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continued on the back inside cover

Cover: The nine vultures of India, digital art made on Krita by Dupati Poojitha.

MATERIALS AND METHODS

We used a SongMeter Micro, which was hung in the enclosure and set for continuous recording in uncompressed waveform audio file format. Recordings of the single male cat took place from 24 to 26 January 2022 at a sampling rate of 24,000 Hz. Recordings of the mother with kittens were taken at a sampling rate of 32,000 Hz, first at irregular intervals between April and August 2024, and then in December 2024 after the separation of mother and offspring. The higher sampling rate was chosen to ensure successful recording of higher frequency calls, which we expected from the kittens. The recording dates are presented in Table 1. Call spectrograms were created with the software Raven Pro (Bioacoustics Research Program 2017).

RESULTS

We recorded two bouts of “meow” calls of good quality from the single male (Wav 1; Image 2A). These calls were similar to the calls from the mother after separation from her offspring (Image 2B). From the

Table 1. Dates of acoustic recordings of Rusty-spotted Cats in Frankfurt Zoo.

Individual	Start	End	Duration in days
Male	24.i.2022 1600 h	26.i.2022 0800 h	1.7
Female with kittens	30.iv.2024 1400 h	06.v.2024 0500 h	5.6
	14.v.2024 1000 h	17.v.2024 0600 h	2.8
	13.vi.2024 1900 h	16.vi.2024 1240 h	2.7
	19.vi.2024 1640 h	22.vi.2024 1300 h	2.8
	25.vi.2024 1115 h	26.vii.2024 0715 h	0.8
	22.vii.2024 1500 h	25.vii.2024 1115 h	2.8
	21.viii.2024 1435 h	24.viii.2024 1105 h	2.9
Female in isolation	12.xii.2024 1147 h	15.xii.2024 0547 h	2.8

mother and her kittens, we recorded more than 400 calls, and several different call types (Image 2C–G). There was a “murmuring” sound (Wav 2), probably the mother calling her kittens or the kittens answering the calls of



Image 1. Female Rusty-spotted Cat and her kittens in Frankfurt Zoo. © Silja Fiedler

