

# Characteristics of Lion roars in Etosha National Park

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## INTRODUCTION

The vocalizing abilities of the lion are traditionally regarded as impressive, but the repertoire, in fact, is limited to three basic categories. As described by Schaller (1972) these categories, miaowing, growling-snarling and roaring, include at least nine expressions.

The function of roaring has been much discussed; Schenkel (1966) and Ulmer (1966) consider it a type of territorial display, whilst Rudnai (1973) believes it ensures cohesion of the group and facilitates contact. "The lion's roar has also much to do with the acoustic demarcation of the territory . . ." (Guggisberg, 1962). Roaring is also known as a spacing mechanism, and to advertise the presence of a lion, Smuts (1982). Schaller (1972) identified four functions of the full roar, either to advertising its presence, or to avoid contact, or to enhance the physical presence of an individual and, communal roaring may help to strengthen the bonds of the group.

The aim of this study was to investigate the characteristics of roars, when roaring occurred and to test the hypothesis that lions have individual roaring patterns.

Roaring by lions of a single pride was recorded in Etosha National park, during the period June-December 1985. The pride roamed over an area of approximately 200 km<sup>2</sup> surrounding the natural fountain, Ombika.

## ABSTRACT

Roaring occurred mainly at dawn, dusk and midnight, when lions were most active. The duration of roars was on average 36.6 seconds. Significant differences were found between the roars of males and females, and between two males. The number of rumbles was correlated with wind strength and duration of roars. Lions roar mostly when walking. Roaring does not feature during hunting activities.

## MATERIAL AND METHODS

The lions in the Ombika pride were individually known from landmarks or from natural features. The pride consisted of two adult males (No. 10,26), five adult females (No. 13, 17, 33, 36, 37, "rat-ears") and two cubs of No. 17.

Lions were usually located by tracking the direction of distant roars, and then followed for other study purposes. A total of 121 roars were recorded during twenty two 24 hour observations during 7 months. During the study period all the members of the pride, including the two 18 month old cubs were observed roaring, although only roars of the two adult males and three adult females were recorded. Whenever a roar occurred it was recorded on magnetic tape using a microphone positioned outside a vehicle. Exact duration of roars were recorded with a stopwatch. Additional information was noted, the time of day, ambient temperature, wind speed (Beaufort scale) and cloud cover. Afterwards the tape recording was played back several times and the characteristics of the roar determined.

For the purpose of this paper the roar is defined as the combination of moans resulting in full throated roars and grunts.

## RESULTS AND DISCUSSIONS

### Characteristics of the roar

A roar of a lion consists of one or two soft moans then several full throated roars, followed by a series of short grunts of diminishing amplitude. On average roars were started off by 0,7 (0 - 4) moans, then 9,1 (3-18) full throated roars, followed by 9,2 (0-26) grunts. Schaller (1972) observed one or two moans, then an average of 9 (4-18) full throated roars, followed by 15 (0-57) grunts.

### Time of day

Guggisberg (1962) found that lions roared shortly after the sun had gone down, then usually an hour or two before sunrise. Occasionally roaring occurred after 16h00 and quite some time after sunrise. Observations on five captive lions showed that they roared any time of day or night, but more in the afternoon and then in the morning (Ulmer 1966). Serengeti lions (Schaller 1972) call mostly at night, particularly just before dawn. In Etosha roaring occurred mainly at night and at dawn and dusk (Figure 1). The first peak of roaring

occurred from dusk until two hours after dark. Females never roared during this period. A second peak occurred near midnight, followed by a third when both males and females roared most. This pattern of vocalization coincides with the pattern of activity and hunting recorded from this and other prides in Etosha (Stander unpub. data).

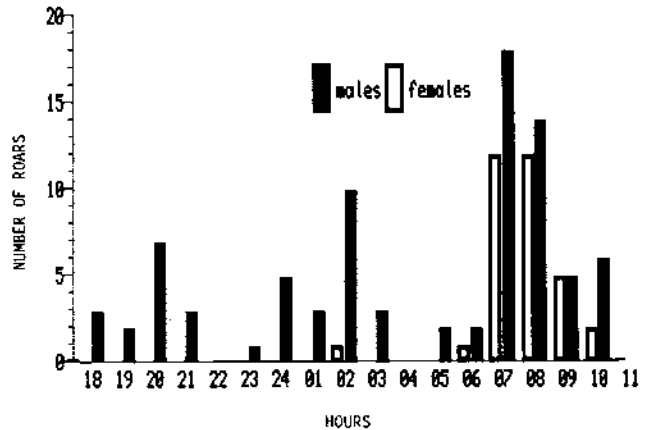


FIGURE 1: Time and frequency of roars by male and female lions.

The two males had similar nightly roaring patterns, however the frequency differed somewhat (Figure 2). Schaller (1972) found similar results with observations on two males in the Serengeti.

