

**Farallon de Medinilla:
Qualitative Survey of the Nearshore Habitat**

Prepared By:

**Michael S. Trianni
Division of Fish and Wildlife
Commonwealth of the Northern Mariana Islands**

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TABLE OF CONTENTS

List of Figures	iii
Introduction	1
Methods	1
Results	3
Discussion	7
Conclusion	8

LIST OF FIGURES

Figure 1. The island of Farallon de Medinilla showing survey locations.....3

Introduction

The United States Navy has been conducting monthly bombing exercises at Farallon de Medinilla (FDM) since 1971, following a lease agreement with the Trust Territory of the Northern Mariana Islands. A preliminary environmental impact statement (EIS) was completed in 1975, and in late 1995 the Commonwealth of the Northern Mariana Islands (CNMI) Division of Fish and Wildlife and the United States Navy agreed to biological surveys of FDM to assess terrestrial species compositions and distributions, and to conduct a marine survey to qualitatively determine the degree of impact from bombing on the fringing coral reef community. The purpose of this survey was to serve as a follow-up to the 1975 EIS.

The original marine survey personnel included a marine biologist contracted to the Navy, a representative from the National Marine Fisheries Service (NMFS), and a biologist from the CNMI Division of Fish and Wildlife. The initial survey to FDM originally took place in November 1996. This survey was cut short due to pre-typhoon conditions, resulting in one day of terrestrial surveys, with the waters being too rough to conduct the marine survey. The marine survey was finally conducted from July 8-10, 1997, with survey personnel including the original marine biologist contracted to the Navy, the NMFS representative, a representative from the United States Fish and Wildlife Service, and a biologist from the CNMI Division of Fish and Wildlife.

It was understood at the beginning of the survey that the marine biologist contracted to the Navy would be assessing the benthic habitat and coral reef community. The USFWS representative would be focusing on fisheries observations, the NMFS representative would be observing all aspects of the habitat, and the CNMI biologist would be serving primarily as an 'observer'. This report documents the observations of the CNMI biologist.

Methods

The goal of the marine survey team was to observe the fringing reef community around the entire island. A total of 16 stations were surveyed by three methods: manta tow, scuba diving, and free diving.

Stations T-1 to T-9 were surveyed by manta tow, with four to five snorkelers towed by an inflatable zodiac. During a tow snorkelers were pulled over a pre-determined area, obtaining a visual impression of the benthic habitat, the coral community and the fisheries diversity. The visual range of the snorkelers was from surface waters down to 60 feet, with the primary focus being on the habitat directly under them. No limits on range of visual observation were agreed to prior to towing.

Five scuba dives were conducted, two on the windward side of the island (S-1 and S-2), and three on the lee side (S-4, S-6 and S-7). Dive times ranged from 15 to 30 minutes, depending upon the depth, diver, and amount of tank air. As a condition set by the Navy, all survey divers were closely followed by Naval Explosive Ordinance Disposal personnel (EOD), and maximum dive depth was limited to 60 feet.

Two areas were surveyed by free diving(S-2 and S-5). As with the scuba dives, all snorkelers were closely followed by EOD personnel.

All dives were directional in nature, thus avoiding any re-tracking.

Results

The orientation of FDM is from NNE to SSW, the island being nearly a mile and a half long, and up to about one-eighth of a mile wide(Figure 1). The surveys began on the windward NNE point, moving around the SSW point and back up the lee side NNE. A brief description of the survey areas follows. The observations that follow are based on qualitative observations, and should therefore be viewed as such. They are not presented as being comprehensive. Observations are organized in chronological order.

July 8

T-1

Four observers participated on this tow, the first in the FDM survey. The benthic habitat was composed of a 'reef pavement habitat', with very little relief. It was essentially homogenous in form, with very little coral cover. The habitat appeared to slope lightly away from the island. Tufts of *Pocillopora* sp. were observed on shallower rock slabs.

Mid-water schools of *Trachinotus bailloni*(approximately 40), and *Pterocaesio* tile(about 30) were conspicuous upon initial entry. Benthic and near bottom fish included Acanthurids(73%), which appeared to be the dominant family of fish in this area. Other families observed were Carangidae((2%), Siganidae(7%), Lutjanidae(7%), Pomacentridae, and Scaridae(11%). About 25% of the Scaridae observed were terminal phase males.

