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Abundance, distribution, and behavior of the southern sea otter (*Enhydra lutris nereis*) in a California estuary

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Abstract

Trends in abundance, distribution, and daily activities of southern sea otters, *Enhydra lutris nereis*, in Elkhorn Slough, a California estuary, were studied. During 66 boat-based surveys, between June and October 1994 and 1995, sea otters were counted and their location, sex, direction of movement, behavior, and degree of grizzling (an indicator of age) were recorded. During 3 night-time surveys in 1995, presence/absence patterns of sea otters were determined.

An influx of sea otters into the estuary occurred between November 1994 and January 1995. Mean number of otters in 1995 (mean $\pm$ Std=24.6 $\pm$ 5.7) was six times greater than in 1994 (mean $\pm$ Std=4.2 $\pm$ 3.1). No significant effects of tide, or time of day, on abundance patterns were detected. Otters present in the estuary were mostly juvenile males. They were distributed along the estuary with different densities, the highest densities occurring within a resting area, where otters tended to congregate in rafts. Feeding occurred with higher frequency in areas closer to the open ocean. Clams of two different species, the Washington (*Saxidomun nuttallii*), and the gaper (*Tresus nuttallii*) were the main prey. Some individuals may use the estuary on a regular basis, since one tagged otter was observed during 58% of the surveys. The estuary was also used at night.

Introduction

Sea otters are known to predate on a variety of marine invertebrates (Ebert, 1968; Shimek, 1977; Calkins, 1978; Estes *et al.*, 1981; Riedman & Estes, 1990). To maintain their high metabolic rate, they have to obtain daily amounts of food equivalent to 20–25% of their body weight (Costa, 1982; Riedman & Estes, 1990). For this reason, sea otter density is generally high in habitats such as kelp forests which support the animal's ability to find an abundant supply of food. In contrast, sea otter density is low in areas where prey is scarce, or where obtaining food is energetically costly.

Estuaries are highly productive environments which provide abundant food resources to a variety of marine and brackish water organisms. In particular, estuaries provide abundant clam beds and a variety of soft sediment prey items, which are an integral part of the sea otter diet in several coastal locations along the current sea otter range (Kenyon, 1969; Wild & Ames, 1974; Miller *et al.*, 1975; Stephenson, 1977; Calkins, 1978; Estes *et al.*, 1981; Garshelis, 1983; Estes & Van Blaricom, 1985; Kvitek & Oliver, 1988).

Before exploitation, sea otters likely occupied many of the estuaries along the California coast, and probably throughout their range. During their decline to near extinction, sea otters abandoned many of their habitual feeding territories, including estuaries. Elkhorn Slough, an estuarine area located at the center of Monterey Bay, California is currently the only estuary throughout the sea otter range where otters occur. This area has been seasonally occupied by small numbers of sea otters since 1984 (Anderson & Kvitek, 1987). Elkhorn Slough, therefore, provided a unique opportunity to study sea otters in an estuarine habitat.

Since its first invasion by sea otters, the slough has been predominantly a male area (Kvitek *et al.*, 1988; Kvitek & Oliver, 1988; Jameson, 1989). This is not surprising, since male otters are the first to colonize new territories, and are mainly found at the outskirts of the population range.

Methods

Study area

Elkhorn Slough lies in the middle of Monterey Bay, and winds approximately 11 km inland from the mouth of Moss Landing harbor (Fig. 1), one of the largest wetlands along the California coast. It is considered a seasonal estuary, mostly influenced by tidal action and marine related cycles, and

