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RED-BACKED SHRIKES *LANIUS COLLURIO* LINNAEUS, 1758 IN SOUTHERN AFRICA

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Abstract.

Published data on migratory birds in their non-breeding grounds are scarce. After ringing and gathering biometric and moult data for more than twenty years in the countries of the southern part of Africa, we are now summarizing our findings. Here, our focus is on the plumage of first-year and adult Red-backed Shrikes Lanius collurio developing during their stay as an aide for the age distinction in the field. We present moult data of both age groups and show moult progression and plumage variation by photographic evidence.

Key words: *shrike; non-breeding grounds; moult; plumage variation; age development; Africa*

Figure 1. Arid savannah of the pre-Namib: one non-breeding habitat of the Red-backed Shrike *L. collurio* in western Namibia. 13 January 2005.

Introduction

After ringing a wide variety of species for more than twenty years in southern African countries, my co-author Dane Paijmans and I are now publishing our results with a focus on species and subspecies mainly from Namibia (Fig. 1) that are lacking data from the field (Paijmans & Bryson 2023). Our "bird bible" of southern Africa, the Roberts (Hockey et al. 2005), is being revised 15 years after the last, the 7th edition, and in this process, the content is being merged with the Handbook of the Birds of the World in the Macaulay Library.

We have published data on moult development and biometric measurements and observations about migratory and resident shrike species: Southern Fiscal *Lanius collaris* Linnaeus, 1766 (Bryson & Paijmans 2021), White-crowned Shrike *Eurocephalus anguitimens* A. Smith, 1836 (2022) and Red-backed Shike *L. collurio* (2023b) as well as about other species: Tractrac Chat *Emarginata tractrac* (Bryson et al. 2023) and Mountain Wheatear *Myrmecocichla monticola* Vieillot, 1818 (Bryson & Paijmans 2023a). Right now we are working on our paper on the Lesser Grey Shrike *Lanius minor* Gmelin, 1788, the

Karoo Chat *Emarginata schlegelii* Wahlberg, 1855 and the Namaqua Sandgrouse *Pterocles namaqua* Gmelin, 1789.

This paper presents some of our findings on the Red-backed Shrike *Lanius colllurio*. We focused on features that help to identify age groups when ringing the birds.

Distribution and Sites

The non-breeding area of the Red-backed Shrike encompasses about the southern and eastern third of the African continent (Fig. 2). We primarily work in Namibia, in a dry habitat, either in the western arid savannah of the pre-Namib (Fig. 3A, B) or towards the east in the often encroached savannah closer to the Botswana border (Fig. 4).

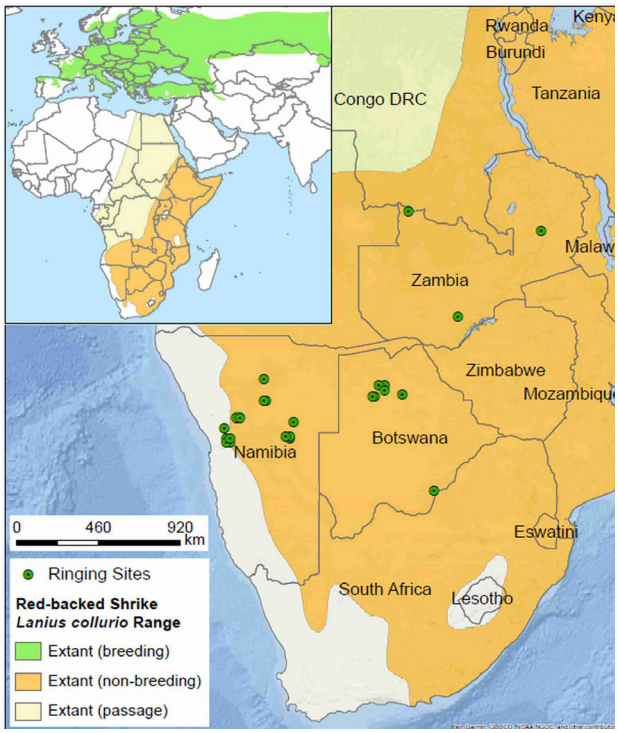

Figure 2. The Red-backed Shrike distribution map was downloaded from www.iucnredlist.org on 18 May 2019. Green dots designate sites where data were gathered in the current study.

The area is dry most of the year; the sustainable average rainfall is 45 mm/year. However, the landscape's appearance rapidly changes with rainfall, and more individuals and more species arrive overnight or within a few days.

We catch with mist nets or spring traps with mealworms as bait, especially along fences (Fig. 4). This proved to be a good catching strategy for shrikes, pipits, larks, chats, roller, starlings, and hornbills. We have ringed almost 2000 shrikes and bush-shrikes of about 20 species, 350 are Red-backed Shrikes and the same number of Lesser Grey Shrikes.

