CHAPTER 11.
MARINE BIOLOGICAL RESOURCES

11.1 AFFECTED ENVIRONMENT

As described in Volume 1 of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), no Marine Corps relocation and/or training activities are planned for the marine environment on Tinian (i.e. no in-water construction, dredging, or training activities and/or land-based construction activities are being proposed that would affect the marine environment). The only potential effect is associated with range surface danger zones (SDZs) extending over the marine environment and potential runoff from land-based activities affecting the nearshore environment. A baseline assessment of the marine biological resources is provided below.

11.1.1 Definition of Resource

For the purpose of this EIS/OEIS, marine biological resources are defined as those marine-related organisms (marine flora and fauna), their behaviors, and their interactions with the environment that may be directly or indirectly affected by the proposed action within the established marine region of influence (ROI). The ROI is defined as the nearshore waters out to the 164- feet (ft) (50-meter [m]) isobath (depth line on a map of the ocean/sea). This ROI boundary was established due to the nature of the proposed action in the nearshore environment and clear distinction between marine mammals species present at this depth.

The environmental analysis focuses on species or areas that are important to the function of the ecosystem, of special societal importance, or are protected under federal, state, commonwealth or territory law or statutes. For the purpose of this EIS/OEIS, marine biological resources have been divided into four major categories: marine flora and invertebrates, fish and Essential Fish Habitat (EFH), special-status species, and non-native species. A brief description of these resources are provided below; Volume 2, Chapter 11 provides a more detailed discussion.

11.1.1.1 Marine Flora and Invertebrates

A description is provided of marine flora and macroinvertebrates (including a brief description of corals that are addressed further under the EFH section) found within the ROI. Examples of marine flora include macroalgae (or seaweeds), sea grasses, and emergent vegetation. Invertebrates may include gastropods (snails), cephalopods (squid and octopus), crustaceans (crabs), and sponges.

11.1.1.2 Essential Fish Habitat

The primary federal laws that make up the regulatory framework for fish and EFH include the Magnuson-Stevens Fishery Conservation and Management Act or Magnuson-Stevens Act (M-SA), Executive Order (EO) 12962, and the Endangered Species Act (ESA). EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (Western Pacific Regional Fisheries Management Council [WPFMC] 2005). EFH for managed fishery resources is designated in the Fishery Management Plans (FMPs) prepared by the local regional fisheries management council - the WPRFMC, which manages the fisheries resources for Tinian and Commonwealth of the Northern Mariana Islands (CNMI).

11.1.1.3 Special-Status Species

As described in Volume 2, special-status species include ESA-listed and candidate species, marine mammals not listed under ESA, and species of concern that are found in the nearshore marine ROI. Table 11.1-1 lists those species evaluated. A brief species description can be found in Volume 2, Chapter 11, Section 11.1.4, Guam Regional Environment that includes the CNMI.

Table 11.1-1. Special-Status Marine Species Present in the ROI Around Tinian

Group	*Common Name/Chamorro Name*	*Status**	
		Federal	*CNMI*
Mammals	Common bottlenose dolphin/Toninos	MMPA	SOGCN
	Spinner dolphin/Toninos	MMPA	SOGCN
Reptiles	Green sea turtle/Haggan bed'di	T	T
	Hawksbill sea turtle/Hagan karai	E	E

Legend: *E = endangered, T = threatened; SOGCN = Species of Greatest Conservation Need (Guam Division of Aquatic and Wildlife Resources [GDAWR] 2006), MMPA= Marine Mammal Protection Act
Sources: National Marine Fisheries Service (NMFS) 2009, United States (U.S.) Fish and Wildlife Service (USFWS) 2009.

ESA-listed Species, Critical Habitat, and Candidate Species

Sea Turtles

All sea turtles that occur in the U.S. are listed under the ESA as either threatened or endangered. No critical habitat has been established for sea turtles in the continental U.S. (USFWS 2009). Two sea turtle species are known to occur in the coastal waters of Tinian. The threatened green sea turtle and the endangered hawksbill sea turtle are the only ESA-listed species that occur in the nearshore marine ROI. Nesting sea turtles are addressed in more detail in Chapter 10, Terrestrial Biological Resources.

Species of Concern

Species of concern are those species that NMFS has concerns about regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA. The goal is to draw proactive attention and conservation action to these species. No species of concern exist or are expected to be present within the Tinian ROI.

Marine Mammals

Marine mammals are discussed in this EIS/OEIS because several species are known to occur or potentially occur in the waters around Tinian. An example would be the recent photo-documentation sightings of short-finned pilot whales (*Globicephala macrorhyncus*) and False killer whale (*Pseudorca crassidens*) off-shore of Tinian and Humpback whales (*Megaptera novaeanliae*) off-shore of Saipan (CNMI, CRMO 2009), although all sightings were outside the Tinian ROI.

According to Navy (2005) Appendix B's figures and supporting text from the Marine Resource Assessment for the Mariana Operating Area, spinner dolphins and common bottlenose dolphins are the only two marine mammals expected to regularly occur within the nearshore marine ROI (164-ft isobath [50-m isobath]) of Tinian (refer to Table 11.1-1). These species, and others, would be discussed proportionate with their presence in the ROI and potential affects from the proposed action.

11.1.1.4 Non-Native Species

Non-native species include all marine organisms that have the potential to be introduced from one location or ecosystem to another where it is not native and potentially cause harm to the receiving ecosystem. Since there is only minimal available information regarding non-native species on Tinian, the broader regional discussion of this topic presented in Volume 2, Chapter 11, Section 11.4.4, provides a comprehensive treatment of not-native species issues in CNMI. Most of the relevant site-specific research to date has been within Apra Harbor on Guam, so the topic is discussed most thoroughly in that section (Volume 2, Chapter 11, Section 11.2.7).

11.1.2 Region of Influence

The marine ROI, as previously discussed, encompasses the submerged lands offshore out to the 164-ft (50-m) isobath that may be directly or indirectly impacted by any component of the proposed action. Construction or training activities may impact biological resources due to ground-disturbing activities, in-water construction and/or benthic substrate-disturbing activities (dredging), but they may also be impacted through noise, decreased water quality, excess lighting, and other factors.

11.1.3 Study Areas and Survey Methods

Three small northern "pocket beaches", Unai Chulu, Unai Babui, Unai Dankulo, and Tinian Harbor were the focus of the baseline assessment for Tinian, as they have been previously evaluated for Marine Corps amphibious training landing exercises and potential harbor improvements, although these actions are not currently part of the proposed action and alternatives.

Marine biological resources are assessed for potential impacts from the implementation of the proposed action within the nearshore marine ROI. This ROI boundary was established due to the nature of the proposed action in the nearshore environment and a clear distinction between marine mammals species present at this depth, which is conservative. Because of either the location or the nature of the action, some components of the proposed action would have no impacts on the marine environment and therefore no impact assessment is provided. In these cases, a brief explanation of why no assessment is required is provided in those site-specific sections.

In addition to existing marine biological resources data for the study areas, project-specific benthic studies and mapping efforts have either been performed, are ongoing, or are being planned for areas potentially impacted by the proposed action(s). Locations and methods for the survey efforts are provided in those respective references, in the EIS/OEIS reference section and/or provided in Table 11.1-2. A summary of key marine biological surveys and related reports used as references for this EIS/OEIS are listed in Table 11.1-2.

Table 11.1-2. Summary of Marine Biological Surveys Occurring in the Study Areas

Reference	*Type of Work*	*Location*
MRC 1996	Marianas EIS, Marine Environmental Assessment	Guam and Tinian
CNMI MMT 2008	Marine Monitoring	Tinian, Unai Babui and Unai Dankulo
Navy 2007	Marine Mammal and Sea Turtle Survey and Density Estimates Report	Guam and the CNMI Islands
Marine Corps 2009	Marine Resource Surveys	Tinian, CNMI
Brainard 2008	NOAA Coral Reef Ecosystem Division (CRED) Mariana Archipelago Reef Assessment and Monitoring Program (MARAMP) research cruises	Guam and CNMI (Santa Rosa Reef, Galvez Bank, Rota, Aguijan, Tinian, and Saipan)

Legend: MRC= Marine Research Consultants; NOAA= National Oceanic and Atmospheric Administration; NAVFAC= Naval Facilities Engineering Command

11.1.4 Tinian

11.1.4.1 Marine Flora and Invertebrates

Information provided in Volume 2, Chapter 11, Section 11.1.4 Guam Regional Environment is applicable to Tinian and CNMI. Island-specific information in addition to that section is provided below.

Coastlines within the study area are generally lined with rocky intertidal areas, steep cliffs and headlands, and the occasional sandy beach or mudflat. Water erosion of rocky coastlines has produced wave-cut cliffs, and sea-level benches (volcanic and limestone) and wave-cut notches at the base of the cliffs. Large blocks and boulders often buttress the foot of these steep cliffs in the Marianas. Wave-cut terraces also occur seaward of the cliffs (Navy 2005).

The North Equatorial Current that provides the bulk of water passing the Mariana archipelago is composed primarily of plankton-poor water; however, detailed information on the North Equatorial Current is lacking. Overall, the upper portions of the water column in the Western Pacific is nutrient depleted, which greatly limits the presence of organisms associated with primary productivity, such as phytoplankton. The region surrounding Tinian has elevated Chlorophyll α (primary production). These areas of localized increased primary production have been attributed to the interaction of island masses and currents, where the currents would eddy and concentrate phytoplankton (Navy 2005).

