



Atlantic Spotted Dolphins Behavior and Communication

How Participatory Research Can Inform us About
Cetacean Culture, Communication, and Intelligence



Spyhopper



Photo courtesy Wild Dolphin Project.

by **Dr. Denise L. Herzing**

It's always a privilege to be at an ACS conference, and it was an even greater privilege to speak at the conference in the fall of 2012. I wanted to challenge the theme "*Humans and Whales: A Conflicted Relationship*" in my talk because, although it is a fact, I don't believe it is our predetermined future. The question now is how can we change our relationship to the positive?

I have worked in the wild and in the water for the last 28 years observing free-ranging Atlantic spotted dolphins (*Stenella frontalis*) and bottlenose dolphins (*Tursiops truncatus*) in the Bahamas. When I set out to explore the lives of these wild dolphins in 1985, the species were unstudied and correlations of underwater sound and behavior were at a minimum. My original goal was to locate a spot in the world where I could plant myself for 20 years to do what Jane Goodall and Dian Fossey had done in the wild with primates: observe their behavior as individuals within a complex society and tell their story.

There are many advantages of working in the Bahamas and seeing clearly underwater is one of them. But spotted dolphins also have the clear distinction of age classes based on their developing spot patterns. Through watching the development of behavior over time we truly see the process of what it takes to grow up as a fully-actuated dolphin in a society. This single aspect has been more informative for the interpretation of underwater behavior than any other part of my research.

Spotted Dolphins, cont.

Second to watching the developmental behavior of dolphins underwater is the advantage that working non-invasively with free-ranging dolphins has provided. Although it takes more time to get certain types of data (such as genetic information via fecal collection vs. biopsy darting) the payoff is tremendous. Investing in the etiquette and relationship with the individual dolphins themselves (learning how to behave appropriately underwater and respect their space) has provided decades of opportunities for intimate observations unattainable anywhere else. I am certainly not suggesting that researchers, or the public, dive thoughtlessly into the water to observe dolphins. However, there are a few areas in the world where such underwater opportunities occur, and science may be missing out on some unique and new ways to understand both dolphin biology and cognition.

What Have We Learned by Observing Dolphins Underwater?

Over the decades, along side brilliant graduate students and colleagues, we have tracked over 300 individual spotted dolphins and documented their degree of spotting, identification marks, reproductive cycles, associations, sounds, and behaviors. Like other well-studied delphinids such as the bottlenose dolphin (*Tursiops sp.*), Atlantic spotted dolphins have similar life history patterns. They live in a fission-fusion society, have close bonds between mothers and offspring, males form alliances, and females give birth every 3-4 years. What is so clearly seen in the Bahamas, and one of the many reasons we believe that dolphins are smart and complex, is the degree of multi-generational participation in the development and education of their young. Juveniles babysit calves, males babysit calves, mothers teach young, juveniles teach each other, and grandmothers oversee the big picture. I often wonder if it could be the lack of this type of horizontal transmission of information and learning, which often occurs in captivity or during issues of population recovery, which determine negative outcomes. Social species require social knowledge and interaction as much as they require food and habitat to survive.

One of the clearest impacts on the social lives of the Bahamian dolphin community occurred at our study site in 2004. After two large hurricanes devastated our study site in 2004 within a three-week period, we incurred a 30% loss in both species across all ages and both sexes, with a slight bias towards younger dolphins. The spotted community was completely destabilized from a social point of view. It took three years before spotted dolphins began behaving normally with each other and for the two sympatric species to reinitiate interaction. It was, on every level, a social shake-up.

In the Bahamas we can now correlate basic behavioral activities to types of sound, and in some cases sequences of sounds. We can match signature whistles to individual dolphins and watch how these signals are used, or change over time, and we can watch the ritualized process of courtship or aggression while observing the inexperienced juveniles, as a team, attempting to learn and adjust their signals, including synchronizing their swimming and vocalizations. We record ultrasonic signals with specialized sound acquisition equipment and now see how much information beyond our hearing is available for the dolphins to encode, decode, and use to communicate with each other.

We can clarify the difference between the normal function of a bubble ring vs. the ones seen on the internet from captive dolphins that create and play with bubble rings as toys. In the wild a bubble ring is a signal of impending aggression, period. It is their natural use of communication signals, not their artificial use, which informs us who dolphins are in their own world.

One of the most fascinating behaviors we observe in the Bahamas is the intimate and complex interspecific interaction between Atlantic spotted dolphins and the sympatric resident bottlenose dolphins. Although some of the most overt interspecific behaviors entail aggression and dominance displays between males of both species, the majority of the time these two species engage in affiliative behavior such as play, travel, and alloparental care. These two sympatric species become helpful neighbors to each other by forming interspecific alliances when a third party intruder threatens the group, such as a shark or non-resident offshore bottlenose. I sometimes wonder if the separation of species breaks down when survival and social considerations come to play. Clearly Atlantic spotted dolphins and bottlenose dolphins have learned to share space in the wild and have developed this relationship over time.

