

California 501(c)(3) non-profit organization



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CALIFORNIA COASTAL DOLPHIN PROJECT
A REPORT



Message from the President

Okeanis was founded at the end of 2006 and became a non-profit in 2007. As all non-profits, Okeanis was a dream, an idea that was

brought to reality by four people with a passion for animals, the ocean and the enchanting California coastline. We knew from the start that the road ahead would be difficult and competitive, and we knew the first five years of an organization would be a testing ground of our determination to succeed.

As we look at the next five years with Okeanis, we are compelled to look back at our roots and enjoy all that we have accomplished, for it is a lot, considering we are still small. As we move into our next five years, we are setting the compass to a slightly new course. What we have learned in the past five years has shown us who we truly are and where our 'heart of hearts' is.

Our identity is strong, we work well together, and we are blessed with incredible friendship, a solid work ethic and many ideas and ideals that make us feel enthusiastic about the future. However, we realize that we need to grow faster financially, one area that has not been a major emphasis so far.

As our financial report shows, we have managed to do the work of a much larger organization with very few resources, thanks to the amazing contributions in time, personal financial support and unwavering commitment of our four Board Members, who also serve as staff for all the programs Okeanis has been involved with.

This *Review of the organization's operations from its inception (FY 2006-2012)* will provide a snapshot of our accomplishments, allowing us to measure our progress and providing us with the opportunity to **share with you next five years' plan. We are looking forward to what lies ahead, and we kindly ask for your support so that we can continue to grow.**

With hope and the best of wishes,

Daniela Maldini, Ph.D.
President and Chief Scientist
Okeanis

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MISSION STATEMENT

Okeanis engages in long-term research that focuses on understanding the social structure and unique cultural identity of specific populations of marine mammals, and is committed to be an ambassador of the beauty and uniqueness of each individual animal inhabiting the world's ocean.

Our Mission Statement is a declaration of the uniqueness of the individual within a population of long-lived marine mammals who depend on complex social interactions for their survival. We strongly believe that animals that have complex social structures also have **unique 'cultures' that make specific populations in specific localities different than other populations of the same species, despite many commonalities.**

Okeanis is dedicated to the study of these cultures and to comparing populations around the world to understand how their cultural differences allow them to survive in their unique environmental situation. The nature of our research is such that our studies need to be long-term, in-depth, and dedicated, so that we are able to get to know intricate social structures and the contribution of individual animals to their development. Because of the nature of our research, we have on-going, daily, field operations which, depending on the project, may require staff to observe animals for long periods of time, even throughout the night, in the case of sea otters in Monterey Bay.

We take on projects that require a long-term investment in time and staff resources, and we are entirely dedicated to the appreciation of the uniqueness of non-human social structures. We believe in field-based studies, and strive to encourage participation of citizen-scientists, students, interns and people from all walks of life so that we can transmit to them, through hands-on experiences, our passion for these animals and, hopefully, an understanding of the importance of non-human animals to the beauty and uniqueness of our oceans.

HISTORY AND PROJECTS

Our current efforts have been dedicated to two major projects along the California coast. With only four unpaid staff, a number of students and interns, and a handful of volunteers currently engaged in operations, our ability to take on new projects has been limited. However, the on-going work has been extraordinarily prolific, rewarding and successful.

Our current projects are as follows:

- The California Coastal Dolphin Project: a long-term study of Pacific coastal bottlenose dolphins (*Tursiops truncatus*);
- The Nereis Project: a long-term study of California (or Southern) sea otters (*Enhydra lutris nereis*) in Elkhorn Slough, Monterey Bay.

These two projects have been ongoing since 1990 and 1994, respectively, and involve year-round field efforts and a variety of sub-projects. These efforts evolved through several phases and have been my main life commitment as President, Chief Scientist and Founder of Okeanis.

I started the California Coastal Dolphin Project when I was a graduate student at Moss Landing Marine Laboratories in Monterey Bay and had to find large sums of money to fund this effort, which was the topic of my master thesis at San Jose State University in 1996. A large portion of the funding between 1992 and 1995 was provided by Earthwatch Institute (www.earthwatch.org) and over 200 volunteers from around the world participated in field work during this period.

While I was in the field with Earthwatch volunteers, I started monitoring sea otters in Elkhorn Slough, a local estuary. This was a side project that became increasingly interesting, as the sea otters invaded Elkhorn Slough in large numbers in 1995. If I had not been there to monitor this invasion, the historical information and insights from this event would have been lost. During this period of time, myself and fellow students and colleagues at Moss Landing Marine Labs co-founded the Pacific Cetacean Group, a non-profit dedicated to the study of marine mammals.

