Go online for additional analysis of this interesting bird

Additional content available to members in the digital edition of *Birding*: **aba.org/magazine**

Analyzing Molts and Plumages with Digital Images

A Young Birder Takes a Closer Look at Young Birds

On a camping trip a few years back, my family visited the iconic Glass Beach in Mendocino County, California. It was chilly and overcast, standard weather for the Pacific Northwest in August. Behind me lay a tract of coastal grassland broken only by the trail to the parking lot. This habitat teemed with Nuttall's White-crowned Sparrows, which are year-round residents in Northern California. The fields and path extended to the top of a large rock going into the ocean. This rock is a popular vantage point for tourists and, naturally, Common Ravens looking for a snack. But my main focus was farther away. The offshore rocks hosted Black Oystercatchers and Black Turnstones working the kelp, and seabirds like Pigeon Guillemots, Common Murres, and a throng of Elegant Terns scouring the distant waters for fish and mussels. Among all this diversity, avian and otherwise, none of these species were my most exciting discovery that day.

It had, in fact, been a European Starling, one of those familiar, gregarious, and invasive street birds. I was on my way to another one of their favorite haunts, the parking lot, when I happened upon a group of them by a picnic bench. Nothing new, right? Wrong. As I briefly looked through the flock, one individual caught my eye as it perched on the table. I had never seen anything like it before. This bird had a pale brown head, brown streaks on its back, and mottled wings. I reaffirmed my identification. It had a stout bill, chunky build, and a short tail. The speckled belly ruled out the similarly built Western Meadowlark. It screamed starling. I snapped two photos and moved on.

As I have thought about it some more, I have become increasingly intrigued and have kept wondering at the strange appearance of the bird. I had never paid much attention to starlings, and, three years later, I still need to work on that aspect of my birding. I'm glad I recently rediscovered the photo again far back in my files. I can

Join the online conversation about this interesting bird: **aba.org/magazine**

Featured Photo—*Fort Bragg, Mendocino County, California; Aug. 15, 2018. Photo by © Ronan Nicholson.* Given this bird's distinctive posture and shape, we readily recognize it as the familiar **European Starling.** And given its mishmash of "young" and "adult" plumages, we correctly infer that the bird is molting from one plumage to the next. Now let's take it to the next step, and pinpoint which feathers refer to which generation—a valuable exercise for learning about birds, and one made vastly more accessible in the digital photography era than ever before.

RONAN NICHOLSON
Candler, North Carolina
birderronan@gmail.com

Supplemental Photo #1—*Mendocino County, California; Aug. 15, 2018. Photo by © Ronan Nicholson.* This is the same individual, a **European Starling,** as in the Featured Photo, here from the bird's right. Birders have always known that the more time you spend watching a bird, the more you learn. In this day and age, that wisdom applies to photography: The more photos you take, the more you'll discover.

now see that the bird was transitioning from juvenile plumage (the brown parts) to adult-like plumage (glossy black with white spots) while undergoing its preformative molt. This means the pictured bird hatched two to three months before I took the image, making it a first-year bird, one transitioning toward formative plumage.

The molt which many birds go through after the preformative is called the prealternate molt, and it typically happens in early spring. In many of our birds, this prealternate molt shifts the bird from the drabber fall (or basic) plumage to breeding (or alternate) plumage. However, such is not the case with starlings! They don't shed feathers to transition into breeding plumage; they remain in formative, or basic, plumage. Instead, the white feather tips on this bird break or wear off in late winter, leaving behind an all-glossy coat for spring. Then, in early summer, the starling transitions back into polka dots during a prebasic molt. In additional pictures taken that day, I could see that some adult starlings in the flock were just completing this molt—from their old basic plumage to a new basic plumage.

A distinctive thing about this bird's appearance is the bird's buffy-gray head, a sign that this part of the bird hasn't molted yet. This is unusual. On most birds that have been studied, the process of feather loss and regrowth starts from the head and progresses downward, but this bird started from the flanks and back, resulting in the interesting plumage it was sporting. I found that starlings are known to have this pattern, but it is difficult to track in other species because, more often than not, the new feathers are similar in color to the old ones, so this strategy may be more common than scientists think. In research and personal experience, I have noticed that Eastern and Spotted towhees and Orchard Orioles also exhibit this pattern, with their rufous flanks coming in before other adult feathers. These species all have different-colored adult and juvenile plumages, so it's easy to recognize when new feathers come in.

Flight Feather Molt Sequence

Much can be learned from the molt sequence of a bird's flight feathers. The "remiges" (the long ones on the wing used for flight) are divided into three groups: the tertials, the secondaries, and the primaries.

Supplemental Photo #3—*Sussex County, Delaware; July 29, 2019. Photo by © Ronan Nicholson.* Despite the ratty appearance of this second-summer **Herring Gull,** there is a method to its molting madness. Note the symmetry of the missing flight feathers (remiges) of the wing, an adaptation that allows the bird to fly even while molting.

