C.F.O. Journal

The Colorado Field Ornithologists' Quarterly

Volume 17, Number 2 Summer 1983

C.F.O. JOURNAL

A quarterly publication of the Colorado Field Ornithologists, c/o Judy Pyle, 2242 16th Street, Boulder, Colorado 80302. Second class postage paid at Boulder, Colorado. ISSN 0362-9902

CFO JOURNAL is devoted to the field study of birds in Colorado. Articles and notes of scientific or general interest, and reports of unusual observations, are solicited. Send manuscripts, with photos and drawings to: Peter Gent, 55 S. 35th St., Boulder, CO 80303. Send rare bird reports to: CFO Official Records Committee, c/o Zoological Collections, Denver Museum of Natural History, City Park, Denver CO 80205.

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Cover Photograph - Dipper by Gary Emerson.
Gary is a long time member of CFO, and lives in Coal Creek Canyon, southwest of Boulder. This photograph was taken along Boulder Creek on the Boulder Christmas Bird Count in 1980.

FOURTH DMNH/CFO TAXONOMY CLINIC

By Dr. Allan R. Phillips, Charles Chase III,
Daniel Casey, and Betsy Webb
September 1981

Cosponsored by the Denver Museum of Natural History
and the Colorado Field Ornithologists

Transcribed and Edited by Charles Chase III, DMNH

Part I: Loons and Grebes--Charles Chase III

There are four species of loon which we will divide and discuss in two size groups: the larger are the yellow-billed loon (Gavia adamsii) and the common loon (Gavia immer), and the smaller are the arctic loon (Gavia arctica) and the red-throated loon (Gavia stellata).

The common loon is the typical loon found in Colorado; it migrates throughout North America and winters along both coasts. The yellow-billed (Y.B.) is predominately a high arctic bird. It winters along the northern pacific coast with very rare excursions into inland areas. We have four reports in Colorado, only one of which was verified with a specimen. Another specimen was later re-identified as a common loon.

Though the Y.B. is somewhat larger, the extreme difference between these specimens is actually the manner in which they were prepared. At this time I'd like to make a few comments about working with study skins. Plumages, measurements of bills, feet and wings, as well as measurements of feathers are valid uses of study skins. However, using a study skin to perceive the shape of a bird is one of the most deceptive things that you can do with a specimen. The resulting shape is totally at the discretion of the preparator. It can be completely flat or an exact taxidermic reproduction. Use great care in your interpretations and use of this material in the field. Now let's get back to the loons.

The Y.B. and common... the Y.B. is named for the pale whitish-yellow bill in the adult breeding plumage; non-breeding and immature birds have a pale bill with the culmen (top of the bill) dark, basally only. The distal or front half of the bill is always going to be light. This is a key character in differing between Y.B. and common loons. The bill of the common loon is black in the breeding season while immatures and non-breeding plumaged birds have a gray bill with a dark culmen that extends most if not the entire length of the bill.

The shape of the bill is another important character. The culmen of the Y.B. is straight or slightly recurved. The inner edges of both mandibles are fairly straight distally but very recurved basally

giving the effect of a "smile." The bottom of the lower mandible is angled and straight for a greater distance than is the common. This accentuates the "chin up" appearance of this species. There is quite a bit of overlap between species in this character. The basal half of the lower mandible tends to be slightly recurved giving a very full appearance to the lower mandible.

The bill of the common loon is quite different. The culmen is somewhat decurved (curved down) distally and straight basally; the mouth is much less recurved basally resulting in little if any "smile" effect; the straight, angled portion of the lower mandible is shorter than the Y.B. while the basal half tends to be somewhat recurved. This results in a much thinner appearing lower mandible in the common loon.

Q: Is there much actual size difference in the bill?

CHASE: Yes, the Y.B. is approximately 10-15% longer and deeper.

There are several other characters of the head and neck that are important regardless of which plumage the bird is in. The eye of the Y.B. is smaller than the common while the neck is thicker. The length of the feathers on the neck (probably an adaptation to nesting in the high arctic) accounts for the thicker neck. The neck feathers of a Y.B. average 4-6 mm longer than in a common. Additionally the feathering on the chin of the common extends only one half of the way to the nostrils. The cumulative effect of all of the above characters results in the Y.B. appearing very large headed in constrast to the common.

One helpful behavioral trait of the Y.B. is the tendency to hold the head and bill tilted upwards as does the red-throated loon. The common and arctic loons hold their head and bill straight or even angled down. This is not to say that Y.B.'s don't occasionally hold their heads straight or downward but they typically are tilted upwards.

Q: Do common and arctic loons ever hold their heads up?

CHASE: Not that I've ever seen or heard of.

The breeding plumages of the birds are fairly distinctive. Continuing with the head, the Y.B. head color is black with purple iridescence except the very back of the head which has a green iridescence. The common's head color is exactly the opposite. All over the Y.B., the number of white spots is reduced (absent/very few on the uppertail coverts and rump) in number but they also tend to be larger. The largest white spots on the back are 15-20 mm in size while those of the common average 5-10 mm. Close-up the Y.B. spot pattern will be very distinctive while at a distance it will appear overall lighter-backed than the common which has smaller spots and greater amount of dark.

The non-breeding or immature loons are less distinctive but there are two good plumage characters to look for. The overall back, neck and head color of the Y.B. is somewhat grayer than the common. The sides of the neck and head are also less contrasted; there is no sharp delineation of dark head and light/white throat. The common has a fairly strong contrast in the head and neck area (though not a sharp line) while this area of the Y.B. merges more and is much hazier. The last character we will mention is one of the most diagnostic for non-breeding birds; the Y.B. has an auricular patch that is dark, while this is absent in the common loon. This patch looks like an ear flap just behind the eye and is usually quite distinctive.

Q: Will the common ever have this patch?

CHASE: No...the dark color on the head and neck is a fairly continuous line in the common loon. There may be very little contrast between the front, side, and back of the neck of a Y.B. It can be very pale especially in freshly molted plumage. As winter progresses, the light tips of the feathers wear off and the bird gets progressively darker, though never as dark as the common loon.

Q: Where and when was the Colorado record Y.B. found?

CHASE: It was collected in the Denver area in October 1930. I suspect that most records we find in Colorado will be fall and very early winter birds, mostly immature birds in non-breeding plumage. (Ed. note--Two Y.B.'s found Christmas 1982 in the Denver area appeared to be adults in non-breeding plumage. So much for guesswork!!)

Let's now take a look at the smaller loons. In breeding plumage they are quite distinct and are named after the most obvious difference: the red-throated (R.T.) and the black-throated or arctic. Fortunately, these two birds are simple to differentiate in breeding plumage; unfortunately, you will rarely see them in breeding plumage in Colorado. The arctic has almost the same back pattern as the breeding plumaged Y.B.; large, broad white patches and numerous white spots. The R.T. has a fairly dark back with numerous pale, small spots, but overall appears dark-backed.

The breeding plumages of the head are well covered in any field guide so I'll only briefly note them here. The arctic has a black throat and dark face with a pale gray head and back of neck. There is some striping under the chin and on the sides of the neck. The R.T. has a red throat, gray face, head, and sides of neck with striping along the back of the head and neck.

The shape of the bill of these birds is very similar to their larger counterparts. The R.T.-Y.B. and the arctic-common. The R.T. has a dark, straight to slightly upturned, thin bill. The R.T. also has a slender neck and smallish head giving an overall small, thin appearance with a skinny little bill that is flipped up at the end. The arctic has a relatively straight to slightly decurved bill that is proportionately somewhat thinner than a common's. As I mentioned

earlier, the R.T. has the behavior of holding its head and bill tilted upwards while the arctic does not typically do this.

These characters will be especially helpful in the non-breeding plumaged birds. The R.T. is a much paler bird in winter due to several factors: The back of the head and neck are quite pale and while the breeding plumage spots have disappeared, they have been replaced with light edgings across the back feathers. The edgings form pale lines across the distal portion of the back and are fairly randomly spread on the basal portion. The arctic has light edges on the back feathers but much reduced, with no distinct pattern. The effect will be of an overall gray-brown. The brown of the back is actually somewhat darker than that of the R.T.

The head characters are the most distinctive between these two species. The arctic is darker with a strong contrast between the light throat and dark back of neck, top of head, and back. The arctic loon we are examining has the greatest amount of mottling between the light and dark that we have in this collection--even so, there is still a strong contrast between the light and dark portions of this bird. The effect of the R.T. is of a pale gray bird while the arctic appears dark gray or brown.

