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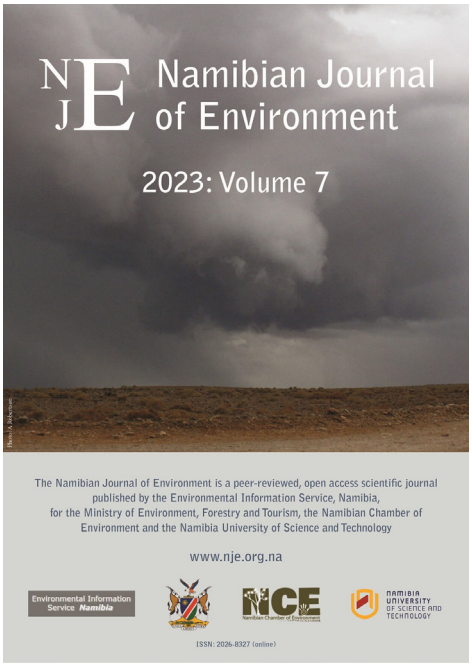

SECTION D: MONOGRAPHS AND MEMOIRS

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Tractrac Chat *Emarginata tractrac*: comparative biometrics, moult data and criteria for the determination of age and sex

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CONTENTS

ABSTRACT

Data on the Tractrac Chat (*Emarginata tractrac*) (Wilkes), 1817 are scarce and widely scattered in the literature. We present measurement and moult data from 97 Tractrac Chats of the subspecies *E. t. albicans* ringed in Namibia over 20 years. We gathered published data of nesting, breeding and moulting, and compare our observations of the moult process and our records of active brood patches with breeding records compiled by Brown *et al*. (2017). On the basis of photographs, we describe the nestling of the ssp. *E. t. albicans* and its development to immature and then adult. We compare young and adult plumage and other features which help to distinguish these age groups. We also document several cases of irregular primary moult. We add observations on site fidelity; on changes in habitat and subsequent changes in numbers of territories; on the development of overall numbers of the species in our research area; on behaviour and on parasites and injuries. We also point out errata in the literature from Levaillant that remain in use, as well as discuss the elevation of the distribution range.

Keywords: age; behaviour; biometrics; bird ringing; breeding; Levaillant; moult; misidentification; *Muscicapidae;* Namibia; SABAP; SAFRING; sex; subspecies; territory

1. INTRODUCTION

Data on the Tractrac Chat (*Emarginata tractrac)* are scarce and widely scattered in the literature. Between 2004 and 2013 we ringed and collected data from 100 Tractrac Chats (*E. t. albicans*) (Figures 1 and 2), including 33 data sets mostly from the coast at Swakopmund and data of one roadkill from that area. In this paper we present our observations, our results of measurement and our moult data from these specimens. During our study we recorded eight individuals with active brood patches which are considered to be a reliable indication for breeding. Our moult data for the species, substantiated by photographs, give insights into the moult strategies of *E. t. albicans*. Furthermore, we discuss the misidentification of a Karoo Chat (*Emarginata schlegelii*) as a Tractrac Chat by Levaillant in his first description as well as other errata in the literature.

Figure 1: *Typical pale and bleached adult Tractrac Chat standing on its perch, a small rock, overviewing the surrounding plains. Erongo region, 11 September 2019. Photo courtesy of Mhairi McFarlane.*

Figure 2: *Adult Tractrac Chat during its annual complete moult in its typical habitat on the edge of the Namib desert. SAFRING FH43100, 3 January 2007.*

2. DISTRIBUTION AND SITES

As near-endemic residents of southern Africa, Tractrac Chats occur throughout the west of Namibia northwards into the arid southwest of Angola and southwards into the west of South Africa (Figure 3). For a detailed map of recorded sightings see the map of the Southern African Bird Atlas Project (SABAP 2022c). For unvetted sightings see the map from eBird (https://birdsoftheworld.org/bow/species/tracha1/cur/introduction).

We collected our data in the arid, almost treeless plains of central Namibia in the pre-Namib (Farm Sphinxblick 22°29'S 15°26'E, Figure 4) and westwards along the Swakopmund-Usakos road around 22°24'S 15°25'E. We also ringed and processed Tractrac Chats in the even more sparsely vegetated Namib desert (Figure 5) around Swakopmund 22°34'S 14°32'E, as well as further south towards Gobabeb 23°27'S 15°02'E and 23°32'S 14°60'E.

3. TAXONOMY AND SUBSPECIES

The southern African Tractrac Chat is split into five subspecies which show considerable differences in colouration and, to a certain extent, in size. All of them occur in Namibia. Three of them were first described in the 20th century. (See Bryson & Paijmans [in prep.] A review of the species complex *Emarginata tractrac*.)

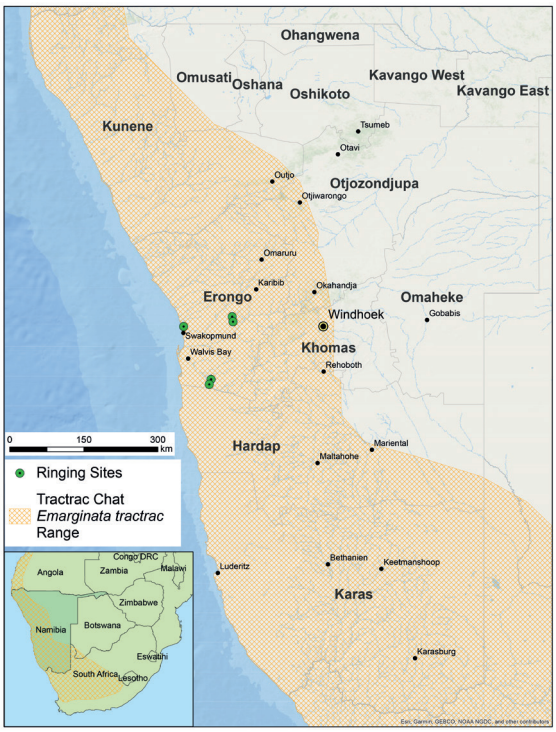

Figure 3: *Distribution map for the Tractrac Chat, downloaded from www.iucnredlist.org on 18 July 2022. The green dots designate sites where the data were gathered.*

4. METHODS

For a general description of the methods and measurements see de Beer *et al.* (2001) and Bryson & Paijmans (2021, 2022). All photographs were taken by the authors on Farm Sphinxblick in the Erongo region if not given otherwise.

