

King penguins



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First encounters with king penguins are unforgettable: the sound and smell of a hundred thousand birds gathered on the beach and by the river at St Andrews Bay is surpassed only by the spectacle that these beautifully plumaged penguins offer the visitor. Whether in the depths of a snowy winter landscape or beneath the brilliant blue skies of a still summer's day, their characteristic grace, superbly contrasting slate-grey and white feathers, and golden orange 'ear' patches, are captivating.

King penguins breed on sub-Antarctic islands that lie close to or within that body of circumpolar water south of the Polar Front and north of the winter pack-ice edge. South Georgia is their South Atlantic stronghold, with over 400,000 pairs breeding in huge colonies found mainly along the north coast. Their reproductive cycle is unique among penguins since it requires more than one year to raise a chick. Birds that failed to breed successfully the previous year ('early breeders') start courtship in November after they have finished their moult. A single egg is laid in early December and incubated on the bird's feet for 54 days until the chick hatches in late January. Hatchlings are then guarded in turn by one parent while the other forages at sea, returning frequently to provision the chick with food.

Once the chick is six weeks old, it no longer requires the warmth and protection of its brooding parents, thanks to a growing layer of fatty tissue and a fluffy brown coat of downy plumage that contrasts so markedly with the sleek lines of the adults. The chicks gather together in crèches, often along

river banks – ribbons of brown amid the mass of grey and orange adults. With both parents now free to forage simultaneously the chick receives double the amount of food and by the end of summer has accumulated the large fat reserves it needs to survive the oncoming winter months. At this time, parents may be away for several weeks as they search the ocean for fish that have become less abundant and are further offshore than in the summer. Meanwhile the chicks huddle together for warmth and shelter, a great body of dark brown on white snow.

With the return of spring, food supplies increase and the chicks are fed more frequently until fledging which starts in December. Successful breeders – those that have raised a chick to fledging – then take a 3 month break before laying their next egg at the end of summer. Chicks of these so-called 'late breeders' are usually too small at the onset of winter to survive the imminent starvation period and it is only in years of favourable winter feeding that some chicks survive to fledging at the end of the following summer. Thus, although king penguins are able to rear two chicks within three years, they most commonly raise one chick and have one failed breeding attempt over a two year period.

South Georgia kings were studied by Bernard Stonehouse who set up camp with the seal biologist, Nigel Bonner, in 1953 at Ample Bay near Salisbury Plain in the Bay of Isles and unravelled the complexities of their unique breeding cycle. Despite their conspicuous year-round presence ashore, it became apparent that these penguins

in fact spend most of their time at sea, where their activities remained a mystery until the recent advent of new technology in the form of miniaturised data loggers. These instruments are attached to the birds' plumage or inserted in their stomachs, storing and transmitting information that tells us where, when and how the penguins feed.

Time depth recorders have told us much about the birds diving behaviour. Their dive profiles reflect the daily migration pattern of myctophid lanternfish, the staple diet of king penguins. These fish swim in dense shoals, moving to the surface at night and returning to the ocean depths in the day, and similarly, the penguins' night dives are no deeper than 30m, whereas during the day they may reach depths of over 350m. The duration of such deep dives can exceed 7 minutes. Most surprisingly, the surface recovery periods are only about two minutes between dives and the birds are able to make up to 7 deep dives in an hour. The physiological adaptations behind these magnificent capabilities are still poorly understood. However during a dive heart beat frequency and blood perfusion is significantly reduced, a

physiological adaptation previously known only in seals. Results from stomach temperature sensors show that more fish are caught during the day at greater depths than during the shallow night dives. These devices also show that towards the end of a foraging trip the temperature of the lower abdomen is maintained well below the average body temperature of 37°C. This is thought to be an adaptation to keep the food as fresh as possible until the meal can be delivered to the chick.

Sophisticated tracking devices have allowed us to follow the birds on their summer foraging trips as they swim the 250km north to the rich feeding grounds of the Polar Front, travelling distances of up to 100km a day back and forth to the colony.

In winter, the birds are thought to feed at the edge of the pack ice zone, thousands of kilometres and several weeks distant from their breeding site.

How they navigate to and from their remote foraging grounds is still unknown.