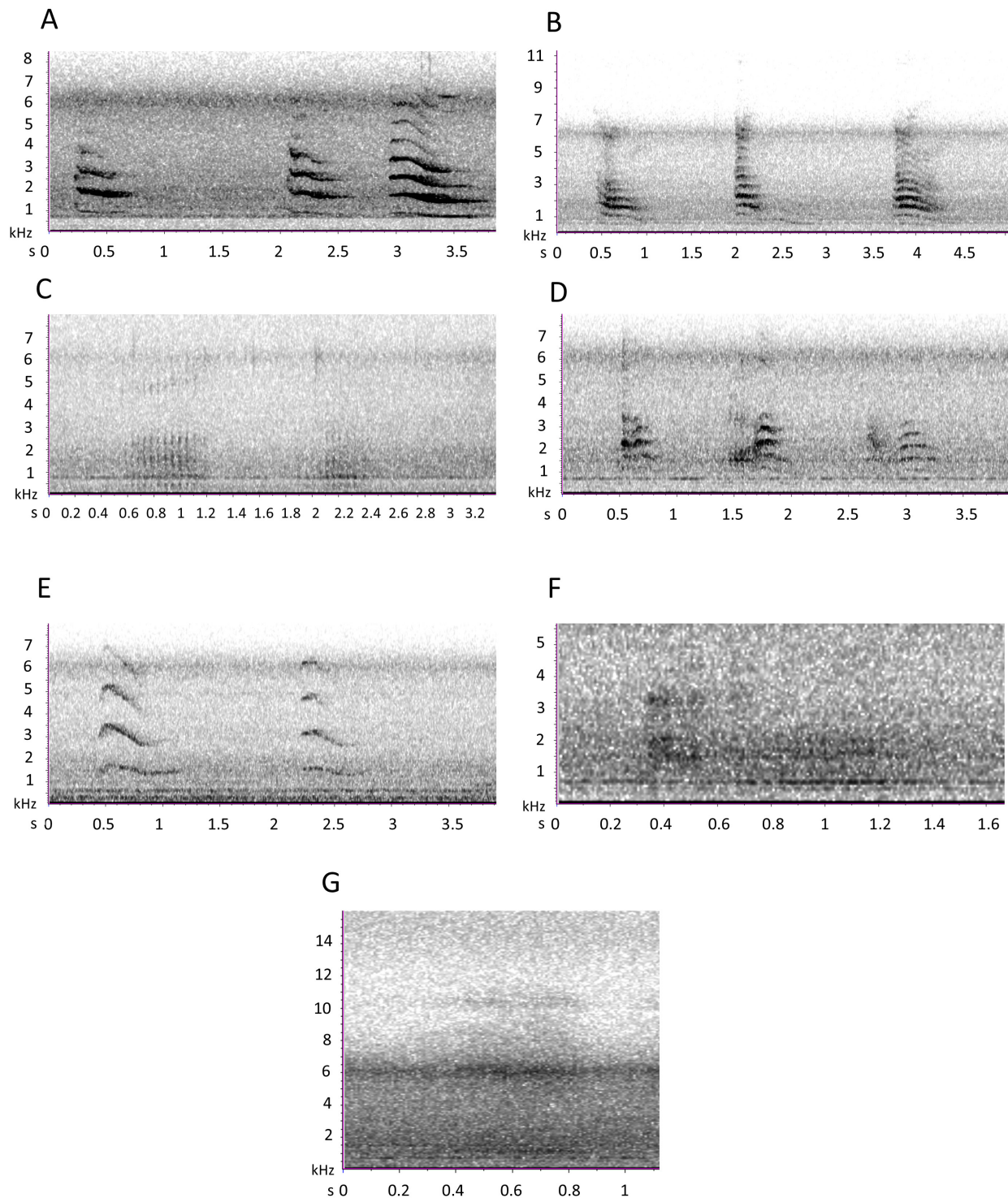


Image 2. A—"Meow" call of an adult male Rusty-spotted Cat in isolation from other cats | B—"Meow" call of an adult female Rusty-spotted Cat after separation from her young | C—"Murmur" call probably from an adult female Rusty-spotted Cat communicating with her young | D—"Meow" call probably from an adult female Rusty-spotted Cat communicating with her young | E—"Meow" call probably from a juvenile Rusty-spotted Cat | F—"Snarl" call from a Rusty-spotted Cat | G—"Hiss" call probably from an adult female Rusty-spotted Cat. All recordings were made at Frankfurt Zoo.

their mother. This was the call type with the highest number of recordings, more than 400. A second call type

with more than 30 recordings was a "meowing" sound, sometimes clearly from the kittens ([Wav_3](#)) because

