

# RANGE EXPANSION AND ACTIVITY PATTERNS IN RHINOCEROS AUKLETS

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The AOU Check-list (1957) lists Destruction Island in northern Washington as the most southerly known breeding site of the Rhinoceros Auklet (*Cerorhinca monocerata*). Since then and particularly since the late 1960s, several new breeding sites of this species have been discovered in British Columbia, Oregon and California. The status of *C. monocerata* in the southern part of its range is either changing or at least becoming better known. In this paper we wish to 1) report some additional breeding sites in the southern part of this species' range, 2) summarize all the new records of the past ten years, and 3) comment on the significance of these records. We also compare Rhinoceros Auklet activity patterns during the breeding season in the new southern extreme of their range with their activity patterns farther north.

## NEW BREEDING SITES FOR RHINOCEROS AUKLETS

Browning and English (1968) suspected but could not confirm the nesting of *C. monocerata* on Goat Island, Curry County, in southern Oregon. On 2 July 1973 we (JMS, WH, CFZ) found a dead nestling on the grassy north slope of Goat Island; a search of several burrows in deep top soil produced two additional nestlings which were photographed (Figure 1). These burrows were situated among those of Tufted Puffins (*Lunda cirrbata*) on the same north slope of the island. At sunset on 2 July, Rhinoceros Auklets in breeding plumage began gathering on the water within 200 m of the island and by dark their numbers had increased to 30 birds. One hour after dark (22:00) an adult in breeding plumage (but without a brood patch) was caught in a mist net. In addition, Rhinoceros Auklets were observed flying from the center of the island just before dawn. From these observations we estimated a breeding population of at least 20 pairs.

Observations summarized in Table 1 indicate the probable breeding of Rhinoceros Auklets at Sea Lion Caves, Lane County, and at three other Oregon localities. The observations of adults in nuptial plumage

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and carrying fish in their bills at Sea Lion Caves is evidence of nesting short only of finding an egg or chick. The latter may never be possible at this site because of its inaccessibility.

Table 1. Summary of observations of breeding and possibly breeding Rhinoceros Auklets in Oregon 1968-73.

DATE	LOCALITY	COMMENTS AND REFERENCE OR OBSERVER
25 March 1968	Goat Island, Curry County	One breeding plumage adult in burrow, remains of other breeding plumaged adults (Browning and English 1968).
July-August 1969	Cape Foulweather, Lincoln County	Up to five breeding plumaged adults foraging and resting, photographed from the beach (Hoffman pers. obs.).
May-August 1969	Yaquina Head, Lincoln County	Groups of up to 25 breeding plumage adults flying in circles immediately off Yaquina Head at dusk (J. M. Scott pers. obs.).
June 1969	Sea Lion Caves, Curry County	At least 20 in caves, 1 with fish in mouth; all in breeding plumage (Crowell and Nehls 1969).
July-August 1970	Cape Foulweather	Breeding plumaged birds foraging and resting (Hoffman pers. obs.).
Summer 1970	Sea Lion Caves	Rhinoceros Auklets inside Sea Lion Caves (Crowell and Nehls 1970).
Summer 1970, 1971, 1972	Yaquina Head	Breeding plumaged adults observed throughout the summer; evening passing flights in 1971 and 1972 (J. M. Scott pers. obs.).
7 August 1972	Cape Meares, Tillamook County	Four breeding plumaged birds flying near Cape at dusk (Hoffman pers. obs.).
16 July 1972	Sea Lion Caves	Three birds carrying food into caves (Crowell and Nehls 1972).
June 1973	Yaquina Head	Eleven or more breeding plumaged adults flying around Head at dusk (J. M. Scott, W. Hoffman pers. obs.).
June 1973	Sea Lion Caves	Three adults in breeding plumage flying into caves at 0900 (R. Olson, P. Rothlisberg pers. obs.).
2 July 1973	Goat Island	Two live chicks taken from burrows and photographed, 1 dead chick on ground, up to 30 adults circling at dusk (W Hoffman, W. Percy, J. M. Scott, C. F. Zeillemaker pers. obs.).

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Breeding by *C. monocerata* at the three other Oregon sites (Table 1) is not as certain as at Sea Lion Caves. At Yaquina Head, Lincoln County, where six other species of seabirds nest (Scott 1973), as many as 25 adult Rhinoceros Auklets in breeding plumage were observed for the entire summer in five consecutive years (1969-1973). During these years they were frequently observed in the evenings as they made "passing flights" near the cliffs, a behavioral characteristic of the breeding birds at nesting sites in Washington (Richardson 1961, Scott pers. obs.). Late evening passing flights suggest breeding of Rhinoceros Auklets at Cape Foulweather, Lincoln County, and Cape Meares, Tillamook County.



