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AGE, SEX, MOLT AND MIGRATION OF DUNLINS AT BOLINAS LAGOON

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Various aspects of the winter biology of Dunlins (*Calidris alpina*) have been studied in California by Storer (1951), Recher (1966), Holmes (1966a, b, 1971), Gerstenberg (1972) and Jurek (1973). Recent studies at Bolinas Lagoon provide information that supplements and in certain details, contradicts previously published accounts. This paper reports on age and sex ratios, molt and migration of Dunlins at Bolinas Lagoon.

STUDY AREA AND METHODS

Bolinas Lagoon is a 570-hectare estuary at the southern edge of the Point Reyes peninsula on the central California coast. It is shallow with extensive sand and mud flats on which large numbers of shorebirds can be found during most of the year.

To estimate the number of shorebirds on the estuary, six censuses per month were taken from June 1971 through May 1972, and usually three but occasionally six censuses per month from June 1972 through May 1974. On each census the estuary was divided into three areas and the birds in each area were counted or estimated simultaneously by three observers. Some censuses included numbers of small sandpipers that could not be separately identified as Dunlin, Least Sandpiper (*Calidris minutilla*) or Western Sandpiper (*Calidris mauri*), but in no census did such observations exceed 20% of the total number. These birds were incorporated into a census total as Dunlins, Least Sandpipers and Western Sandpipers according to the relative abundance of firm identifications of these species in the census. Most censuses were taken on flood or ebb tides 1.1 m to 1.7 m above mean low water.

Between October 1971 and April 1972, Dunlins were trapped after dusk in mist nets set across channels and pools in salt marsh where the birds roosted. Trapped birds were weighed to the nearest gram on Pesola spring balances. The culmen (length from the tip to where the feathers meet the center of the upper mandible) was measured to 0.1 mm with dial calipers. Each bird was banded with a numbered aluminum band on the tarso-metatarsus and a blank aluminum band on the tibiotarsus. Both bands were covered with colored plastic tape to indicate the location and the season of banding and the age of the bird. Birds were considered immature if they had buffy edges on their innermost tertial or inner middle wing coverts, and adult if these feathers were white- or grey-tipped. Molt was recorded for six body regions (crown, upper back, rump, throat, breast and abdomen). The number of growing feathers was estimated in each body area and the molt was scored from 0 to 3 as described in Page (1974, Table 1). The molt score for the entire body is the sum of the different body regions. The flight feathers of the wing were grouped into 10 primaries, 10 secondaries and 5 tertials, including as a tertial the small innermost feather that Holmes (1966a) apparently did not consider a tertial in the Dunlins he examined. Each flight feather was recorded as growing or not growing.

In this paper, "season" as used under the heading "Return Rate" refers to the period from June to May of the following year.

SEASONAL ABUNDANCE

Although the pattern of Dunlin occurrence varied during the study (Figure 1), the birds consistently arrived in late September and were present in the greatest numbers in November. During the period of peak abundance Dunlins were about twice as numerous in 1971 as in 1972 and 1973. During January and February of 1972 and 1974, the Dunlin population ranged from 1000 to 1600 individuals. In January 1973 the Dunlin population decreased from approximately 1000 at the beginning of the month to 300 at the end, probably because of very heavy rains (15 inches in 14 days). During periods of heavy rain, Dunlins and other shorebirds leave the lagoon at moderate and high tides and feed or roost in nearby pastures. In January 1973 heavy rains apparently drove most Dunlins out of the area entirely.

Spring migratory waves of Dunlins were apparent in April 1973 and 1974 although not in April 1972 (Figure 1). The magnitude of these waves was small in comparison to those in other species such as the dowitchers (*Limnodromus* spp) and the Western Sandpiper (Page, Fearis and Jurek 1972).

