Beyond Bird Identification

Details add depth and dimension to birding

Earlier this year, around the end of March, I came across a Facebook post that the Editor of this magazine had shared with the Colorado Field Ornithologists group. Referring to a photo of a Townsend's Solitaire, he exclaimed, "My, what a big, red, round cloaca you have."

This exclamation likely sent some birders to a dictionary, but, being a bird bander, I knew that Ted Floyd was referring to the bird's visibly swollen posterior orifice, known in bird banding lingo as a "CP," short for cloacal protuberance. Upon seeing a bird in this condition, bird banders can confidently identify its sex as male, even in the case of a sexually monomorphic species like the Townsend's Solitaire.

In the nonbreeding part of a bird's annual cycle, however, the appearance of a male and female bird's cloaca is very similar—so much so that even an experienced bird bander cannot confidently determine sex in a monomorphic species in the hand outside the breeding season. The situation changes dramatically, though, as the breeding season approaches. The male's cloaca becomes distended with stored sperm and sometimes even protrudes through the feathers. Hence, cloacal protuberance.

With the exception of ducks, geese, and large species of flightless birds, male birds lack a penis: the cloacal protuberance takes its place. In songbirds, both males and females transfer their gametes via their cloaca, the same orifice through which they also excrete urinary and digestive wastes. Mating in these birds lacking a penis is described as a cloacal "kiss," because there is no penetration. The male simply mounts the female, usually standing on her back, fluttering to maintain his balance, and trying to position himself so that his cloaca can be placed directly against hers. When that happens, he releases his sperm quickly, and it's all over in a matter of seconds.

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Now, Townsend's Solitaires usually don't nest until May, so the fact that the individual pictured in the Facebook post appears to already be in breeding condition at the

Featured Photo–Townsend's Solitaire. Lafayette, Boulder County, Colorado; Apr. 2, 2019. This bird is easily identified as a Townsend's Solitaire by its upright stature, prominent eye-ring, white outer tail feathers, orange in the wings, and gray–brown tones overall. Plus, it's in a juniper tree, a key microhabitat association for the species. Is there anything left to say? In this installment of the *Birding* Featured Photo, we venture "beyond bird identification" with an expert on aging and sexing birds, in the process adding depth and dimension to the experience of birding. *Photo by © Ted Floyd.*

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end of March suggests he was not far from his breeding grounds when the photograph was taken. The species nests as far north as eastern Alaska, but because this bird already shows signs of breeding condition, my guess is that he is a locally breeding bird—an altitudinal migrant who simply moved several miles downslope from its breeding ground in the steep foothills immediately west of Boulder. Supporting that hypothesis, volunteers for the first Colorado breeding bird atlas used a "C" (Courtship) breeding code for observations of the species as early as Apr. 1.

This is what I mean by birding "beyond bird identification." And the interesting extra details about this bird don't end here. In my comment on the Facebook post, I suggested that the solitaire might be a young (second-calendar-year, or first-winter) male. How in the world could I have known that?

Supplemental Image #1. This post to Facebook, of the same individual as in the Featured Photo, contains a critical clue for sexing the bird. *Lafayette, Boulder County, Colorado; Mar. 28, 2020. Photo by © Ted Floyd.*

Supplemental Image #2. In this view, the solitaire's right wing is easily viewed and analyzed. Note the strong contrast between the freshy molted tertials adjacent and the very worn, unmolted outer secondaries. Red and yellow bars indicate the two different feather generations. *Lafayette, Boulder County, Colorado; Mar. 26, 2020. Photo by © Hannah Floyd.*

My experience as a bird bander, not to mention my fascination with molt, has trained my eye to discern subtle differences in plumage color, texture, and luster that can reveal meaningful differences in the age of feathers comprising the overall plumage of birds. These so-called "feather generations" correspond to the different molt cycles that gave rise to the feathers.