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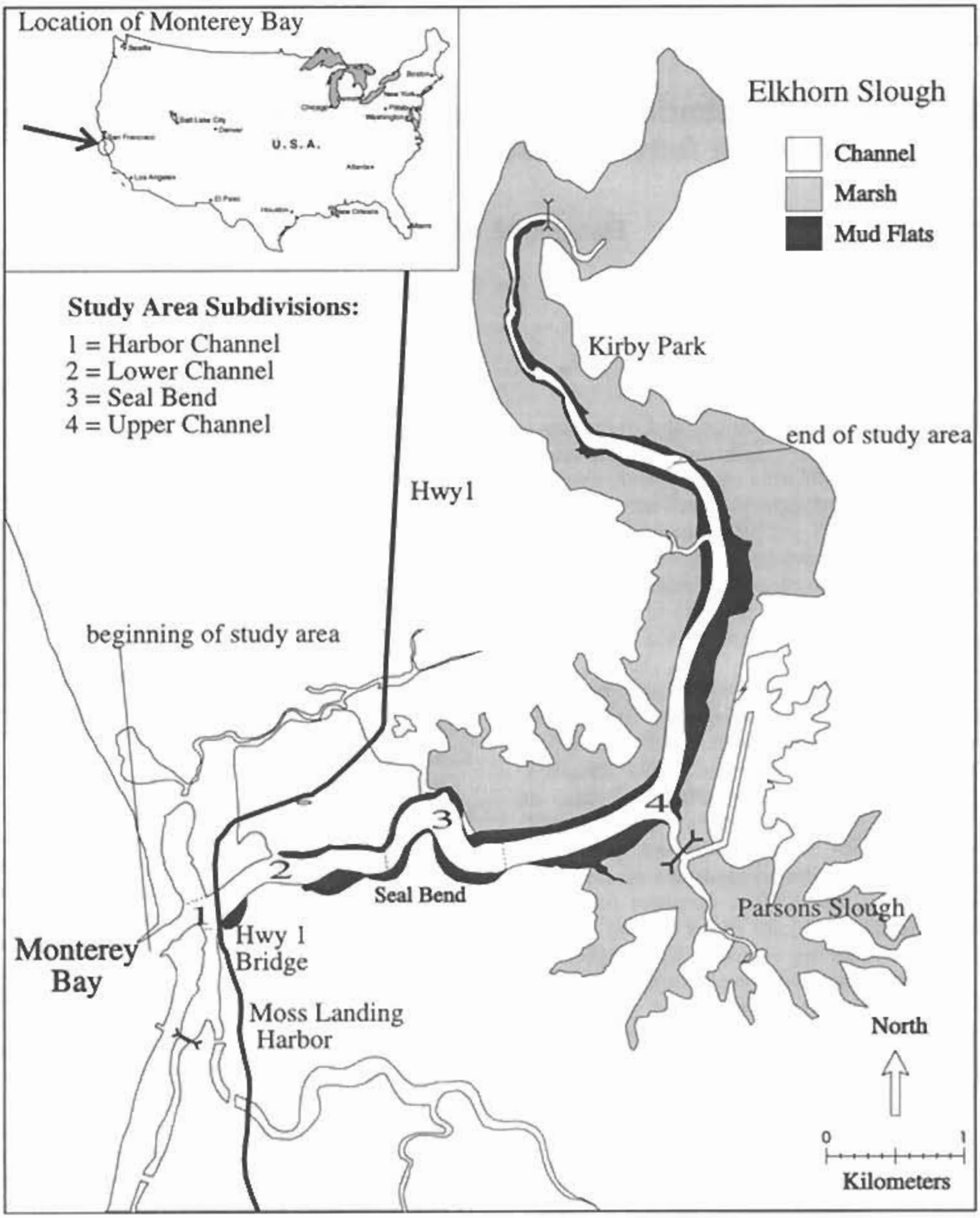

Figure 1. Map of the study area.

receives freshwater input during the rainy season (Silberstein & Campbell, 1989).

The study area was 1.3 km^2 (6.5 km long and 0.2 km wide) between the Moss Landing harbor entrance and Kirby Park. The main channel in Elkhorn Slough was subdivided into four areas having distinctive features: (1) the harbor channel (HR, 0.1 km^2); (2) the main channel (MC, 0.3 km^2); (3) Seal Bend (SB, 0.2 km^2); and (4) the upper channel (UC, 0.7 km^2, Fig. 1).

Moss Landing harbor channel is more exposed to tidal flux, wave action and boat traffic, and has a maximum water depth of approximately 15 m. It connects directly to Monterey Bay and is surrounded on both sides by Moss Landing harbor. The narrow (approximately 200 m) main channel

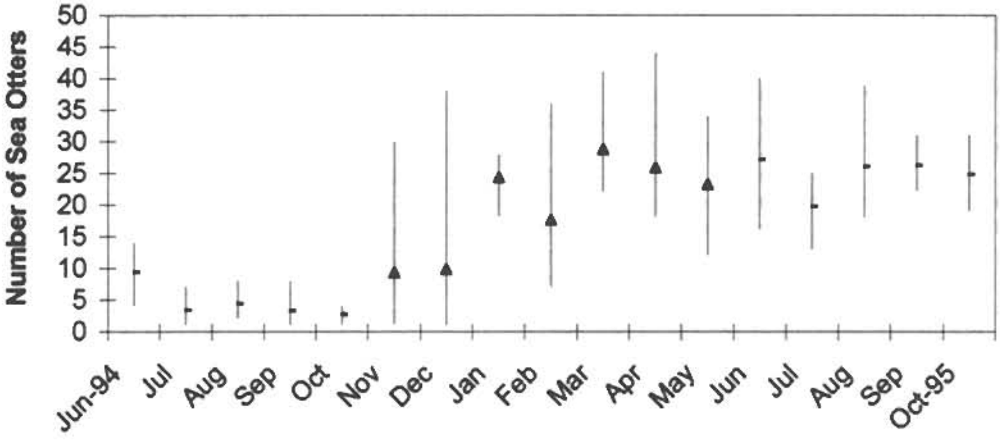

Figure 2. Minimum, maximum, and mean monthly abundance of sea otters obtained by including Elkhorn Slough Safari data collected between November 1994 and May 1995 (88 surveys, triangles) with samples collected during the current study (June–October 1994 and June–October 1995, 66 surveys, squares).