Figure 1. Photograph of nestling Rhinoceros Auklet (*Cerorhinca monocerata*) taken from burrow on Goat Island, Oregon 2-3 July 1973.

Photo by C. Fred Zeillemaker

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In 1966 and 1967 large breeding populations of Rhinoceros Auklets were discovered at two islands in southern British Columbia. Intensive investigation of the seabirds at these islands carried out some years earlier had failed to reveal this species. First, in 1966 Hancock (1970) estimated that 3,000 pairs of Rhinoceros Auklets bred at Triangle Island at the northern end of Vancouver Island. The species was not reported in 1949 or 1950 when extensive ecological surveys were conducted there. It seems that such a large population, if present earlier, would have been difficult to miss. Second, in 1967 Campbell and Stirling (1967) estimated that about 50 pairs of Rhinoceros Auklets nested on Cleland Island at the southern tip of Vancouver Island. Previous intensive avifaunal work had been conducted on this 8.5 ha island as well, the latest being in 1961, but the breeding of *C. monocerata* had only been suspected (Hancock 1970). We know of no recently discovered Rhinoceros Auklet colonies in Washington, but there have been increases in the population size at Smith Island (D. Manuwal pers. comm.). Osborne (1973) estimated that between 50 and 75 pairs bred on Castle Rock, Del Norte County, California in 1970. This is the first report for breeding Rhinoceros Auklets at that site and is only the second breeding locality for California. At the other California site, South Farallon Island (San Francisco Co.) in central California, two and possibly more pairs of Rhinoceros Auklets occupied burrows during the summers of 1972 and 1973 (Ainley and Lewis 1974). Possible disturbance of large numbers of nesting murre and cormorants prevented a search for eggs or chicks. Historically, the Farallon Islands have been the southernmost breeding site of the species. However, the breeding population was exterminated in 1862 (Grinnell 1926, Ainley and Lewis 1974). The nesting of Rhinoceros Auklets in recent years on this island represents a re-establishment of a former breeding population.

The fact that Rhinoceros Auklets nest in burrows, approach their nesting areas only under cover of darkness (Richardson 1961, Bent 1919 but see below) and occur in small numbers in Oregon and California may account for the previous lack of documentation of this species breeding in that area. However, several of the new breeding localities for Rhinoceros Auklets have been well known for an appreciable period prior to the reports summarized in this paper. This is especially true of sites in British Columbia; Goat Island, Oregon; Castle Rock, California (Gabrielson and Jewett 1940, Grinnell and Miller 1944); and the Farallon Islands (Ainley and Lewis 1974). Occurrences at these sites suggest that there has been a real expansion in the range of this species and, in the case of the Farallones, a reoccupation of formerly suitable habitat. Construction of a housing development adjacent to a large nesting colony of Rhinoceros Auklets on Protection Island may have caused the relocation of breeding birds to other areas in the Pacific Northwest. In fact,

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Glaucous-winged Gulls (*Larus glaucescens*) banded as nestlings on Protection Island have been found breeding at sites 37 km distant.

The range of a species may expand and contract with changing environmental conditions. This has probably occurred and may now be occurring with *C. monocerata* in the southern extreme of its breeding range. The possible effect of changes in prey species abundance on the numbers of *C. monocerata* and closely related species in California is discussed elsewhere (Ainley and Lewis 1974).

### DIURNAL VS. NOCTURNAL ACTIVITY PATTERNS IN BREEDING RHINOCEROS AUKLETS

Observations of *C. monocerata* during daylight on Goat Island (Scott, Hoffman and Zeillemaker pers. obs.) and on South Farallon Island (Ainley and Lewis 1974 and below) and of them bringing food to suspected nest sites at Sea Lion Caves during daylight (Table 1) conflict with our previous observations at Destruction Island, Washington (1970-73), and those made elsewhere by others. Historically, *C. monocerata* has been reported to be strictly nocturnal at the breeding grounds (Bent 1919, Richardson 1961, Cody 1973). Nocturnal activity in small auklets, including Rhinoceros Auklets, is supposedly a strategy to avoid predation or piracy by gulls while food is being carried to chicks (Lack 1966, Cody 1973). However, the occurrence of diurnal activity in *C. monocerata* brings to question the factors selecting for nocturnal activity in this species. If this behavior is to avoid predation or piracy, one might expect a relationship between diurnal activity in the auklets and characteristics of the predator, perhaps size or temperament.