S-1

This was the first scuba dive. The maximum depth attained was 60 feet. This area was also described as a 'pavement habitat', though with a higher amount of coral cover than in T-1. Large patches of sand substrate strewn with rock were also present. Acanthurids(24%) and Pomacentrids(45%) appeared to be the dominant families in this area. *Chromis* sp. appeared to be very abundant in this area. Also observed were Labridae(12%), Chaetodontidae(12%), Lethrinidae(2%), Lutjanidae(2%), Balistidae(1%), and Serranidae(2%). Scarids were not observed.

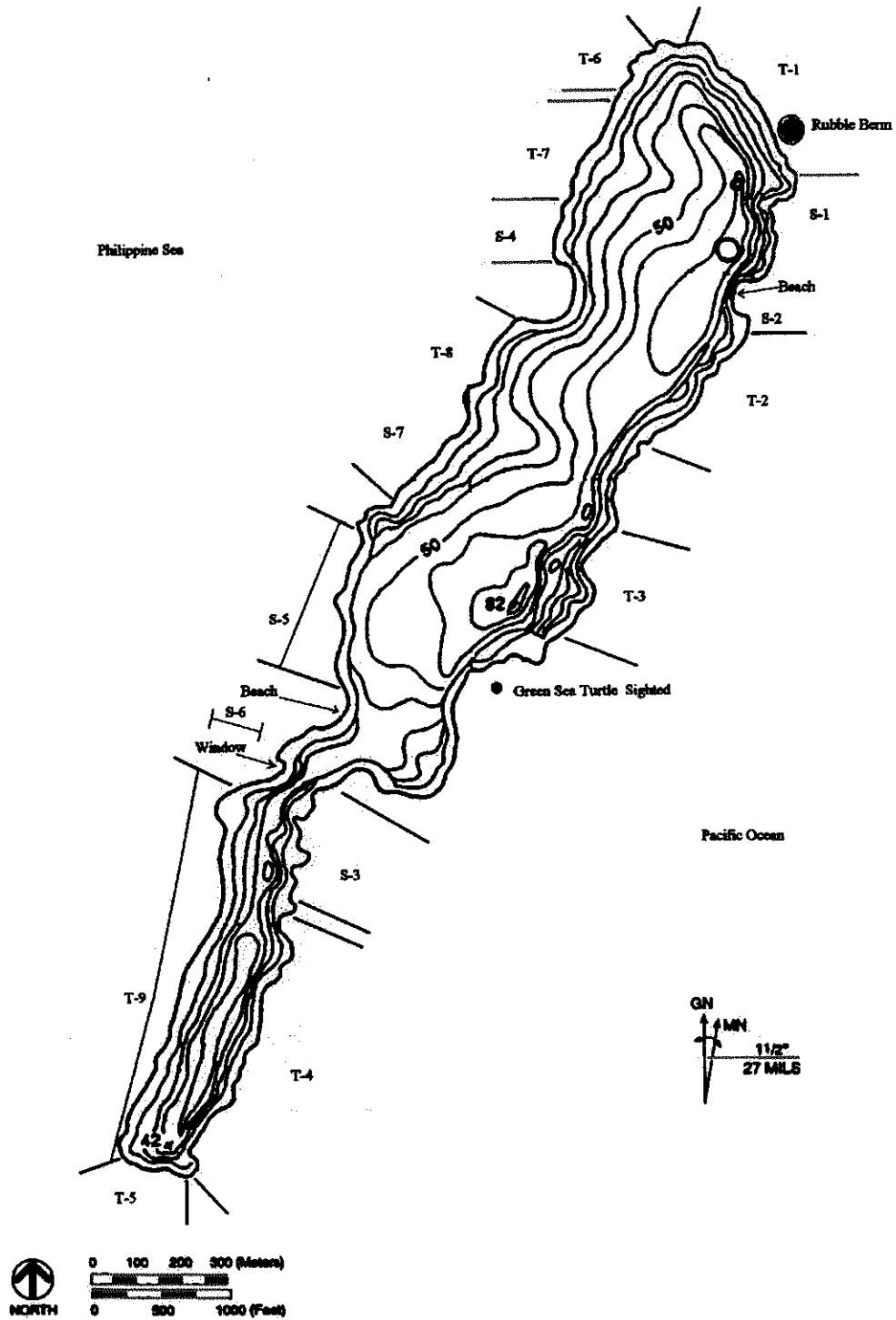


Figure 1. The island of Farallon de Medinilla showing survey locations.