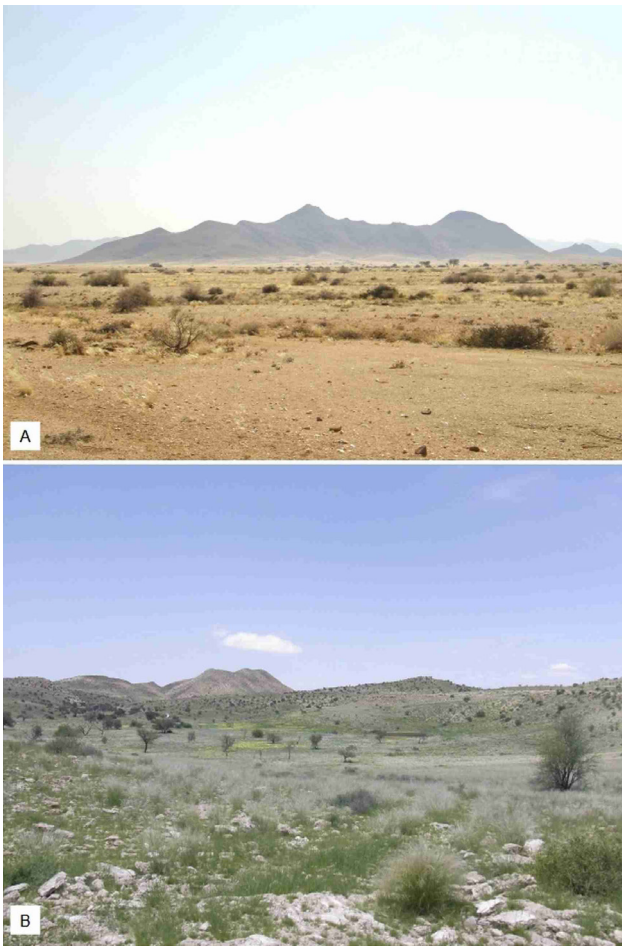

Figure 3. Our main catching area in the pre-Namib, 120 km from the coast. The bushes are used as perches by the shrikes and other species. (A) During the dry season, 15 June 2005.
(B) After two good rainfalls, the area turns green, and flowers bloom, February 2011.

Figure 4. Traps on a farm road in eastern Namibia.18 January 2023.

This paper contains our findings and observations of the Red-backed Shrike. For the biometric data and more details of our research, see Bryson & Paijmans (2023b). For further studies see Heinroth & Heinroth (1924), Traylor (1965), Clancey (1973), Skead (1973), Panow (1983), Bruderer & Bruderer (1994), Herremans (2005), Bruderer (2007), Dowsett (2009), Blasco-Zumeta & Heinze (2019) and SABAP (2022)

Specifically for moult see Stresemann (1963), Snow (1965), Kasparek (1981), Ginn & Melville (1983), Demongin (2016) and Jenni & Winkler (2020a, b).

Results for Red-backed Shrikes

Beyond the biometric data, our monitoring was directed to the moult development throughout the months. We observed a considerable variation of phenotypes, especially in females and young birds.

Moult development of primary feathers, tail, head, and body in Red-backed Shrikes

The development of the primary moult throughout the months for first-year and adult Red-backed Shrikes and the percentage of recorded moult on the head, tail, and body were recorded (Table 1, 2).

Table 1. Extent of primary feather moult (P1 to P10) of **first-year** Red-backed Shrikes in the non-breeding grounds in Namibia, Botswana, and Zambia. The average moult scores between 0 and 1 result from a few individuals with two sprouting primaries (moult score 2). Values are the average moult scores of each primary for the n birds per month sampled. The color gradient is shown at the side. The tail (t), head (h), and body (b) are expressed as a percentage of birds assessed showing signs of active moult. No data were collected during the months marked in grey.

Month	n	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	t	h	b
Jul	0													
Aug	0													
Sep	0													
Oct	0													
Nov	6	0	0	0	0	0	0	0	0	0	0	0%	0%	0%
Dec	44	1	1	0	0	0	0	0	0	0	0	10%	0%	3%
Jan	79	4	4	3	2	1	1	0	0	0	0	67%	16%	29%
Feb	32	4	4	4	4	4	3	2	0	0	0	95%	37%	50%
Mar	44	4	4	4	4	4	4	4	4	3	2	83%	91%	82%
Apr	0													
May	0													
Jun	0													

Moult Score: 0 1 2 3 4 5

Table 2. Extent of primary feather moult (P1 to P10) of **adult** Red-backed Shrikes.

Month	n	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	t	h	b
Jul	0													
Aug	0													
Sep	0													
Oct	0													
Nov	11	0	0	0	0	0	0	0	0	0	0	33%	0%	0%
Dec	27	2	1	1	0	0	0	0	0	0	0	12%	0%	12%
Jan	30	4	4	4	4	3	2	1	0	0	0	75%	25%	56%
Feb	16	5	5	4	5	4	4	4	3	1	0	100%	40%	40%
Mar	23	3	3	3	3	3	3	3	3	3	3	70%	100%	100%
Apr	1	5	5	5	5	5	5	5	5	5	5			
May	0													
Jun	0													

Moult Score: 0 1 2 3 4 5

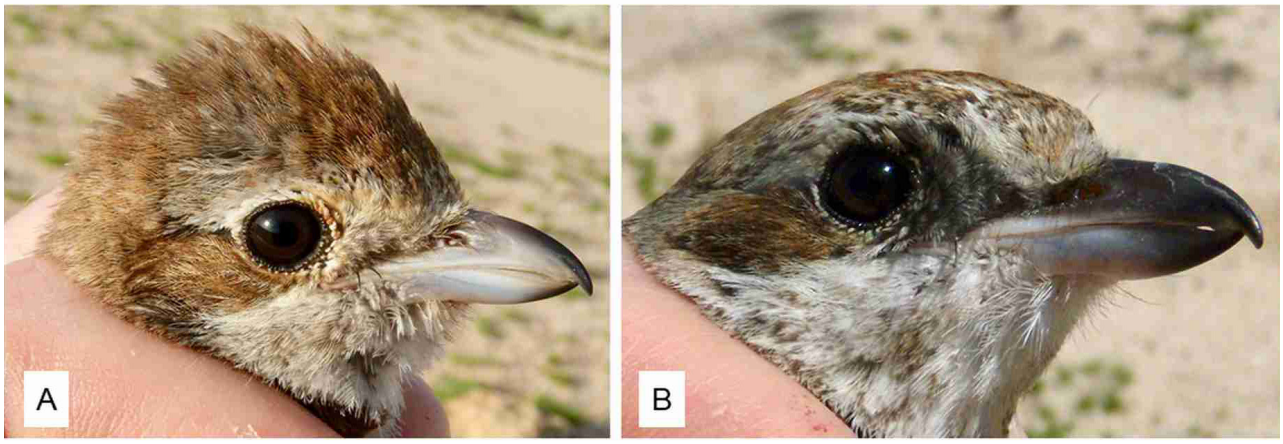

Figure 5. Earliest possible distinction of sexes of first-year Red-backed Shrikes by plumage features on the head and the coloration of the bill: (A) Female with rufous ear coverts and crown, (B) male with first black feathers on ear coverts and mask, and first grey ones on the forehead. 9 January 2011.