starts past the California Highway One bridge and is surrounded by steep banks which experience erosion due to tidal currents (Crampton, 1994). Boat traffic here, as well as in the rest of the study area, is limited to small boats and kayaks. Depths range from 1 to 6 m depending on the tide. Oceanic influence is pronounced and wind and currents can be strong. At Seal Bend the slough is slightly wider and curves. Waters in this area are protected by the high banks from northwesterly winds, the prevalent winds in Monterey Bay, and currents tend to be slower. Water is shallow (1–4 m) and eelgrass (*Zostera marina*) forms dense mats, which are not found elsewhere in the slough. The upper channel connects to a myriad of tributary channels and tidal flats rimmed by pickleweed (*Salicornia virginica*). Water depth is between 1 and 2 m. Because the upper channel is the area farthest away from the ocean, fresh and saltwater take turns influencing its patterns, depending on the season. A slow transition between marine and more brackish water benthic infauna occurs within this area.

Sampling methods

Sixty-six daytime boat-based surveys and three night-time surveys were conducted in Elkhorn Slough: 35 daytime surveys between June and October 1994, and 31 daytime and three night-time surveys between June and October 1995. Date and time of surveys were chosen using a random number generator. Surveys were conducted at all tidal heights, but were limited to fair weather conditions and optimal visibility when possible. The boat was driven at a speed between 2 and 4 knots along the middle of the slough channel. Surveys departed from Moss Landing harbor, and ended near Kirby Park, 6.5 km inland (Fig. 1).

Three night-time surveys were conducted in 1995 to determine their feasibility and to examine whether sea otters spent the night in the slough. Observations at night were conducted with the aid of a spotlight. Only an approximate number of animals present could be determined with this method, since the probability of missing an animal was high. Data recorded at night were limited to counts. The spotlight was directed at the animals for only a few seconds to avoid startling them and to minimize disturbance.

Daytime surveys were used to determine abundance and distribution patterns. When a sea otter was observed, time and location were noted. Degree of grizzling, sex, status (adult or pup), behavior at detection, and number of otters in a raft (if a raft was observed) were determined.

Because of progressive pigmentation loss in the guard hairs of the head, neck, shoulders and chest with age, sea otters exhibit various degrees of grizzling. Amount of grizzling of the head was used to determine the relative age group of an individual, the presence of white fur being more prevalent in older animals (Steller, 1751; Barabash-Nikiforov *et al.*, 1947; Jones, 1951; Kenyon, 1969; Estes, 1980; Garshelis, 1984). Based on this information, otters in Elkhorn Slough were classified as having a low or 'brown', medium or 'golden', high or 'white' head.

Otters become sexually mature at approximately six years of age (Green, 1978; Garshelis, 1983). Garshelis (1984) found male otters with a white head to be at least six years or older. Therefore, the number of white headed males counted in the slough was considered approximately equivalent to the number of breeding age males. Garshelis (1984) found the correlation between white headed females and age to be good for females nine years or older.

A white head in females was therefore considered an indicator of old age rather than of breeding status.

Presence of a penile bulge was used to detect males, and presence of a pup, or the clear presence of vulva and nipples indicated a female (Estes *et al.*, 1982). If no sex determination could be made because of distance, glare, or because the animal's behavior did not allow a clear view of the genital region, the individual was classified as undetermined. Only otters determined to be under the continued supervision and care of an adult identified as the mother were classified as pups. All other individuals were considered adults.

Behavioral states were determined at the time an animal was first sighted to avoid potential effects of boat disturbance. Six behavioral states were identified, including resting, foraging, traveling, grooming, mating, interacting, and responding to the boat. These behavioral states, except for responding to the boat, have been described for sea otters by Estes (1977), and Shimek & Monk (1977). A response to the boat was defined as a sudden change of behavior followed by a sudden dive. If an animal was foraging an effort was made to identify prey items.

Each otter was observed at a distance for a period long enough to obtain all the necessary information. No more than three attempts were made to move closer to the animal with the boat. Occasionally, animals disappeared from view before all the information could be collected, or were too distant to assess their sex and head color.

Statistical differences were tested at a 0.05 significance level unless otherwise stated. Samples were tested for deviation from normality before choosing the proper statistical test.

Results

Abundance and distribution

Udevitz *et al.* (1995) questioned the effectiveness of boat-based surveys in detecting sea otters in a given area. Sighting conditions and boat avoidance were found to be important factors in biasing population estimates of sea otters using strip transect methods. Although detection probability was not available for our study, we assumed that it was close to 1.00 because: (a) the channel within the survey area is approximately 200 meters wide or less. Therefore the study area boundaries are visible at all times, (b) the boat proceeded slowly enough (<4 knots), such that each segment surveyed could be observed for a period longer than an average sea otter dive.

During daylight surveys, 957 otters were counted ($n=146$ in 1994, $n=764$ in 1995). Maximum number of individuals counted during a single survey was 40 on 9 August 1995. There was a significant difference in average sea otter abundance in Elkhorn Slough between 1994 and 1995 ($u=1$; $P<0.001$), mean number of otters in 1995 (mean ± Std = 24.6 ± 5.7) being almost six times greater than in 1994 (mean ± Std = 4.2 ± 3.1).

