

ASSESSMENT OF PINNIPED/HUMAN INTERACTIONS IN  
POINT REYES, CALIFORNIA, 1983-84

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## ABSTRACT

The breeding population of harbor seals in the Point Reyes area, California, is one of the largest in the state and because of its proximity to a large urban area, there is significant potential for human impact. We examined sources for disturbance to seals and the degree to which these sources affect seal behavior at each major haul out site. Recreational fishermen and boats were the major causes for disturbance, and Tomales Bay was the primary area where seals were disturbed. Seals responded to frequent disturbance by using alternative haul out sites and usually rehailed within 30 min. At Tomales Bay, though, a lower proportion of the herd was likely to rehaul in comparison to other locations, and often seals never rehailed. The reproductive rate was depressed and the pup mortality rate was inflated at Tomales Bay compared to more remote haul out areas such as Double Point. Disturbance to California and northern sea lions at Sea Lion Overlook, Point Reyes Headlands, was minimal because of the inaccessibility of the area to hikers and boats. No conflict was observed between pinnipeds and commercial herring fishing activities in Tomales Bay. Commercial gill net fisheries in the area incidentally killed many small marine mammals in 1982, 1983 and 1984.

## INTRODUCTION

The breeding population of harbor seals in the Point Reyes area, California, (i.e., the outer coast of Marin County) is one of the largest in the state (Allen and Huber 1983, Miller 1983), and because of proximity to a large urban area, the potential for human impact is great. Much of the outer coast of Marin County is within the Point Reyes National Seashore and the Golden Gate National Recreation Area, and as a consequence, is heavily frequented by tourists. Human activities near harbor seal haul out sites include commercial and recreational boating and fishing, sport diving, flying (military helicopters, private aircraft), and hiking (birdwatchers, tidepoolers) (Kaza 1984).

Harbor seals, when hauled out on land, are sensitive to the presence of humans, and when disturbed they will characteristically retreat into the water en masse. Seals exposed to frequent and intense levels of human intrusion may change diurnal haul out patterns (Calambokidis et al. 1978, Paulbitski 1975), move to alternative haul out sites (Allen et al. 1984), abandon pups (Johnson and Jefferies 1977, Boulva and McLaren 1979, Slater and Markowitz 1983), or leave an area entirely (Bartholomew 1949, Newby 1971).

The degree to which human activities affect seals in the Point Reyes area has not previously been examined except at Bolinas Lagoon (Allen et al. 1984). At present, the sea lions that haul out at Point Reyes Headland are not breeding there (Allen and Huber 1983) and thus are not as sensitive to disturbance as the harbor seals. Nevertheless, it is still important to

know the degree to which sea lions are affected by human activities because they are as likely as seals to desert haul out areas because of repeated disturbance (Peterson and Bartholomew 1967, Kenyon 1962). Our objective, therefore, was to gather data on the present levels of human/pinniped interactions. From this information, specific management plans can be designed to provide adequate protection for seals and sea lions and informative interpretive programs for park visitors.

#### METHODS

Visitor use is highest on weekends, and thus, we censused harbor seals one weekend a month from March 1983 to March 1984 at Tomales Bay, Bird Rock, Drakes Estero and Double Point, to determine those locations where seals are most subjected to human disturbance (Figure 1). We chose these areas because they are the primary haul out locations in the Point Reyes region (Allen & Huber 1983). All human/seal interactions were recorded. More than one seal flushed into the water because of nearby human activities was counted as a disturbance. We noted type of disturbance, recovery rate, percent of recovery (proportion of animals rehauling within 1 hr), and the use of alternate haul out sites. During the breeding season, seven additional weekend censuses were made to determine whether disturbance was affecting pup survival.

From March 1983 to March 1984, we also noted any disturbance to California or northern sea lions during weekly censuses at Sea Lion Overlook and semi-monthly censuses at Bodega Rock, identifying the source of

disturbance whenever possible.

