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WINTERING BEHAVIOR AND SITE-FAITHFULNESS OF GOLDEN PLOVERS ON OAHU

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In August 1979, we initiated a comprehensive study of the wintering biology of the American Golden Plover (*Pluvialis dominica fulva*). This paper contains various preliminary findings accumulated through October 1980. The project is ongoing, and as we gather additional data further reports of a more detailed nature are planned.

STUDY AREAS AND METHODS

The primary study area is Bellows Air Force Station (BAFS) near Waimanalo, Oahu, Hawaii. BAFS is a relatively large military reservation with ideal plover habitats such as lawns, pastures, and unused runways (Fig. 1) which contain a wintering population of about 300 birds. Additional data were obtained at the nearby Kaneohe Marine Corps Air Station (KMCAS) where there is a larger population of wintering plovers. Unless otherwise noted, the findings reported herein represent observations made at BAFS.

We monitored a combined total of about 400 plovers along two automobile census routes (4.3 km at BAFS, and 7.1 km at KMCAS) covered weekly from 17 August 1979 through 26 May 1980. From June through October 1980, observations were continued on the BAFS route only. The resultant data furnish a continuous record of various behavioral events, and the cycles of postbreeding and prebreeding molts.

We captured 43 plovers in mistnets at BAFS during the period from 29 September 1979 through 20 April 1980, and banded each bird

with a U. S. Fish and Wildlife Service aluminum band plus a unique combination of from 1 to 3 plastic color-bands allowing specific field recognition. Of the total, 37 birds (23 territorial and 14 non-territorial) were located subsequent to banding and each was observed repeatedly during the course of the study, often for several hours at a time. These observations provide a detailed chronicle of daily behavior in known individuals over periods ranging to nearly seven months.

Plovers were collected from BAFS at intervals throughout the wintering cycle. The specimens furnished information about the age and sex of territorial and non-territorial birds; plus materials necessary for work presently underway on the cycles of molt and reproduction, and body fat levels relative to the energetics of long-distance migration. Since fat extractions preclude the preparation of museum skins, only certain components were retained from each specimen (i.e., an intact wing, the rectrices, and samples of feathers plucked from various regions of the body); these are preserved in the museum collections at Moorhead State University.

FALL ARRIVAL

When our studies commenced at BAFS on 17 August 1979, a substantial number of plovers was already present, and data collected subsequently were inconclusive as to the pattern of fall arrival. During the fall of 1980 we visited the area frequently



Figure 1. The abandoned runways at Bellows Air Force Station are extremely attractive to plovers and represent an important component in the mosaic of wintering habitats on the area.

and our records are more complete. Newly arrived plovers were first observed on 9 August. Following this, the gradual appearance of color-banded birds (banded during the 1979-80 wintering season) indicated a continuing migratory influx, lasting until 25 September. The rate of arrival peaked from about 23 August to about 26 August. These records are consistent with the reports of earlier observers (Henshaw 1902, 1910; Morita and Walker 1964) and imply considerable regularity in the chronology of fall migration.

Early in the fall of 1979, the flocks of plovers observed at BAFS and KMCAS were composed entirely of adults. They were in various stages of the postbreeding molt with most individuals still retaining from 25-50% of their breeding plumage. Adults at this season of the year strongly contrast the characteristic juvenile plumage in which many feathers of the underparts are dark-tipped producing a delicate but nonetheless conspicuous pattern of ventral barring (Prater, et al. 1977). We did not encounter juvenile birds until 26 September 1979 when they were found at both BAFS and KMCAS; the arrival of young birds was not monitored during the fall of 1980. The same pattern of differential migration according to age in *P.d. fulva* was reported in Hawaii by Henshaw (1902, 1910), Morita and Walker (1964), and Saito and Walker (1972); was implicit in the studies of Johnston and McFarlane (1967) at Wake Island; and was considered likely by

Dementev and Gladkov (1951) based on breeding ground observations. This phenomenon also occurs in the eastern race of the American Golden Plover (*P.d. dominica*) (Bent 1929); in the Black-bellied Plover (*P. squatarola*) (Branson and Minton 1976); and reaches extraordinary limits among Red-necked Stints (*Calidris ruficollis*) wintering in Australia where juveniles arrived three months later than adults (Paton and Wykes 1978). As adult and juvenile plovers molted into their respective winter plumages they became progressively more alike, and by early December we were no longer able to separate them through external features.

The juvenile fraction during census counts in October and November 1979 ranged from 10 to 13%. This was dramatically lower than the corresponding figure (64%) in a sample of 53 birds examined at Enewetak Atoll in November 1978 (O. W. Johnson and M. L. Morton, unpubl. data). Perhaps the proportion of juveniles fluctuates from year to year in relation to breeding success. Alternatively, geographic separation of age groups might occur through differential patterns of migration, or competitive exclusion of juveniles by adults already established on wintering areas when the juveniles arrive.

TERRITORIAL AND NON-TERRITORIAL BIRDS

A behavioral duality of uncertain ecological significance wherein some wintering individuals are territorial and others are non-territorial has been reported in many species of shorebirds (Myers, et al. 1979a). We found the same pattern at BAFS and KMCAS with about half the plovers territorial and half non-territorial on each area.

Territories occurred in a wide range of habitats and varied in size from about 450 m² to about 1700 m². Lawns and brushy pasture were the most heavily utilized; followed by open stands of ironwood (*Casuarina equisetifolia*), roadsides and other openings in dense thickets of koa haole (*Leucaena leucocephala*), along the beach in stands of *Scaevola taccada* and *Ipomoea* sp., and along the edges of runways. Plovers use their territories extensively for feeding, and also for such activities as preening, loafing, and sleeping. Since the birds had nocturnal roosting sites elsewhere (see section on roosting behavior), territories were occupied primarily through the daytime hours and for relatively brief periods before sunrise and after sunset. During limited nighttime ob-

servations at BAFS, we encountered a few territorial plovers. Whether they remained throughout the night or eventually went to the roost was unclear. Alternatively, some of these birds may have left the roost and returned to their territories at unusual times. Observations of color-banded territorial birds disclosed that a given plover uses its territory for the entire wintering period, and unless disturbed by such things as human activity or inclement weather remains on it throughout each day (Fig. 2).

