3.7 Sea Turtles

Gulf of Alaska Navy Training Activities

Draft Supplemental Environmental Impact Statement/

Overseas Environmental Impact Statement

TABLE OF CONTENTS

List of Tables

There are no tables in this section.

List of Figures

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3.7 Sea Turtles

3.7.1 Introduction

For purposes of this Supplemental Environmental Impact Statement (SEIS)/Overseas Environmental Impact Statement (OEIS), the Study Area remains the same as that identified in the March 2011 Gulf of Alaska (GOA) United States (U.S.) Department of the Navy (Navy) Training Activities Final Environmental Impact Statement (EIS)/OEIS and the July 2016 GOA Navy Training Activities Final SEIS/OEIS. The Study Area includes the Temporary Maritime Activities Area (TMAA). The TMAA is beyond 12 nautical miles (NM) from shore and outside of the U.S. Territorial Sea. The Proposed Action would occur over a maximum time period of up to 21 consecutive days during the months of April–October.

3.7.2 Affected Environment

This section references the Navy's 2016 GOA Final SEIS/OEIS (U.S. Department of the Navy, 2016), which included updates to the affected environment description presented in the 2011 analysis. Similar to the Navy's 2011 GOA Final EIS/OEIS, this section provides an overview of sea turtle distribution and occurrence within the TMAA, with any relevant updates to the affected environment since the completion of the Navy's 2016 GOA Final SEIS/OEIS.

3.7.2.1 General Background

Only the leatherback sea turtle (*Dermochelys coriacea*), a cold-water adapted species, is included for analysis in this SEIS/OEIS. Recent information on population structure (through genetic studies) and distribution (through telemetry, tagging, genetic studies, and population modeling) has led to an increased understanding and refinement of the global stock structure (Clark et al., 2010; Gaspar & Lalire, 2017). This effort is critical to focus efforts to protect the species, because the status of individual stocks varies widely across the world. Unlike populations in the Caribbean and Atlantic Ocean, which are generally stable or increasing, western Pacific leatherbacks have declined more than 80 percent and eastern Pacific leatherbacks have declined by more than 97 percent since the 1980s (Kobayashi et al., 2016). Because the threats to these subpopulations have not ceased, the International Union for Conservation of Nature has predicted a decline of 96 percent for the western Pacific subpopulation and a decline of nearly 100 percent for the eastern Pacific subpopulation by 2040 (Nachtigall et al., 2016; Wallace et al., 2016). Even though new information is available regarding population structure and dynamics, the general density estimate for Pacific leatherback sea turtles used for the analysis of potential impacts (0.00001 leatherbacks/square kilometer) is used in this SEIS/OEIS, and is the same estimate used in the Navy's 2016 GOA Final SEIS/OEIS. Although this SEIS/OEIS includes updated information related to leatherback population dynamics, the new research is generally in agreement with the information provided in the 2011 GOA Final EIS/OEIS and 2016 GOA Final SEIS/OEIS.

Since the release of the Navy's 2016 GOA Final SEIS/OEIS, the Navy has conducted a literature search for recent information that would warrant updating the description of the affected environment for sea turtles in this SEIS/OEIS (see Section 3.0.3, Resources and Issues Considered for Re-Evaluation in This Document). The following sections provide new information since the Navy's 2011 GOA Final EIS/OEIS and 2016 GOA Final SEIS/OEIS for sea turtle diving abilities, as well as for hearing and vocalizations for sea turtles, with specific updates for leatherback sea turtles where species-specific information has appeared in new literature.

Although additional information relating to existing environmental conditions was found, the new information does not indicate an appreciable change to the existing environmental conditions as

described in the 2011 GOA Final EIS/OEIS and 2016 GOA Final SEIS/OEIS. Leatherback sea turtles would still be considered rare in the TMAA, as only 19 sightings have occurred of the species in the GOA since 1960 (National Marine Fisheries Service, 2017).

