

ABSTRACT

The Sungazer (*Smaug giganteus*) is an endemic lizard species that is threatened by habitat destruction and illegal harvesting, and as a result, is listed as 'Vulnerable' on the IUCN Red Data List. The species is restricted to the Highveld grasslands of South Africa, where over 40% of the area is used for crop monoculture, and much of the remainder has been transformed for human habitation and the construction of roads, dams, mines and power plants. This poses serious threats to the persistence of the species, as the Sungazer is a habitat specialist, and is strongly associated with pristine *Themeda* grassland. In addition, the species is illegally harvested from the wild for the traditional medicine, and pet trades. The rate at which these threats are removing habitat and affecting Sungazer populations is unknown, and the lack of such knowledge impedes effective conservation planning. This has prompted the call for research on the population ecology and life history of the species, so that the species can be managed.

Area of occupancy. A minimum convex hull was created around all QDGCs containing species occurrence records, and an Extent of Occurrence (EOO) of 5 833 800 ha was calculated. The distribution of the species (area of QDGCs and portions of QDGCs containing occurrence records that fall within Free State and Mpumalanga Provinces) was calculated as 3 819 600 ha. Of this area, 2 053 035 ha is currently natural. To assess the proportion of EOO and distribution actually occupied by Sungazers, I surveyed 120 random sites for Sungazer presence, and found 5 containing Sungazers (4.17%) within the EOO, and 4 (5.05%) within the distribution. This measure was used to calculate the Area of Occupancy (AOO), which was 103 678 ha.

Population size. I recorded a mean burrow density (MBD) of 6.14 ± 0.87 burrows/ha for 80 sites across the distribution of the species. To estimate the number of burrows within the distribution, I multiplied the MBD by the AOO. I calculated $636\,325 \pm 90\,282$ burrows. Burrow occupancy data reported in the literature indicates that only 85.7% of burrows are occupied at a given time, and there is an average occupancy of 1.83 lizards/burrow in these burrows. When applied to the number of burrows calculated, a total figure of $998\,247 \pm 141\,632$ lizards is estimated to occupy a total of $545\,490 \pm 77\,395$ burrows. Population demographics data reported in the literature indicates that 61.2% of a population is made up of mature (sexually reproductive) individuals, and when applied to the total population size, total mature individual count is $610\,927 \pm 86\,679$ Sungazers.

Population decline. I visited 39 sites where Sungazer populations were reported in 1978, and found a population decline of 20.51% at these sites (0.59% decline/year). I assessed the change in land cover between 2001 and 2009 using geographic information systems (GIS) techniques and found a 13.3% decline in natural habitat across the distribution of the species over this time (1.48% decline/year). The loss of natural habitat was due primarily to an increase in cultivated areas.

Priority conservation areas. Five priority zones, representing the top 20% of optimal Sungazer habitat were identified using an ecological niche model. These zones are spread across the

distribution, with sites situated in the west (Welkom), north centre (Vrede, Edenville), south east (Harrismith) and north east (Volksrust). In total, the priority zones cover 1.7% of the AOO, but are estimated to contain 3-4.4% of the total population based on the habitat quality. The population size estimated contained within these zones is four to five times the mean minimum viable population (MVP) estimated for vertebrate species.

Conclusion. I used my demographic measures to assess the conservation status of *S. giganteus* using Version 3.1. of the IUCN Categories and Criteria for conservation assessments. This assessment improves the precision of the measure of population reduction and includes geographic range for the species. My conservation assessment confirms the current listing of *S. giganteus* as 'Vulnerable' under criteria A2bcd and B2ab. I highlight the need for developing a protocol for translocations, a phylogeographic study to assess the landscape genetics of the species, an investigation of dispersal patterns and colonisation strategies.