

Northwest Fisheries Science Center
FRAMD, NMFS
2725 Montlake Boulevard E
Seattle, WA 98112

**Cruise Report for the
2006 West Coast Groundfish Bottom Trawl Survey
May 22 – Oct. 20, 2006**

Chartered vessels:	F/V <i>Ms. Julie</i>	(2006 Pass 1)
	F/V <i>Noah's Ark</i>	(2006 Pass 1)
	F/V <i>Excalibur</i>	(2006 Pass 2)
	F/V <i>Raven</i>	(2006 Pass 2)

Summary

The Northwest Fisheries Science Center's (NWFSC) Fishery Resource Analysis and Monitoring Division (FRAM) conducted the ninth in a series of groundfish bottom trawl surveys along the west coast upper continental slope and shelf from May 22 to October 20, 2006. The survey targeted the commercial groundfish resources inhabiting depths of 55 to 1,280 meter from the area off Cape Flattery, Washington (lat. 48°10'N) to the U.S.-Mexican border (lat. 32°30'N). The West Coast groundfish fishery includes about 80 commercially fished stocks off Washington, Oregon and California. The goal of the 2006 groundfish survey is to provide fishery-independent data used in the assessment of the status and trends of commercially important species. Four chartered West Coast bottom trawlers were selected to participate in the survey through a competitive bid process. Two vessels, the Fishing Vessel (F/V) *Noah's Ark* and the F/V *Ms. Julie*, were used during the first survey period, pass 1. Two additional vessels, the F/V *Excalibur* and the F/V *Raven*, were used during the second survey period, pass 2. All vessels progressed south along the coast, finishing the survey south of San Diego, CA.

In 2006, 707 stations were sampled with 654 successful tows. Catches were sorted to species, aggregate or other appropriate taxonomic level and then weighed using an electronic, motion-compensated scale. A count of 646 distinct fish and invertebrate species were identified within the survey area. Biological sampling included determination of sex as well as collection of lengths, weights, otoliths, and stomachs. Summaries indicate that 28,004 individual weights and 130,532 length measurements were taken with 20,796 otolith samples collected. A total of 804 stomachs were collected from 12 species: Pacific sanddab, petrale sole, Dover sole, rex sole, bank rockfish,

bocaccio, canary rockfish, chilipepper, flag rockfish, greenstriped rockfish, greenspotted rockfish, and yellowtail rockfish.

Data revealed elevated catch of canary rockfish in the vicinity of Astoria and Mendocino Canyons again in 2006. Repeated high canary catch in these areas in recent years is suggestive of preference for a specific habitat type by larger, older adult canary. Also notable was a reduced catch coupled with low diversity in the region off Oregon where a large anoxic area was observed in 2006. Similarly low catch rates and low diversity were also observed in the waters off Santa Barbara as in prior years. New to the groundfish survey in 2006 were an inventory of West Coast corals and a stationary seabird survey. Corals were encountered in 341 tows with 325 whole specimens retained and 348 samples preserved for DNA analysis. Estimates of seabird abundance were made at the start of each tow, time permitting, with data intended to advance an understanding of the distribution of seabird species and their oceanic habitats.

Itinerary

The survey was conducted on board the chartered commercial trawlers F/V *Ms. Julie* and F/V *Noah's Ark* from May 22 through July 27, 2006 and the F/V *Excalibur* and the F/V *Raven* from August 25 until October 20, 2006. These vessels began the cruise at Cape Flattery, Washington and worked southward to the U.S.-Mexican border sampling in predetermined areas and depths.

Objectives

The West Coast Groundfish Trawl Survey (WCGTS) is designed to provide information on distribution and abundance of demersal fish species, and other biological resource information. Although NWFSC assumed responsibility for the slope portion of the groundfish survey starting in 1998, the time series began as a West Coast continental slope survey conducted by the Alaska Fisheries Science Center (AFSC) in 1988. Since 1998, the NWFSC has conducted an annual coast-wide survey to establish an ongoing time series of groundfish catch, fishing effort, and individual fish measurement. Beginning in 2003, the NWFSC expanded the depth coverage of the slope survey (184 – 1,280 m) to incorporate the continental shelf (55 – 183 m). Consequently, in the current sampling configuration the WCGTS now also encompasses the area historically monitored by the continental shelf survey conducted triennially by the Alaska Fisheries Science Center (from 1977 through 2001). The NWFSC's groundfish survey currently provides not only an annual snapshot of fish stock status, but also provides an extension of two established, long-term time series from which informed management decisions can be made. Prior to 1998, surveys conducted by the AFSC were the principal source for fishery-independent data of groundfish resources along the upper continental slope and shelf of the U.S. West Coast. The AFSC conducted slope surveys, periodically from 1984 – 1987, and annually beginning in 1988 and shelf surveys triennially from 1977 – 2001. The AFSC slope surveys were conducted with the NOAA vessel *Miller Freeman* while the triennial survey used chartered Alaskan fishing vessels. Spatial coverage of the

West Coast surveys varied among years due to constraints imposed by annual budget levels and availability of NOAA ship time.

The NWFSC groundfish survey was initially designed to cover the same depths and latitudes established with the AFSC slope survey. Beginning in 2003, the WCGTS was expanded to include the continental shelf and slope (range of depths 55 m to 1,280 m) along the entire area U.S. West Coast (U.S.-Canadian border to U.S.-Mexican border). Since inception in 1998, the NWFSC survey has utilized chartered fishing vessels from the West Coast commercial fishing industry. This feature capitalizes on the skills of fishing captains familiar with the challenges of fishing in the waters off the West Coast, and fulfills the cooperative research provisions of the Magnuson-Stevens Sustainable Fisheries Act. The results of the surveys provide measures of the change in relative abundance, distribution, and condition of groundfish stocks over time, which is of interest to fisheries managers, fishers, and concerned citizens.

Chartered Vessels and Gear Specifications

The four vessels used in the 2006 charter ranged in length from 65 to 92 feet (19.8 to 28.0 m), with vessel horsepower ranging from 450-1200. Each vessel was rigged as a stern trawler; with a rear gantry housing one or two net reels to set and retrieve trawl gear. Vessels were outfitted with split trawl winches and equipped with modern electronics including global positioning systems (GPS), multiple depth sounders, radars, and other navigational aids. Prior to the start of the survey, the NWFSC provided each vessel with two 5/8" steel core trawl cables, each 2,288 m (1,250 fm) in length. Cables were measured side-by-side and marked at 25 fm increments while being spooled onto the vessel's winches. The markings provided real-time verification of the release of equal warp length from both winches while setting a tow. An experienced captain, two crew members, and three scientists staffed each vessel (Table 1).