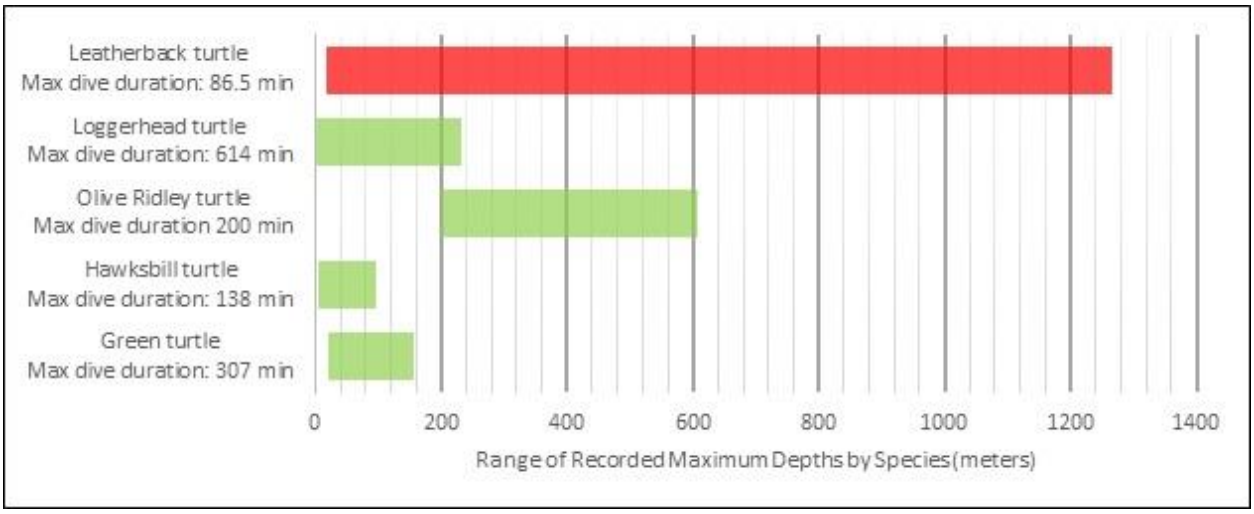
3.7.2.1.1 Species Unlikely to be Present in the Temporary Maritime Activities Area

As noted in the Navy's 2011 Final GOA EIS/OEIS (U.S. Department of the Navy, 2011a), and the 2016 GOA Final SEIS/OEIS (U.S. Department of the Navy, 2016), the Navy conducted a literature search for additional information that would warrant inclusion of the loggerhead sea turtle (*Caretta caretta*), olive ridley sea turtle (*Lepidochelys olivacea*), and green sea turtle (*Chelonia mydas*) in the analysis. One recent reference reported photographic evidence of loggerhead sea turtles in nearshore waters of British Columbia (Halpin et al., 2018). This sighting was considered rare, as would any sighting of Cheloniidae sea turtles, in alignment with previous conclusions presented in the Navy's 2011 GOA Final EIS/OEIS and 2016 GOA Final SEIS/OEIS. Although sightings of sea turtles from the Cheloniidae family have been documented in the TMAA, most of these involve individuals that were either cold stressed, likely to become cold stressed, or already deceased (Hodge & Wing, 2000). Thus, the TMAA is considered to be outside the normal range for sea turtle species of the Cheloniidae family (National Marine Fisheries Service, 2017), and these species are not considered further for analysis in this SEIS/OEIS.

