

UNRAVELING THE MIGRATORY MYSTERIES OF NORTH PACIFIC LOGGERHEADS USING EXPERIMENTAL OCEANOGRAPHY



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SEA TURTLE RESEARCH EXPERIMENT ON THE THERMAL CORRIDOR HYPOTHESIS (STRETCH)

1 BACKGROUND

Until recently, scientists had no clear understanding of the mechanisms by which loggerhead sea turtles (*Caretta caretta*) leave their nesting beaches in Japan and migrate across the entire North Pacific Ocean to Baja California, Mexico. The **Thermal Corridor Hypothesis** (TCH, Briscoe et al. 2021) combined over 2 decades of movement data from satellite-tracked loggerheads with independently-derived data to propose that juvenile loggerheads access an intermittent and spatially variable migratory corridor to transition from the Central North Pacific (CNP) to the west coast of North America. We hypothesized that this migratory corridor opens during anomalously warm conditions (3-month running mean of sea surface temperature anomalies (SSTa) ≥ 0.5 °C). During cool conditions (SSTa ≤ -0.5 °C) the corridor likely closes, causing turtles to stay in the CNP.

2 EXPERIMENTAL APPROACH

- We are undertaking one of the first experimental oceanography approaches of its kind, providing a novel field test of the TCH over a five-year period.
- We deployed 25 and 28 wild-hatched and aquarium-reared satellite-tagged loggerheads in Years 1 and 2, respectively, near the eastern edge of the CNP, using Ships of Opportunity. Oceanographic conditions were warmer than usual due to El Niño and marine heat wave influences.
- Additional cohorts of turtles will be deployed over the next two years. Given the variation in ocean conditions across years, we should experience a range of temperatures. Ocean forecasts and satellite data will allow us to test the influence of oceanographic conditions on their movements

