

Population ecology of *Psammobates oculifer* in a semi-arid environment

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Abstract

We studied the ecology of *Psammobates oculifer* over 13 months near Kimberley, South Africa, to ascertain if the population's life history traits conform to chelonian patterns in arid environments. Capture rates were highest in spring and lowest in winter when environmental conditions were respectively most and least favourable for tortoise activity. Body condition did not change from autumn to spring, but reached lower values during the summer drought. Capture effort averaged 5 hours/tortoise, which corresponds closely to that of species with low population densities in arid regions. Population size structure was skewed towards adults, indicative of low recruitment and/or low juvenile survivorship. Females were larger and heavier than males, confirming sexual dimorphism in this species. Body size of cohorts scaled to annuli counts, indicating a close correspondence between body size and age. Telemetered adults deposited one or no growth ring in the year of study; consequently, annuli counts could underestimate adult age. Regression analyses showed that male and female growth rates did not differ, but males matured at a smaller size and younger age than females. The smallest male showing reproductive behaviour had 12 annuli and a shell volume of 157 cm³, while similar measures for females were 14 annuli and 185 cm³. The sex ratio of the population did not differ from 1:1 but the bias towards males in spring, and towards females in autumn, indicates that studies limited to particular seasons can misrepresent life history traits of populations. We concluded that the life history of *P. oculifer* conforms to chelonian patterns in arid regions.

Introduction

The evolution of life history traits is determined by the organism's environment while it is constrained by trade-offs and phylogeny (Stearns 1992). Life history characteristics generally fall on a fast-slow continuum, reflecting adaptations to environmental predictability or to mortality rates (Stearns 1983; see Reznick *et al.* 2002 and references therein). Chelonian life histories fall at the slow end of the continuum; they display slow growth, delayed sexual maturity, iteroparity and low hatchling/juvenile survivorship (Wilbur & Morin 1988; Shine & Iverson 1995). These traits seem to be related to the protective value of the chelonian shell, which influences size-related mortality because the shell strengthens with growth (Kuchling 1999). Nevertheless, environmental factors affect many aspects of chelonian physiology, behaviour and ecology, and ultimately influence the life history traits of species (Stearns 2000; Tuljapurkar *et al.* 2009 and references therein).

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