

# Ageing Syrian Serin based on moult and wing-feathers

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**K**nowledge of moult patterns and feather wear is essential for ageing birds (eg, Svensson 1992, Jenni & Winkler 1994). It is important to know the age of birds when studying various aspects of bird populations. There are many common ageing criteria in passerines. Most juvenile (first calendar-year) birds have plumages different from adults. Juvenile feathers often have different colours, are looser and narrower or weaker than in adult and some juvenile feathers are retained by some species for a long period. Several books and research papers on the ageing of European passerines have been published in the last few decades (eg, Svensson 1992, Jenni & Winkler 1994, Shirihai et al 2001, Blasco 2012). A number of species in Israel, mostly of African and Asian origin, however, have not been previously studied in detail regarding their age-specific moult and feather coloration; one of these species is Syrian Serin *Serinus syriacus*.

## Distribution and status of Syrian Serin

Syrian Serin breeds from Syria in the north, through Lebanon and northern Israel into Jordan, where it is locally common. It winters in Jordan, southern Israel and Egypt (Clement et al 1993, Andrews 1995, Baumgart 1995, Shirihai 1996, Murdoch & Betton 2008, Ramadan-Jaradi et al 2008). In Israel, Syrian Serins are found during both migration seasons and winter at many locations but the species breeds only on mount Hermon in the north (Clement et al 1993, Shirihai 1996, Perlman 1997), a recognized Important Bird Area (IBA; Evans 1994). The mount Hermon population is considered to represent one of the most important breeding areas of the species throughout its range (Perlman 1997).

To date, the species is poorly described and data in the published literature are based on small sample sizes, especially when it comes to the ageing of individuals (eg, BWPI 2006). The only rele-

**102** Syrian Serin / Syrische Kanarie *Serinus syriacus*, juvenile, mount Hermon, Israel, 11 July 2010 (Yoav Perlman). Note obvious rufous tinge to greater coverts and lower scapulars.



vant information available is that adults complete their moult in July while young birds have a partial moult (BWPI 2006, van Duivendijk 2011).

We ringed and studied Syrian Serins as part of an annual monitoring programme of songbirds in the summer on mount Hermon. We studied moult strategy and wing pattern for suitable ageing criteria, based on individuals of known age that had been ringed in previous years either as juvenile or as adult.

**Methods**

During the last c 30 years, the breeding populations of passerines on mount Hermon have been monitored by ringing during the breeding season (mainly from June to August). Over the years, more than 5000 Syrian Serins were ringed. As a result, a large number of birds of which the exact age is known is re-trapped every year.

Trapping and ringing was conducted at mount Hermon for a total of nine days in July 2007, July 2008 and August 2008. We recorded moult condition of the entire body, including wing and tail. We examined both wings of each bird but we recorded only the moult of the right wing because in all birds moult was symmetrical.

Most of the adults were moulting their feathers when trapped but it was always easy to discern, based on wear and/or feather colour, which of the feathers had been replaced in the previous summer. Before the onset of their first complete post-breeding moult, first-summer (second calendar-year) birds (as defined by ring recoveries) were examined carefully to identify old retained first-generation feathers. These old feathers can in fact



**103** Syrian Serin / Syrische Kanarie *Serinus syriacus*, juvenile, mount Hermon, Israel, 18 July 2008 (*Gidon Perlman*). Note brownish-grey basic colour of alula and greater coverts, not blackish; first (smallest) alula feather fringed rufous; little yellow on second alula feather. In addition, greater coverts have broad rufous edges.

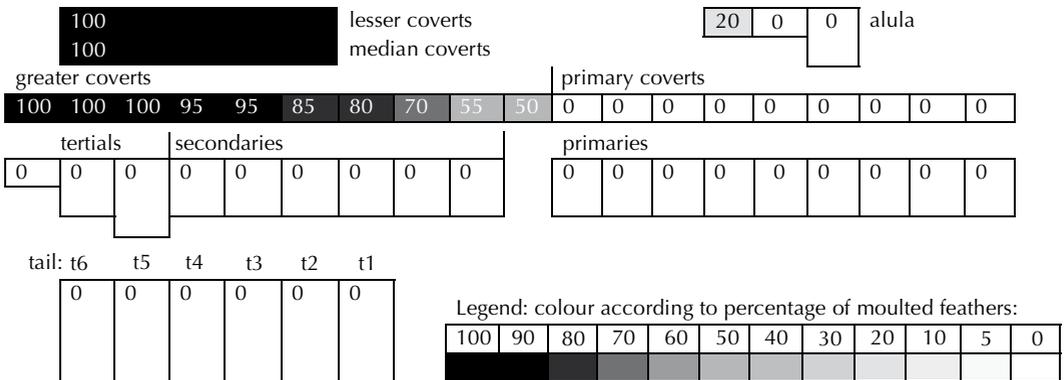
be assumed to represent the pattern and extent of the post-fledging moult the year before (Alström et al 2003, Shirihai et al 2001).

