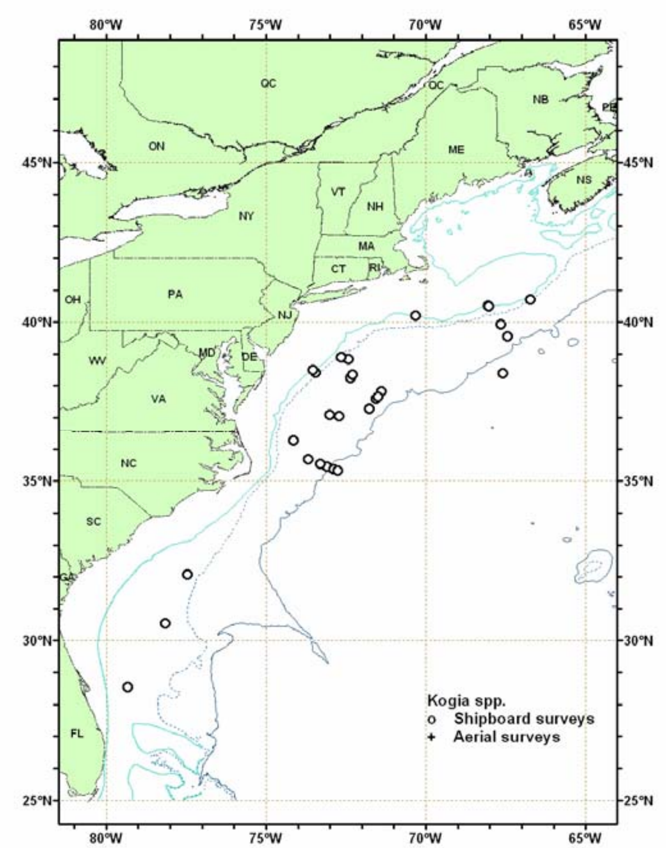
# PYGMY SPERM WHALE (*Kogia breviceps*): Western North Atlantic Stock

## STOCK DEFINITION AND GEOGRAPHIC RANGE

The pygmy sperm whale (*Kogia breviceps*) appears to be distributed worldwide in temperate to tropical waters (Caldwell and Caldwell 1989). Sightings of these animals in the western North Atlantic occur in oceanic waters ( Mullin and Fulling 2003; SEFSC unpublished data). Pygmy sperm whales and dwarf sperm whales (*K. sima*) are difficult to differentiate at sea (Caldwell and Caldwell 1989, Wursig *et al.* 2000), and sightings of either species are often categorized as *Kogia* sp. There is no information on stock differentiation for the Atlantic population. Duffield *et al.* (2003) propose using the molecular weights of myoglobin and hemoglobin, as determined by blood or muscle tissues of stranded animals, as a quick and robust way to provide species confirmation. Using hematological as well as stable-isotope data, Barros *et al.* (1998) speculated that dwarf sperm whales may have a more pelagic distribution than pygmy sperm whales, and/or dive deeper during feeding bouts. Diagnostic morphological characters have also been useful in distinguishing the two *Kogia* species (Barros and Duffield 2003), thus enabling researchers to use stranding data in distributional and ecological studies.. Specifically, the distance from the snout to the center of the blowhole in proportion to the animal's total length, as well as the height of the dorsal fin, in proportion to the animal's total length, can be used to differentiate between the two *Kogia* species when such measurements are obtainable (Barros and Duffield 2003).

## POPULATION SIZE

Total numbers of pygmy sperm whales off the U.S. or Canadian Atlantic coast are unknown, although estimates from selected regions of the habitat do exist for select time periods. Because *Kogia breviceps* and *Kogia sima* are difficult to differentiate at sea, the reported abundance estimates are for both species of *Kogia*.




An abundance of 115 (CV=0.61) for *Kogia* sp. was estimated from a line-transect survey conducted from July 6 to September 6, 1998, by a ship and plane that surveyed 15,900 km of track line in waters north of Maryland (38° N) (Fig. 1; Palka *et al.* in review Unpubl. Ms.). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)*.

An abundance of 580 (CV=0.57) for *Kogia* sp. was estimated from a shipboard line— transect sighting survey conducted between 8 July and 17 August 1998 that surveyed 4,163 km of track line in waters south of Maryland (38°N) (Fig. 1; Mullin and Fulling 2003). Abundance estimates were made using the program DISTANCE (Buckland *et al.* 2001; Thomas *et al.* 1998).