3.7.2.1.2 Diving

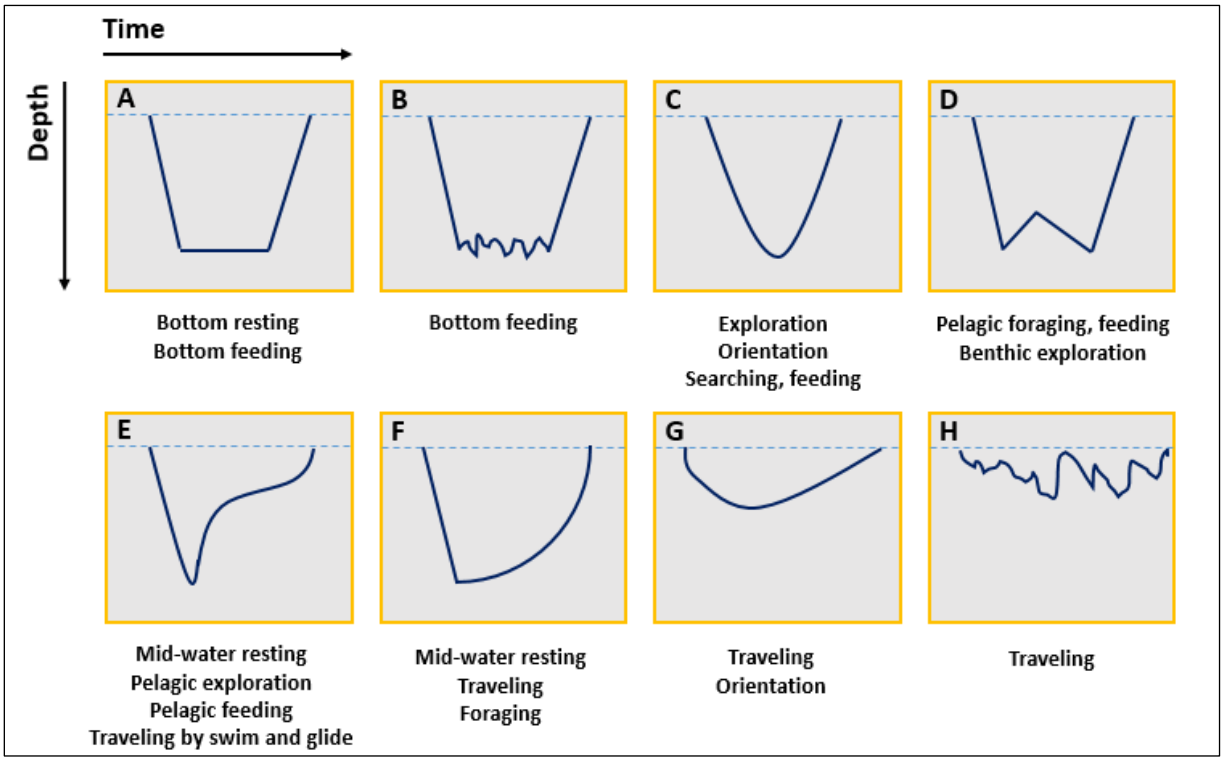
Sea turtle dive depth and duration varies by species, the age of the animal, the location of the animal, and the activity (foraging, resting, and migrating). The leatherback is the deepest diving sea turtle, with a recorded maximum depth of 4,200 feet (ft.) (1,280 meters [m]) (Houghton et al., 2008), although most dives are much shallower (usually less than 820 ft. [250 m]) (Hays et al., 2004b; Hays et al., 2004c; Sale et al., 2006; Wallace et al., 2015). Diving activity (including surface time) is influenced by a suite of environmental factors (e.g., water temperature, availability and vertical distribution of food resources, bathymetry) that result in spatial and temporal variations in dive behavior (James et al., 2006; Sale et al., 2006; Wallace et al., 2016).

Hochscheid (2014) has completed a species-specific summary for sea turtles within the Study Area that was not included in the 2016 GOA Final SEIS/OEIS. Hochscheid (2014) collected data from 57 studies published between 1986 and 2013, which summarized depths and durations of dives of datasets including an overall total of 538 sea turtles. Figure 3.7-1 presents the ranges of maximum dive depths for different sea turtle species that shows the unique diving capabilities of leatherback sea turtles compared to other sea turtle species. This summary can improve the exposure analysis for stressors analyzed in Section 3.7.3 (Environmental Consequences). Hochscheid (2014) also collected information on generalized dive profiles, with correlations to specific activities, such as bottom resting, bottom feeding, orientation and exploration, pelagic foraging and feeding, mid-water resting, and traveling during migrations. Generalized dive profiles compiled from 11 different studies show eight distinct profiles tied to specific activities. These profiles and activities are shown in Figure 3.7-2.



Sources: Hochscheid (2014), Sakamoto et al. (1993), Rice and Balazs (2008), Gitschlag (1996), Salmon et al. (2004)

Figure 3.7-1: Dive Depth and Duration Summaries for Sea Turtle Species



Sources: Hochscheid (2014); Rice and Balazs (2008), Sakamoto et al. (1993), Houghton et al. (2003), Fossette et al. (2007), Salmon et al. (2004), Hays et al. (2004a); Southwood et al. (1999).