Because of funding shortages, I was forced to suspend most field efforts in 1996 and I moved to the University of Hawaii at Manoa to work on my doctorate in Zoology, which I obtained in 2003. During this period I was involved in numerous studies in the tropical Pacific, but my fascination with the California coast and the insights gained from the many years in Monterey Bay kept me wanting to come back. While I was in Hawaii, my friends and colleagues Thomas Kieckhefer and Dr. Susie Shane, both with Pacific Cetacean Group, kept the

flame burning by personally funding and conducting field surveys for the California Coastal Dolphin Project in 1998-2000.

When a new Board of Directors took over Pacific Cetacean Group and decided to go in a different direction, I found myself and my efforts without support. In the meantime, Tom Kieckhefer continued supporting the sea otter project and maintained weekly surveys of the slough until 2004 with both personal funding and funding from Friends of the Sea Otter.

I returned to leading the California Coastal Dolphin Project and the Nereis Project in 2006, with renewed support from Earthwatch Institute which lasted until 2008. Okeanis was founded in 2006. I was inspired once again by the common ideas, passion and commitment I shared with Mark Cotter, Robert Scoles and Ron Eby, amazing individuals that today are at the core of Okeanis. Up to now, all of us have been working without salary, and have often self-funded all research efforts. We would like to change this and finally be able to run the organization full-time without having to have side jobs or periods of inactivity because of funding shortages. We are determined to show you the amazing things we are finding out about these animals and to share our knowledge and passion for all we do.

In 2013, we are committed to seeking more funding for our organization so that we can expand and thrive. We have many ideas, hopes and experiences to share and we sincerely believe we are worth your support. Today, the California Coastal Dolphin Project and the Nereis Project stand testimony to our determination and passion. Please join us in celebrating our journey and enjoy reading about our findings and plans for the future.

OVERALL GOALS

The main goal of the California Coastal Dolphin Project is to understand the social structure of Pacific coastal bottlenose dolphins (*Tursiops truncatus*), a population that lives in the coastal corridor between Ensenada, Mexico and San Francisco, California. We would like to understand how individual animals contribute to the evolution of unique behavioral strategies for survival, to understand changes in abundance, distribution, and movement patterns, and to monitor the long-term health and reproductive potential of this population.

In conjunction with our scientific goals, we seek to educate the public about the uniqueness of Pacific coastal bottlenose dolphins and their role in the coastal environment of California to foster an appreciation for non-human cultures in the ocean.

We pursue our goals by engaging in a long-term, year-round effort, which involves many smaller projects assigned to specific students, interns or staff members. These projects intersect and contribute to the overall knowledge of this population and are conducted with the highest standards of scientific credibility and responsibility.

In the accomplishment of our overarching goal, we provide quality training opportunities for people who want to learn to conduct field-work and data analysis, and we strive to produce high-quality peer-reviewed scientific publications, as well as good quality educational materials.

Specific ongoing studies include:

- Photo-identification work aimed at documenting all members of the California coastal population and at establishing the natural history of each individual dolphin over many years including information on sex, alliances, birthing intervals, survival, and behavioral patterns;
- Monitoring skin lesions, contaminant loads and general health of individual animals using biopsy samples and sequential photography;
- Collaborating with other researchers and the public along the entire California coastline to monitor individual dolphin movement patterns, distribution and seasonal trends;
- Monitoring vocal patterns and how they relate to other information on social structure.

CALIFORNIA

BACKGROUND

There are two recognized stocks of bottlenose dolphin inhabiting California waters: inshore and offshore. The inshore stock ranges at least from Ensenada, Mexico to San Francisco, California (over 1,500 km of coastline).

The presence of bottlenose dolphins north of Point Conception (the geographical and climatic barrier between southern and central California) is relatively recent. Dr. Randy Wells and colleagues documented coastal bottlenose dolphins moving past Point Conception all the way to Monterey Bay during the 1981-82 El Niño Southern Oscillation event, which caused critical changes in the patterns of distribution of many marine species along the California coast.

Since then, bottlenose dolphins have been using central California waters regularly. However, there are still many unanswered questions regarding the limits of these dolphins' geographical distribution. Knowing the exact geographical boundaries of this population is critical to its proper management.