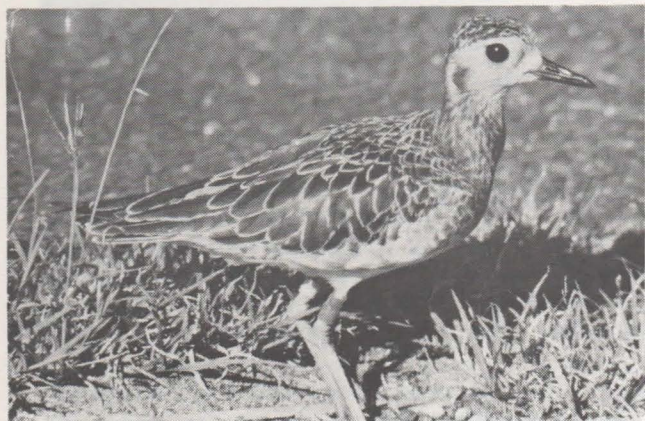


Figure 2. A color-banded golden plover in winter plumage photographed on its territory at Bellows Air Force Station, 2 February 1980.

When disturbed, birds left their territories for varying lengths of time (up to several hours) and retreated to areas having few or no territorial birds such as the golf practice range and the runways.

Territorial individuals were frequently aggressive and interacted along the perimeters of their respective territories. Three conspicuous patterns of interaction were observed: confrontation, crouch-running, and aerial fights.

In a confrontation, two birds challenge one another at relatively close range (often less than 1.0 m). Each bird stands with head erect alertly watching the other, from time to time each takes a few steps to alter its position, and displays intermittent head-bobbing accompanied by slight head to tail rocking motions of the body. The birds sometimes peck at the ground picking up grass, pebbles, etc. which are then flung to the side. After a variable period of time (up to several minutes) the intensity either slackens and the birds gradually drift apart or fighting occurs (see below). Sometimes the behavior terminates when one bird drops to a sitting position which perhaps signals submission.

In crouch-running, the bird assumes a threatening attitude with the body held

parallel to the ground, back feathers fluffed, and the head pulled in on the shoulders. Thus postured, the bird runs rapidly towards its opponent, chasing and attempting to peck it. Frequently, the chase is brief with one bird quickly displacing an intruder; alternatively, two birds chase one another for variable periods of time with one eventually giving way.

Both of the foregoing agonistic behaviors may erupt into relatively violent aerial fighting where the birds make brief fluttering flights and attempt to peck and buffet each other with their wings. We saw one instance of a bird alighting from an aerial encounter with feathers from its adversary clenched in its beak.

The more intense aggressive behaviors accompanied the establishment and reestablishment of territories during the fall arrival period. Following this, most boundary disputes were resolved with minimal energy expenditure. Generally, these disputes involved a brief crouch-run by the territory holder directed at the intruder who quickly retreated. Similar agonistic behaviors occur on the nesting grounds in both races of the American Golden Plover. In the case of *P.d. fulva*, Sauer (1962) described various situations where head-bobbing was correlated with excitement, and observed ground and aerial chases during territorial disputes. Drury (1961) found much the same in *P. d. dominica*.

Non-territorial birds formed flocks wherein feeding, preening, and other activities took place more or less communally. Flocking occurred daily on specific sites such as the golf practice range (Fig. 3) and



Figure 3. The golf practice range at Bellows Air Force Station is a major flocking site used extensively by non-territorial birds. These are often joined by territorial birds when the latter are disturbed and temporarily leave their territories. Aggregations of 100 to 150 plovers were observed here frequently.

various areas of the runways. Aggressive behaviors (mostly crouch-running) occurred among non-territorial birds, but the responses were of lesser intensity and shorter duration than those in territorial birds. Intraflock aggression markedly reduced crowding such that flocks often were relatively dispersed. Agonistic interactions were more frequent during periods of foraging and feeding.

We evaluated the possibility of a difference in the age and sex of territorial as compared to non-territorial plovers through examination of collected birds, and by observations of plumage development in territorial individuals just prior to migration. Collected specimens revealed that: (1) most territory holders are adults (predominantly males), but some juveniles of both sexes also establish territories; (2) the non-territorial population contains mostly females and juveniles; (3) the degree to which the two sexes develop breeding coloration prior to northward migration is distinctly different, with males much brighter than females. The plumage variation can be described as follows: males show a pure white forehead, superciliary line, and neck stripe which strongly contrast the intensely black belly, chest, throat, and cheeks (the latter often are flecked with a few buffy feathers); in females the forehead, superciliary line, and neck stripe are buffy white, the belly and chest show a mixture of black and buff, and the cheeks are mostly buff with only a few dark feathers. This dimorphism is shown clearly in photographs of plovers on the breeding grounds (Sauer 1962), and in photographs of hand-reared, captive birds (Sauer 1963). Using these plumage criteria, we recorded the probable sex of each of 35 territorial individuals at BAFS. This group constituted the total territorial population on two large areas of lawn where no collecting (which might have distorted the ratio) had been done. Each bird was readily observable, and the evaluation was performed on 21 April, just prior to migration when the prebreeding molt was advanced. The result was 23 males and 12 females, further demonstrating that a territorial bird is more likely to be a male than a female.

ROOSTING BEHAVIOR

The plovers wintering at BAFS roost on the nearby (approximately 1.5 km offshore) Mokulua Islands nightly (Fig. 4), and this habit probably eliminates most predation.



Figure 4. The Mokulua Islands as seen from the northeast corner of Bellows Air Force Station. These islands contain important nocturnal roosting sites for Golden Plovers which combine with diurnal onshore habitats to make Bellows Air Force Station a prime wintering area for this species.

Flights to the roost occurred around sunset with birds departing singly or in small flocks. The number of plovers using the islands was estimated through evening counts by observers positioned on the beach at the northeast corner of BAFS. On the average, we saw about 300 birds from 20 minutes before sunset to the limits of visibility at approximately 20 minutes after sunset. The counts were minimal in that a few plovers departed later than this and could not be seen clearly.

