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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Science Center

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ABSTRACT

An aerial photographic census of Pacific harbor seals (*Phoca vitulina richardii*) was conducted in California 22 May-1 July 2002 to document the number of seals hauled out during the molt period. To compensate for latitudinal differences in the timing of the molt, the state of California was divided into three sections and each section was surveyed on different dates. The three sections were: (1) Channel Islands and mainland coast of southern California from the U.S./Mexico border to Pismo Beach, (2) central California from Pismo Beach to Point Reyes and San Francisco Bay, and (3) northern California from Point Reyes to the California/Oregon border. Aerial photographic surveys at the Channel Islands and the mainland coast of southern California occurred during the high-low tide cycle in the afternoon on 22-25 May and the low-low tide cycle during the morning of 16 June. Surveys in central California and northern California occurred during the low-low tide cycle at tides under one foot on 16-17 June and 28 June-1 July, respectively. Color transparency photographs of harbor seals were taken with a 126-mm-format camera equipped with image motion compensation. The geographical position of each photograph was recorded by linking the camera to a computer and Global Positioning System (GPS). Three observers searched for hauled-out seals and photographed them, as the aircraft was flown over the coastline at 213 m (700 feet). A total of 467 haulout sites within the state of California was found during the surveys. At the Channel Islands there were 3,878 seals counted out of the water and 5 in the water near haulout sites. Along the mainland coast of California and San Francisco Bay there were 17,555 seals counted hauled out and 136 seals counted in the water near haulout sites. Statewide, a total of 21,433 seals were counted hauled out of the water and 141 seals were counted in the water. The mainland coast of California was stratified into nineteen 0.5 degree latitude segments with counts from the San Francisco Bay estuary making up the twentieth stratum. Stratum 37.50° to 37.99° had the most seals (n = 3,005), most seals per haulout site (n = 835), second highest number of haulout sites (n = 34), and third highest mean number of seals per haulout site ($\bar{x}$ = 88.4). Of the eight Channel Islands in southern California, Santa Cruz Island had the most seals (n =1,085) and Santa Barbara Island the fewest (n = 15).

INTRODUCTION

Pacific harbor seals (*Phoca vitulina richardii*) are widely distributed along the mainland coast, islands and bays of California. California Department of Fish and Game (CDFG) conducted annual aerial photographic surveys of harbor seals in California during the pre-molt and molt period (when the expected greatest number of seals were hauled out) during early June through early July from 1982 through 1995 (Hanan 1996, Fluharty 1999). Seals from those surveys were counted from near-vertical aerial color-transparency photographs taken with a 70-mm-format Hasselblad camera as the aircraft flew over the coastline at an altitude of 183-213 meters (600-700 feet).

In 1987, biologists from Southwest Fisheries Science Center (SWFSC) began to use photographs taken with a 126-mm-format military recognizance camera equipped with image motion compensation to census California sea lions, northern elephant seals, and Steller sea lions (Lowry et al. 1996, Lowry 1999, Westlake et al. 1997). At a workshop on methods and timing of harbor seal surveys in California (Barlow 2002), it was recommended that SWFSC should use the 126-mm-format camera for the 2002 California harbor seal surveys. This report describes methods and results of the harbor seal census in California conducted by SWFSC during May-July 2002. In addition to providing a total count of harbor seals for California, counts were stratified by 0.5 degrees latitude for coastal mainland sites, for each of the Channel Islands, and for sections of California.

METHODS

The state of California was divided into three sections to adjust for latitudinal differences in the timing of the molt by harbor seals: (1) Channel Islands and mainland coast of southern California from the U.S./Mexico border to Pismo Beach, (2) central California from Pismo Beach to Point Reyes and San Francisco Bay, and (3) northern California from Point Reyes to the California/Oregon border (Table 1, Figure 1).

Aerial photographic surveys of harbor seals at the Channel Islands and the mainland coast of southern California were scheduled during the lowest tide cycle in the afternoon (high-low tide) in late-May through mid-June (Table 2) when previous studies at the Channel Islands determined that the greatest number of harbor seals would be hauled out (Stewart and Yochem 1994). Surveys in central California were scheduled during mid-to-late June during the low-low tide cycle at tides under one foot, however, Monterey Bay was scheduled at tides under 1.5 feet (Table 3) based on recommendations made at the California harbor seal abundance workshop (Barlow 2002). Surveys in northern California were scheduled in late-June through mid-July during the low-low tide cycle at tides under one foot, however, Humboldt Bay was scheduled at tides under a half foot (Table 4) based on recommendations made at the California harbor seal abundance workshop (Barlow 2002). Optimal survey dates during favorable tides were determined to be days with the least amount of difference in tidal height, which corresponded to the troughs in the daily tidal cycle. Surveys were also scheduled after 0800 hours when light conditions were optimal for locating and photographing seals.

A twin-engine, high-wing Partenavia PN68-observer model aircraft was flown at a ground speed of 185 km/h (100 knots) and at an altitude of 213 m (700 feet) above sea level (ASL). However, the altitude was raised at Elkhorn Slough to 305 m (1000 feet) and to 427 m

(1400 feet) at Southeast Farallon Islands due to permit restrictions, to 366 m (1200 feet) at Castro Rocks (San Francisco Bay) due to Federal Aviation Administration (FAA) restrictions, and to 274 m (900 feet) at Humboldt Bay to limit disturbance to seals. The survey was conducted counterclockwise around the Channel Islands and from south to north along the mainland. During the survey, the aircraft was flown directly over the coastline or slightly offshore. Seals were photographed as the aircraft traveled over the coastline, or if the seals were out of camera range or sighted too late to be photographed, the aircraft doubled back to photograph them. Multiple photographic passes were made over large rocks or islands to ensure that the entire rock or island was photographed.

Harbor seals were photographed with a 126-mm-format Chicago Aerial Industries, Inc. KA-76 camera equipped with image motion compensation (IMC) and operated at a cycle rate that achieved 67% overlap between adjacent frames. The geographical position of each photograph was recorded by linking the camera (mounted vertically inside the belly of the aircraft) to a computer and Global Positioning System (GPS.). A 152 mm focal-length lens was used for low altitude photography (i.e., altitude of 213 to 366 m) and a 305 mm focal–length lens was used for higher altitude photography (i.e., altitude of 427 m). Kodak Aerochrome HS Film SO-359, a very fine-grained, high-speed, color transparency film, was used. The camera was set at an aperture of f/5.6 with a shutter speed between 1/400 and 1/2000 second.

The survey team consisted of three observers and the pilot. The observer in the right front seat looked for seals in front and to the right of the aircraft and entered data into the computer linked to the camera and to a Garmin 12XL GPS unit. The second observer was seated on the left rear side of the aircraft and looked for seals to the left and below the aircraft. During the central and northern California surveys, the second observer also operated a second computer that was linked to a Garmin GPSMAP 76 GPS unit for tracking the aircraft on a topographic map displayed on the computer screen (National Geographic Topographic Maps of California on CD's were used) that was loaded with all known harbor seal haulout sites. Locations of haulout sites were provided by Bob Read, California Department of Fish and Game. This computer allowed us to know where the aircraft was in relation to previously known haulout sites as we flew over the coast. Additionally, the second observer monitored the local tide level displayed by the Garmin GPSMAP 76 to ensure that the survey was conducted at optimal tide levels. The third observer looked for seals under the aircraft from the belly viewing port located behind the camera, and operated the camera when seals were sighted. The pilot also looked for seals and flew the aircraft over the coastline so that seals could be photographed without having to double back to optimize the time available for surveying under proper tidal conditions and to cover as much distance as possible during that day's survey.

Aerial surveys were conducted on 22-25 May in southern California and Channel Islands, on 16-17 June in the northern portion of southern California (from Point Mugu to Point Pismo Beach), central California and San Francisco Bay estuary, and, on 28 June-1 July in northern California (Table 1). Ground surveys were conducted at Purisima Point (34.738°N, 120.627°W) on 12 June, and at Yerba Buena Island (37.807°N, 122.363°W) on 18 June (Debbie Green, pers. commun. 20 June 2002; Table 1). The 22 May survey of the mainland coast from Point Mugu to Pismo Beach was not completed due to military operations at Mugu Lagoon and due to restrictions within Vandenberg Air Force Base (this survey was repeated on 16 June).

Commercial aircraft towing advertising banners made it too dangerous to survey the entire southern California coastline; however, known or suspected harbor seal hauling areas were surveyed in the following locations (Figure 1): (1) La Jolla (32.851°N, 117.271°W) to Point Loma (32.663°N, 117.240°W), (2) Seal Beach (33.733°N, 118.098°W) and vicinity, (3) Palos Verdes Peninsula from Point Fermin (33.708°N, 118.287°W) to Malaga Cove, Redondo Beach (33.802°N, 118.393°W) , and (4) Pacific Palisades (34.038°N, 118.555°W) to Point Mugu (34.085°N, 119.060°W). Within San Francisco Bay, the FAA restricted access to the central San Francisco Bay area, however, the following areas were surveyed (Figure 2): (1) Richardson Bay, (2) Tiburon Peninsula (Angel Island was not surveyed), (3) Richmond San Rafael Bridge and Point San Pablo, (4) San Rafael Bay, (5) northern shoreline of San Pablo Bay, (6) Suisun, Honker, and Grissly Bays, and (7) San Francisco Bay south of the San Mateo Bridge. Within San Francisco Bay estuary the following haulout sites were not surveyed: (1) Alameda Breakwater, (2) Brook's Island, (3) Point Ione, Angel Island, and (4) Point Blunt, Angel Island.

Surveys of the Channel Islands were conducted during afternoon hours at tides ranging between 1.8 feet and 0.9 feet from mean lower low water datum reference (MLLW) on 23 May, and at tides between 2.2 feet and 1.3 feet on 24 May (Table 2, Figure 3). Surveys of the mainland coast of southern California from San Diego to Point Mugu were conducted during afternoon hours at tides ranging from 1.3 feet to 1.2 feet on 25 May (Figure 3). Surveys of the mainland coast of southern California from Point Mugu to Pismo Beach were conducted during morning hours at -0.2 foot tide from MLLW on 16 June (Figure 3). All surveys in central and northern California were conducted in the morning at tide levels under one foot from MLLW (and under a half foot in Humboldt Bay; Tables 3 and 4, Figures 4-7).

Harbor seal images were counted through a 7-70X zoom binocular microscope as the photographs were illuminated on a light table. Images of animals were marked on a clear acetate overlay as each was counted. Marks on the acetate were compared and verified with overlapping photographs. If all animals could not be counted in one photograph, the overlay was placed on the adjacent photograph at the exact location where the count ended previously and the count continued. Seals were counted in this manner until all were counted. One count was made for each rock, island, or mainland haulout site. Seals in the water were tabulated separately. Haulout sites were defined as groups of seals or single seals found either on a rock, a group of rocks, or a cove. Counts obtained for each haulout site were entered onto a spreadsheet and tallied. A single latitude and longitude was assigned to each haulout site.

Counts were tabulated by 0.5 degrees latitude for coastal mainland sites (including the Farallon Islands and Año Nuevo Island), and for San Francisco Bay estuary, each of the Channel Islands, and northern, central and southern California sections of the state. Summary statistics were compiled for each group.

RESULTS

Using our criteria for identifying a haulout site, we identified 467 haulout sites within the state of California (Tables 5 and 6). In the Channel Islands there were 3,878 seals counted onshore and 5 in the water near haulout sites at 144 haulout sites (Table 5, Figures 8 and 9). Along the mainland coast of California and San Francisco Bay estuary there were 17,555 seals counted hauled out and 136 seals counted in the water near haulout sites at 323 haulout sites

(Table 6, Figures 8 and 9). Statewide, a total of 21,433 seals were counted hauled out of the water and 141 seals were counted in the water adjacent to a haulout site at 467 haulout sites (Table 7, Figures 8 and 9). On average there were 26.9 seals per haulout site in the Channel Islands , 54.3 seals per haulout site along the mainland coast of California, and 45.9 seals per haulout site statewide (Table 7, Figure 10).

The counts of harbor seals at the mainland coast of California were stratified into nineteen 0.5 degree latitude-segments with counts from the San Francisco Bay estuary making up the twentieth stratum (Table 8). Stratum 37.50° to 37.99° had the most seals (n = 3,005), most seals per haulout site (n = 835), second highest number of haulout sites (n = 34), and third highest mean number of seals per haulout site ($\bar{x}$ = 88.4). Stratum 40.50° to 40.99° had the largest median number of seals per haulout site (median = 70.0); stratum 34.00° to 34.49° had the highest mean number of seals per haulout site ($\bar{x}$ = 134.3); and stratum 38.50° to 38.99° had the highest number of haulout sites (n = 49).

The counts of harbor seals at the Channel Islands in southern California were stratified for each island (Table 8). Santa Cruz Island had the most seals (n =1,085) and Santa Barbara Island the fewest (n = 15). Santa Rosa Island and San Nicolas Island had the highest mean number of seals per haulout site ($\bar{x}$ = 35.0 and $\bar{x}$ = 34.3, respectively). Santa Cruz Island also had the most haulout sites (n = 38).

DISCUSSION

Based on counts obtained at all haulout sites in California during 2002, the population of harbor seals in the state of California appears to be stable (Figure 8; Hanan 1996, Fluharty 1999, Read and Roberts 2001[1]). Harbor seal counts at Channel Islands and along the mainland show no increase from counts obtained during the early-to-mid 1990's. The number of haulout sites found in 2002 were fewer than previous years and the average number of seals found per haulout site in 2002 was greater than previous years (Figures 9 and 10). Possible reasons for these discrepancies could be due to (1) differences in defining haulout sites between researchers, (2) differences in surface area covered by different camera systems (e.g., 70-mm-format photographs vs 126-mm-format photographs), or (3) accuracy in geographical positions of photographs (Loran vs GPS). Although survey date is another possibility because the number of harbor seals on land differs throughout the year, our surveys were conducted during comparable periods to those conducted by CDFG. Future surveys by SWFSC may indicate if the difference in harbor seal counts is real or due to methodological differences.

Many seals were foraging at sea; therefore, haulout counts are not a complete census of the population. Studies have been made to estimate total abundance from counts of seals found out of the water at haulout sites. These studies used radio transmitters on a subset of seals to estimate the proportion of animals on land. Unfortunately, the majority of these studies (reviewed in Boveng 1988) documented the proportion of seals out of the water during certain

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[1]Read, R and E. Roberts. [2001]. Final report: Census/survey of harbor seals in California. Report submitted to Pacific States Marine Fisheries Commission. Available from Robert Read, California Department of Fish and Game, Marine Region, San Diego Field Office, 4949 Viewridge Avenue, San Diego, CA 92123.

time periods of the day, instead of at an instantaneous time (as would occur when an aircraft flies over during aerial surveys), and some were made during months that seals were not molting. The only study that estimated proportion of seals on land during aerial surveys was Huber et al. (2001). Their estimated correction factor is probably not appropriate for our counts because that study was done in the pupping season and was north of our study area. For the California stock of harbor seals, a correction factor of 1.3, derived from data of radio tagged seals collected by D. Hanan (Barlow et al. 1997, Hanan 1996), is currently used for estimating total abundance of harbor seals in California from counts obtained at haulouts (Carretta et al. 2001). Multiplying 21,433, the number of seals counted onshore at haulouts in 2002, by the 1.3 correction factor, estimates the total harbor seal population in California to be 27,862.

