**AUSTRALIAN WALKABOUT TALKING POINTS**
**– KANGAROO/WALLAROO/WALLABY, EMU & CASSOWARY**

## AUSTRALIAN WALKABOUT BAG INVENTORY

- Gray Kangaroo skull (similar in size to a red kangaroo)
- Red Kangaroo pelt (female)
- Emu egg
- Genus *Macropus* (Kangaroo/Wallaby/Wallaroo) & Emu and Cassowary Resource Cards

**Note:** Please return all items to the bag, and make sure lids are secured. Things should be left exactly as you found them. Wrap skull and place in padded insert.

## KANGAROO/WALLAROO/WALLABY (Genus *Macropus*) GENERAL CHARACTERISTICS

- Kangaroos, wallabies and wallaroos are considered macropods (Family Macropodidae, Genus *Macropus*). They are in the Order Marsupialia, endemic to Australia and are distributed across the continent. "Macropod" comes from the Greek for "large foot".
- Marsupials are named for the marsupium, or pouch, where the young develop after birth.
- The primary characteristic defining the Order Marsupialia is the unique reproductive system in that they lack a true placenta. Young or "joeys" are born after a short gestation and develop within the mother's forward facing pouch.
- **Kangaroos** are medium to large herbivores with enlarged hind limbs and feet more than 10 inches in length.
- **Wallaroos** are medium sized, but stockier than kangaroos, with feet less than 10 inches.
- **Wallabies** are all smaller and more slender in build than kangaroos and wallaroos.

## KANGAROO/WALLAROO/WALLABY (Genus *Macropus*) PHYSICAL ADAPTATIONS

1. **Skull/Dentation** (see skull)
   - Head is small in relation to the body with eyes high on skull for a wide field of vision
   - Ears are relatively large
   - Dentition suitable for grazing or browsing; teeth consist of a broad, straight row of incisors, no canines, with a gap (diastema) before the molars.
   - The diastema (gap) allows room for the *Macropus* spp. to manipulate food with their tongues.
   - The two lower incisors protrude forward giving them an elongated surface for cutting grass. *Macropus* spp. are able to cut grass extremely close to the ground.
   - The two sides of the lower jaw are not fused together as in other mammals. As the *Macropus* sp. opens its mouth, the lower jaw slides forward and the two incisors separate. As the *Macropus* sp. bites down the incisors separate more, exposing a larger surface area these lower incisors that can oppose to the upper incisors. (see photo)
   - The four pairs of molars are on either side of the jaws, but only the front ones engage. Molars that are worn down to their roots by the tough, abrasive grasses fall out and those from the rear migrate forward to take their place. Elephants and manatees have similar tooth development.
   - By the time the animal is near the end of its life, 15 -20 years old, its last molars are in use.

2. **Body Characteristics**
   - Females have a pouch, which opens forward and contains four teats. The pouch is mostly hairless; the mother's warm skin helps to keep the babies warm. (see photo)
   - *Macropus* spp. have insulating layer of fur that helps maintain constant body temperature. The lighter color helps radiate the sun's rays. They also become less active and stay in the shade when temperatures are high, panting, sweating, and licking its forelimbs. (see pelt)
   - *Macropus* spp. vary in size considerably, but most have very large hind legs and long, powerfully muscled tails, which they use as an extra leg when moving slowly or as a counter balance at higher speeds.
   - Their short front legs have five separate digits that have sharp claws. Their front paws are used with great dexterity in eating, grooming, and self-defense. (see photo)
   - The very long, narrow hind feet have a distinctive arrangement of toes. The fourth toe is very large and strong, the fifth toe moderately so; the second and third are fused; and the first toe is usually missing. This adaptation is allows for a efficient sartorial (jumping) gait (see photo)
   - Hind legs work much like a rubber band, with the Achilles tendon stretching as the animal comes down, then releasing its energy to propel the animal up and forward, enabling the characteristic bouncing locomotion. (see illustration)
3. **Senses/Scent Marking**
   - *Macropus* spp. have excellent senses of smell, sight and hearing.
   - Ears are able to swivel 180 degrees around to focus on a specific direction.
   - *Macropus* spp. have a wide field of vision.

**KANGAROO/WALLAROO/WALLABY (Genus *Macropus*) BEHAVIORAL ADAPTATIONS**

1. **Lifestyle**
   - Species are mainly nocturnal and crepuscular.
   - *Macropus* spp. also conserve water and stay cool by resting during the heat of the day and emerging in search of food, mainly in the cooler evenings and nights.
   - They can survive temperatures in excess of 104 degrees Fahrenheit by staying in shade and avoiding activity during the day.
   - A *Macropus* sp. will sometimes lick its paws and run them over its fur, which helps it cool off when the weather is hot.
   - **Sartorial gait** - progress by leaps and bounds using their hind legs. *Macropus* spp. are optimized for economical long-distance travel at fairly high speed.
   - Kangaroos live in groups called **mobs**; a mob is led by a mature male and consists of younger males and females with their young; mobs are usually contain 2-10 individuals. Wallabys and Wallaroos tend to be more solitary but this varies between species.
2. **Communication**
   - When alarmed, they will make a guttural cough to warn others.
   - They will stomp their hind legs on the ground when in danger. This alarm signal is loud and carries over a long distance.
   - *Macropus* spp. communicate with clucking noises while courting.
3. **Diet/Eating Habits/Digestion**
   - *Macropus* spp. are herbivorous. Some are browsers, but most are grazers and are equipped with appropriately specialized teeth for digesting fibrous plants, in particular grasses and sedges.
   - *Macropus* spp. exhibit foregut fermentation and are ruminant-like; they have two stomach chambers with gut microbes in the first chamber to help digest plant material.
   - The *Macropus* sp. may spit up bits of undigested food, rechew it and then swallow it again.

- *Macropus* spp. are able to digest their food with a low emission of methane relative to the ruminants.
- Adapted for frequent dry spells, *Macropus* spp. can go weeks, and even months, without drinking water. They gain sufficient moisture through the food they eat. Water conservation is aided by the *Macropus* spp. slow system of digestion, as they drain every possible bit of moisture from their food before disposing of waste.

**4. Breeding/Reproduction/Parental Care**

- *Macropus* spp. lack a true placenta just as all marsupials; female marsupials have dual reproductive systems. The young are born in a minimally developed state after a brief gestation period. (Growing time in the marsupial actually exceeds the gestation period).
- Average gestation period is 36 days.
- Male *Macropus* spp. establish dominance via fighting.
- Kangaroo males kickbox over breeding rights and displaying dominance. The two opponents clasp forearms and trying to kick one another in the belly. (see photo)
- *Macropus* spp. usually give birth to one young at a time. The young are called "**joeys**."
- Joeys are 1-1.5 cm long (less than an inch long - about the size of a jellybean) and weigh less than a gram (.03 oz). (see photo)
- Newborns are blind and hairless; at birth only the clawed forelimbs, tactile sense, olfactory sense, and static sense (anti-gravity reflex that allows them to know which way is up) are well developed. (see photo)
- The newborns climb upward to the marsupium (pouch) and attach themselves to a teat. At this point they are too undeveloped to suckle, thus the teat swell to lock into place and milk is "injected" into the mouth of the joey. (see photo)
- The young reach the pouch within 3-5 minutes without assistance.
- The female *Macropus* sp. exhibits **embryonic diapause** and as a result is usually permanently pregnant. The female mates shortly after giving birth and if she is impregnated, the new embryo in the womb will grow for the first week and then become dormant, allowing the mother's body to continue to provide for the joey in the pouch. The development of the embryo is delayed until the older sibling leaves the pouch, usually at about 7 or 8 months old or if the embryo should die for some unknown reason.
- Embryonic diapause is an advantage - an expectant female can retain an embryo in ready reserve for months, until the conditions are right for its continued development.
- A female may have three offspring simultaneously in different stages of development; the new dormant embryo, the joey in the pouch and a partially weaned offspring (referred to as "**young-at-foot**").
- The mother's body is able to produce a different composition of milk in each nipple; one to feed the joey in the pouch and the other (this is richer) to feed the joey out of the pouch.