Composed primarily of uplifted limestone, Tinian has no permanent rivers and extensive reef formations. Coral reef habitat totals approximately 19 square miles (mi) (49 square kilometers [km]) between the coastline and the 100-meters (m) isobath (Brainard et al. 2008). The majority of Tinian's shoreline consists of low to high limestone cliffs with sea-level caverns, cuts, notches and or slumped boulders, commonly bordered by intertidal benches (Eldredge 1983, Navy 2005). Thirteen beach districts have been defined (Pultz et al. 1999), 10 at west coast locations and three (one distinct and two discontinuous beach complexes) along the east coast. Beach deposits consist mainly of medium to coarse grain calcareous sands, gravel and rubble interspersed amongst exposed limestone rock (Navy 2005). All beaches reportedly support turtle nesting activities (Wiles et al. 1989, Pultz et al. 1999).

Figure 11.1-1 shows an overview of sensitive marine biological resources, including benthic habitats associated with the study areas. These habitats are based on NOAA (2005) Environmental Sensitivity Mapping Index mapping and include:

- Coral Reef and colonized hardbottom that are broken into two density categories:
  - Lower Density Live Coral Cover (Sparse cover: 10% - <50%)
  - Higher Density Live Coral Cover (Patchy: 50% - <90% and Continuous: 90%-100%)
- Coralline Algae (one category):
  - Sparse (10% - <50%), patchy (50% - 90%), and continuous (90% - 100%) combined.
- Macroalgae, Turf Algae, and Seagrass (one separate category each):
  - All coverage percentages combined (sparse, patchy, and continuous) combined
- Turf Algae (one category):
  - All coverage percentages (sparse, patchy, and continuous) combined
- Seagrass (one category):
  - All coverage percentages (sparse, patchy, and continuous) combined

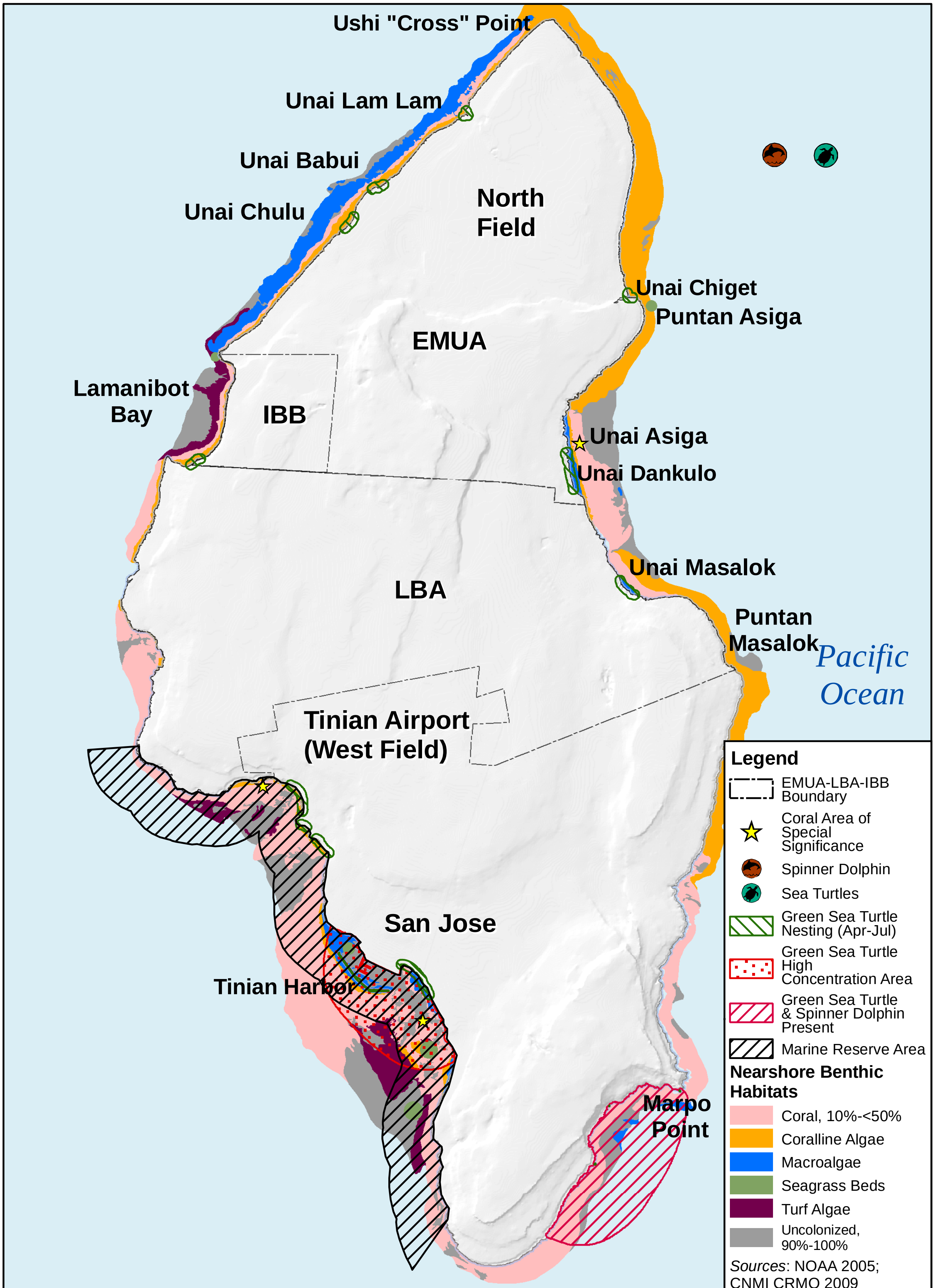

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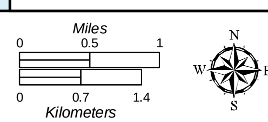
Figure 11.1-1
Nearshore Benthic Habitat and Special-Status Species - Tinian



The north, east, and south coast have very limited fringing or apron reef development that is most conspicuous at Unai Dankulo. Submarine topography appears mainly characterized by limestone pavement with interspersed coral colonies and occasional zones of submerged boulders. Coral reef development is more prevalent at various west coast locations, with fringing coral reef habitats present inside Lamanibot and Peipeinigul Bays and a patch and small barrier reef system (altered as a breakwater for the harbor) located within the Tinian Harbor area (Eldredge 1983, Navy 2005). On the eastern side of the island, from Puntan Tahgong, the northeastern tip of the island, to north of Unai Asiga, coralline algae populate the fringing and fore reefs, and the insular shelf seaward of the fore reef. From Unai Asiga to south of Unai Masalok, coralline algae occupies the reef crest and corals are found along the fore reef and a large portion of the seaward shelf. From Unai Masalok to Puntan Masalok (the southern extremity of the study area on the eastern Tinian coast), no fringing reefs are found and the shelf is composed of coralline algae. Furthermore, there are no fringing reefs from Puntan Masalok to Puntan Carolinas (southernmost point of Tinian). Coralline algae occupy the entire shelf from Puntan Masalok to an area north of Puntan Barangka where coral cover begins to dominate (see Figure 11.1-1). Fringing reefs reoccur past Puntan Carolinas (Navy 2005, NOAA 2005).

An oval-shaped, offshore, submerged reef 2.2 mi by 0.6 mi (3.5 km by 1 km) composed primarily of coralline algae is located approximately 1.7 mi (2.7 km) southeast off the southern most point of Tinian (NOAA 2005). NOAA (2005) determined that the overall coral cover around Tinian ranged from 10 to 50%. Coral cover ranges from 14 to 59% on coral reefs at Kammer Beach and Two Coral Head, respectively. Dominant coral species in terms of cover are *Goniastrea retiformis* at Kammer Beach, and *P. rus* at Two Coral Head. Coral cover is much higher at Two Coral Head compared to Kammer Beach due to fewer coral predator-resistant species (Quinn and Kojis 2003).

Corals are a main constituent of the forereef and insular shelf (refer to Figure 11.1-1) (Navy 2005, NOAA 2005). Surveys conducted in 1994, however, report that the inner reef flat supports an extensive (50 to 70% coral cover) and diverse reef community (25 coral species) (MRC 1999). On the reef front, there is a spur-and-groove system down to a depth of 33 ft (10 m) seaward that the benthos is composed of carbonate pavement. Both the spur-and-groove system and the fore reef pavement are densely populated by corals (36 species of corals). The passage of a typhoon in December 1997 severely altered the reef flat coral community diversity and cover. Coral cover on the reef flat was reduced from an original 50 to 70% cover to 2% cover. No branching corals remained on the reef flat following the typhoon (MRC 1999). The recent benthic habitat mapping of the CNMI by NOAA (2005) reflects the change in reef flat composition. Since NOAA (2005) shows relatively abundant coral cover on the reef front, the fore reef has possibly retained some of its pre-December 1997 characteristics. The impacts of corallivorous predators on corals have most likely altered the coral composition and cover on the fore reef (Quinn and Kojis 2003).

<u>Coastal Communities</u>

The island of Tinian is surrounded by reefs, but lacks a true lagoon complex. The lagoons of Tinian, excepting two off of the Leprosarium at the southwestern edge of the leaseback area and the northern region of the Tinian Harbor area, are all adjacent to military-leased land (Navy 2005, NOAA 2005).

Tinian possesses seagrass beds along the northwestern, the northeastern, the southwestern and the eastern coastlines (Navy 2005) (Figure 11.1-1). *Enhalus acoroides*, a seagrass species reported from Unai Chiget reef (and mapped also at Unai Masalok and Lamonibot Bay in the Integrated Natural Resources Management Plan (INRMP) (Commander of the Navy Region [COMNAV] Marianas 2004). *Halophila* *minor* and *Halodule uninvervis* are found within the are encompassed by the Tinian Harbor (CNMI, CRMO 2009).