Notes: Profiles A-H, as reported in the literature and compiled by Hochscheid (2014). The depth and time arrows indicate the axis variables, but the figure does not represent true proportions of depths and durations for the various profiles. In other words, the depths can vary greatly, but behavioral activity seems to dictate the shape of the profile. Profiles G and H have only been described for shallow dives (less than 5 m).

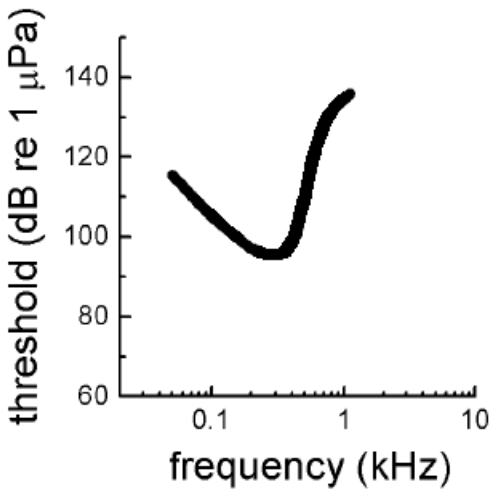
Figure 3.7-2: Generalized Dive Profiles and Activities Described for Sea Turtles

3.7.2.1.3 Hearing and Vocalization

Since the release of the Navy's 2016 GOA Final SEIS/OEIS, the Navy's literature search has found additional sources to improve the understanding of sea turtle hearing and vocalization. Sea turtle ears are adapted for hearing underwater and in air, with auditory structures that may receive sound via bone conduction (Lenhardt et al., 1985), via resonance of the middle ear cavity (Willis et al., 2013), or via standard tympanic middle ear path (Hetherington, 2008). Studies of hearing ability show that sea turtles' ranges of in-water hearing detection generally lie between 50 and 1,600 hertz (Hz), with maximum sensitivity between 100 and 400 Hz, and that hearing sensitivity drops off rapidly at higher frequencies. Sea turtles are also limited to low frequency hearing in air, with hearing detection in juveniles possible between 50 to 800 Hz, and a maximum hearing sensitivity around 300–400 Hz (Bartol & Ketten, 2006; Piniak et al., 2016). Hearing abilities have primarily been studied with sub-adult, juvenile, and hatchling subjects in four sea turtle species, including green (Bartol & Ketten, 2006; Ketten & Moein-Bartol, 2006; Piniak et al., 2016; Ridgway et al., 1969; Yudhana et al., 2010), olive ridley (Bartol & Ketten, 2006), loggerhead (Bartol et al., 1999; Lavender et al., 2014; Martin et al., 2012), and leatherback (Dow Piniak et al., 2012). Only one study examined the auditory capabilities of an adult sea turtle (Martin et al., 2012); the hearing range of the adult loggerhead sea turtle was similar to other measurements of juvenile and hatchling sea turtle hearing ranges. Using existing data on sea turtle hearing sensitivity, the Navy developed a composite sea turtle audiogram for underwater hearing (Figure 3.7-3), as described in the technical report *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III)* (U.S. Department of the Navy, 2017a).

The role of underwater hearing in sea turtles is unclear. Sea turtles may use acoustic signals from their environment as guideposts during migration and as cues to identify their natal beaches (Lenhardt et al., 1983). However, they may rely more on other senses, such as vision and magnetic orientation, to interact with their environment (Avens, 2003; Narazaki et al., 2013).

Some sounds have been recorded during nesting activities ashore, including belch-like sounds and sighs (Mrosovsky, 1972), exhale/inhales, gular pumps, and grunts (Cook & Forrest, 2005) by female leatherback turtles, and low-frequency pulsed and harmonic sounds by embryos in eggs and hatchlings (Ferrara et al., 2014; Ferrara et al., 2019; McKenna et al., 2019).



