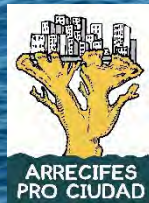


ISLA VERDE REEF MARINE RESERVE 2022 ANNUAL REPORT



Presented by:
Isla Verde Reef Marine Reserve Management Board and
Arrecifes Pro Ciudad Inc.



Isla Verde 1949
Courtesy Hotel la Playita.



Figure 17. Cataloguing ceramics.



Figure 18. Isla Verde ceramic styles.

In 1981 the Archaeologist, Jesús Vega made his master's thesis in this small island, and thus began underwater archaeology in Puerto Rico.

On the left you can see pieces of a pre-Taíno site on Isla Verde.



In 1797 the English fleet led by Ralph Abercromby anchored off the beaches of Isla Verde. It is in this map that we realize that Isla Verde already had its name in the 18th century.



English invasion 1797.



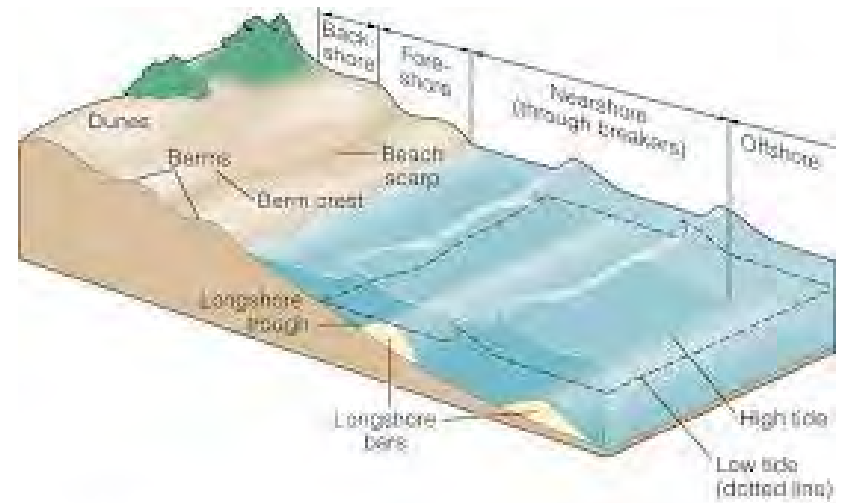
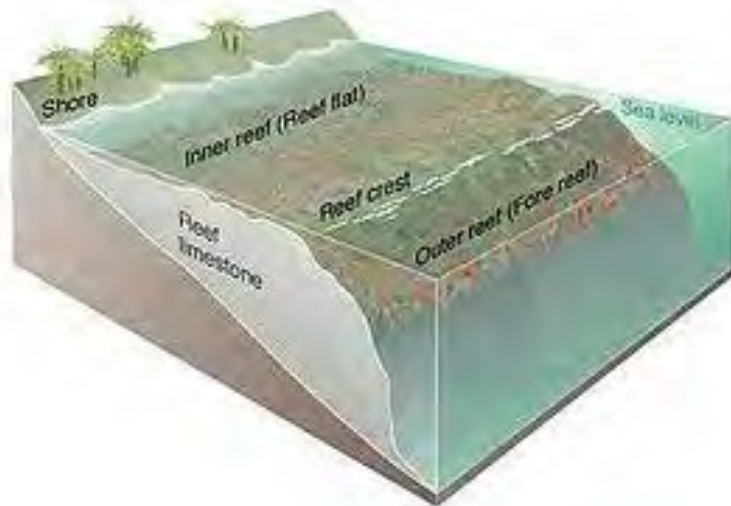


Exterior reef system

Isla Verde
Reef

The reefs of the metropolitan area protect our coast and, perhaps are responsible for our beautiful beaches in San Juan and Carolina.

The only natural barriers that can protect us from storm surges are coral reefs, seagrasses, mangroves and dunes.



© 2007 Brooks/Cole - Thomson

Marine systems:

Hábitats esenciales para los peces en las pesquerías marinas de Puerto Rico e Islas Vírgenes.



El manglar y la desembocadura del río

El manglar es un bosque costero inundado formado por especies de árboles que tienen la capacidad especial de tolerar alta salinidad y colonizar los fondos con sedimentos sueltos.

El manglar sirve como criadero para muchas de las especies de peces que se pescan en los arrecifes en sus etapas adultas.

La desembocadura del río y el estuario constituyen un hábitat de aguas llanas, salinidad variable y gran cantidad de sedimentos suspendidos. Los sedimentos son importantes en la transportación de nutrientes. Muchas especies de organismos se alimentan de esos sedimentos y, además, se protegen de los depredadores que los persiguen.

El fondo de arena y de lodo

Los fondos de arena y de lodo son depósitos formados por sedimentos sueltos. Estas zonas arenosas pueden encontrarse desde aguas llanas cerca de las playas entre las praderas de hierbas marinas y luego en aguas más profundas cercanas a los arrecifes de coral. Aquí abundan el carricho, el lenguado y el salmónete rayado.

La pradera de hierbas marinas

Las praderas de hierbas marinas son comunidades compuestas por plantas vasculares que viven sumergidas en estuarios y en aguas poco profundas, entre los manglares y los arrecifes de coral. Las especies de hierbas marinas más comunes son la hierba de tortuga y la hierba de manatí. Aquí encuentran un hábitat protegido, así como un vivero, varias especies de peces, el carricho y la langosta espinosa.

El arrecife de coral de aguas llanas

El arrecife de coral es el ecosistema marino, exclusivamente tropical, con mayor biodiversidad en la Tierra. Puede encontrarse en aguas llanas cercanas a la orilla desde 30 metros de profundidad y en aguas profundas hasta más de noventa (90) metros y muy lejos de la costa.

El arrecife tiene una laguna, una plataforma, un frontón y un talud. Estos espacios proveen hábitats para diferentes especies importantes en las pesquerías. La mayoría de las especies de peces y de mariscos que sustentan la Industria pesquera en el Caribe provienen de los arrecifes.

El arrecife de coral de aguas profundas

El arrecife que se encuentra en aguas profundas se diferencia de los arrecifes de aguas más llanas en las especies de corales y en la estructura del arrecife. Los corales son mayormente chatos, creciendo unos sobre otros. Estos arrecifes sirven como hábitat para las especies de pargos y meros de agua profunda.

La columna de agua

La columna de agua cubre desde la zona profunda o el mar abierto hasta áreas más llanas sobre la plataforma marina. La porción sobre la plataforma marina es la zona nerítica y la que se encuentra después de la pendiente continental es la zona pelágica. Algunas especies de meros y pargos ososvan y sus huevos se fecundan en la columna de agua, y las corrientes transportan las larvas de un lugar a otro.

Este producto fue subvencionado por: NA 15NMV 4410012



A large, grey shark is swimming horizontally across the frame, positioned slightly above the center. The shark has a sleek, elongated body with a prominent dorsal fin and a long, pointed tail. The background is a vibrant coral reef with various types of coral, including branching and fan-like structures, in shades of brown, orange, and green. The water is clear, and the lighting is bright, suggesting a shallow depth.

Let's dive!

All photos taken by Paco López Mújica at the Isla Verde Reef during the year 2022 using the camera - Olympus Tough TG4.

Isla Verde Reef



Porkfish *Anisotremus virginicus*

Our flagship specie,
Hawksbill sea turtle
Eretmochelys imbricata





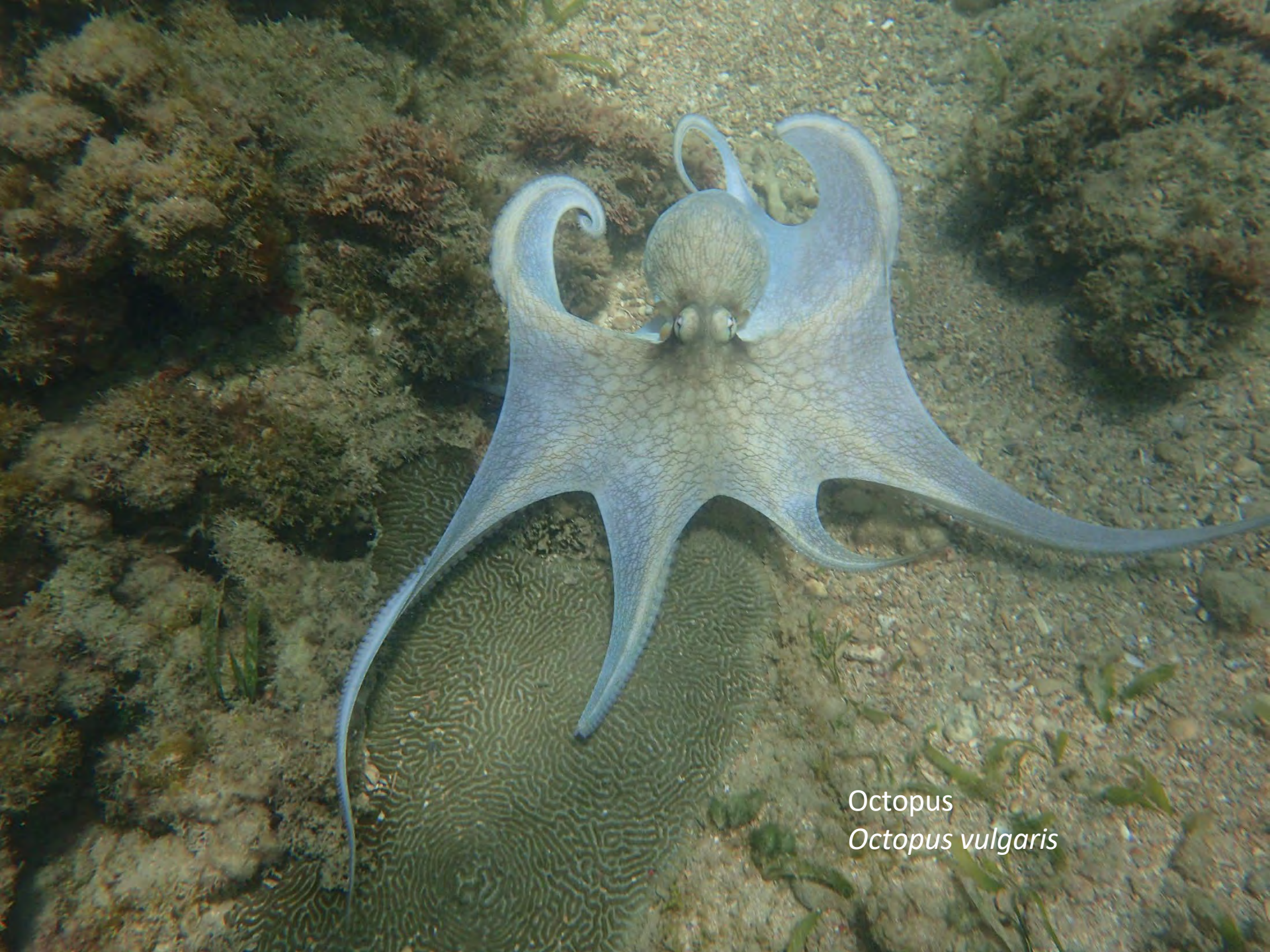
Soft Corals
Pseudoptergorgia spp.



Pseudoplexaura spp.



Hard Corals
Porites porites



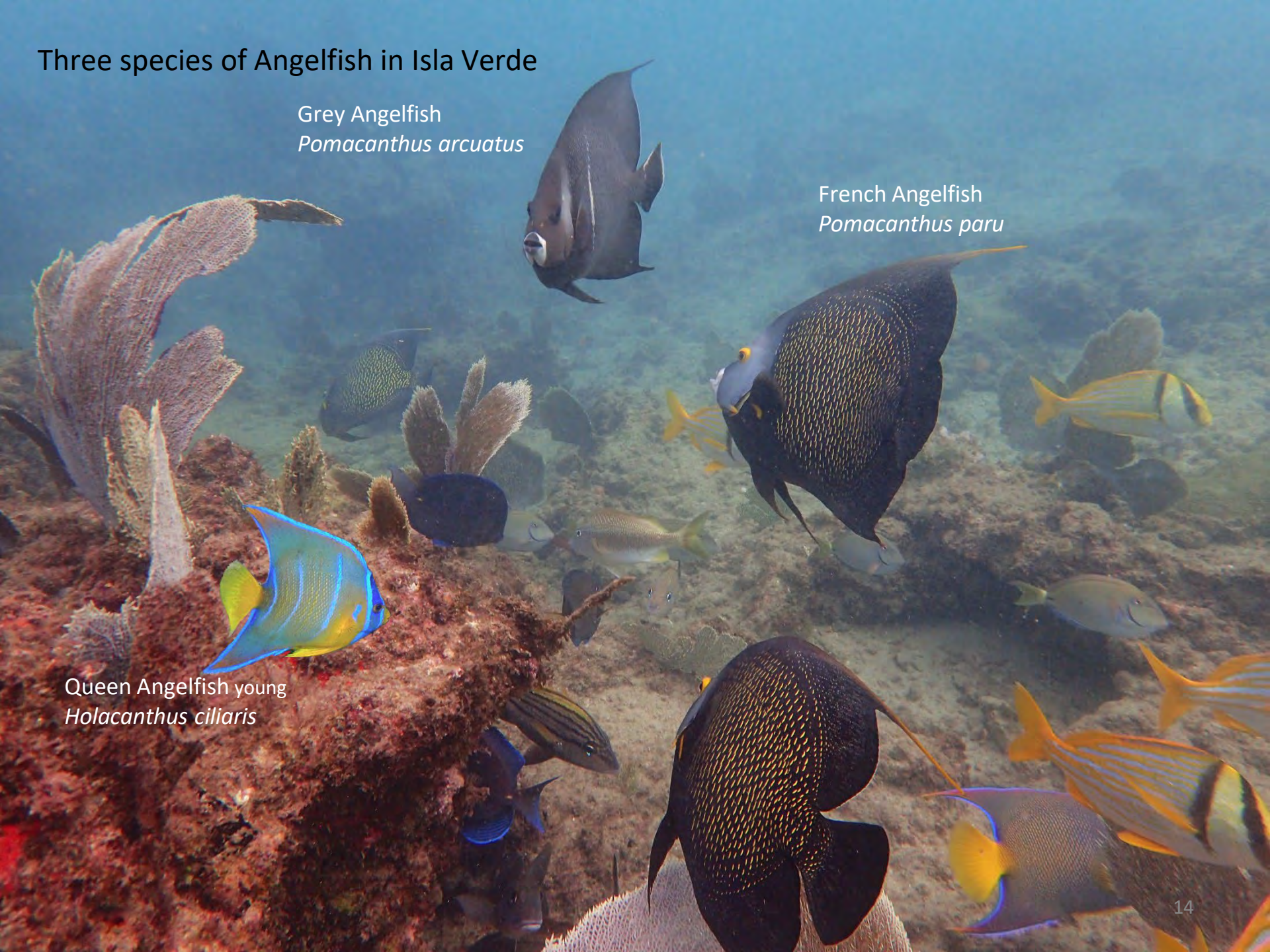
Octopus
Octopus vulgaris

Three species of Angelfish in Isla Verde

Grey Angelfish
Pomacanthus arcuatus

French Angelfish
Pomacanthus paru

Queen Angelfish young
Holocanthus ciliaris





Most common in Isla Verde

French Angelfish
Pomacanthus paru

Juvenile stage





Nurse Shark
Ginglymostoma cirratum



Southern Stingray
Dasyatis americana
Swimming on top, Bar Jack
Caranx ruber



Butterflyfish in Isla Verde Reef,
Chaetodon ocellatus



Eel *Myrichthys ocellatus*



Starfish *Lincida guildingii*



Sea Bream *Kyphosus incisor*



Law 274 of September 26, 2012.