Birds begin growing their original set of contour feathers when they are still in the nest, and this first full covering of feathers is variously known as juvenile or first-basic plumage. Growing this initial feather coat is a high priority. The sooner the feathers are grown, the sooner the nestlings can rely on homeothermy (the ability to regulate their own body temperature) to stay warm, and the sooner they can fledge from the nest. After all, no matter how seemingly well-concealed it is, a bird's nest is a dangerous place; it is, literally, just so many eggs in one basket for a predator like a rat snake, crow, or raccoon.

There is an important tradeoff with respect to fast-growing juvenile plumage, though. Because they grow quickly, juvenile feathers are not as structurally sound as adult feathers that replace them. Juvenile feathers are less pigmented, have many fewer barbs and barbules (the fine structural elements that help knit feathers together), and don't hold up to wear and tear.

Most birds do not wear their juvenile plumage for long. They usually start replacing some or all of their juvenile feathers within days or weeks of leaving the nest. The molt that replaces juvenile feathers is, in many birds, the *preformative* molt (or, using older terminologies, the *first prebasic* or *post-*

juvenile molt). This molt typically results in only a partial or incomplete replacement of feathers grown in the nest. In comparatively few species, the preformative molt replaces all of the juvenile feathers.

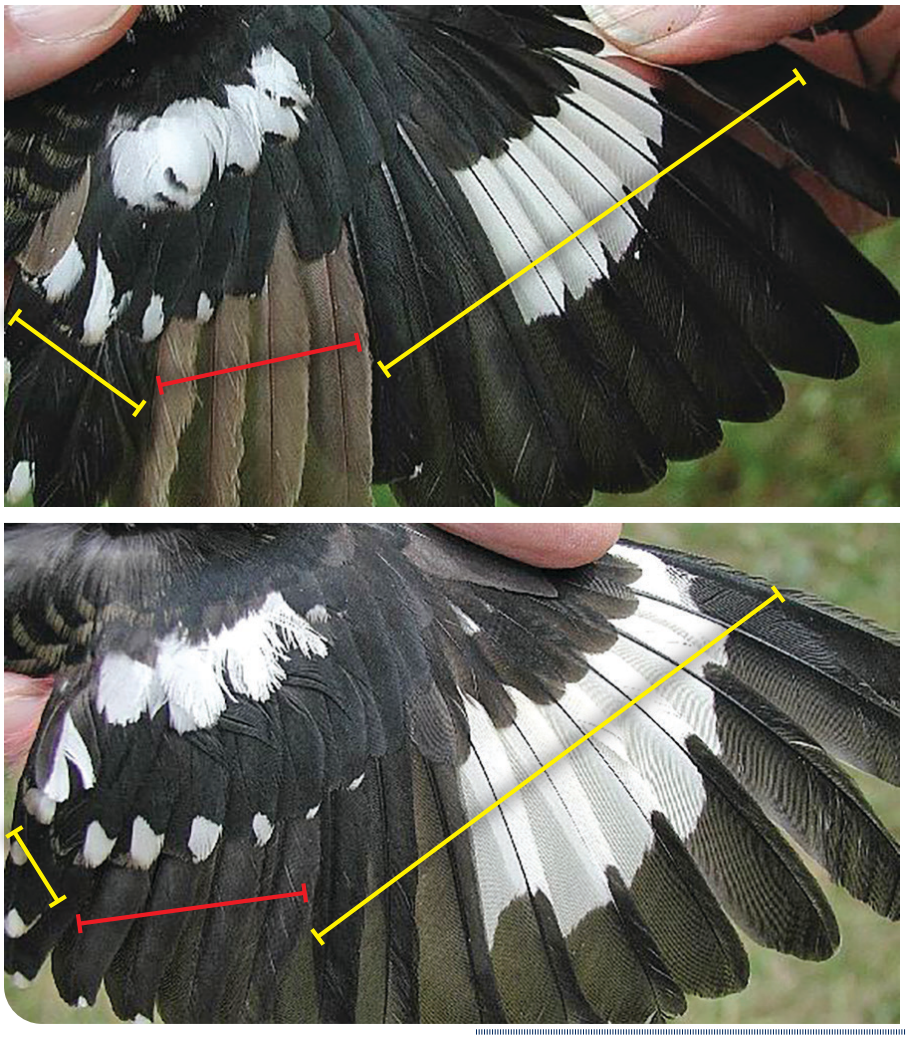
Sometimes the preformative molt can result in eye-popping differences between the two feather generations, such as when a fledgling male Northern Cardinal's brown juvenile body and wing feathers are replaced with bright red ones. But many times the differences are far less obvious. Bird banders, however, are trained to see and diagnose subtle differences in the appearance of feathers and to use their knowledge of species-specific molt patterns to assign precise and accurate age categorizations to birds in the hand based on the molt patterns they present. You don't have to be a bander to do this, though; gull and shorebird enthusiasts, in particular, often make these determinations without recourse to captive birds.