Human/pinniped interactions during the herring (Clupea pallasii) spawn in Tomales Bay were observed from December 1983 through February 1984. Seven separate censuses by boat were originally scheduled; the herring fishery, however, failed to materialize and we were able to monitor interactions on only five days.

When analyzing the effects of disturbance on seal and sea lion haul out behavior, we classified disturbance sources as hiker, fisherman (including abalone diver and clam digger), boat (power, non-power), aircraft, dog, natural (landslide, bird), and unknown. The year was divided into three seasons: spring (March through June), summer (July through October), and winter (November through February). The seasonal frequency of disturbance was estimated for each location and expressed as a percentage of the number of days seals were disturbed divided by the total number of census days for each season. The recovery rate for seals at each location was based on the time it took at least 25% of the original herd to rehaul. Excluded from the analyses were times when fewer than 25% rehailed and times when the disturbance source remained for an extended time period. The percent recovery for each location was based on the average proportion of the original members to rehaul within 1 hr. When multiple disturbances occurred, the last disturbance within a sequence was used as the starting time.

As an index of seal sensitivity at different locations, we recorded the number of "head alerts" during five minute intervals within randomly chosen groups of 10 seals. A "head alert", as defined by Sullivan (1979), is a

stereotyped behavior: the seal raises its head and scans from side to side while in a resting posture on land. We then compared the mean number of "head alerts" per minute at each site using one-way analysis of variance with Scheffe's Test for multiple comparisons at  $\alpha = 0.05$  (Snedecor and Cochran 1967).

During the breeding season, we also collected information on the number of dead pups and on mother/pup separations precipitated by disturbances. We estimated the mortality rate of pups before weaning for each location based on the proportion of the number of dead to the maximum number of live pups counted for the breeding season.

Information on disturbance collected over eight years, 1976-1983, at Double Point was also analyzed. The frequency of disturbance was expressed as a percentage of the days disturbed divided by the days censused per month for each year, and we then calculated the monthly mean percentage combining all years. Sources for disturbance were categorized as previously described; the frequency for each category combining all years was expressed as a percentage. We then divided the year into three seasons (spring, summer, winter) and determined the seasonal frequency for each disturbance category.

## RESULTS

Harbor seals were flushed from haul out sites in Point Reyes on 107 occasions and on 24% of all census days in 1983-84. After combining data from all locations (Table 1), fishermen, including clam diggers, abalone

divers, eel fishermen and crab fishermen, were the primary source of disturbance (41%) (43/107). Hikers and boats (power and non-power) were equally disturbing to seals primarily in Tomales Bay and Drakes Estero. Seals were disturbed more frequently at all locations during the spring (45%) than during either the summer (18%) or winter (19%) (Table 2).

Seals in Tomales Bay experienced the highest level of disturbance for all seasons except winter, and clam diggers were the greatest cause. In a single day, up to 500 people were observed digging for clams on the sand bars preferred by seals between Sand Point and Toms Point. A barge from Lawson's Landing ferried people to the sand bars. Boats passing along the channel bordering haul out sites also disturbed seals. Tomales Bay was the only location in this study where people were observed overtly and maliciously harassing seals. One seal was reported shot with an arrow by people in a boat and on one occasion children were observed harassing a pup left on the beach after the herd was actively flushed by the same children.

At Bird Rock, abalone divers disturbed seals most frequently, while at Drakes Estero they were disturbed equally by fishermen (clam diggers, crab fishermen), boats (power and non-power), and hikers. Hikers were the main disturbance at Double Point. Disturbances from aircraft, dogs, and non-human-related sources (birds, landslides, deer, rain) were incidental at all locations (Table 1).

In most instances, seals rehailed after they were flushed from haul out sites (Table 3). Seals in Tomales Bay, however, were least likely to rehaul during the census time period and most likely to use alternate sand bars on which to rehaul. In many instances, clam diggers in Tomales Bay remained

for entire low tide cycles, thereby precluding the return of seals. In most cases, seals at Drakes Estero, Bird Rock, and Double Point returned to haul out sites and did not move to alternate sites.

