

The ultimate value of a crocodile lies not in his bellyhide, nor in his value as a tourist attraction, nor even his ecological significance, but simply in the fact that he is a crocodile, big and ancient and monstrously magnificent.

Creina Bond in OKVANGO

M & I Morcombe

Crocodiles – A Conservation Conundrum

by Cliff Winfield

Crocodiles preceded humans on this planet by some 195 million years. They are living relics whose ancestors strode the earth with the dinosaurs. Unlike the *Tyrannosaurus* and other prehistoric creatures, however, the crocodiles took to warm waters and survived.

Because of their ancestry crocodiles have special importance for conservation. Although they are highly specialised creatures, superbly adapted for life as aquatic predators, their bodies preserve many archaic features otherwise lost from the evolutionary story.

Yet these very features pose a dilemma for wildlife managers. Large crocodiles are such efficient predators that they may endanger human life. How can this be reconciled with their conservation?

Of the 21 species worldwide,

only two occur in northern Australia, where they range from Rockhampton in Queensland to Broome in W.A., and inland along the major river systems.

Estuarine Crocodiles

The most dangerous to humans are the salties or, more correctly, estuarine crocodiles (*Crocodylus porosus*). These grow to an immense size. The biggest substantiated specimen, from north Queensland, was photographed with 30 people sitting along the carcase, which was estimated to be over 7 m long.

Crocodiles grow slowly. Females are believed to reach sexual maturity at about 12 years old, when they are approximately 2 m long. Males may take a little longer; they are usually about 3.5 m long at maturity.

The age of mature

individuals is difficult to determine because of the dearth of reliable historical data. Adults over 4 m are likely to be at least 40 years old, but as they mature, their growth rate slows down. One can only guess at the age of a 7 m crocodile.

As they grow older and larger, crocodiles move downstream towards the mouth of the river and sometimes further afield. Since they are territorial, young crocodiles may have to travel great distances to establish their own territory. One crocodile has been known to take this to extremes. It appeared in the East Caroline Islands, 1 360 km from its nearest known relatives.

The metabolism of an old crocodile enables it to survive weeks on a single meal, and 20 minutes or more underwater on a single breath.



B. Green

Creatures of habit are the most vulnerable to attack by crocodiles. A kangaroo may visit a watering place every morning, while the crocodile simply waits and watches, studying its prey — sometimes for days. At the chosen moment, powered by its immense tail, the crocodile thrusts out of the water. In an instant the unsuspecting prey is clamped in the crocodile's powerful jaws, drawn deep into the water, and locked in a 'death roll', which both drowns and mauls the victim. Water is essential for the crocodile's capture techniques. After it locks the victim in its jaws it can only kill by drowning.

The crocodile then tows its meal back to its lair and lets it rot for a few days. Crocodiles have great catching teeth, but they are not strong chewers, so

An estuarine crocodile (*Crocodylus porosus*) begins the fight for survival. Only a small percentage of hatchlings reach maturity.



B. Green

the flesh has to virtually fall apart in their mouth.

Estuarine crocodiles occur throughout South East Asia, India, Sri Lanka, the Philippines, Indonesia, New Guinea and northern Australia. Today they are rare or in danger of extinction in most of their range. Salties live mostly in tropical mangrove-lined tidal rivers, creeks and bays. Nevertheless, they are often found upstream in the freshwater reaches and lagoons of major rivers, especially during the breeding season. They can also be found in freshwater swamps some distance from rivers, and at sea.

Estuarine crocodiles breed during the wet season. The female constructs a nest of mud and sticks in the tall grass on the banks of a river or lagoon. The nests are nearly 2 m long, 1.5 m wide, and 0.5 m deep. She lays about 50 eggs, which take around 90 days to hatch. Unlike other reptiles the female stays near the nest during incubation. When the young hatch deep in the nest they start

to cry out, the mother responds to their calls and digs them out from the nest.

What follows is one of the most remarkable sights in nature. A beast with jaws capable of piercing an aluminium boat helps her young from their eggs, cracking the shells with her teeth. She then carefully transfers the hatchlings in her mouth to a nursery site in the river, where she stays with them for another two months.

Although 80 per cent of adult females nest each year, the death rate amongst the young is high. Mortality is due to floods washing the nests away, predation by goannas, or cattle stumbling into the nest and crushing the eggs. Crocodile eggs were also part of the Aboriginals' diet. Young crocodiles are relatively self-sufficient at birth. They immediately begin to prey on crabs, insects and such, but as they grow older their dietary preference turns more to fish, birds and mammals. Little is known of the larger crocodiles'

preferences. Fish is the staple diet, but they also eat kangaroos, small cattle, or dogs when the opportunity arises.