**KANGAROO/WALLAROO/WALLABY INTERESTING/FUN FACTS**

- *Macropus* spp. are the only large animal to use hopping (**saltatory gait**) as their primary method of locomotion. Hopping is a fast and energy efficient means of travelling which allows them to cover large distances in habitats where little food and water are available.
- Kangaroos are good swimmers. They kick their legs differently on land (moves both legs at the same time) than in the water (moves one leg at a time).
- They are bipedal animals but they can't walk or go backwards. The hind legs are designed to move together for hopping.
- A male kangaroo is referred to as a buck, boomer or Jack; a female is a doe, flyer or Jill.
- Does the joey eliminate (pee and poop) in the pouch? Yes, indeed! When it is very small, the joey doesn't produce much, and when it gets bigger, some is absorbed through the

pouch lining. The pouch can get kind of smelly, though, so the mother cleans out her pouch from time to time.
- The red kangaroo, along with the emu, are on the Australian Coat of Arms. Because kangaroos are unable to move backwards and hence they are always moving forward, Australia uses a kangaroo as a symbol of the country's resolute nature and dedication to progress. (see photo)

**KANGAROO/WALLAROO/WALLABY CONSERVATION TALKING POINTS**

- Most *Macropus* spp. are listed as Least Concern on the IUCN Red list (all species at the zoo are abundant). Some of the other macropods that are not in the Genus *Macropus*, such as the tree-kangaroo and rat-kangaroo, which are smaller, are at the greatest risk.
- Most *Macropus* spp. are not considered to be in any immediate danger of extinction due to populations being relatively abundant throughout their range. They are susceptible to habitat destruction and drought.
- Climate change is a threat to *Macropus* spp. Even though the *Macropus* spp. are able to adapt to a variety of areas and living conditions, there is a limit to what they can tolerate.
- *Macropus* spp. have few natural predators. Some of the smaller *Macropus* spp., such as the wallabies, are threatened by dingos, as well as the introduced species such as foxes, feral cats, and both domestic and feral dogs and humans.
- The Australian aborigines and later the European settlers have been hunting *Macropus* spp. for thousands of years for their fur and meat. There are now protected areas for most *Macropus* spp.
- The larger kangaroos, such as the red and eastern grey kangaroos, are reproducing so rapidly that population surveys have to be taken and kangaroos culled. Populations have grown due to land clearing and the subsequent abundance of grass and farmers have come to view kangaroos as pests.
- Today the legal culling of kangaroos is strictly controlled, to ensure that only those species which are a real problem are culled, thus leaving the smaller and usually rarer species an opportunity to re-establish their numbers - so depleted in the past by the advent of European settlement in Australia. The meat and hides from culled animals are sold.

**KANGAROO/WALLAROO/WALLABY OF THE AUSTRALIAN WALKABOUT**
**Specific Species, Adaptations and Home Ranges**

The San Francisco zoo has 3 *Macropus* species: **Red-necked Wallaby** (*Macropus rufogriseus*), **Common Wallaroo** (*Macropus robustus*), and **Red Kangaroo** (*Macropus rufus*)

1. **Red-necked Wallaby** or **Bennett's Wallaby** (*Macropus rufogriseus*)
   - Red-necked Wallabies inhabit the coastal eucalyptus forests of eastern and southeastern Australia with moderate shrub cover and open areas nearby. They can also be found on Tasmania (see map)
   - **Sexual dimorphism:** Males are about 10% larger than the female.
   - Fur is dense and sufficient to withstand freezing weather, showing an evolutionary adaptation to the conditions in their original home, Tasmania
   - Wallabies are mainly solitary but will live in a mob when there are adequate resources.
   - Molars of kangaroos differ from those of wallabies; kangaroos have ridges to help chop up vegetation. Wallabies primarily eat leafy, softer vegetation, which is less fibrous than grass. Their molar teeth crush the vegetation rather than chop it.
   - Weight: males 33 -55 lb, females 26 -34 lb, head- -body-length 1.75-3.5 ft, tail 2.5 ft
   - Lifespan 15-18 years in wild

2. **Common Wallaroo** (*Macropus robustus*)
    - The Common or Hill Wallaroo are found throughout Australia in coastal mountains and rocky inland ranges, preferring grass covered stony ridges.
    - Wallaroos have coarse, shaggy fur, a hairless muzzle, a relatively short, thick tail, and a distinctive upright hopping style.
    - **Sexual dimorphism**: Males are about twice the weight of the female and darker colored.
    - Wallaroos have shorter limbs than other kangaroos, which may be an adaptation for leaping around on rocks of their habitat. There short, broad hind feet have roughened soles to give extra grip on rocks.
    - Can jump up to 13 feet and may reach speeds of 30 mph in open country
    - Births can occur at any time of the year.
    - They lead sedentary and essentially solitary lives. The density of populations is governed both by the amount of available shelter and by proximity to food and water.
    - Wallaroos' behavior is adapted for survival in arid environments where temperatures may reach as high as 120 F. To regulate their body temperature they pant to induce evaporative cooling and also excavate holes near or under rocks and stunted trees. In the hole, they lie in an upright position minimizing their exposure to solar radiation.
    - To minimize water loss, they venture from their shelters and forage in the evening, usually within 200 m from their shelter.
    - Weight: males- 60 - 90 lbs, females- 40 – 53 lbs, head-and-body-length male 3.3-4.5 ft, Tail 2.3-3 ft
    - Life span: 18 years in wild
3. **Red Kangaroo (*Macropus rufus*)**
    - Red Kangaroos are found scattered throughout the central region of Australia where there are dry grassy plains including scrubland, grassland and desert habitats. (see map)
    - The Red Kangaroo is the largest living marsupial.
    - **Sexual dimorphism**: Males are about 2x the size of the female.
    - Male coat color is usually reddish brown giving them the name " red boomers," whereas female coat color is bluish giving them the name "blue flyers".
    - Males are noted for strong-smelling, colored glandular secretions on their neck and chest.
    - Large red kangaroos can reach a running speed of 40 mph, with leaps as long as 26 feet and as high as 10 feet.
    - Red kangaroos are capable of conserving enough water and selecting enough fresh vegetation to survive in an arid environment. The kangaroo's kidneys efficiently concentrate urine, particularly during summer.
    - They have larger nasal passages than those of other kangaroos, which they use for panting to cool off. Panting is more efficient than sweating because it cools core body temperatures, especially in the brain.
    - To help conserve water, they sweat only when exercising.
    - Births can occur at any time of the year.
    - Sexual maturity is reached at 15-20 months in females and 20-24 months in males
    - Weight: male- 121-198 lbs female- 40-80 lbs, Head-and-body length 5.2 ft, Tail 3-4 ft
    - Life span up to 20 years in wild, if they survive the first year of life

## A BRIEF EVOLUTIONARY HISTORY OF AUSTRALIA & MARSUPIALS

A unique feature of Australia's fauna is the relative scarcity of native placental mammals. Consequently, Australia become home to the other two types of mammal: the marsupials, which nourish their young in pouches, and the monotremes (platypus and the echidnas), which nourish their young in eggs. Marsupials of Australia came to occupy many of the ecological niches placental animals occupy elsewhere in the world.