- The Isla Verde Reef Marine Reserve Law designates the coastline located in the Municipality of Carolina with that name, delimits the total area of the reserve for the conservation of its biodiversity, and the proper management of it. The law orders the Department of Natural and Environmental Resources to design and structure a management plan for the Reserve, apply laws and regulations related to the administration and uses of this Reserve. Authorizes the Department of Natural and Environmental Resources to enter into collaborative management agreements with government entities and non-profit organizations for the joint management of the reserve. The law requires annual reports to the Legislative Assembly to allocate funds for the implementation of the provisions of this Act and other related purposes.



The Isla Verde Reef Marine Reserve is governed by a Management Board with representation of the DRNA, academy, tourism, merchants, concessionaires, and citizens of the area.

The Reserve is managed through a Collaborative Agreement between Arrecifes Pro Ciudad Inc. and the Department of Natural and Environmental Resources valid for 15 years since 2016.

In compliance with the Collaborative Agreement, we present the 2022 Annual Report.

 ESTADO LIBRE ASOCIADO DE
PUERTO RICO
Departamento de Recursos Naturales
y Ambientales

ACUERDO DE COLABORACIÓN ENTRE ARRECIFES PRO CIUDAD, INC. Y EL
DEPARTAMENTO DE RECURSOS NATURALES Y AMBIENTALES PARA EL
MANEJO DE LA RESERVA MARINA ARRECIFE DE LA ISLA VERDE

AGENCIA: 133

Acuerdo Núm.: _____
Registro Núm.: _____

COMPARECEN

DE UNA PARTE: EL DEPARTAMENTO DE RECURSOS NATURALES Y AMBIENTALES del Estado Libre Asociado de Puerto Rico, agencia gubernamental creada y autorizada para otorgar este acuerdo al amparo de la Ley Núm. 23 de 20 de junio de 1972, según enmendada, representado en este acto por su **SECRETARIA**, Carmen R. Guerrero Pérez, mayor de edad, soltera y vecina de San Juan, Puerto Rico, en adelante denominado "**DEPARTAMENTO**".

DE OTRA PARTE: ARRECIFES PRO CIUDAD, INC., una corporación sin fines de lucro creada bajo las leyes del Estado Libre Asociado de Puerto Rico, representada en este acto por su **PRESIDENTE**, Francisco López Mujica, mayor de edad, soltero y vecino de Carolina, Puerto Rico, en adelante denominada "**ARRECIFES**".

EXPONEN


POR CUANTO: La **SECRETARIA**, al amparo de las disposiciones de la Ley Orgánica del **DEPARTAMENTO**, al amparo de las disposiciones de la Ley Orgánica del Departamento de Recursos Naturales y Ambientales, Ley Núm. 23, *supra*, la Ley Núm. 133 de 1 de julio de 1975, según enmendada, conocida como *Ley de Bosques*, y la Ley Núm. 150 de 4 de agosto de 1988, según enmendada, conocida como *Ley del Programa de Patrimonio Natural*, está facultada para establecer convenios o acuerdos con instituciones particulares, bajo los términos y condiciones que juzgue convenientes para la mejor aplicación y ejecución de la ley y el logro de sus deberes ministeriales y objetivos.


POR CUANTO: El **DEPARTAMENTO** tiene la responsabilidad de implantar la política pública con relación a la conservación de los recursos naturales y a la administración de las áreas protegidas o designadas como: bosques, reservas naturales, o refugios de vida silvestre, que estén bajo su custodia. Además, está llamado por ley a establecer aquellos mecanismos que redunden en el manejo más eficaz de estas áreas.


POR CUANTO: **ARRECIFES** es una organización sin fines de lucro, fundada en el año 2009, e incorporada el 27 de agosto del 2009, con el objetivo de proteger, fomentar, conservar y colaborar en el manejo y la protección de las playas, los arrecifes, estuarios, manglares, el agua, flora y fauna y los recursos naturales marinos y costeros del área objeto de este **ACUERDO**.

POR CUANTO: El **DEPARTAMENTO** es el administrador primario y custodio de los bienes del dominio público y bienes patrimoniales que se le han encomendado legalmente por medio de la Ley, incluyendo la **RESERVA MARINA ARRECIFE DE LA ISLA VERDE**, en adelante la "**RESERVA**" y demás áreas naturales protegidas de Puerto Rico.

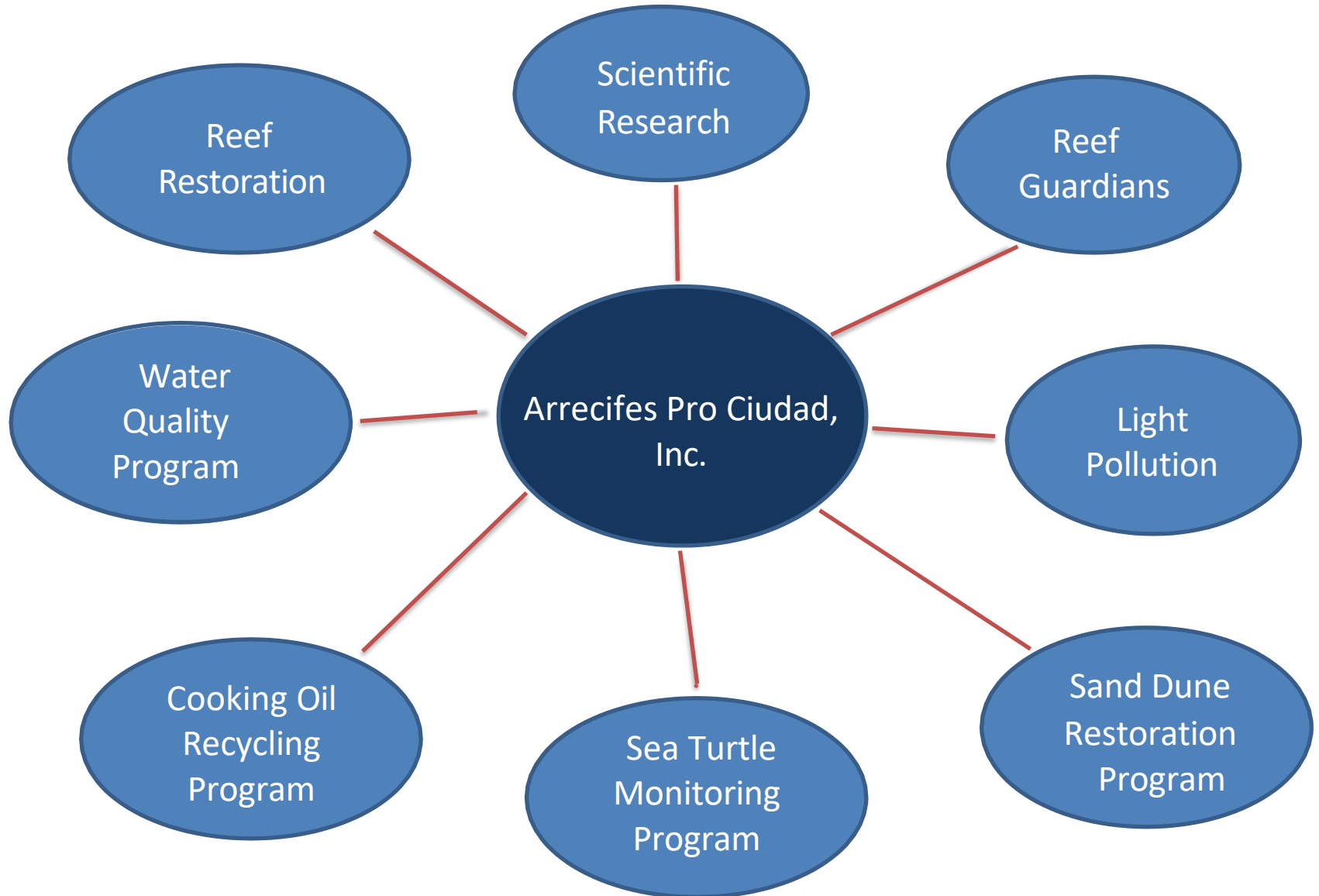
POR CUANTO: La **RESERVA** fue creada en virtud de la Ley 274 del 26 de septiembre de 2012. En dicha Ley se ordenó al **DEPARTAMENTO** a crear un Plan de Manejo para la administración, rehabilitación y conservación del área, estableciendo aquellos usos o



 ARRECIFES PRO CIUDAD



Management Board Isla Verde Reef Marine Reserve



Management Plan –

We are still waiting for the conclusion of the Management Plan.

This document is important since it determines who, why, what, when, which and how tasks should be developed and implemented in the Marine Reserve. The Management Plan is the guide to operate the Reserve.

Isla Verde Reef Marine Reserve Act LAW NO. 274 OF 26 SEPTEMBER 2012



Article 5.- Powers and duties of the Department of Natural and Environmental Resources.

The Secretary of the Department of Natural and Environmental Resources is directed to develop, in one term of hundred twenty (120) days after the approval of this Law, in collaboration with government entities and non-profit organizations, a Co-Management Plan and the compatible regulations for the administration, rehabilitation and conservation of the area described in Articles 3 and 4 of this Law, in accordance with the provisions of Act No. 23 of June 20, 1972, as amended, known as the "Organic Law of the Department of Natural Resources"; Law No. 150 of August 4, 1988, as amended, known as the "Natural Heritage Program Law"; Law 147-1999, as amended, known as the "Law for the Protection, Conservation and Management of Coral Reefs in Puerto Rico"; and the "Coastal Zone Management Program of September 1978", established under the "Federal Law of Management of the Coastal Zone of 1972". Provided, in addition, that within the Management Plan for the Reserve, the Department will establish those uses or non-harmful human activities compatible with the conservation of the Marine Reserve, as well as the viability of recreational activities such as surfing, snorkeling, kayaking or any other activity compatible with the conservation objectives of the area.

NO FISHING NO TAKE ORDER

We thank Secretary Carmen Guerrero for issuing this no-fishing/no take order as we complete the Management Plan..



ESTADO LIBRE ASOCIADO DE PUERTO RICO
Departamento de Recursos Naturales y Ambientales

ORDEN ADMINISTRATIVA NÚM. 2014-01

PARA DECRETAR VEDA DE PESCA Y DE RECOLECCIÓN DE
ORGANISMOS EN LA RESERVA MARINA ARRECIFE DE LA ISLA VERDE

POR CUANTO: La Ley Núm. 23 de 20 de junio de 1972, según enmendada, Ley Orgánica del Departamento de Recursos Naturales y Ambientales (DRNA) de Puerto Rico, delega en esta entidad pública la responsabilidad de implementar, en lo que respecta a la fase operacional, la política pública del Estado Libre Asociado (ELA) de Puerto Rico contenida en la sección 19 del Artículo VI de la Constitución del ELA. De acuerdo con la responsabilidad que le ha sido delegada, el DRNA identifica su misión como la de proteger, conservar y administrar los recursos naturales y ambientales del país de forma balanceada para garantizar a las próximas generaciones su disfrute y

**RESERVA MARINA ARRECIFE DE LA ISLA VERDE
CRIADERO DE ESPECIES**



AQUÍ NO SE PUEDE PESCAR.

Orden Administrativa D.R.N.A. Núm. 2014-01



So that the
massacre of
August 20th
doesn't
happen again



Seven lobsters with eggs.
Thousands of lobsters were lost here.

We thank the Municipal Police Officers, Yamilka Ortíz and Juan Cana, for the intervention, and neighbor Hermín Negrón for the coordination in this seizure.

SIGNS - The first information visitors receive.

Actividades Permitidas
Permitted Activities











Actividades Prohibidas y/o Restringidas
Prohibited and/or Restricted Activities











Para reportar actividades prohibidas, favor comunicarse a:
To report any prohibited activity, please call:

Unidad Marítima Municipio de Carolina 787-791-4468
Cuarteil Policía Municipal 787-769-4000
Cuerpo de Vigilantes DRNA (San Juan) 787-230-4000
Policía de Puerto Rico, Fuerzas Unidas de Rápida Acción (FURA) 787-863-5000
Policía de Puerto Rico 787-343-2020

Para más información:
For more information:
División de Áreas Naturales Protegidas
DRNA - 787-999-2208 ext. 2606 www.arrecifesdeverde.com

*Para información sobre el permiso de captura a él se lección número al (787) 999-2200 ext. 2752.
For information about Lion Fish capture and permit call 787-999-2200 ext. 2752.

