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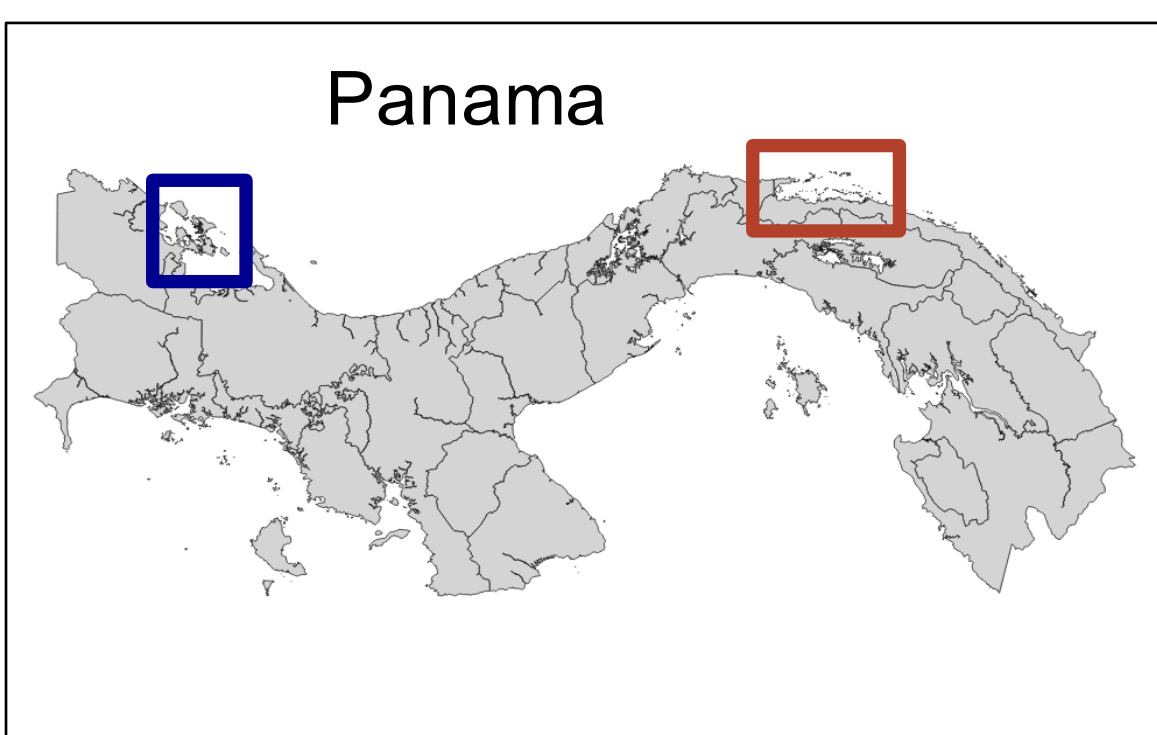


A Caribbean reef shark (*Carcharhinus perezii*) on a BRUV in Guna Yala, Panama

Fisheries-independent data on elasmobranchs in Panama are lacking, notably for sites along the country's Caribbean coast. The Bocas del Toro (BDT) and Guna Yala (GUN) coral reef archipelagos host a variety of similar marine benthic habitats, including sheltered coral reefs, seagrass, and exposed rocky reefs, though they differ in accessibility and fishing pressure. Annual monitoring was conducted at stations in BDT and GUN for three and one years, respectively, to assess the relative abundance and distribution of large marine wildlife (shark, ray, piscivorous finfish, turtle) communities around the islands.