The average time, in minutes, for at least 25% of the herd to rehaul after disturbance was similar for all locations:

Tomales Bay	$\bar{x} = 18.2$ , SD = 8.5, n = 14
Bird Rock	$\bar{x} = 29.2$ , SD = 14.0, n = 6
Drakes Estero	$\bar{x} = 22.3$ , SD = 17.9, n = 17
Double Point	$\bar{x} = 21.7$ , SD = 11.2, n = 12

The percent of recovery (the proportion of the original herd to rehaul within 1 hr) varied, though, for each location. A lower proportion of the herd was likely to rehaul at Tomales Bay ( $\bar{x} = 36.0$ , SD = 38.8, n = 42) than at Bird Rock ( $\bar{x} = 75.4$ , SD = 29.0, n = 9), Drakes Estero ( $\bar{x} = 58.0$ , SD = 39.5, n = 31), or Double Point ( $\bar{x} = 66.2$ , SD = 37.2, n = 16). Furthermore, 42% of the time seals did not rehaul in Tomales Bay (Table 3).

Analysis of the sensitivity of seals at each location based on the number of "head alerts" revealed differences between the areas: seals alerted significantly more often at Tomales Bay (Table 4).

Despite the higher level of disturbance at Tomales Bay, the number of times pups were observed separated from females was equal to that of other locations (Table 3). The number of separations was expectedly higher at Double Point because more pups were present there than at any other location. A survey of pups recovered by the California Marine Mammal Center, however, revealed that a large number of pups (7) were removed by people from Tomales Bay (Lynne Amaya, CMMC, Fort Cronkite, CA, pers.

commun.). This represents 16% (7/45) of the pups counted there in 1983. There are no records of pups removed from the other locations.

Very few dead pups were observed during this survey. The most reliable information on dead pups was gathered at Double Point since distance, poor visibility, and the tide washing pups away precluded accurate counts at other sites. At Double Point the mortality rate was 8.7% (23/264) in 1983.

Observations began at Double Point in 1976, and the level of disturbance there has fluctuated. Nevertheless, a monthly and seasonal pattern is apparent in the sources for and frequency of disturbance relative to the seasonal presence of seals. Disturbance levels were similar for all months except November, when seals were virtually absent (see report Pinniped Assessment 1984 by Allen and Huber) (Table 5). As expected, most disturbances occurred in spring (61% of all disturbances observed) since more censuses were conducted then. However, the proportion of days on which disturbance occurred relative to total census days was similar for all seasons (Table 6).

The primary identifiable reasons for disturbance in spring were hikers, aircraft, and an assortment of non-human causes including landslides, birds alighting too closely to the herd, and wind-whipped debris. Western Gulls (Larus occidentalis) were responsible for many disturbances in their attempts to consume afterbirths of seal pups during spring. Low flying military helicopters as they traveled north or south along the coastline were the main aircraft disturbing to seals. Though abalone are plentiful in this area, we rarely saw abalone fishermen venture as far as Double Point from the Palomarin access trail. During summer, all sources of disturbance

were nearly equal in their effect, but during winter, landslides, rain, and hikers were the main sources. We were unable to identify reasons for disturbance in many instances, but we suspect that non-human-related causes were responsible, such as falling rocks, since slides in this area are common. The marine salvage operation of April 1982 is separated from all other categories because of its unique effect on the seals (see report Pinniped Assessment 1983 Allen and Huber).

During censuses at Sea Lion Overlook and Bodega Rock, northern and California sea lions were flushed into the water ten times (Table 7). The source of disturbance was hiker, abalone diver, sailboat, and low flying helicopter (one occasion each), non-human (four times), and unknown (twice). Most often it was the immature California sea lions which headed into the water and then quickly (within a half hour) rehailed. The percent of days disturbed was 7.7% at Bodega Rock and 12.7% at Sea Lion Overlook. All of the disturbances with known human cause occurred during the spring. Of the non-human disturbances, three were caused by rock slides and one by the resounding splash of a northern sea lion bull as he dove off a rock.