RESERVA MARINA ARRECIFE DE LA ISLA VERDE

Bienvenido - Welcome - Bienvenue - Bem-vindo - Benvenuto - Willkommen



Designada bajo la Ley de la Reserva Marina Arrecife de la Isla Verde. (Ley 274 del 26 de septiembre del año 2012).

Esta es la primera área de arrecifes de coral designada como reserva marina en el Área Metropolitana de San Juan. Aquí podrás conocer los organismos del arrecife y disfrutar de ellas especies.

El manejo de la reserva se logra a través de un acuerdo de colaboración entre el Departamento de Recursos Naturales y Ambientales y la entidad comunitaria Arrecifes Pro Ciudad Inc.

¡Esta es TU Reserva, ayúdanos a protegerla!

Designated under the Isla Verde Coral Reef Marine Reserve (Law 274 of September 26, 2012).

This is the first coral reef marine area designated as a Marine Reserve in the Metropolitan Area of San Juan. Here you will have the opportunity to observe and enjoy the coral reef's organisms in a passive way. Management of the reserve is achieved through a cooperative agreement between the Department of Natural and Environmental Resources and the community entity Arrecifes Pro Ciudad Inc.

This is YOUR Reserve, please help us protect it!

PARA MÁS INFORMACIÓN VISITEN LOS LISTINOS DE RESULTADOS DE CALIDAD DEL AGUA EN ESTA PLAZA ESCANEA EL QR CODE.










ALGUNAS DE LAS ESPECIES QUE HABITAN EL ARRECIFE DE LA ISLA VERDE

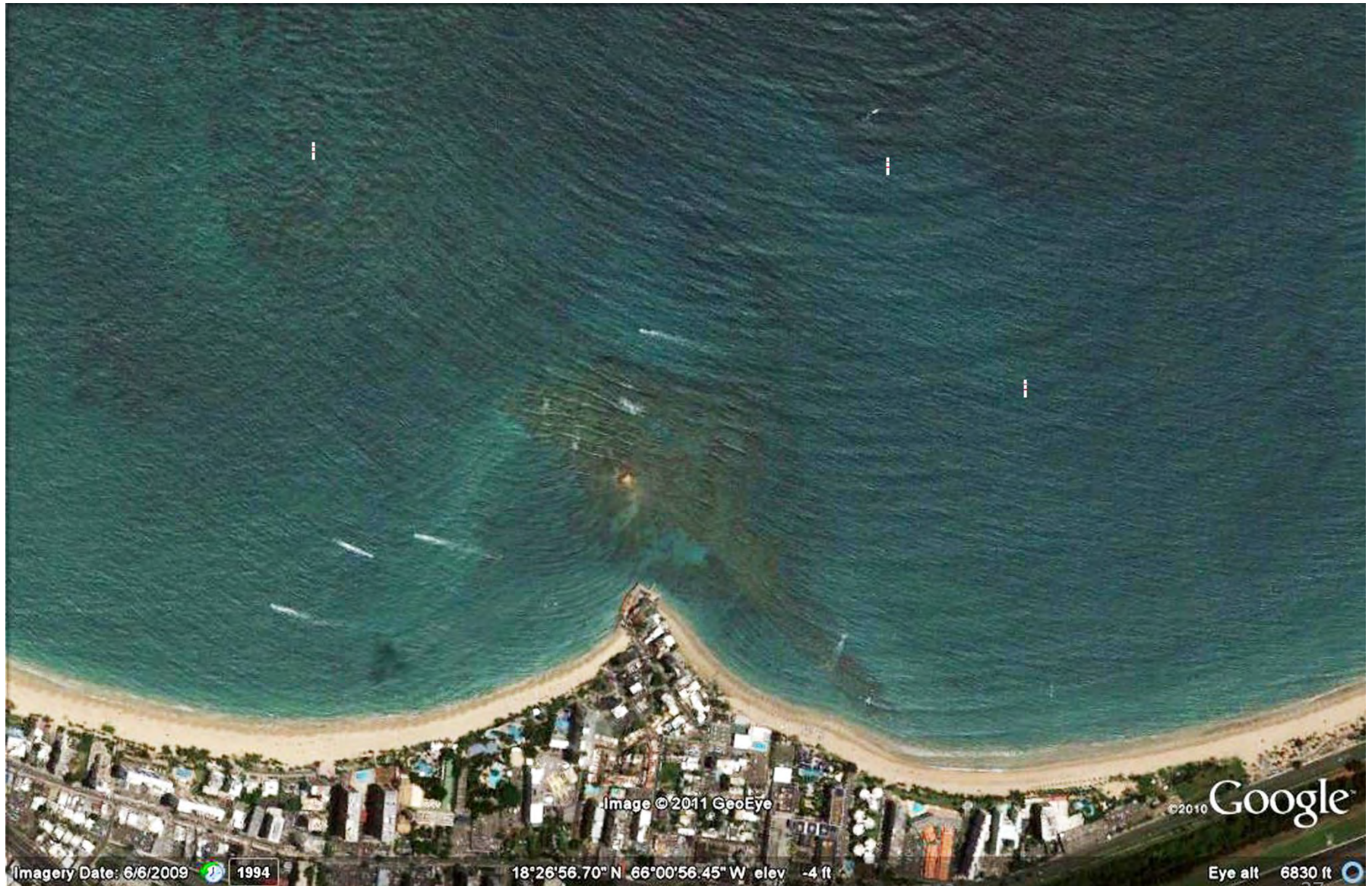


Some of the species that inhabit the Isla Verde Coral Reef.

Through these signs, we educate and inform about this natural resource, the importance of its protection, and it is also the tool to implement the regulations governing the Marine Reserve.



BUOYS PLACEMENT



VIGILANCE



We appreciate the help of the Unidad Marítima del Municipio de Carolina y el Cuerpo de Vigilantes del DRNA.

Unfortunately, vigilance over motorboats is extremely scarce, and it defeats the purpose of the protected marine area. We hope that in 2023 the DRNA will be able to install the buoys on the perimeter of the marine reserve.



These complaints that we have submitted to the DRNA are not accepted because they must be made by a police officer.

As Citizens WE CAN'T - WE DO NOT COUNT.



What we monitor in the Marine Reserve

- No fishing or organisms being removed .
- That motorboats do not sail in the area demarcated by buoys.
- Turtle nesting (Leatherbacks) and accidents with protected species such as the Hawksbill, Green Turtles and Manatees.
- Beach cleanup, maintenance of the dunes, and extraction of garbage that reaches the reef.
- Water quality. Boca de Cangrejos, storm drains, and sewer lines.
- Light pollution.
- Overall health of our urban reef.



Actividades Prohibidas
Prohibited Activities

Para reportar actividades prohibidas, favor comunicarse a:
To report any prohibited activity, please call:

Cuerpo de Vigilantes D.R.N.A. - (787) 724 5700
Policía Municipal - (787) 757 2626
Marítima Municipal - (787) 253 2286 791 4468
Policia Estatal - (787) 343 2020
U.S. Coast Guard - (787) 289 2041

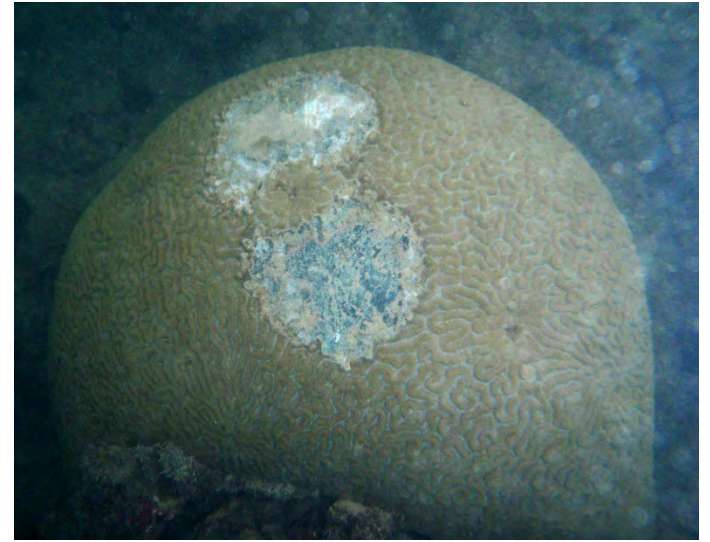
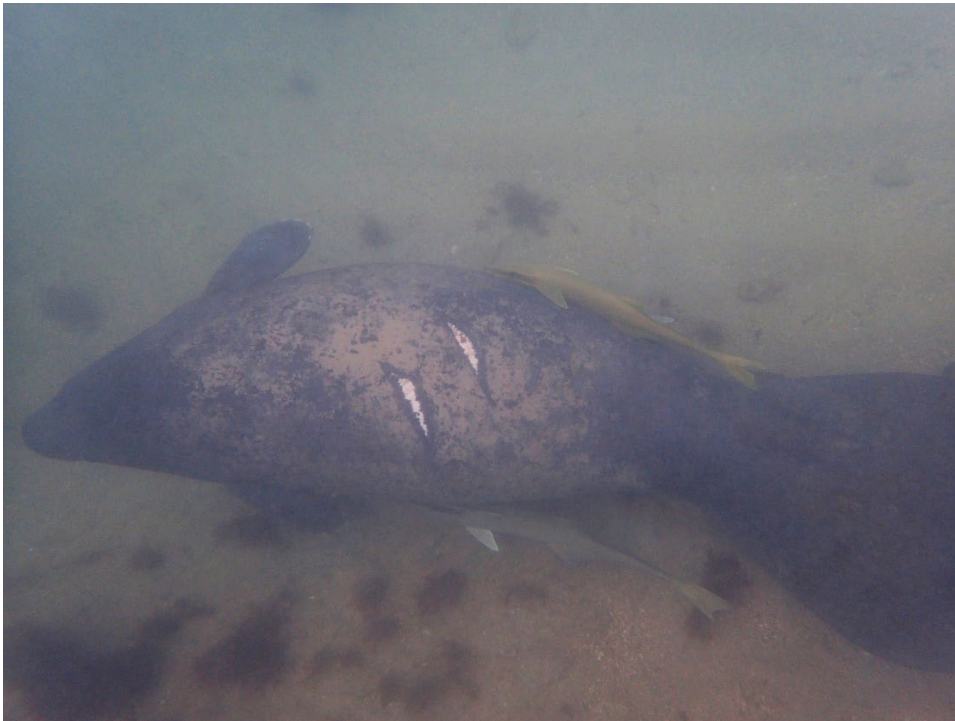
Para más información y contactos de la comunidad:
For information and community contact:

Arrecifes Pro Ciudad - (787) 604 4959
arrecifeislaverde@gmail.com Facebook Arrecife Islaverde

Puedes ver en tu computadora las imágenes en vivo de la Reserva Marina - www.ComoEstaEso.com.

Threat of jet skis and motorboats.

Young manatee photographed in
2021 in front of Punta del Medio.



Las Tortugas Marinas en la Reserva Marina Arrecife de la Isla Verde.

Las especies que protegemos -



Chelonia mydas



Eretmochelys imbricata



Dermochelys coriacea

El arrecife de la Isla Verde se encuentra cerca de la orilla y está compuesto por gran cantidad de cuevas que sirven de refugio para las tortugas juveniles que se protegen de sus depredadores naturales. Además cuenta con hierbas marinas que sirven de alimento para el Peje Blanco *Chelonia mydas* y esponjas y crustaceos que alimentan al Carey *Eretmochelys coriacea*.



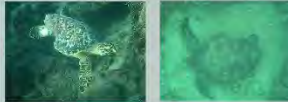
www.arrecifeislaverde.com



Desde que se designó la reserva marina establecimos un grupo tortuguero para tratar las anidaciones y la protección de las tortugas que ocupan nuestra área marina protegida. Los Tortugueros de Isla Verde realizamos patrullajes durante la temporada de anidación de las tinglars y trabajamos bajo el permiso que nos otorga el DRNA anualmente. Educamos e informamos sobre la importancia de mantener la playa oscura y el respeto que se le debe de tener a estas especies que por miles de años utilizan las playas del Archipiélago Boricua para su reproducción.



Poster presented at the Tortuguero Meeting held in Arecibo.



El Arrecife de la Isla Verde y la costa han sufrido por los pasados 73 años todo tipo de impacto, mala calidad de agua, dragados, sedimentación, construcciones costeras, contaminación lumínica, embarcaciones de motor y la pesca desmedida han sido las mayores amenazas que han sufrido nuestras tortugas marinas. A pesar de todo esto, el Arrecife de la Isla Verde sigue siendo un lugar de desarrollo y crecimiento del Carey y Chelonia en sus etapas juveniles. Lo que ha sido documentado gracias al Proyecto Carey que dirige el biólogo Carlos Diez y que desde 2016 hemos comprobado la importancia ecológica que tiene este espacio marino urbano.

PROYECTO CAREY



Durante estos 7 años hemos realizado 33 inmersiones "snorkeling" y se ha intervenido con 20 tortugas Carey (*Eretmochelys imbricata*) y 4 Pejes Blancos (*Chelonia mydas*). Nueve de éstas se han capturado; evidenciando que habitan, se alimentan y crecen protegidas en la Reserva Marina Arrecife de la Isla Verde, primera reserva marina urbana.



CONTAMINACIÓN LUMÍNICA



La contaminación lumínica es la principal amenaza al proceso de anidación en las playas urbanas de Carolina. Actualmente hay muchas propiedades privadas, calles municipales y balneario que están violando la Ley de Luminaria 218 en Clase 8. Es un problema muy dinámico, se arregla una luminaria por un lado y prenden otra más brillante, es un problema enorme por lo que agradecemos la ayuda recibida por el personal del DRNA, Nitzza Marrero y también a Jessica Castro que con el proyecto de Leatherback Habitat Restoration Project nos ayudó con los cambios de luminarias y pudimos reducir la contaminación lumínica en las playas de Isla Verde.

