

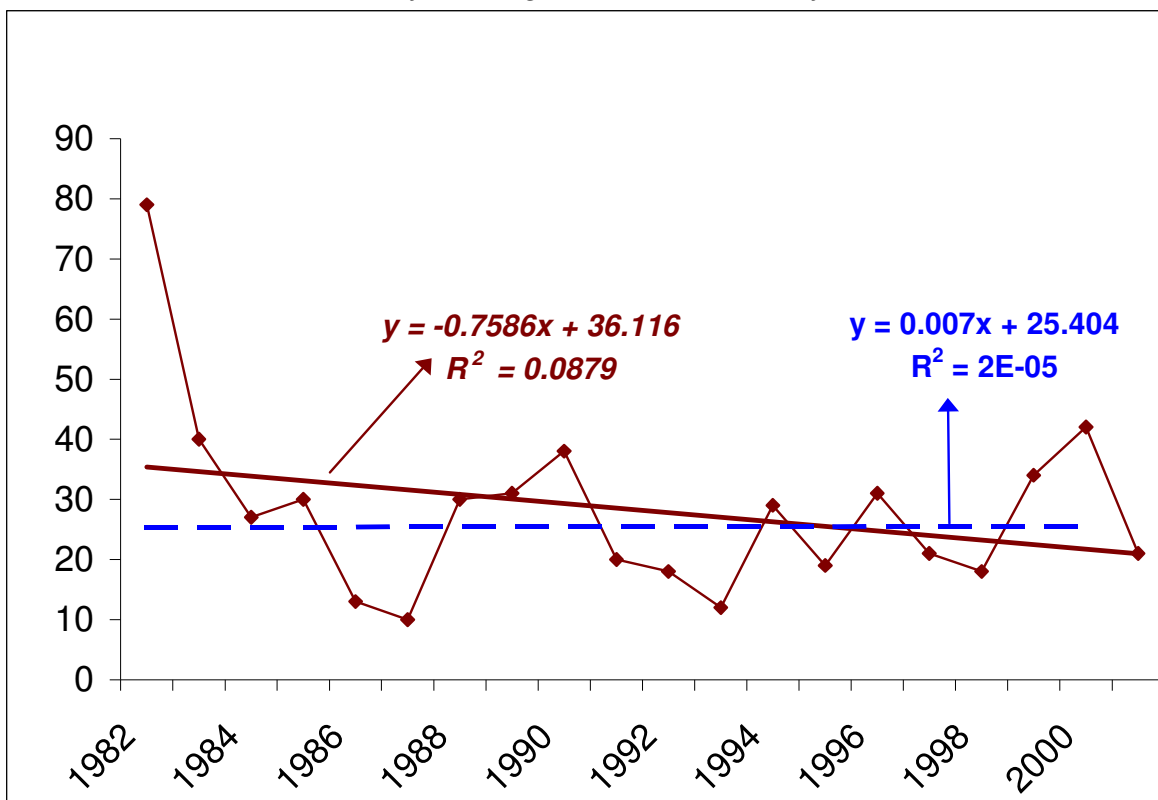
An analyses of the spatial, temporal, and demographic patterns of lions destroyed along the borders of Etosha National Park over a 20-year period. 1982 to 2001

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The conflict between lions and pastoralists bordering Etosha National Park is a well known and documented problem. Every year lions move beyond the borders of Etosha National Park (Etosha) and prey on domestic livestock. In protection of their livestock, pastoralists shoot, trap, or poison lions. Data on these lion mortalities have been collected since 1982. Many individuals, including staff of the Ministry of Environment and Tourism, and visiting researchers, have collected these data. In particular, the following people are acknowledged: H. Berry, I Berhens, L Scheepers, K Venzke, O Fordge, J Kapner & B Kotting.

During the twenty year period a total of 563 lions have reported to have been killed outside Etosha.

The number of lions destroyed along the Etosha boundary, between 1982-2001.



