FEATURED PHOTO

REPLACEMENT OF PRIMARIES DURING PREALTERNATE MOLTS IN NORTH AMERICAN *LARUS* GULLS

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ABSTRACT: We document replacement of primaries during the prealternate molt in two and possibly three species of North American gulls of the genus *Larus*, including the first report of such replacement in an adult Yellow-footed Gull (*L. livens*), the first report in the Lesser Black-backed Gull (*L. fuscus*) in the Americas, and possibly the first report for the American Herring Gull (*L. argentatus smithsonianus*). The incidence and extent of replacement of primaries is greater during the second prealternate than during subsequent prealternate molts, which is likely related to second-cycle molts in *Larus* being earlier than the subsequent molts. The second prealternate molt of the Lesser Black-backed Gull includes up to all flight feathers (but not all wing coverts). The sequence of replacement of primaries during the prealternate molt matches that of the prebasic molt, starting at the innermost primary and proceeding distally; however, the sequence of replacement of secondaries can differ from that during the prebasic molt, perhaps because of a difference in the underlying mechanisms controlling these molts. Prealternate molt of inner primaries can begin before prebasic molt of outer primaries is completed, a pattern resembling Staffelmauser, but all evidence suggests that the ensuing prebasic molt of the primaries begins at p1, as in terns, rather than at the point where the inner molt wave is suspended, as during Staffelmauser in other large volant birds. We propose that the occurrence and extent of prealternate molt of the remiges in *Larus* is correlated with the latitude at which an individual winters and/or the timing of the prebasic molt the year before, as much as or more so than with phylogeny. The possible replacement of primaries during the second prealternate molt in North American but not European subspecies of the Herring Gull could relate to some individuals of the American subspecies wintering farther south.

The molts of most gulls are complex, protracted, and variable, even within a species (Howell and Dunn 2007, Pyle 2008, Howell 2010). Adults of all North American gulls undergo a complete definitive prebasic molt that begins shortly after breeding, primarily in July or August, and usually extends through October or November, sometimes later in species or individuals that migrate to tropical or austral latitudes for the winter. During this molt, primaries are invariably replaced distally from the innermost (p1) to the outermost (p10), and secondaries are replaced distally from the tertials and proximally from two nodes, at the outermost (s1) and the fifth from outermost (s5) secondaries (Pyle 2008). Most species also undergo a partial definitive prealternate molt, which, in the larger species of the genus *Larus*, is unusual in beginning as early as September or October (Howell and Dunn 2007, Pyle 2008) rather than in late winter or early spring, as is typical of

most other North American birds. In pre-breeding birds, during the second and third cycles of molt, the pattern is essentially similar, although in these subadults the prebasic molt often starts earlier in the spring or summer than in adults, presumably because of the lack of time and energy constraints related to breeding. In the second and third cycles, the prealternate molt may also begin earlier and is often more extensive than the definitive prealternate molt, perhaps also because the annual cycle allows additional time and energy for replacing feathers.

The second, third, and definitive prealternate molts of *Larus* gulls are often protracted, extending from fall through March or April, although in species wintering at colder, more northerly latitudes they are often suspended for the winter. In most or all species this molt can include, variably, some to most body feathers and upperwing secondary coverts, up to three tertials, and occasionally the central rectrices, but no other flight feathers (Dwight 1925, Cramp and Simmons 1983, Howell and Dunn 2007, Pyle 2008). The extended and variable nature of this molt, coupled with "molt–plumage interactions" (the gradual change of feathers' appearance during a protracted molt as changing hormone levels induce a change in pigment deposition; cf. Pyle 2013a), leads to substantial variation in gulls' second and third alternate plumages.

Two Northern Hemisphere species of *Larus* have been recorded undergoing replacement of primaries during a prealternate molt. Yellow-footed Gulls (*L. livens*) may replace up to eight inner primaries during the second prealternate molt and six inner primaries during the third prealternate molt (Howell and Dunn 2007, Pyle 2008). They may also replace up to all rectrices and at least two outer secondaries, but the full range of flight-feather replacement during prealternate molts in this species requires further study. Adult Yellow-footed Gulls have not been recorded replacing flight feathers other than the tertials and central rectrices during the definitive prealternate molt (Howell and Dunn 2007, Pyle 2008).