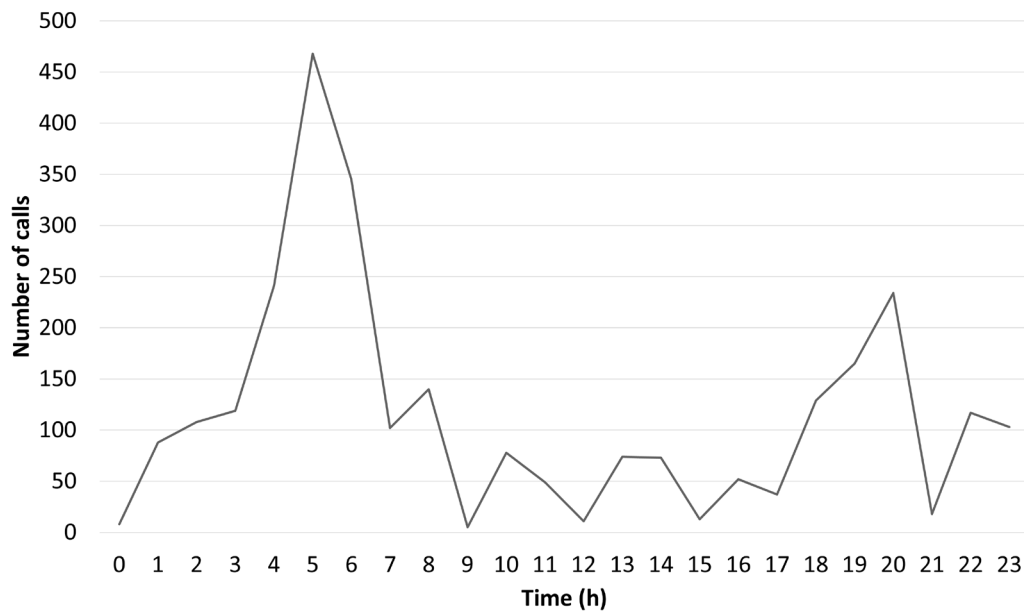


Figure 1. Number of recorded calls of a mother Rusty-spotted Cat with her two kittens in Frankfurt Zoo. Sound recordings were made over three consecutive days and the number of calls per hour were summed up.

it was very high-pitched, sometimes in a lower pitch probably from the mother (Wav 4). A third call type with less than 10 recordings was an aggressive “snarling” sound (Wav 5). Furthermore, we recorded a “hissing” sound in less than five recordings, which occurred only when keepers entered the enclosure. Most of the calls were recorded during the night, early morning or in the evening (Figure 1). We roughly counted the number of calls per hour by hand and found peaks in the number of vocalisations at 0300–0700 h and 1800–2000 h, with the highest number of calls recorded at 0500 h.

DISCUSSION

Our dataset is the first to include close-range vocalisations of Rusty-spotted Cat kittens with their mother. This dataset shows that the vocal repertoire of the Rusty-spotted Cat encompasses at least four different sounds. Peters & Tonkin-Leyhausen (1999) recorded short “gurgling” sounds of 10 adult female Rusty-spotted Cats, which they described as being common to all the 30 Felinae species in their dataset of close-range felid vocalisations.

The captive female and her kittens communicated by using both a “murmuring”, and a “meowing” sound. In contrast, Deshmukh et al. (2020) reported that wild kitten’s “meow” during reunions with their mother after having been separated from her for more than one hour. The “murmuring” call is also one of the most frequent vocalisations of the Domestic Cat in friendly contexts

(Tavernier et al. 2020). The mother utters this call when approaching the nest, or to guide the kittens when they leave the nest (Tavernier et al. 2020). Therefore, we assume that this call is a close-distance call of the mother reassuring the kittens of her presence.

The “meow” calls of the single male Rusty-spotted Cat and of the female after separation from her offspring are likely long-distance calls in search for contact with other individuals (Peters et al. 2009). The “meow” calls from the kittens could be vocalisations that have been named “chirp”, “tweedle” or “tweet” that Domestic Cat kittens utter when they ask for something (Tavernier et al. 2020). They might have been hungry or needed body contact.

In an experiment with Domestic Cats, females reacted faster to kitten calls when the kittens were in a higher arousal state (Konerding et al. 2016). The vocalisations of the Domestic Cat encode arousal and individuality but without cues to its sex (Scheumann et al. 2012; Rutovskaya et al. 2024). Its “hiss” and “snarl” sounds are associated with defensive and aggressive reactions, respectively (Tavernier et al. 2020). We assume that these associations also hold true for similar vocalisations of the Rusty-spotted Cat.

Studying call acoustics and comparing them to known cat vocalisations could help identify the cats’ behavioural states during vocalisations. Using camera traps alongside acoustic recordings might also clarify these behavioural states. Our recordings can serve as reference material

to identify Rusty-spotted Cat vocalisations from acoustic monitoring data in their natural habitat. We encourage further analysis of the acoustic parameters of the recorded calls, which was not possible within the timeframe of this project. Our data are available on the following data repository: <https://doi.org/10.5281/zenodo.14592115>.

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Supplementary material

Wav 1. “Meow” call from the adult male Rusty-spotted Cat



Wav 2. “Murmur” call probably from the adult female Rusty-spotted Cat communicating with her young



Wav 3. “Meow” call probably from a Rusty-spotted Cat kitten



Wav 4. “Meow” call probably from the female Rusty-spotted Cat



Wav 5. “Snarl” call from a Rusty-spotted Cat



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