ANIDACIÓN DE TINGLAR



PLAYA DE ANIDACIÓN DE TORTUGAS MARINAS

SEA TURTLES NESTING BEACH

SI TIENES LLAMABA... IF YOU SEE ONE PLEASE CALL:
 Policía Municipal - (787) 254-6465
 Guardia de Vigilancia Aérea - (787) 724-7700
 WILDLIFE - Tortugueros de Isla Verde

FOR FAVOR DO NOT BE ACCROSED FOR ANY DISTURBANCE
 PLEASE KEEP THE DISTANCE AND LET THE TURTLE
 PERFORM THE NESTING PROCESS

Este año con la ayuda del Programa del Estuario colocamos 15 letreros en los diferentes accesos a las playas de Isla Verde con el propósito de educar y ofrecer los números de contactos para asistencia en caso de avistamiento de anidaciones. Las y los voluntarios nos ayudan cada año organizando y estableciendo el pasillo para que los neonatos puedan llegar al mar. Este año nos visitaron estudiantes de Vermont.



BITÁCORA TORTUGUERA 2022

Bitácora Tortuguera 2022

| Fecha | Nombre | Sexo | Especie | Estado | Observaciones |
|----------|--------|------|---------|--------|---------------|
| 1/1/2022 | ... | ... | ... | ... | ... |

Bitácora Tortuguera 2022

| Fecha | Nombre | Sexo | Especie | Estado | Observaciones |
|-------|--------|------|---------|--------|---------------|
| ... | ... | ... | ... | ... | ... |

Bitácora Tortuguera 2022

| Fecha | Nombre | Sexo | Especie | Estado | Observaciones |
|-------|--------|------|---------|--------|---------------|
| ... | ... | ... | ... | ... | ... |

Bitácora Tortuguera 2022

| Fecha | Nombre | Sexo | Especie | Estado | Observaciones |
|-------|--------|------|---------|--------|---------------|
| ... | ... | ... | ... | ... | ... |

Bitácora Tortuguera 2022

| Fecha | Nombre | Sexo | Especie | Estado | Observaciones |
|-------|--------|------|---------|--------|---------------|
| ... | ... | ... | ... | ... | ... |



SEA TURTLES

Nesting of Leatherbacks and accidents that impact protected species.

This year we documented on the two beaches of Isla Verde, 5 Green Turtles, *Chelonia mydas*, dead and all showed tumors terribly similar to fibropapillomas.



| N | Fecha de (Desove/Incidente) | Tag | Medidas | Eclósión | # Neo | Notas |
|--------------------|-----------------------------|---------------|---------|--------------------|----------------|-------------------------|
| Final De Temporada | | | | | | |
| Total de Nidos | | Tag y Medidas | | Llegadas o Muertes | Total Neonatos | Éxito de Eclósión Total |
| 4 | | 0 | | 7 | 110 | 37% |

Proyecto Carey – “Current status of turtle aggregations, Hawksbill *Eretmochelys imbricata* and Green Turtle *Chelonia mydas* in the Isla Verde Reef Marine Reserve.” - Directed by biologist Carlos Diez - DRNA.



Poster presented by biologist Carlos Diez, DRNA, at the 41st. International Sea Turtle Symposium held in March 2023 in Cartagena, Colombia.



IN-WATER SURVEYS OF SEA TURTLES AT NEARSHORE URBANIZED COASTAL AREAS, PUERTO RICO

Carlos E. Diez¹, Nilda M. Jiménez¹, Francisco “Paco” López²
¹Department of Natural and Environmental Resources of Puerto Rico, cdiez@dnra.pra.gov; njimenez@dnra.pra.gov
²Arrecifes Pro-Ciudad, Isla Verde, Carolina, Puerto Rico; arrecifes@isaverde.com

Introduction:
 Hawksbill turtles continue to be classified as critically endangered species by IUCN and in many countries, while green turtles are classified as threatened, despite the reduction of threats such as poaching, international trade and urban development. In Puerto Rico, hawksbills and green turtles have been protected since 1978 by Federal Law (US Endangered Species Act) and in 1986 by State Law (Ley de Vida Silvestre). Sea turtle nesting surveys to determine status have been conducted since 1984. In addition to nesting surveys, in-water surveys to study sea turtle aggregations of feeding grounds and developmental habitats, were conducted since 1992. Most of in-water surveys were conducted on isolated, pristine adjacent islands of Puerto Rico (i.e., Mona, Moina, Culebra Archipelago and Descartes Islands). See Figure 1.

Study sites:
 Recent in-water surveys identified other important juvenile/sub-adult sea turtle aggregations along mainland Puerto Rico. These sites are Tres Palmas Marine Reserve (Rincón), Rompeolas (Vieques) y Salinas (Cruz Bajá), Escambrón (San Juan) and Reserva Marina de Isla Verde (Carolina). Two of these sites (Rincón and Isla Verde) are protected as marine reserves. All these sites are affected due to their proximity to high-density housing, condos, hotels or other man-made infrastructure (such as piers). See Figure 1, 2, 3, 4, 5, 6.



Figure 2. Aerial photo of Escambrón, at San Juan of PR.



Figure 3. Aerial photo of Isla Verde Marine Reserve at Carolina, PR.



Figure 4. Aerial photo of Rompeolas (Mosquito Pier) at Vieques, PR.



Figure 5. Aerial photo of Punta Salinas, Cruz Bajá, PR.



Figure 6. Aerial photo of Tres Palmas Marine Reserve, Rincón, PR.



Figure 1. Map of Puerto Rico. Red dots indicate our study sites.

Objectives and Methods:
 In-water surveys were conducted at all “urban” study sites to determine sea turtle composition, structure, health, and other biological parameters. Survey methods were consistent with our work in previous years at other sites (i.e., Mona Island) with snorkeling observers recording all turtles captured and observed. Surveys are conducted for ~1-hour periods with 2-4 observers snorkeling at about 10m separation, sometimes followed at some distance by the support vessel or paddle board. Depth ranged from 3 to 15 meters. Sighted turtles are identified by species and size (green or hawksbill; male or mature male/female). A capture attempt of sighted turtles is made if deemed feasible. Any captured turtles are lifted onto the support vessel or taken ashore, and protected from the sun until the survey is completed and the turtles can be processed (tagging, measurements, health assessments). See Figure 7, 8, 9.



Figure 7. Hand captured hawksbills at Isla Verde and measuring turtles at Escambrón.



Figure 8. Releasing a hawksbill turtle at Rompeolas and hand capture of hawksbill at Tres Palmas.



Figure 9. Green turtle with a fibropapillomatosis tumor captured at Punta Salinas and several captured hawksbills at Rompeolas.

Results:
 The catch per unit of effort for each site were 1.6 hawksbill (Isla Verde); 5.4 hawksbill (Rompeolas); 5.0 hawksbill (Punta Salinas); 2.8 hawksbill (Tres Palmas); and 3.5 hawksbill (Escambrón). All turtles captured/observed at Isla Verde, and Tres Palmas were juvenile hawksbills with a size range of 24.1 cm to 61.0 cm SCL. At Escambrón and Punta Salinas, 100% of turtles caught and observed were juvenile green turtles (size range: 23.3- 46.0 cm SCL). At Rompeolas (Vieques), all turtles were caught/observed were hawksbills with a size range of 41.4 cm to 83.5 cm SCL. This site was the only one where adults were reported (3 males and 2 females). See Figure 10. All turtles captured were in good health, except green turtles from Punta Salinas, where 90% of them had fibropapillomatosis.

Table 1. Catch per unit of effort of sea turtles captured at different study sites, Puerto Rico (2020-2022).

| Location | Total Time | Total Number of Turtles | C PUE | Species |
|---------------|------------|-------------------------|-------|---------|
| Isla Verde | 22.5 | 40 | 1.77 | H.E. |
| Rompeolas | 8 | 33 | 5.375 | H.E. |
| Tres Palmas | 9 | 26 | 2.77 | H.E. |
| Escambrón | 13 | 45 | 3.46 | G.C. |
| Punta Salinas | 6 | 30 | 5 | G.C. |

Results:
 The results of these in-water surveys at “urban sites” indicated a similar or lower CPUE than other pristine sites of Puerto Rico. For example, Mona Island (4.8 turtles/hr.); Culebra Archipelago (4.1 turtles/hr.) and Descartes Islands (5.3 turtles/hr.). In addition, recapture rates at our “urban sites” ranged from 18 to 20%, compared to the “pristine” sites, which recaptured rates ranged from 54% (Mona-Island) to 62% (Culebra Archipelago).

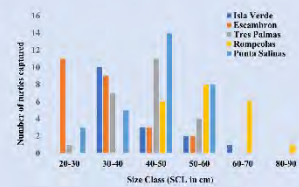


Figure 10. Size class distribution of turtles captured at different sites, Puerto Rico.

Discussion:
 Despite the proximity of urban areas and all its implications for developmental factors in habitats, these areas can be considered as important feeding and developmental habitat providing food and shelter to these aggregations. Future studies should include habitat characterization, quality, home range, habitat use, and migratory patterns. Also, management actions should be taken to improve habitat quality (Figure 11) and further threat reduction, such as habitat degradation, marine debris and incidental catch.



Figure 11. Paco Lopez collecting habitat quality data for future studies at Isla Verde Marine Reserve.

Acknowledgements:
 We would like to thank all the collaborators of this project in particular: Yafel Marrero, Amceé Tallentire, Omar Collazo, Julliane Nevares, Francisco Serrano, Josefina and Paula Diez, and many others. AIMAR for room and board during the ISTS 41. Permit numbers: USNWS 4256/4; PHDRR #2023-3-PE-1063.



With the collaboration of the San Juan Bay Estuary, we placed 15 signs at the entry points to the two beaches of Carolina, Isla Verde (west) and Isla Verde (east).



**PLAYA DE ANIDACIÓN
DE TORTUGAS MARINAS**



**SEA TURTLES
NESTING BEACH**

Si la ves LLAMA A: If you see one PLEASE CALL:
Policía Municipal - (787) 791-4468
Cuerpo de Vigilantes DRNA - (787) 724-7700
WhatsApp - Tortugueros de Isla Verde

**POR FAVOR NO TE LE ACERQUES PARA QUE PUEDA
REALIZAR EL PROCESO DE ANIDACIÓN.**
**PLEASE KEEP THE DISTANCE AND LET THE TURTLE
PERFORM THE NESTING PROCESS.**



PROJECT GRANT:
CE99206926



LIGHT POLLUTION

EL CONDOMINIO PINE GROVE PROTEGE EL HÁBITAT DE LAS TORTUGAS MARINAS

La **contaminación lumínica**, causada por el exceso de luz artificial, es un problema ambiental con graves consecuencias para la vida silvestre y la salud humana.

En el caso de las tortugas marinas, la contaminación lumínica puede afectar la reproducción de estas especies en peligro de extinción, evitando que las adultas salgan a depositar los huevos a la playa o desorientándolas en su regreso al mar luego de que ha ocurrido la anidación, o el nacimiento de las tortuguitas.

Las tortugas desorientadas, si no son rescatadas, mueren por deshidratación, accidentes, o depredación.

Esta propiedad demuestra una luminaria exterior segura para las tortugas marinas, así como otras prácticas idóneas para reducir el impacto de la contaminación lumínica en la playa, las cuales incluyen:

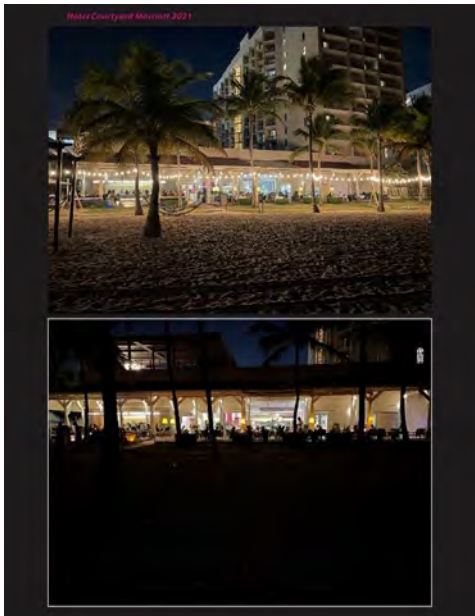
- bombillas de baja potencia (watts), poca brillantez (lumens) y con una larga longitud de onda igual o mayor a 560 nanómetros de color ambar, anaranjado, o rojo.
- lámparas que cubren la bombilla en su totalidad, orientadas hacia abajo, e instaladas lo más bajo posible.
- iluminación controlada manualmente o con horarios definidos, lo cual permite apagarlas una vez el área se desocupa.
- iluminación permanente sólo en las áreas que lo requieran por motivos de seguridad.
- reforestación con plantas costeras para reducir el alcance de la luz hacia la playa.



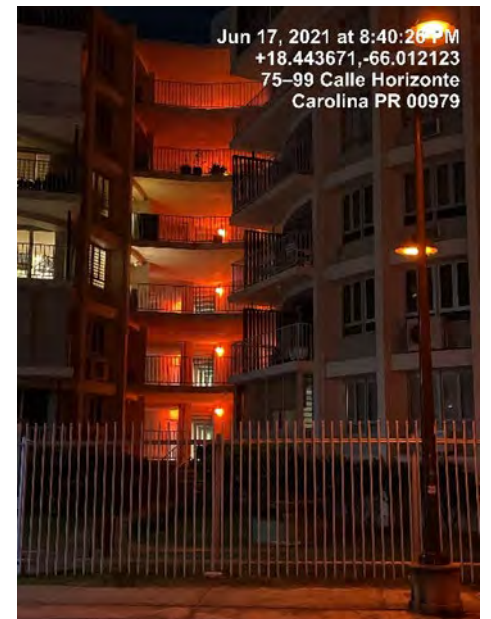
¿SABÍAS QUE AL
UTILIZAR BUENAS PRÁCTICAS
DE ILUMINACIÓN TAMBIÉN
REDUCES EL CONSUMO
DE ENERGÍA?



