# Biological Resources Background Information
# Technical Report

# Biological Resources Background Information Technical Report for the Mariana Islands Training and Testing Study Area

## TABLE OF CONTENTS

## List of Figures

## List of Tables

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# 1 MARINE VEGETATION

## 1.1 GENERAL BACKGROUND

### 1.1.1 TAXONOMIC OVERVIEW

Vegetation includes diverse taxonomic/ecological groups of marine algae throughout the Study Area, as well as flowering plants in the coastal and inland waters. Vegetation can be divided into eight groups that encompass taxonomic categories, distributions, and ecological relationships. These groups include blue-green algae (phylum Cyanobacteria), dinoflagellates (phylum Dinophyta), green algae (phylum Chlorophyta), coccolithophores (phylum Haptophyta), diatoms (phylum Ochrephyta), brown algae (phylum Phaeophyta), red algae (phylum Rhodophyta), and vascular plants (phylums Tracheophyta and Spermatophyte).There is no new information on marine vegetation groups that would change the basis of the conclusions from the 2015 Mariana Islands Training and Testing (MITT) Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) and the 2020 MITT Supplemental EIS/OEIS (SEIS/OEIS) (hereafter collectively referred to as the previous MITT analyses).

### 1.1.2 GENERAL THREATS

There is no new information on threats to marine vegetation in the MITT Study Area that would change the conclusions from the previous MITT analyses.

Human-made stressors that act on marine vegetation include excessive nutrient input (such as fertilizers), siltation (the addition of fine particles to the ocean), pollution (oil, sewage, trash) (Mearns et al., 2011), fishing practices (Mitsch et al., 2009; Steneck et al., 2002), shading from structures (National Marine Fisheries Service, 2002), harvesting (Wilson, 2002), habitat degradation from construction and dredging, and introduced or invasive species (Hemminga & Duarte, 2000; Spalding et al., 2003). The seagrass, cordgrass, and mangrove taxonomic groups are often more sensitive to stressors than the algal taxonomic groups. The great diversity of algae makes generalization difficult, but overall, algae are resilient and colonize disturbed environments created by stressors (Levinton, 2009a).

Marine algae and vascular plants are important ecologically and economically, providing an important source of food, essential ecosystem services (e.g., coastal protection, nutrient recycling, food for other animals, and habitat formation), and income from tourism and commercial fisheries (Spalding et al., 2001).

# 2 MARINE INVERTEBRATES

## 2.1 GENERAL BACKGROUND

### 2.1.1 HABITAT USE

Marine invertebrates live in all of the world’s oceans, from warm shallow waters to cold deep waters. They inhabit the bottom and all depths of the water column in both large marine ecosystems and the open-ocean area that occur in the Study Area (Brusca & Brusca, 2003). Many species that occur in the water column are either microscopic or not easily observed with the unaided eye (e.g., protozoans, copepods, and the larvae of larger invertebrate species).

Many invertebrates migrate to deeper waters during the day, presumably to decrease predation risk. However, some invertebrates, such as jellyfish and squid species, may occur in various portions of the water column, including near the surface, at any time of day. The Study Area extends from the bottom up to the mean high tide line (often termed mean high water [MHW] in literature). The description of habitat use in this section pertains to common marine invertebrates found in the different habitats. This section also identifies marine invertebrates that form persistent habitats, which are structures that do not quickly disintegrate or become incorporated into soft or mixed substrate after the death of the organism. The principal habitat-forming invertebrates are corals and shellfish species (e.g., oysters, mussels). In a strict sense, individual invertebrates with hard shells (e.g., mollusks), outer skeletons (e.g., crabs), tubes (e.g., annelid worms), or cavities (e.g., sponges) also may be habitat-forming, providing attachment surfaces or living spaces for other organisms.

Marine invertebrate distribution in the Study Area is influenced by habitat (e.g., abiotic substrate, topography, biogenic [formed by living organisms] features), ocean currents, and physical and water chemistry factors such as temperature, salinity, and nutrient content (Levinton, 2009b). Distribution is also influenced by distance from the equator (latitude) and distance from shore. In general, the number of marine invertebrate species (species richness) increases toward the equator (Cheung et al., 2005; Macpherson, 2002). Species richness and overall biomass are typically greater in coastal water habitats compared to the open ocean due to the increased availability of food and protection that coastal habitats provide (Levinton, 2009b).

The diversity and abundance of Arthropoda (e.g., crabs, lobsters, and barnacles) and Mollusca (e.g., snails, clams, and squid) are highest on the bottom over the continental shelf due to high productivity and availability of complex habitats relative to typical soft bottom habitat of the deep ocean (Karleskint et al., 2006). Organisms occurring in the bathyal and abyssal zones of the ocean are generally small and have sparse populations (Nybakken, 1993). The deep ocean has a limited food supply for sedentary deposit or filter feeders. The only areas of the deep ocean known to be densely populated are hydrothermal vents and cold seeps.

Shallow-water coral reefs are formed by individual corals with symbiotic, structure-forming algae that require both light and a mean annual water temperature greater than about 64 degrees Fahrenheit (°F) (National Ocean Service, 2016; Nybakken, 1993). Shallow-water corals occur in the euphotic zone, which is the upper layer of the ocean where light levels are sufficient to support photosynthesis in the symbiotic algae. Shallow-water coral species typically occur in water depths less than 30 meters (m). Shallow-water coral reefs occur on hard substrate throughout the MITT Study Area. In addition to the presence of many individual corals, coral reefs also support hundreds of other marine invertebrate species, including representatives of most taxa. Although there is notable variation at individual islands, the amount of hard reef structure covered by living corals, species richness, and species diversity generally remains steady over time (Rodgers et al., 2015).

Deep-water corals occur in water depths where there is low or no light penetration and therefore typically lack symbiotic algae. As such, deep-water corals do not typically form biogenic reefs, but rather form mounds of mixed (cobble-sized) substrate termed “lithoherms” over hard bottom areas (Lumsden et al., 2007). Differences in water clarity and the resulting light penetration at various locations affect the specific depth at which deep-water corals are found. However, in general, deep-water species are considered to occur at depths below 50 m (National Ocean and Atmospheric Administration, 2016; National Oceanic and Atmospheric Administration & National Marine Fisheries Service, 2008). To build their supporting structures, stony corals require calcium carbonate in the form of aragonite or calcite, which they obtain from seawater where carbonate is in solution. Combinations of temperature and pressure result in a boundary, often called saturation depth, below which aragonite and calcite tend to dissolve. Therefore, corals (and other invertebrates) occurring below this boundary have difficulty forming persistent structures that contain calcium carbonate, and the aragonite saturation boundary imposes a depth limit for stony coral occurrence. The depth of the saturation boundary varies in different locations, ranging from about 200 to 3,000 m. Accordingly, deep-water corals are found in the depth range of about 50–3,000 m (Bryan & Metaxas, 2007; Lumsden et al., 2007; Quattrini et al., 2015; Tittensor et al., 2009). The primary taxa of deep-water corals include hexacorals (stony corals, black corals, and gold corals), octocorals (e.g., true soft corals, gorgonians, and sea pens), and hydrocorals (e.g., lace corals) (Hourigan et al., 2017). Of the approximately 600 coral species that occur at depths below 50 m, about 20 are considered structure forming (Hourigan et al., 2017). Stony corals such as *Enallopsammia rostrata* provide three-dimensional structures that may be utilized by other marine species. However, taxa such as black corals, gorgonians, and sea pens may also provide habitat for other marine species, particularly when they occur in dense aggregations. With the exception of sea pens, which occur in soft substrate, deep-water corals generally attach to hard or mixed substrates exposed to strong currents that provide a steady supply of plankton (algae and small animals that drift in the water) to feed on, and that reduce sedimentation that would inhibit colonization and growth of these slow-growing species (Bryan & Metaxas, 2007; Tsao & Morgan, 2005).

A transition zone of reduced light levels, called the mesophotic zone, occurs between the water depths typically associated with shallow-water and deep-water corals. Mesophotic coral communities are composed of stony corals, soft corals, and other structure-forming organisms such as algae and sponges. Some corals with symbiotic, photosynthetic algae occur in the mesophotic zone, although the algae often undergo photosynthesis at reduced rates and the corals, therefore, rely more heavily on planktonic food capture compared to individuals that occur in the euphotic zone. Black corals and octocorals, which do not contain photosynthetic algae, are also characteristic of mesophotic communities. The depth range of the mesophotic zone depends on water clarity, but it is generally considered to extend from 30 m to about 100 to 150 m. Mesophotic communities may occur as deeper extensions of shallow-water reefs or other hard bottom communities (typically in the coastal zone), or they may occur in offshore locations with no connection to shallow-water communities. Mesophotic reefs are usually not detectable on satellite images, which increases the difficulty of identifying and mapping these features. The highest concentrations of stony corals typically occur on persistent, high-relief bottom features that represent a small subset of the hard and, to a lesser extent, mixed substrates of the Study Area.

Chemosynthetic communities may support a relatively high biomass of marine invertebrates. Instead of using photosynthesis driven by sunlight, chemosynthetic organisms derive energy from chemicals originating from the earth's crust. The primary types of habitats supporting chemosynthetic communities are hydrothermal vents and cold seeps. Hydrothermal vents form when seawater permeates downward through the earth's crust and upper mantle, becomes superheated, and removes minerals and chemicals from the crust. The heated fluid may then rise through fissures in the crust and reach cold ocean water at the seafloor, where metals and other minerals precipitate out to form mounds or chimneys. Communities of microbes, such as bacteria, may colonize these structures and use chemicals occurring in the fluid (primarily hydrogen sulfide or methane) to make energy. The microbes may then become the base of a food web that contains invertebrates such as crabs, clams, mussels, worms, snails, and shrimp (Ross et al., 2012; Woods Hole Oceanographic Institution, 2015). Cold seeps are similar to hydrothermal vents, but the fluid exiting the crust is cooler, typically moves at a slower rate, and may spread over a larger area. Methane hydrates (ice-like structures that contain methane) are associated with some chemosynthetic communities. Cold seeps are generally associated with hard substrate on offshore shelf breaks, submarine canyons, and seamounts.

### 2.1.2 MOVEMENT AND BEHAVIOR

Marine benthic and epibenthic (animals that live on the surface of the substrate) invertebrates may be sessile, sedentary (limited mobility), or highly mobile (but typically slower than large vertebrates). Pelagic marine invertebrates include plankton (organisms that do not swim or generally cannot swim faster than water currents) and nekton (active swimmers that can generally swim faster than water currents). Planktonic animals commonly undergo daily migrations to surface waters at dusk and return to deeper waters at dawn. This includes small, microscopic zooplankton and larvae, larger crustaceans (e.g., small shrimp), and jellyfish. Planktonic organisms vary in their swimming abilities, ranging from weak (e.g., larvae) to substantial (e.g., box jellyfish). Nekton such as prawns, shrimps, and squid have relatively strong swimming ability, although they are typically slower than most vertebrate animals.

### 2.1.3 SOUND SENSING AND PRODUCTION

In general, organisms may detect sound by sensing either the particle motion or pressure component of sound, or both. Refer to the *Acoustic and Explosives Concepts Technical Report* (U.S. Department of the Navy, 2026) for an explanation of these sound components. Aquatic invertebrates probably do not detect pressure since many are generally the same density as water and few, if any, have air cavities that would respond to pressure (Budelmann, 1992b; Popper et al., 2001). Marine invertebrates are generally thought to perceive sound via either external sensory hairs or internal statocysts. Many aquatic invertebrates have ciliated "hair" cells that may be sensitive to water movements, such as those caused by currents or water particle motion very close to a sound source (Budelmann, 1992a, 1992b; Mackie & Singla, 2003). This may allow sensing of nearby prey or predators or help with local navigation. Detection of particle motion is thought to occur in mechanical receptors found on various body parts (Roberts et al., 2016). Aquatic invertebrates that are able to sense local water movements with ciliated cells include cnidarians, flatworms, segmented worms, molluscs, and arthropods (Budelmann, 1992a, 1992b; Popper et al., 2001). Crustaceans in particular seem to have extensive occurrence of these structures. The sensory capabilities of adult corals are largely limited to detecting water movement using receptors on their tentacles (Gochfeld, 2004), and the exterior cilia of coral larvae likely help them detect nearby water movements (Vermeij et al., 2010).

Some aquatic invertebrates have specialized organs called statocysts that enable an animal to determine orientation, balance, and, in some cases, linear or angular acceleration. Statocysts allow the animal to sense movement and may enable some species, such as cephalopods and crustaceans, to be sensitive to water particle movements associated with sound or vibration (Hu et al., 2009; Kaifu et al., 2008; Montgomery et al., 2006; Normandeau Associates, 2012; Popper et al., 2001). Because any acoustic sensory capabilities, if present, are apparently limited to detecting the local particle motion component of sound (Edmonds et al., 2016), and because water particle motion near a sound source falls off rapidly with distance, aquatic invertebrates are probably limited to detecting nearby sound sources rather than sound caused by pressure waves from distant sources.

In addition to hair cells and statocysts that allow some marine invertebrates to detect water particle motion, some species also have sensory organs called chordotonal organs that can detect substrate vibrations. Chordotonal organs are typically attached to connective tissue of flexible appendages such as antennae and legs (Edmonds et al., 2016). The structures are connected to the central nervous system and can detect some movements or vibrations that are transmitted through substrate.

Available information indicates that aquatic invertebrates are primarily sensitive to low-frequency sounds. Both behavioral and auditory brainstem response studies suggest that crustaceans may sense sounds up to 3 kilohertz (kHz), but greatest sensitivity is likely below 200 hertz (Hz) (Goodall et al., 1990; Lovell et al., 2005; Lovell et al., 2006). Most cephalopods (e.g., octopus and squid) likely sense low-frequency sound below 1 kHz, with best sensitivities at lower frequencies (Budelmann, 1992b; Mooney et al., 2010; Packard et al., 1990). A few cephalopods may sense frequencies up to 1.5 kHz (Hu et al., 2009). Squid did not respond to playbacks of odontocete (e.g., toothed whales) ultrasonic echolocation clicks, likely because these clicks were outside of squid hearing range (Wilson et al., 2007). Although information on the frequency range of the clicks was not provided, ultrasonic sound typically refers to high frequency sounds above the limit of human hearing (greater than about 20 kHz). Similarly, squid did not respond to killer whale echolocation clicks ranging from 199 to 226 decibels (dB) referenced to 1 micropascal (dB re 1 µPa) (Wilson et al., 2007). Refer to the *Acoustic and Explosives Concepts Technical Report* for an explanation of this and other acoustic terms. The frequency of the clicks was not provided. However, killer whale echolocation clicks have been reported to be mostly between 45 and 80 kHz (Au et al., 2004). Some researchers have suggested sensitivity to sounds of higher frequencies in some species, although study results are inconclusive. European spiny lobsters (*Palinurus elephas*), some of which were exposed to predators, were found to produce ultrasound signals up to about 75 kHz (Buscaino et al., 2011). The investigators speculated that the signals might have an anti-predator function or might be used in intraspecific communication, although these functions (particularly communication) were considered hypothetical. The results of another study suggest that European spiny lobsters likely use acoustic signals to aggregate (frequency was not specified, although lobsters in the study produced sounds of up to 30 kHz) (Filiciotto et al., 2014). However, information currently available indicates that invertebrates are likely sensitive only to local water movement and to low-frequency particle accelerations generated in their close vicinity (Normandeau Associates, 2012; Solé et al., 2023).

Although many types of aquatic invertebrates produce sound and at least some species have the ability to detect low-frequency particle motion, little is known about the use of sound or whether all sound production is purposeful or merely incidental in some cases (Hawkins et al., 2015; Normandeau Associates, 2012). Some invertebrates have structures that appear to be designed specifically for sound production, and the results of various studies (summarized in the following paragraphs) indicate that sound is used for communication or other behaviors in some species. For example, it has been suggested by numerous researchers that the larvae of some marine species (e.g., crustaceans, molluscs, and corals) use sound cues for directional orientation (Budelmann, 1992a, 1992b; Montgomery et al., 2006; Popper et al., 2001).

Aquatic invertebrates may produce and use sound in territorial behavior, to detect or deter predators, and in reproduction (Popper et al., 2001). Some crustaceans produce sound by rubbing or closing hard body parts together (Au & Banks, 1998; Heberholz & Schmitz, 2001; Latha et al., 2005; Patek & Caldwell, 2006). The snapping shrimp chorus makes up a significant portion of the ambient noise in many locations (Au & Banks, 1998; Cato & Bell, 1992; Heberholz & Schmitz, 2001). Each snapping shrimp click is up to 215 dB re 1 µPa at 1 m (root mean square [rms] is implied, but the authors did not explicitly state sound pressure level or peak sound pressure level), with a peak around 2 to 5 kHz. Some crustaceans, such as the American lobster (*Homarus americanus*) and California mantis shrimp (*Hemisquilla californiensis*), may also produce sound by vibrating the carapace (Henninger & Watson, 2005; Patek & Caldwell, 2006). Spiny lobsters typically produce low-frequency rasps by moving a structure at the base of the antennae over a rigid file (Buscaino et al., 2011). Other crustaceans make low-frequency rasping or rumbling noises, perhaps used in defense or territorial display (Patek & Caldwell, 2006; Patek et al., 2009), or perhaps used incidental to a visual display. The aquatic isopod *Cymodoce japonica* produces sound by rubbing body parts together (Nakamachi et al., 2015).

Reef noises, such as fish pops and grunts, sea urchin grazing (around 1 kHz), parrotfish grazing, and snapping shrimp noises (around 5 kHz) (Radford et al., 2010), may be used as a cue by some aquatic invertebrates. Nearby reef noises were observed to affect movements and settlement behavior of coral and crab larvae (Jeffs et al., 2003; Radford et al., 2007; Stanley et al., 2010; Vermeij et al., 2010), although chemical cues and substrate color are also used by some species (Foster & Gilmour, 2016). Larvae of other crustacean species, including pelagic and nocturnally emergent species that benefit from avoiding coral reef predators, appear to avoid reef noises (Simpson et al., 2011). Detection of reef noises is likely limited to short distances. Low-frequency sound pressure and particle motion have been measured near a coral reef off Maui, Hawaii (Kaplan & Mooney, 2016). Results indicate that adult cephalopod species would not be able to detect the low level of particle acceleration at the measurement point nearest the reef (50 m). The specific particle acceleration levels detected by marine invertebrate larvae are unknown, but the authors suggest that invertebrate larvae would be unlikely to detect particle acceleration at distances beyond 150 m at this reef. Playback of reef sounds increased the settlement rate of eastern oyster (*Crassostrea virginica*) larvae (Lillis et al., 2013). Green-lipped mussel (*Perna canaliculus*) larvae settlement rate increased when exposed to underwater noise produced by a ferry (Wilkens et al., 2012).

### 2.1.4 GENERAL THREATS

General threats to marine invertebrates include overexploitation and destructive fishing practices (Halpern et al., 2008b; Jackson et al., 2001; Kaiser et al., 2002; Miloslavich et al., 2011; Pandolfi et al., 2003), habitat degradation resulting from pollution and coastal development (Cortes & Risk, 1985; Downs et al., 2009; Mearns et al., 2011), disease (Porter et al., 2001), invasive species (Bryant et al., 1998; Galloway et al., 2009; Wilkinson, 2002) (which may be introduced as a result of growth on vessel hulls or bilge water discharge), oil spills (Yender et al., 2010), ocean acidification (Hughes et al., 2003), and possibly human-generated noise (Brainard et al., 2011; Vermeij et al., 2010). A relatively new threat to marine invertebrates is bioprospecting, which is the collection of organisms in pursuit of new compounds for development of pharmaceutical products (Radjasa et al., 2011).

Compared to many other invertebrate taxa, the threats to corals are well studied. Numerous natural and human-caused stressors may affect corals in the MITT Study Area, including thermal stress, disease, tropical storms, coastal development and pollution, erosion and sedimentation, tourism/recreation, fishing, trade in coral and live reef species, vessel anchoring or groundings, marine debris, predation, invasive species, military and other security-related activities, and hydrocarbon exploration (Center for Biological Diversity, 2009; National Oceanic and Atmospheric Administration, 2008a, 2008b).

The National Oceanic and Atmospheric Administration (NOAA) monitors global coral bleaching events and indicated that the most recent bleaching event, with signs of mass bleaching observed in the Pacific, Atlantic, and Indian Oceans began in February 2023 (Pacific Islands Climate Adaptation Science Center, 2024). Major bleaching events between 2014–2017 were noted as the longest and most damaging bleaching, with approximately 65 percent of global reef area affected (Pacific Islands Climate Adaptation Science Center, 2024). Coral reefs in the Mariana Islands were significantly impacted In the last series of bleaching events, with a third of Guam’s corals dying from rising sea temperatures and over 60 percent of total coral cover in Saipan were lost (Pacific Islands Climate Adaptation Science Center, 2024). Bleaching of all *Porites* species, and in a few colonies of *Pocillopora damicornis*, have been observed in Guam (Pacific Islands Climate Adaptation Science Center, 2024). In addition, Carilli et al. (2020) documented severe bleaching at Farallon de Medinilla (FDM) related to extended regional heat stress. Three of the dominant scleractinian genera, *Pocillopora*, *Leptastrea*, and *Astreopora*, were severely affected, with more than 90 percent of colonies from many species exhibiting bleaching (Carilli et al., 2020).

Factors that seem to be important for coral reef resilience (ability of a reef to resist and recover from environmental disturbance) were identified by McClanahan et al. (2012) and Hill and Hoogenboom (2022). Some factors are large in scale and difficult to manage, while others, such as fishing methods and adjacent watershed pollution, are more easily affected by local management practices. Primary threats to deep-water or cold-water corals include bottom fishing, hydrocarbon exploration, cable and pipeline placement, and waste disposal (e.g., discarded or lost rope and fishing equipment, dredged sediments) (Freiwald et al., 2004).

Ocean acidification is also a major threat to marine calcifying organisms such as corals. Hill and Hoogenboom (2022) reported that direct effects of acidification are more consistently negative at larger spatial scales, suggesting an accumulation of sublethal physiological effects can result in notable changes at a population and an ecosystem level. This study also suggested that the indirect effects of acidification also have the potential to contribute to declines in coral cover under future acidified conditions.

#### 2.1.4.1 Water Quality

Invertebrates may be affected by changes in water quality resulting from pollution, turbidity and increased particle deposition that may occur as a result of sediment disturbance, and waste discharge. Stormwater runoff and point source discharges associated with coastal development may introduce pollutants into bays and other nearshore coastal areas. The pollutants may degrade sediment and water quality, which in turn can affect marine invertebrate communities. Sediment disturbance may result from activities such as dredging, which can affect sensitive species such as some corals (Erftemeijer et al., 2012). In addition to dredging, erosion due to storm runoff may cause changes in the frequency or magnitude of sedimentation in areas in proximity to ocean outfalls, estuarine inlets, and major river discharges.

Ship discharges may affect water quality and invertebrates associated with the affected water. Discharged materials include sewage, bilge water, graywater, ballast water, and solid waste (e.g., food and garbage). Discharges may originate from military, commercial, and recreational vessels. Under provisions of the Clean Water Act, the U.S. Environmental Protection Agency and the Department of Defense (DoD) have developed Uniform National Discharge Standards to address discharges from U.S. military vessels.

Marine invertebrates can be affected by exposure to oil due to runoff from land, natural seepage, or accidental spills from offshore drilling/extraction or tankers (White et al., 2012). Reproductive and early life stages are especially sensitive to oil exposure. Factors such as oil type, quantity, exposure time, and season can affect the toxicity level. Experiments using corals indicate that oil exposure can result in death, decreased reproductive success, altered development and growth, and altered behavior (White et al., 2012; Yender et al., 2010).

#### 2.1.4.2 Marine Debris

Marine debris (especially plastics) is a threat to many marine ecosystems, particularly in coastal waters adjacent to urban development. Microplastics (generally considered to be particles less than 5 mm in size), which may consist of degraded fragments of larger plastic items or intentionally manufactured items (e.g., microbeads), are of concern because of their durability and potential to enter marine food webs (Setala et al., 2016). Field and laboratory investigations have documented ingestion of microplastics by marine invertebrates including bivalve mollusks; crustacean arthropods such as lobsters, shore crabs, and amphipods; annelid lugworms; and zooplankton (Browne et al., 2013; Setala et al., 2014; Von Moos et al., 2012; Watts et al., 2014). While animals with different feeding modes have been found to ingest microplastics, laboratory studies suggest that filter-feeding and deposit feeding benthic invertebrates are at highest risk (Setala et al., 2016).

#### 2.1.4.3 Invasive Species

There is no new information on invasive marine invertebrates in the MITT Study Area that would change the conclusions from the previous MITT analyses.

## 2.2 Endangered Species Act-Listed Species

In 2014, the National Marine Fisheries Service (NMFS) published the Final Rule (79 Federal Register [FR] 53851) protecting 22 coral species under the Endangered Species Act (ESA), and affirming the listing status of two corals as threatened (these two species were listed as threatened in 2006, and the Proposed Rule in 2014 evaluated whether these two species should be listed as endangered). NMFS also determined that the remainder of the proposed species do not warrant listing as endangered or threatened species, and three proposed species (proposed October 2013) were not determinable under the ESA. Only three coral species (*Acropora globiceps, Acropora retusa*, and *Seriatopora aculeata*) are listed under the ESA and occur in the MITT Study Area. New information that supplements existing knowledge on disturbance responses and survivorship of some ESA-listed corals in the genus Acropora is detailed in (Drury et al., 2017), and reactions of some coral species to thermal stress during a coral restoration project in the Caribbean is documented in Ladd et al. (2017). Since the species were listed, there are only a few locations where *A. globiceps, A. retusa*, and *S. aculeata* have been positively identified in the Action Area.

Carilli et al. (2018) identified another ESA-listed coral species in dive surveys surrounding FDM (*Pavona* cf. *diffluens*). Six colonies of this species were identified as possible *P. diffluens* colonies: four off the west shoreline, and two off the east shoreline on the northern portion of FDM. This coral species had not previously been confirmed within the Commonwealth of the Northern Mariana Islands (CNMI). In the NMFS Final Rule that included the listing of *P. diffluens* (79 FR 53851), however, NMFS only included Red Sea/Indian Ocean populations in the Final Rule because of taxonomic uncertainty that Pacific populations may be a different species. Because the listing of *P. diffluens* only covers colonies outside of the Study Area.

### 2.2.1 *ACROPORA GLOBICEPS*

#### 2.2.1.1 Status and Management

In December 2012, NMFS issued a proposed rule for reef-building coral species, including a proposed listing for the staghorn coral (*Acropora globiceps*) as threatened (77 FR 73220). The proposed listing was based on a comprehensive status review (Brainard et al., 2011), a summary of management and conservation measures, and a supplemental information report addressing new information and public comment to both status and management reports. NMFS reviewed the status of this species and efforts being made to protect the species, as well as public comments received on the proposed rule, and made determinations based on the best scientific and commercial data available. In September 2014, NMFS published a Final Rule (79 FR 53851), which concluded that this species warranted listing as threatened under the ESA. NMFS (2024a) provides a 5-year status review summarizing information for the 15 species of

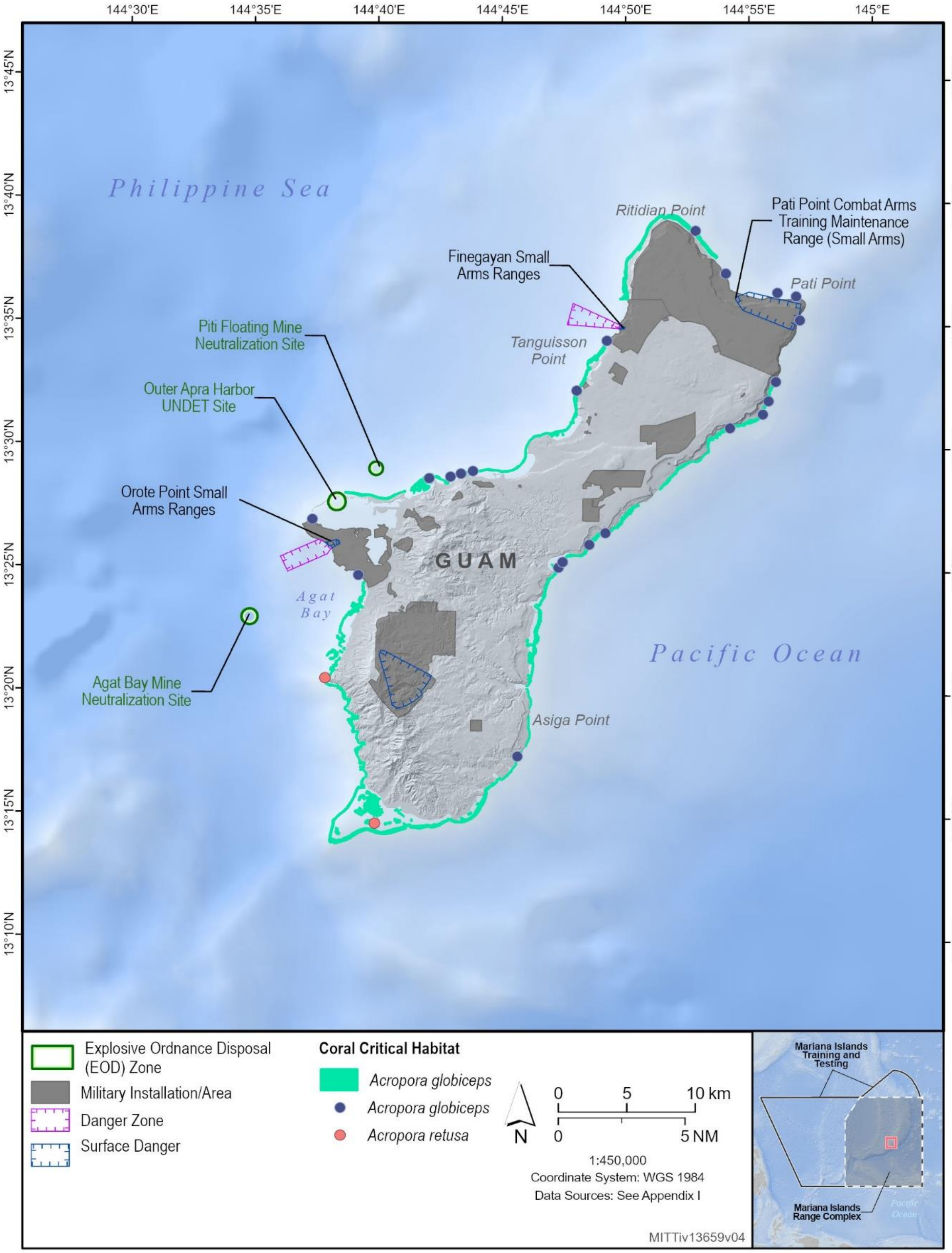
Indo-Pacific reef-building corals listed under the ESA, including *A. globiceps*.

#### 2.2.1.1.1 Critical Habitat

On November 27, 2020, NMFS proposed to designate 17 island units of critical habitat in the Pacific Islands Region for 7 Indo-Pacific coral species listed under the ESA (85 FR 76262). Based on public comments and new information regarding the interpretation of the records of the listed corals and application to critical habitat, a substantial revision of the proposed rule was warranted. Accordingly, NMFS withdrew the 2020 proposed rule and published the new proposed rule (88 FR 83644). On August 15, 2025, NMFS issued a final rule designating critical habitat for five threatened coral species in U.S. waters in the Pacific Islands region, including *A. globiceps* (90 FR 39339). Critical habitat includes Guam, Rota, Aguijan, Tinian, Saipan, Alamagan, Pagan, and Maug Islands, Asuncion and Uracas in the Mariana Trench Marine National Monument. The location of designated critical habitat is presented below for Guam (Figure 1), Rota (Figure 2), and Tinian and Saipan (Figure 3).

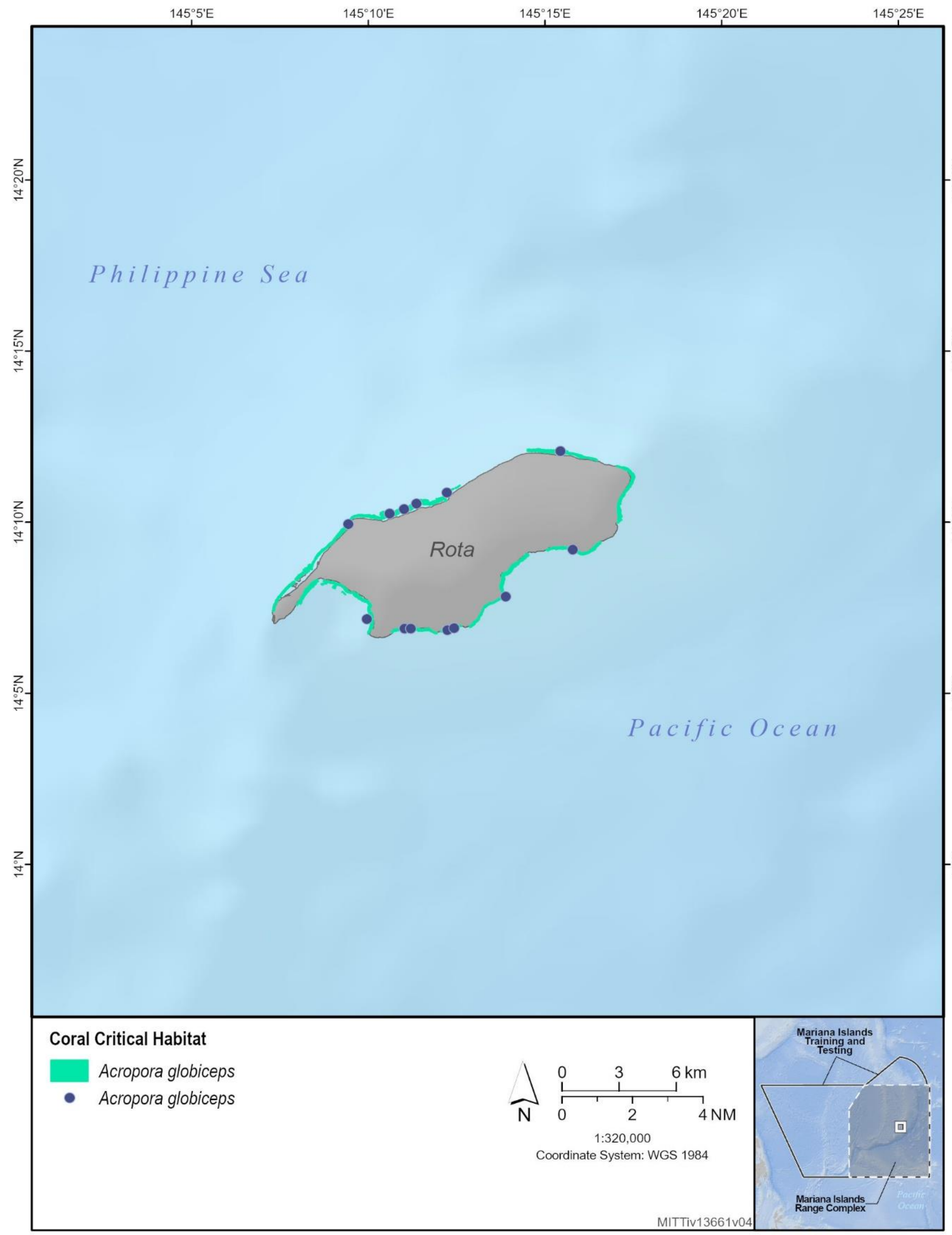
#### 2.2.1.1.2 Recovery Goals

No recovery plan is currently available for ESA-listed corals. However, NMFS has developed a recovery outline to serve as an interim guidance document to direct recovery efforts, including recovery planning, for the 15 species of ESA-listed threatened Indo-Pacific corals (herein referred to as the 15 listed corals).



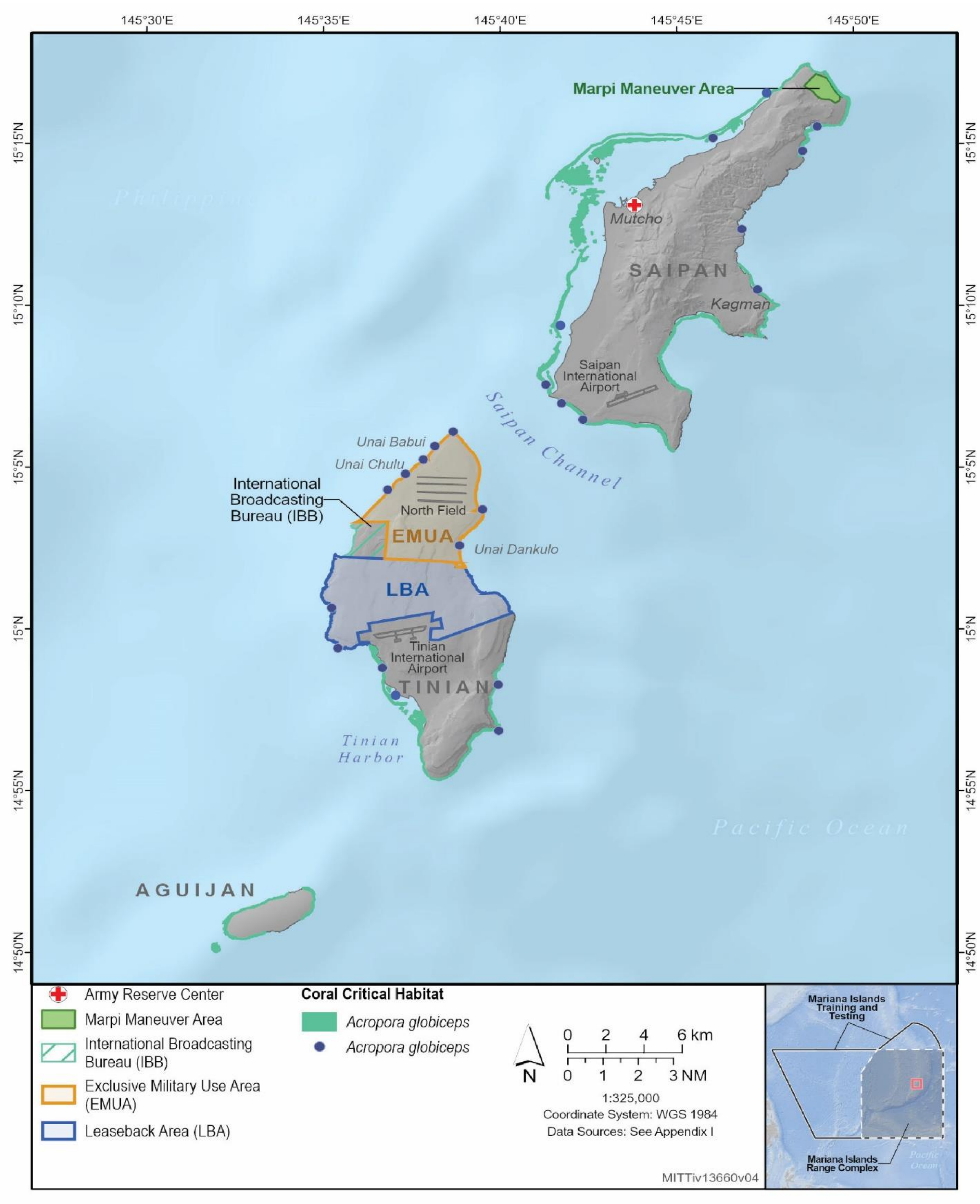
Coral location source: Naval Facilities Engineering Command Marianas (2022a)

**Figure 1: Location of ESA-Listed Coral and Critical Habitat Around Guam**



Coral location source: Maynard et al. (2015)

Figure 2: Location of ESA-Listed Coral Critical Habitat Around Rota



Coral location sources: Maynard et al. (2015) for Tinian; Maynard et al. (2018) for Saipan and U. S. Department of the Navy (2024) for Tinian.

