

In the mid-1990's the live finfish trap fishery expanded in central California. This increase is reflected in the number of pounds of fish landed using trap gear ([Table 1](#)). Concern arose that this gear might pose a risk to sea otters since otters are known to enter and drown in other types of traps of various design ([Table 2](#)). During the same time period when the near shore finfish trap fishing was increasing, the southern sea otter population was experiencing a decline, as indicated by population surveys and an increase in strandings. Some stranded sea otter carcasses were found in the good body condition (with abundant fat) with some evidence, although inconclusive, that drowning may have been the cause of death. Anecdotal reports from more than one fisher also gave reason for concern.

With this information, it was decided that an increase in field observations of the trap fishery and experiments in a controlled setting to observe captive sea otters' reactions to and behavior around fish traps should be undertaken.

Observations Of The Finfish Trap Fishery

Although some opportunistic field observations of the near shore finfish trap fishery were initiated in 1995 by the U.S. Geologic Survey, with additional observations by California Department of Fish and Game (CDFG) in 1997, two people were hired in summer/fall 1999 to increase observation effort. However, through November 1999, only a modest number of trap observations were made, due to several reasons, and not sea otters were observed in traps ([Table 3](#)). Trap fishing effort in the southern half of the sea otter's range dropped off noticeably in 1999, possibly due to i) new restrictive fishing regulations, ii) reduced fishing success, and/or iii) gear switching by fishers. Trap fishing effort began to drop off prior to new restrictions. Reduced fishing effort also made it more difficult for the observer to locate boats fishing with traps. The reported amount of the finfish landed using trap gear in the Monterey area (within the northern half of the sea otter's range) did not decrease through 1998, but this might be at least partially due to reporting practices of the fishers. Fearing a possible change to a limited entry fishery, some fishers may report fish being caught by trap when other methods were actually used (C. Pattison, CDFG, personal communication). In any case, the trap fishery observer program in the Monterey area also experienced difficulty in finding vessels using trap gear to observe. (During frequent trips along the coast between Cambria and Monterey, B. Hatfield rarely noticed active trap boats in 1999, which were commonly observed during the previous few years.)

Trap observations did show that many rock crabs, *Cancer* sp., are frequently caught in fish traps. In addition to being frequently baited with squid, fish traps commonly have rock crabs in them – both of which are known food items of sea otters. Fishers were observed smashing their caught crabs and using them, illegally, for bait.

The most significant provision of the new regulations effective 1 January 1999, in terms of reducing the possible threat to sea otters, might be the prohibition against fishing during the hours of darkness (Appendix). Traps left in the water overnight with their doors open could be explored by foraging sea otters with little risk of getting stuck, in our view. The activity of the vessels during daylight hours, continually rechecking the traps, probably reduces the likelihood of sea otters foraging in the vicinity of the traps. Most likely as a result of this regulation, few of the trap observations in 1999 were of traps left fishing overnight ([Table 2](#)).

There are currently no regulations governing the size of the openings used on fish traps. Traps examined have had inner funnel openings of between 5 and 6 inches in diameter. Some fishers report using funnel openings of between 4 1/2 inches in diameter with a metal ring to prevent stretching of the funnel. If this type of funnel were in universal use, most if not all sea otters would likely be prevented from entering the traps. Testing is currently underway to determine what size opening the smallest sea otters that are able to dive proficiently can pass through. Recent minimum size limits on many near shore fishes (Appendix) might, however, argue against reducing funnel size on traps.

Additional restrictions on the near shore finfish fishery became effective in 1999. Beginning 1 January, a quota of 2,000 pounds of near shore rockfish landed per vessel per month was instated, and beginning 1 October, the quota was reduced to 500 pounds landed per vessel per month. Effective 1 January 2000, the limit was again reduced to 550 pounds per vessel per 2-month period. Two 2-month fishing closures within the sea otter's range became imminent: the area south of Pt. Lopez was to be closed during January and February 2000, and the area north of Pt. Lopez was to be closed during March and April 2000.

Due to a decrease in fishing effort, low observer success in locating fishing activity, recently enacted and impending fishing restrictions, the two observers were terminated in mid-December 1999.

Fish Trap Experiments

In calendar year 1999, ten different sea otters in rehabilitation at the Monterey Bay Aquarium were exposed to a baited fish traps in an experimental setting. The trap, which was commercially made, had two funnel-shaped openings with inner openings that measured 5 1/2" in diameter – a size that was observed on traps used in the fishery. For safety precautions, both funnels were removed for the trial with the first sea otter, and one funnel was removed for the first trial with the second sea otter. The openings without funnels were oval in shape and about 7 1/2" by 12" in size. Most of the sea otters were exposed to the trap for at least 60 minutes. The trap was baited with approximately 1 pound of squid (common bait used in the fishery) and 2 or 3 crabs of the genus *Cancer* (frequently caught in fish traps). The trap trials were observed remotely using a video monitor. None of the tested sea otters were injured during the experiments.

Six of the 10 sea otters exposed to the trap actively attempted to enter the fish trap ([Table 4](#)). Those exposed to the trap without one or both funnels attached (trial nos. 1 and 2a), easily entered and exited the trap. Most of the sea otters tried multiple times to enter the trap, and most seemed interested in the bait – either the crabs or the squid or both. Three otters were able to push through the funnel past their forelimbs, but then pulled back out. Two of these otters bent the wire-framed funnel edge in slightly towards the opening when they pulled out of the funnel-shaped opening. Another sea otter entered the trap completely on three occasions, and apparently could not find her way out after two entries. The trap was raised to the surface after approximately 15 and 26 seconds.

Three of the sea otters tested were characterized by aquarium staff as being, "nervous during rehabilitation". Two of these animals were among the four that never attempted to enter the trap and spent almost all of the test time swimming in circles in the tank. However, among these nervous animals was the otter that entered the trap and apparently got stuck (otter no. 9).

Our experiments have shown that many captive sea otters exhibit no reluctance to attempt to enter baited fish traps and if the openings are large enough (or the sea otter is small enough) they can and will enter these traps. Although we don't know how sea otters in the wild react when encountering trap gear, we have no reason to believe that they would behave in a grossly different manner than they do in captivity. In addition, wild otters would likely be more motivated by hunger to get at perceived bait inside.

The preliminary findings indicate that entrapment and drowning in fishing traps is a potential threat to sea otters in California. At present, the kelp forest fishery appears to be operating at a low level. However, the intensity and nature of the trap-fishing efforts require continuing scrutiny to further evaluate activities that might be ongoing further from shore and to avoid future conflicts over kelp forest resources.