Source: U.S. Department of the Navy (2017a)

Notes: dB re 1 µPa = decibels referenced to 1 micropascal, kHz = kilohertz

Figure 3.7-3: Composite Audiogram for Sea Turtles

3.7.2.2 General Threats

Since the release of the Navy's 2016 GOA Final SEIS/OEIS, the Navy has found additional information relating to general threats to sea turtles, with species-specific updates for Pacific leatherback sea turtles where that appears in the literature.

Climate Change

Since the publication of the 2016 GOA Final SEIS/OEIS, the Navy has obtained and consolidated additional information to conceptualize the potential impacts of climate change on leatherback sea turtles in northern Pacific latitudes. Although recent research is available on potential impacts on nesting habitat loss, decreased productivity, and sex ratio skewing of hatchlings, this information is not relevant to leatherback sea turtles within the TMAA as it does not include nesting habitat. For a discussion of potential impacts associated with climate change, see Jensen et al. (2018); Laloë et al. (2016); Patino-Martinez et al. (2014); Reneker and Kamel (2016); Roden et al. (2017). Especially relevant for leatherback sea turtles is an improved understanding of how sea surface temperature increases may impact jellyfish distributions. New information is regularly being published on the effects of global climate change and ocean acidification on various aspects of invertebrate life development such as larval development and region-specific information for the Northern Pacific (Goyert et al., 2017; Goyert et al., 2018; Smith et al., 2019; Thompson et al., 2019). Although this SEIS/OEIS includes updated information related to potential impacts of climate change, the new research is generally in agreement with the information provided in the 2011 GOA Final EIS/OEIS and 2016 GOA Final SEIS/OEIS.

Marine Debris

Ingestion of marine debris can cause mortality or injury to leatherback sea turtles. The United Nations Environment Programme estimates that approximately 6.4 million tons of anthropogenic debris enters the marine environment every year (Jeftic et al., 2009; Richardson et al., 2016; Schuyler et al., 2016). This estimate, however, does not account for cataclysmic events, such as the 2011 Japanese tsunami, which is estimated to have generated 1.5 million tons of floating debris (Murray et al., 2015). Plastic is

the primary type of debris found in marine and coastal environments, and plastics are the most common type of marine debris ingested by sea turtles (Schuyler et al., 2014). Sea turtles can mistake debris for prey; one study found 37 percent of dead leatherback sea turtles to have ingested various types of plastic (Mrosovsky et al., 2009), and Narazaki et al. (2013) noted an observation of a loggerhead exhibiting hunting behavior on approach to a plastic bag, possibly mistaking the bag for a jellyfish. Even small amounts of plastic ingestion can cause an obstruction in a sea turtle's digestive tract and mortality (Bjorndal, 1997; Bjorndal et al., 1994), and hatchlings are at risk for ingesting small plastic fragments. Ingested plastics can also release toxins, such as bisphenol-A (commonly known as "BPA") and phthalates, or absorb heavy metals from the ocean and release those into tissues (Fukuoka et al., 2016; Teuten et al., 2007). Life stage and feeding preference affect the likelihood of ingestion. Sea turtles living in oceanic or coastal environments and feeding in the open ocean or on the seafloor may encounter different types and densities of debris, and may therefore have different probabilities of ingesting debris. Although this SEIS/OEIS includes updated information related to potential impacts of marine debris, the new research is generally in agreement with the information provided in the 2011 GOA Final EIS/OEIS and 2016 GOA Final SEIS/OEIS. As such, the information presented in the 2011 GOA Final EIS/OEIS and 2016 GOA Final SEIS/OEIS regarding marine debris remains valid.

3.7.3 Environmental Consequences

As described in Chapter 2 (Description of Proposed Action and Alternatives), the Proposed Action includes the No Action Alternative and Alternative 1 (the Proposed Action), which are discussed in the sections below.

3.7.3.1 No Action Alternative

Under the No Action Alternative, proposed Navy training activities would not occur within the TMAA. The impacts associated with Navy training activities would not be introduced into the marine environment. Therefore, existing environmental conditions would either remain unchanged or would improve slightly after cessation of ongoing Navy training activities.