The next character must be used with caution. The R.T. has the white of the throat extending up to and incorporating the eye. There will be white in front of (lore) and occassionally above the eye. In the arctic the dark extends to the bottom or below the eye. You must be careful with this because a molting bird can have much more dark and mottling than a clean winter plumage. Dark below the eye does not necessarily equal an arctic loon while light through the eye is most likely a R.T.

Q: The R.T. appears very skinny, even (especially) in flight. What about the arctic?

CHASE: No, arctics do not appear skinny. In fact, my next point is addressing that question. I would suspect that there will be more difficulty identifying non-breeding arctic and common loons than arctic and R.T. While the arctic is much smaller, when viewed from a half a kilometer that difference isn't going to be particularly noticeable. The arctic has a thinner appearance overall than the common. The bill length and depth, neck, and head, are all proportionately thinner than a common loon. In flight the common, being a larger bird, will have a slower wingbeat. The common will appear larger, stouter, and heavier. The head of the common appears long and double-rounded while the arctic is smaller with only a single rounded shape. If you notice this specimen, the arctic also has a wire protruding from the forehead; this is quite distinctive from the common.

Q: Is that a constant trait?

CHASE: No! No, that's highly variable depending on the treatment a specimen has received.

Q: Are there subspecies of the common loon?

PHILLIPS: Well, the question of the validity of the two subspecies is argued back and forth, probably with more heat than light. In any case, what is important here is species variation.

Q: Can you mistake the small subspecies for an arctic loon?

CHASE: Some people can mistake anything for practically anything else, so... however you shouldn't have problems with that. The characters of smaller common loons are still those of common loons. Juveniles are smaller than adults and females are smaller than males but they are still common loons, and have the proportionate shape of common loons.

GREBES

CHASE: To begin grebes, let's take a look at this immature bird. The date it was collected is 19 August. Any guesses as to what it is?

Q: Pied-billed Grebe. (Several affirmative responses to this.)

CHASE: This is a young coot.

Q: Not fair!

CHASE: Nor will it be any fairer in the field. How often do you identify pied-billed grebes (Podilymbus podiceps) at distance by shape? Quite a few bird watchers I know do. The shape of this young coot is certainly quite similar to a grebe, though the grayish white coloring is different. Pied-billed grebes and coots are often encountered together in marshes and in July and August it isn't unusual to see a young coot wandering by itself. By the end of September the young coot will be a dark gray and much different in proportions than a grebe; by October they'll be the size of adults and by spring will be identical to adults with the exception of gray edgings to the wing.

Breeding adult pied-billed grebes should be fairly simple. There is a triangular shaped, blocky head with a very stout bill. Pied-billed grebes are always brown in all plumages. The bill is bluish white with a broad black band. The throat is black. The winter plumage has a white throat and the black band on the bill is faint or absent. The young birds will have a rather strongly striped pattern on the side of the face and a whitish throat. The very blocky shape of the head with the stout bill should cinch most identifications as long as you are cautious about coots.

The next two grebes are quite common in Colorado and are frequently misidentified. The eared-grebe (Podiceps nigricollis) is an uncommon breeding bird, while the horned grebe (Podiceps auritus) is a common migrant. Both grebes arrive in Colorado in mid-March, though occassional horned grebes may be found in small numbers all year-round.

The characters of these birds are really quite simple, in the hand. The eared is small, with a thin upturned (sometimes) bill. The horned grebe is stouter with a slightly decurved stouter bill, though not nearly as stout as a pied-billed grebe. In breeding plumage the eared has a black throat (from which it received its scientific name nigricollis), head, neck, and body with some rust along the sides and flanks. The ear of the eared grebe is yellow and is located along the side of the head. The black pointed crest is usually visible above the yellow "ear." The crest on this specimen is not visible because it has been laying on it for the past 35 years. The yellow crest of a horned grebe should flare up to or over the top of the head. If any of the head is visible above the crest it should not be pointed, as in the eared, but simply the flat top of the head. The horned will have a red throat, neck, breast and sides with a brown back. The head, which is much flatter on top and overall blockier, is black. Both of these species and the western grebe have red-orange eyes. The pied-billed and red-necked have black eyes. The horned is larger and lighter colored--always; the eared is smaller and darker.

In the non-breeding plumage, the eared grebe has a gray throat and a white chin. The sides of the face and neck are gray turning darker on the head and back of neck. The horned grebe has a strong contrast of white throat, chin, neck, breast, and belly to the dark on the head, back, and back of neck. The sides of the face are also white which is opposite to the eared. The effect of the white chin and side of face is of an even blockier head than really occurs. There is also, sometimes, a dark auricular patch as in the Y.B. loon though not as extensive. One caution--molt can be very confusing. The grebes migrating or breeding in Colorado are frequently observed in molt. At that time color contrasts and light and dark areas may be confused and actually be quite different.

The last characteristic of these two birds that I'd like to discuss is their posture on the water. The eared tends to ride higher in the water with the rear end appearing distinctly out of the water. The back of the horned tends to slope directly into the water; it rides much lower on the surface.

Q: I'd always thought that the eared grebe was puffed out on the rear end while the horned appears slick?

CHASE: If both birds were dry that may be the case; however, since grebes spend much of their time diving, wet feathers may obscure this feature.

The red-necked grebe (Podiceps grisegena) is frequently reported in Colorado but much less frequently well described. All records have been in the late fall and early winter and have been in non-breeding plumage. The breeding plumage is fairly simple to identify and well covered in the field guides. The white chin and throat, the red neck and breast and the yellow bill are usually fairly easy to spot. The non-breeding bird is more difficult. Red-necked grebes are slightly smaller than western grebes, especially their shorter neck. The red-

necked is similar in proportions to the horned grebe with a long neck. Separating these two species may be your most difficult task.

The non-breeding and immature plumaged birds all have gray necks and throats. The bill is yellow at the base only, the rest being a dusky brown. Adults in winter have a white-gray/white crescent under the chin extending up on the side of the head. Immatures are fairly solid gray on the head and chin. The bill is shorter and stouter than the western grebe but longer and stouter than the horned grebe. The top of the head appears relatively flat and the overall head, from the side, is triangular shaped.

That should deal with the small grebes. Any questions?

Q: What is the possibility of confusing winter plumage red-necked grebes and one of the smaller loons?

CHASE: Very little chance of that. The head and neck shape are totally different. The grebe has a large squarish head on a thinner neck. Loons will tend to have a more continuous shape; the head isn't going to look much larger than the neck.

We will next discuss western grebes (Aechmophorus occidentalis) and will concentrate on the two color morphs. If you want to read more about this interesting species complex, see Auk 1979, vol. 96, pp. 573-586. This excellent study demonstrates the difference in behavior, plumage, displays and calls and concludes with the suggestion that the two be split into separate species. Other people looking at these birds have found little or no interbreeding, which supports his conclusion. The light-phased bird (Aechmophorus occidentalis clarkii) occurs predominately in Mexico with some birds coming north. The dark-phased birds (Aechmophorus occidentalis occidentalis) are the race from which the species was first described, and occurs throughout all North America. It is the typical western grebe observed in Colorado, though both are commonly found.

Starting with the dark-phased bird, the bill is dull, yellowish, somewhat brighter in the breeding season, but most importantly, it is dull. There is a dark head with a dark lore and dark extending below or at least to the bottom of the eye. The dark back contrasts strongly with the white sides and front. The flanks tend to be mottled.

Males of both morphs are larger than females with a significantly longer bill. The western grebe is the most sexually dimorphic species (in bill size), of all the grebes. Males of each species are generally larger than females.

Light-phased birds--notice how light the bill color is; it is a bright yellow to yellow orange. This is true at any time of the year with adults; the bill will never be dull colored. There is a light lore and white eye-line above the eye. There is no dark below the eye except for a small amount of dark feathering encircling the eye

itself. The white can extend very high up on the side of the head; through the auricular and back onto the back of the head. The dark on the head is restricted to the top of the head and a narrow strip down the back of the neck. The white face and eye-line should cinch the identification of these birds. The back is paler gray and the flanks are whitish.

Q: Are the young similar?

CHASE: The first month and one half the light-phased young have a white crown. The dark-phased birds are quite dark almost from hatching. After this initial period the young are extremely difficult to tell until they molt into their first adult plumage later in the fall.

Q: Have these birds ever been separated before?

CHASE: Yes, they were initially described separately, then lumped together at a later time.