4.1 Bird ringing

Birds were ringed and measured and moult scores were taken in accordance with the guidelines of the South African Bird Ringing Unit's (SAFRING) Bird Ringing Manual (de Beer *et al.* 2001, based on Svensson 1984).

Figure 4: *Typical habitat of the Tractrac Chat (*E. t. albicans*) in the pre-Namib, with a few rocks and blocks of salt lick in the foreground being used as perches. The photo was taken during the rainy season. On average there is 45 mm or rain per year. Territories here were abandoned after several years of extraordinary precipitation resulted in high grass. 14 January 2005.*

4.2 Measurements

Published measurements of the Tractrac Chat are restricted to four individuals of each sex of the subspecies *E. t. tractrac* in Dean (in Hockey *et al.* 2005, p. 954) and to three females and three males of the subspecies *E. t. albicans* in Keith *et al.* (1992, p. 536).

Table 1 presents our measurements of the Tractrac Chat subspecies *E. t. albicans* taken in Namibia. The measurement of the bill was taken to the indentation on the front of the skull following the convention for the measuring of passerines (Demongin 2016, P. IX). The table also includes the data of *E. t. albicans* from Keith *et al.* (1992) and of mixed subspecies from Rose *et al.* (2020). Our measurements were not included in the latter paper, since we are publishing them separately for Namibia only here.

As is typical for desert birds, mass is highly variable. In a good feeding season, the mass can be more than double the lowest record. Our values of *E. t. albicans* vary between the extremes of 18.6 g and 41.5 g.

A comparison with published data proves almost impossible, since in different sources sets of the different measurements are lacking, subspecies and even sex are not defined, sample sizes are too small or the methods are not declared. When comparing results between researchers these differences become evident (see Paijmans & Bryson 2023).

The measurements of *E. T. albicans* taken during our research show that males are larger than females in wing, tail, tarsus and mass, as documented in Maclean (1993, p. 512) and Keith *et al.* (1992, p. 536). Maclean (1993) does not specify the subspecies, while Keith *et al.* (1992) give the measurements of just three females and three males of *E. t. albicans* which fall within our measurement ranges (see Table 1).

Figure 5: *Typical habitat of the Tractrac Chat in the Namib desert, almost bare of vegetation. See the plumage adaptation to the soil colouration of the ssp.* E. t. albicans*, especially of the adult in the foreground. The juvenile in the background remains darker. Welwitschia Drive, Swakopmund, Namibia. December 2003. Photo courtesy of Christoph Moning.*

Table 1: *Average measurement data of adult Tractrac Chats (*E. t. albicans*) from our sample (including standard deviation, minimum and maximum measurements) and from Keith* et al. *(1992) and of mixed subspecies from Rose* et al. *(2020). Measurements are grouped by sex.*

Grouping	Parameter	Wing (mm)	Tail (mm)	Tarsus (mm)	Culmen (mm)	Head (mm)	Mass (g)
Bryson & Paijmans - ssp. *albicans*							
All Adults SAFRING Code Age 4	Mean ± SD	90.9 ± 3.4	52.9 ± 2.9	30.8 ± 1.1	20.4 ± 1.3	41.4 ± 1	26.2 ± 3.3
	Min–max	83–98	47–65	28.1–34.3	17.9–24.1	37.6–43.5	18.6–41.5
	n	90	86	90	73	95	96
Adult Unknown Sex	Mean ± SD	90.3 ± 1.3	52 ± 2.4	30.9 ± 0.8	19.8 ± 0.9	41.1 ± 0.9	26.5 ± 2.5
	Min–max	88–93	47–60	29.6–32.6	18.3–20.9	39–42.7	23–33.5
	n	27	26	28	17	32	33
Adult Females	Mean ± SD	88 ± 2.4	51.6 ± 2.4	30.4 ± 1	20.4 ± 1.5	41.6 ± 1.1	26.1 ± 2.8
	Min–max	83–93	48–57	28.1–32.8	17.9–24.1	38.1–43.3	18.8–35
	n	31	30	31	25	31	31
Adult Males	Mean ± SD	94.2 ± 2.4	54.9 ± 2.8	31.1 ± 1.2	20.8 ± 1.1	41.5 ± 1.1	25.9 ± 4.5
	Min–max	90–98	50–65	28.4–34.3	18.6–23.2	37.6–43.5	18.6–41.5
	n	32	30	31	31	31	31
Keith *et al*. (1992) – ssp. *albicans*							
Adult Females	Mean ± SD	91.3	48.1	29	15.5		
	Min–max	88–96	47–49		tip to feathers		
	n	3	3	3	3		
Adult Males	Mean ± SD	92.7	49.4	29.7	17		
	Min–max	92–94	47–51		tip to feathers		
	n	4	4	4	4		
Rose *et al*. (2020) - mixed ssp.							
Adult	Mean ± SD	89.5 ± 4.6	53.1 ± 2.5	30.6 ± 11.1	20.4 ± 1.5		26.1 ± 2.7
	Min–max	80–96	50–58	28–33	17–23		22–32
	n	118	65	45	64		127

Comparing our data with the most recent publication on measurements of southern African birds (Rose *et al.* 2020), we must take into account that in their paper neither the subspecies nor the sex has been considered and that retraps were included.

Although *E. t. albicans* is claimed to be larger (Keith *et al.* 1992, p. 536), the average measurements of unknown, but presumably mixed subspecies in Rose *et al.* (2020) match our findings.

4.3 Determination of sex

The sex of the birds was determined, when possible, by the colouration of the plumage and the bill, the shape of the two pelvis bones and their distance from each other, the existence and size of a brood patch and by the shape and placement of the cloaca.

When the brood patch was scored, it was determined as absent or, during its development, as starting, full and post-breeding (Brown & Franke-Bryson 2016). For our records we used only the data from a fully developed, active brood patch.

The brood patch is likely to develop shortly before incubation starts, always in females, but also in males to an extent that seems to correspond with their active participation in breeding. The skin of the area with which the bird has contact with the eggs, becomes naked and looks swollen, and, as the blood vessels increase in size and number, the skin turns dark red. When the young have hatched, the area starts returning to normal conditions. The naked patch shrinks, the skin becomes paler and finely wrinkled; then dry scales appear. Shortly after fledging of the young, the skin returns to normal, while the new feathering on the belly will occur only during the next complete, post-breeding moult, which might start soon after breeding (Svensson 1984, pp. 38–39; Brown & Franke-Bryson 2016).

