

How do our kūpuna islands respond to sea level rise and storms?

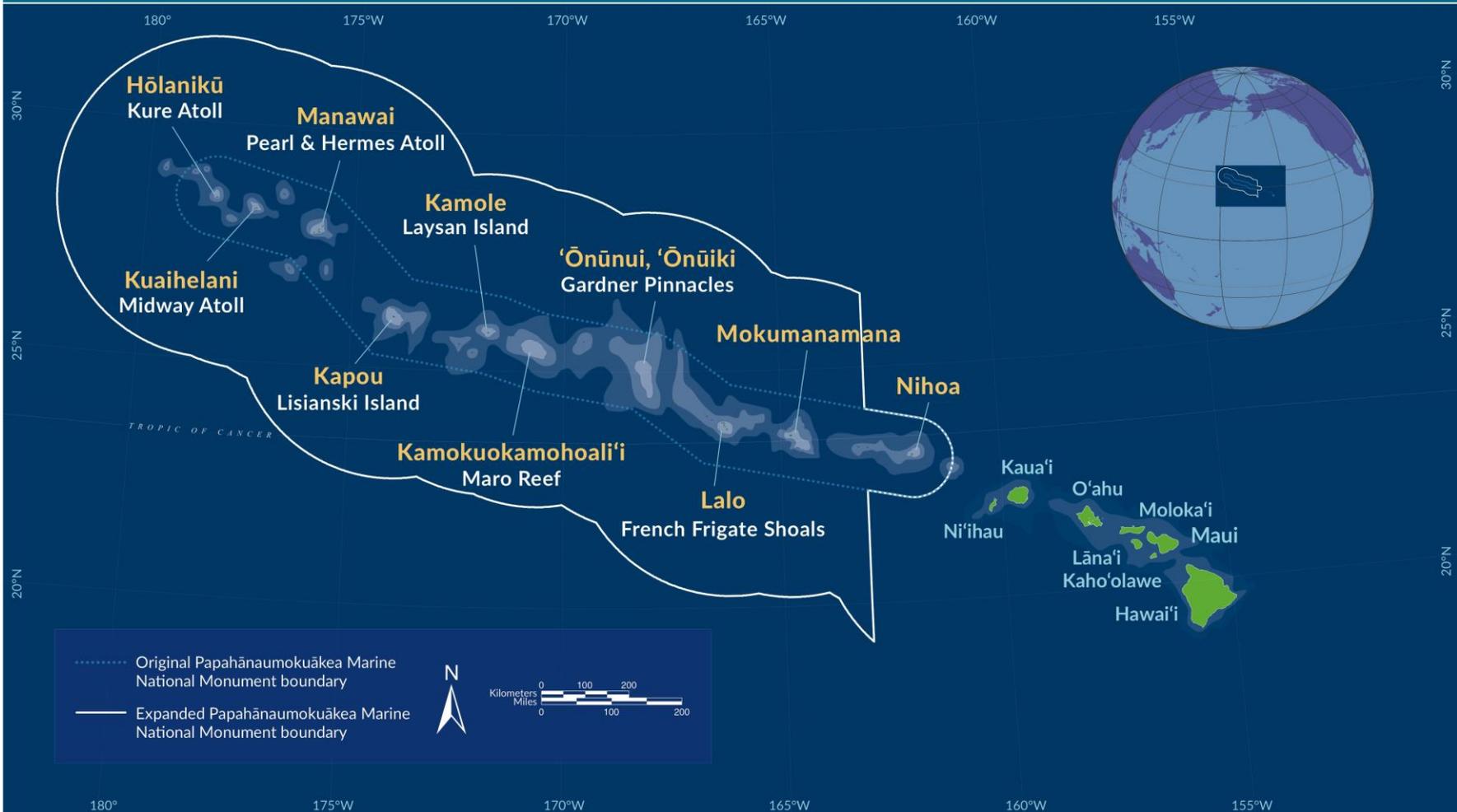
*Hauanani Kane, John Burns, Chip Fletcher, Kammie Dominique Tavares, Kristian McDonald, Tiffany Anderson, Kailey Pascoe

