CSCAPE 2005: NOAA Ship *David Starr Jordan*
Weekly Science Report – Leg 3
Susan Chivers – Cruise Leader

SCIENCE SUMMARY: 1 – 8 September 2005

Last Monday, while many of you were celebrating Labor Day, we were enjoying our busiest day of the leg. We recorded 21 sightings along an approximately 40nm section of our survey line. In this apparently productive 'patch' of ocean we saw lots of animals: mostly fin whales, but also several blue whales and several herds of short-beaked common dolphin. Looking at the oceanographic data, we could see that a sudden drop in sea surface temperature from 18° C to 15° C was recorded just about the time we entered this area. The change in temperature indicates a region of upwelling in which cooler nutrient rich waters are brought up to the surface at the boundary of two currents. In this case, it was the boundary between the California Current and the Davidson Current. The availability of prey in this region of upwelling likely explains the number of cetaceans we saw in this area as well as the numerous fish (mostly albacore) we encountered on either side of the 15° C water.

This week we recorded 17 sightings of fin whales, which have been our most frequently sighted species this leg. Not far behind the fin whales in terms of number of sightings were the short-beaked common dolphin, and we recorded 16 herds of these dolphins this week. Four of the herds we encountered were mixed species groups of short-beaked common dolphin and striped dolphin. These sightings of striped dolphin added a new species to the list for CSCAPE. One of the mixed species herds we sighted on the outer edge of our study area (about 300nm from land) was particularly interesting. We noticed a number of short-beaked common dolphins in this herd that did not have the buff-colored cape typical of the species. Instead, their capes were completely dark and most animals also had a prominent stripe from the flipper to the tail stalk. This color pattern has been described as 'anomalous' among short-beaked common dolphins by Bill Perrin and colleagues who documented animals with this color morphology in eastern tropical Pacific and off California in a 1995 Marine Mammal Science paper. In these mixed species herds, we also observed striped dolphins riding the bow.

This is the final weekly report for Leg 3. Although we lost several days to bad weather this week just like we did last week, we have covered approximately 1300nm of track line and recorded 116 cetacean sightings (see Figure 1 in the oceanography section) since leaving Newport, OR three weeks ago. Today we surveyed our last bit of trackline from about 60 nm offshore of Fort Bragg to Eureka, California. Tomorrow we arrive in Eureka where we will spend a couple of days to refuel, reprovision and then rest before heading out to sea again for Leg 4.

In closing this brief summary of our week's activities, I would like to express my thanks to all of the officers, crew and scientists who sailed this leg. This survey could not be done without each and every one of you. A number of people are leaving the ship in Eureka, and while most will return, some will not. A special thanks to the FOO (field operations officer) Doug Krause for coordinating all our operations out here. We wish him well in his next job. May there be many great adventures. Goodbye and good luck also to Maureen Barrett, our teacher-at-sea, as she takes all that she has learned about marine mammal science and conservation back to the classroom.

Sightings and Effort Summary for Marine Mammals

Date	Start/Stop Time	Position	Total Distance	Avg. Beaufort
090105			0.0 nmi	6.0++
090205	0701	N39:23.28 W126:34.04	91.0 nmi	4.5
	1949	N37:40.27 W127:09.51		
090305	0706	N37:39.36 W127:11.50	85.2 nmi	3.7
	1954	N36:54.52 W128:19.95		
090405	0706	N36:36.50 W127:33.22	80.3 nmi	3.9
	1835	N36:28.59 W125:54.45		
090505	0703	N36:27.50 W125:54.84	51.7 nmi	4.5
	1942	N37:39.69 W125:32.85		
090605	1009	N38:01.95 W127:00.35	49.3 nmi	5.4
	1927	N38:20.10 W128:30.55		
090705			0.0 nmi	6.0++
090805	0904	N39:19.36 W125:01.91	33.7 nmi	3.5
	1913	N40:22.02 W124:36.66		