Figure 6: *The plumage of the female and male Tractrac Chats* E. t. albicans *shows a slight, but perceptible colour difference. The female (above) is sandy brown while the male is paler and a colder grey. From the collection of the Natural History Museum, Berlin.*

Figure 7: *Colour difference of* E. t. albicans *in the field. (A) Slightly browner female. SAFRING FH31336, 20 January 2006. (B) More grey male. SAFRING FH34966, 18 June 2007.*

4.31 Colour differences between the sexes

Dean (in Hockey *et al.* 2005, p. 954) and Keith *et al.* (1992, p. 536) call the sexes of the Tractrac Chat "alike", while Collar (2020) notes that sexes are similar. For the subspecies *albicans*, Niethammer and Hoesch first described a slight colour difference between female and male: "The females have on the upperparts a sand-coloured hue, thus are less purely grey" (Hoesch & Niethammer 1940, p. 241). This can best be discerned when both sexes are compared next to each other. Figures 6, 7 and 8 show the difference between the browner female and the paler, greyer male.

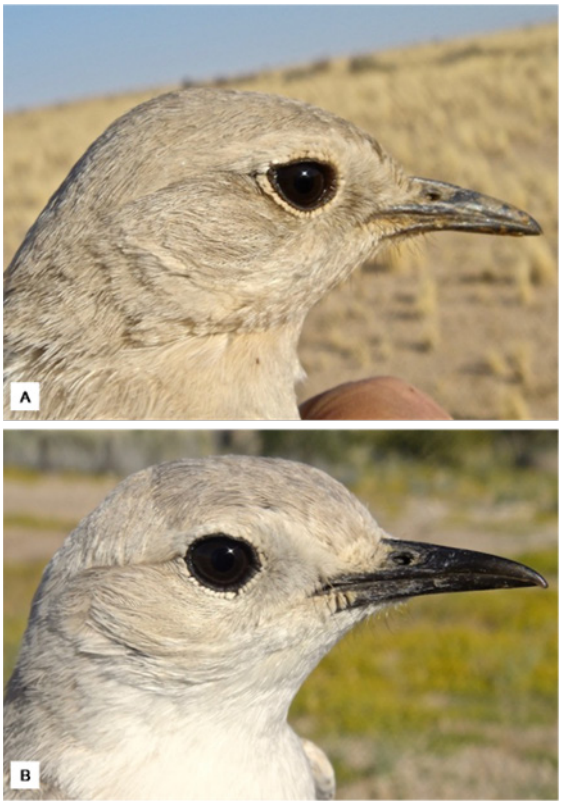

Figure 8: *Head colouration. (A) Adult female, warm-sandy brown. SAFRING FH31182, 13 September 2005. (B) Adult male, lighter and cooler grey with jet-black beak. SAFRING FH31537, 26 May 2006.*

5. BREEDING

5.1 Breeding season

The main criterion that triggers breeding in desert species and thus in the Tractrac Chat is rainfall and the subsequent availability of food for raising the brood. "A long season with opportunistic breeding linked to rainfall is probably the norm" (Harrison *et al.* 1997). The few breeding records (9 in total) obtained in the whole distribution range during data gathering for the Atlas of southern African Birds showed a bias for breeding in spring, i.e. August to October (ibid., p. 179), while in Namibia nesting was recorded in almost every month, except March, July and December (Brown *et al.* 2017).

Our main primary moult records from between November and February follow the (small) peak of these nesting observations in Namibia (as shown in Table 2). With the low number of observations, many breeding events clearly go undetected. It is possible that breeding takes place all year round.

5.2 Records of brood patches

With variable precipitation across years, breeding takes place at different times in different years. For the ssp. *albicans* we recorded seven brood patches out of 64 females spread over the months of the year:

Figure 9: *Descendent primary moult of a Tractrac Chat. While the primary moult score counted 29 (5555540000), the first secondary S1 has almost reached its full length. SAFRING FH34686, January 2007.*

three from January (2004, 2008 and 2012), one from May (2006), two from June (2004 and 2006) and one from September (2005). Beyond that, one nest record with young chicks from 17 August (Demasius 2021) indicates nesting and breeding in July.

6. NESTING AND FLEDGING

Tractrac Chats fledge about 32 days after egg-laying (after 14 days of incubation and 18 days of nestling period) (Tarboton 2014, p. 296) and have been observed to remain with parents for at least one month after fledging (Collar 2020). According to Paterson they are fed for at least nine weeks (unpublished data quoted in Dean 2005).

7. BREEDING AND MOULT

The relationship between breeding and moult is well researched and applicable to the Tractrac Chat. (See Perrins 1970, Svensson & Hedenström 1999, Jenni & Winkler 2020b, pp. 178–179).

8. MOULT

Passerines generally go through two quite distinct moult events every year, a complete and a partial moult. The annual complete post-breeding moult encompasses the whole plumage including the great feathers of wing and tail, while the partial moult is typically restricted to areas of the body plumage (Leisler & Schulze-Hagen 2011, p. 221).

Kasparek (1981, p. 6f.) summarises the progress of the complete moult: all passerines follow a uniform sequence, which is highly consistent through all species, with some minor modifications and very few exceptions. The moult starts with the wing: It begins with the inner primary and progresses towards the outer wing. During this process, which occurs symmetrically on both sides, the secondaries start to be replaced, in such a way that the capacity to fly is not compromised. The moult of the tertials starts shortly after the begin of primary moult and is completed when the growing secondaries reach the tertials. Variations and exceptions occur.

The moult of the Tractrac Chat follows this pattern. The order of the primary moult is descendent, and the secondary moult starts with the outermost S1 (Figure 9).

8.1 Moult of the Tractrac Chat

In the literature “no data” for the moult of Tractrac Chats is recorded (Dean 2005; Clement & Rose 2015).

