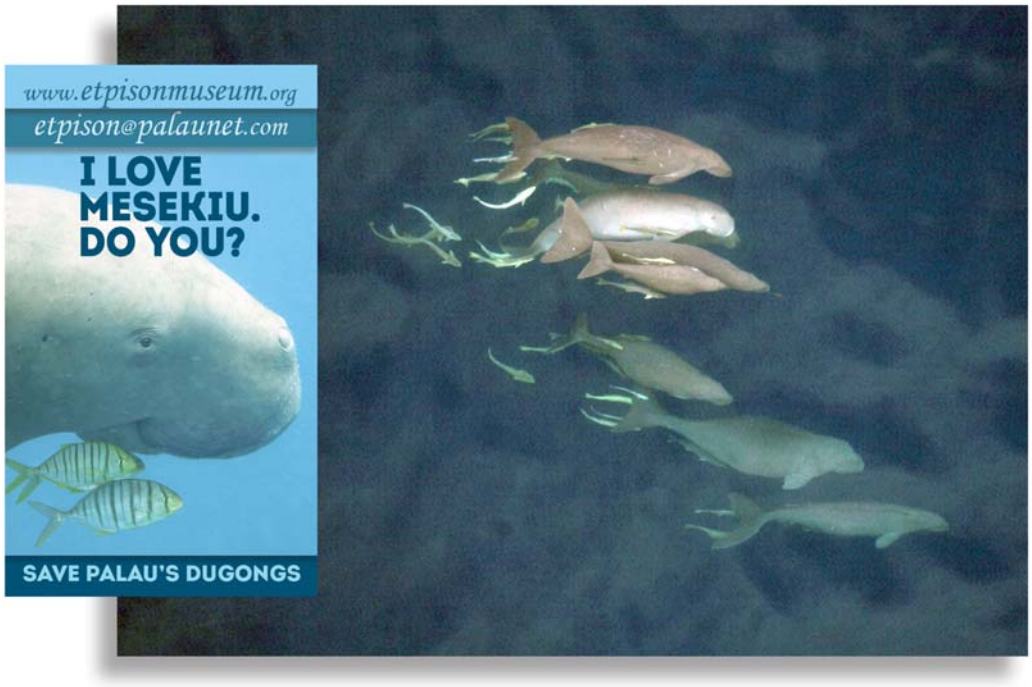
Palau Dugong dugon
Awareness Campaign 2012-2013



by
Patrick L.Colin and Mandy Etpison

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This report was prepared by the Etpison Museum, with editorial assistance by Coral Reef Research Foundation and support from UNEP/CMS. Any comments should be directed to:
Mrs. Mandy Etpison (mandyetpison@outlook.com) and/or Patrick L. Colin (crrfpalau@gmail.com)

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Executive Summary

The 2012-2013 Dugong Awareness Campaign has built upon the success of the initial Campaign of 2010-2011 to raise understanding within the local community of the plight of the Palau dugong and increase knowledge of their biology and ecology for management purposes. Funding for the Campaign was provided by Monaco through the UNEP/CMS office in Abu Dhabi to "Support Dugong Conservation in Palau", building on previous efforts. Education and outreach activities were the core focus of the Campaign through information booklets, baller bands, contests, stickers and new posters. The most important of the new educational materials was a 45 page "Children's Activity Booklet" on dugongs and manta rays which has been distributed to all 7th and 8th grade students in Palau.

Helicopter surveys of the population near Koror, which had been stopped in 2011, were restarted in April 2013 with aid of Rock Island Helicopters and provided important new information on dugong numbers, social groups, their movements and behavior. The new surveys examined dugongs in areas sampled previously around Koror, and added one more survey area. The effect of typhoon Bopha on the dugong population and habitat was also assessed. While no exact population figures are available, our data do provide reasonable baseline information on the population around Koror which can be used to assess future changes. Significant information included the documentation of the largest herd of dugongs (more than 40 individuals) yet seen in Palau.

Arrangements were made with Dr. David Blair of James Cook University to do DNA genetic determination on tissue samples from Palau dugongs. Six tissue samples were sent to Australia in July, 2013; the first samples from Palau to be part of the global examination of dugong population structure. Since the Palau population is so isolated, it is especially important in understanding the overall evolution and status of dugongs worldwide. The goal is to get tissue samples from approximately 30 individual dugongs. This will continue to be done in the future through sampling of dead or confiscated dugongs.

Working with the National Government agencies, necropsies were performed, whenever possible, on all dead dugongs recovered during the Campaign, and this had led to an improved working relationship between the responsible government agencies and NGOs involved.

Internationally, the Campaign significantly raised awareness of Palau's efforts. The Palau Campaign efforts were featured on CNN International's Eco Solutions (August-Sep, 2011). Government highlights included the Second Signatory State Meeting in Manila on February 19-20, 2013, attended by Mandy Etpison. At that meeting Palau's campaign was showcased as an example of social marketing to other dugong range states. Through the Etpison Museum, dugong wood carvings in the style of Palau storyboards have been carved for display at the Palau National Capital and in Taiwan with smaller carvings being given as gifts to official missions. HSH Prince Albert of Monaco also participated in the program, attending and speaking at the donation of the activity booklet to school children in Melekeok.

Because of its high cultural significance to Palauans and status as one of the two most endangered dugong populations in the world, the dugongs of Palau need close and special attention to be maintained as a viable populations. There is an actual danger the species could disappear from Palau unless existing laws are enforced and other efforts made to stabilize and increase the local population.

1.0 Introduction

1.1 Dugongs in Palau

The Republic of Palau is a small island nation in the western Pacific located approximately 1,000 km east of the southern Philippines and 800 km north of the western half of New Guinea island (approximately 7°30'N; 134°24E). The main Palau island group has one large basaltic island (Babeldaob-400 km² in area) and hundreds of smaller limestone islands form a complicated archipelago with a surrounding barrier and fringing reef. The lagoon inside the reefs covers close to 1,000 km². The country has 16 political states of which 10 are on Babeldaob; an 11th, Koror, is the commercial and population center of the country and three others are island entities within or close to the main island/reef complex. The final two states are oceanic islands located up to 500 km southwest of the main group. The total human population is just over 20,000 people with 80% of those residing in Koror State.

Palau has highly diverse shallow water marine communities (Colin 2009). The main island group is surrounded by a barrier reef system on the north, west and south with a fringing reef system on the east. Inside the barrier reef is an extensive lagoon that covers twice the area of land and is no deeper than 50 m. The climate of Palau is tropical with high temperature and humidity throughout the year. The average annual rainfall is 375 cm, with the dry months being February through April.

The dugong, *Dugong dugon* (Muller 1776), or "Mesekiu" in Palauan, is a marine mammal belonging to the order Sirenia, family Dugongidae. They are herbivorous and strictly marine with their diet consisting almost exclusively of seagrass. Previous work on dugongs in Palau, largely on attempting to estimate population size, includes Brownell et al. 1981, Rathbun et al. 1988, Smith 1998 and 2003, and Kitalong 2008.

Dugongs are long lived, perhaps up to 73 years (Marsh 1995); adult females are believed to reach sexual maturity between 7-17 years of age (Marsh and Kwan 2008). The reproductive rate is low with a gestation time around 13 months; only a single calf is normally produced which is then suckled for up to 18 months. Time between calves is between 3-7 years (Marsh et al 2002). Population models indicate that even with the most optimistic combinations of life-history parameters (e.g. low natural mortality and no human-induced mortality) a dugong population is unlikely to increase more than about 5% per year. Thus even a slight reduction in adult survivorship can have dramatic effects on the population (Marsh et al. 2002). This effect is greatly exacerbated when the population is small in terms of number of viable breeding adults (Marsh 1995).

The dugongs of Palau are an important element of traditional Palauan culture. Aspects of this include legends about the origin of the dugong, use of the upper vertebrae of the dugong as a bracelet signifying high cultural rank and dugong as a special food item which could only be caught by certain villages (Etpison 2005). Due to its involvement and importance to Palauan culture, dugongs have been heralded as a "flagship" species for Palau. Palau is the only

country in Micronesia where there is a permanent population of dugongs, although there have been rare sightings in Yap and Guam (Nishiwaki et al. 1979). A stranded dead dugong was reported from Kosrae a few years ago. The closest known permanent populations to Palau are found in Indonesia (800 km to the south) and the Philippines (1000 km to the west) (Nishiwaki and Marsh 1985), with recruitment from these areas to Palau (or the reverse) being unlikely (Marsh 1995). Consequently dugong are virtually unknown in the southwest islands of Palau (between Palau and Indonesia) with only one recent record (2012) of a sick individual found at Pulo Ana that died a few days later.

The Palau population, both geographically and genetically, is perhaps the most isolated dugong population in the world (Marsh et al 2002). In addition to their isolation, at the First Signatory State Meeting on the UNEP/CMS Dugong MoU held October, 2010 in Abu Dhabi, Dr. Helene Marsh, the world's leading authority on dugongs, stressed that Palau's population was one of the two most threatened dugong populations in the world (the other is Okinawa, Japan). Dugongs are listed on Appendix I under both the Convention on the Conservation of Migratory Species of Wild Animals (CMS) and the Convention on International Trade in Endangered Species (CITES), with exception of the Australian population which is listed on CITES Appendix II.

1.2 Review of Activities of the "I ❤ Mesekiu" *Dugong dugon* Awareness Campaign 2010-2011

In line with the United Nations Environmental Program (UNEP) declaring 2010 the Year of the Dugong, the Palau Dugong Awareness Campaign was started in January 2010 with a grant from the Pacific Fund, Embassy of France, Manila, as well as local sponsors. The project engaged in a wide variety of education and outreach activities detailed below. In addition, 38 boat and snorkel surveys and 14 helicopter surveys conducted between October, 2009 and August, 2011 to identify important dugong areas near Koror.

The primary focus of the Campaign was on education and public awareness of all age groups in Palau, because few people were familiar with the rarely-seen dugong. For adults this was accomplished by regular press releases published in the local media and daily conservation messages played on the local TV station. For students, contests and distribution of educational and social media materials, such as baller bands, stickers, booklets, posters and T-shirts, were aimed at all age groups. During the annual Science Week of the Palau Community College (PCC) the Campaign worked through the PCC Marine Science class to showcase the dugong to the students visiting from all Palau's schools. This effort involved participation from the Palau Conservation Society, Koror State Government, Bureau of Marine Resources and Division of Fish and Wildlife officers.

As part of the awareness campaign, a life-sized dugong statue was carved from local hardwood and put on display at the National Capitol Building in the Minister of State's office and featured in the local newspapers. Over 30 smaller dugong statues were carved by the Etpison Museum to be used as official presents from the Palau government to other countries, thus creating more regional and public interest in the Palau's most endangered marine

mammal. One such carving was presented to the Republic of China, Taiwan for their Centennial celebration, and is currently on display at the Presidential Palace in Taipei.

Important governmental activities related to the 2010-2011 Campaign included: 1) the Government of Palau signed the 'Memorandum of Understanding on the Conservation and Management of Dugongs and Their Habitats Throughout their Range' with UNEP/CMS (Oct, 2010), 2) Palau declared its Exclusive Economic Zone a Marine Mammal Sanctuary (Oct, 2010), and 3) the regional launch in Palau of the Pacific Year of the Dugong (March, 2011). Overseas media also highlighted the Palau Campaign's activities, with a feature on CNN's International's Eco Solutions (August-Sep, 2011).

The boat, snorkel and helicopter surveys in 2010-2011 provided the opportunity to obtain semi-quantitative baseline data on dugong numbers and distribution, as well as to take a large number of photographs of individual dugongs, their groups and habitats. On three different helicopter flights, dugongs were photographed mating over deep water, the first time this has been documented with photographs. In October, 2010 the largest herd of dugongs (> 35 individuals) ever seen on any survey in Palauan waters was recorded off Ngederrak reef, Koror (surpassed since then), which provides a spectacular insight into the biology and behavior of the animal and a useful metric against which future observations can be compared.

Photographs from the Palau Campaign have been donated to and are being used by UNEP, Palau government agencies and NGOs around the world for dugong conservation efforts. The Campaign highlighted the ongoing poaching of dugongs locally with regular press releases, and held a workshop to promote and establish a stronger collaboration and involvement between National and State Government agencies with regard to dugong conservation.