Table 1. Sea otter densities (otters/km^2) for each of the four Elkhorn Slough areas in 1994 and 1995. Densities are expressed as mean ± Std

	1994	1995
Moss Landing harbor	4.41 ± 7.05	23.87 ± 20.93
Mid channel	3.43 ± 4.06	12.04 ± 9.53
Seal Bend	10.29 ± 14.97	65.48 ± 32.52
Upper channel	1.09 ± 1.76	7.83 ± 7.57
Entire study area	3.57 ± 2.11	19.07 ± 2.24

Abundance data covering the period July 1994 to September 1995 were obtained from the operator of the Elkhorn Slough Safari, a tour boat regularly covering the same sampling area. When abundance data from the present study were available for the same month, averages from the two censuses were in good agreement. Therefore, Elkhorn Slough Safari data from November 1994 to May 1995, including 88 otter censuses, were used to obtain continuous monthly abundance estimates from June 1994 to October 1995 (Fig. 2). According to the available estimates, immigration of sea otters in the slough occurred between December 1994 and January 1995.

Because of the significant difference in number of otters between 1994 and 1995, data were tested separately for each year. The otter population in Elkhorn Slough was considered at low-density in 1994 (3 otters/km^2), and at high-density in 1995 (19 otters/km^2; Table 1).

Overall, sea otter abundance was analyzed for time and tide variation (Fig. 3). Three time intervals corresponding to morning, midday and afternoon (06:00 to 10:00, 10:00 to 14:00, 14:00 to 18:00), and two tidal cycles (ebb and flood) were considered. In 1994 number of otters fluctuated from no animals to a maximum of 14. No effect of tide ($h=3.11$, $0.05<P<0.10$), time of day ($h=1.11$, $0.50<P<0.75$), and no combined effect ($h=2.95$, $0.25<P<0.10$) was detected. In 1995 otter abundance fluctuated from 13–40 animals. Again no effect of tide ($h=0.195$, $0.5<P<0.75$), time of day ($h=1.37$, $0.5<P<0.75$) or combined effect ($h=3.196$, $0.10<P<0.25$) was detected. Non-significant effects of tide and time of day on otter abundance could have resulted from small sample size. In addition, the necessity to lump time and tide interval haphazardly may have biased conclusions. In contrast, a lack of tidal and temporal effects suggests that the majority of the

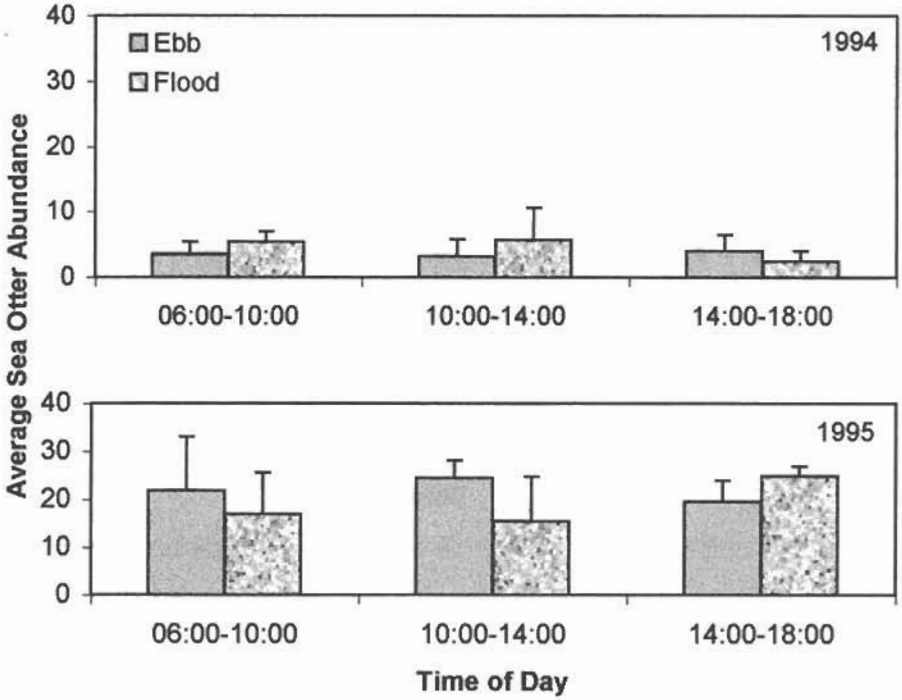

Figure 3. Mean sea otter abundance in Elkhorn Slough with tide and time of day in 1994 and 1995.

animals remain in the slough throughout the day and that movements within the slough may be more important than movements to and from the ocean.

Although no significant difference in sea otter density by location was found in 1994 (Kruskal-Wallis: 7.466, $P=0.058$), the probability value was very close to the chosen significance level. Density at Seal Bend in 1994 was slightly higher than in all other locations. A significant difference was found for 1995 (Kruskal-Wallis: 65.62, $P<0.001$), with significantly higher density found at Seal Bend (non-parametric Tukey-type multiple comparison, Table 1).