8.2 Moult records of the Tractrac Chat in Namibia

Notwithstanding, Hoesch & Niethammer (1940) report three moulting individuals. One male of the ssp. *albicans* in post-juvenile moult (Jugendmauser)

Table 2: *Extent of primary feather moult (P1 to P10) of adult Tractrac Chat (*E. t. albicans*). Values are average moult scores of each primary for the number (n) of birds per month sampled. The colour gradient is shown at the side. The tail (t), head (h) and body (b) are expressed as a percentage of birds assessed as showing signs of moult. Counts of birds displaying a full brood patch (bp) are given, as well as nest count values for Namibia from Brown* et al. *(2017). No data were collected for the cells marked in grey.*

Month	n	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	t	h	b	bp	Nests	Moult Score
Jul	3	0	0	0	0	0	0	0	0	0	0					0	
Aug	9	0	0	0	0	0	0	0	0	0	0	0%	0%	0%		4	0
Sep	1	4	0	0	0	0	0	0	0	0	0				1	6	
Oct	0															3	1
Nov	10	3	3	3	3	2	1	1	1	0	0					1	
Dec	6	2	2	2	2	2	2	2	2	2	2	100%	0%	0%		0	2
Jan	30	1	1	1	1	1	1	1	1	1	1	42%	25%	33%	3	3	
Feb	5	3	3	3	3	3	3	3	2	2	2				1	1	3
Mar	3	0	0	0	0	0	0	0	0	0	0	0%	0%	0%	1	0	
Apr	0															2	4
May	9	1	0	0	0	0	0	0	0	0	0	17%	0%	0%	1	2	
Jun	21	0	0	0	0	0	0	0	1	1	1	6%	0%	12%	1	1	5

Figure 10: *Adult moulting its tail and primaries, secondaries and coverts of the wing. Both sides were moulting symmetrically. SAFRING FH21182, 26 August 2004.*

Figure 11: *This adult is in the process of its complete post-breeding moult with wing (primaries, secondaries, tertials and coverts), tail, head and mantle visibly involved. Both wings were moulting symmetrically. Edge of Namib-Naukluft Park. SAFRING FH43100, 3 January 2007.*

was collected as one of nine individuals from Cape Cross, about 110 km north of Swakopmund on 25 November 1938 (p. 241). One male in post-juvenile moult and one female in complete moult of the now ssp. *barlowi* were collected as two of five individuals in Kubub and the Namib desert near Lüderitz (p. 245).

8.3 Moult and breeding records of the Tractrac Chat throughout the year

In Table 2 we present moult data of 97 Tractrac Chats, including primary, head, tail and body moult, and compare our brood patches data per month with the numbers of active nests from *Brown et al.* (2015) that might include other subspecies than *E. t. albicans.*

Our data on primary moult peak in the months after the main breeding months gathered by Brown *et al.* (2017), although active brood patches and primary moult activity are spread throughout the year. More extensive monthly data for nests, active brood patches and ongoing moult are needed for a more complete overview of the annual life cycle of this species.

Figure 12: *Adult in all fresh plumage. Farm Sphinxblick. SAFRING FH39403, 3 February 2009.*

8.4 Complete moult of the Tractrac Chat throughout the year

The complete moult, which includes the major feathers of wing and tail, follows the breeding events. We found moulting (and non-moulting) adults throughout the year.

Figures 10 and 11 show adults moulting in August and January while the individual in Figure 12 showed a completed moult in the first days of February.

The primary coverts are lost shortly after their corresponding primaries, while the secondary coverts generally fall out all together at the same time (Kasparek 1981, p. 6f.) (Figure 10).

The tail moult starts shortly after the start of the secondary moult. First, the central pair are replaced, with the movement towards the outer side. Body moult starts on the upper part of the body, being followed by the underparts and finally by the head (Kasparek 1981, p. 6f.).

8.5 Irregular primary moult

Out of 97 Tractrac Chats we found four individuals with an irregular primary moult. The code 0 designates an old feather, the code 4 a growing feather of at least 2/3 of its final length and the code 5 a feather that has completed its growth. An x indicates a missing feather.

- FH20658 from 1 June 2006: 0000000555,
- FH20661 from 1 June 2006: 5555505555,
- FH20591 from 26 May 2004: 5000000000 and
- FH31182 from 13 September 2005: 4000000000.

A roadkill from 27 August 2003 had primary moult left 55xx000500 and right 5000000000.

All others had a normal descendant primary moult.

The combination of feathers with code 0 and 5, i.e. old and fresh full-length feathers, points to an interruption of the continuous growth of the wing feathers. This occurs when the primary moult has started and rain sets in, thus triggering breeding activity. In this case no further feathers are shed and replaced, but the ones in development finish their growth.

9. AGE DEVELOPMENT OF TRACTRAC CHATS

There is a lack of published knowledge about the development of African chats. For a first basic ageing structure to be further developed in future studies, we refer to European species for which more extensive research has been done.

For age terms see the Glossary for Ageing in Bryson & Paijmans (2021, pp. 21–22).

9.1 First-year birds

First-year birds comprise individuals from nestling and fledgling to juvenile birds, and, after the post-juvenile moult, also the immature birds. At about one year of age the young birds are thought to become mature and start the adult breeding cycle. Description of fledglings differ and the development during the first year of this species including the juveniles and post-juveniles is almost undescribed.

As far as we can determine, this is the first published description of a nestling of a Tractrac Chat (*E. t. albicans*) (documented by photographs in Demasius 2021).

9.1.1 Nestling

The nest shown in Figure 13 was raided and destroyed presumably by a domestic dog (*Canis lupus familiaris*) or a black-backed Jackal (*Lupulella mesomelas*). The young did not survive the following days.

Like chats in general (Clement & Rose 2015, p. 15), the nestlings of the Tractrac Chat "usually hatch with a fine or rather fluffy textured down" which are whitish in this species (Figure 14). Dean (2005, p. 954) describes long, dark grey down on dark feather tracts in newly hatched Tractrac Chats. It is unclear if this is a question of subspecies differences. Within days, structured feathers are sprouting on the body along the vanes, on the head and on the wing. Out of the sheaths, dark due to the blood supply, grow the wing feathers with a light sandy tinge. The beak is light yellow, as are the legs, the gape flange a pale yellow (Figures 14 and 15).

9.1.2 Juvenile

9.1.2.1 Juvenile plumage of Tractrac Chats

The first plumage is followed within the first two months of life by a partial post-juvenile moult into a second first-year plumage. This development is comparable to the Mountain Wheatear (*Oenanthe oenanthe*) that starts its post-juvenile moult at the age of 5 to 8 weeks (Ginn & Melville 1983) to completion by the third month of life (Heinroth & Heinroth 1924).

