dinner-cam

Using digital photography to discover what birds eat

Dietary studies are important to our understanding of animal population dynamics, ecology and evolution, particularly in complex and dynamic ecosystems such as the ocean. Seabirds indicate the health of marine environments and variations in their diet are likely to reflect changes occurring in marine communities. In South Africa, populations of 10 of the 15 breeding seabird species are decreasing, resulting in these birds being classified as Threatened or Near Threatened.

An exception to this trend is the Swift or Greater Crested Tern *Thalasseus bergii*. Unlike other endemic seabirds such as the African Penguin, Cape Gannet and Cape Cormorant that rely on small pelagic fish such as anchovies and sardines, Swift Terns have increased in number in South Africa during the past two decades. Surprisingly, not much is known about the tern's ecology and the only information about its diet is outdated. The most comprehensive study, published 30 years ago, found anchovies to be its main prey.

Most seabird diet studies are fairly invasive; historically, researchers often resorted to shooting animals to obtain the contents of the stomach. More recently, diets have been studied by inducing chicks or breeding adults to regurgitate, a process that can obviously be detrimental at both an individual and a population level. Such methods are particularly difficult to justify when dealing with threatened species. More recently, the use of digital photography has provided remarkable opportunities for biological research as the development of user-friendly and versatile auto-focus cameras allows us to obtain large numbers of high-quality images at relatively low cost.

Swift Terns carry prey back to their chicks in their bills, and this behaviour enabled us to develop a non-invasive photographic sampling method to assess their diet. For the past 10 years Robben Island in Table Bay has been home to the largest colony of Swift Terns in southern Africa. Over three consecutive breeding seasons I documented the terns' diet using a DSLR camera with a telephoto zoom lens, gathering thousands of images of their prey with virtually no disturbance to breeding birds.

The photographic method provided similar results to the traditional sampling of chick regurgitations collected during ringing activities and enabled prey to be appraised – without stress to the terns – routinely throughout the breeding season. Photo-sampling has several key advantages: there is virtually no limit to the number of images that can be captured; it is easy to share images with experts, allowing most prey items to be identified; images are readily archived and can be re-analysed; and prey size can be estimated relative to the birds' bill length. Fortunately, there is little variation in bill length in Swift Terns.

In this species, in which anchovies comprise nearly 80 per cent of its food in southern Africa, prey size is almost as important as prey identification. It provides information on prey cohorts targeted at different breeding stages and overlap with fisheries, and can be used to estimate the tern's energy balance. However, estimating prey size is complicated because terns typically carry prey crosswise in their bills, preventing a direct photographic comparison of fish and bill length. To overcome this problem of curvature of the prey, I measured features that were less frequently distorted than the fish length (such as eye diameter or head width) and from these measurements I estimated the fish's length. The relationship between these features and length was determined from a sample of fish supplied by fishery biologists.

Photographing terns ferrying prey to their chicks on a daily basis led me to realise that the species feeds on a wide range of prey in addition to anchovies. Other common prey items included sardine, red-eye and horse mackerel, but I was surprised to record bottom-dwelling fish such as soles and eels. Even more unexpected were several instances of the birds carrying juvenile shy sharks. Fish were not the only prey; I also identified several squid, crustaceans and crickets that had not been detected in previous studies using traditional sampling techniques.

When combined with measures of chick growth and survival, the dietary information gleaned from this simple but effective method has the potential to provide a real-time ecological indicator of small pelagic fish abundance to augment current fisheries management approaches and so enhance conservation strategies for Benguela seabird populations. It also improves our knowledge of the distribution and relative abundance of non-commercial prey species. The methodology is open to anyone who enjoys photographing birds, provided they are careful not to make too close an approach to the colonies.

Bird photography is a burgeoning pastime and this sampling method is yet another way to bring people and wildlife together for conservation. Photo-sampling can be used for virtually any bird species that carries prey to a known location, and the images generated can be shared and archived digitally. The data gathered will prove valuable to answer as yet unforeseen questions in the future and will help us to assess and mitigate human impacts on natural ecosystems.

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GET INVOLVED

You will need a digital camera with a telephoto zoom lens (100–400mm). To avoid disturbing breeding birds, position yourself at least 100 metres from the colony, ideally adjacent to the birds' main flyways, rather than at the colony itself. Take about three photographs of each bird carrying a prey item back to the colony.

Camera settings

Shutter speed priority (at least 1/2500 sec); automatic ISO (or aperture priority mode that provides shutter speeds of at least 1/2500 sec); high-speed continuous shooting; autofocus on AI Servo (for moving subjects) using the AF point expansion (image stabiliser on). For high-speed recording, use large .jpg file format.

above *An adult Swift Tern offers a long-snouted pipefish to its young.*

above *Juvenile shy sharks were an unexpected food item caught on camera.*

top *Anchovies comprise nearly 80 per cent of the Swift Tern's diet in southern Africa.*