During both years, distribution at Seal Bend was clumped, and animals were generally found in one or two large rafts. Raft position was predictable, being generally 30 to 50 m offshore in a very shallow (<1 m deep) area of Seal Bend over a large patch of eelgrass. Compared to the rest of the channel this area is protected from heavy tidal flow and away from the path of boat traffic.

In 1994 otters were never sighted inland of Parsons Slough, located in the lower portion of the upper channel. In 1995 otters moved farther inland, approximately 1 km past Parsons Slough (Fig. 1). Although side channels of Elkhorn Slough were not sampled during the study, the presence of otters in these areas has never been reported despite heavy kayak traffic. In contrast, otters occasionally forage and rest amidst anchored vessels in Moss Landing harbor.

Sex and age ratios

Sex was determined for 449 animals ($n=109$ in 1994, $n=340$ in 1995). Male to female ratio was unequal (4:1 in 1994, $\chi=38.76$, $P<0.001$ and 11:1 in 1995, $\chi=233.89$, $P<0.001$), males being significantly more abundant than females in both years (Table 2).

Table 2. White headed versus non-white headed males and females in the Elkhorn Slough sea otter population in 1994 and 1995. Percentages are indicated in parenthesis

		1994	%	1995	%
Males	Non-white	59	(68)	278	(89)
	White	28	(32)	33	(11)
	Total	87		311	
Females	Non-white	22	(100)	21	(72)
	White	0	(0)	8	(28)
	Total	22		29	

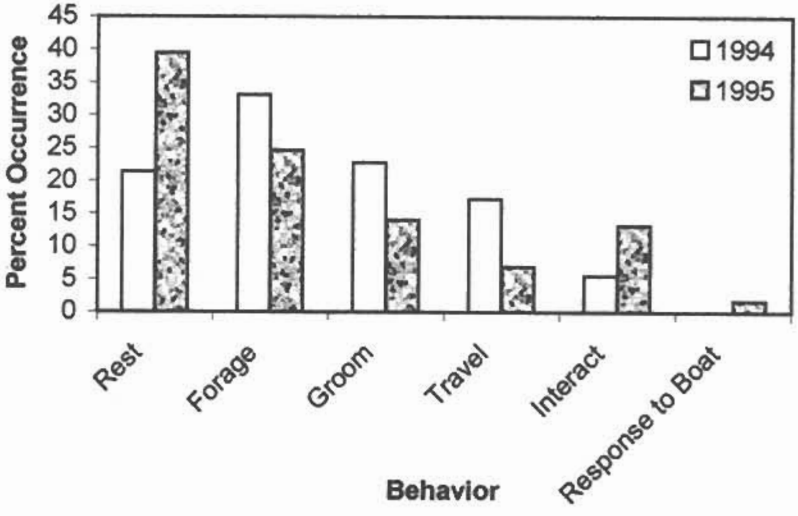

Figure 4. Frequency of occurrence of raft size classes in Elkhorn Slough in 1994 and 1995.

Males are generally easier to identify than females unless a pup is present. No mother/pup pairs were ever sighted in Elkhorn Slough throughout the study. Despite the potential bias toward males, (for both years combined) an otter was classified as undetermined because of doubts about its sexual identity only 5% of the time. In all other instances, animals were classified as undetermined because they could not be approached. It is therefore unlikely that undercounting of females played a significant role in the results obtained.

Twenty-four percent of the population was classified as highly grizzled (white muzzle) in 1994, and 10% in 1995 (Table 2). A higher proportion of white headed (or sexually mature) males was present in 1994 than in 1995. In fact, the number of white headed males varied little considering the increase in abundance of otters between years. No old females were found in 1994 while 8 were counted in 1995 (Table 2).

Behavior

Frequency of occurrence of sea otter behavior was not independent of year sampled (χ=43.779, P<0.001), therefore the two years were not pooled. Behavioral budget was expressed as a percent of the total (Fig. 4). During both years resting, foraging and traveling were the dominant behaviors, accounting for 70% or more of the activity budget. Occurrence of resting was significantly different between years (arcsine transformation; $|t| \pm =2.18$, $P=0.03$), while no significant difference in foraging and traveling was found (arcsine transformation; foraging: ($|t|=0.64$, $P=0.52$; traveling: $|t|=0.66$, $P=0.51$).

Resting was observed in rafts or individually. Several individuals were seen anchoring themselves with eelgrass, a sublittoral plant abundant at Seal Bend, with Enteromorpha, a unicellular alga which forms long strands, or to floats by wrapping the float line around their neck and shoulders.

Foraging otters predated upon a variety of species in Elkhorn Slough: Washington clams (*Saxidomus nuttallii*; 55%), gaper clams (*Tresus nuttallii*; 22%), echiuroid worms (*Eurechis caupo*; 11.1%), basket cockles (*Clinocardium nuttallii*; 7.4%) and crabs which were not distinguished by species (3.7%).

