

# Enhancing the Power of Whale Tagging with Citizen Science

## Whale Habitat, Ecology, and Telemetry (WHET) Laboratory

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Meet Cabernet Sauvignon, a female humpback whale first seen by the WHET Lab in Frederick Sound, Southeast Alaska, in 2015 (*Figure 1*). "CabSav" was feeding with a group of whales when she was instrumented by our team with a satellite tag on November 17, 2015, during an expedition funded by Pacific Life Foundation and MMI donors. The tag allowed us to follow her movements for more than 28 days, during which she spent seven days in Southeast Alaska before heading toward Hawaii. In all, CabSav was tracked for 22 days and 3,640 km during her migration and came within 950 km of Maui before the tag stopped transmitting on December 16.

This information alone was extremely valuable for identifying CabSav's critical habitats in Alaska, her migratory route, and her winter destination. Indeed, tagging allows us to track the movements and dive behavior of individual whales anywhere in the world for periods of weeks to months, thus providing vital data for the management and conservation of these animals. However, all but the very longest-lived tags exhaust their batteries and stop functioning in less than a year, so we rely on other means to augment the information we learn from our tags.

Fortunately for us, studying whales can sometimes be as easy as taking a picture! Humpback whales famously lift their tail out of the water when diving, providing a stunning opportunity for photographs. The unique shape and color pattern of their tail flukes make those photographs



**FIGURE 1:** "Cabernet Sauvignon" with her calf in Southeast Alaska in September 2020. Photograph in Happywhale.com by Mindy Huston, licensed under CC BY 4.0.

a great way to identify individuals. Researchers collect catalogs of fluke photographs (called ID photos) to keep track of where individuals have been seen across multiple years. By looking into her sighting history from photo-ID records, CabSav's story became even richer. Not only has she been seen in Southeast Alaska a whopping 70 times in 11 years (from 2008 to 2020), but she has also been seen in Hawaii in four years dating back to 2006. This year, CabSav was seen near Maui in January and again near Chatham Strait, in the summer, both times with her new calf (*Figure 1*). These connections can have huge conservation implications by telling us, for example, whether a whale using an area is part of the non-endangered Hawaiian population (more than 11,000 individuals) or the critically endangered Central American population (fewer than 800 individuals).

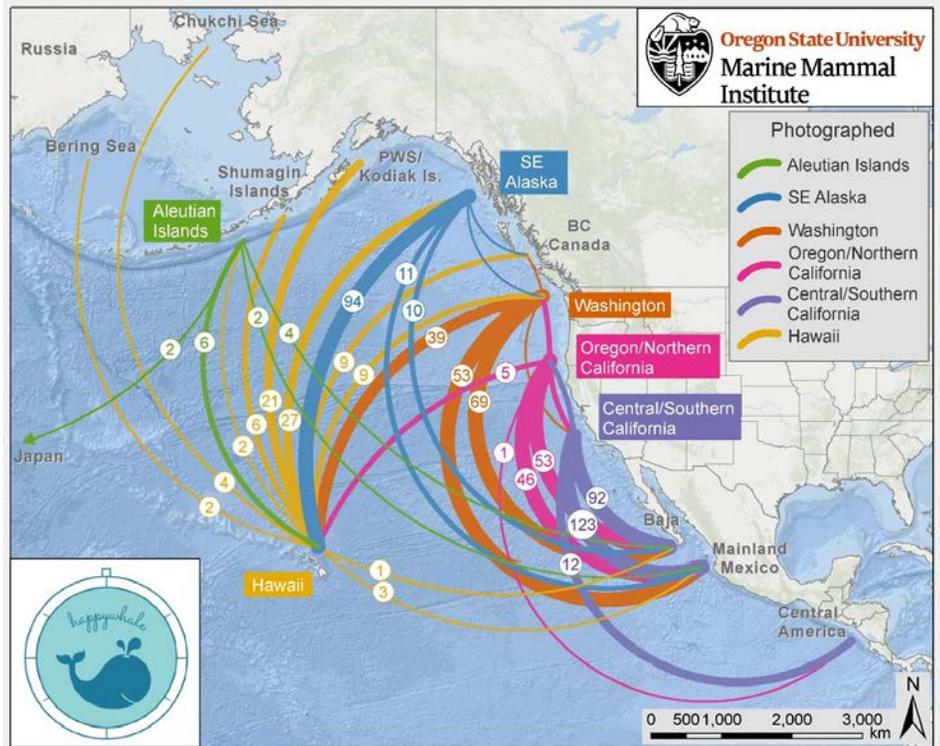
Our ability to access CabSav's rich sighting history was made possible by an online photo-ID resource called Happywhale that compares ID photos

to detect matches that would be very difficult and time consuming for humans. In using Happywhale, we get more bang for our buck from our field efforts by generating additional information from the whales we photograph (both tagged and untagged). To date, we have uploaded 5,217 ID photos of 1,168 unique individuals from locales as remote as Antarctica and the Bering Sea and spanning multiple decades (*Figure 2*). This benefits the broader research community by linking difficult-to-reach places to areas where whales are more commonly photographed, like Monterey Bay or the Hawaiian Islands.

The best part is that anyone can be a whale scientist! In addition to researchers, hundreds of citizen scientists around the globe are submitting their photos to Happywhale. They can then discover where their whales have been seen and by whom, all while helping researchers better understand and conserve these great animals. The public nature of

Happywhale has also connected us with citizen scientists and other researchers who have sighted our tagged whales months and even years after tagging, allowing us to better monitor a whale's long-term health and celebrate milestones like the birth of CabSav's calf.

Photo-ID matching allows us to better connect local and regional movements obtained from tracking data to different humpback whale population segments. During the spring-through-fall feeding season, whales from different breeding populations and with different conservation statuses mix off the western coast of North America, so it is important to understand which whales are using an area (Figure 2). Wildlife management agencies can then prioritize efforts to reduce the impacts from potentially harmful human activities like vessel traffic, fisheries, and noise in places where it matters most (i.e., where endangered populations occur). **MMI**



**FIGURE 2:** Photo-ID matches for 582 humpback whales photographed by the WHET Lab between 2004 and 2019 at six North Pacific locations, as revealed through Happywhale. The numbers in circles indicate the number of connections to known migratory destinations, with the oldest connection dating back to 1981!

**BELOW:** Photographs taken by the WHET Lab in 2004 and 2017 of the whale cataloged as MnCA04-029 show changes over time that can result in missed matches by scientists but are successfully matched by Happywhale. When resighted in 2017 off Half Moon Bay, CA, this whale was within 2 miles of its first encounter 13 years earlier and only 4 days later in the year!



## WHAT IS HAPPYWHALE?

Happywhale is an online photo-ID resource that uses artificial intelligence and machine learning to automatically compare and match ID photos of humpback whales.

To date, Happywhale contains photos of over 40,000 individual humpback whales from around the world. Using the unique coloration patterns and serrations on the trailing edge of the flukes, Happywhale can match whales 40 times faster and more accurately than the human eye. The algorithm has a 99% success rate (even with lesser-quality images), and in many instances has discovered matches that researchers missed.

For the WHET Lab's page on Happywhale, please visit <https://www.happywhale.com/org/169>.