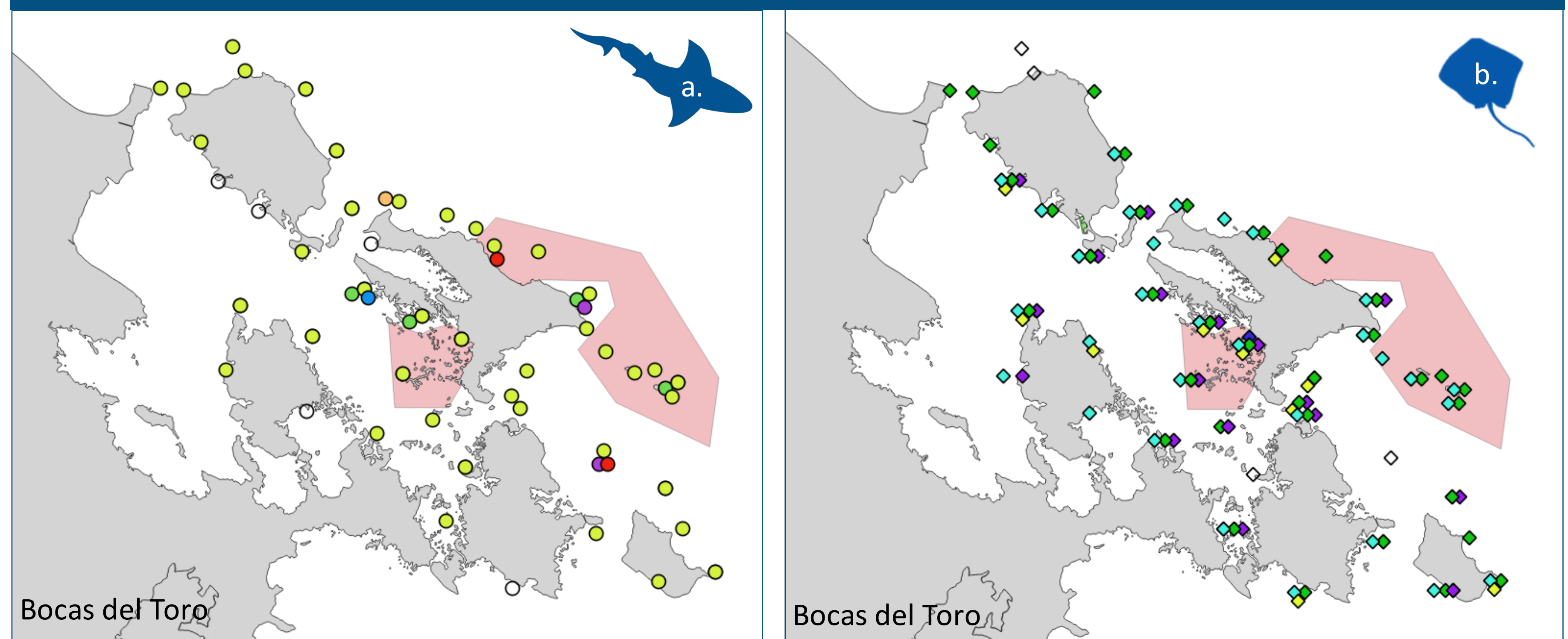
## Methods

- Baited Remote Underwater Videos**
  - Set for 65 minutes minimum
- Underwater Visual Census**
  - 1,000 m x 60 m snorkelling transects, 4 transectors
- Scientific longline**
  - 90 minute soak time, 50 hooks, 16/0 hooks, 4 m gangions



**Figure 1.** Map of Panama highlighting the locations of the study sites for annual monitoring: **Bocas del Toro (BDT)** and **Guna Yala (GUN)**