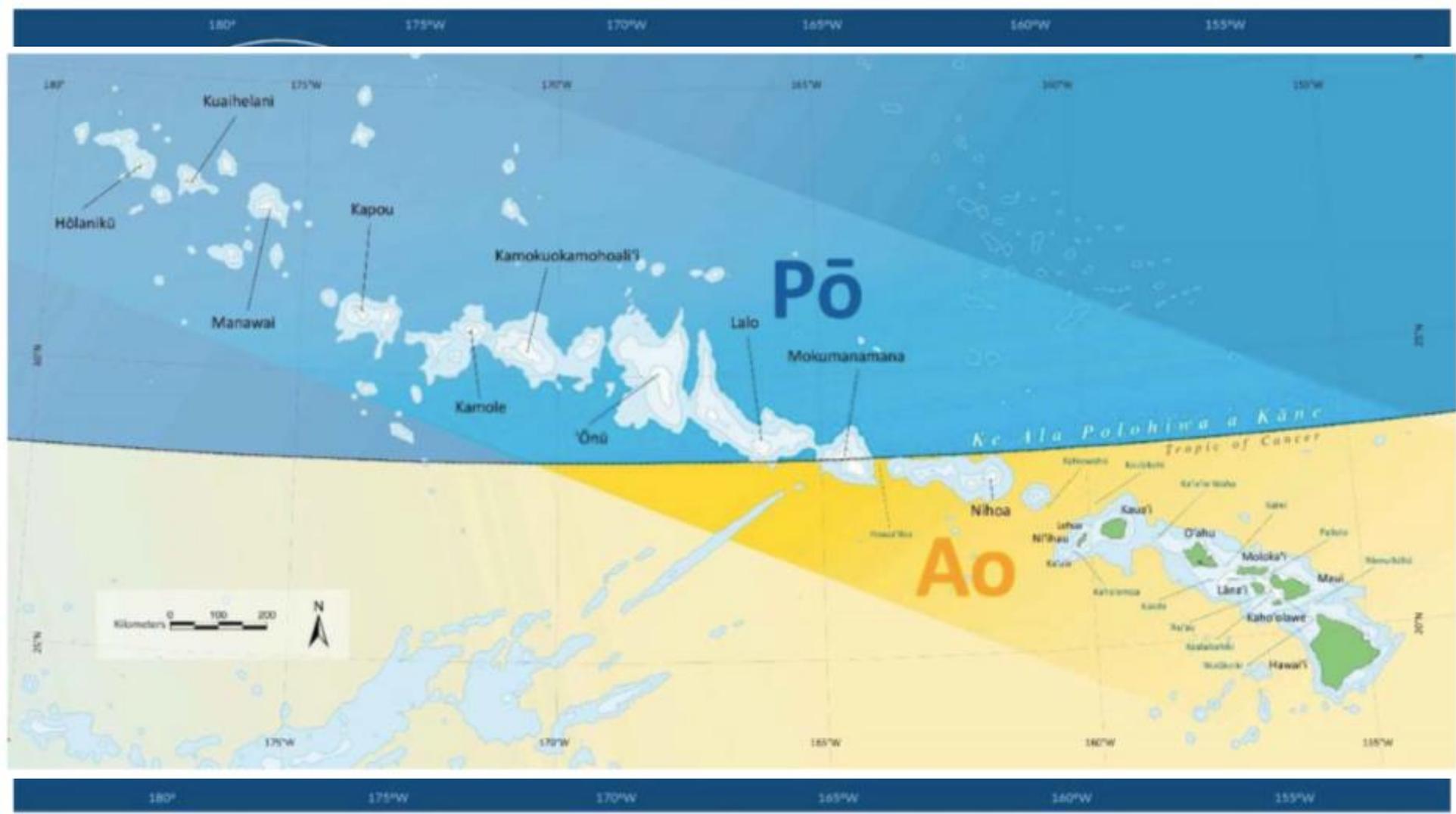


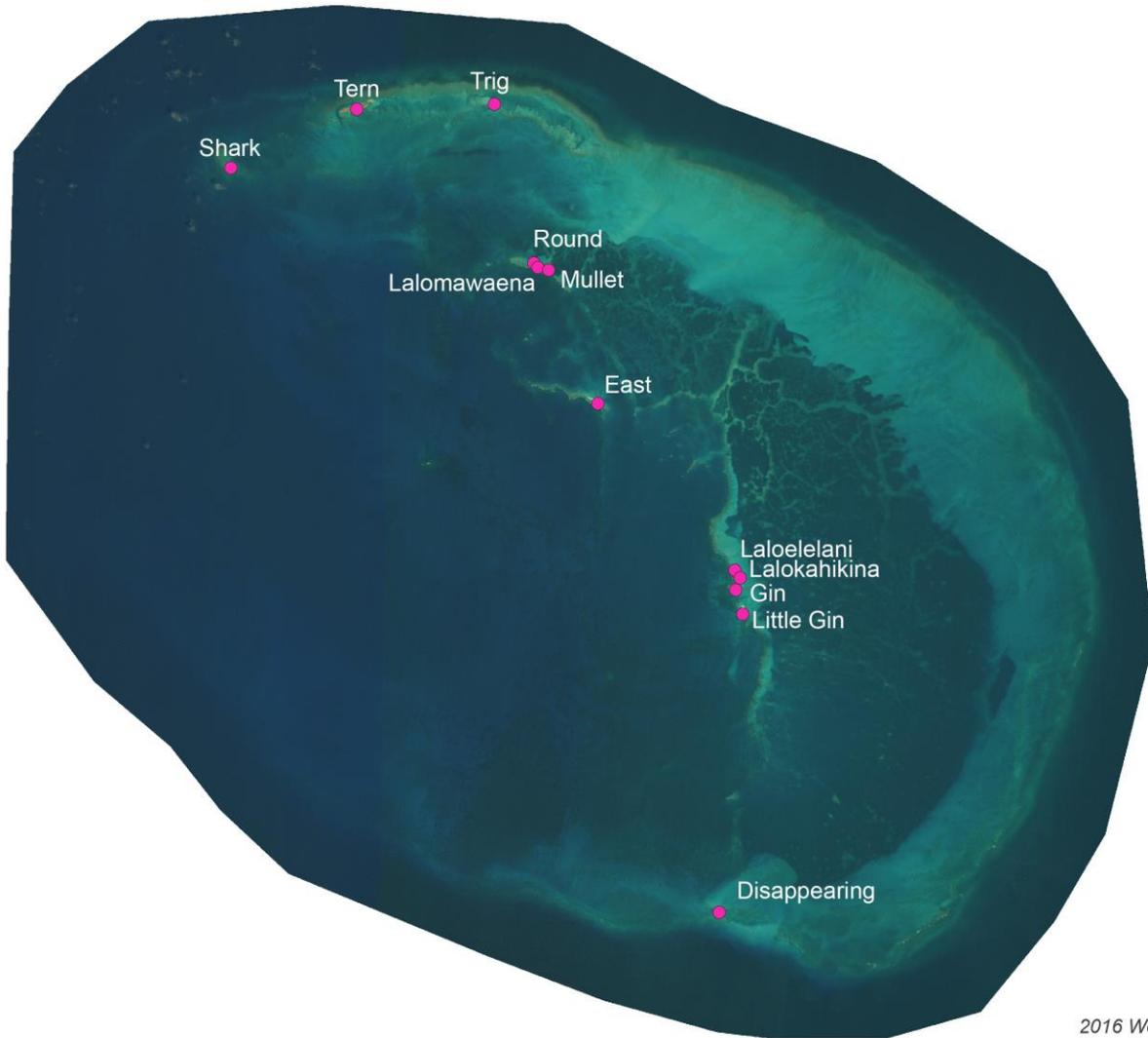
THE MEGALAB

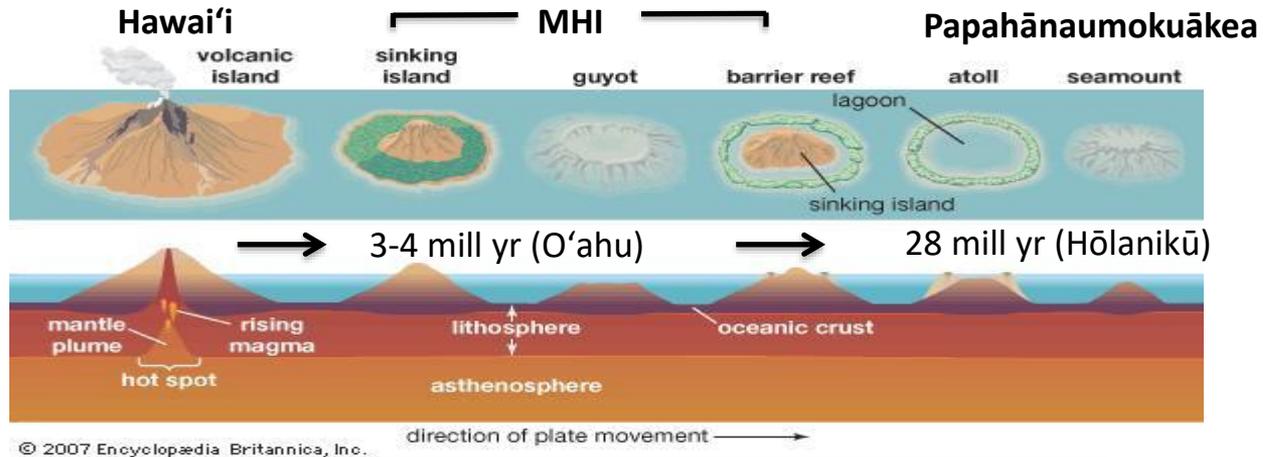


» Ko Hawai'i Pae 'Āina - Hawaiian Archipelago

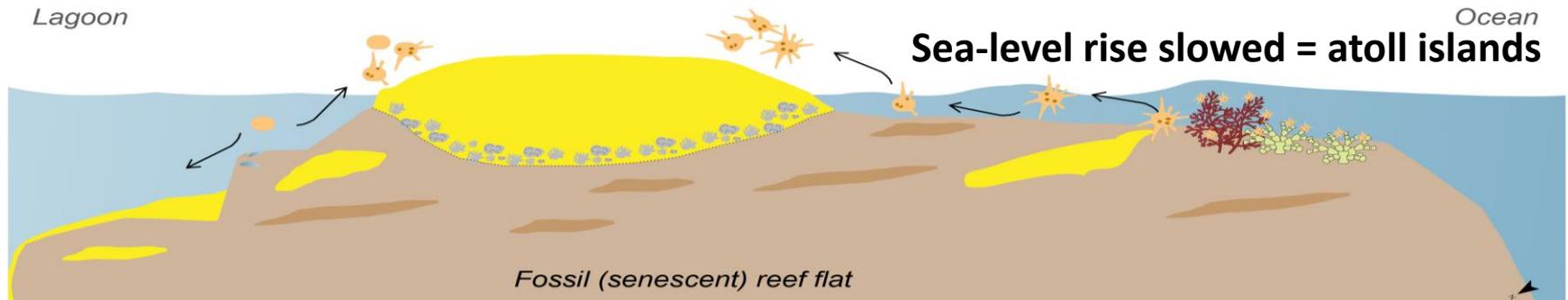
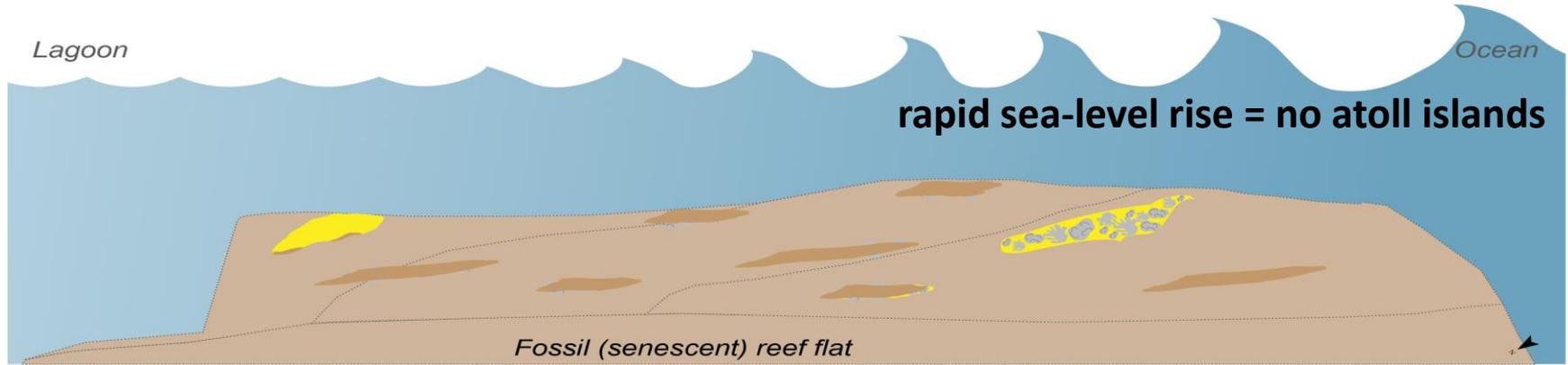