No mangrove forests are located on Tinian and are restricted to Saipan within the CNMI.

As described above, Unai Chulu, Unai Babui, and Unai Dankulo are three small northern "pocket beaches" beaches with nearshore reefs located within ROI. These beaches, along with Tinian Harbor, have been evaluated for amphibious training landing exercises, and although are not currently part of the proposed action would be addressed in this EIS/OEIS. Unai Chulu and Unai Babui are located on the northwestern side of Tinian and Unai Dankulo on the east side of the island, north of Puntan Masalok. A narrow fringing reef composed of coralline algae borders the carbonate sand beaches of Unai Chulu and Unai Babui (refer to Figure 11.1-1) (Navy 2005, NOAA 2005, Marine Corps 2009). Shore access to the ocean is limited to a few steep trails in fissures along the cliffs. In most places along this coast, no reef flats exist; instead the substratum drops quickly from the cliff base to a depth of about 23 ft (7 m) into steep spur and groove formations characterized by high benthic species diversity and ample fish habitat (Oceanit 2006).

Marine Corps (2009) provides the following algae and non-invertebrate data for the following areas:

Unai Chulu

Landward of the fringing reef is a reef flat in a water depth of 1.6 ft (0.5 m), within 66 ft (20 m) seaward of the shoreline, the reef flat substrate includes sand, rubble, and outcrops of a fossil reef.

Live cover in the inner reef flat is mostly composed of turf algae and the red crustose coralline alga *Hydrolithon onkodes*. These two species represented 56% of the observed algae. Forty-eight genera of marine algae were identified on the reef flat, comprising 76.85% ±9.00 of the cover. This was the highest of the three beach areas.

Thirty-nine genera of algae were found on the Unai Chulu reef slope. The dominant species were red crustose coralline algae, including *Hydrolithon onkodes, Lythophyllum pygmaeum,* and *Pneophyllum conicum.* These three species accounted for 49% of the observed algae on the reef slope. Turf alga *Halimeda gracilis* were also important components of the algal community. No trend was apparent for either the number of taxa or density, however, alga taxa richness was positively correlated with depth (r=0.91; p=0.002); deeper sites tended to have higher taxa richness than shallower sites. Green algae, particularly genus *Halimeda*, was entirely lacking at sites shallower than 5 m, but were represented by up to five taxa at deeper survey locations. Algal cover on the reef bottom did not change with depth.

Non-coral invertebrates were represented by 28 taxa in five phyla at Unai Chulu reef flat. Echinoderms and tube worms were the most commonly observed non-coral invertebrates, Echinoderms accounted for 83%.

The Unai Chulu reef slope contained eight-nine observed taxa in sic phyla. Echinoderms, along with mollusks and polychaetes accounted for over 95% of all observed non-coral invertebrates on the reef slope. No spatial pattern in overall taxa richness or density was observed for either the Unai Chulu reef flat or reef slope.

Unai Babui

The reef morphology off Unai Babui is similar to that of Unai Chulu except that the spur-and-groove system was more developed at Unai Babui (MRC 1999). The short narrow reef flat that ranges in depth from zero to approximately 7 ft (2 m) and the reef crest is shallow, except where cut perpendicularly by deeper channels in the reef. This channel appears to have a high density of coral colonies.

Twenty-four genera of marine algae were found on the Unai Babui reef flat. The green alga *Caulerpa cupressoides*, *foraminerferan Baculogypsina sphaerulata*, and brown alga *Turbinaria ornata* were the dominant taxa, accounting for approximately 32% of the observed algae on the reef flat. Percent cover estimates for each taxa had high variability, suggesting a heterogeneous algal community. For example, *C. cupressoides* occurred at only one reef flat survey site but covered 28% of the substrate at that site. Other taxa were more wide-spread but also showed patches of high occurrence.

Forty-two genera of marine algae were found on the Unai Babui reef slope. Algal cover was high, with the encrusting red (Rhodophyta) coralline alga *Hydrolithon onkodes* accounting for 21% of the algal cover at most sites (Table 4.3). The reef slope algal community was dominated primarily by three taxa, *H. onkodes*, turf algae, and another encrusting red coralline alga, *Lithophyllum pygmaeum*. These three taxa accounted for 49% of the algae observed on the Unai Babui reef slope. Eleven taxa (45%) had <1% mean cover and were considered rare. No trend was apparent in the data from south to north on the reef slope for either the number of taxa or density. Both abundance (r=0.75; p=0.088) and taxa richness (r=0.93; p=0.007) were positively correlated with depth. Deeper sites tended to have higher algal cover and greater taxa richness compared to shallower sites.

Non-coral invertebrates included 22 tax in six phyla found. Three species of non-coral invertebrates accounted for 69% of the observed individuals on the reef flat. These species included tube worms, the sea cucumber *Holothuria atra*, and the con snail *Conus flavidus*.

The Unai Babui reef slope non-coral community was more diverse than the reef flat community, comprised of 90 taxa in seven phyla. The three most common phyla included Echinodermata, Polychaeta, and Mollusca, which accounted for 93% of all individuals; Echinoderms accounted for over 50%.

Unai Dankolo

Unai Dankolo, also know as Long Beach, is the location of Tinian's largest beach. A fringing reef borders the white carbonate beach. It is fronted by a large reef flat that extends approximately 1,300 ft (400 m) off shore and varies in depth from zero to 7 ft (2 m). Except were cut by deeper channels, the Unai Dankulo reef has a shallow crest that drops quickly to a depth of 23-33 ft (7-10 m).

Thirty-five genera of marine algae were found on the Unai Dångkolo reef flat. Algal cover on the reef slope and reef flat were similar, but the composition of the communities differed. The reef flat was dominated by turf algae and red coralline algae (primarily *Pneophyllum conicum* and *Hydrolithon onkodes*), which accounted for 31% and 27%, respectively of the observed algae. The foraminiferan *Baculogypsina sphaerulata*, was also common, accounting for 14% of the algae found on the reef flat.

In contrast, 53 genera of marine algae were found on the Unai Dångkolo reef slope. The community was dominated by red coralline algae, including *H. onkodes*, *P. conicum*, and *Lithophyllum pygmaeum*, and turf algae, which accounted for 57% and 15% of the observed algae, respectively. No trend was apparent in the data from south to north on the reef slope for either the number of taxa or density. However, as seen with the Unai Chulu and Babui, richness was positively correlated with depth (r=0.69; p=0.042); deeper sites tended to have higher taxa richness than shallower sites. Shallower sites had a lower richness of green algae (Chlorophyta), particularly the genus *Halimeda*, which was absent at all but one shallow site (4 m or less), but represented by up to five taxa at deeper survey sites (Marine Corps 2009).

Non-coral invertebrates included 28 taxa in 4 phyla on the Unai Dångkolo reef flat. Echinoderms accounted for 85% with two echinoderm taxa, *Echinothrix diadema* and *Holothuria atra* the most commonly observed non-coral invertebrate. *E. diadema* accounting for 61% of all non-coral invertebrates.

One hundred and four taxa in 6 phyla were found on the Unai Dångkolo reef slope. Unlike the other areas surveyed, the Unai Dångkolo reef slope showed a relatively even distribution of organisms among phyla; seven of the nine phyla contributing at least 6% to the overall density. Echinoderms were the most dominant phyla on the reef slope, accounting for 48% of all observed individuals. Sponges and Bryozoans were rare in or absent from the community. No spatial pattern in overall density was observed for either Unai Dångkolo reef flat or reef slope non-coral invertebrate communities. However, a significant negative correlation between depth and taxa richness (r=-0.59; p=0.027) was found on the reef slope.

Tinian Harbor

Tinian Harbor is a small commercial port located in a large sheltered embayment on the southwest coast of Tinian (Figure 11.1-1). The harbor consists of an entry channel and basin dredged to 26-33 ft (8-10 m) fronting the main quay and a shallower <16 ft (<5 m), lagoon-like area to the northwest with piers for smaller crafts. A rock and metal breakwater (now in poor condition) was built along the reef flat margin to provide protection from wave action and ocean swell. The main quay has recently been repaired and there are two piers lying to the southwest of the main quay, providing over 1,500 m of total berthing space. The benthic substrate in the vicinity of the small boat piers is predominantly sand with patches of coral (Marine Corps 2009).

Twenty-one taxa in 16 genera of marine algae were found at sites within Tinian Harbor. The green alga *Halimeda opuntia*, the brown algae *Dictyota* sp. and *Padina* sp., and "fleshy" coralline algae were the most common taxa occurring in more than a third of all quadrats surveyed at each site. Relative abundance estimates for each taxa had high variability, suggesting a heterogeneous algal community.

Twenty-two genera of marine algae were found in the Outer Harbor. Relative algal abundance was higher outside the harbor than inside. Crustose coralline algae occurred in nearly three-quarters of all quadrats and, along with "fleshy" coralline algae, were the dominate taxa on the Outer Harbor reefs. Outer Harbor reefs showed less variability in algal cover the Inner Harbor sites. Algae in the genus *Amphiroa*, turf algae, and *Cyanobacteria* were the most common algae genera/taxa observed at the CRED Rapid Ecological Assessment (REA) site (Marine Corps 2009).

Coral reef communities found off the Tinian Harbor include: Barrier reefs, fringing reefs, and a broad shelf area (305-feet [ft]) (1,000-m) wide (Eldredge 1983, NOAA 2005). The largest amount of coral cover is probably found along the outer edges of the reef (fore reef and terrace) (Navy 2005). Fringing and fore reefs (less than 61-ft [200-m]) wide occur immediately next to the western shoreline of Tinian.