The morning return flight from the roost began 30-40 minutes before sunrise. Many birds did not fly directly to their territories but landed instead on unobstructed lawns and runways. With increasing light, they shifted to territorial areas.

Roosting behavior of the plovers at KMCAS was less clear-cut. An evening watch at the Nuupia Ponds on 21 January 1980 disclosed a total of 165 birds arriving in variously sized flocks presumably to roost. Since this was a relatively small part of the total wintering population at KMCAS, undetected roosts elsewhere on or near the base seemed likely.

WEATHER ASSOCIATED BEHAVIOR

There was a direct correlation between wind speed and nervousness in the birds. Under windy conditions they often flushed at the slightest provocation. This agitated state probably resulted from such visual stimuli as leaves blowing across the ground surface and the swaying of trees and other

vegetation. At these times, all birds (territorial and non-territorial) aggregated together in flocks on the extensive open spaces afforded by the runways and golf practice range. They faced into the wind in both standing and sitting positions. Sitting birds drew their heads close to their shoulders with bills either pointing forward or thrust beneath the feathers of the back. While sitting, the birds often dozed, opening the eyes briefly at frequent intervals. Robertson and Dennison (1979) described similar sitting-sleeping behavior in golden plovers during windy weather in New Zealand. Curiously, Johnston and McFarlane (1967) never observed plovers in sitting positions at Wake Island except for spring transients which may have been fatigued. We saw this behavior frequently in all types of weather and in varying social situations (i.e., individuals either on or off their territories, and among non-territorial birds in flocks).

Rainy weather produced numerous puddles on the runways and the plovers responded by drinking and bathing. The latter involved vigorous wing-flapping and body movements while the birds sat partially submerged in the water. Bathing was followed by lengthy periods of preening.

We were unable to monitor the behavior of the plovers during an unusually severe storm, with winds gusting to approximately 126 kph and very heavy rain, that occurred on 8-9 January 1980. Based upon our other observations, it is probable that the birds spent most of this time aggregated on the runways. Despite the harshness of the weather, there was no apparent mortality. The numbers of birds recorded on censuses before and after the storm remained comparable and all color-banded territorial birds under observation just prior to the storm (16 individuals) survived.

SPRING DEPARTURE

Most birds departed on spring migration during a two-day period from 25-26 April 1980. The full complement of plovers was present at BAFS on the afternoon of 24 April, but when we next visited the area at dawn on 27 April, approximately 80% of the birds were gone. This increased to about 95% by 30 April. Exactly the same pattern occurred at KMCAS. Present records of northbound departures from the Hawaiian Islands are relatively imprecise. Henshaw (1902, 1910) indicated simply that this occurs in April and May. According to the respective findings of

Morita and Walker (1964) and Giffin and Medeiros (1968), 80-90% of the plovers wintering on Oahu departed "during a single week in the middle of May," 1964 and "by May 2nd," 1968. Bruner has observed certain behavioral features of departing birds (see below), however, specific dates are unavailable. We urge field observers to record plover movements in the spring such that the timing of migration can be more thoroughly documented.

Although we did not witness the major exodus, the departure of one flock of plovers was observed by Johnson and Johnson at KMCAS on 27 April. Their field notes read:

"At 4:45 PM we found a flock of about 25 plovers resting near a rainwater puddle on a gravelly flat at the northwestern edge of the base, and we immediately stopped to observe them. Within two or three minutes they suddenly took wing, rapidly gained altitude, and joined with a high-flying flock of about 50 plovers that was passing overhead. We were unaware of this other flock until the two groups merged. Possibly, the take-off of the first flock was triggered by the second though we could scarcely see it without binoculars. The combined group assumed some type of line formation (possibly a "vee," we were unable to determine this from our angle of observation), and flew northwesterly out to sea at around 2000 feet; gradually the birds were lost to view in our binocular fields. By fortunate coincidence we had witnessed the onset of northward migration in this group of plovers."

Both Henshaw (1902, 1910) and Sauer (1962) reported personal communications with field observers who had seen plovers departing on migration. These observers described preliminary circling flights which carried the birds to great altitude from which the actual departure occurred. The birds observed by Johnson and Johnson (above) did not circle, their flight path was a straight ascent to the northwest. Johnston and McFarlane (1967) recorded both the straight and circling modes of departure at Wake Island. Over the past ten years, Bruner has regularly observed departure flights of up to 250 plovers commencing at dusk from a staging area on lawns in front of the BYU-Hawaii campus at Laie, Oahu. In each case, the aggregation of birds rose in ascending circles to at least 1000 feet and then headed directly out to sea in a long, loose line. Although some birds have been seen departing at daybreak (Henshaw 1902), all

other records (including our own) indicate the typical departure time to be from late afternoon to dusk. It is possible that departures also occur at night but this has not been detected.

By 1 May only a few plovers remained at BAFS and KMCAS. Most of these were in non-breeding plumage, a few had slight traces of breeding coloration. Several birds with 50-75% breeding plumage were observed as late as 26 May, but disappeared thereafter.

From 6 to 14 first-year birds in non-breeding plumage were observed at various times through the summer at BAFS. They foraged mostly on the golf practice range, and showed no evidence of territoriality. The summering of young shorebirds on their winter ranges has been reported from many areas (McNeil 1970, Johnson 1973), and represents a poorly understood phase in their life cycles. Possibly, this phenomenon reflects an increment of time required for the maturation of physiological mechanisms underlying long-distance migration. However, present findings revealed major variation in relative maturity among first-year plovers, suggesting that this time lag does not occur in all individuals. We collected several first-year birds in April which had well developed breeding plumage indistinguishable from that of adults. Age criteria for these birds (i.e., bursa of Fabricius present; worn and faded primary feathers dating to the juvenile plumage acquired on the breeding grounds nearly a year earlier) were evident only with the birds in hand. From our field observations at the time of migration, it was clear that those first-year plovers in advanced breeding plumage had left the area presumably in the company of adults. Thus, while some young birds remained at BAFS during the summer others apparently returned to the nesting grounds. In addition to the ambiguous nature of this duality, questions arise concerning the performance of lengthy flights on worn juvenile primaries and the role (if any) of returning first-year birds in the reproductive effort.