CODE	SPECIES	WEEKLY TOTAL#	CSCAPE TOTAL#
005	Unidentified common dolphin	-	1
013	Striped dolphin	4	4
017	Short-beaked common dolphin	20	34
018	Bottlenose dolphin	-	4
021	Risso's dolphin	-	52
022	Pacific white-sided dolphin	-	88
027	Northern right whale dolphin	-	26
037	Killer whale	-	9
040	Harbor porpoise	-	76
044	Dall's porpoise	3	143
046	Sperm whale	3	20
049	Unidentified beaked whale	-	2
051	Mesoplodon sp.	-	4
061	Cuvier's beaked whale	-	3
063	Baird's beaked whale	-	3
069	Gray whale	-	2
070	Unidentified rorqual	9	25
071	Minke whale	-	7
074	Fin whale	19	60
075	Blue whale	6	42
076	Humpback whale	-	364
077	unid. dolphin	3	39
078	unid. medium dolphin	-	1
078	unid. small whale	-	3
079	unid. large whale	-	39
096	unid. cetacean	1	2
	TOTAL	**68**	**1054**

Note: Pinnipeds not included; mixed groups are counted once for each species.

Biopsies (Gary Friedrichsen, Laura Morse, Holly Fearnbach)

This week we added a new species to our list: striped dolphin. We obtained two skin samples from two striped dolphins that came over to ride the bow briefly during an encounter with a mixed species herd of short-beaked common dolphins and striped dolphins. The short-beaked common dolphin samples were collected from six different herds most of which were encountered greater than 200nm offshore.

Species	Weekly	CSCAPE Total
Humpback whale	-	18
Baird's beaked whale	-	2
Blue whale	-	7
Fin whale	-	1
Sperm whale	-	11
Short-beaked common dolphin	21	22
Pacific white-sided dolphin	-	21
Northern right whale dolphin	-	6
Dall's porpoise	-	3
Killer whale	-	5
Risso's dolphin	-	4
Striped dolphin	2	2
GRAND TOTAL	**23**	**102**

Photo-Project (Annie Douglas, Holly Fearnbach, Cornelia Oedekoven)

Once again this week the digital cameras showed their worth compared to film cameras as they intensify your observations in the field by viewing images at the end of the day and opening our eyes to details that would have otherwise escaped unnoticed. One of us caught a brief glimpse of what looked like a striped dolphin during one sighting that consisted of a few hundred short-beaked common dolphins coming to the bow, This could not be confirmed though as this individual was not seen again. Since the dolphins were very cooperative, a few hundred pictures were fired off – some photos turned out really nice, others not nearly so nice and quite a few not at all. However, one of the pictures of the 'not really' category turned out to be the striped dolphin showing all the identifying features and we had to change out final ID for the sighting to a mixed school.

Another observation that could be verified during evening picture viewing was a feature in the color pattern of short-beaked common dolphins. This species of dolphins has a stripe that runs from the eye region to the anus. It is a tan color in the anterior part of the animal and turns gray in the posterior part where it is covered by the dark overlay that dips down. We observed that all individuals with a pronounced anal keel had a darker part to the posterior section of this stripe, rather blackish, and more pronounced than those individuals without a pronounced anal keel. Whether this feature is part of an overall darker coloration in these individuals or sexual dimorphism could not be determined

Two short-beaked common dolphins showing pronounced anal keels and blackish posterior part of eye-to-anus stripe (photo: Cornelia Oedekoven).

In total, we photographed eleven schools of dolphins this week. Seven schools were single species consisting of only short-beaked common dolphins. Four schools were mixed, including short-beaked common dolphins and striped dolphins. Among the many dolphins photographed, we managed to get four different individuals of short-beaked common dolphins that were lacking the dorsal overlay. The overlay generally creates a thoracic patch on the sides, but was absent on these four individuals (see Perrin et al., 1995). Concurrent with Perrin's findings, each of these anomalously pigmented dolphins was in mixed schools including striped dolphins. Our photographs showed no close association of anomalously pigmented common dolphins with the striped dolphins as they were only surrounded by other common dolphins.

Short-beaked common dolphin with dark cape lacking the dorsal overlay that creates the thoracic lateral patch (photo: Laura Morse).

Another pleasant surprise of this week was the overall 'friendliness' of the striped dolphins. For those of us who have seen this species in the eastern tropical Pacific, where they seem to always run away from the ship, it was remarkable to watch them come to the ship and spend quite some time playing in the bow wave. Maybe they were encouraged by their generally more 'friendly' fellows, the short-beaked common dolphins, that they mix with in this region (as opposed to the single species schools in the ETP).

A striped dolphin leaping high while approaching the bow of the David Starr Jordan (photo: Annie Douglas).