11.1.4.2 Essential Fish Habitat

Tinian is within the jurisdiction of the WPRFMC that has designated the marine waters around Tinian as EFH, and adopted a precautionary approach to EFH designation due to the lack of scientific data (WPFMC 2005).

EFH for Coral Reef Ecosystem Management Unit Species covers all the waters and habitats at depths from the sea surface to 100 m extending from the shoreline (including state and territorial lands and waters) to the outer boundary of the Exclusive Economic Zone (see Volume 2 for a detailed description).

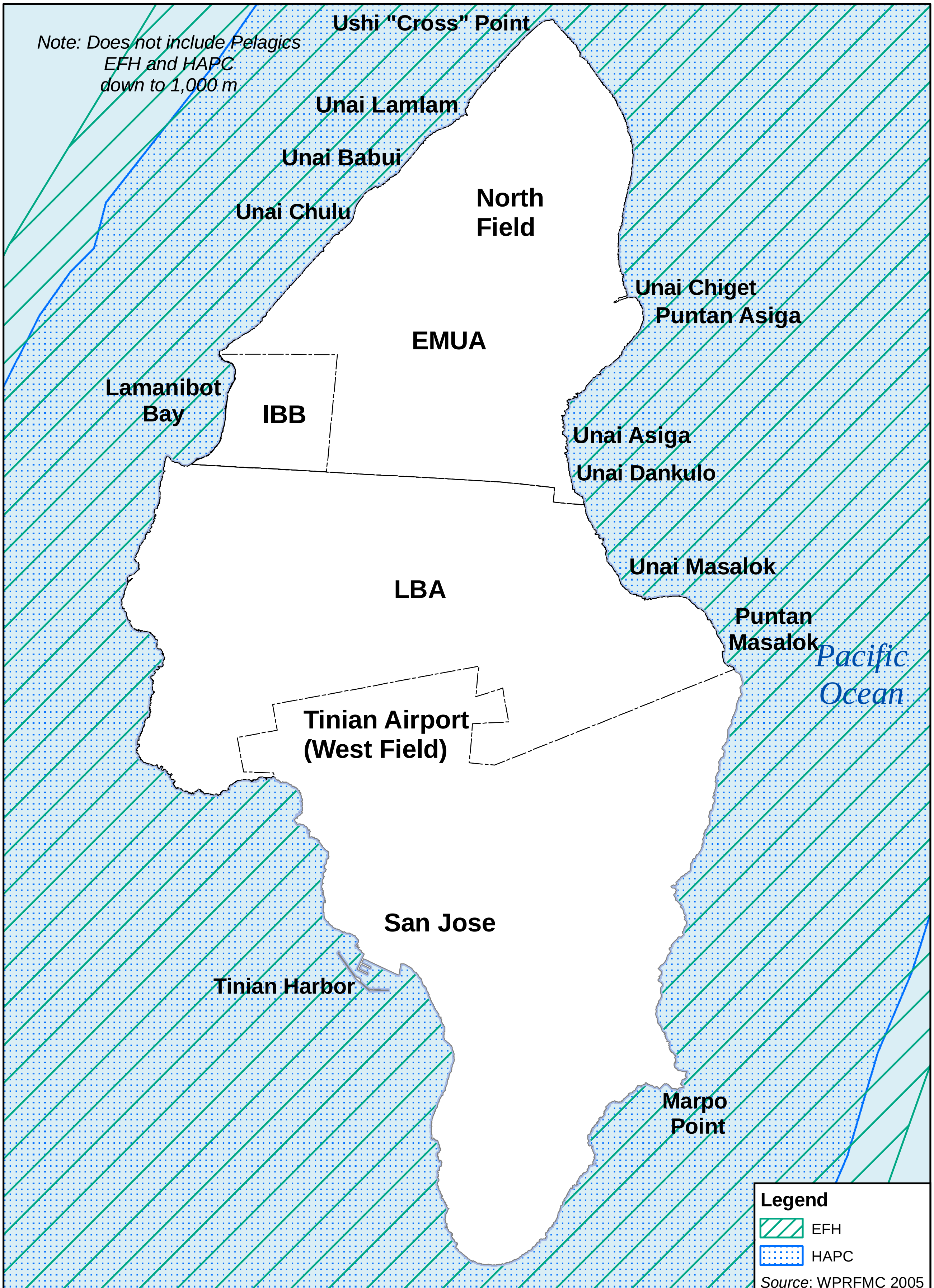


Figure 11.1-2
Essential Fish Habitat and Habitat Area of Particular Concern for all Designations on Tinian

Miles 0 0.5 1
0 0.7 1.4 Kilometers

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Table 11.1-3 summarizes and Figure 11.1-2 depicts the EFH and Habitat Area of Particular Concern (HAPC) designations for Tinian.

EFH for at least one life stage of a managed species group extends from the shoreline to the outer extent of the Exclusive Economic Zone from the surface to a water depth of 3,281 ft (1,000 m) and includes bottom habitat to a depth of 1,312 ft (400 m).

HAPC within submerged lands around Tinian includes seamounts and banks to depths of 3,281 ft (1,000 m), escarpments and slopes between 131 and 919 ft (40 and 280 m), bottom habitat down to depths of 328 ft (100 m) (Table 11.1-3). See Section 11.1.4.2 and the FEP for Mariana Archipelago (WPRFMC 2005) for a description of each FMP and detailed listing of all FMP MUS, respectively.

Table 11.1-3. Tinian Essential Fish Habitat and Habitat Area of Particular Concern

FMP	*EFH (Juveniles and Adults)*	*EFH (Eggs and Larvae)*	*HAPC*
Coral Reef Ecosystems	Water column and benthic substrate to a depth of 328 ft (100 m)	Water column and benthic substrate to a depth of 328 ft (100 m)	All MPAs identified in an FMP, all PRIAs, many specific areas of coral reef habitat (see FMP)
Bottomfish	Bottomfish: Water column and bottom habitat down to 1,312 ft (400 m)	Bottomfish: Water column down to 1,312 ft (400 m)	Bottomfish: All escarpments and slopes between 131-919 ft (40-280 m)
Crustaceans	Bottom habitat from shoreline to a depth of 328 ft (100 m)	Water column down to 492 ft (150 m)	None
Pelagics	Water column down to 3,281 ft (1,000 m)	Water column down to 656 ft (200 m)	Water column above seamounts and banks down to 3,281 ft (1,000 m)

The Division of Fish and Wildlife is the Commonwealth-level agency that is in charge of designating and overseeing marine managed areas in the CNMI. The Protected Areas Program of the Division of Fish and Wildlife has identified six sites as MPAs; five occur around the island of Saipan, and one on Rota. Tinian has a limited take zone being proposed for its coastal waters. The Tinian Fish Reserve, proposed in 2003 under the CNMI House Bill #13-110, is still under debate. No specific HAPC site is identified at Tinian.

Data compiled from both the CNMI Marine Monitoring Team (MMT 2008) and NOAA (Brainard 2008) show with-in site variability associated with depths. Trends found elsewhere in the Marianas suggest that reef flat communities would be less diverse than adjacent forereef slope communities and more heterogeneous in their distribution (NOAA 2008).

CRM has received a "Proactive Species Conservation Grant" through NOAA's Office of Protected Resources to study the distribution of NOAA species of concern (SOC), Napoleon wrasse (*Cheilinus undulatus*) and bumphead parrotfish (*Bolbometopon muricatum*) around Saipan, Tinian, Rota and Agijuan. With a better understanding of population numbers and habitat use, CRM hopes to develop a set of management plans for these species. Currently, there are no documented observations of this SOC on Tinian (NOAA 2005, CNMI MMT 2008, Brainard 2008).

Coral Reef Communities

Four distinct geomorphological reef types, with significantly different coral assemblages, have been identified (Houk and van Woesik, unpublished data, in Marine Corps 2009): (1) Holocene “spur and groove,” which support high coral densities, species richness and large colony size; (2) Holocene high-relief slope, which support low coral species richness and high intra-site variation; (3) Holocene low-relief, which have low species richness and few large corals but many small corals; and (4) Pleistocene basement, which supported few corals and little 3-dimensional relief (Marine Corps 2009).

Marine Corps (2009) provides the following coral and coral reef community (finfish) data for the following areas:

Unai Chulu

Fifteen coral taxa in seven genera were found on the Unai Chulu reef flat. Corals in the genus *Acropora* were the most common, but this resulted from high *Acropora verweyi* densities at one site. This site, which is near the reef crest, also had high densities of *Leptastrea purpurea*, and it appears to be a transitional community between the reef flat and the reef slope. Other than the transition from a reef flat community dominated by *Porites lutea* and *Goniastrea retiformis* to a reef crest community dominated by *A. verweyi* and *L. purpurea*, there is no spatial trend apparent in the reef flat coral data.

The coral community on the Unai Chulu reef slope is taxonomically diverse, 79 taxa in 24 genera. It appears to be a typical spur and groove coral community, and is dominated primarily by the taxa of the genus *Goniastrea*, *Favia*, and *Galaxea*, which accounted for 52% of all observed colonies.

No trend was apparent in the data from south to north on the reef slope for either the number of taxa or density. However, a correlation with depth was observed; shallower reef slope sites tended to have lower taxa richness and colony density. These shallower sites had greater densities of *Pocillopora*, *Acropora*, and *G. retiformis* than deeper sites, but lower densities of *Platygyra varians*, *L. purpurea* and *Favia* (*F. matthaii* and *F. stelligera*). This depth-related distribution appears to be consistent with the reef flat data and further supports the presence of a transitional reef crest community dominated by *Acropora*. Corals varied widely in size, with several colonies on both the reef flat and reef slope reaching a size >40 in (>100 cm). However, coral colonies tended to be smaller, with 67% of reef flat and 64% of reef slope colonies being <2 in (<5 cm) in diameter.