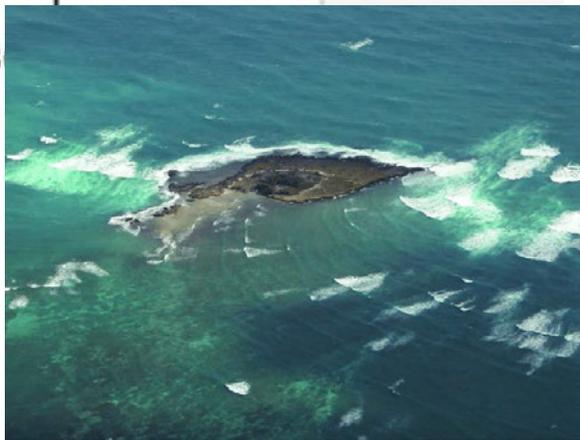
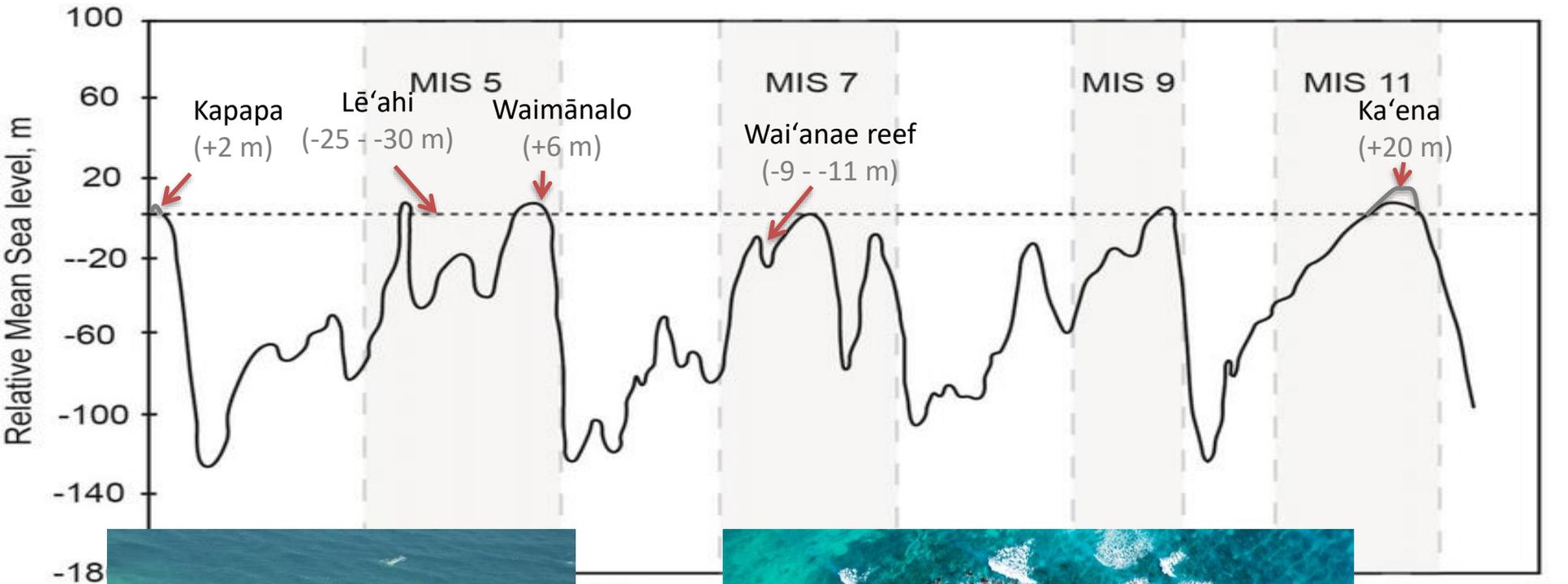






Reef island formation is linked to sea-level change





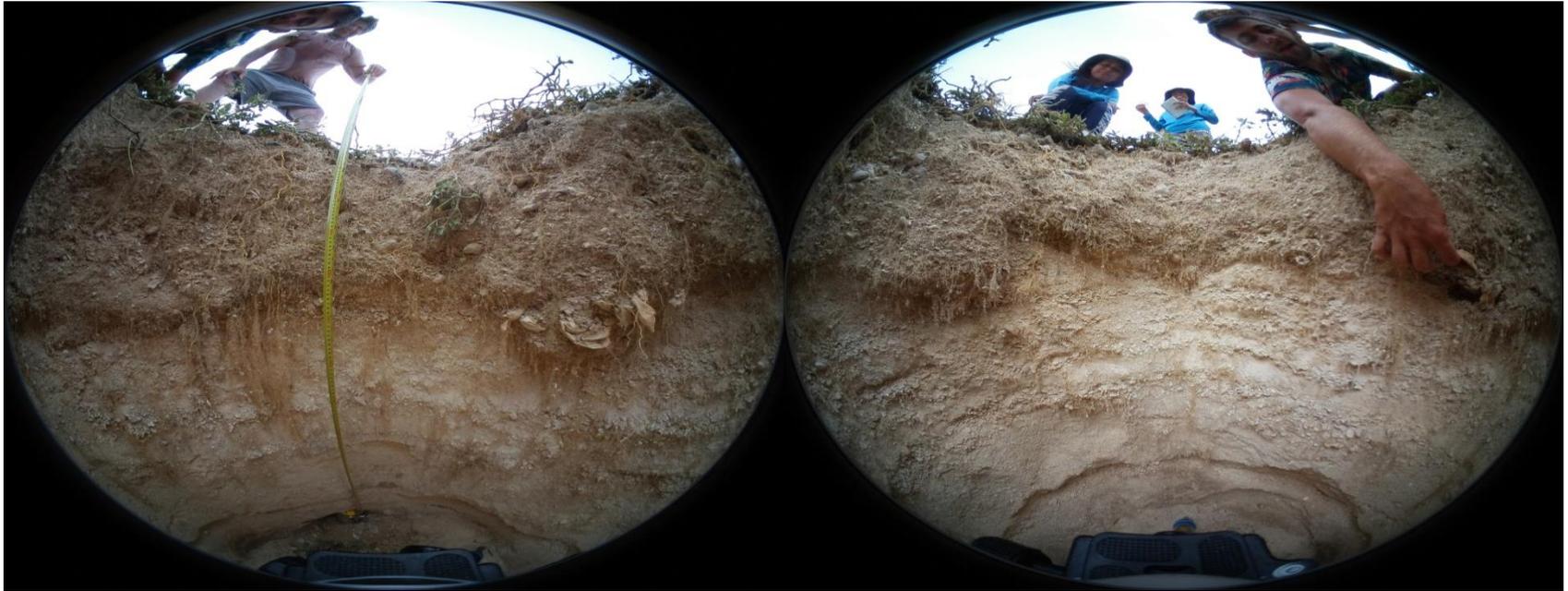
He pūko‘a kani ‘āina

A coral reef that grows into an island.

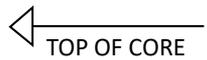


He pūko‘a kani ‘āina

A coral reef that grows into an island.



GC3



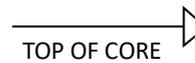
T2



T3



T4



EC5



1 cm



Environment ► Climate change Wildlife Energy Pollution

Hawaii

Hawaii

Remote Hawaiian island vanishes under hurricane

USA TODAY NETWORK Josh Hafner, USA TODAY Published 6:33 p.m. ET Oct. 24, 2018 | Updated



(Photo: Twitter/@NathanEagle)

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A remote Hawaiian island vanished under a powerful hurricane struck earlier this month, according to federal officials citing satellite images.

East Island, a strip of gravel and sand northwest of Honolulu, "appears to be under water"

after Hurricane Walaka surged past the state, the Papahānaumokuākea Marine National Monument said in a Tuesday statement.

The island has played a key role in the survival of beleaguered seals and sea turtles, said the officials, who are "working to better understand the implications" of the sunken status.

"There's no doubt that it was the most important single islet for sea turtle nesting," Charles Littnan, a biologist with the National Oceanic and Atmospheric Administration, told the Honolulu Civil Beat, which first reported the island's disappearance.

The 11-acre isle acted as nesting grounds for half the world's Hawaiian green sea turtles, the Civil Beat reported. It served as the birthplace for roughly one-seventh of all Hawaiian monk seals.

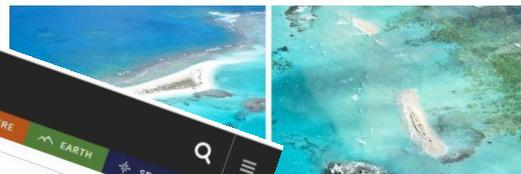


Video credit: Chip Fletcher and Honolulu Civil Beat.

The recent loss of East Island in the Papahānaumokuākea Marine National Monument to rising sea level demonstrates the need to stop climate change. Now, Chip Fletcher, earth sciences professor and associate dean in SOEST, published a video op-ed in the Honolulu Civil Beat. Watch the video here.

