SECOND PREBASIC MOLT OF A BLACK-HEADED GULL AT ANCHORAGE, ALASKA

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ABSTRACT: A second-cycle Black-headed Gull (*Chroicocephalus ridibundus*), a rare to casual visitor in western North America, remained at Anchorage, Alaska, from 16 July through 17 September 2023, providing a unique opportunity to track and document most stages of its second prebasic molt into definitive (adult) basic plumage. I estimated that the Anchorage bird required approximately 3 to 3.5 months (early/mid-June through late September) to complete the molt of its primaries. This is notably longer than the "average" 2.5 months stated for second-cycle Black-headed Gulls in several publications, but consistent with the duration and calendar limits reported by others for the entire species (mid-May/June through September). The start and duration of rectrix molt relative to the stage of primary molt closely matched that described for gulls in general, and specifically for predefinitive Bonaparte's (*C. philadephia*) and Western (*Larus occidentalis*) gulls. When first observed in mid-July, the Anchorage bird had a white tail, as in definitive plumage, a trait infrequent in first-cycle Black-headed Gulls; then it molted the tail again through August. Although Black-headed Gulls occurring in western North America have been presumed to originate from eastern Asia, the timing of the Anchorage bird's primary molt closely matched that published for second-cycle Black-headed Gulls in Europe, which has reported to be earlier—though molt schedules of Charadriiformes at the population level are highly variable.

In North America, the Black-headed Gull (*Chroicocephalus ridibundus*) breeds and winters annually along the Atlantic coast, from western Greenland to New York (AOU 1998), but along the Pacific coast this species is a rare migrant in the Bering Sea and casual from southeastern Alaska to California (California Bird Records Committee 2007, Gibson and Withrow 2015, Tobish 2015). Prior to 2023 the Black-headed Gull had been recorded at Anchorage, Alaska, on nine occasions, all between June and September.

On 16 July 2023 Ben Lagassé found a one-year-old Black-headed Gull on tidal mudflats of Knik Arm in west Anchorage. It lingered until at least 17 September, associating closely with post-breeding and migrant Bonaparte's Gulls (*C. philadephia*) of various ages. When first observed the gull had already begun its second prebasic molt. The inner primaries had been shed, with several regrowing, and molt of the head and wing coverts was underway, but the remaining outer primaries, secondaries, and a few outer primary coverts were very worn, dull, and many had dark marks indicative of juvenile feathers (Malling Olsen and Larsson 2004, Howell and Dunn 2007, Pyle 2008). During the remainder of the gull's stay it nearly completed its second prebasic molt into definitive plumage (Figures 1–5), replacing all its remiges and rectrices.

Black-headed Gulls molt according to the "complex alternate strategy" as defined by Howell et al. (2003) (Pyle 2008). Pyle (2008:640–642) stated that first-cycle Black-headed Gulls undergo a preformative molt between August and October and a partial first prealternate molt between February and May. Both of these molts involve the head, some to most of the body, and in some individuals some wing coverts, but no flight feathers (except occasionally the tertials). Second-cycle birds undergo a complete second prebasic molt

FIGURE 1. Second-cycle Black-headed Gull at Anchorage, Alaska on 3 August 2023. The deep red bill with dark tip is typical of this species. The white head (showing a "ghost" hood) with a dark ear spot and fore-eye crescent, plus uniform pale gray upperparts, are consistent with definitive plumage.

Photo by Robert L. Scher

between July and November and a partial second prealternate molt from January to April (Pyle 2008:640–642). According to Pyle (2008:630), gulls in general replace the primaries slowly from the innermost, p1 (see Methods for feather-numbering scheme), to the outermost, p10. The secondaries are replaced inward from the outermost, s1, rapidly to s4, then more slowly inward from s5. Molt also proceeds outward from the tertials, with the last secondaries to be replaced usually several feathers outward from the tertials. The rectrices are replaced rapidly from the central pair, r1, to the outer pair, r6.

