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COMMON MURRES PROSPECTING WITHIN CORMORANT COLONIES IN DEL NORTE AND HUMBOLDT COUNTIES, CALIFORNIA, 1996 to 2004

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Between the 1940s and 1960s, common murres (*Uria aalge*) colonized or recolonized several islands in Del Norte and Humboldt Counties, northern California, during an extended period of population growth following heavy prior impacts from early settlers and native peoples (Carter and others 2001). The exact timing of these colony formations and various factors influencing them were not well documented. Since the 1st complete northern California seabird colony survey in 1979–80 (Sowls and others 1980), almost annual June aerial photographic surveys have been conducted of breeding colonies of murres and cormorants (Brandt's and double-crested, *Phalacrocorax penicillatus* and *P. auritus*) in northern California (Briggs and others 1983; Takekawa and others 1990; Carter and others 1992, 1995, 1996, 2001; Capitolo and others 2004a; US Fish and Wildlife Service [USFWS], unpubl. data). While several murre colony formations have been documented in Mendocino County primarily with aerial photographs since 1979–80, no colony formations have been documented in Del Norte and Humboldt Counties. In 1996–2004, we documented (1) the 1st known attendance by murres on 4 offshore rocks in Del Norte County (High Bluff South, White Rock, Prince Island, Unnamed Small Rocks); (2) continued sporadic attendance by murres without recent confirmed breeding on 2 other offshore rocks in Del Norte County (Rock R and Sister Rocks); and (3) the 1st recent attendance by murres on 1 offshore rock in Humboldt County (Sea Lion Rock). In this note, we describe these observations of prospecting murres, show relationships with nesting cormorants, and discuss their potential importance to understanding possible future colony formations. We use the term ''prospecting'' to describe murres attending potential breeding habitats on land where murre breeding has not been recently documented, though we usually did not know what activities occurred on land nor how long murres were present on land. Because murres do not attend such habitats without a breeding-related purpose, we consider that prospecting for a breeding site or mate are the chief reasons for such attendance (see later discussion). However, without marked birds or access to colonies, source colonies for these prospecting murres cannot be specifically determined.

Observations of Prospecting Murres

On 1 August 2003, a murre in alternate plumage was present from 11:20 to 12:00 (PDT) within a Brandt's cormorant colony on a small offshore rock (Subcolony 2) within the High Bluff South colony (41°30′29″N 124°04′40″W; USFWS Colony Number 325-061; Fig. 1). PJC noted the arrival of the murre on a steep slope on the east side of the rock while observing the cormorant colony through a spotting scope (Capitolo and others 2004a). Within 5 to 10 min, it had moved about 2 m lower to an area with a small wall separating 2 groups of nesting cormorants where it remained for 20 to 25 min. From 11:30 to 11:45, it stood with its wings hanging down in brooding posture. While in this posture, it pointed its bill to the ground, moving its head from left to right, apparently inspecting the ground below. At 11:45, it moved about 0.5 m higher on the rock after a cormorant jabbed its bill toward the murre. From 11:45 to 12:00, the murre stood upright in alert posture before taking flight and departing from the rock. About 35 cormorant nests remained on 1 August, most attended by 1 adult with 1 to 4 large chicks. Ten to 20 cormorants