Our 2002 survey of San Francisco Bay estuary and Point Reyes was conducted slightly before the peak of the molt (Sarah Allen, pers. comm. 26 June 2002) and thus had the potential for slightly lower counts. The counts we obtained were considered an adequate representation based on past surveys of the area by local biologists (Sarah Allen, pers. comm. 26 June 2002). The earlier survey was scheduled as a contingency against having to cancel the survey because of fog. Fortunately, the fog did not present a problem on the first low-tide survey window and a survey during the second low-tide cycle was not needed. As it turned out, the coast of central and northen California was covered in fog during the later low tide survey window. Ideally, when good results are obtained for the first survey a second survey should be conducted if weather conditions allow, but that would add additional cost which would have to be weighed against the benefit of getting a second count that may or may not be better.

The 126-mm-format camera was used successfully for censusing Pacific harbor seals in California. This camera system could also be applied for censusing harbor seals in other regions outside California. One advantage to using this camera system is that lengths of seals can be estimated from the vertical photographs obtained by the camera system, a project that will be undertaken at a later date. This project would be useful because it could be used to infer the proportion of age classes represented in the census.

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Table 1. Dates and areas surveyed for harbor seals (*Phoca vitulina*) within three sections of California during 22 May through 1 July 2002.

Section	Boundaries of section		Survey coverage	Date surveyed	Time surveyed
	Lat/Long	Lat/Long			
Southern California (Including Channel Islands)	U.S./Mexico border (32.533°N, 117.117°W)	Pismo Beach (35.139°N, 120.645°W)	Port Hueneme to Point Conception	22 May 2002	1320-1428
			Mugu Lagoon and Northern Channel Islands (Anacapa Is., Santa Cruz Is., Santa Rosa Is., and San Miguel Is.)	23 May 2002	1236-1240; 1247-1550
			Southern Channel Islands (SantaBarbara Is., San Nicolas Is., San Clemente Is., and Santa Catalina Is.)	24 May 2002	1301-1307; 1316-1345; 1404-1441; 1450-1527
			Southern California mainland coast (Point Loma to La Jolla, Seal Beach and vicinity, Palos Verdes Peninsula, Pacific Palisades to Point Mugu)	25 May 2002	1403-1535
			Purisima Point	12 June 2002	0820
			Point Mugu to Pismo Beach	16 June 2002	0848-1005
Central California and San Francisco Bay estuary	Pismo Beach (35.139°N, 120.645°W)	Point Reyes (37.995°N, 123.023°W)	Pismo Beach to Monterey	16 June 2002	1005-1238
			Monterey to Point Reyes, and San Francisco Bay estuary	17 June 2002	1000-1211; 1227-1353
			Yerba Buena Island, San Francisco Bay	18 June 2002	1430
Northern California	Point Reyes (37.995°N, 123.023°W)	California/ Oregon border (42.000°N, 124.212°W)	Point Reyes to Fort Ross Point	28 June 2002	1001-1102
			Fort Ross Point to Jughandle State Reserve (6 km south of Fort Bragg)	29 June 2002	0836-1007
			Jughandle State Reserve to California/Oregon border	30 June 2002	0858-1159
			S. E. Farallon Islands	1 July 2002	1009-1023

Table 2. Optimal dates and times for harbor seal (*Phoca vitulina*) census in the Southern California Bight (SCB). Ideal conditions would be during an afternoon low tide. Primary survey dates are highlighted in bold. Tidal heights are referenced from the mean lower low water datum (MLLW).

Date	Santa Rosa Island (mean tide = 2.4 feet)				Ventura (mean tide = 2.7 feet)				Pt. Arguello
	Survey time window	Low/*high* tide time & height	Survey start tide height (feet)	Survey end tide height (feet)	Survey time window	Low-*high* tide time & height (feet)	Survey start tide height (feet)	Survey end tide height (feet)	Low tide time & height (feet)
20 May	1300-1600		0.1	2.3	1300-1600		0.5	3.5	1201 / -0.1
21 May	1300-1600		-0.1	2.1	1300-1600		0.2	2.5	1250 / 0.1
22 May	1300-1545	1317 / 0.29	0.2	2.3	1300-1600	1306 / 0.27	0.3	2.0	1333 / 0.3
23 May	**1300-1600**	**1357 / 0.57**	**1.0**	**1.8**	**1300-1600**	**1346 / 0.55**	**0.6**	**2.2**	**1414 / 0.6**
24 May	**1300-1600**	**1436 / 0.92**	**1.8**	**1.3**	**1300-1600**	**1425 / 0.88**	**1.5**	**1.8**	**1453 / 0.8**
25 May	**1300-1600**	**1514 / 1.29**	**2.2**	**1.8**	**1300-1600**	**1503 / 1.24**	**2.5**	**1.4**	**1531 / 1.1**
26 May	**1345-1600**	**1552 / 1.67**	**2.3**	**1.7**	**1300-1600**	**1541 / 1.61**	**2.5**	**1.8**	**1609 / 1.5**
27 May	1300-1600	1631 / 2.05	3.4	2.1	1330-1600	1620 / 1.97	2.6	2.0	1647 / 1.9
28 May	1300-1600	1712 / 2.42	3.4	2.2	1530-1600	1701 / 2.33	2.6	2.4	1728 / 2.2
2 Jun	1300-1600		1.2	3.1	1300-1445		1.6	2.6	1102 / 0.4
3 Jun	1300-1600		1.0	2.9	1300-1515		1.1	2.6	1151 / 0.7
4 Jun	1300-1600		1.2	3.0	1300-1600		1.0	2.5	1233 / 0.8
5 Jun	1300-1600		1.2	2.7	1300-1545		1.2	2.6	1309 / 1.1
6 Jun	**1300-1600**	**1324 / 1.47**	**1.8**	**2.3**	**1300-1600**	**1313 / 1.41**	**1.4**	**2.5**	**1341 / 1.3**
7 Jun	**1300-1530**	**1354 / 1.69**	**1.9**	**2.3**	**1300-1600**	**1343 / 1.63**	**1.9**	**2.3**	**1411 / 1.5**
8 Jun	**1300-1600**	**1424 / 1.89**	**2.3**	**2.3**	**1300-1600**	**1413 / 1.82**	**2.1**	**2.5**	**1440 / 1.7**
9 Jun	**1300-1600**	**1454 / 2.07**	**2.8**	**2.2**	**1300-1600**	**1443 / 1.99**	**2.5**	**2.3**	**1511 / 1.9**
10 Jun	**1300-1600**	**1526 / 2.25**	**2.8**	**2.3**	**1330-1600**	**1515 / 2.16**	**2.6**	**2.2**	**1543 / 2.1**
11 Jun	1300-1600	1600 / 2.42	3.0	2.2	1330-1600	1549 / 2.32	2.2	2.5	1617 / 2.2

Table 3. Optimal dates and times for harbor seal (*Phoca vitulina*) census in central California from Port San Luis to Pt. Reyes, and San Francisco Bay. Ideal conditions would be when tides are under one foot (under 1.5 feet at Monterey Bay). Primary survey dates are highlighted in bold. Tidal heights are referenced from the mean lower low water datum (MLLW).

Date	Port San Luis (mean tide = 2.8 feet)				Monterey (mean tide = 2.8 feet)				Pt. Reyes (mean tide = 3.1 feet)			
	Survey time window	Low tide time & height (feet)	Survey start tide height (feet)	Survey end tide height (feet)	Survey time window	Low tide time & height (feet)	Survey start tide height (feet)	Survey end tide height (feet)	Survey time window	Low tide time & height (feet)	Survey start tide height (feet)	Survey end tide height (feet)
10 Jun					0800-0845	0521 / -0.69	0.7	1.5				
11 Jun	0800-0900	0530 / -0.98	-0.2	1.0	0800-0915	0600 / -0.93	-0.3	1.5	0800-0915	0617 / -1.10	-0.2	1.0
12 Jun	0800-0915	0612 / -1.09	-0.2	1.0	0800-1015	0641 / -1.07	-0.4	1.5	0800-0930	0658 / -1.25	-0.6	1.0
13 Jun	0800-1015	0656 / -1.10	-0.8	1.0	0800-1115	0725 / -1.09	-1.0	1.5	0800-1030	0742 / -1.28	-1.2	1.0
14 Jun	0800-1130	0743 / -1.01	-1.0	1.0	0800-1215	0812 / -1.00	-1.0	1.5	0800-1130	0828 / -1.18	-1.2	1.0
15 Jun	0800-1130	0832 / -0.82	-0.9	1.0	0800-1215	0900 / -0.80	-0.7	1.5	0800-1145	0916 / -0.96	-0.2	1.0
16 Jun	**0800-1215**	**0923 / -0.53**	**-0.2**	**1.0**	**0800-1315**	**0949 / -0.50**	**0.4**	**1.5**	**0800-1230**	**1006 / -0.61**	**0.3**	**1.0**
17 Jun	**0815-1300**	**1013 / -0.16**	**1.0**	**1.0**	**0800-1345**	**1039 / -0.11**	**1.5**	**1.5**	**0845-1330**	**1056 / -0.16**	**1.0**	**1.0**
18 Jun	**0900-1245**	**1103 / 0.29**	**1.0**	**1.0**	**0900-1345**	**1128 / 0.35**	**1.5**	**1.5**	**1045-1345**	**1146 / 0.36**	**1.0**	**1.0**
19 Jun	**1045-1300**	**1153 / 0.78**	**1.0**	**1.0**	**1030-1415**	**1217 / 0084**	**1.5**	**1.5**	**1200-1300**	**1237 / 0.91**	**1.0**	**1.0**
24 Jun					0800-0830	0517 / -1.31	1.2	1.5				
25 Jun	0800-0845	0534 / -1.40	0.3	1.0	0800-0930	0600 / -1.33	-0.2	1.5	0800-0845	0618 / -1.52	-0.2	1.0
26 Jun	0800-0930	0616 / -1.23	-0.5	1.0	0800-1030	0644 / -1.19	-1.0	1.5	0800-0945	0701 / -1.37	-1.0	1.0
27 Jun	0800-1015	0659 / -0.96	-0.9	1.0	0800-1115	0726 / -0.93	-0.5	1.5	0800-1045	0743 / -1.09	-1.2	1.0
28 Jun	0800-1030	0741 / -0.61	-0.5	1.0	0800-1130	0808 / -0.59	-0.4	1.5	**0800-1030**	**0825 / -0.72**	**-0.3**	**1.0**
29 Jun	0800-1100	0823 / -0.22	-0.2	1.0	0800-1200	0850 / -0.19	-0.2	1.5	**0800-1100**	**0907 / -0.29**	**-0.2**	**1.0**
30 Jun	**0800-1130**	**0904 / 0.20**	**0.7**	**1.0**	**0800-1245**	**0931 / 0.24**	**0.9**	**1.5**	**0800-1145**	**0947 / 0.18**	**1.0**	**1.0**
1 Jul	**0800-1100**	**0946 / 0.63**	**1.0**	**1.0**	**0800-1215**	**1012 / 0.68**	**1.3**	**1.5**	**0930-1200**	**1028 / 0.67**	**1.0**	**1.0**
2 Jul					**0900-1245**	**1052 / 1.12**	**1.5**	**1.5**				

Table 3. (Continued)

Date	San Francisco, Pier 22-1/2 (mean tide = 3.3 feet)			
	Survey time window	Low tide time & height (feet)	Survey start tide height (feet)	Survey end tide height (feet)
9 Jun	0800-0900	0544 / -0.55	0.6	1.0
10 Jun	0800-0930	0618 / -0.86	-0.3	1.0
11 Jun	0800-0945	0654 / -1.10	-0.8	1.0
12 Jun	0800-1030	0732 / -1.25	-1.2	1.0
13 Jun	0800-1130	0815 / -1.28	-1.1	1.0
14 Jun	0800-1230	0900 / -1.20	-0.5	1.0
15 Jun	0800-1230	0949 / -0.98	0	1.0
16 Jun	**0830-1330**	**1041 / -0.64**	**1.0**	**1.0**
17 Jun	**1000-1430**	**1136 / -0.19**	**1.0**	**1.0**
18 Jun	**1030-1400**	**1233 / 0.32**	**1.0**	**1.0**
19 Jun	**1300-1430**	**1329 / 0.86**	**1.0**	**1.0**
24 Jun				
25 Jun	0800-1000	0701 / -1.43	-1.0	1.0
26 Jun	0800-1100	0743 / -1.28	-1.1	1.0
27 Jun	0800-1045	0824 / -1.04	-0.7	1.0
28 Jun	**0800-1130**	**0904 / -0.71**	**-0.4**	**1.0**
29 Jun	**0800-1230**	**0945 / -0.33**	**0.5**	**1.0**
30 Jun	**0900-1300**	**1026 / 0.11**	**1.0**	**1.0**
1 Jul	**0930-1230**	**1110 / 0.58**	**1.0**	**1.0**

Table 4. Optimal dates and times for harbor seal (*Phoca vitulina*) census in northern California from Pt. Reyes to Crescent City, and Humboldt Bay. Ideal conditions would be when tides are under one foot (under 0.5 feet at Humboldt Bay). Primary survey dates are highlighted in bold. Tidal heights are referenced from the mean lower low water datum (MLLW).