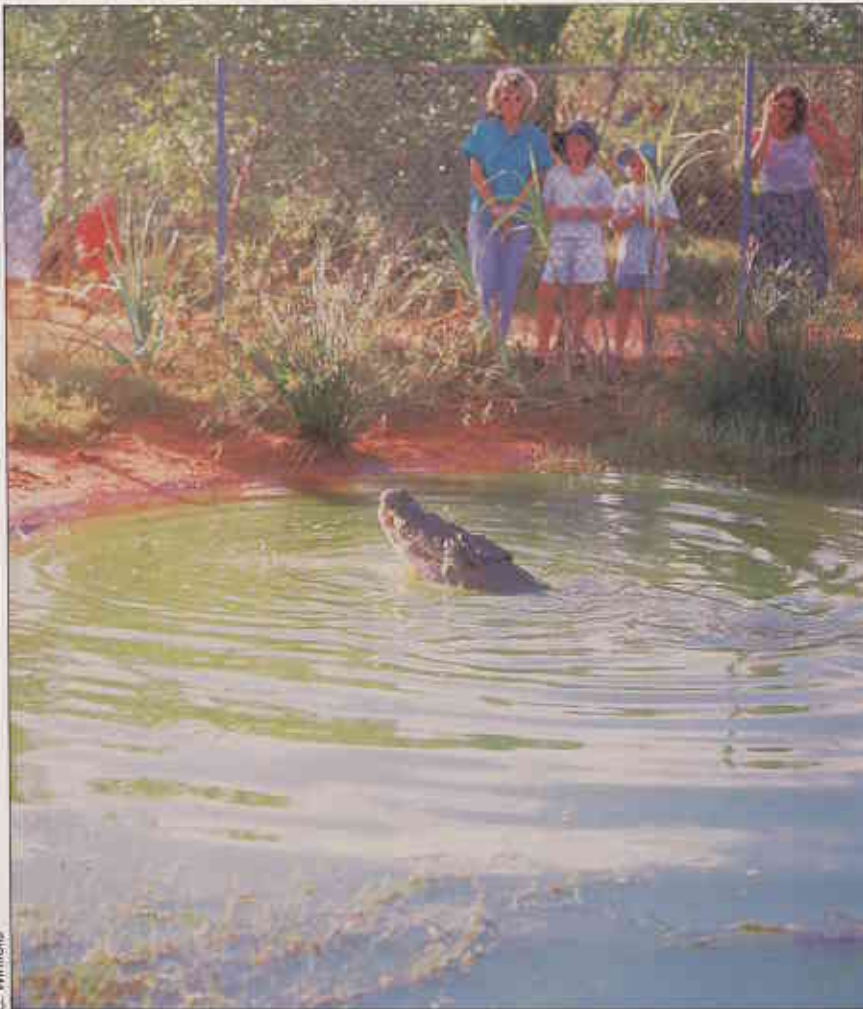
Freshwater Crocodiles

Australian freshwater crocodiles (*Crocodylus johnstoni*) are, as their name suggests, unique to Australia. They occur in the same geographic range as the salties (except for the east coast of Queensland), but are found almost exclusively in the upper freshwater reaches and deepwater pools of rivers and streams.

They are common throughout the Kimberley in most permanent fresh water, especially large expanses of water, such as Geikie Gorge, and the dams on the Ord River. They are much smaller than salties. Females mature at about 11 years old, and 1.5 m long, while males take a few more years to reach their mature length of 1.8 m. Males can grow to 3 m and females to 2 m. Individuals 2.6 m long are

Australian freshwater crocodile high-walking.





C. Winfield

known to be at least 40 years old, but the upper age limit is not known.

Freshwater crocodiles have a specific nesting season in the dry months, usually in the last weeks of August and into early September. The nests are holes in the soft sandy banks near permanent water. About 15 eggs, the size of large hen eggs, are laid in the holes at night and covered with 20 cm of earth.

Female freshwater crocodiles have the same maternal habits as the salties. The young are hatched after a 3 month incubation, then taken to a 'creche' in the debris along the water's edge for a month or so. The mortality rates are very high: only 30 per cent of eggs hatch, and only 10 per cent of hatchlings survive the first wet season.

Freshwater crocodiles have a diet of insects, fish, frogs, lizards and birds. They occasionally take small mammals, but even the largest freshwater crocodiles seem to

prefer small morsels captured by snapping from the water's edge. They are very shy of humans. Consequently, they pose little threat to human life, though they should not be meddled with.

Crocodile Conservation

Large crocodile populations survived the arrival of the Aborigines in Australia, more than 40 000 years ago, and the early white settlers made little impression on the numbers of the world's largest reptile.

By the late 1940s, however, European markets were established for crocodile hides, which were used in the handbag and shoe trades. During the next two decades, throughout tropical Australia and in other tropical regions, estuarine crocodiles were slaughtered in huge numbers for the fashion leather trade.