The FRAM division provided standardized fishing gear for the survey. An Aberdeen-style net, built and rigged to operate within strict specifications in compliance with NOAA protocols for bottom trawl surveys was used to sample fish biomass. The Aberdeen trawl is a four-panel bottom trawl with a small-mesh (1 1/2" stretched measure or less) liner in the codend to retain small organisms. The Aberdeen trawls were fitted with 8" and 10" rubber disc footropes and spread with 1200 lb. 5' x 7' steel V-doors. A Simrad ITI trawl instrumentation package was employed on each net to monitor trawl performance and ensure that the gear's haul-to-haul catching performance was kept as constant as possible. Electronic net mensuration data, as well as global positioning system (DGPS) navigation data, bottom contact sensor data, gear depth, and temperature data were obtained for each tow. Average vessel speed over ground and distance fished were calculated from the position, vessel speed, net-to-vessel range and bearing readings and actual bottom time of the trawl. All features of the trawl event (i.e. from commencement of net deployment to the completion of net retrieval) including net mensuration information, GPS data, trawl location, scope, vessel depth, trawl gear depth, and sea state conditions, were logged using customized software programs. Catches were sorted to species or other appropriate taxonomic levels and then weighed in aggregate using an electronic, motion-compensated scale. Sub samples of important management

species were randomly selected for individual measurements (length and weights) and biological sampling (otoliths and sex determinations). Catch and individual species biological information were logged wirelessly into a rugged notebook computer using the Fisheries Scientific Computing System (FSCS) customized data integration system. Data were quality controlled while at sea using FRAM Division custom-built editing applications.

Survey Design and Methods

The survey followed a stratified random sampling scheme with 2 geographic strata (80% N and 20% S of Pt. Conception, CA) and 3 depth strata. The depth strata were: shallow (55-182 m), middle (183-549 m), and deep (550-1,280 m). The sample design consisted of 720 randomly selected sampling locations within specified depth strata. Each of the four vessels occupied a different subset of 180 cell sites. Table 2 includes the haul numbers, date, station locations (decimal degrees), and depths (m) for completed tows by vessel. The station locations included here were determined during post-season processing and represent the “best” location as defined by a hierarchy of computational preferences that depend on data availability. These are: (1) the mean of the start (touchdown) and stop (liftoff) locations of the net along a tow track, or in absence of these data, any known single net position along the tow track (preferred and actual for most tows); (2) similar means based on the vessel location at the start and end of the tow, or in absence of these data, any known single vessel position along the vessel track (occasional); or (3) if no other information were available, a location central to the sampled survey grid cell that is computed as the mean latitude and mean longitude of the four defined grid cell trapezoid corner positions (rare).

Target duration of each tow was 15 minutes. Captains attempted to maintain a constant speed (2.2 ± 0.5 knots) throughout the tow. Bottom contact sensors (Scott McEntire, AFSC/RACE Division, Seattle WA) were placed on the footrope of the net and used to verify that the trawl was on the bottom. Tow duration was determined from the bottom contact sensors as the time from net touch down to net lift off. Acoustic instruments attached to the net recorded various aspects of the net’s mechanical performance (e.g. net height, net width, distance to bottom, etc.). Other data were collected on the operational conditions (e.g. depth, amount of towing cable deployed, towing speed, tow duration, and weather conditions).

Catches were sorted to species or other appropriate taxon, and then weighed. Samples were taken of the principal species for length-frequency determinations using an electronic measuring board or acquisition of other biological data. The data were logged using a data gathering system called Fisheries Scientific Computing System (FSCS, Dennis Shields, NOAA/OMAO Silver Springs, MD). Following this, marketable fish were placed in the hold of the vessel, iced and delivered to a shore side processing facility within 5 days. Such fish were part of the vessel’s compensation. All prohibited species and other marine organisms with no commercial value were returned to the sea.

Table 1. Scientific survey personnel participating in the 2006 WCGTS.

	Pass 1	F/V <i>Ms. Julie</i>	5/22/06 – 7/27/06
Leg 1	Keith Bosley Keri York Melanie Johnson	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC NMFS-NWFSC
Leg 2	Keri York Keith Bosley Lewis Barnett	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC MLML
Leg 3	John Buchanan John Harms Melanie Johnson	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC NMFS-NWFSC
Leg 4	Victor Simon Keith Bosley Melanie Johnson	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC NMFS-NWFSC
Leg 5	Keith Bosley Victor Simon Melanie Johnson	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC NMFS-NWFSC
	Pass 1	F/V <i>Noah's Ark</i>	5/22/06 – 7/27/06
Leg 1	Erica Fruh Victor Simon John Buchanan	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC NMFS-NWFSC
Leg 2	Aimee Keller Victor Simon John Buchanan	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC NMFS-NWFSC
Leg 3	Erica Fruh John Harms Shaara Ainsley	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC MLML
Leg 4	Dan Kamikawa Erica Fruh John Harms	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC NMFS-NWFSC
Leg 5	Vanessa Tuttle Dan Kamikawa Jen Eicheberger	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC NMFS-NWFSC

NMFS-NWFSC
MLML

National Marine Fisheries Service, Northwest Fisheries Science Center
Moss Landing Marine Laboratory, Santa Cruz, CA

Table 1 (continued). Scientific survey personnel participating in the 2006 WCGTS.

	Pass 2	F/V <i>Excalibur</i>	8/14/06 –10/17/06
Leg 1	Dan Kamikawa Jim Miller Melanie Johnson	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC NMFS-NWFSC
Leg 2	Keith Bosley Dan Kamikawa Nick Wilsman	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC ODFW
Leg 3	Dan Kamikawa Melanie Johnson Simon Brown	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC MLML
Leg 4	Dan Kamikawa John Wallace Isaac Kaplan	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC NMFS-NWFSC
Leg 5	Victor Simon Dan Kamikawa Melanie Johnson	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC NMFS-NWFSC
	Pass 2	F/V <i>Raven</i>	8/14/06 –10/17/06
Leg 1	Erica Fruh Vanessa Tuttle John Buchanan	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC NMFS-NWFSC
Leg 2	John Buchanan Erica Fruh Lewis Barnett	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC MLML
Leg 3	John Buchanan Victor Simon Keri York	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC NMFS-NWFSC
Leg 4	Keri York Erica Fruh Aimee Keller	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC NMFS-NWFSC
Leg 5	Erica Fruh Owen Hamel Lewis Barnett	Chief Scientist Fisheries Biologist Fisheries Biologist	NMFS-NWFSC NMFS-NWFSC MLML
NMFS-NWFSC	National Marine Fisheries Service, Northwest Fisheries Science Center		
ODFW	Oregon Department of Fish and Wildlife		
MLML	Moss Landing Marine Laboratory, Santa Cruz, CA		

Table 2. Station tow number, date, location (DD, decimal degrees), and depth (m) by vessel.