3 METHODS

REARING



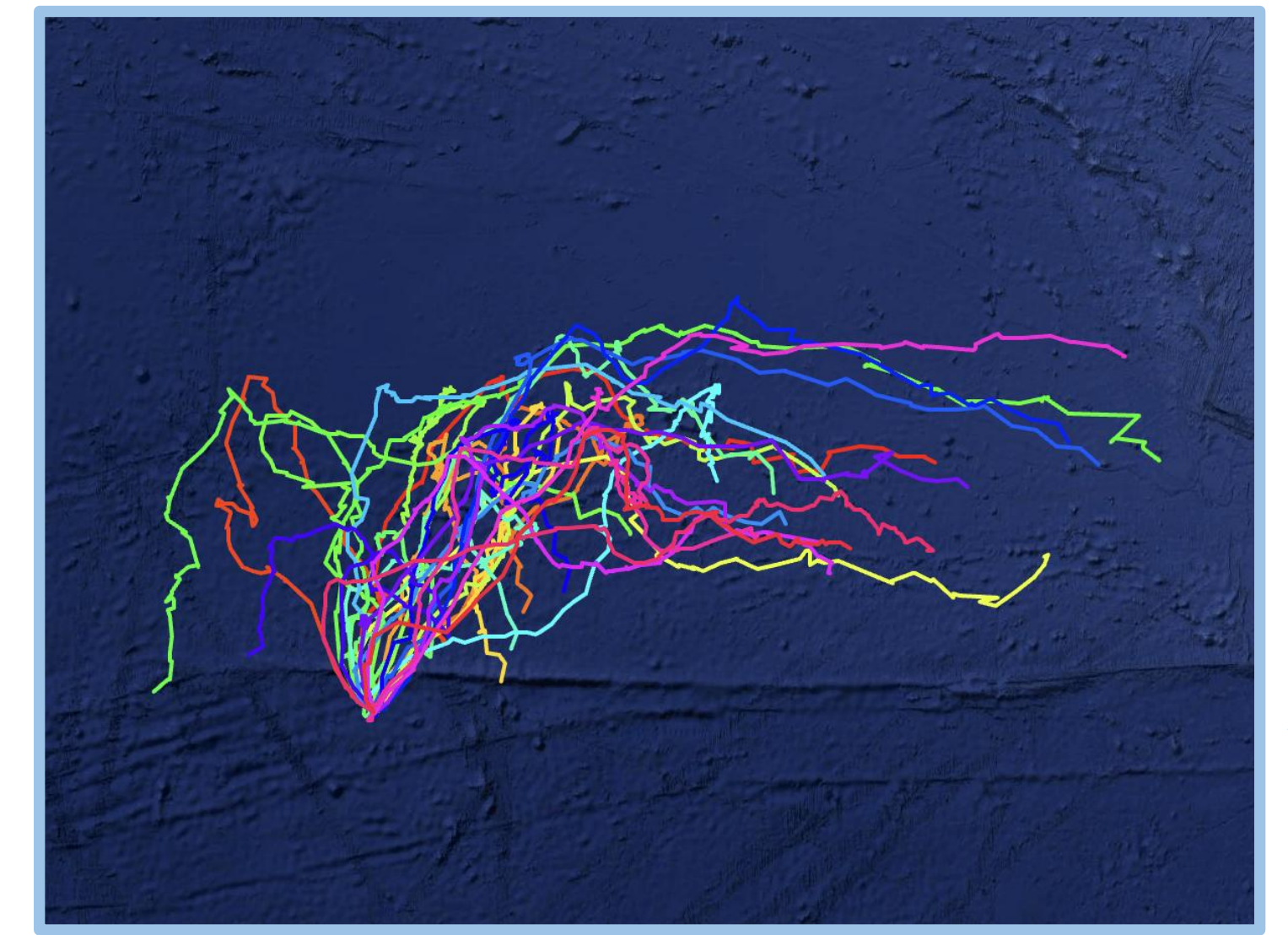
TAGGING

~2 weeks prior to deployment, STRETCH members attached Wildlife Computers Smart Position and Temperature "SPOT6" satellite transmitting tags to each turtle. These tags allowed us to track their horizontal movements in the water.

DEPLOYMENT



Turtles were loaded at the Nagoya port on a cargo 'ship of opportunity' that was traversing across the North Pacific. They were released from the ship in the eastern part of the CNP, based on longitude & preferred SST.