Unai Babui

The reef flat at Unai Babui had only three colonies of a single coral, *Porites lutea*. While surveys were limited to the reef flat directly adjacent to the proposed landing beach due to hazardous ocean conditions there appeared to be a gradient in coral abundance and richness, with higher diversity and coral colony density on the southern end compared to the northern end of the reef flat. Due to rough sea conditions, attempts to survey sites to the south of the beach were not successful, but these reef flat areas appeared to have better developed coral communities. The coral community on the Unai Babui reef slope had 71 taxa in 28 genera. The community appeared to be indicative of a typical spur and groove coral community, being dominated by *Favia* and *Goniastrea* corals that accounted for 42% of all observations.

No trend was apparent in the data from south to north on the reef slope for either the number of taxa or density. However, a correlation with depth was observed; shallower sites (and thus closer to the reef crest/flat) tended to have lower taxa richness and colony density. Shallower survey sites had lower densities of *Goniastrea retiformis*, *Favia matthaii* (complex), and *Galaxea fascicularis* and probably represented a transition community between the spur and groove community found at the deeper survey sites and the reef crest and reef flat community. Corals colonies showed a wide range of sizes. Fifty-seven percent of the colonies observed on the reef slope were <2 in (<5 cm) in diameter and 96% of all observed coral colonies were <8 in (<20 cm) in diameter. Three coral colonies measuring 80 cm were observed. Due to the low density of coral colonies on the reef flat, size data were not examined for this zone.

Unai Dångkolo

The Unai Dångkolo reef flat had the highest coral density and richness of all the reef flats surveyed in this study. *Favia matthai* (complex) and *Goniastrea retiformis* were the dominant coral taxa, with each accounting for 21% of the observed corals. In contrast to the Unai Babui and Unai Chulu reef flats, four taxa of *Acropora* were found at multiple sites on the Unai Dångkolo reef flat. Two possible explanations include: 1) the extended reef flat at Unai Dångkolo may have provided safe opportunity to survey areas nearer the reef crest where *Acropora* was present, unlike at Unai Babui and Unai Chulu where wave action limited surveys in areas where *Acropora* was observed to occur, and/or 2) the Unai Dångkolo reef flat community is influenced by different environmental or demographic factors than the Unai Babui and Unai Chulu reef flats.

The coral community on the Unai Dångkolo reef slope was composed of 80 taxa in 24 genera, the highest richness found for a single area in this study. The dominant coral taxa on the reef slope were *F. matthai* (complex) and *G. retiformis*, comprising 22% and 16% of the corals found in this area; these relative contributions to the coral community were similar to those observed on the reef flat, and highlight greater similarity between the Unai Dångkolo reef flat and slope than was seen at either Unai Babui or Unai Chulu.

No trend was apparent in the data from south to north on either the reef flat or reef slope for the number of taxa or density. However, a significant correlation with depth was observed on the reef slope; taxa richness tended to increase with depth. Deeper sites had more taxa of *Acropora*, *Cyphastrea*, and *Montipora* compared to shallower sites. There was no relationship between depth and coral colony density.

Coral colonies varied widely in size on both the reef flat and reef slope. On the reef flat, coral colonies tended to be more evenly distributed among the size classes than those observed at Unai Chulu (insufficient corals were measured on the Unai Babui reef flat for comparison). Coral colonies <2 in (<5 cm) in diameter comprised 43% of all colonies on the Unai Dångkolo reef flat, compared to 67% at Unai Chulu. Two coral colonies >40 in (>100 cm) were measured on the reef flat transects. A similar trend in coral colony size frequency was observed on the reef slope. Coral colonies <2 in (<5 cm) in diameter comprised 51% of all colonies on the Unai Dångkolo reef slope, with many colonies occupying larger size classes.

Finfish Communities

Unai Chulu

Fifteen fish families comprising 45 species were observed on the Unai Chulu reef flat. Damselfish and wrasses were the most common, accounting for 93% of all fish encountered on the reef flat. The numerically dominant damselfish, however, contributed relatively little to the fish biomass. On the reef flat, wrasses and surgeonfish contributed the most to fish biomass. Thirty three fish families consisting of 167 species were observed on the Unai Chulu reef slope. As on the reef flat, damselfish and wrasses were the most numerous fish, but they only accounted for 59% of all fish counts. Silversides were also numerically abundant on the reef slope, but they were patchily distributed; large schools (>200 individuals/100 m^2) were observed within 2 of 17 reef slope survey sites. However, both damselfish and silversides contributed relatively little to the fish biomass; surgeonfish contributed the most to fish biomass on the reef slope. Large fish (>8 in length [>20 cm]) were relatively common on the Unai Chulu reef slope and had the highest density of any of the sites surveyed. Surgeonfish and parrotfish families were the most abundant. Sharks and rays were rare; one white tip reef shark (*Triaenodon obesus*) was observed and photographed at Unai Chulu by the benthic survey team. Napoleon wrasse and bumphead parrotfish were not seen at Unai Chulu (Marine Corps 2009).

Overall, the reef slope at Unai Chulu had 3.8 times the fish and invertebrate taxa richness of the reef flat. In contracts, the algal community was richer on the reef flat compared to the reef slope. No consistent pattern was apparent in the abundance of the four taxonomic groups (algae, coral, fish, non-coral invertebrates). While algal cover on the reef bottom was similar between the reef flat and reef slope, reef flats had a greater density of non-coral invertebrates. The reverse trend was found for fish biomass and coral densities (Marine Corps 2009).

Unai Babui

Twelve fish families comprising 35 species were observed on the reef flat at Unai Babui. Damselfish and chubs were the most common, accounting for over 92% of all observed individuals. However, a few large surgeonfish present at two survey sites made them the dominant contributor to fish biomass. Fish on the reef flats displayed high spatial variability. Surgeonfish, of which many taxa tend to school and roam over large areas of the reef, were observed within one third of the reef flat transects. The other commonly observed fish taxa tended to have more uniform distributions. Twenty nine fish families consisting of 148 species were observed on the Unai Babui reef slope. The most numerous fish on the reef slope were silversides and damselfish. These two families accounted for over 69% of the observed reef fish density on the reef slope, but they accounted for only about 6% of the observed biomass. However, high variability in silverside density (2,400 silversides/100 m^2 at one survey site) skewed these results. When silversides were excluded from the estimation, the average density of reef fish dropped, and damselfish and wrasses accounted for 82% of all observed individuals. In contrast to density, larger bodied surgeonfish and wrasses, accounted for over 50% of the biomass on the belt transects. Large fish were relatively rare; the most common fish >8 in (>20) cm in length were surgeonfish and parrotfish, respectively. No sharks or rays were observed at Unai Babui. Napoleon wrasse and bumphead parrotfish also were not seen at Unai Babui (Marine Corps 2009).

Unai Dångkolo

Seventeen families of fish composed of 63 species were observed on the Unai Dångkolo reef flat. While damselfish and wrasses were the most numerous fish families on the reef flat (57% and 34%), wrasses and parrotfish contributed the most to biomass at 49% and 25% of the total reef flat fish biomass, respectively. Twenty eight fish families, consisting of 140 species were found on the Unai Dångkolo reef slope. The most numerous fish were silversides and damselfish. Numerically, these two families accounted for over 65% of all observed individuals on the reef slope. However, schooling silversides had a patchy distribution similar to Unai Babui (2000 silversides/100 m^2 at one survey site) and skewed the overall density estimate. When silversides are excluded from the overall density computation, the average density of reef fish dropped, and damselfish and wrasses then account for 70% of all observed individuals. The numerically dominant damselfish, however, contributed only about 5% of the observed reef slope fish biomass. Surgeonfish and parrotfish contributed the most to fish biomass at 42% and 15% of the total, respectively. Large fish (>8 in length [>20 cm]) were more common on the Unai Dångkolo reef slope that at other beach areas. Surgeonfish and parrotfish, were the most abundant families, with only two other fish families, wrasses and snappers (Lutjanidae), represented in this “large category”. No sharks or rays were observed at Unai Dångkolo. The Napoleon wrasse and bumphead parrotfish were also not seen at Unai Dångkolo.

Summary

In summary, benthic survey data from the CNMI MMT (2008) and NOAA CRED (Brainard 2008) as summarized by Marine Corps (2009) were used to compare the coral reef communities among the three northern beaches.

Quadrat data in the form of percent reef bottom cover of all sessile organisms showed that Unai Dångkolo was significantly different from both Unai Chulu and Unai Babui, but Unai Chulu and Unai Babui were not different. An analysis of the taxa that contributed to the observed difference, showed that no single taxa contributed a disproportionate amount. The coral communities on the leeward and windward areas were similar taxonomically, and subtle shifts in abundance of many taxa accounted for the observed differences. This windward-leeward (wind onshore on the eastside, wind offshore on westside) difference was also supported when coral densities by taxa and morphological group were analyzed.

Fish also showed a significant windward-leeward difference in their biomass by taxa. As with the benthic community, there was considerable fish species overlap between the three survey areas and the observed difference was attributable to small shifts in species composition among the many observed.

Corals from the genus *Favia* dominated both the CNMI MMT at Unai Chulu and Babui monitoring sites located at approximately 26 ft (8 m) in depth. The coral genera *Pavona* and *Montipora* are common at Unai Dangkkolo, but at Unai Babui, *Goniastrea* and *Platygra* are common. Echinoderms are dominant among non-coral invertebrates at the sites during all sampling years.

