

Topic summary

Lion vocalization, or lion roar behaviour is a major characteristic of lions, serving many different functions. One main purpose is for territorial defence. When lions encounter conspecifics, whether in home or foreign territory, vocalizations will be made to acknowledge presence (Benson-Amram et al, 2018).

Various factors affect a lion's decision to vocalize. One of the major questions posed by researchers is how climatic and environmental factors influence the likelihood of lion roars. Larom et al. (1997) and Wijers et al. (2021) investigated this question by combining existing research and using movement-tracking biologgers to record audio, locomotion and weather data. They subsequently found that vocalizations occur predominantly during the night, when wind speed and temperature are lower, and humidity is higher. They also found that lions strongly avoid vocalizing outside their home range. Grinnell and McComb (2001) were also interested in environmental factors. They explored this using playback experiments, where lion roars were simulated using audio devices and lion response was recorded. They documented similar findings, noting that nomadic male lions that are not within owned territory do not roar in order to avoid the risk of contests from territorial competitors. This supports a previous finding that also used playback experiments, stating that defending lions will investigate unfamiliar roars (Grinnell et al. 1995). These findings provide support for the integration of lion touch modality.

Another major question involves numerical assessment in territorial defence vocalizations. McComb et al. (1994) investigated this topic using playback experiments. They found that the probability of approach and subsequent vocalizations by territory defenders increases as the number of defending adults increases, and decreases as the number of intruders increases. This is consistent with the findings of Mosser and Packer (2009), who observed aggressive encounters between neighbouring lion groups. They found that larger lion groups fared better in intergroup territorial competition, attributing to higher overall reproductive success. These findings suggest that lions integrate numeric information presented in visual and auditory modalities during territorial defence vocalization.

Individual vocal recognition and the hierarchical system of territorial defence in lions is also pertinent. Wijers et al. (2020) was interested in lion call structures and used movement-tracking biologgers and spectrograms to assess acoustic and accelerometer data. They found that varying temporal patterns in lion call structures, such as fundamental frequency, allows lions to identify conspecifics. In terms of hierarchy, Benson-Amram et al. (2018) reviewed existing research and concluded that a hierarchical rank system may exist in territorial defence behaviour, as some defenders consistently approach intruders first, while other defenders consistently lag behind. Alongside, Gray et al. (2017) used GPS-fitted collars and observed that

the frequency of roaring varies in relation to social rank. These findings suggests a potential learning period and provides insight into how territorial defence behaviour develops.

Lastly, the evolution of lion vocalization during territorial defence is another major question posed. Mosser et al. (2015) investigated this by using simulation models. They suggest that group living evolved due to three behavioural advantages: cooperative defence, increase in territory size, and territorial inheritance. Importantly, they note that variations in landscape structure, population density, and behaviour all factored into this evolution. Alongside, Larom et al. (1997) combined existing research and found that some selective pressures that shaped the evolution of lion nocturnal calling behaviour include topography, regional weather patterns, seasonality and climate variation. These studies possibly suggest that lion vocalization in territorial defence evolved as a side product of group living. However, much still remains unknown about lion vocal behaviour in territorial defence.

Through reviewing these studies, a knowledge gap in both the short and long-term development of lion vocalization during territorial defence can be identified. Future research on this topic could dive deeper into the ultimate influences of vocalization during territorial defence, as opposed to group territoriality in general. Future research could also focus on the exact mechanisms at the individual level that induce lion vocalization. This could include the hormone/physiological response that induce lion roars, the development of vocalizations in the young and how group dynamics effect this vocalization.

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