



NOAA Teacher at Sea
Mary Anne Pella-Donnelly
Onboard NOAA Ship *David Starr Jordan*
September 8 – 22, 2008

NOAA Teacher at Sea: Mary Anne Pella-Donnel

NOAA Ship: *David Starr Jordan*

Mission: LUTH Survey (Leatherback Use of Temperate Habitats)

Date: September 19, 2008

Geographical area of cruise: Pacific Ocean –San Francisco to San Diego

Weather Data from the Bridge

Latitude: 3624.8888 N

Longitude: 12243.8013 W

Wind Direction: 261 (compass reading) SW

Wind Speed: 8.0 knots

Surface Temperature: 16.385

Science and Technology Log

Turtle Genetics

Peter Dutton is the turtle specialist on board, having studied sea turtles for 30 years. His research has taken him all over the tropical Pacific to collect samples, study behaviors and learn more about *Dermochelys coriacea*, the leatherback turtle.

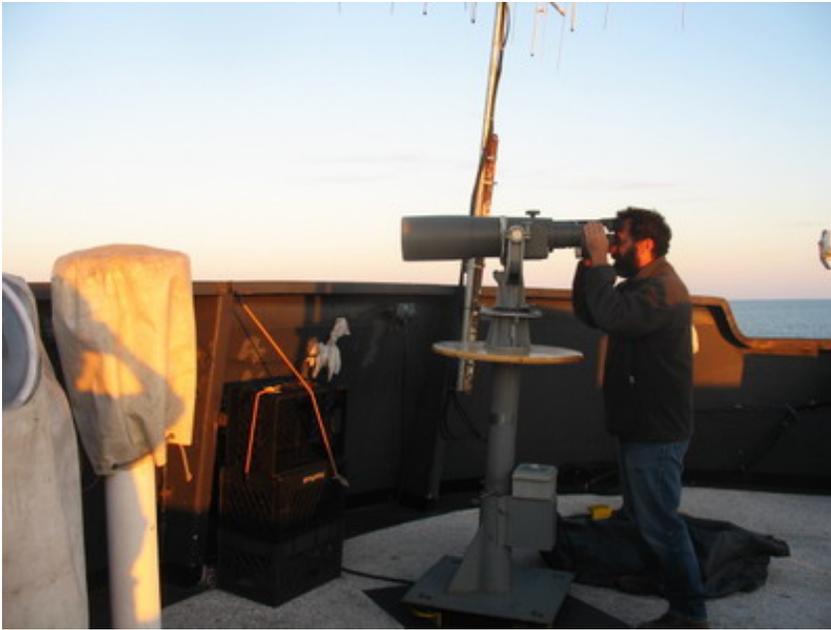
Mitochondrial DNA (is clonal=only one copy) is only inherited maternally (from the mother), so represents mother's genetic information (DNA), while nuclear DNA has two copies, one inherited from the mother and the other from the father. By looking at the genetic fingerprint encoded in nuclear DNA it is possible to compare hatchling "DNA fingerprints", with their mother's and figure out what the father's



Figure indicating migration of different genetic stocks of Pacific leatherback turtles.

genetic contribution was.

This paternity (father's identifying DNA) analysis has produced some intriguing results. An analysis of chick embryos or hatchling DNA indicates all eggs were fertilized throughout the



Peter Dutton looking for turtles with the 'big eyes'.

season from the same dad. It is thought that the female must store sperm in her reproductive system.

Successively, throughout the nesting season, a female will lay several clutches, one clutch at a time. Females come in to the beach for a brief period (leatherbacks – approx 1.5 hrs) every 9-10 days to lay eggs for the 3 or 4 month nesting season (they lay up to 12). Sometimes it is the same beach; sometimes it is a beach nearby.

Research done on other sea turtles is showing some species have actually

produced offspring with other species of sea turtle. One example is of a hawksbill turtle with a loggerhead turtle in Brazil. In this case, the phenotype appeared to indicate one species, while the DNA analysis indicates the animal was a hybrid, with a copy of DNA from each of the two different species. At some point geneticists may need to re-define what constitutes a “species”.

The last few eggs most of the leatherback turtles lay are infertile, yolkless eggs. No one is certain about the function of these eggs, although several theories have been suggested.

Many unknowns exist about these turtles. Scientists have not yet found a means to determine the age of individual sea turtles, so no one knows how long-lived they are.

The early genetic research on leatherbacks showed some information that surprised the scientists. It had been thought that all leatherbacks foraging off the northwestern coast of USA originated in the eastern tropical Pacific, from nesting beaches in Mexico. Careful DNA analysis, however, found that animals at California foraging grounds are part of the western Pacific genetic stock recently identified by Dutton and colleagues.

Both Peter and Scott have emphasized that there is still much to learn, and they have just begun, however, much has also been learned during the past six years, including the origin of leatherbacks that utilize California waters.

Personal Log

Yesterday the sun came out and it was a glorious evening. A group of us watched the sunset from the flying bridge, and then later watched the moon rise. It was spectacular, and with the 'big eyes', it was possible to see many of the moon's craters. The stars were also magnificent! Today has been cloudy with a layer of fog eventually drenching the boat. This weather has made yesterdays blue skies all the sweeter.



Sunset over the port side on 9/17



Sunset over the port side on 9/18

Words of the Day

Mitochondrial DNA: DNA found within the mitochondria – originates from the mother

Clonal: identical to the original

Clutch: a single batch of eggs, laid together

Hybrid: one gene from one species and the second gene from a second species

Species: an organism that can mate with another of its own kind and produce fertile offspring

Animals Seen Today

Common dolphin *Delphinus delphis*

Fin whale *Balaenoptera physalus*

Black-footed Albatross *Phoebastria nigripes*

Moon jellies *Aurelia labiata*

Sea nettle jellies *Chrysaora fuscescens*

Common dolphins *Delphinus delphis*

Questions of the Day

1. Geneticists are beginning to obtain new tools to figure out how similar animals are related to each other. What are some questions you have related to leatherback turtle genetics?
2. Scott's turtle map shows that leatherbacks nesting in the Western Pacific migrate across the Pacific to the coast of North America, while leatherbacks that nest in Costa Rica only migrate to waters off the South American coast. Why might some populations stay in the same region, while others cross the Pacific Ocean?