#### Fishery Interactions

Fishery/pinniped interactions in Tomales Bay during the 1983-84 herring spawning season were minimal because few herring entered the bay to breed. Preliminary data revealed that only 10% of the fishing quota for Tomales Bay was reached in 1983-84 (Pacific Coast Federation of Fisherman's Association, Inc. 1984). On the five occasions when we monitored interactions (December 17, January 12, January 20, February 23, February

24), 5-20 harbor seals and 1-45 California sea lions were observed in the vicinity of fishing boats. Both species were observed actively maneuvering around boats as fishermen pulled nets from the water, but none were observed taking fish from the nets.

The interactions of pinnipeds with commercial gill net fishing operations from May through October 1983 were similar to 1982 (Allen and Huber 1983). We gathered information from various organizations involved in collecting beach-cast marine mammals to determine whether entanglement in set gill nets was incidentally killing marine mammals. Thirty-three dead pinnipeds washed ashore in Marin County between May and October, including 18 harbor seals and 15 California sea lions. More than 75% (14/18) of the dead harbor seals were small, either weaners or immatures, and therefore, more likely to become entangled in the nets since larger animals apparently could break away. Of the total, only three were fresh enough to identify traumas to the head. The others were too decomposed to determine cause of death; they were found, however, in close proximity to other marine mammal carcasses such as harbor porpoises (Phocoena phocoena) which had distinct gill net marks impressed on their skin. Nearly half (7/15) of the California sea lions found washed ashore were immature and four of those were also found in close proximity to other dead marine mammals, indicating death from gill net entanglement.

#### DISCUSSION

With the exception of Tomales Bay, harbor seals in the Point Reyes area

were not severely disrupted from their normal diurnal or seasonal haul out patterns by human disturbance. Primarily in Tomales Bay, but also in Drakes Estero, however, seals were more frequently disturbed than at coastal sites probably because these estuaries are more accessible to the public and because of the recreational pursuits offered there (Kaza 1984). The low incidence of disturbance to seals at Limantour Spit, normally a popular beach, was an artifact of the beach being temporarily inaccessible to the public during this two year study period. The primary sources for disturbance varied for each location, but, in general, recreational fishermen flushed seals more often than any of the other categories. Double Point was the only exception; here seals were equally disrupted by hikers, aircraft, and non-human causes. Fishing activities by park visitors in the vicinity of seal haul out sites ususally consisted of clam digging in estuaries and abalone diving at Bird Rock. Boats traveling close by haul out sites were the second major source for disturbance. In Tomales Bay, power and sail boats were the main type of craft responsible, and in Drakes Estero, kayaks/canoes and power boats were equally disturbing to seals.

The sources for disturbance observed in the Point Reyes area were much the same as those documented in other studies (Allen et al. 1984, Calambokidis et al. 1978 and 1983, Chapman 1979, Johnson and Jefferies 1977, and Paulbitski 1975, Risebrough et al. 1979). The unique attributes which attracted people to each of the areas studied, as well as the accessibility of each, dictated what activities were most likely to flush seals.

Spring was the time of year seals were most likely to be disturbed at all locations in 1983, even though recreational use of the Point Reyes

National Seashore is consistently heavy throughout the year (National Park Service 1978). Clam digging is legal in Drakes Estero and Tomales Bay year round (National Oceanic and Atmospheric Administration 1980); the level of use in Tomales Bay, though, is greatest from February through June when barges carrying up to 500 people per day run from Lawson's Landing to the sand bars of Toms Point. These are the months also when the tides are most favorable for clam digging. Spring tides are also frequently low enough for people to hike along the rocky shore to Double Point and for sport divers to easily collect abalone at Bird Rock.