In European populations of the Lesser Black-backed Gull (*L. fuscus*), the second prealternate molt can include up to many, and possibly all, primaries, secondaries, and rectrices (Muusse et al. 2005). The extent of molt varies geographically in this species, with replacement of remiges during the second prealternate molt being more extensive in nominate *L. f. fuscus* breeding in Finland than in *intermedius* of Scandinavia and *graellsii* of western Europe and Iceland (Jonsson 1998), although inner primaries replaced during the prealternate molt have been recorded occasionally in both of the last two subspecies (Muusse et al. 2005). Replacement of primaries and secondaries during the second prealternate molt has not previously been reported in Lesser Black-backed Gulls in North America, which are assumed to be primarily of *graellsii* (Howell and Dunn 2007). We could find no mention in the literature of other species of *Larus* gulls in Europe or North America replacing primaries during a prealternate molt.

REPLACEMENT OF PRIMARIES DURING PREALTERNATE MOLT IN THE YELLOW-FOOTED AND LESSER BLACK-BACKED GULLS

While studying gulls at the Salton Sea, California, from 28 to 30 September 2017, Ayyash noted at least eight third-cycle and adult Yellow-footed Gulls showing two waves of primary molt, symmetrical in both wings. Figure 1 shows an adult that is completing the prebasic molt with the outermost primaries (p9 and p10) and proximal to middle secondaries (between s5 and the tertials) growing. The bird is also undergoing a second wave of primary molt, with p1–p3 newly replaced and p4 growing. The primary coverts corresponding to these inner primaries are similarly new or being replaced. We infer that the inner wave of primary replacement is part of an early prealternate molt that had begun before the prebasic molt of outer primaries was completed. Other Yellow-footed Gulls that Ayyash photographed showed similar patterns, with outer primaries growing and feathers from p1 to p4 being replaced as part of a second wave of molt. The bird in Figure 1, along with at least two other individuals Ayyash photographed, appear to be adults (4th cycle or older) from their uniformly gray upperwing feathers, lacking the brown or dusky coloration to the older generation of primary coverts typical of the third basic plumage. We are aware of no other reports of replacement



Figure 1. Adult Yellow-footed Gull at the Salton Sea, California, on 29 September 2017. Note the two waves of concurrent primary molt, with p9 and p10 growing (outer wave) and p4 growing (inner wave). The inner wave is part of a definitive prealternate molt. The pure gray primary coverts identify this bird as an adult in its fourth plumage cycle or older. Replacement of primaries during the definitive prebasic molt has not been recorded previously in the genus *Larus*.

Photo by Amar Ayyash

primaries during the prealternate molt in adults of the Yellow-footed Gull or any other species of *Larus*.

Figure 2A shows a second-cycle Lesser Black-backed Gull photographed by Bartosik on Quintana Island, Brazoria County, Texas, on 7 January 2012. This individual was undergoing sequential molt of the primaries, with p1–p8 new, p9 growing, and p10 old on both wings; the primary coverts were being replaced in the same pattern. Among the secondaries, s1–s4, s6–s7, and the tertials were new, while s5 had dropped on both wings. All rectrices appear to have been replaced recently except for the r5 on the right side. The timing of the molt, the secondaries patterned as in definitive plumage, and fresher and broader outer primaries signifying the second basic plumage together indicate that the inner primaries and new secondaries and rectrices were of the alternate plumage. This pattern matches that of the second prealternate molt as reported for many Lesser Black-backed Gulls in Europe (Muusse et al. 2005). Bartosik was able to document progression of molt in this individual through 21 April 2012, by which time all primaries, secondaries, and rectrices had been replaced, with the p10 growing on both wings (Figure 2B). Interestingly, however, on the upperwing of this individual, most of the secondary coverts, including all of the greater coverts, appeared to be retained from the basic plumage through this date.

Among about a dozen second-cycle Lesser Black-backed Gulls in prealternate molt observed by Bartosik during the winter and spring of 2012, the majority were not replacing any remiges other than the tertials. An exception was one other second-cycle bird photographed on 7 January that had replaced or was growing p1–p7 and one or more secondaries between s1 and s3 on both wings (Figure 3A). Another was a third-cycle or fourth-cycle bird photographed that same day and molting p1 (both) and p2 (right side only) while p10 was still growing (Figure 3B)—a pattern similar to that of the Yellow-footed Gull in Figure 1. On the second-cycle bird in Figure 3A, the outer secondaries were being replaced in the order s1–s3–s2 on both wings. On the older bird in Figure 3B, the innermost primary coverts were also new or being replaced, whereas few if any other wing or tail feathers had been recently renewed. To our knowledge, these photos represent the first documentation of Lesser Black-backed Gulls replacing primaries during the second prealternate molt in North America, or replacing primaries during the third or fourth prealternate molt anywhere in the species' range.