**Figure 3: Location of ESA-Listed Coral Critical Habitat Around Tinian and Saipan**

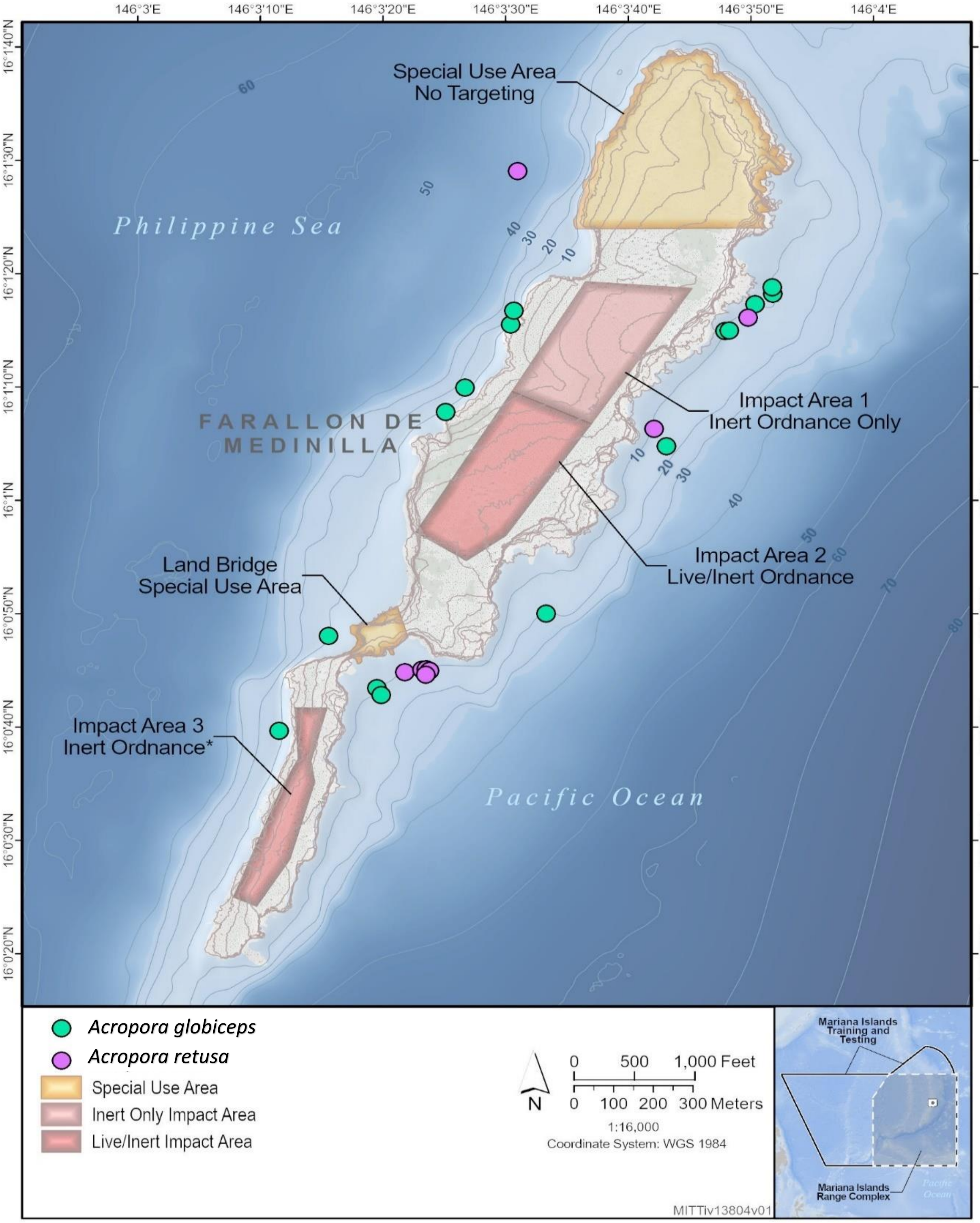
#### 2.2.1.2 Habitat and Geographic Range

*A. globiceps* has a relatively broad distribution, occurring in 39 marine ecosystems of the world and likely has a broader geographic distribution and broader depth distribution (0–20 m instead of 0–8 m), as well as higher absolute abundance (at least hundreds of millions of colonies instead of at least tens of millions of colonies) than previously thought (National Marine Fisheries Service, 2024a). However, *A. globiceps* may be more broadly distributed and more abundant than previously reported in 2014 and thus may have a higher capacity to moderate the effects of the threats (National Marine Fisheries Service, 2024a). *A. globiceps* has been reported from the central Indo-Pacific, the oceanic west Pacific, and the central Pacific (Richards et al., 2008a). Coral reef surveys at FDM in 2022 reported a total of 16 colonies identified as *A. globiceps* (Marx et al., 2023) (Figure 4). *A. globiceps* has the greatest number of records (24) from various locations around Guam compared to the other ESA-listed corals (Naval Facilities Engineering Command Marianas, 2022a), but has also been reported off Tinian (U. S. Department of the Navy, 2024).

Carilli et al. (2018) found a single confirmed colony of *A. globiceps* within survey areas surrounding FDM, confirming this species is rare in waters of less than 20 m depth around the island. In April 2015, several colonies of ESA-listed *A. globiceps* were encountered during a 40-minute non-systematic survey at Spanish Steps in Outer Apra Harbor off Guam (Lybolt, 2015). The colonies were seen in very shallow water less than 3.3 feet (ft.) (1 m) deep. Spanish Steps is just inside the tip of the Orote Peninsula, which is a dynamic location that is exposed to some effect from the ocean outside the harbor. The area has high coral coverage of commonly seen species from Apra Harbor. A second colony was recorded from the reef crest south of Dadi Beach in September 2016. The single colony was approximately 10–15 inches (in.) (25–30 centimeters [cm]) across and was observed during a non-systematic survey of the nearshore area at Dadi Beach (Moribe et al., 2016). The distribution of this species off Guam is presented in Figure 1.

##### 2.2.1.2.1 Population Trends

*Acropora* are sessile colonies that spawn their gametes into the water column, and the azooxanthellate larvae can survive in the planktonic stage from 4 to 209 days. All species of the genus *Acropora* studied to date are simultaneous hermaphrodites, with a gametogenic cycle in which eggs develop over a period of about 9 months and testes over about 10 weeks. Fecundity in *Acropora* colonies is generally described as ranging from 3.6 to 15.8 eggs per polyp. Mature eggs of species of *Acropora* are large when compared with those of other corals, ranging from 0.53 to 0.90 mm in mean diameter. For five *Acropora* species, the minimum reproductive size ranged from 4 to 7 cm, and the estimated ages ranged from 3 to 5 years (Brainard et al., 2011).



Source: Marx et al. (2023)

**Figure 4: Location of ESA-Listed Corals Around FDM**

*Acropora* release gametes as egg-sperm bundles that float to the sea surface, each polyp releasing all its eggs and sperm in one bundle. Fertilization takes place after the bundles break open at the sea surface. Larvae presumably experience considerable mortality (up to 90 percent or more) from predation or other factors prior to settlement and metamorphosis (National Marine Fisheries Service, 2014b). Such mortality cannot be directly observed but is inferred from the large amount of eggs and sperm spawned versus the much smaller number of recruits observed later. Coral larvae are relatively poor swimmers; therefore, their dispersal distances largely depend on the duration of the pelagic phase and the speed and direction of water currents transporting the larvae. The potential for long-term dispersal of coral larvae, at least for some species, may be substantially greater than previously understood and may partially explain the large geographic ranges of many species (National Marine Fisheries Service, 2014b).

#### 2.2.1.3 Population Threats

The specific effects of predation are poorly known for *A. globiceps*. However, most acroporid corals are preferentially consumed by crown-of-thorns seastars (*Acanthaster planci*) and by corallivorous snails. *A. globiceps* is susceptible to the same suite of stressors that generally threaten corals. NMFS evaluated the population’s demographic, spatial structure, and vulnerability factors (77 FR 73220). Elements that contributed to *A. globiceps* threatened status were high vulnerability to ocean warming, moderate vulnerability to disease and acidification, trophic effects of fishing, nutrients, and predation as well as narrow overall distribution (based on shallow depth distribution (79 FR 53851).

### 2.2.2 *ACROPORA RETUSA*

#### 2.2.2.1 Status and Management

In December 2012, NMFS issued a proposed rule for reef-building coral species, including a proposed listing for the staghorn coral (*Acropora retusa*) as threatened (77 FR 73220).

##### 2.2.2.1.1 Critical Habitat

On November 27, 2020, NMFS proposed to designate 17 island units of critical habitat in the Pacific Islands Region for 7 Indo-Pacific coral species listed under the ESA (85 FR 76262). Based on public comments and new information regarding the interpretation of the records of the listed corals and application to critical habitat, a substantial revision of the proposed rule was warranted. Accordingly, NMFS withdrew the 2020 proposed rule and published the new proposed rule (88 FR 83644 On August 15th, 2025, NMFS issued a final rule designating critical habitat for five threatened coral species in U.S. waters in the Pacific Islands region, including *A. retusa* (90 FR 39339). Critical habitat includes Guam, Rota, Aguijan, Tinian, Saipan, Alamagan, Pagan, and Maug Islands, Asuncion and Uracas in the Mariana Trench Marine National Monument.

##### 2.2.2.1.2 Recovery Goals

No recovery plan is currently available for ESA-listed corals. However, NMFS has developed a recovery outline to serve as an interim guidance document to direct recovery efforts, including recovery planning, for the 15 species of ESA-listed threatened Indo-Pacific corals (herein referred to as the 15 listed corals).

#### 2.2.2.2 Habitat and Geographic Range

*A. retusa* has been reported in the southwest and northern Indian Ocean, the central Indo-Pacific, the Solomons, the oceanic west Pacific, and the central Pacific (Richards et al., 2008b). *A. retusa* has been reported to occur in shallow, tropical reef environments and on upper reef slopes and in tidal pools from 1 to 5 m (3.3 to 16.4 ft.). *A. retusa* has a widespread distribution longitudinally but is restricted latitudinally (Brainard et al., 2011). This species is not known to occur in waters off Guam and the CNMI (Brainard et al., 2011).

Coral reef surveys at FDM in 2022 reported a total of 27 colonies identified as *A. retusa* (Marx et al., 2023). Off Guam, this species has only been observed at two locations; in southern/southwestern Guam (Facpi Point on the west side and Aga Point in the south), and its distribution and preferred habitat is not well known (Naval Facilities Engineering Command Marianas, 2022a).

#### 2.2.2.3 Population Trends

Current information indicates that *A. retusa* has a range-wide relative abundance of rare to uncommon, and occurs in 35 marine ecosystems of the world, the same number as time of listing in 2014 (National Marine Fisheries Service, 2024a).

#### 2.2.2.4 Population Threats

Based on the continued worsening in the most important threats, it is likely that *A. retusa* is decreasing in overall abundance (i.e., abundance across all the ecoregions that make up its range) (National Marine Fisheries Service, 2024a).

### 2.2.3 *SERIATOPORA ACULEATA* (CLUB FINGER CORAL)

#### 2.2.3.1 Status and Management

In December 2012, NMFS issued a proposed rule for reef-building coral species, including a proposed listing for the staghorn coral (*Seriatopora aculeata*) as threatened (77 FR 73220). NMFS has not proposed a critical habitat designation. The proposed listing was based on a comprehensive status review (Brainard et al., 2011), a summary of management and conservation measures, and a supplemental information report addressing new information and public comment to both status and management reports. NMFS reviewed the status of this species and efforts being made to protect the species, as well as public comments received on the proposed rule, and made determinations based on the best scientific and commercial data available. In September 2014, NMFS published a Final Rule (79 FR 53851), which concluded that this species warranted listing as threatened under the ESA. NMFS (2024a) provides a 5-year status review summarizing information for the 15 species of Indo-Pacific reef-building corals listed under the ESA, including *S. aculeata*.

##### 2.2.3.1.1 Critical Habitat

On November 27, 2020, NMFS proposed to designate 17 island units of critical habitat in the Pacific Islands Region for 7 Indo-Pacific coral species listed under the ESA (85 FR 76262). Based on public comments and new information regarding the interpretation of the records of the listed corals and application to critical habitat, a substantial revision of the proposed rule was warranted. Accordingly, NMFS withdrew the 2020 proposed rule and published the new proposed rule (88 FR 83644). The proposed critical habitat includes Rota; Aguijan; Tinian; Saipan; Alamagan; Pagan; and Maug Islands and Uracas in the Mariana Trench Marine National Monument, as well as Guam.

#### 2.2.3.1.2 Recovery Goals

No recovery plan is currently available for ESA-listed corals. However, NMFS has developed a recovery outline to serve as an interim guidance document to direct recovery efforts, including recovery planning, for the 15 species of ESA-listed threatened Indo-Pacific corals (herein referred to as the 15 listed corals).

### 2.2.3.2 Habitat and Geographic Range

*S. aculeata* has a relatively confined distribution. It has been reported primarily from the Indo-Pacific, including Australia, Fiji, Indonesia, Japan, and Papua New Guinea and has a depth distribution of 3–40 m (National Marine Fisheries Service, 2024a). According to the International Union for Conservation of Nature and Natural Resources Species Account, *S. aculeata* has been recorded in the Northern Mariana Islands (Hoeksema et al., 2008).

*S. aculeata* has been recorded in Guam (Brainard et al., 2011; Fenner & Burdick, 2016), but not at any other island in the Mariana Archipelago (Naval Facilities Engineering Command Marianas, 2022a).

### 2.2.3.3 Population Trends

Current information indicates that *S. aculeata* has a higher absolute abundance (at least tens of millions of colonies) than at the time of listing in 2014 (at least millions) (National Marine Fisheries Service, 2024a).

### 2.2.3.4 Population Threats

Based on the continued worsening in the most important threats, it is likely that *S. aculeata* is decreasing in overall abundance (i.e., abundance across all the ecoregions that make up its range) (National Marine Fisheries Service, 2024a).

## 2.2.4 *HIPPOPUS HIPPOPUS* (HORSE'S HOOF, BEAR PAW, OR STRAWBERRY CLAM)

### 2.2.4.1 Status and Management

NMFS completed a comprehensive status review of seven species of giant clams in response to a petition to list these species as threatened or endangered under the ESA (89 FR 60498). Based on the best scientific and commercial data available, including the Status Review Report (Rippe et al., 2024), and after taking into account efforts being made to protect these species, NMFS determined that three species are in danger of extinction throughout the entirety of their respective ranges (*H. porcellanus, T. mbalavuana*, and *T. squamosina*), two species are in danger of extinction in a significant portion of their respective ranges (*T. derasa* and *T. gigas*), and one species is likely to become an endangered species within the foreseeable future throughout a significant portion of its range (*H. hippopus*). Therefore, NMFS proposes to list *H. porcellanus, T. mbalavuana, T. squamosina, T. derasa*, and *T. gigas* as endangered species and *H. hippopus* as a threatened species under the ESA.

#### 2.2.4.1.1 Critical Habitat

Critical habitat has not been designated for *H. hippopus*.

#### 2.2.4.1.2 Recovery Goals

Recovery goals have not been determined for *H. hippopus*.

### 2.2.4.2 Habitat and Geographic Range

*H. hippopus* is widely distributed throughout the Indo-Pacific, occurring from India in the west to the Republic of Kiribati in the east, and from New Caledonia in the south to the southern islands of Japan in the north (Neo et al., 2017). It has been recorded in 25 countries and territories across its range, including in the MITT Study Area, (Guam and CNMI), but is likely extinct in these areas (Neo et al., 2017).

### 2.2.4.3 Population Trends

There are no global abundance estimates for *H. hippopus*. Abundance data indicate that *H. hippopus* has suffered significant population declines, resulting in this species being considered "rare," locally extinct, or has been reintroduced after local extinction in 21 of 26 locations throughout its range (Rippe et al., 2024).

### 2.2.4.4 Population Threats

Giant clams face a number of natural and anthropogenic threats throughout their collective ranges (Rippe et al., 2024). Threats to giant clams come from (1) destruction, modification, or curtailment of their habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanism; and (5) other natural or manmade factors affecting their continued existence (Rippe et al., 2024).

## 2.2.5 *TRIDACNA DERASA* (SMOOTH GIANT CLAM)

### 2.2.5.1 Status and Management

NMFS completed a comprehensive status review of seven species of giant clams in response to a petition to list these species as threatened or endangered under the ESA (89 FR 60498). Based on the best scientific and commercial data available, including the Status Review Report (Rippe et al., 2024), and after taking into account efforts being made to protect these species, NMFS determined that three species are in danger of extinction throughout the entirety of their respective ranges (*H. porcellanus, T. mbalavuana*, and *T. squamosina*), two species are in danger of extinction in a significant portion of their respective ranges (*T. derasa* and *T. gigas*), and one species is likely to become an endangered species within the foreseeable future throughout a significant portion of its range (*H. hippopus*). Therefore, NMFS proposes to list *H. porcellanus, T. mbalavuana, T. squamosina, T. derasa*, and *T. gigas* as endangered species and *H. hippopus* as a threatened species under the ESA.

#### 2.2.5.1.1 Critical Habitat

Critical habitat has not been designated for *T. derasa*.

#### 2.2.5.1.2 Recovery Goals

Recovery goals have not been determined for *T. derasa*.

#### 2.2.5.2 Habitat and Geographic Range

The geographic range of *T. derasa* primarily encompasses the Coral Triangle region, although it extends east to Tonga and as far west as the Cocos (Keeling) Islands in the eastern Indian Ocean. Adams et al. (1988) described *T. derasa* as having a patchy distribution, being rare in many places throughout its range and abundant in others. In addition, *T. derasa* historically occurred in CNMI and Guam, but is reportedly extirpated in both locations because of overutilization. Compared to other giant clam species, *T. gigas* is considered a habitat-generalist and can be found in a variety of habitats, including high- and low-islands, atoll lagoons, and fringing reefs (Rippe et al., 2024).

#### 2.2.5.3 Population Trends

This species is likely locally extinct in the CNMI and Guam and information on populations trends are not available (Rippe et al., 2024).

#### 2.2.5.4 Population Threats

Giant clams face a number of natural and anthropogenic threats throughout their collective ranges (Rippe et al., 2024). Threats to giant clams come from (1) destruction, modification, or curtailment of their habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanism; and (5) other natural or manmade factors affecting their continued existence (Rippe et al., 2024). There is no information on specific threats to *T. derasa.* The threat of nearshore habitat destruction or modification due to coastal development is geographically heterogeneous and is likely most severe adjacent to highly populated areas of the central Indo-Pacific (e.g., Indonesia, Malaysia, Papua New Guinea, Philippines), but likely less severe throughout the Pacific island nations (Rippe et al., 2024).

### 2.2.6 *TRIDACNA GIGAS* (TRUE GIANT CLAM)

#### 2.2.6.1 Status and Management

NMFS completed a comprehensive status review of seven species of giant clams in response to a petition to list these species as threatened or endangered under the ESA (89 FR 60498). Based on the best scientific and commercial data available, including the Status Review Report (Rippe et al., 2024), and after taking into account efforts being made to protect these species, NMFS determined that three species are in danger of extinction throughout the entirety of their respective ranges (*H. porcellanus, T. mbalavuana*, and *T. squamosina*), two species are in danger of extinction in a significant portion of their respective ranges (*T. derasa* and *T. gigas*), and one species is likely to become an endangered species within the foreseeable future throughout a significant portion of its range (*H. hippopus*). Therefore, NMFS proposes to list *H. porcellanus, T. mbalavuana, T. squamosina, T. derasa*, and *T. gigas* as endangered species and *H. hippopus* as a threatened species under the ESA.

##### 2.2.6.1.1 Critical Habitat

Critical habitat has not been designated for *T. gigas*.

##### 2.2.6.1.2 Recovery Goals

Recovery goals have not been determined for *T. gigas*.

#### 2.2.6.2 Habitat and Geographic Range

*T. gigas* can be found in shallow (i.e., ≤ 20 m) tropical waters of the Indo-Pacific and the Great Barrier Reef, from Myanmar in the west to the Republic of Kiribati in the east, and from the Ryukyus Islands of southern Japan in the north to Queensland, Australia in the south (Neo et al., 2017). Like most other giant clam species, *T. gigas* is typically associated with coral reefs and can be found in many habitats, including high-and low-islands, atoll lagoons, and fringing reefs (Munro, 1993). Historically, this species occurred in CNMI and Guam but is reportedly extirpated in both locations because of overutilization (Rippe et al., 2024).

#### 2.2.6.3 Population Trends

This species is likely locally extinct in the CNMI and Guam and information on populations trends are not available (Rippe et al., 2024).

#### 2.2.6.4 Population Threats

Giant clams face a number of natural and anthropogenic threats throughout their collective ranges (Rippe et al., 2024). Threats to giant clams come from (1) destruction, modification, or curtailment of their habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanism; and (5) other natural or manmade factors affecting their continued existence (Rippe et al., 2024). There is no information on specific threats to *T. gigas.* The threat of nearshore habitat destruction or modification due to coastal development is geographically heterogeneous and is likely most severe adjacent to highly populated areas of the central Indo-Pacific (e.g., Indonesia, Malaysia, Papua New Guinea, Philippines), but likely less severe throughout the Pacific island nations (Rippe et al., 2024).

### 2.2.7 *TRIDACNA SQUAMOSA* (FLUTED OR SCALY GIANT CLAM)

#### 2.2.7.1 Status and Management

NMFS completed a comprehensive status review of seven species of giant clams in response to a petition to list these species as threatened or endangered under the ESA (89 FR 60498). Based on the best scientific and commercial data available, including the Status Review Report (Rippe et al., 2024), and after taking into account efforts being made to protect these species, NMFS determined that three species are in danger of extinction throughout the entirety of their respective ranges (*H. porcellanus, T. mbalavuana*, and *T. squamosina*), two species are in danger of extinction in a significant portion of their respective ranges (*T. derasa* and *T. gigas*), and one species is likely to become an endangered species within the foreseeable future throughout a significant portion of its range (*H. hippopus*). Therefore, NMFS proposes to list *H. porcellanus, T. mbalavuana, T. squamosina, T. derasa*, and *T. gigas* as endangered species and *H. hippopus* as a threatened species under the ESA.

##### 2.2.7.1.1 Critical Habitat

Critical habitat has not been designated for *T. squamosa*.

##### 2.2.7.1.2 Recovery Goals

Recovery goals have not been determined for *T. squamosa*.

### 2.2.7.2 Habitat and Geographic Range

*T. squamosa* is the second-most widely distributed giant clam species, with a broad geographic range that extends from the Red Sea and eastern Africa in the west to the Pitcairn Islands in the east, and from the Great Barrier Reef in the south to southern Japan in the north (Neo et al., 2017). *T. squamosa* is usually found on coral reefs or adjacent sandy areas (Neo et al., 2017). Juveniles are often attached to the substrate by a "weak but copious byssus," while adults can be found either attached or free-living (Neo et al., 2017).

### 2.2.7.3 Population Trends

Overall, the population status of *T. squamosa* varies considerably across its geographic range. Although *T. squamosa* is native to CNMI and Guam, it is considered extirpated in both locations. However, Neo et al. (2017) reported that the species may still occur in Guam at very low abundance.

### 2.2.7.4 Population Threats

Giant clams face a number of natural and anthropogenic threats throughout their collective ranges (Rippe et al., 2024). Threats to giant clams come from (1) destruction, modification, or curtailment of their habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanism; and (5) other natural or manmade factors affecting their continued existence (Rippe et al., 2024). There is no information on specific threats to *T. squamosa.* The threat of nearshore habitat destruction or modification due to coastal development is geographically heterogeneous and is likely most severe adjacent to highly populated areas of the central Indo-Pacific (e.g., Indonesia, Malaysia, Papua New Guinea, Philippines), but likely less severe throughout the Pacific island nations (Rippe et al., 2024).

# 3 FISHES

## 3.1 GENERAL BACKGROUND

Marine fish can be broadly categorized by their distributions within the water column or habitat usage. Moyle and Cech (2004) define the major marine habitat categories as estuaries, coastal habitats, reefs, the epipelagic zone, the deep sea, and the Polar regions. In the Study Area, the major habitat categories include all except the Polar regions. Many marine fishes that occur in the Study Area are either demersal species (i.e., close to the seafloor) associated with nearshore coastal reefs, or are more oceanic and live in surface waters (pelagic) further offshore (Schwartz, 1989). The highest number and diversity of fishes typically occur where the habitat has structural complexity (reef systems, continental slopes, deep canyons), biological productivity (areas of nutrient upwelling), and a variety of physical and chemical conditions (water flow, nutrients, dissolved oxygen, and temperature) (Bergstad et al., 2008; Helfman et al., 2009; Moyle & Cech, 2004; Parin, 1984; Pyle et al., 2019). Some of the marine fishes that occur in the coastal zone migrate between marine and freshwater habitats (Helfman et al., 2009). Other distribution factors, including predator/prey relationships, water quality, and refuge (e.g., physical structure or vegetation cover) operate, on more regional or local spatial scales (Reshetiloff, 2004). Also, fishes may move among habitats throughout their lives based on changing needs during different life stages (Schwartz, 1989).

Some fish species in the U.S. are protected under the ESA and are managed by either the U.S. Fish and Wildlife Service (USFWS) or NMFS. The recreational and commercial fisheries are managed within a framework of overlapping international, federal, state, interstate, and tribal authorities. Individual states and territories generally have jurisdiction over managed fisheries located in marine waters within 3 nautical miles (NM) of their coast. Federal jurisdiction includes managed fisheries in marine waters inside the U.S. Exclusive Economic Zone (EEZ). The area stretches from the outer boundary of state waters out to 200 NM offshore of any U.S. coastline, except where intersected closer than 200 NM by bordering countries.

The Magnuson-Stevens Fishery Conservation and Management Act and Sustainable Fisheries Act led to the formation of eight regional fishery management councils that coordinate with NMFS to manage and conserve certain fisheries in federal waters. Together with NMFS, the councils maintain fishery management plans for species or species groups comprised of fish, invertebrates, and vegetation to regulate commercial and recreational harvest within their geographic regions. The Study Area overlaps with the jurisdiction of one regional fishery management council, as well as the range of the highly migratory species (e.g., sharks, billfish, swordfish, and tunas), which are managed directly by NMFS.

- **The Western Pacific Regional Fishery Management Council** includes Hawaii, American Samoa, Guam, and the Northern Mariana Islands.
- **NMFS, Office of Sustainable Fisheries** includes all federally managed waters of the U.S. where highly migratory species occur.

### 3.1.1 HABITAT USE

Fishes inhabit most of the world’s oceans, from warm shallow coastal habitats to cold deep-sea waters, and are found on the surface, in the water column, and at the bottom in the Study Area. The description of habitat use in this section pertains to common fishes found in the different habitats.

Fish distribution is restricted by biotic factors (competition or predation) or by abiotic components, such as temperature, salinity, dissolved oxygen, and pH. A species can be excluded from a suitable habitat by competitors, predators, parasites, or a lack of available prey (Moyle & Cech, 2004). For example, Catano et al. (2015) found that a loss of corals and the resulting decline in structural complexity, as well as management efforts to protect reefs, could alter the territory dynamics and reproductive potential of important herbivorous fish species.

Marine and diadromous fishes inhabit the diverse coastal habitats on or near the edges of the continents, from the intertidal regions to the edge of the continental shelf (Moyle & Cech, 2004). The most abundant and conspicuous types of coastal habitats are hard bottom (e.g., rocky reefs which can include shell beds), soft bottom (e.g., sand, mud, silt), submerged aquatic vegetation (e.g., mangroves, salt marshes, seagrass beds, macroalgae beds), and floating macroalgae. Each of these coastal habitats has distinct types of fish associated with it. Common fishes inhabiting hard bottom habitats in the Study Area include gobies (Gobiidae), rockfish (Scorpaenidae), and sculpins (Cottidae), while flounder (Bothidae) and stingrays (Dasyatidae) are found on soft bottoms. Pipefishes (Syngnathidae) and kelpfish (Clinidae) are common inhabitants of submerged aquatic vegetation habitat. Species commonly found under offshore floating macroalgae include ocean sunfishes, tunas, sharks, and mahi mahi.

Somewhere between 30 and 40 percent of all fish species are associated with hard bottom habitats (tropical and subtropical) such as reefs, and anywhere from 250 to 2,200 species are likely to be found in, on, or near a major complex of reefs. Coral reef habitats are found between latitudes 30° North (N) and 30° South (S) in shallow water (usually less than 50 m) that is warm enough to support the growth of corals and clear enough to allow photosynthesis at moderate depths. Most reef habitats are surrounded by nutrient-poor oceanic waters. Compared to the total number of species of carnivorous fishes that inhabit low-latitude coral reefs, the number of herbivores is small (20 percent), but they are often the most noticeable fishes (Moyle & Cech, 2004). Damselfishes (Pomacentridae), parrotfishes (Scaridae), and surgeonfishes (Acanthuridae) are examples of herbivorous fishes found in reef habitat (Moyle & Cech, 2004). In the Study Area, commonly recognized reef fishes include butterflyfishes (Chaetodontidae), puffers (Tetraodontidae), tangs (Acanthuridae), triggerfishes (Balistidae), and wrasses (Labridae).

The upper 200 m of the ocean is known as the photic or epipelagic zone. Sunlight penetrates sufficiently to support the growth of phytoplankton or macro algae. The area between 200 m and 1,000 m is referred to as the mesopelagic zone, where light penetration is minimal. Below the mesopelagic zone is the bathypelagic or aphotic zone, where sunlight does not penetrate. A lack of habitat complexity can limit the number of fish species that inhabit the epipelagic zone. Less than two percent of all fish species inhabit the nutrient-poor waters, with most occurring in the upper 100 m of the water column, where light can penetrate and permit phytoplankton growth and visual predators to see their prey. Epipelagic fish are divided for convenience into nearshore and oceanic groups. Nearshore epipelagic fishes are overall the most commercially valuable group of fishes to humans because they typically occur in large schools, such as herring (Clupeidae) and anchovies (Engraulidae), or are particularly favored as food, such as tunas (Scombridae) and salmon (Salmonidae). Predators on nearshore epipelagic fishes include billfishes and swordfishes (Xiphiidae), sharks (Carcharhinidae), and others. Epipelagic fishes that inhabit the open ocean spend their entire life cycle either free swimming or associated with drifting seaweed e.g., kelp (Moyle & Cech, 2004). In the Study Area, examples of epipelagic open ocean fishes include sharks, tunas, sauries (Scomberesocidae), and ocean sunfish (Molidae).

Mesopelagic habitats are found below the well-lighted, well-mixed epipelagic zone. Between about 120 m and 1,000 m in depth, light gradually fades to extinction, and the water temperature decreases to 39°F. Below 1,000 m, bathypelagic habitats are characterized by complete darkness, low temperatures, low nutrients, low dissolved oxygen, and great pressure. This environment is the most extensive aquatic habitat on earth. The vastness of the deep-sea habitat, coupled with its probable stability through geological time, has led to the development of a diverse fish community, which accounts for 11 percent of all recorded fish species in the oceans. Lanternfishes (Myctophidae), with about 240 species, are an important group of mesopelagic deep sea fishes in terms of diversity, distribution, and numbers of individuals (Helfman et al., 2009). These species make up a large fraction of the deep scattering layer, so-called because the sonic pulses of a sonar can reflect off the millions of swim bladders, often giving the impression of a false bottom (Moyle & Cech, 2004). Generally, deep-sea fish are divided into two groups, those that are found in the water column and others associated with the seafloor. In the Study Area, the cookie cutter shark (Dalatiidae), fangtooths (Anoplogastridae), hatchetfishes (Sternoptychidae), and lanternfishes inhabit the water column while the seafloor is inhabited with grenadiers or rattails (Macrouridae), hagfishes (Myxinidae), rays (Rajidae), and some rockfishes (Sebastidae).

Some fishes use one habitat type over their entire life cycle, while others associate with different habitat types by life stage. Anadromous fishes hatch and rear in freshwater rivers as fry, with early juveniles inhabiting estuaries for short periods as they transition into late-juvenile life stages before entering the ocean to mature into adults. Many other marine fishes inhabit the water column as larvae, settling onto soft bottom habitat as juveniles and remaining there as adults (e.g., flatfish). The reef-associated, Yellow-crowned butterflyfish (*Chaetodon flavocoronatus*) and oceanic Pacific bluefin tuna (*Thunnus orientalis*) provide examples of species closely connected to one habitat category across their life cycle.

### 3.1.2 MOVEMENT AND BEHAVIOR

Fishes exhibit a rich array of sophisticated behavior (Meyer et al., 2010). Fishes have been shown to cooperate in a variety of ways during foraging, navigation, reproduction, and predator avoidance (Fitzpatrick et al., 2006; Huntingford et al., 2006; Johnstone & Bshary, 2004). Some examples of the common types of behavior exhibited by fishes include movement or migration, schooling, feeding, and resting (Moyle & Cech, 2004).

Migratory behavior consists of mass movements from one place to another and can range in occurrence from daily to seasonal, depending on the species. Tunas and eels migrate thousands of miles in short periods of time (e.g., a few months). Daily or seasonal migrations are typically for feeding and/or predator avoidance and can also be referred to as movement patterns. Some common movement patterns include coastal migrations, open ocean migrations, onshore/offshore movements, vertical water column movements, and life stage-related migrations (e.g., eggs and larvae as part of the plankton/nekton). Migratory behavior occurs in response to changing environmental conditions, particularly temperature, or the movement and abundance of food organisms. The destinations of migratory events are often feeding or reproductive grounds. Many fishes have the ability to find their way back to a “home” area and some species use olfactory and visual cues, as well as chemicals released by the other fishes to return home. Highly migratory species such as hammerhead shark (*Sphyrna* species), albacore (*Thunnus alalunga*), wahoo (*Acanthocybium solandri*) and swordfish (*Xiphias gladius*), may move across thousands of miles of open ocean (Beamish et al., 2005; Duncan et al., 2006; Theisen et al., 2008). Other migratory species such as Pacific salmonids exhibit seasonal movement patterns throughout coastal continental shelf waters and beyond.

A shoal is defined as any group of fishes that remain together for social reasons, while a school is a polarized, synchronized shoal (Moyle & Cech, 2004), often swimming together in tight formations. Schools can change shape when traveling, feeding, resting, or avoiding predators. Vision and the lateral-line system play roles in assisting schooling by allowing fish to visually orientate to one another and also sense water movements when visibility is reduced. Schooling behavior may provide protection against predators. Schooling may also be beneficial in terms of reproduction since little energy has to be expended to find a mate when sexes school together (Moyle & Cech, 2004).

Feeding behavior of fishes is influenced by many factors, including characteristics of the environment, predators, and prey. When food is scarce, individual fish have been observed capturing prey items of all sizes, for which there is likely to be a net gain of energy for the fish. However, when food is abundant, a fish will typically seek the prey item that produces the most energy for the least amount of effort. The body shape of a fish species, specifically the mouth, reflects the general method of feeding. Many fishes must swallow their prey whole and have mouths specialized for their prey depending on the prey's size and shape (Price et al., 2015). Fishes with their mouth on the underside of their body (e.g., rays and skates) are typically bottom feeders, while fishes with their mouths near the top of their head (e.g., mullets, halfbeaks, etc.) are typically surface feeders. Fish that typically feed in the water column, which includes most species, have mouths that are centered in their head. Common types of feeding behavior include ambushing, drift feeding, and filter feeding; fishes may regularly switch between two or more modes of feeding behavior depending on the abundance of prey (Moyle & Cech, 2004)

### 3.1.3 HEARING AND VOCALIZATION

Refer to the *Acoustic and Explosives Concepts Technical Report* for a summary and details regarding the hearing and vocalization of fishes.

### 3.1.4 GENERAL THREATS

Fish populations can be influenced by various natural factors and human activities. There can be direct effects, from disease or from commercial and recreational activities such as fishing, or indirect effects, such as those associated with reductions in prey availability or lowered reproductive success of individuals. Human-made effects are widespread throughout the world's oceans, such that very few habitats remain unaffected by human influence (Halpern et al., 2008a). Direct and indirect effects have shaped the condition of marine fish populations, particularly those species with large body size, late maturity ages, or low fecundity such as sharks, Pacific cod (*Gadus macrocephalus*), and Pacific bluefin tuna, making these species especially vulnerable to habitat losses and fishing pressure (Reynolds et al., 2005). Human-induced stressors (e.g., threats) can be divided into four components, which often act on fish populations simultaneously: habitat alteration, exploitation, introduction of non-native species, and pollution (Moyle & Cech, 2004). Climate effects on the marine environment are additional stressors on fish populations.

Coastal development, deforestation, road construction, dam development, water control structures, and agricultural activities are types of habitat alteration that can affect fishes and their environment. These activities may affect the water quality of the nearshore marine environment.

### 3.1.4.1 Water Quality

Parameters such as temperature, dissolved oxygen, salinity, turbidity, and pH define the water quality as a component of habitat quality for fishes. Some land-based activities can directly and indirectly affect water quality in rivers, estuaries, and in the coastal waters. Sediment from activities on land may be transported to the marine environment. Sediment can affect water quality by increasing turbidity and decreasing light penetration into the water column, as well as transport contaminants into the marine environment (Allen, 2006). Increases in sediment can decrease the survival and reproduction of plankton and have food web and ecosystem level effects.

Hypoxia (low dissolved oxygen concentration) is a major effect associated with poor water quality. Hypoxia occurs when water becomes overloaded with nutrients such as nitrogen and phosphorus, which enter oceans from agricultural runoff, sewage treatment plants, bilge water, and atmospheric deposition. An overabundance of nutrients can stimulate algal blooms, resulting in a rapid expansion of microscopic algae (phytoplankton) and can cause anoxic events leading to fish kills (Corcoran et al., 2013). Over the last several decades, coastal regions throughout the world have experienced an increase in the frequency of algal blooms that are toxic or otherwise harmful. Commonly called red tides, these events are now grouped under the descriptor harmful algal blooms (Anderson et al., 2002). Harmful algal blooms can produce toxins, causing human illness and massive fish and other animal mortalities.

#### 3.1.4.1.1 Pollution

Chemicals and debris are the two most common types of pollutants in the marine environment. Global oceanic circulation patterns result in the accumulation of a considerable amount of pollutants and debris scattered throughout the open ocean and concentrated in gyres and other places (Crain et al., 2009). Pollution initially affects fish that occur near the sources of pollution, but may also affect future generations from effects to reproduction and increased mortality across life stages.

Chemical pollutants in the marine environment that may affect marine fishes include organic pollutants (e.g., pesticides, herbicides, polycyclic aromatic hydrocarbons, flame retardants, and oil) and inorganic pollutants (e.g., heavy metals) (Pew Oceans Commission, 2003). High chemical pollutant levels in marine fishes may cause behavioral changes, physiological changes, or genetic damage (Goncalves et al., 2008; Moore, 2008; Pew Oceans Commission, 2003). Bioaccumulation is the net buildup of substances (e.g., chemicals or metals) in an organism from inhabiting a contaminated habitat or from ingesting food or prey containing the contaminated substance (Newman, 1998), or from ingesting the substance directly (Moore, 2008). Biomagnification can also be a concern for fish. Biomagnification occurs when higher trophic organisms (predators) consume many lower trophic organisms that have accumulated toxins, potentially resulting in a higher toxin load for higher trophic organisms. Bioaccumulation and biomagnification of pollutants (e.g., metals and organic pollutants) is also a concern to human health because people consume top predators with high pollutant loads.

#### 3.1.4.1.2 Oil Spills

Groups of fish typically affected by oil spills include surface-oriented or surface dwelling species, nearshore (within 3 NM of the shoreline) species, and species whose spawning time coincided with an oil spill (Yender et al., 2010). Fish can be affected by the oil directly through the gills, or by consuming oil or oiled prey. Potentially harmful physiological effects to fishes from oil spills include reduced growth, enlarged livers, changes to heart and respiration rate, fin erosion, and reproductive impairment. The most damaging effects of oil on fish populations may be in harming eggs and larvae, because these stages are highly sensitive to oil at the surface, in the water column, or on the seafloor, and are subject to increased mortality and morphological deformities and impaired growth (Greer et al., 2012; Ingvarsdottir et al., 2012; National Oceanic and Atmospheric Administration, 2014; Ocean Conservancy, 2010a; Restore the Gulf, 2010). Discharges from ballast water and bilge water during routine ship operations and illegal dumping of solid waste are other sources of oil in the marine environment.

### 3.1.4.2 Commercial and Recreational Activities

Exploitation by commercial and recreational fishing is the single biggest cause of changes in fish populations and communities (Moyle & Cech, 2004). Historic and current overfishing largely contributed to the listing of ESA-protected marine species (Crain et al., 2009; Kappel, 2005). Overfishing of a fishery resource results from both legal and illegal fishing (poaching) and bycatching resources in quantities above a sustainable level. At the end of 2017, 30 managed fish stocks in the U.S. were on the overfishing list and 35 stocks were on the overfished list, while the number of rebuilt fish stocks since 2000 increased to 44 (National Marine Fisheries Service, 2016f, 2018b).

In recent decades, commercial fisheries have targeted the larger, predatory, and sometimes higher-priced fish species. Gradually, this fishing pressure could make the larger species more scarce, and fishing will move towards the smaller species (Pauly & Palomares, 2005). Other factors, such as fisheries-induced evolution and intrinsic vulnerability to overfishing, have been shown to reduce the abundance of some populations (Kauparinen & Merila, 2007). Fisheries-induced evolution is a change in genetic composition of the population that results from intense fishing pressure, such as a reduction in the overall size and growth rates of fishes in a population. Intrinsic vulnerability is when certain life history traits (e.g., large body size, late maturity age, low growth rate, low offspring production) result in a species being more susceptible to overfishing than others (Cheung et al., 2007).

