

murre in central California declined dramatically due to mortality from gill nets, oil spills (including the 1984 PUERTO RICAN and 1986 APEX HOUSTON), as well as the severe 1982-83 El Nino event (Ainley and Boekelheide 1990, Takekawa et al. 1990, Carter et al. 1992). The APEX HOUSTON spill in 1986 contributed significantly to the loss of the Devil's Slide Rock colony near San Francisco (Swartzman and Carter 1991). The San Pedro and Devil's Slide rocks colonies are in close proximity and constitute the only common murre colonies between San Francisco and Monterey. This is a large portion of the range of the central California common murre population. The recolonization of abandoned common murre colonies in central California will contribute to the restoration of this seabirds' historic geographic range.

Given the current depleted condition of the central California common murre population (Ainley and Boekelheide 1990, Takekawa et al. 1990, Swartzman and Carter 1991, Carter et al. 1992, Ainley et al. 1994), extirpated colonies are not likely to be reestablished in the foreseeable future without human assistance. The San Pedro Rock colony has not recolonized over the past 85 years and the Devil's Slide Rock colony has not been recolonized in the 8 years following the APEX HOUSTON spill (Carter et al. 1992, Carter and Takekawa, unpubl. data). Similarly, the Prince Island colony in southern California has not been recolonized since extirpation in the early 1900's (Carter et al. 1992). Furthermore, all six nearshore colonies in central California have remained severely depleted since the mid-1980's (Carter et al. 1992). The reductions of the geographic range and small numbers of breeding common murres along the central California coastline increase the risk that future catastrophic events will result in extinction of the central California population.

Studies of seabird colony formation in Maine demonstrated that recolonization can be achieved using social attractants (Kress 1978, Kress and Nettleship 1988, Kress et al. 1992). The use of decoys and tape recordings has attracted prospecting seabirds, which have then bred, once a threshold group size has been reached. These techniques have assisted in the recolonization of several colonial nesting seabird species (Podolsky 1985; Podolsky and Kress 1989, 1992). These techniques have been utilized in an effort to recolonize common murres in Maine. The common murre recolonization project began when 15 life-size common murre decoys were deployed on Matinicus Rock in

summer 1992 (National Audubon Society, unpubl. data). The closest common murre nesting colony to Matinicus Rock is located approximately 75 miles east on Murre Ledge, a small Canadian island. Common murres began landing among the decoys within 2 days of starting the vocalization tapes (National Audubon Society, unpubl. data). As many as four common murres were sighted at one time among the decoys and at least two birds were present throughout May and June 1992 courting and copulating among the decoys (National Audubon Society unpubl. data). This effort has included the use of various combinations of social attractant techniques to determine the most effective combination, e.g., decoys with and without sound, sound only, decoys with sound and with and without egg decoys, and sound variations (Schubel 1993). Results indicate that a combination of visual and sound stimuli are essential to attract common murres. The highest common murre numbers and activity were observed where egg and murre decoys were accompanied by sound, and decoys were most densely arranged. The recolonization project has continued during 1993 and 1994 with promising results. Common murres continue to exhibit pre-breeding behavior (such as courtship displays, copulation, and passing of fish between potential mates), and the number of common murres attracted to the decoys has increased to approximately 25 birds (National Audubon Society, unpubl. data). However, social attraction techniques must be applied for many years before breeding begins and a self-sustaining breeding colony can be attained (Kress and Carter 1991).

In order to refine recolonization methods and evaluate their success, reference information will be needed on the reproductive biology, behavior, and phenology of common murres at an unmanipulated nearshore site in the local area. However, little information is available from nearshore colonies in central California. Monitoring attendance patterns, arrival dates, reproductive success, and behavior of breeding and nonbreeding common murres at accessible colonies in the Point Reyes area will provide a comparison to evaluate recolonization of Devil's Slide and San Pedro rocks. The Point Reyes colonies (i.e., Point Reyes, Point Resistance, Double Point, and Miller Point rocks) are the closest to the recolonization sites and should provide a reference for what would normally be expected in a nearshore common murre colony as well as a good

comparison with the recolonization site. The monitoring conducted at these unmanipulated colonies will be used to assess recolonization responses and common murre activity patterns at recolonization sites, as well as aid in supporting refinement of recolonization methods.

In addition, unique information will be needed from the common murre colony at the South Farallon Islands at Farallon National Wildlife Refuge in order to evaluate recolonization responses and refine techniques. Common murre reproductive success, diet, and breeding biology have been studied for over 20 years at the South Farallon Islands as part of long-term monitoring of seabird populations required for the Farallon National Wildlife Refuge and other research conducted by the Point Reyes Bird Observatory (Ainley and Boekelheide 1990, Ainley et al. 1994). As a result of these studies, a small number of individually marked birds of known age and sex exist at the Farallon Islands. Limited information is available concerning the attendance of breeding and nonbreeding common murres at breeding sites, especially during winter. Information obtained on individually-marked birds, where age and sex are known, would give a better understanding of expected time-in-attendance and behavior at breeding sites for adult and subadult common murres during the breeding and nonbreeding seasons. Detailed information on common murre attendance and prospecting in the winter will make it possible to evaluate the significance of winter attendance at the recolonization sites. If winter attendance is crucial to successful breeding, social attraction methods may have to be deployed for a longer period. In addition, all accessible subcolonies of common murres at the South Farallon Islands would be examined for more general attendance patterns throughout the year.

Attendance, breeding biology, and behavior will be monitored during the breeding season in marked and unmarked birds in plots at the South Farallon Islands so that recolonization responses at recolonization sites can be more effectively evaluated. Certain colonies with potential for future intensive monitoring efforts may be examined in greater detail, including reproductive success. This information will be important in evaluating and modifying the social attraction methods used at the restoration sites. Information that is only available at this larger, more accessible, and closely monitored common murre colony, including