



Impact of Hurricane Maria on sea turtles nesting activity in Puerto Rico

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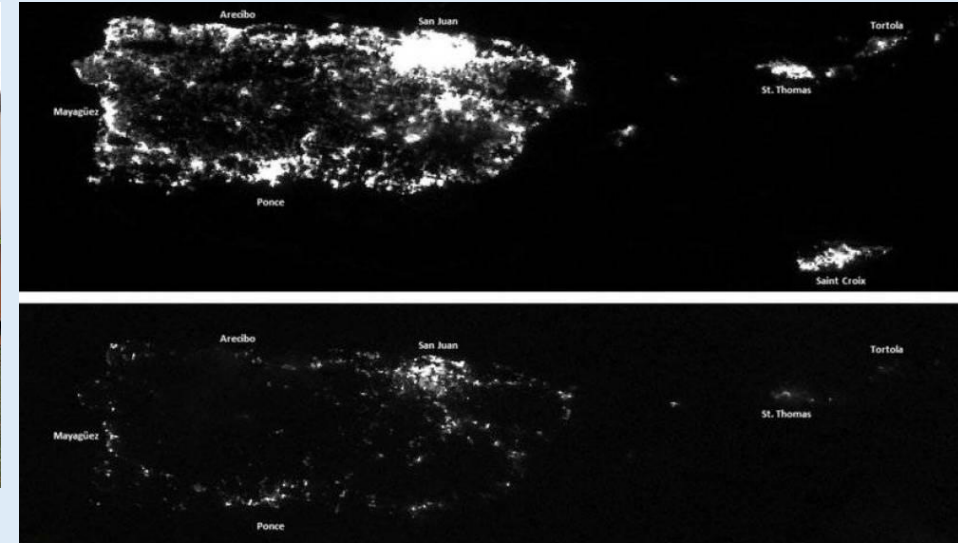