Other threats from commercial industries to fishes include vessel strikes, sea farming, and energy production activities. Large commercial passenger vessels (e.g., cruise liners) pose threats to large, slow-moving open ocean fishes while moving along the sea surface. Species occurring in the Study Area and vulnerable to ship strikes include whale sharks (*Rhincodon typus*), manta rays (*Manta* spp), and ocean sunfish (*Mola mola*) (National Marine Fisheries Service, 2010a; Rowat et al., 2007; Stevens, 2007).

The threats of aquaculture operations on wild fish populations include reduced water quality, competition for food, predation by escaped or released farmed fishes, spread of disease and parasites, and reduced genetic diversity (Kappel, 2005). These threats become apparent when farmed fish escape and enter the natural ecosystem (Hansen & Windsor, 2006; Ormerod, 2003). NOAA (2011) published the Marine Aquaculture Policy which provides direction to enable the development of sustainable marine aquaculture.

Energy production and offshore activities associated with power-generating facilities results in direct and indirect injury and/or mortality of fishes. Injury and mortality sources include entrainment of eggs and larvae during water withdrawal and impingement of juveniles and adults (U.S. Environmental Protection Agency, 2004). Acoustic effects from offshore wind energy development are additional sources of injury and mortality (Madsen et al., 2006).

#### 3.1.4.3 Disease and Parasites

Fishes in poor quality environments have higher incidences of disease, due to increased stress levels and decreased immune system function and are less resilient to fight the disease. Parasites, bacteria, aquaculture conditions, environmental influences, and poor nourishment contribute to fish disease levels (National Oceanic and Atmospheric Administration, 2016a). Disease outbreaks in fishes are influenced by environmental conditions, which typically are more variable in inland waters compared to the open ocean (Snieszko, 1978). Areas with higher density fish populations, such as marine protected areas and fish farms, are at higher risk for disease compared to areas with lower densities (National Oceanic and Atmospheric Administration, 2016b; Wootton et al., 2012). Additionally, introduced species may expose native species to new diseases and parasites.

#### 3.1.4.4 Invasive Species

Native fish populations are affected by invasive (introduced, non-native) species by predation, competition and hybridization (Moyle & Cech, 2004). Non-native fishes pose threats to native fishes when they are introduced into an environment lacking natural predators and then either compete with native marine fishes for resources or prey upon the native marine fishes (Coleman et al., 2014; Crain et al., 2009). Marine invasions by other non-fish species also may affect fish populations. Invasive marine algae have been found to alter the health status of native fishes feeding on the algae, which could affect the reproduction success of those populations (Felline et al., 2012).

#### 3.1.4.5 Marine Debris

Marine debris is a widespread global pollution problem, and trends suggest that accumulations are increasing as plastic production rises (Rochman et al., 2013). Debris includes plastics, metals, rubber, textiles, derelict fishing gear, vessels, and other lost or discarded items. Debris such as abandoned nets and lines also pose a threat to fish. Due to body shape, habitat use, and feeding strategies, some fishes are more susceptible to marine debris entanglement than others (Musick et al., 2000; Ocean Conservancy, 2010b). Entanglement in abandoned commercial and recreational fishing gear has caused declines for some marine fishes.

Microplastics (i.e., plastics less than 5 mm in size) in the marine environment are well documented, and interactions with marine biota, including numerous fish species have been described worldwide (Lusher et al., 2016). Plastic waste in the ocean chemically attracts hydrocarbon pollutants such as PCB and DDT, which accumulate up to one million times more in plastic than in ocean water (Mato et al., 2001). Fish and zooplankton can mistakenly consume these wastes containing elevated levels of toxins instead of their prey. Rochman et al., (2015) found marine debris in 28 percent of the individual fish examined and in 55 percent of all fish species analyzed.

## 3.2 ENDANGERED SPECIES ACT – LISTED SPECIES

ESA-listed fish in the Study Area include oceanic whitetip shark (*Carcharhinus longimanus*), scalloped hammerhead shark (*Sphyrna lewini*), and giant manta ray (*Mobula birostris*).

### 3.2.1 OCEANIC WHITETIP SHARK (*CARCHARHINUS LONGIMANUS*)

#### 3.2.1.1 Status and Management

The oceanic whitetip shark was listed as threatened on January 30, 2018 (83 FR 4153). A comprehensive status review of the oceanic whitetip shark based on the best scientific and commercial information available was completed in 2016 (Young et al., 2016b). Young and Carlson (2020) summarized the biology and conservation information of the oceanic whitetip shark, identified information gaps, and discussed future directions for recovery of this species. In 2023, NMFS published a draft recovery plan which provides detailed information on the oceanic whitetip shark's biology, ecology, status and threats, and conservation efforts, as well as a description of site-specific management actions necessary for the conservation and survival of the species and objective, measurable criteria that, when met, will allow the species to be removed from the endangered and threatened species list (National Marine Fisheries Service, 2023b).

##### 3.2.1.1.1 Critical Habitat

In 2020, NMFS concluded that critical habitat is not determinable because sufficient information is not currently available to assess the effects of designation or regarding physical and biological features essential to the conservation of this species (85 FR 12898). Therefore, there is no designated critical habitat for oceanic whitetip sharks within the MITT Study Area.

##### 3.2.1.1.2 Recovery Goals

NMFS completed a recovery plan for this species with a goal to increase oceanic whitetip shark viability across its range, such that the species can achieve recovery and be removed from the List of Endangered and Threatened Wildlife under the ESA (i.e., delisted) (National Marine Fisheries Service, 2024d). To accomplish this goal, the Recovery Team identified three recovery objectives:

- Ensure the oceanic whitetip shark maintains resiliency and geographic representation, and is a functional component of the ecosystem, by increasing overall abundance to achieve viable populations in all ocean basins.
- Increase oceanic whitetip shark resiliency by managing or eliminating significant anthropogenic threats.
- Ensure the continued viability of the oceanic whitetip shark through the development and effective implementation or regulatory mechanisms for the long-term protection of the species.

#### 3.2.1.2 Habitat and Geographic Range

Oceanic whitetip sharks are found worldwide in warm tropical and subtropical waters between 30° N and 35° S latitude near the surface of the water column (Young et al., 2016a). Oceanic whitetips occur throughout the Central Pacific. This species has a clear preference for open ocean waters, with abundances decreasing with greater proximity to continental shelves. Preferring warm waters near or over 20°C (68°F), and offshore areas, the oceanic whitetip shark is known to undertake seasonal movements to higher latitudes in the summer (National Oceanic and Atmospheric Administration, 2016d) and may regularly survey extreme environments (deep depths, low temperatures) as a foraging strategy (Young et al., 2016a).

Oceanic whitetip sharks are frequently encountered in pelagic longline and seine fisheries; however, they are very uncommon in nearshore waters. The only life stage observed close to shore are pregnant females, but there are no observations from inshore waters (Young et al., 2016a). Based on the animals' known habitat use and life history, occurrence of oceanic whitetip sharks in Apra Harbor or other inshore waters of Guam and other islands within the CNMI is unlikely (Naval Facilities Engineering Command Marianas, 2022a).

#### 3.2.1.3 Population Trends

While the current population size is unknown, the best available information indicates the oceanic whitetip shark has experienced significant declines in abundance throughout its range over at least the last several decades due to overutilization in commercial fisheries resulting in excessive fishing mortality (National Marine Fisheries Service, 2023b).

#### 3.2.1.4 Population Threats

Threats include pelagic longline and drift net fisheries bycatch, targeted fisheries (for the shark fin trade), and destruction or modification of its habitat and range (Baum et al., 2015; Defenders of Wildlife, 2015). Legal and illegal fishing activities have caused significant population declines for the oceanic whitetip shark. It is caught as bycatch in tuna and swordfish longlines throughout its range. Habitat degradation has occurred due to pollutants in the environment that bioaccumulate and biomagnify to high levels in their bodies due to their high position in the food chain, long life, and large size (Defenders of Wildlife, 2015).

As an apex species in the tropical open ocean waters, the oceanic whitetip shark has few natural threats.

### 3.2.2 SCALLOPED HAMMERHEAD SHARK (*SPHYRNA LEWINI*)

#### 3.2.2.1 Status and Management

On July 3, 2014, four of six identified distinct population segments (DPSs) of scalloped hammerhead sharks were listed as endangered or threatened (79 FR 38214). Of these, the Indo-West Pacific DPS is the only one located within the Study Area.

##### 3.2.2.1.1 Critical Habitat

In 2015, NMFS concluded that that there are no marine areas within the jurisdiction of the United States that meet the definition of critical habitat for the Indo-West Pacific DPS of scalloped hammerhead shark (80 FR 71774). In addition, NMFS found that there are no identifiable physical or biological features that are essential to the conservation of the scalloped hammerhead DPSs (80 FR 71774). Therefore, there is no designated critical habitat for scalloped hammerhead sharks in the MITT Study Area.

#### 3.2.2.1.2 Recovery Goals

There is currently no Recovery Plan for scalloped hammerhead sharks.

### 3.2.2.2 Habitat and Geographic Range

The scalloped hammerhead shark is circumglobal, occurring in all temperate to tropical waters (Duncan & Holland, 2006) from the surface to depths of 1,600 ft. (512 m) and possibly deeper (Miller et al., 2014). It typically inhabits nearshore waters of bays and estuaries where water temperatures are at least 22 °C (72°F). The scalloped hammerhead shark remains close to shore during the day and moves to deeper waters at night to feed (Daly-Engel et al., 2012). A genetic marker study suggests that females typically remain close to coastal habitats, while males are more likely to disperse across larger open ocean areas (Daly-Engel et al., 2012).

The earliest confirmed record of a scalloped hammerhead shark in waters off of Guam was in 1968, and confirmed sightings remain rare. These incidental sightings were reported to the Navy by commercial dive professionals during the preparation for the Joint Region Marianas Integrated Natural Resources Management Plan (INRMP) and include reports of scalloped hammerhead sharks (U.S. Department of the Navy, 2019b). These observations show scalloped hammerhead sharks at multiple locations around Guam, including multiple locations within Outer Apra Harbor, Sasa Bay, in the southernmost part of Inner Apra Harbor, along the outer coastline of the Orote Peninsula near the Orote Airfield, the north end of Piti Bay, along Tarague Beach, Pago Bay, and the Ylig River mouth (U.S. Department of the Navy, 2019b). The species information suggests that Sasa Bay in Apra Harbor is a potential nursery area. There is no direct evidence that the site is used as a nursery by scalloped hammerheads, but there are several secondhand accounts of fishermen who accidentally caught young-of-the-year (age >1 year old) hammerheads near Sasa Bay. If used by scalloped hammerheads, it would be reasonable to expect neonates, juveniles, and adult females to occur seasonally (U.S. Department of the Navy, 2019b). They could conceivably use Inner Apra Harbor as habitat, but the amount of human activity and the lack of quality habitat may limit their presence in the area.

Budd et al. (Budd et al., 2021; 2021) detected scalloped hammerhead shark by Environmental DNA (eDNA) survey methods off Guam from a single-day sampling effort. In addition, after a 1.5-year eDNA survey, Budd et al. (2023) revealed the spatial and temporal presence of scalloped hammerhead sharks in Apra Harbor, Guam.

Scalloped hammerhead sharks may dive for prey to depths up to 1,000 m (Anderson et al., 2022). Anderson et al. (2022) also found a female scalloped hammerhead shark dove to a depth of 1,240 m off the Hawaiian Islands, the deepest dive ever recorded for the species.

### 3.2.2.3 Population Trends

The scalloped hammerhead shark has undergone substantial declines throughout its range (Baum et al., 2003). There is some evidence of population increases in some areas of the southeast (Ward-Paige et al., 2012), but because many catch records do not differentiate between the hammerhead species, or shark species in general, population estimates and commercial or recreational fishing landing data are unavailable in the Study Area.

Systematic monitoring of population abundance does not exist for any of the scalloped hammerhead DPSs, so NMFS relies on data from shark deterrent programs, diver and fishermen surveys, and catch per unit effort from fisheries-dependent monitoring (National Marine Fisheries Service, 2020b). Rigby et al. (2019) reported an annual rate of decline of 8.4 percent based on shark bather protection program from 1964 through 2004 in Queensland, Australia. In addition, the shark control program off South Africa indicated a 4.0 percent annual rate of decline from 1978 through (Rigby et al., 2019).

#### 3.2.2.4 Population Threats

The primary threat to the scalloped hammerhead shark is direct take, especially by the foreign commercial shark fin fishery (Miller et al., 2014; National Marine Fisheries Service, 2011b). Scalloped hammerheads are a principal component of the total shark bycatch in the swordfish and tuna longline fishery and are particularly susceptible to overfishing and bycatch in gillnet fisheries because of schooling habits (Food and Agriculture Organization of the United Nations, 2013). Longline mortality for this species is estimated between 91 and 94 percent (National Marine Fisheries Service, 2011b). In addition to the threats outlined in the 2014 status review (Miller et al., 2014), new information indicates that scalloped hammerhead DPSs are exposed to pollutants and contaminants, but the cumulative anthropogenic effects on the species' continued existence are difficult to quantify (National Marine Fisheries Service, 2020b).

Scalloped hammerhead sharks have few predators and few natural threats. However, because this species is found over broad geographic ranges, large-scale effects such as global climate variations that affect ocean temperatures, currents, and potentially food chain dynamics, most likely to pose the greatest natural threat to this species (Miller et al., 2014).

### 3.2.3 GIANT MANTA RAY (*MOBULA BIROSTRIS*)

#### 3.2.3.1 Status and Management

NMFS proposed on January 12, 2017, to list the giant manta ray as a threatened species under ESA (82 FR 3694). Based on the best scientific and commercial information available, including the status review report (Miller & Klimovich, 2016), and after taking into account efforts being made to protect these species, NMFS determined that the giant manta ray is likely to become an endangered species within the foreseeable future throughout a significant portion of its range. On January 22, 2018, NMFS published the Final Rule listing this species as threatened (83 FR 2916).

##### 3.2.3.1.1 Critical Habitat

In 2019, NMFS determined that a designation of critical habitat was not prudent because there are no identifiable physical or biological features that are essential to the conservation of the giant manta ray within areas under U.S. jurisdiction (84 FR 66652). Therefore, there is no designated critical habitat for giant manta rays in the MITT Study Area.

#### 3.2.3.1.2 Recovery Goals

In 2024, NMFS published a Draft Recovery Plan for giant manta rays (National Marine Fisheries Service, 2024b). The Draft Recovery Plan is only one part of a three-part format which provides detailed information on the giant manta ray's biology, ecology, status and threats, and conservation efforts to date, which has typically been included in the background section of a species' recovery plan (National Marine Fisheries Service, 2024c). The Draft Recovery Plan (part two of three parts) focuses on (1) descriptions of site-specific management actions necessary for the conservation and survival of the species (hereafter referred to as recovery actions); (2) objective, measurable criteria that, when met, will allow the species to be removed from the endangered and threatened species list; and (3) estimates of the time and cost to achieve the plan's goals (National Marine Fisheries Service, 2024b).

### 3.2.3.2 Habitat and Geographic Range

Giant manta rays are visitors to productive coastlines with regular upwelling, including oceanic island shores, and offshore pinnacles and seamounts. They utilize sandy bottom habitat and seagrass beds, as well as shallow reefs, and the ocean surface both inshore and offshore. The species ranges globally and is distributed in tropical, subtropical, and temperate waters. Typically they seasonally migrate more than 1,000 kilometers (km) (621.4 miles [mi.]), however not likely across ocean basins (National Oceanic and Atmospheric Administration, 2016c).

No systematic data exists that reports the occurrence of giant manta rays in or near nearshore waters of Guam or the CNMI. During a marine mammal monitoring survey in 2012, a manta ray that was not identified to the species level was observed southwest of the Orote Peninsula, estimated to be a little more than 5 km from shore (HDR EOC, 2012). However, NMFS (2025a) states that this species can exhibit a high degree of plasticity or variation in terms of their use of depths within their habitat. During feeding, giant manta rays may be found aggregating in shallow waters at depths less than 10 m. However, tagging studies have also shown that the species conducts dives of up to 200–450 m and is capable of diving to depths exceeding 1,000 m (National Marine Fisheries Service, 2025a). This diving behavior may be influenced by season and shifts in prey location associated with the thermocline.

### 3.2.3.3 Population Trends

No stock assessments exist for the giant manta ray. Most estimates of subpopulations are based on anecdotal observations by divers and fishermen, with current populations throughout its range estimated between 100 and 1,500 individuals (Miller & Klimovich, 2016). In most regions, giant manta ray population sizes are likely to be small (with recorded individuals <1,000) (National Marine Fisheries Service, 2024b). Although manta rays have been reported to live at least 45 years, not much is known about their growth and development (National Marine Fisheries Service, 2025a). Manta rays have among the lowest fecundity of all elasmobranchs, typically giving birth to only one pup every two to three years (National Marine Fisheries Service, 2025a). Gestation is thought to last around a year. Giant manta rays reach maturity at age 10 and have one pup every two to three years (National Oceanic and Atmospheric Administration, 2016c).

#### 3.2.3.4 Population Threats

The main threats to the giant manta ray are from targeted catch and bycatch in artisanal/small-scale fisheries, inadequate regulatory mechanisms to address targeted fishing and/or bycatch and retention of the species, and illegal retention and enforcement issues (National Marine Fisheries Service, 2024c). These threats occur in a significant portion of the species' range, which comprises the Indian Ocean, Western Pacific Ocean Subregion and Eastern Pacific Ocean Subregion (National Marine Fisheries Service, 2024c). It is important to note that the main driver of these threats is the international gill plate trade supported by the high demand for manta ray gill plates (National Marine Fisheries Service, 2024c). Threats to giant manta rays also include disease and predation. Because of their large size, mantas have few natural predators and only large sharks such as tiger sharks and some hammerhead species are thought to be capable of preying on adult mantas (Manta Trust, 2017).

# 4 MARINE MAMMALS

## 4.1 GENERAL BACKGROUND

Marine mammals are a diverse group of approximately 132 species (Committee on Taxonomy, 2022). Four main types of marine mammals are recognized worldwide: cetaceans (whales, dolphins, and porpoises), pinnipeds (seals, sea lions, and walruses), sirenians (manatees, dugongs, and sea cows), and other marine carnivores (sea otters and polar bears) (Jefferson et al., 2008a; Rice, 1998). However, only 27 species are known to occur in the Study Area, and these include only species of cetaceans.

Cetaceans can be divided into two smaller groups, odontocetes (i.e., toothed whales, dolphins, and porpoises) and mysticetes (i.e., baleen whales), based on their feeding strategy and anatomy. The different feeding strategies affect their distribution and occurrence patterns (Goldbogen et al., 2015). Odontocetes use teeth to capture and consume prey. Baleen whales use a fibrous structure called baleen formed along the upper jaw and made of keratin, a type of protein similar to that found in human fingernails, which enables the whales to filter or extract prey from the water. Baleen whales are batch feeders that use baleen to engulf, suck, or skim large numbers of small prey, such as small schooling fishes, shrimp, or tiny animals called zooplankton from the water or out of ocean floor sediments (Heithaus & Dill, 2008).

All marine mammals in the U.S. waters are protected under the Marine Mammal Protection Act (MMPA), while select species also receive additional protection under the ESA. Within the framework of the MMPA, a marine mammal "stock" is defined as "a group of marine mammals of the same species or smaller taxon (subspecies) in a common spatial arrangement that interbreed when mature" (16 United States Code [U.S.C.] section 1362). Per NMFS guidance, "for purposes of management under the MMPA, a stock is recognized as being a management unit that identifies a demographically independent biological population" (National Marine Fisheries Service, 2016c). However, in practice, recognized management stocks may fall short of this ideal because of a lack of information or, in some cases, stocks may even include multiple species in a management unit. Little is known about the stock structure of most cetaceans in the MITT Study Area, so the results of the analysis of effects from the Proposed Action on marine mammals are at the species level.

The ESA provides for listing species, subspecies, or DPSs of species, all of which are referred to as "species" under the ESA. The Interagency Policy Regarding the Recognition of Distinct Vertebrate Population Segments under the ESA (61 FR 4722, February 7, 1996) defines a DPS as, "any subspecies of fish or wildlife or plants, and any DPS of any species of vertebrate fish or wildlife which interbreeds when mature." If a population meets the criteria to be identified as a DPS, it is eligible for listing under the ESA as a separate species (National Marine Fisheries Service, 2016c). However, MMPA stocks do not necessarily coincide with DPS under the ESA (81 FR 62660–62320, September 8, 2016). While there are no stock designations in the Study Area, NMFS has identified humpback whales occurring in the Study Area as part of the Western North Pacific DPS of humpback whales.

For a comprehensive summary of the general biology and ecology of marine mammals beyond the scope of this section, see Rice (1998), Twiss and Reeves (1999), Hoelzel (2002), Berta et al. (2006), Jefferson et al. (2015), and Perrin et al. (2009b). Additional species profiles and information on biology, life history, distribution, and conservation of marine mammals can also be found through the following organizations:

- NMFS Office of Protected Resources (includes species distribution maps)
- Ocean Biogeographic Information System-Spatial Ecological Analysis of Megavertebrate Populations (known as OBIS-SEAMAP) species profiles
- NOAA Cetacean Density and Distribution Mapping Working Group
- International Whaling Commission
- International Union for Conservation of Nature, Cetacean Specialist Group
- Marine Mammal Commission
- Society for Marine Mammalogy

### 4.1.1 GROUP SIZE

Many species of marine mammals, particularly odontocetes, are highly social animals that spend much of their lives in groups called "pods." The sizes and structures of these pods are dynamic and, based on the species, can range from several to several thousand individuals. Similarly, aggregations of mysticete whales may form during particular breeding or foraging seasons, although they do not persist through time as a social unit. Marine mammals that live or travel in groups are more likely to be detected by observers, and group size characteristics are incorporated into the acoustic effects modeling to represent a more realistic patchy distribution of species density. The behavior exhibited by many species of aggregating into pods is also important for the purposes of mitigation and monitoring, since animals that occur in larger groups have an increased probability of being detected. Information on species group size was reviewed and updated as part of updating density estimates for the Study Area. Refer to the technical report, *Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy's Mariana Islands Training and Testing Study Areas* for species-specific information (Oliveira et al., 2025).

### 4.1.2 HABITAT USE

Marine mammals occur in every marine environment in the Study Area, from coastal and inshore waters to the open ocean. Their distributions are influenced by multiple factors but primarily driven by breeding behaviors and prey distribution. Major ocean currents, bottom relief, water temperature, water depth, and salinity, can all affect prey distribution and are therefore often factors in understanding marine mammal distributions. The continuous movement of water from the ocean bottom to the surface in persistent upwelling zones around the world creates nutrient-rich, highly productive environments for marine mammal prey and are areas where marine mammal densities are typically higher (Jefferson et al., 2015; U.S. Department of the Navy, 2024b). While these factors generally affect the distribution of most marine mammal species, their degree of influence varies by species.

For most cetaceans the distribution, abundance, and quality of prey largely determine where cetaceans occur at any specific time (Heithaus & Dill, 2008). Most of the baleen whales are migratory, but many of the toothed whales do not migrate in the strictest sense. Instead, they undergo seasonal dispersal or shifts in density distribution and occupy habitats preferable for feeding, breeding, and other important behaviors.

An archipelago, a chain or group of islands, like the Mariana Islands, typically has a windward (i.e., the direction facing persistent winds) and a leeward side that can influence the distribution of marine mammals around the archipelago. Some species or individual pods may prefer the sheltered leeward side of islands over the windward side where seas are typically rougher.

The waters around the Mariana Islands have been identified as breeding areas or potential breeding areas for several marine mammal species. Photo-identification data, genetic data, and behavioral observations collected during NMFS Pacific Islands Fisheries Science Center small boat surveys off Saipan and neighboring islands in the Study Area have confirmed that humpback whales are using the Mariana Archipelago as a breeding ground (Hill et al., 2020b). The majority of humpback whale encounters in winter (January to March) small boat surveys were within 18 km of the Saipan shore and around Chalan-Kanoa Reef and Marpi Reef.

While other species have been sighted with calves in the Study Area, data are currently insufficient to identify specific breeding and calving locations for any of these species. For example, the Navy's 2007 survey of the Study Area included several sightings of cow-calf pairs, including Bryde's whale, sperm whale, sei whale, and false killer whale (Fulling et al., 2011a). Both Bryde's whales and sperm whales are expected to be present year-round in the Study Area based on sighting (Hill et al., 2020d) and acoustic (Oleson et al., 2014) data, but information on breeding grounds for these species is not available. During Pacific Islands Fisheries Science Center small boat surveys there were two encounters with dwarf sperm whales off Guam that included the same two cow-calf pairs, but the limited number of sightings of this species does not allow for further confirmation of breeding habitat (Hill et al., 2020d).

Sighting data collected during Pacific Islands Fisheries Science Center large and small boat surveys suggest that many species in the Study Area comprise at least two demographically independent populations, a pelagic population and an island-associated population (Hill et al., 2020d). Current data suggest the potential existence of island-associated populations of spinner dolphins, pantropical spotted dolphins, common bottlenose dolphins, short-finned pilot whales, melon-headed whales, and pygmy killer whales; however, additional data are needed to confirm these population are demographically independent island-associated populations (Hill et al., 2020d).

### 4.1.3 DIVE BEHAVIOR

Most marine mammals spend a considerable portion of their lives underwater while traveling or foraging. Some species of marine mammals have developed specialized adaptations to allow them to make deep dives lasting over an hour, primarily to forage for deep-water prey such as squid. Other species spend the majority of their lives closer to the surface and make relatively shallow, short duration dives. The diving behavior of a particular species or individual has implications for an observer’s ability to detect them for purposes of mitigation and monitoring. In addition, their relative distribution through the water column is an important consideration when conducting acoustic effects and direct strike analyses. Information and data on diving behavior for each marine mammal species were compiled and summarized in a technical report that provides estimates of time at depth based on available research (Oliveira et al., 2025). The dive data compiled in this technical report was incorporated into the Navy acoustic effects modeling.

### 4.1.4 HEARING AND VOCALIZATION

Refer to the *Acoustic and Explosives Concepts Technical Report* for a summary and details regarding the hearing and vocalization of marine mammals.

### 4.1.5 GENERAL THREATS

The growth and productivity of marine mammal populations, stocks, and individuals can be negatively affected by various natural factors and human activities. Direct effects, such as those resulting from disease or activities such as hunting and whale watching, can combine with indirect effects, such as a reduction in prey availability resulting from a large-scale change in the environment (e.g., an El Niño event) or lowered reproductive success of individuals, to affect populations. Nelms et al. (2021) provide a general discussion of current and emerging threats faced by marine mammals and approaches to conservation. General threats to marine mammal populations are summarized for each species in the population threats sections below. A more detailed discussion of general threats to marine mammals was provided in the previous MITT analyses. New research published since 2020 on threats to marine mammals is consistent with information in the previous MITT analyses and does not change the qualitative assessment of general threats on marine mammals described in the previous MITT analyses. Therefore, with one exception, no updates to the descriptions of general threats provided in the 2020 EIS/OEIS are made in this section. The exception is for threats from vessel strike. Information on vessel strikes as a general threat to marine mammals is relevant to the Proposed Action given the potential for vessel strikes from Navy, U.S. Coast Guard, and U.S. Marine Corps vessels in the Study Area, and updates on climate-driven changes in the ocean environment are relevant because of the potential for large-scale effects on most marine mammal species and their distributions and the comprehensive new research published since the 2020 SEIS/OEIS (Frankel et al., 2022; Gulland et al., 2022; Nelms et al., 2021; Sanderson & Alexander, 2020; Santora et al., 2020).

#### 4.1.5.1 Vessel Strike

Vessel strikes are a growing issue for most large marine mammals. Although mortality may be a more significant concern for ESA-listed species, especially those that occupy areas with high levels of vessel traffic, the likelihood of encounter is greater for non-listed species with higher abundances and wider distributions (Currie et al., 2017; Van der Hoop et al., 2013; Van der Hoop et al., 2015). While vessel strikes remain a concern, it is important to note that there have been no vessel strikes on marine mammals from Navy vessels reported in the Study Area.

The reasons that whales are struck by vessels are likely several fold, including vessels approaching at high speeds making avoidance difficult, acoustic shadowing of an approaching vessel (i.e., the vessel body interferes with sound from the propulsion unit propagating forward) reducing alert time, and an increase in the number of vessels over the years transiting the oceans (Winkler et al., 2020). An animal at the surface could be struck directly by a vessel, a surfacing animal could hit the bottom of a vessel, or an animal just below the surface could be cut by a vessel’s propeller. The severity of injuries typically depends on the size and speed of the vessel (Knowlton & Kraus, 2001; Laist et al., 2001; Vanderlaan & Taggart, 2007). Species that spend more time at or near the surface are at greater risk.

An examination of all known ship strikes from all shipping sources (civilian and military) indicates vessel speed is a principal factor in whether a strike results in death (Jensen & Silber, 2003; Knowlton & Kraus, 2001; Laist et al., 2001; Rockwood et al., 2021; Vanderlaan & Taggart, 2007; Winkler et al., 2020). In assessing records in which vessel speed was known, Laist et al. (2001) found a direct relationship between the occurrence of a whale strike and the speed of the vessel involved in the collision. The authors concluded that most deaths occurred when a vessel was traveling more than 13 knots. Jensen and Silber (2003) detailed 292 records of known or probable ship strikes of all large whale species from 1975 to 2002. Of these, vessel speed at the time of collision was reported for 58 cases. Of these cases, 39 (or 67 percent) resulted in serious injury or death. Operating speeds of vessels that struck various species of large whales ranged from 2 to 51 knots. The majority (79 percent) of these strikes occurred at speeds of 13 knots or greater. The average speed that resulted in serious injury or death was 18.6 knots. Pace and Silber (2005) found that the probability of death or serious injury increased rapidly with increasing vessel speed. Specifically, the predicted probability of serious injury or death increased from 45 percent to 75 percent as vessel speed increased from 10 to 14 knots and exceeded 90 percent at 17 knots. Higher speeds during collisions result in greater force of impact, but higher speeds also appear to increase the chance of severe injuries or death by pulling whales toward the vessel. Computer simulation modeling showed that hydrodynamic forces pulling whales toward the vessel hull increase with increasing speed (Clyne et al., 1999; Knowlton et al., 1995; Silber et al., 2010).

#### 4.1.5.2 A Review of Beaked Whale Stranding Information in the Study Area

Stranding is a very high severity response with causes for stranding having natural (old age, disease, pathogens), behavioral (pod cohesion, avoidance, navigation), or anthropogenic (plastic ingestion, sound response, ship strike) influences. Use of mid-frequency sonar has been associated in certain cases with atypical mass strandings of beaked whales in the Mediterranean Sea and Atlantic Ocean (Bernaldo de Quirós et al., 2019; D'Amico et al., 2009; Simonis et al., 2020; West, 2024). Five such stranding events, mostly involving beaked whales, have been attributed to U.S. Navy or NATO active sonar use. However, there have been no strandings within the Pacific Ocean positively attributed to U.S. Navy active sonar use.

Between 2007 and 2019, nine beaked whale strandings were reported in the Mariana Islands, including the three noted above and all but one, in 2011, involved single whales; the 2011 stranding event involved two beaked whales (Center for Naval Analysis, 2020). Sonar use occurred within 72 hours or 80 NM in four of the nine stranding events, meaning that in over half of the events sonar was not in use. Sonar use typically only occurs during brief periods of time and not every day during a joint anti-submarine warfare exercise; joint exercises make up a small fraction of the Navy’s sonar usage in the Study Area. The majority of sonar use is associated with unit-level training and testing activities.

Simonis et al. (2020) used data on beaked whale strandings reported in the Mariana Islands and information on Navy activities using sonar to investigate the temporal relationship between the strandings and sonar use, concluding that the probability that sonar resulted in the strandings was greater than the probability that the occurrences were simply coincidental. A subsequent analysis of the data on sonar use was conducted by the Center for Naval Analysis (Center for Naval Analysis, 2020). The more precise, classified data on sonar use, which was not available to Simonis et al. (2020) (the authors relied on publicly available news releases on Navy exercises), showed that, of the three most recent standing events (March 2016, January 2019, and November 2019), only the events in 2016 and November 2019 coincided with Navy sonar use; however, the evidence did not suggest that the use of sonar caused the standings in those cases.

The confluence of factors that contributed to past strandings is now better understood, and U.S. Navy sonar has not been identified as a causal factor in an atypical mass stranding since 2006. Other high severity responses have not been observed during observations of actual training or testing activities in high use areas of the Pacific, including Southern California, Hawaii, and the Mariana Islands. However, Martín López et al. (2025) investigated the potential for sonar to have a physiological effect leading to changes in diving behavior in some beaked whales that could contribute to stranding.

To further investigate the cause of standings, the Navy began in 2018, and continues to date, to co-fund, along with NMFS, post-mortem analysis of stranded cetaceans in Hawaii and the Mariana Islands. In addition, Marine Corps Base Kaneohe on Oahu provides a no-cost facility for the University of Hawaii laboratory to conduct necropsies and analyses of the data, contributing to a growing body of research highlighting the emergence of new pathogens within Pacific Island odontocetes, including beaked whales (Clifton et al., 2023; Silva-Krott et al., 2025; West et al., 2013; West et al., 2021).

Infectious disease has been reported as a significant pathological finding in 62 percent of cetaceans necropsied in the Pacific Islands between 2006 and 2024 (West et al. In Press).

Beaked whale morbillivirus (BWMV) was first identified from a stranded Longman's beaked whale in Hawaii (West et al., 2013) and, since that time, BWMV has been identified from archived Hawaiian stranding samples (Jacob et al., 2016; West et al., 2015). This research contributed to new methodology for global surveillance of morbillivirus (Yang et al., 2016; Lattao et al. In Revision) conducted whole genome sequencing of BWMV (Landrau-Giovannetti et al., 2020). The researchers have more recently discovered Fraser's dolphin morbillivirus (FDMV), another novel strain, including detection of FDMV in a 1:1000 fecal dilution, which has implications for live health monitoring (West et al., 2021; West et al., 2024).

On a global scale, the first cetacean circovirus was identified in a stranded Hawaiian whale (Landrau-Giovannetti et al., 2020) and Navy-funded research has since detected circovirus in archival tissues from 10 additional species previously stranded in Hawaii, Saipan, and American Samoa (Clifton et al., 2023). Additionally, novel cetacean herpes virus from this region has been identified (West et al., 2013; Waltzek, unpublished data). This research has included reports of other pathogens that threaten Pacific Islands cetaceans, including the fungal disease *Cryptococcus gatti* in a spinner dolphin (Rotstein et al., 2010) and the discovery of lobomycosis like disease for the first time in the central Pacific (West et al., In Press). *Brucella* cases include a neonate sperm whale co-infected with morbillivirus (West et al., 2015) and the identification of a high susceptibility to *Brucella* among pygmy killer whales and striped dolphins (Silva-Krott et al., 2025). Fatal disseminated toxoplasmosis has caused the death of a bottlenose dolphin and three stranded spinner dolphins that researchers project to represent at least 60 spinner dolphin deaths (Landrau-Giovannetti et al., 2022; West et al., In Press). Therefore, the significant of cetacean diseases in the region should factor into any stranding investigation, including beaked whale strandings.

The Navy does not anticipate that marine mammal strandings or mortality will result from the operation of sonar during training and testing activities in the Study Area. Through adaptive management developed during consultations under the MMPA, NMFS and the Navy will determine the appropriate way to proceed if a causal relationship were to be found between Navy activities and a future stranding.

## 4.2 ENDANGERED SPECIES ACT – LISTED SPECIES

There are five marine mammal species occurring in the Study Area that are listed under the ESA and all five are listed as endangered.

### 4.2.1 BLUE WHALE (BALAENOPTERA MUSCULUS)

#### 4.2.1.1 Status and Management

The blue whale is listed as endangered under the ESA and as depleted under the MMPA throughout its range. A single stock of blue whales is recognized by the International Whaling Commission (IWC) in the North Pacific Ocean. NMFS currently recognizes two stocks of blue whales in the North Pacific: an Eastern North Pacific stock and a Central North Pacific stock (Carretta et al., 2023). Little is known about the stock structure of blue whales in the MITT Study Area but, given the two currently recognized NMFS stocks, blue whales in the MITT Study Area would likely belong to the Central North Pacific stock.

#### 4.2.1.1.1 Critical Habitat

There is no designated critical habitat for blue whales.

#### 4.2.1.1.2 Recovery Goals

In response to the current threats facing the species, in 1998 NMFS developed goals to recover blue whale populations. The November 2020 Revised Recovery Plan (National Marine Fisheries Service, 2020a) for the blue whale provides the complete down-listing/delisting criteria to accomplish the recovery goal. The goal of the Revised Recovery Plan is to promote recovery of blue whales to a level at which it becomes appropriate to downlist the species from endangered to threatened status, and ultimately to delist, or remove the species from the list of Endangered and Threatened Wildlife and Plants, under the provisions of the ESA. The plan outlines the recovery actions to accomplish this goal as follows:

- Coordinate federal and international measures to maintain international regulation of whaling for blue whales.
- Determine blue whale taxonomy, population structure, occurrence, distribution, and range.
- Estimate population size and monitor trends in abundance.
- Identify, characterize, protect, and monitor habitat important to blue whale populations.
- Investigate human-caused potential threats and, should they be determined to limit blue whale recovery, take steps to minimize their occurrence and severity.
- Maximize efforts to acquire scientific information from dead, stranded, and entangled or entrapped blue whales.

#### 4.2.1.2 Habitat and Geographic Range

Blue whales inhabit all oceans and typically occur near the coast, over the continental shelf, although they are also found in oceanic waters having been sighted, acoustically recorded, and satellite tagged in the eastern tropical Pacific (Ferguson, 2005; Stafford et al., 2004). Blue whales belonging to the Central Pacific Stock feed in summer in the Pacific south of the Aleutian Islands and in the Gulf of Alaska, and then migrate to lower latitudes in the winter (Carretta et al., 2024).

There are no recent sighting records for blue whales in the Study Area (Fulling et al., 2011a; Hill et al., 2017; Hill et al., 2019; Hill et al., 2018d; Uyeyama, 2014), although this area is in the distribution range for this species (Reilly et al., 2008a). Blue whales were positively identified acoustically by high-frequency acoustic recording packages (HARPs) deployed at both Saipan and Tinian from 2010–2013 (Oleson et al., 2015). Blue whales are likely absent from low-productivity tropical waters in the summer (Jefferson et al., 2008b; Perrin et al., 2009a) and would be most likely to occur in the Study Area during the winter.

#### 4.2.1.3 Population Trends

Widespread whaling over the last century is believed to have decreased the global blue whale population to approximately 1 percent of its pre-whaling population size (Branch, 2007; Monnahan, 2013a; Monnahan et al., 2014; Rocha et al., 2014; Širović et al., 2004). Following the cessation of commercial whaling in 1971, the North Pacific population of blue whales may have recovered and since the 1990s has been at a stable level despite the effects of ship strikes, interactions with fishing gear, and increased levels of ambient sound in the Pacific Ocean (Campbell et al., 2015; Carretta et al., 2018; Carretta et al., 2017a; International Whaling Commission, 2016; Monnahan, 2013b; Monnahan et al., 2015; Monnahan et al., 2014; National Marine Fisheries Service, 2018a; Rockwood et al., 2017; Širović et al., 2015; Valdivia et al., 2019). For the portion of the population present in the eastern Pacific, findings have suggested that the population is now near the environment's carrying capacity and that the rate of change of the population size has declined as a result (Carretta et al., 2018; International Whaling Commission, 2016; Monnahan et al., 2015; Monnahan et al., 2014). There are no blue whale abundance or trend data specific to the MITT Study Area.

#### 4.2.1.4 Population Threats

Blue whales are susceptible to entanglement in fishing gear and ship strikes. Available data from NMFS indicate that in waters off the U.S. West coast between 2007 and 2011, 10 blue whales died from vessel strikes (Carretta et al., 2016a; Carretta et al., 2013). Other human-related threats include pollution exposure, increased noise (e.g., vessel noise), and ingestion or other interaction with marine debris (National Marine Fisheries Service, 2016b).

Natural population threats to blue whales include general threats of disease, parasites, and reduced prey availability, and predator attacks, particularly by killer whales. A total of 25 percent of photo-identified whales in the Gulf of California carry rake scars from killer whale attacks (Jefferson et al., 2008a; Pitman et al., 2007; Sears & Perrin, 2008). Potential changes to oceanographic conditions that drive the distribution of planktonic prey are also a potential threat to blue whale populations (Palacios et al., 2019; Szesciorka et al., 2020).

### 4.2.2 FIN WHALE (BALAENOPTERA PHYSALUS)

#### 4.2.2.1 Status and Management

The fin whale is listed as endangered under the ESA and as depleted under the MMPA throughout its range. In the North Pacific Ocean, the IWC recognizes two stocks of fin whale, an East China Sea stock and a stock that includes the rest of the North Pacific. NMFS recognizes three stocks of fin whales in U.S. Pacific waters: the Northeast Pacific stock, the California/Oregon/Washington stock, and the Hawaii stock (Carretta et al., 2023). Little is known about the stock structure of fin whales in the MITT Study Area.