**Results**

We caught 86 first calendar-year (estimated as 2-4 months old), 15 second calendar-year and 46 adult (third calendar-year or older) birds, ie, a total of 147 known-age birds, and examined the moult strategy, wing pattern and tail pattern.

It appears that Syrian Serins of all age groups did not replace any primaries or secondaries dur-

FIGURE 1 Moult strategy of juveniles, as observed in second calendar-year Syrian Serins *Serinus syriacus* before their first complete post-breeding moult (n=15). Colour and numbers both show percentage of birds that have replaced each feather. Black (100%) denotes that all birds have replaced that specific feather. White (0%) denotes that all birds have not replaced that specific feather. Grey scale shows all other percentages in descending order. Percentages have been rounded to nearest 5%.





**104** Syrian Serin / Syrische Kanarie *Serinus syriacus*, second calendar-year female, mount Hermon, Israel, 15 August 2008 (Yael Lehnardt). All alula feathers and three outer greater coverts juvenile, with rusty fringes, and more strongly worn. Unmoulted outer primary coverts also worn and brownish. Note that two new inner primaries and primary coverts are part of this bird's first post-breeding moult that has started just few weeks before this wing was photographed in July, and are not part of the discussed moult pattern. **105** Syrian Serin / Syrische Kanarie *Serinus syriacus*, adult male, mount Hermon, Israel, 18 July 2008 (Yael Lehnardt). All alula feathers from same moult period, having blackish centre and yellow fringes. Primary coverts neatly tipped pure grey. Compare with plate 103 and 104.

ing the winter since they had no more than only one or two different wear and colour patterns in their wings. Feathers that had been replaced due to accidental loss in winter, evident because they were the least worn and not symmetrically moulted, were not included in our analysis.

#### Moult

We found considerable variation in the moult strategy of the juveniles as reflected by the retained feathers of second calendar-year birds prior to their first complete post-breeding moult. Many of the second calendar-year birds showed considerable variation in the moult of the alula feathers and greater wing-coverts (figure 1). In contrast, the adults had obviously replaced all their wing-, tail- and body-feathers in the previous post-breeding season.

Juveniles undertake only a partial moult, which is obvious in second calendar-year birds. They replace the whole body plumage but they retain their tail-feathers, primaries, primary coverts, secondaries, tertials and the two outer or sometimes all three alula feathers. In some individuals, some of the greater coverts are also not replaced. This partial moult begins immediately after fledging in the lesser wing-coverts and body-feathers. Part of this moult probably takes place away from the breeding grounds as it was not extensive in juveniles during our study period (July-August).

The second calendar-year birds had replaced

all their lesser and median wing-coverts, most (or all) of their greater wing-coverts and occasionally one of their alula feathers. In addition, they had replaced all their body plumage in the post-fledging period. In contrast to the adults, they had not replaced their primaries, primary coverts, secondaries and tertials. After their first breeding season, when one year old, they undertook their first complete moult, like adults.

Adults undertake a complete moult after the breeding season. All wing-feathers had been replaced in all adults examined in the previous year and all adults were in various stages of completing their post-breeding moult, when examined at the end of the summer.

#### Alula feathers pattern

We found that the colour pattern of the first and second alula feathers was an important criterion for ageing Syrian Serins. In juveniles, the centre of the alula feathers is brownish, whereas in adults the centre is more blackish. In addition, the fringes of the alula feathers of the juveniles are rufous, while in adults these are bright to greenish-yellow (compare plate 103-105). All second calendar-year birds had retained at least the two larger (outer) alula feathers, and some even had retained all juvenile alula feathers (figure 1). Therefore, they can be separated from adults by the stronger wear of the juvenile alula feathers and, in a few cases, by the contrast between the moulted first



**106** Syrian Serin / Syrische Kanarie *Serinus syriacus*, second calendar-year female, mount Hermon, Israel, 19 July 2008 (Yael Lehnardt). All retained feathers, especially primaries, extensively worn and browner than adult-type feathers (compare with plate 107). Note that all fresh feathers, including fresh/growing inner primaries and primary coverts, are part of this bird's first post-breeding moult that had started just few weeks before this wing was photographed in July, and are not part of the discussed moult pattern.