What Else Could We Learn by Observing Dolphins Underwater?

Although many of us care deeply for the larger environment, ecosystems, and species protection, it is the dolphins' cognition, culture, and intelligence that give us most pause when we put the lives of these animals in the larger global perspective. This is why we care.



Dolphin foraging. Photo courtesy Wild Dolphin Project.

Like other sentient beings (elephants, primates and others) we begin to understand the greater loss; that of unique societies, cultures, and individuals destroyed by another species, Homo sapiens, sometimes intentionally but most of the time simply neglectfully. Dolphin personalities and individual life histories make a large difference in the way that a dolphin develops and how successful individuals are in their own world. The disruption or loss of individual dolphins from a group, whether from natural causes, slaughters, or capture out of the wild for captive facilities, is devastating to the group. It is clear that we can no longer think of dolphins as “a species or stock” but must consider that they are individuals with unique cultures and societies.

Everything we know about dolphins, from physical measures of Intelligence (brain to body ratios or encephalization quotient – EQ), to their cognitive flexibility (language comprehension, mirror self-recognition), tells us they are

intelligent. Their social and signal complexity point to a complicated creature with much to say in the world. This is also the reason why the term “personhood” and the natural rights of sentient species comes up in dolphin discussions these days. We have proven many things about dolphin intelligence and now it’s time to find appropriate actions that support what we know, rather than turn a blind eye. And yes, many of these studies have taken place in captivity over the decades. Many of these studies have been ground-breaking and have opened up our eyes to the behavioral flexibility and cognitive abilities of dolphins. However, given what we know now, *how do we reform our actions and ethics appropriately to catch up with our scientific knowledge?*

If convergent evolution, via parallel driving forces like complex social structure, communication signals, and politics, drive intelligence, then we probably share the planet with many other intelligent species. There is evidence from other species, including vervet monkeys and prairie dogs, that they use referential signals which encode specific information in their alarm calls, like “types” of predators. With dolphins we still don’t know how much information they encode in their signals. It’s not hard to imagine that it would be evolutionarily smart to be able to communicate the “type” of shark approaching your group. Are their signal whistles, like names, equivalent to the referential signals of alarm calls? Do we know what information lurks in the high frequencies of dolphin burst-pulsed sounds? Perhaps we need new tools and methods to jump to another level of understanding.

Scientific Opportunities - Conflict or Challenge?

There might be a new way of working with dolphins and whales that has not been a primary method of approach, but might be a productive one. *Participatory Science*, a way of including the species as full voluntary participants, might be a new window into revealing important properties of animal communication and cognition. The ability to detect and analyze whatever cognitive processes occur in the brains and minds of these animals would be vastly rewarding.

Given the risk factors and acknowledging the potential impacts, *should scientists be exploring some of these unique opportunities?* I can think of a few ways to start. Using moments of mutual curiosity (respectfully and carefully) to work with wild animals is one. Nothing has paid off more in my work in the wild than investing in the relationship and maintaining a proper etiquette with the dolphins.

Occurrences of spontaneous *mimicry*, both physical and acoustic, are not unheard of between humans and dolphins; could this be used as an invitation across species boundaries? *Cognitive interfaces* in the wild show huge potential for utilizing our knowledge and technology for asking the question, “What are they doing with all that brain in the water?” My colleagues Dr. Adam Pack and Dr. Fabienne Delfour have joined me in the Bahamas over the decades to explore exactly this, albeit with a friendly and semi-habituated (but normally healthy) community of spotted dolphins.

Should we save dolphins just because they’re intelligent? Of course not. We should save a species or ecosystem simply because it has the right to exist in a healthy and normal way. Does the average person want to save intelligent species,

Spotted Dolphins, cont.

yes. The dolphins' ability to connect and show intelligence is an extra draw, a way to link humans with other species, and any edge we can give our aquatic friends is worth a try.

Are Humans and Whales in Conflict: yes. Do they have to be: no. There are many examples around the globe where ecotourism has shown us the possibilities. Special areas like San Ignacio Lagoon, where once hunted gray whales now meet adoring human fans. The practical facts of life have also shed light on ways of working with dolphins for mutual benefit, like the shared hunting activities of fisherman and dolphins in Laguna, Brazil. In this scenario dolphins are not competitors but partners in a joint activity for mutual benefit.

Approached carefully, underwater and participatory frameworks may combine to offer us unique insights unavailable any other way. Such approaches would also give us alternatives to holding wild dolphins captive for human experiments, their lives and future forever taken from their family and friends. It might be time to take a leap of faith and a different approach in both the management of stocks and our activities impacting whales and dolphins. When will our management, education and ethical treatment of dolphins catch up with our science? I, for one, hope soon.