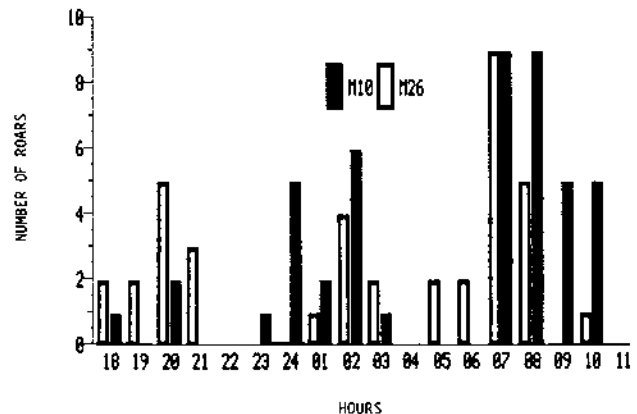


FIGURE 2: Time and frequency of roars by two male lions.

### Duration of the roar

In the Nairobi National Park the duration of roars was 46,4 seconds (39-90 sec.) (Rudnai 1973). "A typical chorus of our five lions lasts an average of 36,6 seconds" (Ulmer 1966). Schaller (1972) measured each episode to last about 40 seconds (25-60 sec.). The observations in Etosha show a shorter duration of 36,6 seconds (17-56 sec.), (Table 1).

TABLE 1.  
Duration of roars in seconds

	Males			Females			Total
	No. 10	No. 26	Mean	No. 13	No. 17	Mean	Mean
Mean (seconds)	40,2	34,8	37,9	37	25,5	28,8	36,6
Range (seconds)	22-56	17-46	17-56	21-39	18-38	18-39	17-56
S.D.	7,11	6,25	7,15	7,52	8,66	7,63	8,06

### Individual roaring patterns

Although Rudnai (1973) found no significant differences between the roaring of males and females, Schaller (1972) could distinguish the roars of a few males, and mentions that the calls of the male are somewhat deeper in tone and louder than those of the female.

The two Ombika male lions roared significantly longer than the females, (Table 1) ( $\sigma$   $n=61$ ;  $\varphi$   $n=10$ ;  $P < 0,05$ ; Mann-Whitney U test, Siegel 1956).

No significant differences of the duration of roars between males ( $P > 0,05$ ), or females ( $P > 0,05$ ) were found.

It was attempted to distinguish between roars from the two males by counting the number of grunts following the full roars. A significant difference was found in the number of grunts between the males using the Mann-Whitney U test (No 26  $n=28$ ; No 10  $n=20$ ;  $P < 0,05$ ). No significant differences could be found between the roars of different females.

### Calculating comparisons to the number of rumbles

"Bivariate plotting" (UNIVAC - BDMP) showed that a positive correlation exists between the number of rumbles and wind velocity ( $n = 99$ ;  $r = 0,481$ ;  $P < 0,001$ ). Rumbles are defined as the number of moans plus full throated roars plus grunts. Lions thus extend the number of rumbles in stronger winds. A 50% correlation was found comparing duration of a roar to the number of rumbles ( $N = 71$ ;  $r = 0,506$ ;  $P < 0,001$ ). There appeared to be no correlation between roars and the ambient temperature and cloud cover.

### Body positions of lions during roars

Lions can roar in almost any position, lying, sitting, walking or running, but mostly do so while standing (Schaller 1972). Rudnai (1973) is of the same opinion, but also mentions a change in body position during the roar. The observations in Etosha show that most

roaring occurred when lions were walking (Table 2), followed by sitting and lying. On 28% of observations lions changed their position during the roar.

TABLE 2.  
BODY POSITIONS OF LIONS DURING ROARS.

Body Position	No. of Observed Roars	%
Walking	14	26,4
Sitting	10	18,9
Lying	7	13,2
Standing	5	9,4
Mating	2	3,8
<i>Changing Positions.</i>		
Standing up	7	13,2
Sitting - lying	6	11,3
Lying - sitting	2	3,8
Total	53	100,0

### Roaring relating to hunting activities

Guggisberg (1966) states that lions roar during hunts. Rudnai (1973) found no such evidence in Kenya and neither did Schaller (1972) in the Serengeti. Selous (1908) believed hunting lions to be "absolutely silent".

Various authors mention that roaring does occur after a kill has been made, (Guggisberg 1966, Rudnai 1973, Selous 1908, Smuts 1982).

During the study on the hunting activities of lions in Etosha (Stander in prep.) no evidence of roaring during 700 observed hunts was found. Roaring did not occur at any of the 120 observed kills.

### CONCLUSION

Roaring occurs mainly during the nightly active periods and mostly at dawn. It appears that Etosha lions have shorter roars than measured in other parts of Africa.

It was possible to distinguish between the roars of males and females, and of individual males, not only by counting the number of grunts but also by the tone of the roar, and by the combination of the two.

No evidence was found to link roaring with hunting or feeding activities, contrary to previous beliefs.

As mentioned, roaring acts as a spacing mechanism. This seems feasible because shortly after the study the whole Ombika pride was destroyed on bordering farmland. Approximately one month after the removal, lions of two adjacent prides moved into the Ombika pride area.

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