**107** Syrian Serin / Syrische Kanarie *Serinus syriacus*, adult (third calendar-year or older) male, mount Hermon, Israel, July 2007 (Yael Lehnardt). Most feathers moulted c 1 year before, at same period. As a result, these feathers have same basic colour, abrasion and pattern (compare with plate 106). Note that all fresh feathers, including fresh/growing inner primaries, are part of this bird's post-breeding moult that had started just few weeks before this wing was photographed, and are not part of the discussed moult pattern.



(inner) alula feather and the retained outer two alula feathers. Adults have a complete moult and do not exhibit this contrast.

#### *Greater coverts pattern*

Juvenile Syrian Serins have very broad rufous edges to the greater coverts (plate 103). Adults have bright greenish-yellow edges to the greater coverts (plate 105). When all greater coverts are replaced after fledging, there is no difference in pattern compared with the greater coverts of adults. However, 50% of the second calendar-year birds had a moult limit, usually between one to four outer coverts (retained juvenile feathers) and the inner moulted greater coverts. The retained outer coverts are usually worn and bleached but retain a faint rusty tinge, unlike the bright yellow of the inner replaced greater coverts.

#### *Primary coverts*

In juveniles, as in second calendar-year birds, the shape of the primary-coverts is different from that in adults. Second calendar-year birds have narrow, pointed primary coverts (plate 104), while adults have broader feathers with a rounded tip (plate 105). After a year of wear, second calendar-year birds not only retain the narrow pointed cov-

verts but these are also more worn than in adults. The primary coverts in juveniles and second calendar-year birds are brown with pale greenish-yellow edges and tip. In contrast, adults have darker-centered primary coverts with bright greenish-yellow edges and distinct pure grey tips.

#### **Discussion**

In our study we show that the moult strategy of Syrian Serins, similar to several other passerines in which it has been studied (Svensson 1992, Jenni & Winkler 1994), is a good criterion for reliable ageing. Ageing according to moult pattern can be used for both males and females, irrespective of the colour or pattern differences between the sexes (plate 108-109), and can be used both in the hand and in the field, provided that the bird can be observed well (plate 110-111). We present the moult strategy of juvenile (post-fledging) Syrian Serins, and we also confirm that adults replace all their feathers as described before (eg, BWPI 2006, van Duivendijk 2011). The major difference in the moult strategy allows to distinguish three age groups during spring/summer before the post-breeding moult is completed in August-September: **1** recently fledged juveniles (first calendar-year), having fresh feathers; **2** second calendar-year

**108** Syrian Serin / Syriscche Kanarie *Serinus syriacus*, adult female, mount Hermon, Israel, 18 July 2008 (Yael Lehnardt). Females are greyer in appearance than males but the age of this bird can be told by evenly fresh alula feathers and primary coverts; latter are also edged bright yellow and neatly tipped grey.





**109** Syrian Serin / Syrische Kanarie *Serinus syriacus*, second calendar-year male, mount Hermon, Israel, 18 July 2008 (Yael Lehnardt). Despite colourful appearance, this bird can be aged by retained juvenile alula feathers and by worn primaries.



**110** Syrian Serin / Syrische Kanarie *Serinus syriacus*, second-year female, mount Hermon, Israel, 29 May 2008 (Lior Kislev). Note brownish and worn alula feathers and primary coverts, lacking yellowish edges and grey tip.

birds, having both adult-type feathers and some old retained juvenile feathers; and 3 adults (third calendar-year or older) of which all feathers are similar in age and pattern.

It is important to note that not only the pattern of retained feathers is useful for ageing but also wear. We found that primaries have the same colour and pattern in adults and juveniles but the amount of wear can be used as an aid for ageing during spring and summer (compare plate 106-107). Juvenile feathers in general, but especially juvenile flight-feathers, are more prone to abrasion because they are more loosely textured (Jenni & Winkler 1994), so they become more strongly worn during the same period of use than the feathers of adults.

When ageing a single bird, all known criteria must be used carefully to reach the correct conclusion as to the age of the individual as there is always the possibility of exceptions to the rule. The amount of wear between different birds, even from the same age group, can differ strongly. An adult bird can have very worn flight-feathers (eg, after the breeding season), whereas a juvenile bird may have less worn flight-feathers than expected. There-

fore, it is necessary to use not a single ageing feature but a combination of criteria. In some cases, birds that have lost single feathers due to accidents can be recognized by comparing both wings to verify the symmetry of the moult strategy.

In addition, the primary coverts are a good indication of the age of the bird. It is, however, not always easy to notice the difference between the pointed and rounded shape of the feathers of juveniles and adults, respectively, but with practice, one knows what to look for.