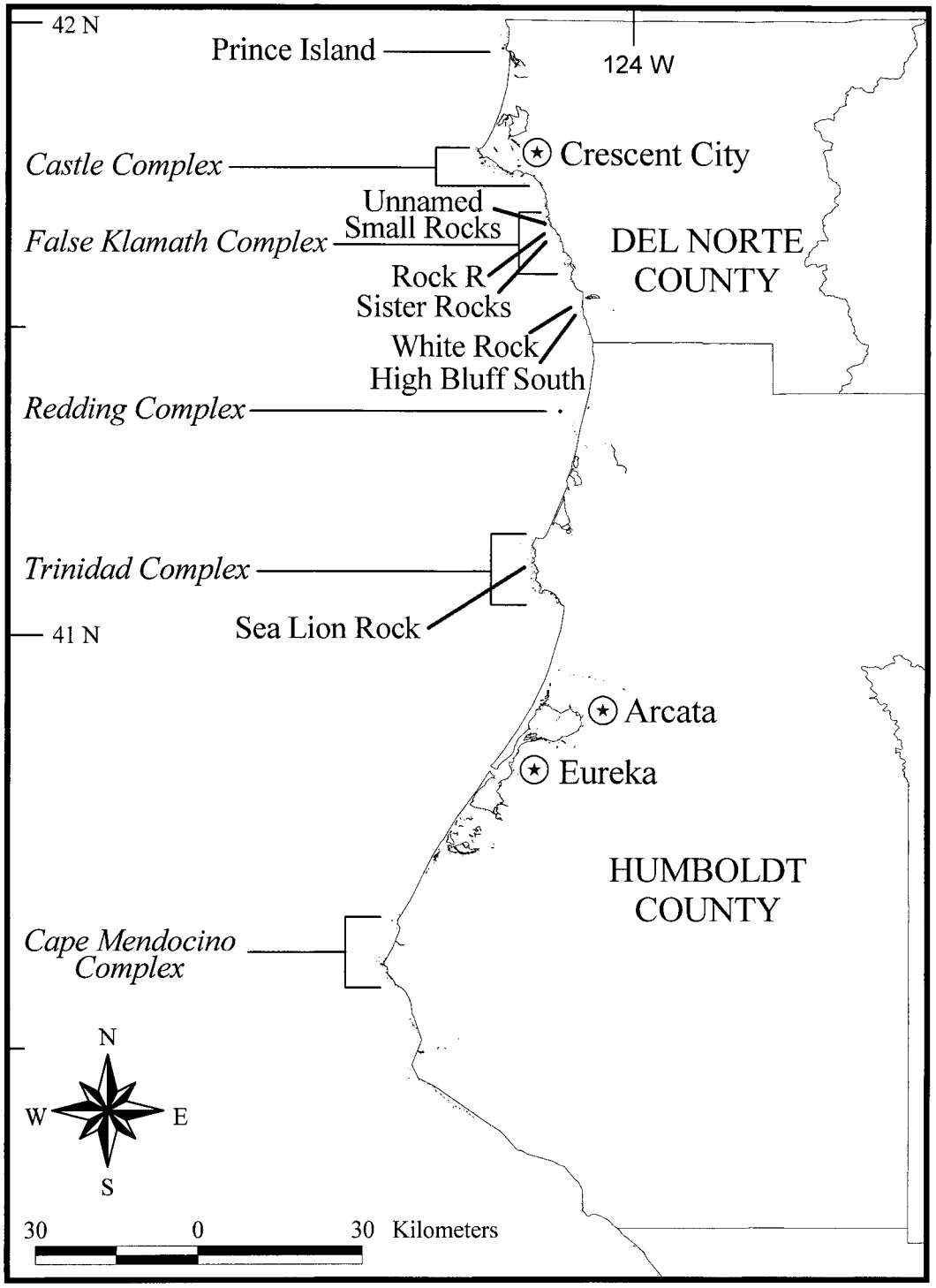

FIGURE 1. Locations of common murre colony complexes and seabird colonies in northern California where prospecting murres were noted in 1996–2004.

also roosted lower on the rock. During this time period, several groups of >20 murres flew in close proximity to the rock, and 5 parent-chick pairs were also noted at sea within 500 m of the rock.