Many birders now also equip themselves with high-tech camera gear. They routinely obtain beautiful images of birds in the field, often to share on social media, but also to document any rarities they may encounter. The quality of these photographs is often so excellent that viewing them is tantamount to having the bird in hand. For this reason, I can rarely resist the temptation to see if I can age the bird in just about every bird photo I come across. In the case of the Townsend's Solitaire discussed here, not only is the bird's sex identifiable, thanks to the quality and angle of the photograph, but so, too, is its age.

The marked contrast between this solitaire's retained juvenile primaries and secondaries vs. the recently molted, formative tertials (comprising the inner three secondaries in passerines) likely is informative. Note that these three feather tracts together comprise the remiges (singular, remex).

Initially, I jumped to the conclusion that the bird was, in bander's terminology, a second-year bird, meaning a bird hatched perhaps eight or nine months earlier in the previous calendar year. I concluded this based on the contrast between obviously freshly molted tertials and the just-as-obviously very worn, unmolted inner secondaries. Preformative molts of many passerines sometimes include the replacement of one or more tertials, in addition to body feathers and a variable number of inner wing coverts. A bird hatched in 2019 that had molted body feathers, wing coverts, and tertials is a pattern that fits many species I'm familiar with, such as the Tufted Titmouse and Dark-eyed Junco.

But as I dug into the literature for this species, with which I have very little firsthand experience, I learned that its preformative molt is much more limited, in keeping with its classification as a thrush. This molt gener-



Supplemental Image #3 (TOP): On this second-calendar-year ("SY") Rose-breasted Grosbeak, note the striking break-point, termed a "molt limit," in the flight feathers of the wing. The bird has held the very brown and frayed formative (normally first-winter) feathers for more than a year.

Supplemental Image #4 (BOTTOM): On this after-second-calendar-year ("ASY") Rose-breasted Grosbeak, there is a molt limit, but it is not nearly so pronounced. This is because the newly molted and retained unmolted feathers both are basic-plumage feathers of similar initial quality. In both images, red and yellow bars indicate the two different feather generations.

Both images, Fall 2002, by © Robert S. Mulvihill.

ally includes only some minor wing coverts and no flight feathers—therefore, no tertials. With this information, I had to revise my assessment of the age of the Townsend's Solitaire in the picture—it was not a second-year (first-winter) bird after all. How, then, to explain the marked difference in the condition of its adjacent tertials and secondaries? How could the bird be older than a second-year and still show such a molt limit? Adults of virtually all passerines undergo a complete molt after nesting, replacing every single feather. With all feathers being the same generation (in other words, having been produced during the same molt cycle), there should be no molt limits to be seen.

Fortunately, there were several more photographs of the bird, and Ted was nice enough to send those to me; see, for example, Supplemental Image #2. The additional photographs confirmed that the bird was an older adult that had suspended, or arrested, its prebasic (post-breeding) molt. Although this molt is normally always complete in songbirds, on rare occasions it can be temporarily suspended or completely arrested. When it is, any unmolted feathers create molt limits in places on the wing that do not match the expected preformative molt limits for young birds of the species.