Observations of Rhinoceros Auklet/gull interactions on South Farallon were made a few hours daily for two months in 1972. There, even though as many as five Rhinoceros Auklets carried on diurnal activity within 4 m of active Western Gull (*Larus occidentalis*) nests, no predation attempts were made toward them. There was, however, interaction, but only after the gull chicks hatched when the adult gulls become very territorial. During this time gulls were observed displacing Rhinoceros Auklets a total of six times. However, during the same period Rhinoceros Auklets were displaced four times by Tufted Puffins, four times by Brandt's Cormorants (*Phalacrocorax penicillatus*) and once by Common Murres (*Uria aalge*). Gulls also displaced Tufted Puffins once, Pigeon Guillemots (*Cephus columba*) four times, and were unsuccessful in two attempts to displace Brandt's Cormorants. On one occasion gulls reached into a cavity to pull out a Rhinoceros Auklet; on another they pulled an adult Pigeon Guillemot from its cavity. In neither case was the victim harmed. In contrast, Western Gulls on the Farallones actively pursue and capture smaller Cassin's Auklets (*Ptychoramphus aleuticus*) and storm-petrels (*Oceanodroma sp.*) that expose themselves during daylight (Manuwal 1972, Ainley et al. 1974).

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We observed no interaction of the diurnal Rhinoceros Auklets with Western Gulls at Sea Lion Caves. In this locality the auklets can approach their nest sites directly from the sea and at least 15 m below the level of the gull colony. Gull harassment is further reduced because the flight of Rhinoceros Auklets into the caves is swift and close to the water, and because gulls do not frequent the dark interior of the caves.

It is of interest that diurnal activity in the auklets has been observed only in that part of their range where Western Gulls and not Glaucous-winged Gulls are known to breed. Glaucous-winged Gulls average somewhat larger in size than Western Gulls, and there is a tendency in both species for birds in the northern part of the breeding range to be larger; however, there is considerable variation in size even at a single colony (Dwight 1925, Ridgway 1919). From British Columbia south to the Farallones there is an almost complete overlap in the size of these two species, and no significant differences in body or bill size were noted at the sites sampled (Table 2). Overlap is greatest on Destruction Island where they interbreed (Scott 1971, Scott and Wiens unpublished data). This lack of difference in predator size at the different sites suggests that some other factor must be responsible for the observed differences in Rhinoceros Auklet nocturnal/diurnal activity patterns. Bent (1919) in-

Table 2. Body measurements of Western Gulls (*Larus occidentalis*) and Glaucous-winged Gulls (*L. glaucescens*) from several sites where they are known to occur syntopically with Rhinoceros Auklets (*Cerorhinca monocerata*).

SPECIES & LOCALITY	WEIGHT, g	BILL DEPTH, mm	CULMEN LENGTH, mm
Glaucous-winged Gull:			
Mandarte Island, British Columbia <sup>1</sup>	$\bar{x}$ =1010 S.D.=136.12 Range=730-1400 n=110	No data	No data
Destruction Island, Washington <sup>2</sup>	$\bar{x}$ =1006 S.D.=330.4 Range=860-1190 n=5	$\bar{x}$ =19.31 S.D.=1.28 Range=17.7-21.5 n=9	$\bar{x}$ =53.9 S.D.=4.29 Range=47.0-59.8 n=9
Western Gull:			
Destruction Island, Washington <sup>2</sup>	$\bar{x}$ =979 S.D.=73.29 Range=900-1150 n=10	$\bar{x}$ =20.1 S.D.=1.6 Range=17.3-22.5 n=30	$\bar{x}$ =55.5 S.D.=3.2 Range=51.5-62.5 n=30
Farallon Islands, California <sup>2</sup>	$\bar{x}$ =1019 S.D.=59.43 Range=800-1190 n=38	$\bar{x}$ =20.72 S.D.=1.66 Range=18.2-23.0 n=30	$\bar{x}$ =55.8 S.D.=3.09 Range=48.0-59.5 n=30

1. John Ward pers. comm.

2. J. M. Scott and John A. Wiens unpublished data.

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dicates that Western Gulls are more predaceous on marine birds at breeding colonies than are Glaucous-winged Gulls. This would suggest that if gull interference or predation were the primary factor selecting for nocturnality in Rhinoceros Auklets, they would be least likely to be diurnal where they were syntopic with Western Gulls. In fact, just the opposite was true. However, the fact that Rhinoceros Auklets were observed carrying food to young only at the Sea Lion Caves site, where harassment by gulls can be avoided, indicates that piracy by gulls may restrict Rhinoceros Auklets to nocturnal feeding of their young. The diurnality of Pigeon Guillemots, despite their being somewhat smaller than Rhinoceros Auklets and the fact that they too carry food in their bills to their nestlings, may be explainable by Guillemots being quicker and more maneuverable in flight, perhaps as a result of their lower wing-loading.

Thus the lack of diurnal feeding of young by Rhinoceros Auklets at all but one site seems to be the result of piracy on the adults by gulls. However, the diurnality of adults without food in their bills in the southern extreme of their breeding range and their complete nocturnality in the north remains unexplained. The answer may lie in regional differences in the offshore distribution and availability of food resources.

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