F/V <i>Ms. Jullie</i>				
Tow	Date	Latitude (DD)	Longitude (DD)	Depth (m)
1	27-May-06	45.5393	-125.1469	1141.55
2	27-May-06	45.7041	-124.7448	408.41
3	27-May-06	45.8088	-124.6391	212.25
4	27-May-06	45.9471	-124.8646	728.36
5	28-May-06	46.5978	-124.2628	55.02
6	28-May-06	46.7393	-124.3740	69.87
7	28-May-06	46.8589	-124.6833	126.61
8	28-May-06	46.6968	-125.0649	779.54
9	28-May-06	46.8967	-125.1678	758.72
10	29-May-06	47.8320	-125.4426	988.72
11	29-May-06	47.9287	-125.2973	393.63
12	29-May-06	47.8882	-125.2114	219.06
13	29-May-06	47.9300	-125.1963	174.72
14	29-May-06	47.9614	-125.1511	153.83
15	30-May-06	48.0052	-125.7584	1007.72
16	30-May-06	48.0259	-125.7334	968.32
17	30-May-06	48.1004	-125.8602	884.71
18	30-May-06	48.2433	-125.6204	155.45
19	30-May-06	48.2383	-125.6272	163.18
20	31-May-06	48.2288	-124.8863	65.90
21	31-May-06	48.1112	-125.3077	226.19
22	31-May-06	48.0394	-125.0776	128.51
23	31-May-06	47.9905	-125.0670	123.87
24	01-Jun-06	47.9044	-124.9709	109.45
25	01-Jun-06	47.7879	-124.8171	79.07
26	01-Jun-06	47.7046	-125.0631	166.54
27	01-Jun-06	47.5604	-125.2916	919.61
28	02-Jun-06	47.2251	-124.6865	101.38
29	02-Jun-06	47.1731	-124.9230	174.09
30	02-Jun-06	47.0142	-125.0795	956.92
31	03-Jun-06	46.4399	-124.3068	68.90
32	03-Jun-06	46.2051	-124.4136	131.45
33	03-Jun-06	46.2885	-124.5880	149.14
34	03-Jun-06	46.1905	-124.9833	907.08
35	04-Jun-06	45.0695	-124.6873	341.53
36	04-Jun-06	45.0217	-124.6943	432.00
37	04-Jun-06	44.8839	-124.7132	463.55
38	08-Jun-06	44.7710	-124.2067	68.85
39	08-Jun-06	44.9615	-124.2596	143.45
40	08-Jun-06	44.9376	-124.5364	421.21
41	08-Jun-06	45.1046	-124.5092	333.18
42	09-Jun-06	45.2699	-124.1856	132.89
43	09-Jun-06	45.3000	-124.2821	176.61

44	09-Jun-06	45.2988	-124.6431	482.23
45	09-Jun-06	45.1044	-124.8624	697.14
46	09-Jun-06	44.9484	-125.0705	1006.68
47	10-Jun-06	44.8753	-125.0041	836.10
48	10-Jun-06	44.7708	-124.8325	483.98
49	10-Jun-06	44.7303	-124.8278	440.87
50	10-Jun-06	44.5777	-124.7019	300.33
51	11-Jun-06	44.4617	-124.7103	146.51
52	11-Jun-06	44.5086	-124.8437	311.72
53	11-Jun-06	44.4407	-124.8760	366.60
54	11-Jun-06	44.3758	-124.8720	513.48
55	12-Jun-06	44.4306	-124.3062	67.56
56	12-Jun-06	44.3318	-124.3177	72.28
57	12-Jun-06	44.1481	-124.2515	69.30
58	12-Jun-06	44.0494	-124.3883	110.50
59	12-Jun-06	44.1702	-124.4916	107.82
60	13-Jun-06	44.1395	-124.6946	109.43
61	13-Jun-06	43.9688	-124.8574	110.15
62	13-Jun-06	44.0590	-125.0201	1081.61
63	13-Jun-06	43.9218	-124.9492	427.10
64	13-Jun-06	43.8477	-124.5737	195.65
65	14-Jun-06	43.9327	-124.4412	120.18
66	14-Jun-06	43.8064	-124.4139	113.23
67	14-Jun-06	43.7177	-124.3278	102.97
68	14-Jun-06	43.4190	-124.5739	141.51
69	15-Jun-06	43.0957	-124.8053	233.47
70	15-Jun-06	42.8827	-124.8921	346.80
71	15-Jun-06	42.9622	-124.8662	167.31
72	15-Jun-06	42.9835	-124.5610	78.85
73	16-Jun-06	43.4877	-124.8159	593.81
74	16-Jun-06	43.4183	-124.6062	164.31
75	22-Jun-06	42.6184	-124.4756	61.36
76	22-Jun-06	42.5947	-124.7327	309.33
77	23-Jun-06	41.5353	-124.2545	54.16
78	23-Jun-06	41.4359	-124.2557	68.22
79	23-Jun-06	40.8440	-124.4676	378.33
80	23-Jun-06	40.5838	-124.6370	185.10
81	24-Jun-06	40.3377	-124.5092	429.04
82	24-Jun-06	40.2734	-124.6181	385.75
83	24-Jun-06	40.1061	-124.6183	823.46
84	24-Jun-06	39.9943	-124.5317	1105.24
85	24-Jun-06	39.9473	-124.3698	1091.74
86	25-Jun-06	40.1037	-124.2817	154.46
87	25-Jun-06	39.8424	-124.1282	337.40
88	25-Jun-06	39.7973	-123.9057	85.71
89	25-Jun-06	39.5432	-123.8237	64.22
90	26-Jun-06	39.3108	-124.0504	596.20
91	26-Jun-06	39.2198	-124.1770	914.40

92	26-Jun-06	39.2197	-124.1764	991.36
93	26-Jun-06	39.1538	-123.9287	138.90
94	26-Jun-06	39.1332	-123.8643	111.46
95	27-Jun-06	38.7120	-123.8416	486.72
96	27-Jun-06	38.6501	-123.7478	254.83
97	27-Jun-06	38.5873	-123.6828	212.04
98	27-Jun-06	38.5971	-123.4559	93.99
99	27-Jun-06	38.4385	-123.5491	190.40
100	28-Jun-06	38.0344	-123.3689	118.87
101	28-Jun-06	38.0293	-123.3747	112.13
102	28-Jun-06	38.0420	-123.1990	103.56
103	28-Jun-06	38.0052	-123.2132	104.46
104	02-Jul-06	37.4595	-122.7119	74.13
105	02-Jul-06	37.3709	-122.8959	231.98
106	02-Jul-06	37.4340	-123.0305	557.35
107	02-Jul-06	37.3213	-123.0163	628.21
108	02-Jul-06	37.2637	-123.1787	1229.87
109	03-Jul-06	37.3600	-123.0694	804.57
110	03-Jul-06	37.2986	-122.8805	260.99
111	03-Jul-06	37.2325	-122.6582	96.99
112	03-Jul-06	37.3841	-122.5779	65.25
113	03-Jul-06	37.4283	-122.5563	53.26
114	04-Jul-06	37.1617	-122.6815	115.69
115	04-Jul-06	37.1358	-122.7832	438.14
116	04-Jul-06	37.0677	-122.6394	137.78
117	04-Jul-06	37.0170	-122.3506	89.88
118	04-Jul-06	36.9746	-122.2279	60.38
119	05-Jul-06	36.7932	-121.8842	376.73
120	05-Jul-06	36.8129	-121.8839	74.87
121	05-Jul-06	36.7789	-121.8879	225.47
122	05-Jul-06	36.7581	-121.9313	94.19
123	05-Jul-06	36.3955	-122.0667	625.83
124	10-Jul-06	35.4106	-121.5284	941.86
125	10-Jul-06	35.3708	-121.7532	1268.47
126	10-Jul-06	35.3752	-121.7327	1268.39
127	10-Jul-06	35.2430	-121.6922	1148.07
128	11-Jul-06	35.1012	-121.3388	641.16
129	11-Jul-06	35.1803	-121.0999	491.72
130	11-Jul-06	34.9607	-121.1356	558.87
131	11-Jul-06	34.9895	-120.9911	400.09
132	11-Jul-06	35.0712	-120.8905	164.44
133	12-Jul-06	35.0126	-120.7665	69.92
134	12-Jul-06	34.9404	-120.8242	128.78
135	12-Jul-06	34.8504	-120.8465	161.03
136	12-Jul-06	34.7092	-120.7667	80.37
137	12-Jul-06	34.4559	-120.5344	69.45
138	13-Jul-06	34.0792	-120.7730	795.32
139	13-Jul-06	34.1458	-120.8287	811.08