Dr. Defran, Professor Emeritus at San Diego State University, suggested that social exchange for coastal dolphins may stop almost completely between San Diego, California and San Quentin, Mexico, making San Quentin the southernmost limit of their distribution. In

CALIFORNIA COASTAL DOLPHIN PROJECT



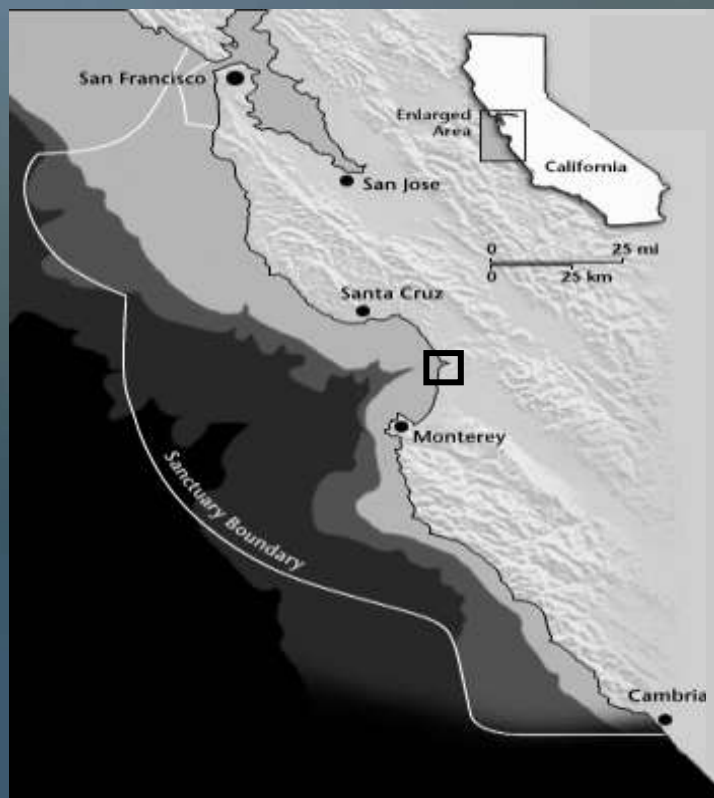
In recent years, climate change and frequent El Niño Southern Oscillation events have caused changes in the coastal California ecosystem which appear to have pushed California bottlenose dolphins farther north than they have ever been documented with sightings in Bodega Bay in 2012, and unusual sightings off the Oregon coast.

With a total population of up to 430 animals, based on recent estimates by Kimberly Dudzick at the California Center for Marine Sciences, there is cause for concern for these animals. Coastal bottlenose dolphins are important bio-indicators of the health of our ecosystem as they: 1) feed at the top of the marine food chain so they tend to accumulate human-related contamination as it passes from the bottom of the food chain to the top; 2) spend all their life in coastal water in close contact with human-related activities; and 3) have frequently been observed feeding in highly polluted areas like storm drain outflows and watershed plumes, according to Dr. Maddalena Bearzi of Ocean Conservation Society.

Our study is important because we are acquainted with the majority of the dolphins in this population as our catalog contains almost 400 individuals and we share information with researchers along the entire California coast. Because we spent many years studying these animals, we have a detailed history for each individual dating back to the 1990s in Monterey Bay, and to the 1980s when collating information shared by other researchers in southern California.

We are working on the historical analysis of the data we have collected to soon present a model for the social structure of these dolphins. We share our information with the general public on our online database at www.californiacoastaldolphinproject.org.

We have been spending as much time in the field as possible to collect the vital information that is providing the basis for our studies. Since 2006, we have completed over 300 boat-based surveys of Monterey Bay (see map above), which is the hub of bottlenose dolphin activity for the Central California coastline.



OUR GOALS FOR FY 2013

Our efforts in 2013 will focus on meeting the following objectives:

- Obtain enough funding to be able to conduct monthly surveys of Monterey Bay, and at least one State of California coastal survey (October);
- Complete Quality Control for our entire photo-identification catalog (1990-2012) and publish the entire catalog online;
- Complete analysis of contaminant samples (biopsies) collected between 2006-2012;
- Obtain funding for equipment and set protocols for beginning acoustic studies.

The survival of the California Coastal Dolphin Project is always dependent on our ability to support our field operations in the form of monthly surveys of the study area to locate, identify and collect monitoring data on individual animals. This effort involves at least two staff members in the field full-time for several days per month, a week of data entry and preliminary analysis by one staff member, and Quality Control against our historical catalog. Each set of surveys costs about \$1000 (about \$12,000 per year).