Dr. Denise Herzing, Research Director of the Wild Dolphin Project (www.WildDolphinProject.org) has completed 28 years of her long-term study of the Atlantic spotted dolphins inhabiting Bahamian waters. She received her B.S. in Marine Zoology in 1979; her M.A. in Behavioral Biology in 1988; and her Ph.D. in Behavioral Biology/Environmental Studies in 1993. She is an Affiliate Assistant Professor in Biological Sciences and in the Dept. of Psychology at Florida Atlantic University, Boca Raton, Florida. In 2008 Dr. Herzing received a Guggenheim Fellowship. She is also a fellow with the Explorers Club, a scientific advisor for the Lifeboat Foundation and the American Cetacean Society, and on the board of Schoolyard Films. In addition to many scientific articles, she is the author of the new book "*Dolphin Diaries: My 25 years with Spotted Dolphins in the Bahamas*" and "*The Wild Dolphin Project (2002)*."

Dr. Herzing has authored and co-authored many papers in the fields of whale biology, animal communication, and human consciousness. Coverage of her work with the spotted dolphins has appeared in National Geographic, BBC Wildlife, Ocean Realm and Sonar magazines. Her work has been featured on Nature, Discovery Channel, PBS, ABC network television, BBC in England and NHK in Japan.

Her fields of interest are animal consciousness, behavior and communication of cetaceans, and environmental ethics. Dr. Herzing has given presentations and lectures to the following research, education and conservation organizations: Society for Marine Mammalogy, European Cetacean Society, International Fund for Animal Welfare, and American Cetacean Society.



Rare Views of Beautiful Whales

Beautiful Whale by Bryant Austin

Foreword by Sylvia Earle

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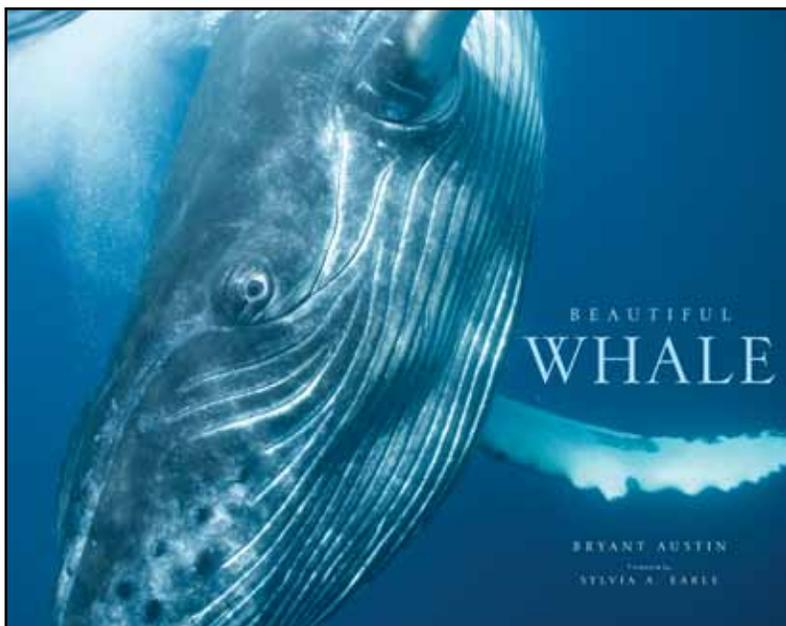
Hardcover - 124 pages with 80 color illustrations

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Book Review by Uko Gorter

Slowly, my eyes wandered around the cetaceous immensity that was before me. Following every curvy fold, deep crease, and each flake of sloughing skin. Observing a tiny cyamid (whale louse) seeking shelter near the base of a barnacle. Noticing a knobby tubercle, itself supporting a diminutive hair follicle. Admiring the painterly swirly patterns of pigmentation above the thick eyelid folds. Inspecting a persistent remora that is clinging on in the shadow of the whale's enormous pectoral fin. And finally, gazing into the penetrating stare of an inquisitive minke eye. A strange sensation came over me – a feeling that I could actually touch the whale, caress its sculptural hulking body and take in all its finer details. It is a true palpable experience that moved me nearly to tears.



But I did not need to come up for air, nor was I in need of SCUBA gear. I didn't even have to get wet. No, I merely immersed myself in the two-dimensional world of a book.

This is no ordinary book, however. It is a culmination of a near decade-long odyssey of photographer Bryant Austin in his quest to bring whales closer to all of us. But he has done so with an entirely new vision and a fresh perspective.

In *Beautiful Whale*, Bryant lets his photos and the whales do most of the talking. However, the few chapters give us a glimpse into his arduous but rewarding journey photographing whales at a scale that is completely unique. He introduces us to some of the individual whales that have sought him out for close up inspection. Like 'Corduroy,' the humpback calf off Tonga, 'Scar,' the sperm whale near Dominica, and 'Ella,' the dwarf minke whale off the Australian Barrier Reef. The text also gives us snippets of valuable information about the whales portrayed.

A lovely and poignant foreword is given by, none other than, Sylvia Earle, famous ocean explorer and author.

Bryant set out to photograph the whales through full-size portraits by using high-resolution composite images, making him the first person ever to undertake such an effort. It was an incredible feat that took many tries and an astounding 240 gigabytes of RAM on his computer.