Date	Pt. Reyes (mean tide = 3.1 feet)				Shelter Cove (mean tide = 3.2 feet)			
	Survey time window	Low tide time & height (feet)	Survey start tide height (feet)	Survey end tide height (feet)	Survey time window	Low tide time & height (feet)	Survey start tide height (feet)	Survey end tide height (feet)
24 Jun					0800-0845	0539 / -1.3	0.5	1.0
25 Jun	0800-0845	0618 / -1.52	-0.2	1.0	0800-0930	0622 / -1.3	-0.5	1.0
26 Jun	0800-0945	0701 / -1.37	-1.0	1.0	0800-1030	0705 / -1.2	-1.2	1.0
27 Jun	0800-1045	0743 / -1.09	-1.2	1.0	0800-1015	0746 / -0.9	-0.8	1.0
28 Jun	**0800-1030**	**0825 / -0.72**	**-0.3**	**1.0**	0800-1100	0828 / -0.6	-0.6	1.0
29 Jun	**0800-1100**	**0907 / -0.29**	**-0.2**	**1.0**	**0800-1130**	**0911 / -0.2**	**0.2**	**1.0**
30 Jun	**0800-1145**	**0947 / 0.18**	**1.0**	**1.0**	**0800-1130**	**0954 / 0.2**	**0.6**	**1.0**
1 Jul	**0930-1200**	**1028 / 0.67**	**1.0**	**1.0**	**0930-1130**	**1038 / 0.7**	**1.0**	**1.0**
10 Jul	0800-0900	0558 / -1.23	-0.2	1.0	0800-0845	0603 / -1.1	0.3	1.0
11 Jul	0800-0900	0640 / -1.35	-0.3	1.0	0800-0945	0644 / -1.2	-0.8	1.0
12 Jul	0800-1000	0722 / -1.30	-1.2	1.0	0800-1030	0727 / -1.2	-1.1	1.0
13 Jul	0800-1045	0804 / -1.07	-1.0	1.0	0800-1030	0810 / -0.9	-0.9	1.0
14 Jul	**0800-1100**	**0848 / -0.66**	**-0.2**	**1.0**	**0800-1115**	**0856 / -0.6**	**-0.4**	**1.0**
15 Jul	**0800-1130**	**0932 / -0.10**	**0.3**	**1.0**	**0800-1130**	**0943 / 0**	**1.0**	**1.0**
16 Jul	**0930-1145**	**1018 / 0.55**	**1.0**	**1.0**	**0900-1100**	**1033 / 0.6**	**1.0**	**1.0**

Table 4. (Continued)

Date	Humboldt Bay (*mean tide = 3.3 feet*)				Crescent City (*mean tide = 3.7 feet*)			
	Survey time window	Low tide time & height (feet)	Survey start tide height (feet)	Survey end tide height (feet)	Survey time window	Low tide time & height (feet)	Survey start tide height (feet)	Survey end tide height (feet)
24 Jun	0800-0900	0637 / -1.42	-1.0	0.5	0800-0900	0614 / -1.71	-0.8	1.0
25 Jun	0800-0915	0723 / -1.45	-1.3	0.5	0800-0930	0658 / -1.74	-0.8	1.0
26 Jun	0800-1000	0807 / -1.30	-1.2	0.5	0800-1030	0740 / -1.57	-1.2	1.0
27 Jun	0800-1100	0850 / -1.01	-0.3	0.5	0800-1115	0822 / -1.26	-1.2	1.0
28 Jun	**0830-1030**	**0932 / -0.61**	**0.5**	**0.5**	**0800-1100**	**0904 / -0.84**	**-0.2**	**1.0**
29 Jun	**0900-1130**	**1014 / -0.14**	**0.5**	**0.5**	**0800-1130**	**0945 / -0.35**	**0.2**	**1.0**
30 Jun	**1030-1130**	**1057 / 0.38**	**0.5**	**0.5**	**0900-1200**	**1025 / 0.19**	**1.0**	**1.0**
10 Jul	*0800-0930*	*0707 / -1.31*	*-1.1*	*0.5*	*0800-0930*	0640 / -1.43	-1.0	1.0
11 Jul	0800-0930	0751 / -1.47	-1.3	0.5	0800-0930	0721 / -1.60	-1.0	1.0
12 Jul	0800-1030	0835 / -1.42	-1.3	0.5	0800-1030	0803 / -1.57	-1.6	1.0
13 Jul	**0800-1130**	**0919 / -1.17**	**-0.1**	**0.5**	**0800-1130**	**0845 / -1.34**	**-1.0**	**1.0**
14 Jul	**0900-1145**	**1005 / -0.71**	**0.5**	**0.5**	**0800-1145**	**0929 / -0.90**	**0.5**	**1.0**
15 Jul	**0930-1130**	**1051 / -0.08**	**0.5**	**0.5**	**0815-1200**	**1014 / -0.27**	**1.0**	**1.0**
16 Jul					**1030-1230**	**1101 / 0.48**	**1.0**	**1.0**

Table 5. Counts of harbor seals (*Phoca vitulina*) obtained from 126-mm-format aerial color photographs taken at 144 haulout sites on the Channel Islands on 23-24 May 2002.

Island	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Anacapa Island	NE West (Anacapa) Island	34.011	119.415	23-May-02	2	
Anacapa Island	S West (Anacapa) Island	34.010	119.436	23-May-02	2	
Anacapa Island	S West (Anacapa) Island	34.011	119.434	23-May-02	41	
Anacapa Island	S West (Anacapa) Island	34.010	119.433	23-May-02	5	
Anacapa Island	S West (Anacapa) Island	34.010	119.433	23-May-02	10	
Anacapa Island	S West (Anacapa) Island	34.009	119.431	23-May-02	7	
Anacapa Island	S West (Anacapa) Island	34.008	119.430	23-May-02	31	
Anacapa Island	S West (Anacapa) Island	34.008	119.428	23-May-02	24	
Anacapa Island	S West (Anacapa) Island	34.008	119.427	23-May-02	22	
Anacapa Island	S West (Anacapa) Island	34.008	119.426	23-May-02	36	
Anacapa Island	S West (Anacapa) Island	34.008	119.425	23-May-02	1	
Anacapa Island	E of Cat Rock Point, West (Anacapa) Island	34.005	119.420	23-May-02	8	
Anacapa Island	E of Cat Rock Point, West (Anacapa) Island	34.006	119.419	23-May-02	6	
Anacapa Island	SE Middle (Anacapa) Island	34.005	119.401	23-May-02	14	
Anacapa Island	SE Middle (Anacapa) Island	34.004	119.401	23-May-02	11	
Anacapa Island	SE Middle (Anacapa) Island	34.003	119.397	23-May-02	11	
San Clemente Island	Northwest Harbor Islet	33.038	118.590	24-May-02	29	
San Clemente Island	Northwest Harbor Islet	33.038	118.592	24-May-02	21	
San Clemente Island	3.8 km N of Eel Point	32.952	118.557	24-May-02	12	
San Clemente Island	3.2 km N of Eel Point	32.947	118.554	24-May-02	1	
San Clemente Island	1.7 km SSE of Mail Point	32.874	118.508	24-May-02	35	
San Clemente Island	Pyramid Head	32.817	118.356	24-May-02	16	
San Clemente Island	11.2 km SSE Wilson Cove	32.925	118.487	24-May-02	1	

Table 5. (Continued)

Island	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
San Miguel Island	Cardwell Point	34.026	120.308	23-May-02	3	
San Miguel Island	Cardwell Point	34.027	120.308	23-May-02	30	
San Miguel Island	Challenge Point	34.037	120.314	23-May-02	25	
San Miguel Island	Hoffman Point	34.045	120.327	23-May-02	124	
San Miguel Island	Harbor Seal Cove	34.067	120.360	23-May-02	10	
San Miguel Island	Harbor Seal Cove	34.068	120.361	23-May-02	51	
San Miguel Island	Harbor Seal Cove	34.068	120.362	23-May-02	23	
San Miguel Island	Harbor Seal Cove	34.069	120.362	23-May-02	35	
San Miguel Island	West end of Simonton Cove	34.052	120.405	23-May-02	18	
San Miguel Island	West end of Simonton Cove	34.052	120.407	23-May-02	24	
San Miguel Island	Otter Harbor	34.053	120.411	23-May-02	1	
San Miguel Island	Otter Harbor	34.054	120.412	23-May-02	3	
San Miguel Island	Oil Point	34.055	120.414	23-May-02	2	
San Miguel Island	Oil Point	34.055	120.415	23-May-02	4	
San Miguel Island	Oil Point	34.055	120.416	23-May-02	38	
San Miguel Island	Oil Point	34.055	120.417	23-May-02	48	
San Miguel Island	3.2 km WNW of Crook Point	34.026	120.390	23-May-02	4	
San Miguel Island	3.1 km WNW of Crook Point	34.025	120.389	23-May-02	31	
San Miguel Island	1.9 km WNW of Crook Point	34.020	120.377	23-May-02	3	
San Miguel Island	1.5 km WNW of Crook Point	34.019	120.374	23-May-02	34	
San Miguel Island	Crook Point	34.015	120.358	23-May-02	32	
San Miguel Island	Crook Point	34.014	120.359	23-May-02	2	
San Miguel Island	Crook Point	34.016	120.358	23-May-02	57	
San Miguel Island	Crook Point	34.017	120.356	23-May-02	8	
San Miguel Island	Crook Point	34.017	120.356	23-May-02	1	

Table 5. (Continued)

Island	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
San Miguel Island	SE Beach, 1.1 km ENE of Crook Point	34.020	120.349	23-May-02	27	
San Miguel Island	SE Beach, 2.0 km WSW of Cardwell Point	34.019	120.323	23-May-02	57	
San Miguel Island	SE Beach, 2.0 km WSW of Cardwell Point	34.019	120.321	23-May-02	31	
San Miguel Island	SE Beach, 1.9 km WSW of Cardwell Point	34.019	120.317	23-May-02	5	
San Nicolas Island	Pirates Cove	33.279	119.518	24-May-02	154	1
San Nicolas Island	0.7 km WNW Pirates Cove	33.283	119.524	24-May-02	26	
San Nicolas Island	Vizcaino Point, Rocks NW of Red Eye Beach	33.273	119.565	24-May-02	45	
San Nicolas Island	Vizcaino Point, Rocks NW of Red Eye Beach	33.273	119.566	24-May-02	63	
San Nicolas Island	Vizcaino Point	33.273	119.576	24-May-02	18	
San Nicolas Island	Hercules Beach	33.245	119.559	24-May-02	3	
San Nicolas Island	Beach SSE of Hercules Beach	33.243	119.557	24-May-02	25	
San Nicolas Island	Flat Rock	33.216	119.477	24-May-02	48	
San Nicolas Island	Flat Rock	33.216	119.476	24-May-02	38	
San Nicolas Island	Flat Rock	33.215	119.471	24-May-02	65	
San Nicolas Island	Flat Rock	33.215	119.470	24-May-02	3	
San Nicolas Island	Flat Rock	33.215	119.468	24-May-02	16	
San Nicolas Island	Flat Rock	33.216	119.464	24-May-02	1	
San Nicolas Island	Flat Rock	33.216	119.459	24-May-02	7	
San Nicolas Island	Flat Rock	33.216	119.458	24-May-02	26	
San Nicolas Island	Rocks east of Daytona Beach	33.220	119.442	24-May-02	45	
San Nicolas Island	East Sand Spit	33.225	119.437	24-May-02	1	

Table 5. (Continued)

Island	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Santa Barbara Island	Webster Point	33.480	119.049	24-May-02	8	
Santa Barbara Island	Webster Point	33.481	119.047	24-May-02	7	
Santa Catalina Island	Palisades	33.304	118.340	24-May-02	49	1
Santa Catalina Island	Palisades	33.303	118.338	24-May-02	1	
Santa Catalina Island	0.8 km SSE West End	33.473	118.603	24-May-02	3	
Santa Catalina Island	0.6 km E of Whale Rock	33.434	118.554	24-May-02	19	
Santa Catalina Island	Kelp Point	33.435	118.545	24-May-02	4	
Santa Catalina Island	Cape Cortes/Lobster Bay	33.431	118.531	24-May-02	4	
Santa Catalina Island	1.1 km NNE of China Point	33.338	118.474	24-May-02	20	
Santa Catalina Island	0.9 km NNE of China Point	33.336	118.473	24-May-02	103	
Santa Catalina Island	0.2 km N of China Point	33.331	118.468	24-May-02	33	
Santa Cruz Island	1.3 km SE of San Pedro Point	34.026	119.530	23-May-02	8	
Santa Cruz Island	Between Chinese Harbor and Prisoners Harbor	34.016	119.641	23-May-02	25	
Santa Cruz Island	Between Chinese Harbor and Prisoners Harbor	34.016	119.644	23-May-02	43	
Santa Cruz Island	Between Chinese Harbor and Prisoners Harbor	34.019	119.656	23-May-02	85	
Santa Cruz Island	Between Chinese Harbor and Prisoners Harbor	34.019	119.657	23-May-02	25	1
Santa Cruz Island	Twin Harbors	34.043	119.716	23-May-02	3	
Santa Cruz Island	Between Twin Harbors and Platts Harbor	34.046	119.724	23-May-02	5	
Santa Cruz Island	Platts Harbor	34.050	119.741	23-May-02	1	
Santa Cruz Island	Diablo Anchorage, Diablo Point	34.058	119.764	23-May-02	1	
Santa Cruz Island	Diablo Anchorage, Diablo Point	34.056	119.765	23-May-02	2	
Santa Cruz Island	Ladys Harbor	34.055	119.786	23-May-02	15	

Table 5. (Continued)

Island	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Santa Cruz Island	Vicinity of Arch Rock	34.054	119.799	23-May-02	33	
Santa Cruz Island	Vicinity of Arch Rock	34.057	119.795	23-May-02	39	
Santa Cruz Island	Vicinity of Arch Rock	34.056	119.797	23-May-02	37	
Santa Cruz Island	3.5 km ESE of Profile Point	34.058	119.825	23-May-02	6	
Santa Cruz Island	3.1 km ESE of Profile Point	34.059	119.829	23-May-02	5	
Santa Cruz Island	1.7 km W of Profile Point	34.073	119.880	23-May-02	2	
Santa Cruz Island	1.8 km W of Profile Point	34.073	119.881	23-May-02	7	
Santa Cruz Island	1.2 km NNE of Black Point	34.046	119.893	23-May-02	2	
Santa Cruz Island	Klinton Point	34.008	119.887	23-May-02	16	
Santa Cruz Island	Klinton Point	34.006	119.886	23-May-02	70	
Santa Cruz Island	Vicinity of Klinton Point	34.004	119.885	23-May-02	25	
Santa Cruz Island	Vicinity of Klinton Point	34.003	119.885	23-May-02	26	
Santa Cruz Island	Vicinity of Klinton Point	34.003	119.884	23-May-02	11	
Santa Cruz Island	Vicinity of Klinton Point	34.000	119.883	23-May-02	36	
Santa Cruz Island	Vicinity of Klinton Point	33.999	119.883	23-May-02	15	
Santa Cruz Island	Vicinity of Klinton Point	33.998	119.882	23-May-02	3	
Santa Cruz Island	Vicinity of Klinton Point	33.997	119.882	23-May-02	52	
Santa Cruz Island	Vicinity of Klinton Point	33.996	119.881	23-May-02	128	
Santa Cruz Island	Vicinity of Klinton Point	33.995	119.881	23-May-02	49	
Santa Cruz Island	Klinton Point	34.007	119.886	23-May-02	12	
Santa Cruz Island	Klinton Point	34.007	119.886	23-May-02	71	
Santa Cruz Island	Vicinity of Klinton Point	34.005	119.885	23-May-02	30	
Santa Cruz Island	Vicinity of Klinton Point	33.991	119.879	23-May-02	5	
Santa Cruz Island	Vicinity of Klinton Point	33.989	119.879	23-May-02	13	1
Santa Cruz Island	Laguna Harbor	33.963	119.797	23-May-02	1	
Santa Cruz Island	2.3 km W of Sandstone Point	33.989	119.593	23-May-02	94	

Table 5. (Continued)