##### 4.2.2.1.1 Critical Habitat

There is no designated critical habitat for fin whales.

##### 4.2.2.1.2 Recovery Goals

In response to the threats facing the species, NMFS developed goals to recover fin whale populations. The 2010 Final Recovery Plan (National Marine Fisheries Service, 2010b) for the fin whale provides complete downlisting/delisting criteria for both of the following recovery objectives (1) Achieve sufficient and viable population in all ocean basins, and (2) Ensure significant threats are addressed. To accomplish these objectives, the plan outlines the recovery actions as follows:

- Coordinate state, federal, and international actions to implement recovery actions and maintain international regulation of whaling for fin whales.
- Determine population discreteness and population structure of fin whales.
- Develop and apply methods to estimate population size and monitor trends in abundance.
- Conduct risk analysis.
- Identify, characterize, protect, and monitor habitat important to fin whale populations in U.S. waters and elsewhere.
- Investigating causes and reduces the frequency and severity of human-caused injury and mortality.
- Determine and minimize any detrimental effects of anthropogenic noise in the oceans.
- Maximize efforts to acquire scientific information from dead, stranded, and entangled or entrapped fin whales.
- Develop post-delisting monitoring plan.

#### 4.2.2.2 Habitat and Geographic Range

The fin whale is found in all the world’s oceans and is the second largest species of whale (Jefferson et al., 2015). Fin whales prefer temperate and polar waters and are scarcely seen in warm, tropical waters (Reeves et al., 2002). Fin whales are typically not expected south of 20°N during summer and are not likely to occur near Guam (Edwards et al., 2015; Miyashita et al., 1996). Miyashita et al. (1996) presented a compilation of at-sea sighting results from commercial fisheries vessels in the Pacific Ocean from 1964 to 1990. For fin whales in August, Miyashita et al. (1996) reported no sightings south of 20°N, and significantly more sightings north of 40°N. However, they also showed limited search effort south of 20°N.

There are no sighting records for fin whales in the Study Area (Fulling et al., 2011a; Hill et al., 2017; Hill et al., 2019; Hill et al., 2018d; Oleson et al., 2015; Uyeyama, 2014). During systematic surveys in the eastern tropical Pacific from 1986 to 2005, there were far fewer sightings of fin whales than blue whales south of 30°N (Hamilton et al., 2009a). However, fin whales were positively identified acoustically in April and May by HARPs deployed at both Saipan and Tinian for 2010–2013 (Oleson et al., 2014). Fin whale vocalizations were also detected in January 2010 in the Transit Corridor between Hawaii and Guam (Oleson & Hill, 2010a). Fin whales are likely absent from low-productivity tropical waters in the summer (Jefferson et al., 2008b; Perrin et al., 2009a).

#### 4.2.2.3 Population Trends

There are no fin whale abundance or trend data specific to the MITT Study Area.

#### 4.2.2.4 Population Threats

Fin whales are susceptible to both ship strikes and entanglement in fishing gear (Carretta, 2022). Available data from NMFS indicate that, along the U.S. west coast from 2010 to 2014, 9 ship strikes with fin whales were reported (Carretta et al., 2016a). The most recent NMFS data from 2016 through 2020 reported the serious injury or mortality of 6 fin whales, with five deaths from ship strikes and one serious injury from entanglement with fishing gear (Carretta, 2022).

Natural population threats to fin whales include disease, parasites, reduced prey availability, and predator attacks. In regions where killer whales are abundant, some fin whales exhibit attack scars on their flippers, flukes, and flanks suggesting predation by killer whales (Aguilar, 2009).

### 4.2.3 HUMPBACK WHALE (*MEGAPTERA NOVAEANGLIAE*)

#### 4.2.3.1 Status and Management

Humpback whales occur worldwide, with separate subspecies recognized for the North Pacific (*Megaptera novaeangliae kuzira*), the Atlantic (*M. n. novaeangliae*), and the Southern Hemisphere (*M. n. australis*). In all oceans, humpback whales are known to migrate seasonally from high latitude subarctic and temperate areas in the summer to low latitude subtropical and tropical areas in the winter (Barlow et al., 2011; Carretta et al., 2023). NMFS has identified 14 DPSs of humpback whales worldwide, with 4 DPSs occurring in the North Pacific (Carretta et al., 2023). Humpback whales that occur in the MITT Study Area are from the Western North Pacific DPS. The three previously defined stocks of North Pacific humpback whales did not align with the DPS structure, so NMFS reevaluated the stock structure to incorporate both the locations of foraging and overwintering areas and population demographics. As a result, NMFS defined five stocks in the North Pacific:

1. Central America/Southern Mexico-California-Oregon-Washington stock
2. Mainland Mexico-California-Oregon-Washington stock
3. Mexico-North Pacific stock
4. Hawaii stock
5. Western North Pacific stock

The Western North Pacific stock is currently recognized as a single stock, although based on movement and genetic data the stock comprises two units: (1) Philippines/Okinawa-Northern Pacific unit and (2) the Mariana Islands/Ogasawara-Northern Pacific unit (Oleson et al., 2022). Whales in the Philippines/Okinawa-Northern Pacific unit winter near the Philippines and in the Ryukyu Archipelago and migrate to summer feeding areas primarily off the Russian mainland. Whales in the Mariana Islands/Ogasawara-Northern Pacific unit winter off the Mariana Archipelago, Ogasawara, and other areas not yet identified and then migrate to summer feeding areas off the Commander Islands, the Bering Sea and Aleutian Islands (Oleson et al., 2022).

Humpback whales in the Mariana Islands/Ogasawara-Northern Pacific unit of the Western North Pacific stock occur seasonally (mainly winter) in the MITT Study Area (Bettridge et al., 2015a; Carretta et al., 2023; National Marine Fisheries Service, 2016d; Young, 2023) and migrate to summer foraging areas off Russia and the Aleutian Islands/Bering Sea (Figure 5). For additional information on the revised stock and DPS structure and population dynamics refer to Martien et al. (2023), Wade (2021), Martien et al. (2021) and Martien et al. (2019).

Humpback whales from the Western North Pacific DPS are listed as endangered under the ESA (National Marine Fisheries Service, 2016a). As part of the Western North Pacific Stock, the population is considered depleted under the MMPA (Muto et al., 2017; Muto et al., 2018; Muto et al., 2019).

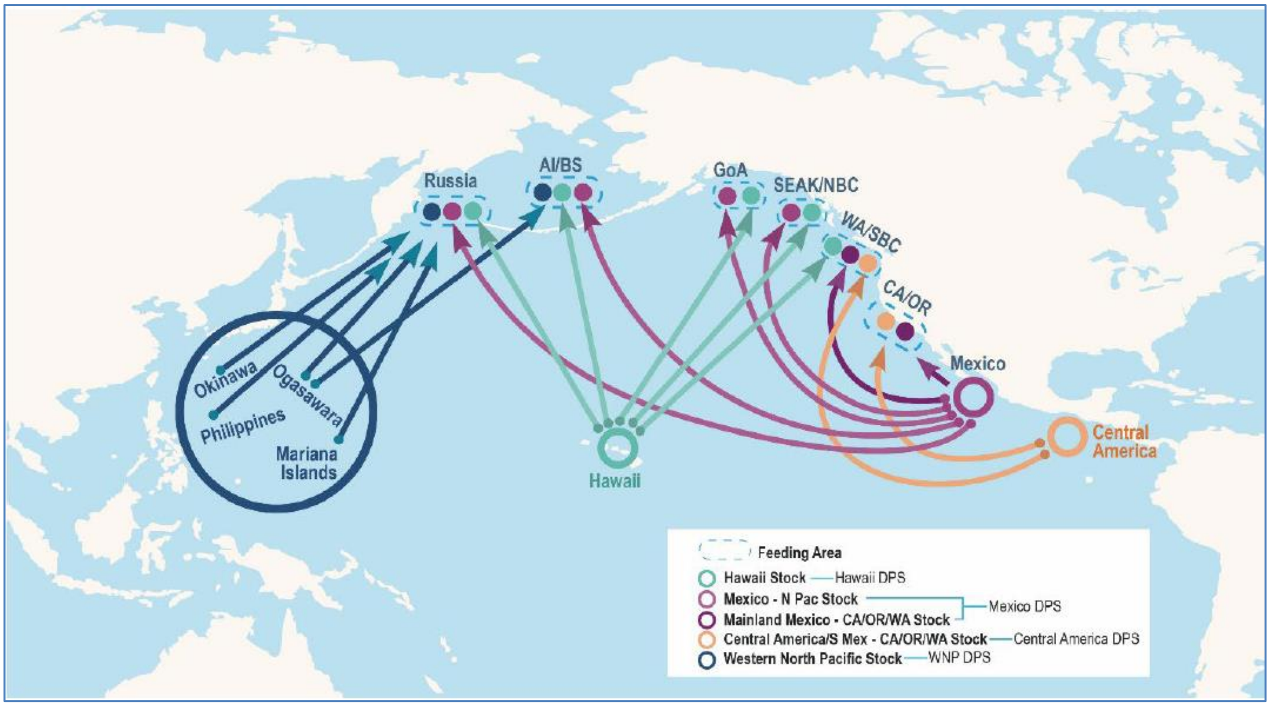
##### 4.2.3.1.1 Critical Habitat

There has been no critical habitat designated for the humpback whale Western North Pacific DPS.

##### 4.2.3.1.2 Recovery Goals

In response to the threats facing the species, NMFS developed goals to recover humpback whale populations. The 1991 Final Recovery Plan (National Marine Fisheries Service, 1991) for the humpback whale provides the complete down listing/delisting criteria for each of the four following recovery goals:

1. Maintain and enhance habitats used by humpback whales currently or historically.
2. Identify and reduce direct human-related injury and mortality.
3. Measure and monitor key population parameters.
4. Improve administration and coordination of recovery program for humpback whales.



*Notes: AI/BS = Aleutian Islands/Bering Sea, GoA = Gulf of Alaska, SEAK/NBC = Southeast Alaska/Northern British Columbia, WA/SBC = Washington/Southern British Columbia, CA/OR = California Oregon. Source: Carretta et al. (2023)*

**Figure 5: Humpback Whale Stocks and DPSs Defined in the North Pacific. Whales From the Western North Pacific Stock and DPS Occur Seasonally in the Study Area.**

#### 4.2.3.2 Habitat and Geographic Range

Humpback whales are distributed worldwide in all major oceans and most seas (Bettridge et al., 2015a; National Marine Fisheries Service, 2016a). They typically are found during the summer in high latitude feeding grounds, including Russia, Alaska and British Columbia, and during the winter migrate to breeding areas off Hawaii, Mexico, Central America, and Okinawa where breeding and calving occurs. Humpback migrations are thus complex and cover great distances (Bettridge et al., 2015a; Calambokidis et al., 2009; Calambokidis et al., 2008a). Recently, researchers have confirmed that humpback whales use the Mariana Islands as a winter breeding and calving area (Hill et al., 2016a; Hill et al., 2020c; Hill et al., 2019; Hill et al., 2018d; National Oceanic and Atmospheric Administration, 2018).

The Western North Pacific DPS is based on a known breeding group of individuals found off Okinawa and Ogasawara Islands (approximately 1,230 NM north of Guam) in Japan waters and in Philippine waters (approximately 1,350 NM west of Guam), as identified by photographic identification of individuals (Calambokidis et al., 2008b; Calambokidis et al., 2010), in addition to an “unknown breeding group” from a location in the western North Pacific that remained unidentified until recently (National Oceanic and Atmospheric Administration, 2018). Humpback whales found off Okinawa, Ogasawara, the Philippines, and the unknown area were combined to form the Western North Pacific population (Bettridge et al., 2015b). This "unknown area" corresponds to the historical range for the western North Pacific that included waters extending from the South China Sea east through the Philippines, the Ryukyu Islands, Mariana Islands, and Marshall Islands and from there, north to the Arctic (Muto et al., 2017; Muto et al., 2018; Muto et al., 2019; Rice, 1998).

Information on the occurrence and distribution of humpback whales in the MITT Study Area has substantially increased over the last 20 years. Prior to the Navy-funded 2007 line-transect survey, humpback whales had been sighted during the Navy's routine aerial surveys of FDM on several occasions, including two sightings in 2006 (January and March), both close to the island, and another sighting in February 2007, 18 mi. (29 km) north of Saipan (Vogt, 2008). During the 2007 systematic ship survey (January–April 2007), there was only one humpback whale sighting, but there were numerous acoustic detections (Fulling et al., 2011a). These observations indicated that there could be a small wintering population of humpback whales in the MITT Study Area. Humpback whales were also positively identified acoustically by HARPs deployed at both Saipan and Tinian for 2010–2013 (Oleson et al., 2014). There were no humpback whales sighted during three systematic Pacific Islands Fisheries Science center (PIFSC) line-transect surveys in 2015, 2018, and 2021, but this is not surprising given that humpbacks are expected to occur in these waters from approximately December to April, and the surveys were conducted in the May to July time frame (Hill et al., 2020d).

During the winter months (January to March) of 2015 to 2020, PIFSC conducted small boat surveys for humpback whales off Saipan and neighboring islands in the Mariana Archipelago (Deakos et al., 2021; Hill et al., 2020a). From 2015 through 2019, a total of 14 calves and 42 percent of preferred suitable habitat. None of the other islands or offshore reefs comprise more than 7 percent of the suitable breeding habitat for humpback whales in the Mariana Archipelago. The habitat in each shallow-water area differs; for example, a large, shallow plateau surrounds FDM which defines the suitable habitat in that location, whereas the habitat area off Guam is represented as a narrow band adjacent to and surrounding the island (Deakos et al., 2021).

Based on the results of the small boat surveys, the Navy established two geographic mitigation areas off Saipan to in part reduce or avoid impacts on humpback whale breeding behavior from the use of sonars and explosives. Data and information supporting the development of the mitigation areas are provided in Appendix I (Geographic Mitigation Assessment) of the 2020 SEIS/OEIS.

#### 4.2.3.3 Population Trends

Between 1948 and 1979, Soviet Union commercial whaling alone took 7,344 humpback whales from the North Pacific (Ilyashenko & Chapham, 2014). It is therefore likely that humpback whales in the western North Pacific are still recovering and will remain rare in parts of their former range.

Based on photographic identifications off Okinawa and Ogasawara gathered previously and conclusions reached in 2008 (Calambokidis et al., 2008b), the abundance of humpback whales in the Western North Pacific population was estimated to be approximately 1,000 individuals (Bettridge et al., 2015b; Muto et al., 2017). From that same data set, the growth rate of the

Western North Pacific DPS was estimated to be 6.9 percent (Bettridge et al., 2015b; Calambokidis et al., 2008b). This can be viewed in context of the North Pacific population, which has been increasing at a rate of between 5.5 percent and 6.0 percent per year, approximately doubling every 10 years (Bettridge et al., 2015b; Muto et al., 2017; Wade et al., 2016). The inclusion of more recent data from photographic identifications off Okinawa has documented the presence of at least 1,402 unique individuals in the Western North Pacific DPS (Kobayashi et al., 2016). The NMFS Alaska Final 2023 Stock Assessment Report provides a population estimate for humpbacks in "Asia" of 1,084 that did not include samples from the Mariana Islands, so this is likely an underestimate of the Western North Pacific Stock's true abundance (Wade, 2021; Young, 2024).

Mark-recapture analyses of photo-identification data collected during PIFSC small boat surveys were used to derive preliminary abundance estimates for humpback whales off Saipan and neighboring islands in the Mariana Archipelago (Hill et al., 2020d). Based on this analysis, yearly abundance ranged from 34 (coefficient of variation [CV] = 0.56) in 2019 to 126 (CV = 0.35) in 2017, with an average of 61 whales (CV=0.21) over the five years when data were collected (2015 to 2019). These estimates reflect the high-use areas identified in the shallow waters off these islands, but do not represent all whales potentially occurring within the MITT Study Area.

#### 4.2.3.4 Population Threats

Humpback whales are susceptible to entanglement in fishing gear, ship strikes, and marine debris (Young, 2024). Pot and trap fishery entanglements are the most-common source of injury to humpback whales along the U.S. west coast (Carretta et al., 2022). Humpback whales have also been reported seriously injured and killed from entanglement in fishing gear while in their Alaskan feeding grounds (Helker et al., 2017). To derive a minimum estimate of mortality and serious injury for the Western North Pacific stock, numbers were prorated using the mean estimates of the summering to wintering area movement probabilities (Wade, 2021). Between 2016 and 2020, the minimum estimated mean annual level of human-caused mortality and serious injury for the Western North Pacific stock of humpback whales was 5.82 whales: 0.012 in U.S. commercial fisheries, 5.8 in non-U.S. commercial fisheries, 0.001 in unknown (commercial, recreational, or subsistence) fisheries, 0.005 in marine debris, and 0.004 due to other causes (intentional unauthorized removal, vessel strikes and intentional unauthorized take) (Young, 2024).

Natural population threats to humpback whales include disease, parasites, reduced prey availability, and predator attacks, particularly by both killer whales and false killer whales. Humpback whales observed on the feeding grounds off Washington and California had the one of the highest rates of rake marks of any of the feeding grounds observed (Steiger et al., 2008).

### 4.2.4 SEI WHALE (BALAENOPTERA BOREALIS)

#### 4.2.4.1 Status and Management

The sei whale is listed as endangered under the ESA and as depleted under the MMPA throughout its range. A single stock of sei whales is recognized by the IWC in the North Pacific Ocean. NMFS recognizes three stocks of sei whales within the U.S. Pacific EEZ: (1) the Hawaii stock, (2) the California/Oregon/Washington stock, and (3) the Alaska stock (Carretta et al., 2023). Little is known about the stock structure of sei whales in the MITT Study Area.

#### 4.2.4.1.1 Critical Habitat

There has been no critical habitat designated for the sei whale.

#### 4.2.4.1.2 Recovery Goals

In response to the threats facing the species, NMFS developed goals to recover sei whale populations. The 2011 Final Sei Whale Recovery Plan (National Marine Fisheries Service, 2011a) provides the complete downlisting/delisting criteria for both of the following objectives, (1) Achieve sufficient and viable populations in all ocean basins, and (2) Ensure significant threats are addressed. The plan outlines the following recovery actions to accomplish these objectives:

- Coordinate state, federal, and international actions to implement recovery actions and maintain international regulations of whaling for sei whales.
- Develop and apply methods to collect sei whale data.
- Support existing studies to investigate population discreteness and population structure of sei whales using genetic analyses.
- Continue to collect data on “unknown” threats to sei whales.
- Maximize efforts to acquire scientific information from dead, stranded, and entangled sei whales.
- Estimate population size and monitor trends in abundance.
- Initiate new studies to determine population discreteness and population structure of sei whales.

### 4.2.4.2 Habitat and Geographic Range

Sei whales have a worldwide distribution and are found primarily in cold temperate to subpolar latitudes. Although sei whales have been observed south of 20° N in the winter (Fulling et al., 2011b; Horwood, 2009; Horwood, 1987), they are considered absent or at very low densities in most equatorial areas. Sei whales are typically found in the open ocean and are rarely observed near the coast (Horwood, 2009). Whaling data provide some evidence of differential migration patterns by reproductive class, with females arriving at and departing from feeding areas earlier than males (Horwood, 1987; Perry et al., 1999). Although there appears to be some seasonal movement between higher latitude summer feeding areas and lower latitude winter calving areas, these movements are not as extensive as those of many other baleen whale species (Jefferson et al., 2015).

Sei whales were considered extralimital in the MITT Study Area until the Navy’s 2007 systematic survey, when sei whales were sighted on 16 separate occasions (Fulling et al., 2011a). There were no sei whales sighted during three systematic PIFSC line-transect surveys in 2015, 2018, and 2021, but this is not surprising given that sei whales are likely absent from low-productivity tropical waters in the summer (Jefferson et al., 2008b; Perrin et al., 2009a), and the PIFSC surveys were conducted in the May to July time frame (Hill et al., 2020d).

#### 4.2.4.3 Population Trends

Data from the Navy's 2007 systematic survey were used to derive an abundance estimate for sei whale of 166 whales (CV = 0.49) in waters of Guam and the CNMI (Fulling et al., 2011a). No data are available on current population trends for sei whales in the MITT Study Area.

#### 4.2.4.4 Population Threats

Sei whales are likely susceptible to entanglement in fishing gear and ship strikes. Based on the discovery of a sei whale entangled in rope and fishing gear in Hawaii that presumably came from Alaska (Bradford & Lyman, 2015), sei whales may be subject to entanglement from fishery activity taking place in the western Pacific, including the MITT Study Area. Based on the statistics of other large whales along the U.S. Pacific coast and Alaska (Carretta et al., 2019a; Helker et al., 2019), it is likely that ship strikes also pose a threat to sei whales in the MITT Study Area from commercial vessels transiting that area.

Natural population threats to sei whales include disease, parasites, reduced prey availability, and predator attacks, particularly by killer whales.

### 4.2.5 SPERM WHALE (PHYSETER MACROCEPHALUS)

#### 4.2.5.1 Status and Management

The sperm whale is listed as endangered under the ESA and as depleted under the MMPA throughout its range. The IWC historically has recognized two stocks of sperm whale in the North Pacific, divided into eastern and western regions defined by a zig-zag line which starts at 150°W at the equator, is 160°W between 40-50°N, and ends up at 180°W north of 50° (Carretta et al., 2023). NMFS recognizes three stocks of sperm whale in the U.S. North Pacific: the California/Oregon/Washington stock, the Hawaii stock, and the Alaska stock (Carretta et al., 2023). Although little is known about the stock structure of sperm whales in the MITT Study Area, the species would presumably be included in the IWC western North Pacific management unit.

##### 4.2.5.1.1 Critical Habitat

There has been no critical habitat designated for the sperm whale in the North Pacific.

##### 4.2.5.1.2 Recovery Goals

In response to the threats facing the species, NMFS developed goals to recover sperm whale populations. The 2010 Final Sperm Whale Recovery Plan (National Marine Fisheries Service, 2010c) provides the complete downlisting/delisting criteria. The two main objectives for sperm whale recovery are to (1) achieve sufficient and viable populations in all ocean basins, and (2) ensure significant threats are addressed. The plan outlines the following recovery actions to accomplish these objectives:

- Coordinate state, federal, and international actions to implement recovery actions and maintain international regulation of whaling for sperm whales.

- Develop and apply methods to estimate population size and monitor trends in abundance.
- Determine population discreteness and population structure of sperm whales.
- Conduct Risk Analyses.
- Identify, characterize, protect, and monitor habitat important to sperm whale populations in U.S. waters and elsewhere.
- Investigate causes of and reduce the frequency and severity of human-caused injury and mortality.
- Determine and minimize any detrimental effects of anthropogenic noise in the oceans.
- Maximize efforts to acquire scientific information from dead, stranded, and entangled sperm whales.
- Develop post-delisting monitoring plan.

#### 4.2.5.2 Habitat and Geographic Range

The sperm whale is one of the most widely distributed cetacean species. This species is primarily found in the temperate and tropical waters of the Pacific (Rice, 1989), with a secondary range that includes areas at latitudes higher than 50 degrees in the North Pacific (Jefferson et al., 2015; Whitehead, 2009; Whitehead et al., 2008; Whitehead & Weilgart, 2000). This species appears to have a preference for deep waters (Baird et al., 2013; Jefferson et al., 2015). Typically, sperm whale concentrations correlate with areas of high productivity. These areas are generally near drop offs and areas with strong currents and steep topography (Gannier & Praca, 2007; Jefferson et al., 2015).

Sperm whales are somewhat migratory. General shifts occur during summer months for feeding and breeding, while in some tropical areas, sperm whales appear to be largely resident (Rice, 1989; Whitehead, 2003, 2009; Whitehead et al., 2008). Pods of females with calves remain on breeding grounds throughout the year, between 40° N and 45° N (Rice, 1989; Whitehead, 2003), while males migrate between low-latitude breeding areas and higher-latitude feeding grounds (Pierce et al., 2007). In the northern hemisphere, "bachelor" groups (males typically 15 to 21 years old and bulls [males] not taking part in reproduction) generally leave warm waters at the beginning of summer and migrate to feeding grounds that may extend as far north as the perimeter of the arctic zone. In fall and winter, most return south, although some may remain in the colder northern waters during most of the year (Pierce et al., 2007).

Whaling records indicated that sperm whales occur year-round in the MITT Study Area (Townsend, 1935). Sperm whales positively identified acoustically by HARPs deployed at both Saipan and Tinian for 2010–2013 also revealed year-round occurrence (Oleson et al., 2014). No clear seasonal pattern was evident from the recordings, although they may be more common from January to March. The sperm whale was the most-frequently sighted cetacean (21 sightings) during the Navy's 2007 survey, with acoustic detections three times higher than visual detections (Fulling et al., 2011a). During three subsequent PIFSC line transect surveys, there were 3 on-effort sightings in 2015, a single on-effort sighting in 2018, and 15 on-effort sightings in 2021 (Hill et al., 2020d).

#### 4.2.5.3 Population Trends

Sighting data collected during the PIFSC line transect surveys allowed for the derivation of an updated abundance estimate of 1,574 (CV = 0.79) sperm whales for waters of Guam and the Commonwealth of the Northern Mariana Islands (Bradford et al., In Prep.). Current data are not sufficient to assess a population trend for the population of sperm whales that occur in the MITT Study Area.

#### 4.2.5.4 Population Threats

Sperm whales are susceptible to entanglement in fishing gear and ship strikes. Sperm whales in the Pacific have been documented as susceptible to entanglement and other interactions with fishing gear (Bradford & Lyman, 2015; Carretta et al., 2016b; Carretta et al., 2017a; Helker et al., 2017). Sperm whales have also been documented as having ingested marine debris, resulting in mortality (Garibaldi & Podesta, 2014; Jacobsen et al., 2010), and as with almost all marine mammals, are susceptible to disease (West et al., 2015).

Natural population threats to sperm whales include disease, parasites, reduced prey availability, and predator attacks and harassment, particularly by killer whales, false killer whales, and pilot whales.

## 4.3 SPECIES NOT LISTED UNDER THE ENDANGERED SPECIES ACT

### 4.3.1 BRYDE'S WHALE (*BALAENOPTERA EDENI*)

#### 4.3.1.1 Status and Management

The IWC recognizes four stocks of Bryde's whales in the North Pacific (eastern, western, East China Sea, and Gulf of California). NMFS recognizes two stocks of Bryde's whales in the U.S. Pacific, the Eastern Tropical Pacific stock (whales found east of 150° W, including the Gulf of California and waters off California) and the Hawaii stock (Carretta et al., 2023). Little is known about the stock structure of Bryde's whales in the MITT Study Area.

#### 4.3.1.2 Habitat and Geographic Range

Bryde's whales occur primarily in offshore oceanic waters of the North Pacific (Hamilton et al., 2009b; Jefferson et al., 2015). They typically do not move poleward of 40 degrees in either hemisphere and tend to occur primarily in tropical and subtropical zones, where water temperatures are relatively warm (Jefferson et al., 2015). Data suggest that winter and summer grounds partially overlap in the central north Pacific (Murase et al., 2015; Ohizumi et al., 2002). Long migrations are not typical of Bryde's whales, although limited shifts in distribution toward and away from the equator, in winter and summer, have been observed (Best, 1996; Cummings, 1985).

Bryde's whales were identified 18 times during the Navy's 2007 survey of the MITT Study Area, with the majority of encounters in areas of steep bathymetric relief including the West Mariana Ridge and the Mariana Trench where depths ranged from 2,549 m to 7,373 m (Fulling et al., 2011a). They were observed in groups of one to three, with several sightings including calves.

During subsequent PIFSC surveys, Bryde's whales were sighted in a variety of depths (487 m–4,295 m) and over a broad range of distances from shore (9–302 km) (Hill et al., 2020d). Based on sighting data collected during PIFSC large and small boat surveys, Bryde's whales are expected to be present year-round in the MITT Study Area (Hill et al., 2020d).

#### 4.3.1.3 Population Trends

Line-transect analyses of sightings from the Navy's 2007 survey provided an abundance estimate of 233 (CV = 0.45) Bryde's whales (Fulling et al., 2011a). These data currently provide the best available abundance estimate for Bryde's whale in the MITT Study Area. Little is known of population status and trends for most Bryde's whale populations (Carretta et al., 2023), and current data are not sufficient to assess a population trend for the population of Bryde's whales that occur in the MITT Study Area.

#### 4.3.1.4 Population Threats

Bryde's whales are subject to entanglement risk from fishing activities, particularly those out of Japan and South Korea given the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Bettridge et al., 2015b; Lukoschek et al., 2009). In nine market samples from South Korea between 2003 and 2005, molecular DNA evidence indicated that four products contained Bryde's whale meat (Baker et al., 2006). There has been one recorded stranding of a Bryde's whale (at Tinian in 2005) within the Study Area (Trianni & Tenorio, 2012).

Bryde's whale is known to be prey for killer whales, as evidenced by an aerial observation of 15 killer whales attacking a Bryde's whale in the Gulf of California (Weller, 2009).

### 4.3.2 MINKE WHALE (BALAENOPTERA ACUTOROSTRATA)

#### 4.3.2.1 Status and Management

The IWC recognizes three stocks of minke whales in the North Pacific: (1) Sea of Japan–Yellow Sea–East China Sea (the "J" stock); (2) Okhotsk Sea–West Pacific (west of 180 degrees North (°N), the "O" stock); and (3) "remainder of the Pacific" (east of 180°) (Donovan, 1991). These broad designations basically reflect a lack of knowledge about the population structure of minke whales in the North Pacific (Carretta et al., 2023). NMFS has designated three stocks of minke whale in the U.S. North Pacific: (1) the Hawaii stock, (2) the California/Oregon/Washington stock, and (3) the Alaska stock (Carretta et al., 2023). The three NMFS stocks primarily fall into the IWC's "remainder of the Pacific" stock. Little is known about the stock structure of minke whales in the MITT Study Area, but presumably whales in this area are members of the IWC's Okhotsk Sea–West Pacific (west of 180°N) stock.

#### 4.3.2.2 Habitat and Geographic Range

Common minke whales have a cosmopolitan distribution in tropical and temperate waters to the ice edges in the northern and southern hemispheres, and generally occupy waters over the continental shelf, including inshore bays and even occasionally estuaries (Jefferson et al., 2015). However, records from whaling catches and research surveys worldwide indicate there may be an open-ocean component to minke whale habitat (Jefferson et al., 2015; Perrin & Brownell, 2009). The migration paths of some populations of minke whales include travel between low-latitude breeding grounds in the winter to high-latitude feeding grounds in the summer (Jefferson et al., 2015), although in some areas there appears to be resident populations (Dorsey et al., 1990).

Minke whales have not been visually detected in the Study Area during any recent survey efforts; however, they are the most common acoustically detected mysticete in the area (Fulling et al., 2011a; Hill et al., 2013a; Hill et al., 2011; Hill et al., 2017; Hill et al., 2014; Hill et al., 2020d; Hill et al., 2015; Mobley, 2007b; Norris et al., 2014; Oleson & Hill, 2010a; Tetra Tech Inc., 2014; Uyeyama, 2014). Minke whales are likely absent from low-productivity tropical waters in the summer (Jefferson et al., 2008b; Perrin et al., 2009a).

#### 4.3.2.3 Population Trends

During the Navy's 2007 line-transect survey of the waters off Guam and the CNMI, sea states were typically high and there were no sightings of minke whales. However, the 2007 survey included passive acoustic monitoring using a towed array system, and resulted in 30 unique acoustic detections of minke whales (Norris et al., 2017). Line-transect analyses of these acoustic detections resulted in a minimum abundance estimate of 91 (CV = 0.34) minke whales (Norris et al., 2017). Methods for estimating density from acoustic detections continue to be developed, and numerous assumptions are associated with the calculations. However, these data currently provide the best available abundance estimate for minke whale in the MITT Study Area. Current data are not sufficient to assess a population trend for the population of minke whales that occur in the MITT Study Area.

#### 4.3.2.4 Population Threats

Minke whales are subject to entanglement risk from fishing activities, particularly those out of Japan and South Korea given the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Dalebout et al., 2002a; Lukoschek et al., 2009). For example in 2008, the reported bycatch in Japan and South Korea totaled 214 minke whales (Lukoschek et al., 2009). In nine market samples from South Korea between 2003 and 2005, molecular DNA evidence indicated that 230 products contained minke whale meat (Baker et al., 2006). In the two-year period between 2013 and 2014, the total bycatch by South Korean fisheries in the East Sea totaled a reported 48 minke whales (Song, 2017).

### 4.3.3 OMURA'S WHALE (*BALAENOPTERA OMURAI*)

#### 4.3.3.1 Status and Management

Omura's whale was first recognized as a species in 2003. They were previously confused as Bryde's whale until molecular genetic studies confirmed that they are a separate species (Jefferson et al., 2015). Omura's whales are not assigned to a stock by NMFS because this species is not known to occur in U.S. waters and is therefore not managed under U.S. jurisdiction. Given the general paucity of data on this species, nothing is known of the stock structure of Omura's whale, and it is currently assumed to comprise one Western North Pacific stock throughout its range in the western Pacific Ocean.

#### 4.3.3.2 Habitat and Geographic Range

The primary range of Omura's whale is considered the tropical and subtropical waters of the western Pacific and eastern Indian oceans, and the species tends to occur in nearshore waters over the continental shelf (Jefferson et al., 2015). Although there is a lack of confirmed sightings, the distribution of this species is expected to extend into the MITT Study Area (Reilly et al., 2008b).

#### 4.3.3.3 Population Trends

Since this species was only formally recognized in 2003, little population information is known or available for this species. There are no reliable estimates of the global population size of Omura's whale, nor are there abundance estimates or trend data available for the MITT Study Area.

#### 4.3.3.4 Population Threats

An individual Omura's whale observed in Sri Lanka waters showed evidence of an entanglement scar on the left side of its upper jaw, indicating that entanglement is a potential threat for this species (Cerchio et al., 2015; Cerchio et al., 2019; de Vos, 2017). One Omura's whale was reported struck by a fishing boat in the Philippines (Obusan et al., 2016), and there is one recorded strike off Japan (Cerchio et al., 2019).

### 4.3.4 BLAINVILLE'S BEAKED WHALE (*MESOPLODON DENSIROSTRIS*)

#### 4.3.4.1 Status and Management

NMFS recognizes a Blainville's beaked whale stock around Hawaii, as well as recognizing the species as a member of the California/Oregon/Washington Mesoplodont Beaked Whale stock of six species (Carretta et al., 2023). Little is known about the stock structure of Blainville's beaked whale in the MITT Study Area.

#### 4.3.4.2 Habitat and Geographic Range

Blainville's beaked whales are one of the most widely distributed of the distinctive toothed whales in the *Mesoplodon* genus (Jefferson et al., 2015; MacLeod & Mitchell, 2006). This species is observed in offshore temperate and tropical waters and are globally distributed in lower and mid-latitudes (Hildebrand et al., 2015). Blainville's beaked whale is considered one of the most tropical of any of the *Mesoplodon* beaked whales (Jefferson et al., 2015). In Hawaii, some populations have been documented to be long-term residents to particular areas (Baird, 2011; Baird et al., 2015; Baird et al., 2009; McSweeney et al., 2007).

There were two *Mesoplodon* whale sightings during the Navy's 2007 survey of the Study Area, but they were not identified to the species level (Fulling et al., 2011a). There were two sightings of Blainville's beaked whales during the PIFSC 2015 line-transect survey, and although there were no visual sightings, there were multiple acoustic detections during the 2018 and 2021 surveys (Hill et al., 2020d; Yano et al., 2022). Passive acoustic data collected from eight Drifting Acoustic Spar Buoy Recorders (DASBRs) during the 2018 survey and 21 DASBRs deployed during the 2021 survey were used to estimate density for both Blainville's and Cuvier's beaked whales (Badger et al., 2024). In addition to providing the first density estimates of Cuvier's and Blainville's beaked whales in the Mariana Islands region, the analysis of the DASBR data revealed a substantial latitudinal difference in the encounter rate and therefore estimated density of both species in the Study Area (Badger et al., 2024; McCullough et al., 2021).

Acoustic detections of Blainville's beaked whales have occurred year round with no clear seasonal variation (U.S. Department of the Navy, 2024a). Autonomous glider surveys for beaked whales in the Mariana Islands detected Blainville's beaked whales mainly near the Mariana Trough and Mariana Ridge in water depths ranging from 1,800 to 2,300 m (U.S. Department of the Navy, 2024a). (Badger et al., 2024) noted that detections of Blainville's beaked whales were seven times higher north of 15.5°N latitude, which is north of Saipan, than south of that latitude.

#### 4.3.4.3 Population Trends

Density data derived from the passive acoustic data collected during the 2018 and 2021 PIFSC surveys resulted in abundance estimates of 14,258 (CV = 0.207) Blainville's beaked whales north of 15.5 °N and 1,447 (CV = 0.494) south of 15.5 °N (Badger et al., 2024). Current data are not sufficient to assess a population trend for the population of Blainville's beaked whales that occur in the MITT Study Area.

#### 4.3.4.4 Population Threats

Blainville's beaked whales are subject to entanglement risk from fishing activities, particularly those out of Japan and South Korea given the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009). In nine market samples from South Korea between 2003 and 2005, molecular DNA evidence indicated at least one product contained Blainville's beaked whale meat (Baker et al., 2006). While not considered a population-level threat, beaked whale strandings have received widespread attention, particularly in association with anthropogenic activities, including Navy sonar. West (2024) analyzed beaked whale strandings in the Pacific from 1950–2023, during which time Blainville's beaked whales were the second most frequently stranded beaked whale species; goose-beaked whales had the highest number of reported strandings. Twenty-two stranding events involving Blainville's beaked whales were reported with the Northwestern Hawaiian Islands identified as a cluster area; although there were also events reported in the Study Area.

### 4.3.5 COMMON BOTTLENOSE DOLPHIN (*TURSIOPS TRUNCATUS*)

#### 4.3.5.1 Status and Management

Common bottlenose dolphin populations have a complex structure. The basic division in populations is often between offshore and coastal forms (Baird et al., 1993; Wells et al., 1999), but there may be more or less population structure in differing areas. NMFS recognizes two stocks and one stock complex of bottlenose dolphins in U.S. Pacific waters: a Hawaiian Island Stock Complex, a California/Oregon/Washington Offshore stock, and a California Coastal stock (Carretta et al., 2023). Currently there is no stock assigned to bottlenose dolphins in the MITT Study Area. However, sighting data, photo-identification data, and genetic analyses collected during small boat surveys from 2010 to 2019 suggest that there is a small island-associated population of common bottlenose dolphins in the Mariana Islands (Martien et al., 2024).

#### 4.3.5.2 Habitat and Geographic Range

Common bottlenose dolphins are found in coastal and continental shelf waters of tropical and temperate regions of the world and generally do not range north or south of 45° latitude (Jefferson et al., 2011; Wells & Scott, 2009). They occur in most enclosed or semi-enclosed seas in habitats ranging from shallow, murky, estuarine waters to deep, clear offshore waters in oceanic region, although they typically have higher density closer to shore (Jefferson et al., 2011; Wells & Scott, 2009).

Common bottlenose dolphins were one of the most commonly encountered species during small boat surveys conducted around the Mariana Islands from 2010 to 2019 (Hill et al., 2020d). During the Navy's 2007 survey of the Study Area, there were a total of four sightings of common bottlenose dolphins, including two mixed-species aggregations: one included sperm whales (with calves) logging at the surface and another involved short-finned pilot whales and rough-toothed dolphins (Fulling et al., 2011a). During the subsequent PIFSC line-transect surveys, there were three sightings in 2015, three sightings in 2018, and one sighting in 2021. The wide range of different sighting locations, from deep offshore waters near the Mariana Trench (Fulling et al., 2011a) to shallow coastal waters of the islands (Hill et al., 2020d), suggest there could be both pelagic and island-associated populations of common bottlenose dolphins in the MITT Study Area.

#### 4.3.5.3 Population Trends

Mark-recapture analysis of the photo-identification from the small boat survey data yielded initial abundance estimates for the small island-associated population, but additional survey effort is necessary to generate a full population abundance estimate (Martien et al., 2024). Data collected during the PIFSC line-transect surveys allowed for the derivation of an updated design-based abundance estimate of 1,800 (CV = 1.11) common bottlenose dolphins (Bradford et al., In Prep.). Current data are not sufficient to assess a population trend for common bottlenose dolphins that occur in the MITT Study Area.

#### 4.3.5.4 Population Threats

Common bottlenose dolphins are subject to entanglement risk from fishing activities, particularly those out of Japan and South Korea given the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009). In nine market samples from Korea between 2003 and 2005, molecular DNA evidence indicated that at least 2 products contained bottlenose dolphin meat reflecting an estimated 23 bottlenose dolphins (Baker et al., 2006). The stranding of a single bottlenose dolphin in 2013 near Tumon, Guam is the only known stranding for this species in the Mariana Islands area (Uyeyama, 2014).