REPLACEMENT OF PRIMARIES DURING THE PREALTERNATE MOLT IN THE AMERICAN HERRING GULL?

The outside back cover of this issue shows two images of an American Herring Gull (*L. argentatus smithsonianus*), photographed by Ayyash on 22 November 2015 in Chicago, Illinois. On each wing, the five inner primaries (p1–p5) contrast substantially in color pattern with the six outer primaries. The replaced inner primaries are definitive in appearance whereas the outer primaries are typical of the second basic plumage. On the bird's upper surface, the inner four primary coverts, most or all feathers of the mantle (back feathers and scapulars), most median coverts, scattered lesser secondary and lesser primary coverts, a few greater coverts, and the three tertials were also

patterned as in the definitive plumage. These feathers contrasted with the remaining upperwing coverts and secondaries, which appeared typical of the second basic plumage. The wear of the inner primaries appeared to match that of the other definitive-like feathers of the second alternate plumage, suggesting that all these feathers were of the same generation. Other than the inner primaries, the appearance of this bird is consistent with the Herring Gull's second alternate plumage at this time of year (Howell and Dunn 2007).

The upper image on the inside back cover shows another American Herring Gull, photographed by Ayyash on 25 January 2013 in Whitting, Indiana. Similarly, it appears to be in second alternate plumage with contrasting inner primaries (p1–p3) patterned as in the definitive plumage. These contrasting primaries seem newer than the outer primaries (p4–p10) and to be of the same generation as the other wing feathers, of the second alternate plumage. If the inner primaries of these gulls are indeed of the second alternate plumage, as can be found in the Yellow-footed and Lesser Black-backed gulls at this time of year, the photo represents the first documentation of a Herring Gull replacing primaries during the prealternate molt.

Another possibility, however, could be that these birds were in their third cycle but slow to mature except for the advanced appearance of the inner primaries. Most of this bird's plumage, including the basic (older) upperwing coverts, outer primaries, secondaries, and rectrices, can be matched by both fast-maturing second-cycle and slow-maturing third-cycle birds (Howell et al. 2007, Pyle 2008). Although a few third-cycle birds show all of these features, most of their basic plumage is more definitive in appearance. In a third-cycle gull, molt–plumage interactions could explain a transition from inner primaries matching the definitive plumage to outer primaries matching the second basic plumage. However, such molt–plumage interactions usually result in a gradual change in color pattern as pigment-deposition signals shift over the time of replacement (see Pyle 2013a). For example, the lower image on the inside back cover shows a Herring Gull, more likely in its third than its second cycle, photographed by Ayyash on 14 September 2014 in New Buffalo, Michigan. Whatever its age, note how, from inner to outer, the primaries gradually become less like the definitive plumage, not abruptly as on the other two Herring Gulls.

The Gull Research Organisation (www.gull-research.org/index.html) has posted many photos of third-cycle Herring Gulls, banded as chicks and so of known age, of both European and North American subspecies. In most of these, the transition in coloration of the inner primaries is gradual, as in the bird in the lower photo on this issue's inside back cover. Their inner primaries do not match the freshness of the tertials, which are of the alternate plumage. In general, their wings and tails look more like the definitive plumage than do those of the Herring Gulls on the outside back cover and inside back cover, upper photo. In most of the birds depicted at the Gull Research Organisation's website, fewer tertials and wing coverts are of the alternate plumage, which may indicate that the prealternate molt did not extend to replacing the primaries. Some birds, however, such as the known third-cycle bird with the band DKC 4298575 and photographed in the Netherlands on 30 October 2015 (http://www.gull-research.org/hg/hg3cy/4298575.html), more closely resemble the one on this issue's back