140	13-Jul-06	34.2386	-120.5383	504.22
141	13-Jul-06	34.2683	-120.4133	416.47
142	13-Jul-06	34.2695	-120.3919	409.40
143	14-Jul-06	33.9181	-120.4158	428.51
144	14-Jul-06	34.2116	-120.3087	469.96
145	14-Jul-06	34.1754	-120.0995	534.12
146	14-Jul-06	34.1769	-120.0660	547.70
147	14-Jul-06	34.1710	-120.0341	550.28
148	14-Jul-06	34.1877	-119.8543	464.84
149	15-Jul-06	34.3758	-119.8327	61.24
150	15-Jul-06	34.2075	-119.6676	161.87
151	15-Jul-06	34.2108	-119.6089	157.90
152	15-Jul-06	34.0111	-119.1793	506.61
153	15-Jul-06	33.9283	-119.0677	815.51
154	16-Jul-06	33.9270	-118.9876	867.22
155	16-Jul-06	33.8803	-118.9203	891.31
156	16-Jul-06	33.8202	-118.6973	842.92
157	16-Jul-06	33.1999	-118.7470	833.95
159	17-Jul-06	32.7120	-118.0852	555.38
160	17-Jul-06	32.8129	-117.8426	344.73
161	17-Jul-06	32.6612	-117.4744	382.14
162	17-Jul-06	32.6133	-117.3661	208.74
163	17-Jul-06	32.6369	-117.3049	83.10
164	18-Jul-06	32.6908	-117.3030	71.55
165	18-Jul-06	33.1554	-117.4199	181.19
166	18-Jul-06	33.3049	-117.6082	138.41
167	18-Jul-06	33.0263	-117.9267	967.88
169	18-Jul-06	33.0002	-118.0183	925.80
170	19-Jul-06	33.2963	-118.3667	640.08
171	19-Jul-06	33.2922	-118.3597	83.48
172	19-Jul-06	33.2904	-118.3392	84.43
173	19-Jul-06	33.3062	-118.2857	93.45
174	19-Jul-06	33.4174	-118.2758	844.09
175	19-Jul-06	33.3957	-118.3256	203.83
<i>F/V Noah's Ark</i>				
Tow	Date	Latitude (DD)	Longitude (DD)	Depth (m)
1	27-May-06	44.6825	-124.9088	582.94
2	27-May-06	44.6726	-124.8782	464.87
3	27-May-06	44.7312	-124.7316	365.71
4	27-May-06	45.1000	-124.6134	430.10
5	27-May-06	45.2785	-124.7977	700.29
6	28-May-06	46.2049	-124.9543	963.88
7	28-May-06	46.5323	-124.4969	155.54
8	28-May-06	46.6916	-124.5424	120.38
9	28-May-06	46.7933	-124.8355	182.33
10	28-May-06	46.9162	-124.6589	116.44
11	29-May-06	47.4719	-125.2919	1146.86
12	29-May-06	47.5992	-125.3672	927.26

13	29-May-06	47.7131	-125.7689	1238.84
14	29-May-06	47.7639	-125.4137	825.77
15	29-May-06	47.9274	-125.4467	593.54
16	30-May-06	48.2689	-125.5446	135.33
17	30-May-06	48.2639	-125.5621	141.72
18	30-May-06	48.2611	-125.6000	144.47
19	30-May-06	48.2599	-125.3003	99.78
20	30-May-06	48.4258	-125.0627	115.23
21	30-May-06	48.1090	-125.4053	117.14
22	30-May-06	48.0540	-125.2842	165.71
23	31-May-06	47.2652	-125.0648	713.24
24	31-May-06	47.1041	-124.5499	73.36
25	31-May-06	47.0246	-124.6523	100.72
26	31-May-06	46.9963	-124.8009	149.17
27	01-Jun-06	46.2223	-124.3721	121.74
28	01-Jun-06	46.0654	-124.4188	132.36
29	01-Jun-06	45.8943	-124.5126	149.26
30	01-Jun-06	45.9548	-124.2381	113.16
31	01-Jun-06	45.9043	-124.2373	117.66
32	02-Jun-06	45.5548	-124.0998	87.63
33	02-Jun-06	45.6482	-124.1007	83.61
34	02-Jun-06	45.6533	-124.3834	151.79
35	02-Jun-06	45.6547	-124.4336	176.88
36	02-Jun-06	45.6570	-124.4565	192.53
37	02-Jun-06	45.5642	-124.4898	256.99
38	03-Jun-06	45.3133	-124.6146	448.50
39	03-Jun-06	45.3547	-124.2276	157.29
40	03-Jun-06	45.3291	-124.1211	98.76
41	03-Jun-06	45.3141	-124.1257	102.98
42	03-Jun-06	45.3260	-124.0865	83.91
43	03-Jun-06	45.2666	-124.2564	172.67
44	04-Jun-06	45.0775	-124.2879	176.30
45	04-Jun-06	45.0275	-124.2592	157.80
46	08-Jun-06	44.8404	-124.3103	131.80
47	08-Jun-06	44.7006	-124.2430	74.76
48	08-Jun-06	44.3991	-124.4549	86.28
49	08-Jun-06	44.3113	-124.2288	63.13
50	08-Jun-06	44.2173	-124.5250	98.38
51	09-Jun-06	44.2902	-124.9370	503.63
52	09-Jun-06	44.2611	-124.8239	133.87
53	09-Jun-06	44.1138	-124.4095	107.01
54	09-Jun-06	43.9220	-124.4641	126.35
55	09-Jun-06	43.9186	-124.4362	113.84
56	09-Jun-06	43.9020	-124.4403	123.69
57	10-Jun-06	43.9806	-124.9523	231.64
58	10-Jun-06	43.9514	-124.9382	151.79
59	10-Jun-06	43.9433	-124.9148	134.30
60	10-Jun-06	43.9185	-125.0466	1192.60