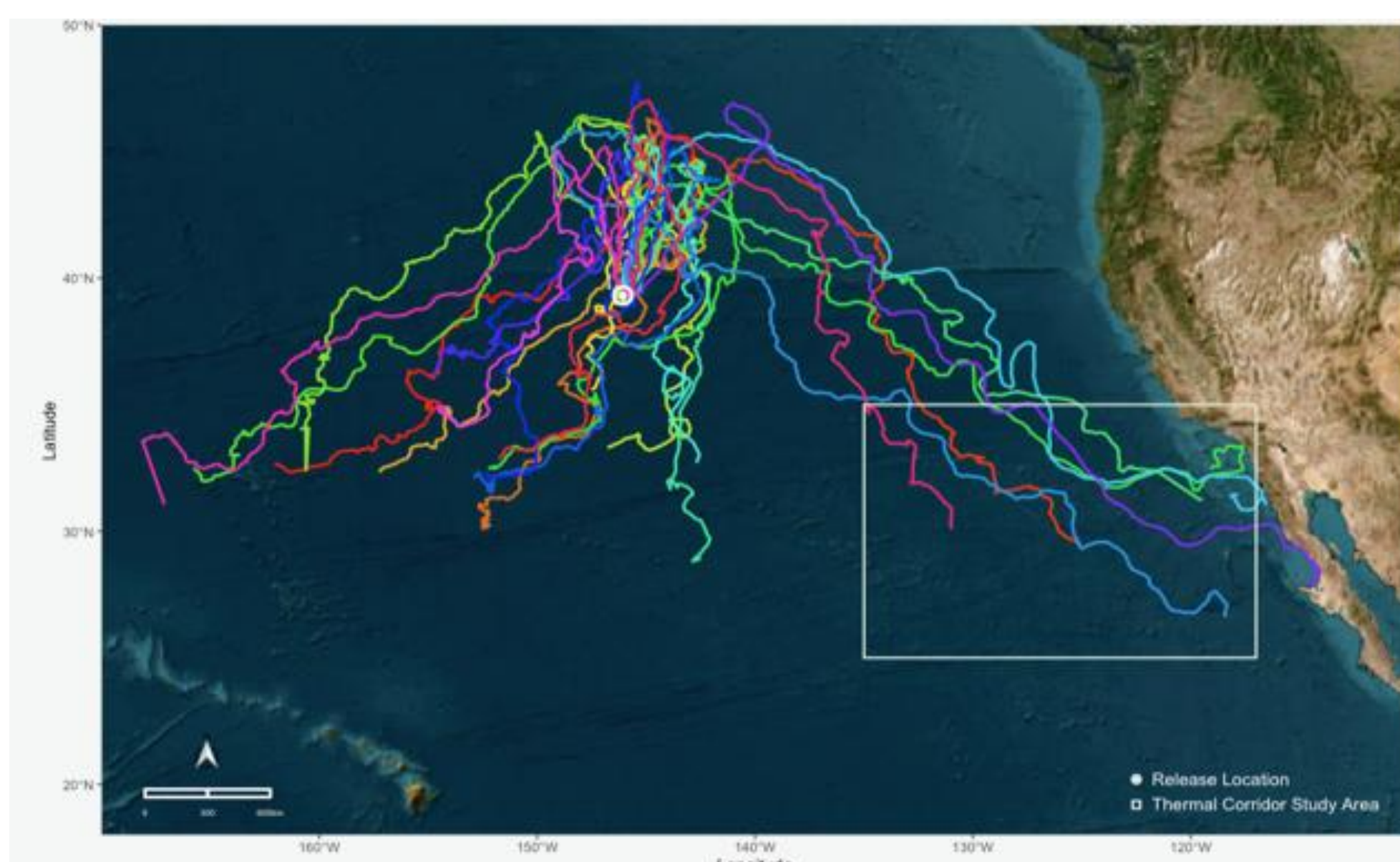
TRACKING

Each turtle was tracked daily using ARGOS to follow their movements and behavior. From the data, we seek to understand how loggerhead movements may change under various ocean conditions and directional climate change.

4 RESULTS

YEAR 1 (released 10 July 2023)

