



# FISHERIES FACT SHEET

# ESTUARINE CROCODILE



Estuarine crocodile (other common names: saltwater crocodile, Indo-pacific crocodile)  
*Crocodylus porosus*

## Largest living reptile

The estuarine crocodile is a large member of the Crocodylidae family and is the largest of all living reptiles. Crocodiles are believed to have existed for 200 million years, whereas dinosaurs became extinct a mere 65 million years ago.

Estuarine crocodiles are identified by their long, well-toothed snout, eyes and nostrils set atop the head, thick skin with embedded bony plates, long muscular tail, streamlined body and short limbs with clawed webbed feet.

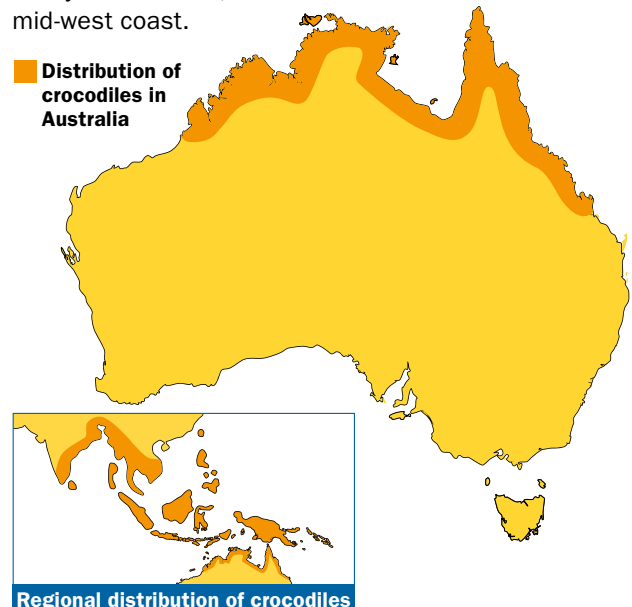
Adults typically have a heavy build and range in colour from golden tan to grey or almost black, with irregular darker mottling. Juveniles are brightly patterned and are generally pale tan in colour, with black stripes and spots on the body and tail. The underside of the animal is generally cream coloured.

### Where they live

The estuarine crocodile is found in northern Australia, India, through south-east Asia, the Philippines and Papua New Guinea with isolated populations in Palau, Solomon Islands and Vanuatu.

In Western Australia, the species is found in most of the major Kimberley river systems, with the largest populations occurring in the rivers draining into the Cambridge Gulf, Prince Regent and Roe River systems. They have also been

recorded in isolated rivers in the Pilbara region, around Derby and Broome, and as far south as Carnarvon on the mid-west coast.



## The toothy difference between crocodiles and alligators

Crocodiles and alligators both belong to the Order Crocodylia. True crocodiles have lower teeth that neatly fit into notches on the outside of their upper jaw and thus are visible when their jaws are closed. In contrast, the lower teeth of alligators (and their close relatives, gharials and caimans) cannot be seen when their jaw is shut because the teeth in their upper jaw hang over the ones in the lower.

In adults, the snout is relatively broad. The tails of estuarine crocodiles are solid muscle and their main propulsion mechanism when in the water. Estuarine crocodiles are estimated to live to 70 years of age, and as adults have between 65 and 67 teeth.

Adult males are, on average, five metres long and weigh 450 kg. Females are much smaller and average around three metres long and 150 kg.



**Gharials (pictured) are closely related to alligators which unlike crocodiles, do not display any lower teeth when their mouth is closed.**  
Photo: Larisa Vanstien

## Bite force

Crocodiles are believed to have the greatest bite pressure of any creature – and that includes the Tyrannosaurus Rex! The jaw muscles of a 4.6 metre estuarine crocodile can generate two tonnes of pressure – which is enough for their teeth to punch a hole through metal plate.

The reason for this strong bite is so crocodiles can crush through the tough shells of animals like crabs and turtles, but also to hold tightly onto their prey. This strong grip enables crocodiles to tear limbs off their prey by flicking their head from side-to-side or performing a 'death roll' by rotating their bodies sideways.

## Population trends

The hunting of crocodiles for their skins in Australia between the 1940s and 1960s resulted in their near extinction. In 1970, protection was given to the estuarine crocodile from hunting (freshwater crocodiles were protected in 1962).

Since this protection was introduced, crocodile populations have increased throughout Australia. Today, the total population is estimated to be around 100,000.

## Life cycle

The build-up to the wet season in northern Australia stimulates courtship and mating behaviour in estuarine crocodiles. As the breeding season approaches, males show off with displays of extrovert behaviour, intended to drive-off rival males and stimulate receptive females. Interaction between males includes chasing, head slapping and growling and can escalate to full-blown combat, leading to serious injury and death.