SITE-FAITHFULNESS

Many years ago, Max Schlemmer amputated an injured leg from a golden plover wintering on Laysan Island. Over the next five consecutive years he recorded in his journals that a one-legged plover had wintered on the island, arriving and departing on almost the same dates each year (Bryan 1915). This early record of apparent winter range fidelity can now be verified conclusively.

Of the 43 plovers banded, one was

found dead several weeks after banding, leaving 42 as possible spring migrants. A minimum of 30 of these marked birds returned during the fall of 1980. It is possible that additional banded birds have escaped detection amidst relatively dense vegetation in certain areas at BAFS. Each returning banded bird retained a social position identical to that recorded during the winter of 1979-80: overall, 16 territorial and 14 non-territorial individuals. Furthermore, each of the territorial birds reoccupied the same territory that it had held the previous winter. Four instances were seen where earlier migrants temporarily occupied the territories of banded individuals. In each case, when the banded bird eventually arrived, it displaced the intruder and reclaimed the territory. On 31 August 1980, Bruner saw a banded plover alight on one of the four disputed territories. Within minutes after landing, it vigorously attacked and drove off the other bird; only the banded individual was seen on the territory thereafter. Whether this instance marked the actual migratory return of that particular bird is impossible to know.

Although various authors have reported site-faithfulness in wintering shorebirds (Middlemiss 1961, Thompson 1973, Elliott, et al. 1976, Kelly and Cogswell 1979, Myers, et al. 1979b, Smith and Stiles 1979), our findings represent one of the most impressive and best documented examples of the phenomenon to date. Complementing its feats of long-distance migration, it is now clear that the golden plover also possesses remarkable homing abilities and the capacity to reestablish territorial boundaries nearly identical to those of the previous year.

ACKNOWLEDGMENTS

We are grateful to various officials of the Hawaii Division of Forestry and Wildlife; U. S. Fish and Wildlife Service; U. S. Air Force; and U. S. Marine Corps for their kind cooperation in securing the collecting and access permits essential to our research. A. J. Berger, R. L. Walker, D. H. Woodside, and T. A. Burr provided invaluable advice and assistance during the course of the work and also in preliminary planning. Special thanks are extended to the staff at Bellows Air Force Station. Without the courtesy, tolerance, and friendly cooperation of Capt. L. K. C. Chang, Senior M/Sgt. G. E. Tubbs, M/Sgt. R. H. Robinson, and members of the security force, this study could not have been carried out. At the Kaneohe Marine Corps Air Station, we thank Col. M. H. Sauter for allowing us access to the base, and

Staff Sgt. A. Cox for aid while on the area. Most specimen collection was done jointly with R. M. Nakamura who furnished both assistance and congeniality. Banding was conducted under a permit held by R. L. Pyle and we appreciate his cooperative spirit. O. Bussen helped in the field and provided extra mistnets. This study was done while the first author spent a sabbatical year in the Department of Zoology at the University of Hawaii. The many courtesies extended by members of that department are acknowledged with gratitude.

LITERATURE CITED

- Bent, A.C. 1929. Life histories of North American shorebirds. Part 2. U.S. Natl. Mus., Bull. 146.
- Branson, N.J.B.A. and C.D.T. Minton. 1976. Molt, measurements and migrations of the Grey Plover. *Bird Study* 23:257-266.
- Bryan, W.A. 1915. Natural history of Hawaii. Hawaiian Gazette Co. Ltd., Honolulu.
- Dementev, G.P. and N.A. Gladkov (eds.). 1951. Birds of the Soviet Union. Vol. 3. Israel Program for Scientific Translations, Jerusalem.
- Drury, W.H. 1961. The breeding biology of shorebirds on Bylot Island, Northwest Territories, Canada. *Auk* 78:176-219.
- Elliott, C.C.H., M. Waltner, L.G. Underhill, J.S. Pringle, and W.J.A. Dick. 1976. The migration system of the Curlew Sandpiper *Calidris ferruginea* in Africa. *Ostrich* 47:191-213.
- Giffin, J.G. and J.S. Medeiros. 1968. Ecological investigation of the migratory game birds: Plover census (Oahu). Unpublished research report, Hawaii Division of Fish and Game, Honolulu.
- Henshaw, H.W. 1902. Birds of the Hawaiian Islands. Thrum Publishers, Honolulu.
- Henshaw, H.W. 1910. Migration of the Pacific plover to and from the Hawaiian Islands. *Auk* 27:245-262.
- Johnson, O.W. 1973. Reproductive condition and other features of shorebirds resident at Eniwetok Atoll during the boreal summer. *Condor* 75:336-343.
- Johnston, D.W. and R.W. McFarlane. 1967. Migration and bioenergetics of flight in the Pacific Golden Plover. *Condor* 69:156-168.
- Kelly, P.R. and H.L. Cogswell. 1979. Movements and habitat use by wintering populations of Willets and Marbled Godwits *In* Shorebirds in Marine Environments (F.A. Pitelka, Ed.). *Stud. Avian Biol.* 2:69-82.
- McNeil, R. 1970. Hivernage et estivage d'oiseaux aquatiques nord-americains dans le Nord-Est du Venezuela (mue, accumulation de graisse, capacite de vol et routes de migration). *L'Oiseau Rev. Francaise Ornithol.* 40:185-302.
- Middlemiss, E. 1961. Biological aspects of *Calidris minuta* wintering in Southwest Cape. *Ostrich* 32:107-121.
- Morita, C. and R.L. Walker. 1964. Ecological investigation of the migratory game birds: Plover survey (Oahu). Unpublished research report, Hawaii Division of Fish and Game, Honolulu.
- Myers, J.P., P.G. Connors, and F.A. Pitelka. 1979a. Territoriality in non-breeding shorebirds *In* Shorebirds in Marine Environments (F.A. Pitelka, Ed.). *Stud. Avian Biol.* 2:231-246.
- Myers, J.P., P.G. Connors, and F.A. Pitelka. 1979b. Territory size in wintering Sanderlings: The effects of prey abundance and intruder density. *Auk* 96:551-561.
- Paton, D.C. and B.J. Wykes. 1978. Re-appraisal of moult of Red-necked Stints in southern Australia. *Emu* 78:54-60.
- Prater, A.J., J.H. Marchant, and J. Vuorinen. 1977. Guide to the identification and ageing of holarctic waders. British Trust for Ornithol., Field Guide 17.
- Robertson, H.A. and M.D. Dennison. 1979. Feeding and roosting behavior of some waders at Farewell Spit. *Notornis* 26:73-88.
- Saito, R. and R.L. Walker. 1972. Ecological investigation of the migratory game birds: Plover survey (Oahu). Unpublished research report, Hawaii Division of Fish and Game, Honolulu.
- Sauer, E.G.F. 1962. Ethology and ecology of Golden Plovers on St. Lawrence Island, Bering Sea. *Psychol. Forsch.* 26:399-470.
- Sauer, E.G.F. 1963. Migration habits of Golden Plovers. *Proc. 13th Int. Ornithol. Congress*: 454-467.
- Sauer, S.M. and F.G. Stiles. 1979. Banding studies of migrant shorebirds in northwestern Costa Rica *In* Shorebirds in Marine Environments (F.A. Pitelka, Ed.). *Stud. Avian Biol.* 2:41-47.