First-year Red-backed Shrikes start their primary moult later than adults. Both age groups finish the complete moult before departure in April.

Distinction of sexes in first-year birds

The distinction of sexes is generally possible by February and usually concerns observations in the field. In our sample with the birds in the hand, the features diverged with progressing moult from the end of December and early January onwards (Fig. 5).

Development of Plumage in the Non-Breeding Grounds

First-year and adult Red-backed Shrikes undergo a complete moult in the non-breeding grounds. Here we depict the process through the months. We can give only examples of moult progress, since it is very variable.

Development of plumage in females from November to March

Red-backed Shrikes arrived in small numbers in our research area in mid-November (see Tables 1 and 2).

First-year and adult females in November

While first-year birds mainly display only a few body feathers in moult (Fig. 6), not all of them we recorded for the summaries. The primary and tertial moult show first (Fig. 6, 7).

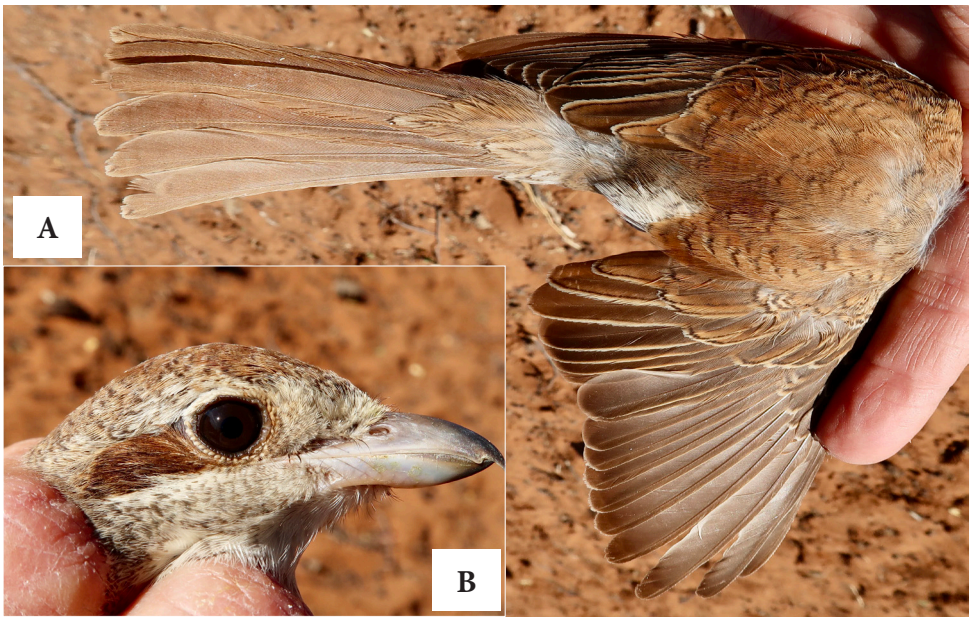

Figure 6. First-year female, on arrival in the non-breeding grounds (A) with hardly worn wing and tail. (B) The sex was determined by the coloration of the ear-coverts and the crown. 17 November 2016.

Figure 7. Adult female with worn tips and first growing primaries. 29 November 2017.

First-year and adult females in December

From December, the two age groups of old and freshly moulted feathers can be distinguished on the mantle, head, and rump, as well as on some first coverts and scapulars (Fig. 8, 9A, B).

Figure 8. First-year female with fresh feathers on the mantle, rump, head, and lesser coverts which betray the sex already at that date. The crown and head lacks any grey and there are no signs of black mask, both signs of males. 20 December 2021.