The unusually high figure of 79 lion recorded in 1982 could possibly be incorrect. This was the first year that data were collected and farmers likely reported lions shot during several previous years. If this data point is removed (blue dashed line is the average, excluding the 1982 data point) the running average remains constant and the variance is markedly less.

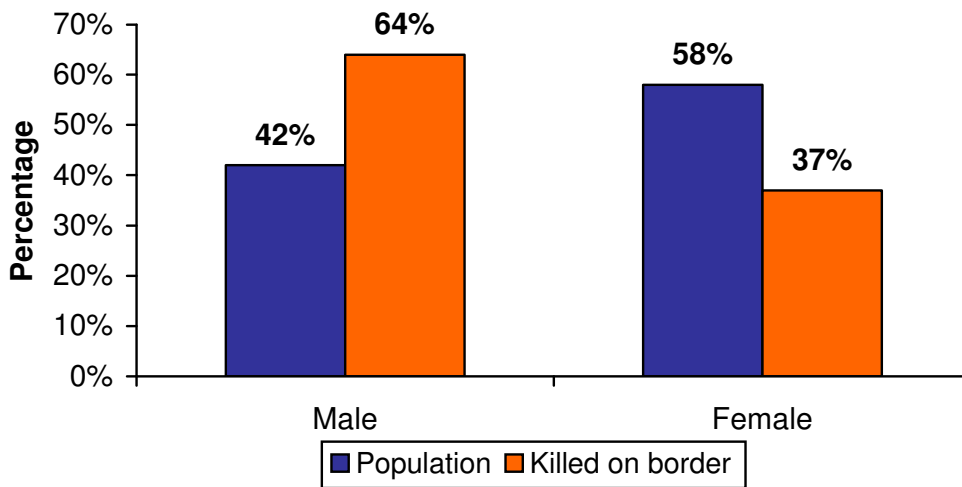
Summary statistics of lions destroyed along the Etosha boundary (1982-2001)

| | All records | Excluding 1982 |
|---------------------------------|-------------|----------------|
| Total number of lions destroyed | 563 | 484 |
| Yearly average | 28.15 | 25.47 |
| Number of years | 20 | 19 |
| Standard Deviation | 15.135 | 9.518 |
| Standard Error | 0.869 | 0.689 |
| Range | 10 - 79 | 10 - 42 |

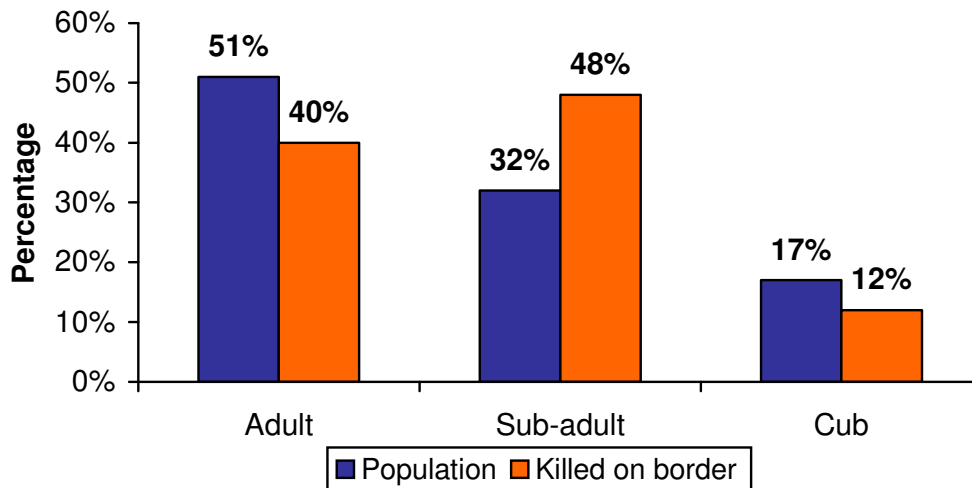
With the exclusion of the 1982 data a constant number of 25 lions were destroyed every year. This average, however, had a standard variation of approximately 50%.