### 4.3.6 DERANIYAGALA'S BEAKED WHALE (*MESOPLODON HOTAULA*)

#### 4.3.6.1 Status and Management

Genetic and molecular analyses only recently confirmed that Deraniyagala beaked whale was genetically distinct from the ginkgo-toothed beaked whale (Dalebout et al., 2014). Little is known about this beaked whale species but, based on stranding records, its distribution is thought to include the MITT Study Area (Jefferson et al., 2015). No stock information is available for Deraniyagala's beaked whales.

#### 4.3.6.2 Habitat and Geographic Range

There are no known live sightings of Deraniyagala's beaked whale. This species is currently known from fewer than 12 stranded individuals in the tropical Indo-Pacific Ocean, suggesting a distribution in warm tropical waters from the western Indian Ocean to the central Pacific, although its range may extend across the entire tropical Pacific (Jefferson et al., 2015).

#### 4.3.6.3 Population Trends

No abundance or population trend information is available for Deraniyagala's beaked whales.

#### 4.3.6.4 Population Threats

No species-specific data are available, but it is assumed that Deraniyagala's beaked whales are subject to threats similar to other beaked whales. Beaked whales are subject to entanglement risk from fishing activities, particularly those out of Japan and South Korea given the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009). In nine market samples from Korea between 2003 and 2005, molecular DNA evidence indicated at least one product contained Blainville's beaked whale meat (Baker et al., 2006), suggesting the same risk may be present for Deraniyagala's beaked whales. While not considered a population-level threat, beaked whale strandings have received widespread attention, particularly in association with anthropogenic activities, including Navy sonar. West (2024) analyzed beaked whale strandings in the Pacific from 1950 to 2023, during which time three standing events of Deraniyagala's beaked whales were recorded at Palmyra Atoll, Kwajalein Atoll, and Kiribatai, a small island nation in the Central Pacific Ocean between Hawaii and Australia.

### 4.3.7 DWARF SPERM WHALE (*KOGIA SIMA*)

#### 4.3.7.1 Status and Management

Before 1966, dwarf and pygmy sperm whales were thought to be a single species, until form and structure distinction were shown (Handley, 1966). Misidentifications of these two species are still common (Jefferson et al., 2015). Rare sightings indicate they may avoid human activity, and they are rarely active at the sea surface. Because of the scarcity of biological information available for dwarf sperm whales, almost nothing is known regarding the population status for this species. Stranding frequency suggests they may not be as uncommon as sighting records would suggest (Jefferson et al., 2015; Maldini et al., 2005). In U.S. Pacific waters, NMFS currently defines two stocks of dwarf sperm whales: the California/Oregon/Washington stock, and the Hawaii stock (Carretta et al., 2023). The two stocks are considered discrete from each other. Little is known about the stock structure of dwarf sperm whales in the MITT Study Area.

#### 4.3.7.2 Habitat and Geographic Range

Dwarf sperm whales appear to be distributed worldwide in temperate to tropical waters (Caldwell & Caldwell, 1989; McAlpine, 2002). Dwarf sperm whales generally occur in offshore waters and appear to prefer warmer waters than the pygmy sperm whale (Jefferson et al., 2015). Although deep oceanic waters may be the primary habitat for this species, there are very few oceanic sighting records offshore (Jefferson et al., 2015). The lack of sightings may have more to do with the difficulty of detecting and identifying these animals at sea and lack of effort than with any real distributional preferences.

There were no sightings of *Kogia* made during the 2007 survey of the Marianas Study Area (Fulling et al., 2011a). However, this species is difficult to detect in high sea states, and more than half of this survey was conducted in rough conditions (i.e., Beaufort Sea states greater than 4). There is only one stranding record available for *Kogia* in the Study Area and vicinity (Eldredge, 1991, 2003b; Kami & Lujan, 1976; Reeves et al., 1999). During marine mammal monitoring for Valiant Shield 07, a group of three *Kogia* (dwarf or pygmy sperm whales) was observed about 8 NM east of Guam (Mobley, 2007a). There were six dwarf sperm encounters during small boat surveys conducted by PIFSC in the Mariana Archipelago between 2010 and 2019 (Hill et al., 2020d). There was also a sighting of an individual dwarf sperm whale during the PIFSC line-transect survey in 2018; however, the lack of additional systematic sighting data precluded the derivation of a density estimate from this single sighting.

Dwarf sperm whales feed on cephalopods and, less often, on deep sea fishes and shrimps (Caldwell & Caldwell, 1989; Sekiguchi et al., 1992). Dwarf sperm whales are believed to generally forage near the seafloor (McAlpine, 2009).

#### 4.3.7.3 Population Trends

No abundance or population trend information is available for dwarf sperm whale in the MITT Study Area.

#### 4.3.7.4 Population Threats

Based on data collected in Hawaiian waters, dwarf sperm whales are susceptible to injury or mortality from fisheries interactions (Bradford, 2018; Bradford & Forney, 2016). It is assumed that fishery activities in the MITT Study Area pose a similar threat to the species.

### 4.3.8 FALSE KILLER WHALE (*PSEUDORCA CRASSIDENS*)

#### 4.3.8.1 Status and Management

NMFS currently recognizes three stocks of false killer whale in Hawaiian waters: the Main Hawaiian Islands insular stock, the Northwestern Hawaiian Islands stock, and the Hawaii pelagic stock (Carretta et al., 2023). There are two additional stocks recognized outside of Hawaiian waters including the Palmyra Atoll stock, which includes animals found within the U.S. EEZ of Palmyra Atoll, and the American Samoa stock, which includes animals found within the U.S. EEZ of American Samoa. Little is known about the stock structure of false killer whales in the MITT Study Area, despite photo-identification data, genetic analyses, and tag data collected during multiple non-systematic small boat surveys conducted since February 2010 (Hill et al., 2013a; Hill et al., 2011; Hill et al., 2017; Hill et al., 2014; Hill et al., 2016b; Hill et al., 2020d; Hill et al., 2015).

#### 4.3.8.2 Habitat and Geographic Range

False killer whales occur worldwide throughout warm temperate and tropical oceans in deep open-ocean waters and around oceanic islands, although they sometimes occur over the continental shelf and occasionally come into shallow coastal waters (Baird et al., 2008; Leatherwood & Reeves, 1983; Odell & McClune, 1999b). Occasional inshore movements are usually associated with movements of prey and shoreward flooding of warm ocean currents. False killer whales are not considered a migratory species, although seasonal shifts in density likely occur. Seasonal movements in the western north Pacific may be related to prey distribution (Odell & McClune, 1999a). Satellite-tracked individuals around the Hawaiian islands indicate that false killer whales can move extensively among different islands and also sometimes move from an island coast to as far as 60 mi. (96.6 km) offshore (Baird, 2009).

During the Navy's 2007 survey of the Study Area, false killer whales were sighted 10 times in groups ranging from 2 to 26 individuals with several including calves (Fulling et al., 2011a). During the PIFSC line-transect surveys, there were two sightings in 2015, no sightings in 2018, and six sightings in 2021.

#### 4.3.8.3 Population Trends

Data collected during the PIFSC line-transect surveys allowed for the derivation of an updated design-based abundance estimate of 1,059 (CV = 0.84) false killer whales (Bradford et al., In Prep.). Current data are not sufficient to assess a population trend for the population of false killer whales that occur in the MITT Study Area.

#### 4.3.8.4 Population Threats

False killer whales are subject to entanglement risk from fishing activities, particularly those out of Japan and South Korea given the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009). In nine market samples from Korea between 2003 and 2005, molecular DNA evidence indicated that at least 19 products contained false killer whale meat (Baker et al., 2006). Necropsy results from four stranded false killer whales in Hawaii documented stomach contents that included fishing gear (hooks, leaders, and line) in two of the four animals (West, 2016), confirming interactions with fishery activities pose a threat to false killer whales.

### 4.3.9 FRASER'S DOLPHIN (*LAGENODELPHIS HOSEI*)

#### 4.3.9.1 Status and Management

NMFS recognizes a single Hawaiian stock of Fraser's dolphins in U.S. waters (Carretta et al., 2023). Little is known about the stock structure of Fraser's dolphins in the MITT Study Area.

#### 4.3.9.2 Habitat and Geographic Range

Fraser's dolphin has a pantropical distribution, mainly occurring between 30°N and 30°S throughout the Pacific, Atlantic, and Indian Oceans (Jefferson et al., 2015). Fraser's dolphin is considered an open ocean deepwater species, except where deep water approaches the coast (Dolar, 2009). Given their documented distribution patterns, Fraser's dolphins are expected to occur regularly within the MITT Study Area (Jefferson et al., 2015). There were no Fraser's dolphin sightings during the Navy's 2007 systematic survey of the Study Area (Fulling et al., 2011a), nor during any of the subsequent PIFSC systematic ship surveys in 2015, 2018, and 2021. Genetic samples collected from common bottlenose dolphins during PIFSC surveys in waters off Saipan, Tinian, Aguijan, Rota, and Guam suggest a history of hybridization with Fraser's dolphin (Hill et al., 2020d).

#### 4.3.9.3 Population Trends

No abundance or population trend information is available for Fraser's dolphin in the MITT Study Area.

#### 4.3.9.4 Population Threats

No species-specific data are available regarding threats to Fraser's dolphin in the MITT Study Area and there is very limited information on fishery-related injury to Fraser's dolphins in Hawaiian waters (Carretta et al., 2023). There is a report of a Fraser's dolphin being taken as a result of a fishery interaction in the Philippines (Obusan et al., 2016). Fraser's dolphin has been subjected to predation by killer whales in the Bahamas (Dunn et al., 2007).

### 4.3.10 GINKGO-TOOTHED BEAKED WHALE (*MESOPLODON GINKGODENS*)

#### 4.3.10.1 Status and Management

The ginkgo-toothed beaked whale is known from strandings and a few unconfirmed sightings in tropical waters of the Pacific and Indian Oceans (Jefferson et al., 2015; Mead, 1989; Palacios, 1996). Due to the difficulty in distinguishing the different *Mesoplodon* species from one another, the ginkgo-toothed beaked whale has been combined with other *Mesoplodon* species to make up the California, Oregon, and Washington stock of Mesoplodont beaked whale (Carretta et al., 2023). Little is known of the stock structure of ginkgo-toothed beaked whales in the MITT Study Area.

#### 4.3.10.2 Habitat and Geographic Range

Similar to other beaked whale species, ginkgo-toothed beaked whales are expected to inhabit continental slope and deep ocean waters (greater than 200 m) and only occasionally occur in waters over the continental shelf (Cañadas et al., 2002; Ferguson et al., 2006; MacLeod & Mitchell, 2006; Pitman, 2009; Waring et al., 2001). Based largely on stranding records, the distribution of ginkgo-toothed beaked whales is presumed to include temperate and tropical waters continuous across the Pacific Ocean and possibly into the Indian Ocean (Jefferson et al., 2015). Suspected ginkgo-toothed beaked whale vocalizations have been regularly detected in the Study Area throughout the year (U.S. Department of the Navy, 2024a); specifically, the "BWC" signal has been detected and is thought to be from the ginkgo-toothed beaked whale. However, there are no confirmed sightings or strandings of ginkgo-toothed beaked whales in waters of the Mariana Islands. Henderson et al. (2026) reported acoustic detections of the BW43 beaked-whale signal off the Baja California Peninsula, Mexico, and confirmed that the call is from the ginkgo-toothed beaked whale through genetic sampling and visual observation, meaning that the BWC signal is not from the ginkgo-toothed beaked whale. The authors speculate that the BWC echolocation call may be from the dense-beaked whale and may only be used during nighttime foraging, distinguishing the known call from this species.

#### 4.3.10.3 Population Trends

No abundance or population trend information are available for ginkgo-toothed beaked whales in the MITT Study Area.

#### 4.3.10.4 Population Threats

No species-specific data are available but it is assumed that ginkgo-toothed beaked whales are subject to threats similar to other beaked whales. Beaked whales are subject to entanglement risk from fishing activities, particularly those out of Japan and South Korea given the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009). In nine market samples from Korea between 2003 and 2005, molecular DNA evidence indicated at least one product contained Blainville's beaked whale meat (Baker et al., 2006), suggesting ginkgo-toothed beaked whales may have a similar risk. While not considered a population-level threat, beaked whale strandings have received widespread attention, particularly in association with anthropogenic activities, including Navy sonar. West (2024) analyzed beaked whale strandings in the Pacific from 1950–2023, during which time two stranding events involving ginkgo-toothed beaked whales were recorded in Micronesia.

### 4.3.11 GOOSE-BEAKED WHALE (*ZIPHIUS CAVIROSTRIS*)

#### 4.3.11.1 Status and Management

The goose-beaked whale, also known by the common name "Cuvier's beaked whale," is protected under the MMPA and is not listed under the ESA. There are three stocks of goose-beaked whale recognized by NMFS: an Alaska stock, a California/Oregon/Washington stock, and a Hawaii stock (Carretta et al., 2023). However, little is known of the stock structure of goose-beaked whales in the MITT Study Area.

#### 4.3.11.2 Habitat and Geographic Range

Similar to other beaked whale species, goose-beaked whales are expected to inhabit continental slope and deep ocean waters (greater than 200 m) and only occasionally occur in waters over the continental shelf (Cañadas et al., 2002; Ferguson et al., 2006; MacLeod & Mitchell, 2006; Pitman, 2009; Waring et al., 2001).

Acoustic detections of goose-beaked whales have occurred year-round in the Study Area with no clear seasonal variation (Klinck, 2024; U.S. Department of the Navy, 2024a). Several different types of hydrophones have been deployed during passive acoustic surveys, including moored, towed array, drifting, and autonomous hydrophone systems (U.S. Department of the Navy, 2024a). Goose-beaked whales were detected acoustically by all systems except the autonomous gliders. The data indicated that goose-beaked whales may move north and south along the Mariana Island archipelago on a regular basis. During systematic ship surveys conducted by NMFS within the MITT Study Area, there was one sighting of goose-beaked whales in 2018, and two sightings in 2021, as well as multiple acoustic detections during both the 2018 and 2021 surveys (Hill et al., 2020d; Yano et al., 2022). Passive acoustic data collected during these surveys were used to derive the first density estimate for goose-beaked whales in the Mariana Islands region (Badger et al., 2024). Badger et al. (2024) noted that detections of goose-beaked whales were two times greater north of 15.5°N latitude, which is north of Saipan, than south of that latitude (Klinck, 2024).

#### 4.3.11.3 Population Trends

No abundance or population trend information are available for goose-beaked whales in the MITT Study Area.

#### 4.3.11.4 Population Threats

No species-specific data are available, but it is assumed that goose-beaked whales are subject to threats similar to other beaked whales. Beaked whales are subject to entanglement risk from fishing activities, particularly those out of Japan and South Korea given the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009). While not considered a population-level threat, beaked whale strandings have received widespread attention, particularly in association with anthropogenic activities, including Navy sonar. West (2024) analyzed beaked whale strandings in the Pacific from 1950 to 2023, during which time more stranding events of goose-beaked whales were reported than for any other beaked whale species. There was a total of 67 stranding events reported, clustered at islands in American Samoa, Samoa, Tonga, the Hawaiian archipelago, and the Mariana Islands. The authors noted that while goose-beaked whales stranded more than other beaked whale species, they are more widespread and recognizable than other species (West, 2024).

### 4.3.12 KILLER WHALE (*ORCINUS ORCA*)

#### 4.3.12.1 Status and Management

The stock structure for killer whales remains uncertain in the western Pacific, and killer whales present in the Study Area have not been assigned to a stock in the current SARs (Carretta et al., 2019b; Muto et al., 2019). NMFS recognizes eight stocks of killer whales for the Pacific, but none of the identified ranges are within the Study Area (Carretta et al., 2019b; Muto et al., 2019).

Under the ESA, the Southern Resident Distinct Population Segment of killer whales is the only species listed as endangered, but those animals do not venture beyond the North American nearshore waters. Killer whales in the Study Area are not listed pursuant to the ESA.

#### 4.3.12.2 Habitat and Geographic Range

Killer whales are found in all marine habitats from inland and nearshore coastal areas, to the deep mid-ocean, and from equatorial regions to the polar pack ice zones of both hemispheres. Forney and Wade (2006) found that killer whale densities increased by one to two orders of magnitude from the tropics to the poles.

There are accounts of killer whales off the coast of Japan (Kasuya, 1971). Japanese whaling and whaling sighting vessels indicate that concentrations of killer whales occurred north of the Northern Mariana Islands (Miyashita et al., 1995), and the species has been reported in the tropical waters around Guam, Yap, and Palau (Rock, 1993). Between 1987 and 2017 in the Mariana Islands, killer whales in pods of three to five individuals were observed on only six occasions (Eldredge, 1991; Uyeyama, 2014). There was also a badly decomposed killer whale found stranded on Guam in August 1981 (Kami, 1982). There were no sightings of the species during a 2007 systematic line-transect survey (Fulling et al., 2011a) or a 2010 survey of the area

(Oleson & Hill, 2010a). In May 2010, a group of approximately five killer whales, including one calf, were observed about 20 NM south of Farallon de Medinilla (Uyeyama, 2014; Wenninger, 2010). The Navy-funded small boat surveys between 2010 and 2018 in the Mariana Islands did not encounter any killer whales (Hill et al., 2017; Hill et al., 2014; Hill et al., 2019; Hill et al., 2018d). Vocalizations from killer whales were detected on three occasions south of Guam by passive acoustic recorders aboard an underwater glider survey in 2014 (Klinck et al., 2016).

Killer whales feed on a variety of prey, including bony fishes, elasmobranchs (a class of fish composed of sharks, skates, and rays), cephalopods, seabirds, sea turtles, and other marine mammals (Fertl et al., 1996; Ford et al., 2014; Ford et al., 2013; Jefferson et al., 2015). In May 2010 during the routine Navy aerial survey of Farallon de Medinilla about 20 mi. (32 km) south of the island, a group of approximately five killer whales, including one calf, were observed feeding on a large whale carcass (Uyeyama, 2014; Wenninger, 2010).

#### 4.3.12.3 Population Trends

There are no abundance estimates for killer whales in the Study Area.

#### 4.3.12.4 Population Threats

The killer whale has no known natural predators; it is considered to be the top predator of the oceans (Ford, 2008).

Entanglement and mortality associated with fishery interactions, particularly from commercial fishers from Japan and South Korea, are a threat to killer whales in the region. The commercial sale of whale meat and related products are allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009). In nine market samples from South Korea between 2003 and 2005, molecular DNA evidence indicated that at least two products contained killer whale meat (Baker et al., 2006).

### 4.3.13 LONGMAN'S BEAKED WHALE (*INDOPACETUS PACIFICUS*)

#### 4.3.13.1 Status and Management

Longman's beaked whale is not listed under the ESA. Only one stock has been identified for the Pacific for the population present in Hawaiian waters (Carretta et al., 2019b). The stock structure for Longman's beaked whale remains uncertain in the western Pacific, and the species in the Study Area has not been assigned to a stock in the current SAR (Carretta et al., 2019b).

#### 4.3.13.2 Habitat and Geographic Range

Longman's beaked whales are found in warm tropical waters, and most sightings occur in waters with sea surface temperatures warmer than 78°F (26°C) (Anderson et al., 2006; MacLeod et al., 2006; MacLeod & D'Amico, 2006). Based on systematic survey data collected from 1986 to 2005 in the eastern Pacific, all Longman's beaked whale sightings were south of 25° N (Hamilton et al., 2009b). Sighting records of this species in the Indian Ocean showed that Longman's beaked whales are typically found in waters over deep bathymetric slopes reaching 200–2,000 m or greater (Anderson et al., 2006). In the Study Area, (Klinck et al., 2016) detections of Longman's beaked whales have occurred only north of 15.5°N latitude, which is north of Saipan, and associated with deepwater habitat near the Mariana Trench and Ridge (Hill et al., 2020d; McCullough et al., 2021; Yano et al., 2022).

Although the full extent of this species' distribution is not fully understood, there have been many recorded sightings at various locations in tropical waters of the Pacific and Indian Oceans (Afsal et al., 2009; Dalebout et al., 2002b; Dalebout et al., 2003; Moore, 1972). In the Pacific, records of this species indicate presence in the eastern, central, and western Pacific, including waters off the coast of Mexico and Hawaii. Longman's beaked whales have been detected acoustically during several surveys in the Study Area (U.S. Department of the Navy, 2024a), and Yano et al. (2022) reported a concurrent visual observation consisting of 11 individuals. (U.S. Department of the Navy, 2024a)

All beaked whales probably feed at or close to the bottom in deep oceanic waters, taking suitable prey opportunistically or as locally abundant, typically by suction feeding (Heyning & Mead, 1996; Jefferson et al., 2015; Werth, 2006a, 2006b). Feeding may also occur at mid-water as shown by tagging data from Cuvier's and from Blainville's beaked whales in Hawaii (Baird et al., 2006c; Baird et al., 2005).

#### 4.3.13.3 Population Trends

Data collected during the PIFSC line-transect surveys allowed for the derivation of an updated design-based abundance estimate of 730 (CV = 1.09) Longman's beaked whales (Bradford et al., In Prep.). Current data are not sufficient to assess a population trend for the population of Longman's beaked whales that occur in the MITT Study Area.

#### 4.3.13.4 Population Threats

*Mesoplodon* beaked whales are preyed upon by killer whales (Wellard et al., 2016); it is assumed this may also be the case with Longman's beaked whales.

Morbillivirus was documented in a juvenile male Longman's beaked whale that stranded in Hawaii in 2010 (West et al., 2012) and in five individuals stranded in New Caledonia (Garrigue et al., 2016) indicating that disease may be a threat to the species.

No species-specific data are available, but it is assumed that Longman's beaked whales are subject to threats similar to other beaked whales. There were two observed interactions between unidentified beaked whales and longline fishing activities in Hawaiian waters between 2009 and 2013 (Bradford & Forney, 2016) and it is assumed that beaked whales in the Study Area are subject to the same threat. Entanglement and mortality associated with fishery interactions, particularly from commercial fishers from Japan and South Korea, are a threat to beaked whales in the region. The commercial sale of whale meat and related products are allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009). In nine market samples from South Korea between 2003 and 2005, molecular DNA evidence indicated that at least one product contained Blainville's beaked whale meat (Baker et al., 2006).

While not considered a population-level threat, beaked whale strandings have received widespread attention, particularly in association with anthropogenic activities, including Navy sonar. West (2024) analyzed beaked whale strandings in the Pacific from 1950–2023, during which time just three stranding events involving Longman's beaked whales were reported.

### 4.3.14 MELON-HEADED WHALE (*PEPONOCEPHALA ELECTRA*)

#### 4.3.14.1 Status and Management

Melon-headed whales are not listed under the ESA. The stock structure for melon-headed whales remains uncertain in the western Pacific, and melon-headed whales in the Study Area have not been assigned to a stock in the current Pacific SAR (Carretta et al., 2019b). NMFS recognizes two stocks of melon-headed whales in the Pacific associated with Hawaiian waters (Carretta et al., 2019b).

#### 4.3.14.2 Habitat and Geographic Range

Melon-headed whales are found worldwide in tropical and subtropical waters, but movement patterns for this species are poorly understood. It has been suggested that melon-headed whales near oceanic islands rest nearshore during the day and feed in deeper waters at night (Brownell et al., 2009a; Gannier, 2002; Woodworth et al., 2012). In surveys around the main Hawaiian Islands, melon-headed whales showed no clear pattern in depth use (Baird, 2013). Melon-headed whales are also known to enter shallow water areas on occasion, although these are generally characterized as animals being "out of habitat" or "mass strandings." Such out-of-habitat events, each involving a few hundred melon-headed whales, have occurred at Sasanhaya Bay, Rota (Jefferson et al., 2006); and in Hawaii (Fromm et al., 2006; Mobley et al., 2007; Southall et al., 2006) on the same day in 2004. Similar numbers did so twice in the Philippines entering Manila Bay in February 2009 and the bay at Odiongan, Romblon in March of 2009 (Aragones et al., 2010; Obusan et al., 2016).

There were two sightings of melon-headed whales during the 2007 survey of the Study Area, with group sizes of 80–109 individuals (Fulling et al., 2011a). There was one sighting of approximately 53 individuals southeast of Guam and two mid-ocean sightings (pods sizes of 43 and 72) in the Transit Corridor portion of the Study Area during the large vessel Pacific Islands Fisheries Science Center survey (Oleson & Hill, 2010a). During small boat surveys occurring from 2010 to 2018, melon-headed whales have been encountered on only three occasions, but in large pods numbering between 85 and 380 individuals off Guam and Tinian/Saipan (HDR, 2012; Hill et al., 2014; Hill et al., 2019; Hill et al., 2018d). The NMFS 2015 month-long survey of the Mariana Islands encountered melon-headed whales on four occasions, in offshore waters and in large pods estimated to number between 90 and 268 individuals (Hill et al., 2018c; Oleson, 2017).

There was a live stranding of a melon-headed whale on the beach at Inarajan Bay, Guam in April 1980 (Donaldson, 1983; Kami, 1982), and four individuals at Orote in 2009 (Uyeyama, 2014).

Melon-headed whales' prey on squid, pelagic fishes, and occasionally crustaceans. Most of the fish and squid species are found in waters up to 1,500 m deep, suggesting that feeding takes place deep in the water column (Baird et al., 2010; Jefferson & Barros, 1997).

#### 4.3.14.3 Population Trends

Based on sighting data from a systematic survey in 2007, there were an estimated 2,455 (CV = 0.70) melon-headed whales in the Study Area (Fulling et al., 2011a).

#### 4.3.14.4 Population Threats

Melon-headed whales are likely preyed on by killer whales; they have been observed fleeing from killer whales in Hawaiian waters (Baird et al., 2006a). Between 2006 and 2022, 20 melon-headed whale strandings in the Pacific were investigated to determine a cause. Only 1 of the standings occurred in Guam; 18 occurred in the main Hawaiian Islands and 1 was in Micronesia (West et al., 2024). Natural disease resulting from poor nutrition and parasitic infections were two of the most frequently occurring contributors to the standings. No anthropogenic causes were identified.

### 4.3.15 PANTROPICAL SPOTTED DOLPHIN (*STENELLA ATTENUATA*)

#### 4.3.15.1 Status and Management

The pantropical spotted dolphin is not listed under the ESA. The stock structure for pantropical spotted dolphin remains uncertain in the western Pacific, and pantropical spotted dolphins in the Study Area have not been assigned to a stock in the current SAR (Carretta et al., 2019b). NMFS recognizes a single pelagic stock and three Hawaiian Island-associated stocks of pantropical spotted dolphin in Hawaiian waters (Carretta et al., 2019b). Results from genetic analyses of pantropical spotted dolphin populations, including the Indo-Pacific and eastern tropical Pacific Ocean (including eight samples from Guam and the Northern Mariana Islands), support the current taxonomy and indicate very close genetic relationships among the Indo-Pacific populations (Leslie & Morin, 2018).

#### 4.3.15.2 Habitat and Geographic Range

A survey of the Mariana Islands in 2007 encountered 17 groups of pantropical spotted dolphins, ranging in size from 1 to 115 individuals (Fulling et al., 2011a). Aerial surveys in August 2007 covering 2,352 km of linear effort encountered a single pod of 30 pantropical spotted dolphins (Mobley, 2007b). In total during the Navy-funded 2010 to 2018 small boat surveys in the Mariana Islands, pantropical spotted dolphins were encountered on 53 occasions in group sizes of 1–145 individuals at a median approximate distance from shore of 6 km (Hill et al., 2017; Hill et al., 2014; Hill et al., 2019; Hill et al., 2018d). Approximate satellite tag locations from a pantropical spotted dolphin in 2016 demonstrated wide-ranging use of the waters at a median of 6.1 km offshore of Guam (Hill et al., 2017), although they have also been encountered off Rota, Antiguan, Tinian, and Saipan (Hill et al., 2018d).

Pantropical spotted dolphins prey on fishes near the surface as well as on squid and crustaceans (Perrin & Hohn, 1994). Results from various tracking and feeding studies suggest that pantropical spotted dolphins in the eastern tropical Pacific and off Hawaii feed primarily at night on species that rise with the deep scattering layer toward the water's surface after dark (Baird et al., 2001; Silva et al., 2016).

#### 4.3.15.3 Population Trends

Pantropical spotted dolphins were sighted 17 times during the Navy's 2007 ship survey, with group size ranging from 1 to 115 individuals (Fulling et al., 2011a). During the PIFSC line-transect surveys, there were no sightings in 2015, nine sightings in 2018, and eight sightings in 2021. Data from all four of these systematic surveys were used to estimate cetacean species density from habitat-based density models developed specifically for the Mariana Islands region, resulting in a 2021 abundance estimate of 33,866 (CV = 0.39) pantropical spotted dolphins (Becker et al., In Prep.). Model-based annual estimates for 2018 through 2021 were very similar (Becker et al., In Prep.); however, these data are not sufficient to assess a population trend for the population of pantropical spotted dolphins that occur in the MITT Study Area.

#### 4.3.15.4 Population Threats

No species-specific data are available, but it is assumed that pantropical spotted dolphins are subject to threats similar to other dolphins in other locations. Pantropical spotted dolphins in Hawaii and Samoa have been observed interacting with the long line fishing gear, resulting in injury (Bradford & Forney, 2014), and there was one case of serious injury to a spotted dolphin observed entangled in fishing line (Bradford & Lyman, 2015). Entanglement in fishing gear set by commercial fishers from Japan and South Korea is a potential threat, particularly considering the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009).

Pantropical spotted dolphins may be preyed on by killer whales and sharks and have been observed fleeing killer whales in Hawaiian waters (Baird et al., 2006b). Other predators may include the pygmy killer whale, false killer whale, and occasionally the short-finned pilot whale (Perrin, 2009a).

### 4.3.16 PYGMY KILLER WHALE (*FERESA ATTENUATA*)

#### 4.3.16.1 Status and Management

The pygmy killer whale is not listed under the ESA. The stock structure for pygmy killer whale remains uncertain in the western Pacific, and pygmy killer whales in the Study Area have not been assigned to a stock in the current SAR (Carretta et al., 2019b).

#### 4.3.16.2 Habitat and Geographic Range

This species has been documented in the western Pacific (Taiwan and Japan) (Sylvestre, 1988; Wang & Yang, 2006; Wang et al., 2001). Like similar deep-water and deep-diving cetaceans, pygmy killer whales are likely highly mobile in the marine environment with no known concentration areas in the Mariana Islands. There was only one pygmy killer whale sighting of a group of six animals during the 2007 systematic survey of the Study Area (Fulling et al., 2011a). The sighting occurred near the Mariana Trench, south of Guam, where the bottom depth was 14,564 ft. (4,413 m). This is consistent with the known habitat preference of this species for deep, oceanic waters. In the Study Area, where there are deep waters relatively close to the islands, pygmy killer whale sightings close to shore are not unexpected. During small boat surveys between 2010 and 2018, there was a single pygmy killer whale sighting northeast of Saipan in 2011 and then single sightings in 2013 and 2014 off Guam; group sizes were from six to nine individuals (Hill et al., 2017; Hill et al., 2014; Hill et al., 2019; Hill et al., 2018d). Median distance from shore for these sightings was 6.9 km (range 1.1–10 km). There is no information on the wider distribution of pygmy killer whales in the Study Area given the limitations of the survey coverage (Hill et al., 2019). Boat surveys for the most recent pygmy killer whale sightings between 2010 and 2018 are typically of short duration (day-trips over a period of 6–20 days) and may not reflect year-round occurrence or distribution (Hill et al., 2019).

Pygmy killer whales feed predominantly on fish and squid. They have been known to attack other dolphin species, apparently as prey, although this is not common (Jefferson et al., 2015; Perryman & Foster, 1980; Ross & Leatherwood, 1994).

#### 4.3.16.3 Population Trends

Data collected during the PIFSC line-transect surveys allowed for the derivation of an updated design-based abundance estimate of 4,351 (CV = 1.11) pygmy killer whales (Bradford et al., In Prep.). Current data are not sufficient to assess a population trend for the population of pygmy killer whales that occur in the MITT Study Area..

#### 4.3.16.4 Population Threats

No species-specific data are available from the Study Area but it is assumed that pygmy killer whales are subject to threats from interactions with fishing activities based on data from other locations including Hawaii (Bradford & Forney, 2017; Carretta et al., 2017a). Entanglement risk may include fishing activities out of Japan and South Korea (Miyashita, 1993b). Entanglement in fishing gear set by commercial fishers from Japan and South Korea is a potential threat, particularly considering the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009).

Entanglement in fishing gear set by commercial fishers from Japan and South Korea is a potential threat, particularly considering the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009; Miyashita, 1993b).

Two mass strandings of pygmy killer whales occurred in 2004 and 2005, respectively, on Taiwan. Wang and Yang (2006) speculated on the cause, suggesting that, "…naval sonar and live ammunition exercises are two of many plausible causes that need to be investigated." Given there was a lack of necessary information (e.g., if sonar was even in use) regarding relatively contemporaneous and distant events involving the U.S. Navy, People's Republic of China Navy, Taiwan's Republic of China Navy, Japanese Navy, and oil and gas seismic exploration occurring in the eastern Pacific, the authors could not conclusively determine the cause of the strandings. Between 1995 and 2005 there were six pygmy killer whale mass stranding events and three milling events involving the same species in Taiwan (Brownell et al., 2009b; Yang et al., 2008), confounding the identification of a specific cause for pygmy killer whale stranding events. The suggestion that sonar, underwater detonations, or seismic oil and gas exploration may have caused the 2004 and 2005 strandings has remained speculative, with researchers pointing to the need for further investigation (Brownell et al., 2009b; Wang & Yang, 2006; Yang et al., 2008). The *Acoustic and Explosives Concepts Technical Report* provides a general discussion of strandings potentially related to the use of sonar and other anthropogenic sound.

The pygmy killer whale has no documented predators (Weller, 2009), although it may be subject to predation by killer whales (*Orcinus orca*).

## 4.3.17 RISSO'S DOLPHIN (*GRAMPUS GRISEUS*)

### 4.3.17.1 Status and Management

Risso's dolphin is not listed under the ESA. The stock structure for Risso's dolphin remains uncertain in the western Pacific, and Risso's dolphins in the Study Area have not been assigned to a stock in the current SAR (Carretta et al., 2019b). Other than for waters along the U.S. West Coast, NMFS recognizes a single stock of Risso's dolphins in the Pacific in Hawaiian waters (Carretta et al., 2019b).

### 4.3.17.2 Habitat and Geographic Range

Occurrence of this species is deep open ocean waters off Hawaii and in other locations in the Pacific (Au & Perryman, 1985; Bradford et al., 2017; Leatherwood et al., 1980; Miyashita et al., 1996; Wang et al., 2001). Fishery interaction data determined the species occurrence west of the International Date Line extended as far north as 40° N, but the southern extent of the range could not be determined (Miyashita, 1993a). Aerial surveys in August 2007 covering 2,352 km of linear effort encountered a single pod of eight Risso's dolphins (Mobley, 2007b). During the NMFS survey of 2010, there was a single Risso's dolphin sighting of three individuals approximately 60 NM north of FDM (Oleson & Hill, 2010a). The 2015 NMFS month-long survey of the Mariana Islands encountered Risso's dolphins only twice and in small pods with a median group size of three (Hill et al., 2018c; Oleson, 2017). The species has not been detected in any other surveys efforts in the Study Area (Fulling et al., 2011a; Hill et al., 2017; Hill et al., 2018b; Hill et al., 2014; Hill et al., 2019; Hill et al., 2018c; Hill et al., 2018d). Vocalizations from Risso's dolphins were also detected south of Guam by passive acoustic recorders aboard an underwater glider survey in 2014 (Klinck et al., 2016).

Cephalopods and crustaceans are the primary prey for Risso's dolphins (Clarke, 1996), which feed mainly at night (Fernandez et al., 2017; Jefferson et al., 2015; Perrin et al., 2009a).

### 4.3.17.3 Population Trends

There are no abundance estimates for Risso's dolphin in the Study Area.

### 4.3.17.4 Population Threats

This dolphin may be preyed on by both killer whales and sharks, although there are no documented reports of predation by either (Weller, 2009).

Entanglement in fishing gear set by commercial fishers from Japan and South Korea is a potential threat, particularly considering the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009; Miyashita, 1993b). In nine market samples from South Korea taken between 2003 and 2005, molecular DNA evidence indicated that at least one product contained Risso's dolphin meat (Baker et al., 2006).

### 4.3.18 ROUGH-TOOTHED DOLPHIN (*STENO BREDANENSIS*)

#### 4.3.18.1 Status and Management

The rough-toothed dolphin is not listed under the ESA. The stock structure for rough-toothed dolphins remains uncertain in the western Pacific, and rough-toothed dolphins in the Study Area have not been assigned to a stock in the current SAR (Carretta et al., 2019b). NMFS recognizes a single stock of rough-toothed dolphins in the Pacific in Hawaiian waters (Carretta et al., 2019b).

#### 4.3.18.2 Habitat and Geographic Range

Rough-toothed dolphins were sighted twice during a 2007 survey; once as nine individuals in a mixed group of short-finned pilot whales and bottlenose dolphins, and once in a pod of nine individuals with calves present (Fulling et al., 2011a). A pod of eight rough-toothed dolphins was also sighted approximately 175 km south of Guam during a 2007 aerial survey (Mobley, 2007b). There were no rough-toothed dolphins identified in the broad offshore survey in 2010 (Oleson & Hill, 2010a). The species was encountered only three times during the month-long 2015 NMFS survey of the islands, twice in a group with another cetacean species (Oleson, 2017). Annual small boat surveys conducted from 2010 to 2018 have encountered rough-toothed dolphins on seven occasions, and again all but one of those encounters were in a group with other cetaceans (Hill et al., 2014; Hill et al., 2019; Hill et al., 2018c; Hill et al., 2018d). Four of the same photo-identified rough-toothed dolphins encountered in 2013 have been seen multiple times since in the same general location to the west of Saipan off CK Reef (Hill et al., 2017; Hill et al., 2014). One group of rough-toothed dolphins was sighted in 2014, but none were encountered in surveys occurring in 2015 through 2018 (Hill et al., 2017; Hill et al., 2018b; Hill et al., 2019; Hill et al., 2018d).

Rough-toothed dolphin prey includes fishes and cephalopods. They are known to feed on large fish species, such as mahi mahi (Miyazaki & Perrin, 1994; Pitman & Stinchcomb, 2002), and have been observed feeding during the day on species found near the surface, including flying fishes (Gannier & West, 2005). Perkins and Miller (1983) noted that parts of reef fishes have been found in the stomachs of stranded rough-toothed dolphins in Hawaii.

#### 4.3.18.3 Population Trends

Data collected during the PIFSC line-transect surveys allowed for the derivation of an updated design-based abundance estimate of 9,256 (CV = 1.22) rough-toothed dolphins (Bradford et al., In Prep.). Current data are not sufficient to assess a population trend for the population of rough toothed dolphins that occur in the MITT Study Area..

#### 4.3.18.4 Population Threats

No species-specific data are available from the Study Area, but it is assumed that rough-toothed dolphins are subject to threats from interactions with fishing activities based on data from other locations including Hawaii (Bradford & Forney, 2017; Carretta et al., 2017a). From 2010 to 2014, two rough-toothed dolphins were observed injured during deep-set and shallow-set fisheries in the Hawaii Exclusive Economic Zone (Bradford & Forney, 2017).

Entanglement risk may include fishing activities out of Japan and South Korea (Miyashita, 1993b). Entanglement in fishing gear set by commercial fishers from Japan and South Korea is a potential threat, particularly considering the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009).

Although this species has not been documented as prey by other species, it may be subject to predation from killer whales.

### 4.3.19 SHORT-FINNED PILOT WHALE (*GLOBICEPHALA MACRORHYNCHUS*)

#### 4.3.19.1 Status and Management

The short-finned pilot whale is not listed under the ESA. The stock structure for short-finned pilot whales remains uncertain in the western Pacific, and short-finned pilot whales in the Study Area have not been assigned to a stock in the current SAR (Carretta et al., 2019b). With the exception of the U.S. West Coast, NMFS recognizes a single stock of short-finned pilot whales in the Pacific in Hawaiian waters (Carretta et al., 2019b).