The most commonly observed coral genera during the NOAA CRED survey performed at Unai Chulu and Babui at depths of 40 ft [12 m]), were *Favia*, *Asreopora*, and *Porties*. These genera are typically associated with spur and groove habitat in the Mariana Islands. Fish diversity was similar across all REA sites, but abundance varied widely between years and by site. Surgeonfish, parrotfish, wrasses, and soldierfish dominated the northern REA sites (Marine Corps 2009).

The Unai Dångkolo reef slope had 2.4 times the taxa richness of the reef flat, and had the highest overall taxa richness of any area surveyed. Densities of fish and corals were higher on the reef slope than the reef flat, but no trend was apparent for algal cover and non-coral invertebrate densities.

Tinian Harbor

Fifteen genera of coral were found in the Inner Harbor. A single taxa, *Leptastrea purpurea*, accounted for 60% of all of the observed colonies and along with *Pocillopora damicornis* represented 72% of all observed colonies.

Sixty-three taxa in 27 genera were found on the reefs in the Outer Harbor, including the ocean side of the breakwater. While coral diversity was comparable to reef slope sites surveyed on the northern beaches, the coral density was lower. The community was not dominated by any single taxon. *Goniastrea retiformis* accounted for 24% of all observed colonies. Coral colonies >16 in (>40 cm) accounted for 9% of the observed colonies. In contrast, coral colonies in the Inner Harbor were heavily skewed toward small size classes, with 62% of colonies <0.78 in (<2 cm) and 81% of all observed colonies being <2 in (<5 cm).

The Inner Harbor had a rich fish community; 101 fish taxa in 28 families were found within Tinian's Inner Harbor. Damselfish and wrasses were numerically dominant, accounting for over 64% of all observed individuals. While parrotfish were less dominant numerically, they were the primary contributor to biomass, accounting for 32% of the fish biomass at Inner Harbor sites, over twice that attributable to any other fish family. Parrotfish and mullets were numerically the most commonly observed large fish in the Inner Harbor, but densities of large fish were lower at Inner Harbor than at Outer Harbor sites.

One hundred and twenty-eight fish taxa in 26 genera were found in the Outer Harbor. Three families, wrasses (26% of individuals), damselfish (26% of individuals), and surgeonfish (22% of individuals) accounted for the 74% of the fish observed in the Outer Harbor. These same families also contributed 64% to the overall fish biomass. Large fish were relatively rare; the most common fish 8 in (>20 cm) in length were parrotfish. However, large emperors and triggerfish were dominant in terms of biomass. A small school of barracuda was observed at one Outer Harbor site, but because they were small and rare at the Outer Harbor, they were not significant contributors to the fish biomass.

No sharks or rays were observed at Tinian Harbor. The Napoleon wrasse and bumphead parrotfish were also not seen in Tinian Harbor.

11.1.4.3 Special-Status Species

As noted in Section 11.1.1.3, this section includes USFWS ESA-listed and candidate species and marine mammals not listed under ESA. There are no NMFS species of concern on reported at Tinian.

The threatened green sea turtle and the endangered hawksbill sea turtle are the only two ESA-listed species that are anticipated in the nearshore marine environment and adjacent beaches. The Navy, in cooperation with the USFWS and Guam Division of Aquatic and Wildlife Resources, monitors for sea turtle nesting on Navy land throughout the sea turtle nesting season (April – July for the green sea turtle and January – March for the hawksbill sea turtle).

The spinner dolphin and common bottlenose dolphin are the only two marine mammals anticipated in the nearshore (<164-ft isobath) (<50-m isobath) ROI for the study areas (Navy 2005). Table 11.1-4 shows the special-status species that are addressed in this EIS/OEIS.

Table 11.1-4. Special-Status Species for Tinian

Group	*Common Name/Chamorro Name/Scientific Name*	*Status**	
		Federal	*CNMI*
Mammals	Common bottlenose dolphin/Toninos/*Tursiops truncates*	MMPA	SOGCN
	Spinner dolphin/Toninos/*Stenella longirostris*	MMPA	SOGCN
Reptiles**	Green sea turtle/Haggan bed'di/*Chelonia mydas*	T	T
	Hawksbill sea turtle/Hagan karai/*Eretmochelys imbricata*	E	E

Legend: *E = endangered, T = threatened; **Does not include nesting sea turtles;
Sources: NMFS 2009, USFWS 2009.

The special-status species are briefly described below and in more detail in Volume 2, Chapter 11, Section 11.1.4.3. Information about these species, including status, habitat preferences, distribution, behavior and life history, can be found in Volume 9, Appendix G.

Green Sea Turtles

The threatened green sea turtle is by far the most abundant sea turtle found around Tinian. The green sea turtle occurrences are listed as "concentrated" in nearshore waters of Tinian (Navy 2005). The number of green sea turtles inhabiting Tinian's nearshore environment is estimated to total approximately 800 turtles. Green sea turtle density at Tinian is estimated to be twice that of Saipan and nearly an order of magnitude greater than Rota, Aguijan, and FDM (Kolinski et al. 2004).

The green sea turtle nests on Tinian and all beaches reportedly support turtle nesting activities (Pultz et al. 1999). For successful nesting, green sea turtles require deep sand beaches with open ocean exposure and minimal disturbance. Beaches where green sea turtles have nested include Unai Masalok, Unai Dankolo, Unai Lamlam, Unai Babui, Unai Chulu, Unai Dunk Coke, Unai Barcinas, and Leprosarium Beach (COMNAV Marianas 2004). Green sea turtle nesting activity occurs as early as late January and ends in mid-July on most of Tinian's sandy beaches (Kolinski et al. 2001). The beaches that occur on Tinian are surveyed for sea turtle activity (i.e., crawls, nests, potential nests, body pits and hatching tracks) from February through August. Between 1999 and 2005, no nesting activity was noted in 2001 and 2003, while 2005 had the highest number of beach crawls (13) and the highest number of nests (6) (Kolinski et al. 2005). Nesting sea turtles would be discussed further in the Terrestrial Biological Resources, Section 10.

Hawksbill Sea Turtles

The endangered hawksbill turtle has been sighted in the waters offshore, but is not known to nest on the island. The hawksbill sea turtle occurrences are listed as "expected" in nearshore waters of Tinian (Navy 2005).

Common Bottlenose Dolphin

There is no occurrence on record for this species in the Marianas, but this is within the known distribution range for the species. Bottlenose dolphins are "expected" to occur from the coastline to the 6,562 ft (2,000 m) isobaths (Navy 2005).

Spinner Dolphins

The spinner dolphin is expected to regularly occur all around Tinian (Navy 2005).

<u>Non-Native Species</u>

Marine organisms, pathogens, or pollutants may be taken up with ship ballast water (or attached to vessel hulls) and be transferred to a different location or ecosystem and cause harm to the receiving ecosystem. These organisms and pollutants are in greater concentration within 6 km (3 nautical miles) of the coast (COMNAV Marianas 2007).

Information is limited for Tinian. However, U.S. Army Corps of Engineers (2009) reports a new non-native species of algae described as *Gracilaria* that has been intentionally introduced into Tinian Harbor and that an abalone species has also been introduced. The Tinian Mayor's office, together with the Northern Marianas College Cooperative Research Extension & Education Services' staff, attended specialized training on abalone (*H. asinine*) Nursery and Grow-out culture and seaweed (*Gracilaria*) farming (NMC-CREES 2009).

Balazs et al. (1987) identified ten genera of algae that he considered to be "preferred forage for green sea turtles in Hawaii, *Gracilaria* was listed as one of these algal species. *Gracilaria salicornia* is native to other parts of the Pacific and was introduced as a potential species for aquaculture in 1971 in Hawaii. It reproduces vegetatively and fish don't seem to prefer as forage. *Gracilaria* responds moderately to nitrogen, but once established, becomes very competitive. It exhibits 3-D growth form and is not limited by space (ANTSF 2009).

Most of the marine non-native species survey work, although limited, has been conducted in Apra Harbor and is discussed in Volume 2, Chapter 11.

11.2 ENVIRONMENTAL CONSEQUENCES

11.2.1 Approach to Analysis

11.2.1.1 Methodology

The methodology for identifying, evaluating, and mitigating impacts to marine biological resources was based on federal laws and regulations including the ESA, MMPA, Magnuson-Stevens Fishery Conservation and Management Act or Magnuson-Stevens Act (M-SA), Section 404(b)(1) Guidelines (Guidelines) of the Clean Water Act (CWA), and Executive Order (EO) 13089, *Coral Reef Protection*. Significant marine biological resources include all special-status species including species that are ESA-listed as threatened and endangered or candidates for listing under ESA, species protected under the MMPA, or species with designated EFH or HAPC established under the M-SA. The M-SA defines EFH as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." 'Waters' include aquatic areas and their associated physical, chemical, and biological properties that are used by fish. 'Substrate' includes sediment, hard bottom, structures underlying the waters, and associated biological communities. 'Necessary' means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem, and 'spawning, breeding, feeding, or growth to maturity' covers a species' full life cycle (16 United States Code [USC] 1801 et seq.). Additionally, at least one or more of the following criteria established by the NMFS must be met for HAPC designation: 1) the ecological function provided by the habitat is important, 2) the habitat is sensitive to human-induced environmental degradation, 3) development activities are, or would, stressing the habitat type, or 4) the habitat type is rare. It is possible that an area can meet one HAPC criterion and not be designated an HAPC. The Western Pacific Regional Fishery Management Council (WPRFMC) used a fifth HAPC criterion, not established by NMFS, that includes areas that are already protected, such as Overlay Refuges (WPRFMC 2005).