Shocked by Quicken Loans

East Island, Remote Hawaiian Sliver of Sand, Is Largely Wiped Out by a Hurricane



It was an 11-acre sliver of land in the Pacific Ocean that disappeared. Dan Link/US Fish and Wildlife Service

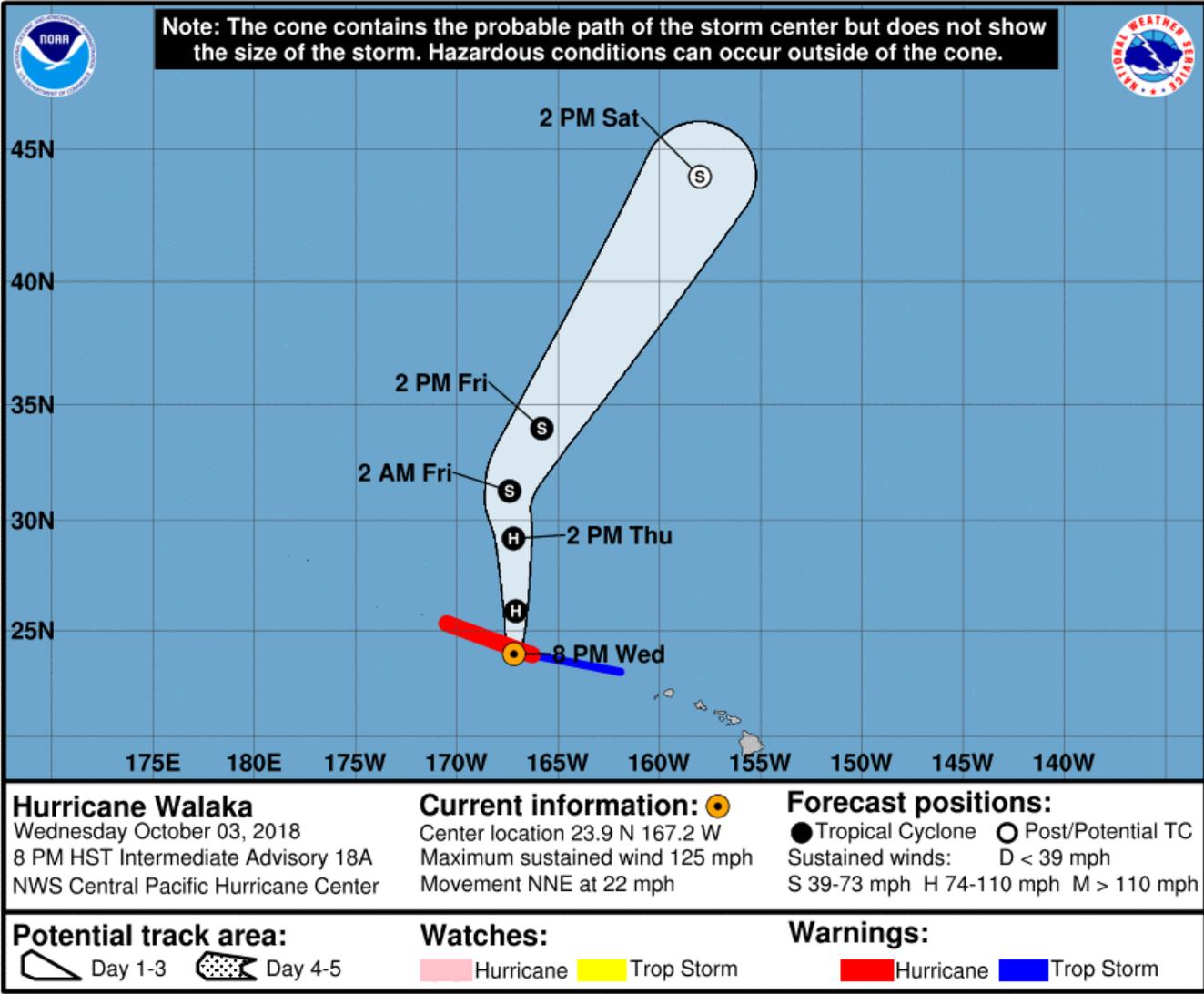
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When it was mostly gone. swept through the central Pacific this captured in images as an 11-acre sliver of sand on the turquoise ocean. Government officials confirmed that the island, in the Hawaiian archipelago, had been largely lost, said Athline Clark of the National Oceanic and Atmospheric Administration. East Island is the second island to disappear in recent months from French Frigate Shoals, a crescent-shaped group of many islets, Ms. Clark said. Chip Fletcher, a climate scientist with the University of Hawaii who is studying East Island's natural history, said it comprises loose sand and gravel rather than solid rock. His team had just taken several samples from the island in July. But late last week, he said, government officials reported that it had mostly disappeared.

Hurricane Walaka

- Wed. Oct 3, 2018: 100 miles west of Lalo
- Cat 3: sustained winds of 125 mph w/ stronger gusts
- Increased occurrence of Hurricanes in Hawaiian waters is projected due to climate change.





East prior to Hurricane (Aug. 2018)

**Island
moved
offshore**



East after Cat 3 Hurricane (Oct 2018)



2007 Quickbird imagery (0.6 m)



2011 Worldview 2 imagery (0.5 m)



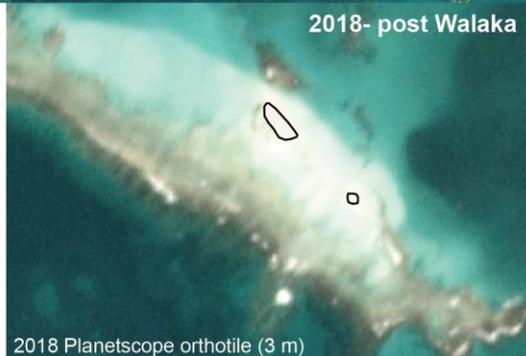
2016 Worldview 3 imagery (0.3 m)



2017 RapidEye orthotile (5 m)



2018 UAS derived imagery (0.026 m)



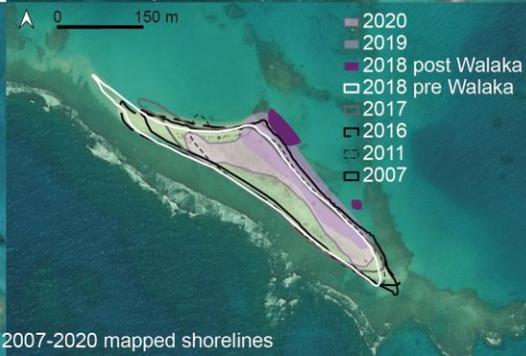
2018 Planetscope orthotile (3 m)



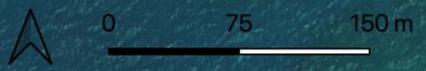
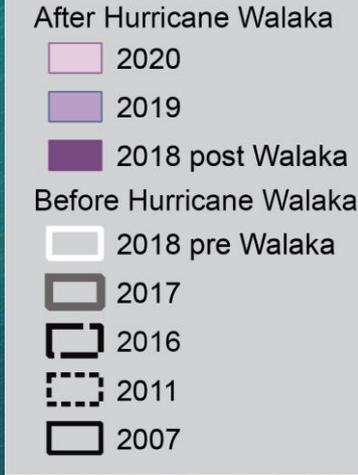
2019 Planetscope orthotile (3 m)