September 20, 2017



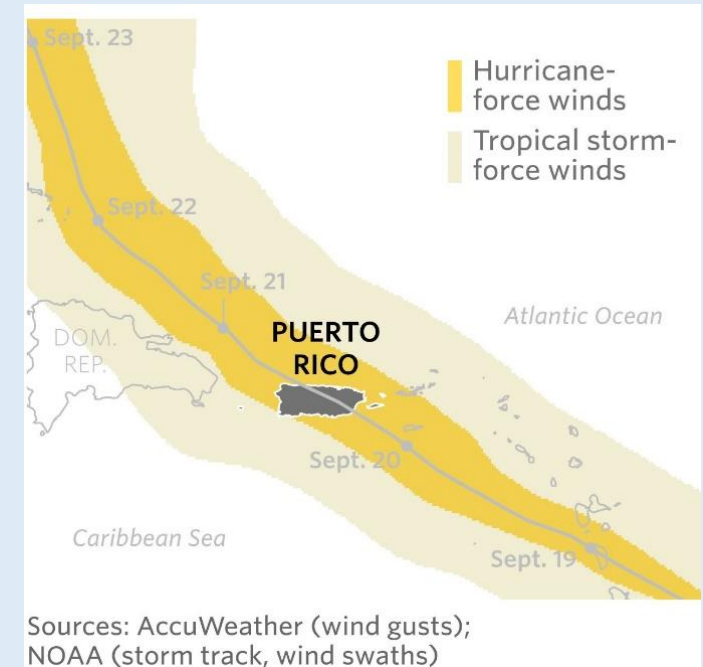
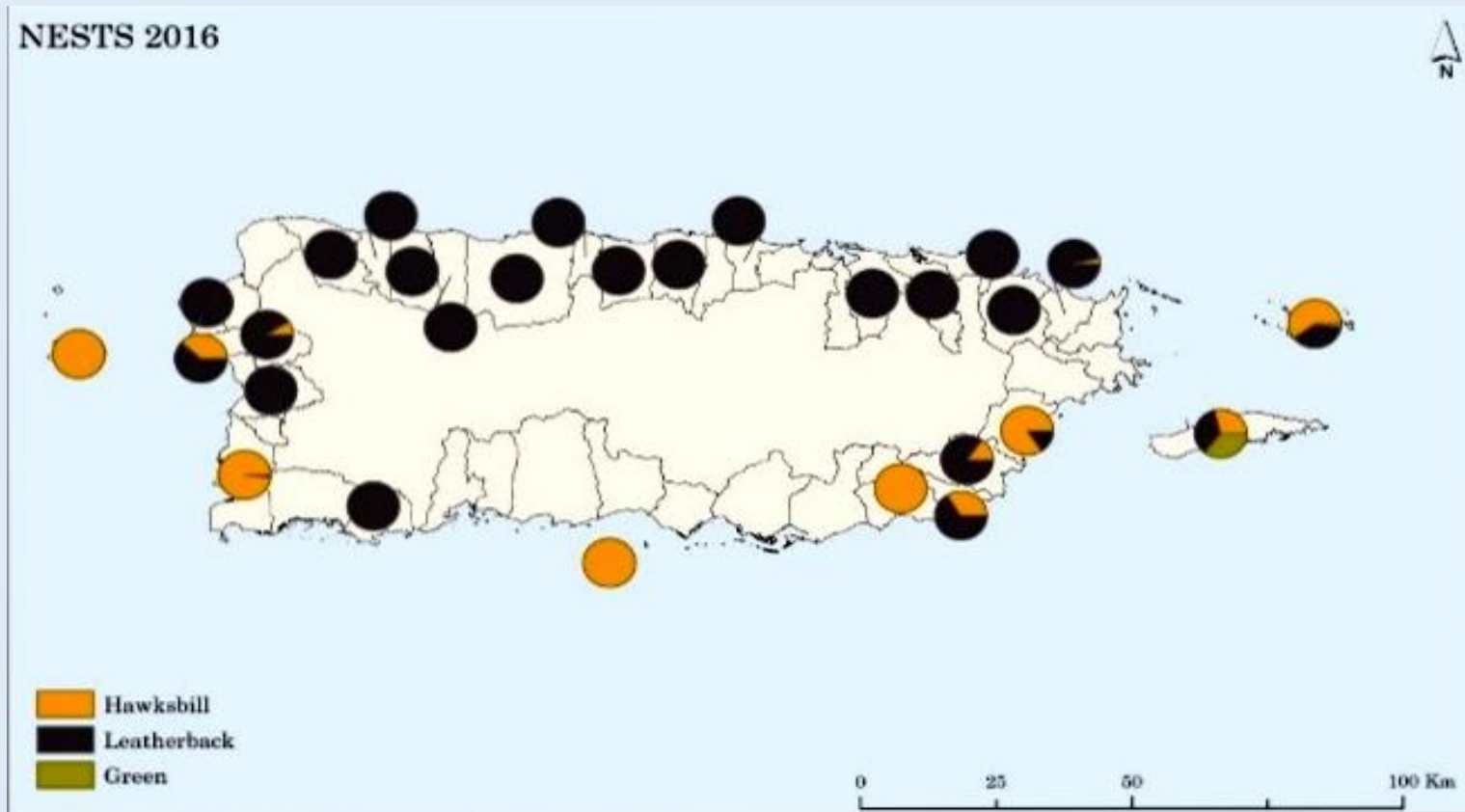
New way of life



Three weeks later, the support and relief came in different ways..



Nesting distribution of hawksbills, green and leatherback turtles in Puerto Rico during 2016.



Objectives and methods:

1) Damage assessment:

Nests loss –Local project leaders were visited to collect the information on active nests before and after hurricanes, and photographs showing the condition of the beaches few days after these catastrophic events. Nest loss were estimated as the total number of active nests during the hurricanes that did not hatch, or no evidence of hatchling was found after hurricanes.

Vegetation loss and debris accumulation – Beaches were visited to calculate the percentage of the beach that lost vegetation, and the percentage of the beach occupied by storm debris using four ranges (0-25%, 25-50%, 50-75%, 75-100%). These data was corroborated with aerial photographs collected by NOAA after hurricane Maria (<https://storms.ngs.noaa.gov/storms/maria/index>).

Heavy equipment to remove debris from the beach–Regular visits were conducted to monitor if heavy equipment was being used in nesting beaches in accordance with the Department of Natural and Environmental Resources (DNER) regulations. In those beaches where heavy equipment was used to remove debris with the allowance of DNER, existing nests were clearly marked with large buffer areas and with highly visible tape to be easily observed by heavy equipment operators. Debris within the marked buffer of a nest were removed by hand following the DNER sea turtles management protocol. In those nesting beaches where heavy equipment was used to remove debris without permits from DNER, the activity was immediately stopped and fines were assigned if needed.

