



This photo shows a bottlenose dolphin being biopsy sampled at the moment the dart hits the individual, just below the dorsal fin. The yellow float on the arrow allows it to be retrieved. From the genetics we know this individual is a male. This dolphin is #HITt0736 in our photo-ID catalog, and has been photographed nine times (in seven different years) over an eight-year span, all off Kauai.

Do Scientists Really Know What They Are Talking About?

I have heard many times from fishermen in Hawai'i that scientists spend so little time on the water that they just don't know what they are talking about. It is certainly true that many fishermen in Hawai'i spent a lot more time offshore. In the course of conducting a long-term study of Hawai'i's dolphin and whale populations, my team and I have spent an average of two months per year on the water in Hawai'i. This year marks the 20th year of this study, and the days do add up. As of the end of June 2019, we've spent 1,123 days on the water in Hawai'i, working off all the main islands.

When on the water, we try to cover a lot of area each day. Combined, we've covered more than 80,000 miles off the islands. We've worked off Hawai'i island every year for the last 18 years, off Kaua'i and Ni'ihau for 11 different years, off Maui nui for eight years, and off O'ahu for six years. Our surveys covered every month of the year and waters from near-shore out to about 75 miles offshore.

We spent most days off the west or southwest (leeward) sides of the islands, but we always tried to spread our effort out as broadly as possible. When the weather allowed, we worked in the channels and as far offshore as possible. When the trade winds failed completely, we worked off the north and east coasts of Kaua'i, west of Ni'ihau (to Ka'ula) and well south of O'ahu.



This false killer whale, designated HIPc114 in our photo-ID catalog, was first documented in May 1990 and was last seen in August 2018.

How We Learn About Hawaii's Dolphin and Whale Populations

by Robin Baird

Every day we recorded detailed information on where we searched, what the sea conditions were, and how many sea birds and game fish and flying fish we saw. We also recorded the number of tour vessels, fishing vessels and Navy vessels we observed. For every encounter with dolphins or whales (3,179 and counting), we recorded detailed information on the group, how many there were, their behavior, how spread apart they were, what species of birds were associated with the group, etc. This information was entered into a database. We used both the effort and sighting data to compare sighting rates, group sizes and behavior among the islands in relation to depth and season and other variables. The process is similar to the way fishermen record details on days they've fished, where they've fished and every fish they've caught. Having this information in our database means we aren't just dependent on what we remember about any particular day or encounter. That said, our time on the water is only a small part of how we learn about different species in the islands.

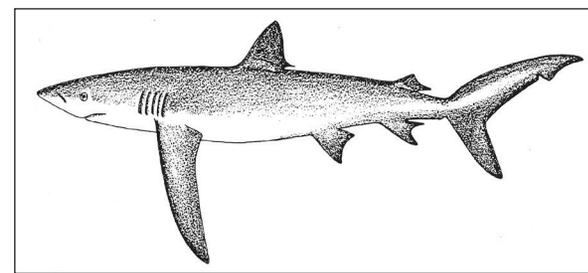
Satellite Tagging: Movements Offshore and Among the Islands

Most of our days on the water are spent off the leeward sides of the islands, so our survey effort is biased toward what species do in these calmer waters. In 2006, we started using remotely-deployed satellite tags to collect longer-term information on the movements and behavior of individuals wherever they go. These tags are deployed using an air rifle. The tags anchor into the dorsal fin of different species with two titanium darts. Through the end of June, we've obtained movement data (lasting at least two days) from 320 individual dolphins and whales in Hawai'i. These tags have lasted an average of 32 days (the longest transmitted for 228 days), so this information adds up. Combined, the attachment durations for these tags add up to 9,931 days, the equivalent of 27 years. These include tag deployments on 12 different species, including common ones (short-finned pilot whales—131 deployments) and less common ones (false killer whales—62 deployments and killer whales—three deployments).

Most of the tags only transmitted information on locations of the individuals, but more than 80 of them (on 11 of the 12 species) have also transmitted information on dive depths and durations, so we know where and when the individuals are foraging. We know, for example, that pilot whales do most of their foraging at night at depths of 300 to 1,000 feet, and that during the full moon they dive deeper and stay farther offshore than they do during the new moon. False killer whales, which we see feeding a lot during the day near the surface, also dive to more than 4,000 feet, including at night, although not very often.