1.3 Summary of Activities of the 2012-2013 Campaign

We continued our Campaign in 2012-2013 with funding provided by Monaco through the UNEP/CMS office in Abu Dhabi to "Support Dugong Conservation in Palau", building on previous efforts. The focus of the new campaign was to re-print the dugong information booklets and rubber baller bands, as well as print and distribute newly-designed posters, vinyl folders and stickers. A 45-page Children's Activity Booklet on Dugongs and Manta Rays was designed and published by the Etpison Museum in 2013 as part of the Campaign. We also continued to monitor the dugong population around Koror, adding one more survey area. Working with the National Government agencies, necropsies were performed, whenever possible, on dead dugongs recovered during the Campaign. This led to an improved working relationship between the responsible government agencies and NGOs involved.

From February, 2011 to April, 2013 there was no helicopter available for aerial surveys. Super Typhoon Bopha hit Palau on December 2, 2012, and boat and snorkel surveys for dugong were stopped for several months due to the bad visibility in Malakal harbor. In April, 2013 Rock Island Helicopters started operations and regular aerial surveys were resumed.

Elections in November, 2012 brought a new administration into office in Palau in January, 2013. Because cabinet members had not yet been confirmed, the Palau Government did not have a designated person to attend the Second Signatory State Meeting in Manila on February 19-20, 2013, organized by the Dugong MoU Secretariat. Ms. Mandy Etpison, with approval from Palau President Remengesau, represented Palau at the meeting and attended at her own cost. Palau's campaign was showcased as an example of social marketing at the meeting to other dugong range states. At the meeting Ms. Etpison was able to meet Dr. David Blair of James Cook University and make arrangements to send 6 dugong tissue samples for DNA analysis to Australia in July, 2013. Additional tissue samples will continue to be gathered for genetic analysis whenever possible. A total of approximately 30 tissue samples are needed to have a clear DNA profile of the Palau population. Interestingly, this number of samples could have been obtained already if tissue samples had been taken from every confiscated or recovered dugong in the last decade. However, not until this Campaign was a formalized effort outlined to collect these samples and send them to qualified scientists for study. It is anticipated that we will have occasional opportunities to collect more samples, and it is now clear to all parties the importance of continuing these tissue collecting efforts in the coming years.

Efforts are ongoing to increase knowledge of the life history and ecology of dugong in Palau. While knowledge of important factors, such as diving behavior (Chilvers et al. 2004), habitat use (de Longh et al. 1998) and movement relative to tides (Sheppard et al. 2009), is often better known in other areas, we continue to gathering information on these aspects of life history whenever possible, often by "piggybacking" with other projects, such as the manta ray work and reef fish spawning research in Palau.

March 2013 Visit of HSH Prince Albert of Monaco

In March 2013, HSH Prince Albert and HSH Princess Charlene of Monaco visited the Republic of Palau for a dive vacation. They set aside March 11th to visit the capitol and meet with Palau's government officials (see Figure 1). Upon our request, because our education materials were funded by a grant from Monaco this year, they also visited Palau's elementary school in Melekeok State to help us distribute the newly-published Palau dugong and manta ray Children's Activity Booklets and dugong posters to local elementary students. Prince Albert spoke briefly at the event and congratulated Palau on its dugong and general conservation efforts. The presence and participation of Prince Albert and Princess Charlene was greatly appreciated and created a lot of interest in the Dugong Awareness Campaign and the new educational booklets.

The Children's Activity Booklet was distributed to all elementary schools in Palau for all 7th and 8th grade students later in March. These included current data and information on the animals, quizzes, games, mazes and stickers on and about Palau dugongs and manta rays (see Appendix I).

Figure 1. Highlights of the visit of HSH Prince Albert of Monaco to the Melekeok Elementary School on March 11, 2013 to present the dugong-manta ray activity booklet to students.

2.0 Methods

2.1 Helicopter Surveys

Helicopter surveys for dugongs have proven far more effective than any previous boat, underwater or airplane surveys in Palau, and provide important information about dugong movements and insight into their behavior. The slower speed of a helicopter, relative to fixed-wing aircraft, allows more careful inspection of areas, and a helicopter's ability to stop, hover, and turn sharply are all positive factors in obtaining high quality data and photographs. Helicopter surveys were conducted only on a few occasions between February 2011 and April 2013, when no regular helicopter operation was available in Palau, relying on donated airtime from visiting yachts with helicopters. Once Rock Island Helicopters started operation again 16 aerial surveys were conducted between April and July 2013, with pilot Matt Harris, who has flown aerial surveys by plane and helicopter in Palau since 1999.

2.2 Boat and Underwater Surveys

Boat and snorkel surveys were conducted occasionally in 2012, whenever dugongs were sighted, but dugongs in Palau are very difficult to approach by boat, and even when snorkeling or kayaking, they do not stay around and a short glimpse is usually all we could manage.

In an effort to enhance the knowledge of dugong occurrence and behavior without the disturbing influence of a human observer being present, ten GoPro Hero 2 cameras and underwater housings were purchased and modified, powered by custom D-cell battery packs. These cameras take high resolution still photos (8-11 megapixels, depending on angle setting) and have a time lapse mode, making it easy to set up for doing sequential photos of many days. The large battery packs allow the cameras to be located at a given site underwater taking time-lapse photos every 30 seconds for up to 5 days at a time. These cameras were to be set out along the routes the dugongs normally follow, as well as at resting and feeding areas. Although this method proved highly successful in identifying individual Manta rays at reef cleaning stations in Palau (Manta ID Palau project), and for monitoring fish spawning aggregations (CRRF), it proved to be less successful for dugong surveys. Limitations included the fact that dugongs prefer murky waters and rest on sandy bottoms, so fouling of the camera port with silt and deterioration of photo quality occurred in less than a day, greatly reducing the information from the photographs. Also dugongs are difficult to tell apart under the best of circumstances, so it was impossible to tell if the same or different dugongs were passing by the camera more than once. Finally the cameras were usually located too far away from the dugongs, so even if they swam by the cameras they were only visible as a dark shape. The main result from the camera deployments was the confirmation that dugongs frequented certain routes and areas, information which compliments the results obtained from aerial surveys. The two approaches together provided a broader perspective than could be achieved with either one along.

The boat and snorkel surveys stopped for several months after Super Typhoon Bopha hit Palau on December 2, 2012, due to the poor underwater visibility around Malakal and the

Figure 2. GoPro cameras in underwater housings equipped with external battery packs to provide power to run the system for up to five days taking time lapse photos every 30 seconds. These were deployed at a variety of dugong sites. The underwater photos of the dugong show the resolution produced by the camera system as long as the water is clear and the animals close to the camera.

eastern reefs. The sediments mobilized into shallow water were kept in suspension by wave action and were also shed into the open ocean. This was visible for weeks in satellite images, reaching over 100 km offshore from Palau's reefs. We attempted to resume the boat and snorkel surveys when the helicopter started operating again in April 2013, but the visibility around the Malakal dugong areas was still limited. As of July 2013 it has not yet improved much since the December typhoon to make boat and snorkel surveys effective, but we continue to monitor the situation and will resume doing these when conditions allow.

2.3 Stranding Protocol and Necropsies

One of the challenges at the start of the Palau Dugong Awareness Campaign in 2010 was that the various Government agencies appointed under the existing law (2002) to deal with anything related to dugongs were not communicating or sharing data with each other. They were also not sure about their roles and responsibilities under the existing law, which had not had any regulations in place since it was passed in 2002. Things improved after we co-hosted a workshop in 2011 with the various agencies, which included staff from the Bureau of Marine Resources, Marine Law, Division of Fish and Wildlife, and the Koror State Rangers.

Because dugongs are protected under a national law, the Division of Fish and Wildlife (DFW), under the Ministry of Justice, is the agency responsible for enforcing illegal hunting of them. We stressed the need to DFW 1) for a necropsy to be performed on all dead dugongs found to determine the cause of death, 2) the importance to share information between the agencies, and 3) the need to collect tissue and stomach content samples and preserve them for future research. A basic stranding protocol was agreed upon between the agencies, but is not yet published for distribution. It has been agreed and accepted that any samples taken in necropsies would be held by the Coral Reef Research Foundation (CRRF). CRRF agreed to do this because none of the government agencies involved have the proper equipment and means to store samples. Necropsies would be performed whenever possible by a local veterinarian, typically by the vet that would be based at the Koror State Animal Shelter on Malakal Island.

3.0 Results

3.1 Aerial Surveys

Palau Helicopters was the only helicopter operator in Palau during 2010-2011, but stopped flying in Palau in February 2011. After that time no regular aerial surveys could be done again until April 2013. However, when possible, we intermittently used helicopters carried aboard private "superyachts" visiting Palau or military vessels on "Goodwill visits" to monitor the dugongs around Koror, done by Ms. Etpison. These vessels and their helicopters include R/V Alucia (Jan, 2013), M/Y Octopus (Mar,2012), R/V Plan B (Jan, 2011), and the Veldemiare French military vessel Alouette helicopter (Feb, 2012). The yacht owners or others provided the flight time free of charge (Fig. 3).

Figure 3. Helicopters used for aerial dugong surveys in Palau. Upper left - Typical high quality aerial photograph obtained from a helicopter. Upper right - The Bell Jet Ranger helicopter of Palau Helicopters, now Rock Island Helicopters. Middle left - Eurocopter from the R/V Alucia. Middle right - Eurocopter on board the M/Y Octopus. Lower left - Eurocopter on board the R/V Plan B. Lower right - Alouette Helicopter on board the French Naval Vessel Veldemiare.

In April 2013 the helicopter and pilot previously based in Palau started operations in Palau again under a new company, Rock Island Helicopters. The pilot, Matt Harris, had flown dugong surveys for many years, including the previous surveys in Palau, and once ready the aerial surveys were resumed. From April-July, 2013, sixteen dugong survey flights were done, and incidental dugong sightings were recorded from tourist flights, especially from new locations outside the Malakal survey area. With our limited budget, and helicopter flights being very expensive, we were still able to monitor the dugongs on these flights by combining the flight time with surveys for our other project, the Palau Manta ID project. Since the manta rays were often located in areas where we had never previously surveyed for dugong, we were also able to document dugongs from other areas where they had not been previously recorded in Palau.

3.2 Size of Dugong Aggregations Seen in Palau

Generally dugong sightings range from a single individual to groups of about 4-6 animals. These are usually encountered when the animals are moving between areas or on feeding grounds and the social components determining the make-up of groups are not well known. At times though, dugongs in Palau appear to gather into much larger groups, up to 30-40 animals, again for unknown reasons. Such larger aggregations provide one way of assessing population structure since the highest number of individuals that might be found together is possibly reflective of the actual size of the population.

On May 24, 2013 at mid-afternoon on the day before the full moon, a large aggregation of more than 20 dugongs was observed on the outer edge of Ngederrak conservation reef within an area only a few hundred feet across by Matt Harris while on a tourist flight. The group was encountered around 3 PM (Low tide - 12:57 PM, high tide - 7:13 PM) and Matt immediately reported this to us. We arranged to go back up in the helicopter at 4 PM to make further observations and found there were now over 40 animals in the same area. Because it was a spring tide near the full moon the tidal range was relatively high (-0.1 feet low tide to 5.6 feet high tide) and the observations were made at mid tide, as the tide was rising.

Upon our arrival above the area, twenty-one animals were found on the top of the shallow reef (Figs. 4 and 5), with several of these seen actively feeding and leaving trails of stirred-up sediment behind (the only feasible way to confirm feeding activity from the air). The other half of the group was present in deeper water on the reef edge, perhaps waiting for the incoming tide to rise further (as it would for another 3 hours).

The following morning (May 25) we went up by helicopter again at 7.30 AM, but found the aggregation had dispersed with the outgoing tide. Only a few scattered small family groups were seen moving east, away from the reef into deep water (Fig. 6). That same afternoon at 4 PM, with permission from Koror State, we did a snorkel survey in the conservation area where the dugong aggregation was seen the day before. Heavy surf had us rolling around on the reef edge, and we were repeatedly pulled into the lagoon by the strong incoming currents. We did manage to see 8 different dugongs swimming along the outer edge of the reef, but the visibility

Figure 4. Dugong aggregation seen moving into shallow water on top of the Ngederrak conservation area.