61	10-Jun-06	43.8119	-124.7997	413.56
62	11-Jun-06	43.8488	-124.7506	329.69
63	11-Jun-06	43.6146	-124.6751	425.61
64	11-Jun-06	43.5834	-124.5110	157.62
65	11-Jun-06	43.4245	-124.6621	259.17
66	12-Jun-06	43.3845	-124.4775	100.96
67	12-Jun-06	43.4817	-124.7820	553.80
68	12-Jun-06	43.2573	-124.6656	154.52
69	12-Jun-06	43.2560	-124.6894	181.44
70	12-Jun-06	43.2602	-124.7286	253.71
71	13-Jun-06	43.1814	-125.0026	1044.40
72	13-Jun-06	43.1820	-124.9694	1010.13
73	13-Jun-06	43.0249	-124.8097	123.36
74	13-Jun-06	43.0553	-124.6679	149.17
75	13-Jun-06	42.9579	-124.5675	75.88
76	14-Jun-06	42.4850	-124.5983	84.41
77	14-Jun-06	42.4279	-124.6067	87.33
78	14-Jun-06	42.0664	-124.6788	550.49
79	14-Jun-06	42.0024	-124.8844	971.80
80	14-Jun-06	41.8579	-125.0233	996.01
81	15-Jun-06	41.7269	-124.9286	1028.69
82	15-Jun-06	41.7207	-124.6290	691.53
83	15-Jun-06	41.7291	-124.4883	294.65
84	15-Jun-06	41.3690	-124.7252	1144.56
85	15-Jun-06	41.2942	-124.8306	1162.00
86	16-Jun-06	41.2360	-124.2395	77.19
87	16-Jun-06	41.1011	-124.4285	506.61
88	21-Jun-06	41.2562	-124.3223	116.95
89	22-Jun-06	41.3366	-124.4815	339.03
90	22-Jun-06	40.9752	-124.5948	632.56
91	22-Jun-06	40.6849	-124.7018	963.93
92	22-Jun-06	40.6019	-124.6462	185.17
93	22-Jun-06	40.5977	-124.6494	198.73
94	23-Jun-06	40.5922	-124.6414	183.37
95	23-Jun-06	40.4593	-124.6032	141.88
96	23-Jun-06	40.0920	-124.9462	1240.28
97	23-Jun-06	40.0196	-124.6682	1017.59
98	24-Jun-06	40.0711	-124.2056	134.57
99	24-Jun-06	39.8663	-124.1527	388.92
100	24-Jun-06	39.8598	-124.0060	110.30
101	24-Jun-06	39.3883	-123.9295	138.76
102	25-Jun-06	39.3466	-123.9247	139.64
103	25-Jun-06	39.2827	-123.9845	355.15
104	25-Jun-06	39.2015	-123.9795	341.97
105	25-Jun-06	39.1047	-123.9815	359.30
106	25-Jun-06	39.0794	-123.9851	454.28
107	26-Jun-06	38.4147	-123.6855	771.75
108	26-Jun-06	38.2786	-123.5035	301.51

109	26-Jun-06	38.2467	-123.4096	214.44
110	26-Jun-06	38.3089	-123.3176	115.94
111	27-Jun-06	38.2389	-123.0910	77.61
112	27-Jun-06	38.1454	-123.4393	231.99
113	27-Jun-06	38.1058	-123.5046	295.40
114	27-Jun-06	38.0162	-123.5327	845.34
115	28-Jun-06	37.9043	-123.1035	91.95
116	28-Jun-06	37.8193	-122.9251	66.27
117	02-Jul-06	37.5461	-122.7014	59.66
118	02-Jul-06	37.5291	-122.6540	59.09
119	02-Jul-06	37.3975	-123.0887	733.86
120	02-Jul-06	37.3110	-123.0251	652.10
121	02-Jul-06	37.3000	-122.9674	499.63
122	03-Jul-06	37.1632	-122.6271	107.90
123	03-Jul-06	37.0417	-122.6707	385.60
124	03-Jul-06	36.8193	-122.0831	107.12
125	03-Jul-06	36.7295	-122.1842	805.14
126	04-Jul-06	36.3995	-122.0837	673.34
127	04-Jul-06	36.3541	-122.1894	859.30
128	04-Jul-06	36.2479	-122.0786	535.84
129	04-Jul-06	36.2543	-122.0815	546.71
130	04-Jul-06	36.1921	-122.1971	1138.52
131	04-Jul-06	36.1426	-122.0941	1173.33
132	05-Jul-06	35.8075	-121.7644	995.80
133	05-Jul-06	35.8232	-121.5573	526.24
134	05-Jul-06	35.7427	-121.4571	328.06
135	05-Jul-06	35.4228	-121.0827	226.18
136	08-Jul-06	35.5943	-121.5587	768.47
137	08-Jul-06	35.6379	-121.5831	756.80
138	08-Jul-06	35.5414	-121.5948	866.79
139	08-Jul-06	35.2313	-121.4187	712.30
140	08-Jul-06	35.1364	-121.3935	564.05
141	12-Jul-06	34.9356	-120.8909	215.13
142	12-Jul-06	34.8186	-120.9913	378.28
143	12-Jul-06	34.7902	-121.0885	518.53
144	12-Jul-06	34.8589	-121.2993	439.09
145	12-Jul-06	34.7279	-121.2765	593.59
146	13-Jul-06	34.6158	-121.2528	865.87
147	13-Jul-06	34.5178	-121.1430	1036.03
148	13-Jul-06	34.4946	-121.1467	1099.48
149	13-Jul-06	34.5083	-120.8339	492.47
150	13-Jul-06	34.4342	-120.6917	411.85
151	14-Jul-06	34.3145	-120.6013	465.60
152	14-Jul-06	34.3152	-120.4208	358.94
153	14-Jul-06	34.3065	-120.1538	509.39
154	14-Jul-06	33.7686	-119.8980	129.07
155	15-Jul-06	33.7300	-119.9764	128.93
156	15-Jul-06	33.7198	-119.9744	126.19

157	15-Jul-06	33.7238	-120.0085	122.19
158	15-Jul-06	33.7720	-120.0738	301.75
159	15-Jul-06	33.7773	-120.0668	288.19
160	15-Jul-06	33.6619	-119.8331	235.91
161	16-Jul-06	33.2663	-120.3253	1023.54
162	16-Jul-06	33.2097	-120.3177	892.63
163	16-Jul-06	32.9730	-120.3657	912.35
164	16-Jul-06	33.1535	-119.9547	1232.61
165	16-Jul-06	33.1537	-119.9595	1241.23
166	17-Jul-06	34.0040	-118.9905	144.52
167	17-Jul-06	33.9900	-118.6682	73.70
168	17-Jul-06	33.9493	-118.6279	216.66
169	17-Jul-06	33.7917	-118.4685	71.92
170	17-Jul-06	33.5819	-118.6084	540.87
171	18-Jul-06	33.5624	-118.6444	587.91
172	18-Jul-06	33.5223	-118.6963	358.87
173	18-Jul-06	33.4436	-118.5986	119.87
174	18-Jul-06	33.0820	-118.6550	385.64
175	18-Jul-06	33.3772	-118.0983	728.87
176	19-Jul-06	33.3909	-117.9255	552.44
177	19-Jul-06	33.3399	-117.9520	613.27
178	19-Jul-06	32.7635	-117.8995	489.61
179	19-Jul-06	32.6981	-117.7822	365.36
180	20-Jul-06	32.9805	-117.3130	66.48
181	20-Jul-06	32.6025	-117.4002	135.60
<i>F/V Excalibur</i>				
Tow	Date	Latitude (DD)	Longitude (DD)	Depth (m)
2	18-Aug-06	44.6372	-125.1367	852.10
3	18-Aug-06	44.9937	-124.5864	449.16
4	18-Aug-06	45.0944	-124.7329	385.21
5	18-Aug-06	45.2662	-124.8095	713.38
6	19-Aug-06	45.2576	-124.6488	496.56
7	19-Aug-06	45.2933	-124.7480	544.08
8	19-Aug-06	45.3338	-124.8122	709.63
9	19-Aug-06	45.4935	-124.7099	511.91
10	19-Aug-06	45.5071	-124.5437	473.48
11	19-Aug-06	45.5560	-124.4702	237.84
12	19-Aug-06	45.7255	-124.5235	191.30
13	20-Aug-06	45.7702	-124.3925	150.96
14	20-Aug-06	45.9368	-124.7768	575.77
15	20-Aug-06	46.1203	-124.9492	1271.10
16	20-Aug-06	46.2963	-125.0058	1147.63
17	20-Aug-06	46.3175	-124.8717	977.62
18	21-Aug-06	46.9375	-124.8339	314.47
19	21-Aug-06	47.0048	-124.8326	156.18
20	21-Aug-06	47.1857	-124.9261	192.44
21	21-Aug-06	47.3983	-124.9244	1170.69
22	21-Aug-06	47.4202	-124.9312	1135.38