Para más información, síguenos en las redes sociales @leatherbackpr



Arrecifes Pro Ciudad - Tortugueros de Isla Verde have been working together with the light pollution division of the DRNA. Since 2020, the National Fisheries and Wildlife Foundation sponsors the project “[Leatherback Sea Turtle Nesting Habitat Restoration Project](#)” which allowed us to resolve several light pollution problems in the beaches of Isla Verde, but there is still a LOT to fix.



GARBAGE ON THE REEF

Thanks to the garbage collection program, on the metropolitan beaches, funded by the Tourism Company the accumulation problem is fixed, but we still always find **harmful materials** to marine systems.



Mangual Cleaning

Directed by David Pérez- ¡MUCHAS GRACIAS!



TOURISM

The beaches of Isla Verde are visited by many tourists, offering opportunities for the economic development of entrepreneurs who benefit from the coastal resource. We appreciate the participation of the Tourism Company in the Management, especially Isabel Burgos, who is a great friend of the Isla Verde Reef.





Una muestra de como se va formando y regando por la arena y agua el MICROPLÁSTICO que contamina nuestras playas.

El "Estairo FÓ" es lo próximo que debemos sacar de los anaqueles de las tiendas.

← Estas no son conchitas...

¡Eso es ESTAIRO FÓ!

¡DILE NO AL ESTAIRO FÓ!

PLAYA LIBRE DE PLÁSTICO



PLASTIC FREE BEACH

THANK YOU - GRACIAS



#watersports4u



HISTORY - to protect a place you have to know its history.

In this photo dating from 1937, we can see the enormous number of mangroves and sand dunes in what is now Boca de Cangrejos.

In 1951. They are already dredging the navigation channel in the Torrecillas Lagoon. The airport runway is being built, and much of the mangroves have been removed.

This was the first punch received by the Isla Verde Reef!



3-13-37

K 37 63

Isla Verde and
Boca de
Cangrejos in
1937

Punta
del
Medio



Photo from 1951. Notice the marked erosion that we already see in Punta del Medio in front of Isla Verde and the turbidity in the water.





East to west current



At present Boca de Cangrejos is the exit to the sea that the Estuary has at its eastern end.

WE KEEP AN EYE ON THE SEWERS



We created a graphic manual to publicize the most important infrastructure for our health, and the most ignored.

Pluvial y Sanitaria reciclando aceite de cocinar para gozar de aguas limpias y buena salud.



Manual gráfico para participar en un esfuerzo ambiental.

WATER QUALITY

We have learned that **poor water quality = Reef No. 1 threat.**

In 2018 we started the quality of the water in the Isla Verde reef area under the auspices of The Nature Conservancy. Using the multi sensor of YSI ProDSS we can collect parameters of

Temperature

Conductivity

Dissolved oxygen

PH

Turbidity

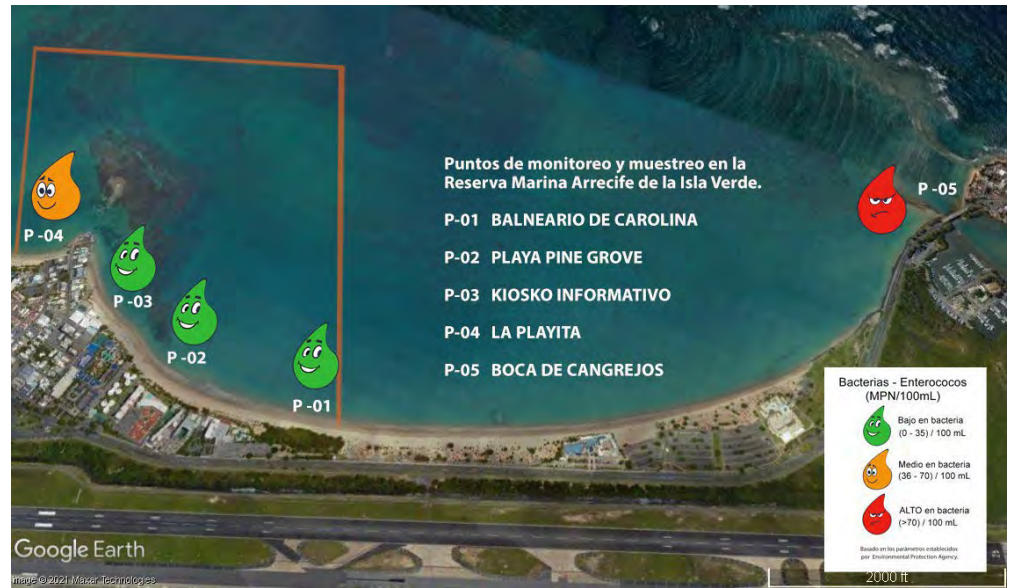
Salinity



These parameters are indicators of water quality, they tell us if a body of water is healthy or not. They all interact and have a direct relationship. **Conductivity** is the ability of positive and negative ions to conduct electricity in water. In other words, we can determine how salty the water is through conductivity. A high number of conductivity can indicate high salinity, the lower the conductivity, the sweeter the water. This measure allows us to determine if there is rainwater or runoff reaching the Reserve. This runoff water can carry contaminants such as oils and sanitary overflows. The **pH** tells us how acidic or alkaline the water can be. One of the factors that kills corals is the acidity of the water, a pH with dwindling numbers. This pH should be maintained near eight. **Dissolved oxygen** is particularly important since all species found on the reef need oxygen in the water. A body of water with a low percentage of dissolved oxygen causes mortality in fish and crustaceans. In other words, the higher the dissolved oxygen the better we are. The level of **turbidity** tells us how “opaque” the water is due to the presence of sediment and dissolved material. The reef needs clear and transparent waters. Therefore, elevated levels of turbidity are one of the greatest threats to corals. An elevated level of turbidity tells us that corals do not receive the sunlight they need.

Every Wednesday, we sample and monitor five points in the Marine Reserve

- P-01 Balneario de Carolina
- P-02 Pine Grove
- P-03 Kiosko Informativo
- P-04 Playita
- P-05 Boca de Cangrejos



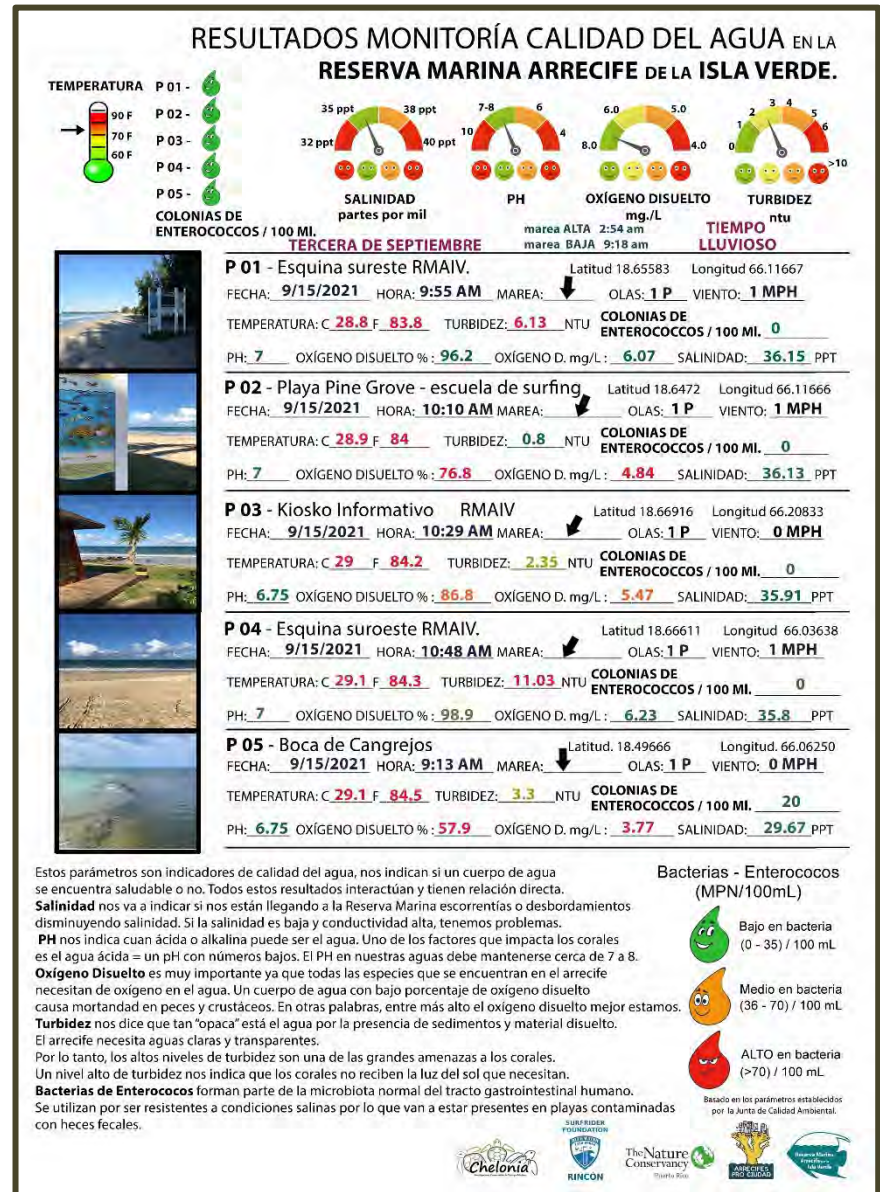
During the year 2022 we conducted 49 monitoring and sampling events.

Every Wednesday, we go to the water and on Thursday afternoons we publish the results on our page - arrecifeislaverde.com

Facebook - Arrecifes Pro Ciudad

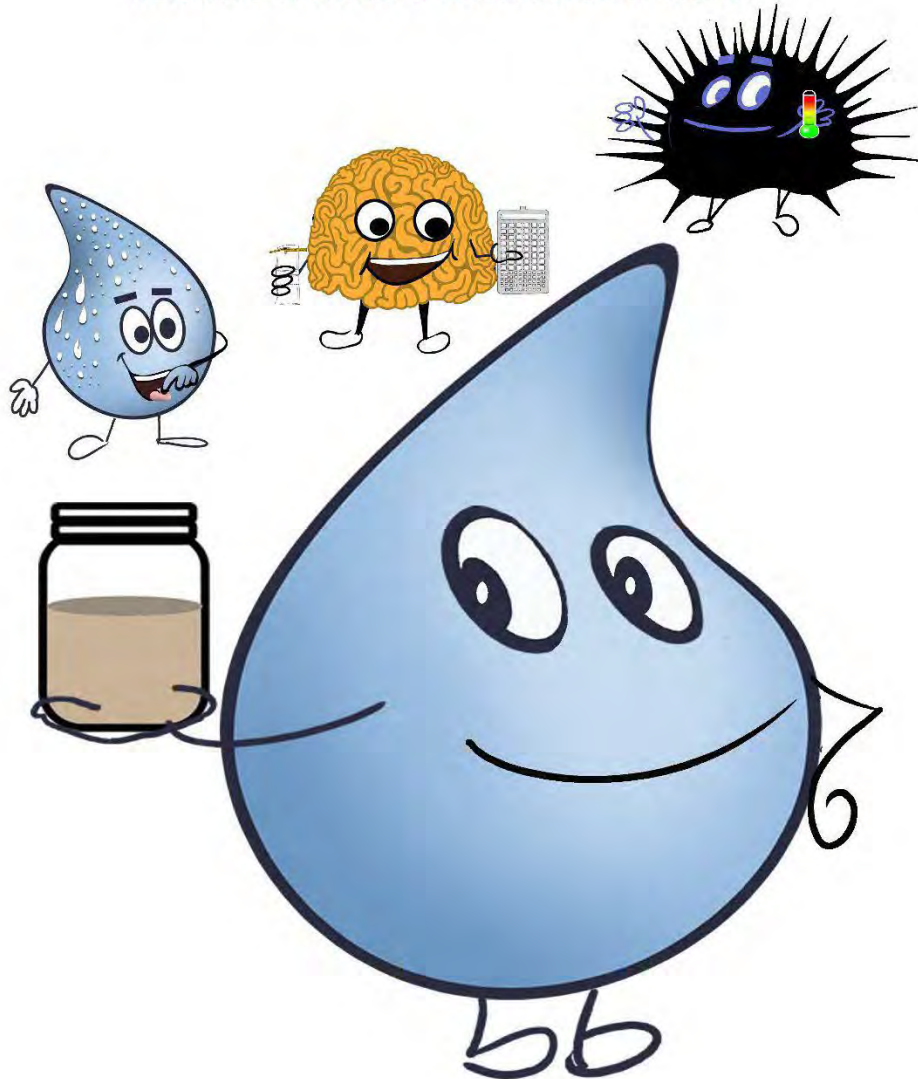
Blue Water Task Force de Surfrider Foundation.

Instagram - @arrecifesprociudad

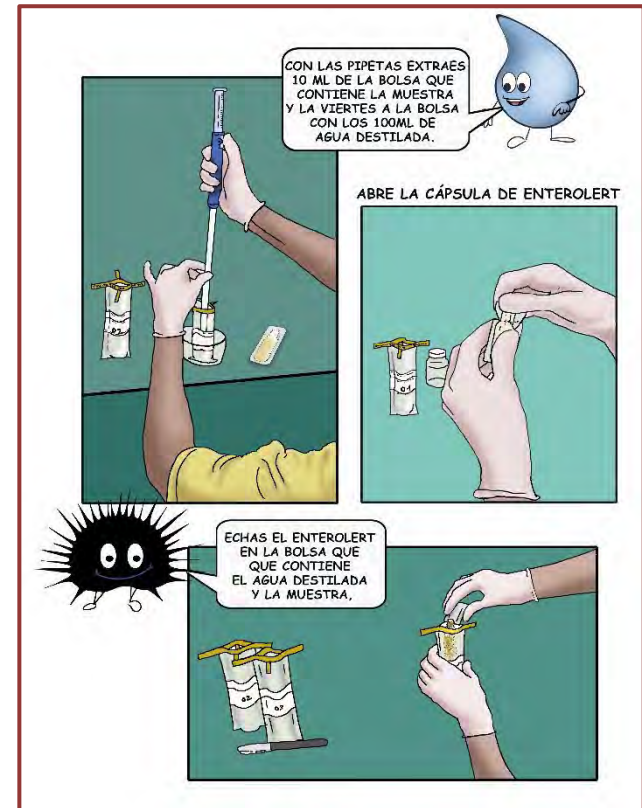


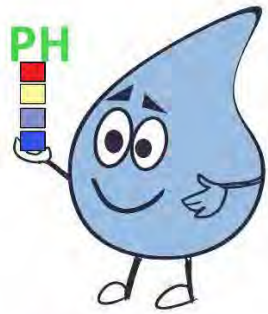
CALIDAD DEL AGUA

MANUAL GRÁFICO Y GUÍA PASO A PASO.