Figure 5. A Dugong feeding on sea-grass in 6 ft of water, leaving a sand and sea-grass trail in the current.

Figure 6. Dugongs traveling in family groups in deep water east of Malakal, Koror.

and conditions were terrible. The helicopter passed by the reef (while on their way to the airport to refuel) and did a quick survey of dugongs. They reported seeing only a dozen dugongs from the air in the area while we were snorkeling. By the end of July no similar large aggregations have been seen since May, despite regular survey flights over the area and other sporadic tourist flights near this location. The only comparable observation of numbers of animals was during October 2010 when a group of >35 animals was seen and photographed in that same location by helicopter, again in the afternoon and also on the day before the full moon during a strong incoming tide.

3.3 Distribution and Occurrence of Dugongs in the Survey Areas, 2012-2013.

During the 2010-2011 surveys we regularly checked four areas which seemed to be the principal locations where dugongs were seen (Fig. 7). We tried to examine all of these areas on each dedicated survey flight during this period. During 2012-2013 we added a fifth area, Mekeald Bay, to be regularly surveyed on helicopter flights as we had seen dugongs there in the past. It seemed likely that we were missing part of the Malakal Harbor population by not examining this area during each flight (Fig. 8). Detailed aerial photos of each of the five areas are included as Figures 9-13. Each of the five areas has somewhat different characteristics, described below, which underlie the rationale for considering these separate locations for logging dugong occurrence.

The East Malakal Harbor is a busy area with abundant boat traffic, ranging from container ships to small fast outboard boats (Figs. 9 and 10). One of the interesting aspects of Palau's dugongs is that there seem to be very few boat strikes on dugongs given the amount of boat traffic. Only one female dugong has been photographed from the air with obvious propeller cuts in her tail during three years of aerial surveys. The East Malakal area also seems to hold important 'resting and sleeping' sites, although at times no dugongs can be found there. The reasons for their coming and goings are not known.

West Malakal Harbor (Fig. 11) is sheltered with dugongs seen most often near small patch reefs in the central lagoon area. There is some boat traffic through this area, but generally boats do not run through the area where dugongs are most often seen. The occurrence of sea grass beds in the area is known, but their distributions are not well quantified.

Mekeald Bay (Fig. 12) is a circumscribed area delineated by islands and shallow reefs. Dugongs are often seen within its confines (Fig. 8) and may either reside in the area for a period of time (days?) or move through the area to other feeding and/or resting sleeping areas further inside Malakal Harbor, such as East Malakal Harbor. Dugongs transiting into Mekeald Bay area could potentially cross the shallow Lighthouse Reef at high tide, or enter/exit the bay through deeper water openings from Lighthouse Channel. Otherwise the shallow channel side is not particularly amenable to the large animals moving across it except at high tide. Within the bay itself there are sinuous coral ridges snaking across much of it, and no known large seagrass beds within its confines. Most observations of dugongs there have been in the open central

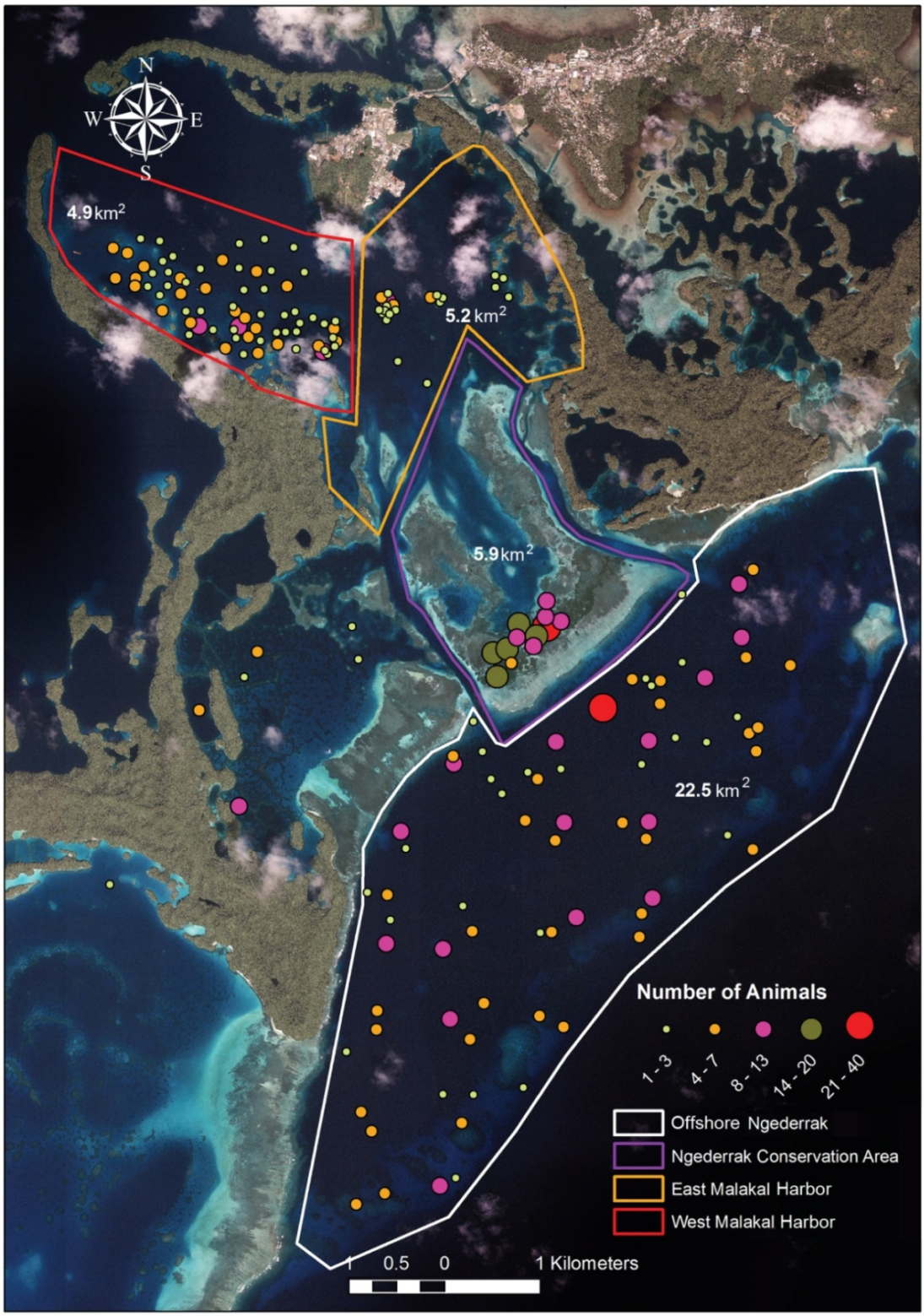

Figure 7. The four areas, indicated in the legend, near Malakal Harbor where about 95% of all dugong sightings were made during the 2010-2011 surveys (previous report data).

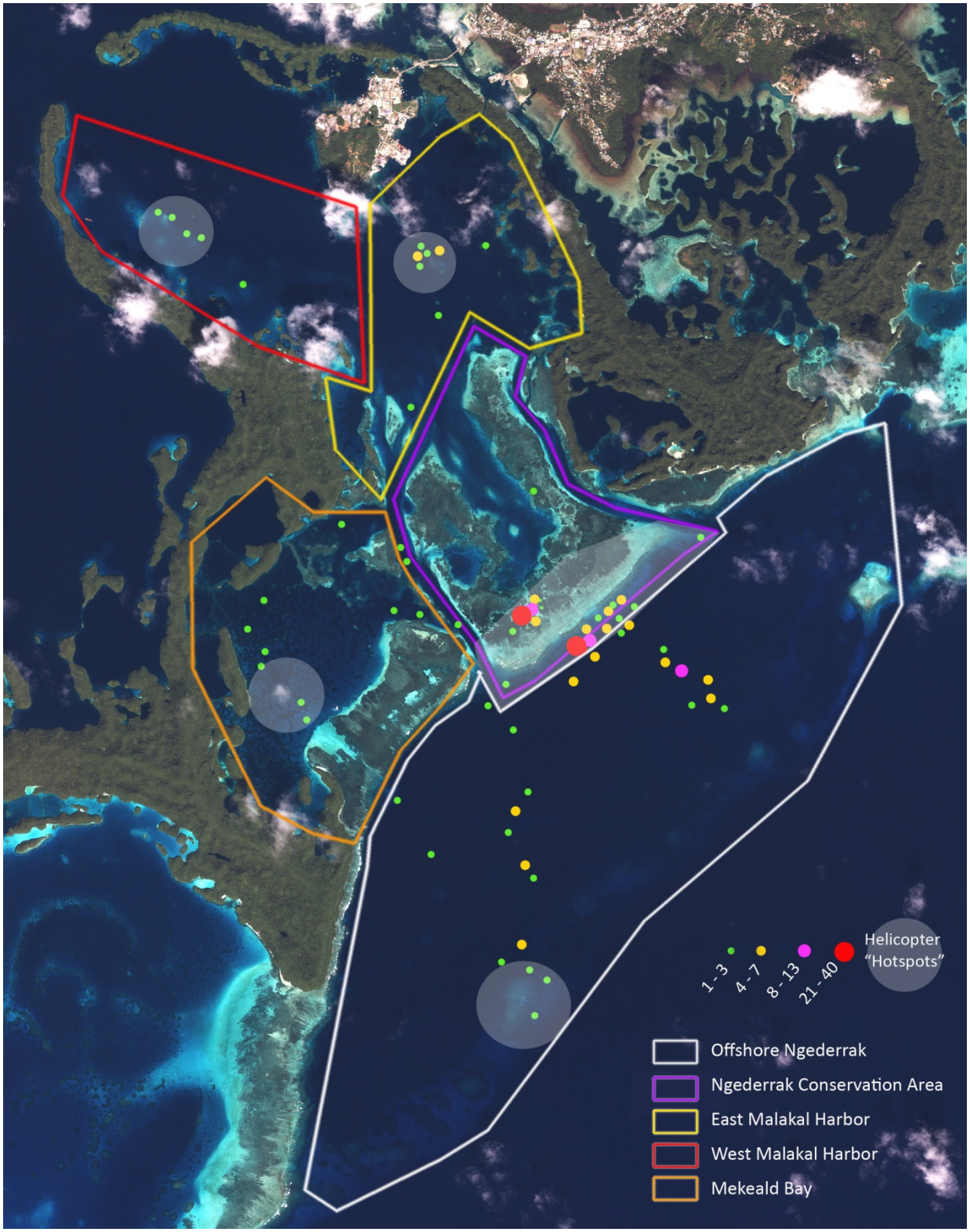

Figure 8. This map shows dugong sighting locations from April- July, 2013, during 16 helicopter surveys. The four areas, indicated in the legend, that were surveyed by helicopter during 2010-2011 are shown as well as a fifth area, Mekeald Bay, added during the 2012-2013 surveys.

Figure 9. The East Malakal Harbor area is one of the dugong survey areas with documented 'resting and sleeping' sites. The Palau commercial port is seen in the background on Malakal Island, while most of the town of Koror is to the right outside the area of the image. The dugongs in the main survey areas are actually quite close to the major human habitation in Palau.