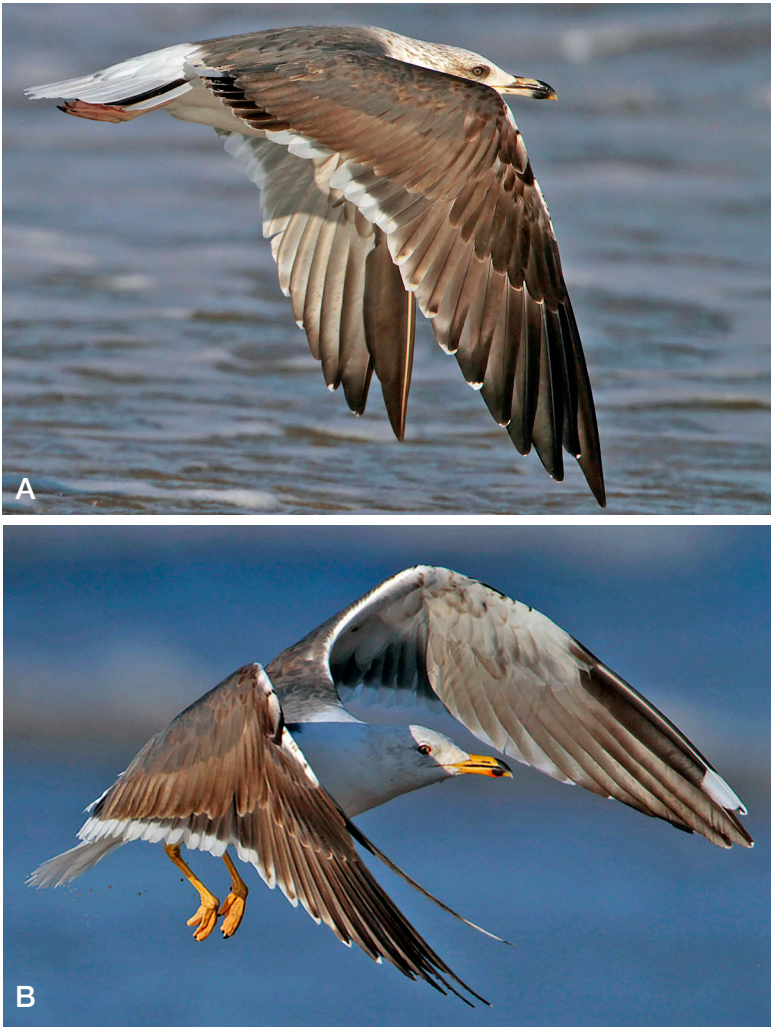


Figure 2. Second-cycle Lesser Black-backed Gull at Quintana Island, Brazoria County, Texas, 7 January 2012 (A) and 21 April 2012 (B). Note the progession of prealternate molt. In January (A), p1–p8 have been replaced and p9 is growing. By April (B), the outermost primary (p10) is completing growth and all other primaries, secondaries, and rectrices, but not all wing coverts, have been replaced during the second prealternate molt. These photos represent the first evidence for prealternate molt including primaries in the Lesser Black-backed Gull in North America.

Photos by Mark Bartosik



Figure 3. Second-cycle (A) and third-cycle (B) Lesser Black-backed Gulls at Quintana Island, Brazoria County, Texas, on 7 January 2012. (A) The second-cycle bird is undergoing the prealternate primary molt, which had reached p7. Secondaries s1–s3, as well as the tertials and adjacent inner secondaries are new or growing. Note that the sequence of replacement of the outer secondaries on both wings, s1–s3–s2, is not consistent with the sequence during the prebasic molt. (B) This third-cycle (or possibly fourth-cycle) Lesser Black-backed Gull has both the outermost (p10) and two innermost (p1–p2) primaries growing on both wings. We infer that the inner wave of primary molt represents the start of the third prealternate molt. This photo constitutes the first documentation of replacement of primaries during this molt in the Lesser Black-backed Gull.

Photos by Mark Bartosik

cover. We believe it is still an open question whether or not the Herring Gull on the back cover is in its second cycle with inner primaries replaced during the second prealternate molt or in its third cycle with all primaries of the third basic plumage. Nevertheless, we believe that these photographs suggest that some small proportion of American Herring Gulls replaces the inner primaries during the second prealternate molt.