The ability of seals to adjust to human activities was similar to findings in a study at Bolinas Lagoon (Allen et al. 1984) where seals sought alternate locations to haul out and usually rehailed within about 30 min. The recovery rate of seals in Tomales Bay, however, was much lower than that of the other sites. We did not conduct night-time censuses in Tomales Bay but would suspect that seal numbers may be higher then because this was the only site in the Point Reyes region with more seals present in the early morning than at mid-day (see report on Pinniped Assessment by Allen and Huber 1984). Paulbitski (1975) also found this to be the case for harbor seals at Strawberry Spit in San Francisco Bay.

Our information suggests that there is a relationship between harbor seal reproductive success and human disturbance. At both Tomales Bay and Drakes Estero, the pupping rates were depressed compared to Double Point and Tomales Point where disturbance levels were lower (see report on Pinniped assessment by Allen and Huber 1984). Slater and Markowitz (1983) also calculated a reduced reproductive rate for a harbor seal population in San

Mateo County compared to an undisturbed one in Santa Cruz County. At Bolinas Lagoon where seals are often disturbed, the reproductive rate was also depressed (Allen et al. 1984). The large percentage of pups removed by humans from Tomales Bay (16%) also compounds the deleterious effects of disturbance on pup survivorship. Many of the pups recovered by the CMMC were most likely separated/abandoned due to disturbance. If these pups are included in calculations, our estimate for the pup mortality rate is 22.2% (10/45) for Tomales Bay. The estimated pup mortality rate at Double Point was 13% in 1982 when an intensive marine salvage operation occurred, compared to 1977 and 1983, when the levels of disturbance were low, and the mortality rates were only 7.4% and 8.7%, respectively (Allen 1980, Allen and Huber 1983).

The sea lions at Sea Lion Overlook are naturally protected in their chosen haul out area since it is inaccessible to hikers because of steep cliffs and to boaters because of hazardous rocks and surf. Nonetheless, several hundred California sea lions stampeded into the water one day at the sound of a loud whistle from a sightseer on the cliffs 200 feet above. The source of most other disturbance (3/7) was small rock slides from crumbly cliffs. Sea lions were disturbed less frequently than harbor seals at all sites.

Fishery/pinniped interactions in Tomales Bay during the herring season were minimal in both 1982 and 1983 because the numbers of seals and sea lions near fishing vessels were low. Miller (1981) also found little interaction between pinnipeds and herring operations in Tomales Bay.

The incidental take of pinnipeds along with other marine mammals in

association with the commercial gill net fishing operations, however, has increased substantially in this area over the past three years. Public concern over this issue has been so great that recent legislation has been passed in California (Senate Bill 2266) to mitigate the adverse effects on marine bird populations. Concern has since increased, though, that measures to lower bird mortality have inadvertently increased mammal mortality (Marine Mammal Commission Annual Meeting, 1984). In general, restrictions were enacted on the length of net, depth of net set (which varies from 10 to 15 fathoms), and the number of fishing permits. The California Department of Fish and Game was authorized to continue a monitoring program to evaluate the effectiveness of these measures. Preliminary analyses of the Marine Mammal Commission and CDFG indicate that harbor seals are equally susceptible to entanglement at depths deeper than 15f and in all types of gear excluding small-mesh monofilament netting (Bishop 1983, Wild 1983). These findings suggest that current legislation is insufficient in curtailing the incidental take of pinnipeds in gill nets. Information is not yet available to determine whether this fishery is adversely affecting local harbor seal and California sea lion populations.

#### SUMMARY

The qualities that attract seals to Point Reyes to breed in large aggregations are numerous, including habitat and food availability. Likely another important reason is lack of human intrusion because most of these areas have not been developed nor are they readily accessible.