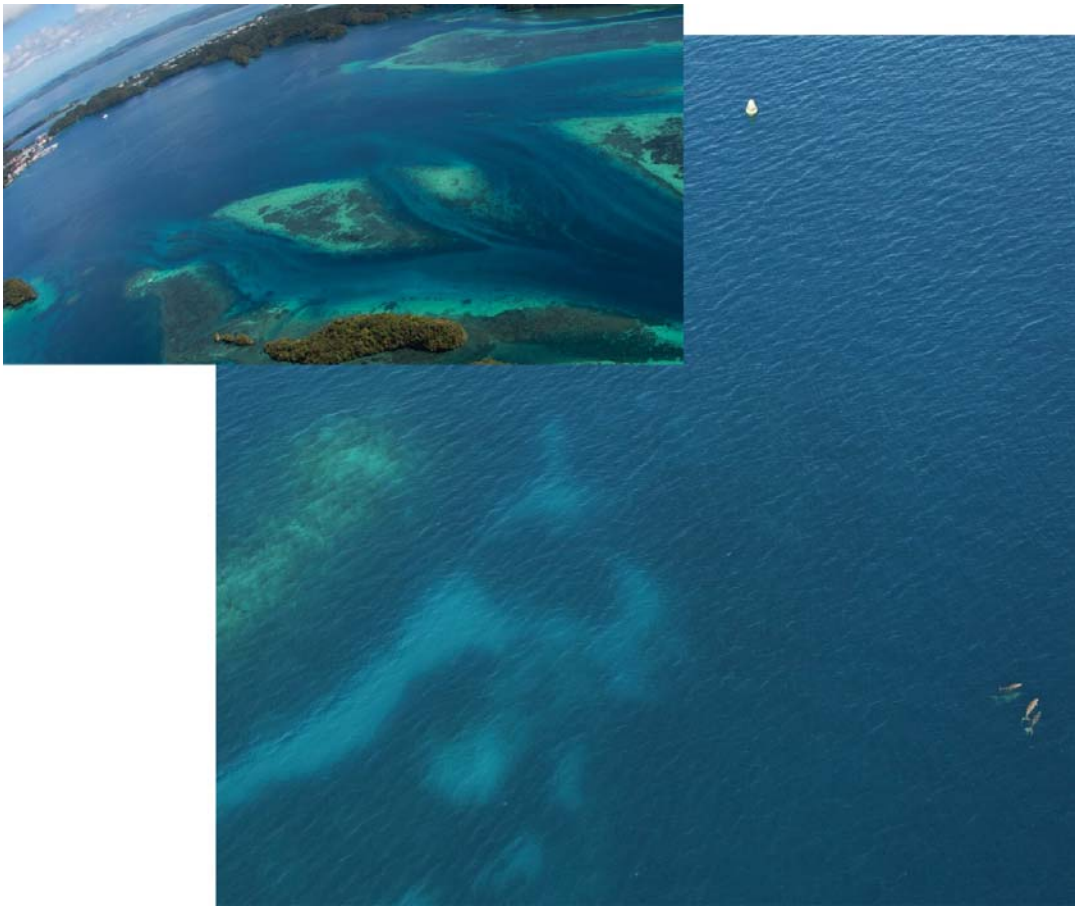

Figure 10. These detailed views show some areas inside the East Malakal harbor survey area where dugongs often occur. This area has the highest boat traffic in all of Palau, ranging from large container ships to smaller outboard tour and fishing boats. Boats roar through this area at full speed many times a day, yet there are very few reports of dugong boat strikes.

portion (Fig. 8), again where sea grass beds are unlikely, so it would seem this area is not a major feeding area for dugong.

The area called "Offshore Ngederrak" is somewhat enigmatic in that it is largely deepwater, ranging from about 30 to 70 m depth, with the outer limit of the area delineated by the sunken barrier reef, with a minimum depth of 5 to 12 m (Fig 13). Dugongs have never been seen very far beyond this line of the sunken barrier reef. The shallowest points on the sunken barrier reef, particularly the southern side of the largest patch (Fig 13, lower photo), do have regular groups of dugongs seen on their seaward side. To the southeast the water becomes quite deep, sloping steeply to 300-400 m within one kilometer of the reef. Exactly why dugongs would be found commonly in this area is not known. It seems unlikely there are any feeding areas nearby, due to the depth, and the area is a few kilometers from the nearest known shallow water feeding area.

Figure 11. The dugong survey areas of West Malakal Harbor.

The Ngederrak Reef Conservation Area (NCA) is the dugong area which has been most thoroughly examined, although there are still many questions regarding their relationship with

the habitats found there. The entire conservation area was mapped using satellite imagery and GIS techniques (Collins 2010), so the distribution and quantity of various habitats within NCA is well quantified. Supposed feeding trails of dugongs have been photographed repeatedly from the air, in an attempt to quantify changes in the sea grass beds where they occur, but a rigorous examination of such changes has not yet been attempted. We do, however, have the photographs needed to do this analysis in the future. The Ngederrak site is also the place where the largest groups of dugongs have been observed in Palau. Over 40 individuals have now been seen in a limited area both on top and in the front area of the reef. Such observations have typically been made on mid- rising tide periods in the afternoon just before the full moon. We will be attempting to make observations for dugongs at such times in the future. As detailed subsequently, the seaward front of this reef was highly affected by the passage of typhoon Bopha in December 2012.

Figure 12. Mekeald Bay is a location where dugongs are often seen, and is relatively sheltered. This view is to the north, with Lighthouse Reef on the right.

Additional observations of dugongs outside the five primary observation areas are shown in Figure 14. These records are important in that they expand the general area where dugongs still occur in Palau, and cover the areas away from Koror where poaching is liable to go undetected. Hence, if we can still find dugong in such areas, it provides minimal reassurances that there are at least some remaining individuals outside of our more familiar and nearby Koror survey areas. The data corroborate the accepted belief that dugongs can occur virtually anywhere within the inshore lagoon areas of Palau, and are on occasion found in the waters on the seaward sides of barrier and fringing reef. These observations also help us to decide what areas outside of Koror to target for future surveys for dugong population estimates.

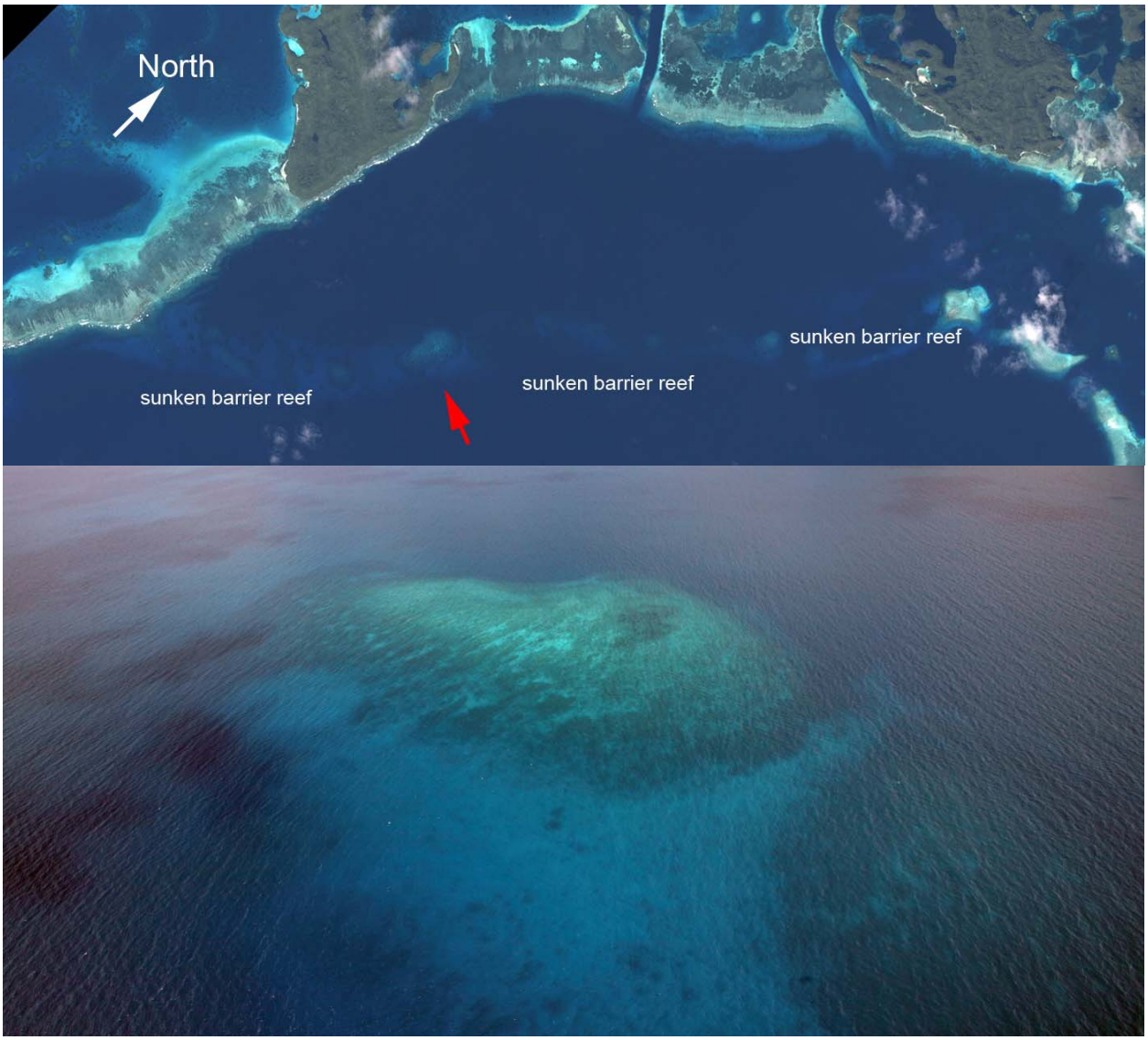

Figure 13. Upper - Satellite view showing the "Offshore Ngederrak" dugong survey area relative to the inshore, shallower reefs. Dugongs are commonly seen both in open water and around the shallow patches of the sunken barrier reef. White arrow indicates north. Lower - Shallow reef patch on the sunken barrier which has numerous dugongs around it; its location is indicated by red arrow in the upper photo.

3.4 Typhoon Bopha: Effects on Dugongs and Dugong Habitat

On December 2-3, 2012, Super Typhoon Bopha hit Palau. The area of the eye, with winds estimated at 232 KPH (145 MPH) went about 56 kilometers south of Angaur. This was the first time in 45 years that the main islands of Palau were hit directly by a typhoon. While the dugong survey areas were affected by winds only slightly over the minimum for typhoon strength, the northeast quadrant of the storm produced massive waves which hit the entire eastern side of Palau, causing massive destruction of outer slope reefs and a large tidal surge on

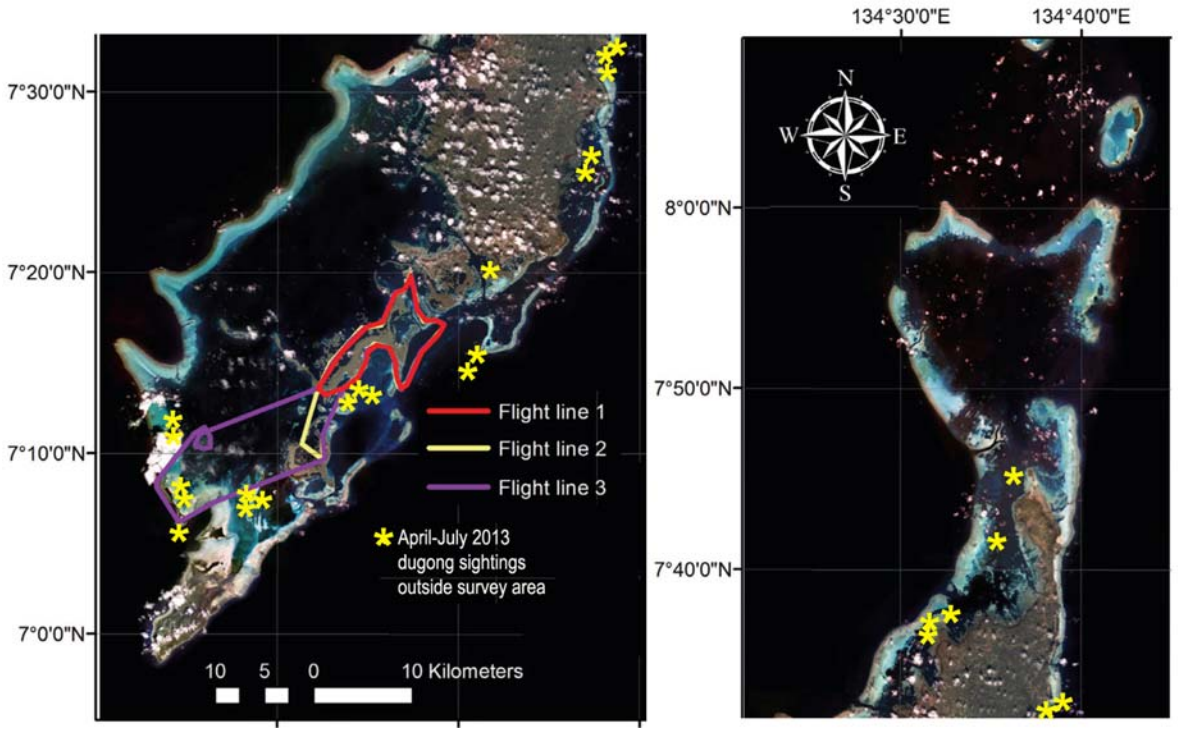

Figure 14. Incidental dugong sightings located outside the Malakal survey areas during helicopter flights in Palau from April- July, 2013 (right and left photos). These areas are seldom visited and are mostly outside of the usual tourist flight lines shown on the left.