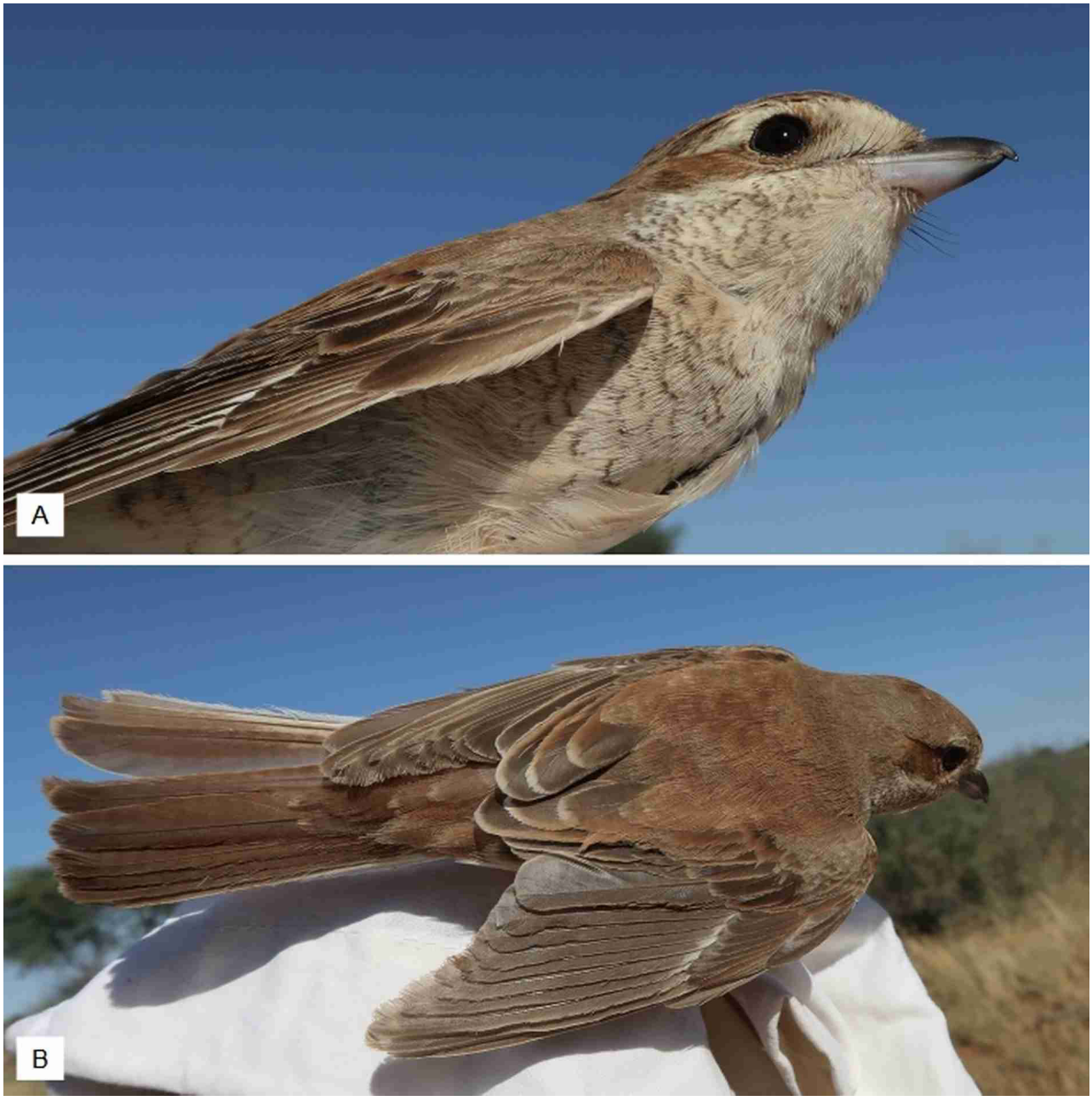

Figure 9. Adult female from below (A) and above (B) with fresh freshly moulted feathers on the mantle, rump, and lesser and median coverts. 9 December 2022.

First-year and adult females in January

In January, the contrast between the two age groups of feathers becomes noticeable (Fig. 10, 11). The feather quality and density in the young birds contrasts with that of the adults.

Rarely could we record a very young individual in January who has not even begun their post-juvenile moult (Fig. 12).

Figure 10. First-year female moulting wing, tail, and body. 23 January 2022.

Figure 11. An adult female with markings of a so-called „juvenile-like“ female on some feather-tips of the rump, mantle and coverts. The adult age was determined by the abraded primaries, the contrasting mantle and greyish neck and the rich coloration of ear-coverts and tail. Furthermore, this individual shows male features, as there is the black coloration above the bill and a central black tail feather sprouting (not visible on this picture). Moult is visible on the mantle, medium coverts, and primaries with corresponding coverts. 7 January 2023.

Figure 12. First-year female, still with white dots, and fringes at the tips, signs of juvenile plumage. 8 January 2023.

First-year and adult females in February

The moult progress continues to be variable. Some birds are still in the moult of primaries, secondaries, tertials (Fig. 13), and tails (Fig. 14A, B), while others have already completed their wing and tail moult (Fig. 15A, B).

Figure 13. First-year female with primary, secondary, and tertial moult. 28 February 2016.

Figure 14. First-year female (A) with wing moult almost completed and tail still growing. 19 February 2015; (B) with wing moult in progress and tail still growing. 28 February 2016.

Figure 15. Adult female with early completed wing (A) and tail (B) moult. 25 February 2022.

First-year and adult females in March

During March, the moult is almost complete (Fig. 16). Age differences can be observed by the quality of the plumage and subtle differences in the markings (Fig. 17A, B).

Figure 16. Adult female in fresh plumage. 18 March 2023.