Consequently, reasons for preserving and protecting existing haul out locations are enhanced. Based on this two-year survey and a previous study, we have determined that with the exception of Tomales Bay and Bolinas Lagoon, the seals in Point Reyes presently do not experience levels of disturbance that severely disrupt their normal diurnal or seasonal haul out patterns. Note, however, that we were unable to assess the situation at Limantour because the beach was temporarily inaccessible to humans during this study. To maintain present low levels of human impact, a series of options are possible:

1. Posting of educational and informative signs regarding harbor seal behavior and sensitivity at the access routes of each haul out location. Most human-related disturbances that we observed were non-malicious in intent and were merely the desire to interact with wildlife by persons unaware of adverse effects those interactions might precipitate (e.g. pup abandonment). Signs were placed at the south end of Double Point in 1978 and have proven effective. Access routes would include access by foot and various boat launches in the vicinity of haul out areas, i.e. Lawson's Landing in Tomales Bay and Johnson's Oyster Farm in Drakes Estero.

2. Pamphlets including more detailed information on harbor seal behavior, haul out locations, and the effects of human disturbance could be available at various facilities in the Point Reyes National Seashore frequented by visitors.

3. Restriction of future access to seal haul out areas. This would include plans for boat ramps in Drakes Estero providing increased access for power and non-power boats.

4. Because Tomales Bay has already been identified as a sensitive area, special programs could be instituted there to minimize existing human pressures. We, therefore, recommend more frequent patrolling of this area on weekends during the clam digging season by personnel responsible for the enforcement of the Marine Mammal Protection Act. Another option would be to encourage the owners of Lawson's Landing to transport clam diggers to sand bars other than the primary haul out areas used by seals during the peak pupping season during April and May.

5. Primary haul out sites should be monitored on an annual basis during the pupping season to determine the health of this major population. If censuses were conducted in early May, one could determine whether the reproductive success of the population was similar to or depressed in comparison to this study period.

6. Support continued monitoring efforts by the California Department of Fish and Game of commercial gill net fishing operations in the area, because the potential adverse effects are likely high.

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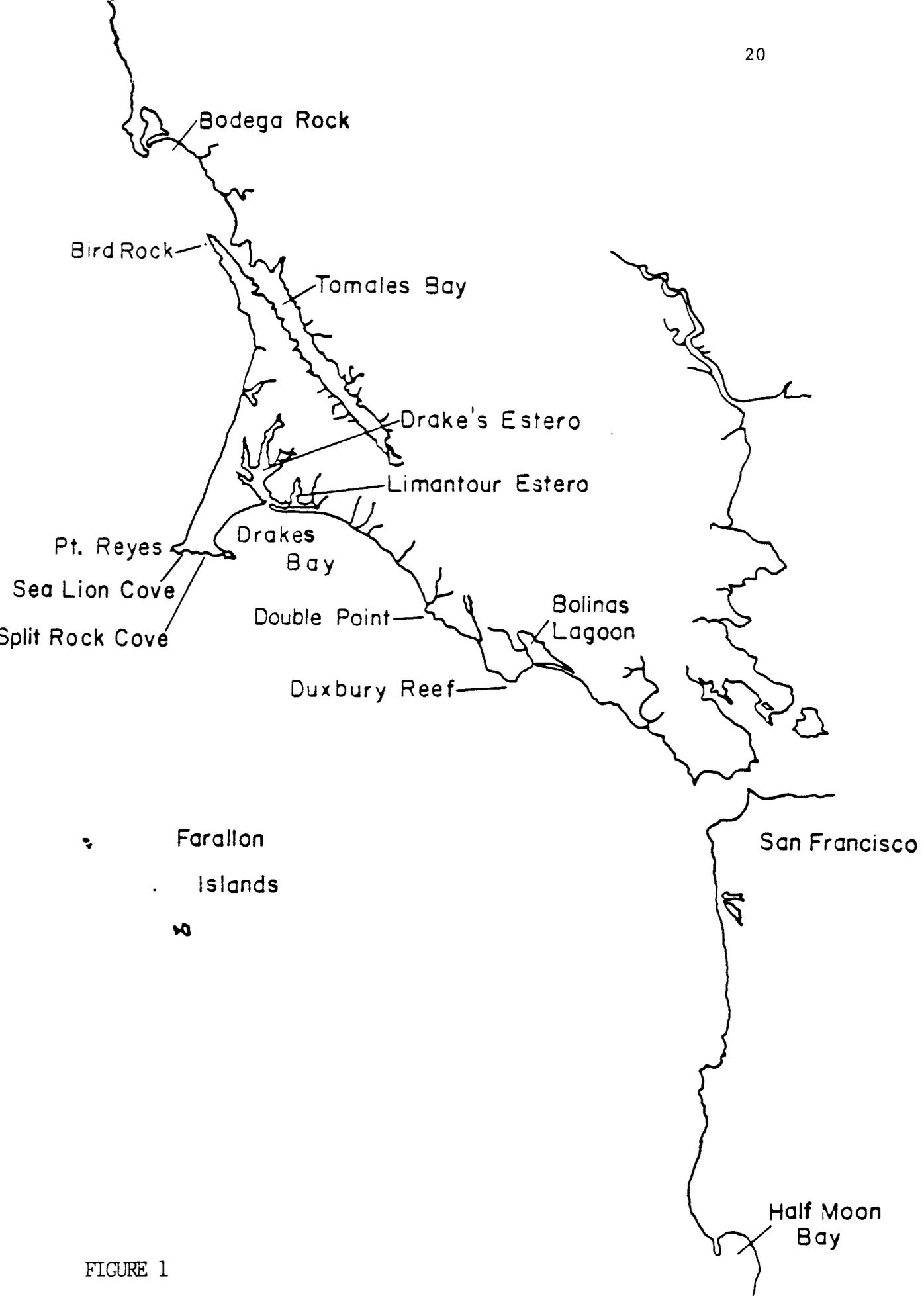