#### 4.3.19.2 Habitat and Geographic Range

In the 2007 survey of the Mariana Islands, short-finned pilot whales were encountered five times in groups ranging in size from 5 to 43 animals (Fulling et al., 2011a). During the 2010 NMFS survey there was a single sighting of 23 short-finned pilot whales in the northern portion of the Study Area (Oleson & Hill, 2010a). Closer to the islands, there have been numerous incidental sightings of short-finned pilot whales occurring between 1977 and 2013 (Uyeyama, 2014). During the Navy-funded 2010–2018 small boat surveys in the Mariana Islands, short-finned pilot whale groups were encountered on 23 occasions in a median depth of approximately 720 m and median approximate distance from shore of 5 km, including one pod of 35 individuals off Marpi Reef north of Saipan (Hill et al., 2017; Hill et al., 2018b; Hill et al., 2014; Hill et al., 2019; Hill et al., 2018d). Satellite tag locations from one short-finned pilot whale in 2016 appeared to indicate a position inside the mouth of Apra Harbor (there were no prior or subsequent positions on that day) (Hill et al., 2017). However, it should be considered uncertain if the animal was in Apra Harbor, due to the limited precision (error range) of even high-quality Argos satellite fixes, and in particular with regard to reduced longitudinal precision, given the Argos satellites are in polar orbits (Boyd & Brightsmith, 2013; Vincent et al., 2002). Based on the locations from the 2013 to 2016 satellite tagged individuals in the May–August timeframe, Hill et al. (2018a) argued that the combined data suggested the northwest side of Guam is a frequently used area for pilot whales during that time of the year. During the August 2018 small boat surveys off Guam, satellite tags were deployed on an additional five adult short-finned pilot whales, three at Marpi Reef and two offshore of Tinian (Hill et al., 2019). Tag durations lasted from approximately 9–128 days, with the individuals ranging from the south at Tumon Bay off Guam to as far north as the waters west of Anatahan (Hill et al., 2019). These tag locations suggest multiple areas of frequent use by pilot whales in the Mariana Islands. A single pilot whale standing was reported by the CNMI Division of Fish and Wildlife on Saipan in November 2025 (Tenorio, 2025). The cause of the standing was unclear and a necropsy was not possible.

Pilot whales feed primarily on squid but also prey on fishes (Bernard & Reilly, 1999). They are generally well adapted to feeding on squid (Jefferson et al., 2015; Werth, 2006a, 2006b). Analysis of satellite tagging data from pilot whales in Hawaii correlated with environmental parameters, suggesting that the deep mesopelagic boundary community serves as is the primary foraging area for short-finned pilot whales (Abecassis et al., 2015). Pilot whales are not generally known to prey on other marine mammals, but records from the eastern tropical Pacific suggest that the short-finned pilot whale does occasionally chase and attack, and may consume, dolphins (Olson, 2009; Perryman & Foster, 1980).

#### 4.3.19.3 Population Trends

Genetic samples taken during small boat surveys between 2010 and 2014 found evidence of genetic differentiation for short-finned pilot whales between the Mariana Islands, although they possess haplotypes also common in the South Pacific, North Atlantic, Indian Ocean, and off of southern Japan (Martien et al., 2014). Data collected during the PIFSC line-transect surveys allowed for the derivation of an updated design-based abundance estimate of 1,192 (CV = 0.98) short-finned pilot whales (Bradford et al., In Prep.). Current data are not sufficient to assess a population trend for the population of short-finned pilot whales that occur in the MITT Study Area.

#### 4.3.19.4 Population Threats

Entanglement risk may include fishing activities out of Japan and South Korea (Miyashita, 1993b). Entanglement in fishing gear set by commercial fishers from Japan and South Korea is a potential threat, particularly considering the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009). In nine market samples from South Korea taken between 2003 and 2005, molecular DNA evidence indicated that at least two products contained short-finned pilot whale meat (Baker et al., 2006).

This species is not known to have any predators (Weller, 2009), although it may be subject to predation by killer whales.

### 4.3.20 SPINNER DOLPHIN (*STENELLA LONGIROSTRIS*)

#### 4.3.20.1 Status and Management

The spinner dolphin is not listed under the ESA. The stock structure for spinner dolphins remains uncertain in the western Pacific, and spinner dolphins in the Study Area have not been assigned to a stock in the current SAR (Carretta et al., 2019b). NMFS recognizes seven stocks of island- or atoll-associated spinner dolphin populations in the Pacific in Hawaii and American Samoa waters (Carretta et al., 2019b; Carretta et al., 2017a; Carretta et al., 2017b), which are all at locations well to the east of the Study Area.

#### 4.3.20.2 Habitat and Geographic Range

Spinner dolphins traveling among the Mariana Islands chain are expected to occur throughout the Mariana Islands, having been observed from Uracas in the north to Guam in the south (Fulling et al., 2011a; Hill et al., 2017; Hill et al., 2019; Hill et al., 2018d; Jefferson et al., 2006; Oleson, 2017; Oleson & Hill, 2010b; Tetra Tech Inc., 2014; Trianni & Kessler, 2002; Uyeyama, 2014; Vogt, 2008). Spinner dolphins have been the most frequently encountered species during small boat reconnaissance surveys conducted in the nearshore waters of the Mariana Islands since 2010 but were uncommon offshore (Fulling et al., 2011a; HDR, 2011; HDR EOC, 2012; Hill et al., 2013a; Hill et al., 2017; Hill et al., 2018b; Hill et al., 2014; Hill et al., 2019; Hill et al., 2016b; Hill et al., 2018d; Hill et al., 2015; Ligon et al., 2011; National Marine Fisheries Service, 2019; Oleson, 2017; Oleson & Hill, 2010b). Previously reported spinner dolphin high-use areas nearshore at Guam include Bile Bay, Tumon Bay, Double Reef, north Agat Bay, and off Merizo (Cocos Lagoon area), where these animals congregate during the day to rest (Amesbury et al., 2001; Eldredge, 1991). More recently, high-use areas have included Agat Bay; the Merizo channel, tucked into the several small remote bays between Merizo and Facpi Point; Piti Bay; Hagatna; Tumon Bay; and Pugua Point (Ligon et al., 2011). There have been no documented sightings within Apra Harbor. The locations where spinner dolphins have been documented resting in Agat Bay were used to support development and implementation of a geographic mitigation area, as detailed in Appendix I (Geographic Mitigation Assessment) of the 2020 SEIS/OEIS.

During the Navy-funded 2010–2018 small boat surveys in the Mariana Islands, there were 157 encounters with pods of spinner dolphins (Hill et al., 2019). The approximate distance from shore for these encounters was 1 km (Hill et al., 2017; Hill et al., 2018b; Hill et al., 2019). During a survey in August 2013 at Pagan Island, spinner dolphins calves and juveniles were encountered; although sighting rates were low relative to other island areas, re-sightings of four individual spinner dolphins on subsequent days were suggested to be consistent with residency patterns seen elsewhere (Tetra Tech Inc., 2014), which would be similar to behaviors seen in Hawaii (Heenehan et al., 2017b; Lammers, 2004; Marten & Psarakos, 1999; Norris et al., 1994; Tyne et al., 2017; Tyne et al., 2015).

Spinner dolphins feed primarily in the water column on small fishes, squids, and shrimp, and can dive to at least 200–300 m (Benoit-Bird & Au, 2003; Perrin & Gilpatrick, 1994). They forage primarily at night, when prey migrates toward the surface and closer to shore (Benoit-Bird, 2004; Benoit-Bird & Au, 2009; Benoit-Bird et al., 2001; Tyne et al., 2017). Spinner dolphins track the horizontal and vertical migrations of their prey (Benoit-Bird & Au, 2003), allowing for foraging efficiencies (Benoit-Bird & Au, 2003, 2004; Benoit-Bird & Au, 2009; Benoit-Bird et al., 2001). Foraging behavior has also been linked to lunar phases in scattering layers off of Hawaii (Benoit-Bird & Au, 2004).

#### 4.3.20.3 Population Trends

As noted previously, spinner dolphins have been the most commonly encountered species in nearshore waters within 1 km from shore and have been encountered in group sizes of up to 124 individuals in a pod (HDR, 2011; HDR EOC, 2012; Hill et al., 2013a; Hill et al., 2011; Hill et al., 2017; Hill et al., 2018b; Hill et al., 2014; Hill et al., 2013b; Hill et al., 2019; Hill et al., 2016b; Hill et al., 2015; Ligon et al., 2011; Oleson & Hill, 2010b). Genetic samples (n = 93) from spinner dolphins encountered during small boat surveys off Guam and Saipan between 2010 and 2014 suggest the population has high haplotypic diversity similar to that observed in the Society Islands of French Polynesia and that spinner dolphins around the Mariana Islands are much less isolated than those around the Hawaiian Islands (Martien et al., 2014).

There was only one spinner dolphin sighting of approximately 98 individuals during the Navy's 2007 line-transect survey of the Study Area (Fulling et al., 2011a). During the PIFSC line-transect surveys, there were eight sightings in 2015, six sightings in 2018, and one sighting in 2021. Data from all four of these systematic surveys were used to estimate cetacean species density from habitat-based density models developed specifically for the Mariana Islands region, resulting in a 2021 abundance estimate of 9,011 (CV = 0.46) spinner dolphins (Becker et al., In Prep.). The spatially explicit model predictions clearly show a strong island association for this species, consistent with the data collected during the PIFSC small boat surveys. Model-based annual estimates for 2018 through 2021 were not substantially different (Becker et al., In Prep.); however, these data are not sufficient to assess a population trend for the population of spinner dolphins that occur in the MITT Study Area.

#### 4.3.20.4 Population Threats

No species-specific data are available from the Study Area, but it is assumed that spinner dolphins are subject to threats from interactions with fishing activities based on data from other locations including Hawaii (Bradford & Forney, 2017; Carretta et al., 2017a). In Hawaiian waters from 2008 to 2012, three serious injuries, leading to mortalities, of spinner dolphins were reported (Bradford & Lyman, 2015). Two of these injuries were attributed to fisheries interactions, and the third involved marine debris preventing the animal's mouth from opening. Entanglement in fishing gear set by commercial fishers from Japan and South Korea is a potential threat, particularly considering the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009).

Spinner dolphins are also at risk if ecotourism and whale-watching activities result in chronic disturbance in their resting habitats (Courbis & Timmel, 2008; Heenehan et al., 2016; Heenehan et al., 2017a; Tyne, 2015; Tyne et al., 2018; Tyne et al., 2017; Tyne et al., 2015; Tyne et al., 2014). Courbis (2008) found changes in spinner dolphin aerial behaviors and suggested it was likely that vessel and swimmer activity was at least synergistically involved in causing these changes. Whether the behavioral changes affected the survival and fitness of the spinner dolphins remains unknown.

Spinner dolphins have stranded at Saipan (Trianni & Kessler, 2002). Spinner dolphins may be preyed on by sharks, killer whales, pygmy killer whales, and short-finned pilot whales (Perrin, 2009b).

### 4.3.21 STRIPED DOLPHIN (*STENELLA COERULEOALBA*)

#### 4.3.21.1 Status and Management

The striped dolphin is not listed under the ESA. The stock structure for striped dolphins remains uncertain in the western Pacific, and striped dolphins in the Study Area have not been assigned to a stock in the current SAR (Carretta et al., 2019b). Other than along the U.S. West Coast, NMFS recognizes only a single stock of striped dolphins that is present within the 200-mi. Exclusive Economic Zone defining Hawaiian waters (Carretta et al., 2019b)(Carretta et al., 2017a; Carretta et al., 2017b)

#### 4.3.21.2 Habitat and Geographic Range

Striped dolphins are generally restricted to oceanic regions and are seen close to shore only where deep water approaches the coast. In the eastern tropical Pacific, striped dolphins inhabit areas with large seasonal changes in surface temperature and thermocline depth, as well as seasonal upwelling (Au & Perryman, 1985; Reilly, 1990). The observed northern limits for the species are the Sea of Japan off Hokkaido, off Washington State in the eastern Pacific, or roughly along 40° N latitude across the western and central Pacific (Reeves et al., 2002).

Prior to the 2007 survey of the Study Area (Fulling et al., 2011a), striped dolphins were only known to occur in the area from two strandings, one recorded in July 1985 (Eldredge, 1991, 2003c) and a second in 1993 off Saipan (Trianni & Tenorio, 2012). However, striped dolphins were sighted throughout the Study Area during the 2007 survey (Fulling et al., 2011a). There was at least one sighting over the Mariana Trench, southeast of Saipan. Group sizes ranged from 7 to 44 individuals, and several sightings included calves. In early April 2010, during an oceanographic survey of waters in Micronesia and the Commonwealth of the Northern Mariana Islands, there were two striped dolphin sightings (pod sizes of 6 and 12) in waters to the south of Guam (Oleson & Hill, 2010a). Striped dolphins have not been reported during more recent non-systematic surveys in the Study Area involving small boats operating close to shore (Hill et al., 2013a; Hill et al., 2011; Hill et al., 2017; Hill et al., 2018b; Hill et al., 2014; Hill et al., 2019; Hill et al., 2018d; Hill et al., 2015).

Striped dolphins feed in the open ocean and near the seafloor, or benthic zone, along the continental slope and seaward of the slope. Most of their prey possess light-emitting organs (e.g., lanternfishes), suggesting that striped dolphins may forage at great depths, possibly diving to 200–700 m, and may feed at night in order to access prey in the deep scattering layer, including small fishes and squids (Archer & Perrin, 1999; Perrin et al., 1994).

#### 4.3.21.3 Population Trends

Prior to the Navy's 2007 survey of the Study Area (Fulling et al., 2011a), striped dolphins were only known from one stranding that occurred in July 1985 (Eldredge, 1991, 2003b). However, striped dolphins were sighted 10 times throughout the Study Area during the 2007 survey in waters with variable bottom depth, ranging from 2,348 to 7,526 m (Fulling et al., 2011a). There was at least one sighting over the Mariana Trench, southeast of Saipan. Group size ranged from 7 to 44 individuals, and several sightings included calves. During the PIFSC line-transect surveys, there were no sightings in 2015, one sighting in 2018, and one sighting in 2021. Data from all four of these systematic surveys were used to estimate cetacean species density from habitat-based density models developed specifically for the Mariana Islands region, resulting in a 2021 abundance estimate of 7,103 (CV = 0.37) striped dolphins (Becker et al., In Prep.). Model-based annual estimates for 2018 through 2021 were not substantially different (Becker et al., In Prep.); however, these data are not sufficient to assess a population trend for the population of striped dolphins that occur in the MITT Study Area.

#### 4.3.21.4 Population Threats

This species is preyed upon by sharks (Ross & Bass, 1971). It may also be subject to predation by killer whales.

Striped dolphins have been taken as bycatch by the tuna purse seine fishery in the eastern tropical Pacific and are susceptible to entanglement in fishing gear in other areas (Carretta et al., 2017a; Carretta et al., 2017b). No species-specific data are available from the Study Area, but it is assumed that striped dolphins are subject to threats from interactions with fishing activities based on data from other locations including Hawaii (Bradford & Forney, 2017; Carretta et al., 2017a). Entanglement in fishing gear set by commercial fishers from Japan and South Korea is a potential threat particularly considering the incentive created by the commercial sale of whale meat and related products allowed under Japanese and South Korean law (Baker et al., 2006; Lukoschek et al., 2009).

# 5 SEA TURTLES

## 5.1 GENERAL BACKGROUND

Sea turtles are highly migratory, long-lived reptiles that occur throughout the open-ocean and coastal regions of the Study Area. Generally, sea turtles are distributed throughout tropical to subtropical latitudes, with some species extending into temperate seasonal foraging grounds. Leatherback sea turtles are endothermic, enabling them to tolerate colder waters than other sea turtle species. This allows for a much greater range at higher latitudes than other species of sea turtles, which are exothermic and therefore less tolerant of colder waters. Sea turtles spend most of their time at sea, with female turtles returning to land to nest. Green sea turtles in the Mariana Islands, however, will also bask on the shore, particularly on beaches with lower levels of human disturbance. Green sea turtles bask on the shore for purposes of resting, thermoregulation (increasing their temperature by laying in the sun), and predator avoidance. Females also haul out onshore to avoid the advances of males during reproductive season (Spotila, 2004). Habitat and distribution vary depending on species and life stages and is discussed further in the species profiles and summarized in the following sections.

Additional species profiles and information on the biology, life history, species distribution, and conservation of reptile species can also be found on the following organizations:

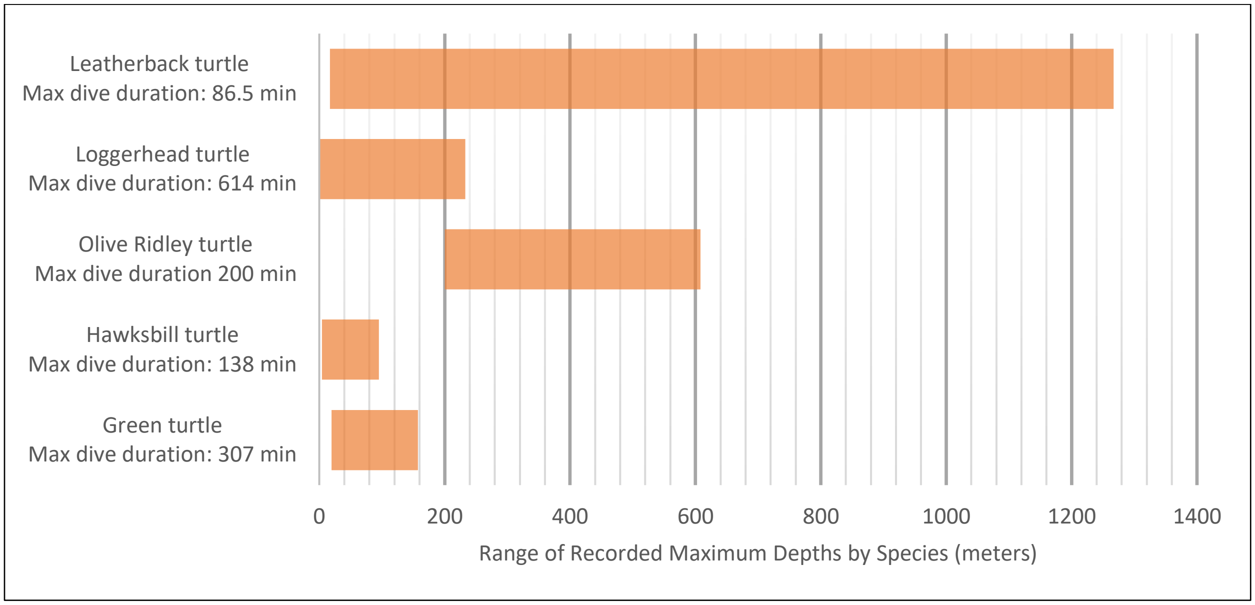
- NMFS Office of Protected Resources (includes sea turtle species distribution maps)
- USFWS Ecological Services Field Office and Region Offices (for sea turtle nesting habitat and general locations of nesting beaches)
- OBIS-SEAMAP species profiles
- International Union for Conservation of Nature, Marine Turtle Specialist Group
- State resource agencies (specifically, Hawaii Division of Land and Natural Resources)

Detailed information about threats to sea turtles and life history information can be found in the ESA listing documentation and their recovery plans (44 FR 75074; 52 FR 21059; 72 FR 13027; (U.S. Fish and Wildlife Service, 1999).

### 5.1.1 DIVE BEHAVIOR

Sea turtle dive depth and duration vary by species, the age of the animal, the location of the animal, and the activity (e.g., foraging, resting, and migrating). Regional differences in behavior among the same species may also occur.

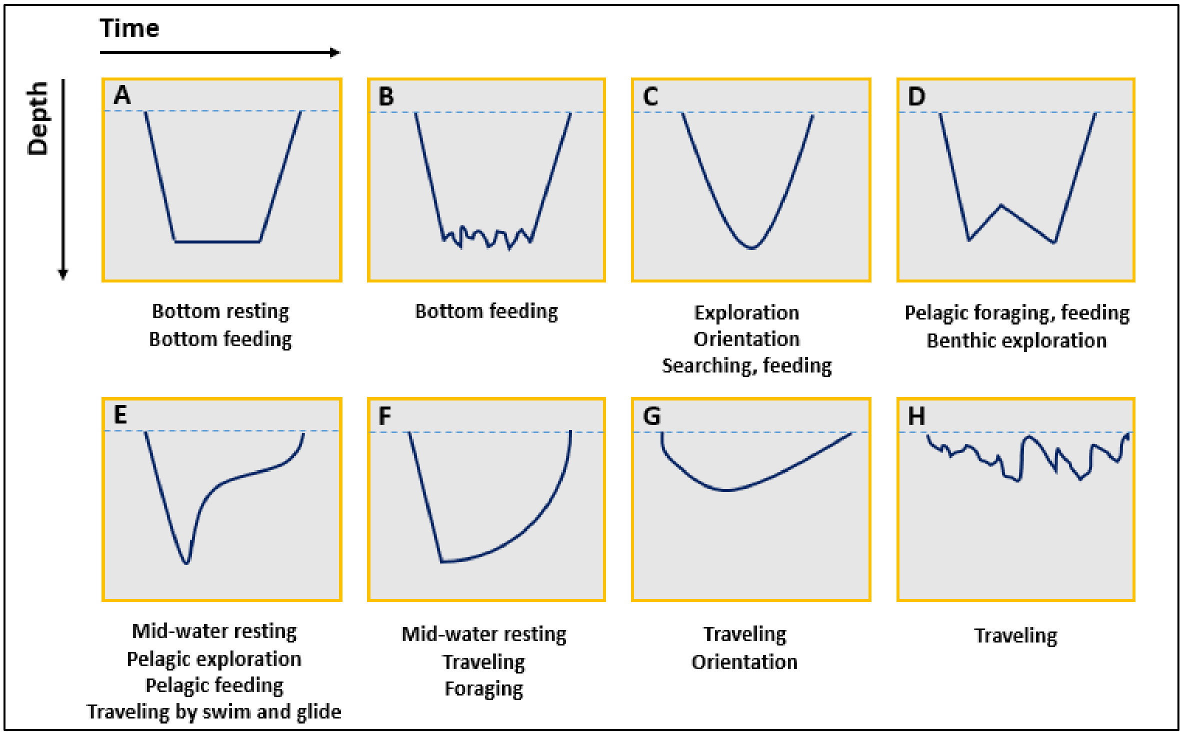
Dive durations are often a function of turtle size, with larger turtles being capable of diving to greater depths and for longer periods (Asada et al., 2022). Fukuoka et al. (2022) noted that olive ridley sea turtles exhibit longer dive times in warmer ocean temperatures. The diving behavior of a particular species or individual has implications for mitigation, monitoring, and developing sound conservation strategies. Figure 6 presents the ranges of maximum dive depths for each sea turtle species found in the Study Area.



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

**Figure 6: Dive Depth and Duration Summaries for Sea Turtle Species**

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 by Hochscheid (2014) show eight distinct profiles tied to specific activities. These profiles and activities are shown in Figure 7.



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. (2004); 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 7: Generalized Dive Profiles and Activities Described for Sea Turtles**

### 5.1.2 HEARING AND VOCALIZATION

Refer to the *Acoustic and Explosives Concepts Technical Report* for a summary and details regarding the hearing and vocalization of sea turtles.

### 5.1.3 GENERAL THREATS

#### 5.1.3.1 Water Quality

Water quality in sea turtle habitats can be affected by a wide range of activities. Chemical pollution and effects on water quality are also of great concern, although its effects on reptiles are just starting to be understood in marine organisms (Aguilar de Soto et al., 2008; Jepson et al., 2016; Law et al., 2014; National Marine Fisheries Service, 2011c, 2014a; Ortmann et al., 2012; Peterson et al., 2015). Oil and other chemical spills are a specific type of ocean contamination that can have damaging effects on some sea turtle and other marine reptile species directly through exposure to oil or chemicals and indirectly due to pollutants' effects on prey and habitat quality. Ingested plastics, discussed in more detail in Section 5.1.3.5 (Marine Debris), can also release toxins, such as bisphenol-A (commonly known as "BPA") and phthalates, and organisms may absorb heavy metals from the ocean and release those into tissues (Fukuoka et al., 2016; Teuten et al., 2007). Life stage, geographic location relative to concentrations of pollutants, and feeding preference affect the severity of effects on reptiles associated with chemical pollution in the marine environment. Exposure to pollutants may reduce turtle immune system responses, making them more susceptible to disease (Spotila, 2004).

#### 5.1.3.2 Commercial and Recreational Industries

One comprehensive study estimates that worldwide, 447,000 sea turtles are killed each year from bycatch in commercial fisheries around the world (Wallace et al., 2010). Lewison et al. (2014) compared bycatch using three different gear types (longline, gillnet, and trawling nets) for sea turtles, marine mammals, and seabirds. Sea turtles were most susceptible to bycatch, with the Mediterranean and waters off the Atlantic coast of South America as the two fisheries reporting the highest number of sea turtle mortalities (primarily through trawling) (Lewison et al., 2014). In U.S. fisheries, Finkbeiner et al. (2011) estimate that bycatch resulted in 71,000 sea turtle deaths per year prior to effective regulations that protect sea turtles (e.g., regulations adopted since the mid-1990s in different U.S. fisheries for turtle exclusion devices). Mortality estimates are 94 percent lower (4,600 deaths) than pre-regulation estimates (Finkbeiner et al., 2011). The trend in bycatch reductions continues throughout the Study Area. For example, (Eguchi et al., 2018) determined that current restrictions in West Coast fisheries (e.g., time-area closures for West Coast drift gill net fishery) have been effective and suggested that if the fixed time-area closure regulation existed in the 1990s, 18 of 19 observed bycatch events in this fishery could have been avoided (Eguchi et al., 2018).

Large-scale commercial exploitation also contributes to global decline in marine turtle populations. Currently, 42 countries and territories allow direct take of turtles and collectively take in excess of 42,000 turtles per year, the majority of which (greater than 80 percent) are green sea turtles (Humber et al., 2014). Illegal fishing for turtles and nest harvesting also continues to be a major cause of sea turtle mortality, both in countries that allow sea turtle take and in countries that outlaw the practice (Lam et al., 2011; Maison et al., 2010). For example, Humber et al. (2014) estimated that in Mexico 65,000 sea turtles have been illegally harvested since 2000. The authors, however, noted a downward trend of legal and illegal direct takes of sea turtles over the past three decades—citing a greater than 40 percent decline in green sea turtle take since the 1980s, a greater than 60 percent decline in hawksbill and leatherback take, and a greater than 30 percent decline in loggerhead take (Humber et al., 2014).

Vessel strike has been identified as one of the important mortality factors in several near-shore turtle habitats worldwide. Precise data are lacking for sea turtle mortalities directly caused by ship strikes; however, live and dead turtles are often found with deep cuts and fractures indicative of collision with a boat hull or propeller (Hazel et al., 2007; Lutcavage & Lutz, 1997). For example, scientists in Hawaii reported that 2.5 percent of green sea turtles found dead on the beaches between 1982 and 2003 had been killed by boat strike (Chaloupka et al., 2008), and in the Canary Islands, 23 percent of stranded sea turtles showed lesions from boat strikes or fishing gear (Oros et al., 2005). Denkinger et al. (2013) reports that boat strikes in the Galapagos Islands were most frequent at foraging sites close to a commercial and tourism port.

Onshore development can lead to nesting habitat loss or habitat degradation. Construction activities can facilitate erosion or inhibit natural sediment deposition to form beaches. Once facilities are operational, artificial lighting, noise, and other stressors can degrade nesting habitats (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2011; Seminoff et al., 2015). Two utility-grade offshore wind projects are in the early planning stages for Hawaii (Smith et al., 2015). Projects generating electricity in offshore areas may also use wave generation technologies. While no projects are planned for West Coast states, waters off of Oregon and Washington have the most potential for wave generation, with a targeted installed capacity of 500 megawatts by 2025 (Parkinson et al., 2015). These early individual projects will not likely harm sea turtles or disrupt behaviors because of their northern location, but an increasing trend in offshore energy development may present a cumulative threat to sea turtles in nearshore environments with higher sea turtle concentrations. The anticipated increase in renewable energy development in coastal waters and deeper sites on the continental shelf will require increased vessel traffic, seismic surveys, and possibly pile driving activities for the turbine footings (Pacific Fishery Management Council, 2011), all of which may potentially stress sea turtles and their habitats.

#### 5.1.3.3 Disease and Parasites

Fibropapillomatosis is a disease of sea turtles that results in the production of tumors, both external and internal, that are considered benign, but may obstruct crucial functions, such as swimming, feeding, sight, and buoyancy, and can lead to death (Balazs, 1986; National Marine Fisheries Service & U.S. Fish and Wildlife Service, 1991; Patrício et al., 2016; Work & Balazs, 2013). Fibropapillomatosis was first scientifically observed and described in the 1930s in green sea turtles captured in the Florida Keys (Jones et al., 2015; Page-Karjian, 2019). The disease is caused by a specific sea turtle herpesvirus, but scientists believe that environmental stress, especially pollution in the shallow coastal waters where turtles feed, acts as a major trigger for the development of these tumors (Manes et al., 2023). The disease shows the highest prevalence among green sea turtles (Patrício et al., 2016). While the disease is now found in turtle populations worldwide, the trends vary by location. In some areas where the disease has been around for decades, like Hawaii and Florida, the rates are stable or even decreasing. However, in many other parts of the world, the disease is continuing to spread and is becoming more common (Manes et al., 2023; McCorkle, 2016).

Edmonds et al. (2016) lists 16 parasites known to occur in sea turtles, with the most common and significant (in terms of effects on health) being blood flukes and flatworms (Watson et al., 2017). Some of the common external parasites found on sea turtles include leeches and a number of different species that reside on the shell called epibiota (Suzuki et al., 2014). Leeches and parasitic isopods (sea lice) are usually found on the soft skin tissues around the base of flippers, neck, tail, eyes, and the mouth. Parasitic isopods (e.g., sea lice) can attach themselves to sea turtle soft tissue on the outside and within the mouth (Júnior et al., 2015).

#### 5.1.3.4 Invasive Species

Invasive species have been shown to have both harmful and beneficial effects on sea turtles. Effects on sea turtles associated with invasive species primarily concern nest predation and prey base (Stokes et al., 2024). Nests and eggs in the Northwestern Hawaiian Islands are at low risk of predation, but eggs deposited on beaches in the main Hawaiian Islands may be consumed by a variety of introduced species (e.g., mongooses, rats, feral dogs and cats, pigs, ants). In foraging grounds, sea turtles have been shown to adapt their foraging preferences for invasive seagrass and algae. Becking et al. (2014) showed green sea turtle foraging behavior shift to consumption of *Halophila stipulacea*, a rapidly spreading seagrass in the Caribbean. In Hawaii, green sea turtles in Kaneohe Bay have modified their diets over several decades to include seven non-native species (*Acanthophora spicifera, Hypnea musciformis, Gracilaria salicornia, Eucheuma denticulatum, Gracilaria tikvahiae, Kappaphycus striatum,* and *Kappaphycus alvarezii*), with non-native algae accounting for over 60 percent of sea turtle diet (Russell & Balazs, 2015).

#### 5.1.3.5 Marine Debris

Ingestion of marine debris can cause mortality or injury to sea turtles, with adverse effects resulting from blocking of gastro-intestinal tracts and succumbing to toxicity from harmful chemicals (Sinaei et al., 2021). The United Nations Environment Program estimates that approximately 6.4 million tons of anthropogenic debris enters the marine environment every year (United Nations Environmental Program, 2005). This estimate, however, does not account for cataclysmic events, such as the 2011 Japanese tsunami 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 jelly fish. Even small amounts of plastic ingestion can cause an obstruction in a sea turtle’s digestive track 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 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 affects 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. The likelihood of ingestion of debris would therefore be dependent on location. In 2014, Schuyler et al. (2014) reviewed 37 studies of debris ingestion by sea turtles, showing that young oceanic sea turtles are more likely to ingest debris (particularly plastic), and that green and loggerhead sea turtles were significantly more likely to ingest debris than other sea turtle species.

## 5.2 ENDANGERED SPECIES ACT – LISTED SPECIES

### 5.2.1 GREEN SEA TURTLE (*CHELONIA MYDAS*)

#### 5.2.1.1 Status and Management

The green sea turtle was first listed under the ESA in 1978 (43 FR 32800 published July 28, 1978). In 2016, NMFS and USFWS reclassified the species into 11 “DPSs,” which maintains federal protections while providing a more tailored approach for managers to address specific threats facing different populations (see 81 FR 20058 published April 6, 2016). The geographic areas that include these DPSs are: (1) North Atlantic Ocean, (2) Mediterranean Sea, (3) South Atlantic Ocean, (4) Southwest Indian Ocean, (5) North Indian Ocean, (6) East Indian Ocean – West Pacific Ocean, (7) Central West Pacific Ocean, (8) Southwest Pacific Ocean, (9) Central South Pacific Ocean, (10) Central North Pacific Ocean, and (11) East Pacific Ocean.

The green sea turtle was listed range wide under the ESA on July 28, 1978. On April 6, 2016, NMFS listed 11 DPSs of green sea turtles as threatened or endangered under the ESA. Eight DPSs are listed as threatened: Central North Pacific, East Indian-West Pacific, East Pacific, North Atlantic, North Indian, South Atlantic, Southwest Indian, and Southwest Pacific. Three DPSs are listed as endangered: Central South Pacific, Central West Pacific, and Mediterranean. The Central West Pacific DPS nests on Guam and other islands in the Mariana Archipelago, while the East Indian-West Pacific DPS and Central North Pacific DPS occur in pelagic waters of the Study Area. (Seminoff et al., 2015).

#### 5.2.1.2 Critical Habitat

On July 19, 2023, NMFS issued a proposed rule for critical habitat designation (88 FR 46376) containing four essential features, two of which, overlap with the Western Pacific Ocean DPS, and Navy training and testing activities. The reproductive essential feature proposed by NMFS for the Central West Pacific Ocean DPS extends “from the [mean high water] to 20 m depth, sufficiently dark and unobstructed nearshore waters adjacent to nesting beaches proposed as critical habitat by USFWS… to allow for the transit, mating, and interesting of reproductive individuals and the transit of post-hatchlings.” Navy activities also overlap with the proposed benthic foraging habitat essential feature for the Central West Pacific DPS, which ranges from the mean high water line to 20 m depth, and includes underwater refugia and food resources (i.e., seagrasses, macroalgae, or invertebrates) of sufficient condition, distribution, diversity, abundance, and density necessary to support survival, development, growth, and/or reproduction.

On July 19, 2023, the USFWS proposed critical habitat for the nesting locations on Guam, Rota, Tinian, Saipan, Pagan, and Agrihan (88 FR 46376), and NMFS proposed critical habitat for nearshore reproductive habitat and benthic foraging habitat in waters off of Guam, Rota, Aguijan, Tinian, Saipan, Sarigan, Alamagan, Pagan, and Agrihan (88 FR 46572). Both USFWS and NMFS declined to include FDM in the proposed critical habitat designation. Figure 8 shows the proposed critical habitat surrounding Guam, Figure 9 shows proposed critical habitat surrounding Rota, and Figure 10 shows proposed critical habitat surrounding Tinian and Saipan.

#### 5.2.1.3 Recovery Goals

The major recovery actions for green sea turtles include the following:

- Protecting green sea turtles on nesting beaches
- Protecting nesting and foraging habitats
- Reducing bycatch in commercial and recreational fisheries through gear modifications, changes to fishing practices, and time and area closures
- Reducing the effects of entanglement and ingestion of marine debris

- Studying the impact of diseases on green sea turtles
- Working with partners internationally to protect turtles in all life-stages in foreign waters

#### 5.2.1.4 Habitat and Geographic Range

Habitat preferences for the green sea turtle Central West Pacific DPS and determined that this DPS is spatially bounded by the Asian continent to the west and north, the Solomon Islands to the south, the Marshall Islands in the east, and Palau in the west.

The habitat for the green sea turtle Central West Pacific DPS changes with the turtle's age and life stage. This DPS nests on beaches in the Mariana Archipelago, which includes Guam and the Northern Mariana Islands (Gaos et al., 2024). After hatching, young turtles prefer pelagic habitats for several years before moving to nearshore habitats as juveniles (Bresette et al., 2006). The optimal developmental habitats for late juveniles and foraging habitats for adults are warm shallow waters (3–5 m depth) with abundant submerged aquatic vegetation, close to nearshore reefs or rocky areas. Adults are primarily herbivores and inhabit shallow lagoons, where they feed on seagrasses and algae (National Marine Fisheries Service, 2025b). The specific underwater refugia and food resources, such as seagrasses and macroalgae, are essential features of their critical habitat (National Marine Fisheries Service, 2023a, 2025b).

The Navy has funded sea turtle tagging occurred off Guam, Saipan, and Tinian from 2013 through 2018. Since August 2013, when tagging began, Martin et al. (2018) reported that green sea turtles comprised the majority (76 percent or 332 or 438) of sea turtles observed or captured since tagging began in August of 2013. Of 94 satellite-tagged individuals, 82 were green sea turtles. Almost all of the captured turtles were sub-adults or juveniles. Tagged turtles exhibited high site fidelity and limited movements. The core area (50 percent Kernel interpolation with barriers [KIWB] volume contour) was geographically concentrated (mean = 0.51 square kilometers [km$^2$], standard deviation [sd] = 0.66 km$^2$, range = 0.03–2.58 km$^2$) as were home ranges (95 percent KIWB volume contour), with green turtles using an average area of 3.20 km$^2$ (sd = 4.47 km$^2$, range = 0.07–18.17 km$^2$). However, one adult male green sea turtle tagged off Orote Point in Guam in May 2016 and moved 39 km north to Pati Point before making a 70 km roundtrip jaunt offshore and then traveling south again to Apra Harbor and Orote Point. Given there are known nesting sites near both Pati Point (e.g., along Andersen Air Force Base beaches) and Orote Point (e.g., Spanish Steps in Apra Harbor), this adult male could have been visiting multiple breeding grounds or possibly moving between a combination of foraging and breeding sites. Figure 11 shows a habitat use map based on cumulative green sea turtle tagging results for Guam. All of these green sea turtles are believed to be part of the Central West Pacific DPS.

Figure 8: Proposed Critical Habitat for the Green Sea Turtle around Guam

Figure 9: Proposed Critical Habitat for the Green Sea Turtle around Rota

Figure 10: Proposed Critical Habitat for the Green Sea Turtle around Tinian, Saipan, and Aguijan

The green sea turtle is the dominant species reported in the CNMI (Kolinski et al., 2006; Minton et al., 2009). Recent ecological assessments confirmed that the southern arc islands, particularly Saipan, Tinian, and Rota, function as important foraging grounds for large aggregations of mainly immature resident green turtles, with earlier estimates suggesting approximately 1,000 to 2,000 individuals inhabit the nearshore waters around Saipan and Tinian, and approximately 118 individuals at Rota (Kolinski et al., 2004)(Kolinski et al., 2004; Wiles et al., 2008). FDM, due to its small size, is projected to sustain a smaller, resident population (Naval Facilities Engineering Command Marianas, 2022b).

Green sea turtles have repeatedly been observed in water and from the air in FDM's nearshore waters. The Navy completed an aerial photogrammetry survey of FDM in 2021 using a fixed-wing small unmanned aerial system (sUAS) to acquire high-resolution imagery for mapping and land characterization inside FDM's impact zones and in non-targeted portions of the island (U.S. Department of the Navy, 2021). The sUAS imagery was analyzed for marine resources of interest and identified one sea turtle (likely green sea turtle) all visible in the nearshore waters surrounding the island. Dive surveys surrounding FDM have repeatedly recorded green sea turtles (Carilli et al., 2018; Carilli et al., 2020), noting healthy and robust coral fauna suggests FDM supports healthy foraging habitats for sea turtles (Naval Facilities Engineering Command Marianas, 2022a; Smith & Marx, 2016).

Beyond the outer reef and in water depths greater than 100 m, green sea turtle occurrence is expected to be lower. Although nesting females and early juveniles are known to move through deeper marine waters between islands in the Marianas archipelago during reproductive and developmental migrations (Martin et al., 2018), they likely do so in small numbers. While the vast majority of green sea turtles in the region are believed to be part of the Central West Pacific DPS, the Study Area overlaps with the East Indian-West Pacific DPS and Central North Pacific DPS. The Navy derived density estimates to support the analysis of effects from acoustic and explosive stressors in the Navy Acoustic Effects Model. Details on the derivation of sea turtle densities in the Study Area and maps depicting density distributions are provided in the technical report U.S. Navy Marine Species Density Database Phase IV for the Mariana Islands Training and Testing Study Area (U.S. Department of the Navy, 2024c).