Bill colour is also an indicator for the young age. It turns from a yellowish flesh colour to blackish.

Figure 13: *Nest of a Tractrac Chat (*E. t. albicans*), destroyed by a predator. Swakopmund, Namibia, August 2017. Photo courtesy of Eckart Demasius.*

Figure 14: *Nestling of a Tractrac Chat (*E. t. albicans*), outside of its nest. Swakopmund, August 2017. Photo courtesy of Eckart Demasius.*

Figure 15: *Nestling of a Tractrac Chat (*E. t. albicans*) outside of its nest, killed by a predator. Swakopmund, August 2017. Photo courtesy of Eckart Demasius.*

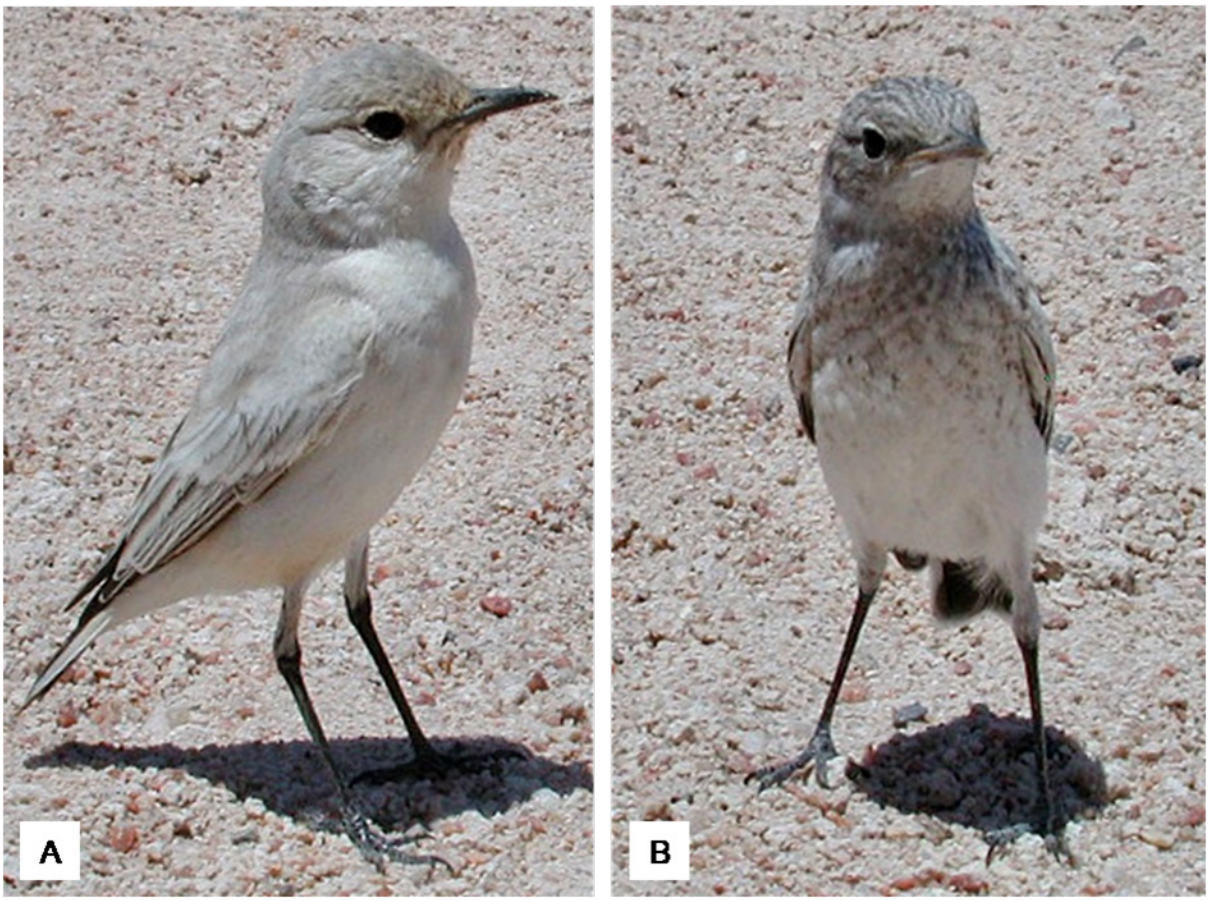

Figure 16: *Comparison of (A) an adult, with white chest, uniform head and dark bill, with (B) the accompanying juvenile with dark, mottled chest, streaked head and lighter coloured bill. See also the dark ear coverts and cheeks of the young. Welwitschia Drive, Swakopmund, Namibia; December 2003. Photo courtesy of Christoph Moning.*

9.1.2.2 Juvenile plumage of Tractrac Chat subspecies *E. t. albicans*

The plumage of the juvenile Tractrac Chat of the subspecies *albicans* is "speckled with buff and black above and below" (Dean 2005) (Figure 16) and lacks most of the brown colouration described (p. 623) and depicted (p. 150) by Clement & Rose (2015) which therefore must refer to the more southern subspecies.

9.1.3 Post-juvenile plumage of Tractrac Chat *E. t. albicans*

The post-juvenile plumage, acquired within the first two months of life, can easily distinguished from the adult plumage by, among other factors, the quality and density of the plumage, although the differences are quite subtle on first sight (Figures 17, 18 and 19). As is well documented in most European passerines, it is looser in structure and lesser in mass when compared to the adult plumage (see discussion and references in Jenni and Winkler 2020a, p. 62). This is the case also in southern African juvenile passerines as well as in first-year birds after the post-juvenile moult (pers. obs.).

The gape flange of a young bird and the edge of the lower mandible, though, show a yellowish tinge for some months which, with other features, allows the determination of age. It is not known if the inner upper mandible is not yellowish and thus diagnostic for a first-year bird, like in *Oenanthe oenanthe*, where it is black in adults (Jenni & Winkler 2012, p. 104).

The bird in Figure 17A was still in company of the adult (17B) which points to quite a young age of several weeks after fledging, as does the yellowish edge along the lower mandible and a yellowish gape flange. The juvenile plumage, though, had already been replaced.

When comparing the plumage of the adult parent and its young, the darker colouration of the adult wing and tail and the stronger contrast between centres and edges of the remiges are visible, while the young show broader fringes of the tertials and longer white tips of the primaries and secondaries (Figure 18). See also the plumage on head and mantle which is plain in the adult and uneven and patchy due to the ongoing moult in the young (Figure 19).

