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INSTITUTO NACIONAL DE ECOLOGÍA, SEMARNAT

VAQUITA EXPEDITION 2008

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FINISHING BUSINESS: BUOYS, HABITAT, FISHERMEN AND SIGHTINGS

6 - 25 NOVEMBER 2008

BARBARA TAYLOR

Why are vaquita where they are?

Part of the job of a conservation scientist is to be constantly on the lookout for questions that science can address to help conservation managers. Our success in the first month of the project allowed us to contemplate taking on new projects in the second half of the Expedition. One of the truly fun parts of our work is solving problems and bringing in new people with different expertise to make the science happen with a solid foundation but in a quick timeframe. While the ship was refueling in early November, papers were read, hypotheses formulated, experts assembled and new plans were laid. The observation that inspired this activity was the remarkably similar distribution of vaquitas in 1993, 1997 and now 2008. Most vaquita sightings are in a crescent moon shape surrounding but not close to Rocas Consag.

Rocas Consag conveniently sits in the middle of the upper Gulf allowing us to be oriented at all times. From San Felipe, the Rock looks like a white Hershey's kiss on the horizon. It lies in a basin of deeper, clearer water that vaquita evidently find not to their liking. The questions we pondered were "Why are vaquita found primarily in this little area? What makes them tick?"

Rocas Consag can be seen from just about anywhere that vaquita live.

Animal distributions are often explained by food, fear or reproduction. Porpoises generally are found in the muddy shallow waters of the marine world. Muddy waters suggest two possibilities: special abilities to outcompete the larger dolphins for food or protection from predators. These are not mutually exclusive. The high frequency clicks that we use to identify vaquita in the acoustic part of our research is certainly used to find prey in waters where vision is a singularly useless way to find your dinner. In June, Armando Jaramillo dove off the Koipai to see whether we could mount trawler-proof housings on the bottom for our acoustic porpoise detectors. Not only could he push his arm into the soft mud of the Colorado River delta to his elbow with no resistance, but at 70 feet of depth he could not see his depth gauge held in front of his face at mid-day. This murky world seems the realm of porpoise and perhaps also protects them from killer whales and large sharks.

It is curious that the maps of the underwater sediment plume from the Colorado River Delta includes the vaquita distribution but we don't often find vaquita in waters less than 30 feet (10 m) deep even though the bottom type remains the same. We found an intriguing paper that mapped how muddy the water was both at the surface and also at 4 meters above the bottom. The surface map didn't mimic the vaquita distribution, but the bottom map came closer: the darkest muddiest bottom waters were in the western part of the upper gulf between 30 and 90 feet (10 and 30 meters) of water. So, we wanted to measure the muddiness (turbidity) of the bottom layer of water. The device to do that is called a transmissometer and we wanted one quickly. With the help of Dr. Dick Norris, Ben Neal and other scientists at Scripps Institution of Oceanography we located the device and started lining up the other gear from our own supplies to be able to characterize vaquita habitat.

Using discussions with marine geologists, oceanographers, experts in vaquita biology and acoustics we formed a plan to sample the water column near our two longest-term buoys. One of these buoys has detected no vaquita while the other has detected vaquita very regularly (but more on the buoy results later). The upper Gulf is known for its large tidal fluctuations

with the biggest tides of the month (called spring tides) ranging over 24 feet (8 meters) and the smallest (called neap tides) ranging only about 6 feet (2 meters). Any species found only here must form its life around these tides. We decided to sample a full 12 hour tidal cycle at our two buoys and at the smallest and largest tides in our remaining time. Our instrument package (called a CTD) has the transmissometer and sensors that allow us to tell the depth, temperature, beam transmission (turbidity) and salinity in real time. We also take water samples to ground truth the measurements.

The CTD is readied to be lowered into vaquita habitat by Tracey Regan (left) and Candice Hall (right). The vertical gray tubes are water bottles that can be "fired" at depths of interest using the live feed data on turbidity, salinity and temperature.