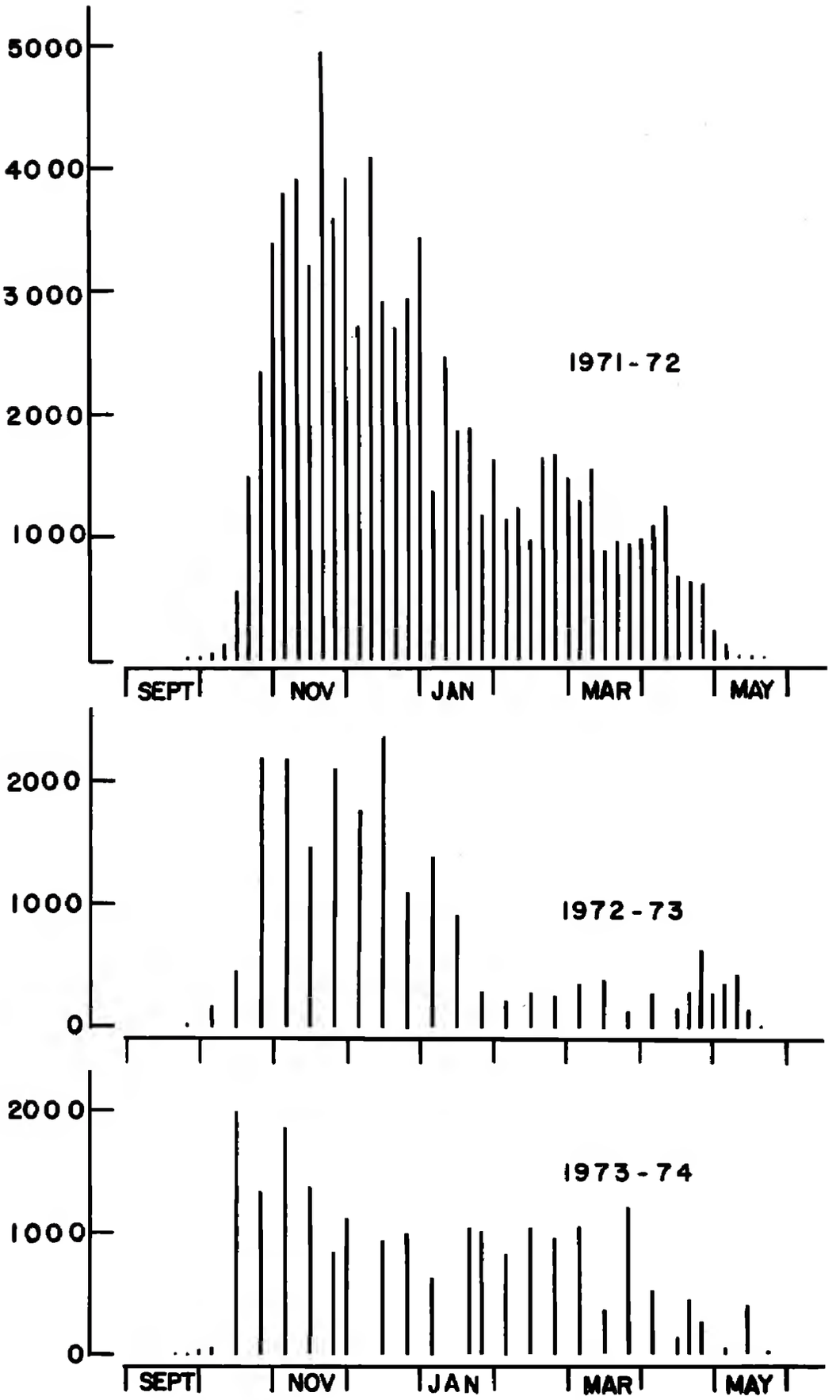

Figure 1. Numbers of Dunlins at Bolinas Lagoon from September 1971 to May 1974. Dunlins are absent from late May until late September.

DETERMINING THE SEX FROM THE BILL MEASUREMENT

MacLean and Holmes (1971) found a culmen range of 34.0 mm to 41.0 mm with a mean of 37.2 mm for male Dunlins, and a range of 34.5 mm to 45.0 mm with a mean of 40.5 mm for female Dunlins wintering in western North America. I measured Dunlin specimens in breeding plumage from California at the Museum of Vertebrate Zoology, Berkeley, and the California Academy of Sciences and obtained similar results. Bill lengths of 87 males were in the range of 33.1 mm to 41.3 mm with a mean of 36.9 mm (S.D.=1.7 mm) and those of 82 females in the range of 35.7 mm to 44.6 mm with a mean of 40.5 mm (S.D.=1.6 mm). Most if not all of these 169 specimens must also have been used by MacLean and Holmes. From these statistics the normal distributions of male and female bill lengths were determined (see Page and Fearis 1971). I found that 70% of the male and 4% of the female Dunlins had a bill length $\leq$ 37.7 mm and 67% of the females and 4% of the males had a bill length $\geq$39.8 mm. Twenty-five percent of the males and 28% of the females had a bill length between 37.8 mm and 39.7 mm. If Dunlins with culmens $\leq$ 37.7 mm are considered males and those $\geq$39.8 mm females, in a normally distributed sample with a 1:1 sex ratio the result would be 35% of the birds sexed correctly as males, 34% correctly as females, 2% incorrectly as males, and 2% incorrectly as females. Twenty-seven percent of the birds in the sample would be unsexed, of which 13% are expected to be males and 14% females. In the birds trapped from October 1971 to April 1972 the culmens of 24% of the adults and 23% of the immatures were between 37.8 mm and 39.7 mm. As my data suggest that approximately the same number of males and females will remain unsexed if Dunlins with bill lengths $\leq$37.7 mm are considered males and $\geq$39.8 mm females, I have used these divisions to separate the sexes in this paper.

AGE AND SEX COMPOSITION

Adult Least Sandpipers and Western Sandpipers leave the breeding grounds before they begin the bulk of their prebasic molt and arrive in California well before the immatures. In contrast, Dunlins undergo most of the prebasic molt on the breeding grounds and the adult and immature Dunlins arrive together in California. Holmes (1966b) states that adult and immature Dunlins arrive in about equal numbers in California. This was based on the occurrence of approximately equal numbers of Dunlins of both age classes in museum collections (Holmes pers. comm.). But in birds trapped at Bolinas Lagoon in October 1971, im-

matures markedly outnumbered adults (Figure 2). Adults made up 17% of the birds trapped from October to December 1971, 40% from January to February 1972, and 45% from March to April 1972. A possible explanation is that immatures are more easily trapped early in the season and are less wary of nets than adults. Later in the season adults and young may perhaps be trapped with similar ease. Differential mortality rates or movements of the two age classes could also affect the observed age ratio change in the Dunlin population between the spring and fall.