S-2

This was a snorkel toward the exposed beach on the windward side. Visibility was very much reduced, to less than 15 feet in some areas. A high degree of suspended sediment was observed in this area, due primarily to the exposed nature of this beach to persistent physical disturbance by wind and waves. The appearance of the beach indicated that it would be covered by higher tides. From this factor, coupled with the high degree of physical disturbance, it was concluded that this beach was not suitable for turtle nesting.

From what could be observed, very little coral growth existed. The most abundant fish family was Acanthuridae, which comprised over 98% of all fish observed. *Acanthurus trigosteus* was very dominant in this area, comprising over 75% of the Acanthurids. Kyphosids were observed for the first time in this area (*Kyphosus bigibbus*).

T-2

The CNMI biologist was stung by a man o' war at the commencement of this tow and was not able to continue to participate.

T-3

This habitat was also characterized by a pavement substrate, strewn with large boulders. Coral cover appeared low. Acanthurids were the dominant family of fish. From the Scaridae observed, 25% appeared to be terminal phase males.

A green sea turtle was observed following this tow (Figure 1).

S-3

The CNMI biologist did not dive in this area, but instead snorkeled. There appeared to be a high degree of coral cover in this habitat, which was characterized by large rock slabs and numerous crevices. The high degree of coral cover is attributed to the relative protected nature of this habitat (Figure 1).

T-4

This tow covered more of the pavement habitat which dominated the windward side of the island. Coral cover was low, as well as the abundance and diversity of fish species. Acanthurids were dominant, comprising over 90% of observed fish. Six *Cetoscarus bicolor* (all terminal phase males) were observed. At the end of the tow near a deep drop off, a school of

approximately 30 Rainbow Runner(*Elegatis bipinnulatus*) were observed near the surface. Below the Rainbow Runners, a school of approximately 75 Grey Reef Sharks(*Carcharhinus amblyrhynchos*) were observed down to about 70 feet. This appeared to be a school of 'pups', the size range being from 2 to 4 feet. Initially the school began to rise towards the observers, then sounded.

T-5

This was a tow over a shallow flat area at the SSW tip of the island, extending from the high relief area observed at the end of T-4. The current was very strong at about 4 knots. Coral cover appeared good on top of the flat area, where a crater appeared to be present from an exploded ordinance.

July 9

T-6

This tow began at the NNE lee side of island, towing SSE. The benthic habitat during this tow was bottom pavement with scattered boulders of varying size. Coral cover appeared to be medium, with the highest cover above 40 feet. The substrate in this area appeared to be steeper than in others observed. Of the observed fish, over 90% appeared to be Acanthurids. Two schools of *Trachinotus bailloni*(approximately 50 and 60) were observed during the tow. All Scarids observed were terminal phase males.

T-7

The benthic habitat at the beginning of this tow was similar to that in T-6. The tow length was shortened when a steep drop-off(from 20 to 80 feet) was observed. At that point it was decided to dive on the wall area. Acanthurids were observed to be the dominant family of fish. Kyphosids, Scarids(*Scarus rubrioviolaceus*, three terminal phase males) and Carangidae were also observed.

S-4

This was the third dive of the survey. The initial habitat was a near vertical wall, dropping from 20 to 80 feet. Near the bottom of the wall large boulders, numerous caves, overhangs, crevices and tunnels combined to provide a high degree of spatial heterogeneity, supporting a diverse assemblage of fauna. Coral cover was very high near the top of the wall, near 90%.