An abundance of 358 (CV= 0.44) for *Kogia* sp.was estimated from a line-transect sighting survey conducted during June 12 to August 4, 2004 by a ship and plane that surveyed 10,761 km of track line in waters north of Maryland (38° N) to the Bay of Fundy (45° N) (Figure 1; Palka unpublished). Shipboard data were collected using the two independent team line-transect method and analyzed using the modified direct duplicate method (Palka 1995) accounting for biases due to school size and other potential covariates, reactive movements (Palka and Hammond 2001), and *g(0)*, the probability of detecting a group on the track line. Aerial data were collected using the Hiby circle-back line-transect method (Hiby 1999) and analyzed accounting for g(0) and biases due to school size and other potential covariates (Figure 1; Palka unpublished).

A survey of the U.S. Atlantic outer continental shelf and continental slope (water depths ≥ 50m) between 27.5 – 38 ºN latitude was conducted during June-August, 2004. The survey employed two independent visual teams searching with 50x bigeye binoculars. Survey effort was stratified to include increased effort along the continental shelf break and Gulf Stream front in the Mid-Atlantic. The survey included 5,659 km of trackline, and there was a total of 473 cetacean sightings. Sightings were most frequent in waters north of Cape Hatteras, North Carolina along the shelf break. Data were analyzed to correct for visibility bias (*g(0)*) and group-size bias employing line-transect distance analysis and the direct duplicate estimator (Palka 1995; Buckland *et al.*, 2001). The resulting abundance estimate for *Kogia* sp. between Florida and Maryland was 37 (CV=0.75).

The best 2004 abundance estimate for *Kogia* sp.is the sum of the estimates from the two 2004 U.S. Atlantic surveys, 395 (CV=0.40), where the estimate from the northern U.S. Atlantic is 358 (CV=0.44), and from the southern U.S. Atlantic is 37 (CV=0.75). This joint estimate is considered the best because together these two surveys have the most complete coverage of the species' habitat. A separate estimate of pygmy sperm whale abundance cannot be provided due to the uncertainty of species identification at sea.

Table 1. Summary of abundance estimates for the western North Atlantic *Kogia* pp. Month, year, and area covered during each abundance survey, and resulting abundance estimate ($N_{best}$) and coefficient of variation (CV).

| Month/Year | Area | $N_{best}$ | CV |
|---|---|---|---|
| Jul-Sep 1998 | Maryland to Gulf of St. Lawrence | 115 | 0.61 |
| Jul-Aug 1998 | Florida to Maryland | 580 | 0.57 |
| Jul-Sep 1998 | Florida to Gulf of St. Lawrence (COMBINED) | 695 | 0.49 |
| Jun-Aug 2004 | Maryland to Bay of Fundy | 358 | 0.44 |
| Jun-Aug 2004 | Florida to Maryland | 37 | 0.75 |
| Jun-Aug 2004 | Florida to Bay of Fundy (COMBINED) | 395 | 0.40 |

### Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log- normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for *Kogia* sp. is 395 (CV=0.40). The minimum population estimate for *Kogia* sp. is 285.

### Current Population Trend

The available information is insufficient to evaluate trends in population size for this species in the western North Atlantic.

## 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 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 285. 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 0.4 because the coefficient of variation for the mortality estimate was greater than 0.8. PBR for the western North Atlantic *Kogia* sp. is 2.

## ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

### Fishery Information

Detailed fishery information is reported in Appendix III. There has been one logbook report of fishery- related serious injury recorded off the east coast of Florida in the pelagic longline fishery in 2000 (Table 2) (Yeung 2001; Garrison 2003; Garrison and Richards, 2004). Total annual estimated average fishery-related mortality and serious injury to this stock during 1999-2003 was 6 (CV=1.0) *Kogia* sp.

Table 2. Summary of the incidental mortality and serious injury of pygmy sperm whales (*Kogia breviceps*) 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 observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

| **Fishery** | | | | **Observer Coverage** | **Observed Serious Injury** | **Observed Mortality** | **Estimated Serious Injury** | | **Estimated Combined Mortality** | | **Mean Annual Mortality** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pelagic Longline[b] | 99-03 | 198, 180, 161, 149, 127 | Obs. Data Logbook | .04, .04, .02, .04, .02 | 0, 0, 1,0, 0 | 0, 0, 0, 0, 0 | 0, 0, 28, 0, 0 | 0, 0 ,0 ,0, 0 | 0, 0, 28 [2], 0, 0 | 0, 0, 1, 0, 0 | 6 (1.0) |
| TOTAL | | | | | | | | | | | 6 (1.0) |

[a] Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Southeast Fisheries Science Center (SEFSC) Observer Program. NEFSC collects landings data (Weighout), and total landings are used as a measure of total effort for the coastal gillnet fishery. Observed bycatch rates are raised to total fishing effort reported to the SEFSC Atlantic Large Pelagic Logbook.