3.7.3.2 Alternative 1

Alternative 1 for this SEIS/OEIS remains consistent with the description of Alternative 1 in the 2011 GOA Final EIS/OEIS and the 2016 GOA Final SEIS/OEIS. Though the types of activities and number of events in the Proposed Action are the same as in the previous documents (Alternative 1 in both the 2011 GOA Final EIS/OEIS and 2016 GOA Final SEIS/OEIS), there have been changes in the platforms and systems used as part of those activities.

For this SEIS/OEIS, the Navy Acoustic Effects Model was utilized to estimate impacts to leatherback sea turtles. The Gulf of Alaska Large Marine Ecosystem was used as the potential area of species occurrence to generate the leatherback sea turtle density estimate. Overall, due to a low density estimate, zero leatherback sea turtle impacts were estimated to occur from the use of acoustic and explosive sources under Alternative 1 of the Proposed Action. Because the existing baseline conditions have not changed appreciably, and no new Navy training activities are proposed in the TMAA in this SEIS/OEIS, a detailed re-analysis of this alternative with respect to sea turtles is not warranted. As described in Chapter 5 (Mitigation), the Navy will continue to implement mitigation to avoid or reduce potential impacts on sea turtles under Alternative 1 of the Proposed Action, although leatherback sea turtles are not expected to co-occur with Navy training activities in the TMAA due to low expected occurrence in the TMAA and the limited duration of the Proposed Action each year (National Marine Fisheries Service, 2017).

Prior analyses include the 2011 GOA Final EIS/OEIS (U.S. Department of the Navy, 2011a), the 2011 Record of Decision (U.S. Department of the Navy, 2011b), the 2016 GOA Final SEIS/OEIS (U.S. Department of the Navy, 2016), the 2017 Record of Decision (U.S. Department of the Navy, 2017b), and Navy activities analyzed pursuant to the Endangered Species Act (ESA) are in the current National Marine Fisheries Service (NMFS) Biological Opinion (National Marine Fisheries Service, 2017). The National Marine Fisheries Service concluded in its Record of Decision and Final Rule (82 Federal Register 19530) that the Navy's training activities would have a negligible impact on the sea turtles present in the TMAA. In its Final Biological Opinion under the ESA, NMFS concluded that the Navy's training activities were not likely to jeopardize the continued existence of any ESA-listed sea turtle species and would not adversely modify any critical habitat.

3.7.4 Conclusion

As described above, there is new information on existing environmental conditions since the analysis in the 2016 GOA Final SEIS/OEIS, including updated information on sea turtle hearing. However, this new information does not significantly change the affected environment, which forms the environmental baseline of the analysis in the 2011 GOA Final EIS/OEIS and 2016 GOA Final SEIS/OEIS. Additionally, no new activities are being proposed in this SEIS/OEIS that would affect sea turtles in the TMAA. Therefore, conclusions for sea turtles made for Alternative 1 in the 2011 GOA Final EIS/OEIS and 2016 GOA Final SEIS/OEIS remain unchanged in this SEIS/OEIS. For a summary of effects of the action alternative on sea turtles under both the National Environmental Policy Act and Executive Order 12114, please refer to Table 3.7-2 in the 2011 GOA Final EIS/OEIS.

As part of this SEIS/OEIS, the Navy is consulting under Section 7 of the ESA with NMFS for the ESA-listed leatherback sea turtle, but will continue to rely on the prior analysis from the 2011 GOA Final EIS/OEIS and Biological Evaluation, and the 2016 GOA Final SEIS/OEIS and Biological Evaluation, as it remains valid. Specifically, there has not been an exceedance of incidental take for the leatherback sea turtle under the current Biological Opinion; there is no new information that reveals new effects to leatherback sea turtles or critical habitat associated with leatherback sea turtles that were not previously considered; Navy training activities in the TMAA are not being substantially modified in a manner that would cause effects to listed leatherback sea turtles or their critical habitat that was not previously considered; and there has not been a new species of sea turtle listed or critical habitat for other sea turtles created within the TMAA. Based on the current Biological Opinion, the likelihood of Navy training activities in the TMAA impacting leatherback sea turtles is discountable due to their low abundance in the TMAA and low likelihood that any leatherback sea turtles would occur in the TMAA during training activities. Therefore, sea turtles are not likely to be adversely affected by the Proposed Action (National Marine Fisheries Service, 2017).

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