Using a sub-set of the data (N = 508 lions; 1982 – 1999), where data were available, the age and sex structure of lions destroyed were compared with the Etosha population. Age and sex data from the Etosha population were collected between 1985 and 1999.

The proportion of male and female lions destroyed along the Etosha boundary compared with the sex ratio in the Etosha population.



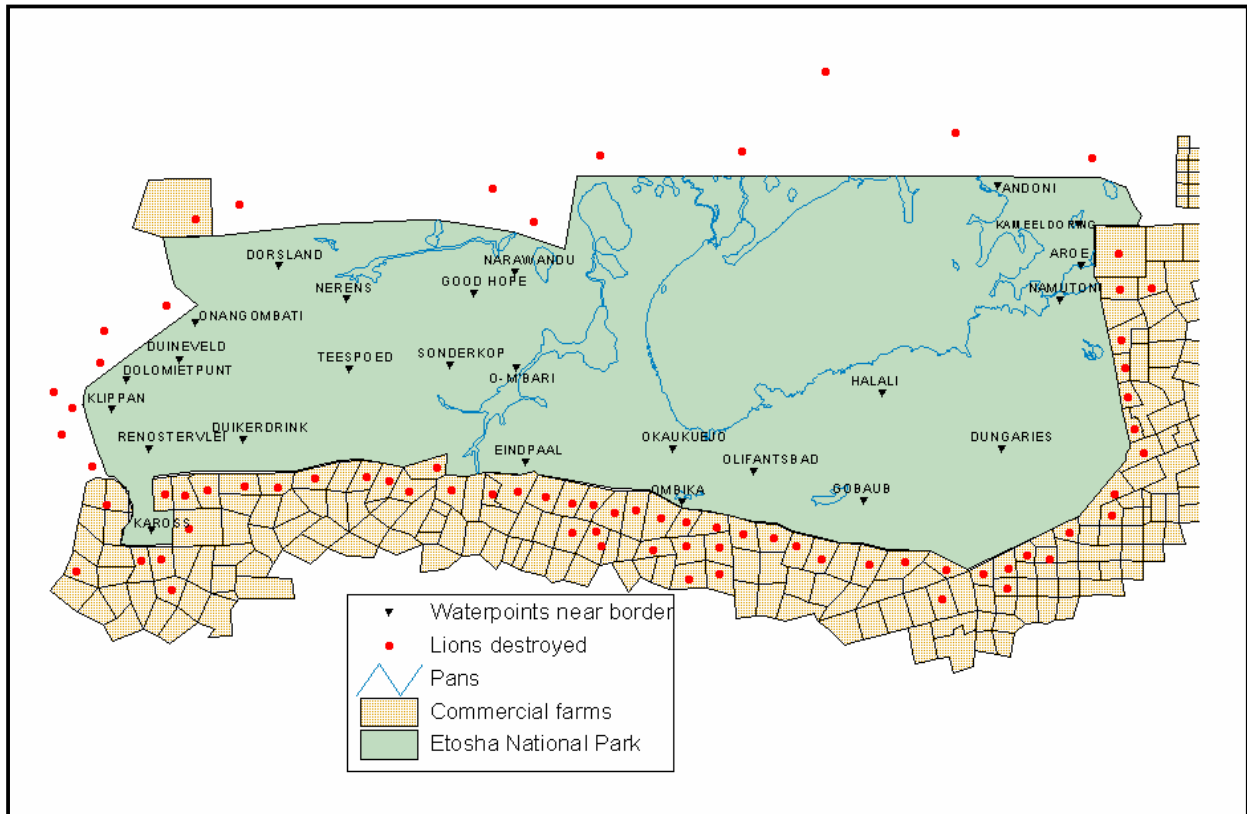
The age-structure of lions destroyed versus the Etosha population.