In addition, we would like to conduct one 10-day survey of the entire California coastline from San Diego to San Francisco, along the coastal strip (500 yards or less from shore), to locate dolphins we have not seen in our main study area. This effort involves at least four staff members for 10 days. We piloted this type of survey in 1997 with good results. Along the way, we would like to stop in specific coastal communities and talk about our studies and the dolphins to outreach to the public. This effort will cost \$6500.

Analyzing biopsy samples for pollutants averages about \$2000 per sample. We have already obtained 30 samples which have been waiting for funding to be analyzed. This effort will cost \$60,000.

In order to deepen our understanding of social structure, we are adding an acoustic component to our studies by monitoring wild dolphin communication patterns during particular behaviors. We are seeking funding to purchase equipment: hydrophone, recorder, software and underwater filming equipment. This effort will require an investment of \$15,000.

BOAT-SURVEYS

We operate our boat-based surveys from Moss Landing Harbor, in Monterey Bay (see map previous page). We would like to be able to expand our departures to other harbors in California, but this ability will depend on the repair of our boat trailer to make it safer for transporting the boat to other areas. During a survey, we travel along the shoreline at about 250 yards from shore, following the contours of the coastline and looking for bottlenose dolphins. Because the dolphins are always found within 500 yards from shore, they are relatively easy to spot, if the sea conditions are good. Because we work so close to the shoreline, days of high surf are too dangerous for our boat and we are not able to approach the dolphins in those conditions. When we find dolphins (which occurs 98% of the time, i.e., they are in Monterey Bay year round), we assess how many there are, what they are doing, which direction they are going and then carefully

Scientists at Okeanis are able to approach bottlenose dolphins and conduct benign research because they hold a Federal Letter of Authorization (LOC#xxxxxx) from the National Oceanic and Atmospheric Administration (NOAA) to conduct photo-identification work along the California coast. Member of the general public and organizations not holding a federal permit have to remain at a distance of 100 yards or more from these animals at all times. We are very careful when we approach animals and make sure we are safe and respect the dolphin at all stages of our work.

approach them close enough to be able to have a clear view of their dorsal fin so we can take an identifying photograph of each individual (this methodology is called photo-identification).

Using this method we have been able to individually recognize 412 adult animals, which we have been following over the years.

We are able to tell a lot from the photographs: for example, we know when and where an individual was seen along the coastline, who it was with, whether it had a calf or not (this is how we determine an animal is a female), and how permanent the association with other

Our collaborators are San Diego State University (Cetacean Behavior Lab), NOAA-SWFSC, Scripps Institution of Oceanography, Orange Coast College, Ocean Conservation Society in Los Angeles, and Golden Gate Research in San Francisco. Together we are able to follow the movements of individual animals along the entire California coastline through the exchange of photographic information.

We are very proud of our extensive photo-identification catalog which is being published on-line thanks to a grant from the American Cetacean Society, Orange County Chapter and can be found on our website (www.californiacoastaldolphinproject.org).



A nice photo-identification shot of the left side of the dorsal fin of female Deuce and her newborn calf taken in 2008. Deuce has also been seen in Santa Barbara, Los Angeles and

individuals is over time. We can also look at how long a calf remains with its mother, whether it survives or not, and monitor body condition (is the animal the appropriate weight or emaciated), and skin conditions (more later). In addition, we can look at individual behavior over time and determine social relationships.

We also collaborate with other researchers along the coast through the California Dolphin Online Catalog (CDOC) hosted through OBIS-SEAMAP (<http://seamap.env.duke.edu>).



The mother-calf bond lasts 4-6 years and is critical to the calf's long-term survival.



Male Akeakamai (above), male Poke (below left) and male Allure (below right)



Maintaining our boat-based survey program is critical to being able to follow the lives and health of dolphins over time and keeping close tabs on our females, their birth rate and the success or failure of their efforts as mothers.



This is how close to shore California coastal bottlenose dolphins are found on a daily basis. Calm conditions and low surf are critical to safely operate so close to shore.

Your support is the lifeline of this effort.

BIOPSY SAMPLING

Biopsy sampling has been a very useful methodology in cetacean (whales, dolphins, and porpoises) research in the last decade. This technique involves a specially constructed dart outfitted with a tissue-collection tip, which is fired toward a dolphin or whale to hit the **dorsal side of the body and collect a “plug” of skin and fat (blubber)** to be analyzed in the lab.