Peering into the vaquita's world has been fascinating. The water column is far from being a boring mixture but has many layers of water. The most consistent pattern is a mass of water that extends about 12 feet (4 meters) up from the bottom that is very muddy. We were also fortunate enough to find another cluster of vaquita while on visual transect and stopped to sample the water column there. After we get all the results from the buoys, we'll be able to put together acoustic, visual and oceanographic data to better understand why vaquita are where they are.

The buoys: what's a WUT?

Live data can be seen on the computer screen allowing Candice to request the instruments be pulled up to specific depths to sample specific water masses.

Early analyses of the data from our porpoise detectors put out on the buoys showed some success, some failure and some "what's that?" The success stories were that we did indeed detect vaquita regularly in areas where we had many visual detections. We also had a buoy in an area with only a few visual detections and that buoy had 11 days with no vaquita detected and one day with several vaquita detected. These are just the kind of data we need to design a monitoring system. We also had a few out-and-out failures where devices turned off during the terrible storms. And then the surprise: several buoys that became very noisy after one week with "Weak Unidentified Trains" or WUTs. We have no idea what a WUT is, but it seems to be something making noise in porpoise frequencies very close to the hydrophone. I mentioned to POD designer Nick Tregenza that the PODs are quite clean when we go to download the data with just a bit of your typical ocean slime (which is not very photogenic). Nick thought there might be a mischievous slime eater about and that

C-POD with its head slathered in protective chili mixture. We hope for comedy value alone that this hot Mexican solution is effective at warding off WUTs.

we should discourage it from munching near his hydrophones. This all sounds funny, but it could be a show-stopper if the PODs which should only need to be serviced once every few months to change their batteries are now needing a wipe down every week. So we gave a try at discouraging the WUTs by slathering the top of the POD with a mixture of silicon grease and chili powder. Can a better solution be invented for a Mexican Expedition? We look forward to hearing the results of our chili experiment following the cruise. We even have a chili powder type comparison as our Mexican colleagues (who thought this was a joke at first) used habanero chilis (no doubt a bigger challenge to the WUT slime fiends).

Although much remains to be learned about the details of autonomous acoustic monitoring for vaquita, our Expedition has succeeded in all it could gather in our brief 2 months. We still need to learn how quickly the PODs become fouled with marine life, how long their batteries live, whether we can filter out the WUTs, and many, many more items that we will discover when the data are analyzed in detail. But we do know that these new tools could be the future of understanding the status of vaquita and give us new insights into the biology of vaquita that has been literally hidden by darkness and nasty weather from our visual and terrestrial selves.

A day with fishermen

Communication about how scientists estimate the status of vaquita is particularly important for the parties who will be most affected: the fishermen. We had been working with Luis Fueyo, the head of Mexico's recovery effort, to invite fishermen out to see the science in action. Our plans were foiled last month by very high winds. Although the winds were not fully cooperative this time, we were able to take five fishermen aboard for the day. The fishermen got to spend much of the day looking through our "big eyes" and saw most of the local whale and dolphin fauna, but no vaquita because of poor sighting conditions.

Julian Guardado, Instituto Nacional de Pesca, observing from the flying bridge.

The wind did allow more time for interactions between fishermen and scientists. I gave the fishermen the same orientation talk that I gave to the Expedition scientists. Lorenzo Rojas-Bracho translated and added more about the Mexican acoustic research. The presentation explained why it is accidental deaths in fishing nets that is endangering vaquita. This is very difficult for fishermen to accept (a common problem world-wide) when many, perhaps most, have never seen a live vaquita despite working here their entire lives. In fact, most fishermen will never see a dead vaquita in their nets simply because these animals are so very rare. Why, fishermen ask, should vaquita alter their way of life? The sad combination of a naturally rare and shy porpoise that reproduces very slowly with a high density and intensity of gillnet fishing results in an unsustainable catch that is all but invisible to the fishing community. For example, 100 vaquita can increase their population by only 4 calves recruited each year. To erase that potential growth with 1,000 pangas only 1 in every 250 pangas would need to catch a vaquita. Even if there were 300 vaquita with 12 new vaquitas possible per year, the population couldn't recover if only 1.2 vaquita/100 pangas were killed. This means that 98% of fishermen in any given year would not see or kill a vaquita, yet the population would not survive.