In the present case, the bird's unmolted secondaries differ in color and condition so markedly from the adjacent molted tertials and other secondaries (being much more worn and brown) that they must be juvenile feathers which the bird grew not in the immediately previous summer, as I had originally thought, but two summers prior! In bander's terminology, this makes the bird a third-year (TY) individual. It hatched in the summer of 2018, overwintered (as an HY–SY), then bred (as an SY) in the spring of 2019. It began molting its flight feathers for the first time that fall, but apparently didn't complete that molt before it was impelled to move away from its breeding grounds in fall 2019 to its downslope wintering grounds (the Floyd back yard). When winter crossed over into a new calendar year (2020), the bird automatically became a TY, meaning it was approaching two years old.

This scenario implies that its first nesting season as an adult bird was protracted for some reason, perhaps due to repeated re-nesting attempts following nest losses, or because it was raising a late second brood. Either way, it would have less time to complete its molt before migration.

When I worked as a bird bander at Powdermill Nature Reserve in western Pennsylvania, I handled tens of thousands of birds of a great many species. I saw examples of many molt patterns, including exceptional patterns like that shown in this Townsend's Solitaire. Case in point: a Rose-breasted Grosbeak (Supplemental Image #3) whose molt pattern is similar to that of our Townsend's Solitaire, with some retained, very worn juvenile secondaries surrounded by molted flight feathers. This grosbeak was banded in fall 2002, when it could be confidently identified as a second-year bird (hatched in 2001) because the unmolted secondaries were so worn and brown. In another grosbeak (Supplemental Image #4) in a similar stage of arrested molt (also in fall), it is more difficult to discern a difference between the molted and unmolted secondaries. This is because those retained secondaries are not juvenile feathers; instead, they are higher-quality non-juvenile feathers. This grosbeak has to be older than its second calendar year, so banders can use the age code ASY, meaning "after second year."

The vast amount of information contained in a digital photograph gives us the ability to examine and manipulate images—for example, to enhance contrasts and sharpen and magnify details. So birding can go beyond species identification more than ever before. Excellent examples of how "detail birding" can open up volumes of information come from two passionate and patient observers of Blue Jays.

Lesley The Bird Nerd (facebook.com/LesleyTheBirdNerd), a Newfoundlander known as Lesley Earle in real life, describes herself as someone who "began my birding journey in late winter of 2011." She goes on to say: "At the time, it was just a fun little hobby. I had no idea I'd be as deeply immersed into the lives of birds as I have become. I certainly did not think it was possible to acquire such close relationships with wild birds as I have, and I definitely didn't know it could last for years." Earle uses her photographs and videos of individual Blue Jays, as well as many other birds from the boreal Canadian forest, to tell stories of her birds not just as species, but also as individuals whom she recognizes as surely as we humans do one another, by their unique features. She can do this because she has patiently lured them to regularly take food from her hand, which lets her study them much more closely than most birders typically do.

Artist, writer, and blogger Julie Zickefoose has spent a great deal of time with an individual Blue Jay she rehabilitated and released back into the wild (tinyurl.com/Zick-Blue-Jay). Her family's relationship with, and tales about, this particular jay form the story line of her latest book, *Saving Jemima*. Zickefoose's astute observations of certain peculiarities in Jemima's wing feathers proved to be one of the central dramas of her captivating story about the bird.

Birding is the practice of correctly identifying the species you see, usually with some level of attendant list-making: trip list, yard list, year list, life list. The lists we keep often require us to see one example of each species in order to count it. But it is also worthwhile to study behavior, individual plumage variation, and, with digital photography, finer details of plumage variation, molt progression, and physical condition in ways that weren't possible before. It is gratifying that many birders are making a special point to describe and recount their observations of conspicuous plumage variants, like albinism, leucism, erythrism, and gynandromorphism. Let's also go out and notice and note details like molt gaps, molt limits, and, of course, any "big, red, round cloacas" that you see while birding.

