6.6.2   PROBABILITY OF VESSEL STRIKE OF LARGE WHALE SPECIES

Most vessel strikes of marine mammals reported involve commercial vessels and occur over or near the continental shelf (Laist et al., 2001). It is Navy policy to report all marine mammal strikes by Navy vessels. The information is collected by Office of the Chief of Naval Operations Environmental Readiness and provided to NMFS on an annual basis. Only Navy and the U.S. Coast Guard reliably report in this manner. Therefore, it should be noted that Navy vessel strikes reported in the scientific literature and NMFS databases are the result of the Navy's commitment to reporting all strikes to NMFS rather than a greater frequency of collisions relative to other ship types (e.g. commercial cargo vessels). Vessel strike to marine mammals is not associated with any specific training or testing activity but rather a limited, sporadic, and incidental result of vessel movement within the Study Area. Figure 6.6-1 provides the history of Navy vessel strikes reported in the AFTT Study Area for the eight-year period from 2009 through 2016.
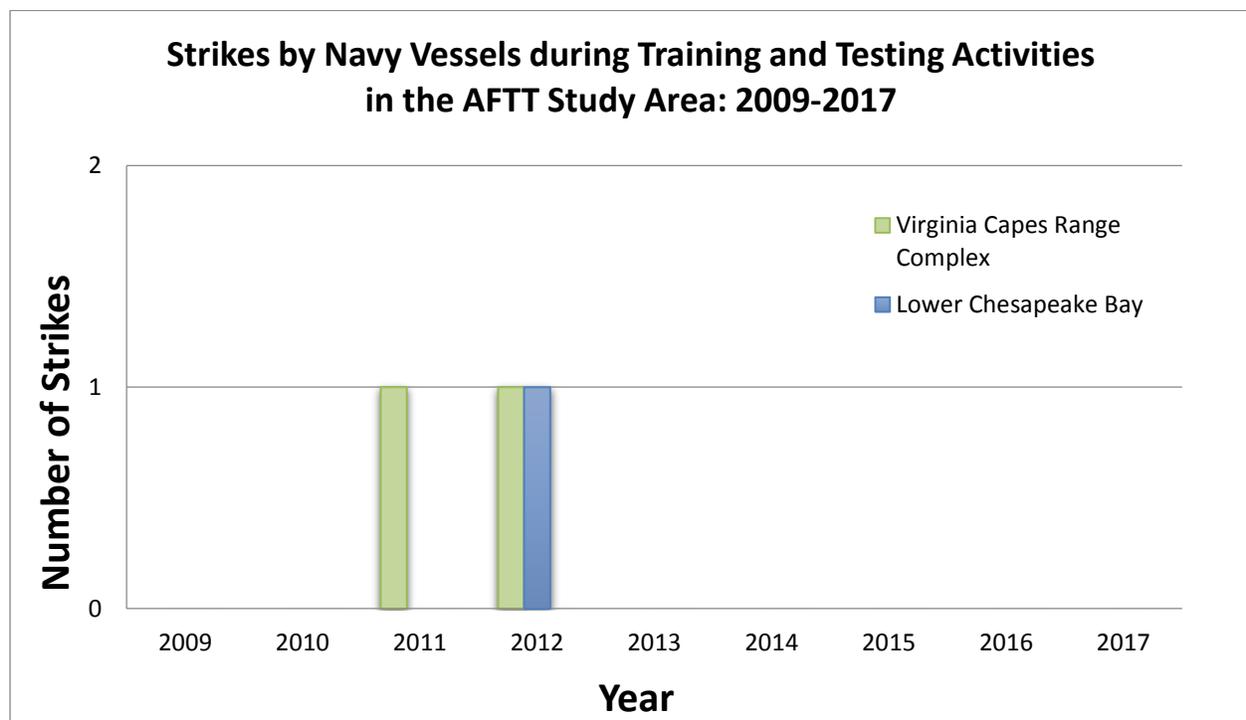

Figure 6.6-1: Navy Vessel Strikes Reported by Year (2009 - April 2017)

Between 2007 and 2009, the Navy developed and distributed additional training, mitigation, and reporting tools to Navy operators to improve marine mammal protection and to ensure compliance with upcoming permit requirements. In 2007, the Navy implemented the Marine Species Awareness Training, which is designed to improve the effectiveness of visual observations for marine resources, including marine mammals and sea turtles. In subsequent years, the Navy issued refined policy guidance regarding marine mammal incidents (e.g., ship strikes) in order to collect the most accurate and detailed data possible in response to a possible incident. For over a decade, the Navy has implemented the Protective Measures Assessment Protocol software tool, which provides operators with notification of the required mitigation and a visual display of the planned training or testing activity location overlaid with relevant environmental data.