Although Bryant's vision of inspiring today's and future audiences through his leviathanic portraits, early funders were hard to convince. But they needn't be. While his full-scale work should be seen in large (museum) galleries, where Bryant has already found unprecedented praise in whaling-countries like Norway and Japan, his images still manage to make a profound impact in this handsome publication.

The book measures 15 x 12 inches, but some gatefold pages open up to 5 feet in length, giving these graceful behemoths their deserving space. Some photos, notably the whale's eyes, are at full 1:1 scale. Personally, I found these stunningly detailed photos in Bryant's book most impactful.

Beautiful Whale, cont.

We have come a long way from the monstrous depictions of whales in the woodcuts by Olaus Magnus in the early 16th century, to the full sized high-resolution photos by Bryant Austin. I cannot help but think that Bryant's work is a pivotal milestone in not only whale photography, but also as a seminal moment of how we see whales today. As such, he is continuing to build on the legacy of well-known cetacean photographers like Flip Nicklin of *National Geographic* fame. It is exciting to see artistic vision and technology come together to further our appreciation of the beautiful whales in their natural world.

Bryant's first encounter with Can Opener as she exhibits a possible threat display. Can Opener's family is closely related to Scar and Enigma's family, and they are often observed together. RED One camera video still by Bryce Groark, True Blue Films, 2011.



Bryant's Sperm Whale Composite Two, April 2011: "It took me four months to raise sufficient funding to build a computer powerful enough to complete this image—measuring ten by thirty-six feet—of Scar. The working file is roughly 60 gigabytes in size and required more than 240 gigabytes of memory in Photoshop. To meet this challenge, I built a computer with 48 gigabytes of RAM with ten 60-gigabyte SATA III solid-state hard drives (SSD) for the Photoshop scratch disk. I configured an additional two 60-gigabyte SATA III SSDs to temporarily store this file, allowing me to save it in less than twenty minutes as opposed to the hour plus it took two years previously to save Sperm Whale Composite One." © Bryant Austin/studio: cosmos.

Chapters in Action

Mike Makofske, Orange County

On December 6 the Orange County chapter graduated its latest group of Naturalists with a special presentation, a skit written by the Naturalists themselves and directed by instructor Desi Green. Look for our Naturalists on boats out of both Dana Point and Newport Beach – we have quite a contingent now, engaging and educating the public about our favorite animals.

Cetaceans have been putting on quite a show off OC this winter. We've seen grays, humpbacks, fins and minke, along with common, bottlenose, Risso's and Pacific whitesided dolphins. The dolphins and whales have been interacting in highly entertaining ways, especially around Dana Point. ACS-OC Naturalist Steve O'Toole, a regular weekend presence on Dana Wharf's boats, got an excellent shot of a gray whale (below) with its head above the surface on February 2, and it quickly became one of the most popular posts ever on our Facebook page (Facebook.com/acsorangecounty).

OC Board Member Mike Makofske was elected to ACS's National Board at the January meeting in San Pedro. Mike's focus with National will be on Media relations and publicity. Chapter President Wellington Rogers continues as OC's Chapter Representative to National.

We're looking forward to the Dana Point Festival of Whales, where ACS always has a strong presence. The Festival will be March 2-3 and 9-10, and the OC chapter will have a booth on Sunday, March 3 – come see us! Our February 28 meeting (7:30 p.m., 1845 Park Avenue in Costa Mesa) will feature a speaker from the Pacific Marine Mammal Center in Laguna Beach. All our meetings are free and everyone is welcome.



Photo by Steve O'Toole.

where we gave a talk on 'Marine Mammals of Puget Sound'. This was well received and open to both students and the local community. Circa 50 plus attendees packed the classroom, with some having to stand in the back. A more extensive version of this presentation was given at the Trinity Lutheran College in Everett, WA, on January 23.

We will continue our ACS-PS Speaker Series meetings until June. These are held every third Wednesday at the Phinney Neighborhood Center (room 6), just north of Woodland Park Zoo. There is free parking, easily accessible by bus, and the center has handicap access. Our remaining calendar:

February 20: Peggy Foreman (NOAA Fisheries), presentation on NOAA-Fisheries NWR office educational outreach efforts.

March 20: Joe Gaydos (SeaDoc Society), "Bears to Barnacles, Incredible Animals of the Salish Sea."

April 17: Tony Orr (NOAA/NMML), pinniped ecology

May 15: Chris Bassett (UW Mechanical Engineering/Applied Physics Lab), on tidal energy development in Puget Sound and its acoustic impact on marine life.

June 18: TBA.

We hope to welcome any of you who happen to be in the area. Like us on Facebook and check our web site for continuing updates: www.acspugetsound.org

Uko Gorter, Puget Sound

Still inspired from our excellent ACS International Conference in San Diego this past November, we forged ahead into the new year. We welcomed Sally Mirzorch, well-known biologist at NOAA/NMML in Seattle, who gave a fascinating talk on her extensive whale survey as part of the IWC's POWER cruises in the North Pacific. Sally wowed us with her wonderful up close photos of a curious sei whale, and many other amazing sightings.