After this observation, PJC inspected flight-log datasheets and the archived but uncounted aerial photographs (slides) of High Bluff South taken in 1996–2004 to determine the presence or absence of murres. On 2 June 1998, 16 murres in alternate plumage, some in incubation postures and some standing, were clumped tightly together on Subcolony 2 with nesting Brandt's and double-crested cormorants. The discovery of murres attending an active cormorant colony at High Bluff South in 1998 and 2003 prompted additional searches of archived aerial photographs of cormorant colonies in Del Norte and Humboldt Counties to find small numbers of murres mixed in with nesting cormorants. At neighboring White Rock (41°30′56″N 124°05′06″W; USFWS Colony Number 325-012; Fig. 1), located <1.5 km N of the High Bluff South colony, 1, 2, 4, 6, and 2 murres in alternate plumage attended the same location at the north end of the rock on 7 June 1999, 15 June 2000, 5 June 2001, 6 June 2002, and 1 June 2004, respectively. In each of these 5 y, murres were among hundreds of nesting Brandt's cormorants, which annually breed there. Murres were not found among smaller numbers of nesting double-crested cormorants, which also regularly breed there. In 1999, the lone murre was standing, but in all other years murres were clumped together, mostly in incubation postures. Both High Bluff South and White Rock occur outside of current murre colony complexes, but within 10 to 20 km of the False Klamath and Redding murre colony complexes (Fig. 1). Carter and others (2001) defined murre colony complexes as adjacent individual islands, rocks, and mainland habitats with breeding murres within about 5 km of each other, reflecting major assemblages of breeding murres within geographic areas.

On Prince Island (41°57′04″N 124°12′41″W; USFWS Colony Number 325-003; Fig. 1), 1 murre in alternate plumage stood at the edge of a Brandt's cormorant nesting area on 15 June 2000. Prince Island also occurs outside of a current murre colony complex, but within 25 km of the Castle murre colony complex (Fig. 1) in California and other colonies in Oregon (Carter and others 2001). Hundreds of nests of Brandt's and double-crested cormorants also annually occur at this colony. On Unnamed Small Rocks (41°42′00″N 124°08′00″W; USFWS Colony Number 325-046; Fig. 1), 5 murres in alternate plumage were in incubation postures among about 30 double-crested cormorant nests on 8 June 1999. Only a small nesting colony of double-crested cormorants (<50 nests) occurs irregularly on these rocks. Unnamed Small Rocks occurs within 1 to 2 km of other colonies in the False Klamath murre colony complex (Fig. 1). On 4 June 1998, 1 murre in alternate plumage stood amid 19 double-crested cormorant nests at Sea Lion Rock (41°05′40″N 124°09′49″W; USFWS Colony Number 325-018; Fig. 1). Murre breeding was previously recorded at Sea Lion Rock prior to the 1950s, before a portion of the rock fell into the ocean and altered breeding habitats (Carter and others 2001). Sea Lion Rock occurs within the Trinidad murre colony complex, 1 km from the nearest colony (Fig. 1).

Also within the False Klamath murre colony complex, murres had previously been noted at Rock R (41°40′00″N 124°08′30″W; USFWS Colony Number 325-048; Fig. 1) in certain years (1980, 1989, 1994), but breeding had not been confirmed. At adjacent Sister Rocks (41°39′29″N 124°08′47″W; USFWS Colony Number 325-009; Fig. 1), small numbers of murres reportedly bred in 1980–82, but breeding has not been confirmed since, though attendance was noted in 1989 and 1995 amid nesting Brandt's cormorants (Carter and others 2001). Because prior breeding or attendance by murres had occurred at these colonies, murres and cormorants were counted in aerial photographs of these colonies in 1996–2003 in a separate study (Capitolo and others 2004b). Murres attended Rock R in 1996 and 2000 amid nesting Brandt's cormorants. Breeding may have occurred in 1996 when 73 murres were present, many in incubation postures. However, only 5 murres (4 standing), which did not appear to be breeding, were noted in 2000. Brandt's cormorants do not nest annually at Rock R, and murres have been noted there only in certain years when cormorants did nest. Attendance by 3 to 7 standing murres was also noted on a cliff ledge at Sister Rocks in 1996–97 and 1999, though no cormorants nested there in 1996–2003. Disturbance by boats may

have led to colony abandonment or lack of breeding at Sister Rocks (Carter and others 2001). However, definitive evidence of breeding (observations of eggs, chicks, or fish-holding adults) was not obtained in 1980–82, and some doubt exists whether murres bred. The strongest pieces of evidence for breeding at Sister Rocks were 30 ''brooding birds'' observed on 20 June 1980 and the presence of murres on 19 May 1980 and 25 July 1980 (Sowls and others 1980; Carter and others 2001), but perhaps prospecting murres were mistaken for breeding birds in 1980–82.