On the folded wing, the tertials are the top three overlapping feathers that protect the secondaries. The secondaries are found in a stack directly below the tertials, and the inner primaries are placed outwardly, each usually longer than the last, under the secondaries.

While evaluating the image, I noticed the odd wing feathers. After some research on that subject, I learned that the pictured bird is showing a typical strategy for replacing juvenile flight feathers. What looks like a jumbled mess is actually a specific sequence so the bird can maintain flight while molting. In this sequence, the primaries are replaced first, starting with the innermost feather and progressing outward toward the wingtip. The tertials are substituted at the same time as the primaries, usually beginning with the middle one. When almost all the primaries have gone through this process, the *outermost* secondary, found near the middle of the wing, is molted, and the secondaries are molted inward. This sequence limits the size of the gaps in a bird's wing at any one time, so flight is still possible throughout this period.

The bird in the Featured Photo is in the middle of this process. Most of the primaries are a dark grayish color, indicating they are formative feathers and have already molted. The long visible juvenile primary, a pale brown color, has yet to be replaced.

Supplemental Photo #2—*Mendocino County, California; Aug. 15, 2018. Photo by © Ronan Nicholson.* This adult **European Starling** was in the same flock as the hatch-year starling in our Featured Photo. Note the bright white spots below. These are at the tips of the feathers, which wear down or break off in winter; the result is the glossy feathers we see in spring. Starlings acquire their breeding plumage "aspect" by wear, not by an actual replacement (molt) of feathers at the beginning of the breeding season.

Supplemental Photo #4—*Sacramento County, California; Sept. 20, 2019. Photo by © Ronan Nicholson.* Besides morphological clues like plumage, juvenile birds may often be told by their behavior. If the bird is being fed by an adult, that's a powerful sign! But look for subtler cues, like the general awkwardness with which juveniles catch insect prey. This juvenile **Northern Mockingbird** attracted the photographer's attention by its clumsy handling of a moth it eventually subdued.

I'm so pleased and excited to see young birders like Ronan with an interest in molts and plumages—and using digital images to study them. Even better, to be accurately describing these molts and plumages using Humphrey–Parkes (H–P) terminology! This terminology, if properly applied, will carry us forward in the future, as those it replaces are rather hopeless, so much so in my experience that they have actually rebuffed as opposed to attracted young birders. But as Amanda Gorman says, regarding topics rather more important than bird molt: You have to be "brave enough to see it" and "brave enough to be it." Seeing it is the hard part, one that still confuses many who think in two dimensions, as I discuss in an article on Sanderlings in the Aug. 2019 *Birding*.

How does a young birder get going on molts and plumages? First, it is imperative to learn feather tracts, especially those of the wing. There are many good diagrams in field guides and reference books, including that of Steve Howell (2010) on bird molt. If looking at a book is, well, just *too* 2010, there are diagrams online, including one in my *Birding* article on studying molts and plumages and aging birds in digital images (tinyurl.com/Pyle-molt-primer).

Pay particular attention to the standard numbering of flight feathers: p1–p10 from the innermost to the outermost primary in most birds (p1–p9 in some passerines and p1–p11 in grebes and flamingos), s1–s9 from the outermost to innermost secondary (including the tertials) in passerines, and r1–r6 among the rectrices (from the center outward) on each side of the tail in most species. As you have learned from Ronan's article, this scheme corresponds, conveniently, to the sequence in which these tracts are molted in most birds, except that the tertials (s7–s9) are usually replaced first, followed by s1 to s6 in that order. Then practice identifying each flight feather in images. There are thousands out there to choose from!

On Ronan's starling, as an example, the three tertials (s7–s9) are new, with s7 still growing; s6 to s4 are juvenile; s3 is growing; s2 is new; and s1 is not visible but undoubtedly also new. Among the primaries, p1 may be out of view under the secondaries, but p2–p6 are new, p7 appears to be dropped or growing and out of view, p8 sticks out to form the wing tip, and p9 is juvenile, as can be seen along the wing's edge. (The p10 in starlings is short, about the size of a primary covert.) For the tail, r1–r2 on each side are new, r3 is growing, r4–r5 appear juvenile, and r6 may also be growing; r6 is dropping before some or all of r3–r5, a fairly common sequence in birds and a subject ripe for more study.

Using the preceding as a guide, see if you can perform an analogous exercise with a similar starling in Steve's molt book (p. 214) or for this wing at the Slater Museum of Natural History's Wing & Tail Image Collection: tinyurl.com/Slater-EUST. The Slater collection and the Cornell Lab of Ornithology's Macaulay Library (ebird.org/media/catalog) are *the* go-to online sources to study molts and plumages of birds these days; for Macaulay, see tinyurl.com/Pyle-Macaulay. If you want a grander challenge, see if you can also identify as many flight feathers as possible on Ronan's Herring Gull, a species which has 10 primaries and 20–21 secondaries (per wing) and 12 rectrices.