The only field studies I found investigating the sequence, rate, and duration of prebasic molt in the Black-headed Gull took place in Europe (Walters 1978, 1982, Cramp and Simmons 1983, Malling Olsen and Larsson 2004, Meissner 2007). Those studies also tracked molt in large numbers of birds, not individually. Thus the observations at Anchorage presented a unique opportunity to document all but the earliest stage of the second prebasic molt of a Black-headed Gull, albeit a singleton and vagrant, for two months in western North America.

METHODS

I interpreted the state of the Anchorage Black-headed Gull's second prebasic molt through my field observations, made at roughly one to two week intervals after 2 August (Figures 1–5), and review of other photographs that showed one or both open wings (27 in total from 16 July to 17 September 2023). All photos are archived at the Cornell Lab of Ornithology's Macaulay Library (ML; http://www.macaulaylibrary.org).

To quantify the progress of molt of the primaries, I used these photographs to estimate a range of single-wing primary-molt scores versus time. The score

FIGURE 2. Black-headed Gull undergoing the second prebasic molt at Anchorage, Alaska, on 3 August 2023. Note the new adult primaries (p1–5 regrown, p6–7 growing), secondary s1 (and possibly s5) emerging from beneath the greater coverts, and central rectrices (r1). Note the juvenile primaries (p9–10), some inner secondaries, and primary coverts (at p9–10). Apparently missing are p8, a large number of outer secondaries (s2–s8), which at least had not yet emerged from beneath the greater coverts, and several rectrices (possibly r2 and r3?).

Photo by Bob Waldrop

can range from zero for a bird that has not yet started its primary molt (all primaries present and old), to a maximum of 50 at completion of primary molt (all primaries new and fully grown). I adopted the following rankings, somewhat modified from those defined by Ginn and Melville (1983): 0 for old feathers, 1 for an apparently missing or not visible feather, 2 for a visible feather less than about one-third grown, 3 for a feather between about one- and two-thirds grown, 4 for a feather more than about two-thirds but less than fully grown or a fully grown new primary adjacent to a missing or partially grown primary, and 5 for an apparently fully grown primary adjacent to fully regrown feathers. Ranges of the score on a specific date reflect cases where the length of the feather appeared to border two conditions, and/or considering that the persistence of a waxy sheath at the base of a feather cannot be discerned in a photograph.

Terms for molt and feather tracts are generally consistent with definitions in Pyle (2008) and Howell (2010). According to Ginn and Melville (1983) and Pyle (2008), the Black-headed Gull has 10 functional primaries numbered outward from p1 to p10, 20–21 secondaries, numbered inward from s1 to s17 or s18, plus three tertials numbered outward from t1 to t3, and 12 rectrices numbered symmetrically outward from the center pair, r1, to the outermost pair, r6.

For this study I attempted to differentiate only secondaries s1 to s15 in a photograph, and used "s16+" as a proxy for the innermost group (s16–17/18) because of the difficulty in distinguishing these in images. I also did not at-

FIGURE 3. Black-headed Gull undergoing the second prebasic molt at Anchorage, Alaska on 16 August 2023. The primaries out to p6 had been regrown, p7 was almost fully regrown, p8–9 were growing, and p10 was missing. The outer secondaries were regrown inward to about s9 (possibly s10), but the next inner secondaries in to about s15 or s16+ were missing. Additionally, one of the outer pairs of tail feathers (possibly r4 or 5?) appeared to be missing.

Photos by Robert L. Scher

tempt to differentiate tertials as on flying gulls those are usually covered by the scapulars (Grant 1986).

RESULTS

The following subheadings describe the progress of the Anchorage Black-headed Gull's second prebasic molt. Soft parts and plumage aspects that did not appear to change during the gull's stay are not described but are visible in the figures.

