

Abstract

As global climate change warms the Southern Ocean, wild king penguins (*Aptenodytes patagonicus*) possibly face drastic population declines in the future. Also, the captive breeding program in Europe is currently unsustainable and it is thus imperative to determine what is required for successfully breeding king penguins in captivity. The husbandry practices and breeding success of 16 American and European zoos were compared and the population of the sustainably breeding Basel Zoo was modeled using stage-based matrix models. A positive relationship was found between egg productivity and density of king penguins as well as the density of all birds held in the enclosure. Egg productivity was found to be negatively related to deviation from even sex ratio. Therefore, to maximize breeding success zoological institutions should focus on increasing density and striving toward equal sex ratios within populations.

Introduction

Ex-situ conservation could serve as a crucial tool in securing a species' place on our planet in the future (Glowka et al. 1994). Although the king penguin (*Aptenodytes patagonicus*) is currently listed by IUCN as a species of least concern (BirdLife International 2012), this could be different in our planet's unknown future, especially with advancing global climate change. Particularly polar habitats have been affected strongly by increasing temperatures (Solomon et al. 2007) and an accelerated warming of the Southern Ocean can be expected (Mayewski et al. 2009, Liu and Curry 2010). Studies based on current estimates of temperature changes by the Intergovernmental Panel on Climate Change (IPCC) suggest shifts of king penguin foraging ranges and consequently possibly drastic population declines putting king penguins at risk of extinction (Péron et al. 2012, Le Bohec et al. 2008). This is complicated by this species' complex breeding cycle, which extends past one year, and a long generation time (Weimerskirch et al. 1992), both of which are not favorable to microevolution and thus reduce the chances of selective adaptation (Gienapp et al. 2008).

Because of this future risk of dramatic drops in wild king penguin population numbers, it is imperative to determine what is required for their breeding success in captivity, so that ex-situ