Island	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Santa Cruz Island	3.1 km WSW of Sandstone Point	33.993	119.585	23-May-02	54	
Santa Rosa Island	Vicinity of Southeast Anchorage, Beechers Bay	33.983	120.014	23-May-02	7	
Santa Rosa Island	Vicinity of Southeast Anchorage, Beechers Bay	33.985	120.021	23-May-02	21	
Santa Rosa Island	Vicinity of Northwest Anchorage and Corral Point, Beechers Bay	34.020	120.048	23-May-02	15	
Santa Rosa Island	Vicinity of Carrington Point	34.035	120.050	23-May-02	10	1
Santa Rosa Island	3.7 km E of Brockway Point	34.020	120.107	23-May-02	7	
Santa Rosa Island	3.1 km E of Brockway Point	34.020	120.114	23-May-02	36	
Santa Rosa Island	2.9 km E of Brockway Point	34.021	120.117	23-May-02	100	
Santa Rosa Island	2.1 km E of Brockway Point	34.023	120.125	23-May-02	40	
Santa Rosa Island	1.6 km E of Brockway Point	34.024	120.130	23-May-02	2	
Santa Rosa Island	3.7 km ENE of Sandy Point	34.007	120.211	23-May-02	19	
Santa Rosa Island	1.2 km ESE of Sandy Point	33.996	120.239	23-May-02	134	
Santa Rosa Island	1.3 km ESE of Sandy Point	33.996	120.239	23-May-02	77	
Santa Rosa Island	1.4 km ESE of Sandy Point	33.995	120.238	23-May-02	65	
Santa Rosa Island	3.4 km ESE of Sandy Point	33.983	120.221	23-May-02	1	
Santa Rosa Island	3.5 km ESE of Sandy Point	33.982	120.221	23-May-02	44	
Santa Rosa Island	3.2 km NNW of Cluster Point	33.951	120.194	23-May-02	19	
Santa Rosa Island	3.1 km ESE of Cluster Point	33.911	120.151	23-May-02	22	
Santa Rosa Island	3.4 km ESE of Cluster Point	33.910	120.149	23-May-02	6	
Santa Rosa Island	3.4 km ESE of Cluster Point	33.910	120.148	23-May-02	32	
Santa Rosa Island	4.5 km ESE of Cluster Point	33.905	120.139	23-May-02	9	
Santa Rosa Island	1.3 km NE of Ford Point	33.924	120.039	23-May-02	12	
Santa Rosa Island	1.6 km NE of Ford Point	33.925	120.035	23-May-02	63	

Table 5. (Continued)

Island	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Santa Rosa Island	2.3 km NE of Ford Point	33.928	120.029	23-May-02	76	
Santa Rosa Island	2.7 km NE of Ford Point	33.931	120.025	23-May-02	58	
Santa Rosa Island	3.0 km NE of Ford Point	33.931	120.023	23-May-02	5	
Santa Rosa Island	1 km N of East Point	33.951	119.970	23-May-02	31	

Table 6. Counts of harbor seals (*Phoca vitulina*) obtained from 126-mm-format aerial color photographs taken at 323 haulout sites along the mainland coast of California and San Francisco Bay estuary on 16-17, 28-30 June and 1 July 2002. Counts for Purisima Point and Yerba Buena Island were obtained by biologists onshore on 12 June and 18 June, respectively.

Mainland section	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Northern CA	Smith River	41.934	124.200	30-Jun-02	52	
Northern CA	Vicinity of Castle Rock, Crescent City	41.765	124.245	30-Jun-02	143	1
Northern CA	Vicinity of Castle Rock, Crescent City	41.765	124.243	30-Jun-02	74	1
Northern CA	Vicinity of Castle Rock, Crescent City	41.763	124.244	30-Jun-02	260	2
Northern CA	Vicinity of Castle Rock, Crescent City	41.762	124.245	30-Jun-02	61	1
Northern CA	Pelican Rock, Crescent City	41.744	124.186	30-Jun-02	2	1
Northern CA	Floating marina, Crescent City	41.744	124.185	30-Jun-02	45	1
Northern CA	3.8 km N of Midway Point	41.691	124.144	30-Jun-02	54	
Northern CA	1.8 km NNE of Midway Point	41.673	124.142	30-Jun-02	120	8
Northern CA	2.0 km SSE of Midway Point	41.642	124.124	30-Jun-02	53	3
Northern CA	2.7 km NW of Klamath River	41.566	124.100	30-Jun-02	11	
Northern CA	Flint Rock Head	41.524	124.086	30-Jun-02	4	
Northern CA	1.1 km NNE of Split Rock	41.503	124.079	30-Jun-02	4	
Northern CA	1.4 km S of Split Rock	41.482	124.071	30-Jun-02	1	
Northern CA	0.6 km N of Mussel Point	41.328	124.086	30-Jun-02	4	
Northern CA	1.2 km SSW of Mussel Point	41.313	124.092	30-Jun-02	13	
Northern CA	0.5 km N of Redwood Creek	41.297	124.093	30-Jun-02	11	
Northern CA	0.3 km S of Rocky Point	41.136	124.163	30-Jun-02	22	
Northern CA	Palmers Point	41.129	124.165	30-Jun-02	138	
Northern CA	0.6 km SSE of Palmers Point	41.125	124.162	30-Jun-02	10	
Northern CA	0.7 km SSE of Palmers Point	41.124	124.162	30-Jun-02	63	
Northern CA	0.2 km S of Scotty Point	41.099	124.164	30-Jun-02	2	

Table 6. (Continued)

Mainland section	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Northern CA	1.1 km SSE of Scotty Point	41.091	124.158	30-Jun-02	4	
Northern CA	1.7 km SSE of Scotty Point	41.087	124.156	30-Jun-02	38	
Northern CA	0.4 km N of Elk Head	41.071	124.159	30-Jun-02	68	
Northern CA	0.8 km NE of Trinidad Head,	41.059	124.158	30-Jun-02	20	
Northern CA	0.8 km E of Trinidad Head, Trinidad Bay	41.056	124.142	30-Jun-02	18	
Northern CA	0.6 km E of Trinidad Head, Trinidad Bay	41.055	124.144	30-Jun-02	34	
Northern CA	1.2 km E of Trinidad Head, Trinidad Bay	41.054	124.136	30-Jun-02	20	
Northern CA	1.8 km ESE of Trinidad Head, Trinidad Bay	41.051	124.130	30-Jun-02	48	1
Northern CA	Arcata Bay, Humboldt Bay	40.839	124.160	30-Jun-02	136	
Northern CA	Arcata Bay, Humboldt Bay	40.838	124.112	30-Jun-02	126	
Northern CA	Arcata Bay, Humboldt Bay	40.813	124.146	30-Jun-02	31	
Northern CA	South Bay, Humboldt Bay	40.703	124.225	30-Jun-02	116	
Northern CA	South Bay, Humboldt Bay	40.703	124.236	30-Jun-02	142	
Northern CA	South Bay, Humboldt Bay	40.702	124.255	30-Jun-02	40	
Northern CA	South Bay, Humboldt Bay	40.701	124.227	30-Jun-02	238	
Northern CA	South Bay, Humboldt Bay	40.700	124.236	30-Jun-02	21	
Northern CA	South Bay, Humboldt Bay	40.700	124.234	30-Jun-02	21	
Northern CA	South Bay, Humboldt Bay	40.700	124.238	30-Jun-02	29	
Northern CA	South Bay, Humboldt Bay	40.699	124.236	30-Jun-02	242	
Northern CA	South Bay, Humboldt Bay	40.699	124.235	30-Jun-02	98	
Northern CA	South Bay, Humboldt Bay	40.698	124.239	30-Jun-02	225	
Northern CA	Mouth of Eel River	40.644	124.309	30-Jun-02	17	7
Northern CA	0.6 km S of False Cape	40.505	124.388	30-Jun-02	29	

Table 6. (Continued)

Mainland section	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Northern CA	0.8 km S of False Cape	40.503	124.388	30-Jun-02	42	
Northern CA	0.9 km N of Cape Mendocino	40.447	124.407	30-Jun-02	20	
Northern CA	Hair Seal Rock	40.326	124.354	30-Jun-02	141	1
Northern CA	0.6 km S of Hair Seal Rock	40.321	124.352	30-Jun-02	1	
Northern CA	1.1 km N of Punta Gorda	40.271	124.365	30-Jun-02	62	3
Northern CA	Vicinity of Punta Gorda Lighthouse	40.249	124.353	30-Jun-02	107	2
Northern CA	11.6 km NNE of Point Delgada, Shelter Cove	40.113	124.134	30-Jun-02	34	
Northern CA	Point Delgada, Shelter Cove	40.020	124.068	30-Jun-02	38	
Northern CA	Vicinity of Double Rock	39.942	123.968	30-Jun-02	13	2
Northern CA	High Tip	39.922	123.955	30-Jun-02	10	
Northern CA	0.8 km NNW of Mistake Point, Anderson Cliff	39.866	123.909	30-Jun-02	314	
Northern CA	0.8 km SE of Mistake Point	39.855	123.897	30-Jun-02	9	5
Northern CA	0.3 km N of Soldier Frank Point	39.760	123.839	30-Jun-02	23	
Northern CA	Rockport Bay	39.737	123.833	30-Jun-02	66	1
Northern CA	2.7 km N of Abalone Point	39.691	123.797	30-Jun-02	65	
Northern CA	Abalone Point	39.666	123.794	30-Jun-02	6	
Northern CA	0.4 km N of Bell Point	39.630	123.786	30-Jun-02	39	
Northern CA	0.4 km SSE of Bruhel Point	39.605	123.789	30-Jun-02	132	
Northern CA	Vicinity of Newport	39.582	123.778	30-Jun-02	36	3
Northern CA	Vicinity of Newport	39.580	123.778	30-Jun-02	17	
Northern CA	1.1 km NE of Laguna Point	39.495	123.795	30-Jun-02	136	
Northern CA	Laguna Point	39.490	123.804	30-Jun-02	49	

Table 6. (Continued)

Mainland section	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Northern CA	Laguna Point	39.490	123.806	30-Jun-02	23	
Northern CA	Laguna Point	39.489	123.805	30-Jun-02	13	2
Northern CA	1.0 km NNE of Soldier Point, Fort Bragg	39.448	123.817	30-Jun-02	1	
Northern CA	0.9 km NNE of Soldier Point, Fort Bragg	39.447	123.817	30-Jun-02	46	
Northern CA	0.3 km SSW of Soldier Point, Fort Bragg	39.437	123.821	30-Jun-02	47	
Northern CA	0.7 km SSE of Soldier Point, Fort Bragg	39.433	123.818	30-Jun-02	24	
Northern CA	1.7 km NNE of Caspar Point	39.383	123.821	30-Jun-02	35	
Northern CA	0.8 km S of Caspar Point, vicinity of Caspar Anchorage	39.361	123.826	29-Jun-02	5	
Northern CA	0.3 km SSE of Point Cabrillo	39.346	123.826	29-Jun-02	48	
Northern CA	Goat Island	39.307	123.813	29-Jun-02	65	1
Northern CA	Goat Island	39.306	123.813	29-Jun-02	13	
Northern CA	2.0 km SSE of Goat Island, vicinity of Mendocino Bay	39.289	123.804	29-Jun-02	155	2
Northern CA	Buckhorn Cove	39.258	123.785	29-Jun-02	3	
Northern CA	Stillwell Point	39.255	123.786	29-Jun-02	31	
Northern CA	0.8 km SSE of Stillwell Point	39.247	123.783	29-Jun-02	14	1
Northern CA	1.3 km N of Albion Head	39.243	123.781	29-Jun-02	14	
Northern CA	0.8 km S of Salmon Point	39.207	123.774	29-Jun-02	34	
Northern CA	Navarro Point	39.194	123.771	29-Jun-02	24	
Northern CA	0.3 km SSE of Saddle Point	39.174	123.752	29-Jun-02	4	
Northern CA	Devils Basin	39.170	123.748	29-Jun-02	58	
Northern CA	2.2 km N of Cuffeys Point	39.161	123.739	29-Jun-02	28	1
Northern CA	2.2 km N of Cuffeys Point	39.161	123.738	29-Jun-02	21	

Table 6. (Continued)

Mainland section	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Northern CA	Cuffeys Point	39.143	123.740	29-Jun-02	56	
Northern CA	4.0 km SSE of Cuffeys Point	39.109	123.715	29-Jun-02	10	1
Northern CA	5.3 km SSE of Cuffeys Point	39.098	123.711	29-Jun-02	51	
Northern CA	11.3 km NNE of Point Arena	39.050	123.692	29-Jun-02	11	2
Northern CA	10.4 km NNE of Point Arena	39.042	123.694	29-Jun-02	3	
Northern CA	10.4 km NNE of Point Arena	39.042	123.695	29-Jun-02	24	
Northern CA	9.9 km NNE of Point Arena, Mouth of Mallo Pass Creek	39.035	123.692	29-Jun-02	95	6
Northern CA	Point Arena	38.957	123.743	29-Jun-02	77	3
Northern CA	1.5 km SSE of Point Arena	38.943	123.733	29-Jun-02	107	1
Northern CA	1.8 km SSE of Point Arena	38.941	123.732	29-Jun-02	20	1
Northern CA	1.4 km SE of Iverson Point, Morrison Gulch	38.839	123.634	29-Jun-02	95	
Northern CA	0.6 km ESE of Steens Landing	38.826	123.612	29-Jun-02	7	
Northern CA	1.7 km N of Havens Neck	38.823	123.607	29-Jun-02	23	1
Northern CA	1.4 km N of Havens Neck	38.821	123.605	29-Jun-02	33	
Northern CA	1.4 km NNE of Havens Neck	38.820	123.607	29-Jun-02	28	
Northern CA	Havens Neck	38.807	123.602	29-Jun-02	9	
Northern CA	Havens Anchorage	38.802	123.590	29-Jun-02	7	
Northern CA	Fish Rocks	38.800	123.591	29-Jun-02	5	
Northern CA	1.8 km NW of Robinson Point	38.783	123.556	29-Jun-02	5	
Northern CA	1.6 km NW of Robinson Point	38.782	123.552	29-Jun-02	5	
Northern CA	Bourns Rock	38.779	123.557	29-Jun-02	41	
Northern CA	Robinson Point	38.771	123.540	29-Jun-02	7	

Table 6. (Continued)