Females also become intolerant of other females and will jostle for dominance. Courtship observed in captive animals has involved snout contact and rubbing, body riding, vocalising, bubbling and circling, with both partners constantly submerging and resurfacing. Copulation lasts up to 15 minutes and may take place while completely submerged.

In Arnhem Land, females are estimated to reach sexual maturity at a snout-vent length of about 110 cm. Males reach sexual maturity at about 160 cm snout-vent, but at this size they may be prevented from reproducing by larger dominant males.

Nesting takes place throughout the wet seasons (from late October to May/June). The estuarine crocodile is a 'mound nester', preferring areas with tall vegetation and permanent water close by.

Some nests are built on floating mats of vegetation that extend from the river bank into the river. Once the mound is constructed, the female digs out an egg chamber and lays, on average, 52 eggs. Incubation time varies between 65 and 114 days.

The adult female excavates the nest after hearing the calls of the hatchlings and carries them to the water. Once in the water, hatchlings are stimulated by the calls of other hatchlings and form crèches, which are guarded by the mother for up to two months.

## Habitat

Estuarine crocodiles mostly occur in tidal rivers, coastal floodplains and channels, billabongs and swamps up to 150 km inland from the coast. The estuarine crocodile usually inhabits the lower reaches of rivers, while the upper reaches are inhabited by the freshwater crocodile (*Crocodylus johnstoni*). In the Fitzroy River, populations can be found hundreds of kilometres upstream. Estuarine crocodiles seem to be limited in their upstream movement primarily by physical barriers such as escarpments and other types of rapidly rising ground.

The preferred nesting habitat for the estuarine crocodile includes elevated freshwater swamps that are not influenced by tidal movements. In the Northern Territory, most nest sites are found on the north-west banks of rivers, usually exposed to the midday sun and shaded in the early morning and late evening.



**Estuarine crocodile at Corroboree Billabong.** Photo: Kara Dew

## Sex determination

The sex of an estuarine crocodile is determined by the temperature inside the egg during gestation, with the preferred temperature of the surrounding nest being around 31 – 33°C. This is determined by heat generated within the nest and the external ambient temperature. Males are produced between 31 – 33°C, with females dominating when nest temperatures are cooler.

## Movement is the key

Estuarine crocodiles are 'ectotherms', meaning they're cold-blooded and require external means to control their body temperature. Moving continually in and out of the water is their main 'thermoregulatory' behaviour. Other behaviours such as basking, shade seeking and mouth-gaping are used to regulate their body temperature when out of the water.

Hatchlings remain near their nest for up to two months. During the first year of their life, over 90 per cent of crocodiles that survive the hatchling period stay within five kilometres of their nest site. While the movements of older animals are not precisely known, relocated animals have demonstrated their ability to travel long distances (up to 280 km) and even return to their sites of capture.

Crocodiles walk on land at a speed of about one to two kilometres per hour. Short bursts of speed on land rarely exceed 10 km per hour and tire the animal quickly.



**Crocodiles bring their temperature down by moving into cool water.**  
Photo: Shannon Conway

## A broad diet

Estuarine crocodiles are mostly nocturnal, but will also hunt during the day should an opportunity arise. They will eat just about anything they can catch and overpower.

The primary food source of small estuarine crocodiles is crustaceans and insects, whereas larger crocodiles feed less often and on bigger prey including mud crabs, birds, sea turtles, fish, flying foxes, dingoes, cats, dogs, pigs, buffalo, cattle and horses. They are also known to be cannibalistic.

## Communication

Estuarine crocodiles communicate with each other using sound, visual and chemical signals. Hatchlings 'chirp' to gain the attention of their mother and keep members of the crèche together. Adults and juveniles may emit a low rumbling growl in response to a predator, and males will also growl to advertise their presence during the breeding season.

Body posture is used as a visual form of communication, e.g. raising the snout to signal submission or tail-arching as a threat display.

## Threats

In Australia, threats to the estuarine crocodiles include incidental mortality from fishing nets and habitat destruction. Also feral animals have the potential to destroy prime crocodile nesting areas by increasing drainage and reducing vegetation.

Eggs are subject to predation by goannas, feral pigs and dingoes, but high egg mortality is largely caused by short and long-term rainfall, washing eggs away.

## Management in WA

The two species of crocodiles in Western Australia are fully protected by state, national and international legislation. Poaching, killing or interfering with crocodiles, their eggs or habitat is an offence carrying penalties of up to \$10,000. In Western Australia, crocodiles are protected by the *Wildlife Conservation Act 1950*. The Act and associated regulations allow the licensing of a range of activities relating to the commercial harvesting of crocodiles.