This technique is quite safe for the animals, as the dart only penetrates less than one inch into the skin and has been shown to elicit mild to no reaction from the dolphins.

In fact, dolphins seem to become more startled by a dart missing them and hitting the water than by an actual hit. These animals have a tough build and the procedure is similar to what we would experience by getting an injection from a nurse or doctor. We would not consider using this technique if we were not comfortable with its safety for the animal.

The information provided by the small skin and blubber samples collected is invaluable. The skin can be used to determine the sex of the dolphin, which is not easily obtainable visually, as males and females look the same. Skin can also be used to culture pathogens and determine the potential source of skin diseases. It can also provide information that helps to understand social organization, kinship, mating

patterns, population size, stock identity, and variability within and among populations.

Subcutaneous fat (fat found under the skin) can be used to determine how dolphins have been affected by pollution, as many contaminants originating from human activities bind with fat molecules. Stable isotope and fatty acid analyses can also provide information on feeding ecology, nutritive condition and hormones for determining reproductive state and stress levels.

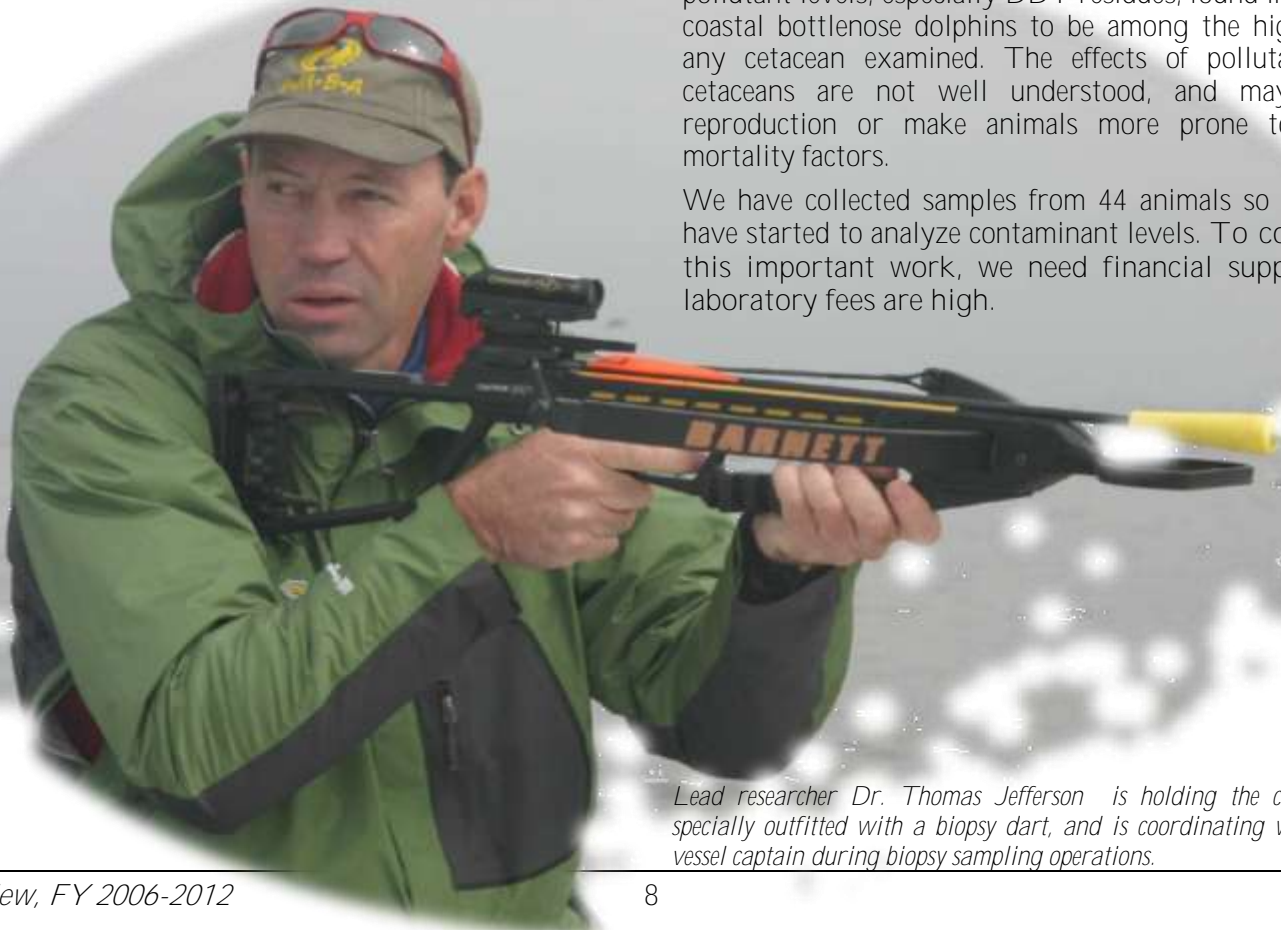


Biopsy dart bouncing off the body of a dolphin. You can see the dart bouncing off the dolphin's body and a piece of blubber (subcutaneous fat) sticking out of the tissue-collection tip (Photo by Mark Cotter).

STATUS REPORT

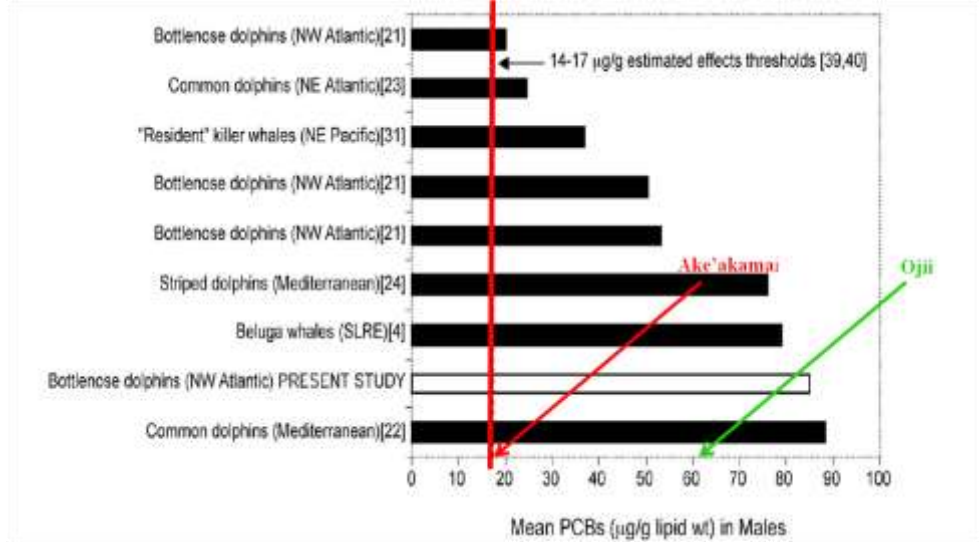
Preliminary data from stranded carcasses have shown pollutant levels, especially DDT residues, found in Pacific coastal bottlenose dolphins to be among the highest of any cetacean examined. The effects of pollutants on cetaceans are not well understood, and may affect reproduction or make animals more prone to other mortality factors.