The first marsupials appeared in North America approximately 80 million years ago – (marsupials can be distinguished from placentals by their dentition - marsupials have 3 premolars and 4 molars whilst placentals have 3-5 premolars and 3 molars). Towards the end of the Late Cretaceous, marsupials start appearing in South America. From South America, marsupials were able to cross Antarctica into southern Australia.

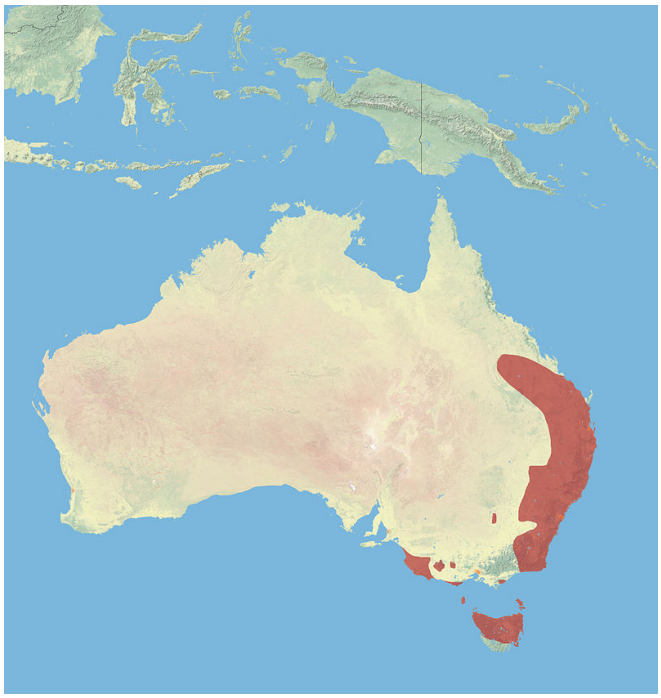
Early in geological history, Australia became separated from the rest of the world when it broke away from the southern supercontinent Gondwanaland (Australia, Antarctica and South America). The isolation of Australia, combined with its harsh, arid climate has allowed for the evolution of unique species, each filling a particular ecological niche.

Prior to the isolation of Australia, all three types of mammals existed. Monotremes, which have the lowest metabolisms and energy needs of the three, thrived in Australia but lost the race in South America. Placental mammals, which have the highest metabolisms and energy needs of the three, thrived in South America but lost the race in Australia. Marsupials, whose metabolic rate and energy requirements lie between those of the other two, didn't lose on either continent but clearly prevailed in Australia.

Macropod Information Sources:
Walker's Mammals of the World 6th edition Vol II © 1999 Ronald M. Nowak, Johns Hopkins University Press
A Field Guide to the Mammals of Australia © 2004 Peter Menkhorst & Frank Knight, Oxford University Press
Kangaroos: Biology of the Largest Marsupials © 1995 Terence J. Dawson, Cornell University Press
Zoobooks Series: Koalas & Other Australian Animals
http://animaldiversity.ummz.umich.edu/
http://www.animalfactsencyclopedia.com/Kangaroo-facts.html

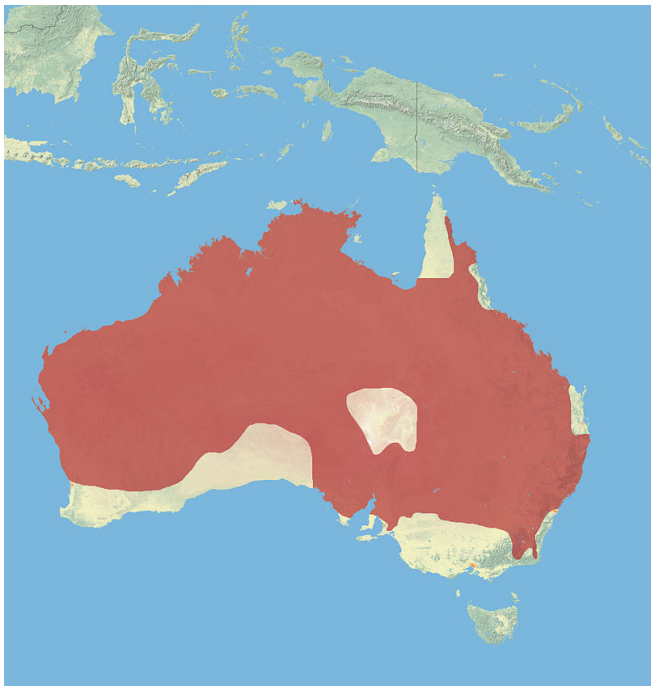
**Note:** The "sp." is an abbreviation for "species" and refers to a single species. The plural form of this abbreviation is "spp." and indicates "several species."