I'm eager to hand off the molt and plumage baton. I currently plod along on my old laptop with Windows 7 (as long as "they" will let me), using standard programs developed in the 1990s or so. I've never read a Face Book—and Twitter is what swifts do. But, hanging out with the young San Francisco birders, I see already that coming generations will have many more resources at their palm-held disposal, and the ability to "wing" photos, eBird checklists, and feather-by-feather analyses through various social platforms. They are eager and ready to give this a go! And regarding H–P terminology, I count on them not only to see it, but to be it.

—Peter Pyle

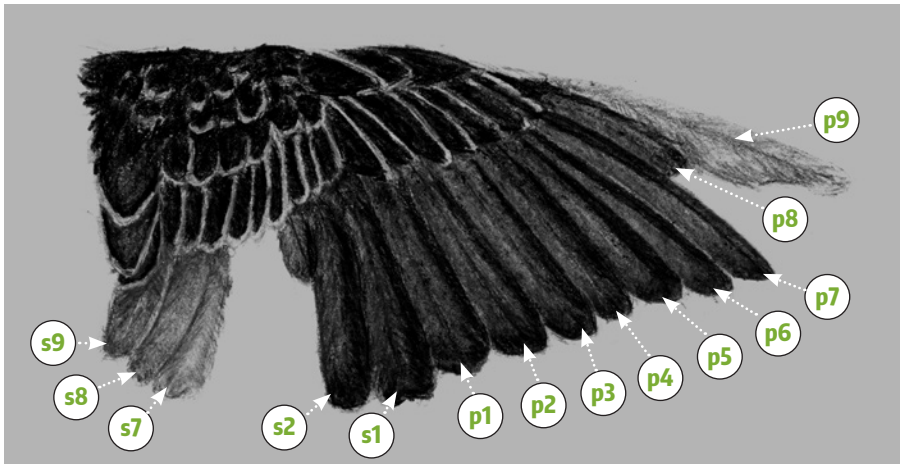
The tertials are all adult feathers and the secondaries have just started molting. All of these molt patterns make for an unusual-looking bird.

As it turns out, starlings aren't the only birds that show patchwork plumages during their first year.

Here are a Herring Gull in flight and a perched Northern Mockingbird, along with our European Starling. What's the theme? Besides being common across large swaths of the ABA Area, the ones pictured, like the starling, are young birds, not in adult-like plumage. I saw this Herring Gull in Sussex County, Delaware, at the end of July 2019, almost a year from my encounter with the starling, and I photographed the mockingbird in Sacramento County, California, in early June of that same year. Let's start with the gull.

Much has been written about gull molt, but, for now, the operative part of this bird is the wings. The same sort of thing is going on with this gull's wings that is happening with the starling's, but we get a better view this time. On the gull, most of the primaries have been replaced, and the secondaries have just started the process, with the tertials and innermost ones already lost. The feathers were lost naturally and not by mishap because both wings are symmetrical and show the same gaps and feather wear. The rectrices (the flight feathers of the tail) are also molting, a process which typically proceeds from the center outwards, or generally so, on each side of the tail. Unlike the starling, molt in most first-year gulls does *not* include the flight feathers; thus, this bird is a year older than the starling and is undergoing the second prebasic molt.

The mockingbird was photographed in early June before juvenile birds molt into adult-like (formative) plumage, so this individual has a complete set of juvenile feathers. While relatively similar to other birds, including the Sage Thrasher (once known



Supplemental Photo #4—*Sacramento County, California; Sept. 20, 2019. Drawing by © Ronan Nicholson.* The bird in the Featured Photo, although superficially "messy," presents a rather specific, stereotyped molt strategy, one showed by a great many species. Of particular relevance are the flight feathers of this starling's wings (the "remiges"). This is my interpretation of what the wing probably looks like when outstretched.

We can see that the feather at the wingtip (p9) is old and soon to be replaced. The growing one is numbered p8, and the other seven feathers inward (p7–p1) are new. The secondaries started this molt after the primaries, so there are still a few old feathers among the secondaries. Note that some secondaries are missing; the starling's molt strategy places gaps away from each other, so that the bird can still fly while molting. *Drawing by © Ronan Nicholson.*

as the "Mountain Mockingbird"), juvenile mockingbirds are pale under their spotty breast and have white in the wings. Behavior is another essential part of picking out juvenile birds. Most inexperienced birds have a hard time catching prey. This mockingbird awkwardly jumped and flew all over the place before finally nabbing a moth.

I confess I don't always go looking for these birds. They aren't rare, and they're often locally common. I found all three while looking for *other* birds. But these commoners remind us that birding the same areas and seeing the same birds year-round is very helpful. You can learn what to expect in your region so that unusual birds can be easily identified. Juveniles and other immature birds in molt aren't too hard to find in the right season, with their wing-fluttering solicitations, high-pitched calls, and other distinctive behaviors. So check your starling flocks right now. You might discover one like this.

Acknowledgments

Peter Pyle helped invaluably with this text. He pointed out that the molt started on the flanks of the bird in the Featured Photo, he fixed aging details on the gull, and he corrected my terminology and understanding of molt throughout the text—not to mention improving the precision of all the information presented. This article could not have been what it is without Peter's expertise.