Male and female Dunlins arrived simultaneously at Bolinas Lagoon in October but males outnumbered females (Figure 2). Of birds trapped and sexed between October and December 1971, only 37% of the adults and 34% of the immatures were females; between January and February 1972, 25% of the adults and 18% of the immatures were females; and between March and April 1972, 46% of adults and 32% of immatures were females. Assuming that there is not an unequal sex ratio in the *C. alpina pacifica* population as a whole, the uneven sex ratios at Bolinas may indicate geographic or ecological segregation by sex of Dunlins on the wintering grounds. I was unable to trap enough birds to determine when males and females left the lagoon in the spring.

MOLT

The Dunlin lingers on or near the breeding grounds and molts into its basic plumage (Holmes 1971) whereas the Western Sandpiper (Holmes 1972) and Least Sandpiper (Page 1974) migrate south before molting. Holmes (1971) reported that Dunlins leave the breeding grounds before the prebasic molt is complete but, except for a few early birds, have completed molt on arrival in California. I found some Dunlins in light molt at Bolinas Lagoon in October 1971 but body molt was most intense between late October and the third week of November (Figure 3). Growing feathers were apparent in many birds in most or all body areas I examined. Evidently body molt is not complete by the time many Dunlins arrive in California.

Molt of flight feathers differed in one respect between Least and Western Sandpipers and Dunlins. None of the 258 immature Dunlins captured between October and December 1971 had new or growing tertials or rectrices. Between 28 September and 6 November, during the height of the first prebasic molt of Least and Western Sandpipers at Bolinas, 8.2% of 61 Western Sandpipers trapped had new or growing tertials and 3.3% had new or growing tail feathers, as compared to 78.3% and 30.0% respectively for 217 Least Sandpipers. During the prealter-

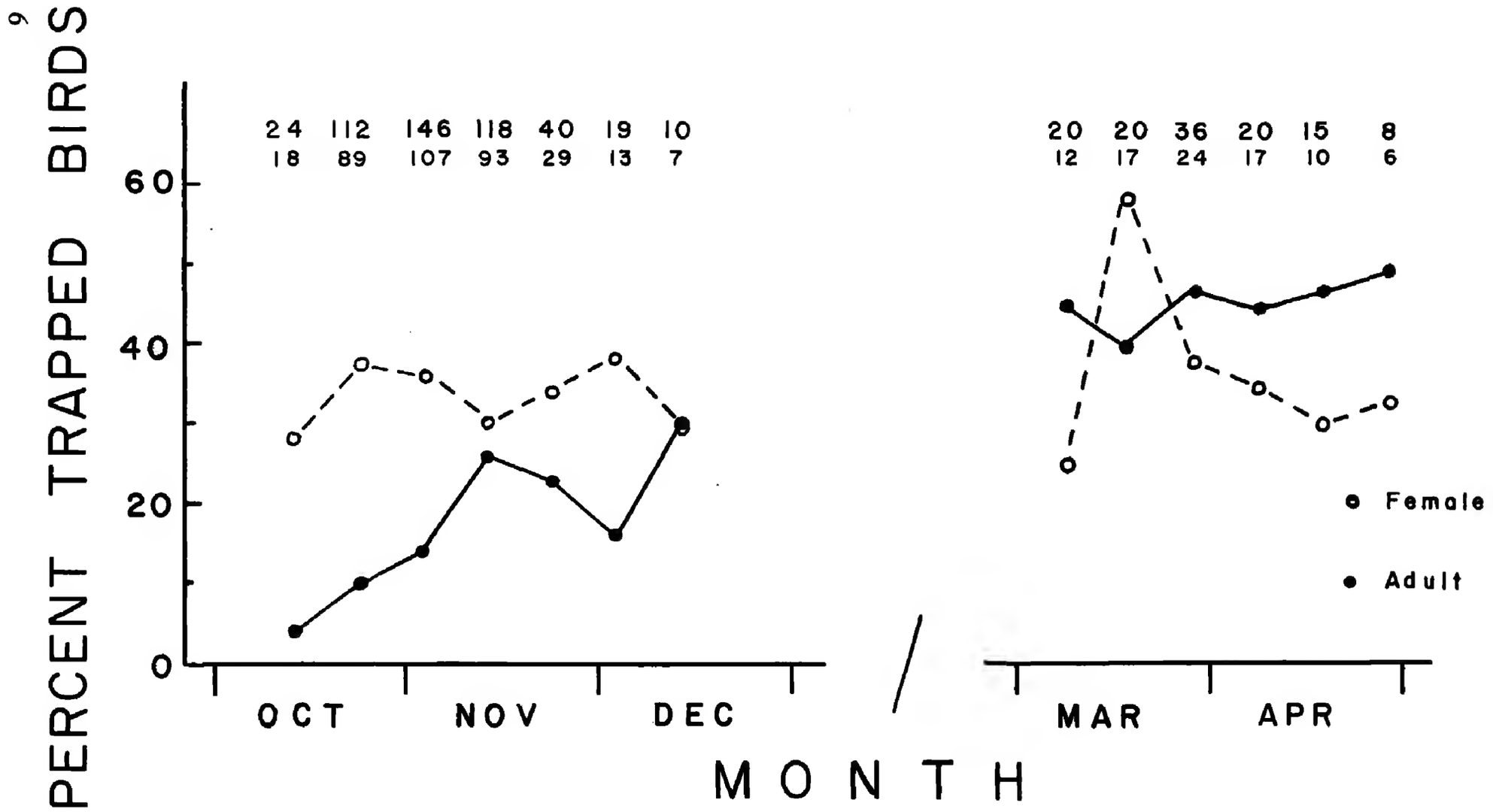

Figure 2. Age and sex ratios of Dunlins trapped at Bolinas Lagoon between October 1971 and April 1972. Sample sizes at the top of the figure include birds of known and unknown sex (upper) and birds of known sex (lower). Age ratios are based on all birds; sex ratios are based only on birds of known sex.