Our chapter participated in two educational outreach events. The first was on January 12 at the Marine and Technology Center (MaST) of the Highline Community College at Redondo, WA,

Chapters, cont.

Diane Alps, Los Angeles

Whale watching is spectacular in Southern California! Not only has the weather been cooperating (most of the time!), but we are also enjoying record numbers of whales daily. Fin whales are being seen almost every day from both our shore-based location on the Palos Verdes Peninsula and our Cabrillo Whalewatch trips from San Pedro and Redondo Beach. Minke whales have been seen on several occasions recently. And gray whales! This season has recorded what might be the largest documented pod of gray whales along our coast!

All of this is getting us very excited for our upcoming Ultimate Whale Watch scheduled for March 23rd. It is the only 9-hour whale watch trip of its type. In years past we have had incredible encounters with fin whales, breaching humpback whales, offshore bottlenose dolphins, large pods of Risso's dolphins....are you getting the idea!?! It's a great trip! (ultimatewhalewatch.eventbrite.com).

We've kicked off an exciting 2013 Speaker Series with William Whittenbury and his lecture "Sophomore assignment: Save the world's most endangered cetacean." William is a high school student and president of the Muskwa Club, whose number one teen-led project is to create awareness of the vaquita. ACS-LA is excited to partner with the Muskwa Club in this critical issue. Muskwa Club joins ACS-LA and other ACS Chapters in supporting ¡Viva Vaquita!'s efforts to save this small population of porpoise only found in the northern Gulf of California. Our monthly Speaker Series is held at the Cabrillo Marine Aquarium in San Pedro the last Tuesday of every month. Visit our web site for scheduled speakers: www.acs-la.org.

The ACS-LA Gray Whale Census and Behavior Project has had an exciting season, with record numbers! Keep up to date with the daily sightings at www.acs-la.org/seewhales2.htm. We still have several months to go and can always use help! If you're interested in participating, please e-mail us at acs-la@acs-la.org, or give us a call (424) 266-0516. Happy whale watching!

Cabrillo Marine Aquarium held its annual "Whale Fiesta" on January 27, 2013 where ACS/LA talked to hundreds of people about how baleen works and whales of Southern California. ACS/LA. Education Chair, Susan Hustad, loves to teach children about whales. You can always find her (and her husband, Mike) at the ACS/LA table at events throughout Los Angeles. Photos by Diane Alps.



Sabena Siddiqui, Student Coalition

The ACS-SC is having a fun and productive spring semester with a full schedule of planned guest speakers, campaigns, events, and film screenings.

The ACS-SC is continuing its previous campaigns such as the sustainable seafood activities that involve its partnership with the Monterey Bay Aquarium's Seafood Watch Program. We have handed out over 800 seafood watch cards to community members and are continuing to hand out more in addition to our ACS-SC plastics informative brochures. The plastics campaign includes continuing our watershed project in partnership with Bloomington Parks and Recreation and the Indiana University Chemistry department. The internal education phase of the captivity campaign is now transitioning to a focus upon community education and we are equipped with an informative pamphlet.

Our new project is an entertaining and informative YouTube series highlighting our multiple campaigns! We will be focusing on writing a script and finding resources that can help with all aspects of producing short videos to upload.

The end of the semester will call our energy and attention to ranching out, and creating a national network of student coalitions.

Sandy Rosenberg, San Diego

The San Diego chapter has had an exciting couple of months. Tom Jefferson gave a fascinating talk in December on porpicide. In January, elections were held and board positions were filled. We held our first whale watch with San Diego Whale Watch and were treated to some fun common dolphins and several cooperative gray whales. At the end of the trip we found a juvenile gray right by the jetty. Happily, it soon went back out to sea. The naturalist on our trip, Melissa Galieti, has now gained national fame for her wonderful video of the megapod of gray whales as it came through the San Diego area.

The month ended with a joint event with the San Diego Natural History Museum at which Dr. Paul Dayton spoke on kelp bed ecology and the importance of establishing marine protected areas. The collaboration with SDNHM is just one of our new partnerships.

We are also teaming up with folks from the San Diego Zoo on their efforts related to keeping the vaquita from extinction. Another whale watch is scheduled for February 24 and we will be participating in the Whale Watch Weekend and Intertidal Life Festival at Cabrillo National Monument February 9-10.

Joy Primrose, Oregon

Our speaker series meetings continue at the Newport Public Library. A presentation by Dr. James Sumich, professor, author, and researcher, was held on February 16, 2013. He presented "*Gray Whales in Captivity - Gigi and JJ.*" He discussed issues of captive maintenance of gray whales and some of the results of the studies conducted on them.

Whale Watching Spoken Here Spring Watch Week is March 23- 30. Many of our ACS members will be volunteering all along the Oregon Coast to help visitors view and learn about whales.