Thompson, M.C. 1973. Migratory patterns of Ruddy Turnstones in the central Pacific region. *Living Bird* 12:5-23.

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FIRST GULL RECORD FOR SAMOA

by C.J. Muse and Shirley Muse

During a recent extended stay in the Samoan Islands, we recorded the first sighting of a gull of any species for these Islands. We were there photographing the birds of Samoa for a forthcoming book, and spent three months in American Samoa and three months in Western Samoa. Our field work consisted of daily surveys around the island roads and frequent forays into the interior.

On January 23, 1980 at 8:15 a.m. a solitary gull was spotted standing 15 meters offshore opposite the Malua Methodist Seminary on the north shore on Upolu, Western Samoa. It was low tide and the bird was conspicuous on the mud flat of the lagoon. We observed it at close range for a total of 40 minutes at that time. Lighting was excellent and we photographed the gull using a Leicaflex with Leitz 560 mm telephoto lens.

Early research of available literature on this area of the South Pacific Ocean had not prepared us for the appearance of any gull species and, caught by surprise, we were able to determine only that it was an immature gull of uncertain species. We realized that we had a problem in identification. We are not experts on gulls and the fact that it was an immature bird made it even more difficult. Literature at hand was searched for positive identification, but no conclusions were reached.

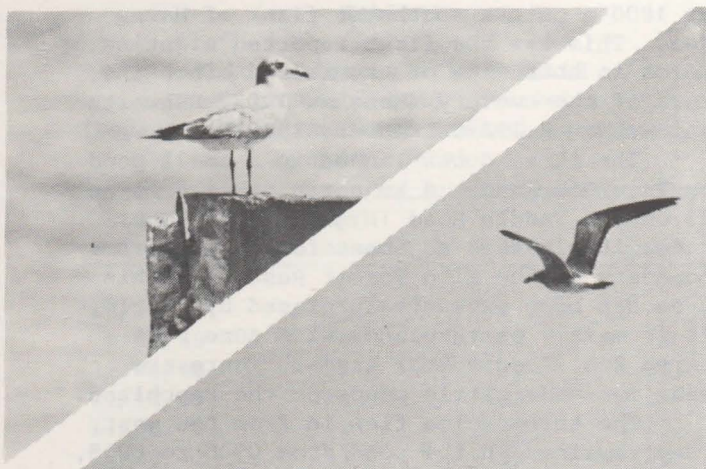
Returning the following day and finding the gull still there, we watched it for some time and enjoyed observing it fishing in a fresh water lagoon nearby, and then returning to its perch on a cement piling. This afforded us an excellent observation of the bird in flight as well as in a standing position.

We can summarize the description as follows: small to medium-sized based on comparison with the Pacific Golden Plover (*Pluvialis dominica fulva*) and Wandering Tattler (*Heteroscelus incanus incanus*), both in close proximity; gray to mottled brown on head, back and upper wings; white on tail, with dark terminal band extending to edges of tail feathers; wing tips black; gray on breast and sides; white underbelly; white forehead and "appearance" of white eye ring; beak black; legs and feet dark to "blackish."

The gull was subsequently seen at one other location--the mudflats at Mulinu'u Lagoon near Apia, approximately 24 km (15 miles) east of Malua--on January 26th and 27th. We determined to our satisfaction that it was the same individual by driving at once to the Malua location and not finding the bird there.

Further observations were made on January 28, 30, 31 and February 3, 7, 8, 9, 15, 20, and 26. We were accompanied on one occasion by Ragni Askevold and Brian Keating, two touring Canadian Wildlife Service biologists, but they could offer nothing more to our tentative identification. On February 9, Terry Teppen, a Peace Corps volunteer with a Masters degree in biology, observed the bird with us, but, again, we were unable to arrive at positive identity. We photographed it on several other occasions. The bird appeared content and had a ready source of food available. It was totally unfamiliar to the Samoans whom we questioned and they simply identified it as a "Tuli," the name applied to all shorebirds by the Samoans. We last observed the bird, still healthy and well fed, on February 27, as we departed Western Samoa. We had chosen not to collect the "specimen" but to attempt identification by means of our photographs and description when we could search more complete references.