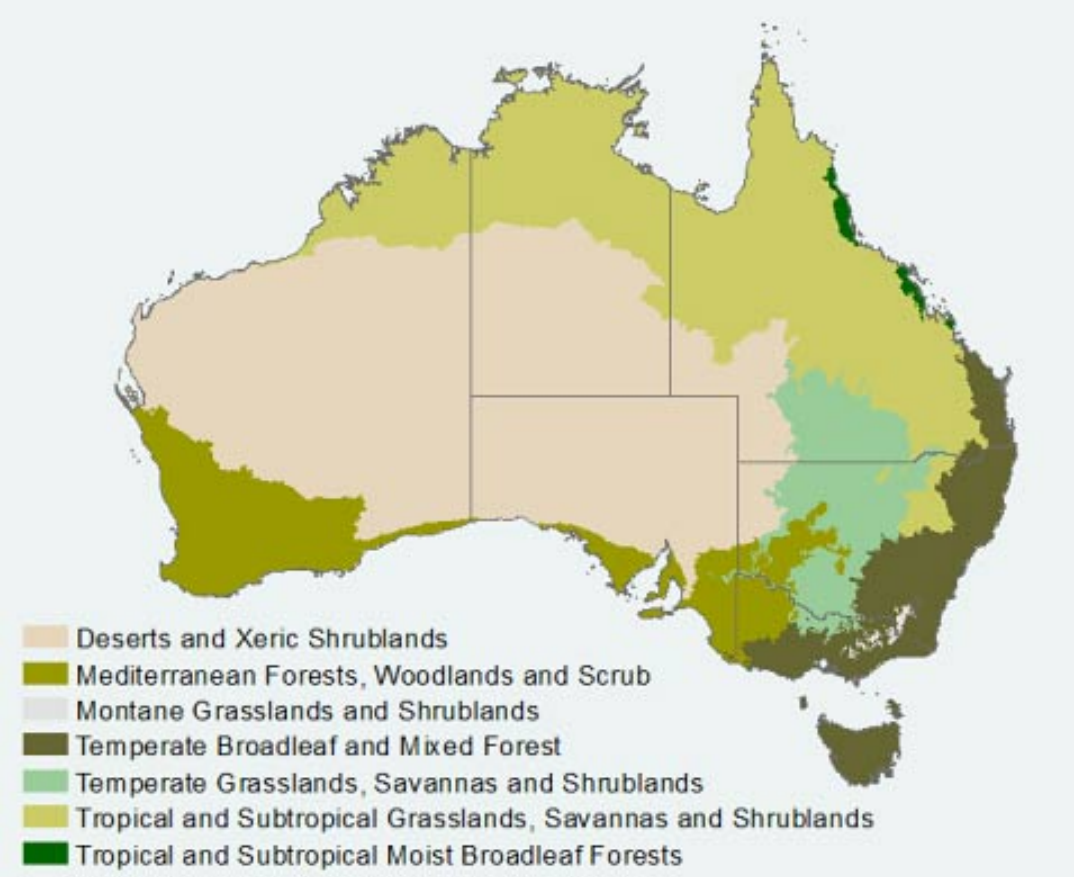
Wallaby Range



Hill Wallaroo Range

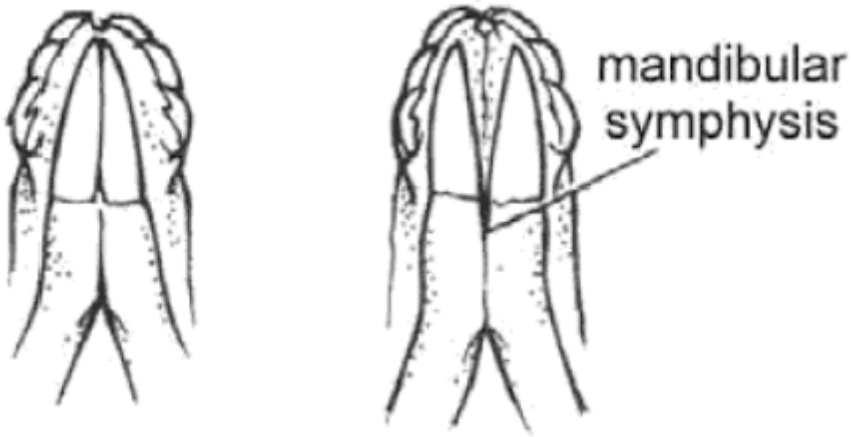
Red Kangaroo Range





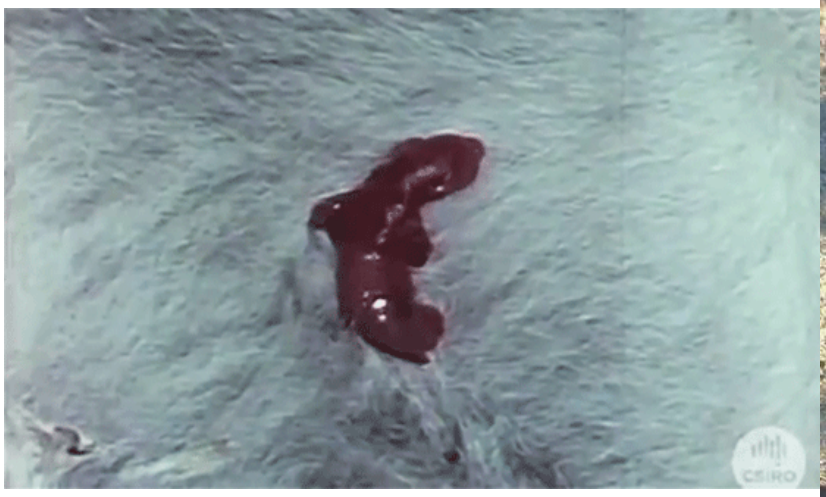

Ecoregions of Australia and Tasmania

Fore and hind feet of the kangaoo
**Note:** the large fourth toe and the fusion of the second and third of the hind foot




Two positions of lower incisors, ventral view

Note the separation in the lower incisors while biting down (above right) vs. at rest (above left).



Newborn climbing to mother's pouch
(newborn is size of a dime)

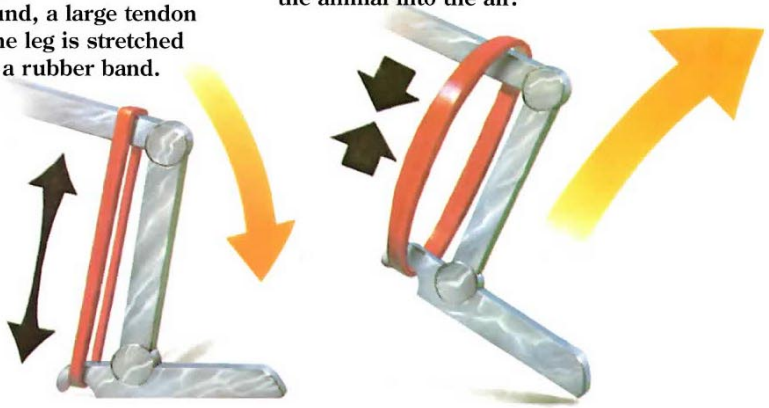
Older Joey in pouch

Male red kangaroos kick-boxing for dominance

The kangaroo is the only animal known to science that actually uses *less* energy as it moves faster and faster. This is because kangaroos have a unique ability to recycle energy.

When the foot of a kangaroo hits the ground, a large tendon in the leg is stretched like a rubber band.

As the kangaroo leaves the ground again, the tendon "snaps back" and helps to lift the animal into the air.



As the kangaroo hops faster and faster, the "rubber band" snaps back faster and harder. More energy is stored and released in every hop. At speeds over nine miles per hour, almost two-thirds of the energy used is recycled through the leg tendons and other parts of the body. For this reason, a kangaroo can hop for a very long time before it gets tired.


**Australia's Coat of Arms:** The Red Kangaroo and the Emu signify Australia's aspiration and intent as a nation to always move forwards.

## EMU TALKING POINTS

## GENERAL EMU INFORMATION

The emu, *Dromaius novaehollandiae,* is the second largest living bird by height after the ostrich. (see photo) It is endemic to Australia, where it is the largest native bird. Its closest relative is the cassowary. The name may have come from the Portuguese word “ema”, a term used to describe large birds and used by early Portuguese explorers to describe the birds they saw.

The emu is one of five extant ratites. Ratites are large, flightless birds having a flat breastbone without a keel and small or rudimentary wings. “Ratite” derives from the Latin “*ratis*” or raft, a craft without a keel. The keel anchors wing muscles in flighted birds. The other living ratites are the ostrich, cassowary, rhea and kiwi. In addition to the emu, we are fortunate to have three of the above living at the Zoo and one (the kiwi) permanently cast in the Sculpture Garden. Recent studies have suggested that the tinamou shares characteristics with the ratites (including the extinct moa) and should be classified as such, even though they are capable of flight. Tinamou are found in Mexico and in Central and South America. The zoo has a two extant tinamous species.

**EMU HABITAT/RANGE/DISTRIBUTION** (see range map)

- Emus live in a variety of habitats throughout mainland Australia, most commonly in grassy plains and open forest areas.
- They are least common in rain forest, populated and very arid areas.
- Historically they were found on Tasmania and King Island, but went extinct in both locations shortly after European settlement due to hunting. They have been successfully introduced on Kangaroo Island.
- Emus are nomadic birds and can cover very large areas in search of food.