Contour Feathers and Wing Coverts

When first observed on 16 July 2023 the gull's head appeared white with dull smudge marks on the crown and face (as in first alternate plumage) and a rather distinct dark gray fore-eye crescent and ear spot (e.g., ML594800151, 16 July 2023, Enric Fernandez). For the most part the contour feathers of the upperparts and the wing coverts were gray (as in definitive plumage). Lagassé noted that the upperwing coverts lacked brown markings (ebird.org/ak/checklist/s144798045), which is also borne out in the photographs from that time, albeit all taken from a great distance, that show no sign of the darkish carpal/ulnar markings typical of juvenile plumage. On both the upper and underwing the outer greater coverts corresponding to s1 to about s8/10 were missing. By 2 and 3 August (Figures 1 and 2) the head was cleaner white, which accentuated the dark fore-eye crescent and ear spot; a pale gray-

FIGURE 4. Black-headed Gull at Anchorage, Alaska, nearing completion of the second prebasic molt on 2 September 2023. All secondaries (including tertials), wing coverts, and rectrices were regrown, but p9 and p10 were still growing.

Photo by Robert L. Scher

ish "ghost" hood-ring was very faint. The outer upperwing greater coverts appeared fully replaced, but now the inner greater coverts were missing. Additionally, Figure 2 shows dark-marked juvenile greater primary coverts corresponding to p9–10. By 16 August (Figure 3) all upperwing coverts appeared fully replaced.

Primaries

On 16 and 17 July, p1 appeared fully grown, p2 was at least two-thirds regrown, p3–4 were possibly one- to two-thirds regrown, p5–6 were missing or less than one-third grown, and p7–10 were old (juvenile), resulting in an estimated primary-molt score of 18–20 (ML594939661, 16 July 2023, Bill Carpenter; ML594915441, 17 July 2023, Emily Weiser). By 14 September (Figure 5), the last date I observed the bird, all primaries out to p9 appeared fully grown, with p10 nearly fully grown (score 49). Figures 2–5 illustrate the progress of primary molt for the period over which the bird was observed in Anchorage (see also my photos ML600108961, 2 August 2023; ML606995091 and ML606991671, 21 August 2023; ML608298927 and ML608298926, 29 August 2023, and ML608411233, 2 September 2023. Ages or apparent lengths of regrown feathers and molt scores are detailed in Table 1, and the scores are plotted versus time in Figure 6.

Secondaries

Observers' details (ebird.org/ak/) and photographs from 16 and 17 July (ML594939661, 16 July 2023, Bill Carpenter; ML594915441, 17 July 2023, Emily Weiser) did not mention or show evidence that any secondaries had yet been shed, and all but the innermost exposed secondaries had a dark sub-

FIGURE 5. Black-headed Gull at Anchorage, Alaska, nearing completion of the second prebasic molt (only p10 appeared not yet fully regrown) on 14 September 2023.

Photos by Robert L. Scher

terminal band, indicating juvenile feathers. On 2 and 3 August (Figure 2; also ML600108961), s1, and possibly s5, had emerged from beneath the greater coverts, but approximately six to seven of the next outer secondaries (among s2–s8/9) were missing or concealed beneath the greater coverts, which created a very large mid-wing gap. At least four or five dark-marked juvenile inner secondaries remained (among likely s9–s14), and the other inner secondaries (among s14–s16+) were gray with white tips but of unclear age. By 16 August (Figure 3), the outer secondaries from s1 to about s9 (possibly s10) appeared fully regrown. The next inner secondaries to about s15 were then missing or concealed by the greater coverts, and the innermost group, s16+, appeared unworn and new. On 21 August (ML606991671 and ML614207827) the secondaries from s1 to at least s12 and possibly s13 appeared fully grown, with s14 and s15 possibly growing but concealed. On 29 August (ML608298927 and ML608298926), all secondaries to at least s14 appeared replaced, with s15 possibly (and s16?) still growing. By 2 September (Figure 4) all secondaries, including the tertials, appeared fully regrown.