Our beach clean-up in partnership with the Surfrider Foundation will be on May 18, 2013 from Noon to 3:00 PM. Summer Whale Watch Weekend is scheduled for July 27 & 28 from 9:00 AM to 1:00 PM.

The chapter is selling ACS T-shirts as a fundraiser for a graduate student research grant to be awarded this year. Our chapter is continuing to grow, with both new members and new programs for 2013!

Chapters, cont.



Note from National Board to our Membership: ACS is looking for an individual with strong financial/accounting experience interested in assuming the volunteer position of National Board Treasurer. If you are interested and qualified, please contact Diane Glim at diane@mcweekly.com.

The ACS National Board of Directors met in San Pedro, CA, this January for its annual strategic planning meeting. Pictured (left to right) are Wellington Rogers, Jerry Loomis, Uko Gorter, Joy Primrose, Barbara Bennett (front), Lynette Koftinow, Diane Alps (front), Sandy Rosenberg, Kaye Reznick, Diane Glim.

Lynette Koftinow, San Francisco

On January 19-20 presidents from our ACS chapters SF Bay, Monterey, Los Angeles, Orange County, San Diego, Oregon, Puget Sound, plus national secretary Barbara Bennett and business manager Kaye Reznick, attended our National ACS board meeting. The board welcomed our new national president Diane Glim. It was an excellent meeting to talk about and compare procedures, events, and discuss new ideas for the chapters and the future of ACS.

To kick off our 2013 presentation speaker series we were very fortunate to have Dr. Wallace J. Nichols, Research Associate at California Academy of Sciences and founder/co-director of *OceanRevolution.org*, an international network of young ocean advocates, *SEetheWILD.org*, a conservation travel network, and *LiVBLUE.org*, a global campaign to reconnect us to our water planet. His presentation: *BLUEMIND (The Mind + Ocean Initiative, merging the fields of cognitive science and ocean exploration): Putting the Science of Emotion Into Ocean Conservation,*” was standing room only and inspirational to all.

Lynette R. Koftinow attended the February 2 reception of Bryant Austin’s “*Beautiful Whale*” exhibit at the Museum of Monterey. The show runs from February 2 to August 31. I encourage any of you that are going to or are near Monterey to see this outstanding show of his breathtaking and inspirational photography.

Bryant Austin will be our presentation speaker on February 26. Bryant Austin is an experimental multi-media artist whose life-long passion has been exploring the depths of possibility in connecting with the greatest minds in the waters. The impetus behind his work is the thought of losing over five million years of evolving culture and communication in the largest brain ever to exist on Earth; to not only lose it, but to never understand what we’ve lost.

Please join us for our 2013 presentation series. The following are our spring presenters. To see our complete 2013 presentation series with descriptions please go to www.acs-sfbay.org.

March 28th: Bob Wilson: “*Polar Bears in a Changing World.*” Polar bears are as dependent on the oceans as cetaceans. They just like it frozen. But, all the oceans creatures are faced with a changing planet. Bob will discuss polar bear biology, the threats they face and share his appreciation of these great creatures.

April 30th: Frances C. Robertson, SF Bay ACS Student Travel Grant awardee and Honorable Mention awardee of the National ACS conference Poster contest, University of British Columbia. *“A question of availability: The variable detectability of bowhead whales exposed to seismic sounds Bowhead whales (*Balaena mysticetus*) are known to alter their diving behavior when exposed to seismic sounds.”*

May 28th: Ship Strike Issue Panel - After an extensive time of research and subsequent paper, members of the ship strike research board will be on hand to talk about their findings and our shipping lanes future. Please join us for this very special Ship Strike Issue Panel. John Calambokidis (Olympia, WA) - Cascadia Research, Leslie Abramson, John Berge - Pacific Merchant Shipping Association, Jackie Dragon - Greenpeace, Jaime Jhancke - PRBO Conservation Science. Tentatively, if available, Frances Gulland - Senior Scientist at The Marine Mammal Center and one of three Commissioner positions at the U.S. Marine Mammal Commission, Michael Jasny - Natural Resource Defence Council (focusing on legal and acoustics issues).

Please join us on Saturday, April 13th for a Whale Watching trip with Oceanic Society out of Pillar Point, Half Moon Bay. This should be an exciting trip for viewing the gray whales' northern migration. For discount information call Oceanic Society and tell them you are a member of our SF Bay ACS chapter, and for full details please check our web site or e-mail acs.sfbay@gmail.com. Looking forward to seeing you onboard!

We are putting a call out for new board members and volunteers. We have an opportunity for you to become a board member and/or to become a volunteer with our active chapter. We have a variety of positions available that only require as little as two hours of your time a month. To find out more about becoming a member of the SF Bay ACS board or volunteering please contact Lynette R. Kofinow at acs.sfbay@gmail.com

For our wonderful monthly speakers, events, and updates on issues visit our web site: www.acs-sfbay.org and be sure to follow us on Facebook at [facebook.com/sfacs](https://www.facebook.com/sfacs).