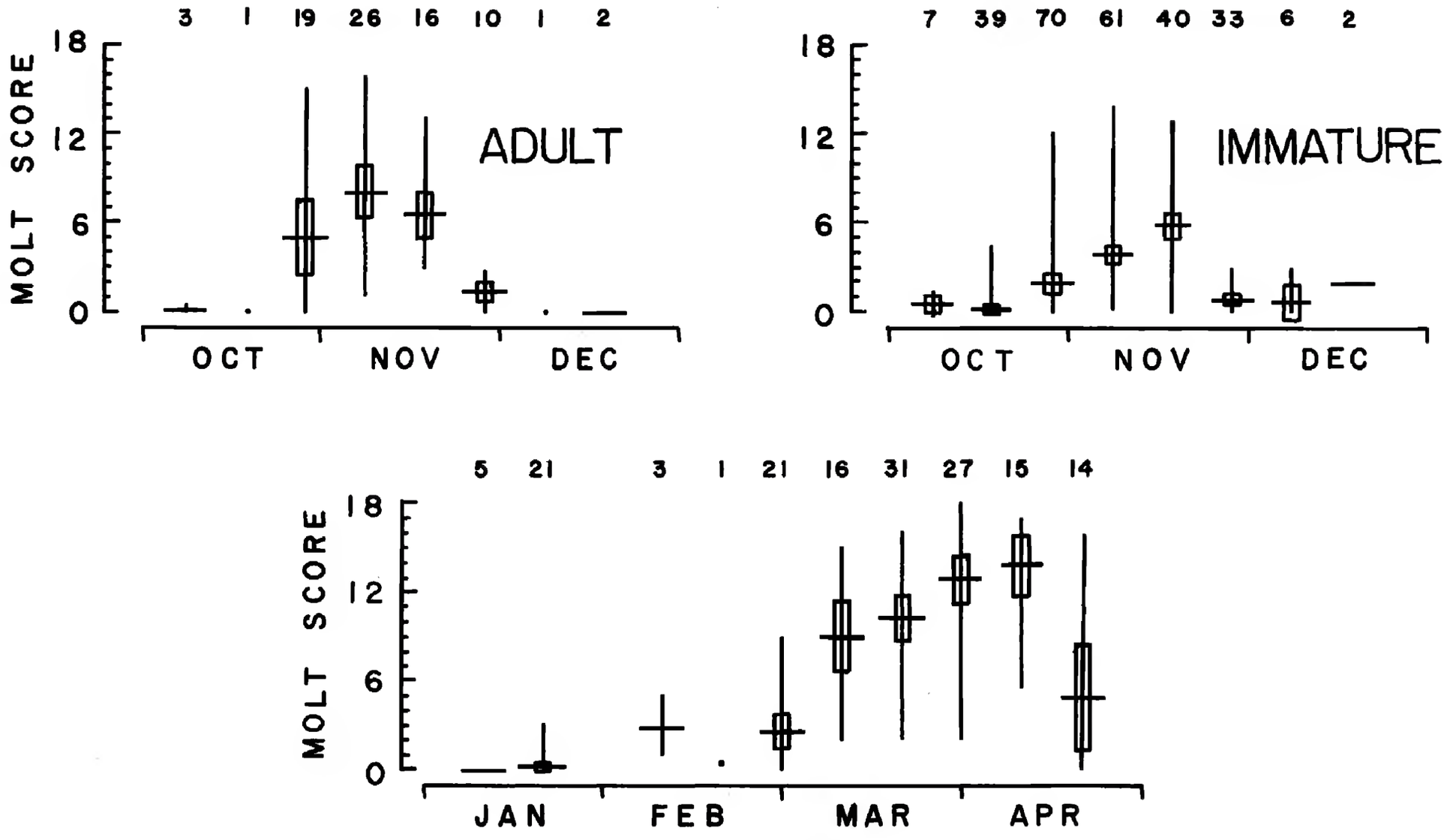

Figure 3. Intensity of body molt in Dunlins at Bolinas Lagoon, autumn 1971 and spring 1972. Vertical line is range, horizontal line is mean and rectangle is 95% confidence interval of mean. Sample sizes are at the top of figure.

nate molt in March and April 1972, 1.8% of 55 adult Dunlins and 4.7% of 64 immature Dunlins had new or growing tertials. None had new or growing rectrices. More than 85% of 104 Western Sandpipers trapped in April had some new or growing tertials and 35% had replaced some rectrices. More than 80% of 110 Least Sandpipers trapped in March and April were replacing tertials and at least 37% of the adults and 20% of the immatures were replacing rectrices. The first prebasic molt and the prealternate molt includes more of the flight feathers in the Least Sandpiper and Western Sandpiper than in the Dunlin.