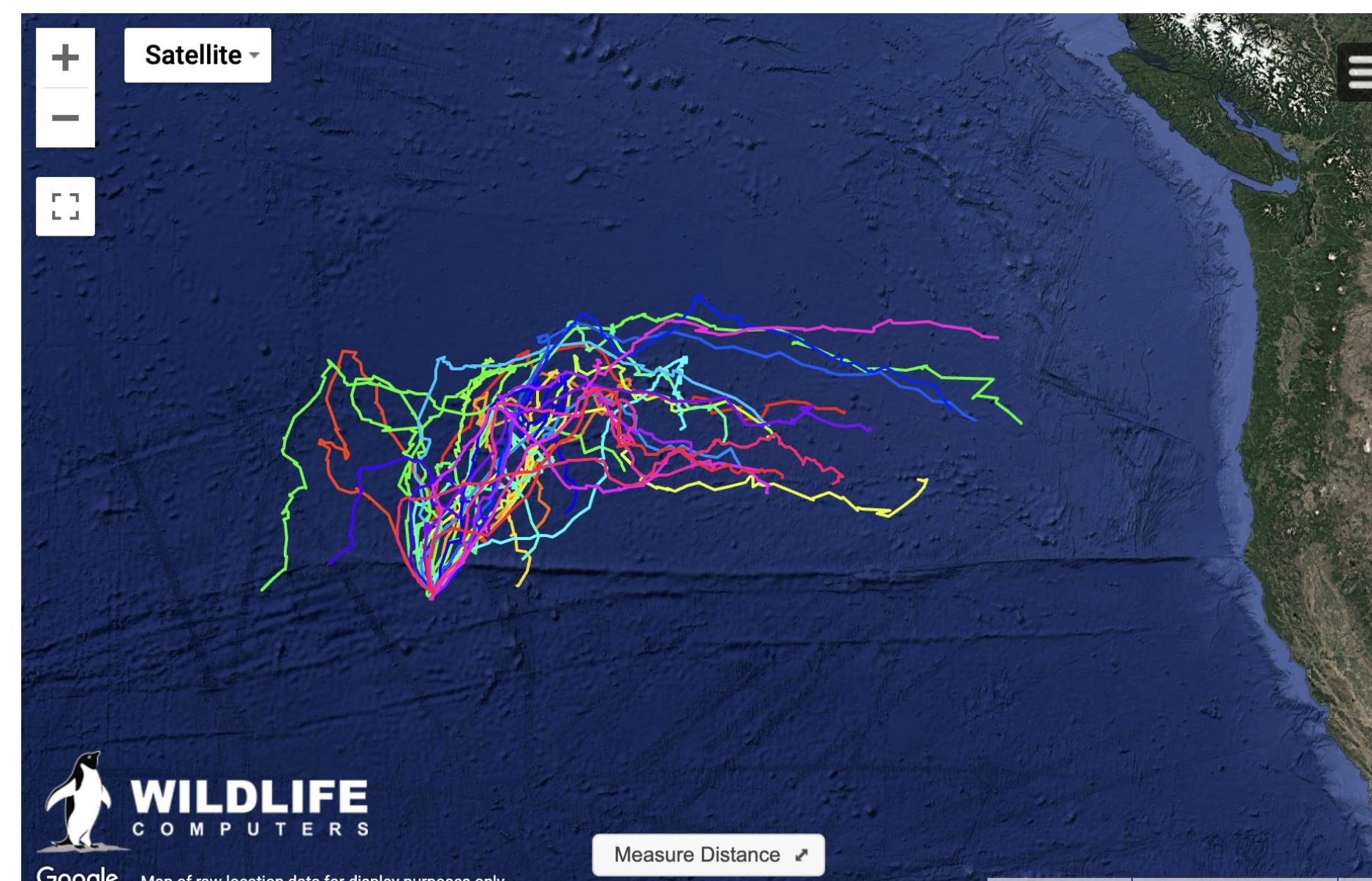
✓ DEPLOYMENT COMPLETE



- Longest transmitting tag lasted 271 days
- All turtles traveled through warmer than average SST, due to influences of a marine heatwave and an El Niño
- All turtles moved north until September 2023, following seasonal patterns in their feeding habitat
- After September, they moved south, with 7 turtles moving towards N America — 3 of which entered coastal waters of S California US & Baja California Mexico
- The remainder traveling westward or to destinations unknown before their satellite tags stopped transmitting

YEAR 2 (released 7 July 2024)

🕒 DEPLOYMENT IN PROGRESS



- 27 out of 28 turtles are still transmitting after 110 days
- The turtles have divided into two groups, those heading south (n=9) & those heading east (n=18)
- It is possible that strong Ekman transport, in response to especially strong westerlies, and/or warm SST anomalies may be driving the strong eastern movements of the turtles. As a result, the loggerheads are entering the California Current in a more northerly area than typical

5 SIGNIFICANCE

- Understanding distributional shifts due to changing ocean conditions will allow us to adapt our management & protection of this species
- Hypothesis validation is a critical step. If a corridor were to open more frequently, it could result in increased abundances for all migratory animals that utilize these habitats.
- STRETCH will create a unique educational opportunity to engage interested individuals around the world, allow them to learn about how sea turtles across all ocean basins respond to climate variation.

To learn more, follow STRETCH at:
www.loggerheadstretch.org



Citations: Briscoe et al. 2021, *Frontiers in Marine Science*.
Photo credits: Ralph Pace, Port of Nagoya Public Aquarium, Kochi University

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