Factors Affecting Prospecting

Murres and Brandt's cormorants (and to a lesser extent murres and double-crested cormorants) often breed together in co-mingled colonies in California. The presence of nesting cormorants likely attracted murres to attend and prospect at potential breeding habitats on these 7 offshore rocks by indicating habitat suitability and safety for landing and by providing social stimuli related to breeding (Manuwal and Carter 2001). Where both cormorant species bred on the same island, prospecting murres were more closely associated with Brandt's cormorants. Temporal and spatial associations between murre colony or subcolony formations and nesting Brandt's cormorants have also been noted elsewhere in California and Oregon, with most formations occurring within current murre colony complexes (Carter and others 1996, 2001; Manuwal and Carter 2001; McChesney and others 1998, 1999; USFWS, unpubl. data). Roosting Brandt's cormorants also can attract murres to temporarily attend areas (Carter 2004). Murres were noted in aerial photographs standing among roosting Brandt's cormorants on 20 June 1995 and in late June and July 1998 at the South Rock subcolony at Double Point Rocks within the ''Drake's Bay'' (or Points Resistance-Double) colony complex in central California, where little potential nesting habitat occurs and historical murre breeding is not known but where cormorants regularly roost (Carter and others 2000, 2001, 2003).

Murres prospecting in cormorant colonies may reflect visitation of nearby non-natal colonies by immatures before they return to breed at natal colonies (Halley and Harris 1993; Halley and others 1995; Manuwal and Carter 2001). While breeding may not occur at visited sites, immature murres may gain experience with landing on islands and interacting with cormorants during such visits. Younger immatures may be reluctant to land within large and busy murre and cormorant colonies and some may choose less daunting locations for initial visits. If accompanied by other conspecifics, such activity could encourage longer use, possible breeding, or movements to other nearby cormorant colonies without murres. Due to the difficulties and infrequency of closely observing most cormorant colonies without causing disturbance, murre prospecting behavior at these and other colonies prior to or without breeding may occur more frequently than is generally known, especially if such visits are brief (as noted above at High Bluff South in 2003) or occur to a greater extent in the late breeding season after most colony surveys have been conducted (as noted above at the Drake's Bay colony complex in 1998).

Prospecting activities in Del Norte and Humboldt Counties in 1996–2004 also may reflect continued population growth at active murre colonies in northern California, with possible saturation at some nearby colonies leading to greater emigration by immatures or adults to other sites. Most murre colonies in Del Norte and Humboldt Counties have increased or remained stable since 1979, and most large islands are now occupied by breeding murres (Carter and others 2001; Capitolo and others 2004b). Although murres have not been previously noted on 4 of these Del Norte County rocks, they may have historically bred there without documentation. Previous undocumented colonies may have been extirpated in the 1800s and early 1900s due to such factors as egg-collecting, human disturbance, or oiling. In addition, certain offshore rocks in northern California may have been disturbed frequently prior to the 20th century by native peoples in canoes, preventing breeding by murres (Carter and others 2001). Prospecting may lead to eventual recolonization at these sites in the future. With population growth, greater numbers of prospecting birds may visit non-natal colonies during the mid breeding season when surveys are typically conducted, aiding our detection of such attendance with aerial photographs. Even if these sites were not occupied in the past, prospecting behavior could lead to

temporary colonization and breeding attempts by small numbers of murres at sites with little suitable nesting habitat (Carter 2004).