Part II--Vireos, by Daniel Casey

CASEY: Today I'll be speaking about the plumage characters which can be used in the field to identify the species of vireos which occur in Colorado. My own experience with vireos came primarily during my graduate studies in Pennsylvania. I hope I can offer some insight into the identification of those eastern species which are uncommon to rare in Colorado. If time permits, I'll discuss a few species for which extralimital observations have not yet been recorded in Colorado.

There are two basic groups of vireos: Those with wing-bars and those without. I'll begin with the wing-barred vireos.

The solitary vireo breeds here in Colorado and is the only species I'll discuss which has a race worth mentioning. As you can see, the solitary vireo is a large vireo. The common race in Colorado is the plumbeus vireo (Vireo solitarius plumbeus) which is a very gray bird. There is some olivaceous color down toward the tail on the back, but for the most part, the crown, neck, and sides of the head are all gray. Distinct white wingbars and the white eye-ring are key characters in this species. Note that the eye-ring and the white in the lores combine to give this bird a "spectacled" appearance. Note also that the eye-ring is broken immediately in front of the eye, in the lower lore region. You can see that well on this specimen.

The other race of the solitary vireo, which is found in Colorado, primarily in migration, or exclusively in migration...

PHILLIPS: We don't know if it breeds, yet...

CASEY: ...is the Cassin's solitary vireo (Vireo solitarius cassinii) which has much more olivaceous coloration on the back. Notice the contrast between these two birds of the same species: the plumbeus is larger and the Cassin's has a much more olive back. The contrast in color between the gray crown and the olivaceous back is noticeable in the Cassin's. Finally, the plumbeus has a very light olivaceous/yellow wash on the flanks; on the Cassin's the flanks are brighter, with some of the feathers being almost canary yellow.

A third race of the solitary vireo which Dr. Phillips recommended I discuss, and which may occur in eastern Colorado but hasn't been recorded yet, is the blue-headed vireo (V. s. solitarius). This race is similar to the Cassin's, but has an even more pronounced contrast between the crown and back. Notice its very distinctly gray crown and more yellowish-green back. This back color extends further up the back than the Cassin's, giving this bird a more distinctly "capped" appearance. The head is also a deeper slate-gray in the blue-headed vireo.

To summarize the three solitary vireo races: all have the white spectacles and white wingbars; note that there is a cline from the very gray plumbeus, to the more olivaceous Cassin's, to the colorful blue-headed. The back color goes from almost pure gray in the plumbeus, to gray followed by olive in the Cassin's, to a distinct demarkation between deep gray crown and yellow-olive back in the blue-headed.

Q: Which is the largest:

PHILLIPS: Plumbeus is the largest, Cassin's the smallest.

CASEY: Now I'll move on to a bird that is somewhat similar to the plumbeus solitary vireo: the gray vireo (V. vicinior). This species is found primarily in the western portion of the state, with a few records from southeastern Colorado. Like the solitary, this species has "spectacles," but they're not as pronounced, particularly in front of the eye, where the white line is thinner than that on the solitary. Note also that in the gray vireo the eye-ring is complete; it lacks the small gap we saw in front of the eye on the solitary. While the gray vireo is classified as a wing-barred vireo, it is really only marginally wing-barred. The gray vireo really only has the suggestion of a single wing-bar...on a worn specimen, such as this one, even that single wing-bar is not very visible. This species is aptly named; it's a very drab gray bird with only the slightest suggestion of an olive tinge on the lower back. The gray vireo has a smaller-headed appearance than the solitary; its smaller bill keeps it from having the heavy-headed appearance of the solitary, which has a larger bill. Its body size is similar to the solitary vireo.

The next species is a bird that's very distinctive; it could be confused with a Cassin's solitary vireo but it's much more colorful. It's the yellow-throated vireo (V. flavifrons), one of the most distinctive, easy-to-identify vireos. This species has a much yellower

breast, chin, and throat when compared to the solitary; it's the only species of vireo with extensive bright canary yellow which can be expected in our state. The yellow-throated vireo is another heavy-billed, robust vireo. The crown and back are olive-green with a yellowish tinge. Like the solitary, this species has dark wings with two distinct white wing-bars. This species also has "spectacles" but instead of being white, they are a rich yellow, similar to the breast.

PHILLIPS: I like to think of this species as the reverse of the blue-headed vireo. You see, they both have the same patterned eye-ring and so forth, but the eastern solitary is gray-headed with yellow behind, and the yellow-throated is yellow toward the head and gray toward the rump.

Q: Are they still that yellow in the fall?

PHILLIPS: Yes.

CASEY: One last note on the yellow-throated vireo; they have white undertail coverts while the Cassin's solitary usually has yellowish undertail coverts.

Another species which could be considered in some ways to be like a smaller version of the yellow-throated is the white-eyed vireo (V. griseus). There are limited records of this species in the eastern half of Colorado. Like the yellow-throated, this species has yellow "spectacles." The cotton in this specimen is appropriate, since the species has a distinct white iris. The white-eyed is smaller billed than the yellow-throated, giving a less robust appearance. It strikes you as a smaller bird.

Q: Is that throat supposed to be grayer?

CASEY: On the white-eyed there isn't a yellow throat; but instead a white throat fading into some yellow on the belly. This is really variable, but the flanks are always yellow. A contrast between the flanks and the throat and breast is distinctive.

PHILLIPS: What about habitat?

CASEY: There is a great habitat difference between these two species in particular...the white-eyed is more of a shrub-type bird...in Pennsylvania it's very common in old fields bordering wet meadows, shrubby habitats, low tangles on forest edge. The yellow-throated is much more of a tree-top bird; I think of it as an open oak-forest bird.

Like the yellow-throated, the white-eyed vireo has a yellowish olive crown and back, but in the white-eyed this color contiues to the tail. It will strike you as a very yellowish bird. The wingbars in this species are dusky; whereas the yellow-throated has dark grayish wings with bright white wing-bars, this species has an olivaceous-brown wing with dusky yellowish wing-bars.

The white eye is certainly the most distinctive character for this species in the adult; I'm not sure if it's white in the immatures.

PHILLIPS: I'm not sure at what age it becomes white.

CASEY: In any case, it's more of a character than the red-eye of the red-eyed vireo, which I'll discuss in a minute. The white-eyed vireo will almost strike you as a warbler sometimes in that it's often seen in low growth, is active and small, and shows a lot of yellowish.

The smallest of the wing-barred vireos in Colorado, and it's only marginally wing-barred in some individuals, is the Bell's vireo (V. bellii), found along river bottoms in the extreme eastern portion of the state. This species is smaller than the white-eyed but has a very similar plumage in many respects. This species has a grayish-olive crown and nape, and a yellowish-olive back which is brighter toward the tail. It does have wing-bars, but they are much less distinct than in the white-eyed. Like the white-eyed, this species does have "spectacles", but they are white not yellow, and surround a dark eye. In an adult, eye color will separate these species. Bell's vireos can have a great deal of yellow on the lower flanks, but none on the throat or breast, other than an occasional light yellowish wash. This bird is found primarily in deciduous forest habitats along rivers, in vines among large cottonwoods, for example.

PHILLIPS: In brush, not in the trees.

CASEY: Right, it would be in forest habitats, but not nesting in the treetops.

Now on to those species without wingbars. I'll begin by describing the most distinctive species before moving on to the ones that have more subtle differences.

The red-eyed vireo (V. olivaceus) is a large vireo with clean white underparts. This is the robust, treetop vireo which most people are probably familiar with. It is characterized by a distinct gray crown and olive back; there is some yellowish wash near the flanks and it may have a little wash near the bend of the wing, but generally it has very clean, white underparts.

The face of the red-eyed vireo is distinctive. There is a white superciliary stripe and a black line through the eye. Since the border of the gray crown is also dark, this bird has a well-defined white eye-line which will jump out when you see this bird. The distinct eye-line is useful in separating this species from the next two I'll address. The adult, of course, has a red eye; but unless the light is right you may not see this. There are no wing-bars; the wings and tail are generally darker brown than the olive back but that doesn't stand out much. The contrast you notice most is that between the wings and the clean breast.

The song of the red-eyed vireo is repititious, nearly constant, and similar in phrasing to the song of the American Robin. I bring this up because songs of the other vireos without wing-bars can be very useful in field identification.

The warbling vireo (V. gilvus) is another species for which we have two races in Colorado, (V. g. gilvus) and (V. g. swainsonii). The latter is the widespread breeder in the mountains. There are not any verified breeding records of (V. g. gilvus).

PHILLIPS: They might breed in the northeast corner of the state.