RETURN RATE

The number of Dunlins on Bolinas Lagoon between 23 October and 6 December 1972 that had been marked between October 1971 and April 1972 was estimated by multiplying the mean proportion of marked birds by the maximum estimated Dunlin population (2100 birds) on the estuary between 23 October and 6 December 1972. I determined that 32% of the adult and 15% of the immature Dunlins banded in the 1971-72 season returned the following autumn. During autumn 1972, 26% of the adult and 22% of the immature Least Sandpipers (Page 1974) but only 1% of the adult and immature Western Sandpipers banded the previous season returned to Bolinas Lagoon. Western Sandpipers are primarily transients at Bolinas (Page, Fearis and Jurek 1972), whereas many Least Sandpipers (Page 1974) and Dunlins are winter residents. Given sufficient habitat to choose from, as in the Point Reyes-San Francisco Bay area, individual sandpipers seem more likely to return to particular molting and wintering areas year after year than to particular migratory stopover places. The return rates given for the three sandpipers are minimal as in the calculations I used the mean rather than the maximum number of marked birds on the estuary during the period that each species was most abundant. The fact that Western Sandpipers are more transitory at Bolinas than Dunlins or Least Sandpipers may have pulled the calculated return rate for the Western Sandpiper down proportionately more than those for the other species.

MIGRATION

Holmes (1966b) reported that Dunlin populations at several locations in central California did not increase during spring migration. He suggested that the entire Dunlin population probably shifted northward gradually in an early, slow-moving spring migration, so that a spring

Table 1. Weight in grams of Dunlins trapped at Bolinas Lagoon, Marin Co., California between November 1971 and April 1972. A is adult, I is immature.

	NOV (A)	NOV (I)	JAN-FEB	APR
Range	42-62	41-67	42-58	45-66
Mean	50.9	50.3	47.8	53.5
Standard deviation	4.1	4.1	3.6	4.9
Coefficient of variation	8.0	8.1	7.5	9.5
Sample size	52	172	34	41

build-up in numbers could not be observed. He thought that the birds moved primarily along the coast, although in the spring there was some shift inland. However, spring migrational peaks of Dunlins have been observed along the coast in some locations in some years. At Humboldt Bay Gerstenberg (1972) reported an increase in April 1969, and at Bolinas Lagoon spring migration waves of small magnitude were apparent in two of the three years of this study (Figure 1). Dunlins at Bolinas Lagoon were heavier during April than in January and February (Table 1), suggesting that April birds had fat deposits for migratory flights. These observations neither refute nor substantiate Holmes' suggestions.

In Oregon and Washington there are conspicuous waves of Dunlins during migration along the coast in April and May (Gabrielson and Jewett 1940; Jewett et al. 1953) and there are spring movements of Dunlins in the interior of Oregon (Strauch 1967). To probe more into the situation in California, I have summarized data from Jurek (1973) that provide an index of the relative abundance of Dunlins between the coast and the interior (Table 2). During fall migration the ratio of Dunlins on the coast compared to the interior was 3.2:1, in winter 8.2:1, but during spring migration only 0.4:1. Thus there appears to be a substantial shift of birds from a coastal to an inland migration route in California between fall and spring.

Dunlins may shift directly from coastal areas such as Bolinas Lagoon to the interior of California in late winter and spring. At a small marsh in the Willamette Valley in the interior of Oregon, Strauch (1967) regularly found a few hundred Dunlins in spring. Although Strauch indicates that this species does not normally winter in the interior of Oregon, in January and February 1965 they occurred in his study area in substantial numbers. Their appearance coincided with the beginning of heavy flooding on the coast which Strauch thought may have driven the birds inland. During this study, the disappearance of a large proportion of the Dunlin population from Bolinas Lagoon in January was correlated with heavy rainfall in the area. Therefore in some instances, a shift of Dunlins directly from the coast to the interior may be affected by the amount of rainfall on the coast, and very heavy rainfall in some years

Table 2. Seasonal numbers of Dunlins at census sites in different parts of California. Data are from Jurek (1973), and for Point Reyes, from unpublished data of Point Reyes Bird Observatory. Number of census sites in each area is in parentheses. Maximum census figure for period of time under consideration has been used in all instances.

LOCATION	SEP-NOV	JAN-FEB	APR-MAY
Interior:			
N. E. California (4)	3238	0	4180
Central Valley (9)	3668	1813	9917
Coastal:			
S. California coast (10)	2248	1337	248
San Francisco Bay (7)	10946	5876	3704
Point Reyes area (5)	9193	7693	1348
Total of all areas	29293	16719	19397

may cause some birds to move inland considerably earlier than in years of more moderate rainfall. Another possibility suggested by Jehl (pers. comm.) is that inland birds come from southern wintering grounds and are following the most direct northern route from the Gulf of California and the Salton Sea. The nature of the Dunlin spring migration clearly needs further investigation.

The number of Dunlins that Jurek (1973) reported at all sites was lower in spring than in fall (Table 2). At Bolinas Lagoon between October 1972 and February 1973, Page and Whitacre (1975) estimated that raptors ate at least 21% of the wintering Dunlins and heavy mortality was observed throughout the study. Heavy predation here and elsewhere may substantially reduce winter populations and may account for some of the decline in winter on the California coast.

SUMMARY

Dunlins were studied at Bolinas Lagoon from June 1971 to May 1974. They arrived in late September and were present in peak numbers between mid-October and late December. After December numbers declined until April and May, when small influxes sometimes occurred.