Figure 17: *(A) Close up of the plain head of a first year Tractrac Chat (*E. t. albicans*) after its post-juvenile moult, with yellowish edge of the lower mandible and still scanty feathering. Near Swakopmund, November 2006. (B) Fully grown adult with dense feathering and all-black bill. SAFRING FH30311, 11 February 2005.*

9.2 Adults

When birds become sexually mature, they are considered to be adults. In passerines this occurs at about one year of age. Around this time, the first-year birds generally undergo their first complete moult and acquire a first fully adult plumage. Remiges may moult slightly later in Palearctic passerines (Jenni & Winkler 2020a, p. 61), but detailed knowledge about the moult strategies of chats are still to be explored. In Tractrac Chats, this plumage is similar to that of the first-year. Adults, however, show a plain and abundant plumage which gives the head and the body a smooth round shape (Figure 20).

We observed differences in moult pattern and subtle colour differences in the plumage of adults, which raises the question of whether a second-year plumage will be recognisable as such.

We ringed two individuals on two subsequent days in the same area (Figure 21). One showed a uniform plumage and no signs of primary moult (A) but fresh scapulars and lower mantle, while the other (B) had started the primary and secondary moult and was moulting head, mantle and body with well discernible old lighter and fresh darker feathers.

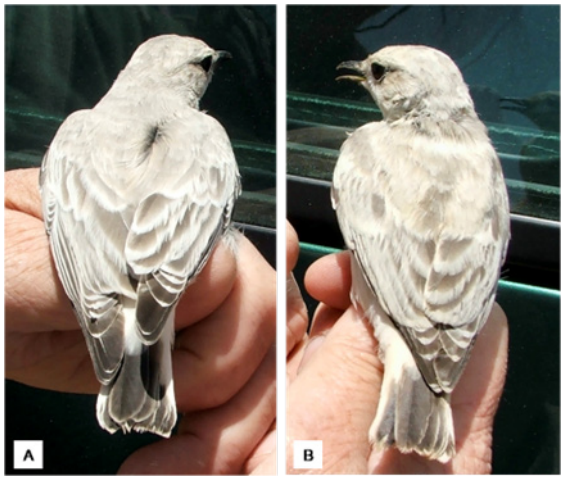

Figure 18: *Comparison of adult and first-year Tractrac Chat (*E. t. albicans*). (A) Adult with uniform back, dark primaries and tail, and contrasting rectrices. SAFRING FH18950. (B) First-year bird with yellow edge of the lower mandible, broad white edges on tertials, longer white tips of primaries and mottled back, due to post-juvenile moult. Near Swakopmund, November 2006.*

Figure 19: *Close up of head and back of an adult (left) and a first-year (right) Tractrac Chat (*E. t. albicans*). See also the yellow in the lower mandible of the first-year bird. The beak is all black in adults. Near Swakopmund, November 2006.*

Figure 20: *Full adult with well developed "thick" plumage. SAFRING FH34966, 18 June 2007.*

Figure 21: *Difference in moult pattern in two adult Tractrac Chats ringed on two subsequent days in the same area. (A) In plain, almost uniform plumage with fresh scapulars and lower mantle, a pale tail compared to (B), but without signs of primary moult. (B) Moulting head, mantle, primaries and secondaries, with fresh, darker grey feathers. SAFRING FH34966 and FH34962 respectively, 18 and 17 June 2007 respectively.*

We propose as a hypothesis to be explored that the Tractrac Chat passes through a second-year plumage before acquiring a consistent adult plumage.

One challenge for the precise determination of age (of second-year and older) is the wide range of timing for breeding which triggers a subsequent complete moult. Thus, the moult process cannot be attributed to certain months, but occurs variably during all the year.

To date, it has not been possible for us to collect enough data to compare the stage of moult in one population throughout all the months of the year.

10. NOTES AND OBSERVATIONS

10.1 Movements

Tractrac Chats are considered to be sedentary (Collar 2020) but locally nomadic (Dean 2005) with nomadic short-distance movement in non-breeding season (Clement & Rose 2015) associated with unpredictable rainfall (Harrison *et al.* 1997, p. 178). No regular movements are known or discernible from scientific models (ibid.)

10.2 Site fidelity and retraps

Despite ringing for 12 years in the very same locations during the same season, none of 66 birds were retrapped. A single uncounted retrap in our records was a persistent individual that was caught again in the same trap five minutes after being first ringed.

The site fidelity, though, was high. Ringed birds were resighted in the known territories. Even after one and two years we saw a ringed bird on the same bush in the same territory of a previous trapping.

At one of our standard ringing sites (Figure 4) we observed ringed Tractrac Chats inspecting the traps, but they never attempted to get the worm. This behaviour is quite different from other chats like Mountain Wheatear (*Myrmecocichla monticola*) (Bryson & Paijmans 2023), Capped Wheatear (*Oenanthe pileata*) (both Franke-Bryson 2016) and Karoo Chats (ibid., unpubl. data). Unfortunately, we could not identify specific individuals.

North of Swakopmund, we ringed 33 Tractrac Chats and resighted or retrapped four of them up to two years and four months later at the same location or in an adjacent pentad.

10.3 Changing habitat, and changing numbers of observed territories and ringed Tractrac Chats

10.3.1 Changing habitat

Since 2002 we have been ringing in the Erongo region, at the guest and hunting farm Sphinxblick (22°29'S, 15°27'E). In the years following our first visit in 1995, the area was extremely dry. From 1999 on, though, for about 15 years the rainfall was constantly above the average 45 mm. The years 2006, 2010 and 2011 brought exceptional precipitation, with peaks of overall 90, 60 and 85 mm per year respectively, in localised places up to 165 mm and flooding. What used to be quite barren land, carried more and more vegetation. The grass grew high and interfered with the hunting habits of the Tractrac Chats. The area depicted in Figure 22A had hosted several Tractrac Chats in their long-term territories. After the massive rains in 2011, they disappeared from the area and have not returned (Figure 22B).