Lynette Kofinow from ACS-SFO was one of the delighted attendees at the reception for Bryant Austin's "Beautiful Whale" exhibit at the Museum of Monterey on February 2. The show will run at the museum through August 31.

Jerry Loomis, Monterey Bay

The Monterey Bay chapter continues to have excellent speakers, as well as strong attendance at their monthly programs held at the Hopkins Marine Station. The December program featured naturalist Kate Spencer on the Natural History of the Antarctic, and was followed in January by Cassey Clark's informative talk regarding the male versus female migratory habits of Humpback Whales in Monterey Bay. Dr. Bill Gilly will enlighten us about the seemingly growing population of Humboldt Squid on February 28th.

January's annual *Whale Fest* weekend, although cold and windy, was a great success as the chapter set up their booth on the Custom House Plaza, and went whale watching. Forty elementary school students from Salinas ventured out and saw whales for the first time as guests of the Monterey Bay chapter and Monterey Whalewatching. Joining them were 25 other whale enthusiasts on the 32nd annual fundraiser with Monterey Whalewatching. The Monterey Chapter looks forward to an exciting 2013!

For Kids Who Love Cetaceans

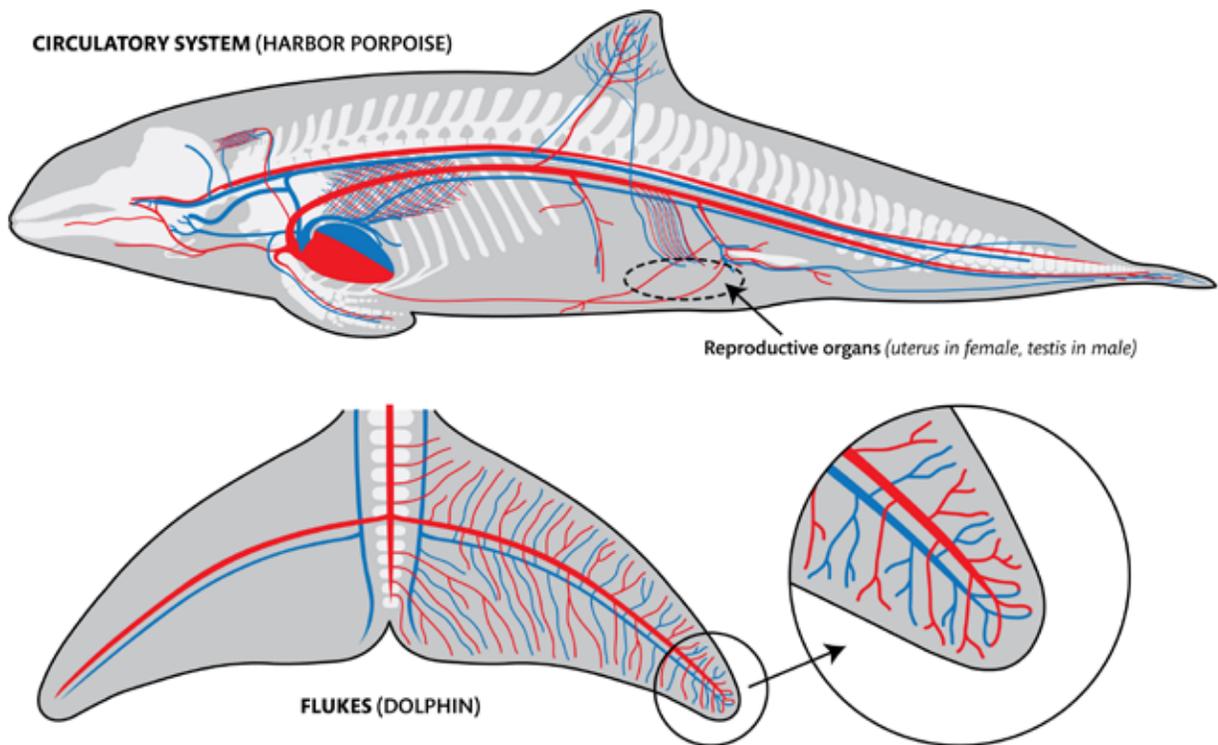
Baby it's Cold Outside! The Skinny on Thermoregulation in Cetaceans

As you already know, whales, dolphins, and porpoises (cetaceans) are mammals, just like us. And, like us, they are warm-blooded and need to maintain a constant internal body temperature.

Some whales live in the icy polar-waters (the bowhead whale is a good example) and others prefer warmer waters (like the bottlenose dolphin). Of course, whales and dolphins have a good insulating blubber layer that keeps them nice and toasty. Bowhead whales have a blubber layer that is nearly 20 inches thick. Bottlenose dolphins, on the other hand, are typically around 0.7 to 1 inch thick. They are also a lot smaller, of course.