Grooming generally occurred after foraging bouts, just before resting. Grooming also occurred within rafts and was generally exhibited by several animals at the same time. Although the percent occurrence of the two patterns was not quantified, solitary grooming seemed to occur more frequently than grooming within a raft.

Mating was never witnessed during sampling surveys, although it was reported by a tour operator in Elkhorn Slough. Other types of social interactions, which often appeared like mocked copulations, occurred among groups of 2–3 animals and were characterized by bouts of high energy activity such as chases, rolls, bites, and frequent, shallow dives. Less energetic interactions occurred within a raft when a newcomer to the raft would circle the group of otters and nuzzle individuals within the raft before positioning itself among them.

Responses to the boat generally occurred if the boat traveled within 10 m of a raft or a foraging individual. Solitary resting otters did not respond until the boat approached within 5 m or less.

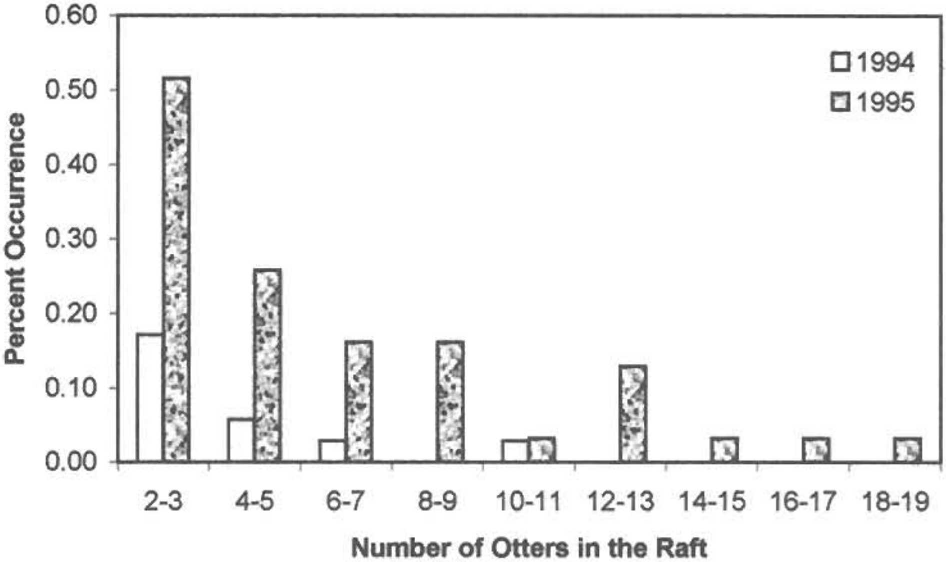

Figure 5. Percent occurrence of six behavioral states in a population of sea otters in Elkhorn Slough.

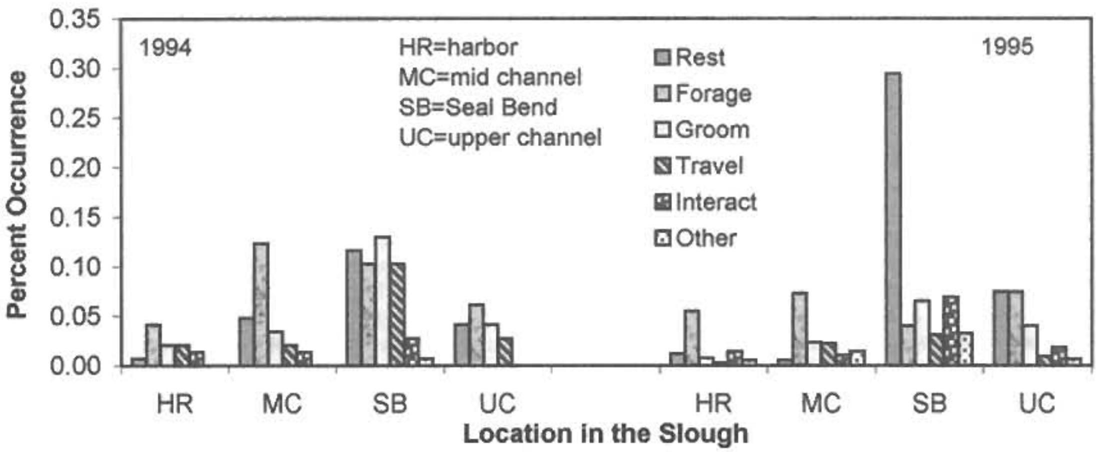

Figure 6. Percent occurrence of behavioral states by category within the different areas of Elkhorn Slough in 1994 and 1995.

A raft was defined as a group of two or more animals resting in close proximity (<5 meters). Raft size distribution favored smaller rafts (2–3 individuals) during both years (Fig. 4). The largest documented raft was 18 individuals. Mean raft size almost doubled in 1995 (mean ± Std = 3.90 ± 2.56 in 1994; 6.12 ± 4.33 in 1995; t=2.12, P=0.045), although variability in size was high. Rafts were rare in 1994 (23% of the surveys) and common in 1995 (74% of the surveys). Seventy-seven percent of the rafts (pooling both years) were found at Seal Bend, 17% in the upper channel, 6% in the middle channel, and none in the harbor.