Over 45 species of fish were observed. Fish families included Carangidae, Lutjanidae, Zanclidae, Scaridae, Carcharhinidae, Caesionidae, Balistidae, Pomacentridae, Pomacanthidae,

Chaetodontidae, Lethrinidae, Labridae, Scombridae, Kyphosidae, Pempheridae, Serranidae, Mullidae, and Holocentridae. A large school *P. tile* (about 140) was observed, as well as 15 Grey Reef sharks in a cave at 50 feet, and a Dogtooth tuna (*Gymnosarda unicolor*).

Also observed were feather stars, wire coral, spiny lobsters, giant clams (*Tridacna maxima*), and sea cucumbers including *Bohadschia graffei* (about 100), *Thelanota ananas*, *Stichopus chloronotus*, *Holothura hilla*, *H. nobilis* (1), and *Actinopygna mauriantiana* (10). It was concluded that this habitat contains a very rich faunal assemblage.

T-8

This habitat consisted initially of a shelf area with numerous drop-offs, followed by pavement with large boulders near the end of the tow. There were 25 ordinance observed during this tow. Coral cover was approximately 50%. Acanthurids appeared to be dominant, followed by Labridae, Serranidae, and Scaridae. Another large school of *P. tile* (about 100) was observed. Approximately 25 *A. mauriantiana* were observed.

S-5

This area was observed using snorkel. It was the second of the two beaches found at FDM. The visibility in this area was much reduced as the beach was approached. There appeared to be a high amount of suspended sediment in the water. The cliff wall in back of the beach appeared to be highly eroded, probably from bombing exercises. This was the probable primary cause of suspended sediment. Acanthurids were the dominant species of fish, although Kyphosids were numerically very high, as numerous schools of 20-30 were encountered. Coral cover was low in this area.

As with the first beach, this beach was also probably covered during higher tidal events. It was also not deemed suitable as a sea turtle nesting site.

T-9

This area began near the 'window' or hole through FDM near the narrowest width of the island. The initial habitat was a rubble field near the hole. As the tow progressed south steeply sloping pavement habitat dominated. This area exhibited a low amount of coral cover (10-15%). There also existed large patches of alga growth, up to 70% coverage. One area was observed where the surface of a rise was fractured (approximately 50 feet). The cause of this fracture was not discernible. Anchor damage or detonation were speculated as possible causes, as well as tremors.

Acanthurids continued to be the dominant family of fish. Of the observed members of the family Scaridae, 50% were terminal phase males. Other notable observations included one Reef blacktip shark (*Carcharhinus melanopterus*), one Reef whitetip shark (*Triaenodon obsesus*), and one blue spotted stingray (*Dasyatis kuhlii*).

Sea cucumber observed included *H. mauriantiana*(67), *S. chloronotus*, *T. ananas*, and *B. graffei*.

S-6

This was the fourth dive of the survey. The CNMI observer dove for only 15 minutes due to low tank air. The area was an extensive gently sloping reef flat about 150 feet offshore from the 'window' or hole at the beginning of T-9. The dive depth ranged from 30-60 feet. This habitat exhibited a high degree of coral cover. It appeared very diverse biotically, with numerous species of fish, as well as sponges, tunicates, and algae. A Tritons trumpet was also observed(*Charonia tritonis*). This habitat was dominated by Labrids and Pomacentrids, it being the only habitat surveyed not dominated by Acanthurids. This was concluded to be very good reef habitat.

July 10

S-7.

This dive closely followed T-8, and is an extension of the habitat surveyed in S-4. The habitat was characterized as a shelf with a steep drop-off, from approximately 40 to 80 feet. The coral cover on the shelf was about 90%, most consisting of *Poecillipora* sp., *Acropora* sp., and encrusting *Porites* sp. The surveyors descended onto the shelf, went over the wall and descended to 60 feet, following the wall in a southerly direction. The wall was followed until it gave way to a pavement bottom interspersed with varying sized boulders. The pavement was then followed up to shoreline(30-40 feet), which was subsequently followed.

Over 50 species of fish from 16 families were observed. A green sea turtle was also observed. Sea urchins were very common near the end of the wall, as well as giant clams (*T. maxima*), ascidians, and algae. Sea cucumbers observed included; *S. chloronotus*, *T. ananas*, and *B. graffei*. This habitat contains a very rich faunal assemblage.

