SPINY Individual

by Peggy Rismiller

Pelican Lagoon: Research C&— Echidna

TYRES SCREECH the car swerves, and passengers hold their breath as all stare at the amazing, prickly creature waddling across the road. Disturbed by urgent sounds and strange smells, our spiky friend hurries headfirst into a bush and remains motionless, hoping not to be seen. Safely halted, all pile out of the car and cry in unison: 'Wow, it's an Echidna!'

Everyone loves seeing an Echidna. Why? It's a rare and unusual sight; body covered in spiny armour, bird-like beak, hind feet rotated backwards giving it a funny, rolling gait. These features combine to give us the charismatic creature that fascinates Australians and international visitors alike. In this Olympic year, the Short-beaked Echidna ***(Tachyglossus aculeatus)*** is one of our mascots. Cute and charismatic on the surface, what really makes our Echidna so special? The Short-beaked Echidna is one of only three, living, egg-laying mammals in the world. The others are the Platypus ***(Ornithorhynchus anatinus)*** and Long-beaked Echidna. These three belong to a group of mammals called monotremes that have the distinction of beina the oldest survivina mammal familv in the world.

The Echidna's ancestors roamed the planet with the dinosaurs more than 120 million years ago. Short-beaked Echidnas and Platypus can only be found in Australia. The Long-beaked Echidna is restricted to Papua New Guinea. It's true, we do have the largest and greatest variety of pouched mammals, but marsupials can be found on three other continents. Our monotremes are unique. Of the three monotremes, the Short-beaked Echidna is the most adaptable. Echidnas are Australia's most widely distributed native mammal. They can be found in every state and territory, inhabiting every ecosystem from inland desert to coastal waters. and from trooical rain forests to alpine regions above the snow line. How do they do it? What amazing secrets lie behind their survival?

Solo survival

Although rnonotreme history dates back 120 million years, Echidna biology has only been scientifically documented during the last 200 years. The first Echidna specimen was shipped to London in 1791; a year later, it was described in a scientific journal. One fact scientists couldn't learn from the specimen was that the Echidna was an egg-laying mammal. It took science nearly another 100 years to discover this unique and very un-mammalian trait. Why? Echidnas are solitary-living, masters of camouflage and extremely quiet. In other words, they are difficult to find and study. They are also fiercely independent and use large areas as home ranges. They defy captivity and are known to be great escape artists, digging through wooden, plastic or concrete barriers and scaling walls a couple of metres high. Confined, their behaviour alters, and they don't readily breed.

To learn more about the special characteristics and life-history of the Echidna, I moved to Kangaroo Island, South Australia. For more than a decade I've been living in the field and working with Echidnas in their natural habitats. Together with a team of colleagues, we've established a program that will enable generations of biologists to continue learning from a known population of Individual Echidnas. It still takes us nearly 300 hours of searching on foot for a first encounter with an Echidna. So if you see an Echidna while walking through the bush or driving your vehicle, consider yourself extremely fortunate. Although Echidnas are widely distrlbuted, their population densities aren't high. Today, after following individual Echidnas for more than ten years, I categorise their unique qualities with one word — individualism. Although Echidnas. as a species. have characteristic traits for survival, each animal uses specific adaptations of these traits.

Echidna Food

Many books still advise that Echidnas are highly specialised, feeding solely on ants and termites. In reality, Echidnas are versatile foragers, dining on a multitude of invertebrates in varlous forms. These include beetles, earthworms, moth larvae, ant eggs, cockroaches and even centipedes. As a group, the invertebrate family has been around much longer than mammals. Some invertebrates, such as the cockroach, have proved to **be** virtually indestructible, so eating invertebrates is a smart move for long-term survival. Some of the Echldnas favourite invertebrate foods are actually too large to be ingested whole. These include the thumbsized, julcy, plumpbodied larvae of many beetles and moths that rest under bark or in the roots of plants awaiting pupation. We've watched Echidnas digging up these delicacies. They use thelr beak as a battering rod, ramming the body of the larvae until it splits open. Then. before the nutrltrous hiah-fat, hiah-protein body content can ooze out. the Echidna efficientlv transports the contents to its mouth with its darting, worm-like tongue. Some Echidnas even show food preferences, foraging more extensively for one food source than another. Why? Individualism, adaptability and survival. Additional food-for-thought about the Echidna, and what makes it so different from other mammals, is the entire eating process. Its tiny mouth is located on the underside of the beak, not close to the neck, but at the tip. The long, thin, lower jawbones of the Echidna are not articulated as in other mammals. They rotate on their longitudinal axis as tongue movement opens and closes the mouth. The gape of the mouth is only as large as the widest part of the tongue. Incredibly agile, the tongue can **be** up to 17 cm long when fully extended. Strong muscles at its base in the throat control its darting action. The Echidna's Latin name. ***Tachyglossus,*** means 'swift tongue'. Echidnas have no teeth, but grind their food between a rigid, spiky, studded palette and a horny plate on the back of the tongue.