Other parameters- Additional data was collected on the beach such as stray dogs presence, erosion, type of protection, urban area, roads parallel to the beach, and nest relative abundance (including all sea turtle species).

Methods and objectives:

1) Restoration activities:

Reforestation—Coastal vegetation will be planted in nesting beaches with highest percentages of erosion. A candidate species for planting includes the sea grape (*Cocoloba uvifera*), which is a native and fast-growing species, very common in coastal habitats of Puerto Rico. Furthermore, this is a suitable tree species used by hawksbill sea turtles in Mona Island Natural Reserve. The greenhouse of the DNER will provide the saplings that will be used for planting following the recommendations of the agency's botanist.

Debris removal—Debris will be classified as artificial (e.g., cement structures) or natural (vegetation). Artificial debris and natural debris reducing the area available for nesting will be removed from the beach using chainsaws and heavy equipment if needed. Natural debris not affecting the nesting area will be left on the beach to allow the sand to accumulate, and decelerate the process of erosion and promote natural reforestation (seeds germination, seedling establishment, and growth).

Mitigate light pollution and prevent access to roads—We will reduce the impact of light pollution by replacing conventional lights by wildlife-approved lights (“turtle friendly lights”), and by re-directing other sources of direct light that could be disorienting sea turtles. Wildlife-friendly lights have already been used in Puerto Rico to prevent sea turtles disorientation. We will take advantage of the many trees that have fallen down to construct a natural barrier to direct nesting and hatchling sea turtles away from landward hazards.

Remove and control stray dogs and invasive vegetation— Stray dogs will be trapped and brought to local shelters as done before, while invasive saplings will be manually removed.

Objectives and methods:

Matrix was created to prioritize beaches in need of rapid mitigation and restoration

Eleven index beaches were evaluated including all nesting species

Parameters: total number of nests, nesting relative abundance (%), nests loss, debris in %

Vegetation loss (%), stray dogs, near urban area, light pollution, beach designation, public road and access,

Beach erosion (%).

Yabucoa

Damage assessments:
Preliminary results

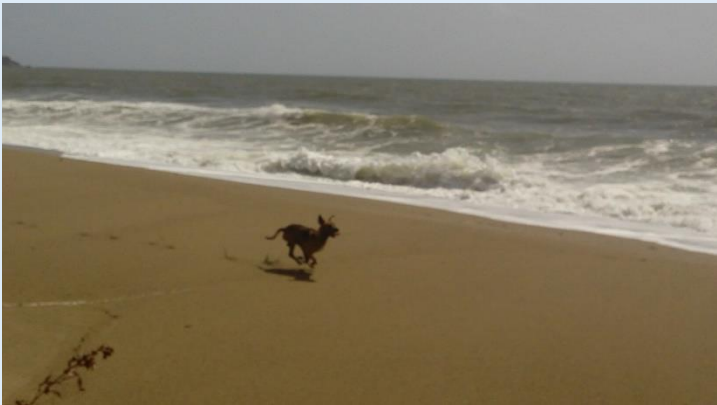


Municipality	Beach	Total nests hawksbill (#)	Total nests leatherback(#)	Total nests green (#)	Grand Total	Nests relative abundance (%)	Nests loss* (#)	Nests loss* (%)	Debris (%)	Vegetation loss (%)	Stray Dogs (#)	Urban area (%)	Light pollution	Not Protected	Road	Erosion %
Yabucoa	Cocal	10	121	2	133	7	3	30	0	100	0	25	25	100	0	40

Maunabo

Damage assessments:

Preliminary results



Municipality	Beach	Total nests hawksbill (#)	Total nests leatherback(#)	Total nests green (#)	Grand Total	Nests relative abundance (%)	Nests loss* (#)	Nests loss* (%)	Debris (%)	Vegetation loss (%)	Stray Dogs (#)	Urba area (%)	Light pollutio n	Not Protect ed	Road	Erosion %
Maunabo	California	83	180	10	273	16	50	60	10	90	1	20	25	25	25	40

Patillas



Damage assessments:

Preliminary results

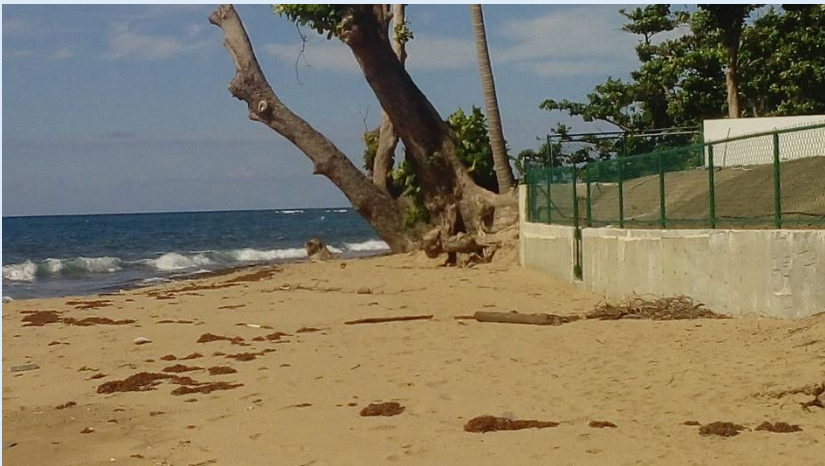


Municipality	Beach	Total nests hawksbi ll (#)	Total nests leatherback(#)	Total nests green (#)	Grand Total	Nests relative abundance (%)	Nests loss* (#)	Nests loss* (%)	Debris (%)	Vegetation loss (%)	Stray Dogs (#)	Urban area (%)	Light pollution	Not Protected	Road	Erosion %
Patillas	Guardarra ya	119	0	1	120	6	52	44	50	90	4	100	100	100	100	11

Rincon

Damage assessments:

Preliminary results



Municipality	Beach	Total nests hawksbill (#)	Total nests leatherback (#)	Total nests green (#)	Grand Total	Nests relative abundance (%)	Nests loss* (#)	Nests loss* (%)	Debris (%)	Vegetation loss (%)	Stray Dogs (#)	Urban area (%)	Light pollution	Not Protecte d	Road	Erosion %
Rincon	Tres Palmas	13	9	0	22	1	4	31	0	50	2	75	25	100	20	50

Dorado

Damage assessments:

Preliminary results



Municipality	Beach	Total nests hawksbill (#)	Total nests leatherback(#)	Total nests gree n (#)	Grand Total	Nests relative abundance (%)	Nests loss* (#)	Nests loss* (%)	Debris (%)	Vegetation loss (%)	Stray Dogs (#)	Urban area (%)	Light pollution	Not Protected	Road	Erosion %
Dorado	Unico El	2	182	4	188	11	0	0	80	10	4	0	11	0	100	100