CASEY: I have one good (swainsonii) skin here; you'll notice that the back is very uniformly colored, from the crown to the tail, as opposed to the contrast of gray crown and olive back in the red-eyed. There is a slight suggestion of olivaceous towards the tall.

There is a suggestion of an eye-stripe in the warbling vireo; there is a whitish superciliary stripe but it is not bordered by black either through the eye or along the brow, as in the red-eyed. Let me call your attention to a contrast in bill size; the warbling is smaller-billed, it appears to be "daintier" than the red-eyed. If you see the two together, you'll notice the larger, slower appearance of the red-eyed.

The Swainson's warbling vireo is found in a variety of mountain habitats; I have found it in greatest densities in aspen stands. The (gilvus) race is more a bird of eastern habitats; second growth and riparian areas. The (gilvus) race is a yellower bird, somewhat more similar in its back color to a red-eyed. It has more of a suggestion of a cap, more gray toward the crown, than does (swainsonii). This race (gilvus) will show more colorful yellowish flanks. I mention this because the extent and location of yellow will help separate warbling vireos from the next species--the Philadelphia vireo (V. philadelphicus).

Perhaps the hardest identification problem with vireos, and I'm not sure I'll resolve anything today, is separating warbling and Philadelphia vireos. There are regular reports of Philadelphia vireos in eastern Colorado. Notice that the back color is similar in these species; somewhat grayer at the nape but generally olivaceous gray. In both species the wings are darker gray-brown than the back. Both species can have quite a bit of yellow on the underparts; in both, the amount of yellow is quite variable. The distribution and intensity of yellow can be useful in separating the two, however. In general, more of the yellow (if present) on a warbling vireo will be toward the flanks. I remind you, these birds are very variable; but bright yellow central breast feathers may indicate you have a Philadelphia vireo. More often these species should be separated based on differences in the plumage of the head. The Philadelphia has more of a "capped" appearance, the crown being darker than the cheek.

Field guides often show a dark line through the eye of the Philadelphia vireo; I haven't seen that very often. What strikes me about this species is the pronounced contrast between the white line of the eye and the olive color below. This sharp contrast gives the face a more unique look than the washed-out cheek and indistinct eye-line of the warbling. This difference is particularly evident in front of the eye-that's a good character. Often a Philadelphia will have a more triangular auricular patch than a warbling; but I grant you that these are fairly subjective characters, very subtle, and hard to see even in these skins. In summary, the Philadelphia is generally a bird with more yellow in the central portion of the breast, which has more contrast between the cheek and eyeline and more suggestion of an auricular patch. In the vireos as a whole, many of the characters are right around the eyes.

PHILLIPS: Well, that is the place where vireo species differ the most.

CASEY: The last species I want to cover here is one for which there are no Colorado records, the Hutton's vireo (V. huttoni). Since Hutton's occurs in Arizona, it could potentially occur here. This is the kinglet of the vireos. It's a small, grayish olive vireo with wing-bars and a "spectacle" type of eye-ring. The eye-ring is broken above the eye. Note also that Hutton's vireo has light edging on all primaries, similar to a kinglet. The back color is also very similar to a kinglet, as you can see by these specimens. Note, however, the thick vireo bill and slightly larger size.

Q. Will the Hutton's behave like a kinglet?

PHILLIPS: Yes, it's exactly like the kinglet except the bill and size. (ed. note)--Hutton's will tend to be a little more sluggish, does much less, if any, flycatching, and rarely flicks its wings with the frequency of a kinglet.

CASEY: It's also relatively longer-tailed and darker between the wing-bars than the kinglet.

That's all the vireos; now I'd like to mention one more thing on vireo songs. If you see a bird which is either a warbling or a Philadelphia, listen for its song. The warbling vireo is aptly named; the song is much like that of the Cassin's finch, an extended warble with phrases reminiscent of the yellow warbler. The Philadelphia is more similar to the red-eyed; bursts of short phrases.

PHILLIPS: Generally three notes together, Philadelphia; more than three, warbling. At least according to statistical terms which are so fashionable these days.

Parts III and IV will appear in the next issue of the Journal.

THE BREEDING SEASON (1 JUNE - 31 JULY) 1982

by Chip Blake
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In Colorado this breeding season, 261 species of birds were recorded and nests of 140 species were located. (For comparison, about 415 species have been seen in the state, and about 260 known to nest.) There were no new state records, nor any new breeding species; however, there were 22 changes of status in the latilong study, including 16 new breeding species and 2 first records. Not surprisingly, 14 of the 22 changes came from the western half of the state; the Delta latilong (15) alone had 9 changes, thanks to Mark Janos.

Some exciting ornithological events of the summer included a female Northern Parula building a nest in Golden, a singing male Magnolia Warbler in Granby, a singing male Hooded Warbler in Boulder, and a Barrow's Goldeneye on Shadow Mountain Reservoir. All of these reports represented first summer records for the state. Boreal Owls nested again on Cameron Pass, and Cattle Egrets, Wood Ducks, and Great-tailed Grackles continued to expand their breeding ranges. 100 White-winged Crossbills appeared at a lake north of Boulder, and especially high numbers of Black Swifts and Northern Three-toed Woodpeckers were found.

As previously noted, 140 species were found breeding in the state this summer. However, some 50 species which are known to breed regularly and commonly in the state went without the discovery of a nest. These include Turkey Vulture, Ferruginous Hawk, Northern Harrier, White-tailed Ptarmigan, Wilson's Phalarope, Band-tailed Pigeon, Gray, Pinyon, and Blue Jays, Northern Mockingbird, Swainson's Thrush, Golden-crowned Kinglet, Orange-crowned Warbler, MacGillivray's Warbler, Common Yellowthroat, Pine Siskin, Lark Bunting, and White-crowned Sparrow. Hairy and Downy Woodpeckers were represented by two nests apiece, Swainson's Hawk and Scrub Jay one apiece, and Broad-tailed Hummingbird nests were reported only from Golden. On this note, I must reiterate the pleas of Bruce Webb in 1980 and Elinor Wills in 1981 for observers to devote more of their summer bird-watching energy to nest-finding. Just as with the monitoring of numbers of birds, the monitoring of numbers of nests and their habitat associations gives us important insight as to the status (or fate) of both common and uncommon species alike. The convenience of the latilong system should make this an easier and more rewarding endeavour.

American Bitterns, Least Terns, Pygmy Owls, Long-eared Owls, and Sage Sparrows went unreported this breeding season. Species found in lower than usual numbers included Northern Harrier, Long-billed Curlew (2 individuals), all hummingbirds and mountain woodpeckers except the Three-toed, Western Kingbird, Horned Lark, all mountain corvids, Loggerhead Shrike (1 report), and Lark Bunting (2 reports). Species found in higher numbers were Blue Grouse, Common Turkey, Northern Phalarope, Mourning Dove, Common Nighthawk, Black Swift, Northern Three-toed Woodpecker, Blue Grosbeak, Indigo Bunting, and Great-tailed Grackle.

Some numbers that are perhaps interesting regarding potentially confusing and closely related species: Lesser Yellowlegs outnumbered Greater Yellowlegs 14:1. Of 429 "peep" sandpipers reported, 52% were Western, 23% were Baird's, 12% were Semipalmated, 11% were Least, and 2% were White-rumped. On the east slope, Empidonax flycatchers were found as follows: 72% Western, 16% Dusky, 7% Hammond's, 5% Willow, and no Gray. On the west slope, it was: 34% Western, 34% Willow, 13% Dusky, 10% Hammond's and 9% Gray. On the eastern slope, Lazuli outnumbered Indigo Buntings by 224 to 29, with 5 hybrids. However, on the west slope, Indigo was the more common species by 12 to 5.

Part I

The following table summarizes some unusual summer records of normally migratory species.

Species and Location	Date of Observation
White-faced Ibis (Boulder)	16 July (VD)
Bufflehead (Boulder)	1 June (MF)
Hooded Merganser (Colo. Spr.)	19 June (RB)
Bald Eagle (Platteville)	13 July (RD)
Bald Eagle (Loveland)	16 July (MB)
Osprey (E. Colo.)	13 June (JR)
Piping Plover (S.E. Colo.)	30 July (DFO)
Solitary Sandpiper (Montrose)	14 July (MJ)
Black-necked Stilt (Boulder)	10 June (MF)
Herring Gull (Montrose)	16 June (MJ)
Bonaparte's Gull (Chatfield)	8 June (AB)
Bonaparte's Gull (North Park)	9 June (DFO)
Bonaparte's Gull (Antero)	14 July (RB)
Ash-throated Flycatcher (Ft. Morgan)	14 July (JRi)
Ash-throated Flycatcher (Pawnee)	18 July (DW)
Swainson's Thrush (Boulder)	10 June (MF)
MacGillivray's Warbler (Loveland)	9 June (JC)

Part II

This table summarizes the observations of species of interest, but for which it is not necessary to distinguish among individual observations because the pattern of occurrence is sufficiently well-established and the total number of observations in the state is reasonably large.