2020 Planetscope orthotile (3 m)



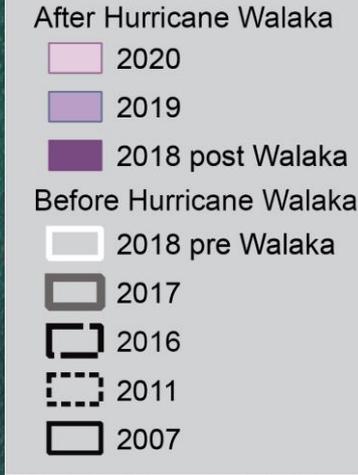
2007-2020



East



2007



East

2011

After Hurricane Walaka

- 2020
- 2019
- 2018 post Walaka

Before Hurricane Walaka

- 2018 pre Walaka
- 2017
- 2016
- 2011
- 2007

-12%



East

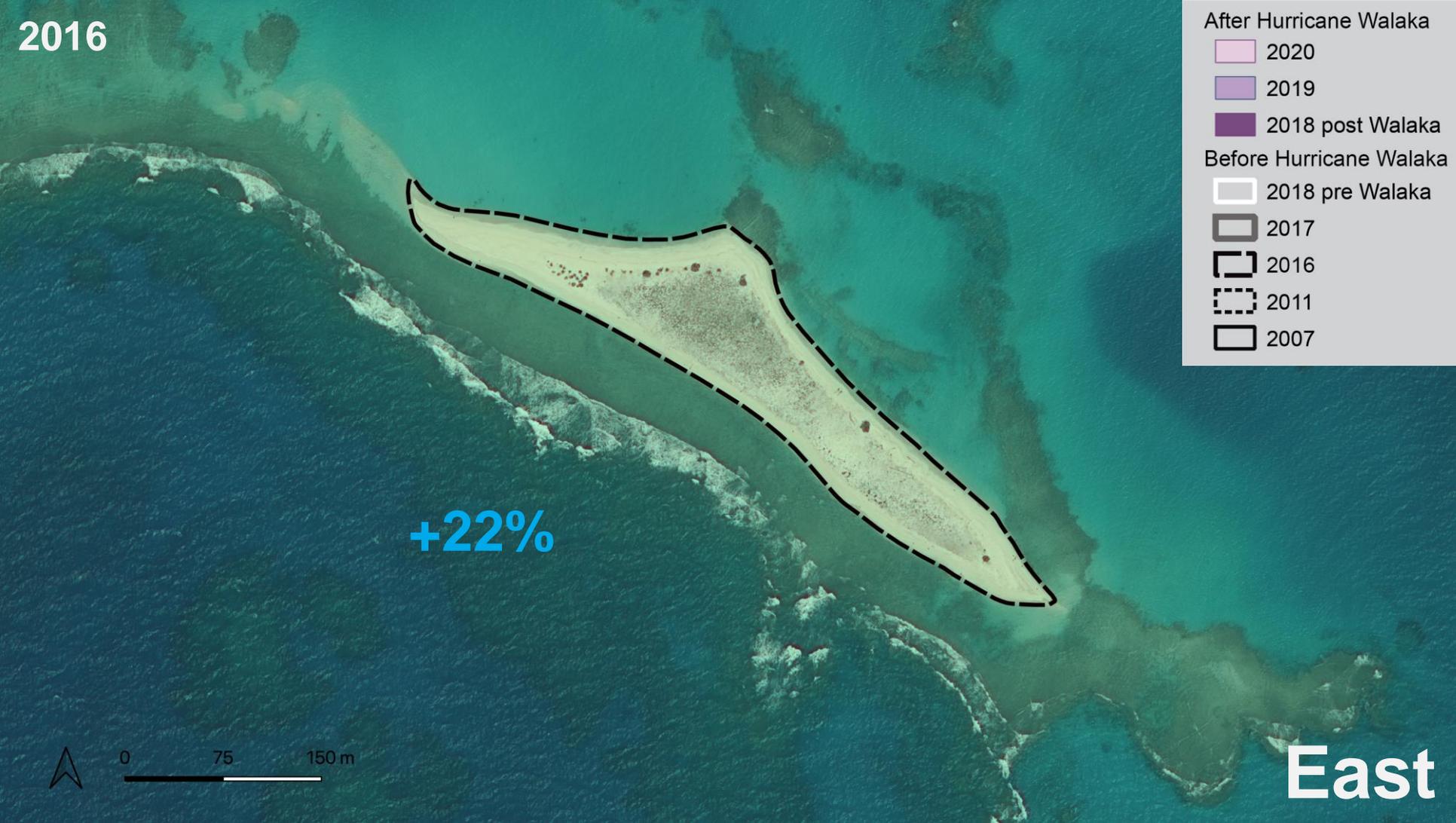
2016

- After Hurricane Walaka
 - 2020
 - 2019
 - 2018 post Walaka
- Before Hurricane Walaka
 - 2018 pre Walaka
 - 2017
 - 2016
 - 2011
 - 2007

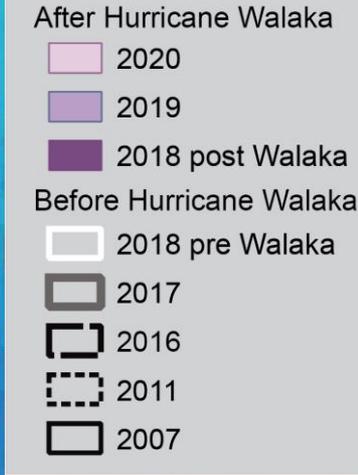
+22%



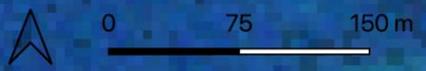
East



2017



-14%



East

2018 pre Walaka

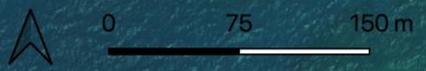
After Hurricane Walaka

- 2020
- 2019
- 2018 post Walaka

Before Hurricane Walaka

- 2018 pre Walaka
- 2017
- 2016
- 2011
- 2007

+6%



East



2018 post Walaka

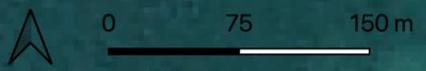
After Hurricane Walaka

- 2020
- 2019
- 2018 post Walaka

Before Hurricane Walaka

- 2018 pre Walaka
- 2017
- 2016
- 2011
- 2007

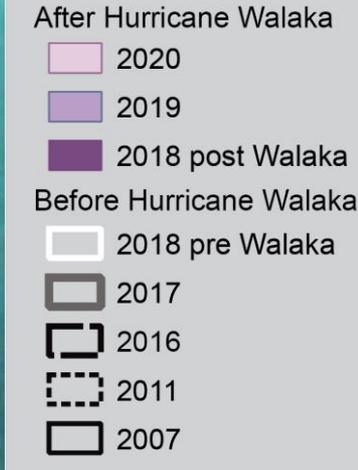
-94%



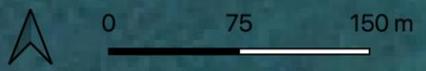
East



2019



+594%



East

2020

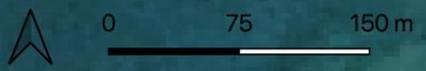
After Hurricane Walaka

- 2020
- 2019
- 2018 post Walaka

Before Hurricane Walaka

- 2018 pre Walaka
- 2017
- 2016
- 2011
- 2007

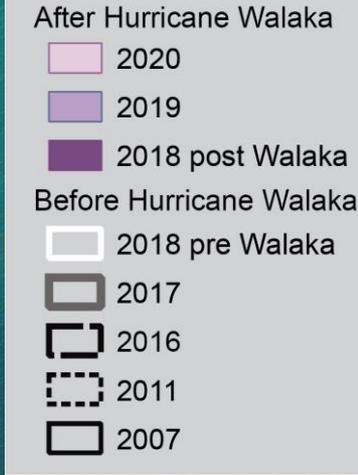
+39%



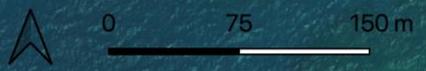
East



2020



~60% recovery relative to pre Walaka size



East

0 75 150 m

2007-2020

After Hurricane Walaka

2020

2019

2018 post Walaka

Before Hurricane Walaka

2018 pre Walaka

2017

2016

2011

2007

Gins





0 75 150 m

2007-2020



- After Hurricane Walaka
- 2020
 - 2019
 - 2018 post Walaka
- Before Hurricane Walaka
- 2018 pre Walaka
 - 2017
 - 2016
 - 2011
 - 2007

