

## Using behavioural and state variables to identify proximate causes of population change in a seabird

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**Abstract** Changes in animal population size are driven by the interactions between intrinsic processes and extrinsic forces, and identifying the proximate mechanisms behind population change remains a fundamental question in ecology. Here we report on how measuring behavioural and state proxies of food availability among populations experiencing different growth rates can be used to rapidly identify proximate drivers of population trends. In recent decades, the Cape gannet *Morus capensis* has shown a major distributional shift with historically large colonies in Namibia decreasing rapidly, whilst numbers at South African colonies have increased, suggesting contrasting environmental conditions in the two regions. We compared *per capita* growth rates of five of the six extant colonies with foraging range (using miniaturized Global Positioning System loggers), foraging work rate, food delivery rates and body condition of breeding adults. We found significant associations between the rate of population change, individual behaviour, energetic gain and body condition that indicate that recent population changes are associated with extrinsic effects. This study shows that behavioural and state data can be used to identify important drivers of population change, and their cost-effectiveness ensures that they are an appealing option for measuring the health of animal populations in numerous situations.