* - indicates not all sightings considered. m - male. i - immature. n - nest. m.o. - many observers. ----- present throughout period. ____ - unusual number, date, or location.

Species	Total Birds	Dates	Location (Observer)
Common Loon	3	6/3-7/10	Denver
Northern Green Heron	8	6/5-7/30	E. Plains
White Pelican	1000	7/17	Riverside & Empire Res. (DFO)
Cattle Egret	29	---	N.E. Colorado
Great Egret	2-3n	---	Boulder, Ft. Collins
Wood Duck	27+	6/10-7/18	N.E. Colorado
Common Merganser	nests	---	Granby, McCoy, Eagle
Mississippi Kite	1;8	7/10;7/31	Pueblo; Lamar
Northern Goshawk	10+	---	Golden(n), 3 Lakes area(n), Boulder, N.E. Colo.
Sharp-shinned Hawk	12+	---	Eagle, 3 Lakes area, Plains
Cooper's Hawk	12+	---	Denver(n), Delta(n), McCoy, Bldr., Durango, Grand Jct.
Golden Eagle	23, 4n	---	Plains and Foothills
Bald Eagle	n, 21	---	Durango (EF)
Osprey	5+	---	3 Lakes area (DJ)
Prairie Falcon	4n	---	Boulder (2), Castlewood Canyon, 3 Lakes Area
Scaled Quail	4	6/12-7/31	E. Plains
Gambel's Quail	12	6/6-7/4	CNM
Semipalmated Plover	1	7/30	S.E. Colorado (JR)
Snowy Plover	15	7/30	S.E. Colorado (JR)
Upland Sandpiper	9	6/9-10	N.E. Colorado (DFO)
Lesser Yellowlegs	150+	7/26	Loveland (AB)
White-rumped Sandpiper	7	6/13	E. Plains (DFO)
Baird's Sandpiper	97	6/1, 7/24-30	E. Plains
Stilt Sandpiper*	400	7/30	S.E. Colorado (JR)
Semipalmated Sandpiper*	50	7/30	S.E. Colorado (JR)
Marbled Godwit	9	7/1-18	Denver
Sanderling	2	7/30	S.E. Colorado (JR)
Black-necked Stilt*	8	6/10, 7/30	Boulder(MF), S.E.Colo.(JR)
Northern Phalarope*	200	7/30	S.E. Colorado (JR)
Bonaparte's Gull	11	6/7-9, 7/14	North Park, Chatfield, Antero
Black Tern	740	7/30	S.E. Colorado (JR)
Yellow-billed Cuckoo	47,4n	---	Mostly Plains & Foothills; nests in Golden & Durango
Black-billed Cuckoo	2	6/21	Ft. Collins (RR)
Greater Roadrunner	2	7/31	Baca Co. (JR)
Barn Owl	2n	---	Ft. Collins (RR)
Screech Owl	15, 4+n	---	Ft. Collins, Pawnee (RR)
Burrowing Owl	37n	---	Pueblo, Loveland, Alamosa
Black Swift	16	6/17-7/28	Boulder, Glenwood Spgs., Fountain, Wolf Creek Pass
Calliope Hummingbird	3	7/10-16	Durango, Jefferson, Boulder
Red-headed Woodpecker	58	---	Foothills, RMNP
Ladder-backed Woodpecker	1f	7/31	2 Buttes Res. (JR)
Yellow-bellied Sapsucker	6n	---	Mountains

Species	Total Birds	Dates	Location (Observer)
Cassin's Kingbird	12	7/10	Pueblo-Rye (DFO)
Eastern Phoebe	11	7/31	Baca Co. (JR)
Gray Flycatcher	2; 1n	6/10; 7/4	Canyon City, Mesa Co.
Bank Swallow*	400	7/24	N.E. Colorado (DFO)
Blue Jay*	1	5/31-6/12	Golden
White-necked Raven	8	7/31	Baca Co. (JR)
Common Bushtit*	31, 4n	---	Lyons (MF)
Bewick's Wren*	4n	---	Pueblo Res. (VT)
Brown Thrasher	2	July	Lyons (HL), Eldora (GS)
Curve-billed Thrasher	4	7/10-31	Pueblo, S.E. Colorado
Long-billed Marsh Wren	12	6/13-7/24	N.E. Colorado
Veery	7+	6/12-13,7/7	Colo. Sp., Loveland, Eagle
Eastern Bluebird	1m	6/5	Pawnee (DFO)
Blue-gray Gnatcatcher	15	---	Lyons(n), Delta(n), E. Colorado, 3 Lakes area
Gray Vireo	6	7/1-4	CNM
Grace's Warbler	4	6/17-7/10	Rye
Chestnut-sided Warbler	1m	6/27	Colo. Spr. (singing)
American Redstart	1m	6/13	E. Colorado (JR)
Northern ("Baltimore") Oriole*	1	6/5	Jefferson (CH, KH)
Bobolink	10	6/3-26	Longmont, Douglas Co.
Rose-breasted Grosbeak	3	6/1-21	Foothills
Lazuli × Indigo Bunting	5	---	Boulder, North Park
Dickcissel	2	6/9	N.E. Colorado (DFO)
Brown Towhee	5	7/10-12	Pueblo, Colo. Spr.
Cassin's Sparrow*	25m	---	Pueblo (VT)
Black-throated Sparrow	7	6/6-12	CNM(MJ), Colo. Spr. (DFO)

Part III

These observations are sufficiently rare or interesting to warrant them being discussed individually.

Western Grebe - Many young were seen at Hart's Basin starting 11 July, changing the status in latilong 16 from n to B (MJ).

Pied-billed Grebe - Flightless young present at Hart's Basin starting 30 June, changing the status in latilong 16 from M to B (MJ). An adult with 4 flightless young in Delta Co. 20 July changes latilong 15 from M to B (MJ).

White Pelican - RR reported that several hundred fledged at Riverside Res., with 100 banded 12 July.

Double-crested Cormorant - RR reported that Riverside Res., Empire Res., and Barr Lake had 750 nesting pairs each. Observers in Boulder noted a significant population increase, and HK commented that cormorants "have nested at Chatfield for 4 years; they

arrived the year Chatfield first filled up. The numbers of nests have been 5, 26, 27, and 66 in 1982."

Cattle Egret - 1 adult in breeding plumage in Delta Co. 23 July changes the status in latilong 15 from M to b (MJ). 5 pairs nested at Riverside Res. with 5 young banded 29 July (RR).

Yellow-crowned Night Heron - 1 adult on a DFO field trip to northeastern Colorado 9-10 June.

Least Bittern - 1 reported from Wheatridge 16-17 June (DM, DN) and the usual one at Sawhill Ponds in Boulder throughout the period (m.o.).

White-faced Ibis - nested at Saguache, changing the status in latilong 17 from b to B (RR).

Wood Duck - 3 nests found near Ft. Collins (RR), and 2 nests, with 4-5 more suspected nearby, were found north of Boulder (MF), changing the status in latilong 4 from M to B.

Barrow's Goldeneye - An immature male on Shadow Mountain Res. 17-18 July was a first summer record for the state (DJ).

American Kestrel - 1 was seen at an unusual elevation of 12,300' on the San Luis Valley Pass 20 July (VS).

Common Turkey - numerous sightings around the state, including many adults with young, but no nests located.

Whooping Crane - 1 spent part of the summer at Monte Vista, but died 15 July (JK).

Piping Plover - 1 in the southeastern portion of the state 30 July (DFO).

White-rumped Sandpiper - 7 reported from the eastern plains at the very late date of 13 June (DFO).

Short-billed Dowitcher - 1 reported from the southeastern part of the state 30 July (JR).

California Gull - There are two breeding colonies of this species in the state. The one at Antero Res. reported 600 pairs, and 50 pairs were present at Riverside Res. (DFO).

Yellow-billed Cuckoo - 3 nests were found in Durango, giving latilong 23 its first breeding records (EF).

Black-billed Cuckoo - an adult visited Escalante Wildlife Area in Delta Co. 21 July, giving that latilong its first record (MJ).