Besides the dolphins, we obtained ID-pictures of four blue whales and eleven fin whales. One of the blue whales was fluking up high, giving us the opportunity for a quality 1 tailstock picture that is usually desired for the humpback whales.

Species	Weekly	CSCAPE Total
Humpback whale IDs	-	86
Blue whale IDs	4	33
Fin whale IDs	11	28
Sperm whale IDs	-	19
Killer whale IDs	-	61
Baird's beaked whales*	-	2
Short-beaked common dolphins*	7	13
Bottlenose dolphins*	-	1
Northern right whale dolphins*	-	7
Pacific white-sided dolphins*	-	13
Risso's dolphins*	1	10
Dall's porpoise*	-	2
Striped and short-beaked common dolphins*	4	4

*number of groups photographed

Bird Buzz (Scott Mills, Thomas Staudt)

The majority of the last week of Leg 3 was spent in deep water more than 150 miles offshore. As a result, daily species numbers and bird totals were low -- between 9 and 14 species a day and between 83 and 215 birds a day. Most numerous species included Leach's Storm-Petrel, Red Phalarope, Long-tailed Jaeger, and Arctic Tern. Highlights included eight more Red-tailed Tropicbirds, 37 Cook's Petrels, a Dark-rumped Petrel, three Canada Geese, and a wayward Great Blue Heron. The last day was spent closer to shore and many species not seen for many days were observed. These included Sabine's Gull, Western Gull, Rhinoceros Auklet, Red-necked Phalarope, Pink-footed Shearwater, and Pomarine Jaeger. We also had a number of coastal birds including a flock of Northern Pintails, a Surfbird, a dowitcher, a Western Sandpiper, several Brown-headed Cowbirds and a Yellow Warbler.

Oceanographic Operations (Candice Hall, Liz Zele)

For this the final week of Leg 3, all oceanographic objectives have been enthusiastically accomplished. Even though we have been faced with 4 – 10 ft swells and winds gusting over 30kms/hr during the past week (although not simultaneously), due to the experience of the deck crew we weren't forced to reduce our operations. Our safety while 'manhandling' equipment on deck was always first priority to all concerned and I'm thrilled that we were able to complete our scheduled agenda. Sadly we had to cancel our end of leg 'Sea Biscuit' CTD race due to the seriousness of the weather, but hopefully we'll be able to continue this event next leg.

We have dubbed this the 'Leg of the Fish' due to the high albacore catch rates on certain days, accompanied by rapid changes in water temperature (~ 3°C in two to three hours on the 1st, 2nd and 5th). In fact it became quite easy for us oceanographers to predict the events of the coming day: ~ 15°C (59°F) would produce plenty of fin and blue whales, whereas ~ 18°C (64°C) would herald cries of 'fish on' from the aft deck. Throughout these prolific thermo-frontal zones the salinity has remained between 32 and 33 psu. However we have observed some interesting salinity traces below the surface mixed layer during the CTD casts, indicating the density instability of this part of the ocean. We are certainly surveying in dynamic thermohaline waters as the California Current meets the coastal and Davidson currents. As we travel towards Eureka today the temperature has dropped from 17°C (62 °C) to 10°C (50°C).

