Is the Sand Lark *Alaudala raytal krishnakumarsinhji* a valid taxon?

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The Sand Lark *Alaudala raytal* occurs from south-eastern Iran, across the northern parts of the Indian Subcontinent, to Myanmar (Rasmussen & Anderton 2012; Ganpule & Alström 2022). Three subspecies are usually recognized: *A. r. raytal*, *A. r. adamsi*, and *A. r. krishnakumarsinhji* (Dickinson & Christidis 2014; del Hoyo & Collar 2016; Clements et al. 2021; Gill et al. 2021). The subspecies *raytal* ranges eastwards from Haryana, through the plains of northern India, and along the Himalayan foothills, and further east towards the Brahmaputra Valley in Assam and Arunachal Pradesh to Bangladesh and Myanmar; *adamsi* occurs from Iran to north-western India (Jammu & Kashmir, Himachal Pradesh, Punjab, and Gujarat); while *krishnakumarsinhji* is known only from its type locality in Bhavnagar, in the Kathiawar Peninsula (=Saurashtra), in Gujarat, India. The separation of the Sand Lark from the Turkestan Short-toed Lark A. *heinei* and the Asian Short-toed Lark *A. cheleensis* (which have recently been suggested to be separate species: Ghorbani et al. 2020; Alström et al. 2021) has recently been dealt with by Ganpule (2019a), and Ganpule & Alström (2022).

Alström et al. (2021) found deep mitochondrial divergence, and some song differentiation as well as on average differences in habitat/climate, between *A. r. raytal* and *A. r. adamsi*, but low nuclear divergence, and concluded that more studies were needed on this complex.

Vaurie & Dharmakumarsinhji (1954: 8) described the subspecies *A. r. krishnakumarsinhji* based on a total of eleven specimens from Bhavnagar, which were said to differ from *raytal* and *adamsi* 'by being more heavily streaked and much darker in all plumages, dark gray above, not sandy as in nominate *raytal* or *adamsi* … The dark shaft streaks are broader throughout and the lower throat and breast is more heavily and more abundantly streaked; flanks greyish and faintly streaked, not whitish or buffy and unstreaked as in the other two races. Bill short and thick as in *C. r. adamsi* but blackish above and below, not horn color above, and yellow at the base of the mandible as in specimens of *adamsi* or nominate *raytal* …'

We suggest, based mainly on field observations, that the subspecies *krishnakumarsinhji* be synonymised with the subspecies *adamsi*.