Discussion

It was observed that coral growth on the windward side of the island was very patchy, and in general coral cover very low. The windward habitat was primarily composed of a flat, 'pavement' type environment which gradually sloped away from the island. The habitat on this side of the island is subjected to a high degree of physical disturbance, resulting from open exposure to significant wave energy and wind force. These factors inhibit the establishment of juvenile coral, resulting in settlement events occurring only during periods of relative calm, thus explaining the patchy coral distribution.

Numerous bomb shells were observed scattered around the bottom down to 60-70 feet, usually singly, with no direct evidence of damage from bombing observed. EOD personnel who

accompanied and provided support to the survey team stated that the types of shells observed were from bombs that were not packed with explosives, but rather only 'smoked' on impact. In general, the spatial homogeneity of the windward side habitat, coupled with exposure to severe physical forces, is not a habitat that promotes significant coral growth and subsequently rich faunal assemblages.

As expected, the lee side of the island exhibited the highest degree of coral growth. The benthic habitat on this side had a much higher degree of spatial heterogeneity, and subsequently richer faunal assemblages. The most abundant growth was observed from the middle of the lee side to near the SSW tip of the lee side. In this area there existed significant patches of coral growth, as well as numerous drop-offs or 'walls', from 20-30 feet down to 60-80 feet. This area receives the highest degree of protection from physical forces, and therefore ample coral recruitment. The surveyed sites that exhibited the richest faunal assemblages were S-4, S-6, and S-7. Not coincidental, these were also sites surveyed by scuba. Another area of note is the high relief area near the SSW tip of the windward side, near the end of T-4. It was here that a large number of juvenile grey reef sharks were observed. This area may in fact be an important pupping ground for this species of shark. Although the survey was focused on the quality of coral reef habitat, survey findings should not be constrained as such. Because of the shark observation near the end of T-4, it is thus necessary to include this area as being of significant value ecologically.

The highest densities of bomb shells were observed near the middle of the lee side, but again, no damage from bombing to the coral reef community was documented.

Near the SSW tip of the island a shallow flat area was observed to have been damaged directly from a bombing event (T-5).

Conclusion

The windward side of the island does not provide sufficient protection from physical forces to contribute to extensive coral settlement and growth. Although some nearshore areas were found to contain high degrees of suspended sediment(S-2), aerial bombing cannot be assumed to be the primary cause. In addition, no impact from bombing was observed. In contrast, the most protected parts of the lee side of the island supported the highest degree of coral growth. One observation of damage from bombing was observed at the SSW point of the island.

As expected, the lee side of the island contained the richest faunal assemblages of the surveyed areas. It was noted that certain nearshore areas contained considerable amounts of suspended sediment, usually coincident with eroding cliff lines (S-5). On this side of the island bombing events can be considered to have a greater impact on the nearshore fringing reef community, but because FDM is a very narrow island and only one and a half miles long, the entire fringing reef community will be exposed to natural physical forces. This was very evident in November 1996, when the first marine survey was attempted, and FDM was being exposed to pre-typhoon conditions.

The major fishery around FDM targets the shallow water bottomfish complex, comprised mainly of Lethrinids, in particular *Lethrinus rubrioperculatus*, the Red-gilled emperor. The depths fished in this fishery range from 60 to 100 meters, well beyond the nearshore waters of FDM. No reef fish fishery exists at FDM, although the survey did encounter evidence of near shore bottomfishing. Because of the large population of sharks in the waters surrounding FDM, local fishermen avoid spear fishing there.

The survey would have benefited from a more inclusive plan. It is acknowledged that only 2.5 days were allotted by the Navy for this survey, and because of this only a qualitative impression was obtained. Regardless, the survey did cover all sides of FDM, and provided an excellent template if future investigations are deemed necessary.

It is concluded here that cessation of bombing at FDM would probably not contribute significantly to the enrichment of faunal assemblages already present. It can be suggested that certain areas, such as the lee side in general, be bombed less extensively than the windward side, and that the area of the 'window' or hole at the narrowest part of the island not be bombed at all.