Similar mitigation, reporting, and monitoring requirements have been in place since 2009 and are expected to continue into the future. Therefore, the conditions affecting the potential for ship strikes are the most consistent across this time frame. As a result, data from the past eight years (i.e., 2009 to 2016) are used to calculate the probability of a Navy vessel striking a whale during proposed training and testing activities in the Study Area. The year 2009 was selected because it is the beginning of programmatic permitting within the Atlantic and Pacific oceans; acknowledges advances in Navy marine species awareness training and overall enhanced sensitivity to marine resource issues in general; and is the first year of the codification of multiple marine species mitigation measures including specific measures to avoid large whales by 500 yards so long as it is safe for navigation. Additionally, due to better data and knowledge of species presence, the period beginning in 2009 is more representative of current and reasonably foreseeable marine mammal occurrence in AFTT. The level of vessel use and the manner in which the Navy trains and tests in the future is expected to be consistent with this time period.

Since the probability of a Navy vessel strike to whales is influenced by the amount of time at sea for Navy vessels within the AFTT Study Area during future training and testing activities, historical vessel use (i.e. steaming days) and reported ship strike data from 2009- 2016 were used to calculate the probability of a direct strike during proposed training and testing activities in the offshore portion of the AFTT Study Area over the five-year period covered by this application. The Navy determined that data beginning in 2009 would be the most representative for predicting the potential for future vessel strikes, because this coincided with when the Navy's mitigation, monitoring, and reporting requirements became standardized across the Navy with the issuance of MMPA Authorizations for sonar and explosive usage in at-sea Navy ranges, as discussed above.

There were a total of three reported vessel strikes of whales by Navy vessels from 2009-2016 in the AFTT Study Area. During this same time period there was a total of 39,040 steaming days by Navy vessels use within the Study Area. Therefore, there was an average strike rate of 0.00008 strikes per steaming day. Based on the annual average from 2009-2016, the Navy estimates that 24,400 steaming days will occur over the five-year period covered under the requested LOAs. These values were used to determine the rate parameters to calculate a series of probabilities based on a Poisson distribution. A Poisson distribution is often used to describe random occurrences when the probability of an occurrence is small, e.g., count data such as cetacean sighting data, or in this case strike data, are often described as a Poisson or over-dispersed Poisson distribution). In modeling strikes as a Poisson process, we assume this strike rate for the future and we use the Poisson distribution to estimate the probability of a number of strikes over a defined time period in the future:

$$P \left\langle n \,\middle|\, \mu \right\rangle = \frac{e^{-\mu} \bullet \mu^{n}}{n!}$$

P($n|\mu$) is the probability of observing n events in some time interval, when the expected number of events in that time interval is μ. As stated previously, the Navy estimates that 24,400 steaming days would occur over the five-year period covered under the anticipated MMPA authorization; given a strike rate of 0.00008 strikes per steaming day, the expected number of strikes (μ) over a five-year period is 1.875. The Poisson distribution can then be used to estimate the probability of n where n=0 (no strikes), 1 strike, 2 strikes, etc., over the time period. For example, the equation yields a value of $P(0) = 0.153$, indicating a 15 percent probability of not striking any whales over the five-year period. The resulting

probabilities of one through five strikes over the next five years covering through the end of the anticipated MMPA authorization are:

- 29 percent probability of striking one whale over 5 years
- 27 percent probability of striking two whales over 5 years
- 17 percent probability of striking three whales over 5 years
- 8 percent probability of striking four whales over 5 years
- 3 percent probability of striking five whales over 5 years

Based on the resulting probabilities presented in this analysis and the cumulative low history of Navy vessel strikes since 2009 and introduction of the Marine Species Awareness Training and adaptation of additional mitigation measures, the Navy estimates that it may strike, and take by injury or mortality, up to three large whales incidental to training and testing activities within the AFTT Study Area over the course of the 5 years of the AFTT regulations. Most Navy-reported whale strikes are not identified to the species level, however, large whales (i.e. mysticetes and sperm whales) are the most likely to be struck by a large vessel as a result of training and testing activities, primarily in the offshore portion of the Study Area.

Because of the number of incidents in which the struck animal has remained unidentified to species, the Navy cannot quantifiably predict that the proposed takes will be of any particular species, and therefore seeks take authorization for any of the following species: humpback whale, fin whale, sei whale, minke whale, blue whale, and sperm whale. Based on the broad distribution of training and testing activities and the relative distribution and abundances of these species within the AFTT study area, it is not anticipated that vessel strikes would exceed two (2) of any individual stock.

The Navy does not anticipate it will strike a North Atlantic right whale as a result of training or testing activities because of the extensive measures in place to reduce the risk of a strike to this species. Refer to Chapter 11 (Mitigation Measures) for a full list of these measures. Although vessels may transit into bowhead whale habitat during training and testing activities, these transits are expected to be very infrequent and it is therefore extremely unlikely that this species will be struck by Navy vessels in the AFTT study area.