Slightly more male lions, than lionesses, were killed along the boundaries of Etosha, than was present in the populations. Similarly, more sub-adult lions were destroyed than were present in the population. These discrepancies, however, were not significant.

The spatial patterns of where lions have been destroyed contribute to our understanding of the phenomenon.

Distribution of the locations where lions were destroyed between 1982 and 2001, in relation to land tenure systems outside Etosha, and water points inside Etosha.

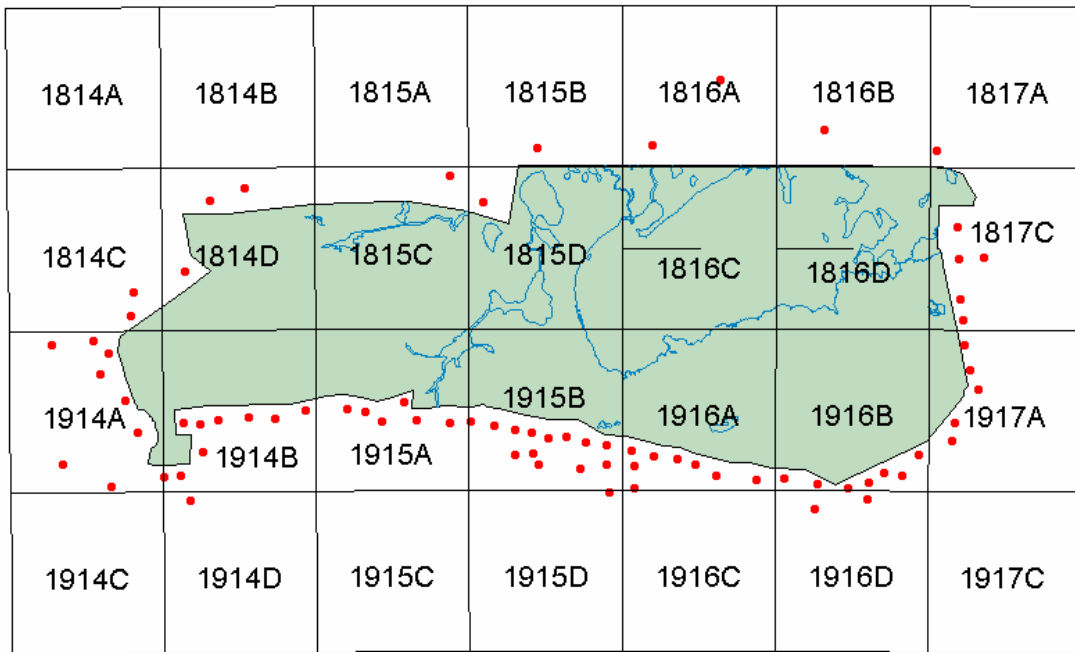


Over the twenty-year period lions moved beyond the Etosha boundary, and were subsequently destroyed, in an apparently uniform pattern. The least number of incidents occurred to the north of Etosha.