Guidelines of the CWA are in essence a Memorandum of Agreement (MOA) between the U.S. Environmental Protection Agency (USEPA) and U.S. Department of the Army (Army), to articulate policies and procedures to be used in the determination of the type and level of mitigation necessary to demonstrate CWA compliance. The MOA is specifically limited to the Section 404 regulatory program and does not change substantive Section 404 guidance. The MOA expresses the intent of the Army and USEPA to implement the objective of the CWA to restore and maintain the chemical, physical, and biological integrity of the Nation's waters, including special aquatic sites (SAS). SAS are those sites identified in 40 CFR 230, Subpart E (i.e., sanctuaries and refuges, wetlands, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes). They are geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. These areas are generally recognized as significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region.

In general, the main intentions of the three federal acts listed above are as follows:

- The ESA establishes protection over and conservation of threatened and endangered species and the ecosystems upon which they depend, and requires any action that is authorized, funded, or carried out by a federal entity to ensure its implementation would not jeopardize the continued existence of listed species or adversely modify critical habitat.

- The MMPA was established to protect marine mammals by prohibiting take of marine mammals without authorization in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S.
- The M-SA requires NMFS and regional fishery management councils to minimize, to the extent practicable, adverse effects to EFH caused by fishing activities. The M-SA also requires federal agencies to consult with NMFS about actions that could damage EFH.
- The CWA Guidelines set forth a goal of restoring and maintaining existing aquatic resources, including SAS (i.e. coral reefs, wetlands etc.).

The ESA, MMPA, and M-SA require that NMFS and/or the USFWS be consulted when a proposed federal action may adversely affect an ESA-listed species, a marine mammal, EFH or HAPC. In addition, while all habitats are important to consider, 'coral reef ecosystems' are perhaps the most important habitats and the analysis is included under EFH. As a note, EO 13089 also mandates preservation and protection of U.S. coral reef ecosystems that are defined as "… those species, habitats and other natural resources associated with coral reefs in all maritime areas and zones subject to the jurisdiction and control of the United States."

The CWA guidelines and the subsequent MOA require the USEPA and Army to implement the objectives of the CWA. In regard to dredging activities, the U.S. Army Corps of Engineers (USACE) first makes a determination that potential impacts have been avoided to the maximum extent practicable (striving to avoid adverse impacts); remaining impacts would be mitigated the extent appropriate and practicable by requiring steps to reduce impacts; and finally, compensate for aquatic resource values. This sequence is considered satisfied where the proposed mitigation is in accordance with specific provisions of a USACE- and USEPA-approved comprehensive plan that ensures compliance with the compensation requirements of the Guidelines.

11.2.1.2 Determination of Significance

This section analyzes the potential for impacts to marine biological resources from implementation of the action alternatives and the no-action alternative. Factors considered in the analysis of potential impacts to marine biological resources include: 1) importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource, 2) proportion of the resource that would be affected relative to its occurrence in the region, 3) sensitivity of the resource to proposed activities, and 4) duration of ecological ramifications. The factors used to assess the significance of the effects to marine biological resources include the extent or degree that implementation of an alternative would result in permanent loss or long-term degradation of the physical, chemical, and biotic components that make up a marine community. The following significance criteria were used to assess the impact of implementing the alternatives:

- The extent, if any, that the action would diminish suitable habitat for a special-status species or permanently lessen designated EFH or HAPC for the sustainment of managed fisheries.
- The extent, if any, that the action would disrupt the normal behavior patterns or habitat of a federally listed species, and substantially impede the Navy's ability to either avoid jeopardizing or to conserve and recover the species.
- The extent, if any, that the action would diminish population sizes or distribution of special status species or designated EFH or HAPC.
- The extent, if any, that the action would be likely to jeopardize the continued existence of any special-status species or result in the destruction or adverse modification of habitat of such species or designated EFH or HAPC.

- The extent, if any, that the action would permanently lessen physical and ecological habitat qualities that special-status species depend upon, and which partly determines the species' prospects for conservation and recovery.
- The extent, if any, that the action would result in a substantial loss or degradation of habitat or ecosystem functions (natural features and processes) essential to the persistence of native flora or fauna populations.
- The extent, if any, that the action would be inconsistent with the goals of the Navy's Integrated Natural Resources Management Plan (INRMP).

The MMPA generally defines harassment as Level A or Level B, and these levels are defined uniquely for acts of military readiness such as the proposed action. Public Law (PL) 108-136 (2004) amended the MMPA definition of Level A and Level B harassment for military readiness events, which applies to this action.

- Level A harassment includes any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild.
- Level B harassment is now defined as "any act that disturbs or is likely to disturb a marine mammal or marine mammal stock by causing disruption of natural behavioral patterns including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behaviors are abandoned or significantly altered." Unlike Level A harassment, which is solely associated with physiological effects, both physiological and behavioral effects may cause Level B harassment.

ESA specifically requires agencies not to "jeopardize" the continued existence of any ESA-listed species, or destroy or adversely modify habitat critical to any ESA-listed species. Under Section 7, "jeopardize" means to engage in any action that would be expected to reduce appreciably the likelihood of the survival and recovery of a listed species by reducing its reproduction, numbers, or distribution. Section 9 of the ESA defines "take" as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect.

Effects determination for EFH are either "no adverse effect on EFH" or "may adversely affect EFH" (WPRFMC 2005). Pursuant to 50 CFR 600.910(a), an "adverse effect" on EFH is defined as any impact that reduces the quality and/or quantity EFH. Adverse effects to EFH require further consultation if they are determined to be permanent versus temporary (NMFS 1999). To help identify Navy activities falling within the adverse effect definition, the Navy has determined that temporary or minimal impacts are not considered to "adversely affect" EFH. 50 CFR 600.815(a)(2)(ii) and the EFH Final Rule (67 FR 2354) were used as guidance for this determination, as they highlight activities with impacts that are more than minimal and not temporary in nature, opposed to those activities resulting in inconsequential changes to habitat. Temporary effects are those that are limited in duration and allow the particular environment to recover without measurable impact (67 FR 2354). Minimal effects are those that may result in relatively small changes in the affected environment and insignificant changes in ecological functions (67 FR 2354). Whether an impact is minimal would depend on a number of factors (Navy 2009):

- The intensity of the impact at the specific site being affected
- The spatial extent of the impact relative to the availability of the habitat type affected
- The sensitivity/vulnerability of the habitat to the impact
- The habitat functions that may be altered by the impact (e.g., shelter from predators)
- The timing of the impact relative to when the species or life stage needs the habitat

The analysis of potential impacts to marine biological resources considers direct, indirect, and cumulative impacts. The *Council on Environmental Quality (CEQ), Section 1508.08 Effects*, defines direct impacts as those caused by the action and occur at the same time and place, while indirect impacts occur later in time or farther removed in distance, but are still reasonably foreseeable. CEQ defines cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other action.

Direct impacts may include: removal of coral and coral reef habitat (a CWA special aquatic site), "taking" of special-status species, increased noise, decreased water quality, and/or lighting impacts resulting from construction or operation activities.

Indirect impacts, for the purposes of this evaluation, may include any sedimentation/siltation of coral reef ecosystems resulting from construction or operational activities (i.e. dredging, resuspension of sediment via prop wash), or recreational activities in the vicinity of the resource that may lead to impacts to special-status species and EFH.

If marine resources could be significantly impacted by proposed project activities, potential impacts may be reduced or offset through implementation of appropriate best management practices (BMPs) or mitigation measures.

11.2.1.3 Issues Identified during Public Scoping Process

The following analysis focuses on possible effects to marine biological resources that could be impacted by the proposed action. As part of the analysis, concerns relating to marine biological resources that were mentioned by the public, including regulatory stakeholders, during scoping meetings were addressed. A general account of these comments includes the following:

- Potential impacts to endangered species (including nesting habitats), species of concern, and federal trust species such as corals and marine mammals.
- Potential impacts from military expansion from all project sites on the marine resources, including removal or disturbance of the marine habitat.
- Impacts to culturally significant marine-related areas for subsistence fishing and beliefs.
- Increased land runoff impacting beaches and marine life (erosion and sediment stress).
- Increased anthropogenic factors impacting the coral reef ecosystem and concerns about the education and training that would be provided for newly arriving military and their dependants regarding reef protection.
- Impacts to coral reef ecosystems regarding amphibious landing craft operations.
- Mitigation measures and non-structural alternatives to avoid and minimize impacts to coral reefs.

11.2.2 Alternative 1 (Preferred Alternative)

11.2.2.1 Tinian

The action alternatives have the potential to impact the quality and quantity of the surface runoff, during both the construction and operational phases of the project. Both construction activities as well as long-term training activities may cause erosion and sedimentation that can degrade coastal waters and potentially impact nearshore marine biological resources. In addition, the action alternatives would increase the potential for leaks and spills of petroleum, oil, and lubrications, hazardous waste, pesticides, and fertilizers. These potential impacts may affect the coastal waters and in turn the biological resources and habitats.

Construction

There are no in-water construction, dredging, or training activities proposed for this study area. There are no land-based construction activities that would impact the marine environment. Land-based construction actions associated with Alternative 1 would occur more than 1 mile from the coastline. In addition, no construction would occur within the identified 100-year floodplain (Flood Zone A areas). While alterations to the watershed have the potential to result in indirect impacts that could alter the coastal water quality as described above (see Chapter 4, Water Resources), these potential effects would be minimized by complying with all applicable orders, laws and regulations, including low impact development stormwater management strategies and BMPs (Volume 7). Supply barge traffic in Tinian Harbor supporting construction activities would increase in the short-term; however, this effect would be negligible. Therefore, there would be no impacts to marine flora and invertebrates, no adverse effects to fish and EFH or significant impacts to special-status species (The action would not “jeopardize” or “take” an ESA-listed species per ESA Section 7 and 9, no serious injury or mortality of any marine mammal species is reasonably foreseeable and no adverse effects on the annual rates of recruitment or survival of any of the species and stocks with implementation per Section 3 [16 USC 1362] of MMPA, and no major conduit exists for introduction of non-native species into the marine environment with the implementation of Alternative 1.