In 1994 behavior was independent from location in the slough (χ=16.86, $0.05<P<0.10$), each behavior occurring with the expected frequencies at each location. In 1995 frequency of occurrence of behaviors was dependent on location in the slough (χ=226.21, P<0.001; Fig. 6). The deviation from the expected frequencies could be entirely explained by foraging and resting patterns. Foraging occurred with higher than expected frequency in the harbor and middle channel and with lower than expected frequency at Seal Bend. Resting occurred almost exclusively at Seal Bend, and was almost absent in the harbor and middle channel. Otters resting in the upper channel were found mostly at the boundaries between the upper channel and Seal Bend. Often rafts at Seal Bend drifted with the incoming tide into the upper channel boundary.

Night-time surveys

Elkhorn Slough is very narrow, except at its mouth, and both banks can be easily seen in the dark on a clear night. This situation provides a unique opportunity for night-time observation of sea otters at close range. Some of the problems encountered during our test surveys were a high probability of missing animals not illuminated by the spotlight, reduced observer depth perception in the dark, and limitations of the wide beam spotlight. Some of these problems could be resolved by the availability of better equipment and repeated sampling, and by the use of a night scope.

Sea otters were present in Elkhorn Slough at night although conclusions about presence/absence patterns are limited because of sample size. Of the three night-time surveys, only one (31 August 1995) was successful, and 18 sea otters were counted between 01:00 and 03:00. Behavior was determined for 12 of these animals as 1 foraging, 4 grooming, 5 resting, and 2 interacting. All the animals detected, except one, were located between Seal Bend, and the upper channel, while the remaining animal was observed in the harbor. The 31 August 1995 night count was followed by a night watch from the boat, anchored at the entrance of the slough's main channel, where otters moving into the slough or out into the harbor could be easily detected. The purpose of the watch was to determine the occurrence of movements of otters to and from the open ocean through the night or early in the morning. No otters were seen throughout the watch. An early morning count on 1 September 1995 detected 18 otters in the slough, the same number present during the night survey. Although the correspondence in abundance is likely a coincidence, the result suggests some site fidelity for Elkhorn Slough sea otters.

Although sea otters were not visually detected at night on 3 August 1995, the sound of foraging animals pounding rocks against their chests was distinctively heard throughout the survey. By this indirect evidence it was inferred that at least some otters were present in the slough that night and that foraging occurred.

Tagged otters

Tagged otters were encountered during 18 surveys in 1995 (58% of the surveys). Of these sightings, one otter, a juvenile male tagged and released by the Monterey Bay Aquarium was seen on 15 occasions (83% of sightings) between June and October 1995. Maximum number of tagged animals observed was 2 during two surveys in October 1995. The second animal was the same on both occasions and was also a juvenile male released by the Monterey Bay Aquarium.

Discussion

Although Elkhorn Slough is currently the only estuarine area used by otters throughout their range, the implications of their presence in such an environment may be important for the California sea otter population. A few sea otters have been using Elkhorn Slough as a foraging ground since 1984 (Anderson & Kvitek, 1987; Kvitek *et al.*, 1988), but only as recently as November 1994 did sea otters move into the slough in significant numbers. It is difficult to determine the reasons for this migration. Both in California and Alaska, male otters are the first to colonize unoccupied habitats (Jameson, 1989), and the occupation of Elkhorn Slough by male otters may reflect range expansion of the Monterey Bay population.

When male sea otters first occupied Elkhorn Slough in 1985, their activity in this area was reported to be seasonal, possibly reflecting some seasonality in breeding activity (Anderson & Kvitek, 1987; Kvitek *et al.*, 1988; Kvitek & Oliver, 1988; Jameson, 1989). In fact, mating of territorial males in California may increase from September to November (Wild & Ames, 1974). Results from the current study do not support this observation. Between 1994 and 1995, the proportion of white headed or older animals decreased, and the ratio of males to females increased (Table 2). Such patterns suggest that the majority of the otters moving into the slough in 1995 were juvenile males. It is therefore unlikely, at least for the sample period, that mating activity was a motivation for otters to move out of the estuary.

While female otters generally recruit into established female areas, which overlap areas occupied by a territorial male, non-territorial and juvenile male otters have to find new suitable areas to survive. Male groups are commonly found at the outskirts of the sea otters' range in California, and juvenile males may occur well offshore in exposed areas (Riedman & Estes, 1990). In Alaska, male groups are generally located in areas with more abundant food resources, but less protected from stormy weather than female areas (Garshelis *et al.*, 1984). Therefore, juvenile males experience high mortality rates, being more exposed to heavy storms and predation, mainly by sharks (Riedman & Estes, 1990; Ames *et al.*, 1996; Thomas & Cole, 1996).

Elkhorn Slough provides an area of refuge from these natural phenomena and a rich foraging ground, enhancing the probability of survival for young and maturing male sea otters. In support of this role of Elkhorn Slough, researchers at the Monterey Bay Aquarium have re-located a number of their rehabilitated and released pups in this area, whose fate was unknown.