The sex of Dunlins was inferred from culmen measurements: birds with culmen $\leq$37.7 mm were considered males and $\geq$39.8 mm females. During much of the 1971-72 season males outnumbered females about 2:1. Immatures were much more abundant than adults from October to December; but in March and April adults and immatures were almost equally abundant. In autumn 1972 at least 32% of the adults and 15% of the immatures banded the previous season returned to Bolinas Lagoon.

In autumn, birds of both age classes underwent some body molt after arriving at Bolinas Lagoon. Adults and immatures underwent a partial prenuptial molt in spring in which very few birds replaced any flight feathers.

Evidence suggesting migration is much more pronounced in the interior of California in spring than in fall conflicts with the previously held view and points out the need for further studies of Dunlin migration in California.

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LITERATURE CITED

Gabrielson, I. N. and S. G. Jewett. 1940. Birds of Oregon. James, Kerns and Abbott Co., Portland, Oregon.

Gerstenberg, R. H. 1972. A study of shorebirds (Charadrii) in Humboldt Bay, California. M. S. Thesis, California State Univ. at Humboldt, Arcata, Ca.

Holmes, R. T. 1966a. Molt cycle of the Red-backed Sandpiper (*Calidris alpina*) in western North America. Auk 83:517-533.

Holmes, R. T. 1966b. Breeding ecology and annual cycle adaptations of the Red-backed Sandpiper (*Calidris alpina*) in northern Alaska. Condor 68:3-46.

Holmes, R. T. 1971. Latitudinal differences in the breeding and molt schedules of Alaskan Red-backed Sandpipers (*Calidris alpina*). Condor 73:93-99.

Holmes, R. T. 1972. Ecological factors influencing the breeding season schedule of Western Sandpipers (*Calidris mauri*) in subarctic Alaska. Am. Midl. Nat. 87:472-491.

Jewett, S. G., W. P. Taylor, W. T. Shaw, and J. W. Aldrich. 1953. Birds of Washington State. Univ. of Washington Press, Seattle.

Jurek, R. M. 1973. California shorebird study. Final report. California Department of Fish and Game.

MacLean, S. F., Jr. and R. T. Holmes. 1971. Bill lengths, wintering areas, and taxonomy of North American Dunlins, *Calidris alpina*. Auk 88:893-901.

Page, G. 1974. Molt of wintering Least Sandpipers. Bird-Banding 45:93-105.

Page, G. and B. Fearis. 1971. Sexing Western Sandpipers by bill length. Bird-Banding 42:297-298.

Page, G., B. Fearis, and R. M. Jurek. 1972. Age and sex composition of Western Sandpipers on Bolinas Lagoon. Calif. Birds 3:79-86.

Page, G. and D. F. Whitacre. 1975. Raptor predation on wintering shorebirds. Condor 77:(in press).

Recher, H. F. 1966. Some aspects of the ecology of migrant shorebirds. Ecology 47:393-407.

Strauch, J. G., Jr. 1967. Spring migration of Dunlin in interior western Oregon. Condor 69:210-212.

Storer, R. W. 1951. The seasonal occurrence of shorebirds on Bay Farm Island, Alameda County, California. Condor 53:186-193.

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 cirrhata*) 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

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. Pearcy, J. M. Scott, C. F. Zeillemaker pers. obs.).

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

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 murres 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,

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 (*Cepphus 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).

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[1]	$\bar{x}$=1010 S.D.=136.12 Range=730-1400 n=110	No data	No data
Destruction Island, Washington[2]	$\bar{x}$=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[2]	$\bar{x}$=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[2]	$\bar{x}$=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.

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.

ACKNOWLEDGMENTS

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LITERATURE CITED

Ainley, D. G., and T. J. Lewis. 1974. The history of Farallon Island marine bird populations, 1854-1972. Condor (In press).

Ainley, D. G., S. Morrell, and T. J. Lewis. 1974. Annual cycles of storm-petrels on the Farallon Islands. The Living Bird (In press).

American Ornithologists Union. 1957. Check-list of North American birds. Fifth ed. Am. Ornithol. Union, Baltimore, Md.

Bent, A. C. 1919. Life histories of North American diving birds. U. S. Natl. Mus. Bull. 107.

Browning, M. R., and W. English. 1968. A breeding colony of Cassin's Auklets and possible breeding of the Rhinoceros Auklet on Goat Island, southeastern Oregon. Condor 70:88.

Campbell, R. W., and D. Stirling. 1967. Notes on the natural history of Cleland Island, British Columbia, with emphasis on the breeding bird fauna. Rept. Provincial Mus., 1967, Victoria. Pp. 32-41.

Cody, M. 1973. Coexistence, coevolution and convergent evolution in seabird communities. Ecology 54:31-44.

Crowell, J. B., and H. B. Nehls. 1969. Nesting season. Northern Pacific Coast region. Audubon Field Notes 23:84-88.

Crowell, J. B., and H. B. Nehls. 1970. Nesting season. Northern Pacific Coast region. Audubon Field Notes 24:708-711.

Crowell, J. B., and H. B. Nehls. 1972. Nesting season. Northern Pacific Coast region. Birds 26:893-897.

Dwight, J., Jr. 1925. The gulls (Laridae) of the world: Their plumages, moults, variations, relationships and distribution. Bull. Am. Mus. Nat. Hist. 52:63-401.