DISCUSSION

We document replacement of primaries during the prealternate molt in two and possibly three species of *Larus* in North America. The timing of this replacement appears to be consistent, with up to p1–p4 being replaced sequentially by late September in Yellow-footed Gulls in southern California, up to p1–p5 possibly being replaced by mid November in American Herring Gulls in Chicago, and up to p1–p9 being replaced by early January and p1–p10 by late April in Lesser Black-backed Gulls along the Texas coast. We infer that to have reached these extents by these dates, replacement of primaries during the prealternate molt began as early as late August or early September. This schedule would be consistent with replacement of median coverts and other feathers as early as September during the prealternate molt (Howell and Dunn 2007, Pyle 2008), provided that the inner primaries had dropped before other feathers, as typical of a complete molt. As far as we have observed, this timing may apply only to the second prealternate molt in the Herring Gull and the second and third prealternate molts in the Lesser Black-backed Gull, whereas it may apply to these as well as the definitive prealternate molt in the Yellow-footed Gull. Our one example of primaries being replaced during the third or fourth prealternate molt in the Lesser Black-backed Gull indicates that this molt started later, likely sometime in late December.

SEQUENCE OF REPLACEMENT OF REMIGES

The sequence of replacement of primaries during the prealternate molt in these and other species of *Larus* matches that during the second and later prebasic molts, starting at p1 and proceeding distally. This typical sequence differs from the sequence of replacement of primaries during the definitive prealternate molt documented in an Indigo Bunting (*Passerina cyanea*) and apparently some shorebirds (Pearson 1984, Marks 1993, Balachandran and Hussain 1998; cf. Wolfe and Pyle 2011). In those cases, the primaries appear to be replaced distally from a point in the middle of the tract, rather than from p1. Interestingly, in these passerines and shorebirds, the primaries are also replaced in this "eccentric" sequence during the preformative molt (Pyle 1997, 2008). By contrast, in a case of atypical replacement of primaries during prealternate molt in the Yellow Warbler (*Setophaga petechia*), that replacement began at p1 (Pyle and Kayhart 2010), as in our three species of *Larus*. In none of these four species is replacement of primaries during the preformative molt eccentric, although at least one species of *Larus*, *heermanni* (Heermann's Gull), can show an eccentric preformative molt

(Howell and Dunn 2007, Pyle 2008). Further study is needed to ascertain whether or not there is a correlation between the sequence of replacement of primaries during the preformative and prealternate molts within a species.

The sequence of replacement of secondaries during the prealternate molt in the Lesser Black-backed Gulls appears to differ from that during the second and later definitive prebasic molts in *Larus* in general. The prebasic molt begins with the tertials (likely proceeding bidirectionally from the second tertial) and continues proximally from s1 and s5 (Pyle 2008). On both wings of the Lesser Black-backed Gull that Bartosik photographed at Quintana Island, Texas (e.g., Figure 2A, B), the sequence of the prealternate molt of the tertials was similar, and a wave of molt ran proximally from s1. But the other wave running proximally commenced at s6 rather than s5, which was instead the last feather replaced in the wave commencing at s1. On the other Lesser Black-backed Gull replacing primaries (Figure 3A), the secondaries were being replaced in atypical sequence as well, with s3 preceding s2. Among second-cycle Lesser Black-backed Gulls photographed in Europe the pattern of replacement of secondaries during prealternate molt is inconsistent (www.gull-research.org/index.html; Figure 4). Although in all birds the tertials appeared to include a node, s1, s2, s5, s6, s7, s9, and s12 also functioned as a node in various individuals. In many (but not all) birds s1 was a node. On some birds (e.g., Figure 4) asymmetry between the two wings was substantial.

Within an order of birds, the sequence of replacement of the remiges during the prebasic molt is quite fixed (Pyle 2013b). As discussed by Pyle (2013c), the prebasic molt may involve, in addition to feather replacement, a metabolic process encompassing most body tissues, as part of a cycle of restoration ancestral to reptiles and most or all vertebrates (King 1972, Murphy 1996, Kuenzel 2003). But inserted prealternate molts may have evolved simply to replace worn feathers and may not be accompanied by such a substantial physiological process. We suggest that in *Larus* the apparent differences in the sequence of replacement of secondaries between the prebasic and prealternate molts could be related to such a difference in the underlying mechanisms controlling molt. For this concept to be explored further, a better understanding of variation in sequences of gulls' replacement of the secondaries, during both the prebasic and prealternate molt, is needed.