Mainland section	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Northern CA	1.6 km SE of Gualala Point	38.742	123.515	29-Jun-02	29	
Northern CA	4.7 km SE of Gualala Point	38.727	123.485	29-Jun-02	257	2
Northern CA	4.7 km SE of Gualala Point	38.727	123.484	29-Jun-02	5	
Northern CA	4.7 km SE of Gualala Point	38.727	123.482	29-Jun-02	3	
Northern CA	5.3 km SE of Gualala Point	38.723	123.479	29-Jun-02	37	
Northern CA	5.9 km NNE of Black Point	38.721	123.472	29-Jun-02	21	
Northern CA	4.8 km NNE of Black Point	38.715	123.462	29-Jun-02	62	
Northern CA	3.4 km NNE of Black Point	38.705	123.451	29-Jun-02	59	2
Northern CA	2.5 km NNE of Black Point	38.699	123.443	29-Jun-02	2	
Northern CA	0.5 km NNE of Black Point	38.682	123.435	29-Jun-02	9	
Northern CA	0.5 km ESE of Black Point	38.677	123.427	29-Jun-02	39	1
Northern CA	1.1 km ESE of Black Point	38.674	123.421	29-Jun-02	17	
Northern CA	Stewarts Point	38.654	123.409	29-Jun-02	134	
Northern CA	0.7 km SE of Stewarts Point	38.651	123.403	29-Jun-02	51	
Northern CA	Sandy Point	38.644	123.400	29-Jun-02	46	
Northern CA	Sandy Point	38.644	123.400	29-Jun-02	1	
Northern CA	0.5 km N of Rocky Point	38.635	123.390	29-Jun-02	10	
Northern CA	0.3 km ESE of Rocky Point	38.628	123.389	29-Jun-02	74	1
Northern CA	0.4 km SE of Rocky Point	38.628	123.387	29-Jun-02	13	
Northern CA	Horseshoe Cove	38.613	123.368	29-Jun-02	4	
Northern CA	3.2 km SE of Horseshoe Point	38.589	123.344	29-Jun-02	6	
Northern CA	3.3 km SE of Horseshoe Point	38.587	123.344	29-Jun-02	42	
Northern CA	Salt Point	38.565	123.333	29-Jun-02	39	1
Northern CA	1.1 km SE of Salt Point	38.560	123.323	29-Jun-02	78	1

Table 6. (Continued)

Mainland section	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Northern CA	1.5 km SE of Salt Point	38.559	123.318	29-Jun-02	4	
Northern CA	1.7 km NW of Windermere Point	38.536	123.283	29-Jun-02	20	
Northern CA	1.6 km NW of Windermere Point	38.536	123.281	29-Jun-02	24	1
Northern CA	1.0 km NW of Windermere Point, Timber Cove	38.531	123.278	29-Jun-02	20	
Northern CA	Vicinity of Northwest Cape	38.517	123.259	28-Jun-02	5	
Northern CA	Clam Beach, Vicinity of Northwest Cape	38.516	123.255	28-Jun-02	11	
Northern CA	Fort Ross Cove	38.513	123.246	28-Jun-02	19	
Northern CA	Fort Ross Cove	38.512	123.248	28-Jun-02	51	2
Northern CA	Northwest Cape	38.512	123.254	28-Jun-02	41	
Northern CA	Vicinity of Fort Ross Reef	38.504	123.233	28-Jun-02	34	
Northern CA	3.6 km ESE of Northwest Cape	38.496	123.213	28-Jun-02	1	
Northern CA	3.6 km ESE of Northwest Cape	38.496	123.212	28-Jun-02	4	
Northern CA	5.4 km WNW of Mouth of Russian River	38.480	123.178	28-Jun-02	46	1
Northern CA	Mouth of Russian River	38.451	123.130	28-Jun-02	45	18
Northern CA	Rock off Wrights Beach, 1.3 km NNE of Duncans Point	38.403	123.101	28-Jun-02	16	
Northern CA	Gleason Beach, 0.8 km ESE of Duncans Point	38.391	123.087	28-Jun-02	32	
Northern CA	Vicinity of Horshoe Cove, Bodega Head	38.319	123.075	28-Jun-02	18	
Northern CA	Vicinity of Horshoe Cove, Bodega Head	38.317	123.073	28-Jun-02	67	
Northern CA	Bodega Rock	38.296	123.048	28-Jun-02	64	
Northern CA	Tomales Point	38.236	122.994	28-Jun-02	14	
Northern CA	Bird Rock, Tomales Point	38.230	122.994	28-Jun-02	408	15

Table 6. (Continued)

Mainland section	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Northern CA	Tomales Point	38.228	122.988	28-Jun-02	60	1
Northern CA	Tomales Point	38.227	122.988	28-Jun-02	4	
Northern CA	Tomales Point	38.226	122.987	28-Jun-02	17	
Northern CA	Tomales Point	38.226	122.986	28-Jun-02	70	1
Northern CA	Tomales Point	38.225	122.986	28-Jun-02	2	
Northern CA	Tomales Point	38.225	122.985	28-Jun-02	2	
Northern CA	Tomales Point	38.223	122.983	28-Jun-02	13	
Northern CA	0.9 km WNW of Toms Point, Tomales Bay	38.218	122.962	28-Jun-02	472	
Northern CA	Tomales Point	38.207	122.973	28-Jun-02	103	2
Central CA	Fisherman Bay, SE Farallon Island	37.701	123.003	01-Jul-02	6	
Central CA	Maintop Bay, SE Farallon Island	37.700	123.006	01-Jul-02	30	
Central CA	Mussel Flat, Mirounga Bay, SE Farallon Island	37.696	123.003	01-Jul-02	105	
Central CA	Point Reyes	37.994	122.994	17-Jun-02	18	
Central CA	Point Reyes	37.994	122.996	17-Jun-02	137	
Central CA	Point Reyes	37.994	123.001	17-Jun-02	24	
Central CA	Point Reyes	37.994	123.000	17-Jun-02	7	
Central CA	Point Reyes	37.993	122.995	17-Jun-02	30	
Central CA	Point Reyes	37.993	122.994	17-Jun-02	70	
Central CA	Point Reyes	37.993	122.984	17-Jun-02	6	
Central CA	Drake's Estero	38.038	122.937	17-Jun-02	588	1
Central CA	Drake's Estero	38.034	122.933	17-Jun-02	267	
Central CA	Drake's Estero	38.033	122.927	17-Jun-02	114	

Table 6. (Continued)

Mainland section	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Central CA	Double Point	37.945	122.776	17-Jun-02	835	
Central CA	Double Point	37.945	122.777	17-Jun-02	50	
Central CA	Bolinas Lagoon	37.916	122.667	17-Jun-02	92	
Central CA	Bolinas Lagoon	37.914	122.666	17-Jun-02	59	
Central CA	Bolinas Lagoon (Kent Isl.)	37.911	122.675	17-Jun-02	197	1
Central CA	Duxbury Point	37.889	122.699	17-Jun-02	60	
Central CA	2.9 km NW Point Bonita	37.845	122.560	17-Jun-02	6	
Central CA	0.9 km NNE Point Bonita	37.823	122.524	17-Jun-02	3	
Central CA	0.5 km N Point Bonita	37.820	122.528	17-Jun-02	14	
Central CA	0.4 km N Point Bonita	37.819	122.528	17-Jun-02	33	
Central CA	0.31 km NNW Point Bonita	37.818	122.529	17-Jun-02	25	
Central CA	1.5 km S Point Montara Light	37.524	122.519	17-Jun-02	11	
Central CA	Garnet Point, Ryer Island	38.095	122.039	17-Jun-02	31	
Central CA	Castro Rocks	37.933	122.418	17-Jun-02	120	
Central CA	Marina at north end of Sausalito	37.873	122.499	17-Jun-02	41	
Central CA	Yerba Buena Island	37.807	122.363	18-Jun-02	90	
Central CA	Newark Slough	37.506	122.086	17-Jun-02	22	
Central CA	Mowry Slough	37.493	122.046	17-Jun-02	13	
Central CA	Mowry Slough	37.493	122.044	17-Jun-02	70	
Central CA	Mowry Slough	37.493	122.044	17-Jun-02	85	
Central CA	Mowry Slough	37.488	122.034	17-Jun-02	13	
Central CA	Coyote Creek	37.464	122.030	17-Jun-02	36	
Central CA	Coyote Creek	37.464	122.034	17-Jun-02	37	
Central CA	Reefs 1.2 km W of Half Moon Bay airport	37.519	122.516	17-Jun-02	2	

Table 6. (Continued)

Mainland section	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Central CA	Reefs 1.2 km W of Half Moon Bay airport	37.518	122.516	17-Jun-02	67	
Central CA	Reefs 1.2 km W of Half Moon Bay airport	37.516	122.515	17-Jun-02	53	
Central CA	Reefs 1.2 km W of Half Moon Bay airport	37.516	122.514	17-Jun-02	11	
Central CA	Reefs 1.2 km W of Half Moon Bay airport	37.511	122.512	17-Jun-02	7	
Central CA	Reefs 1-1.5 km NW Pillar Point	37.505	122.506	17-Jun-02	50	
Central CA	Reefs 1-1.5 km NW Pillar Point	37.504	122.503	17-Jun-02	1	
Central CA	Reefs 1-1.5 km NW Pillar Point	37.503	122.502	17-Jun-02	10	
Central CA	Sail Rock. - Pillar Point	37.494	122.500	17-Jun-02	17	
Central CA	2.0 km SSE Miramontes Point	37.417	122.435	17-Jun-02	138	
Central CA	2.2 km SSE Miramontes Point	37.415	122.434	17-Jun-02	1	
Central CA	3.8 km SSE Miramontes Point	37.402	122.426	17-Jun-02	51	1
Central CA	Martins Beach	37.376	122.412	17-Jun-02	27	
Central CA	0.3 km SW Pescadero Creek mouth	37.266	122.414	17-Jun-02	54	
Central CA	Bean Hollow State Beach	37.234	122.417	17-Jun-02	40	
Central CA	Bean Hollow State Beach	37.233	122.416	17-Jun-02	24	
Central CA	Bean Hollow State Beach	37.231	122.415	17-Jun-02	90	
Central CA	Bean Hollow State Beach	37.230	122.414	17-Jun-02	9	
Central CA	1.6 km NNW Bolsa Point	37.211	122.409	17-Jun-02	19	
Central CA	1.6 km NNW Bolsa Point	37.210	122.408	17-Jun-02	68	3
Central CA	Bolsa Point	37.195	122.405	17-Jun-02	7	
Central CA	Point Año Nuevo	37.120	122.339	17-Jun-02	12	
Central CA	Point Año Nuevo	37.117	122.338	17-Jun-02	10	
Central CA	Point Año Nuevo	37.116	122.337	17-Jun-02	9	
Central CA	Point Año Nuevo	37.111	122.330	17-Jun-02	12	2

Table 6. (Continued)

Mainland section	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Central CA	Año Nuevo Island	37.110	122.339	17-Jun-02	10	
Central CA	Año Nuevo Island	37.110	122.338	17-Jun-02	62	
Central CA	Año Nuevo Island	37.107	122.336	17-Jun-02	7	
Central CA	Año Nuevo Island	37.106	122.337	17-Jun-02	5	
Central CA	0.81 km NW Greyhound Rock	37.084	122.273	17-Jun-02	8	
Central CA	5.7 km NW El Jarro Point	37.068	122.259	17-Jun-02	31	
Central CA	5.3 km NW El Jarro Point	37.066	122.257	17-Jun-02	61	
Central CA	4.6 km NW El Jarro Point	37.060	122.253	17-Jun-02	1	
Central CA	4.4 km NW El Jarro Point	37.058	122.252	17-Jun-02	146	
Central CA	4.2 km NW El Jarro Point	37.057	122.250	17-Jun-02	53	1
Central CA	0.4 km NW Davenport Pier	37.013	122.204	17-Jun-02	22	
Central CA	Vicinity Table Rock	36.968	122.133	17-Jun-02	332	
Central CA	Elkhorn Slough	36.816	121.746	17-Jun-02	116	
Central CA	Elkhorn Slough	36.815	121.746	17-Jun-02	10	
Central CA	Elkhorn Slough	36.814	121.761	17-Jun-02	95	
Central CA	Elkhorn Slough	36.811	121.770	17-Jun-02	82	
Central CA	Point Cabrillo	36.622	121.904	17-Jun-02	131	
Central CA	Point Alone	36.619	121.901	17-Jun-02	29	
Central CA	Cannery Row	36.617	121.900	17-Jun-02	32	
Central CA	Cannery Row	36.616	121.899	17-Jun-02	1	
Central CA	Cannery Row	36.616	121.898	17-Jun-02	18	
Central CA	Seal Rock	36.588	121.966	16-Jun-02	111	
Central CA	Cypress Point	36.581	121.979	16-Jun-02	96	
Central CA	0.4 km NNE Pescadero Point	36.564	121.951	16-Jun-02	86	

Table 6. (Continued)

Mainland section	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Central CA	Pescadero Rocks	36.562	121.945	16-Jun-02	55	
Central CA	0.2 km E Arrowhead Point	36.561	121.938	16-Jun-02	42	
Central CA	Point Lobos State Preserve	36.522	121.945	16-Jun-02	37	
Central CA	Point Lobos State Preserve	36.522	121.944	16-Jun-02	7	
Central CA	Point Lobos State Preserve	36.516	121.950	16-Jun-02	11	
Central CA	5.9 km SSE Yankee Point	36.442	121.924	16-Jun-02	37	
Central CA	1.7 km ESE Point Sur Light	36.300	121.885	16-Jun-02	12	
Central CA	1.7 km ESE Point Sur Light	36.300	121.886	16-Jun-02	84	
Central CA	2.6 km SE Point Sur Light	36.292	121.880	16-Jun-02	14	
Central CA	3.2 km SE Point Sur Light	36.287	121.877	16-Jun-02	25	
Central CA	7.0 km SE Point Sur Light	36.265	121.844	16-Jun-02	63	
Central CA	4.0 km ESE Pfeiffer Point	36.224	121.773	16-Jun-02	17	
Central CA	4.0 km ESE Pfeiffer Point	36.224	121.773	16-Jun-02	10	
Central CA	Vicinity of Lafler Rock	36.200	121.728	16-Jun-02	7	
Central CA	Vicinity of Lafler Rock	36.199	121.726	16-Jun-02	6	
Central CA	Vicinity of Lafler Rock	36.198	121.723	16-Jun-02	5	
Central CA	0.5 km WNW Anderson Landing	36.148	121.663	16-Jun-02	19	1
Central CA	1.4 km NNW Dolan Rock	36.098	121.622	16-Jun-02	22	
Central CA	Square Black Rock	36.075	121.607	16-Jun-02	134	
Central CA	8.3 km NNW Cape San Martin	35.962	121.486	16-Jun-02	27	
Central CA	7.7 km NNW Cape San Martin	35.957	121.485	16-Jun-02	3	
Central CA	4.5 km NNW Cape San Martin	35.929	121.474	16-Jun-02	26	
Central CA	1.3 km SE Cape San Martin	35.881	121.455	16-Jun-02	10	
Central CA	1.6 km SE Cape San Martin	35.880	121.453	16-Jun-02	16	

Table 6. (Continued)