Culebra

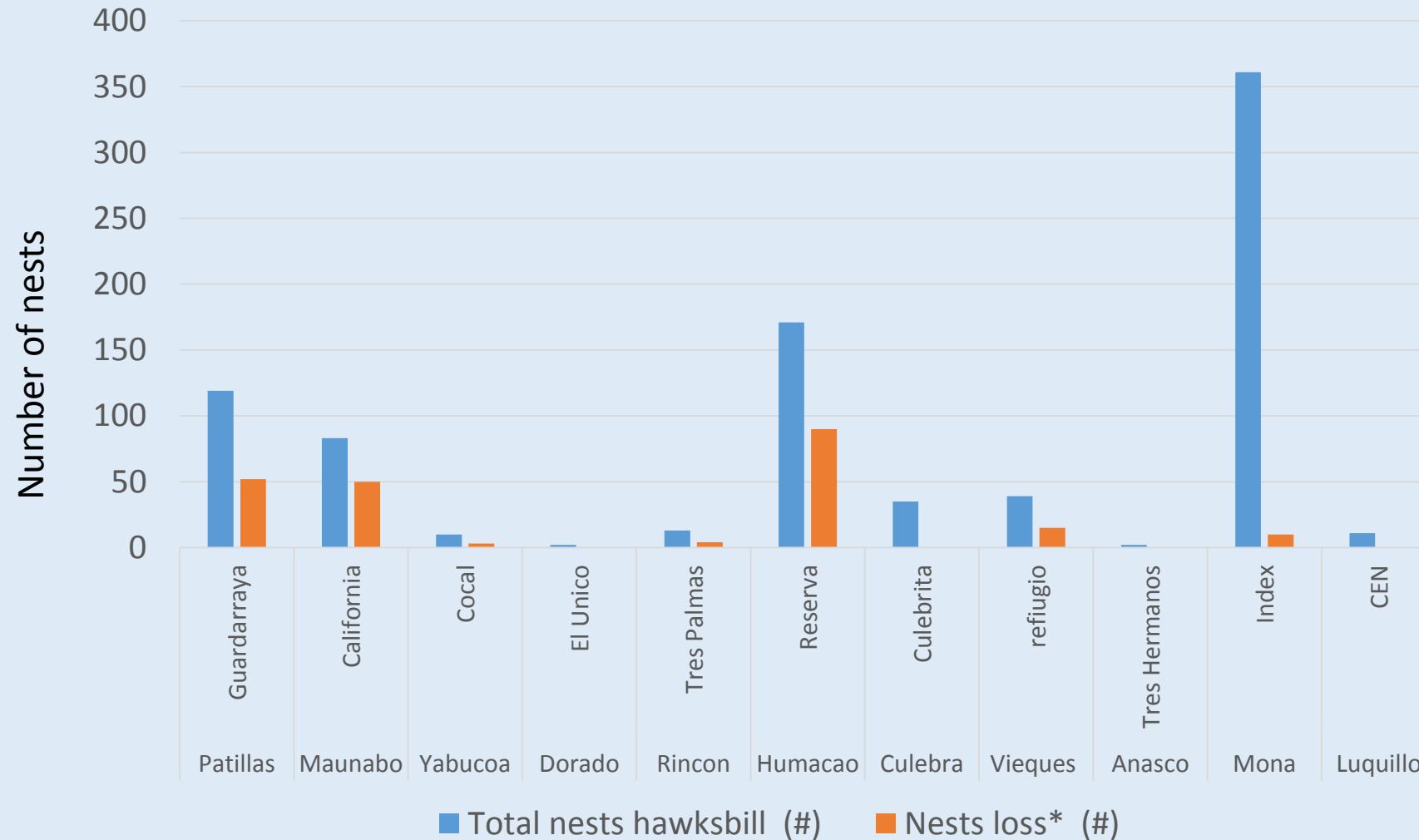
Damage assessments:

Preliminary results



Beach	Total nests hawksbill (#)	Total nests leatherback (#)	Total nests green (#)	Grand Total	Nests relative abundance (%)	Nests loss* (#)	Nests loss* (%)	Debris (%)	Vegetation loss (%)	Stray Dogs (#)	Urban area (%)	Light pollution	Not Protected	Road	Erosion %
Culebrita	35	2	0	37	4	0	0	0	3	0	0	0	0	0	0

Preliminary conclusions:



Number of hawksbill nests affected by Hurricane Maria on important sea turtle nesting beaches, September 20, 2017. Total nests lost: 224 (24%). Without Mona Island: 54% nests lost of the total season.

Preliminary conclusions:

Preliminary matrix to prioritize restoration needs for important sea turtle nesting beaches at Puerto Rico, November 2017

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Preliminary conclusions:

- Coastal development is the major threat for sea turtle nesting habitat





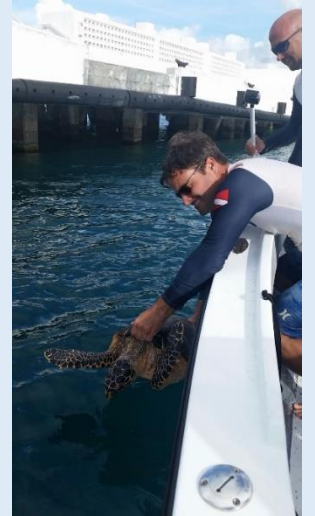
Preliminary conclusions:

-Hawksbill turtles are known to be resilient to hurricanes and other natural events; but its recovery can be hampered due to habitat loss and degradation caused by anthropogenic actions



Other assessments:

Index feeding grounds and/or developmental areas for marine turtles
in Puerto Rico