Gins



0 75 150 m



2007

After Hurricane Walaka

2020

2019

2018 post Walaka

Before Hurricane Walaka

2018 pre Walaka

2017

2016

2011

2007

Gins





0 75 150 m

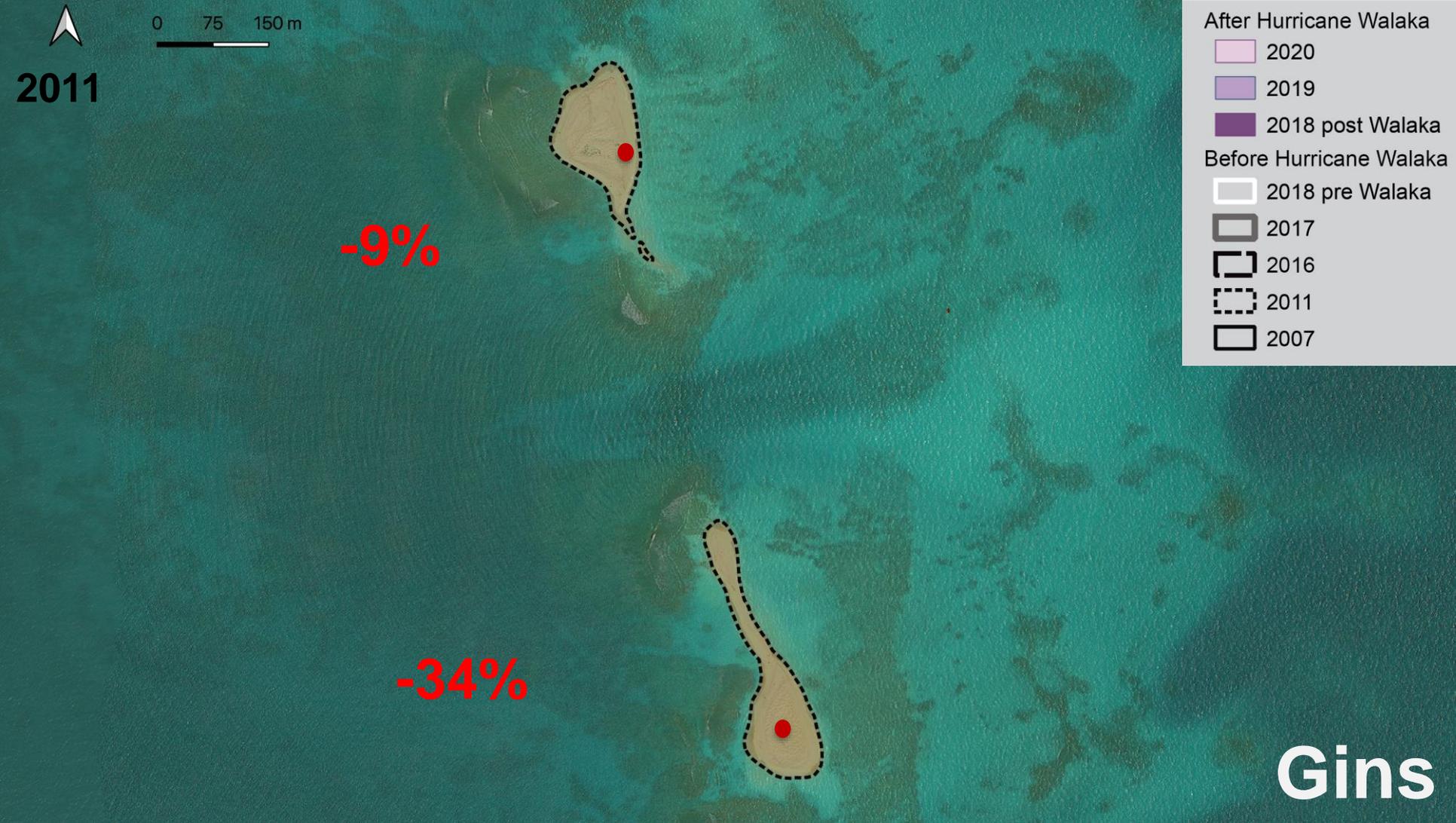
2011

-9%

-34%

- After Hurricane Walaka
- 2020
 - 2019
 - 2018 post Walaka
- Before Hurricane Walaka
- 2018 pre Walaka
 - 2017
 - 2016
 - 2011
 - 2007

Gins





0 75 150 m

2016

+18%

+36%

After Hurricane Walaka

2020

2019

2018 post Walaka

Before Hurricane Walaka

2018 pre Walaka

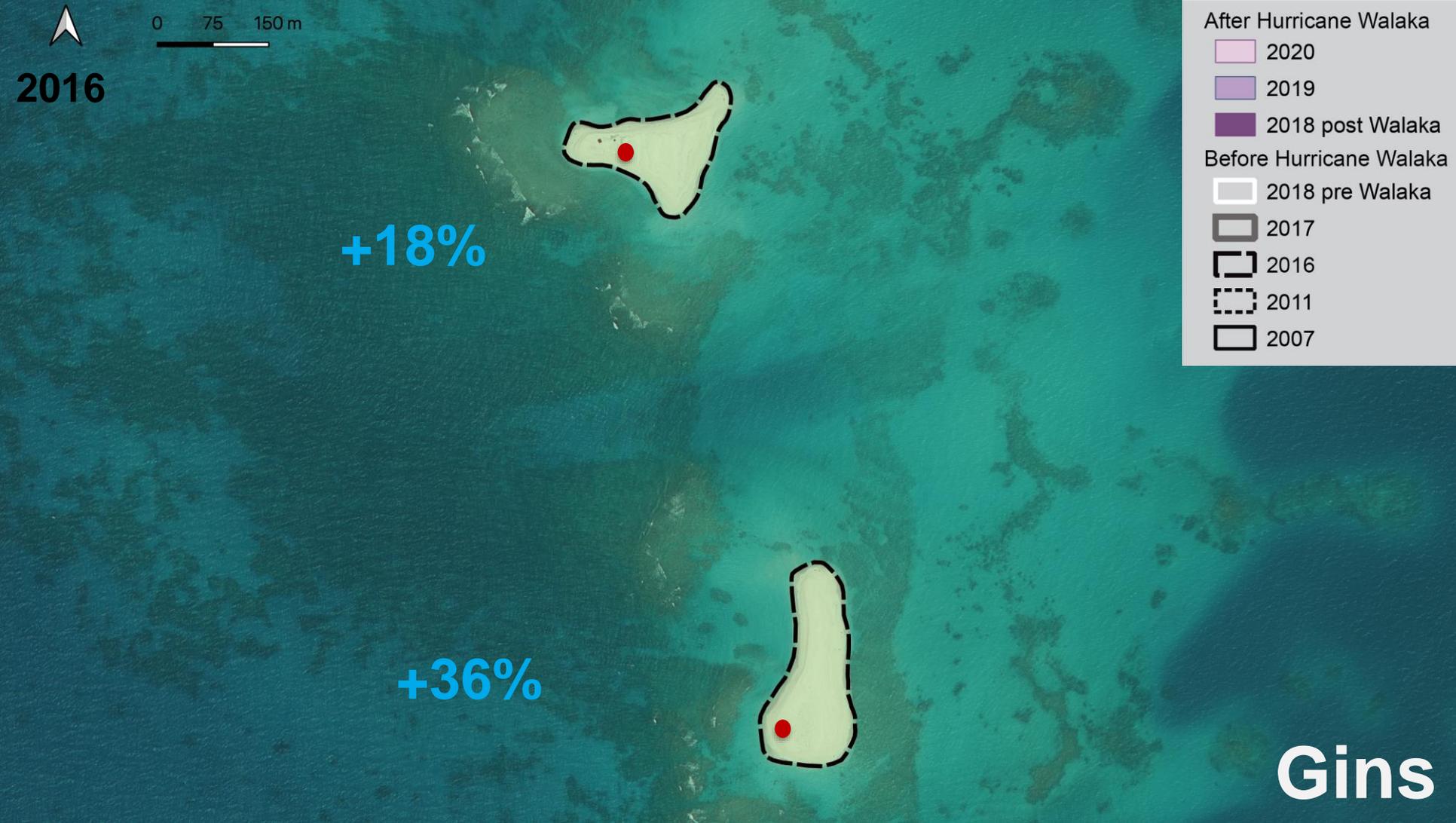
2017

2016

2011

2007

Gins





0 75 150 m

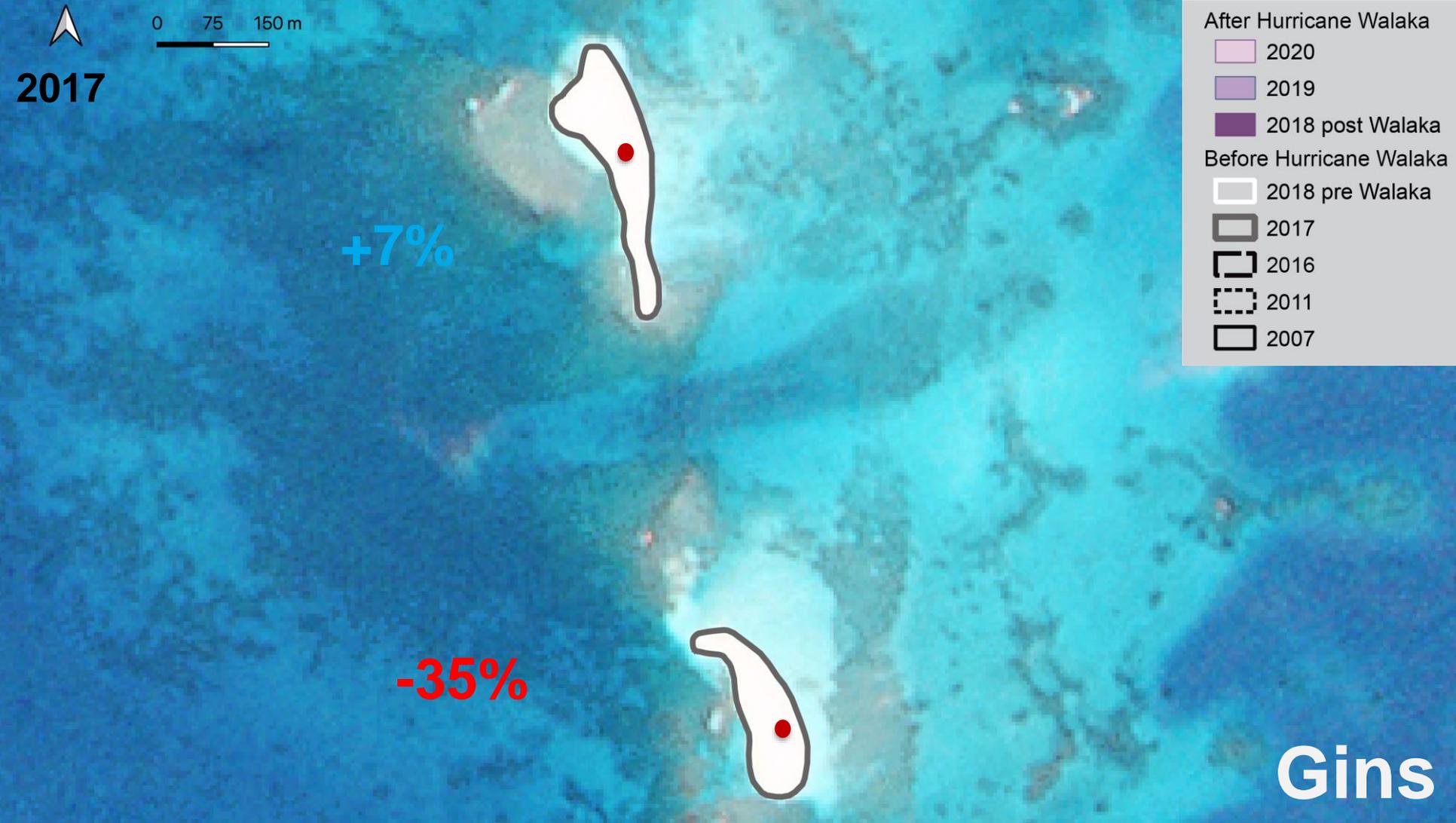
2017

+7%

-35%

- After Hurricane Walaka
- 2020
 - 2019
 - 2018 post Walaka
- Before Hurricane Walaka
- 2018 pre Walaka
 - 2017
 - 2016
 - 2011
 - 2007