### Interesting facts

- Rocks and stones swallowed by crocodiles may aid their digestion, as well as serving other functions such as helping them keep their balance in the water.
- When opening its mouth, a crocodile can seal the back of its throat to avoid gulping water. Underwater, a special transparent eyelid covers the crocodile's eyes for protection.
- As much as 50 to 70 per cent of the food a crocodile eats is converted into flesh and energy. In humans, this applies to only three to four per cent of food consumed. This ability means crocodiles can survive for months without eating.



**A basking estuarine crocodile.** Photo: Kara Dew

- Opening its mouth while basking in the sun prevents a crocodile's brain from overheating while its body continues to absorb heat.
- Crocodiles have no vocal chords. Growls are made by snorting air through the back of their throat or nostrils.
- Large crocodiles can stay underwater for at least an hour by dropping their heart rate to two to three beats per minute to conserve energy.

## Freshwater crocodiles (*Crocodylus johnstoni*)

Freshwater crocodiles are often found in areas inhabited by the estuarine crocodile, but as the name suggests, they are more likely to be found in freshwater habitats. They occasionally occur in coastal areas where estuarine crocodiles are absent.



Freshwater crocodile at Malcolm Douglas's Park in Broome.  
Photo: Kara Dew

The freshwater crocodile is also similar in appearance to the estuarine crocodile, but distinguished by its more slender snout and generally lighter build. They are also smaller and do not grow to more than three and a half to four metres. Freshwater crocodiles are also much faster on land than their estuarine relative, reaching speeds of up to 18 km per hour.

In areas where there is permanent water, freshwater crocodiles can be active year round.

Courtship and mating begins at the start of the dry season in June, with egg-laying taking place around six weeks later. Courtship in captive freshwater crocodiles involves the male placing his head on top of the female's and slowly rubbing the

glands underneath his throat against her before copulation takes place.

The egg-laying period typically lasts for four weeks through August and September. The eggs are laid in sandy soil adjacent to water. On average a dozen eggs are laid, although females can lay between four and 20. The hard-shelled eggs take between two to three months to hatch, depending on the nest temperature. Unlike estuarine crocodiles, the females do not guard the nest, but return and excavate the nest when the eggs have hatched, homing in on the calls of the young.

Once her young have been uncovered, the female carries them down to the water and aggressively protects them for a period of time.

Freshwater crocodiles feed mainly on insects and fish – the average size of their prey is small. Freshwater crocodiles are known to bite humans but are much more timid than their estuarine relatives, usually only attacking when forced to defend themselves.

Mature freshwater crocodiles have few enemies besides other crocodiles and the toxic cane toad (*Bufo marinus*), which is thought to have had a serious impact on some populations after the discovery of many dead crocodiles with toads in their stomachs.



Juvenile freshwater crocodiles at Malcolm Douglas's Crocodile Park.  
Photo: Kara Dew

## References

### Websites:

Australian Museum  
[www.australianmuseum.net.au](http://www.australianmuseum.net.au)

Department of Environment and Conservation,  
Western Australia:  
[www.dec.wa.gov.au](http://www.dec.wa.gov.au)

Department of Sustainability, Environment,  
Water, Population and Communities:  
[www.environment.gov.au](http://www.environment.gov.au)

### Books:

Grigg, Gordon and Gans, Carl. 1993. **Morphology and Physiology of the Crocodylia in Fauna of Australia Vol 2A Amphibia and Reptilia.** Australian Government Publishing Service, 326–336.

## Glossary

### Death roll

A full-body 'sideways' roll underwater carried out by a crocodile or alligator that is holding its prey in its mouths, used to shock and drown the prey.

### Maturity

Stage at which a crocodile can reproduce or breed.

### Thermoregulation

The process of regulating body temperature.

### Vent

The common opening for the urinary, digestive and reproductive systems.

This fact sheet is the twenty fourth (No. 24) in a Department of Fisheries series. ISSN 1834-9382

## FURTHER INFORMATION

Visit the Department's website at [www.fish.wa.gov.au](http://www.fish.wa.gov.au) or contact:

### DEPARTMENT OF FISHERIES – HEAD OFFICE

3rd Floor, The Atrium,  
168 St George's Terrace, Perth 6000  
Ph: (08) 9482 7333 Fax: (08) 9482 7389  
E-mail: [headoffice@fish.wa.gov.au](mailto:headoffice@fish.wa.gov.au)  
ABN: 55 689 794 771