For a population of only 2400 otters in California (U.S. Fish and Wildlife Service, 1996), survival of each individual is a critical factor to population growth. By providing protection and food resources, Elkhorn Slough may play an important role in this process with respect to male sea otters, but females were not so abundant.

Juvenile females have been proposed as the most vulnerable portion of the population, since they experience the highest mortality rate among sea otter age classes (Siniff & Ralls, 1991). This has been attributed to competition for food resources with adult females and territorial males (Siniff & Ralls, 1991). Based on the previous observations, Elkhorn Slough may favor higher male survival rates in California. Differential survival may eventually create a shortage of breeding age females. In such circumstance, the role of Elkhorn Slough in protecting and enhancing otter survival will benefit the overall growth of the otter population only if females also start utilizing its resources.

The sudden and sharp increase in sea otter abundance in the slough occurred between November 1994 and January 1995, in a period when winter storms hit the California coast with high frequency and strength. Combined with other unknown factors, these storms may have induced juvenile males normally living in exposed coastal areas to move into the slough's sheltered waters.

In the estuary, sea otters found a very rich feeding ground characterized by the presence of abundant clam beds, especially Washington and gaper clams. (Kvitek *et al.*, 1988; Jolly, 1996). Otters in Elkhorn Slough were shown to prefer mid-sized clams. The bigger the clam, the deeper the burrow, the greater the amount of sediment to be excavated to obtain it, and hence, the greater the otter's energy output (Kvitek *et al.*, 1988). Preferential predation on mid-sized clams provides an energetic compromise, while larger clams are afforded some size shelter from otter predation. This situation may contribute to a more long term availability of food to sea otters in Elkhorn Slough, as opposed to other locations, where shallower burrowing species dominate (Wendell *et al.*, 1986; Miller *et al.*, 1975; Stephenson, 1977).

Factors such as prey abundance, shelter from storms and predators, and the tendency of male sea otters to congregate in large rafts, contributed to the high densities recorded in Elkhorn Slough. These densities are higher than those reported by De Master *et al.* (1996) for sandy habitats (<1 otter/Km^2) along the California coast. It is therefore important, when evaluating habitat availability for sea otters, to consider estuarine habitats separately from other soft bottom communities, and allow for potentially higher carrying capacity. What remains to be evaluated is how stable these high densities can be over time, since a recent study of foraging activity of sea otters in Elkhorn Slough (Jolly, 1997) predicted a potential decline of the slough prey abundance because of otter predation.

Sea otter densities within the slough reflect the differential use of each portion of the channel. In both years, but especially in 1995, otter distribution was centered around a resting location at Seal Bend. This location was the focal point of sea otter activity throughout the day. Other authors reported the existence of defined subdivisions in sea otter territories, with the presence of resting and foraging areas (Loughlin, 1980; Riedman & Estes, 1990). In a kelp forest, resting and foraging areas are generally close together and sometimes overlapping. Kelp is an ideal anchorage for resting otters and a protection from predators, while abundant foraging grounds lie below. In areas where kelp is absent, otters are exposed to wind, currents and predation. An ideal resting area, in the absence of kelp, is one that is sheltered from wind, waves, currents, and predators and that provides some form of 'anchorage'. Seal Bend meets all of these requirements by providing a thick bed of eelgrass, which otters use to wrap themselves as they rest, and a natural bend which slows the current and protects from the wind. Rafts at Seal Bend appeared to serve as the center of activity. Rafting otters acted in unison, alternating between alert states and periods of complete rest.

The absence of sea otters beyond Parsons Slough, approximately 4 km inland, is indicative of the change from an estuarine area where oceanic influence predominates, to a more brackish water environment. In particular, the gaper and the Washington clam are most abundant near the slough's mouth and are replaced by dense beds of the rough piddock clam (*Zirfaea pilsbryi*) around Seal Bend (Oliver & Slattery, 1976; Oliver *et al.*, 1977; Nybakken *et al.*, 1977). This change in prey availability may be an important factor in determining how far within the estuary sea otters venture. Indeed, foraging was more frequent in the harbor and mid channel, where the most abundant clam beds are located. Nonetheless, some sea otters were seen foraging on clams even in the upper reaches of the slough. It is possible that erosion and subsequent widening of the banks is bringing salt water farther up into the channel, thus creating the conditions for the development of clam beds farther inland than where they were previously found. If this is the case otters may continue to move farther inland into the slough.

Many authors reported night-time activity budgets of sea otters (Loughlin, 1979; Riedman & Estes, 1990; Ralls & Siniff, 1990; Ralls *et al.*, 1995). In general, otters tend to exhibit at night similar behaviors as during the daytime. Preliminary results for Elkhorn Slough seem to agree with this trend, although sample size limited reliable quantitative information on behavioral budgets. Obtaining such information would help explain the relationship between resting and foraging patterns documented during daylight. Nonetheless, the presence of sea otters in the slough at night and the preliminary information on opportunistic sightings of tagged animals support the possibility of individual site fidelity to the slough.

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