Upon returning to the U.S., several experts on gulls and seabirds were provided with slides and field notes on the bird. Although it was not unanimous, most agreed the bird is a first-winter plumaged Laughing Gull (*Larus atricilla*). The Southern Black-backed Gull (*Larus dominicanus*) was ruled out as the slides and description did not agree in overall size and shape, bill size and shape and color of mantle of that species. Those who were familiar with the Laughing Gull in all plumages agreed that in overall size and shape, bill size and shape, mantle coloration (initial gray feathering), eye ring, white on head, primary color and tail and rump pattern, the bird matched museum specimens and available literature of this species. Museum specimens were compared at the Buffalo Museum of



This gull, probably a Laughing Gull in first winter plumage, was photographed on the north shore of Upolu Island, Western Samoa, in January 1980.

Photos by C.J. and S. Muse

Science, Buffalo, New York, and at the Smithsonian Institution Museum of Natural History.

Assuming it was a Laughing Gull, this bird was observed about 8,000 km from its nearest breeding area in Southern California and since it is not an oceanic species, this makes the recorded sighting one of interest to observers of the Pacific Islands avifauna. The Samoan Islands can continue to provide both the professional ornithologist and the amateur birdwatcher excellent opportunities for interesting field work and also possible exciting sightings such as we have described.

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AUDUBON OFFERS ENVIRONMENTAL STUDIES SCHOLARSHIPS

The National Audubon Society Expedition Institute today announced that it is making scholarship funds available to graduate, college, and high school students who are interested in the subjects of outdoor education or environmental studies. Financial aid, in varying amounts, will be awarded by July 31, 1981 and may be used for any Audubon educational program or other school, college, or conservation education programs. Application forms may be obtained by the student writing to the National Audubon Society, Expedition Institute, 950 Third Avenue, New York, New York 10022.

THE KOLOA (HAWAIIAN DUCK) ON THE ISLAND OF HAWAI'I

by Peter W. C. Paton

The Koloa or Hawaiian Duck (*Anas wyvilliana*) was once a common species on all the major Hawaiian Islands with the exception of Lana'i and Kaho'olawe (Perkins 1903, Munro 1944). The Koloa is now found only on Kaua'i, O'ahu, and Hawai'i, and is considered to be an endangered species (U.S.D.I. 1974). Koloa are the most widespread of the three endemic Anatidae. The Nēnē or Hawaiian Goose (*Branta sandwicensis*) is found on the islands of Maui and Hawai'i and the Laysan Duck (*Anas laysanensis*) is confined to Laysan Island in the Northwest chain. This paper reviews the decline of the Koloa in the islands and reports on the present status of the species on the island of Hawai'i.

The population of the Koloa began to dwindle in the early 1900's. This decline has been attributed to several factors: hunting by man, predation by introduced species, and a reduction in their foraging and breeding habitat (Schwartz and Schwartz 1953).

Hunting of the Koloa was permitted up to 1925. Before 1925 there was a four-month hunting season, with a bag limit of 25 ducks per day. Even after the ban on hunting Koloa was enacted, it was still legal to hunt migratory ducks. Therefore the 1925 law probably did not afford the Koloa much protection due to its similarity to several species of ducks that regularly migrate to the Hawaiian Islands. It wasn't until 1942 that there was a total ban on all duck hunting in the islands (refs. in Swedberg 1967).

Since the Koloa is a ground-nesting species, they are extremely vulnerable to the predators that have been introduced to the islands over the years. Almost all the present population of the Koloa resides on Kaua'i, where an estimated 3,000 birds remain (Swedberg 1967). Until 1976, Kaua'i was the only major island not inhabited by the mongoose (*Herpestes auropunctatus*) (Anon. 1978). Although no observations have been recorded of a mongoose preying on Koloa, the circumstantial evidence points to the mongoose as a major threat to the species. Dogs (*Canis familiaris*) have been recorded killing flightless adult Koloa. Cats (*Felis domesticus*) and rats (*Rattus* spp.) probably prey upon their nests and young (Swedberg 1967).

The Koloas' preferred habitat is mountain streams from 150 m to 1220 m in elevation, although Perkins (1903:365-466) reported them as high as 2440 m. These streams are usually less than 7 m wide, swift flowing, strewn with boulders, and the banks heavily vegetated with native forest trees and shrubs. The population that resides below 150 m is found in reservoirs, major irrigation ditches, flooded fields, and the larger streams with outlets to the ocean (Schwartz and Schwartz 1953).

Much of the Koloas' former habitat in the lowlands is now gone. Natural wetlands, such as Mana Swamp on Kaua'i and Waikiki Swamp on O'ahu, have been drained. Taro fields were once extensively used by Koloa for foraging. In 1900, the total taro acreage in the islands was 18,922 acres, but by 1960 this land had been reduced to 510 acres (refs. in Swedberg 1967).

The history of the Koloa on the island of Hawai'i is a depressing one. Henshaw (1902:110) wrote: "Upon the island of Hawaii the Koloa used to be numerous, by no means uncommon about Hilo, the type locality, as recently as five years ago. But the mongoose has increased in numbers, the Koloa has diminished, and it is no longer found about Hilo at all, while becoming comparatively scarce on other parts of the island." The species was rarely seen on the Big Island by 1953 (Schwartz and Schwartz 1953). When Stanley Shima observed two Koloa in the Kohala Mountains in 1968, it was the first positive sighting of wild birds on the island in almost twenty years (Swedberg 1969).

In 1958, the then Hawaii Division of Fish and Game initiated a Koloa captive propagation and release program to replenish the species diminishing numbers. Birds were raised at the Pōhakuhoa endangered species facility under the guidance of Ah Fat Lee. Koloa were released on the islands of Hawai'i and O'ahu. Released birds were marked with a U.S.F.W.S. leg band. All releases on the island of Hawai'i, until December 1980, were at Kahuā Ranch (Table 1). This site is located on the western slopes of the Kohala Mountains (Department of Land and Natural Resources, unpubl. data).

Although there has been no recent accurate census, Koloa are considered common in the Kohala mountains and may be expanding their range. Jon Giffin (pers. comm.) of the Hawaii Division of Forestry and Wildlife reports that Koloa are regularly seen around Waimea, Pololū Valley, Waipi'o Valley, and the Kahuā Ranch area.