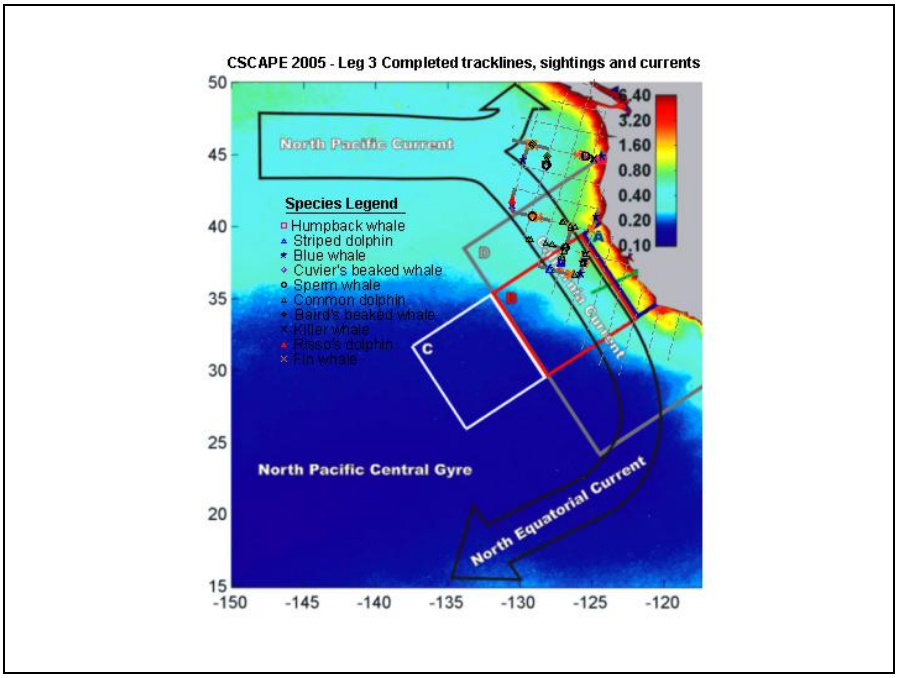

Figure 1: Completed trackline and sightings with relations to the North Pacific currents (currents adapted from Friederich & Chavez, 2004, sightings courtesy of Susan Chivers).

Concurrent to the drop in temperature has been the increase in water CO_2 levels. They have recently risen off the display chart to 739 µmoles/mole and are still climbing. This corresponds with Gernot Friederich and Francisco Chavez's graph below (Figure 2), which predicts that hydrographic CO_2 levels should increase with proximity to the coast.

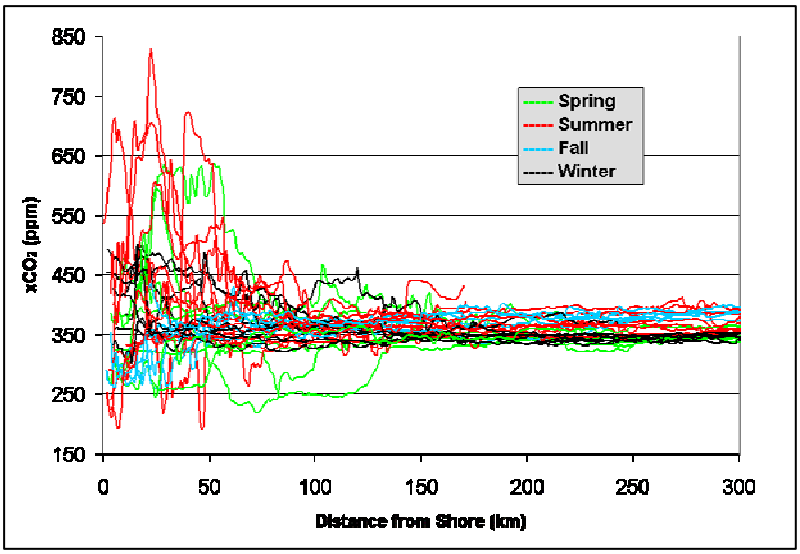

Figure 2: xCO2 ppm related to distance from shore (Friederich & Chavez, 2004)

Overall this has been a very successful leg, with loads of science and super exciting emergency drills. We'd like to thank the soon-to-be ex-NOAA Lt. Krause for facilitating our operations for us. Doug, we wish you every success in your future endeavors, may your communications always be unclear, Fiji-man☺!

Our quote for the week: 'In the end we will conserve that which we love, we will love only that which we understand, and we will understand only that which we are taught' (Baba Dioum). Farewell to our teachers-at-sea, Greta Lyons and Maureen Barrett (thanks for the quote, Maureen!). Best of luck in shaping the future of conservation!

Date	CTD's	Bongo tows	XBT's	Comments
09/01	0	0	2	Weather restrictions.
09/02	1	1	4	
09/03	2	1	4	
09/04	1	1	4	
09/05	2	1	4	
09/06	2	1	4	
09/07	1	1	4	
09/08	1	1	4	

Squeakly Report (Liz Zele)

"Dolphins on the bow!" seemed to be the phrase of the week. Luckily, many were chatting up a storm, particularly our mixed groups of common and striped dolphins. Although we painstakingly listened for blue whales on a few occasions, they just aren't into gossiping out here! Other than these antisocial giants, we sadly encountered no other large whales at which to throw a sonobuoy. Make sure to listen to our short clips of bow riders!