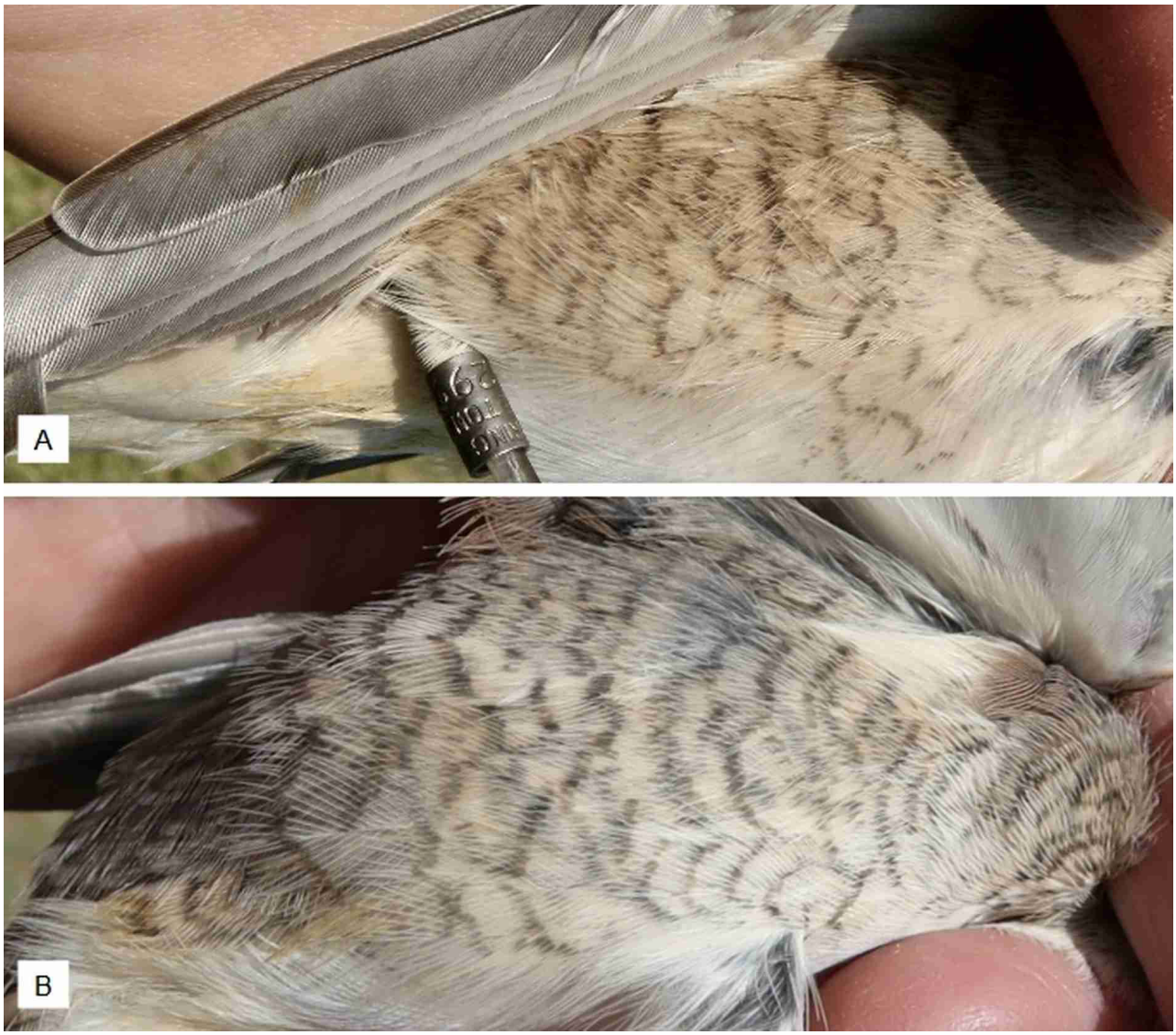

Figure 17. Underparts in March of (A) first-year (of life) and (B) adult female. 12 March 2011 and 24 March 2022, respectively.

Development of plumage in males from November to March

First-year and adult males in November and December

Some first-year males show the first black feathers on the head by the end of November (Fig. 18). In December, with progressing moult, all males in our area were recognizable as such (Fig. 19). The distinction between the age groups is apparent. Adult males show moult on the wing, tail, and mantle (Fig. 20).

Figure 18. First-year with black feathers between bill and eye. The gape flange is still yellow. 29 November 2023.

Figure 19. First-year male with first signs of the black mask and grey head. 5 December 2007.

Figure 20. Adult male moulting wing, coverts, body, and tail. 17 December 2020.

First-year and adult males in January

The differences between the two age groups are still evident in January. The contrast of head and upperparts of first-year males (Fig. 21A) is blatant when compared with adults (Fig. 21B).

First-year and adult males in February

With migration time approaching, moult reaches completion. The plumage of first-year males is converging to that of adults. The age difference is still evident by brown feathers on the head, not yet fully expressed mask and markings on the underparts in the young (Fig. 22A) compared to plain wing head and underparts in adults (Fig. 22B).

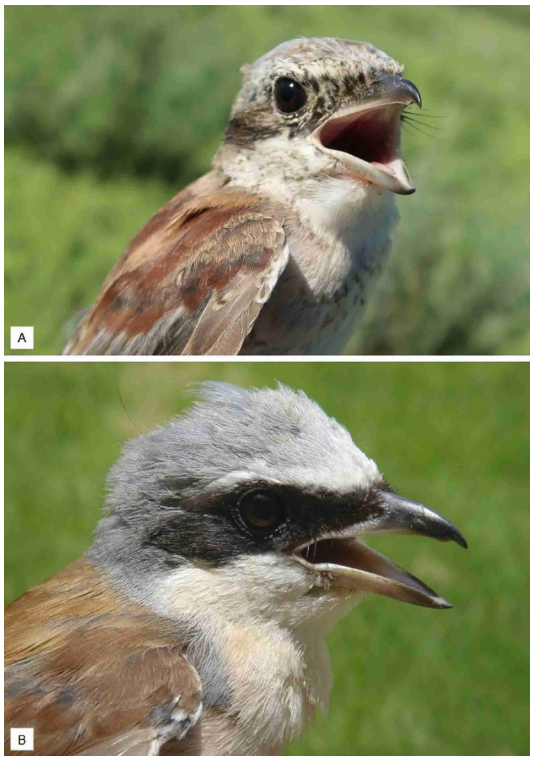

Figure 21. (A) First-year male with his mask and mantle moulting into the darker, more saturated-colored adult plumage. 24 January 2020. (B) Adult male with plain grey head, black mask, and brown wings during his moult. 16 January 2006.

Figure 22. (A) First-year male finishing his primary moult (P10 still old). The light brown feathers on the head will be replaced, and the mask be completed. The underparts still show markings. 25 February 2022. (B) Adult male with plain wing, head, and underparts. 1 February 2020.

First-year and adult males in March

At this stage, moult is almost complete in both age groups (Fig. 23). In March, males in their first year of life can still be distinguished from adults by minute signs like a yellowish gape flange (Fig. 24A) or residual feathers from the (post-)juvenile plumage (Fig. 24B,C).