Further Musings on an Unusual Solitaire:

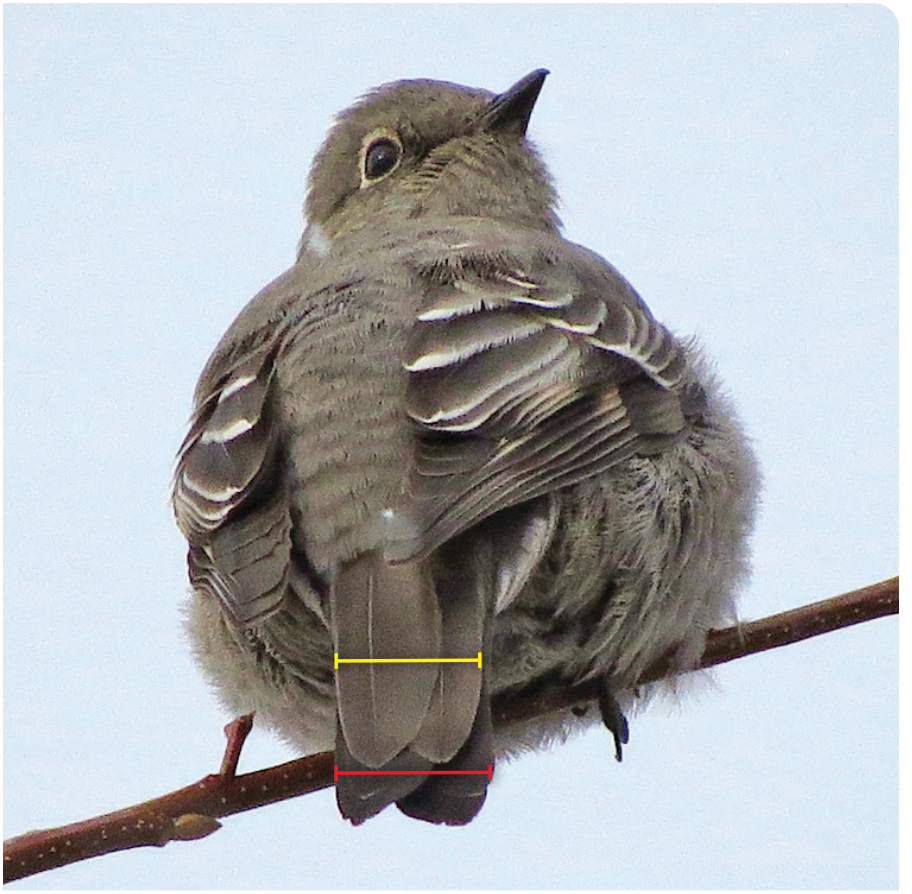
Was It a Returning Bird?

I am really pleased to see this article by Bob Mulvihill, documenting an incomplete second prebasic molt in a "TY" (or second-cycle) Townsend's Solitaire. Bob is also speaking for me when he writes, "My experience as a bird bander, not to mention my fascination with molt, has trained my eye to discern subtle differences in plumage color, texture, and luster that can reveal meaningful differences in the age of feathers comprising the overall plumage of birds." And just like Bob, "I can rarely [or never in my case] resist the temptation to see if I can age the bird in just about every bird photo I come across." I talk about this from my perspective in a 2008 article in *Birding* (tinyurl.com/Pyle-riffs) that also anticipates our current COVID-19 situation by advocating close-to-home birding.

I have seen a few retained secondaries from prebasic molts in other North American passerines, most notably among migratory Cardinalidae (tanagers and grosbeaks, including Blue and Black-headed grosbeaks), vireos, finches (especially crossbills), and tyrannid flycatchers, but I don't think I have seen as many feathers retained as in this Townsend's Solitaire. In addition to the retained juvenile feathers pointed out by Bob, note the condition of the outer rectrices (the flight feathers of the tail) in the Featured Photo. The rectrices are exceedingly "trashed"—not an official feather term, but used a lot in molt studies—and tapered at the tip, indicating retained juvenile feathers here as well.