Gins





0 75 150 m



2018- pre Walaka

-7%



-12%



After Hurricane Walaka

2020

2019

2018 post Walaka

Before Hurricane Walaka

2018 pre Walaka

2017

2016

2011

2007

Gins



0 75 150 m



2018- post Walaka

-31%

-4%

After Hurricane Walaka

2020

2019

2018 post Walaka

Before Hurricane Walaka

2018 pre Walaka

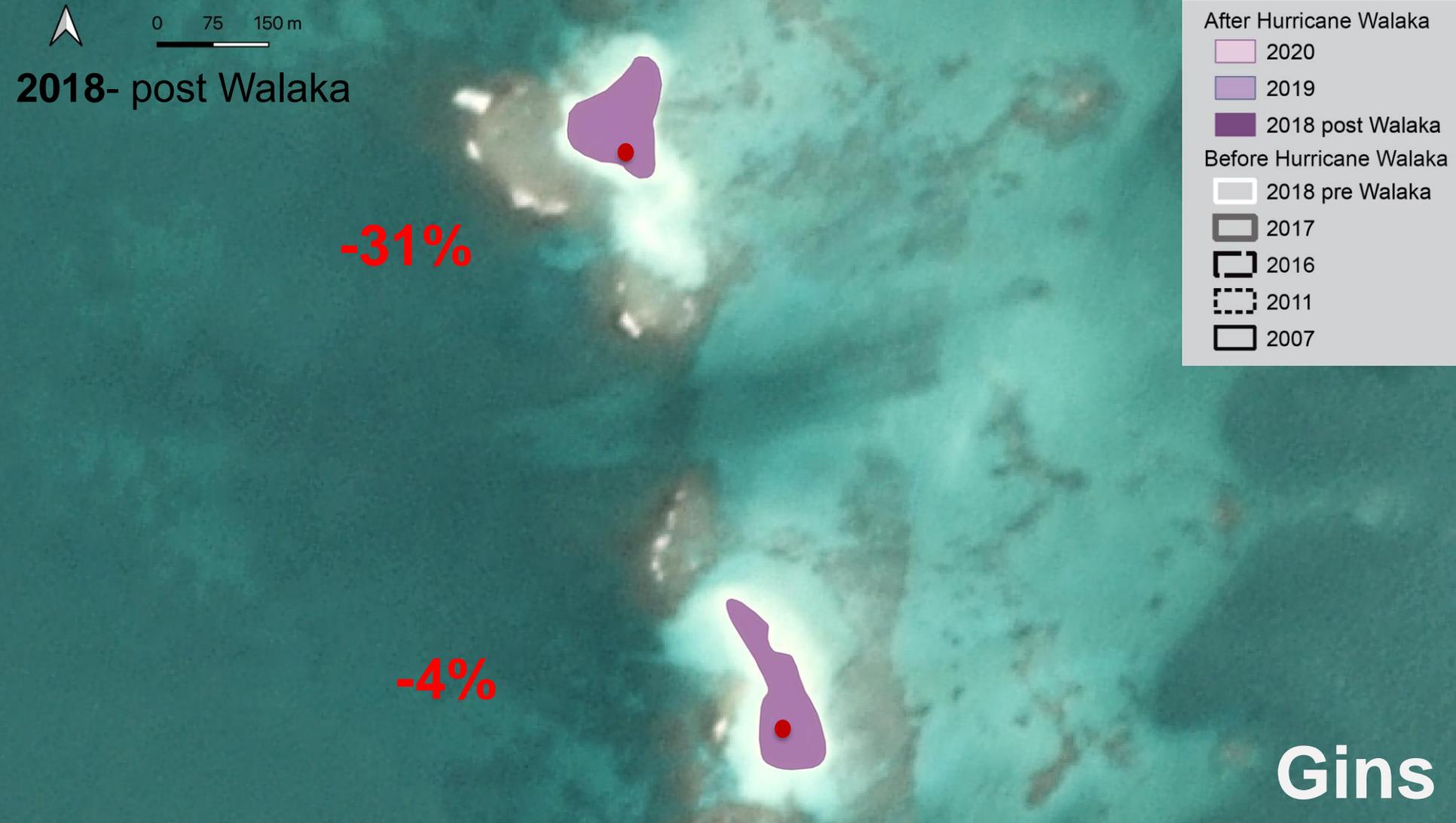
2017

2016

2011

2007

Gins





0 75 150 m

2019

+43%

+30%

After Hurricane Walaka

2020

2019

2018 post Walaka

Before Hurricane Walaka

2018 pre Walaka

2017

2016

2011

2007

Gins





0 75 150 m



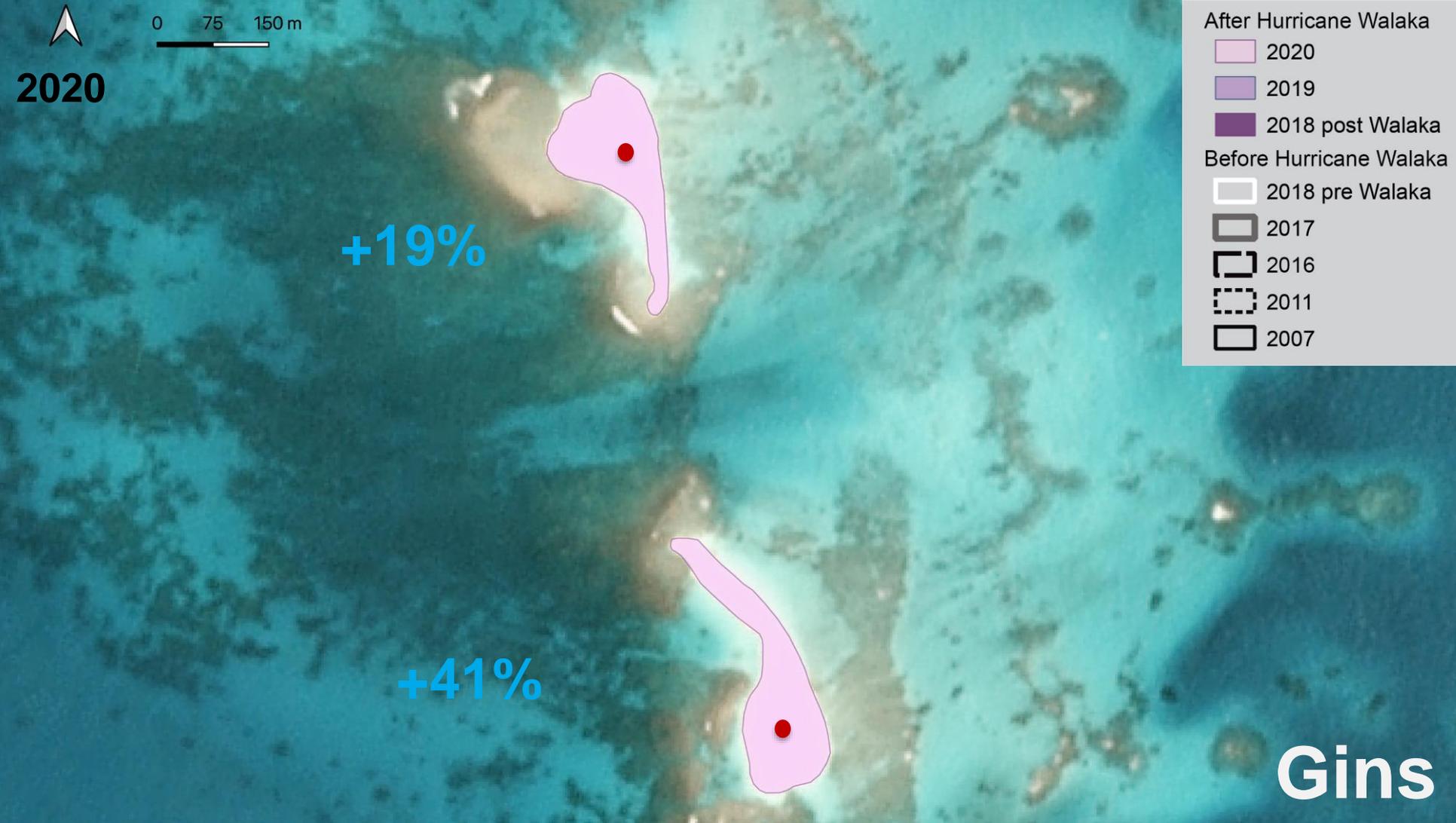
2020

+19%

+41%

- After Hurricane Walaka
- 2020
 - 2019
 - 2018 post Walaka
- Before Hurricane Walaka
- 2018 pre Walaka
 - 2017
 - 2016
 - 2011
 - 2007