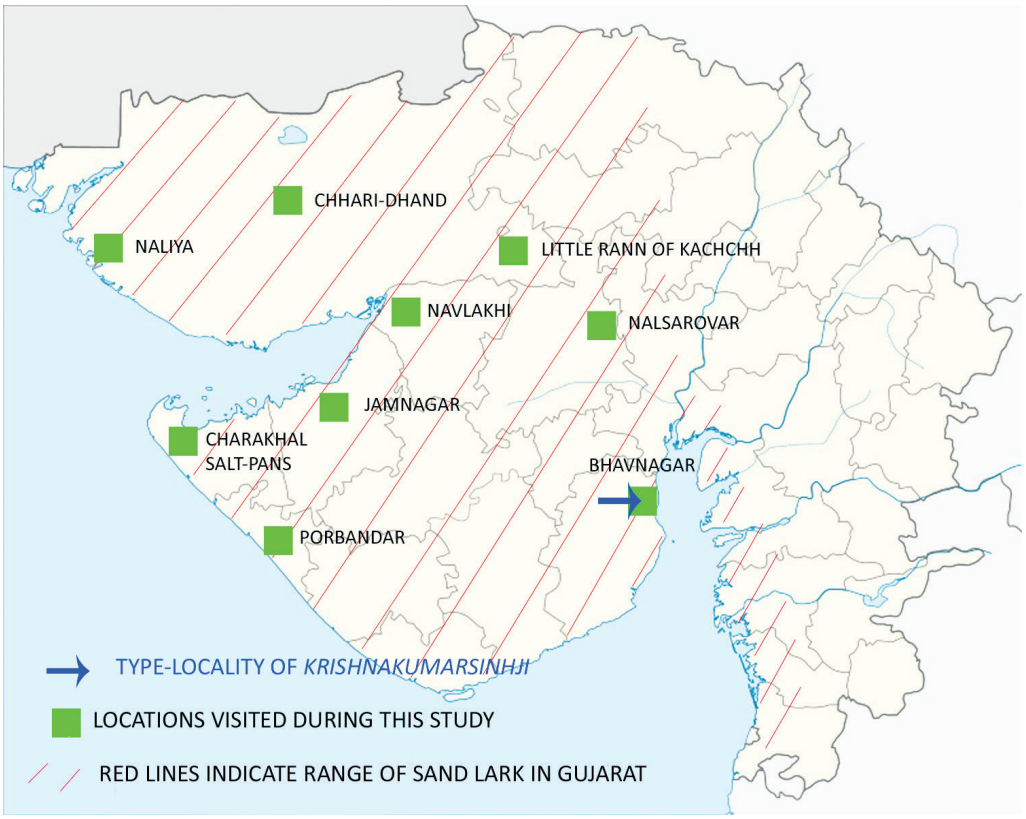

Fig. 1. Range of Sand Lark in Gujarat, India, and the locations visited during this study.

Material

PG studied Sand Larks in Gujarat over a period of five years (2017–2021), with an initial focus on the separation of this species from the Turkestan Short-toed Lark, and the Asian Short-toed Lark. During the course of this study, much material in the form of field observations and photographs

was collected from different parts of Gujarat, including the type locality for *krishnakumarsinhji* (Fig. 1). Three specimens (two labelled female and one male) of *krishnakumarsinhji*, including the holotype, were compared to series of *adamsi* and *raytal* by PA in the American Museum of Natural History (AMNH), New York, USA.

Results

The examination of specimens in the AMNH confirmed that *krishnakumarsinhji* is darker, with broader and darker streaks above, and slightly more heavily streaked on the breast than *adamsi*. In the field, individuals with plumages matching *krishnakumarsinhji* were seen widely in Saurashtra and Kachchh in Gujarat, and were not restricted to Bhavnagar. Moreover, birds with the *krishnakumarsinhji* plumage type were not geographically separated from typical *adamsi*, but co-occurred in some places (Fig. 2). For example, on 19 January 2020, at the salt pans near Navlakhi (22.948ºN, 70.486ºE), in Morbi District around 20 Sand Larks were present. In this flock, individuals with plumages similar to *adamsi* as well as *krishnakumarsinhji* were seen and photographed **[201 a–d]**. The upperparts ranged from pale brownish, brownish-grey, to darker grey, with variably prominent streaking. The breast streaking was thin in some birds, while others showed heavier streaks, with faint streaking also on the flanks, as said to be diagnostic of *krishnakumarsinhji*. Also, at other locations in Jamnagar, Porbandar, and Kachchh districts, the plumage ranged from what is seen in typical *adamsi* to darker grey, with heavily streaked breast, matching *krishnakumarsinhji*. Further, birds intermediate between *adamsi* and *krishnakumarsinhji* were observed in different parts of Gujarat. It was noted that in Sand Larks seen south of Bhavnagar, in the southern Gujarat districts of Bharuch, Valsad, and Surat, the plumage was similar to that of *krishnakumarsinhji* or intermediate between *adamsi* and *krishnakumarsinhji*.

At the type locality at Bhavnagar, the Sand Larks showed variation in bill size, shape, and colour as well as in underpart and upperpart streaking (Ganpule 2019a). Not all individuals had streaks on the flanks, while the upperparts ranged from greyish, dark greyish, to brownish-grey. The underparts showed prominent streaking in some birds while in others, the streaking was finer.

The online links of a few photographs of Sand Larks, with plumages similar to *adamsi* type and *krishnakumarsinhji* type, seen in the same area/region, are given in Table 1. All photographs are sourced from 'eBird', with ML number (https://macaulaylibrary.org) given.