Color variations of the Red-backed Shrike

An extensive color variation is documented for this species. Possibly, individuals of the whole breeding range from Spain into Siberia spend the non-breeding season in the southern part of Africa, bringing birds of different provenience and formerly discussed subspecies to our research area (Clancey 1973; Cramp & Perrins 1993; del

Figure 23. This first-year male has almost the whole plumage replaced. Some brown feathers on the head, old feathers on the neck, and a growing tail are still visible. 4 March 2019.

Figure 24. The age of some males at the end of their first year of life can be determined by (A) a yellowish gape flange or residual feathers from the (post-)juvenile plumage on (B) the mask or (C) the underparts. (A)18 March 2022, (B) and (C) 25 March 2019.

Hoyo & Collar 2016; Pârâu et al. 2019, 2022; Yosef 2008; Yosef & International Shrike Working Group 2019). Beyond that, vast individual variation has been observed, even with different color expressions already of young in one nest (Stauber in litt. in Bub 1981, p. 113).

Also documented are numerous introgressions through hybridization with Isabelline Shrike (*L. isabellinus* Hemprich & Ehrenberg, 1833), Brown Shrike (*L. cristatus* Linnaeus, 1758), or Turkestan Shrike (*L. phoenicuroides* Schalow, 1875) in the breeding grounds. See Lefranc & Worfolk (2022) and Bryson & Paijmans (2023b) for more details.

Color variations in females

We observed various plumage colorations, especially in females (Fig. 25).

Figure 25. The enormous variation of adult female Red-backed Shrikes ringed in southern Africa, which presumably indicates provenience over a wide range. Observe the diversity of markings and coloration on top of the head, the throat, ear coverts, and the supercilium. (A) Botswana, 28 January 2015; (B) Farm Sphinxblick, Erongo region, 6 January 2011; (C) near Witvlei, 30 March 2015; (D) Botswana, 1 December 2007; (E) near Witvlei, 28 March 2014; (F) Waterberg, Namibia, 15 January 2006.

Color variation in males

Color variation of the upperparts

Beyond a diversity of shades on the upperparts, there are two types of transition from the grey of the neck to the mantle. Some individuals display a clear boundary between the two areas (Fig. 26A); in others, it is a gradient transition (Fig. 26B).

Color variations of the underparts

On the underparts, we also found a broad diversity of shades between grey and pink on the chest (Fig. 27) and most expressed on the flanks (Fig. 28, 29).

Figure 26. Adult males. (A)The mantle is rufous and the wings are brownish. The grey of the head and neck ends in a distinct line. Lake Ngami, Botswana, 10 December 2005. (B) The mantle is grey and red-brown, and the wings are blackish. The grey of the head and neck disperses downwards into the mantle. Witvlei, Namibia, 4 March 2019.

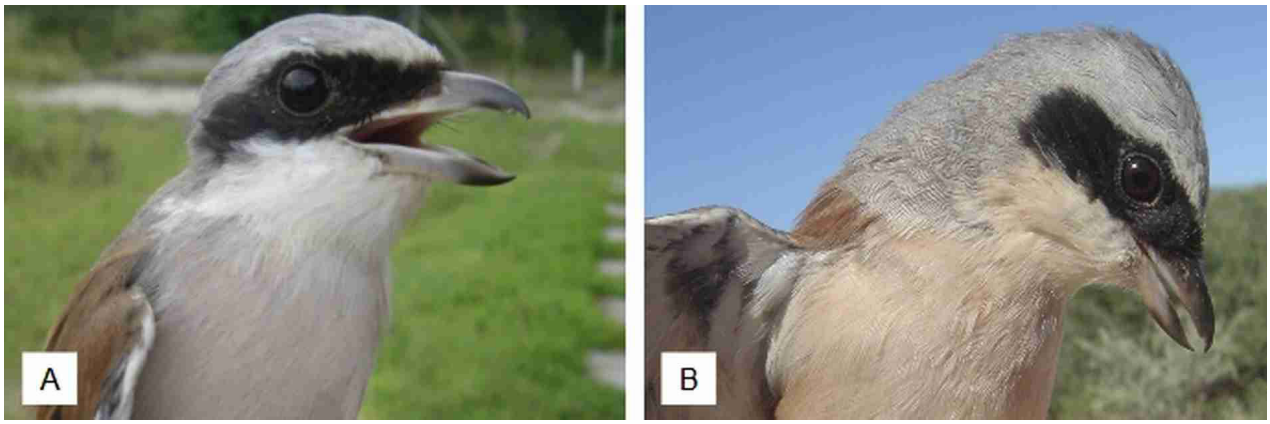

Figure 27. Adult males with (A) cold grey and (B) warm pinkish chest. 21 February 2006 and 2 February 2008, respectively.

Figure 28. The male flanks show a coloration from (A) cold grey with pale pink to (B) light salmon. 20 March 2022 and 16 January 2023, respectively.

Some males show exceptionally rufous or dark flanks, without extraordinary upperparts, such that an introgression by other species is up for discussion (compare Lefranc & Worfolk 2022, p. 219).

Change of coloration of the bill during the non-breeding season

The coloration of the bill provides information about age, sex, and breeding status. It differs between females and males during the breeding and non-breeding season.

Figure 29. Males with extraordinarily (A) rufous and (B) dark flanks. 20 March 2022 and 27 December 2022, respectively.

In July/August, the bills of adults become pale, beginning at the base, and only after the complete moult in the non-breeding area it turns entirely black again, starting from the tip (Harris & Franklin 2000; Jenni & Winkler 2012). The color change is more evident in males (Fig. 30), while the bill of the female "never becomes as dark black as in males" (Kramer 1950, pp. 21-22). Also, during the non-breeding season, the bill of the adult never turns as pale as in young birds (ibid.).

Adult males in the non-breeding grounds show pale bills with black on the upper mandible and the tip of the lower mandible and acquire the black bill of a breeding male shortly before or during migration.