**EMU PHSYCICAL ADAPTATIONS**

1. **Size/Weight/ Life Span**
    - Males are slightly smaller and lighter than females. (sexual dimorphism)
    - Height ranges from 5’ – 6.6 ‘.
    - Average weight ranges from 65 – 120 pounds.
    - Life span in wild is 10-20 years – in captivity up to 40 years.
2. **Head/Neck**
    - The head is small with sparse, downy feathers and very small ears.
    - The black beak is small and soft, adapted to grazing.
    - The blue skin of the long neck can be seen through sparse, soft feathers.
    - Emu eyes are quite large and golden brown to black in color. The eyes feature a nictitating membrane (sometimes called a second eyelid) that serves to protect against dust and moisture loss. (see photo)
    - Large nasal passages have multiple folds used to recycle air and create moisture in cold weather.
3. **Body/Plumage**
    - There is no sexual difference in color (no sexual dichromatism).
    - Soft, brown or grey-brown, hair-like feathers cover the large bodies.
    - Emus have two feathers growing from each follicle, thus increasing the total number of feathers and enhancing the adaptation to temperature extremes. (see photo)

- The feather barbs are not hooked, but rather hang loosely, providing the shaggy, hair-like look. (see photo)
- The feather shafts and tips are generally black and absorb energy from the sun; the loosely packed inner plumage insulates the skin, thus allowing emus to be active during the heat of the day. They are well adapted to withstand a wide range of habitat temperatures.
- Emus do not have sweat glands; they pant rapidly to release excess heat.
- One very interesting adaptation is a large fat pad on the backs of emus used to store water and nutrition when both might be sparse (similar to the fat pad of a camel). This fat pad also serves as extra insulation against temperature extremes.
- The small, vestigial wings measure about seven inches, are tipped with a small claw and are concealed in the plumage of the body; they are held out as stabilizers when emus run.
- Emus have highly specialized pelvic limb musculature that contribute total body mass similar to the flight muscles of flighted birds. This musculature enhances their ability to run at speeds of up to 30 MPH.

4. **Legs/Feet**
   - The legs are long, hairless, scaled, leathery, tough and very powerful. (see photo)
   - Emus are the only bird with gastrocnemius muscles in the back of the lower leg (the same as human calf muscles), providing power to deliver deadly forward kicks.
   - Each walking stride covers about 3.3 feet; each running stride can cover up to 9 feet.
   - Each featherless foot has 3 toes, an adaptation for running.
   - The center toe is about 6 inches long and is equipped with a long, sharp nail; combined with the powerful kick, the foot becomes a formidable defensive weapon. (see photo)
   - The under side of each foot features a thick, cushioned pad.
5. **Senses**
   - They have excellent eyesight and hearing.

**EMU BEHAVIORAL ADAPTATIONS**

1. **Life Style**
   - Emus may live in pairs, but can also lead solitary lives or travel in large flocks when seeking food. (see photo)
   - They typically travel long distances to find food and may follow seasonal patterns of movement in their search for food.
   - Usually diurnal, they may awaken several times at night to feed or defecate.
   - They sleep sitting down for about 7 hours.
   - Emus enjoy the water! They are very good swimmers and will splash about in it playfully when the temperatures soar. (see photo)
2. **Communication**
   - Vocalizations are made by inflating a sac at the front of the neck and expelling the air.
   - Females make a low-pitched boom and males make short, pig like grunting sounds.
   - These sounds, which vary in pitch and intensity, are usually made during courtship and can be heard for up to a mile away.
3. **Diet/Eating Habits**
   - Omnivores, their diet consists of flowers, fruit, grasses, seeds, large insects (particularly caterpillars and grasshoppers) and small rodents.
   - Some consider them pests because they will eat from planted fields, but they are also appreciated when they eat large quantities of the burrs that tangle sheep wool and eat unwanted insects.

- Because they eat seed bearing plants, they are excellent seed dispersers.
- Because they do not have teeth, they swallow large pebbles to grind up food in their gizzards (they do not have a crop).
- Because of their ability to store fat, they can go for long periods of time without eating, but need water once or twice a day and can drink large amounts when it is available.

4. **Breeding/Reproduction/Parental Care**
    - Breeding pairs form in the summer months of December and January, with mating occurring in May and June.
    - During courtship the male and female participate in a dance, making snake-like head movements. The male must make the right moves or lose the female!
    - Pairs stay together for about 5 months when they start to mate.
    - The male builds a nest in a hollow on the ground out of leaves, twigs and grass.
    - The female then lays 8-11 (sometimes up to 20) eggs over several days.
    - The eggs are on average 5" long and 3" wide with a thick, dark green shell and weigh between 1-2 lbs.
    - The green color derives from the presence of biliverdin, a green bile pigment, and provides camouflage in the grass. (****Note this information when showing the emu egg from the biofact bag.)**
    - The male takes charge of the nest, brooding the eggs for the next 8 weeks, surviving on stored body fat and morning dew, losing about 1/3 of his body weight.
    - The male stands up to turn each egg about 10 times per day.
    - Once the eggs are laid, the female may mate with other males and lay additional egg clutches.
    - Newly hatched chicks are active right away (precocial) and stand about 10" tall, sporting fluffy brown and cream striped feathers; they assume adult feather color in about 3 months. (see photo)
    - The male cares for the chicks, providing protection, brooding them for a month and then teaching them to find food and fend for themselves.
    - On average 4 or 5 chicks survive to adulthood.
    - The chicks grow quickly and are fully grown in 12-14 months; they stay with the family group for another 6 months before leaving.
    - Emus reach sexual maturity at about 2 years of age.

**EMU CONSERVATION**

1. **Status/Historical Status**
    - Emus are listed as of Least Concern on the IUCN Red List.
    - The estimated population is between 630,00 – 725,000 and varies from decade to decade depending on rainfall; they are subject to starvation during periods of drought.
    - They are found in abundant numbers over most habitat areas in Australia.
    - Emus have been hunted for thousands of years by aboriginal people and were hunted by the early European settlers. Hunting peaked in the 1930's and bounties were common.
    - Wild emus now have a protected status and only aboriginal people are allowed to hunt them.
2. **Predation/threats**
    - Primary predators are dingoes that raid nests for the eggs; the dogs hunt cooperatively with one distracting the male emu, exposing the nest, while the other takes the eggs.
    - Other predators include eagles, cats, foxes and lizards that eat emu eggs.

- Wedge-tailed eagles will dive down to tackle an emu, trying to break the neck.
- In some areas emus are in danger because of habitat loss and collisions with automobiles are too common. (As is true with other animals in Australia)

**EMU's COMMERCIAL VALUE**

- The Australian government issues licenses to commercial emu farms. All products are derived from captive born emu. The wild are protected.
- The United States, India and China also allow the commercial farming of emu and in the U.S., the Dept. of Agriculture and the FDA regulate the farming and products.
- Emus are raised commercially for their meat, oil, eggs, eggshells, feathers and leather. Emu meat is lower in fat than is beef. Jewelry is made from emu toenails.

**EMU INERTERESTING/FUN FACTS**

- Emu oil has a long history as having medicinal properties and is used to lower cholesterol, as allergy medicine, to treat headaches, erase stretch marks, alleviate joint pain and as a skin cream. Some complain that it smells like rancid chicken fat!
- Boots, wallets, handbags, shoes and other products are made from emu leather. Fishing lures and decorative displays are made from the feathers. Eggshells are painted and sold for display.
- The emu is the unofficial national bird of Australia and appears as the shield bearer on the Coast of Arms of Australia with the red kangaroo. (****SEE PHOTO OF COAT OF ARMS IN KANGAROO TALKING POINTS)**
- The emu has always had a special place in the mythology of the aboriginal people of Australia. One legend relates that the sun was created when an emu egg was thrown into the sky. Another legend holds that the dark dust lanes in the Milky Way represent an emu in the sky.
- Emus have been featured on Australian postage stamps and on coins.
- Emu behavior is marked by curiosity – they peck at objects they find while foraging and will peck at the clothing of people who might be in close proximity to them.
- One emu egg will hold the equivalent of 12 chicken eggs! (An ostrich egg is equivalent to 24 chicken eggs
- Each emu yields about 3 gallons of emu oil.