10.3.2 Changing numbers of observed territories and ringed Tractrac Chats

The drought of 2014 to 2021 was so severe that the game populations almost completely died. Only small patches received rain of 10 to 15 mm. In the field, no Tractrac Chats were found or observed and most of the birds, even the sandgrouse, left the area. The only four remaining territories of Tractrac Chats were around waterholes and human constructions. One constantly occupied throughout all the years was located near the farmhouse, where the sheep and the

Figure 22: *Typical habitat of the Tractrac Chat (*E. t. albicans*) in the pre-Namib. (A) The few low dry bushes in the foreground are being used as perch. Farm Sphinxblick, Erongo region; 25 January 2008. (B) Former area of the Tractrac Chat after extraordinary rain that changed the vegetation to a degree that the habitat became unsuitable. 24 February 2011.*

horses provided dung and attracted insects. Two territories were entirely deserted in 2017 after 30 months of drought. One was deserted in 2018 and occupied again five years later, in 2023 (pers. obs.).

Figure 23 shows the rainfall over a larger area covering Usakos and Karibib. Our research area is on the edge of the Namib-Naukluft Park and receives just a fraction of the precipitation for areas only 10 or 20 km further inland (or 65 km like Usakos, or 95 km like Karibib). After years with high precipitation, the numbers of Tractrac Chats were low.

Due to the secluded nature of our sites, accurate long term weather station measurements were not easily available, so as an alternative Climate Hazards Group InfraRed Precipitation with Station (CHIRPS) data was sourced (Funk *et al.* 2015) to estimate average precipitation levels of the area (0.05° resolution, gridded precipitation time series between [-21.91874, -22.65359] latitude, [15.00748, 15.84465] longitude. Although CHIRPS has been assessed to be an adequate dataset for long term precipitation trends, limited suitability studies have been done in Namibia (Liu & Zhou 2021, Robertson 2023), and over/underestimation of the seasonal precipitation may be present at small scales and closer to the Namibian coastline (Robertson 2023).

10.4 Overall numbers of the Tractrac Chat

The South African Bird Atlas Project 2 hosts continually updated statistical data about the birds of southern Africa (SABAP 2022a).

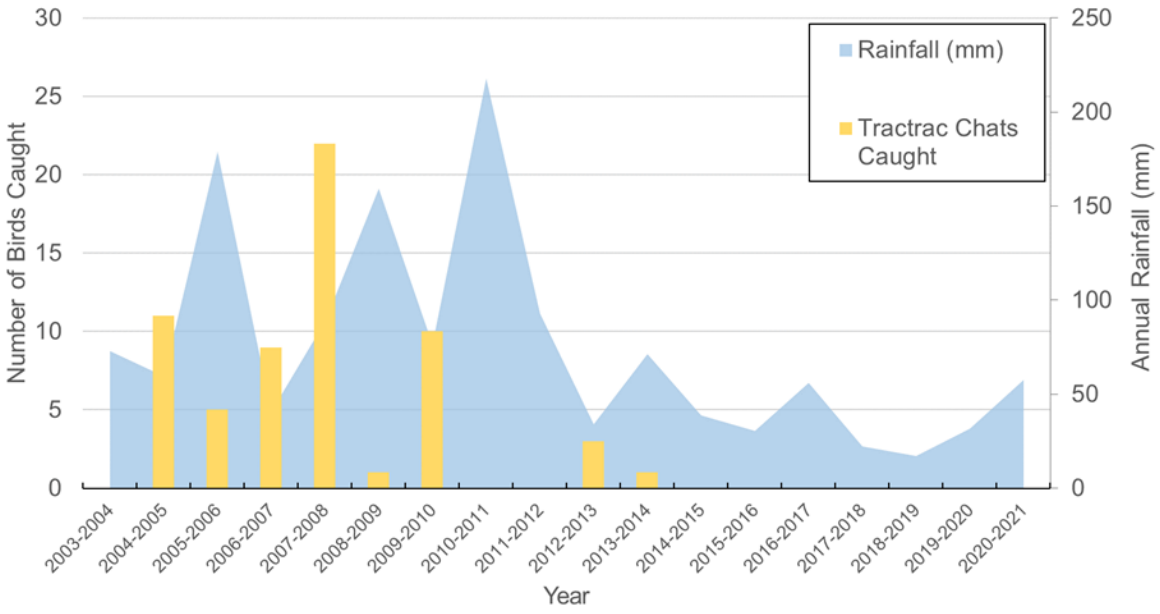

Figure 23*: Annual rainfall fluctuations in the pre-Namib savanna in relation to the numbers of Tractrac Chats (*E. t. albicans*) ringed per year. The low record for individuals caught for 2008/2009 is due to reduced ringing activity. Precipitation estimates retrieved from the CHIRPS dataset between [-21.91874, -22.65359] latitude, [15.00748, 15.84465] longitude).*

In the database, the average reporting rate of Tractrac Chats has declined over the years (SABAP 2022c). In Namibia since SABAP1 (1981–1998), there has been a decline in reporting rate compared to SABAP2 (2007–present) of over 20% in 2022 (SABAP 2022b), with similar pictures for the Northern and Western Cape.

It is not known if this decrease reflects real change of chat numbers or if it is related to a change in observation intensity or protocols. Although there are differences in methodology between SABAP1 and SABAP2 (i.e. survey protocol, spatial unit and no measure of effort), this is still a notable decrease in reporting rate for the Tractrac Chat in Namibia.

10.5 Behaviour

Notes on behaviour of the Tractrac Chat are scarce and general, restricted to perching, running fast after prey, short hovering for inspection when alarmed or when hunting, wing flicking and jerking the tail (Maclean 1993, p. 513) while for *Oenanthe* species a wide variety of behaviour elements have been described in detail: song flights as behaviour against intruders of the territory or during pair formation; mating; nest defence; roosting behaviour; body posture; bobbing and many more patterns and single observations (Cramp 1988, p. 755 ff.).

During our studies, we repeatedly observed Tractrac Chats hovering when they were inspecting prey (or our traps) as described in Macdonald (1957, p. 125) and Maclean (1985, p. 513). See also the photographic report of Demasius (2021) and Figure 24.

We observed an interaction between one Tractrac Chat repeatedly swooping down on another individual (Franke-Bryson 2017) which left us in doubt about the causes (mating behaviour or territorial defence). We suggest that more complex behavioural actions are still undetected or undescribed.