Mona



Desecheo



Tres Palmas



Isla Verde



Culebra



Vieques



Escambron

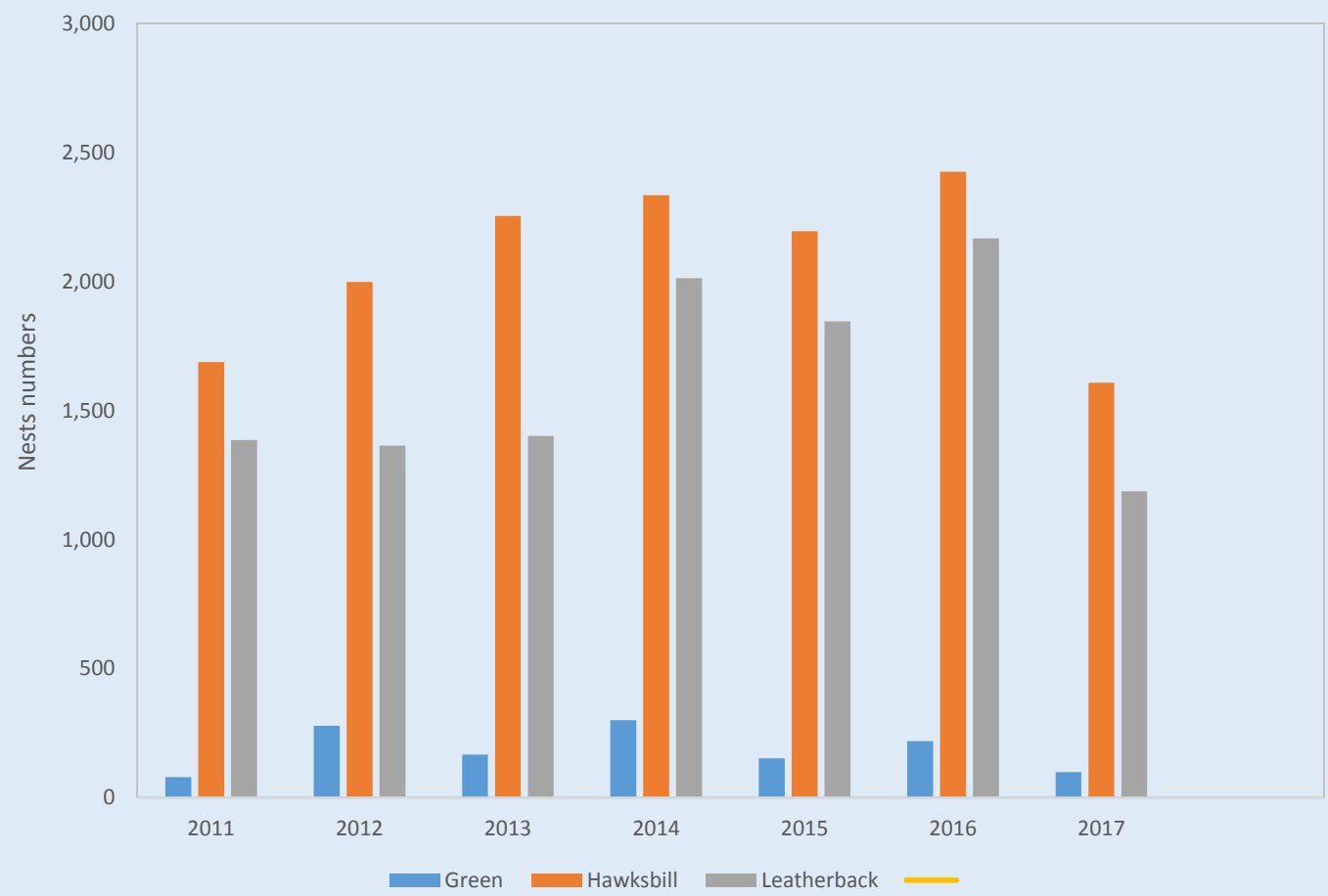


La Cordillera





Nests numbers for three species of sea turtles at Puerto Rico, 2011-2017

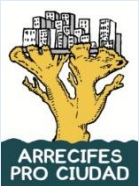


Year	Green	Hawksbill	Leatherback
2011	79	1687	1385
2012	278	1998	1364
2013	167	2254	1401
2014	300	2334	2013
2015	152	2195	1845
2016	219	2425	2167
2017	99	1607	1187

Data source:



Acknowledgments:





Gracias!