Relatively large numbers of murres seen in 1998 at High Bluff South also suggested that temporary attendance may be enhanced under El Niño conditions. In 1998, severe El Niño conditions persisted along the California coast that led to wide-scale colony abandonments by murres (Carter and others 2003). Murres attending High Bluff South may have been adults that failed or did not breed at other colonies and chose to temporarily attend breeding habitat on land elsewhere. However, some individuals (adults or immatures) may attend High Bluff South in future years (such as 2003), possibly leading to breeding. Parker and others (1999) also noted relatively high attendance of non-breeding murres in 1998 within murre decoy areas on San Pedro Rock in central California, but subsequent attendance has been sporadic by a few individuals, and breeding had not occurred by 2004 (McChesney and others 2004; USFWS, unpubl. data).

Prospecting may also result from emigration movements by adults or immatures from colonies experiencing poor reproductive success or decline in population size. At nearby Redding Rock in northern Humboldt County (41°20′29″N 124°10′26″W; USFWS Colony Number 325-013; Fig. 1), murre numbers have declined since 1989, probably due to human disturbance related to maintenance of a navigational-aid light by the US Coast Guard, disturbance in certain years by large numbers of hauled-out California sea lions (*Zalophus californianus*) (Carter and others 2001; Capitolo and others 2004b), and human disturbance from fishing boats. Emigrants may be hesitant to attend large active colonies with little available breeding space and may choose to attend other similar habitats with less competition for space. Thus, temporary attendance by murres at cormorant colonies may also reflect displacement of murres from disturbed nearby colonies. Also, since the late 1990s, extensive murre colony abandonments have been occurring in northern and central Oregon due to disturbance by bald eagles (*Haliaeetus leucocephalus*) (Carter and others 2001). Long-distance southern emigration movements of some individuals to northern California may result from these disturbances.

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SUSPECTED SURPLUS KILLING OF HARBOR SEAL PUPS (*PHOCA VITULINA*) BY KILLER WHALES (*ORCINUS ORCA*)

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Key words: harbor seal, killer whale, *Orcinus orca, Phoca vitulina,* surplus killing, predation, disease, San Juan Islands, Washington

Within the inland waters of Washington State and southern British Columbia Province, 3 distinct ecotypes of killer whales (*Orcinus orca*) occur. The better known ''resident'' and ''transient'' populations each display unique genetic (Hoelzel and others 2002), dietary (Baird and Dill 1995; Ford and others 1998), behavioral (Baird 2000), vocal (Ford 1990) and morphological differences (Baird and Stacey 1988). The resident pods, also known as the ''southern resident'' population, eat primarily fish and occur in large stable groups (Bigg and others 1990). Transients feed primarily on other marine mammals and occur in smaller and less stable groups (Baird and Dill 1995, 1996; Baird and Whitehead 2000; Baird 2000). The 3rd population, which is seen occasionally in the area, is called the ''offshore'' ecotype (Wiles 2004). These killer whales are believed to be primarily fish eaters (Hoelzel and others 2002) that are smaller in size than other ectotypes and genetically distinct from both residents and transients, although more closely related to the resident killer whales. We recently identified a novel mortality pattern in harbor seals (*Phoca vitulina*) that strongly suggests 1 or more individuals from 1 of these ecotypes killed seal pups for reasons other than consumption.

As part of an ongoing disease-screening project, complete postmortem examinations were performed on dead marine mammals in suitable condition from San Juan County, Washington (48.6°N, 123.0°W). Necropsies were oriented toward determining the cause of morbidity or mortality and to survey for specific pathogens. Routinely complete examinations were performed and gross observations were recorded. Tissue samples were preserved in 10% neutral buffered formalin, processed, and evaluated microscopically. Kidney and liver were screened for heavy metals, and other ancillary tests such as aerobic bacterial culture, polymerase chain reaction, and attempted virus isolation were performed as indicated.

Since 1977, The Whale Museum (Friday Harbor, Washington) has maintained a database of public and scientific sightings of killer whales and other cetaceans in Washington and southern British Columbia inland waters. In 1981, the marine mammal sighting network was expanded to include stranding data for San Juan County. These databases provided stranding