Energy efficiency

Another highly-specialised monotreme characteristic is low body temperature. Both Echidnas and Platypus carry out their daily activities at a body temperature of 31-33C. Our body temperature, and that of many other mammals, is close to 37°C. **If** Our temperature varies a few degrees in either direction we're in big trouble. We've documented Echidnas on the move with a body temperature of 26°C. In the 1970s, researchers worklng In the Snowy Mountains showed that Echidnas could lower their **body** temperature to **2°C** and hibernate.

We now know that Echidnas from many different parts of Australia are capable of torpor, a lowering of body temperature and metabolism. But what good is this condition to Echidnas living in the tropics or in temperate regions? Torpor is an energy-saving mechanism that can be used at any time of the year. During the hot summer months, Echidnas must avoid the heat because they can't sweat or pant. In addition, some of their food sources disappear deep into the ground. Looking for food means expending energy. If times are tough for any reason, saving energy is a good idea. As with food preferences, use of torpor by Echidnas on Kangaroo Island is individualistic. This 'lower the body temperature strategy' was once considered imperfect or primitive regulation. Now, scientists are beginning to see it as a highly sophisticated method of coping with pressures and stress. Through the long processes of biological adaptation we call evolution, many species have lost this strategy and developed more specific mechanisms.

Ancient survival plan

Echidnas are not prolific breeders. During an eight-year period, we monitored 17 reproductively active females, that produced 22 young. Breeding cycles were individualistic, but most females mated every three to five years. One female did breed in three consecutive years, but died the following winter. A long-term strategy of not over-populating means Echidnas never compete with themselves. As long as they have an intact ecosystem, they won't put excessive pressures on habitat or food availability due to their own over-abundance. An ancient survival plan? In today's environment, where major changes to habitat and land use are occurring at previously unknown rates, this strategy may not continue to be viable. Indeed, many question if the Echidna can survive our rapidly changing world.

Less than 200 years ago, adult Echidnas had few natural predators. Other animals were easier to eat than the Echidna. Large snakes, lizards and perhaps Quolls or Tasmanian Devils preyed on burrow young Echidnas. Based on our observations, this accounts for a 10 to 15 per cent loss through natural mortality. Generally, Echidnas didn't have a lot to worry about, so low reproduction rates kept populations in balance within natural ecosystems. During the past decade, 33 per cent of all young hatched in my study area were killed before they were weaned. Although goannas took a few, feral cats killed the majority. There are no foxes on Kangaroo Island, and no feral pigs in the study area. Both of these introduced mammals are impacting Echidna numbers on the mainland. A recent Australia-wide Echidna survey. ***Echidna Watch,*** recorded that an astonishing 22 per cent of all Echidnas sighted were dead. Reports documented that more than 90 per cent of all deaths were road kills, followed by mortalities on electric fences. The effects that herbicides and pesticides are having on the invertebrate food chain and Echidna health are unknown and not easily recognised. The long-term implications of placental mammal invasion to Australia cannot yet be assessed. Maybe the individualism of Echidnas will cope with this challenge.

The Echidna may appear a strange and inadequate creature at first sight. But behind those well-protected eyes and toothless beak is a highly developed brain giving it acute senses of hearing, smell, sight and intelligence. Attached to the short, stout limbs is a complicated muscular system from which the Echidna derives its phenomenal strength. Echidnas are special. They exploit unorthodox physical features, habits, biology and life styles. Echidnas have been loners and survivors, not just for centuries, but over millennia. The Echidna embodies the essence of the archetypal Aussie, a true individualist with the art of survival. This year, by remembering, sharing and mplementing some of the strategies used by the Echidna, we can nake our Olympic mascot more that just an icon for sport. The Echidnais a living model for the future. — **Peggy Risrniller**

Photos: McKelvey-Rismiller

top: *An Echtdna's nostrils are located at the tip of its soft, leathery beak The small, dark eyes glint with mtelligence.*

middle, *At 45 days-old, a puggle's eyes are still closed and i tbecomes too large to fit inside its mother's pouch.*

above left; *By 90 days-of-age, burrow young are covered w i t soft, dark hair The young remain in the burrow until weaned at seven months*

above r i g h t *Echidna h i n feet are turned backward, have five claws and often a spur.*

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