Individual Photo Identification

Photographs of individual animals are the basis of much of what we know about the residency patterns and movements, social organization, and age and sex of many species. Over the years, we have taken almost 1.3 million photos of dolphins and whales in Hawai'i and more than 10,000 photos of birds and other wildlife we have encountered. We've also collected tens of thousands of photos from others who work on the water. Some of our photo-identification catalogs extend back to the mid-1980s. Currently, there are three people working full-time on these photos, slowly compiling identifications of distinctive individuals into long-term catalogs, so that we can say when and where, for example, a particular dwarf sperm whale or false killer whale was first (and last) seen in the islands, and what other animals it was seen with and where. From these sighting histories, we can estimate age, often identify sex (for example when an individual is seen with a small calf in attendance), and look at shark bites and other scars or injuries that might influence their health. **continued. . .**



Hawaii's Dolphin and Whale Population ... continued

We've never seen a shark attack on a whale or dolphin in Hawai'i, but we've documented large healed shark-bite wounds on many species, such as false killer whales, melon-headed whales and pygmy killer whales. These sighting histories can also be used to estimate abundance, learn whether individuals move among the islands, and get at the details of who they associate with. For example, we were surprised to recently learn that rough-toothed dolphin (often referred to as Steno) calves stay with their mothers for up to 10 years.

Shooting Dolphins with darts for Skin Samples

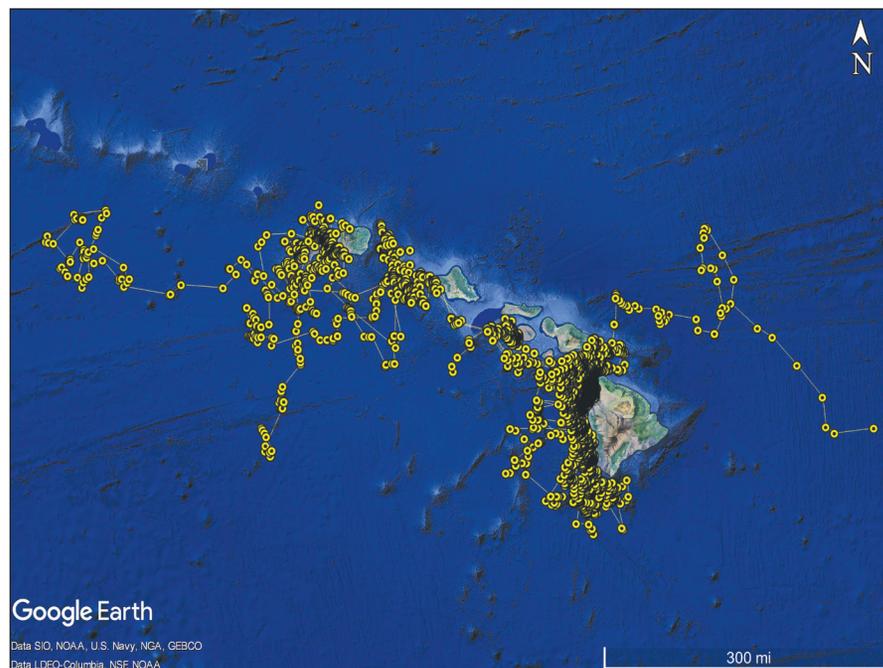
We also collect biopsy samples using a crossbow and a floating arrow with a biopsy dart attached to the end that removes a pencil-eraser-sized plug of skin and blubber. We've collected more than 1,200 samples from 14 different species, and these have been used to learn about genetics, toxicology and hormones, among other things. From the genetics alone, we can learn the sex of an individual, its relative age (through a new method called epigenetic aging), who it is related to (in some cases, like false killer whales, we are even learning who the fathers are), and broader-scale information, such as how reproductively isolated individuals are in comparison to elsewhere in the Pacific. These analyses have shown that bottlenose dolphins off Kona, for example, are genetically isolated from those off Maui nui, and that false killer whales around the main Hawaiian Islands are all closely related to each other.

Our couple of months a year on the water are only a small part of the story. Each field project collects enough photos, tag data, biopsy samples and other information to keep several people busy for months, or even years. We also share samples and data sets with graduate students and other researchers that use advanced analytical techniques to better understand how many individuals there are in each population, where they spend their time and why, and how different populations may be related.