23	22-Aug-06	48.2571	-124.9047	97.29
24	22-Aug-06	48.2720	-125.1722	120.36
25	22-Aug-06	48.2032	-125.1638	122.33
26	22-Aug-06	48.1251	-125.1357	247.83
27	22-Aug-06	48.0626	-125.3794	144.48
28	23-Aug-06	48.1204	-125.7146	256.53
29	23-Aug-06	47.9275	-125.6852	604.41
30	23-Aug-06	47.6359	-125.3906	1075.60
31	23-Aug-06	47.8230	-125.3100	588.63
32	24-Aug-06	47.8655	-125.3023	460.89
33	24-Aug-06	47.6889	-125.0051	154.37
34	24-Aug-06	47.3920	-124.6166	78.27
35	24-Aug-06	46.9694	-124.4084	59.29
36	24-Aug-06	46.9161	-124.4877	80.88
37	24-Aug-06	46.7905	-124.5112	96.62
38	24-Aug-06	46.7261	-124.4809	94.90
39	25-Aug-06	46.3350	-124.8701	972.96
40	26-Aug-06	46.2852	-124.3214	107.10
41	26-Aug-06	45.9694	-124.3876	142.41
42	26-Aug-06	45.7575	-124.0775	77.24
43	26-Aug-06	45.4941	-124.0534	69.14
44	26-Aug-06	45.2961	-124.1754	130.21
45	26-Aug-06	45.2402	-124.2136	154.83
46	26-Aug-06	45.2459	-124.2791	181.29
47	26-Aug-06	45.0833	-124.2796	171.97
48	27-Aug-06	44.7370	-124.6355	268.89
49	27-Aug-06	44.6150	-124.7483	306.66
50	27-Aug-06	44.5929	-124.4602	80.47
51	31-Aug-06	44.4583	-124.3401	70.05
52	31-Aug-06	44.3755	-124.2812	70.32
53	31-Aug-06	44.2806	-124.2485	68.92
54	31-Aug-06	44.0837	-124.2824	78.63
55	31-Aug-06	44.0796	-124.3910	109.13
56	31-Aug-06	44.1142	-124.3717	99.62
57	31-Aug-06	44.4107	-124.7289	143.56
58	01-Sep-06	44.1898	-124.6421	116.48
59	01-Sep-06	44.1444	-124.9520	207.25
60	01-Sep-06	43.9598	-124.9514	210.31
61	01-Sep-06	43.9552	-124.9537	226.01
62	01-Sep-06	43.6424	-125.0831	1098.94
63	01-Sep-06	43.4193	-125.1071	1056.14
64	07-Sep-06	43.8764	-124.5436	162.26
65	07-Sep-06	43.8210	-124.6059	257.87
66	07-Sep-06	43.7560	-124.5518	189.97
67	07-Sep-06	43.6419	-124.4622	137.03
68	07-Sep-06	43.4181	-124.6828	326.79
69	07-Sep-06	43.3728	-124.6514	193.04
70	08-Sep-06	43.3261	-125.0014	906.49

71	08-Sep-06	43.2955	-125.0222	1012.72
72	08-Sep-06	43.0657	-124.8778	321.53
73	08-Sep-06	43.0573	-124.7186	168.19
74	08-Sep-06	43.0483	-124.6040	116.05
75	08-Sep-06	42.6638	-124.6929	168.91
76	09-Sep-06	42.5564	-124.5749	89.45
77	09-Sep-06	42.5891	-124.7684	441.21
78	09-Sep-06	42.4532	-124.8120	331.41
79	09-Sep-06	42.3007	-124.6718	365.26
80	09-Sep-06	42.1985	-124.7324	568.93
81	09-Sep-06	42.2328	-124.6051	236.63
82	10-Sep-06	41.9957	-124.4060	79.75
83	10-Sep-06	42.0017	-124.6005	307.83
84	10-Sep-06	42.0001	-124.5479	139.34
85	10-Sep-06	41.7659	-124.7706	849.56
86	10-Sep-06	41.7004	-124.7567	859.98
87	10-Sep-06	41.5607	-124.9570	978.92
88	11-Sep-06	41.2686	-124.6231	1119.88
89	11-Sep-06	41.1926	-124.3322	137.96
90	11-Sep-06	40.9758	-124.2677	79.29
91	15-Sep-06	41.0360	-124.5840	712.69
92	15-Sep-06	41.0133	-124.5670	645.88
93	15-Sep-06	41.0011	-124.6946	737.42
94	15-Sep-06	40.7092	-124.6986	921.59
95	15-Sep-06	40.5797	-124.5508	146.40
96	16-Sep-06	40.3183	-124.4176	84.16
97	16-Sep-06	40.1558	-124.8452	980.67
98	16-Sep-06	40.0857	-124.6889	916.11
99	16-Sep-06	40.0472	-124.6162	922.03
100	16-Sep-06	39.9599	-124.3372	1004.50
101	17-Sep-06	39.6002	-124.1797	1172.52
102	17-Sep-06	39.4955	-124.1571	998.96
103	17-Sep-06	39.5269	-123.8932	120.10
104	17-Sep-06	39.2989	-123.9780	330.08
105	17-Sep-06	39.1608	-124.0127	475.77
106	18-Sep-06	38.8242	-123.9348	658.63
107	18-Sep-06	38.8415	-123.9008	266.78
108	18-Sep-06	38.7716	-123.7410	128.19
109	18-Sep-06	38.5668	-123.7124	490.24
110	18-Sep-06	38.3632	-123.5577	274.23
111	18-Sep-06	38.3125	-123.4923	245.41
112	19-Sep-06	38.1030	-123.2414	113.55
113	19-Sep-06	37.8714	-123.2835	107.10
114	19-Sep-06	37.8071	-123.1325	81.94
115	19-Sep-06	37.8274	-123.0975	85.12
116	20-Sep-06	37.5159	-122.6714	61.93
117	20-Sep-06	37.3845	-122.6788	86.86
118	20-Sep-06	37.1410	-122.8763	491.33