Discussions were frank, open, and, therefore, quite passionate at times. I think we were all a bit nervous about how this day would go. By the time the fishermen departed both the fishermen and the scientists had learned and benefited from the interaction. We hope many more days like this are ahead that include local fishermen in the process of learning about vaquita.

Fishermen visit together with an enforcement officer (far left) and the Mexican chief scientist Dr. Lorenzo Rojas-Bracho (2nd from left).

The visual survey

Long-beaked common dolphin

Frigate bird

Pelican

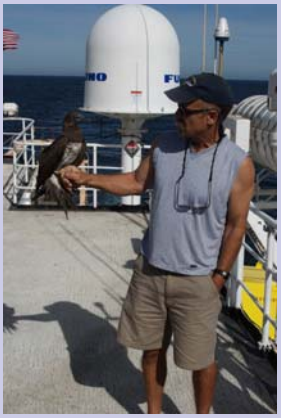
Bryde's whale

October was so successful that any further trackline in November would simply increase this survey as the best ever completed. By the time visual efforts were to start, the seasons had changed. The observer crew was trapped in San Felipe for several days with winds too high to make the several-mile trip by small boat to the ship. When we did get out on the water the birds had changed dramatically from a mostly tropical flavor of frigatebirds, tropicbirds and boobies to a distinctly northern flavor with grebes, phalaropes and murrelets. The number of birds is jaw-dropping with swarms and spirals of them feeding on fishes boiling at the surface. The water and air have both cooled and with the cooler weather comes also baleen whales, including blue whales, and thousands of common dolphins right into the heart of vaquita-land. This new scene gives a new context for thinking about this strange little desert porpoise. Our past surveys have all been at the most extreme desert time of year when air temperatures in excess of 100 F (37.7 ̊C) and water temperatures of 90 F (32 ̊C) make this an exceedingly odd place to find a porpoise. Seeing vaquita in the company of grebes and murrelets makes me somehow more comfortable. I marvel at an animal that can live in comfort in both 35 ̊C water and a few months later in 15 ̊C water. No wonder they looked so plump last month…they were dressing for winter.

There were down sides, however, to our November time slot: the winds. It doesn't take much wind to shut down observations for vaquita, only 10 mph (16 kph). Day after day no further trackline is completed. We finally see our first vaquita on Nov. 22. However, winds let up in the final days and we are able to complete the new primary trackline we added to the east and most of our secondary tracklines.