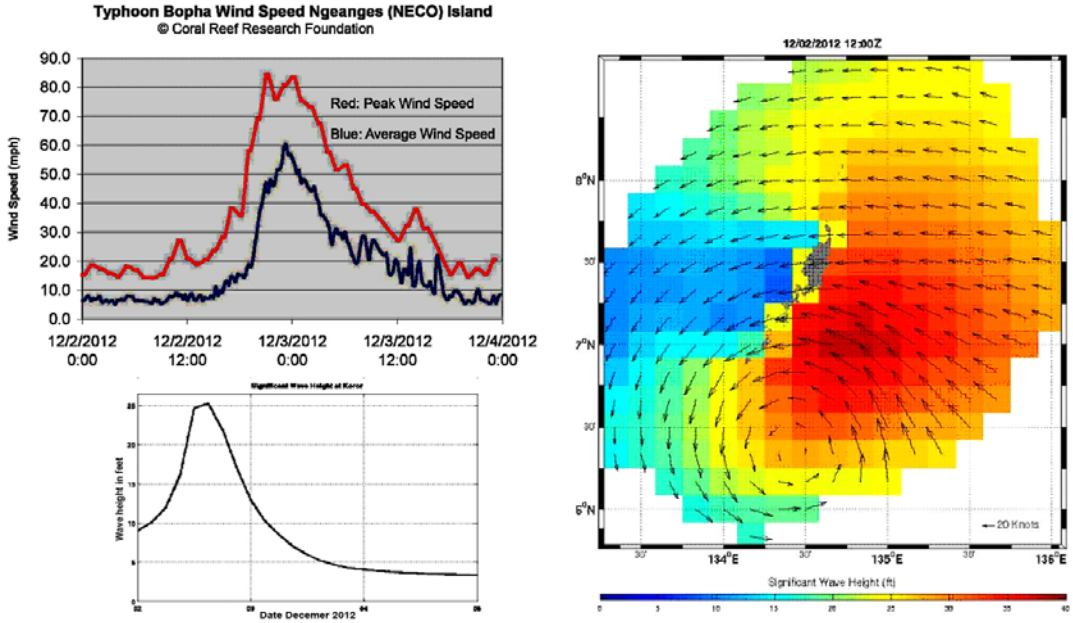

Figure 15. Upper left - Wind speeds at Ngeanges Island, Koror State during typhoon Bopha. Right - Model of significant wave height during the peak of typhoon Bopha. Lower left - Graph of modeled significant wave height for Koror, the area of Ngederrak-Lighthouse Reef where dugongs are regularly sighted. Wave model courtesy Dr. Eric Terrill, Scripps Institution of Oceanography.

central Babeldaob, which inundated coastal villages. We have a number of autonomous weather stations in Palau and were able to obtain accurate data on wind strength from the typhoon and to also estimate the wave height produced by the storm(Fig. 15).

The typhoon posed a particular threat to the Malakal Harbor/Koror population of dugongs, since they generally occur in the areas to the east of the Lighthouse Reef-Ngederrak Reef complex, on the front of the reef or within Malakal Harbor behind the protection of the reef. The reefs on the eastern side of this area were largely reduced to rubble by the storm waves, and if any dugong were present on the eastern side of the reefs prior to the storm and not able to take shelter, they would have been in grave danger of death or injury. The storm began to hit Koror shortly after dark on 2 December, and the worst waves would have been present on the eastern reefs over the next several hours, so potentially the dugongs were faced with being caught in a very dangerous location at night.

The next day (December 3), one dugong near death was found floating near Malakal Island in the morning, a few hours after the typhoon had largely moved past Palau, and later died while being recovered by the crew of a live-aboard vessel. The dugong was externally bruised with a laceration on its underside. A necropsy found that it most likely died from an internal hemorrhage due to injuries sustained (possibly from being thrown onto the reef) during the typhoon. Unfortunately, due to lack of a helicopter in Palau, we were unable to search for other floating dead dugongs from the air immediately after the storm. The occurrence of one mortality as a result of the storm implies that there may well have been others that were not documented. The location of the dugong before and during the storm is, of course, unknown, but it seems likely that this one mortality was the result of the dugong being thrown against the Eastern reef. This likely would not have occurred had the animal been on the inside the reef within Malakal Harbor during the storm, as the waves were not particularly high inside the reef.

One month (January 3, 2013) after the typhoon, we were able to use a helicopter from the visiting yacht "R/V Alucia", and survey some of the typhoon damage to the reefs and check the Malakal area for dugongs. During two flights, six and nine dugongs were sighted respectively inside Mekeald Bay and east of Ngederrak reef, locations where they were regularly seen prior to the storm. The Ngederrak sea grass beds, an important dugong feeding area, were only damaged on the outer edges (Fig. 16), and dugongs have been observed feeding there regularly in the months since the typhoon. The typhoon did not seem to have negatively affected the Malakal dugong survey areas, or the dugong's movements around that area.

Similar to Ngederrak Reef, the Lighthouse Reef, to the southwest, was also affected by the storm with another large rubble berm built on its forward top and the front slope largely scrapped clean by the waves and rubble set in motion by the storm (Fig. 17). Again, the habitats behind the reef front were protected and largely unaffected. The storm rubble berm thrown up on Lighthouse Reef could potentially make passage for dugongs across the reef more difficult, as the berm reduced the depth across the reef flat at any tide by 0.5 m or more.

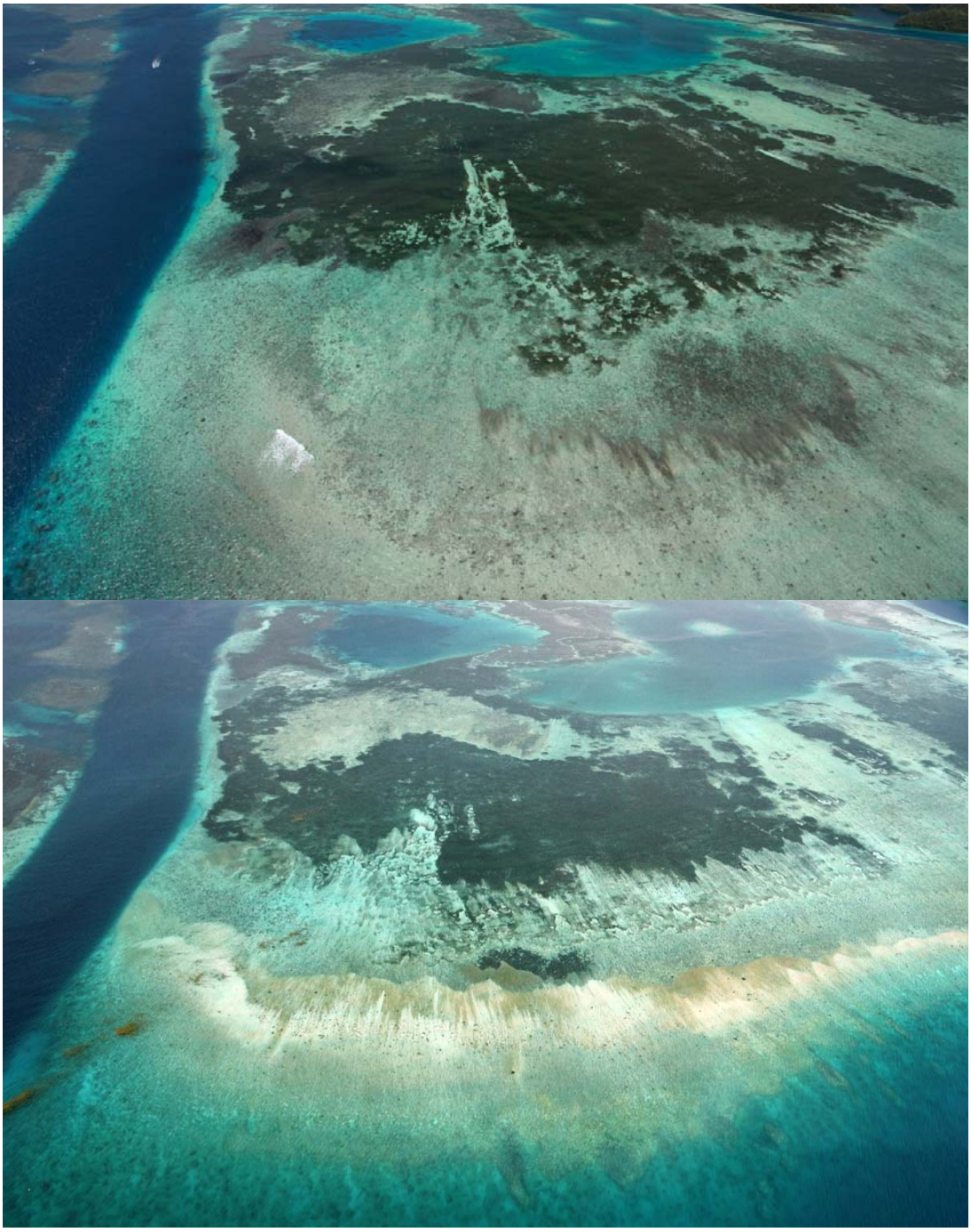

Figure 16. Ngderrak Reef conservation reef was affected by Typhoon Bopha. In 2010 (upper photo) the reef front was largely sand and coral, which provided some protectin against wave action to the sea grass beds on the reef top. After the passage of Bopha, (lower photo) in January 2013, a substantial berm of reef rubble had been deposited in the shallow water of the reef front and most of the coral on the outer slope and reef top front had been destroyed. However, the sea grass beds were protected form the worst of the wave action and survived essentially unaffected by the storm.

Figure 17. The Lighthouse Reef is found just to the south of Ngederrak Reef, and again had its outer (eastern) slope devastated by Typhoon Bopha. A lengthy rubble berm was thrown up into shallow water, while the reef just behind that area was largely untouched by the storm waves and winds. Dugongs are occasionally seen on the front of this reef and are commonly found on the lagoon side in the area called Mekeald Bay.

3.5 Stranding Protocol, Necropsies and Tissue samples

Since 2011, every dead dugong found and brought into Koror was reported to all agencies involved, and whenever possible, a necropsy was performed and tissue samples taken before the carcass was destroyed. During the Campaign, necropsies were performed by Bureau of Marine Resources JICA volunteer Dr. Koji Hina (DVM) and Dr. Eileen Wronski (DVM). Dr. Wronski, the veterinarian at the Koror State Animal Shelter (who has since left Palau), was the more experienced of the pair, but neither vet had ever worked on dugongs before; it was therefore a learning process for everyone involved. From these experiences it became clear that a simple stranding protocol in writing still needed to be developed to make it clear to state rangers how to recover and preserve a dead dugong for a successful necropsy. In addition, a standard necropsy report form needed to be created, and would be modeled after Eros et al., 2007 - "Procedures for the Salvage and Necropsy of the Dugong *(Dugong dugon*)." This is an excellent reference for Palau use to draft their own, simpler necropsy report, and the Campaign has contacted the Great Barrier Reef Marine Park Authority to get permission to use some of the published forms. Dugong tissue samples from necropsies were collected by CRRF personnel and stored for future shipment to Australia.