119	20-Sep-06	37.0223	-122.7731	1035.39
120	21-Sep-06	36.9118	-122.1063	62.94
121	21-Sep-06	36.9108	-122.1635	84.02
122	21-Sep-06	36.1621	-121.9954	1100.34
123	21-Sep-06	36.0895	-121.9570	1196.63
124	22-Sep-06	36.0519	-121.6660	594.62
125	22-Sep-06	35.8167	-122.0090	1173.31
126	22-Sep-06	35.6855	-121.8546	1039.54
127	23-Sep-06	35.7193	-121.3689	62.70
128	23-Sep-06	35.6217	-121.2993	102.41
129	28-Sep-06	35.6183	-121.3724	312.32
130	28-Sep-06	35.4111	-121.4903	901.34
131	28-Sep-06	35.3236	-121.6456	958.81
132	28-Sep-06	35.2802	-121.5861	867.37
133	29-Sep-06	35.0609	-121.1329	548.64
134	29-Sep-06	34.9765	-120.8710	180.68
135	29-Sep-06	34.9637	-120.7381	64.21
136	29-Sep-06	34.8123	-120.7228	68.71
137	30-Sep-06	34.7944	-120.7401	79.37
138	30-Sep-06	34.7074	-120.9912	442.92
139	30-Sep-06	34.3946	-120.5501	231.86
140	30-Sep-06	34.3543	-120.4560	276.20
141	01-Oct-06	34.2523	-120.3321	439.22
142	01-Oct-06	34.3157	-120.2624	402.42
143	01-Oct-06	34.3961	-120.2241	270.06
144	01-Oct-06	34.4076	-120.2038	202.36
145	02-Oct-06	34.4233	-120.1354	80.02
146	02-Oct-06	34.3471	-120.0119	521.82
147	02-Oct-06	34.3364	-119.9992	527.81
148	02-Oct-06	34.2385	-120.0164	587.06
149	02-Oct-06	34.2263	-119.8380	438.09
150	03-Oct-06	34.2070	-119.6262	159.16
151	03-Oct-06	34.2063	-119.5463	114.96
152	06-Oct-06	33.5807	-119.8319	398.10
153	06-Oct-06	33.6185	-119.9704	667.51
154	06-Oct-06	33.6311	-119.9375	280.42
155	06-Oct-06	33.6241	-119.9281	275.40
156	06-Oct-06	33.5763	-119.9937	694.50
157	06-Oct-06	33.3644	-120.0693	960.35
158	07-Oct-06	33.5108	-120.3477	974.27
159	07-Oct-06	33.4648	-120.3024	777.24
160	07-Oct-06	33.4601	-120.3014	765.35
161	07-Oct-06	33.4777	-120.3426	1091.86
162	07-Oct-06	33.2045	-120.4954	1089.16
163	07-Oct-06	33.1231	-120.3321	344.61
164	08-Oct-06	32.7680	-120.1143	465.84
165	08-Oct-06	32.6874	-119.7702	1095.73
166	08-Oct-06	32.6814	-119.6524	960.71

167	09-Oct-06	32.6334	-118.7001	1055.68
168	09-Oct-06	32.5620	-118.6203	1034.29
169	09-Oct-06	32.5984	-118.4495	1122.83
170	09-Oct-06	32.7307	-118.4222	227.15
171	09-Oct-06	32.9161	-118.2035	873.51
172	10-Oct-06	33.4683	-118.6262	98.49
173	10-Oct-06	33.5023	-118.7209	259.46
174	10-Oct-06	33.5453	-118.8091	440.74
175	10-Oct-06	33.5422	-118.8255	416.97
176	10-Oct-06	33.5697	-118.8096	544.70
177	10-Oct-06	33.6406	-118.7254	898.41
178	11-Oct-06	33.5007	-118.0966	416.67
179	11-Oct-06	33.5467	-117.8694	377.39
180	11-Oct-06	33.1881	-117.5068	317.10
181	11-Oct-06	33.1709	-117.4324	81.43
182	11-Oct-06	33.0622	-117.3948	379.04
183	12-Oct-06	32.7431	-117.3169	75.85
184	12-Oct-06	32.5636	-117.3737	141.37
<i>F/V Raven</i>				
Tow	Date	Latitude (DD)	Longitude (DD)	Depth (m)
1	18-Aug-06	44.7860	-124.9794	753.11
2	18-Aug-06	44.7841	-124.9384	530.08
3	18-Aug-06	44.7373	-124.8950	578.99
4	18-Aug-06	45.0644	-124.7951	593.69
5	19-Aug-06	45.3858	-124.9325	1141.27
6	19-Aug-06	45.4989	-124.7484	558.95
7	19-Aug-06	45.5056	-124.6064	460.82
8	19-Aug-06	45.6863	-124.5304	205.67
9	19-Aug-06	45.7594	-124.6710	247.50
10	20-Aug-06	46.7520	-124.7891	178.42
11	20-Aug-06	46.7245	-125.1836	947.33
12	21-Aug-06	47.6058	-125.4706	1023.77
13	21-Aug-06	47.6363	-125.5724	1183.57
14	21-Aug-06	47.8018	-125.2307	544.98
15	21-Aug-06	47.9576	-125.0711	129.35
16	21-Aug-06	47.9901	-125.0360	119.99
17	22-Aug-06	48.2419	-125.4726	133.50
18	22-Aug-06	48.2383	-125.4711	136.18
19	22-Aug-06	48.3954	-125.1845	173.19
20	22-Aug-06	48.3762	-125.0356	176.89
21	22-Aug-06	48.2443	-125.0716	115.21
22	23-Aug-06	47.7971	-124.8523	94.30
23	23-Aug-06	47.6876	-124.7083	66.27
24	23-Aug-06	47.6330	-124.8888	120.37
25	23-Aug-06	47.4467	-124.8145	166.45
26	24-Aug-06	46.7380	-124.5156	101.78
27	24-Aug-06	46.7819	-124.4429	82.24
28	24-Aug-06	46.7922	-124.3369	58.68

29	24-Aug-06	46.2731	-124.5454	139.74
30	25-Aug-06	46.2387	-124.6235	848.11
31	25-Aug-06	46.1440	-124.8165	1139.91
32	25-Aug-06	45.9181	-124.5730	169.07
33	25-Aug-06	45.8338	-124.5125	159.30
34	25-Aug-06	45.8706	-124.3049	139.65
35	26-Aug-06	45.7542	-124.0434	65.70
36	26-Aug-06	45.7619	-124.1978	113.65
37	26-Aug-06	45.5938	-124.2060	125.99
38	26-Aug-06	45.4978	-124.0841	79.11
39	26-Aug-06	45.4732	-124.3183	175.80
40	26-Aug-06	45.1964	-124.2984	193.21
41	27-Aug-06	44.8417	-124.3859	147.73
42	27-Aug-06	44.6773	-124.2188	69.23
43	31-Aug-06	45.0438	-124.5158	376.99
44	31-Aug-06	44.9590	-124.6826	451.04
45	31-Aug-06	44.8983	-124.5508	360.06
46	31-Aug-06	44.8062	-124.7570	420.16
47	31-Aug-06	44.8106	-124.5676	245.55
48	31-Aug-06	44.6054	-124.5492	143.15
49	01-Sep-06	44.5254	-124.7922	406.43
50	01-Sep-06	44.5468	-124.6727	307.65
51	01-Sep-06	44.6006	-124.5361	141.11
52	01-Sep-06	44.4934	-124.3221	71.50
53	01-Sep-06	44.3730	-124.3751	81.60
54	02-Sep-06	44.1099	-124.9314	192.13
55	02-Sep-06	44.0429	-124.2549	76.82
56	02-Sep-06	43.8842	-124.4534	126.00
57	02-Sep-06	43.8020	-124.3802	109.40
58	02-Sep-06	43.5932	-124.5667	200.37
59	03-Sep-06	43.5684	-124.9420	853.48
60	03-Sep-06	43.2584	-125.0243	1045.41
61	03-Sep-06	43.1487	-124.8228	278.77
62	03-Sep-06	43.3004	-124.5121	89.57
63	04-Sep-06	43.1545	-125.0048	1024.50
64	04-Sep-06	43.0910	-124.9680	1047.72
65	04-Sep-06	42.7844	-124.7367	213.97
66	05-Sep-06	42.6216	-124.8436	830.92
67	05-Sep-06	42.5622	-124.7796	404.84
68	05-Sep-06	42.4160	-124.7239	186.74
69	05-Sep-06	42.5129	-124.6522	106.98
70	05-Sep-06	42.6713	-124.5463	89.43
71	06-Sep-06	42.5151	-124.6179	97.22
72	06-Sep-06	42.3111	-124.6978	440.88
73	06-Sep-06	42.2542	-124.7013	496.94
74	06-Sep-06	42.2922	-124.6079	184.71
75	06-Sep-06	42.2283	-124.5795	180.60
76	07-Sep-06	42.1713	-124.5683	161.72