Mainland section	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Central CA	4.6 km SE Cape San Martin	35.861	121.428	16-Jun-02	9	
Central CA	10.4 km NW Ragged Point	35.834	121.398	16-Jun-02	14	
Central CA	2.6 km SSE Ragged Point	35.738	121.318	16-Jun-02	38	
Central CA	2.7 km SSE Ragged Point	35.737	121.319	16-Jun-02	175	
Central CA	La Cruz Rock	35.708	121.312	16-Jun-02	25	
Central CA	Piedras Blancas	35.664	121.287	16-Jun-02	19	
Central CA	Piedras Blancas	35.664	121.288	16-Jun-02	21	
Central CA	2.8 km ESE Piedras Blancas Light	35.659	121.255	16-Jun-02	32	
Central CA	3.6 km ESE Piedras Blancas Light	35.654	121.247	16-Jun-02	48	
Central CA	3.7 km ESE Piedras Blancas Light	35.653	121.246	16-Jun-02	23	
Central CA	1.2 km WNW San Simeon Point	35.640	121.206	16-Jun-02	54	
Central CA	1.5 km ENE San Simeon Point	35.640	121.179	16-Jun-02	35	
Central CA	3.2 km ESE San Simeon Point	35.627	121.160	16-Jun-02	1	
Central CA	1.6 km NW San Simeon Creek/River	35.604	121.141	16-Jun-02	62	
Central CA	1.4 km NW San Simeon Creek/River	35.603	121.139	16-Jun-02	73	
Central CA	San Simeon State Beach	35.576	121.117	16-Jun-02	26	
Central CA	10.3 km NW Point Estero	35.529	121.080	16-Jun-02	21	
Central CA	8.2 km NW Point Estero	35.514	121.065	16-Jun-02	48	
Central CA	3.7 km NW Point Estero	35.486	121.029	16-Jun-02	54	
Central CA	2.2 km NW Point Estero	35.476	121.019	16-Jun-02	56	
Central CA	1.6 km NW Point Estero	35.472	121.015	16-Jun-02	29	
Central CA	4.6 km WNW Cayucos Point	35.460	120.986	16-Jun-02	36	
Central CA	2.1 km WNW Cayucos Point	35.453	120.960	16-Jun-02	38	
Central CA	1.4 km E Cayucos Point	35.447	120.923	16-Jun-02	18	

Table 6. (Continued)

Mainland section	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Central CA	1.2 km W Cayucos Point	35.447	120.951	16-Jun-02	11	
Central CA	Cayucos Point	35.446	120.938	16-Jun-02	41	
Central CA	Morro Bay	35.340	120.848	16-Jun-02	50	
Central CA	9.5 km WNW Point San Luis	35.203	120.846	16-Jun-02	33	
Central CA	8.5 km WNW Point San Luis	35.198	120.837	16-Jun-02	98	
Central CA	7.6 km WNW Point San Luis	35.196	120.828	16-Jun-02	32	
Central CA	6.7 km WNW Point San Luis	35.191	120.820	16-Jun-02	19	
Central CA	6.7 km WNW Point San Luis	35.191	120.819	16-Jun-02	114	
Central CA	5.3 km WNW Point San Luis	35.185	120.807	16-Jun-02	23	1
Southern CA	0.3 km NNE Point Sal	34.906	120.670	16-Jun-02	47	1
Southern CA	0.6 km SE Point Sal	34.901	120.667	16-Jun-02	16	
Southern CA	6.6 km SE Point Sal	34.866	120.617	16-Jun-02	12	
Southern CA	2.3 km SSE of Purisima Point	34.738	120.627	12-Jun-02	25	
Southern CA	2.7 km SE Point Arguello	34.560	120.631	16-Jun-02	102	
Southern CA	2.8 km SE Point Arguello	34.560	120.630	16-Jun-02	213	2
Southern CA	3.0 km SE Point Arguello	34.558	120.628	16-Jun-02	17	
Southern CA	0.32 km ENE Point Conception	34.449	120.469	16-Jun-02	444	2
Southern CA	0.9 km ESE Point Conception	34.447	120.462	16-Jun-02	44	
Southern CA	3.8 km ENE Goleta Point	34.417	119.806	16-Jun-02	31	
Southern CA	Point Mugu Lagoon	34.102	119.098	16-Jun-02	24	
Southern CA	Point Mugu Lagoon	34.102	119.096	16-Jun-02	258	5
Southern CA	Point Mugu Lagoon	34.102	119.094	16-Jun-02	5	
Southern CA	La Jolla Children's Pool -outside reef	32.848	117.279	25-May-02	8	
Southern CA	La Jolla Children's Pool -beach	32.848	117.279	25-May-02	83	

Table 6. (Continued)

Mainland section	Location of haulout site	Degrees latitude	Degrees longitude	Date	Count of seals onshore	Count of seals in water
Southern CA	La Jolla Children's Pool -inside reef	32.848	117.277	25-May-02	64	1

Table 7. Summary statistics for the number of harbor seals (*Phoca vitulina*) counted onshore at haulout sites for sections of California, and California statewide from surveys conducted during 23 May-1 July 2002.

Section	Mean # of seals per haulout	Median # of seals per haulout	Minimum # of seals per haulout	Maximum # of seals per haulout	Sum of seals from all haulouts	Total # of haulouts
Northern California	51.02	29.00	1	472	8,418	165
Central California	54.54	30.00	1	835	7,744	142
Southern California, mainland	87.06	37.50	5	444	1,393	16
Southern California, Channel Islands	26.93	19.00	1	154	3,878	144
Southern California total	32.94	20.50	1	444	5,271	160
California mainland total	54.35	30.00	1	835	17,555	323
California total	45.90	25.00	1	835	21,433	467

Table 8. Summary statistics for the number of harbor seals (*Phoca vitulina*) counted onshore at haulout sites by 0.5 degree latitude increments for mainland coastal sites (see footnotes), San Francisco Bay estuary, and each of the Channel Islands in southern California from surveys conducted during 23 May-1 July 2002.

Latitude range, estuary, or island	Mean # of seals per haulout	Median # of seals per haulout	Minimum # of seals per haulout	Maximum # of seals per haulout	Sum of seals from all haulouts	Total # of haulouts
41.50° to 42.00°	67.92	53.00	2	260	883	13
41.00° to 41.49	30.24	20.00	1	138	514	17
40.50° to 40.99°	97.06	70.00	17	242	1,553	16
40.00° to 40.49°	57.57	38.00	1	141	403	7
39.50° to 39.99°	60.83	29.50	6	314	730	12
39.00° to 39.49°	36.81	24.00	1	155	1,141	31
38.50° to 38.99°	35.43	21.00	1	257	1,736	49
38.00° to 38.49°	72.90	25.00	1	472	1,458	20
37.50° to 37.99° [1, 2]	88.38	30.00	1	835	3,005	34
San Francisco Bay estuary [2]	50.73	37.00	13	120	558	11
37.00° to 37.49° [2]	36.19	22.00	1	146	977	27
36.50° to 36.99°	71.72	48.50	1	332	1,291	18
36.00° to 36.49°	32.50	18.00	5	134	455	14
35.50° to 35.99°	35.04	26.00	1	175	806	23
35.00° to 35.49°	43.47	36.00	11	114	652	15
34.50° to 34.99°	61.71	25.00	12	213	432	7
34.00° to 34.49°	134.33	37.50	5	444	806	6
33.50° to 33.99°	0	0	0	0	0	0
33.00° to 33.49°	0	0	0	0	0	0
32.50° to 32.99°	51.67	64.00	8	83	175	3
Anacapa Island	14.44	10.50	1	41	231	16
Santa Cruz Island	27.76	15.50	1	128	1,055	38
Santa Rosa Island	35.04	21.50	1	134	911	26
San Miguel Island	25.21	24.00	1	124	731	29
San Nicolas Island	34.35	26.00	1	154	584	17
Santa Barbara Island	7.50	7.50	7	8	15	2
Santa Catalina Island	26.22	19.00	1	103	236	9
San Clemente Island	16.43	16.00	1	35	115	7

[1] SE Farallon Islands and Drake's Estero are included in latitude segment 37.50° to 37.99°.

[2] San Francisco Bay estuary is excluded in latitude segments 37.50° to 37.99° and 37.00° to 37.49°.

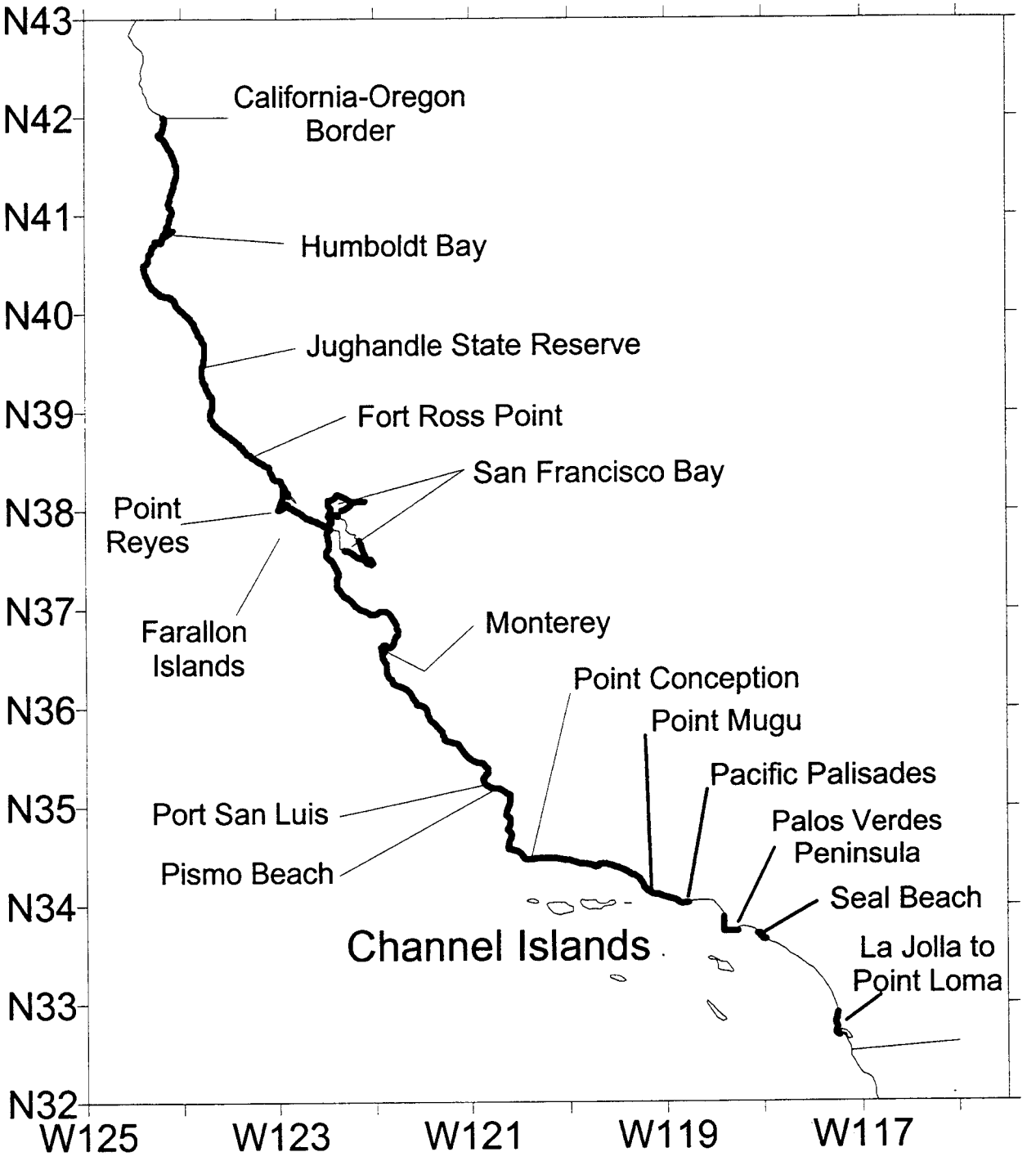

Figure 1. California coastline and Channel Islands surveyed for harbor seals (*Phoca vitulina*) in California during 22 May-1 July 2002. Bold line shows survey coverage along the mainland coastline and in San Francisco Bay; the coastline of all Channel Islands and Southeast Farallon Island were surveyed. There are no known haulout sites that are within the unsurveyed portions between La Jolla and Pacific Palisades.

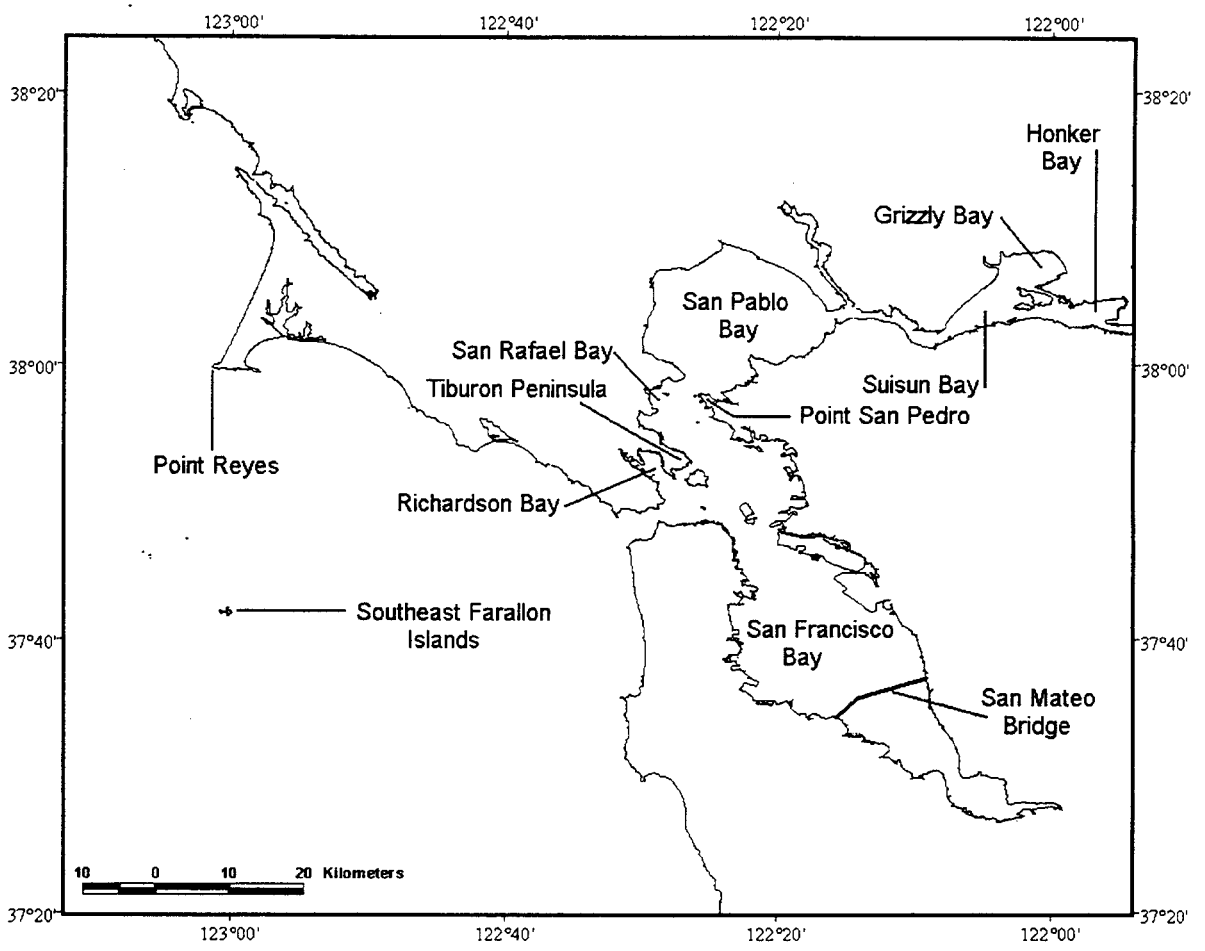

Figure 2. Coastline of San Francisco Bay estuary surveyed for harbor seals (*Phoca vitulina*) during 17 June 2002. Within the bay area, seals were surveyed in Richardson Bay, Tiburon Peninsula, San Rafael Bay, Point San Pedro, north shoreline of San Pablo Bay, Suisun Bay, Grizzly Bay, Honker Bay, and San Francisco Bay south of the San Mateo Bridge.