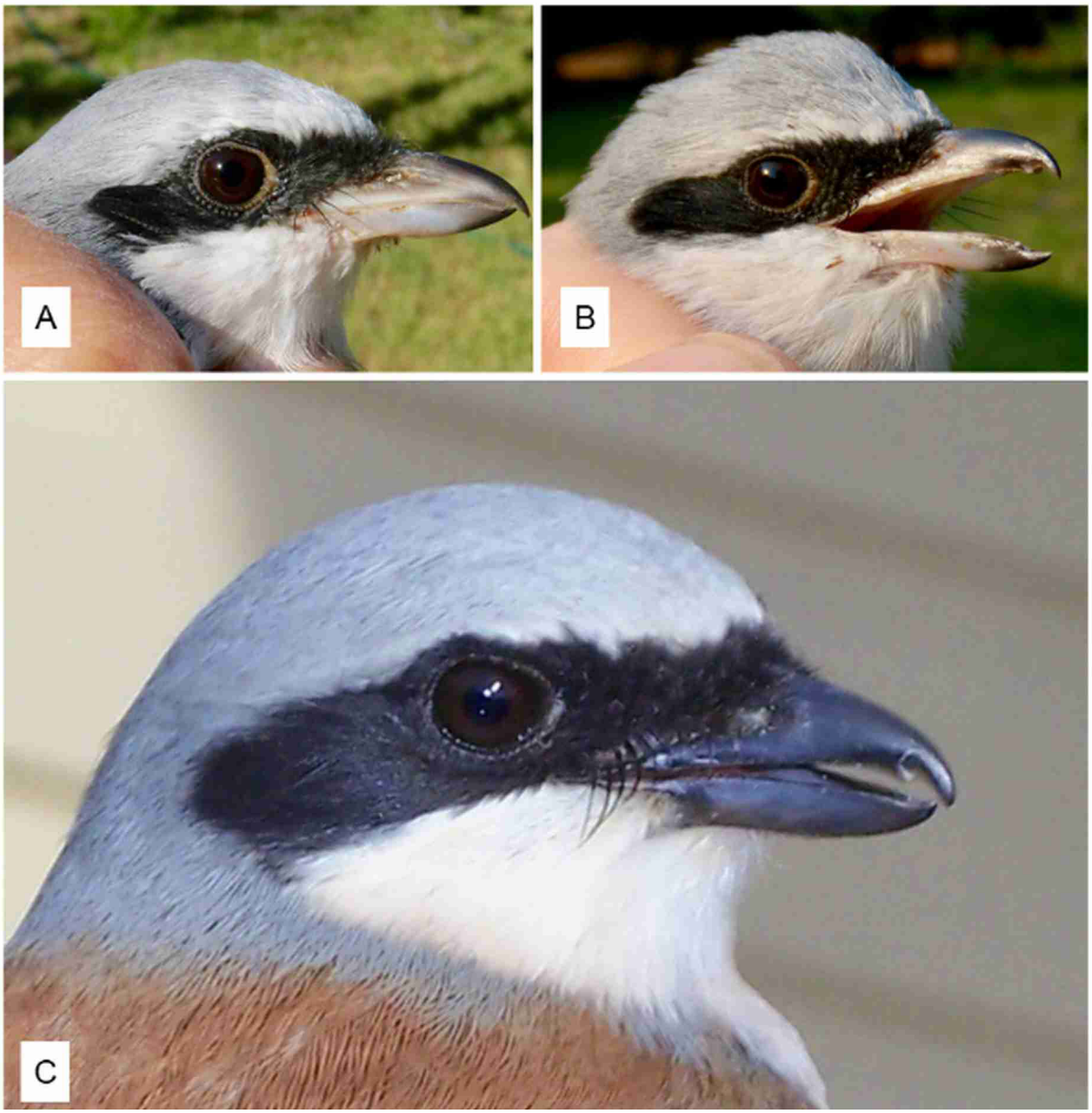

Figure 30. Bill coloration of adult males. The bill is bluish or pinkish pale in the non-breeding grounds, with black on the upper mandible and the tip. (A) 9 March 2011, (B) 12 March 2011. (C) shows a male after arrival in Europe with an entirely black bill. Ventotene Island, Italy, 15 May 2012.

Features of the opposite sex

We recorded a small percentage of the birds processed with features of the opposite sex, well described in the literature. (Bub1981, p.111; Shirihai & Svensson 2018, p. 186; Lefranc & Worfolk 2022, p. 217; Bryson and Paijmans 2023).

Females with male features

A small proportion of the females in our sample have shown male features. Crown, nape, rump, and tail coverts are grey to varying degrees. The tail is plain, and the underparts show the typical female vermiculation (Fig. 31).

Figure 31. Adult female with unmarked male-like grey nape and crown and dark mantle, but female-colored, uniformly brown tail and ear coverts and typical female vermiculation of the underparts. 1 December 2007.

Adult male with female features

Rarely have we found males with female features where the mask is not fully developed, and the crown of the head and the ear coverts are tinged brown. The tail, though, points out towards a male (Fig. 32).

8. White primary patch (Spiegel)

In our sample, an aggregation of possibly highly diverse origins, several individuals (at least 15% of 164 males) showed a primary patch of varying size. With one exception (Fig. 33), we found primary patches only in males (Fig. 34). The patch has been described in varying forms

Figure 32. Adult male with female-like features: Upperparts with a typical adult male black and white tail pattern, but mostly brown ear coverts and brown top of the head. The mask is not entirely black, while the rump is slate-grey. 26 January 2007.

Figure 33. Adult females with white primary patches are rare. 9 December 2022.