[b] The 2000 mortality estimates were taken from Table 10 in Yeung 2001, and exclude the Gulf of Mexico.

[c] Number of vessels in the fishery are based on vessels reporting effort to the pelagic longline logbook.

**Other Mortality**

From 1999-2003, 125 pygmy sperm whales were reported stranded between Maine and Puerto Rico (Table 3). The total includes 7 animals stranded in Florida in 1999; 3 animals stranded in North Carolina, 1 in South Carolina, 7 in Florida and 1 in Puerto Rico in 2000; 1 animal stranded in North Carolina, 4 in South Carolina, 3 in Georgia, and 24 in Florida in 2001; 7 animals stranded in North Carolina, 5 in South Carolina, 4 in Georgia, and 15 in Florida in 2002; and 1 animal stranded in Nova Scotia, 4 animals in North Carolina, 7 in Georgia, and 31 in Florida in 2003. In addition to the above strandings of *Kogia breviceps,* there were 8 strandings reported as *Kogia* sp. as follows: 1 *Kogia* sp. stranded in Georgia in 2000, 1 stranded in North Carolina and 2 in Florida in 2002, 1 stranded in Georgia and 3 in Florida in 2003.

Table 3. Pygmy sperm whale (*Kogia breviceps*) strandings along the Atlantic coast, 1999-2003

| **STATE** | **1999** | **2000** | **2001** | **2002** | **2003** | **TOTALS** |
|---|---|---|---|---|---|---|
| Nova Scotia[a] | | | | | 1 | 1 |
| North Carolina | 0 | 3 | 1[b,c] | 7[c] | 4 | 15 |
| South Carolina | 0 | 1 | 4 | 5 | 0 | 10 |
| Georgia | 0 | 0[c] | 3 | 4[c] | 7[c] | 14 |
| Florida | 7[b] | 7 | 24 | 15[d] | 31[e] | 84 |
| Puerto Rico | 0 | 1[b] | 0 | 0 | 0 | 1 |
| TOTALS | 7 | 12 | 32 | 31 | 43 | 125 |

[a] Data supplied by Tonya Wimmer, Nova Scotia Marine Animal Response Society (pers. comm.)

[b] Signs of human interaction reported

[c] 1 additional *Kogia* sp. stranded

[d] 2 additional *Kogia* sp. stranded

[e] 3 additional *Kogia* sp. stranded

There were 3 documented strandings of pygmy sperm whales along the U.S. Atlantic coast during 1999- 2003 which were classified as likely caused by fishery interactions., 1 in Florida in 1999, 1 in Puerto Rico in 2000 and 1 in North Carolina in 2001. In one of the strandings in 2002 of a pygmy sperm whale, red plastic debris was found in the stomach along with squid beaks.

Historical stranding records (1883-1988) of pygmy sperm whales in the southeastern U.S. (Credle 1988), and strandings recorded during 1988-1997 (Barros *et al.* 1998) indicate that this species accounts for about 83% of all *Kogia* sp. strandings in this area. During the period 1990-October 1998, 21 pygmy sperm whale strandings occurred in the northeastern U.S. (Delaware, New Jersey, New York and Virginia), whereas 194 strandings were documented along the U.S. Atlantic coast between North Carolina and the Florida Keys in the same period. Remains of plastic bags and other marine debris have been retrieved from the stomachs of 13 stranded pygmy sperm whales in the southeastern U.S. (Barros *et al.* 1990, 1998), and at least on one occasion the ingestion of plastic debris is believed to have been the cause of death. During the period 1987-1994, 1 animal had possible propeller cuts on its flukes.

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, 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 interaction.

Rehabilitation challenges for *Kogia* sp. are numerous due to limited knowledge regarding even the basic biology of these species. Advances in recent rehabilitation success has potential implications for future release and tracking of animals at sea to potentially provide information on distribution, movements and habitat use of these species (Manire *et al.*, 2004).

## STATUS OF STOCK

The status of the pygmy sperm whale relative to OSP in the western U.S. Atlantic EEZ is unknown. This species is not listed as endangered or threatened under the Endangered Species Act. There is insufficient information with which to assess population trends. Total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. This is a strategic stock because the 1999-2003 estimated average annual fishery-related mortality to pygmy sperm whales exceeds PBR.

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