I consider molt to comprise four main strategies: timing, extent, geography, and sequence. And of these four, I am most fascinated by sequence, as it is the one that appears to be rather fixed, evolutionarily speaking. When tracing homologies of molt strategies from ancestral to present-day bird taxa, so as to correctly apply Humphrey–Parkes molt terminology, we rely a lot more on sequence than on the other three factors.

For example, falcons and parrots are the only two avian orders in which all or nearly all species molt both primaries and secondaries "inside out," from the middle of these tracts toward either end, as opposed to, for instance, distal replacement, from the inner (p1) to the outer (p10) primary shown by the majority of other bird families (see tinyurl.com/falcons-parrots-molt). Not only does this indicate relatedness between parrots and falcons, as recently confirmed by molecular genetic analyses, but it may indicate that these molt sequences evolved way back, before these two orders split. This happened before the ancient continent Gondwanaland broke apart, about 175 million years ago! By contrast, timing, geography, and extent of molts can show extensive variation among families, genera, and between sister species such as American and Pacific golden-plovers; it can even happen *within* species such as the Warbling Vireo and the Chipping Sparrow. These aspects of molt can thus evolve quite rapidly and appear to reflect local adaptation or simply immediate responses to on-the-ground conditions. Therefore they are not at all useful in determining molt homologies.



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This **Townsend's Solitaire** was in Ted Floyd's Boulder County, Colorado, back yard during the winter of 2018–2019, the winter before the solitaire analyzed by Bob Mulvihill in this issue's Featured Photo. This bird is in its first winter and shows typical molt limits between formative (indicated in yellow) and juvenile (indicated in red) feathers following a partial preformative molt. The solitaire is a thrush, and many thrushes replace between one and five inner greater coverts during this molt, so the replacement here of four or five is typical; note the better quality and brighter pattern to the replaced formative coverts (including the outer median coverts), which contrast with the duller and more worn, retained juvenile outer greater and all primary coverts.

About 7% of Townsend's Solitaires replace their two central rectrices as well, in this case in keeping with the more-than-average number of greater coverts replaced. In passerines, secondary coverts are typically replaced in a distal–lateral sequence (from inner lesser to outer greater coverts), and molt of the rectrices nearly always begins with the central pair, the limits thus reflecting where the preformative molt was arrested during this sequence. That it was a formative (first-winter) bird in 2018–2019 supports Ted Floyd's initial supposition that the second basic (second-winter) bird of the Featured Photo a year later is the same individual. *All photos from the same Boulder County, Colorado, back yard. Right, lower: Feb. 20, 2019. Right, upper: Feb. 21, 2019. Left: Feb. 19, 2019. Photos by © Ted Floyd.*

How does this relate to our Townsend's Solitaire? Passerines generally conform to the remigial molt sequences of most birds, likely the retention of an ancestral avian state. (*Remigial* is related to the word *remex*, denoting the primaries and secondaries.) In this ancestral state, primaries are molted distally as described above, with molt of the nine secondaries beginning with the tertials (usually the middle one, s8, first), and also proximally from the outer secondary (s1) toward the tertials; meanwhile, the 12 rectrices frequently (but not always) molt from the inner pair (r1) outward (to r6) on each side of the tail. Thus, it is not surprising that an arrested prebasic molt in our featured solitaire would result in the retention of outer primaries, secondaries from s4 to s6 (see tinyurl.com/Pyle-secondaries for more on retention of secondaries during prebasic molts), and outer rectrices, the last feathers of each tract typically replaced. This strengthens the conjecture that these were retained feathers from an incomplete molt as opposed to feathers retained accidentally, due to follicle damage or the like.