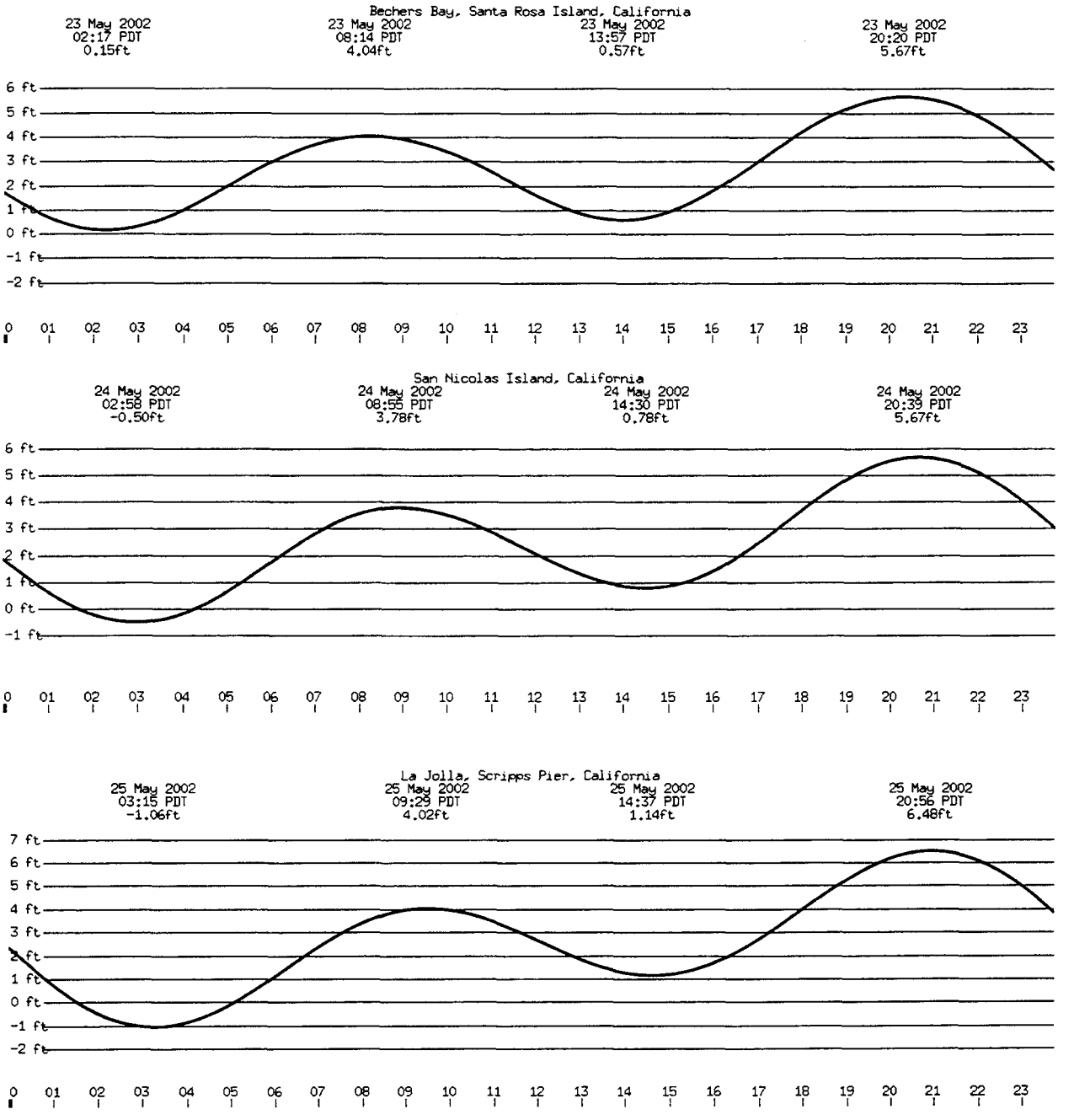

Figure 3. Predicted tide cycle for dates that harbor seals (*Phoca vitulina*) were surveyed at the Channel Islands (charts for Santa Rosa Island and San Nicolas Island are shown) and southern California coastline (chart of La Jolla, California is shown). Bottom row of numbers for each chart correspond to hour of the day; date and time of high and low tide heights are given at the top of each chart.

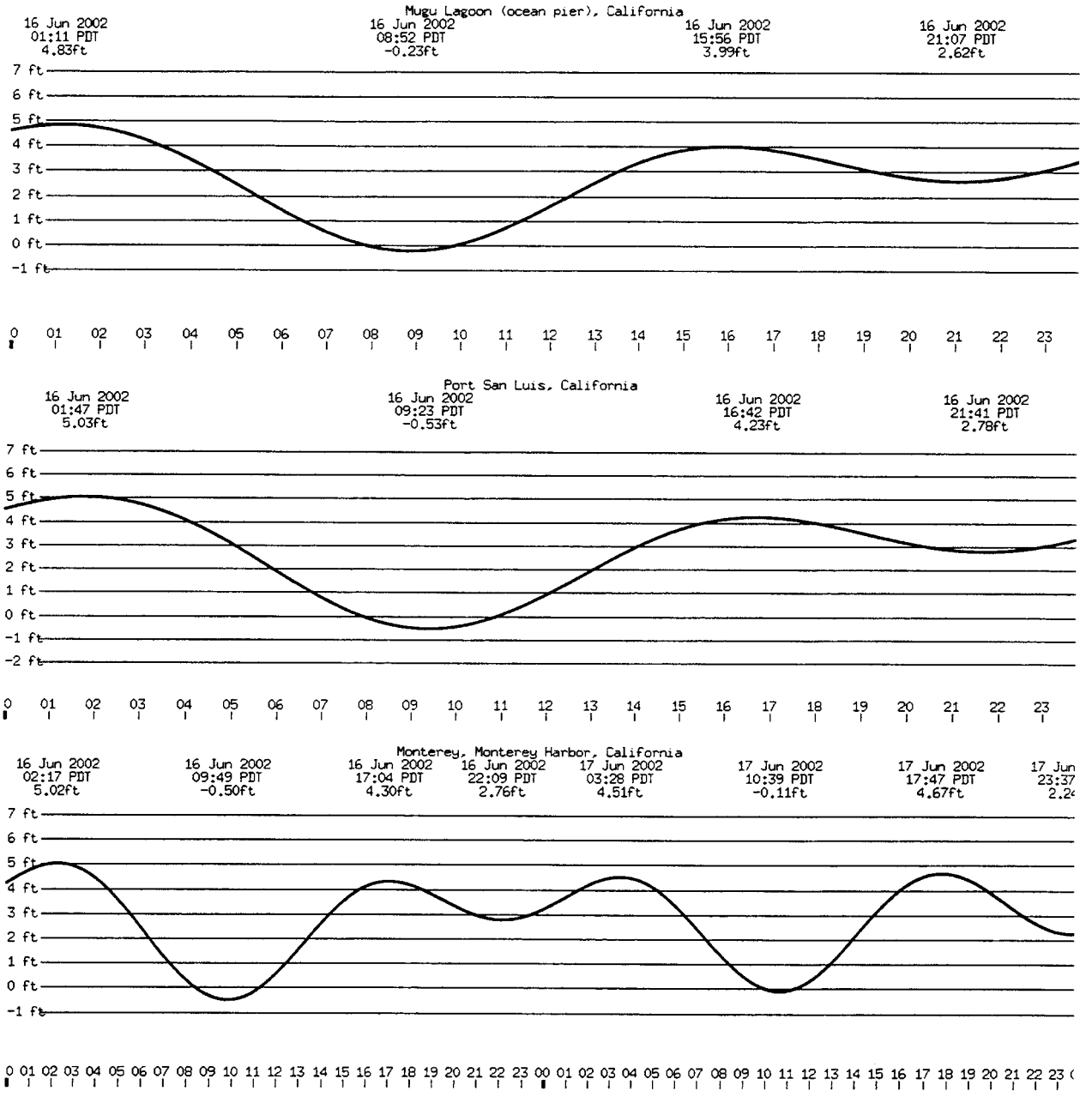

Figure 4. Predicted tide cycle for dates that harbor seals (*Phoca vitulina*) were surveyed in central California (charts for Mugu Lagoon, Port San Luis, and Monterey are shown). Bottom row of numbers for each chart correspond to hour of the day; date and time of high and low tide heights are given at the top of each chart.

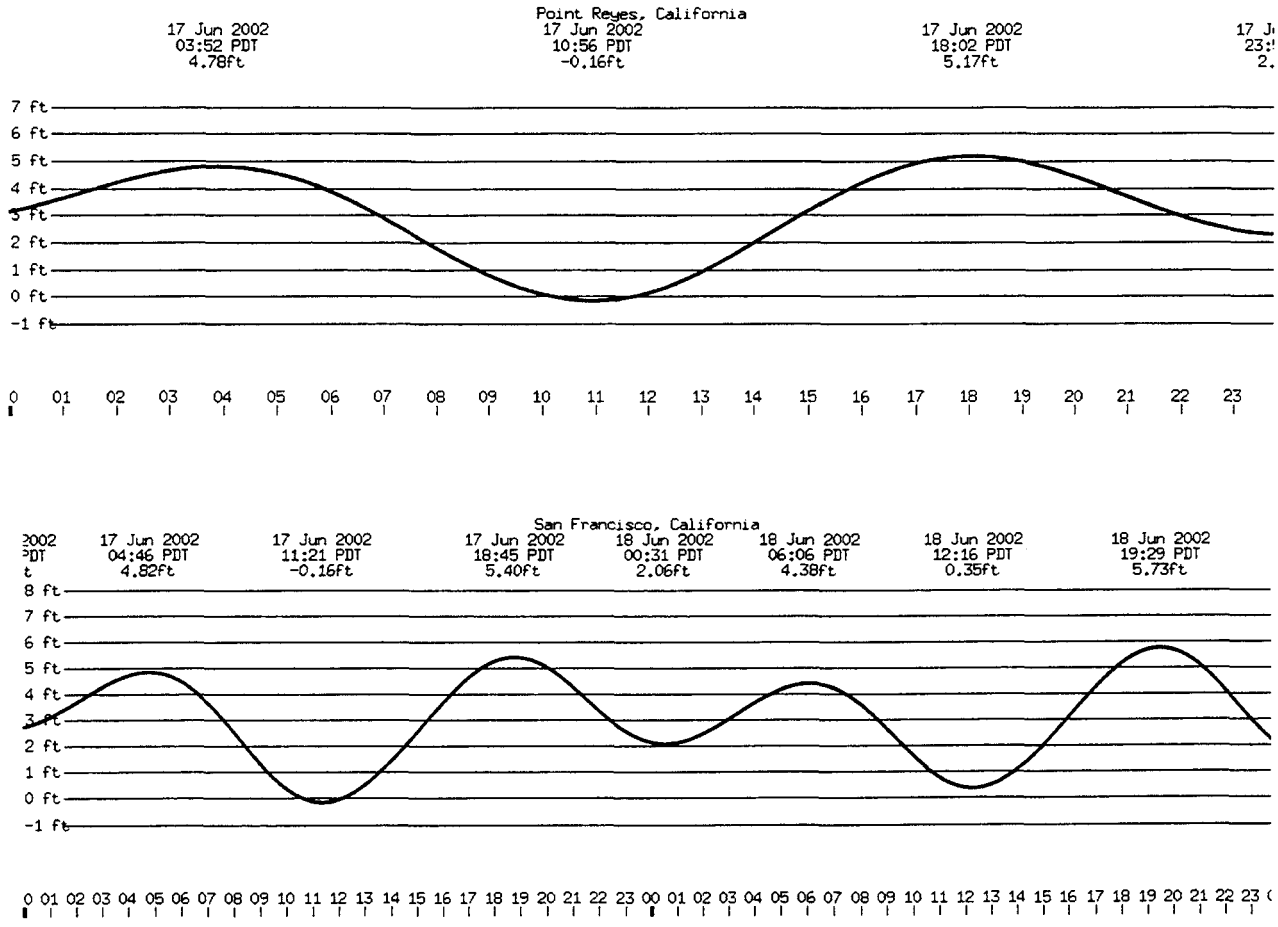

Figure 5. Predicted tide cycle for dates that harbor seals (*Phoca vitulina*) were surveyed in central California (charts for Point Reyes and San Francisco are shown). Bottom row of numbers for each chart correspond to hour of the day; date and time of high and low tide heights are given at the top of each chart.