Gabrielson, I. N., and S. W. Jewett. 1940. Birds of Oregon. Oregon State Monographs, Studies in Zoology No. 2.

Grinnell, J. 1926. The evidence as to the former breeding of the Rhinoceros Auklet in California. Condor 28:37-40.

Grinnell, J., and A. H. Miller. 1944. The distribution of the birds of California. Pac. Coast Avif. No. 27.

Hancock, D. 1970. New Rhinoceros Auklet colony for British Columbia. Condor 72:491.

Lack, D. 1966. Population studies of birds. Clarendon Press, Oxford.

Manuwal, D. A. 1972. The population ecology of Cassin's Auklet on Southeast Farallon Island, California. Ph.D. Dissertation, Univ. California, Los Angeles.

Osborne, T. O. 1973. Recent nesting of the Rhinoceros Auklet in California. Condor 75:463-464.

Richardson, F. 1961. Breeding biology of the Rhinoceros Auklet on Protection Island, Washington. Condor 63:456-473.

Ridgway, R. 1919. The birds of North and Middle America, Part VIII. U. S. Natl. Mus. Bull. 50.

Scott, J. M. 1971. Interbreeding of the Glaucous-winged Gull and Western Gull in the Pacific Northwest. Calif. Birds 2:129-133.

Scott, J. M. 1973. Resource allocation in four syntopic species of marine diving birds. Ph.D. Dissertation, Oregon State University, Corvallis.

NOTES

ALBINO ROCK WREN

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Albino Rock Wren *(Salpinctes obsoletus)* photographed 28 May 1974 on a rocky serpentine slope at Laguna Lake Park, San Luis Obispo, California. First noted 17 December 1973 on the Morro Bay Christmas Bird Count, the bird subsequently established a territory. From its song and actions we presumed it to be a male. A second albino seen on the same slope the day of the Christmas count was not seen again. The bird pictured was carrying food the day it was photographed, but we were unable to locate a nest. The only marks visible on this bird were extremely pale brownish barring on the wings and tail. It was not possible to get close enough to determine exact soft part color; the eye appeared dark, the bill and feet pale.

Photo by David S. Johnston

BREEDING RECORD FOR THE SEMIPALMATED PLOVER AT OCEAN SHORES, WASHINGTON

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On 23 June 1973, at Ocean Shores, Grays Harbor County, Washington, Eugene Hunn and I observed an adult Semipalmated Plover *(Charadrius semipalmatus)* in breeding plumage calling incessantly and diving at us as close as 15 feet. The bird seemed to be defending a territory in a flat sandy area covered with pebbles and broken seashells, surrounded by sand dunes, and situated near the tip of a mile-long sand spit extending from the southern tip of the Ocean Shores peninsula into the mouth of Grays Harbor. We searched for eggs and young but found none.

On 1 July 1973, I returned to the same location and found two adult Semipalmated Plovers defending the same territory. In the center of the flat sandy area stood one downy young Semipalmated Plover, which immediately ran into the dune grass as I approached. I watched the young plover for approximately 15 seconds with 10 power binoculars from 30 feet. Within one hour after this sighting, I made a rough sketch of the young plover from memory. Joseph R. Jehl Jr. has examined this sketch and agreed with the identification. Eighty yards from this first pair of adult Semipalmated Plovers, I observed another pair of adults defending a similar territory, but I could not find eggs or young.

On 7 July 1973, I returned with Glen Hoge to confirm my previous findings. We observed the first pair of adults and their one downy young at the same location. We also observed the second pair of adults defending the same territory as previously, but this time we observed one downy young Semipalmated Plover there also. We estimated that the downy young of this second pair was approximately one week older than the downy young of the first pair. It would have been possible for more than one downy young per pair of adults to have been present, since the young were difficult to see amid the dune grass and the gravel. However the maximum number of young observed was two, one for each pair of adults.

Also breeding on the mile-long sand spit were approximately three pairs of Snowy Plovers (*C. alexandrinus)* and one pair of Killdeer (*C. vociferus*). The coloration of the two downy young Semipalmated Plovers precluded any possible confusion with the downy young of these other two species of breeding plovers. The brown upperparts of the downy Semipalmated Plovers distinguished them readily from pale-backed downy Snowy Plovers, which both Glen Hoge and I have seen in the area. The downy young Semipalmated Plovers also lacked a black stripe around the neck and a long downy tail characteristic of downy Killdeer (Gabrielson and Lincoln, The Birds of Alaska, 1959).

This is the first breeding record for the Semipalmated Plover in Washington. Larrison (Washington Birds, Their Location and Identification, 1968) records the Semipalmated Plover as a migrant and a non-breeding summer resident in Washington. The A.O.U. Check-list of North American Birds (1957) records the southernmost breeding range in western Canada as the Queen Charlotte Islands and northwestern British Columbia. Godfrey (Birds of Canada, 1966) cites a breeding record for south-central interior British Columbia. An extralimital breeding record for the Semipalmated Plover for Vancouver, British Columbia in 1967 is described by Campbell (Murrelet 53:11-12, 1972).

In late June 1974 I returned with Glen Hoge to check the sand spit for breeding Semipalmated Plovers. Numerous dune-vehicle tracks were discovered through both previous nest sites. No Semipalmated Plovers were found.