We have collected samples from 44 animals so far, and have started to analyze contaminant levels. To complete this important work, we need financial support, as laboratory fees are high.



Lead researcher Dr. Thomas Jefferson is holding the crossbow specially outfitted with a biopsy dart, and is coordinating with the vessel captain during biopsy sampling operations.

There is cause for concern over the potential long-term effects of contaminants for dolphins and people alike. Being able to associate contaminant levels with the residence history of individual animals, their sex and their social affiliation patterns will provide currently unavailable and important information on how these contaminants may affect individuals (*i.e.*, reproductive rates, sociality, and health). One class of such contaminant is Polychlorinated byphenils or PCBs. They are artificially synthesized chemicals that have been created for industrial purposes, and are a type of organochlorine. PCBs bind to fat so they readily bioaccumulate in fatty tissues. PCBs are known to suppress the immune system, promote cancer, and interfere with other biological systems in animals. Additionally, PCBs are believed to have the ability to trick the endocrine system, mimicking estrogen, the female hormone responsible for the development of sexual characteristics. Evidence suggests that this endocrine modulating behavior may be 'feminizing' males of many different species--resulting in decreased reproductive fitness.



This figure comes from a 2009 research paper by Pulster and colleagues published in the journal *Environmental Toxicology and Chemistry*, Volume 28. It reports PCB levels for bottlenose dolphin populations in the Atlantic, striped dolphins in the Mediterranean and other cetacean populations. The red line is the level of contaminants that is considered dangerous to health. The arrows indicate where our two dolphins fall in comparison to other populations in this graph.