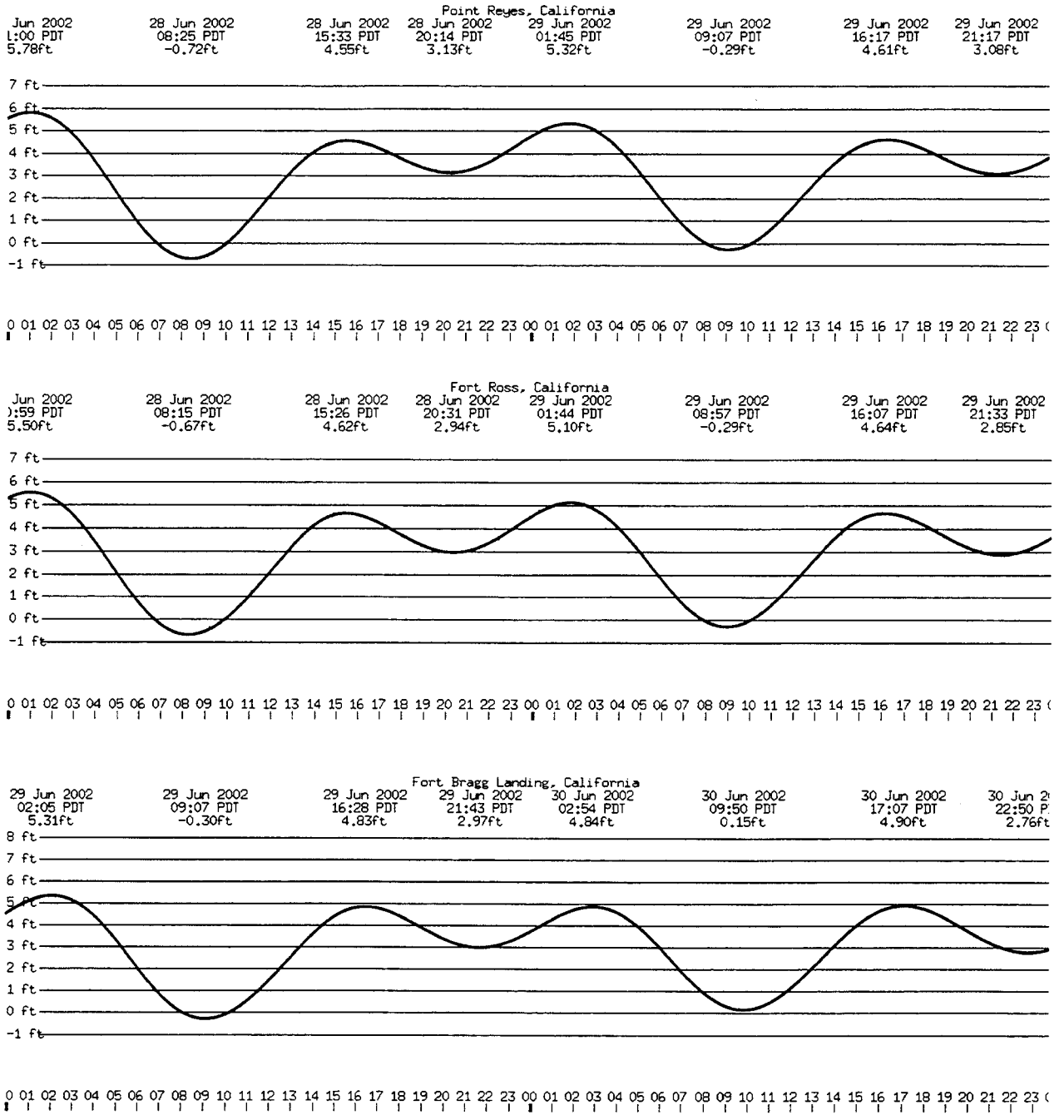

Figure 6. Predicted tide cycle for dates that harbor seals (*Phoca vitulina*) were surveyed in northern California (charts for Point Reyes, Fort Ross, and Fort Bragg are shown). Bottom row of numbers for each chart correspond to hour of the day; date and time of high and low tide heights are given at the top of each chart.

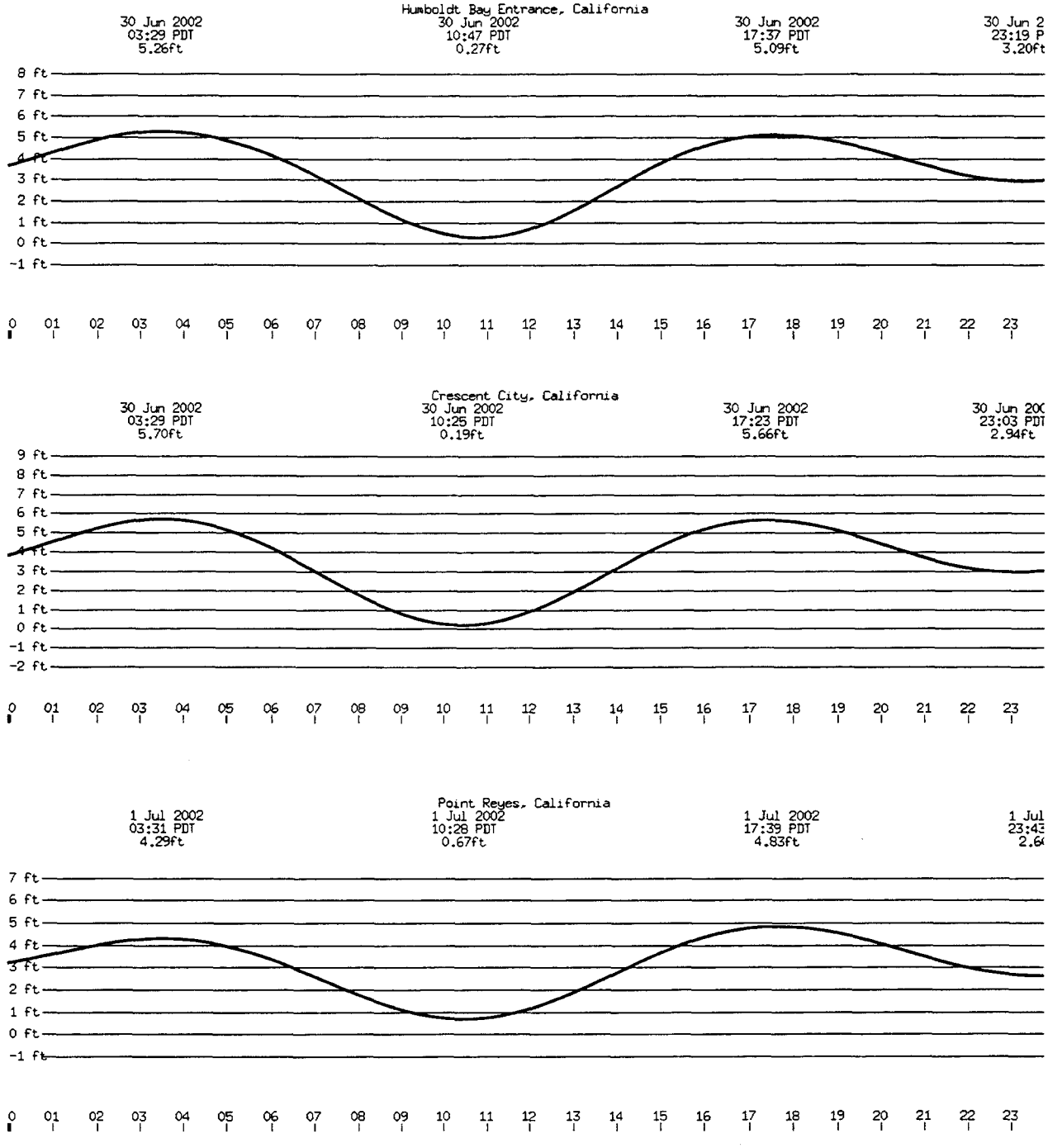

Figure 7. Predicted tide cycle for dates that harbor seals (*Phoca vitulina*) were surveyed in northern California (charts for Humboldt Bay, Crescent City, and Point Reyes are shown). Bottom row of numbers for each chart correspond to hour of the day; date and time of high and low tide heights are given at the top of each chart.

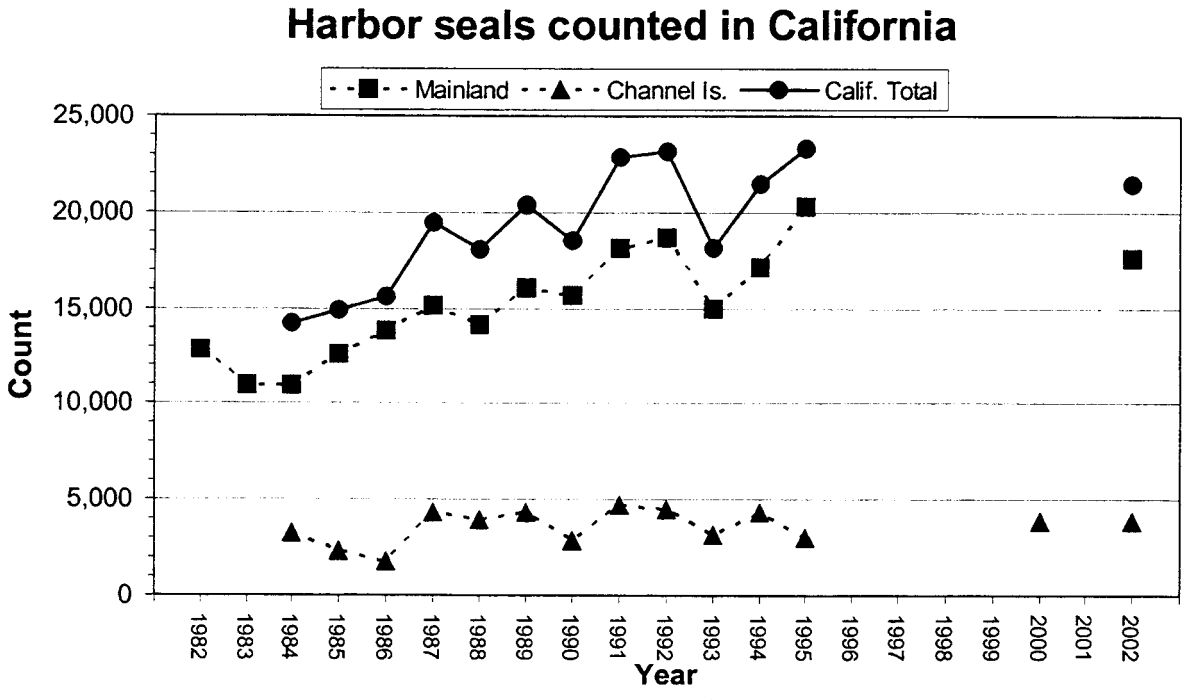

Figure 8. Counts of harbor seals (*Phoca vitulina*) in California (mainland and Channel Islands) for 1982-2002. Data from 1982-1995 obtained from Hanan (1996) and Fluharty (1999); data for 2001 is unpublished data from Bob Read, California Department of Fish and Game; data for 2002 is from this report.

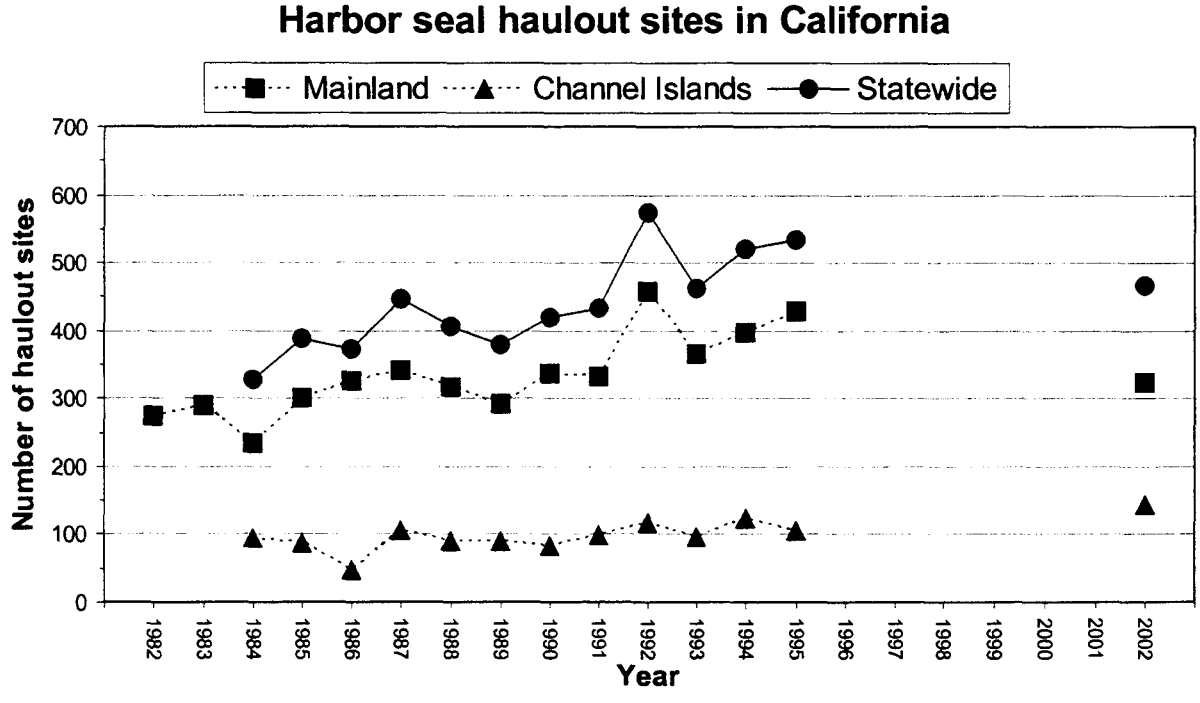

Figure 9. Number of harbor seal (*Phoca vitulina*) haulout sites found in California during annual aerial photographic surveys. Data for 1982-1995 is from Fluharty (1995); data for 2002 is from this report.

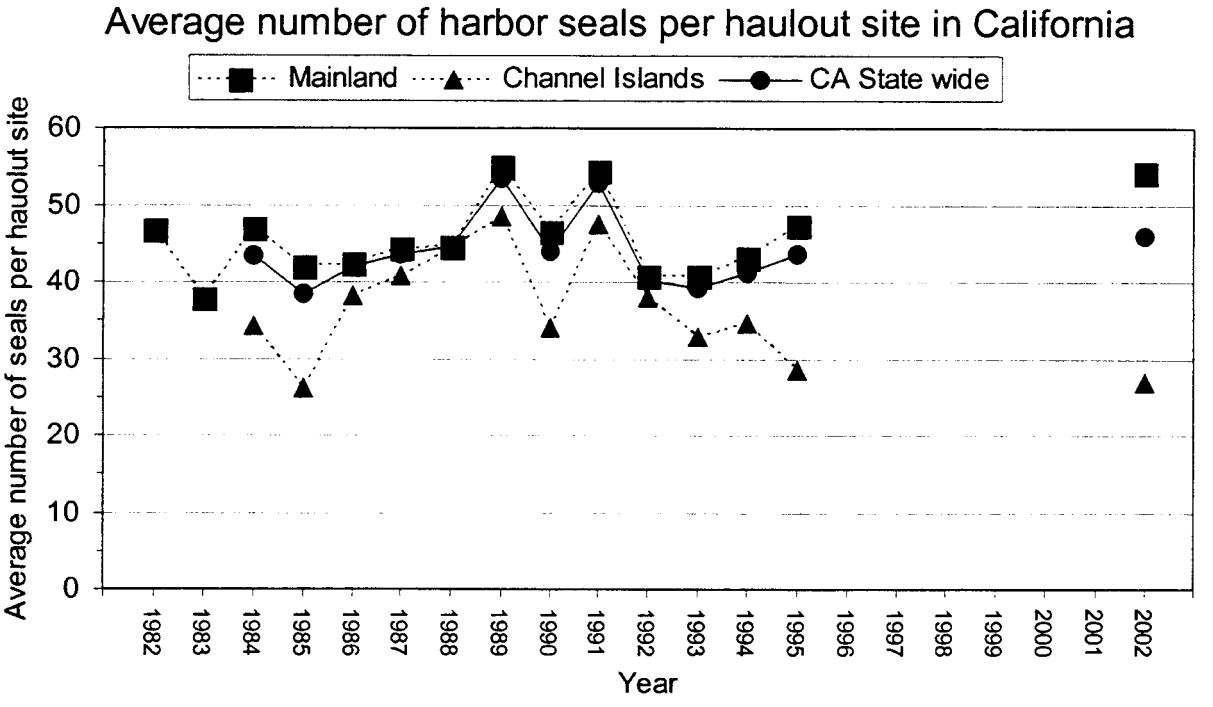

Figure 10. Average number of harbor seals (*Phoca vitulina*) per haulout site found in California during annual surveys in the molt season. Data for 1982-1995 obtained from Fluharty (1999); data for 2002 is from this report.

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