In October 1980 I observed three Koloa

at 1800 m on the southeast flank of Mauna Kea. This was the first reported sighting of Koloa in that area of the island since the turn of the century (Henshaw 1902, Schwartz and Schwartz 1949, Swedberg 1969).

The three ducks landed in a small pond on Pu'u O'o Ranch, 4 km north of mile marker 23 on the Saddle Road (Highway 20). The ranch is situated adjacent to the western boundary of the Hilo Forest Reserve. This area has been extensively grazed by cattle. It is mainly pasturelands with some scattered Koa (*Acacia koa*) trees. There are many man-made cattle ponds on the ranchland.

The three Koloa flew in from the west. They remained in the pond from 0900 to 0915, then left to the north. I was able to watch them from 75 m under good light conditions with 7x50 binoculars. I also took two photographs, unfortunately of poor quality. All three were medium-sized ducks. Two were identical with: cinnamon/brown bodies; greenish bills with a slight tinge of yellow at the base; dark blue speculums, bordered with white on both sides; orange legs; and when they flew off I noticed that both of them were unbanded. The third bird was more gray than the other two, its body and head was mainly grayish/brown. It had a greenish bill and its speculum was also dark blue, bordered on both sides with white. I did not see its legs.

It is possible that the ducks reached Pu'u O'o Ranch via the saddle between Mauna Loa and Mauna Kea. Two different pairs of Koloa that were released at Kahuā Ranch have returned to Pōhakuhoa (Lee pers. comm.). The distance from Kahuā Ranch to Pu'u O'o Ranch via the saddle is about 57 km. Another route for the birds would have been around the northeast flank of Mauna Kea, a distance of approximately 75 km.

The Hilo Forest Reserve still has much habitat that is suitable for Koloa. It is possible that birds have started to re-establish themselves in the forest reserve and the three ducks that I saw came from there. Predators such as mongoose and other feral mammals are the major problem confronting Koloa in this area. Only a small number of hunters use the forest and they are closely regulated by state personnel (Bachman pers. comm.).

The Division of Forestry and Wildlife in December 1980 released 58 Koloa in the Hilo Watershed near the Wailuku River (Giffin pers. comm.). The Wailuku offers good feeding and breeding grounds for the species. With some predator controls, hunter education, and a little luck these may become re-established into the drainage system.

Table 1

Koloa releases at the Kahuā
Ranch on the island of Hawai'i
(Department of Land and Natural Resources,
unpubl. data)

Date of Release	Total Released	Drakes	Hens
12/12/58	21	-	-
8/01/59	4	2	2
12/06/68	52	30	22
11/12/69	44	23	21
11/06/70	42	19	23
12/29/71	53	30	23
11/14/72	55	29	26
11/18/73	55	26	29
1/14/74	44	28	19
10/25/79	43	25	18
TOTALS:	416	212	183

ACKNOWLEDGMENTS

I would like to thank Jon Giffin, Curtice Griffin, and C. John Ralph for their helpful comments on the manuscript and Ron Bachman of the Hawaii Division of Forestry and Wildlife for access to their files.

LITERATURE CITED

- Anon. 1978. The great mongoose hunt is on. 'Elepaio 38:119.
- Henshaw, H.W. 1902. Birds of the Hawaiian Islands. T. G. Thrum. Honolulu.
- Munro, G. C. 1944. Birds of Hawaii. Tongg Publishing Co. Honolulu.
- Perkins, R. C. L. 1903. Fauna Hawaiiensis. Vol 1(IV). Cambridge Univ. Press.
- Schwartz, C. W. and E. R. Schwartz. 1949. A reconnaissance of the game birds in Hawaii. Bd. of Comm. of Ag. and For. Terr. of Hawaii.
- Schwartz, C. W. and E. R. Schwartz. 1953. Notes on the Hawaiian Duck. The Wilson Bull. 65:18-25.
- Swedberg, G. E. 1967. The Koloa; A preliminary report on the life history and status of the Hawaiian Duck (*Anas wyvilliana*). Dep. of Land and Nat. Res. Honolulu.
- Swedberg, G. E. 1969. Sighting of a Koloa on the Island of Hawaii. 'Elepaio 29: 87-88.
- U. S. Dept. of the Interior (U.S.D.I.). 1974. U. S. list of endangered fauna. Gov't Printing Office. Washington, D.C.

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UPDATE ON CHRISTMAS ISLAND

by George G. Campbell

In 'Elepaio, Vol. 41(5), HAS Past President Robert Pyle reported on a trip to Christmas Island which he and family members had made in January 1980. I had planned to be on the same flight but other matters intervened. In January 1981, I did make the trip with friends from the Hawaiian Malacological Society. This story is an update on Christmas Island as the visitor sees it.

The two-hour and forty-five minute flight from Honolulu to Christmas on a Boeing 727 was pleasant. The Republic of Kiribati (formerly the Gilbert Islands) became an independent Commonwealth nation on July 12, 1979. Air Tungaru, the Kiribati airline, is still chartering a plane from Air Nauru for this run, but has plans to obtain its own aircraft in the near future. The Captain Cook Hotel, clean and comfortable, served excellent meals and provided packed lunches on request.

The two birders in our party of twelve were joined by four photographers to rent a new, commodious mini-bus. With knowledgeable guide Tekiera Mwemwenikeaki and capable driver Kente Maake, we were able to go when and where we desired. The other six Honoluluans, concentrating on scuba diving and fishing, found a pickup truck suitable for their needs. It should be noted here that the Christmas Island roads must rank among the best in the Pacific Ocean area.

Activities occupying time of the photography/birding group included observing the islanders harvesting milkfish for air shipment to Honolulu. This is the fish that Hawaiians call a'wa. The harvest is one phase of the Kiribati economic development program, which includes encouragement of tourism. Shelling, snorkeling and sightseeing also lent variety to the week-long stay.

The birds seen and photographed were generally as reported by Dr. Pyle. We did not locate Audubon's Shearwater, nor did we see shore birds other than a few Wandering Tattlers and many Golden Plovers. We especially hoped to see the Lesser Frigatebird (*Fregata ariel*) which has only recently been discovered on the island. We saw the small lagoon island where the species had been reported but the frigatebirds soaring over it were too far away for identification. We did not have time to arrange for a closer look.