## SOUTHERN (DOUBLE-WATTLED) CASSOWARY TALKING POINTS

### GENERAL SOUTHERN CASSOWARY INFORMATION

The Southern or double-wattled cassowary, *Casuarius casuarius,* is the third largest bird by height after the ostrich and the emu and the second largest by weight after the ostrich. Its closest living relative is the emu. The name derives from two Papuan words, "kasu", meaning "horned" and "weri" meaning "head", referring to the helmet-like casque on its head. Many of the physical and behavioral adaptations of the southern cassowary are a reflection of the dense rainforest habitat in which they are found.

Cassowaries, like the emu, ostrich, rhea and kiwi, are ratites, flightless birds having no keels in their sternums. (See general ratite notes in the emu talking points).

There are three extant cassowary species: **Southern** (double-wattled) found in southern New Guinea, northeast Australia and the Aru Islands, mainly in the lowlands; **Northern** (single-wattled), *Casuarius unappendiculatis,* found in the lowlands of northern and western New Guinea and Yapen; **Dwarf or Bennett's,** *Casuarius bennetti,* found mainly in the highlands of New Guinea, New Britain and Yapen.

### SOUTHERN CASSOWARY HABITAT/RANGE/DISTRIBUTION

- Southern cassowaries live in dense, tropical rainforest areas of northeast Australia, southern New Guinea and adjacent islands. (See the Cassowary Range Map)
- The New Guinea population is found throughout the lowlands, except in the northern watershed area.
- In Australia there are three sub-populations in the wet, tropical lowlands of coastal Queensland.
- Range territory averages .3 to 1.5 sq. miles, but it can be larger. Males defend their territory.
- The home ranges can overlap and change in size and shape according to the season and food availability.
- Because of the dense forest in which they live and their solitary, reclusive life style, they are difficult to study in the wild.

### SOUTHERN CASSOWARY PHYSICAL ADAPTATIONS

1. **Size/Weight/Life Span**
   - Males are smaller and lighter than females.
   - Height ranges from 4.9' – 5.9', though some females may reach 6' 6".
   - Weight ranges from 84 - 129 lbs., though can reach 150 lbs.
   - Average life span in the wild is unknown; in captivity it ranges from 20 - 40 years, though one bird is known to have lived 61 years.
2. **Head/Neck**
   - Heads are small and pale to dark blue and featherless with amber colored, forward facing eyes.
   - The beak is pointed and ranges from 5 - 6.7" in length and is used to pick up food and toss it to the back of the throat; the lower bill is used to scoop water.
   - A prominent feature of the adult southern cassowary is the helmet like, wedge shaped casque on the top of the heads of both male and female birds. The casque:
     - Is not present on newly hatched chicks, but develops at one to years of age.

- Continues to grow throughout the life of the bird and is unique to each bird.
- Is made of sponge like material covered with a thick layer of keratin.

- The exact purpose of the casque is not known, but various explanatory theories hold that it:
  - Is used to batter through dense rainforest underbrush and protect the brain.
  - Is used as a weapon in dominance displays.
  - Plays a role in sound reception or acoustic communication in the rainforest by amplifying deep sounds.
- Southern cassowary necks are blue, purple or red with a light coat of hair-like feathers.
- Females have more vivid neck coloration.
- Two red wattles (bare, fleshy pouches of skin) hang from the neck; there does not seem to be a biological function associated with the wattles.
- The colors of the head, neck and wattles can change with the mood of the bird.

**3. Body/Plumage**

- The wedge shape of the large body is an adaptation that helps the bird move through dense rainforest habitat.
- Both adult male and female bodies are covered in hard and coarse glossy black plumage.
- The feathers have no barbs and very little down.
- Each feather is double, with a secondary shaft sprouting from the base, providing a thick coat. Feathers are similar to the emu feathers. (see photo)
- The thick, stout coat help protect the southern cassowary from vines, thorns and tough leaves.
- The feathers are not waterproof, so the birds shake themselves dry after being in water.
- The wings are tiny and have no feathers, but do have a few long, modified quills, which curve around and help protect the bird when it moves through the dense forest.

**4. Legs/Feet**

- The legs are thick, strong and scale covered and reminiscent of dinosaur legs.
- The strong legs enable the southern cassowary to jump straight up six feet. (see photo)
- The large feet have three toes, each sporting a sharp claw.
- The middle toe claw is a spike that can reach 7 inches in length and together with a strong kick and high jump, serves as a formidable defensive weapon. (see photo)

- The legs and feet also enhance agility and enable the birds to run up to 30 mph, even through the dense forest. **(NOTE: The cassowary leg/foot on the small items shelf would serve as an excellent compliment to the items in the bag)**

**5. Senses**

- The southern cassowary has a well developed sense of smell, thus enabling the bird to better find food in leaf litter and dense forest. (kiwis, small ratites, also have a good sense of smell).
- Southern cassowaries have excellent eyesight (as with many birds) and are able to see ultraviolet light not visible to the human eye. This adaptation helps them find food in the forest, as many fruits, flowers and seeds stand out more strongly from the background in ultraviolet wavelengths.
- Southern cassowaries have an excellent sense of hearing, which again is especially important in their forest habitat.

## SOUTHERN CASSOWARY BEHAVIORAL ADAPTATIONS

1. **Life Style**
   - Lead solitary lives except when breeding or tending chicks.
   - Are active in the morning and late afternoon and on moonlit nights.
   - Are very good swimmers in both rivers and in the ocean.
   - As noted above, can run up to 30 MPH.
   - Are usually very shy and reclusive, but will attack to defend themselves if provoked.
2. **Communication**
   - Southern cassowaries make a variety of noises:
     - If approached, they may make a rumbling sound.
     - When threatened, they may stand upright, raise their plumage and hiss.
     - If angry or in attack mode, the bird will put its head down and produce a deep booming noise – the lowest frequency bird call known (at the lower limit of human hearing).
3. **Diet/Eating Habits**
   - Southern cassowaries are omnivores, but really prefer fallen fruit; their diet also includes other plant material, snails, insects, fungi, flowers and small vertebrates.
   - They have been recorded eating over 238 species of plants.
   - They will congregate around trees that are dropping fruit, with each bird claiming and defending a tree.
   - Fruit and other food are swallowed whole.
   - Southern cassowaries play an extremely important role in the rain forest as seed dispersers. Their digestive systems pass seeds from the fruit and plants they eat in an intact state into piles of dung – a natural fertilizer. This means the seeds are not damaged and thus are able to germinate.
   - Because the seeds may remain in the gut for 10 hours or more, the cassowary may wander over a 7-mile range before expelling the seeds.
   - 70 – 130 rainforest plant species are dependent on the cassowary to disperse their seeds.
   - The southern cassowary is the only animal large enough to eat the fruit from some of the tropical plants.
4. **Breeding/Reproduction/Parental Care**
   - During the breeding season (June – October), males and females court over several days or weeks. Both sexes may have multiple partners.
   - The female defends her breeding territory by making loud booming noises that serve to warn other female birds.
   - The male builds a nest in a well-hidden shallow depression using a thick layer of leaves and grass.
   - The female lays 3-5 eggs, which measure about 3-1/2 by 5-1/2 inches and are light bluish green in color. (see egg photo)
   - The male then takes over, sitting on the eggs for about 50 days, leaving the nest only to drink some water.
   - The female has no role in brooding the eggs or caring for the chicks. After laying her eggs, she moves on to lay eggs in the nests of several other males.
   - Newly hatched precocial chicks are striped black and cream with pale brown heads, tiny wattles, but no casques.
   - The male is very protective of the chicks, hiding them in his plumage in times of danger and watching over them for about 9 months.

