



Effects of Climate Change On Marine Mammal Habitat Loss

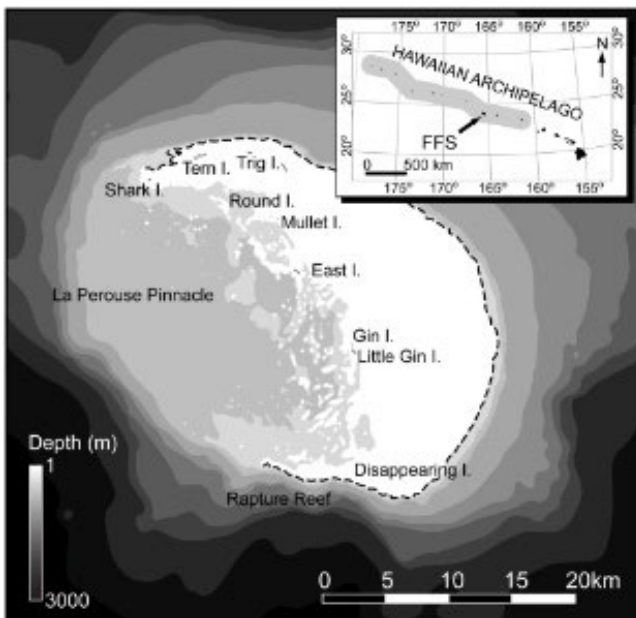
More resources are needed to increase our understanding of the effects of climate change on marine mammals

What We Know:

Marine mammal habitat is being lost due to climate change in the United States. Sea level rise and storms lead to erosion and inundation of shoreline habitat. Reduced Arctic sea ice affects polar bears, walrus, and ice-dependent seals.

Case Study: The Hawaiian Monk Seal

The Hawaiian monk seal (*Neomonachus schauinslandi*) is experiencing impacts of climate change in the Northwestern Hawaiian Islands (NWHI), specifically at Lalo (French Frigate Shoals). These seals require terrestrial habitat to breed and rest, while remaining within range of foraging habitat.



Lalo (French Frigate Shoals)

- An atoll in the Northwestern Hawaiian Islands (NWHI) with multiple islands that historically hosted the largest population of monk seals
- Lalo (French Frigate Shoals) provides access to more than 40% of the foraging habitat in NWHI
- Three of the most important pupping islands have already been mostly or entirely lost to sea-level rise and storms

Since 2000, the three main pupping islands have been inundated:

Whaleskate Island, Trig Island, and East Island. Only a remnant of East Island still exists, while the other two islands have vanished. Losing this prime habitat has made pups vulnerable to predation by Galapagos sharks and drowning during high surf and storm conditions.

Only 57% of Lalo pups survived to weaning in 2018 compared to an average 95% throughout the rest of the NWHI. If all the islands at Lalo eventually disappear, then the species would lose access to almost one-third of the foraging habitat in the NWHI, greatly reducing the prospects for monk seal recovery. Habitat loss will also likely impact other portions of the NWHI monk seal population, as well.

Map of Lalo (French Frigate Shoals) from Dale et al. (2011 doi: [10.1371/journal.pone.0016962](https://doi.org/10.1371/journal.pone.0016962)).

What We Don't Know:

1. **Exact impacts of habitat loss on different species.** Lalo monk seals have been adversely affected by habitat loss, and pinnipeds in the Arctic have been affected by loss of sea ice, but not all impacts to marine mammal species are currently known.
2. **How and when habitat loss will occur.** We cannot currently predict habitat loss with certainty, nor what new threats species will face as a result. Early modeling suggested East Island would be relatively resilient, but then it was inundated by Hurricane *Walaka* in 2018. Polar bears in the Arctic are being forced into new conflicts with humans as a result of loss of foraging habitat, but the degree of impact is variable across polar bear populations and geography.



Monk seal resting atop a small sandspit at Lalo. These small fragments of terrestrial habitat are less secure for breeding, pupping, and molting, relative to more protected shoreline (Louise Giuseffi, NOAA #16163-01).



Monk seal pup (red circle) trapped and pinned inside a Tern Wall seawall. The pup was rescued with great difficulty as the tide was rising, and was ultimately saved from drowning (NOAA).

What We Need:

Monitoring and predictive modeling

Monitoring and predictive modeling of habitat loss is necessary to better anticipate and mitigate impacts. Studies of how ice loss affects distribution, survival, foraging success and reproduction of Arctic marine mammals are also needed. Climate change effects can be unpredictable and we need to detect them in order to respond quickly and appropriately.

Conservation interventions

Direct interventions can improve quality of remaining or new habitat. Tern Island at Lalo, for example, could be improved by removing man-made infrastructure that entraps seals, preserving and restoring terrestrial habitat. Efforts to preserve, protect, and rebuild islands and coastlines will help to protect marine mammals and humans.

So What? Climate change will continue to impact marine mammal habitat. Investment in habitat loss monitoring, modeling impacts, and direct interventions are necessary to mitigate the impacts of habitat loss on marine mammals.