10.6 Parasites and injuries

Out of 66 ringed individuals only two birds from mid-June were parasitised by ticks: one hosted one, the other three ticks. One adult was missing one foot (Figure 25), which did not seem to affect his physical condition. It had a freshly moulted plumage and weighed 23.9 g, compared to an average mass of 27.3 g (out of seven) (collected by Hoesch & Niethammer 1940, p. 241) and our median mass of 26.2 g (range 18.6–41.5 g).

11. ERRATA IN THE LITERATURE

In the literature we found some incorrect descriptions and information that are being passed on unnoticed in further publications. In the reference to "Motacilla tractrac Wilkes, 1817, Encyclopaedia Londinensis 14:89" (Dean in Hockey *et al.* 2005, p. 954) the volume number should be 16, not 14 (Wilkes 1817).

Figure 24: *(A) A Tractrac Chat overviewing the disturbance and (B) hovering in front of the windscreen when inspecting an intruder close to its nest. Swakopmund. August 2017. Photos courtesy of Eckart Demasius.*

Figure 25: *This Tractrac Chat (*E. t. albicans*) had lost its right foot, which did not seem to present a handicap for normal mass and moult. SAFRING FH39762, 15 December 2009.*

11.1 Depiction of the Tractrac Chat

In the first description of a Tractrac Chat in Levaillant's "Histoire naturelle des oiseaux d´Afrique (1805)" the drawing shows a Karoo Chat (*E. schlegelii*), with the middle tail feathers dark up to the rump and white upper-tail coverts (Figure 26).

The description of the plumage in the text is also that of a Karoo Chat*:* "The twelve feathers of the tail are generally black ending in white and all equal in length: the first four on each side are edged in white on the outside, but the fourth and the third are not of this white until near their beginning..." (ibid. p. 104, compare with Figure 27B.)

In the text Levaillant describes the behaviour: "... it frequents the bushes, at the top of which it is always seen to perch, ... fleeing ... from bush to bush" (ibid. p. 103). Tractrac Chats prefer open arid plains with few scrubs, or perennial grasslands in deserts, or, when on dunes, those are vegetated sparsely with shrubland (Macdonald 1957, p. 124; Dean 2005, p. 954).

Figure 27 shows a Tractrac Chat (A) and a Karoo Chat (B) from Namibia for comparison.

The "Auteniquois" country where Levaillant first observed and collected the as such described Tractrac Chat is the "high country lying behind Knysna, southern Cape province" (Macdonald 1957, p. 125). The fact that the species is recorded there in only five quite isolated pentads and in very low numbers (https://sabap2.birdmap.africa/species/571) while the Karoo Chat in the area is observed in high numbers and high frequency (https://sabap2.birdmap.africa/species/566) raises the question of identification and range. See also Macdonald (1957, pp. 125–126) where he discusses the possible confusion between Tractrac and Karoo Chat).

Without detailed descriptions, photographs or genetic samples, it is difficult to define the taxonomy. Further studies would improve our understanding of this species and its range.

Figure 26: *Levaillant's depiction of a Tractrac Chat shows a Karoo Chat (see text). Histoire naturelle des oiseaux d´Afrique by Levaillant (1805).*

11.2 Elevation of the distribution range

The occurrence of the Tractrac Chat in Clement and Rose (2015, Habitat, p. 622) is specified as "from sea-level to c. 350 m" which is in contrast to Hoesch who collected five specimens in Kubub (26°43'60" S and 16°16'60" E), south west of Lüderitz, about 30 km south of Aus, 1552 m above sea level (Hoesch & Niethammer 1940, p. 61, map on page 15). Tecklenburg, "the most eastern location" where the then called *Oenanthe albicans* was found (Hoesch & Niethammer 1940, p. 241), is situated north of Uis near the Brandberg at an elevation of about 800 m at 21°19' S and 14°81' E, while our main ringing site for the species, Farm Sphinxblick, is at about 1,000 m above sea level.

12. FURTHER RESEARCH

Much is still unknown or unrecorded about the Tractrac Chat and many questions are unanswered. More continuous monthly data of nests, active brood

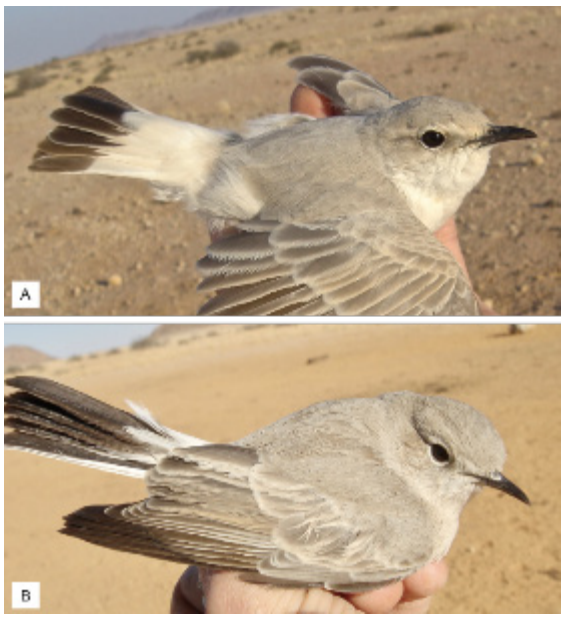

Figure 27: *(A) Tractrac Chat with white tail and black tips. SAFRING FH34975, 18 June 2007. (B) Karoo Chat with dark tail and whiter outer tail feathers as described and depicted by Levaillant. SAFRING FH34958, 17 June 2007.*

patches and ongoing moult are needed for a more complete overview of the annual life cycle of this species.

Concerning the breeding period and the first-year development detailed research is needed to gain sufficient data:

- to observe the nesting activity to define the still unknown incubation period and the also unknown breeding success (Dean 2005).

Concerning the plumage description and the age development basic research is needed:

- to document the appearance of hatchlings and young birds and the development into adult age;
- to identify and describe a possible second phase of the juvenile plumage, the adaptation of the adult moult cycle by first-year birds, and a possible second-year plumage;
- to investigate the inner mouth colour in first- and second-year birds and adults to determine the age more precisely.

For further research we recommend:

- gathering more data on the size of territories and relating nest data to precipitation data;
- studying and describing the behaviour all year round, from song flight and mating behaviour to territorial defence, against intruders or during pair formation, behaviour at the nest and nest defence, roosting behaviour, body posture, etc.
- monitoring the area where the species was first described (Auteniquois country) to learn about the species´ actual distribution and abundance and the possible misidentification of Karoo Chats.

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