FIGURE 1

Table 1. The occurrence of disturbance to harbor seals at four major haul out sites in Point Reyes, March 1983 - March 1984.

Sources	LOCATION					All Sites
	Tomales Bay	Bird Rock	Drakes Bay	Limantour	Double Point	
Hiker	6	1	7	0	9	23
Fisherman	22	8	12	0	1	43
Boat	13	1	9	1	0	24
Aircraft	0	1	0	0	3	4
Dog	2	0	0	0	1	3
Non-human	0	0	3	0	4	7
Unknown	0	0	1	0	2	3
Totals	43	11	32	1	20	107
Days Disturbed	19	9	13	1	15	57
Days Censused	46	44	45	45	59	239
% Days Disturbed	41.3	20.5	28.9	2.2	25.4	24.0

Table 2. The level of disturbance by season to harbor seals at four major haul out sites in Point Reyes, 1983 - 1984.

	LOCATION				Totals
	Tomales Bay	Bird Rock	Drakes Estero	Double Point	
<b>Spring</b>					
Days Disturbed	14	5	8	10	37
Total Census Days	17	19	17	30	83
% Days Disturbed	82.4	26.3	47.1	33.3	45.0
<b>Summer</b>					
Days Disturbed	4	2	2	1	9
Total Census Days	12	11	14	14	51
% Days Disturbed	33.3	18.2	14.2	7.1	18.0
<b>Winter</b>					
Days Disturbed	1	2	3	4	10
Total Census Days	10	14	14	14	52
% Days Disturbed	10.0	14.2	21.4	28.5	19.0

Table 3. A summary of the effects of disturbance on harbor seals in Point Reyes, 1983-84.