But where the patterns in this solitaire contravene my expectations is with the retention of outer upper-wing median and greater coverts, formative and juvenile, respectively, as these are usually replaced in birds with incomplete molts of primaries and secondaries. It is the same with the apparent retention of the formative inner greater covert in Bob's SY Rose-breasted Grosbeak, as upper-wing coverts, too, usually molt from inside out, resulting in retained greater coverts being to the outside rather than the inside of the tract. I am currently working on a paper describing suspended preformative molts. Another possibility could be that these upper-wing coverts were replaced before migration and thus contrast in wear and color with those replaced after migration, following a "suspended" molt (temporarily stopped to resume in place within the molt cycle). As such, they are "officially" part of the same molt and feather generation. This scenario differs from an "arrested" molt, which is terminated altogether within the cycle. As soon as I can re-access specimen collections after COVID-19 closures, I intend to dive head-first into this question—and to extend it to suspended prebasic molts as well.

I immediately agreed with Bob that the solitaire's retained secondaries were juvenile, and that this was, indeed, a TY, although short of stable-isotopic analysis of new and old secondaries, it may be impossible to absolutely confirm feather generations. Feathers are essentially designed to last as long as they need to before the next molt, so even basic feathers that are two years old (one year past warranty) can get quite trashed. Bob alluded to this bird's "wintering grounds" in Ted Floyd's back yard. Might it had been in the yard the winter before?

Ted sent me photographs of a Townsend's Solitaire that claimed the same winter territory in 2018–2019, the year before our featured bird. He wondered if it was the exact same individual, and asked me if I might be able to confirm that hunch. Is the 2018–2019 bird in formative (first-winter) plumage, as it should have been to match ages with the 2019–2020 bird? As Bob noted, the preformative molts of thrushes are fairly conserved in extent, as compared to many other passerines. Most *Catharus* thrushes, for example, even Neotropical resident species, typically replace most to all median coverts and 1–5 inner greater coverts. Contrast this to the situation in *Haemorhous* finches; the preformative molts of Purple and Cassin's finches are similar to those of thrushes, whereas that of the House Finch can vary from replacing even fewer wing coverts than this to replacing all wing and tail feathers during a complete preformative molt.

Sure enough, Ted's 2018–2019 solitaire shows molt limits typical of formative plumage in thrushes and in this species (see accompanying photos), indicating an SY in February 2019, and consistent with the same bird returning as a TY by the early winter months of 2020. Another hobby of mine is to try to match feathers in photographs to see if birds found in different places or seasons are the same individual, as long as the feathers have not molted in the interim. For example: tinyurl.com/Snow-Bunting-photos (for Snow Buntings); tinyurl.com/Caracara-photos (for Crested Caracaras). In the present case, not enough of the retained juvenile feathers of the TY (January–March 2020) are visible on the SY (February 2019) to say for sure, not to mention their greatly differing states of wear. So, although we can't absolutely confirm that it is the same individual, I believe that our exercises in aging goes a long way to reaching such a conclusion.

I applaud Bob's call to birders to examine their crisp digital images not just for species or subspecies identification, but also for sex, age, molt, and feather generations. Later this year, I will begin revising Part 1 of my *Identification Guide to North American Birds* (slakecreekpress.com), covering land birds in Canada, Alaska, and the Lower 48. A major prompt for this revision is to align molt and plumage terminology to current thinking, as reflected in Part 2 (diurnal raptors and waterbirds), such that the terminologies of all the treated species will be presented in the same consistent format—and based on evolutionary homologies.

I also intend to update and revise as much information as I can about molt and age determination for each species. I have made a call to banders to please send me any updates that they have come across using the guide over the past 23 years (tinyurl.com/Pyle-update), and I here make the same call to birders: Please do send me images of anything that looks interesting in the molt department. Email me at ppyle@birdpop.org. I'm ready for any onslaught of info and even hacking, if this is what we're worried about. As I like to say, I hope the Russians hack my computer so they'll learn about molt. But, up to you; I'm easy enough to track down.

Now is your chance!