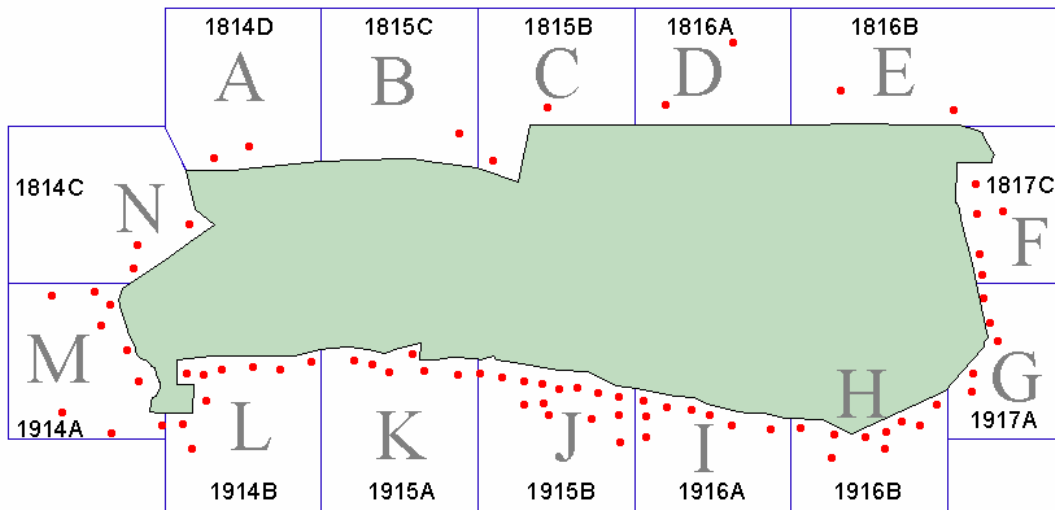
However if the frequency and number of lions destroyed are evaluated, significant special patterns emerge. In order to demonstrate these spatial patterns the Etosha boundary, and bordering land had to be sub-divided into zones. A grid of ½ degree blocks was superimposed on the map of Etosha and the data. The border areas were then sub-divided into approximate ½ degree zones, following the latitude and longitude lines. Each zone was then allocated an identity code, ranging from A to N.

Patterns in the numbers and frequency of lions destroyed between 1982 and 2001, were assessed in relation to the defined zones.

A grid of 1/2 degree blocks superimposed on the Etosha map and distribution of lion mortalities