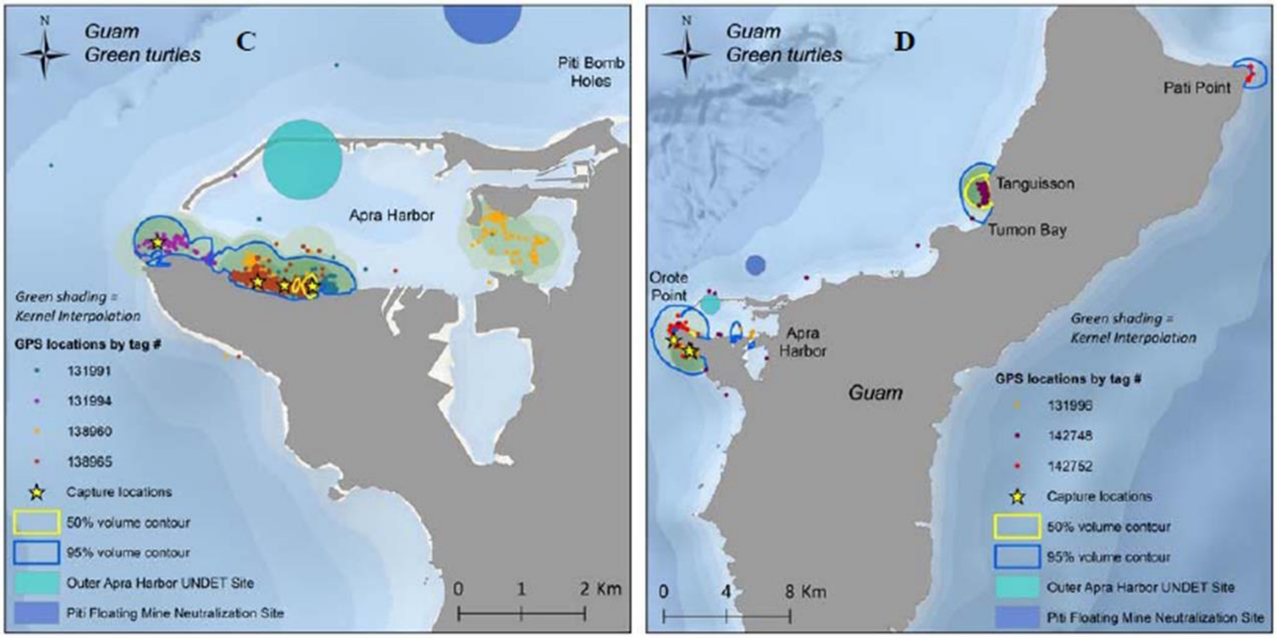


**Figure 11: Guam Green Sea Turtles Habitat Use**

#### 5.2.1.5 Population Trends

Genetic work currently underway indicates the majority of green turtles foraging in waters of the Mariana Islands originate from nesting beaches in the Republic of the Marshall Islands. There are substantial contributions from FDM and minor contributions from other countries (Gaos et al., 2024).

Green turtle nesting is widely dispersed throughout the East Indian-West Pacific DPS, with important nesting sites occurring in Northern Australia, Indonesia, Malaysia (Sabah and Sarawak Turtle Islands), Peninsular Malaysia, and the Philippine Turtle Islands. The largest nesting site lies within Northern Australia, which supports approximately 25,000 nesting females, calculated from the 5,000 nesting female's order of magnitude. Currently, the East Indian-West Pacific DPS hosts 58 reported nesting sites (in some cases nesting sites are made up of multiple beaches based on nesting survey information), with six of these sites supporting more than 5,000 nesting females each (including the 25,000 nesters in Northern Australia). Despite some nesting locations increasing, sea turtles within this DPS are believed to be substantially depleted from historical levels.

The in-water range of the East Indian-West Pacific DPS is similarly widespread, with shared foraging sites throughout the DPS. The extensive coastline and islands of Indonesia support a large range of nesting and foraging habitat for green sea turtles (National Marine Fisheries Service, 2017). A Green sea turtle from this DPS was incidentally caught in the Hawaii deep-set pelagic longline fishery, which operates inside and outside the EEZ primarily around the main Hawaiian Islands and Northwestern Hawaiian Islands, with some trips to the EEZs around the remote U.S. Pacific Islands of Johnson Atoll, Kingman Reef, Palmyra, Jarvis, Howland, Baker, Midway, and Wake Islands (National Marine Fisheries Service, 2017). The estimated total nester abundance for this DPS is approximately 77,009(Seminoff et al., 2015).

The nesting range of the Central North Pacific DPS covers the Hawaiian Archipelago and Johnson Atoll. The principal nesting site for green turtles in the Central North Pacific DPS is French Frigate Shoals, where 96 percent of the population (3,710 of 3,846 nesting females) currently nests (Balazs, 1980). Current nesting by green turtles occurs in low numbers (3–36 nesting females at any one site) throughout the Northwest Hawaiian Islands at Laysan, Lisianski, Pearl and Hermes Reef, and very uncommonly at Midway. Since 2000, green turtle nesting on the Main Hawaiian Islands has been identified in low numbers (1–24) on seven islands. Green turtles in the Central North Pacific DPS bask on beaches throughout the Northwest Hawaiian Islands and on islands within the main portion of the Hawaiian Archipelago.

Since nesting surveys were initiated in 1973, there has been a marked increase in annual green turtle nesting at East Island, French Frigate Shoals (FFS), where approximately 50 percent of the nesting on FFS occurs. During the first five years of monitoring (1973–1977), the mean annual nesting abundance was 83 females, and during the most recent five years of monitoring (2009–2012), the mean annual nesting abundance was 464 females. This increase over the last 40 years corresponds to an annual increase of 4.8 percent. Information on in-water abundance trends is consistent with the increase in nesting. Although the causes are yet to be determined, there has been a dramatic increase in the number of basking turtles in the Hawaiian Islands over the last two decades, both in the southern foraging areas of the main islands as well as at northern foraging areas at Midway Atoll.

The majority of tagged green sea turtles from nesting beaches in this DPS have been recovered within the Hawaiian Archipelago. The three outliers involved a recovery in Japan, one in the Marshall Islands, and one in the Philippines. (National Marine Fisheries Service, 2017; Seminoff et al., 2015).

#### 5.2.1.6 Population Threats

The recovery of green sea turtles in the Mariana Islands is hindered by both human and environmental factors. Poaching, a major concern, was found to reduce the annual population growth rate from an estimated 11.4 percent to the observed 7.4 percent on Saipan (Summers et al., 2017; Summers et al., 2018a; Summers et al., 2018b). Furthermore, studies indicate that climate change is negatively impacting nesting success. Rising nest temperatures are leading to a female-biased sex ratio and an increase in embryonic mortality, which could further jeopardize the population's recovery (Summers et al., 2017). While the presence of a healthy juvenile population in foraging grounds around islands like Tinian and Rota suggests ongoing recruitment, the combination of poaching and climate-related threats poses a serious risk to the long-term sustainability of the green sea turtle population in the region (Kolinski et al., 2006; Seminoff et al., 2015; Summers et al., 2018a).

NMFS provided Navy unpublished data in April 2019 on green sea turtle strandings in Guam. For 2018, the only year provided by NMFS, there were seven green sea turtle strandings. Suspected causes included were plastic ingestion (1), illegal harvest (1), unknown (2), and vessel strikes (3 – Apra Harbor).

## 5.2.2 HAWKSBILL SEA TURTLE (*ERETMOCHELYS IMBRICATA*)

### 5.2.2.1 Status and Management

The Hawksbill sea turtle is listed as endangered under the ESA (35 FR 8491). While the current listing as a single global population remains valid, data may support separating populations at least by ocean basin under the distinct population segment policy (National Marine Fisheries Service, 2013). The most recent status review was released in 2013 by the NMFS and USFWS (National Marine Fisheries Service, 2013). There is no critical habitat designated for this species in the Study Area.

#### 5.2.2.1.1 Critical Habitat

There is no designated critical habitat for hawksbill sea turtles within the Study Area.

#### 5.2.2.1.2 Recovery Goals

Recovery goals were formally established in the Recovery Plan for U.S. Pacific Populations of the Hawksbill Turtle (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 1998a) and updated in subsequent status reviews (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2007a, 2013a). The major recovery actions for hawksbill sea turtles include the following:

1. Protecting hawksbill sea turtles on nesting beaches, including potential nest sites on Guam and on islands within the CNMI
2. Protecting nesting and foraging habitats
3. Reducing bycatch in commercial and recreational fisheries through gear modifications, changes to fishing practices, and time and area closures
4. Reducing the effects of entanglement and ingestion of marine debris
5. Studying the impact of diseases on hawksbill sea turtles
6. Working with partners internationally to protect turtles in all stages of life in foreign waters

### 5.2.2.2 Habitat and Geographic Range

Hawksbill sea turtles occur in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. Hawksbill sea turtles occupy different habitats depending on their life history stage. After entering the sea, hawksbill turtles occupy pelagic waters and occupy weed-lines that accumulate at convergence points (National Oceanic and Atmospheric Administration, 2024a).

Recent data from five decades of aerial surveys in nearshore waters around Guam have improved population and abundance estimates for hawksbills in this region. Between 2013 and 2018, Navy-funded tagging efforts off Guam, Saipan, and Tinian observed that Hawksbills comprised approximately 7.5 percent (representing 33 individual sea turtles) of all sea turtles tagged in these nearshore waters. These studies noted one hawksbill sea turtles (measuring 61.7 cm in carapace length) tagged on Tinian in 2013 travelled 233 km south to Guam's southern coast, remaining there for over two years. This movement was unusual for a sub-adult, suggesting possible early maturity, a shift to a new foraging site, or unknown reasons

Another sub-adult hawksbill (measuring 72.3 cm in length) tagged off of Tinian in 2014 migrated 2,118 km east over 74 days to Ant Atoll near Pohnpei, Federated States of Micronesia, where it stayed for 10 months. This individual was likely a mature adult on a breeding migration or returning to forage after breeding near Tinian. Overall, the trend data indicate a significant increase in sea turtle populations, including hawksbills, in Guam's waters (Martin et al., 2018).

Less is known about the hawksbill's oceanic stage, but it is thought that neonates live in the oceanic zone where water depths are greater than 200 m. Distribution in the oceanic zone may be influenced by surface gyres (Gaos, 2011; Leon & Bjorndal, 2002).

In offshore areas, there is little information in regard to distribution. Telemetry data collected by Miller et al. (1998) indicated that hawksbill sea turtles migrate between Australia and neighboring Pacific countries such as Vanuatu, Solomon Islands, Papua New Guinea, and Indonesia. Surveys conducted by Naughton (1991) at Oroluk Atoll reported that hawksbill comprised only 6 percent of all sea turtle observations, with the majority being green sea turtles. The density estimates for pelagic green sea turtles served as a baseline and was multiplied by 0.06 to derive the corresponding density estimate for hawksbill sea turtles. Details on the derivation of sea turtle density estimates and maps showing density distributions in the Study Area are presented in the technical report *U.S. Navy Marine Species Density Database Phase IV for the Mariana Islands Training and Testing Study Area* (U.S. Department of the Navy, 2024c).

#### 5.2.2.3 Population Trends

In the NMFS and USFWS 5-Year Review, recent trends for 42 monitoring sites indicated that 69 percent experienced population declines, 7 percent remained stable, and 24 percent showed increases. Seven of the 83 sites occur in the central Pacific Ocean, and one is located in the eastern North Pacific Ocean (Baja California, Mexico); all of these sites show decreasing long-term population trends. The only exception is the Hawaii site, which has exhibited a recent increasing trend.

Although historical abundance data are lacking, hawksbill sea turtles are considered severely depleted, due to the fragmentation and low use of current nesting beaches(National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2007a). Worldwide, an estimated 21,212 to 28,138 hawksbills nest each year across 83 sites. Among the 58 sites with historic trends, all show a decline during the past 20 to 100 years. On Guam, only 5 to 10 females are estimated to nest annually(National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2013a).

#### 5.2.2.4 Population Threats

In addition to the general threats described in Section 5.1.3 (General Threats) the greatest threat to hawksbills is harvest for commercial and subsistence use (Van Houtan et al., 2016). Direct harvest of eggs and nesting adult females from beaches, as well as direct hunting of turtles in foraging areas, continues in many countries.

Hawksbills, like other sea turtles, face predation primarily by sharks. All sea turtles except leatherbacks can undergo "cold stunning" if water temperatures drop below a threshold level, which can be lethal(National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2013a).

Summers et al. (2018a) summarized more than a decade of stranding recoveries (live and dead turtles) on the islands of Saipan and Tinian to obtain baseline information on the primary threats to sea turtles in the CNMI. Of the 89 sea turtle stranding records, 5 were hawksbill sea turtles (2 of which were recovered live, 3 dead). The authors report that four of the five hawksbill turtle strandings were the result of human take, including individuals recovered with spear gun injuries, butchered, or used as ornamental decorations, with one animal entangled in marine debris.

## 5.2.3 OLIVE RIDLEY SEA TURTLE (*LEPIDOCHELYS OLIVACEA*)

### 5.2.3.1 Status and Management

Olive ridley sea turtles that nest along the Pacific coast of Mexico are listed as endangered under the ESA, while all other populations are listed under the ESA as threatened (43 FR 32800). Based on genetic data, the worldwide olive ridley population is composed of four main lineages: east India, Indo-Western Pacific, Atlantic, and eastern Pacific Ocean (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2014; Shankar et al., 2004). Most olive ridley sea turtles found in Hawaiian waters are of the eastern Pacific Ocean lineage, with about a third from the Indo-Western Pacific lineage. Off of California, olive ridleys are thought to be within the eastern Pacific Ocean lineage (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2014).

#### 5.2.3.1.1 Critical Habitat

There is no critical habitat designated for this species in the Study Area.

#### 5.2.3.1.2 Recovery Goals

Recovery goals for the Pacific population of the olive ridley sea turtle were established in 1998 with the publication of the *Recovery Plan for U.S. Pacific Populations of the Olive Ridley Turtle* (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 1998b) and updated in subsequent status reviews (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2007b, 2014). The major recovery actions for olive ridley sea turtles include the following:

1. Supporting efforts of foreign governments (e.g., Mexico, South American countries) to protect turtles and eggs on nesting beaches).
2. Protecting nesting and foraging habitats.
3. Reducing bycatch in commercial and recreational fisheries through gear modifications, changes to fishing practices, and time and area closures.
4. Reducing the effects of entanglement and ingestion of marine debris.
5. Working with partners internationally to protect turtles in all life stages in foreign waters.

### 5.2.3.2 Habitat and Geographic Range

The olive ridley is known as an open ocean species but can be found in coastal areas. They are predominantly found in tropical waters of the south Atlantic, Indian, and Pacific Oceans. Most olive ridley turtles exhibit pelagic behavior throughout their life history (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2014). Outside the breeding season, individuals disperse widely, with neither males nor females exhibiting fidelity to specific foraging grounds, instead utilizing multiple feeding areas across the open ocean. The olive ridley has a large range in tropical and subtropical regions of the Pacific Ocean, and is generally found between 40°N and 40°S. Both adult and juvenile olive ridley turtles typically inhabit offshore waters, foraging from the surface to a depth of 490 ft. (149.4 m) (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2014).

Olive ridley turtles are rare year-round in waters surrounding Guam and the CNMI beyond the shelf break, consistent with their oceanic nature. Sightings within portions of the MITT Study Area inside the shelf break—such as Apra Harbor, Agat Bay, and nearshore waters around northern Tinian—are also expected to be rare.

#### 5.2.3.3 Population Trends

Little is known about the age and sex distribution, growth, birth and death rates, or immigration and emigration of olive ridley turtles. Hatchling survivorship is unknown. As with other sea turtle species, high mortality is presumed during early life stages. Both adults and juveniles occur in open sea habitats, often seen on at-sea transect studies(Eguchi et al., 2007). The median age to sexual maturity is 13 years, with a range of 10–18 years (Zug et al., 2006).

There has been a general decline in the abundance of this species since its listing in 1978. Although current global abundance estimates are unavailable, the olive ridley remains the most abundant sea turtle species worldwide and is the most prevalent in the open ocean waters of the eastern tropical Pacific (National Oceanic and Atmospheric Administration, 2024d). However, the population of olive ridley turtles in U.S. territorial waters is believed to be small (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2014; National Oceanic and Atmospheric Administration, 2024d). Before the commercial exploitation of olive ridley turtles, this species was highly abundant in the eastern tropical Pacific Ocean, likely outnumbering all other sea turtle species combined in the area (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2014).

#### 5.2.3.4 Population Threats

Besides the array of threats to sea turtles in general, most of the species-specific threats for olive ridleys in the east Pacific coast population are associated with nesting habitats along the eastern Pacific coast. (Montero et al., 2016) note that effects on nesting habitats for olive ridley sea turtles include construction of buildings and pilings, beach armoring and nourishment, and sand extraction. These activities have increased in many parts of the olive ridley's range and pose threats to major nesting sites in the Indo-Pacific region (Cáceres-Farias et al., 2022; National Oceanic and Atmospheric Administration, 2024d).

### 5.2.4 LOGGERHEAD SEA TURTLE (*CARETTA CARETTA*)

#### 5.2.4.1 Status and Management

In 2009, a status review conducted for the loggerhead (the first turtle species subjected to a complete stock analysis) identified nine DPS within the global population (Conant et al., 2009). In a September 2011 rulemaking, NMFS and USFWS listed five of these DPS as endangered and kept four as threatened under the ESA, effective as of October 24, 2011 (76 FR 58868). The

North Pacific Ocean, South Pacific Ocean, North Indian Ocean, Northeast Atlantic Ocean, and Mediterranean Sea DPSs of the loggerhead sea turtle are classified as endangered under the ESA, and the Southeast Indo-Pacific Ocean, Southwest Indian Ocean, Northwest Atlantic Ocean, and South Atlantic Ocean DPS are classified as threatened. Only the North Pacific Ocean DPS occurs within the Study Area; however, mixing is known to occur between other populations in the Pacific and Indian Oceans, enabling a limited amount of gene flow with other DPSs (Gaos, 2011). NMFS and USFWS completed the most recent status review for the North Pacific Ocean DPS in 2020 (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2020a).

#### 5.2.4.2 Critical Habitat

There is no critical habitat designated for loggerhead sea turtles within the Study Area.

#### 5.2.4.3 Recovery Goals

There is no recovery plan for the Pacific loggerhead sea turtle, but recovery goals are included in general conservation information provided by NMFS (National Oceanic and Atmospheric Administration, 2024c) and specified in periodic status reviews (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2020a). NMFS has established specific recovery goals for the Pacific loggerhead sea turtle, summarized below:

- Reduce incidental capture of loggerheads by coastal and high seas commercial fishing operations
- Establish bilateral agreements with Japan and Mexico to support their efforts to census and monitor loggerhead populations and to minimize impacts of coastal development and fisheries on loggerhead stocks
- Identify stock home ranges using eDNA analysis
- Determine population size and status (in U.S. jurisdiction) through regular aerial or on-water surveys
- Identify and protect primary foraging areas for the species

#### 5.2.4.4 Habitat and Geographic Range

Loggerhead sea turtles occur in U.S. waters in habitats ranging from coastal estuaries to waters far beyond the continental shelf (Dodd, 1988; Martin et al., 2020). Loggerheads typically nest on beaches close to reef formations and in close proximity to warm currents (Dodd, 1988), preferring beaches facing the ocean or along narrow bays (National Marine Fisheries Service & U. S. Fish and Wildlife Service, 1998; Rice et al., 1984). Most of the loggerheads observed in the eastern North Pacific Ocean are believed to come from beaches in Japan where the nesting season is late May to August. Aschettino et al. (2015) found that most loggerheads that use the Southern California Bight are more similar, using stable isotope analysis, to loggerheads in the Central North Pacific, as opposed to loggerheads that nest in Baja. Migratory routes can be coastal or can involve crossing deep ocean waters (Schroeder et al., 2003). The species can be found hundreds of km out to sea, as well as inshore areas, such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky areas, and shipwrecks are often used as feeding areas. The near-shore zone provides crucial foraging habitat, as well as habitat during nesting season and overwintering habitat.

Loggerhead sea turtles are primarily carnivorous in both open ocean and nearshore habitats, although they also consume some algae (Bjorndal, 1997). Diet varies by age class (Godley et al., 1998) and by specializing in specific prey groups dependent on location (Besseling et al., 2015; Biggs et al., 2000). For post hatchlings that tend to be grouped in masses of floating habitats, various diet analyses of gut contents show parts of marine algae, zooplankton, jellyfish, larval shrimp and crabs, and gastropods (Browlow et al., 2016; Burkholder et al., 2004; Carr & Meylan, 1980; Harrison et al., 2021; Morales-Zárate et al., 2021; Richardson & McGillivary, 1991). Both juveniles and adults forage in coastal habitats, where they feed primarily on the bottom, although they also capture prey throughout the water column (Bjorndal, 2003; DiMatteo et al., 2022; Harrison et al., 2021; Morales-Zárate et al., 2021). Adult loggerheads feed on a variety of bottom-dwelling animals, such as crabs, shrimp, sea urchins, sponges, and fish. They have powerful jaws that enable them to feed on hard-shelled prey, such as whelks and conch. During migration through the open sea, they eat jellyfish, mollusks, flying fish, and squid (Besseling et al., 2015; Harrison et al., 2021; Martin et al., 2020; Rice et al., 1984).

Pacific Ocean loggerheads appear to use the entire North Pacific Ocean during development. There is substantial evidence that the North Pacific Ocean stock makes two transoceanic crossings. The first crossing (west to east) is made immediately after they hatch from the nesting beach in Japan, while the second (east to west) is made when they reach either the late juvenile or adult life stage at the foraging grounds in Mexico. Offshore, juvenile loggerheads forage in or migrate through the North Pacific Subtropical Gyre as they move between North American developmental habitats and nesting beaches in Japan. The highest densities of loggerheads can be found just north of Hawaii in the North Pacific Transition Zone (Briscoe et al., 2021; Polovina et al., 2000).

The North Pacific Transition Zone is defined by convergence zones of high productivity that stretch across the entire North Pacific Ocean from Japan to California (National Park Service, 2023). Within this gyre, the Kuroshio Extension Bifurcation Region is an important habitat for juvenile loggerheads Kobayashi et al. (2008); Polovina et al. (2006). These turtles, whose oceanic phase last a decade or more, have been tracked swimming against the prevailing current, apparently to remain in the areas of highest productivity. Juvenile loggerheads originating from nesting beaches in Japan migrate through the North Pacific Transition Zone, north of the Mariana Islands, to important foraging habitats in Baja California, and may be found in the norther part of the Study Area (Briscoe et al., 2021). Seminoff et al. (2014) first reported that waters off the southern Baja Peninsula support a high abundance of loggerheads that originate from the Japanese nesting grounds.

#### 5.2.4.5 Population Trends

The largest nesting aggregation in the Pacific Ocean occurs in southern Japan, where fewer than 1,000 females breed annually (Briscoe et al., 2021; Ceriani et al., 2019; National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2020a)\. Despite historic long-term declines from Japan nesting beaches (50 to 90 percent), nesting populations in Japan have gradually increased since 2000 (Briscoe et al., 2021; Saito et al., 2018; Saito et al., 2015), based in part on modeling conducted by Morales-Zárate et al. (2021) and Morales-Zárate et al. (2021) carried out aerial surveys for loggerhead sea turtles along the Pacific Coast of the Baja California Southern California Bight resulted in 215 loggerhead sea turtle sightings over the course of one month in the fall of 2015 (Eguchi, 2015; Martin et al., 2020).

#### 5.2.4.6 Population Threats

Loggerheads that occur within the Study Area primarily originate from nesting grounds in Japan and use the North Pacific as migration and foraging grounds. Therefore, species-specific threats are limited to this geographic area. A primary threat to North Pacific loggerheads is the high degree of juvenile and adult mortality off the Baja California Peninsula. This location is considered a biological hotspot for loggerheads in a location where bycatch and human consumption present significant threats (Fisheries and Oceans Canada, 2011, 2016b; National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2020a). Mortality associated with shrimp trawls has been a substantial threat to juvenile loggerheads because these trawls operate in the nearshore habitats commonly used by this species. Although shrimping nets have been modified with turtle excluder devices to allow sea turtles to escape, the overall effectiveness of these devices has been difficult to assess (Bugoni et al., 2008; Ellis, 2016). Shrimp trawl fisheries account for the highest number of loggerhead sea turtle fishery mortalities; however, loggerheads are also captured and killed in other trawls, traps and pots, longlines, and dredges (Morales-Zárate et al., 2021; National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2020a).

### 5.2.5 LEATHERBACK SEA TURTLE (*DERMOCHELYS CORIACEA*)

#### 5.2.5.1 Status and Management

The leatherback sea turtle is listed as a single population and is classified as endangered under the ESA (35 FR 8491, January 26, 2012). Although USFWS and NMFS believe the current listing is valid, preliminary information indicates an analysis and review of the species should be conducted under the DPS policy (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2013b, 2020b). Recent information on population structure (through genetic studies) and distribution (through telemetry, tagging, and genetic studies) have led to an increased understanding and refinement of the global stock structure (Clark et al., 2010; National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2020b).

##### 5.2.5.1.1 Critical Habitat

There is no designated critical habitat for leatherback sea turtles in the Study Area

##### 5.2.5.1.2 Recovery Goals

Recovery goals for leatherback sea turtles are sourced from recovery plans and recent literature, such as National Oceanic and Atmospheric Administration (2024b), (Kuschke et al., 2023), and National Marine Fisheries Service and U.S. Fish and Wildlife Service (2020b). The top five recovery actions identified in these sources include the following:

1. Reduce fisheries interactions
2. Improve nesting beach protection and increase reproductive output

3. International cooperation
4. Monitoring and research
5. Public engagement

#### 5.2.5.2 Habitat and Geographic Range

The leatherback sea turtle is distributed worldwide in tropical and temperate waters of the Atlantic, Pacific, and Indian Oceans. Pacific leatherbacks are split into western and eastern Pacific subpopulations based on their distribution and biological and genetic characteristics. Eastern Pacific leatherbacks nest along the Pacific coast of the Americas, primarily in Mexico and Costa Rica, and forage throughout coastal and pelagic habitats of the eastern tropical Pacific, between the months of October and February (Burns et al., 2016; Eckert et al., 2015; Kuschke et al., 2023; Stewart et al., 2016). Western Pacific leatherbacks nest in the Indo-Pacific, primarily in Indonesia, Papua New Guinea and the Solomon Islands. A proportion of this population migrates north through the waters of Indonesia, Malaysia, Philippines, and Japan, and across the Pacific past Hawaii to feeding areas off the Pacific coast of North America. Another segment of the western subpopulation migrates into the southern hemisphere through the Coral Sea, into waters of the western South Pacific Ocean (National Marine Fisheries Service, 2016e). The Western Pacific leatherback group is the primary stock that occurs within the Study Area.

Leatherback sea turtles feed throughout the water column (Davenport, 1988; Eckert et al., 1989; Eisenberg & Frazier, 1983; Grant & Ferrell, 1993; James et al., 2005; Salmon et al., 2004). Leatherback prey is predominantly jellyfish (Aki et al., 1994; Bjorndal, 1997; James & Herman, 2001; Salmon et al., 2004). Engelhaupt et al. (2016) conducted gastrointestinal analysis on two leatherbacks southeast of Hawaii and found 94 percent of stomach contents to be comprised of salps, the remaining portions were unidentifiable invertebrates.

#### 5.2.5.3 Population Trends

Most stocks in the Pacific Ocean are faring poorly, where nesting populations have declined more than 80 percent since the 1980s, and because the threats to these subpopulations (e.g., bycatch in fishing gear; illegal fishing activity; pollution including plastic, discarded gear, and chemicals; and loss of nesting habitat due to erosion and accretion of beaches) 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 (Clark et al., 2010; National Marine Fisheries Service, 2016e; National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2020b; Sarti-Martinez et al., 1996; Stewart et al., 2016). Causes for this decline include the intensive egg harvest in Pacific leatherback rookeries and high levels of mortality through the 1980s associated with bycatch in Pacific gill net fisheries (Fisheries and Oceans Canada, 2016a; Florida Fish and Wildlife Conservation Commission, 2015). In contrast, western Atlantic and South African populations are generally stable or increasing.

#### 5.2.5.4 Population Threats

In addition to the general threats to sea turtles described previously, bycatch in commercial fisheries is a particular threat to leatherback sea turtles. Incidental capture in longline and coastal gillnet fisheries has caused a substantial number of leatherback sea turtle deaths, likely because leatherback sea turtles dive to depths targeted by longline fishermen and are less maneuverable than other sea turtle species. Natural factors, including the 2004 tsunami in the Indian Ocean and the tsunami that affected Japan in 2011, may have affected leatherback nesting beach habitat through encroachment, erosion, or increased inundation with debris in leatherback foraging habitats and migratory routes (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2013b). Eckert and Sarti-Martinez (1997) attributed the decline in the Mexican population of leatherbacks to the growth of the longline and coastal gillnet fisheries in the Pacific. Leatherbacks from this population migrate to the north Pacific and southeastern Pacific where these fisheries operate. Robinson et al. (2013) suggest that changes in global temperatures are contributing to the Pacific leatherback population decline through a shifting of nesting dates, which increases stressor exposure. Lastly, changing ocean temperatures and dynamics may affect leatherback distribution by affecting the occurrence of jellyfish aggregations, a primary prey for leatherbacks (Pike, 2014).

## 5.3 SPECIES NOT LISTED UNDER THE ENDANGERED SPECIES ACT

The Navy reviewed the status and distribution of other pelagic reptile species, such as sea snakes, to evaluate if these species should be included in this SEIS/OEIS. In support of the 2026 Draft SEIS/OEIS, the Navy conducted a literature review of any additional sea snake records that differed from what was reported in the 2020 SEIS/OEIS. There are no verified records of sea snakes in nearshore waters of the Mariana Islands. Eldredge (2003a) notes that the few anecdotal reports of sea snakes are probably the result of confusion between the sea krate *Laticauda colubrina* commonly found on Palau and the snake eel *Myrichthys colubrinus*, indigenous to Guam. In the early 1970s there was a newspaper report of a yellow-bellied sea snake (*Pelamis platurus*) found on a Saipan beach (Eldredge, 2003a). Sea snake occurrences in both pelagic and nearshore waters of the Study Area is extremely rare; therefore, sea snakes are not included in this report.

# 6 SEABIRDS

## 6.1 GENERAL BACKGROUND

Seabirds – birds that forage primarily on the open ocean - are of particular interest as the group of birds with the broadest distribution and exposure to Navy activities in the Study Area. Seabirds are a diverse group that are adapted to living in aquatic environments (Enticott & Tipling, 1997; North American Bird Conservation Initiative, 2022a) and, in the Study Area use coastal (nearshore) waters, offshore waters (continental shelf), or open ocean areas (Harrison, 1983). There are many biological, physical, and behavioral adaptations that are different for seabirds than for terrestrial birds. Seabirds typically live longer, breed later in life, and produce fewer young than other bird species (Onley & Scofield, 2007). The feeding habits of seabirds are related to their individual physical characteristics, such as body mass, bill shape, and wing area (Hertel & Ballance, 1999). Some seabirds look for food (forage) on the sea surface, whereas others dive to variable depths to obtain prey (Burger, 2001). Many seabirds spend most of their lives at sea and come to land only to breed, nest, and occasionally rest (Schreiber & Chovan, 1986). Most species nest in groups (colonies) on the ground of coastal areas or oceanic islands, where breeding colonies number from a few individuals to thousands. However, many species are distributed nesters, and some seabirds are cavity nesters. Typical bird behavior to be encountered within the Study Area would include breeding, foraging, roosting, and migration. Beaches and wetlands within or bordering the Study Area may also be used as molting grounds by some species.

Additional information on the biology, life history, and conservation of bird species, including species-specific descriptions, is available from the websites of these sources:

- USFWS Migratory Bird Program and Endangered Species Program
- Birdlife International
- International Union for Conservation of Nature and Natural Resources Red List of Threatened Species
- National Audubon Society
- The Waterbird Society
- DoD’s Partners in Flight

The following sections contain additional information on group size, habitat use, diving behavior, hearing and vocalization, and general threats.

### 6.1.1 GROUP SIZE

Avian radar studies at sea shows some bird groups moving across open oceans in large numbers (Desholm et al., 2006; Gauthreaux & Belser, 2003). During the winter months, large groups of ducks (rafts) could be encountered. During the nesting and breeding season, pelagic seabirds could be encountered in large groups following the currents and upwellings in pursuit of prey (Sibley, 2014). In the nearshore environments, terns, gulls, shorebirds, and plovers may occur in large groups while in their breeding and feeding areas.

Most resident seabird species nest in groups (colonies) on the ground of coastal areas or oceanic islands, where breeding colonies number from a few individuals to thousands. This breeding strategy is believed to have evolved in response to the limited availability of relatively predator-free nesting habitats and distance to foraging sites from breeding grounds (Siegel-Causey & Kharitonov, 1990). Outside of the breeding season, most seabirds within the Order Procellariiformes, such as the black-vented shearwater (*Puffinus opisthomelas*), are solitary, though they may join mixed-species flocks while foraging and can be associated with whales and dolphins (Onley & Scofield, 2007) or areas where prey density is high (U.S. Fish and Wildlife Service, 2005c). During the breeding season, these seabirds usually form large nesting colonies. Pelecaniform (birds within the Order Pelecaniformes) breeding, whether on the ground or in trees, is typically colonial and is the most common order of birds in the Study Area. Foraging seabirds of the order Charadriiformes (e.g., Heermann’s gull [*Larus heermanni*]) can range from singles or pairs (International Union for Conservation of Nature and Natural Resources, 2010b;

U.S. Fish and Wildlife Service, 2005b) and can extend upward into larger groups where juveniles accompany adults to post-breeding foraging areas, where the water is calm and the food supply is good. There are post-season dispersal sites, where adults and fledglings congregate (U.S. Fish and Wildlife Service, 2006). Large groups are occasionally observed foraging at great distances from colonies, including at inland water sources (Atwood & Minsky, 1983).

### 6.1.2 HABITAT USE

#### 6.1.2.1 Migratory Corridors

A flyway is a flight path used by large numbers of birds while migrating between their breeding grounds and their overwintering quarters. The Study Area is within the West Pacific Flyway—a component of a major set of movement patterns known as the Pacific Ocean Flyway (Figure 12). Large movements of birds undergo a clockwise travel direction by migrating from the north to south via an oceanic route and south to north along a more coastal route (Morten et al., 2025). The Mariana Islands provide stopover habitat for numerous shorebird and waterbird species that conduct these long distant migrations between wintering grounds and breeding habitats.

Nonresident migrant shorebirds, such as the Pacific golden plover, migrate to Guam and the CNMI during winter months along the West Pacific Flyway. There are no breeding shorebirds in the Mariana Islands (Engilis & Naughton, 2004). The West Pacific Flyway, shown in Figure 12, includes various other Pacific archipelagos, such as New Zealand, Samoa, Line Islands, Phoenix Islands, Hawaii, and continental sub-arctic and arctic regions in Alaska. Upon arrival, the Mariana Islands provide limited resources for shorebirds due to small island size, narrow intertidal zones, and lack of extensive mudflats (Parish et al., 1987). The highest-quality habitats for wintering shorebirds are found on Guam and Saipan. During the wet season, approximately June through November, ephemeral basins with short grass, exposed mud, and shallow pools provide habitat for migratory shorebirds wintering in the islands. Larger expanses of short grass habitats associated with military bases, airports, golf courses, fields, and residential parks are utilized by golden-plovers and, to a lesser extent, turnstones (Engilis & Naughton, 2004).

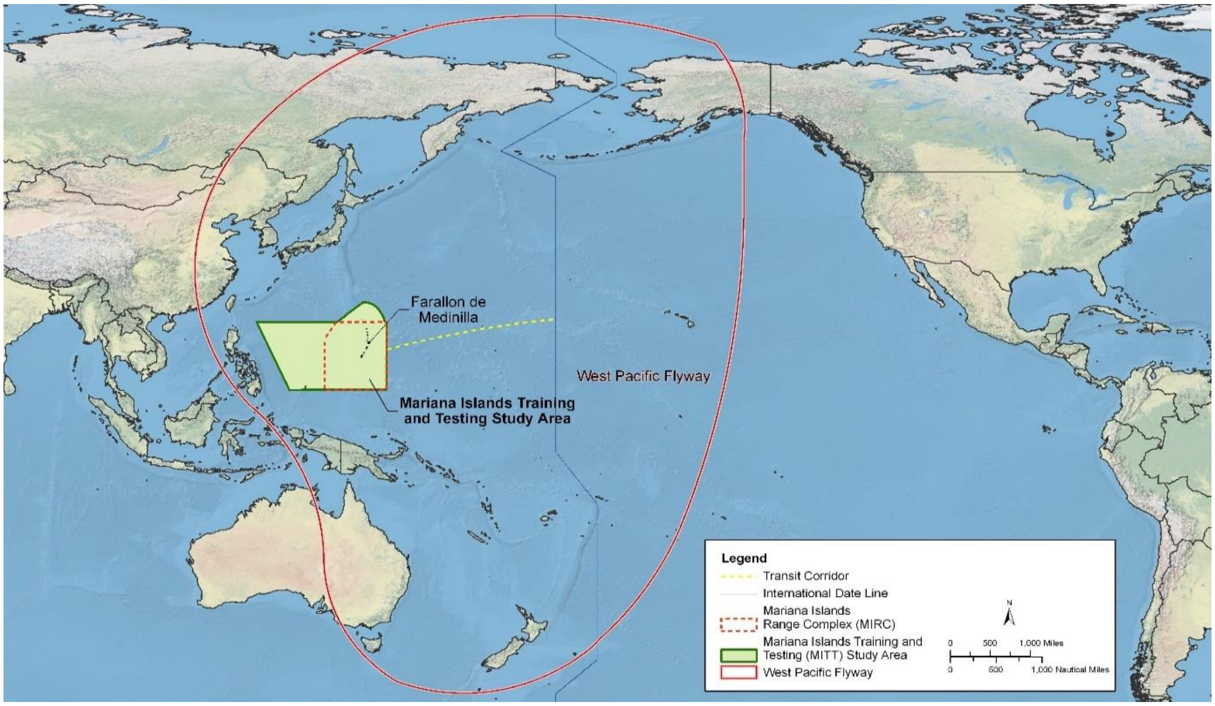


Figure 12: West Pacific Flyway

#### 6.1.2.2 Colony Locations within the Study Area

All of the islands within the Mariana Archipelago can support colony-nesting birds. Inhabited islands within the Study Area have been extensively altered by humans and support a wide array of introduced predators, plants, and invertebrate pests. The largest inhabited islands are located in the southern portion of the Marianas Archipelago (Guam, Rota, Saipan, and Tinian) and support less than 4 percent of the 265,000 seabirds estimated to occur within the Study Area (U.S. Fish and Wildlife Service, 2005a). The most important colony locations for seabirds are in the northern portion of the Mariana archipelago, particularly Uracas, Maug, Guguan, Asunción, FDM, and Naftan Rock off of Aguiguan (Kessler, 2009; U.S. Fish and Wildlife Service, 2005a). These islands are of little commercial value, and with the exception of FDM, are all designated by CNMI as wildlife areas or sanctuaries (Kessler, 2009; U.S. Fish and Wildlife Service, 2005a). Table 1 lists known colony locations on DoD-owned or leased lands within the Study Area, and Figure 13 shows known rookery locations for breeding seabirds within the Study Area from other sources.

### Table 1: Known Colony Locations on DoD-Owned or Leased Lands

| DoD Owned or Leased Property | Rookery/Nesting Location | Species Supported |
|---|---|---|
| **Guam** | | |
| Naval Base Guam Main Base | North coast of Orote Peninsula, rocky offshore islets | Breeding for white terns |
| | Orote Island, rocky offshore islets | Brown noddies (approximately 150 individuals reported in 2005) |
| | Neye Island | Breeding location for black noddies, brown noddies, Pacific reef-herons, white terns, yellow bitterns[1] |
| | Portions of Main Base | Possible breeding for white terns and noddies on portions of the Main Base. |
| Andersen Air Force Base | Shoreline between Pati Point and Tagua Point | Breeding for black noddies and brown noddies |
| **Tinian** | | |
| Tinian Military Lease Area | Puntan Masalok | Known breeding for black noddies, brown noddies, brown boobies |
| | Unai Dankulo | Known breeding for Pacific reef herons |
| | Puntan Lamanibot | Known breeding area for Pacific reef heron |
| **Farallon de Medinilla** | | |
| Farallon de Medinilla | Cliffline habitats and Islets | Known breeding for black noddies, brown noddies, brown boobies, masked boobies, red-footed boobies, white terns, great frigatebirds |
| | Upland vegetated areas | |

[1] Breeding activity at Neye Island is questionable due to the possible presence of brown treesnakes

Note: DoD = Department of Defense

Sources: National Oceanic and Atmospheric Administration (2005a, 2005b, 2005c, 2005d, 2005e); Naval Facilities Engineering Command Marianas (2022a); U.S. Department of the Navy (2011).