Some Vaquita Expedition Observers

Chief Scientist, Barbara Taylor



Bob Pitman

Cornelia Oedekoven

Dawn Breeze

Ernesto Vázquez

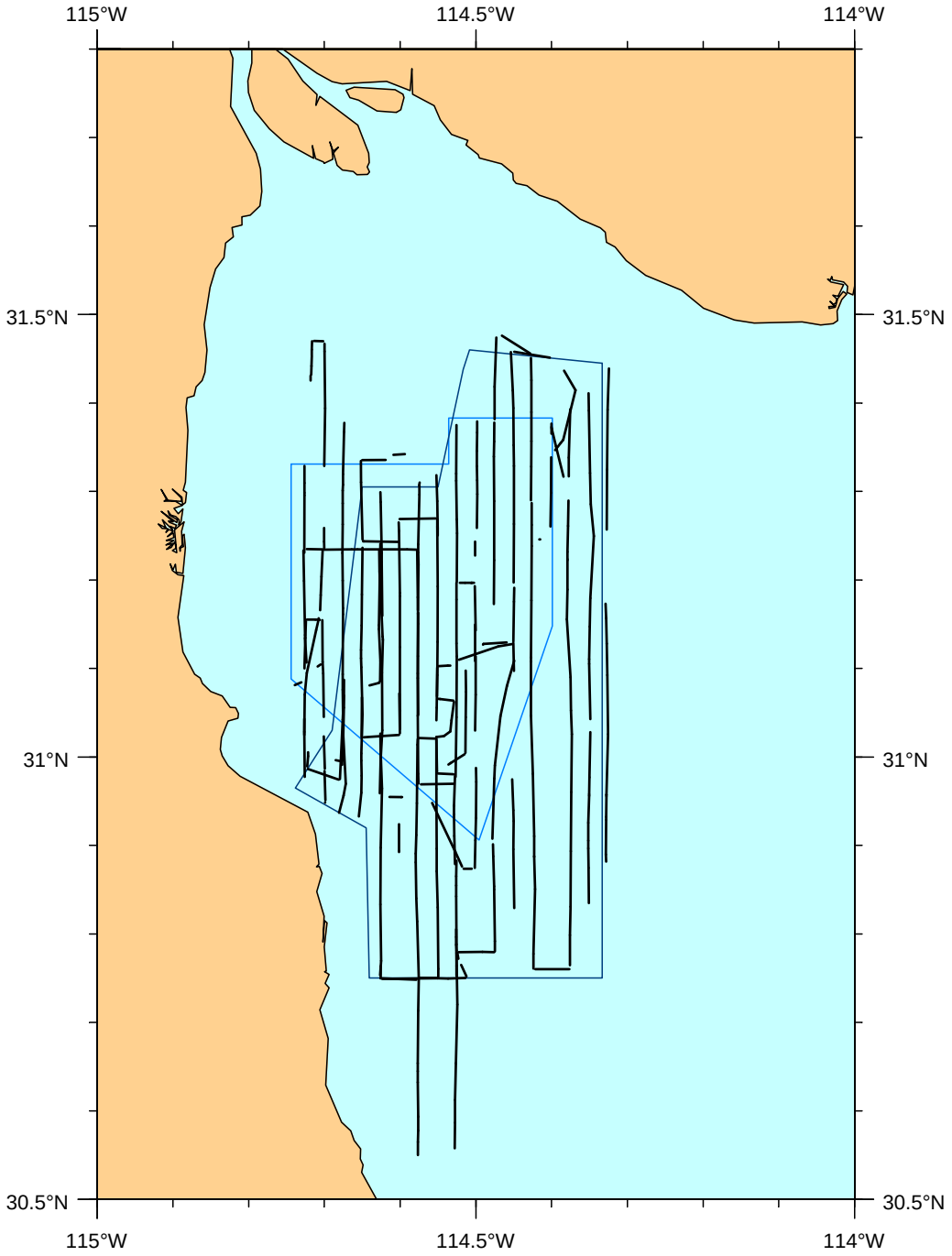
Trackline effort during Vaquita Expedition 2008 and in the 1997 cruise for comparison.

Beafort sea state	Km effort 2008	Km effort 1997
0	78	51
1	579	223
2	574	406
3	211	429
4	116	401
5	72	148
Total	**1631**	**1658**

Species identified during Vaquita Expedition 2008:

vaquita	*Phocoena sinus*
bottlenose dolphin	*Tursiops truncatus*
Bryde's whale	*Balaenoptera edeni*
fin whale	*Balaenoptera physalus*
long-beaked common dolphin	*Delphinus capensis*
humpback whale	*Megaptera novaeangliae*
killer whale	*Orcinus orca*
false killer whale	*Pseudorca crassidens*
blue whale	*Balaenoptera musculus*

Vaquita Expedition Scientists, Crew and Command, Leg II



Tracklines completed in Beaufort 0-2 conditions. The light blue polygon is the vaquita reserve. The dark blue shape outlines the study area for R/V David Starr Jordan in 1997. The 2008 tracklines were designed to both replicate the 1997 cruise and add western lines in areas not covered by this ship then but within the vaquita reserve.