Discussion

Many lark species (Alaudidae) show a remarkable degree of intraspecific geographical variation in plumage colour tones. It has long been recognized that the variation in plumage colour is closely related to the colour of the substrate (soil, rock, or sand) that different populations live on (Donald et al. 2017: and references therein). For *krishnakumarsinhji*, the correlation between soil colour and plumage was apparent in the sample from the marine mud flats at Bhavnagar; Vaurie & Dharmakumarsinhji (1954: 9) stated that, 'the soil of these flats varies from brown to dark muddy-brown and becomes very dark when wet by the tide (Vaurie finds that the correlation in coloration is very good between a sample of this soil and the plumage of the birds).'

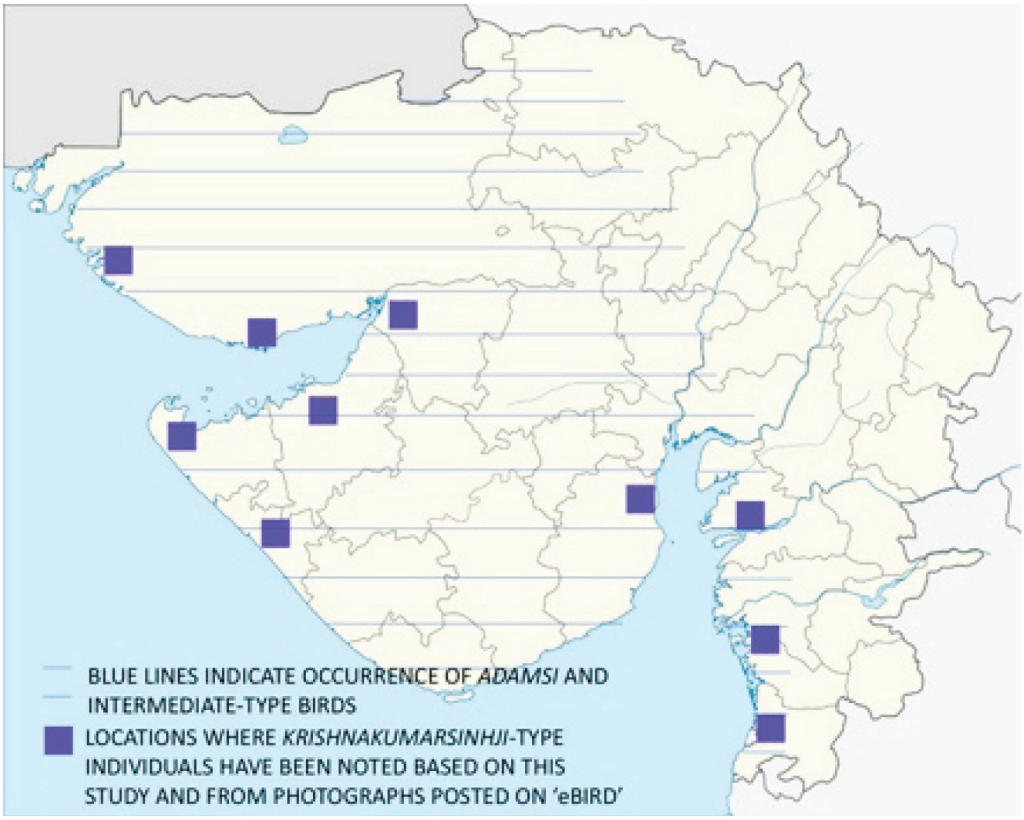

Fig. 2. Range of *adamsi*- and intermediate-type, along with localities where *krishnakumarsinhji*-type birds were noted.

Abdulali (1976), and Rasmussen & Anderton (2012) found in studies of museum specimens of Sand Larks from Kachchh that these individuals were similar to *krishnakumarsinhji*. In other parts of coastal Saurashtra, in salt pans, mud-flats, and margins of lakes, the colour of the soil varies from sandy, pale brownish, brownish, muddy-brown, to blackish (when wet). Individuals similar to *krishnakumarsinhji* have been observed in these coastal regions with dark soils in the present study, as well as in photographs posted on eBird, indicating local adaptation to the substrate colour by the Sand Larks inhabiting these areas (cf. Donald et al. 2017). Where the substrate colour is paler, the plumage of the Sand Larks corresponds to the soil/substrate.