To enrich empathy and effectiveness of the water quality workshops we hope to raise the funds to make the graphic manual of 20 pages illustrated with the characters "Gotita", "Coralí" y "Erizo".





PH nos indica cuan ácida o alcalina puede ser el agua. Uno de los factores que impacta los corales es el agua ácida = un pH con números bajos. El PH en nuestras aguas debe mantenerse cerca de 7 a 8.



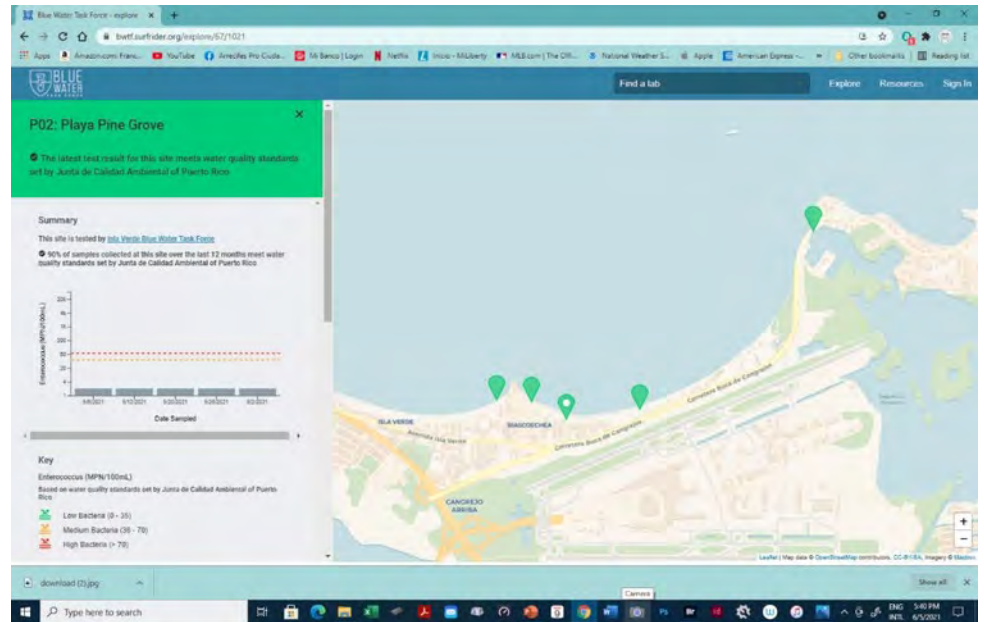
Oxígeno Disuelto es muy importante ya que todas las especies que se encuentran en el arrecife necesitan de oxígeno en el agua. Un cuerpo de agua con bajo porcentaje de oxígeno disuelto causa mortandad en peces y crustáceos. En otras palabras, entre más alto el oxígeno disuelto mejor estamos.



Turbidez nos dice que tan “opaca” está el agua por la presencia de sedimentos y material disuelto. El arrecife necesita aguas claras y transparentes. Por lo tanto, los altos niveles de turbidez son una de las grandes amenazas a los corales. Un nivel alto de turbidez nos indica que los corales no reciben la luz del sol que necesitan.



IDEXX equipment provided to us by the EPA Environmental Protection Agency, under the Region 2 Equipment Lending Program.



In mid-2020, we began the third stage of the Water Quality Program in the marine reserve. During the months of the pandemic, we took the opportunity to work on the expansion of the water quality program in the marine reserve.

We thank Ms. Rachael Leta Graham of EPA Region 2 and the Equipment Lending Program for supporting us and renewing the loan agreement for this year 2023.

In order to conduct bacteria sampling, we have a collaboration agreement with Surfrider Foundation – Rincón; in which, we at Isla Verde send our results every Thursday to the Blue Water Task Force. In return, they provide us with materials such as Enterolerts, Quantitrays, Whirlbags and Pipettes. Results are published on <https://bwtf.surfrider.org/> - every Friday.

Water Quality Workshops

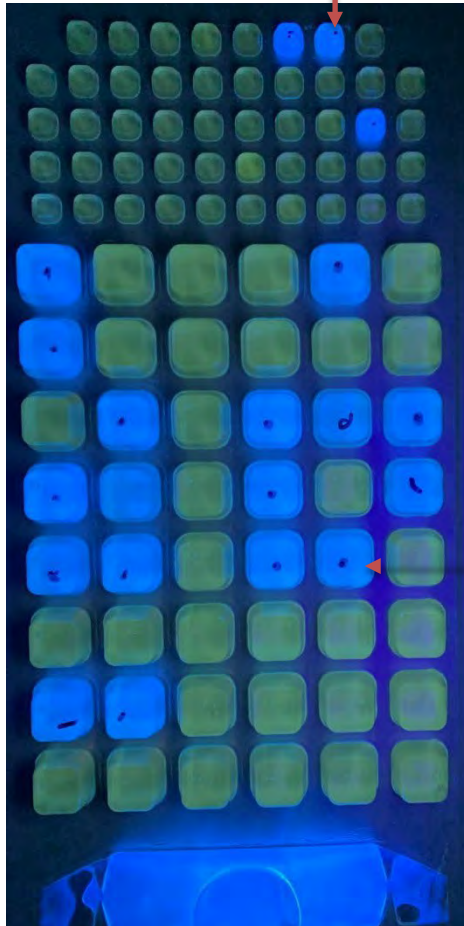
We conducted three workshops that we call "De la Playa al Laboratorio".



IDEXX SYSTEM

After 24 hours in the incubator, the blue wells are counted, they are positive for Enterococci bacteria.

POZOS PEQUEÑOS
(SMALL WELLS POSITIVE)



POZOS GRANDES
(LARGE WELLS POSITIVE)

IDEXX Quanti-Tray®/2000 MPN Table (per 100ml)