So far our results for the two samples we have been able to process (we had only funding for these two PCB samples so far) show that levels of PCB in two of our male dolphins (Akeakamai and Ojii) are very different (red and green arrow in figure) but are both above the estimated safe threshold, *i.e.*, they are in a range where harmful effects to health can be expected. Ojii in particular has PCB levels that are four times the safety threshold. We expect similar results for all other dolphins and knowing where each animal falls and monitoring the animal over time will give us information on how animals fare over their lifetime.

With regards to mercury, we were able to analyze 19 samples and found levels of total mercury to be $1.83 \mu\text{g/g}_{\text{wet}}$ ($\text{SE}=0.12$) on average. These levels are high as the United States EPA defines safe levels at $0.1 \mu\text{g/g}$. These dolphins, on average are 18 times above safe levels of mercury in their tissues and one animal had levels as high as $3.6 \mu\text{g/g}_{\text{wet}}$. Researchers found that high levels of mercury passed from human mothers to their child *in utero* produced irreversible impairment to specific brain functions in the children. In addition, researchers report that neurological changes from high levels of mercury may be linked to decreased nervous system control of the heart function.

Dr. Jefferson processing biopsy samples and Field Director Mark Cotter observing the procedure.



WE ARE CONCERNED ABOUT SKIN CONDITIONS IN CALIFORNIA

The calf of one of our favorite mothers, Sakura, developed a frightening condition that we could not explain. We have seen other calves with the same condition in the last few years (large photo).

Healer", calf of Marea, was documented as a calf (2006) with an unknown severe skin condition which improved over two years and is currently disappearing. Healer separated from its mother and started life on his own in September 2008 (photo below)



Between August and October 2006-2008, Okeanis's research team conducted 88 coastal surveys specifically targeted at understanding the incidence of skin conditions on California coastal bottlenose dolphins. Such boat-based surveys resulted in the photo-identification of 212 adult bottlenose dolphins and of 42 calves of known mothers.

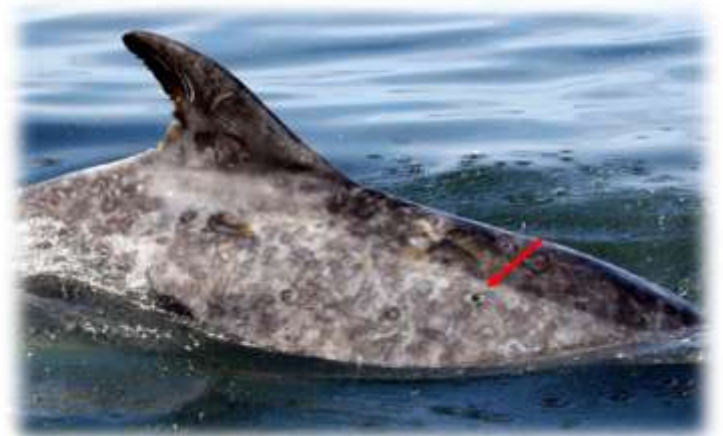
Using the best photographs of individual dolphins, we performed an in-depth assessment of the type of skin conditions we could readily observe in the photos and were able to classify them according to their visual characteristics and to the areas of the body that we could see them on. We found that over 90% of the adult dolphins and 91% of the calves were affected by one or multiple skin conditions. Some animals were affected by up to seven different skin conditions at the same time and both males and females were equally likely to have these conditions.

We do not understand enough about these skin conditions to be able to correlate them to a specific factor, but we possess in-depth histories for individual dolphins and would like to continue investigate these issues.

NIA BOTTLENOSE DOLPHINS

We sincerely hope that your continued support will allow us to discover more and more about the threats facing these animals and the possible solutions. We are working continuously to analyze each photo in more detail and to follow each recognizable calf over long periods of time.

The red arrow on male Wizard indicates the biopsy sample that was collected in an area where skin condition is occurring. We hope to be able to sample affected skin and conduct tests to determine the potential cause of the condition.