Dr. David Blair, Associate Professor at James cook University in Australia and a specialist on dugong population genetics, was approached by Palau Campaign coordinator Mandy Etpison at the Second Signatory State Meeting of the MoU on "the Conservation and Management of Dugongs and their Habitats throughout their Range" in Manila (February, 2013) about the possibility of doing DNA analyses on the six Palau dugong tissue samples collected during the Campaign. Dr. Blair enthusiastically agreed to work on any Palau samples we could provide. We then started the long process of obtaining the CITES permits from both Australia and Palau, allowing legal shipment of the samples to Australia. These were finally sent off and received in Australia the first week of July, 2013. The samples are presently undergoing analysis and we are expecting results later this year (2013). One of the goals would be to compare the results with those obtained from nearby dugong range states, such as the Philippines, Indonesia and New Guinea, to see their relationships to Palau dugongs. However, we were surprised to learn that few or no samples have been analyzed from these other dugong range states to date. We are also now well prepared to preserved samples from any future dugong deaths, with the goal to gather the needed 30 or so samples to characterize the Palau population when opportunities arise.

One of the problems the Campaign faces is that input from all Palau government agencies involved is needed to complete this Stranding and Necropsy Protocol form, and currently, some of the key positions in these government agencies have been vacant since the new administration took office in January, 2013. As soon these positions are filled, the Campaign plans to host another workshop for this purpose, and also to bring the new people up to date on our experience with poaching and the recovery of dead dugongs in Palau. Dr. Koji Hina finished his contract and left Palau in January, 2013, and Dr. Eileen Wronski also left Palau in June, 2013. Koror State's new veterinarian arrives from Japan in Sept. 2013. Clear rules and regulations are also needed under the existing dugong law to clarify the various agencies' responsibilities, authority and actions with regards to the storage and destruction of recovered or confiscated dugong meat and/or bones, dugong research permits, tissue sampling, etc.

Summary Comments for Necropsies (6 total) Performed during the 2012-2013 Campaign:

1) **Case No. 13-0103-1420-01FW January 4, 2013 (Thursday) 14:20 hours**

A 120 inch (300 cm) female dugong was reported by Koror State Rangers floating near the Ngemelis Rock islands. DFW officers and Dr. Koji Hina responded to the scene where a necropsy was performed. Dr. Hina found a large stingray barb had pierced the skin/body wall, left side slightly ventral, and almost parallel with genital opening and lodged in the intestine. The stingray barb was recovered. This was the obvious cause of death. Ms. Gerda Ucharm (CRRF) obtained tissue and stomach content samples, and took photographs. Report from BMR pending.

2) **Case No. 12-1203-1330-17FW December 03, 2012 (Monday) 13:30 hours**

Dugong approximately 86 inches (220 cm) length was found by the crew of the Palau Sports live-aboard vessel, only hours after Super Typhoon Bopha passed Palau, near the Pinchers, Koror. The dugong died during transport to Koror where DFW officers and Koror State Rangers took possession of it. Due to the power and water outage after the typhoon, Ms. Mandy Etpison offered the NECO Yamaha facilities, where the necropsy was performed by Dr. Hina and Dr. Wronski. A small hole in the abdominal wall, a large rupture in the internal abdominal section and internal bruising were revealed during the necropsy. Although no report was been received from BMR, the cause of death was believed to have been from injuries sustained during the typhoon. Tissue samples were collected by Ms. Lori Colin (CRRF) and photos taken by Ms. Mandy Etpison.

Stomach contents were preserved and sea grass identifications done by Gerda Ucharm of CRRF. Gut was full and most of the sea grass in the gut was macerated *Cymodocea rotunda* and/or *C. serrulata*, *Syringodium isoetifoliu* was also identified; no *Halophola ovalis/minor* was seen. No miscellaneous matter (sponges etc.) was found in the stomach contents.

3**) Case No. 12-0520-1545-08FW May 20, 2012 (Sunday) 15:45 hours**

Juvenile female dugong approximately 57 inches (145 cm) length was found near Ngeremdiu Reef in the morning, and later that day transported to DFW by Koror State Rangers and kept on ice. Necropsy was performed the next day by Dr. Koji Hina (BMR) with assistance from Dr. Wronski, and tissue collected by Ms. Lori Colin (CRRF). Report received from BMR, cause of death unknown.

Stomach contents and sea grass identifications done by Gerda Ucharm of CRRF revealed coarsely-macerated sea grass and little to no sand. Sea grass was not as finely macerated compared to the sample from the February case animal. The majority was identified as *Cymodocea rotunda* and/or *C. serrulata*, and/or *Thalassia hemprichii*. The macerated blades of sea grasses from the two genera are difficult to distinguish. One intact blade of *T. hemprichii* was seen. Smaller amounts of *Halophila ovalis/ H. minor*, and *Syringodium isoetifolium* were also seen. Various bits of presumed by-catch was also found amongst the sea grass: sponges, algae, and gastropod egg cases. No quantitative analysis was done.

4) **Case No.12-0219-1503-04FW February 19, 2012 (Sunday) 1505 hours**

Juvenile male dugong approximately 63 inches (160 cm) length was transported to DFW by Koror State Rangers and DFW officers and frozen. The dugong was found by a tour boat floating near Ngeremdiu reef. Dr. Koji Hina from the Bureau of Marine Resources (BMR) did not perform the necropsy until Feb 24, when tissue samples were collected by Dr. Wronski (Koror Animal Shelter) and Ms. Lori Colin (CRRF). Cause of death unknown but there was no evidence of malicious action.

Stomach contents were preserved and sea grass identifications done by Gerda Ucharm of CRRF. The vast majority of the gut contents were *Cymodocea rotundata* & *C. serrulata*; small amounts of *Halophola ovalis* & *Syringodium isoetifolium* were found and 1 rhizome piece of possible *Thalassia hemprichii*.

The other two samples included for genetic sampling were collected by CRRF from stranded dugongs before the 2012-2013 Dugong Awareness Campaign:

5) **April 1, 2010 9:00 hours**

A 76 inch (190 cm) length female dugong was reported floating in Mekeald Bay, Malakal by helicopter pilot Matt Harris in the morning. The dugong was recovered and brought to Koror by Ms. Mandy Etpison, and reported to DFW, BMR, and Koror State. A necropsy was performed at the Koror State Rangers office the same afternoon by Koror State Animal shelter veterinarian Dr. Mihnea Muresanu and his assistant Sherman Sato. Stomach contents were examined but not sampled. Tissue samples were collected by Sherman Sato. Photos taken by Ms. Mandy Etpison. Cause of death believed to be heart failure, probably due to explosives thrown nearby.

Formalin-fixed tissue samples were sent to the USGS National Wildlife Health Center in Hawaii for pathology with the following report:

> Findings: Dugong immature female in good body condition. Significant gross findings included lacerations on the skin, generalized subcutaneous bleeding, bleeding from the ears, nostrils and eyes, and bleeding around the heart. Microscopy of tissues revealed severe bleeding of skeletal muscle and no other significant lesions.
>
> Final Diagnosis: Trauma suspect. Gross and microscopic lesions (bleeding skeletal muscle) pointed to trauma as probable cause of death. The nature of the trauma was not natural (e.g. predation by shark) but rather more compatible with man-induced factors (e.g. boat strike or other manmade cause).

6**) February 11, 2006**

A dead floating dugong (<1.5m length) was found by tour boat and brought to the RITC dock in Koror, and confiscated by DFW officers. No necropsy was performed. Tissue samples (muscle) were taken by Ms. Lori Colin (CRRF). Cause of death was unknown, possibly from explosives, since the animal was bleeding from the ears but had no other visible external wounds or injuries.

Figure 18. Photo montage of dugong mortalities and activities during the necropsies of 2012-2013.

3.6 Legislation

Dugongs in Palau are protected under an existing 2002 law, but during our 2010-2011 Dugong Awareness Campaign we found out that poaching still remains a problem today, with an estimated 5-15 animals being killed deliberately for food every year according to local fishermen/poachers. On January, 2013, President Johnson Toribiong signed into law (a week before leaving office) House Bill No.8-85-6, PD1, entitled "An Act to increase the penalties for killing or causing injury to a dugong or possessing or selling any dugong parts or products, and for other related purposes". This Bill was first introduced in May, 2010, during our first 2010-2011 Dugong Awareness Campaign. It was approved by the congress in May, 2011, but referred back twice to the congress by the president, who wanted to have the mandatory minimum sentence taken out.

The most recent court case involving dugong poaching had an ambivalent outcome that indicate some of the problems associated with enforcing regulations for dugong and other marine resources. On October 2, 2011, two men were observed offloading what turned out to be dugong meat at the Ngatpang State dock, which was later distributed to several of their relatives. A witness reported this to DFW, who confiscated portions of a dead dugong. In Criminal Case No.12-055, filed on May 24, 2012, four defendants were charged with thirteen counts including the "taking, possessing, or export of dugong or any part or product thereof", a misdemeanor in violation of 24PNC 1231(a), and 24PNC 1007. On August 29, 2012, one of the defendants pleaded guilty under a plea agreement to "knowingly and illegally participate in the killing and taking of a dugong" while a second one only admitted to the lesser charge of possessing a dugong. Under the plea agreement, their entire one year jail sentence was suspended, their confiscated boat and fishing gear returned to them and they were only put on probation. A $5,000 fine was imposed, to be paid in installments. The sad reality is that the government's witness who testified against these defendants was harassed to the extent that he had to move off island, which will deter any other people from reporting such a crime to the authorities. The witness, who could be rewarded the $5,000.00 fine money as allowed under the law, will probably never receive this money since it is to be paid in installments under the plea agreement, with no set dates or schedule for payment.

Aside from the increase in penalties, clear rules and regulations are desperately needed to be written for the existing law which has been in place since 2002, to clarify many issues related to poaching, enforcement and permitting under the 2002 dugong law, and to improve enforcement mechanisms. After discussing this with the current Attorney General, whose office would be tasked with writing the rules and regulations for the Minister of Natural Resources, Environment and Tourism, she informed us that there are probably over a hundred laws in existence in Palau without rules and regulations written, so this will be an enormous task for which they do not have the resources, budget and time at the moment. Therefore, although this is not really part of the 2013 Dugong Awareness Campaign, we will make an offer to the Minister for us to fund the drafting of these rules and regulations by a lawyer, for review by the Attorney General, the Minister, and the government agencies involved, since we believe this is the best immediate solution to improve the permitting process and enforcement mechanisms.

Some provisions to be put in the rules and regulations to be drafted will include:

1) Permitting provisions for tissue sample collection and storage from confiscated or recovered dugongs for research, which technically is illegal now under the current law.

2) Permit provision for educational display and/or DNA sampling of dugong bones that were legitimately recovered or confiscated by the Division of Fish and Wildlife or others. Rather than destroying such bones after the closure of a case, they should be made available to be utilized for education and research locally.

3) Permits for invasive research methods such as tagging or biopsy sampling of live dugongs **should not** be allowed. Tissue and bone sampling for DNA and genetic research can be done using samples taken from recovered dugongs (as is being done at the moment), as well as from the bones of dead animals. With the small, vulnerable population that Palau has, and illegal poaching still taking place, added stress and harassment of the animals with the risk of hurting or scaring them away from their traditional feeding and resting areas should be avoided. There is evidence that dugongs are susceptible to Stress Capture Syndrome and can suffocate easily during capture or stressful events (Marsh and Anderson 1983).

4.0 Discussion

4.1 Observations of Dugong Behavior in Palau

The Dugong Awareness Campaign has been instrumental in creating more public interest in dugongs in Palau in general, and since the helicopter operation started business again in April, 2013, a lot of tourists are now specifically requesting to see a dugong when they book a sightseeing flight. Locating or seeing a dugong by boat or kayak is difficult in Palau, so a helicopter flight is the best chance to see a dugong here. Because of this we now get data of almost daily sightings from tourist flights starting April, 2013.

Most often 1-3 animals are seen swimming together around the Malakal harbor, channel, and Ngederrak reef areas. This has enabled us to pinpoint their daily movements more accurately within the Malakal survey area. To locate a dugong, the helicopter pilot checks the same locations around Malakal each time, and although their movements around Palau's reefs in general are still unknown to us, it is becoming clear that the dugongs are quite predictable in their routes and regular resting areas around Malakal if they are in the area. It appears they also sometimes leave the Malakal area for months at a time for unknown reasons, and in the last two years they have avoided one of the shallower resting areas we identified during the 2010-2011 surveys within the harbor. They instead now seem to prefer the deeper waters east of Malakal and off the edge of the Ngederrak Conservation reef.

