

We found the sea lion sleeping in a children's playground beneath a water slide

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ADAPTED TO CHANGE

by Stella Villegas-Amtmann

After many days of radio silence, we suddenly heard a beep. It was the signal from a transmitter we had attached to a Galapagos sea lion ten days earlier. That is how we knew she was back from her foraging trip, returning to the island of San Cristobal to nurse her hungry pup that had been waiting on the beach.

The signal was strong but its direction was hard to determine. We searched all the beaches where sea lions haul out, but this female was nowhere to be found. It was crucial to locate her as she was carrying an instrument with highly valuable information about her foraging trip, and we needed a sample to help us to determine the metabolic rate of this species for the first time.

As we walked through town, searching for higher ground to scan, the signal became stronger. How could this be? There was no beach nearby. The sea lion surprised us. Eventually we found her lying in the middle of town, sleeping in a children's playground beneath a water slide. We transported her down to the beach and recovered our instruments.

The Galapagos sea lion poses a conundrum. Of all six extant sea lion species, this is the smallest. Adult females have a mass of around 75 kg compared to California sea lions, the next smallest species, with an approximate mass of 95 kg. There is a limit then to the amount of oxygen they can carry, which should constrain their ability to make long, deep dives. Yet all evidence to date suggests that the Galapagos sea lion is a more proficient diver than many of its closest relatives.

As the Galapagos sea lion lives in less productive, unpredictable and warmer waters than other species, it could have evolved the ability to operate at a lower metabolic rate. In order to explore this idea, we studied the behaviour of ten female Galapagos sea lions that were suckling pups and yearlings.

We focused on lactating females given that lactation is the most energetically expensive period in the life of mammals.

We fitted them with time-depth recorders to inform us about the depth and duration of their dives and VHF radio transmitters to help us locate them on land. Before release, we injected them with a small dose of isotopically labeled water and took a blood sample. A second blood sample collected soon after each animal returned from a foraging trip would allow us to calculate their metabolic rate.

Interestingly, we found that the age of the pups had a strong effect upon the foraging behaviour of these mothers. Those with the youngest pups around one-month old travelled to the north of San Cristobal, whilst females with older yearlings headed

west, suggesting the two groups may be targeting different prey types. Females going north are probably hunting fish in the water column, both close to the surface and at great depths, while females going west are likely after those nearer the sea floor.

The data from the time-depth recorders confirmed just how impressive this species is at diving, with events often lasting well over ten minutes and reaching depths of almost 600m below sea level. This far exceeds the reported duration and depths of the New Zealand sea lion, the species formerly considered to be the sea lion with the longest, deepest dives. Our calculations of metabolic rate hint at how they might be achieving such feats. The Galapagos sea lion has the lowest metabolic rate of any sea lion measured to date.

All these traits – the flexibility of foraging patterns, the extreme dives and the low metabolic rate – may help the Galapagos sea lion to survive in an environment where the waters are frequently warm and the productivity is low and unpredictable. In spite of these adaptations to change, however, Galapagos sea lion pups commonly face higher nutritional stress than sea lions living at higher latitudes. The concern, therefore, is that the oceans continue to warm and productivity declines still further. For the Galapagos sea lion, a species that might already be operating close to its physiological limit, this may prove to be a change too far.



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