Cetaceans live in an environment that conducts water away from the body 25 times faster than air at the same temperature. So, while they have to minimize heat loss, whales and dolphins also have to control overheating. Powerful swimming muscles can generate a lot of heat inside the insulated body. So, how do cetaceans keep their body temperature in check?

Even though their bodies are well insulated, cetacean flippers, flukes, and dorsal fin (if they have one) have no blubber layer at all. And it is here that we can find our answer.



Illustrations by Uko Gorter, adapted and modified from Slijper 1958, Reynolds & Rommel 1999, Pabst et al. 1995

A simplified view of a typical cetacean (harbor porpoise) circulatory system. It shows how blood circulates through the body. Oxygen-rich warm blood is transported from the heart via the arteries (red), and deoxygenated blood returns through the veins (blue). The uninsulated fins, flukes and flippers contain a vascular network that can conserve or dissipate body heat. Detailed view of the blood flow in a dolphin flukes and how it returns the cooled blood back via the veins.

Inside the flippers (or pectoral fins), tail flukes, and dorsal fin, we find a vast network of arteries and veins. Only the flippers contain bones (just like the bones in your arm and hand). The dorsal fin and tail flukes are made up of a fibrous connective tissue, held together by a firm ‘ligamentous sheath’ (LS) and an outer skin, or epidermis (EP).

If we take a look at a cross section of an average cetacean dorsal fin (below), we see a number of thick arteries immediately surrounded by thin-walled veins in the center of the fin. We call these ‘per-arterial venous retes’ (PAVR). These act as a ‘counter-current heat exchanger’ (CCHE). So let’s explain how this works.

In normal swimming or resting periods, the center arteries slowly pump up warm blood from the heart towards to uninsulated fins and extremities. The blood is returned through the surrounding veins, and while cooled in the fins, pick up some of the heat from the center arteries on their way back. This way the cetacean can effectively maintain its body temperature.

Now, when a dolphin or a whale is spending a lot of energy during bursts of speed, the arteries pump a lot more blood towards the fins. The arteries swell up and the surrounding thin-walled veins are flattened and close up. Now the blood is returned via the ‘superficial veins’ (SV) that lie closer to outer the skin of the fin, where the blood is cooled to bring the body’s temperature down. This is especially important for the reproductive organs deep inside the cetacean body.

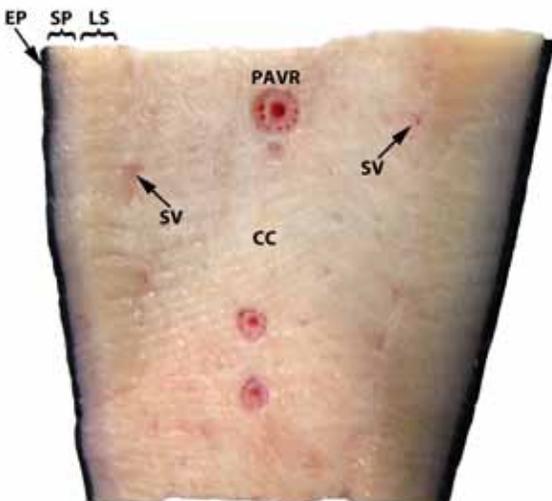
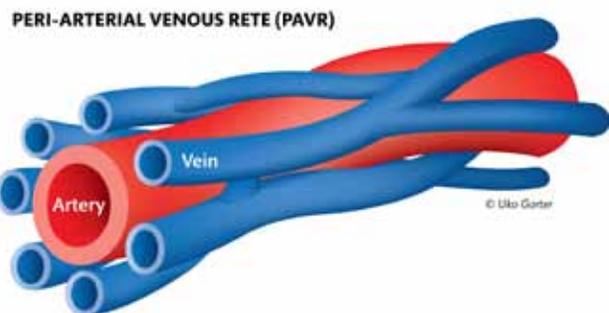


Photo: Juliana Houghton, NOAA/Northwest Fisheries Science Center

Cross sectional detail of a killer whale (orca) dorsal fin. Cetacean dorsal fins do not contain bones, instead are made up of a fibrous connective tissue. It also contains a vascular network of veins and arteries. EP= epidermis (outer skin); SP= Subpapillary layer; LS= Ligamentous sheath (giving the fin a firm structure); CC= Central Core of connective tissue; PAVR= Periarterial Venous Rete; SV= Superficial vein (cools body and reproductive organs).

Peri-arterial venous rete (PAVR), that includes the central artery (red) and its unique surrounding network of veins (blue). Blood routed back through the veins absorb heat from the warmer artery, thereby maintaining the body temperature.



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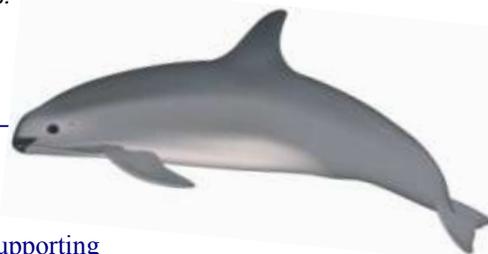
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