#1

| # Large Wells Positive | # Small Wells Positive | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | |
| 0 | 4.1 | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 | 11.0 | 12.0 | 13.0 | 14.1 | 15.1 | 16.1 | 17.1 | 18.1 | 19.1 | 20.2 | 21.2 | 22.2 | 23.3 | 24.3 | |
| 1 | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | 6.0 | 7.1 | 8.1 | 9.1 | 10.1 | 11.1 | 12.1 | 13.2 | 14.2 | 15.2 | 16.2 | 17.3 | 18.3 | 19.3 | 20.4 | 21.4 | 22.4 | 23.5 | 24.5 | 25.6 | |
| 2 | 2.0 | 3.0 | 4.1 | 5.1 | 6.1 | 7.1 | 8.1 | 9.2 | 10.2 | 11.2 | 12.2 | 13.3 | 14.3 | 15.4 | 16.4 | 17.4 | 18.5 | 19.5 | 20.6 | 21.6 | 22.7 | 23.7 | 24.8 | 25.9 | | |
| 3 | 3.1 | 4.1 | 5.1 | 6.1 | 7.2 | 8.2 | 9.2 | 10.3 | 11.3 | 12.4 | 13.4 | 14.4 | 15.5 | 16.5 | 17.6 | 18.6 | 19.7 | 20.8 | 21.8 | 22.9 | 23.9 | 25.0 | 26.1 | 27.1 | 28.2 | |
| 4 | 4.1 | 5.2 | 6.2 | 7.2 | 8.3 | 9.3 | 10.4 | 11.4 | 12.5 | 13.5 | 14.6 | 15.6 | 16.7 | 17.8 | 18.8 | 19.9 | 21.0 | 22.0 | 23.1 | 24.2 | 25.3 | 26.3 | 27.4 | 28.5 | 29.6 | |
| 5 | 5.2 | 6.3 | 7.3 | 8.4 | 9.4 | 10.5 | 11.5 | 12.6 | 13.7 | 14.7 | 15.8 | 16.9 | 17.9 | 19.0 | 20.1 | 21.2 | 22.2 | 23.3 | 24.4 | 25.5 | 26.6 | 27.7 | 28.8 | 29.9 | 31.0 | |
| 6 | 6.3 | 7.4 | 8.4 | 9.5 | 10.6 | 11.6 | 12.7 | 13.8 | 14.9 | 16.0 | 17.0 | 18.1 | 19.2 | 20.3 | 21.4 | 22.5 | 23.6 | 24.7 | 25.8 | 26.9 | 28.0 | 29.1 | 30.2 | 31.3 | 32.4 | |
| 7 | 7.5 | 8.5 | 9.6 | 10.7 | 11.8 | 12.8 | 13.9 | 15.0 | 16.1 | 17.2 | 18.3 | 19.4 | 20.5 | 21.6 | 22.7 | 23.8 | 24.9 | 26.0 | 27.1 | 28.3 | 29.4 | 30.5 | 31.6 | 32.8 | 33.9 | |
| 8 | 8.6 | 9.7 | 10.8 | 11.9 | 13.0 | 14.1 | 15.2 | 16.3 | 17.4 | 18.5 | 19.6 | 20.7 | 21.8 | 22.9 | 24.1 | 25.2 | 26.3 | 27.4 | 28.6 | 29.7 | 30.8 | 32.0 | 33.1 | 34.3 | 35.4 | |
| 9 | 9.8 | 10.9 | 12.0 | 13.1 | 14.2 | 15.3 | 16.4 | 17.6 | 18.7 | 19.8 | 20.9 | 22.0 | 23.2 | 24.3 | 25.4 | 26.6 | 27.7 | 28.9 | 30.0 | 31.2 | 32.3 | 33.5 | 34.6 | 35.8 | 37.0 | |
| 10 | 11.0 | 12.1 | 13.2 | 14.4 | 15.5 | 16.6 | 17.7 | 18.9 | 20.0 | 21.1 | 22.3 | 23.4 | 24.6 | 25.7 | 26.9 | 28.0 | 29.2 | 30.3 | 31.5 | 32.7 | 33.8 | 35.0 | 36.2 | 37.4 | 38.6 | |
| 11 | 12.2 | 13.4 | 14.5 | 15.6 | 16.8 | 17.9 | 19.1 | 20.2 | 21.4 | 22.5 | 23.7 | 24.8 | 26.0 | 27.2 | 28.3 | 29.5 | 30.7 | 31.9 | 33.0 | 34.2 | 35.4 | 36.6 | 37.8 | 39.0 | 40.2 | |
| 12 | 13.5 | 14.6 | 15.8 | 16.9 | 18.1 | 19.3 | 20.4 | 21.6 | 22.8 | 23.9 | 25.1 | 26.3 | 27.5 | 28.6 | 29.8 | 31.0 | 32.2 | 33.4 | 34.6 | 35.8 | 37.0 | 38.2 | 39.5 | 40.7 | 41.9 | |
| 13 | 14.8 | 16.0 | 17.1 | 18.3 | 19.5 | 20.6 | 21.8 | 23.0 | 24.2 | 25.4 | 26.6 | 27.8 | 29.0 | 30.2 | 31.4 | 32.6 | 33.8 | 35.0 | 36.2 | 37.5 | 38.7 | 39.9 | 41.2 | 42.4 | 43.6 | |
| 14 | 16.1 | 17.3 | 18.5 | 19.7 | 20.9 | 22.1 | 23.3 | 24.5 | 25.7 | 26.9 | 28.1 | 29.3 | 30.5 | 31.7 | 33.0 | 34.2 | 35.4 | 36.6 | 37.9 | 39.1 | 40.4 | 41.6 | 42.9 | 44.2 | 45.4 | |
| 15 | 17.5 | 18.7 | 19.9 | 21.1 | 22.3 | 23.5 | 24.7 | 25.9 | 27.2 | 28.4 | 29.6 | 30.9 | 32.1 | 33.3 | 34.6 | 35.8 | 37.1 | 38.4 | 39.6 | 40.9 | 42.2 | 43.4 | 44.7 | 46.0 | 47.3 | |
| 16 | 18.9 | 20.1 | 21.3 | 22.6 | 23.8 | 25.0 | 26.2 | 27.5 | 28.7 | 30.0 | 31.2 | 32.5 | 33.7 | 35.0 | 36.3 | 37.6 | 38.8 | 40.1 | 41.4 | 42.7 | 44.0 | 45.3 | 46.6 | 47.9 | 49.2 | |
| 17 | 20.3 | 21.6 | 22.8 | 24.1 | 25.3 | 26.6 | 27.8 | 29.1 | 30.3 | 31.6 | 32.9 | 34.1 | 35.4 | 36.7 | 38.0 | 39.3 | 40.6 | 41.9 | 43.2 | 44.5 | 45.9 | 47.2 | 48.5 | 49.8 | 51.2 | |
| 18 | 21.8 | 23.1 | 24.3 | 25.6 | 26.9 | 28.1 | 29.4 | 30.7 | 32.0 | 33.3 | 34.6 | 35.9 | 37.2 | 38.5 | 39.8 | 41.1 | 42.4 | 43.8 | 45.1 | 46.5 | 47.8 | 49.2 | 50.5 | 51.9 | 53.2 | |
| 19 | 23.3 | 24.6 | 25.9 | 27.2 | 28.5 | 29.8 | 31.1 | 32.4 | 33.7 | 35.0 | 36.3 | 37.6 | 39.0 | 40.3 | 41.6 | 43.0 | 44.3 | 45.7 | 47.1 | 48.4 | 49.8 | 51.2 | 52.6 | 54.0 | 55.4 | |
| 20 | 24.9 | 26.2 | 27.5 | 28.8 | 30.1 | 31.5 | 32.8 | 34.1 | 35.4 | 36.8 | 38.1 | 39.5 | 40.8 | 42.2 | 43.6 | 44.9 | 46.3 | 47.7 | 49.1 | 50.5 | 51.9 | 53.3 | 54.7 | 56.1 | 57.6 | |
| 21 | 26.5 | 27.9 | 29.2 | 30.5 | 31.8 | 33.2 | 34.5 | 35.9 | 37.3 | 38.6 | 40.0 | 41.4 | 42.8 | 44.1 | 45.5 | 46.9 | 48.4 | 49.8 | 51.2 | 52.6 | 54.1 | 55.5 | 56.9 | 58.4 | 59.9 | |
| 22 | 28.2 | 29.5 | 30.9 | 32.3 | 33.6 | 35.0 | 36.4 | 37.7 | 39.1 | 40.5 | 41.9 | 43.3 | 44.6 | 46.2 | 47.6 | 49.0 | 50.5 | 51.9 | 53.4 | 54.8 | 56.3 | 57.8 | 59.3 | 60.8 | 62.3 | |
| 23 | 29.9 | 31.3 | 32.7 | 34.1 | 35.5 | 36.9 | 38.3 | 39.7 | 41.1 | 42.5 | 43.9 | 45.4 | 46.8 | 48.3 | 49.7 | 51.2 | 52.7 | 54.2 | 55.6 | 57.1 | 58.6 | 60.1 | 61.7 | 63.2 | 64.7 | |
| 24 | 31.7 | 33.1 | 34.5 | 35.9 | 37.3 | 38.8 | 40.2 | 41.7 | 43.1 | 44.6 | 46.0 | 47.5 | 49.0 | 50.5 | 52.0 | 53.5 | 55.0 | 56.5 | 58.0 | 59.5 | 61.1 | 62.6 | 64.2 | 65.8 | 67.3 | |
| 25 | 33.6 | 35.0 | 36.4 | 37.9 | 39.3 | 40.8 | 42.2 | 43.7 | 45.2 | 46.7 | 48.2 | 49.7 | 51.2 | 52.7 | 54.3 | 55.8 | 57.3 | 58.9 | 60.5 | 62.0 | 63.6 | 65.2 | 66.8 | 68.4 | 70.0 | |
| 26 | 35.5 | 36.9 | 38.4 | 39.9 | 41.4 | 42.8 | 44.3 | 45.9 | 47.4 | 48.9 | 50.4 | 52.0 | 53.5 | 55.1 | 56.7 | 58.2 | 59.8 | 61.4 | 63.0 | 64.7 | 66.3 | 67.9 | 69.6 | 71.2 | 72.9 | |
| 27 | 37.4 | 38.9 | 40.4 | 42.0 | 43.5 | 45.0 | 46.5 | 48.1 | 49.6 | 51.2 | 52.8 | 54.4 | 56.0 | 57.6 | 59.2 | 60.8 | 62.4 | 64.1 | 65.7 | 67.4 | 69.1 | 70.8 | 72.5 | 74.2 | 75.9 | |
| 28 | 39.5 | 41.0 | 42.6 | 44.1 | 45.7 | 47.3 | 48.8 | 50.4 | 52.0 | 53.6 | 55.2 | 56.9 | 58.5 | 60.2 | 61.8 | 63.5 | 65.2 | 66.9 | 68.6 | 70.3 | 72.0 | 73.7 | 75.5 | 77.3 | 79.0 | |
| 29 | 41.7 | 43.2 | 44.8 | 46.4 | 48.0 | 49.6 | 51.2 | 52.8 | 54.5 | 56.1 | 57.8 | 59.5 | 61.2 | 62.9 | 64.6 | 66.3 | 68.0 | 69.8 | 71.5 | 73.3 | 75.1 | 76.9 | 78.7 | 80.5 | 82.4 | |
| 30 | 43.9 | 45.5 | 47.1 | 48.7 | 50.4 | 52.0 | 53.7 | 55.4 | 57.1 | 58.8 | 60.5 | 62.2 | 64.0 | 65.7 | 67.5 | 69.3 | 71.0 | 72.9 | 74.7 | 76.5 | 78.3 | 80.2 | 82.1 | 84.0 | 85.9 | |
| 31 | 46.2 | 47.9 | 49.5 | 51.2 | 52.9 | 54.6 | 56.3 | 58.1 | 59.8 | 61.6 | 63.3 | 65.1 | 66.9 | 68.7 | 70.5 | 72.4 | 74.2 | 76.1 | 78.0 | 79.9 | 81.8 | 83.7 | 85.7 | 87.6 | 89.6 | |
| 32 | 48.7 | 50.4 | 52.1 | 53.8 | 55.6 | 57.3 | 59.1 | 60.9 | 62.7 | 64.5 | 66.3 | 68.2 | 70.0 | 71.9 | 73.8 | 75.7 | 77.6 | 79.5 | 81.5 | 83.5 | 85.4 | 87.5 | 89.5 | 91.5 | 93.6 | |
| 33 | 51.2 | 53.0 | 54.8 | 56.5 | 58.3 | 60.2 | 62.0 | 63.8 | 65.7 | 67.6 | 69.5 | 71.4 | 73.3 | 75.2 | 77.2 | 79.2 | 81.2 | 83.2 | 85.2 | 87.3 | 89.3 | 91.4 | 93.5 | 95.7 | 97.8 | |
| 34 | 53.9 | 55.7 | 57.6 | 59.4 | 61.3 | 63.1 | 65.0 | 66.8 | 68.7 | 70.6 | 72.5 | 74.4 | 76.3 | 78.3 | 80.3 | 82.3 | 84.3 | 86.3 | 88.4 | 90.4 | 92.5 | 94.6 | 96.7 | 98.9 | 100.2 | 102.4 |
| 35 | 56.8 | 58.6 | 60.5 | 62.4 | 64.4 | 66.3 | 68.3 | 70.3 | 72.3 | 74.3 | 76.3 | 78.4 | 80.5 | 82.6 | 84.7 | 86.9 | 89.1 | 91.3 | 93.5 | 95.7 | 98.0 | 100.3 | 102.6 | 105.0 | 107.3 | |
| 36 | 59.8 | 61.7 | 63.7 | 65.7 | 67.7 | 69.7 | 71.7 | 73.8 | 75.9 | 78.0 | 80.1 | 82.3 | 84.5 | 86.7 | 88.9 | 91.2 | 93.5 | 95.8 | 98.1 | 100.5 | 102.9 | 105.3 | 107.7 | 110.2 | 112.7 | |
| 37 | 62.9 | 65.0 | 67.0 | 69.1 | 71.2 | 73.3 | 75.4 | 77.6 | 79.8 | 82.0 | 84.2 | 86.5 | 88.8 | 91.1 | 93.4 | 95.8 | 98.2 | 100.6 | 103.1 | 105.6 | 108.1 | 110.7 | 113.3 | 115.9 | 118.6 | |
| 38 | 66.3 | 68.4 | 70.6 | 72.7 | 74.9 | 77.1 | 79.4 | 81.6 | 83.9 | 86.2 | 88.6 | 91.0 | 93.4 | 95.8 | 98.3 | 100.8 | 103.4 | 105.9 | 108.6 | 111.2 | 113.9 | 116.6 | 119.4 | 122.2 | 125.0 | |
| 39 | 70.0 | 72.2 | 74.4 | 76.7 | 78.9 | 81.3 | 83.6 | 86.0 | 88.4 | 90.9 | 93.4 | 95.9 | 98.4 | 101.0 | 103.6 | 106.3 | 109.0 | 111.8 | 114.6 | 117.4 | 120.3 | 123.2 | 126.1 | 129.2 | 132.2 | |
| 40 | 73.8 | 76.2 | 78.5 | 80.9 | 83.3 | 85.7 | 88.2 | 90.8 | 93.3 | 95.9 | 98.5 | 101.2 | 103.9 | 106.7 | 109.5 | 112.4 | 115.3 | 118.2 | 121.2 | 124.3 | 127.4 | 130.5 | 133.7 | 137.0 | 140.3 | |
| 41 | 78.0 | 80.5 | 83.0 | 85.5 | 88.0 | 90.6 | 93.3 | 95.9 | 98.7 | 101.4 | 104.3 | 107.1 | 110.0 | 113.0 | 116.0 | 119.1 | 122.2 | 125.4 | 128.7 | 132.0 | 135.4 | 138.8 | 142.3 | 145.9 | 149.5 | |
| 42 | 82.6 | 85.2 | 87.8 | 90.5 | 93.2 | 96.0 | 98.8 | 101.7 | 104.6 | 107.6 | 110.6 | 113.6 | 116.9 | 120.1 | 123.4 | 126.7 | 130.1 | 133.6 | 137.2 | 140.8 | 144.5 | 148.3 | 152.2 | 156.1 | 160.2 | |
| 43 | 87.6 | 90.4 | 93.2 | 96.0 | 99.0 | 101.9 | 105.0 | 108.1 | 111.2 | 114.5 | 117.8 | 121.1 | 124.6 | 128.1 | 131.7 | 135.4 | 139.1 | 143.0 | 147.0 | 151.0 | 155.2 | 159.4 | 163.8 | 168.2 | 172.8 | |
| 44 | 93.1 | 96.1 | 99.1 | 102.2 | 105.4 | 108.6 | 111.9 | 115.3 | 118.7 | 122.3 | 125.9 | 129.6 | 133.4 | 137.4 | 141.4 | 145.5 | 149.7 | 154.1 | 158.5 | 163.1 | 167.9 | 172.7 | 177.7 | 182.9 | 188.2 | |
| 45 | 99.3 | 102.5 | 105.8 | 109.2 | 112.6 | 116.2 | 119.8 | 123.6 | 127.4 | 131.4 | 135.4 | 139.6 | 143.9 | 148.3 | 152.9 | 157.6 | 162.4 | 167.4 | 172.6 | 178.0 | 183.5 | 189.2 | 195.1 | 201.2 | 207.5 | |
| 46 | 106.3 | 109.8 | 113.4 | 117.2 | 121.0 | 125.0 | 129.1 | 133.3 | 137.6 | 142.1 | 146.7 | 151.5 | 156.5 | 161.6 | 167.0 | 172.5 | 178.2 | 184.2 | 190.4 | 196.8 | 203.5 | 210.5 | 217.8 | 225.4 | 233.3 | |
| 47 | 114.3 | 118.3 | 122.4 | 126.6 | 130.9 | 135.4 | 140.1 | 145.0 | 150.0 | 155.3 | 160.7 | 166.4 | 172.3 | 178.5 | 185.0 | 191.8 | 198.9 | 206.4 | 214.2 | 222.4 | 231.0 | 240.0 | 249.5 | 259.5 | 270.0 | |
| 48 | 123.9 | 128.4 | 133.1 | 137.9 | 143.0 | 148.3 | 153.9 | 159.7 | 165.8 | 172.2 | 178.9 | 186.0 | 193.5 | 201.4 | 209 | | | | | | | | | | | |

Scientific Research

Tissue loss disease in hard corals and antibiotic treatment under the direction of biologist Nilda Jiménez of the DRNA. In the Isla Verde reef, from 2021 to the present, treatment has been applied to 450 colonies. This includes colonies that have been treated more than once. There have been 28 visits to treat the disease.

The limitations being the maritime conditions. This is a beach with high waves, we work when the sea allows us.

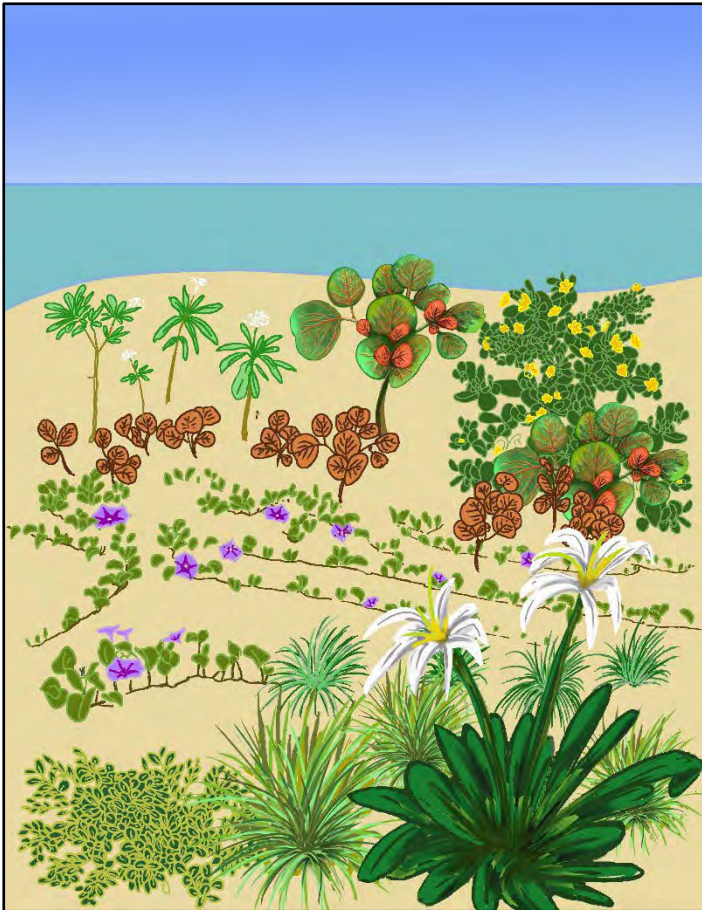


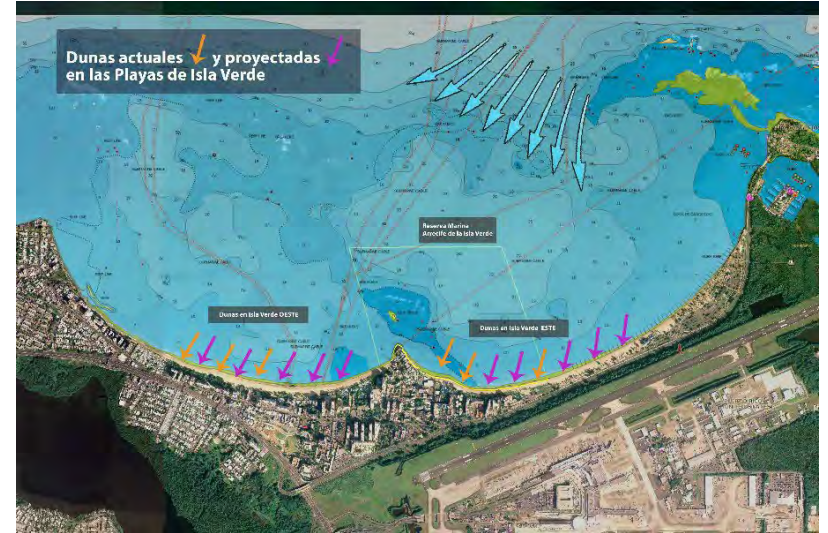
- Also, the reef has ideal conditions to train new volunteers (shallow waters, reef close to the shore and easy access to the beach).