	LOCATION				Totals
	Tomales Bay	Bird Rock	Drakes Estero	Double Point	
Total Disturbances	43	11	32	20	106
Times Not Rehaul	18	0	5	3	26
% Times Not Rehaul	42.0	0	15.5	15.0	24.5
% Times Rehaul	58.0	100.0	84.5	85.0	75.5
Times Use Alternate Site	12	3	1	0	16
Times Pups Separated	3	2	3	3	11
Total # Pups Separated	3	2	3	8	16
Total Pups Dead	3	5	2	23	33

Table 4. A comparison of the frequency of "head alerts" per minute at each harbor seal haul out site using one-way analysis of variance with Scheffe's Test for multiple comparisons; df = degrees of freedom, SS = Sums of Squares, MS = Mean Square.

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Source	df	SS	MS	F	F-probability
Total	63	8.91			
Alerts/min	3	1.64	0.55	4.51	0.006
Error	60	7.27	0.12		

Area	Mean	Sample Size	Separation
Drakes Estero	.276	17	a
Tomales Point	.350	8	ab
Double Point	.447	19	ab
Tomales Bay	.680	20	b *

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\* Significant at  $\alpha = 0.05$



Table 6. A summary of disturbances to seals at Double Point by season, 1976 to 1984; TD = total disturbances,

TCD = total census days, DD = days seals were disturbed, and %DD = the percentage of disturbance days to total census days.

		SOURCE										
		Hiker	Boat	Fisherman	Aircraft	Non-Human	Unknown	Marine Salvage	TD	TCD	DD	%DD
Spring												
Number		21	2	1	30	20	18	8	100	190	75	39.5
% of Total		21.0	2.0	1.0	30.0	20.0	18.0	8.0	61.4			
Summer												
Number		6	6	3	6	4	20		45	75	29	38.7
% of Total		13.3	13.3	6.7	13.3	8.9	44.4		27.6			
Winter												
Number		6	0	1	1	5	5		18	60	16	26.7
% of Total		33.3	0	5.6	5.6	27.8	27.8		11.0			
Total Disturbances for each category												
Number		33	8	5	37	29	43	8	163	325	120	36.9
% of Total		20.2	5.0	3.1	22.7	17.8	26.3	5.0				

THE TOTAL NUMBER OF SEALS AT DOUBLE POINT IN 1976 WAS 1000. IN 1977, 1978, 1979, 1980, 1981, 1982, 1983, AND 1984, THE TOTAL NUMBER OF SEALS WAS 1200, 1400, 1600, 1800, 2000, 2200, 2400, AND 2600, RESPECTIVELY.



Table 2. The average number of harbor seals hauled out by season during simultaneous censuses in the Point Reyes/Farallon Islands Marine Sanctuary in 1982 - 83;  $\bar{x}$  is the mean number of seals, SE is the standard error, and n is the sample size. Tomales Bay includes Hog Island, Tomales Point includes Bird Rock, and Drakes Estero includes Limantour Spit.

	LOCATION							
	Tomales Bay	Tomales Point	Point Reyes	Drakes Estero	Double Point	Duxbury Reef	Bolinas Lagoon	All Sites
<b>Breeding</b>								
$\bar{x}$	213.0	376.2	104.5	436.7	517.5	82.6	73.8	1839.4
SE	13.3	50.8	16.8	25.3	30.6	9.5	9.6	150.1
n	10	10	10	30	33	10	10	10
range	149-285	151-563	44-232	116-726	228-851	19-109	30-126	
<b>Summer</b>								
$\bar{x}$	191.6	242.9	71.7	331.1	246.5	62.3	83.3	1191.5
SE	21.5	45.5	18.4	39.1	46.1	23.8	10.3	108.5
n	8	8	6	12	8	8	9	8
range	102-281	137-454	13-149	146-469	69-469	0-164	24-138	
<b>Winter</b>								
$\bar{x}$	92.3	158.3	49.1	257.4	142.9	49.5	56.4	692.4
SE	30.7	22.2	17.9	34.5	47.7	21.5	6.1	164.1
n	8	8	8	12	8	8	8	8
range	31-271	30-240	8-155	93-421	30-359	0-148	29-83	

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