Gins





0 75 150m

2020

+117%



After Hurricane Walaka

2020

2019

2018 post Walaka

Before Hurricane Walaka

2018 pre Walaka

2017

2016

2011

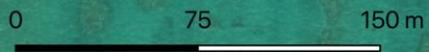
2007

Both island are larger than pre-Walaka size

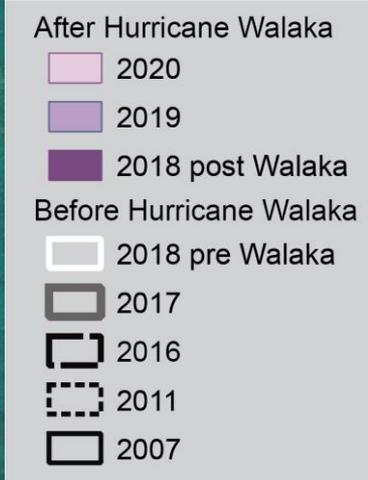
+176%



Gins



2007-2017



Trig



2007-2020

After Hurricane Walaka

2020

2019

2018 post Walaka

Before Hurricane Walaka

2018 pre Walaka

2017

2016

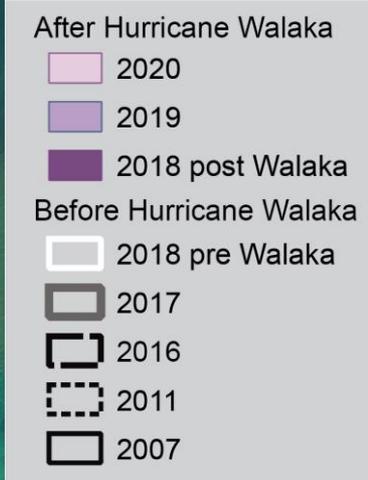
2011

2007



Shark

2007-2017



Tern



Direction of wave overwash

Tern Island



Direction of wave overwash



Tern Island

Removed vegetation & elevated portions of the island



**Hurricane
overwash**

Pre hurricane soil layer



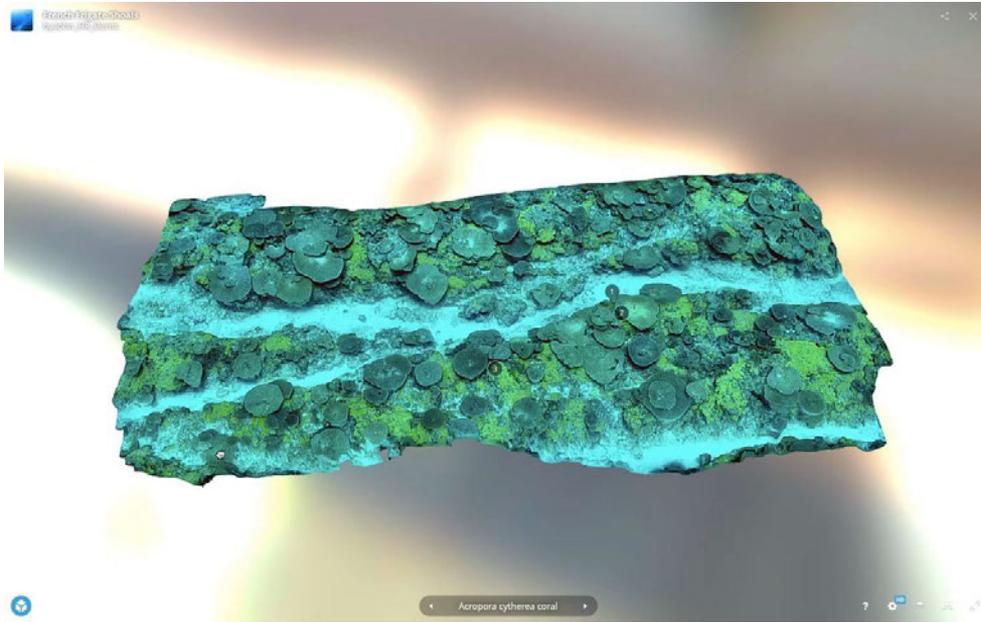
An aerial photograph of a tropical atoll. The water is a vibrant turquoise color, transitioning to a deeper blue as it meets the horizon. A narrow, sandy beach runs along the edge of the atoll, with some dark patches of vegetation or coral. The sky is a deep, dark blue with some light clouds. In the top left corner, there is a small red rectangular bar.

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He pūko‘a kani ‘āina

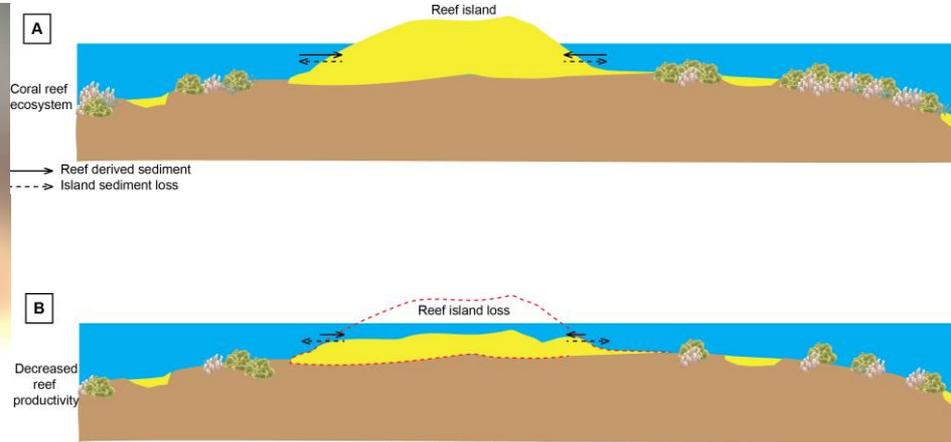
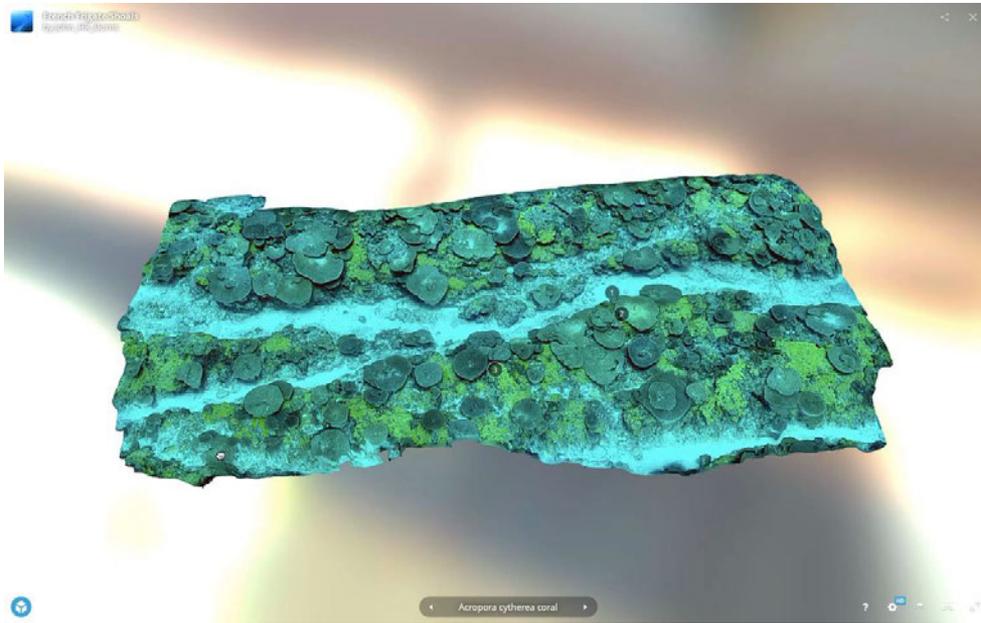
A coral reef that grows into an island.



How does the biodiversity & productivity of coral reefs impact island composition? Island resiliency?

He pūko‘a kani ‘āina

A coral reef that grows into an island.



How does the biodiversity & productivity of coral reefs support island resiliency to sea level rise and storms?