Alternative 1 would result in less than significant impacts to marine biological resources.

Operation

There would be no maritime training on Tinian. Training activities associated with Alternative 1 would occur more than one mile from the coastline. The transport of 200-400 Marines to Tinian from Guam for the proposed 1 week per month company-level training exercises would be via air transport. The estimated sorties associated with the notional airlift requirements are provided in Table 11.2-1.

Table 11.2-1. Daily and Annual Use of Proposed Small Arms Qualification Ranges on Tinian

Range	*Weapon*	*Ammunition Type*	*Typical Use Estimate*			*Ammunition Expenditure Estimates*		
			Crews or Personnel	*Hours*	*Days Per Yr[(a)]*	*Busy Day [(b)]*		*Annual [(d)]*
						Day	*Night[(c)]*	
Known Distance	Rifle	5.56 mm	100	8:00 -12:00 7:00- 9:00	80	12,000	0	960,000
Automated Combat Pistol/ Multipurpose Firearms Qualification	Pistol (M9)	9 mm	100	8:00-10:00 7:00- 9:00	60	3,750	1,250	300,000
	45	.45caliber	50	8:00-10:00 7:00- 9:00	20	3,750	1,250	100,000
Platoon Battle Course	Rifle	5.56 mm	120	8:00-4:00 7:00- 1:00	80	6,750	2,250	720,000
	SAW	5.56 mm	40	8:00-4:00 7:00- 1:00	80	2,250	750	240,000
Field Firing Range	Rifle	5.56 mm	120	8:00-4:00 7:00- 1:00	80	9,000	3,000	960,000
							Total	**3,280,000**

Legend: mm = millimeters; SAW = Squad Assault Weapon

Notes:

[a] The figures for number of days of use are determined based on an estimated use of the ranges up to 16 weeks per year (1 week per month plus 1 additional week per quarter), 5 days per week. Range use would occur periodically throughout the year, with no predictably busy or non-use periods.

[b] Estimates based on the maximum number of shooters per day who could make use of each proposed range (calculated by multiplying the number of firing points or lanes by the number of firing relays), firing the number of rounds prescribed for a standard string of fire. This estimate is consistent with the ammunition allocation for the relocated Agreed Implementation Plan units.

[c] Night refers to non-daylight hours that are generally 7:00 p.m. – 6:00 a.m. on Tinian.

[d] The estimate of annual numbers of rounds expended is consistent with the Agreed Implementation Plan ammunition allocation.

No SDZs extend overwater for this Alternative. As stated above, based on compliance with all federal, the CNMI, and military orders, laws, and regulations, impacts would be negligible. Therefore, there would be no impacts to marine flora and invertebrates, no adverse effects to fish and EFH, no significant impacts to special-status species (i.e. the action would not “jeopardize” or “take” an ESA-listed or marine mammal species per ESA Section 7 and 9 or Section 3 [16 USC 1362] of MMPA), and no major conduit exists for introduction of non-native species into the marine environment with appropriate maritime policies.

Alternative 1 would result in less than significant impacts to marine biological resources.

11.2.2.2 Summary of Alternative 1 Impacts

Table 11.2-2 summarizes the Alternative 1 Impacts.

Table 11.2-2. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	There may be negligible short-term and localized impacts from increased turbidity in coastal waters from increased runoff to all marine biological resources. Short-term and localized disturbances to marine biological resources residing in Tinian Harbor may occur from increased barge traffic.
	Operation	There would be negligible impacts to all marine biological resources.

11.2.2.3 Alternative 1 Potential Mitigation Measures

No mitigation measures are identified under Alternative 1.

11.2.3 Alternative 2

11.2.3.1 Tinian

Construction

Impacts to marine biological resources resulting from the implementation of Alternative 2 are similar to the impacts discussed under Alternative 1 (Section 11.2.2.1). Therefore, Alternative 2, would result in less than significant impacts to marine biological resources.

Operation

Impacts to marine biological resources resulting from the implementation of Alternative 2 are similar to the impacts discussed under Alternative 1 (Section 11.2.2.1) with the exception that a small SDZ area extends over Unai Dångkulo Beach. While ground disturbing activities would occur within the range, the SDZ is largely unaffected by the range, and is a safety feature left in its natural state. Based on the probability analysis performed in Volume 2, Chapter 11, Section 11.2.2.2, impacts from range munitions would be negligible to special-status species.

This alternative would require restricted access to the waters and shoreline encompassed by the SDZs during operation of the Platoon Battle Course. Restricted access to the coastal areas during range operations would result in a positive impact to special-status species and EFH. Therefore, Alternative 2, would result in less than significant impacts to marine biological resources overall, with a positive impact to Unai Dångkulo, a sea turtle nesting beach, and the coral area of special significance offshore during range operations.

11.2.3.2 Summary of Alternative 2 Impacts

Table 11.2-3 summarizes Alternative 2 impacts.

Table 11.2-3. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	There may be negligible short-term and localized impacts from increased turbidity in coastal waters from increased runoff to all marine biological resources. Short-term and localized disturbances to marine biological resources residing in Tinian Harbor may occur from increased barge traffic.
	Operation	There would be negligible impacts to all marine biological resources. A beneficial impact to sea turtles and a coral area of special significance associated with Unai Dångkulo may during range training operations and the respective coastal area restricted access.

11.2.3.3 Alternative 2 Potential Mitigation Measures

No mitigation measures are identified for Alternative 2.

11.2.4 Alternative 3

11.2.4.1 Tinian

Construction

Impacts to marine biological resources resulting from the implementation of Alternative 3 are similar to the impacts discussed under Alternative 1 (Section 11.2.2.1). Therefore, Alternative 3 would result in less than significant impacts to marine biological resources.

Operation

Impacts to marine biological resources resulting from the implementation of Alternative 3 are similar to the impacts discussed under Alternative 1 (Section 11.2.2.1).

Restricted access to the coastal areas during range operations would result in a positive impact to special-status species and EFH, specifically, nesting sea turtles and a coral area of special significance offshore of Unai Dankulo. Therefore, Alternative 3 would result in less than significant impacts to marine biological resources.

11.2.4.2 Summary of Alternative 3 Impacts

Table 11.2-4 summarizes Alternative 3 impacts.

Table 11.2-4. Summary of Alternative 3 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	There may be negligible short-term and localized impacts from increased turbidity in coastal waters from increased runoff to all marine biological resources. Short-term and localized disturbances to marine biological resources residing in Tinian Harbor may occur from increased barge traffic.
	Operation	There would be negligible impacts to all marine biological resources.

11.2.4.3 Alternative 3 Potential Mitigation Measures

No mitigation measures are identified for Alternative 3.

11.2.5 No-Action Alternative

Under the no-action alternative, Marine Corps units would remain in Japan and not conduct additional training on Tinian. No construction, dredging, training, or operations associated with the military relocation would occur. Existing operations on Tinian would continue. Therefore, the no-action alternative would not have significant impacts to marine biological resources.

11.2.6 Summary of Impacts

Table 11.2-5 summarizes the potential impacts. A text summary is provided below.

Table 11.2-5. Summary of Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Marine Flora and Invertebrates			
LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities.	LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities.	LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities.	NI • No impact
Essential Fish Habitat			
LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities.	LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities. • Positive impact to coral area of special significance off Unai Dankulo due to restricted coastline access during range operations.	LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities.	NI • No impact
Special Status Species			
LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities.	LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities. • Positive impact to sea turtles due to restricted coastline access (and Unai Dankulo nesting beach) during range operations.	LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities.	NI • No impact

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Non-native Species			
LSI • Less than significant impact as no maritime construction or operations are planned.	LSI • Less than significant impact as no maritime construction or operations are planned.	LSI • Less than significant impact as no maritime construction or operations are planned.	NI • No impact

Legend: SI-M = Significant impact mitigable to less than significant; LSI = Less than significant impact; NI = No impact.

Many of the action alternatives have the potential to impact the quality and quantity of the surface runoff, during both the construction and operational phases of the project. Both construction activities as well as long-term training activities may cause erosion and sedimentation that can degrade coastal waters and potentially impact nearshore marine biological resources. In addition, the action alternatives would increase the potential for leaks and spills of petroleum, oil, and lubrications, hazardous waste, pesticides, and fertilizers. These potential impacts may affect the coastal waters and in turn the biological resources and habitats. The action alternatives, however, would be conducted in accordance with all applicable orders, laws, and regulations that would reduce their potential for impact on marine biological resources from runoff within the nearshore environment. A beneficial impact on sea turtles may be seen during training activities due to restricted access along the coastal areas and sea turtle nesting beach in the area.

Additionally, considering that Alternative 2 would have some access restrictions placed on the coastal areas during range training operations, this could provide some added protection to nesting sea turtles and coral and coral reef habitat offshore.

Therefore, the alternatives would result in less than significant impacts to marine biological resources, with Alternative 2, having positive impacts on special-status species and EFH.

11.2.7 Summary of Potential Mitigation Measures

Table 11.2-6 summarizes potential mitigation measures for all alternatives.

Table 11.2-6. Summary of Potential Mitigation Measures

Alternative 1	*Alternative 2*	*Alternative 3*
Marine Biological Resources		
• None	• None	• None

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