## Results

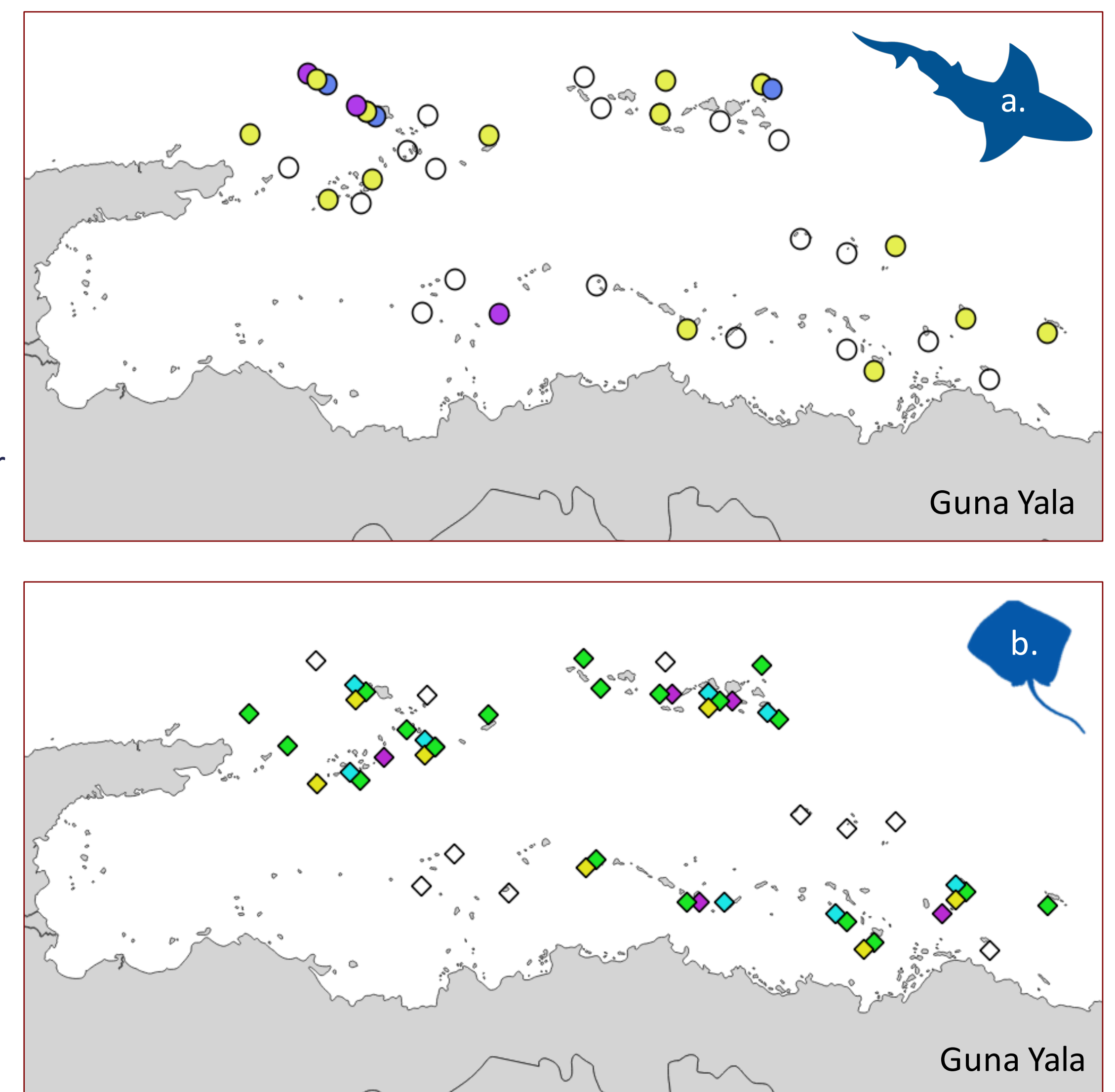


**Figure 2.** Distribution of species of sharks (a) and rays (b) seen or captured during annual monitoring in Bocas del Toro islands. National Marine Park Isla Bastimentos (in red). *White icons* denote stations with no records of sharks or rays.

**Table 1.** Fisheries-independent monitoring effort in **Bocas del Toro (BDT)** and **Guna Yala (GUN)**

		BRUVs		UVC		Longline
<b>Effort</b>		135	17	78	28	20
<b>Species Richness</b>		10	4	5	5	4
		<b># of sightings</b>		<b># of sightings</b>		<b># of captures</b>
<b>Nurse shark</b> <i>Ginglymostoma cirratum</i>	●	78	4	26	17	2
<b>Caribbean reef shark</b> <i>Carcharhinus perezii</i>	●	3	3	0	0	0
<b>Blacktip shark</b> <i>C. limbatus</i>	●	6	0	0	0	1
<b>Blacknose shark</b> <i>C. acronotus</i>	●	0	4	0	0	1
<b>Great hammerhead</b> <i>Sphyrna mokarran</i>	●	2	0	0	0	0
<b>Scalloped hammerhead</b> <i>Sphyrna lewini</i>	●	1	0	0	0	0
<b>Southern stingray</b> <i>Hypanus americanus</i>	◆	35	3	74	32	1
<b>Caribbean whiptail ray</b> <i>Styracura schmardae</i>	◆	12	0	60	11	0
<b>Spotted eagle ray</b> <i>Aetobatus narinari</i>	◆	7	0	39	7	0
<b>Yellow ray</b> <i>Urobatis jamaicensis</i>	◆	3	0	8	7	0
<b>Longnose stingray</b> <i>Hypanus guttatus</i>	◆	1	0	0	0	0

**Figure 3.** Maps showing the distribution of shark (a) and ray (b) species seen during monitoring in the Guna Yala islands. *White icons* are monitoring stations where no sharks or rays were seen UVC or with BRUVs.



**References** Andrefouet, S. and Guzman, H.M. 2005. Coral reef distribution, status and geomorphology - biodiversity relationship in Kuna Yala (San Blas) archipelago, Caribbean Panama. *Coral Reefs* 24: 31-42  
 Dominić-Arosemena A. And Wolff M. 2005. Reef fish community structure in Bocas del Toro (Caribbean, Panama): Gradients in habitat complexity and exposure. *Caribbean Journal of Science* 41: 613-637  
 Vergara-Chen C. 2016. La investigación y gestión pesquera para la conservación de la biodiversidad marina de Panamá. *Tecnociencia* 18: 73-85.

## Conclusions

- A combination of different monitoring methods is necessary to evaluate elasmobranch diversity and distribution.
- UVCs are more effective for documenting rays; BRUVs better for sharks
- Southern stingrays and nurse sharks → most common species, found with all methods and in all habitat types in GUN and BDT
- Caribbean reef sharks and hammerheads → deeper, rocky reef sites
- Deeper, fore-reef sites (more distant from human communities) → higher shark diversity and abundance
- Sheltered inner reef and lagoon sites → higher ray diversity and abundance
- Marine Protected Area (BDT) → probably not beneficial for most shark species