Rectrices

It was very difficult to judge which rectrices were actively molting, even from photographs showing the spread tail, so the following summaries should be considered qualitative at best. On 16 July Lagassé described the tail as "white" (ebird.org/ak/checklist/s144798045), and none of the other eBird checklists from 16 or 17 July (including some with photographs, albeit from great distances: e.g., ML594939661, 16 July 2023, Bill Carpenter, and ML594915441, 17 July 2023, Emily Weiser) indicated tail feathers with dark tips (as in predefinitive plumages). On 2 and 3 August (Figure 2), the central pair of rectrices (r1) appeared to be growing, the next two to three pairs

Table 1 Replacement of Primaries during the Second Prebasic Molt of a Black-headed Gull at Anchorage, Alaska, 16 July–17 September 2023

	Condition or estimated length						
Date	Old	Missing	<1/3	1/3-2/3	>2/3	Fully grown	Score
16 Jul	p7–10	p6–(5)	(p5)	p3–4	p2 –(3)	p1 –(2)	18–20
2 Aug[a]	p9–10	p8	(p8)	p7	p6	p1–5	33–34
16 Aug[b]		p10	p9	p8	p7	p1–6	40–42
21 Aug			p10	p9 –(10)	p8	p1–7	43–44
29 Aug				p10	p9	p1–8	46–47
2 Sep[c]					p9–10	p1–8	47–48
8 Sep					p10	p1–8/9	48–49
14 Sep[d]					p10	p1–9	49

[a]See Figure 2.
[b]See Figure 3.
[c]See Figure 4.
[d]See Figure 5.

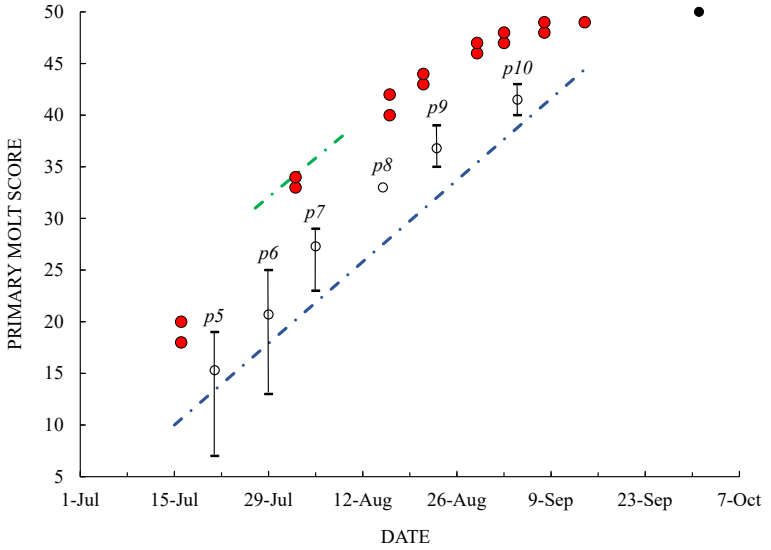

Figure 6. Primary-molt scores versus date for the Black-headed Gull observed at Anchorage, Alaska, from 16 July to 17 September 2023 (red circles) and average or apparent mean values published for adults in England (blue dash-dot line from Ginn and Melville 1983), for adults near Amsterdam (open circles from Walters 1978, black circle from Walters 1982), and for second-cycle birds on the Baltic coast of Poland (green dash-dot line from Meissner 2007). Vertical black lines represent the range of primary-molt scores that Walters (1978) estimated from recovered dead birds, corresponding with the average date each primary (labeled above each line) was shed. Note that after p5 and p6 were shed, the actual dates that Walters (1978) reported p7 to p10 were shed in adults ranged up to about four weeks on either side of the plotted average date.