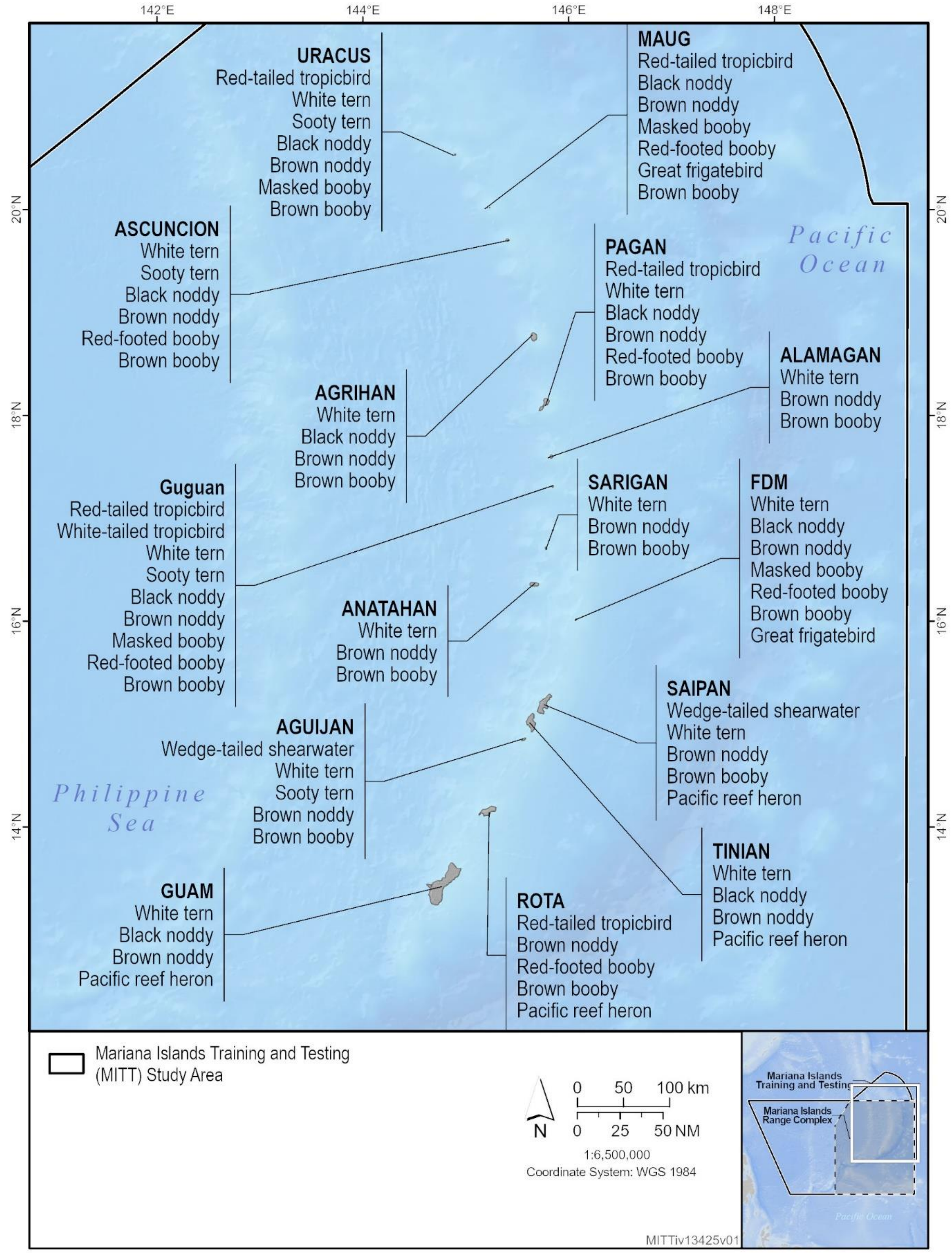


Figure 13: Known Colony Locations in the Mariana Islands

#### 6.1.2.3 Pelagic Habitats

Ocean habitats are dynamic and often change in size, shape, magnitude, and location as water masses of varying temperature, salinity and velocity converge and diverge (U.S. Fish and Wildlife Service, 2005a). Dynamic habitats are also created when water interacts with ocean floor topography (such as islands, seamounts, and ocean trenches) and interactions with the North Equatorial Current. Current convergences and eddy effects, created by points and islands within the Study Area, enhance local upwelling, which in turn promotes primary production and concentrates prey for seabirds (Mann & Lazier, 1996; Oedekoven et al., 2001). Generally, most fish are found in schools close to land, and consequently most distinctive seabirds of this region (e.g., tropicbirds, boobies, frigatebirds, and several species of terns) keep to nearshore or coastal waters (McGowan et al., 2003).

### 6.1.3 DIVE BEHAVIOR

Many of the seabird species found in the Study Area will dive, skim, or grasp prey at the water’s surface or within the upper portion (1–2 m) of the water column (Bentley et al., 2021; Jiménez et al., 2012; Yano et al., 2022). However, numerous seabirds, including various species of diving ducks, cormorants, and alcids (the family that includes murres, murrelets, auks, auklets, shearwaters, and puffins), including the threatened Newell’s shearwater, are known to feed at depths greater than 100 ft. (Ehrlich et al., 1988). Some seabirds are aerial plunge divers in which they dive from above the surface and make generally shallow dives into the water column after prey (e.g., terns, gannets). Others are considered surface divers, where they plunge directly from the surface underwater after prey (e.g., puffins, loons). Most diving species tend to catch the majority of their prey near the surface of the water column or on the bottom in shallow water (e.g., clams, mussels, and other invertebrates) (Cook et al., 2011), although some pursue prey to considerable depths as noted previously. Dive durations are correlated with depth and range from a few seconds in shallow divers to several minutes in alcids (Ponganis, 2015). Petrels forage both night and day; they capture prey by resting on the water surface and dipping their bill and by aerial pursuit of flying fish.

### 6.1.4 HEARING AND VOCALIZATION

Although hearing range and sensitivity has been measured for many land birds, fewer studies have focused on seabird hearing; most published literature on bird hearing focuses on terrestrial birds and their ability to hear in air. A review of 32 terrestrial and marine species indicates that birds generally have the greatest hearing sensitivity between 1 and 4 kHz (Beason, 2004; Dooling, 2002). Very few can hear below 20 Hz, most have an upper frequency hearing limit of 10 kHz, and none exhibit hearing at frequencies higher than 15 kHz (Dooling, 2002; Dooling & Popper, 2000). Hearing capabilities have been studied for several seabirds (Beason, 2004; Beuter et al., 1986; Crowell et al., 2015; Johansen et al., 2016; Smith et al., 2023; Thiessen, 1958; Wever et al., 1969); these studies show that seabird hearing ranges and sensitivity in air are consistent with what is known about bird hearing in general. More recent studies of long-tailed duck, common eider, and surf scoter (McGrew et al., 2022); and Atlantic puffin and common murre (Mooney et al., 2019) support previous conclusions that birds generally have greatest hearing sensitivity between 1 and 4 kHz. Two field studies (Mooney et al., 2020; Mooney et al., 2019) of wild captured Atlantic puffin produced auditory curves between 0.5 and 6 kHz, similar to measurements for other seabirds. Smith et al. (2023) measured the same range in marbled murrelet. Hansen et al. (2017) studied great cormorants and found maximum sensitivity at 2 kHz, and Larsen et al. (2020) found that great cormorants have underwater hearing sensitivity that is at least as good as their aerial sensitivity along with anatomical adaptations to underwater hearing (thickened eardrum).

Crowell (2016) studied the relationship between the vocalizations of ten diving bird species and their in-air hearing sensitivity. Vocalizations were obtained for eight of the species, and for seven of these, the peak frequency fell within the range of highest in-air hearing sensitivity. The study suggested that colonial nesting species may have reduced hearing sensitivity because they rely on unique, short-range calls, while species with more sensitive hearing were found in quieter freshwater habitats (compared to noisy marine environments).

Diving birds might have less sensitive underwater hearing compared to non-avian species. This reduced sensitivity is likely a consequence of physical adaptations that evolved to protect their ears from pressure changes during diving (Dooling & Therrien, 2012). Since communication and reproduction occur in the air, these diving adaptations may have primarily evolved to preserve in-air hearing ability, potentially leading to the observed reduced auditory sensitivity underwater (Hetherington, 2008).

Hansen et al. (2020) observed that common murres (*Uria aalge*) consistently reacted to underwater sound bursts and mid-frequency sonar signals. There are many anatomical adaptations in diving birds that may reduce sensitivity both in air and underwater. Anatomical ear adaptations include cavernous tissue in the meatus and middle ear that may fill with blood during dives to compensate for increased pressure on the tympanum, active muscular control of the meatus to prevent water entering the ear, and interlocking feathers to create a waterproof outer covering (Crowell et al., 2015; Rijke, 1970; Sade et al., 2008). Zeyl et al. (2022) used nano-CT scanning of the ears of 127 bird species to measure the morphological adaptations to aerial and underwater hearing. Pursuit and deep diving species have heavily modified middle ears, including smaller tympanic membranes and columella footplate of the middle ear, shorter extrastapedius, and reduced cranial air volume and connectivity. These likely facilitate hearing underwater and provide baroprotection, while potentially constraining the sensitivity of aerial hearing

### 6.1.5 GENERAL THREATS

Seabirds are some of the most threatened marine animals in the world, with 29 percent of species at risk of extinction (Spatz et al., 2014). The most immediate threat to seabirds nesting within the Mariana Islands is predated by introduced vertebrates, primarily rodents. Most of the northern Mariana Islands support large and regionally important breeding colonies of several seabird species, but most of these island have invasive rat populations that negatively affect colonies on these remote islands (Young & VanderWerf, 2023). Islands in the southern portion of the archipelago have several species of predators—in particular the invasive brown treesnake (*Boiga irregularis*) on Guam (Fritts & Leasman-Tanner, 2001).

In pelagic environments of the Study Area, other threats include interactions with commercial and recreational fishing gear (often abandoned) and pollution, such as that from oil spills and undigestible plastic debris (Anderson et al., 2007; Burkett et al., 2003; California Department of Fish and Game, 2010; Carter & Kuletz, 1995; Clavero et al., 2009; International Union for Conservation of Nature and Natural Resources, 2010a; North American Bird Conservation Initiative, 2022b; North American Bird Conservation Initiative & U.S. Committee, 2010; Onley & Scofield, 2007; Phillips et al., 2023; Piatt & Naslund, 1995; Richards et al., 2021; U.S. Fish and Wildlife Service, 2005b, 2008a, 2010; Waugh et al., 2012; Weimerskirch, 2004). Disease, volcanic eruptions, storms, and harmful algal blooms are also natural threats to birds (Anderson et al., 2007; Jeglinski et al., 2024; Jessup et al., 2009; North American Bird Conservation Initiative, 2022b; North American Bird Conservation Initiative & U.S. Committee, 2010; U.S. Fish and Wildlife Service, 2005b). Harmful algal blooms often result from human activities, namely, nutrient loading and coastal development (Anderson et al., 2021; Moore et al., 2024).

Loss of habitat and nesting areas is a major concern, primarily driven by coastal development and human encroachment that directly destroys or degrades critical breeding sites (Dias et al., 2019). This habitat degradation is frequently exacerbated by introduced invasive plants that displace native vegetation essential for nesting and burrows, altering the ecological structure of the colonies (Phillips et al., 2023; Spatz et al., 2023). Furthermore, nocturnal species, particularly petrels and shearwaters, face mortality from light pollution emitted by coastal development and ships, which disorient fledglings on their maiden flight to sea. Once grounded by the artificial light, they become highly vulnerable to collisions, predation, and starvation, contributing to significant local population declines (Rodríguez et al., 2017).

Young et al. (2012) and Phillips et al. (2023) summarized the hypothesized effects of changing long-term, macro-weather patterns on seabirds in the Pacific Climate, which include possible changes in wind patterns (affecting frontal zones and coastal upwelling important for prey items), oceanic warming and increasing thermal stratification, higher sea levels and storm surge events causing inundation of breeding locations, changes in ocean chemistry (creation of low oxygen zones or areas with high acidity), and increased heat stress for breeding birds at terrestrial colony sites

## 6.2 ENDANGERED SPECIES ACT – LISTED SPECIES

### 6.2.1 SHORT-TAILED ALBATROSS (*PHOEBASTRIA ALBATRUS*)

#### 6.2.1.1 Status and Management

The short-tailed albatross is widely regarded as one of the rarest species of albatrosses and one of the world's rarest birds (U.S. Fish and Wildlife Service, 2020b, 2023). The short, tailed albatross is listed as endangered under the ESA throughout its range. No critical habitat is designated for this species because little is known about its life in the open ocean (U.S. Fish and Wildlife Service, 2023).

#### 6.2.1.2 Habitat and Geographic Range

The range of the short-tailed albatross extends from Siberia south to the China coast, into the Bering Sea and Gulf of Alaska south to Baja California, Mexico, and throughout the North Pacific. Breeding is primarily restricted to islands in Japan and Taiwan, principally Torishima Island and the Senkaku Islands of Japan (U.S. Fish and Wildlife Service, 2008b, 2020a). Short-tailed albatrosses are typically found in the open ocean and tend to concentrate along the edge of the continental shelf (NatureServe, 2004). Nutrient rich upwelling enhances primary production, which increases prey availability for albatross. Upwelling occurs when the wind moves warm, nutrient poor water away from the area, which allows colder, nutrient rich water to rise to the surface of the ocean. Short-tailed albatross nest on isolated, windswept, offshore islands with restricted human access (U.S. Fish and Wildlife Service, 2000). Current and historical nesting habitats can be described as flat to steep slopes that are sparsely or fully vegetated. Short-tailed albatrosses disperse throughout the temperate and subarctic North Pacific approximately from May to October when they are not breeding, from Japan through California (U.S. Fish and Wildlife Service, 2005b, 2008a). Non-breeders and failed breeders disperse from the colony months sooner. While many non-breeders return to the colonies each year, the presence of immature birds far from the colony (such as the U.S. Pacific coast) during the breeding season suggests that some immature birds may spend years at sea before they return to the colony (U.S. Fish and Wildlife Service, 2005c).

Albatross diet includes squid (especially the Japanese common squid [Todarodes pacificus]), shrimp, fish (including bonitos [Sarda sp.], flying fishes [Exocoetidae] and sardines [Clupeidae]), flying fish eggs, and other crustaceans. Short-tailed albatross forages diurnally and possibly nocturnally, either singly or in groups (occasionally in the hundreds). The species is a surface feeder and scavenger, and predominately takes prey by surface-seizing, not diving (U.S. Fish and Wildlife Service, 2008c).

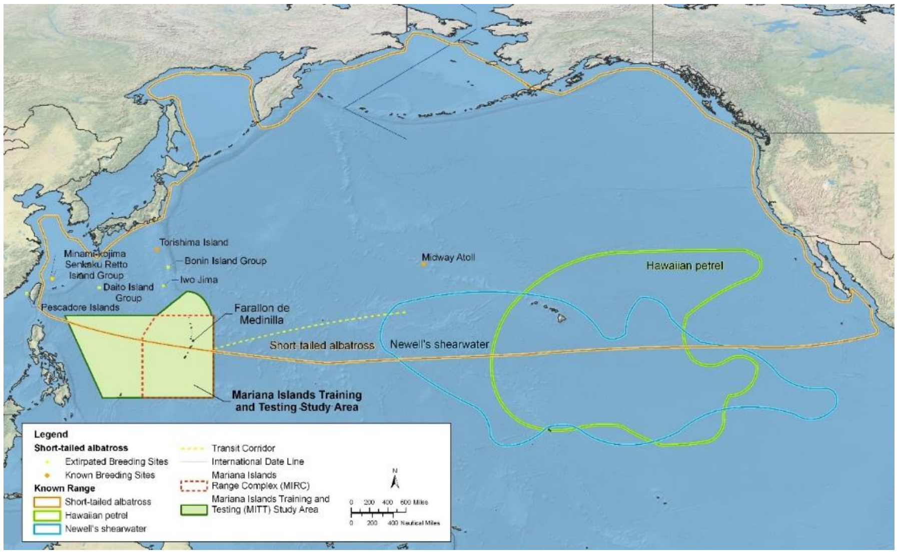
#### 6.2.1.3 Population Trends

Prior to its exploitation, the short-tailed albatross was possibly the most abundant of the three North Pacific albatross species (U.S. Fish and Wildlife Service, 2023). By the 1950s, this species was nearly extirpated in the Pacific as populations were harvested by feather hunters. Since then, the population has steadily increased by approximately 8 to 9 percent every year, the most recent status review (completed in 2020 with another status review expected in 2025) estimates a current population of approximately 7,300 individuals (U.S. Fish and Wildlife Service, 2020b). The species is known to breed on four islands (Agreement on the Conservation of Albatrosses and Petrels, 2011). Torishima, where 80–85 percent of short-tailed albatrosses breed, is an active volcano, and Tsubame-zaki, the natural colony site on the island, is susceptible to mud slides and erosion. An artificial colony has also been established in another area less prone to erosion on Torishima. As of the 2004–2005 season, four pairs have nested and fledged chicks at the artificial colony site. Most of the remaining short-tailed albatrosses breed at Minami-kojima in the Senkaku Islands, to the southwest of Torishima, where volcanism is not a threat (U.S. Fish and Wildlife Service, 2023). Both islands are controlled by Japan; however, the Senkaku Islands (including Minami-kojima) are claimed by the People's Republic of China and Taiwan (Republic of China).

In late 2010 two short-tailed albatross nests were recorded, one each on Kure Atoll and Midway Atoll, both of which contained an egg that was incubated. The nest on Midway Atoll successfully fledged the first chick outside of Japan in June 2011, but the nest on Kure Atoll had failed by late December 2010. Short-tailed albatrosses have begun breeding on Kure Atoll again, and at the same nest site as in 2010, with the birds arriving to Kure Atoll in late October 2011 (Agreement on the Conservation of Albatrosses and Petrels, 2011). On Midway, the pair returned in October 2011, with an egg observed on 14 November 2011 (BirdLife International, 2012). Another short-tailed albatross hatched in 2019 on Midway Atoll and returned to the island in 2023 (U.S. Fish and Wildlife Service, 2023). See Figure 14 for Pelagic Ranges and Breeding Locations.

#### 6.2.1.4 Population Threats

The short-tailed albatross, although recovering from near-extinction caused by historical feather harvesting, remains vulnerable due to a narrow suite of threats primarily focused on its limited breeding grounds and expansive oceanic foraging range (U.S. Fish and Wildlife Service, 2023). According to the 2020 5-Year Status Review by USFWS, the greatest risk stems from the species' small breeding distribution, with the majority of the population nesting on a single, active volcanic island, Torishima. This makes the species highly susceptible to catastrophic events like volcanic eruptions, landslides, or severe typhoons, which could devastate the primary colony (U.S. Fish and Wildlife Service, 2020b). At sea, the principal threat is bycatch mortality from commercial fisheries, particularly longline operations, where albatrosses are hooked or entangled while scavenging near vessels, though mitigation measures like streamer lines have reduced this threat in some U.S. waters. Finally, long-term threats include marine pollution—specifically the ingestion of plastic debris, which can cause injury, block the digestive tract, and lead to malnutrition—and the impacts of climate change, such as sea level rise and increased storm frequency that threaten low-lying nesting habitat (U.S. Fish and Wildlife Service, 2020b).



*Notes and Sources: Short-tailed albatross pelagic range and breeding sites from U.S. Fish and Wildlife Service (2005, 2008b). Newell's shearwater range and from BirdLife International (2010a, 2010b). Hawaiian petrel range from Birdlife International (2010b).*

**Figure 14: Pelagic Ranges and Breeding Locations for the Short-Tailed Albatross, Newell's Shearwater, and Hawaiian Petrel**

### 6.2.2 NEWELL'S SHEARWATER

#### 6.2.2.1 Status and Management

The Newell's shearwater is a medium-sized shearwater. It has a glossy black top, a white bottom, and a black bill that is sharply hooked at the tip. Its claws are well adapted for burrow excavation and climbing (U.S. Fish and Wildlife Service, 2012b).

As of May 2016, Newell's shearwater is considered a subspecies of Townsend's shearwater (*P. auricularis*) by the USFWS (FR 81 [91], 29165–29166, May 11, 2016). It is regarded by some authorities as a distinct species, *P. newelli* (American Ornithological Society, 2018; International Union for Conservation of Nature, 2017), and at least one author (Harrison, 1983) considered Newell's shearwater a subspecies of Manx shearwater (*P. puffinus newelli*), but since 1982, most authorities have considered it a subspecies of Townsend's shearwater (American Ornithologists' Union, 1998). Newell's shearwater is also known as Newell's dark-rumped shearwater.

The Newell's shearwater was listed as a threatened species by the USFWS in 1975 (U.S. Fish and Wildlife Service, 2012b), and under evaluation to be uplisted to endangered (U.S. Fish and Wildlife Service, 2011b).

#### 6.2.2.2 Habitat and Geographic Range

Newell's shearwaters are considered an exceptionally rare, extralimital vagrant in the waters surrounding the Mariana Islands; its known breeding colonies and primary pelagic range are concentrated in the central Pacific Ocean around the Hawaiian Archipelago (U.S. Fish and Wildlife Service, 2024). They spend most of their time in the open ocean year-round (U.S. Fish and Wildlife Service, 2005b) and come ashore only to nest. They avoid inshore waters except when gathering before they fly inland to breeding colonies at night (International Union for Conservation of Nature, 2017).

Newell's shearwaters forage only over open ocean waters of depths reportedly much greater than 2,000 m (Spear et al., 1995). Even when nesting, they feed over deep waters and are typically not within approximately 25 km of island shores (International Union for Conservation of Nature, 2017). In particular, they find abundant food along oceanic fronts, such as the Equatorial Countercurrent (Spear et al., 1995). The meteorological conditions favored by Newell's shearwaters are frequent clouds and rain squalls typical of intertropical convergence zones (Spear et al., 1995).

Although the diet of the Newell's shearwater is not well known, evidence suggests that squid is a major dietary item. It often forages hundreds of km offshore, often in large, mixed flocks associated with schools of large, predatory fish that drive prey species to the ocean surface. Newell's shearwaters capture food by pursuit-plunging (diving into water and swimming after prey, typically 10 to 30 m deep), usually in company with multispecies feeding flocks associated with tuna (International Union for Conservation of Nature, 2017). This species is not attracted to discarded fish byproducts and does not follow ships (Onley & Scofield, 2007).

#### 6.2.2.3 Population Trends

The population trend for Newell's Shearwater (*Puffinus newelli*) is one of steep and significant decline, leading to its listing as Threatened under the ESA. The vast majority of the global population (estimated at over 90 percent) breeds on the island of Kauaʻi, where studies using radar to track nightly commuting flights have documented a catastrophic decline. Specifically, radar data from 1993 to 2013 indicated an overall decline of approximately 94 percent in the Kauaʻi population (Day & Cooper, 1995; Day et al., 2003), with an average annual decline rate of about 13 percent over that 20-year period (Raine et al., 2023b).

While the rate of decline may have leveled off in the years following 2012, the population index remains at a significantly lower level than its pre-1990s abundance, demonstrating a massive loss of breeding individuals (Raine et al., 2020). This severe contraction is largely attributed to increased threats, particularly following Hurricane Iniki in 1992, which magnified the impacts of introduced predators (rats, cats, and pigs), collisions with power lines, and light attraction from coastal development that disorients fledglings (Raine et al., 2020). The population now exists in a highly fragmented state, concentrated in remote montane regions that are difficult to access for effective conservation and management.

#### 6.2.2.4 Population Threats

Historical threats to Newell's shearwater included subsistence hunting by Polynesians and predation by introduced species (a continuing threat) including rats, dogs, pigs, barn owls, feral cats, and the small Indian mongoose (*Herpestes auropunctatus*) (Hawaii Department of Land and Natural Resources, 2005). Recently, Young et al. (2023) successfully translocated 86 Newell's shearwaters (along with 110 Hawaiian petrels) to a predator free enclosure on Kauai, establishing the first predator-free colony for Newell's shearwaters.

Current threats include hooking and drowning on commercial longline gear (McCracken, 2014), artificial lights (e.g., street and resort lights) along the coast that blind and disorient fledglings. Once on the ground, these fledglings are unable to fly, and thousands are killed each year by cars, cats, and dogs. In addition, adults can collide with power facilities and associated utility wires and associated lines are in the direct path of known Newell's flight corridors. Additional threats are the loss and degradation of forested habitat caused by plants and herbivores.

### 6.2.3 HAWAIIAN PETREL

#### 6.2.3.1 Status and Management

The Hawaiian petrel was recently split from the Galapagos petrel (*Pterodroma phaeopygia*) based on genetic and morphological evidence; before the split they were collectively known as the dark-rumped petrel (U.S. Fish and Wildlife Service, 2005b).

The Hawaiian petrel is found only in Hawaii and is listed as endangered throughout its range under the ESA (U.S. Fish and Wildlife Service, 2005b); there is no designated critical habitat.

#### 6.2.3.2 Habitat and Geographic Range

The Hawaiian petrel's breeding distribution has significantly contracted from historical levels, where subfossil evidence suggests it nested widely across all main Hawaiian Islands at various elevations, including the lowlands (Hawaii Division of Forestry and Wildlife, 2024). Today, breeding is restricted to remote, high-elevation areas on the islands of Maui (most notably Haleakalā National Park), Kauai, Lānai, and Hawaii Island (U.S. Fish and Wildlife Service, 2022). The terrestrial habitat varies sharply across these islands: on Maui and Hawaiʻi Island, colonies are typically found above 2,500 m (8,200 ft.) in xeric, sparsely vegetated lava fields where they nest in natural crevices. Conversely, on Kauai and Lānai, colonies are often located in lower-elevation wet forests utilizing burrows dug into the soil (Raine et al., 2023a; Young et al., 2023).

During the breeding season, adults embark on some of the longest recorded foraging trips for any seabird. Satellite-tracked birds have been shown to travel over 6,000 kilometers (nearly 4,000 miles) on a single round trip to find food for their chicks, often reaching the waters near the Aleutian Islands in the far North Pacific (U.S. Fish and Wildlife Service, 2022).

Outside of the breeding season, individuals disperse widely across the North Pacific, which may extend into the northeastern portion of the MITT Study Area. Non-breeding Hawaiian Petrels and fledglings utilize waters extending from the equator north toward 50° N latitude. Observations have confirmed their presence far off the West Coast of North America, including the coasts of California, Oregon, and Washington (Raine et al., 2023a; Young et al., 2019).

#### 6.2.3.3 Population Trends

A population estimate supported by pelagic surveys put the total population at 19,000 (range 10,600–34,400), including a best estimate of 4,500–5,000 breeding pairs. However, the discovery of previously unknown colonies in 2006–2007 may bring the total population closer to the upper estimate of 6,500–8,300 pairs (International Union for Conservation of Nature, 2017). The current status of the Hawaiian petrel is uncertain due to the difficulty surveying this species. Recent at-sea surveys are currently being analyzed for Hawaiian petrel and Newell's shearwater (U.S. Fish and Wildlife Service, 2011a). The total population of Hawaiian petrels was estimated at 20,000, with a breeding population of 4,500–5,000 pairs (Spear et al., 1995; U.S. Fish and Wildlife Service, 2005b) overall population trends on the Hawaiian Islands are not known (U.S. Fish and Wildlife Service, 2005b, 2022). Numbers of breeding Hawaiian petrels on Maui appear stable and have increased in areas of the Haleakala National Park, where predators are being managed (U.S. Fish and Wildlife Service, 2005b). On Hawaii, numbers may be declining because of predation by introduced species (U.S. Fish and Wildlife Service, 2005b).

#### 6.2.3.4 Population Threats

Threats to the Hawaiian petrel include predation by introduced mammals, development, light attraction and collision, ocean pollution, and disturbance of its breeding grounds. The petrel does not have any natural defenses against predators such as rats, feral cats, and mongooses, and its burrows are very vulnerable (U.S. Fish and Wildlife Service, 2012a). Although predator control now occurs at several Hawaiian petrel breeding sites, the threat posed by introduced predators remains significant throughout the species' range (U.S. Fish and Wildlife Service, 2011a). Recently, Young et al. (2023) successfully translocated 110 Hawaiian petrels (along with 86 Newell's shearwaters) to a predator free enclosure on Kauai, establishing the first predator-free colony for Hawaiian petrels.

Collisions with artificial lights, utility poles, and fences kill Hawaiian petrels on some islands (International Union for Conservation of Nature, 2017). Little progress has been made toward addressing the chief threats to or meeting the recovery criteria for Hawaiian petrels. Remnant breeding colonies thought to occur on west Maui, Hawaii Island, Kauai, Lanai, and possibly Molokai are not mapped or managed. These colonies are certainly subject to predation by alien mammals, possibly are subject to the threat of light attraction and collision, and most are thought to be dwindling as well (U.S. Fish and Wildlife Service, 2011a).

The species may be adversely affected by declines in the populations of large predatory fish that drive prey to the surface. In addition, a significantly lower percentage of birds come ashore to nest during El Niño years (ca.40 percent compared to ca.65 percent normally), suggesting that the species is sensitive to such disturbances in environmental conditions (International Union for Conservation of Nature, 2017). In addition, the species is currently threatened with habitat disturbance by goats, pigs and cattle. On Lanai, habitat degradation caused by the invasive tree, strawberry guava *Psidium cattleianum*, may be the biggest threat to the long-term survival of the colony. On occasion, fledglings become grounded after colliding with lights, and mortality sometimes results from collisions with fences and powerlines. Once on the ground, fledglings are unable to fly and are killed by cars or cats and dogs, or die from starvation or dehydration (International Union for Conservation of Nature, 2017).

# 7 TERRESTRIAL SPECIES AND HABITATS

## 7.1 GENERAL BACKGROUND

The U.S. military has used the island of FDM as a bombing range since 1971 (U.S. Department of the Navy, 1975), and the agreement between the U.S. Government and the Commonwealth of the Northern Mariana Islands was formalized in a 50-year lease agreement (Naval Facilities Engineering Command Marianas, 2022a; United States of America and Commonwealth of the Northern Mariana Islands, 1983).

The long-term military use of FDM as a live-fire range has directly influenced the island's ecological communities. Historical accounts and aerial photography indicate that repeated ordnance impacts have transformed the vegetation structure from a more closed-canopy, low-stature forest to a landscape characterized by open areas, bare ground, and intermittent patches of forest (Lusk et al., 2000; Naval Facilities Engineering Command Marianas, 2022a). The direct destruction of habitat and creation of craters alters the terrain and favors opportunistic, often non-native, plant species that colonize disturbed soil. For wildlife, this habitat alteration directly affects the island’s significant seabird colonies, which include multiple species of boobies, frigatebirds, and terns (Naval Facilities Engineering Command Marianas, 2022a). The primary influences on these bird populations are the direct mortality of individuals from ordnance, the physical destruction of nesting sites, and auditory or visual disturbances that may disrupt breeding behaviors (Camp et al., 2015). Despite these pressures, the island remains a critical nesting area for at least 12 migratory bird species, supports an isolated population of Micronesian megapodes on the island, and provides potential temporary stopover habitat for Mariana fruit bat and birds moving through the archipelago (Naval Facilities Engineering Command Marianas, 2022a).

### 7.1.1 VEGETATION COMMUNITIES ON FARALLON DE MEDINILLA

FDM's vegetation appears to have undergone significant changes since the island was leased by the Department of Defense and the subsequent bombardment for military training. The most intensive bombardment to date of FDM occurred during the Vietnam era, when as much as 22 tons of ordnance per month were dropped on the island (Lusk et al., 2000). Based on early 20th century descriptions of FDM vegetation and aerial photographs of the island prior to military bombardment activities, island tree height and canopy cover have been greatly reduced (Lusk et al., 2000; Mueller-Dombois & Fosberg, 1998; Mueller-Dombois & Fosberg, 2013). The earliest published description of FDM's vegetation, dating back to 1902 by Fritz, noted that the upland area was covered by brush approximately 4 meters tall, as reported in Naval Facilities Engineering Command Marianas (2022). This brush savanna included native tree and shrub species such as *Terminalia catappa*, *Cynometra ramiflora*, *Morinda citrifolia*, *Premna serratifolia*, *Hernandia* sp., and *Ficus* sp., in addition to the introduced papaya (*Carica papaya*).Currently, the island's vegetation may be grouped into the following vegetation communities: coastal vegetation, cliff-line vegetation, upland shrubland and herbaceous vegetation, and bare ground exposed within impact zones. A brief botanical survey of the northern portion of the island carried out in 1996 identified 43 plant species, 32 of which were native (Mueller-Dombois & Fosberg, 1998; Mueller-Dombois & Fosberg, 2013). By the time of these 1996 surveys, the woody vegetation was described as restricted to small pockets, mainly consisting of Pisonia grandis, and was no greater than 2 m in height. Currently, the majority of the intact forest remaining on FDM is located within Special Use Area 1 (a no-fire zone in the northern portion of the island), which is approximately 135 m from the nearest impact area.

A narrow band of vegetation located just above the high tide mark is dominated by indigenous littoral plant species. Limestone cliff communities on the eastern side of FDM are dominated by plants that can live rooted in cracks among limestone rocks (Naval Facilities Engineering Command Marianas, 2022a). A mesic terrace community dominates the central uplands of the island. Most of this upland community has been fragmented by cratering and habitat disturbance from bombardment by naval munitions and rockslides. The low-lying vegetation provides suitable habitat for some birds for nesting, foraging, and sheltering, particularly on the northern end of the island. Vegetation is comparatively sparse on the southern end of the island, south of the land bridge (Naval Facilities Engineering Command Marianas, 2022a).

### 7.1.2 WILDLIFE COMMUNITIES ON FARALLON DE MEDINILLA

#### 7.1.2.1 Mammals

The only native mammal known to occur on FDM is the Mariana fruit bat (*Pteropus mariannus mariannus*). A rat thought to be the Polynesian rat (*Rattus exulans*) is the only known non-native mammal species on FDM (Naval Facilities Engineering Command Marianas, 2022a).

#### 7.1.2.2 Birds

FDM is recognized by regional ornithologists as an important bird area for many species of marine birds and migrant shorebirds, and supports a limited number of terrestrial bird species (Lusk et al., 2000; U.S. Department of the Navy, 2019a; U.S. Fish and Wildlife Service, 1998).

Breeding has been reported on FDM for seven seabird species: black noddies (*Anous minutus)*, brown noddies (*Anous stolidus*), brown boobies, masked boobies, red-footed boobies, white terns (*Gygis alba*), and great frigatebirds (*Fregata minor*). Booby species are the most readily identifiable due to their numbers and individual sizes. The other species breeding locations are either dispersed or breeding activity is sporadic. The great frigatebird may occasionally nest on FDM, which is one of only two small breeding colonies known to exist within the Mariana Islands (the other is located on Maug in the northern portion of the archipelago.

Red-footed boobies, which roost and nest in trees, appear more common than masked and brown boobies, which roost and nest on the ground (Naval Facilities Engineering Command Marianas, 2022a). During surveys conducted from 1997 to 2016, the numbers detected during each survey range from 0 to 447 for brown booby, 6 to 404 for masked booby, and 42 to 1,195 for red-footed booby (Naval Facilities Engineering Command Marianas, 2022a). During the most recent aerial surveys conducted in 2016, biologists counted 233 brown boobies, 324 masked boobies, and 1,195 red-footed boobies on FDM (Naval Facilities Engineering Command Marianas, 2022a). There is some evidence that masked and red-footed booby populations declined from 1996–2017 while brown booby populations increased. However, the general conclusion was that all three species exhibited population fluctuations over this time period. That, combined with the level of variability observed in the count data, precluded any definite conclusion about long-term significant population trends. The majority of the bird species observed on FDM are protected under the Migratory Bird Treaty Act (MBTA).

In 2007, the USFWS published a final rule that granted authorization for incidental take of migratory birds during military readiness operations, provided that the DoD action proponent confers with USFWS to develop and implement appropriate conservation measures to minimize or mitigate negative effects if it is determined that an action will have a significant negative effect on the sustainability of a species' population (72 FR 8931; 50 Code of Federal Regulations Part 21.15). Lusk et al. (2000) reported white-throated ground doves on FDM, which are protected under the MBTA and CNMI-designated as a Species of Greatest Conservation Need; however, no information was provided relating to population size or status on the island (Naval Facilities Engineering Command Marianas, 2022a).

### 7.1.3 OTHER WILDLIFE COMMUNITIES

Only two species of reptiles are reported on FDM—the Pacific blue-tailed skink (*Emoia caeruleocauda*) and the oceanic snake-eyed skink (*Cryptoblepharus poecilopleurus*). No observations of brown treesnakes have been reported on the island. Coconut crabs (*Birgus latro*) occur on FDM. No information is available on other terrestrial invertebrates (Naval Facilities Engineering Command Marianas, 2022a).

## 7.2 ENDANGERED SPECIES ACT LISTED SPECIES

### 7.2.1 MICRONESIAN MEGAPODE/SASANGAT (*MEGAPODIUS LAPEROUSE LAPEROUSE*)

The Micronesian megapode was first listed as endangered in 1970 (under the Endangered Species Conservation Act, 35 FR 8491–8498). No critical habitat is designated for this species. Threats to this species include habitat loss from typhoons and volcanic activity, damage by feral herbivores, hunting and illegal egg collection, increased tourism, and predation by introduced predators (Radley et al., 2024; U.S. Fish and Wildlife Service, 1998). Small remnant populations are known to exist on the southern Mariana Islands of Aguiguan, Saipan, and FDM; larger populations are reported on uninhabited northern islands of Anatahan, Guguan, Sarigan, Alamagan, Pagan, Asuncion, Maug, and possibly Agrihan (Amidon et al., 2011; Radley et al., 2024). Recent conservation assessments suggest that islands with low human presence and without ungulates have the highest densities of megapodes (i.e., Maug, Asuncion, Guguan, and Sarigan) (Radley et al., 2024).

Surveys for megapodes have been conducted intermittently on FDM since 1996, with the most recent available data from a 2023 survey. The first comprehensive ground survey in 1996 detected four megapodes (Naval Facilities Engineering Command Marianas, 2022a). Surveys in 2007 and 2008 used timed walking transects and walking surveys with playbacks, detecting 11 to 16 and 28 megapodes, respectively. The 2008 survey, which detected the highest number of birds to date (28), was the most expansive, covering the entire central and northern portions of the island (U.S. Department of the Navy, 2008). Starting in 2013, the Navy implemented a consistent point count survey protocol restricted to trails cleared of unexploded ordnance, allowing for more direct comparison of results (Naval Facilities Engineering Command Marianas, 2022a).

Results from the consistent point count surveys show variability in megapode detections. The total number of individuals detected was 11 in 2013, 23 in 2019, 10 in 2021, and 16 in the most recent 2023 survey (Naval Facilities Engineering Command Marianas, 2021; Naval Facilities Engineering Systems Command Marianas, 2023). The significant decrease in detections between 2019 (23 birds) and 2021 (10 birds) may be due to environmental factors, such as significantly higher wind speeds and a later survey start time during the 2021 event, which might have reduced the effectiveness of the playback recordings. The 2023 survey's minimum detection of 16 individuals represents an increase from the 2021 survey, falling within the historic range of observations for the island.

The location of megapode sightings in relation to the live-fire zones on FDM is variable, yet the data suggests the continued use of areas near or within the Impact Areas. Megapode detections have been recorded within and near Impact Area 1 (inert ordnance only) and Impact Area 2 (live/inert ordnance) across all survey years. In the 2023 survey, the highest percentage of detections (69 percent) were located in or near Special Use Area 1 (SUA 1), which is designated a no-targeting/no-ordnance zone intended to alleviate direct impacts on the birds. Conversely, only 15 percent of detections in 2023 were associated with Impact Area 1, and 15 percent with Impact Area 2 (Naval Facilities Engineering Systems Command Marianas, 2023). Despite the ongoing use of the live-fire range, the number of megapodes detected within or near Impact Areas 1 and 2 does not appear to show a significant decline over time when compared across the different survey methods, suggesting that military activity may not be causing a significant localized decline in the number of birds in those specific areas.

### 7.2.2 MARIANA FRUIT BAT/FANIHI (*PTEROPUS MARIANNUS MARIANNUS*)

The Guam population of the Mariana fruit bat (Fanihi in Chamorro) was federally listed as endangered in 1984 (U.S. Fish and Wildlife Service, 2009). However, in 2005, the Mariana fruit bat was listed as threatened throughout the Mariana archipelago and downlisted to threatened in Guam. The recovery plan for the Mariana fruit bat was first finalized in 1990; however, a draft revised recovery plan for the Mariana fruit bat was released in March 2010. Critical habitat is designated on Guam and Rota, but there is no critical habitat designated on FDM.

The limited availability of foraging and roosting habitat may restrict the number of fruit bats recorded on FDM (Naval Facilities Engineering Command Marianas, 2022a). Military bombardment is a primary factor affecting fruit bat habitat and numbers on FDM. Although more intact forests, and hence fruit bat roosting areas, are located at the northern tip of FDM, recent observations of bomb craters in the same area prove that the best precautions are sometimes insufficient, and bombardments sometimes miss their targets (U.S. Fish and Wildlife Service, 2015). Limited fruit bat food sources known to occur on FDM include the fruits of introduced Ficus spp., papaya (*Carica papaya*), and the flowers of the coconut (*Cocos nucifera*) (Wiles, 2005; Wiles et al., 1989). Only a single incidental sighting of a fruit bat was observed historically during surveys in 2008 (U.S. Department of the Navy, 2008). More recent surveys for the Micronesian megapode in 2021 and 2023 both reported no Mariana fruit bats were observed during the point count periods or subsequent monitoring activities (Naval Facilities Engineering Systems Command Marianas, 2023).

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