We were glad to see Christmas Island's only indigenous land bird, the Pokikokiko or Christmas Island Warbler, near the hotel. This small bird, with the conformation of some

North American flycatchers, showed enough curiosity to give photographers good opportunities to record it.

A major reason for the thorough enjoyment of our trip was the cooperation of local officials and other persons with whom we came in contact. With initiative and friendliness they briefed us on our arrival and were always available for consultation. In particular, we appreciated the assistance of Patrick Lawrence, Natural Resources Development Officer; Andrew Barty-King, Hotel Manager; and Martin Garnett, the Wildlife Conservation Officer.

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PREDATION OF PIPTURUS ALBIDUS FRUIT BY RODENTS

On September 24, 1980, at 1:30 p.m., we observed a rodent in the upper branches of a 3.5 m *Pipturus albidus* (H&A) Gray tree consuming the ripe fruit. To our knowledge, this is the first documentation of rodent predation on native *Pipturus* fruits. The tree was located at 520 m elevation in Pahole Gulch, Waianae Mountains, Oahu. The daytime sighting and size of the rodent suggests that the animal was either a mouse of (very) large proportions or an immature roof rat (*P. Quentin* Tomich, pers. commun.). The animal's body size was approximately 9 cm long with a slightly longer tail, perhaps 11-12 cm. Its ears were rounded and small, but prominent. Over a period of approximately 10 minutes, we watched it scamper from branch to branch, apparently undisturbed by our presence, and selectively pick and consume 5-6 white fruits. Consumption of a single fruit was timed at about one minute. In our efforts to get closer to obtain photographs for documentation, we finally frightened the rodent, who scurried away along the adjacent branches of neighboring trees and finally disappeared from view.

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JUNE CONSERVATION UPDATE

By the Executive Board
Hawaii'i Audubon Society

Enhancement of Conservation Strategy- In concordance with the Society's By-laws, the Corresponding Secretary normally transmits testimony and position statements on conservation and other important matters that have been adopted by the Board of Directors. While it is not absolutely essential, nor desirable, that this procedure be followed in all cases, such a policy nevertheless helps to enhance the Society's effectiveness by emphasizing that the correspondence carries the full and formal endorsement of the Board of Directors.

Kaula Island- The legal researching of this case has continued to be undertaken by lawyers representing a conservation coalition that includes the Hawaii Audubon Society. To our knowledge, neither the U.S. Fish and Wildlife Service nor the State Department of Land and Natural Resources have as yet issued the Navy a permit to allow the killing of seabirds in association with practice bombing on this 100 acre island. The use of live bombs (as opposed to 500 lb "inert" bombs) was suppose to have resumed in May, but apparently has been postponed. We are grateful to Representative Cecil Heftel for making inquiries to the Fish and Wildlife Service in Washington, D.C. on behalf of the Society.

Proposed Spiny Lobster Management Plan for the Northwestern Hawaiian Islands- Testimony submitted by the Society to the Western Pacific Fishery Management Council was critical of the plan's inadequate consideration of impacts and ramifications relating to monk seals and sea turtles. In spite of this serious shortcoming, the plan purports a likelihood of being more effective in protecting monk seals than provisions of the Endangered Species Act. The most serious deficiency of the plan is the total absence of any reporting requirement for the accidental capture of monk seals or sea turtles in lobster fishing gear. The Society recommended that the filing of such reports be mandatory, and that both the captain and the owner of the fishing vessels agree to this condition, under penalty of permanent revocation of their fishing permits. It should be noted that last year an adult leatherback turtle (an endangered species) became severely entangled in lobster fishing gear set near Kure Atoll in the Northwestern Hawaiian Islands. The animal had been restrained underwater by the gear for an unknown period of time. When the entangling lines were cut free, the turtle moved slowly away in a lethargic manner.

Proposed Marine Corps Weapons' Firing "Danger Zone" around the Moku Manu State Seabird Sanctuary- The Society has been informed that the U.S. Army Corps of Engineers has forwarded a favorable recommendation to Washington, D.C. on this long-pending proposed action. The State Department of Land and Natural Resources (administrator of the sanctuary) has been opposed to the proposal. If the area in question is hazardous to humans during certain types of weapons' firing, then it would certainly also have to present a danger to seabirds that nest on Moku Manu in large flocks. Moku Manu would be situated in the very center of the proposed two square mile danger zone.

Special Investigators Needed- Society members that would like to be available for short-term investigative assignments involving specific conservation problems are invited to contact the Board of Directors by writing to P.O. Box 22832, Honolulu, 96822.

JUNE PROGRAM

HAWAIIAN LAND SNAILS

While the plight of O'ahu tree snails of the genus *Achatinella* has made news comparatively frequently this past 1½ years because of efforts to place all of its 41 species on the U.S. Endangered Species List, practically nothing has been said about the conservation status of Hawaii's other native terrestrial molluscs. This is most unfortunate since there are well over 1,000 species of the little-known animals. HAS will help to rectify this situation when Dr. Carl Christensen, Assistant Curator, Division of Malacology, Bishop Museum speaks to the Society in June.

Dr. Christensen will give us a wide-ranging perspective of the fascinating land snail fauna, and describe their habitats as well as the impacts of man-induced habitat reduction, introduced predators and other introduced snails and slugs. He will illustrate this with color slides. The program will be at the McCully-Moiliili Library, 2211 S. King Street, 7:30PM on June 15.

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HAWAII AUDUBON SCHEDULE OF EVENTS

(for details, see inside back cover)

June 15 (Monday). Regular meeting at 7:30PM
Dr. Carl Christensen, Division of
Malacology, Bishop Museum will give a
presentation on *Hawaiian Land Snails*

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Members and subscribers wishing to have the 'Elepaio sent by airmail to addresses outside Hawaii may now obtain this service by remitting the additional amount needed to cover airmail postage costs. These amounts, for 12 monthly issues, are:

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