77	08-Sep-06	42.0786	-124.4482	95.65
78	08-Sep-06	42.0453	-124.6343	445.06
79	08-Sep-06	42.1401	-124.8561	829.69
80	08-Sep-06	41.9356	-125.0450	1000.35
81	08-Sep-06	41.7896	-124.6213	616.13
82	08-Sep-06	41.7337	-124.5955	599.31
83	09-Sep-06	40.8819	-124.4934	444.97
84	09-Sep-06	40.8672	-124.4017	168.65
85	15-Sep-06	41.4938	-124.4768	171.14
86	15-Sep-06	41.6015	-124.6138	773.95
87	15-Sep-06	41.6087	-124.7500	884.58
88	15-Sep-06	41.4590	-124.8268	854.34
89	15-Sep-06	41.3395	-124.7667	1105.02
90	16-Sep-06	40.7718	-124.6785	708.78
91	16-Sep-06	40.2839	-125.1117	1228.49
92	16-Sep-06	40.1282	-124.9237	1138.68
93	17-Sep-06	40.2123	-124.5862	529.21
94	17-Sep-06	40.2088	-124.5174	482.19
95	17-Sep-06	39.9803	-124.6938	1084.17
96	17-Sep-06	40.0339	-124.5147	939.86
97	18-Sep-06	39.3820	-124.1030	736.09
98	18-Sep-06	39.3162	-123.9522	167.02
99	18-Sep-06	39.1076	-123.8698	111.34
100	18-Sep-06	39.0902	-123.8658	107.09
101	18-Sep-06	39.0077	-123.9022	125.19
102	18-Sep-06	39.0053	-123.8150	89.79
103	18-Sep-06	38.8455	-123.7538	91.51
104	19-Sep-06	38.7826	-123.8257	152.60
105	19-Sep-06	38.5473	-123.5304	137.72
106	19-Sep-06	38.5488	-123.4071	95.44
107	19-Sep-06	38.3119	-123.4304	170.20
108	19-Sep-06	38.2745	-123.1595	87.08
109	20-Sep-06	38.1778	-123.5703	666.78
111	20-Sep-06	38.0123	-123.3483	111.87
112	20-Sep-06	37.9395	-123.4387	141.62
113	20-Sep-06	37.8647	-123.3360	117.34
114	21-Sep-06	37.8504	-123.2312	101.36
115	21-Sep-06	37.9289	-123.1724	95.54
116	25-Sep-06	36.2742	-122.0564	382.55
117	25-Sep-06	36.3324	-122.0254	124.56
118	25-Sep-06	36.3536	-121.9882	117.97
119	25-Sep-06	36.1611	-121.8318	573.43
120	25-Sep-06	35.8615	-121.6130	647.98
121	26-Sep-06	35.3299	-121.6945	1155.69
122	26-Sep-06	35.3585	-121.6355	1047.61
123	26-Sep-06	35.6219	-121.9518	914.40
124	26-Sep-06	35.6084	-121.9264	1002.08
125	26-Sep-06	35.7715	-121.5130	462.12

126	27-Sep-06	35.5486	-121.4561	658.93
127	27-Sep-06	35.0700	-121.0387	448.20
128	27-Sep-06	35.0496	-121.0883	510.59
129	28-Sep-06	35.3397	-120.9418	76.79
130	28-Sep-06	35.0877	-120.7926	76.23
131	28-Sep-06	34.9886	-121.0930	522.37
132	28-Sep-06	34.8079	-120.9632	354.89
133	28-Sep-06	34.6400	-121.4237	940.80
134	29-Sep-06	34.6773	-121.5887	991.22
135	29-Sep-06	34.6863	-121.6227	947.78
136	29-Sep-06	34.6030	-121.3997	1018.21
137	29-Sep-06	34.2185	-121.0341	1028.15
138	29-Sep-06	34.3623	-120.6898	530.10
139	30-Sep-06	34.2207	-120.3862	462.67
140	30-Sep-06	34.1964	-119.8278	422.87
141	30-Sep-06	34.2839	-119.7707	242.98
142	30-Sep-06	34.3025	-119.6902	121.79
143	01-Oct-06	34.2307	-119.5604	97.67
144	01-Oct-06	34.1774	-119.5711	239.25
145	05-Oct-06	33.8470	-119.8851	263.35
146	05-Oct-06	33.6845	-120.0015	120.79
147	05-Oct-06	33.6657	-119.8912	138.05
148	06-Oct-06	33.2463	-119.8845	320.43
149	06-Oct-06	34.0115	-118.8745	74.59
150	06-Oct-06	33.9223	-118.7221	514.17
151	07-Oct-06	33.7297	-118.4124	75.90
152	07-Oct-06	33.7744	-118.4630	78.76
153	07-Oct-06	33.8911	-118.6074	84.83
154	08-Oct-06	33.5358	-118.7002	403.56
155	08-Oct-06	33.5326	-118.5965	500.93
156	08-Oct-06	33.4102	-118.5275	119.77
157	08-Oct-06	33.3364	-118.6100	1245.94
158	08-Oct-06	33.3164	-118.4884	92.08
159	08-Oct-06	33.2411	-118.3671	1168.80
160	09-Oct-06	33.2509	-118.0428	879.83
161	09-Oct-06	33.2945	-118.0838	835.02
162	09-Oct-06	33.2593	-118.2280	240.27
163	09-Oct-06	33.0849	-118.2420	1116.84
164	10-Oct-06	33.0925	-118.6766	451.31
165	10-Oct-06	32.8916	-118.6220	509.42
166	10-Oct-06	32.7207	-118.3857	303.17
167	11-Oct-06	33.3774	-117.6603	79.20
168	11-Oct-06	33.1979	-117.7037	799.78
169	11-Oct-06	33.0568	-117.7092	850.39
170	11-Oct-06	33.0730	-117.4503	491.96
171	12-Oct-06	32.9694	-117.3722	513.31