(r2–4?) appeared missing or growing, and the remaining outer feathers were white (as in definitive plumage). On 16 August (Figure 3) r1–r3 appeared fully or mostly regrown, but one of the outer pairs (possibly r4 or r5) was now missing. On 21 August all rectrices appeared grown, except for possibly the outermost pair (r6) (ML614207827). By 29 August (ML608298928), and certainly by 2 September (Figure 4), all rectrices appeared fully regrown.

DISCUSSION

For the two full months of its stay in 2023, the Black-headed Gull observed in Anchorage showed no sign of ill health or poor physical condition, and it remained fully capable of flight. Despite the active wing and tail molt it moved daily along several kilometers of tidal flat, and it was observed to fly off when a raptor soared over and on several occasions when I tried to approach closer than about 25–50 meters. Therefore I consider the progress of its second prebasic molt to be likely representative of a normal and healthy second-cycle Black-headed Gull. General measures of the Anchorage Black-headed Gull's second prebasic molt (i.e., duration and rate of primary, secondary and tail molt, and dates of primary molt) conform with most but not all other published accounts for this species.

Duration of Primary Molt

When first observed on 16 and 17 July 2023, the Black-headed Gull at Anchorage had already begun its second prebasic molt (p5 and p6 appeared to have been recently shed), and I scored the molt of its primaries as 18–20 (Table 1; ML594939661, 16 July 2023, Bill Carpenter; ML594915441, 17 July 2023, Emily Weiser). When last photographed two months later on 14 September (Figure 5), the bird had nearly completed its primary molt, as only p10 was not yet fully regrown (molt score 49; Table 1). As inferred from Walters' (1978) multi-year field study of Black-headed Gulls around Amsterdam, the Netherlands, about four to six weeks had elapsed between the average dates when p1 and p5–6 were shed during the second prebasic molt. And from the apparent progress of growth in p10 between my observations on 21 August and 14 September, I estimate that p10 would have fully regrown by late September. Adding these intervals to the two months the bird was tracked in Anchorage, I infer that the replacement of the primaries during the second prebasic molt took approximately 3 to 3.5 months (early/mid-June through late September).

The estimated duration of the Anchorage bird's primary molt, 3–3.5 months, is notably longer than the "average 2.5 months" Walters (1978) estimated for second-cycle Black-headed Gulls at Amsterdam, an interval repeated by Cramp and Simmons (1983) and Ginn and Melville (1983). But it is within the span of three to four months Malling-Olsen and Larsson (2004) and Pyle (2008) attributed to this species as a whole. Malling Olsen and Larsson (2004) further stated that second-cycle Black-headed Gulls molt the primaries at a pace slower than the approximately three months adults take.

Walters (1978) estimated an average date each primary was shed, on the basis of primaries collected off the ground during regular visits to his study sites. To determine the "average" duration of primary molt and to predict

the additional days p10 should take to fully regrow after it is shed, he then assumed a single linear rate of change in molt score versus date, averaged from a limited number of dead birds recovered during the study. However, Dawson and Newton (2004) demonstrated that the score does not change linearly over the full course of primary molt, especially in the early and later stages, as a linear relationship does not account for the differences in primary lengths and feather mass, and thus underestimates the duration of molt, especially late in that cycle. Figure 6 confirms that the rate of primary molt is nonlinear and likely explains the discrepancy between my results and those of Walters (1978).

My observations of the second-cycle Black-headed Gull at Anchorage bracketed the complete molt of four primaries (p6 to p9), from shedding to full replacement, which individually appeared to each take roughly three to four weeks to complete regrowth. As seen in Table 1, p6 was missing by mid-July and regrown by mid-August, p7 was shed in the last half of July and regrown by late August, p8 was missing by the beginning of August and regrown by the end of August, and p9 was shed in the first half of August and regrown by early to mid-September.

Secondary Molt

The Anchorage Black-headed Gull appeared to complete molt of its secondaries over four to five weeks (late July to early September) and followed the pattern described by Pyle (2008) for gulls in general. Specifically, the outer nine secondaries (s1–9) were replaced over a period of about two to three weeks (late July to mid-August), while the remaining inner secondaries (s10–s16+) were replaced over a longer period of about three to four weeks (early/mid-August to early September). Additionally, the last secondaries to regrow were s14 and s15, which are several feathers outward from the tertials.