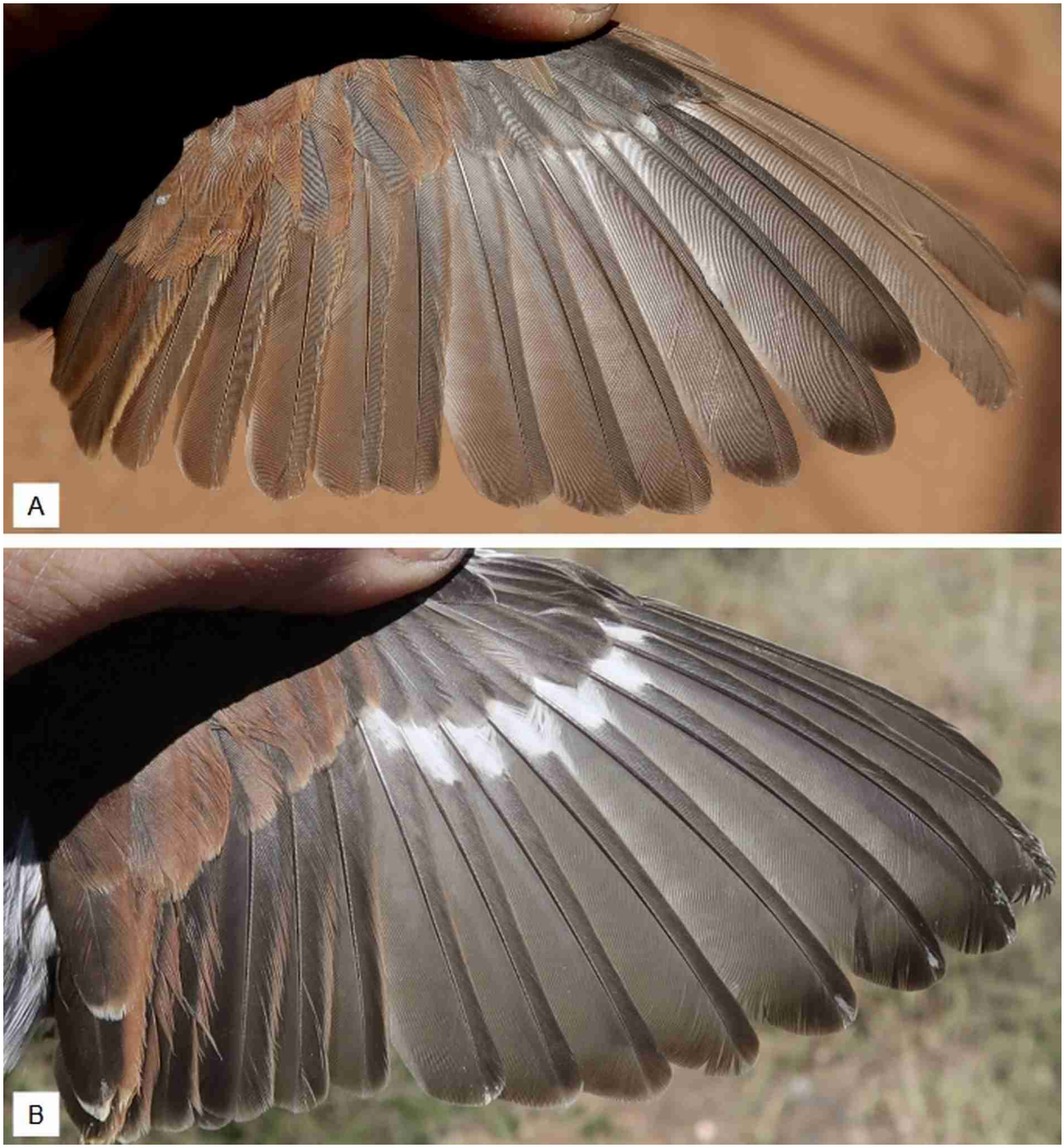

Figure 34. Adult males with variable size of the primary patch. (A) 8 January 2023. (B) 18 March 2023.

by Stresemann (1920) in Bub (1981, p. 115), Shirihai & Svensson (2018, p. 185), Lefranc & Worfolk (2022, p. 216), and Kauzál from the Czech Republic who recorded at least 25% in males (personal communication, 2022).

9. Breeding in Africa?

Migratory Palearctic bird species have been found to breed in southern Africa, including White Stork (*Ciconia ciconia*), European Bee-eater (*Merops apiaster*), and Booted Eagle (*Hieraaetus pennatus*; Yosef et al. 2000). For 150 years now, there are also claims of possible breeding of Red-backed Shrike in the southern hemisphere (Andersson 1872, p. 136; Roberts 1940, p. 299; Macdonald 1957, p. 143 [erroneously]; territorial behavior in Sauer & Sauer 1960, p. 73; Becker 1974, p. 76).

The occurrence of breeding in Africa goes undetected because it is not considered an option in the reality of field work and does not match our knowledge about this species. One individual was trapped in the Czech Republic in May

2020 by Ondrej Kauzál. It "looked like a bird in juvenile plumage. But considering the date of capture (beginning of May, actually it was at the time Shrikes began to appear that year), a bird in juvenile plumage is very unlikely" (2022, http://ondrejkauzal.org/gallery/_spec173-lan_col.html, individual CZEP20-149). The bird was aged "as a second year because of the much retained juvenile contour feathers" (ibid.) (Fig. 35). Possibly, we see here a female in particularly aberrant plumage (Norbert Lefranc, pers. comm.) More research is needed to resolve this question.

Acknowledgments

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Figure 35. Red-backed Shrike in juvenile plumage, ringed in May in Europe. It was aged as second-year. It is undetermined if the major part of the plumage was retained from the previous year or if this is a bird that fledged in Africa. Czech Republic, 10 July 2022. Photo courtesy of Ondrej Kauzál.

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