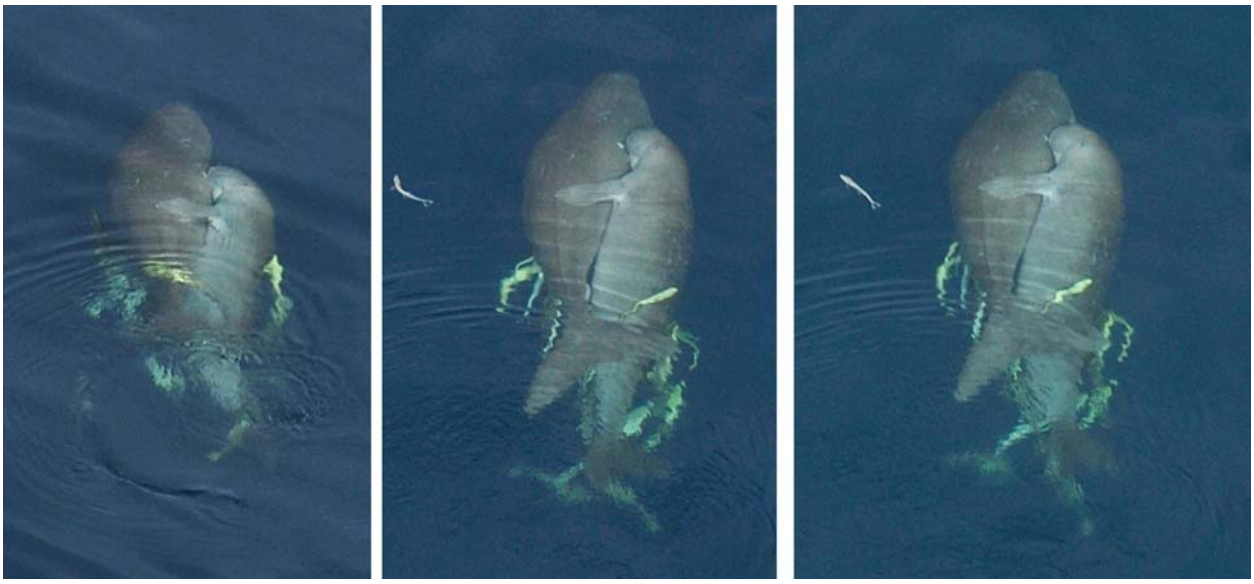

Figure 19. Dugong mating observed in August, 2013. Only pair mating has been observed in Palau, inside the harbor lagoon as well as in deep water off eastern Koror. The male is smaller than the female, and is seen here scratching the female's skin with his tusks (above), and fresh white marks can be seen on the female's side on the below photos.

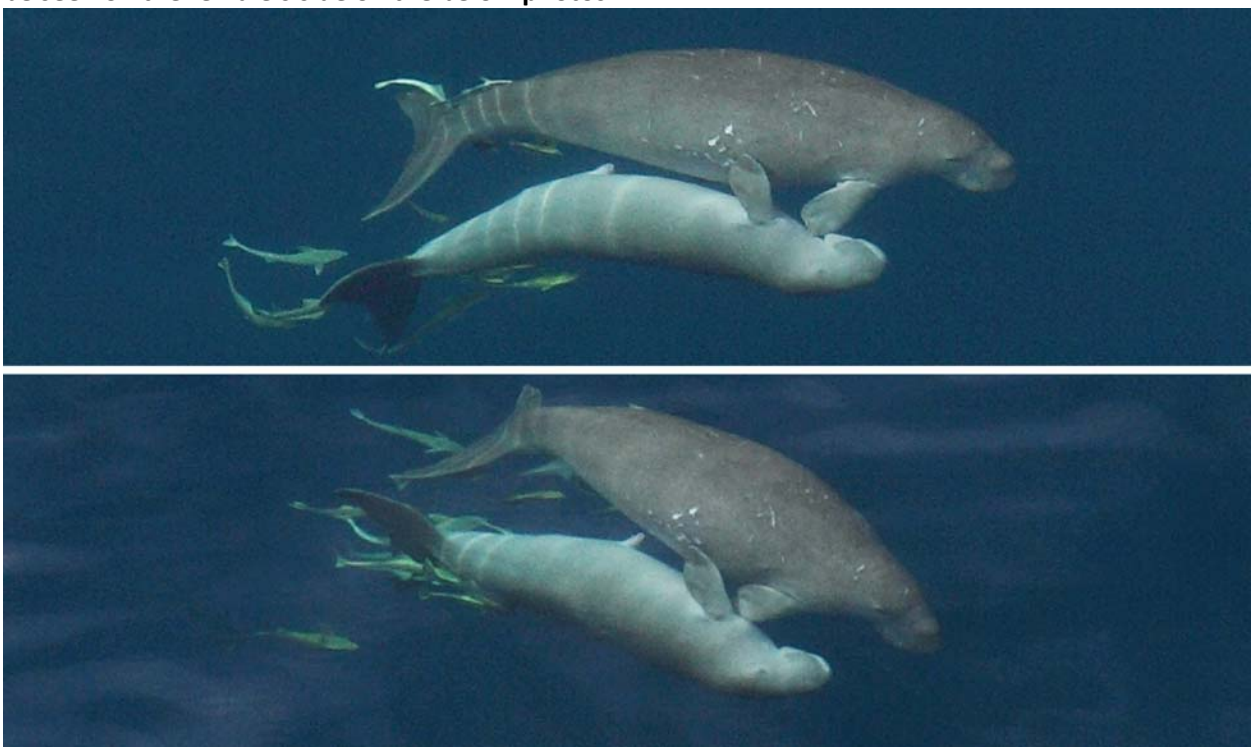

Figure 20-21. At each of the five mating events photographed in Palau, the female pushed the male aside after mating, and rolled onto her back for several minutes.

5.0 Conclusions, Future Work Needed and Challenges facing Dugong Conservation Efforts in Palau

Our Campaign surveys have been focused on the Koror and Malakal area, because it is easier to monitor on a small budget, since the dugongs are concentrated in a small area close to the population center. Long-term aerial surveys and research of other dugong areas around Palau is needed to learn more about the total Palau population, where their feeding and breeding habitats are located, and their movements around Palau. This will require a large budget due to the distances to be covered and the associated fuel costs for boat and aerial surveys.

There are many challenges facing dugong conservation efforts in Palau. Palau is a small tight-knit community, and people tend to protect and cover up for their relatives when it comes to poaching. The older generation was raised as fishermen and hunters, and conservation is not always taken seriously. In the past, a lot of key national and state government positions dealing with marine species protection and enforcement were filled with political appointees, who change every four years with a new administration, so there is little or no continuity or follow-through on conservation programs and grants, or enforcement of the existing conservation laws. A bad example was in 2011, when the Chief of the Division of Fish and Wildlife in Palau was removed from office and was convicted in court himself of, amongst other things, possession of dugong bones which he had buried in his yard.

Important offices and positions, like the office of the "Palau Vulnerable Marine Species Conservation Program" under the Bureau of Marine Resources, have been mostly vacant for several years and without a budget, while people in other key positions in the Division of Fish and Wildlife and the Koror State Rangers regularly change jobs or have been re-assigned after this new administration took office in January, 2013. To continue the good working relationship that we have built up with and between the various agencies since the start of our Dugong Awareness Campaign in 2010, and to make sure necropsies and tissue samples will continue to be taken from every recovered dugong, we will have to continue working with these key agencies. Right now there is no one at a government level to "keep the ball rolling" if the Dugong Campaign efforts cease. This is why our one-year Awareness Campaign is still continuing three years later.

The lack of follow-through from the relevant government agencies has also been the main problem with previous dugong surveys done in Palau that highlighted the need for legislation and actions to protect this isolated local population (Marsh 1995, Davis 2003, Kitalong 2008). The Incidental Sightings Program and 5-year Action plan that was developed in 2007 had no one at a government level following up or implementing it, so it did not produce the desired results.

There is an urgent need for a centralized and institutionalized facility and database under the Bureau of Marine Resources for the permanent storage of data, photographs and specimen material, not just for dugongs, but for all marine research done in Palau. For each

dugong recovered, a necropsy should be performed if possible, with tissue samples and stomach content samples taken and stored, as well as biological and anecdotal information to be included in a timely produced report which is kept on file. Currently, there is not even a proper designated place for a necropsy to take place, or a facility where samples can be kept safely. Rules and regulations for the existing dugong law are needed to improve the permitting process and enforcement mechanisms.

Major threats to dugongs in Palau:

1) Illegal poaching activities.
2) Dynamite fishing and sand dredging activities in known dugong habitats.
2) Increased development and destruction of dugong habitat.
3) High-speed boat traffic around Malakal harbor.

Challenges facing dugong conservation and management in Palau:

1) Lack of data and information on dugong movements and basic population parameters, especially around the northern states of Babeldaob Island.
2) Limited information exchange and collaboration locally and regionally.
3) Limited in-country skills/ capacity to provide long-term marine species management .
4) Lack of enforcement of existing law on poaching.
6) Lack of funding for long-term aerial surveys and monitoring of dugong and their habitats.

To date there has not been a long-term scientific study of the entire Palau dugong population. Most studies have been short in terms of their temporal range and there has been little concerted effort by national government agencies to develop, implement or fund any long term studies. This needs to change if the long term welfare and survival of this emblematic animal is to be assured. There have been some excellent recent examples of dedicated conservationists securing funding for campaigns and studies (Helene Marsh, Patricia Davis, Ann Kitalong). However, as was mentioned in our previous campaign report, these were unable to include the full scope of information and geographic area needed, so can not answer the critical questions needed to fully understand the present status of Palau's dugong.

If the Palau dugong population is to survive and hopefully increase in the future, there needs to be greater ownership of the effort, funding, research and reporting of findings. This will require a strong stance from national and regional agencies, as well as external expertise which can be translated into capacity building for aspiring Palauan researchers. Palau will be a much poorer place if it loses this critically endangered species through a lack of commitment, expertise and funding for further research.

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Appendix I: Educational and Promotional Materials from the Campaign

Above: The Southern Lagoon of Koror was elected as Palau's first World Heritage Site, and includes important dugong habitats. Dugong photos from the Palau Awareness Campaign were included in the UNESCO World Heritage Site application, and are now being used by various agencies around the world for dugong conservation efforts.

Below: The life-sized dugong statue made for the Campaign was displayed at the Minister of State office from 2010-2012, and is now displayed at the lobby of the Palau Pacific Resort where it is highly visible to tourists and locals alike, and continues to generate public interest in Palau's dugongs.

Palau Unveils Lady of the Sea

A tribute to the Year of the Dugong was unveiled by the Vice President of Palau Hon. Kerai Mariur in Samoa on the 19th of July as their contribution to the Secretariat of the Pacific Regional Environment Programme (SPREP) for their work on the conservation of dugongs in the Pacific, including the 2011 Pacific Year of the Dugong Campaign.

The stunning carving of a dugong (also known as the 'lady of the sea') was gifted to SPREP from the Government of Palau who are environmental leaders in the effort to protect marine species.

Palau declared a shark sanctuary in its EEZ in 2009. This was further strengthened in 2010 through extending the protection to encompass all marine mammals including dugongs.

During a special unveiling ceremony at the SPREP headquarters in Apia on the 19th of July, the Vice President of Palau expressed their appreciation to SPREP for their generous assistance to Palau and the Pacific region. The presentation of a special letter from the President of Palau to SPREP, the gifting of the carving and a copy of the "Mesekiu" booklet was made.

"This is symbolic of our national commitment toward conservation efforts," said Vice President Mariur.

"The designation of the 'Pacific Year of the Dugong' is indicative of the enduring efforts of SPREP to continue to lend its assistance toward the protection and preservation of the ecological and rich marine ecosystems that sustain the balance of nature that our Pacific Island Countries continue to be dependent on."

A certificate of Environmental Leadership was presented to Palau by SPREP. The Pacific nation was host of the regional launch of the Pacific Year of the Dugong and has since prepared many different resources to help conserve this species which is vulnerable to exctinction.

"There is a saying, 'actions speak louder than words', and we must congratulate and commemorate Palau because they are taking positive actions and we are encouraged by these important efforts," said Kosi Latu, the Acting Director of SPREP.