A YELLOW-BILLED LOON IN BAJA CALIFORNIA, MEXICO

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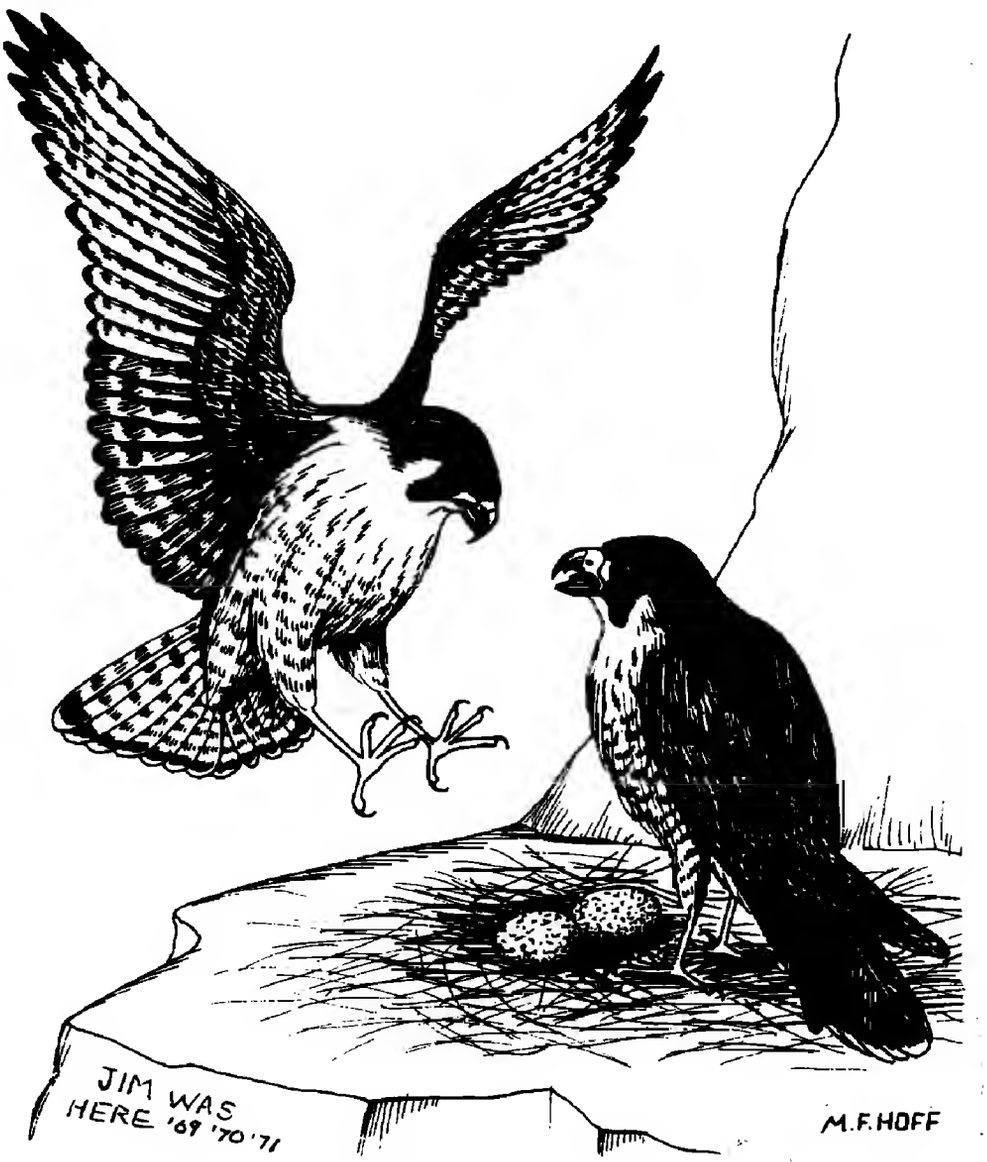
Late in the afternoon of 30 June 1973 we observed a loon offshore at Pete's El Paraiso approximately 9 miles by road north of San Felipe, Baja California, Mexico. Upon setting up our 20x spotting scope we were amazed to discover that it had a very large, very yellow bill.

The bill was pale sulphur or butter yellow becoming white at the tip. There were dark brown markings extending approximately a fourth of the total length of the bill from the base and along the gape as well. The gape markings appeared to be on both mandibles. The bill was very long and high at the base. About a third of the way from the base, the lower mandible began to angle up; the bill thus appeared to come to a long attenuated point. The culmen was straight along most of its length angling up slightly at the tip. The bird seemed very large with a disproportionately thick neck. It was assuming a black and white plumage. The head, throat and upperparts were mostly blackish, but some white still remained on the posterior cheek and auricular areas, and the wing coverts and scapulars bore four rows of large white squares. Thus the bird was at least two or more years old.

We feel that we conclusively identified a Yellow-billed Loon (*Gavia adamsii*) on the basis of the foregoing description. Unfortunately we were unable to photograph the bird, nor were we able to relocate it on a return trip there the following weekend.

This sighting is remarkable in several respects. It is the southernmost North American record of the species. It is only the second known occurrence in Mexico, the first being a specimen taken in extreme northwestern Baja California (Jehl, Condor 72:376, 1970). This sighting in the warm Sea of Cortes is one of the very few records away from the Pacific. The date is unusual in that summer records are scarce in California, Oregon and Washington. Finally, most records in the United States south of Alaska are of birds in brown plumage.

Sketch by Tim Manolis



Peregrines at Morro Rock

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