Flammulated Owl - In an area of approximately one square mile near Colorado Springs, 5 nests were found, with several more pairs suspected nesting in the same area (RR).

Boreal Owl - 3 birds fledged from the same nest hole as last year, on Cameron Pass near Ft. Collins (RR).

Saw-whet Owl - Nested at Estes Park, and provided a first breeding record for that latilong (m.o.).

Black Swift - Nested in Eldora, giving latilong 11 a change of status from b to B, and behind Ouzel Falls in RMNP (MF). About 20 individuals of this species were reported from RMNP for the period.

Black-chinned Hummingbird - Nests found in McCoy and Delta; the one in Delta gives latilong 15 a change of status from b to B (MJ).

Blue-throated Hummingbird - A large hummer, suspected to be a female of this species, was present in Golden 25 July-11 August (PH).

Northern Three-toed Woodpecker - Found in hoards this report period as compared to others; at least 15 individuals located. Nests were

found on LaSalle Pass (RB) and in South Park (DFO). Others encountered in RMNP, Boulder, Park Co. and Clear Creek Co.

Eastern Kingbird - 2 pairs found on nests in Delta 5 July, giving that latilong its first breeding records (MJ).

Scissor-tailed Flycatcher - 1 male strayed north to Boulder 5-10 June (PG).

Ash-throated Flycatcher - A nest with two young being fed by adults in Delta 25 July gives latilong 15 a change of status from b to B (MJ). One visited the Pawnee Grasslands 18 July, giving latilong 5 its first record (DW).

Willow Flycatcher - A barely fledged bird at Escalante 6 July provided the first breeding record for latilong 15 (MJ).

Western Wood Pewee - 3 pairs were present all summer at Escalante Wildlife Area, with one bird on a nest 6 July, and two young 21 July. First Delta latilong breeding record (MJ).

Vermilion Flycatcher - 1 reported from Boulder 6 June (MB).

Rough-winged Swallow - Found nesting in Delta, changing the status in that latilong from b to b (MJ).

Plain Titmouse - 1 seen in Radium 24 June was out of its range (DJ).

Sage Thrasher - Nested at Fountain and Pueblo, giving latilong 19 its first breeding record (RB, VT).

Cedar Waxwing - Nesting was found in Denver, giving that latilong its first breeding record (AB, BL).

Phainopepla - An individual was reported from Durango 13 June (GC).

Virginia's Warbler - Seen in Eagle during July with signs of nesting behavior, thus changing the status in latilong 10 from M to b (JM).

Northern Parula - The most amazing occurance of the breeding season was the nest of this species found near Golden. DS watched a female building the nest 11-16 June, but heavy rains 20 June destroyed the nest and discouraged the female, which was not seen again. As Kingery reports in American Birds, this extends the possible breeding range of this species by over 500 miles.

Magnolia Warbler - DJ found a male, singing every 2-3 minutes, near Grand Lake. This species has never nested in Colorado.

Black-throated Gray Warbler - Also in the Grand Lake area 2 July was a bird of this species, "perturbed by my presence and with a mouthful of bugs...trying to feed young somewhere." This event changes the status in latilong 4 from M to b, and represents an extension of the possible breeding range in a northeasterly direction (DJ).

Ovenbird - 1 in Eldora 21 July with signs of nesting behavior, and singing the next day (DB).

Hooded Warbler - A visitor to our state from Pennsylvania found a male singing several times per minute at Gregory Canyon in Boulder; the bird was present 21 June-12 July, however, no other observers saw it (MK). There are no nesting records for Colorado.

Western Meadowlark - 1 on the tundra at 12,000' in RMNP 19 June seems a bizarre locale (JR).

Scott's Oriole - 1 male in Fruita 6 June (MJ).

Great-tailed Grackle - This species continues its amazing expansion. As many as 4 individuals were seen in Colorado Springs, and 3 in Pueblo. Nesting occurred in Fountain (RB) and Durango (EF).

White-winged Crossbill - On 20 June, a flock of 100 flew over Diamond Lake near Eldora (MF). There are very few summer records of this species and no breeding records.

Fox Sparrow - MF, EB, GS, and DH found them to be fairly common and a probable nester in willow bogs northwest of Boulder.

Contributors (underlined) and Cited Observers

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Locations

Colorado National Monument (CNM), Rocky Mountain National Park (RMNP).

WINTER TERRITORIAL BEHAVIOR OF THE TOWNSEND'S SOLITAIRE (Myadestes Townsendi) NEAR MORRISON, COLORADO

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Introduction

The Townsend's Solitaire (Myadestes townsendi) is a common bird of the western coniferous forests, but relatively little is known of its behavior and habitat requirements. During the summertime, the Solitaires occupy mountainous areas with open pine and fir forests from Alaska to northwest Mexico (Terres, 1980). In the winter there is some movement to the south and to lower elevations to juniper woodland habitats. Their diet is seasonally dependent, including insects, spiders, worms, and various fruits and berries in the summer, but during the winter they eat juniper berries almost exclusively.

There have been only a few previous studies of the winter territoriality of Townsend's Solitaires. Lederer (1977a, 1977b) studied an area in northern California over a two year period. Lederer found that the Solitaires occupied and defended feeding territories, and he noted an inverse relationship between territory size and juniper berry density. Salomonson and Balda (1977) studied Solitaires near Flagstaff, Arizona. They also mapped territories over a two year period and found that lower berry density led to larger territories. Benedict and Williams (1981) observed winter territorial behavior by Solitaires in Colorado. Their diet study showed that the Solitaires fed primarily on berries of the red cedar (Juniperus scopulorum) and common juniper (J. communis).

The primary objective of this project was to determine whether Solitaires exhibit territorial behavior in defense of winter feeding areas in the foothills of the Front Range in Colorado. If such behavior were observed, the territories were to be mapped. Secondary objectives were to develop an activity time budget for the Solitaires and to compare the results with previous studies.

Description of the study site

The site selected for this study was along the top of the Hogback between Alameda Parkway and Morrison (Secs. 26 and 35, T4S, R70W). A key feature of this site is that the juniper habitat is in a long, narrow strip along the top of the ridge. This linearity simplified the mapping of territories by reducing it from a two-dimensional to a one-dimensional problem. The total length of the study site is 2.7 km.

The elevation of the crest of the Hogback is between 1830 meters and 1915 meters (6000 to 6283 feet). The average elevation difference between the Hogback and the adjacent valleys is about 105 meters. The Hogback is formed by the resistant beds of the Cretaceous Dakota

TABLE 1

Composite Stand-Type

Tree Species	Number of Individuals	Density Trees/hectare	Basal Area, cm^2	Importance Value
Ponderosa Pine (P. ponderosa)	52	34.8	22,630	96.7
Red Cedar - Female (J. scopulorum)	79	52.9	11,980	92.0
Red Cedar - Male (J. scopulorum)	69	46.1	11,740	88.1
Gambel's Oak (Q. gambelii)	16	10.7	2,880	23.2

Shrub species	% Cover
Mountain Mahogany (Cercocarpus montanus)	13.3
Prairie Sage (Artemesia ludoviciana)	2.2
Winter Sage (Artemesia frigida)	0.8
Starvation Cactus (Opuntia polycantha)	0.4
Wax Currant (Ribes cereum)	0.4
Oregon-grape (Mahonia repens)	0.2
Serviceberry (Amelanchier pumila)	0.2
Spanish Bayonet (Yucca glauca)	0.1
Rabbitbrush (Chrysothamnus nauseosus)	<0.1
Hawthorn (Craetegus erythropoda)	<0.1
Wild Plum (Prunus americana)	<0.1
Skunkbrush (Rhus trilobata)	<0.1
Wild Rose (Rosa woodsii)	<0.1
Boulder Rasberry (Rubus deliciosus)	<0.1

Sandstone. The Dakota is exposed as a west-facing cliff (3 to 10 meters high) at the crest of the ridge. The east slope of the ridge is roughly parallel to the bedding planes of the Dakota. On the west side of the ridge, the slope is formed by the siltstones, shales, and sandstones of the Jurassic Morrison Formation.

A composite stand-type for the study area was generated by compiling the data from a series of vegetation transects. These data are summarized in Table 1. The dominant tree species is red cedar (Juniperus scopulorum), but ponderosa pine (Pinus ponderosa) is also important. A number of ponderosas in the area have been killed by the pine bark beetle infestation, and many more have been damaged. The dominant shrub in the study area is mountain mahogany (Cercocarpus montanus), but prairie sage (Artemesia ludoviciana) and winter sage (A. frigida) are also common. Several other shrubs are present in low concentrations.