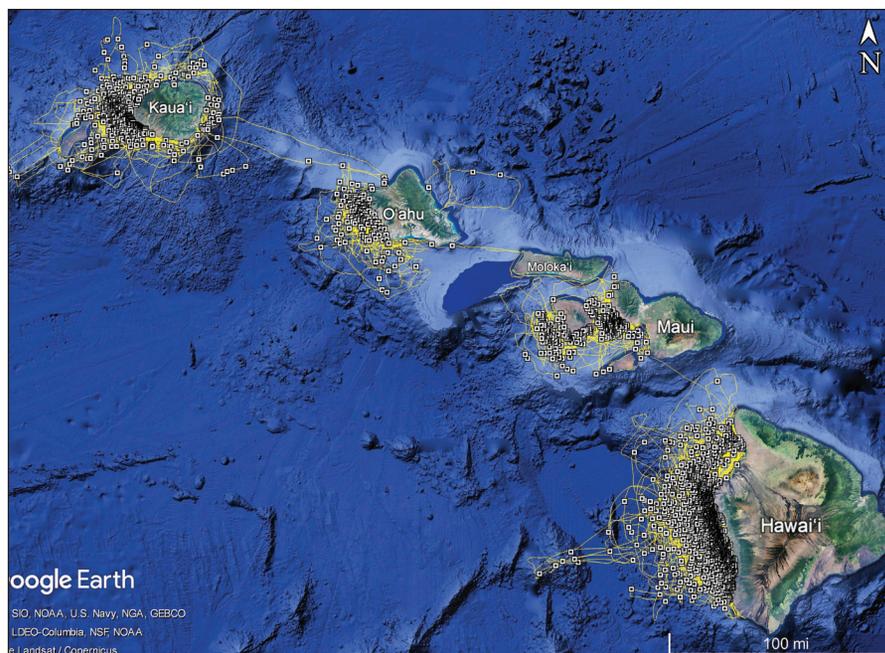
Talking Story – Learning From Others

We also learn a great deal from others, including local fishermen, tour operators and other researchers. Over the years, we've had hundreds of people out on the boat with us and use those opportunities to share what we've been learning and to learn from our guests. I recognize that our perspective is only that—our perspective, albeit based on a long-term and diverse study of Hawai'i's dolphins and whales. There are limitations to what we can see and learn from our field projects, and learning from others' experiences, perspectives, ideas and criticisms has been central to improving our understanding of Hawai'i's diverse communities of both humans and cetaceans.

Many fishermen have contributed directly to our studies by sending in photos or videos taken while fishing. We have provided cameras on loan to several fishermen that spend time in areas we rarely get to. Killer whales photographed by a fisherman off Moloka'i in October 2016 have been matched to killer whales seen off Kona by researchers in May 2017, providing the first documented between-year resighting of killer whales in Hawai'i's waters. More photos, particularly of uncommon species such as beaked, fin, sei, killer, or false killer whales, are welcome. Photos of any species from areas we don't normally get a chance to survey, such as off the windward sides of the islands, would also help us study how animals are moving among and around the islands. If you've had experiences you want to share, or if you have any photos of marine mammal encounters we can match to our catalogs, please contact me at <rwbaired@cascadiaresearch.org>.



These data points from 27 melon-headed whales satellite tagged off the main Hawaiian Islands from 2008 through 2018 represent 329 days of locations for individuals from a population resident to the Kohala area as well as a wide-ranging population that moves offshore and among the islands.



This map shows our boat tracklines over a period of 20 years, with over 3,000 dolphin and whale sightings of 21 different species.

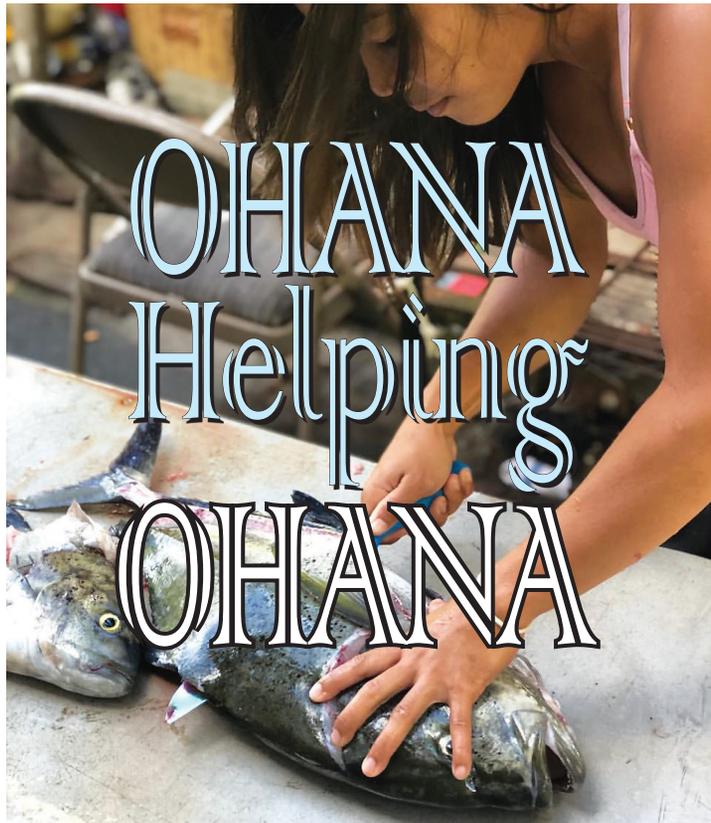
We are not doing this purely for science's sake: we work to make the results of our research as broadly available as possible so that the information can be utilized by ocean users and ocean managers to better understand and manage Hawai'i's dolphin and whale populations.

We share the results in scientific publications, as well as on social media and websites, and we work with teachers and other educators, journalists, authors and filmmakers.

We also give information back to those who contribute photos—information on where and when the individuals were previously photographed.

If you want to know more about what we've learned about Hawai'i's dolphin and whale populations, check out the individual species pages we've created at <http://www.cascadiaresearch.org/projects/hawaii/hawaiian-odontocete-species>.

... Robin



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