The general plumage tone is usually the main, and

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201 a–d. The four photos presented here illustrate the variation in plumage of Sand Larks on 19 January 2020, near Navlakhi, Morbi District, Gujarat. These individuals were in a flock of 20 birds, feeding on grain at the edge of salt-pans. The bird in (a) is a typical *adamsi*, with pale brownish plumage, thin streaks on the breast, and plain flanks; the bird in (b) shows darker brownish and more prominently streaked upperparts, and more heavily streaked breast, and the plumage is intermediate between typical *adamsi* and *krishnakumarsinhji*; in the birds in (c) and (d), the upperparts are greyer and more heavily streaked, the breast streaking is prominent, and faint streaking is visible on the flanks, and these birds are similar to the *krishnakumarsinhji*-type. Note that all four birds have a similar bill colour.

indeed, often, the only character by which different lark subspecies are recognised (de Juana et al. 2004). We suggest that local adaptation to match the substrate colour is the reason why Sand Larks similar to *adamsi*, as well as the *krishnakumarsinhji* plumage type are seen throughout Saurashtra and Kachchh. Birds with the *krishnakumarsinhji* plumage type are not limited to Bhavnagar, and this plumage type is not geographically well defined but is rather widespread, occurring with *adamsi* plumage type birds over a large part of Gujarat. Individuals with seemingly dark greyish plumage, which appear to match *krishnakumarsinhji*, have also been noted in Iran (Daneshvar 2021 ML480154501, Doroudi 2019 ML304194401), and Pakistan (Mursalin 2019 ML180447621) too.

Vaurie & Dharmakumarsinhji's (1954) claim, that the bill of *krishnakumarsinhji* is blackish above and below is incorrect based on examination of specimens in the AMNH as well as

Table 1. Variations in plumages of Sand Larks in the same area/region in Gujarat

Region/Area	Plumage		Remarks
	adamsi-type	*krishnakumarsinhji-type*	
Jamnagar District	Kapdi 2020); ML345083351 Sant 2011); ML378169091 Radadia 2021); ML297575451	Khira 2022); ML430332761 Agashe 2019); ML254197601 Kholiya 2017); ML405319711	*adamsi* type more common
Kachchh District	Vijayaraghavan 2021); ML414459931 Francis 2008); ML377833691 Ganpule 2019b); ML368149751	Parekh 2018); ML379388061 Vijay 2020); ML296384311 Rajasekaran 2021); ML401005181	*krishnakumarsinhji* type more common
Bhavnagar District	Pankaj 2016); ML377240961 Bhil 2022); ML420737621	Varu 2015); ML378214541 Ganpule 2019c); ML356985871	*krishnakumarsinhji* type dominant
Charakhla, Dev-Bhoomi Dwarka District	Ganpule 2019d); ML365986631 Ganpule 2019e); ML358172421	Malav 2018); ML378926621 Balar 2018); ML379682601	*adamsi* type more common

observations in the field.

Based on the above evidence, we suggest that *A. r. krishnakumarsinhji* is better treated as a synonym of *A. r. adamsi*, and is more adequately considered to be a locally adapted colour morph rather than a distinct taxon. Even more distinct colour morphs have been noted within Dune Lark *Calendulauda erythroclamys patae* in coastal northernmost South Africa (Kolberg et al. 2016; Derek Engelbrecht, Paul F. Donald, PA., *personal observations*), and Ash's Lark *Mirafra ashi* appears to be a colour morph of the Somali Long-billed Lark *M. somalica rochei* (Alström et al. submitted). Moreover, Crested Larks, of the subspecies *Galerida cristata nigricans*, which occur on the dark soils of the Nile Delta are dark and heavily streaked, in contrast to the paler and less streaked populations in desert habitats immediately to the east and west of that location (Hartert 1917).

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