Prealternate molt of inner primaries as early as late August means that this molt starts before prebasic molt of the outer primaries is completed, as we have shown in the Yellow-footed Gull and third or fourth plumage cycles of the Lesser Black-backed Gull. The result, multiple concurrent waves of primary molt, mimics Staffelmauser (Pyle 2006). Indeed, Stresemann and Stresemann (1966) implied that nominate *Larus fuscus fuscus* may undergo Staffelmauser. However, we suspect that the ensuing prebasic molt of the primaries begins at p1, rather than at the point where the inner molt wave was suspended, as occurs during Staffelmauser. We agree with M. Muusse (pers. comm.) that the molt of the Lesser Black-backed Gull reported as Staffelmauser by the Stresemanns likely represented the beginning of the second prealternate molt overlapping the end of the second prebasic molt of primaries. In this regard, the prealternate molt of the primaries in gulls



Figure 4. Second-cycle Lesser Black-backed Gull (presumably of subspecies *L. f. graellsii*) at Texel, the Netherlands, on 1 May 2006. The bird was banded as a chick so its age is known. The inner five primaries (p1–p5) on the left wing and the inner six primaries (p1–p6) on the right wing had been replaced during the second prealternate molt, after which this molt was arrested. All secondaries had been replaced, but note that the order of this replacement appears to have been asymmetrical, irregular, and different from the continuous sequence of replacement during the prebasic molt. All 12 rectrices had also been replaced during the second prealternate molt.

Photo by Mars Muusse

is similar to that of terns (Pyle 2008), suggesting that this pattern may have been inherited from a common ancestor.

GEOGRAPHIC VARIATION IN THE TIMING AND EXTENT OF MOLT

In Europe, replacement of primaries during the prealternate molt is more frequent in the nominate subspecies of the Lesser Black-backed Gull than in the other subspecies. This difference led Jonsson (1998) and Muusse et al. (2005) to infer that the patterns of molt in this species vary by phylogeny. But Muusse et al. (2005) also documented replacement of primaries during prealternate molt in two individuals of *intermedius* and one of *graellsii*. Other examples of these subspecies molting primaries during the prealternate molt, including the bird in Figure 4, may be seen at www.gull-research.org/index.html. We agree with Howell (2001) and Pyle (2008), however, that the occurrence and extent of prealternate molt of the primaries in *Larus* may be related more to the distance an individual migrates and latitude at which it winters than to its phylogeny. Such patterns have been observed in other species of Charadriiformes, including shorebirds, terns, and jaegers

(Pyle 2008:500–505, 691–694; Pyle and Reid 2016), and even in passerines (Pyle 1998). In migratory birds that winter in the Southern Hemisphere and tropics, molt is more extensive than in those that winter in the North Temperate Zone. The difference may be related to differences in the light regimes and greater supply of food at lower latitudes and in the Southern Hemisphere during the boreal winter. Such factors could also explain the molt of the Franklin's Gull (*Leucophaeus pipixcan*), which winters primarily in southern South America and is the only gull species known in which the prealternate molt is normally complete (Howell and Dunn 2007, Pyle 2008). In the Lesser Black-backed Gull, *Larus fuscus fuscus* winters primarily in tropical Africa and southwestern Asia, whereas subspecies *intermedius* and *graellsii* winter farther north in southwestern Europe and northern Africa (Jonsson 1998). A role for latitude of wintering would thus be consistent with the observations in Europe of many examples of nominate *fuscus* but only few of *intermedius* and *graellsii* (that under this premise may have wintered farther south) replacing primaries during the second prealternate molt. The same pattern might be expected in *L.* [*f.?*] *taimyrensis*, as it winters as far south as southeast Asia (N. Moores pers. comm.).

The Lesser Black-backed Gulls, presumably of subspecies *graellsii*, that were replacing their primaries during prealternate molt in coastal Texas (Figures 2 and 3) were wintering at 29° N. This latitude, equivalent to north Africa through northern India, is perhaps near the southern edge of the winter range of *intermedius* and *graellsii*. It might be consistent with the latitudes at which some Lesser Black-backed Gulls may replace primaries during their prealternate molt, regardless of their subspecies. On the other hand, many Lesser Black-backed Gulls along the Texas coast had replaced no primaries during the second prealternate molt.