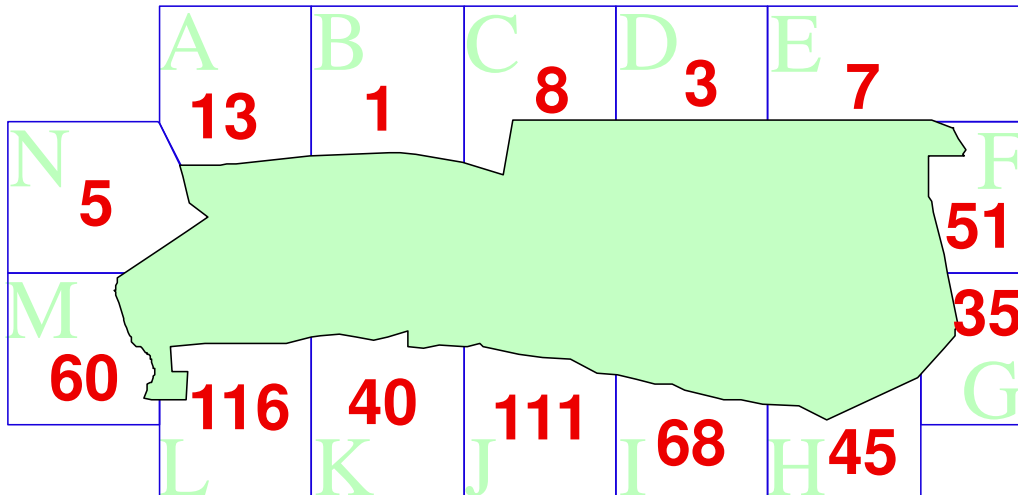


Border zones to Etosha, following 1/2 degree block units



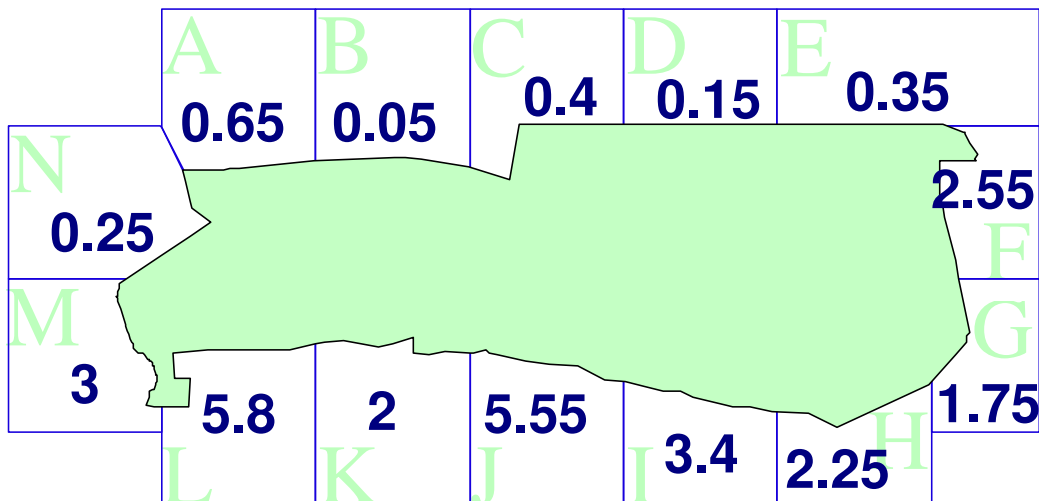
A significant proportion (93%) of the lions destroyed during the 20 years, were killed along the eastern, southern and south-western borders. In fact the southern border of Etosha (zones H to L) accounted for 380 (67%) of the mortalities.

Total number of lions destroyed in each of the 14 Zones over 20 years (1982—2001).



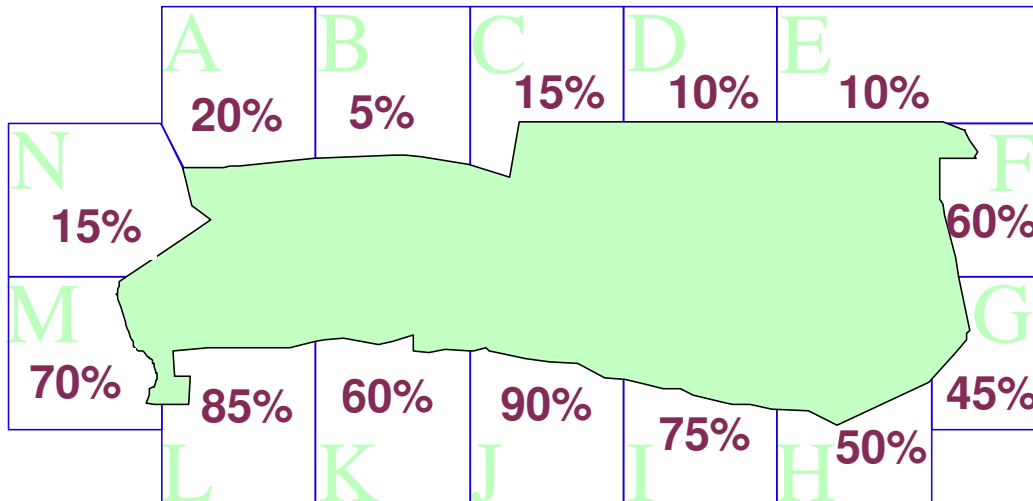
The average number of lions destroyed each year was also significantly higher on the east, south, and south-west border. In zone J, south of Okaukuejo, and zone L, east of Otjovasandu, an average of more than five lions were killed each year.

Average number of lions destroyed per year in each of the 14 Zones, between 1982 and 2001.



In half the zones, especially those to the north and west of Etosha, lion mortalities were recorded during less than half the years. Lions were killed almost every year in zone J and L. The high frequencies along the east, south, and south-west are supportive of the high total number of lions, and the average destroyed per year, in those zones.

The yearly frequency, between 1982 and 2001, that lions were destroyed in each of the 14 Zones (percentage of 20 years).



These data and the results presented here provide a valuable insight into the characteristics of lion mortalities along the Etosha boundary. Although the numbers of lions killed are high, the off-take does not appear to have a limiting affect on the population. Further analysis is, however, recommended. The continuation of monitoring lion mortalities on Etosha borders is highly recommended.

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