Rectrix Molt

The Anchorage bird started its tail molt in late July, after p1 and p2 (possibly p3) were regrown and juvenile p9 (possibly also p8) and p10 remained, when the primary-molt score was approximately 25 (visually extrapolated from Figure 6). The duration of tail molt was also roughly four to five weeks (late July through August). The schedule of this tail molt, in terms of start and duration relative to molt of the primaries, closely matches that described by Dwight (1925) for gulls in general. More specifically, it agrees with the schedule of the second prebasic molt of Bonaparte's Gull (Braune 1987) and the second and third prebasic molts of the Western Gull (*Larus occidentalis*) (Howell and Corben 2000).

When the Anchorage gull was first found in mid-July, its white rectrices also resembled those of definitive plumage. It then proceeded to molt the rectrices again after the primary molt had progressed further. Black-headed Gulls can occasionally or rarely replace all rectrices with adult-like tail feathers during the first preformative and/or first prealternate molts (Grant 1986, Pyle 2008). Another possibility is that through injury the Anchorage gull had previously lost its juvenile tail feathers, which it then replaced with feathers mimicking the definitive plumage.

Dates of Primary Molt

During the second prebasic molt of the Black-headed Gull, at least in Europe, the primaries are replaced between mid/late-May and September, roughly two to four weeks earlier than during the definitive prebasic molt of adults (Cramp and Simmons 1983, Ginn and Melville 1983, Malling Olsen and Larsson 2004, Howell and Dunn 2007, Pyle 2008). Those conclusions are supported by field studies in the Netherlands (Walters 1978, 1982) and on the Baltic coast of Poland (Meissner 2007) (see Figure 6). Malling Olsen and Larsson (2004) also stated that Black-headed Gulls breeding in northeastern North America follow a molt schedule "slightly later" than populations in Europe. Furthermore, Howell and Dunn (2007) and Pyle (2008) stated that in east Asian Black-headed Gulls the prebasic molt may occur later than in European populations. And the California Rare Birds Committee (2007), Howell and Dunn (2007), and Pyle (2008) postulated that Black-headed Gulls occurring in western North America likely originate from east Asian populations rather than from birds breeding along the northeast coast of North America, in Iceland, or in Europe.

The Anchorage Black-headed Gull did not entirely fit these reported characteristics. The primary-molt scores I estimated for it appear to be roughly two to three weeks earlier than the corresponding average scores reported for adults in Europe, at least from mid-July through August (Figure 6). Additionally, my scores are consistent with those reported by Meissner (2007) for second-cycle Black-headed Gulls in Poland from late July to early August. Furthermore, the actual dates the Anchorage bird appeared to shed p5 through p10 (Table 1) match closely with the average dates Walters (1978) reported those primaries were shed in second-cycle Black-headed Gulls near Amsterdam. On the other hand, the Anchorage bird did not fully regrow p3 and p4 until late July, p6 and p7 until mid-August, and p9 until early to mid-September, all somewhat later than the typical dates of mid-July, late July, and late August, respectively, for complete regrowth of those same feathers as reported by Malling Olsen and Larsson (2004) for European birds.

There are multiple plausible explanations why my findings differ from the schedule of primary molt previously reported in the Black-headed Gull. The inconsistencies may simply reflect intraspecific variability, which in the Charadriiformes is wide, especially in migratory species (Pyle 2008). There may be no real statistical differences in molt schedule between the isolated populations of the Black-headed Gull. Or some individuals reaching the west coast of North America may originate from Europe. Regardless, further detailed field studies of the molt of the populations of the Black-headed Gull breeding in east Asia and eastern North America are warranted to clarify the variability in this species across its full global range.

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