URBAN DUNES RESTORATION = sand is GOLD.

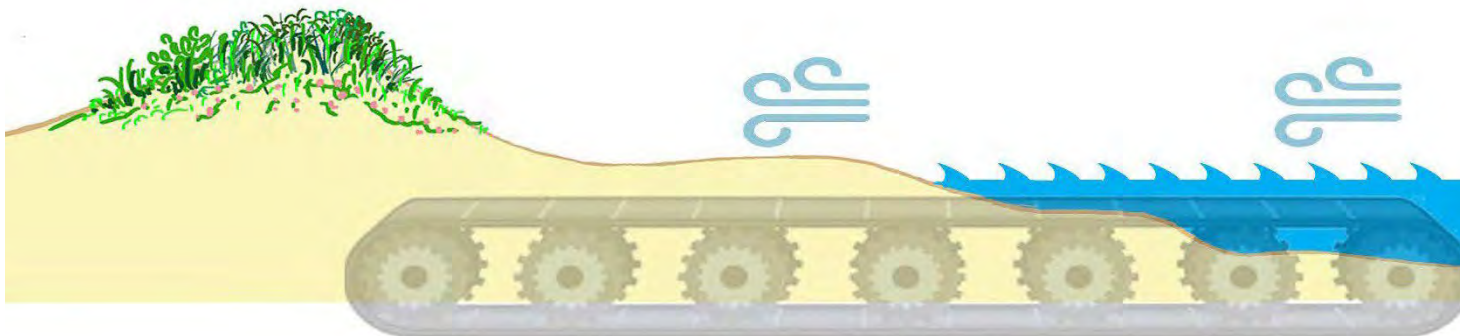
We continue the maintenance, reseedling and removal of invasive species in the dunes established on Pine Grove Beach. We hope that the dune restoration initiative will continue to be repeated on the beaches of Carolina, protecting our lives and property.





The restoration of natural infrastructure initiates the processes of adaptation to Climate Change.

When insurance companies no longer want to cover properties on the coast, natural barriers will help depending on the beach.



The currents bring the sediment to the shore, the wind is accumulating it on the beach forming sand dunes and vegetation retains it.

Informe Financiero



Presented by Ricardo Lugo -
Treasurer Arrecifes Pro Ciudad Inc.

Arrecifes Pro Ciudad Inc., organized under the laws of Puerto Rico on August 27, 2009. Registered with the Department of State of Puerto Rico under number 58487 as a non-profit corporation. Its purpose is the protection and restoration of the urban reefs of the metropolitan coast. The corporation maintains a Collaboration Agreement with the Department of Natural and Environmental Resources for the management of the Isla Verde Reef Marine Reserve. The Reserve is created by Act No. 274 of 26 September 2012. Arrecifes Pro Ciudad, Inc. is exempt from contributions in Puerto Rico (USA) (Sec. 1101.01; INTERNAL REVENUE CODE FOR A NEW PUERTO RICO Law No. 1 of 31 January 2011, as amended as of August 23, 2017) and obtained 501(c)(3) designation by the IRS.



Arrecifes Pro Ciudad, Inc. 2022

Balance Sheet

| Assets | | |
|---|----------------------|---------------------|
| Current assets: | Previous Year | Current Year |
| Cash | 10,272.20 | 4,505.96 |
| Grants | 1,500.00 | 1,570.00 |
| Service Contracts | 6,000.00 | 11,950.00 |
| Sponsors | 4,615.00 | 2,324.00 |
| Pre-paid expenses | - | - |
| Other | - | - |
| Total current assets | 22,387.20 | 20,349.96 |
| Fixed assets: | Previous Year | Current Year |
| Property and equipment | - | - |
| Leasehold improvements | - | - |
| Equity and other investments | - | - |
| Less accumulated depreciation | - | - |
| Total fixed assets | - | - |
| Other assets: | Previous Year | Current Year |
| Goodwill | - | - |
| Total other assets | - | - |
| Total assets | 22,387.20 | 20,349.96 |
| Liabilities and owner's equity | | |
| Current liabilities: | Previous Year | Current Year |
| Accounts payable | | |
| Operations | 3,144.00 | 4,199.00 |
| Water Quality Program | 5,378.31 | 1,832.43 |
| Cooking Oil Recycling Initiative | 6,559.47 | 1,960.00 |
| Marine Reserve Program | 3,234.05 | 6,806.47 |
| Sea Turtle Conservation Program | 62.24 | 99.00 |
| Total current liabilities | 18,378.07 | 14,896.90 |
| Long-term liabilities: | Previous Year | Current Year |
| Mortgage payable | - | - |
| Total long-term liabilities | - | - |
| Owner's equity: | Previous Year | Current Year |
| Investment capital | 4,009.13 | 5,453.06 |
| Accumulated retained earnings | - | - |
| Total owner's equity | 4,009.13 | 5,453.06 |
| Total liabilities and owner's equity | 22,387.20 | 20,349.96 |
| Balance | (0.00) | 0.00 |

ACTIVITIES 2022

- Water Quality Workshops
- Talks for surfers
- Beach Cleaning
- Dune maintenance
- Sand Workshop.
- 10th Anniversary

**ANIVERSARIO
RESERVA MARINA
ARRECIFE DE LA ISLA VERDE**

SÁBADO 15 DE OCTUBRE 2022
EN EL KIOSKO INFORMATIVO DE LA RESERVA MARINA

Actividad Diurna
8 am a 11 am
Breve charla de las labores realizadas este año, sembraremos plantas playeras y tendremos un recorrido por las dunas a cargo de Marcos Pérez Rámirez.

Actividad Nocturna
7 pm en adelante.
Compartir Playero celebrando 10 años de grandes logros, aprendizaje y protección del Arrecife de la Isla Verde. Ven y acompañanos y se parte de este esfuerzo.



Sand Workshop by Professor Lesbia Montero at COPI learning about the different sands of the Puerto Rican Archipelago. Thank you very much to Lesbia, Maricruz Rivera Clemente, and all the attendees!

TALLER DE ARENAS
EN LA
**RESERVA MARINA
ARRECIFE DE LA ISLA VERDE**
presentado por la profesora bióloga
Lesbia Montero
sábado 30 de julio a las 9:00 am.
en **COPI Corporación Piñones se Integra**
Google Maps - COPI - <https://goo.gl/maps/NhP5MKicwof3pbjX7>



CUPO MÁXIMO 20 PERSONAS RESERVA TU ESPACIO
Organizado por Arrecifes Pro Ciudad - **USO DE MASCARILLA OBLIGATORIO**
Confirma **ESCRIBIENDO** a arrecifeislaverde@gmail.com



A decorative border surrounds the central text, featuring a repeating sequence of marine life icons: a starfish, a fish, a five-pointed star, a conch shell, a scallop, a sea turtle, and a starburst. The icons are rendered in a light, textured style against a white background.

Isla Verde Marine
Reserve

2023

TASKS

We continue our compromise to protect and manage the Reserve:

- **Finalize the Management Plan with DNER.**
 - **Continue the action plan outlined in the management plan.**
- Enforce the rules protecting the Marine Reserve.
- Educate about natural resources in an urban setting.
- Buoy installation in the Reserve perimeter.
- Monitor Isla Verde beach Leatherback nesting season.
- Report light pollution violations which hamper the nesting of sea turtles.
- Conduct sand dune restoration, micro-plastic pollution coastal workshops.
- Recruitment of volunteers to staff the information kiosk.
- Sea Turtle population in the reef.
- Monitoring coastal erosion.
- Water Quality Program and the workshops for volunteers.



We hope this year the Department of Natural and Environmental Resources will conclude the Management Plan that has been in the final draft since 2015. The management plan of the marine reserve is fundamental because the study will determine the final rules to protect and restore the area. We are following the action plan outlined in the draft document.



Re-installation of the buoys delimiting the perimeter of the Isla Verde Reef Marine Reserve.

Localización de boyas de delimitación en la Reserva Marina de Isla Verde



Imagen 2007.



Water quality, a priority issue: Num. 1-A



This year we will continue with the water quality workshops for volunteers in the Marine Reserve and weekly we will be reporting and publishing the results every Thursday on arrecifeislaverde.com

Scanning the QR Code will give you the result of the latest quality monitoring of water for that beach.

The report is posted on Facebook Instagram @ Arrecifes Pro Ciudad



One year study conducted by the USGS in Isla Verde.







Trabajo del USGS en Puerto Rico (2022)

Monitoreo de Playas con CoastCam

El Servicio Geológico de los Estados Unidos (USGS, por sus siglas en inglés) instaló sistemas de cámaras en Puerto Rico que producen estimaciones por hora de los niveles de agua de la costa influenciados por vientos, olas y mareas, así como imágenes de los cambios costeros resultantes. Las cámaras de video remotas son herramientas poderosas que pueden monitorear continuamente largos tramos de la costa. Cada píxel de las imágenes proporciona información útil para probar y mejorar los pronósticos de los niveles de agua en la costa y la erosión. Estas herramientas de pronóstico están disponibles a lo largo de 3,000 millas de playas de los Estados Unidos y las comunidades pueden utilizarlas para identificar la vulnerabilidad de las costas locales a las inundaciones y la erosión debido a tormentas. Los resultados de este estudio se incluirán en informes públicos y artículos científicos, y todos los datos y pronósticos estarán disponibles en línea para el público.

Ver Imágenes




Dorado
Isla Verde

Contactos

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U.S. Department of the Interior
U.S. Geological Survey

Datos de Dorado: cmgds.marine.usgs.gov/data/dorado/
 Datos de Isla Verde: cmgds.marine.usgs.gov/data/islaverde/







Trabajo del USGS en Puerto Rico (2022)

Boya de Oleaje

El Servicio Geológico de los Estados Unidos (USGS, por sus siglas en inglés) desplegó boyas de olas y sensores de presión en Puerto Rico para desarrollar herramientas de pronóstico para los niveles de agua en la costa y el potencial de erosión durante tormentas. Estos productos están disponibles para 3,000 millas de la costa de los Estados Unidos y se pueden acceder a través del Portal de Riesgos por Cambios Costeros (marine.usgs.gov/coastalchange/hazardportal/) y el Visualizador de Nivel de Agua Total y de Pronósticos de Cambios Costeros (coastal.er.usgs.gov/hurricanes/investigación/twiviewer/). El USGS está desarrollando pronósticos para la costa de Puerto Rico para ayudar a mejorar la planificación y preparación en áreas propensas a peligros costeros. El despliegue de este instrumento permitirá a las comunidades acceder a las condiciones del océano en tiempo real, como lo son la altura, el período y la dirección de las olas y los niveles de agua.

Boya Spotter + Sensor de Presión

Spotter es una boya desarrollada por Sofar Ocean del tamaño de una pelota de baloncesto que recopila mediciones de olas, viento, temperatura de la superficie del mar y presión barométrica y transmite los datos a la internet en tiempo real, donde el público puede verlos. Se puede conectar a un dispositivo Smart Mooring con sensores de temperatura y presión cerca del fondo marino. Los sensores de presión miden los cambios en el nivel del agua influenciados por las mareas y las marejadas ciclónicas.

Contactos

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Ver Datos




Dorado
Isla Verde

U.S. Department of the Interior
U.S. Geological Survey

Datos de Dorado: cmgds.marine.usgs.gov/data/dorado/
 Datos de Isla Verde: cmgds.marine.usgs.gov/data/islaverde/



Bright / Brillante





We need volunteers who want to attend the Information Kiosk on weekends. Students can count them as green hours. They can write to arrecifeislaverde@gmail.com. For these purposes they will be given an educational talk about the component of the Reef and the meaning of a marine reserve.

Sponsors

Lic. Juan Carlos Stolberg

Christopher Krzoska & Family



Cámara para la Reserva Marina Arrecife de la Isla Verde

¡NECESITAMOS TU AYUDA!

Para instalar una cámara en VIVO que transmita 24/7 y que puedas ver las condiciones del mar en el Arrecife de la Isla Verde desde tu casa o celular.

SE PARTE DE ESTE ESFUERZO HAZ TU DONATIVO



Arrecifes Pro Ciudad, Inc., is a non-profit company exempt from contributions in Puerto Rico (USA) and the United States. (Sec. 1101.01; INTERNAL REVENUE CODE FOR A NEW PUERTO RICO Law No. 1 of January 31, 2011, as amended as of August 23, 2017) (26 Code of Federal Regulation, Internal Revenue Service, Sec. 501(c)(3) amended 1986). You can send a check payable to Arrecifes Pro Ciudad - 6981 Carr. 187 Apt. 11 A Carolina, PR 00979

Visit arrecifeislaverde.com , and through PayPal you can contribute to the Water Quality program of the Isla Verde Reef Marine Reserve, THANK YOU VERY MUCH!!!



To access our site
arrecifeislaverde.com



Management Board Isla Verde Reef Marine Reserve

Álida Ortiz
Nilda Jiménez
Carlos Diez
Yazmín Solla
Isabel Burgos
Annette Tolentino
Alberto Pérez
Marcos Pérez
Ricardo Lugo
Kenny Pastor
Carlos Félix
Robert Matos
Paco López



¡Muchas gracias!



www.arrecifeislaverde.com

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VIDEOS- YouTube canal-Arrecife Isla Verde.