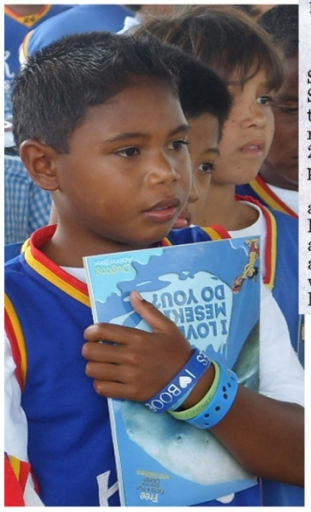
To learn more about the Dugong and hear the Dugong Song produced by Palau please visit the Pacific Year of the Dugong website: www.sprep.org/Biodiversity/PYoD/index.asp

One of the 30+ Dugong statues carved by the Etpison Museum since the 2010 start of the Campaign.

These Dugong carvings have helped create public interest in Palau's Dugongs locally and abroad.

Islandtimes, Tuesday, March 26 2013

2013 kids activity booklets and posters given to students



BY PETER ERICK L. MAGBANUA
Reporter

After Melekeok Elementary School, 7th and 8th graders from Seventh Day Adventist Elementary School and Koror Elementary School yesterday received the 2013 kids activity booklets and posters.

The booklets and posters are about Dugongs and Manta Rays. They are activity booklets and posters that tell about facts about Dugongs and Manta Rays with free stickers for kids to enjoy learning. The booklets were given out by Mandy Etpison and Yalap Yalap of the Palau Conservation Society.

Aside from facts, the booklets also tells about how important Dugongs and Manta Rays to Palau's economy as tourists come to see them as well in Palau's magnificent waters. It also speaks of how important it is to conserve them for future generations.

According to Mandy Etpison, they will be giving out booklets and posters to other schools within the month and extra copies are available at the Etpison Museum while supply last. The booklets are published by Etpison Museum as part of the Palau Dugong Awareness Campaign.

Appendix II. New Palau legislation on Dugongs

Dugong Protection Act signed

BY AUREA GERUNDIO-DIZON
Reporter

Exactly a week before leaving the office, outgoing President Johnson Toribiong yesterday signed a bill into law that will increase penalties for causing injury or killing dugong.

In his letter to the leadership of the Senate and the House, the president expressed that he is honored and privileged to sign the bill into law as one of his last act to protect the country's natural heritage while serving as president of the Republic.

Toribiong said he approved the bill as he believes it is long overdue for Palau to upgrade its conservation

policy and law to increase the penalties for killing or injuring the dugongs, which he described to be indigenous endangered marine mammals, that have lived in Palau and in the nation's folklore for thousands of years.

RPPL 8-57 or the Dugong Protection Act states that those who are found guilty of recklessly injuring or killing a dugong shall, upon conviction, be imprisoned for not more than two years, or fined not more than $5,000, or both. For every violation thereafter, the convicted person shall be imprisoned for not more than four years, or fined not more than $10,000, or both.

A person found guilty of intentionally injuring or killing a dugong shall, upon conviction, be imprisoned for not more than five years, or fined not more than $15,000, or both. For every violation thereafter, the convicted person shall be

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Dugong Protection ...

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imprisoned for not more than 10 years and fined not more than $25,000, with a minimum sentence of imprisonment of not less than three months, or a minimum fine of not less than $1,000, or both.

Each dugong killed or injured, or part or product thereof taken, possess, exported, sold, purchased, or offered for sale or purchase shall constitute a separate violation.

The dugong or mesekiu reportedly has great importance in Palauan culture. However, its population in Palau is facing a very real threat of local extinction. It is believed that there are less than 200 dugongs remaining in Palau waters. Out of this small population, four dugongs have been found killed in recent months. Given the slow reproduction rate of dugongs, the population cannot grow quickly enough to survive this kind of assault. Therefore, a proposal to preserve the vulnerable population of dugongs was initiated.

Vice Speaker Alexander Merep, Del. Horace Rafael and Del. Rebluud Kesolei authored the bill that is now a law.

The House Bill 8-85-6, "A Bill for an Act to increase the penalties for killing or causing injury to a dugong or possessing or selling any dugong parts or products, and for other related purposes", was first introduced in May, 2010, upon the request of the "I love Mesekiu" Awareness Campaign. After it was approved by the Congress in May, 2011, a year later, President Toribiong returned it to the congress to take out the mandatory minimum sentence. It was finally signed by President Toribiong on January 10, 2013 right before he left office. Ongoing work by the Campaign will include efforts to get rules and regulations established under the existing law to enable government agencies to work better together on recoveries, necropsies, and future permitting and research on dugongs.

EIGHTH OLBIIL ERA KELULAU

RPPL NO. 8-57

Sixth Regular Session, May 2010 (Introduced as House Bill No. 8-85-6, PD1)

A BILL FOR AN ACT

To increase the penalties for killing or causing injury to a dugong or possessing or selling any dugong parts or products, and for other related purposes.

THE PEOPLE OF PALAU REPRESENTED IN THE OLBIIL ERA KELULAU DO ENACT AS FOLLOWS:

Section 1. Short Title. This Act shall be known as the Dugong Protection Act.

Section 2. Legislative Findings. The dugong, or mesekiu, has great importance in Palauan culture. However, the Palauan population of dugongs, which is isolated from all other global populations, is facing a very real threat of local extinction. It is believed that there are less than 200 dugongs remaining in Palauan waters. Out of this small population, four dugongs have been found killed in Palauan waters in recent months. Given the slow reproduction rate of dugongs, the population cannot grow quickly enough to survive this kind of assault. The Olbiil Era Kelulau finds that action must be taken to preserve this vulnerable population. Toward that end, this Act increases the penalties for the destruction or taking of a dugong, the trade in dugong products or parts, and the possession (except for properly registered olecholl bracelets) of any dugong part or product.

Section 3. Amendment. Section1231 of Title 24 of the Palau National Code is hereby amended as follows:

"(a) . . .

(b) . . .

(c) . . .

(d) No person shall intentionally or recklessly injure or kill a dugong.

(e) (1) A person found guilty of violating subsection (a), (b) or (c) of this section shall, upon conviction, be imprisoned for not more than one year, or fined not more than $1,000, or both. For every violation thereafter, the convicted person shall be imprisoned for not more than two years, or fined not more than $2,000, or both.

(2) A person found guilty of violating subsection (d) of this section by reckless injury [or killing], shall, upon conviction, be imprisoned for not more than two years, or

fined not more than $5,000, or both. For every violation thereafter, the convicted person shall be imprisoned for not more than four years, or fined not more than $10,000, or both.

(3) A person found guilty of violating subsection (d) of this section by intentional injury or killing, shall, upon conviction, be imprisoned for not more than five years, or fined not more than $15,000, or both. For every violation thereafter, the convicted person shall be imprisoned for not more than ten years and fined not more than $25,000, with a minimum sentence of imprisonment of not less than three months, or a minimum fine of not less than $1,000, or both.

Each dugong killed or injured, or part or product thereof taken, possess, exported, sold, purchased, or offered for sale or purchase shall constitute a separate violation."

Section 4. Effective Date. This Act shall take effect upon its approval by the President of the Republic of Palau or upon its becoming law without such approval, except as otherwise provided by law.

PASSED: July 14, 2011

Approved this 10th **day of** January, **2013.**

His Excellency Johnson Toribiong
President, Republic of Palau

Island Times
Palau

President celebrates with Palauans in Oregon
LOCAL/page 2

Plane crash in Nigeria kills all 147 on board
WORLD/page 8

Rays stay perfect in Palau Little League
SPORTS/page 12

Koror, Palau Tuesday, June 5 Vol. 7 / No. 62 website: http:// www.islandtimes.us E-mail address: islandtimes@reklai.com 12 Pages 60¢

Four face criminal charges for taking of dugongs, lobster

BY PETER ERICK L. MAGBANUA
Reporter

Four individuals are facing several counts of criminal charges for taking dugongs and berried lobsters.

In Criminal Case No. 12-055, Helacio Ngiraibakes, Quincy Oiterong, Mers Ngitong and Hastina Ngitong were charged with at least 13 counts of criminal acts ranging from taking, possession, aiding and abetting or export of dugongs ; prohibited acts; fishing for and possessing a female berried lobster and aiding and abetting the taking and possession of a female berried lobsters.

According to the affidavit of probable cause executed by Division of Fish and Wildlife Protection officer Volette Polloi; on Oct. 3, 2011 , the DFWP office received a report stating that there were possible dugong skins and intestines at the Ngatpang State Dock.

Polloi with two other officers went to the said dock to investigate and during the probe they were able to identify and collect slightly open yellow sack containing a dugong head, suspected dugong intestines, suspected dugong liver and suspected dugong skins.

The affidavit further added that on January 11, 2012, a

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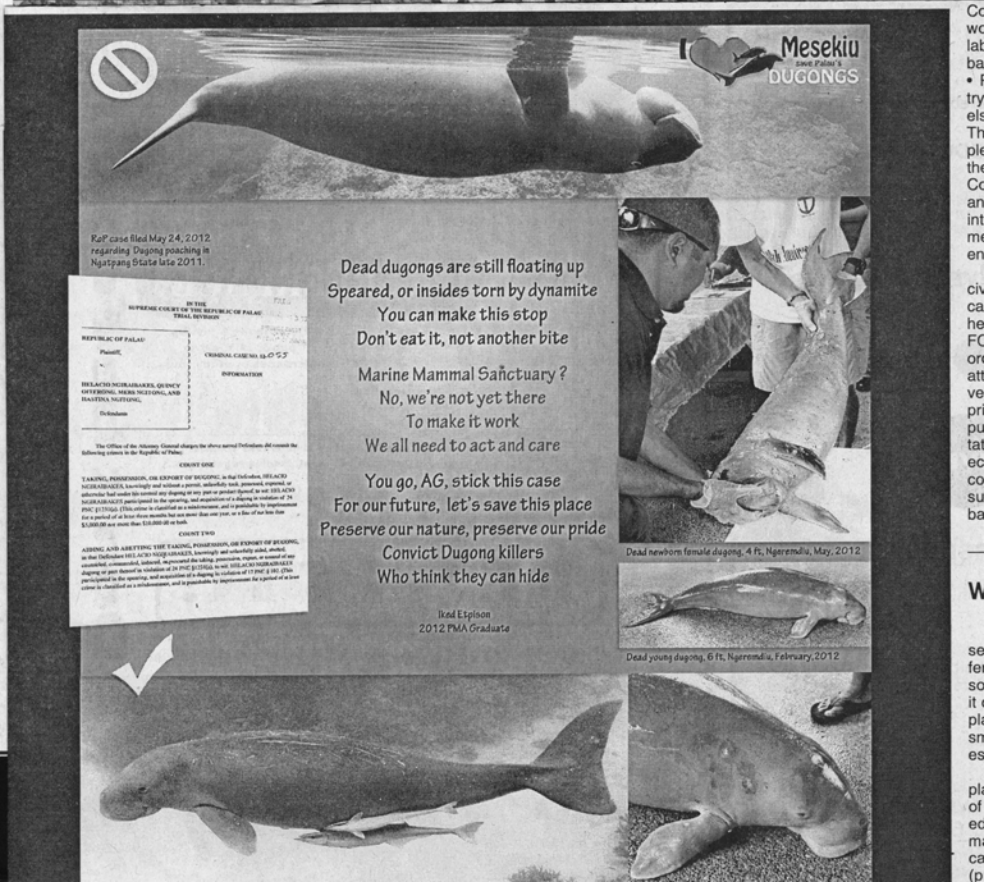

Appendix III. Dugong Sighting Form

DUGONG SIGHTING FORM

ROCK ISLAND HELICOPTERS
779- 5831

Date:_____

Time of observation: _____AM/PM Moon/ tide: _____

Total # Dugongs seen:_____ # Dugongs swimming together:_____

calves:_____ newborn _____ larger sized calves

O Idling **O** On the move

O Inside lagoon **O** Open ocean **O** Sandy bottom **O** Reef

O Harbor area inside **O** Outside Lighthouse Channel **O** Airai

O Other:_____

O Unusual behaviour or feeding: _____

_____

_____

_____

_____

submit to: I ❤Mesekiu- Palau Dugong Awareness Campaign
Mrs.Mandy Etpison 488- 6730 www.etpisonmuseum.org mandyetpison@outlook.com