The mammals seen in the study area are listed in Table 2. Of the species seen, the rock squirrel (Citellus variegatus) and the chipmunk (Eutamias sp.) are potential competitors with the Solitaires for juniper berries that have fallen to the ground. A herd of about eighteen mule deer (Odocoileus hemionus) is resident on the Hogback, and the shrubs in some areas have been heavily browsed.

During the time spent in the field, all other bird species and individuals were counted. The list of species and estimates of relative abundance are given in Table 3. Because this study was conducted during the winter and early spring, a number of common summer residents were just arriving at the end of the study period. Of the species on this list, the only ones that appeared to be direct competitors with the Solitaires for juniper berries were the American Robin (Turdus migratorius), Scrub Jay (Aphelocoma coerulescens), and Bohemian Waxwing (Bombycilla garrulus). A number of species, including the Canada Goose (Branta canadensis) and most of the raptors, were only seen flying or soaring over the site. The only raptor that appeared to be a resident within the area was the American Kestrel (Falco sparverius).

TABLE 2

Mammals Seen in the Study Area

Gray Fox (Urocyon cinereoargenyus)
Coyote (Canis latrans)
Rock Squirrel (Citellus variegatus)
Chipmunk (Eutamias sp.)
Cottontail (Sylvilagus sp.)
Mule Deer (Ococoileus hemionus)

TABLE 3

Birds Seen in the Study Area

A - Abundant (Seen on almost all trips)
C - Common (Seen on 1/3 to 2/3 of trips)
U - Uncommon (Seen on less than 1/3 of trips)
R - Rare (Seen only once or twice)

Canada Goose (Branta canadensis) U
Turkey Vulture (Cathartes aura) U
Osprey (Pandion haliaetus) R
Cooper's Hawk (Accipiter cooperii) U
Goshawk (Accipiter gentilis) R
Red-tailed Hawk (Buteo jamaicensis) U
Rough-legged Hawk (Buteo lagopus) R
Golden Eagle (Aquila chrysaetos) U
American Kestrel (Falco sparverius) C
Prairie Falcon (Falco mexicanus) R
Rock Dove (Columba livia) C
Mourning Dove (Zenaida macroura) R
White-throated Swift (Aeronautes saxatalis) C
Downy Woodpecker (Picoides pubescens) R
Northern Flicker (Colaptes auratus) U
Scrub Jay (Aphelocoma coerulescens) C
Black-billed Magpie (Pica pica) A
Common Raven (Corvus corax) C
Black-capped Chickadee (Parus atricapillus) R
Mountain Chickadee (Parus gambeli) R
Bushtit (Psaltriparus minimus) U
Canyon Wren (Catherpes mexicanus) C
Ruby-crowned Kinglet (Regulus calendula) R
Townsend's Solitaire (Myadestes townsendi) A
American Robin (Turdus migratorius) A
Bohemian Waxwing (Bombycilla garrulus) U
European Starling (Sturnus vulgaris) U
Yellow-rumped Warbler (Dendroica coronata) U
Chipping Sparrow (Spizella passerina) U
Dark-eyed Junco (Junco hyemalis) A
Pine Siskin (Carduelis pinus) R

Behavior analysis

Behavioral data for all Solitaires were compiled to develop an overall time budget. These data are summarized in an activity time budget (Table 4), which presents the amount of time spent on specific activities, and a habitat zone time budget (Table 5), which gives the time spent in specific segments of the habitat.

A number of interesting results can be seen in these tables. The most common single activity is perching, occupying 78.6% of the total

TABLE 4

Activity Time Budget
Sample Size - 413.5 min

Behaviors	% of Time	
Feeding Behaviors		
Searching	0.48	
Aerial Gleaning	0.48	
Stationary Gleaning	3.87	
Ground Gleaning	3.14	
Hawking	0.48	
Total Feeding Time		8.45
Perching		78.61
Vocalizations		
Calling	4.24	
Singing	0.72	
Total Vocalizations		4.96
Flying		4.00
Interactions		
Intraspecific	0.72	
Interspecific	0.60	
Total Interactions		1.32
Maintenance		2.66
TOTAL		100.00

TABLE 5

Habitat Zone Time Budget
Sample Size - 413.5 min

Location	% of Time	
Red Cedar		
Upper Third	31.44	
Middle Third	7.50	
Lower Third	2.65	
Total		41.59
Ponderosa Pine		
Upper Third	22.74	
Middle Third	13.78	
Lower Third	3.51	
Total		40.03
Mountain Mahogany		2.06
Gambel's Oak		3.26
Ground		3.50
Air		4.72
Other (Yucca, Power Line, Fallen Branches)		4.84
TOTAL		100.00

time. A large portion of this time is probably related to territorial defense, particularly the time spent near the tops of junipers, ponderosa pines, or power lines. This type of conspicuous perching is 67.8% of the perching time, or 53.3% of the total time. The proportion of time spent in perching is so high that a bias in the data seems possible. An obvious behavior, such as perching at the tip of a pine tree, is more easily observed than an inconspicuous behavior, such as ground gleaning. It seems likely that the data could reflect this variability.

A significant amount of time is spent in territorial defense. A total of 1.3% of the time is spent in direct defense involving interactions with other Solitaires or other species. The calling vocalizations (4.2% of the total time) are usually given from a conspicuous perch and are believed to be related to territorial defense. If the

additional time spent on conspicuous perches is related to defense, as assumed above, then the total percent of time spent on territorial activities is 58.8%. Although this is a time-consuming activity, it is not energetically demanding because most of the time is spent quietly perching.

Feeding is also an important activity, occupying 8.5% of the total time. The abundance of food is indicated by the small proportion of time (only 5.7% of feeding time) spent searching. The most important feeding behavior (45.8% of feeding time) is stationary gleaning, in which the Solitaires gather juniper berries while perched on a branch. Ground gleaning, gathering berries from the ground below a juniper, is the next most important feeding behavior, occupying 37.2% of the feeding time. Aerial gleaning, collecting berries from branches while hovering, is relatively unimportant (5.7% of feeding time). The dominance of juniper berries in the Solitaires' diet is reflected by the proportion of feeding time, 94.3%, directed toward the junipers.

The Solitaires were observed to spend 4.0% of their time in flight from place to place within their territories. This value may have been inflated by two possible sources of bias. First, flight is again an obvious, easily observed behavior. Second, my presence within the territory may have encouraged a flight response. Routine maintenance activities, primarily preening, occupied only 2.7% of the total time.

Not surprisingly, the Solitaires spend more time in the junipers (41.6% of the total) than in any other segment of their habitat. The junipers are used for all types of activities. The Solitaires also spend a large amount of their time in the ponderosa pines (40.0%). This value is proportionately greater than the representation of ponderosas in the vegetation. Of this time, 92.5% is spent perching or calling. The ponderosas appear to be important for territorial defense. Of the time spent on maintenance activities, 92.3% is in the ponderosa pines. Other segments of the habitat, such as mountain mahogany and Gambel's oak, are used for lesser fractions of the total time. In one territory, a power line was frequently used for perching and calling.

Interactions

Seventeen interactions involving Solitaires were observed in the study area (Table 6). Thirteen of the interactions were between Solitaires, two were with American Robins, and two were with Bohemian Waxwings. Interactions occurred at a rate of approximately 2.5 interactions per hour of observation.

The Solitaire interactions are almost evenly divided between displacement/pursuit and possible courtship behaviors. The displacement/pursuit interactions (Levels I and II) indicated relatively low levels of aggression and never involved physical contact. In only two cases were pursuits continued for a long distance along

TABLE 6
Interaction Levels

I. Aggressive displacement and pursuit
II. Mild displacement and minimum pursuit
III. No displacement or pursuit
IV. Displacement by another species
V. Courtship behavior

Number of Observed Interactions

Level	I	II	III	IV	V
Townsend's Solitaire	2	5	-	-	6
American Robin	-	-	-	2	-
Bohemian Waxwing	-	-	2	-	-

the ridge crest, and in one of these the resident Solitaire was chasing two intruders. Most of the interactions were short pursuits ending at a territory boundary, after which the resident Solitaire usually perched and called. The resident appeared to be dominant in all interactions of this type.

Possible courtship interactions were observed between five pairs of Solitaires. At least three of these pairs involved birds occupying adjacent territories. In these interactions, the two Solitaires frequently perched within a few meters of each other, or one would mildly pursue the other until they both landed close together. The birds often exhibited a nervous flicking of wings and tails. Singing was noted in five of these interactions. In these interactions there was no attempt by one bird to drive the other away. The boundary between aggression and courtship appeared to be narrow. Both types of interactions were noted for at least three pairs of Solitaires.