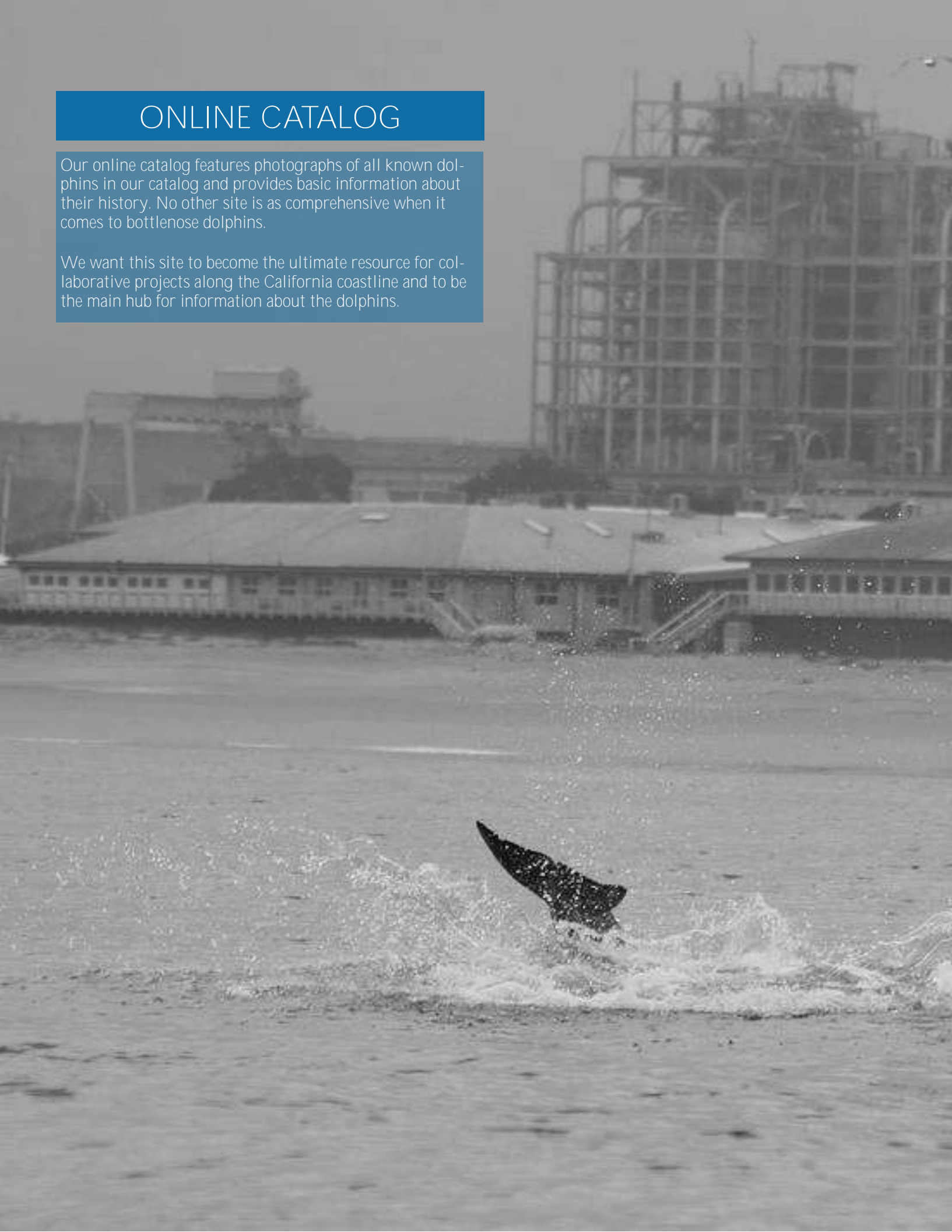


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ONLINE CATALOG

Our online catalog features photographs of all known dolphins in our catalog and provides basic information about their history. No other site is as comprehensive when it comes to bottlenose dolphins.

We want this site to become the ultimate resource for collaborative projects along the California coastline and to be the main hub for information about the dolphins.





Thanks to a grant provided by the American Cetacean Society, Orange County Chapter, we were able to launch a comprehensive website that will feature all aspects of the California Coastal Dolphin Project, including a blog, a complete year-by-year catalog of dolphin dorsal fins and links to all reports, publications and news about the project. This is a major accomplishment, that will allow us to reach many people at the same time.

We are planning for this site to grow in scope to offer on-line courses on dolphin ecology, photo-identification, behavior and to cover many aspects of our results. In addition, we will use the site as a resource to advocate for the California coastline and to push for better protection of our shorelines. The web-site is at its fledging stages but we are already proud of its message and looks.

We strongly believe in the use of technology to reach out to as many people as possible and we would like to expand our site to the maximum extent possible. This site is in conjunction with our main Okeanis website (www.okeanis.org), which features all other projects we are currently involved in.

We hope you will visit our project's webpage and that you will provide us with feedback on its featured content. We also welcome any help you can provide to make sure our page is seen by as many people as possible.

THE MISSION OF OKEANIS

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Established 2007



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