- At 3 - 6 months the stripes fade and at one year the chicks are a dull brown and the skin around the necks begins to color.
- At the beginning of the new mating season the male chases the chicks away and they must fend for themselves; this is a very dangerous time for the juvenile birds, as they must compete with adults for food.
- Young birds acquire full adult size, plumage and color at about three years of age.
- The casque begins to develop at six months and continues to grow throughout the lifetime of the bird.
- Sexual maturity is reached at about 3-1/2 years of age.

## SOUTHERN CASSOWARY CONSERVATION

1. **Status/Historical Status**
   - Southern cassowaries are listed as Vulnerable in the IUCN Red List (2016).
   - The population size is estimated to be between 6000 – 15,000 mature birds.
   - It is estimated that there are fewer than 2200 southern cassowaries in Australia.
   - It is believed that the southern cassowary population has undergone a rapid decline in the last three generations (44 years) in Australia and probably in New Guinea as well.
   - There have been local extirpation reports from parts of New Guinea.
   - Under Federal and Queensland State legislation in Australia, the southern cassowary population is listed as Endangered.
   - Only 20-25% of former cassowary habitat remains, and much of it is still under pressure.
2. **Predation/Threats**
   - In Australia the major factors for decline are habitat loss and habitat fragmentation as the rain forest is cut back for agriculture. Birds are also lost when hit by motor vehicles on roads and by dog attacks. Bird eggs and chicks are susceptible to being eaten by feral animals. (see road sign photos)
   - In New Guinea, hunting of the birds, high impact logging, and clearing of the rain forest to plant palm oil trees have all taken a large toll on the birds. Action is needed to preserve the rainforest, but economic interests may determine outcomes.
   - Because of their role in seed dispersal, southern cassowaries are considered a keystone species in the World Heritage rainforests of tropical Queensland.
   - The Australian government is supporting various initiatives that protect the southern cassowary directly and restore their habitat areas.

## SOUTHERN CASSOWARY INTERESTING/FUN FACTS

- Southern cassowaries were once a traditional food source for aboriginal people and are still hunted for their meat in New Guinea.
- The birds have been a part of the wet tropics aboriginal culture, featured in traditional ceremony and dance.
- One southern cassowary egg is the equivalent of 10 chicken eggs.
- Unlike the emu, the cassowary is not suitable for commercial farming; the bird is not docile and can pose a considerable danger when confronted.
- The southern cassowary has aptly been called “the dinosaur bird”.
- The Guinness Book of Records lists the southern cassowary as the most dangerous bird in the world!

**Emu & Cassowary Information Sources:**

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www.Animalcorner.co.uk/animals/emu/
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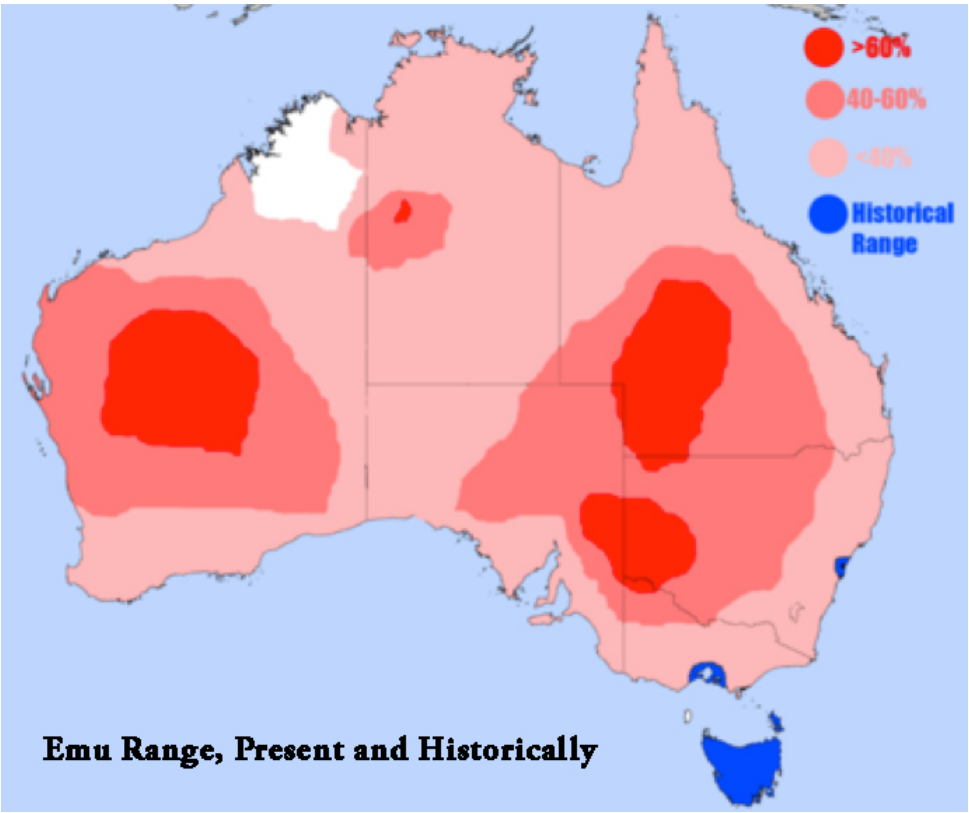
## Evolution of Ratites:

The ratites are a group of birds that includes the ostrich, emu, kiwi, rhea, and cassowary. The now extinct moa of New Zealand and the elephant bird of Madagascar are also ratities. The prevailing evolutionary theory of these flightless birds that were found on numerous continents was due to early adoption of flightlessness on Gondwanaland before continental drift separated them and evolution made them diverge, already as a group of flightless birds.