Use of the moult limit in the greater coverts for ageing a bird as a first calendar-year (or second calendar-year next spring/summer) is only reliable if the pattern and the larger amount of wear of the retained feathers are obvious. We consider the alula feathers to be the most reliable criterion. All first calendar-year individuals retain the second and third alula feathers from the juvenile plumage. It is easy to recognize the older alula feathers by their brownish centre and rufous edges, especially if the first alula feather has been replaced and the moult limit can be seen.

Our study on how to age Syrian Serin is not only of importance for understanding the moult

strategies between the age groups but also because of its conservation implications in the near future. In Israel, Syrian Serin breeds only on mount Hermon and increased development activities here have led to exploitation of natural resources for human consumption (eg, overgrazing and extracting fresh water; Evans 1994). Environmental changes and human pressures combined have the potential to alter the breeding habitat, and exercise ecological pressures on Syrian Serin and other alpine species that (in Israel) breed almost exclusively on mount Hermon, such as Western Rock Nuthatch *Sitta neumayer* and Asian Crimson-winged Finch *Rhodopechys sanguineus*. Our study on the identification of age groups can assist the monitoring and conservation of populations of Syrian Serin as it enables the calculation of population dynamics and breeding success.

### Samenvatting

**LEEFTIJDSBEPALING BIJ SYRISCHE KANARIE OP BASIS VAN RUI EN VLEUGELVEREN** In juli en augustus in 2007 en 2008 werden 147 Syrische Kanaries *Serinus syriacus* (waarvan de leeftijd bekend was doordat ze het jaar daarvoor als juveniel of als adult werden geringd) op de berg Hermon, Noord-Israël, gevangen en onderzocht om criteria vast te stellen voor de leeftijdsbepaling. Hiervoor zijn rui en sleet van het verenkleed belangrijk. In het late voorjaar en zomer,

voordat de najaarsrui is voltooid in juli-augustus, kunnen drie leeftijdsklassen worden onderscheiden: juveniele vogels van het lopende jaar, tweede kalenderjaarvogels (eerste-zomer) en adulte vogels (derde kalenderjaar of ouder). De recent uitgevlogen juveniele hebben een vers kleed en zijn gemakkelijk herkenbaar aan de brede rossige randen aan de grote dekveren en onderste schouderveren. Tweede-kalenderjaarvogels zijn herkenbaar aan oude, niet geruide veren van het juveniele kleed (deze worden niet geruid tijdens de post-juveniele rui een jaar eerder; zie figuur 1): alle slag- en staartpenen; de buitenste grote dekveren (50% van alle tweede-kalenderjaarvogels had een ruigrens in de grote dekveren); de buitenste (grootste) twee duimvleugelveren (een klein aantal vogels had de binnenste duimvleugelveer geruid); en alle handpendekveren. Bij adulte vogels zijn al deze veerpartijen van dezelfde generatie (alle werden een jaar eerder geruid). De veren zijn minder sterk gesleten (bij tweede-kalenderjaars sterk gesleten) en er zijn geen rui-contrasten zichtbaar.

Het rui- en slijtagepatroon van de duimvleugel (alula) en handpendekveren vormen het meest betrouwbare kenmerk bij het onderscheiden van adulte en tweede-kalenderjaarvogels. Bij de laatste zijn de handpendekveren sterker gesleten, smal en puntig, en hebben een bruin centrum en bleke groengele randen (bij adulte breed en afgerond, met een donker zwartbruin centrum, helder groengele randen en opvallende grijze top). Bij tweede-kalenderjaarvogels die bij de post-juveniele rui de binnenste duimvleugelveer hebben geruid, is de ruigrens tussen de

**111** Syrian Serin / Syrische Kanarie *Serinus syriacus*, adult male, mount Hermon, Israel 29 June 2008 (*Lior Kislev*). Note dark centre with broad yellow edges of alula feathers and primary coverts, latter also neatly tipped grey.





**112** Syrian Serin / Syrische Kanarie *Serinus syriacus*, male, Bloudan, Syria, 30 April 2006 (Aurélien Audevard). Age of this bird cannot be determined for certain since alula feathers and primary coverts are invisible. Note that tertials of left wing have been moulted, obviously as a result of some accident.

binnenste en de twee buitenste oude duimvleugelveren zeer opvallend; indien geen enkele duimvleugelveren is geruid (en er dus geen contrast zichtbaar is), zijn alle drie duimvleugelveren sterk gesleten en hebben een bruin centrum (duimvleugelveren van adulte zijn duidelijk minder gesleten en met een zwarter centrum).

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