If latitude is a primary factor influencing prealternate molt, how do we explain the Herring Gulls with inner primaries possibly replaced in the prealternate molt but wintering at the latitude of Chicago and northwestern Indiana (41–42° N)? Perhaps a more important factor in the incidence of prealternate primary molt in *Larus* may the timing of the prebasic molt the previous spring and early summer. In these gulls, the prebasic molt is generally earlier in the second cycle than in the third cycle, and prebasic molt in the third cycle is generally earlier than in older adults (Pyle 2008). We suspect this pattern is responsible for the greater incidence of replacement of primaries during predefinitive prealternate molt than during definitive prealternate molt. Variation among species and individuals in the timing of the second prebasic molt may, in turn, be related to latitude of wintering. We expect that, on average, birds wintering farther south molt earlier than those wintering farther north. For example, a Lesser Black-backed Gull in San Diego, California (latitude 32.7° N), was beginning its third prebasic molt when it was photographed on 23 March 2012 (California Bird Records Committee record number 2012-942, reported by Pike et al. 2014). This date is earlier than expected for prebasic molt of this species elsewhere (Cramp and Simmons 1983, Howell and Dunn 2007, Pyle 2008). Might so early a date then lead to a higher probability of replacement of primaries during the third prealternate molt?

Had the Herring Gulls wintering at Chicago (this issue's back cover) spent

the previous winter and spring farther south, they may have begun the second prebasic molt earlier, leading to replacement of primaries during the second prealternate molt, irrespective of where these individuals spent their second winter. American Herring Gulls may winter as far south as northern South America (Nisbet et al. 2017), farther south than European subspecies of the Herring Gull (Cramp and Simmons 1983). Wintering farther north could explain why no evidence of primaries replaced during a prealternate molt has been noted among thousands of Herring Gulls observed and photographed in Europe (M. Muusse, P. Adriaens pers. comm.), even though it may occur in a small proportion of North American Herring Gulls, in theory those that have wintered in tropical or equatorial latitudes.

MORE STUDY NEEDED

These and other questions about prealternate molt in *Larus* remain to be answered through further observation and study. Why might replacement of primaries during the prealternate molt be largely restricted to the second cycle of the Lesser Black-backed and perhaps American Herring Gull but continue through later cycles in the Yellow-footed Gull? Could earlier breeding and molt, along with more intense exposure to the sun, explain the prevalence of primaries being replaced during the prealternate molt of the Yellow-footed Gull, while they are apparently not replaced during this molt in the Western Gulls (*L. occidentalis wymani*) breeding in cooler and foggier conditions on the Pacific side of Baja California? Or has such molt just gone so far undetected? Finally, if latitude of wintering affects whether gulls replace primaries during their prealternate molt, why has it not been recorded yet in Laughing Gulls (*Leucophaeus atricilla*) or Sabine's Gulls (*Xema sabini*) wintering in northern South America? Atypical prealternate molt of the primaries has also been observed in passerines and shorebirds (see above). Along with the possible atypical prealternate molt of the Herring Gull we have reported here, such molt implies a mechanism underlying the occasional replacement of primaries in some individuals that have, during the prealternate molt, replaced feathers in other tracts more extensively. Further study of these underlying mechanisms could lead to a better understanding of this phenomenon in gulls.

Finally, what are the implications for assessing the age and plumage of gulls whose prealternate molt is more extensive, including primaries and secondaries? In spring, second-cycle Lesser Black-backed Gulls replacing all remiges during an extensive prealternate molt, such as the one shown in Figures 2 and 3 and others documented in Europe (Muusse et al. 2005), might be difficult or impossible to distinguish from third-cycle individuals, especially given how variable both the second and third alternate plumages can be in *Larus*. In Figure 2B, for example, note the large white mirror on p10, replaced during the second prealternate molt. Likewise, the often cited earlier maturation of the "three-year" Yellow-footed vs. the "four-year" Western Gull appears to be due to the Yellow-footed's more extensive prealternate molt rather than to a difference in the intrinsic rate of plumage maturation, as is often assumed. As if evaluating the ages of gulls in predefinitive plumages was not difficult enough (Howell and Dunn 2007, Pyle 2008), extensive

prealternate molt, including the primaries, can only reduce the accuracy of such evaluations further (cf. Figure 3B).

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Back cover "Featured Photos" by Amar Ayyash of Orland Park, Illinois: American Herring Gull (*Larus argentatus smithsonianus*) at Chicago, Illinois, 22 November 2015. Note the contrast between the inner five primaries, patterned as in the definitive plumage, with the outer primaries, patterned as in the second plumage cycle. The inner primaries may have been replaced during a prealternate molt.