Both observed interactions with American Robins were brief, resulting in a Robin displacing a Solitaire. In one case, the Solitaire was feeding on berries on the ground below a juniper. The Robin displaced the Solitaire and began feeding in the same area. When a flock of about fifty Robins moved through the study area, no direct interactions were observed. However, the resident Solitaires could not be located while the Robins were in their territories.

The interactions with the Bohemian Waxwings were the most interesting. In the first instance, the resident Solitaire was perched on a juniper when a flock of about fifteen Waxwings landed in a juniper about twelve meters away and started eating berries. The Solitaire became very agitated. It flew out towards the Waxwings, but it quickly retreated to its perch. It was using a call note that seemed much lower in pitch and rougher than the standard call note. The Solitaire was nervously flicking its wings and tail. The Waxwings seemed to ignore the Solitaire totally, and they moved out of the

study area after about one minute. In the second of these interactions, the Solitaire was staying low in the junipers, repeatedly giving a low, rasp-like call note. It seemed agitated, with continuous flicking of wings and tail. The cause of this behavior appeared to be a single Bohemian Waxwing in a juniper within five meters of the Solitaire. No direct contact or pursuit was observed. The behavior continued for two to three minutes after the Waxwing left the area.

Territorial analysis

Twelve Townsend's Solitaire feeding territories were mapped within the study area, using a photo-enlargement of a portion of the U.S.G.S. Morrison 7-1/2 minute quadrangle. The territory boundaries were determined by perching locations, interactions, and unwillingness of the birds to go beyond specific limits when I followed them along the ridge. The east and west boundaries were determined by the limits of suitable habitat. After all boundaries had been defined, the areas were measured on the map.

At the beginning of the project, it was hoped that the nature of the habitat distribution along the top of the ridge would give a linear arrangement of territories. For the most part, this hypothesis proved to be true. In only one case (Territories A and B) were two territories side by side with a boundary along the ridge crest. All other territories included both sides of the ridge, and individuals were frequently observed moving back and forth across the top of the ridge. Water was equally accessible to all territories in Vernon Creek in the valley west of the Hogback. On a few occasions, Solitaires were observed flying out of their territories towards the stream. The territories were not continuous along the ridge, but were separated in several places by gaps. These gaps suggest that the area was below its carrying capacity for Solitaires, but some gaps may be explained by vegetation differences.

Because this project was not initiated until February, it is not known when the Solitaires first established their territories. At the end of the winter, they did not abandon their territories simultaneously. By late March, the birds seemed restless, moving around more and perching less. By April 10, most of the Solitaires were gone from the southern part of the area (Territories J, K, M, and N), but two birds appeared to be occupying Territory O. On April 13 and 16, two Solitaires were seen near Territories C and D, but other territories appeared to be abandoned. On April 27 no Solitaires were seen in the study area. It is possible that some of the last birds seen were not residents but transients passing through.

Comparison with previous studies

This site is similar to those studied in California and Arizona. In Arizona, the tree species on the site were ponderosa pine, pinyon pine (Pinus edulis), and three species of juniper (Juniperus monosperma, J. deppeana, and J. scopulorum), of which the one-seeded juniper was the most common (Salomonson and Balda, 1977). The average

forest height was four meters, with some ponderosas twelve to twenty-five meters high. Each of the territories they mapped included at least one of these tall ponderosas. In the California study site, closely related species appeared to occupy niches similar to those at the Morrison site. The dominant species were western juniper (Juniperus occidentalis), jeffrey pine (Pinus jeffreyi), and mountain mahogany (Cercocarpus ledifolia) (Lederer, 1977a, 1977b). Shrub species included basin sage (Artemesia tridentata) and rabbit brush (Chrysothamnus nauseosus).

The time budgets presented in the previous studies are similar to that obtained in this study. Direct comparisons are difficult because of differences in activity and vegetation categories, but some general comments are possible. In this study, 8.5% of the time was spent on the various feeding activities. Salomonson and Balda (1977) reported that feeding behaviors occupied 14.1% of the time in 1973-74 and 14.3% of the time in 1974-75. Juniper berries were the main food source, but mistletoe berries were also important. Corresponding data from California were 9.2% of the time in 1975 and 25.7% of the time in 1976 (Lederer, 1977b). Lederer suggested that this difference may have been due to a greater Solitaire density in 1975, which required a greater proportion of time in defense activities.

Perching occupied more time than any other activity in all studies. In this study, perching and maintenance consumed 81.3% of the time. In Arizona, these activities used 72.1% of the time in 1973-74 and 71.1% in 1974-75 (Salomonson and Balda, 1977). Lederer (1977b) reported values of 79.3% in 1975 and 60.7% in 1976.

Salomonson and Balda (1977) lumped vocalizations, chases, and fights into territorial activities and reported values of 12.9% of the time in 1973-74 and 12.8% in 1974-75. Lederer (1977b) reported corresponding results of 11.5% in 1975 and 13.6% in 1976. In this study, these territorial activities occupied only 6.3% of the time. Because of the linear nature of the territories on the Hogback, the Solitaires had at most two, rather than four, boundaries requiring defense. Therefore, it seems reasonable that less time was required for defense activities.

Intraspecific territorial interactions were frequently observed in all studies. The most common form of these interactions was a resident Solitaire displacing and/or pursuing an intruder to its territory boundary. Both Salomonson and Balda (1977) and Lederer (1977a) reported infrequent aggressive encounters with physical contact between the birds. Interactions like the possible courtship behaviors observed in this study were not reported previously, but Lederer (1977b) observed several instances in which two birds foraged within two meters of each other.

Interactions with other species were reported in both Arizona and California. Lederer (1977a, 1977b) observed interactions with American Robins in 1975 and 1976, with the Robins always dominant. He did not observe interactions with any other species. Salomonson and

Balda (1977) reported two interactions in 1973-74 involving other species. A Gray-headed Junco (Junco caniceps) was displaced and chased for about fifteen meters, and a Solitaire gave an aggressive display to a flock of Western Bluebirds (Sialia mexicana). This display involved extending the head and neck and giving a call similar to the scolding call of a Steller's Jay (Cyanocitta stelleri). This interaction was similar to that observed with the Bohemian Waxwings on the Hogback. Salomonson and Balda reported definite interspecific territoriality in 1974-75 directed towards Gray-headed Juncos, Western Bluebirds, and one Pygmy Nuthatch (Sitta pygmaea). The interaction with the Nuthatch occurred when both were hawking insects from the same tree.

Salomonson and Balda (1977) reported four territory areas ranging between 6100 m^2 and 8200 m^2, with an average area of 7000 m^2 in 1973-74. The three territories they mapped in 1974-75 had an average area of 38,500 m^2 and ranged between 24,800 m^2 and 53,400 m^2. The twenty-five territories mapped by Lederer (1977b) in 1975 were between 1150 m^2 and 6957 m^2, with an average of 2302 m^2. He observed nine larger territories in his second year of study, ranging between 8520 m^2 and 13,416 m^2 and averaging 10,879 m^2. The territories on the Hogback ranged between 7440 m^2 and 27,840 m^2, with an average of 14,260 m^2, which is consistent with the previous studies.

Acknowledgements

I would like to thank Dr. Carl Bock, of the University of Colorado at Boulder, for his guidance and for many helpful discussions related to this project. I would also like to thank Louise Hose for her assistance with the vegetation transects.

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ANNUAL LATILONG BREEDING BIRD TRIP

The annual Latilong field trip will be to Latilong 28--Baca County with some time spent in Latilong 21--Lamar. Both of these latilongs have not been well covered during the breeding season and should yield some interesting birds such as Scissor-tailed Flycatchers, Rufous-crowned Sparrows, and possibly Hepatic Tanagers. The trip will take place 18 and 19 June. Those wanting to camp can stay at Corrizo Campground while those desiring a roof over their heads will stay in Pritchett. For further information and to sign up, please contact Stephen Bissell (w)297-1192.

This is CFO's most important field trip of the year and one of our most important activities. Please support this trip if you possibly can.

FROM THE EDITOR

I have been informed that several CFO members objected to the message about renewing subscriptions on the flycover of the last issue. The message was on all copies of the Journal and was only meant to apply to those members who had not renewed their subscriptions. Members can tell whether their 1983 payment has been received and recorded by looking at the top right hand corner of their address label: if it says 83, then their subscription has been received. Thank you,

PETER GENT