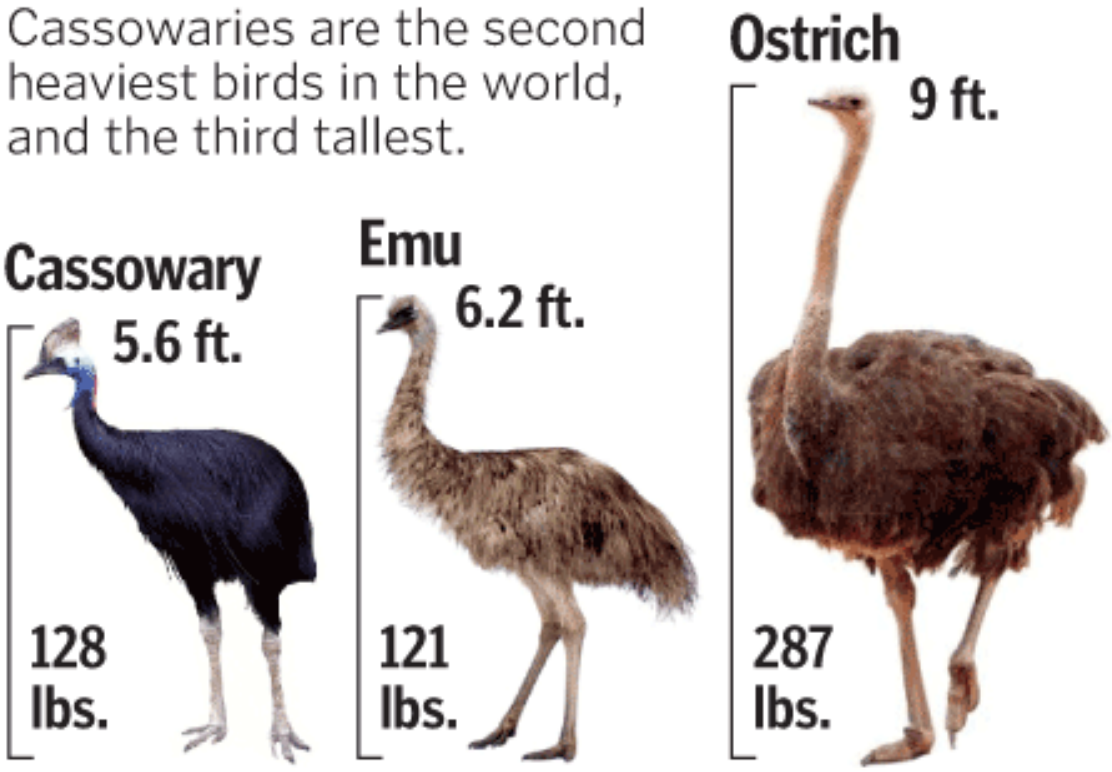
Recent DNA analysis shows that a ratite which can fly, the tinamou of South America, fits in the family tree in such a way that indicates that actually the whole group of ratites spread around the world as flying birds and later all independently developed their flightless habits. The new genetic evidence suggests that the common ancestor of the ratites and the tinamou could fly, and while the tinamou held onto this skill, the branches leading to other ratites lost the ability to fly independently of each other. Convergent evolution occurred as the demands of land-bound life made ratites' skeletons evolve in similar ways. (see diagram of evolutionary tree)

**Ratite Evolution Sources:**

1. *Science* 23 May 2014: Vol. 344, Issue 6186, pp. 898-900, DOI: 10.1126/science.1251981
2. Baker AJ, Haddrath O, McPherson JD, & Cloutier A (2014). Genomic Support for a Moa-Tinamou Clade and Adaptive Morphological Convergence in Flightless Ratites. *Molecular biology and evolution* PMID: 24825849


>60%
40-60%
<40%
Historical Range
Emu Range, Present and Historically


Southern Cassowary Range





**Note:** central toe with claw is defense mechanism for the emu


**Note:** dagger-like claw on the inner toe is defense mechanism for cassowary

**Left:** Emu feathers are unique in having two feathers per central shaft; there are two feathers growing from each follicle. **Note:** there are no barbs that hold the vanes together making the feather soft and flexible. **Below:** A cassowary feather has a secondary shaft growing from the base, not from the follicle.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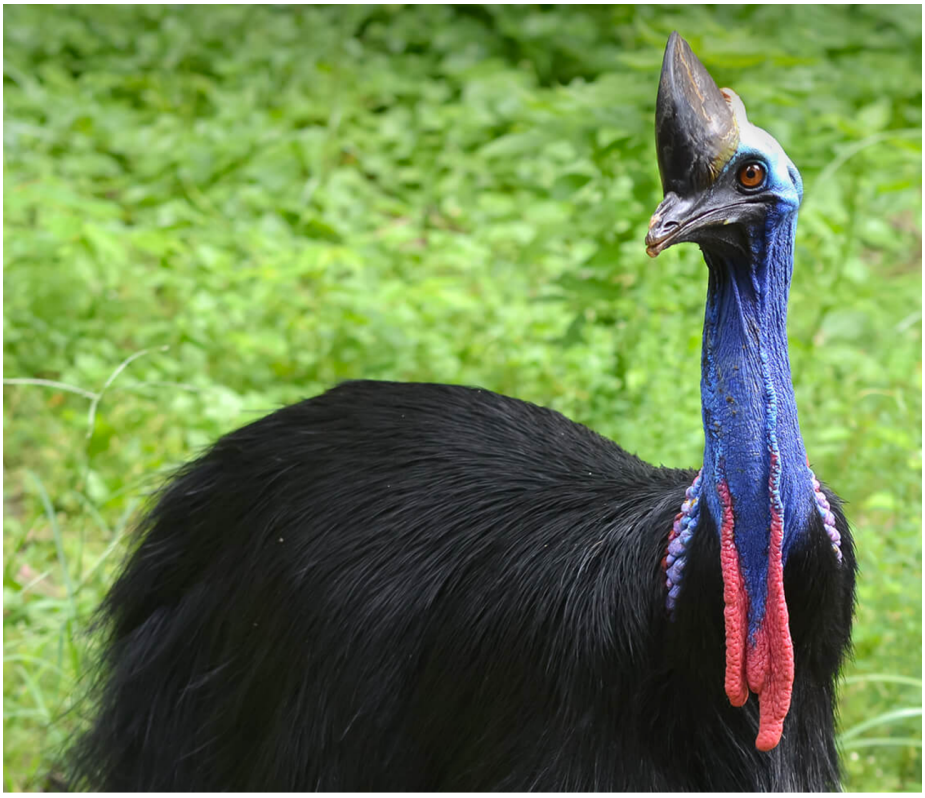
Emu chicks

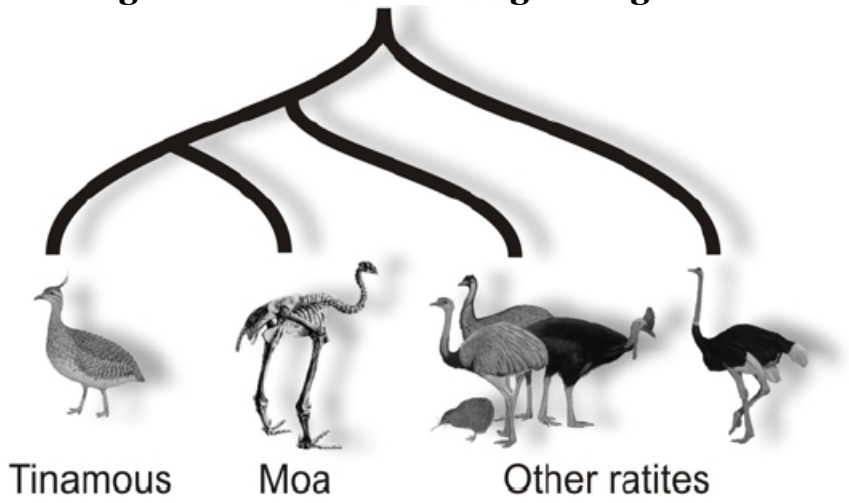

RATITE EGG COMPARISON
OSTRICH
EMU
RHEA
CASSOWARY
KIWI
CHICKEN




ARE YOU SPEEDING ?


AFTER
BEFORE

**Convergent Evolution occurring among the Ratites**




Since tinamous kept their ability to fly, every other branch in this tree probably also started with a flying bird.