Probably because of their size, freshwater crocodiles were not subjected to the same

You can safely smile at a crocodile from behind a cyclone wire fence...

intensive legal hunting as the salties. Populations in easily accessible areas, however, have suffered from poaching, mostly by amateur shooters hunting souvenirs. Freshwater crocodiles were protected by law in W.A. in 1962. During the 1960s professional poachers sold the skins in Queensland, but wildlife authorities in the northern states have co-operated in efforts to put a stop to poaching and protect the species in many reserves and national parks.

The number of estuarine crocodiles taken commercially is not known, but Father Sanz, formerly of Kalumburu Mission, recalls that hunters shot 35 estuarine crocodiles in one day on the Mitchell River in 1962. Seven of them exceeded 4.3 m. After two years, more than 3 000 crocodiles were taken, mostly in the Admiralty Gulf.

When hunting was banned in W.A. in 1971, it seemed that the estuarine crocodile faced extinction in northern Australia. In 1977 a survey found less than 100 (mostly small) estuarine crocodiles in the two river systems of Admiralty Gulf.

Because of the possibility of estuarine crocodiles becoming extinct in the Northern Territory, a research team from the University of Sydney worked through the 1970s to develop accurate methods of surveying their population numbers, and general biology. This team, in conjunction with Dr Andrew Burbidge from the Department of Fisheries and Wildlife, conducted a survey of seven major estuarine systems of the Kimberley in 1977-78, concluding that the population of mature adults in the region was around only 2 500.

Fifteen years after the estuarine crocodile was protected in W.A., it seems to be making a comeback. There are more reports of crocodiles in

North Kimberley estuaries such as the mouth of the Ord River. A re-survey this year of the seven Kimberley river systems showed an overall population increase of 30 per cent. The same trends are occurring in the Northern Territory and Queensland.

Conservationists are delighted that one of the world's most fascinating reptiles now seems to have been saved. Local residents and visitors (those that know) are concerned. A 4 m crocodile can be a danger to humans as recent attacks in North Queensland have shown.

This creates several problems: not only are estuarine crocodiles increasing
...but it wouldn't be wise to get too close.

in size and numbers, but they are also less timid than their predecessors because they are not hunted.

With the increase in human population and tourist traffic in the Kimberley many people may not be wise to the danger of crocodiles. Wading in a billabong, a picnic on a shady river bank or crabbing in the mangroves may prove dangerous to the unknowing visitor on a hot Kimberley summer day.

What should be done? Crocodiles have a right to exist. Yet the presence of large and dangerous crocodiles in areas which people frequent is a problem. Who should give way? Should the crocodiles be

removed? Or should the people keep away?

Commercial hunting to keep crocodiles numbers down is not an acceptable solution. The best option for the time being seems to be to remove any 'nuisance' estuarine crocodiles from population centres, and to educate people about the danger.

The continued protection of both crocodile species is vital for their long-term survival. The most important conservation strategy for estuarine crocodiles must be to provide special estuarine nature reserves far away from human populations where the animals may live unmolested. And of course, where there are no people to be molested by crocodiles.



Landscape

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COVER PHOTO

A tender moment between human and whale shows the care which was a feature of the highly successful Augusta whale rescue.

Photo courtesy of the Western Mail.

A Conflict of Interests

Why are there so many conflicts when it comes to our natural environment? There is conflict among industrial groups exploiting natural resources; environmentalists advocating preservation of wildlife; government agencies; and recreation groups.

In an ideal world we would have a total understanding about ecosystems and natural resources, and of the long term needs of the community. But this is not an ideal world, and much of the conflict stems from a lack of agreement about environmental impact and human needs.

Take whale strandings for instance. From the time whales beach, tissue damage occurs due to a rise in body temperature and the sheer weight of the mammal. We don't know how long they have to lie there and how hot they have to get before the chances of survival are next to nil. Strandings may be part of a natural culling process or accidents caused by human impact on the environment. And, what about the people who turn out in large numbers under often adverse conditions, and become so emotionally caught up in saving these creatures? What weight do we put on their need?

It is not an ideal world. We are a long way from knowing the answers to too many important questions.

There is a need for more investigation, better communication and a broader understanding of environmental processes and human needs.

This brings us to *Landscape* and its purpose. Its prime objective is to achieve an understanding about conservation of ecosystems and management of natural resources.

Landscape's aim is to provide expert information on the major conservation issues, latest developments, research in progress and general features of the State's wildlife, national and marine parks, nature reserves and forests.

It will give a balanced representation of viewpoints and will not shy from contentious issues.

Landscape will inform readers about the natural wonders of our environment, the management considerations involved and the lifestyle of its inhabitants. It will not provide all the answers, but it will present the facts and therefore a basis for sound argument.

Landscape is Western Australia's own conservation and wildlife magazine.

Wetlands

The theme for this year's World Environment Day has been 'Wetlands — Not just for the Birds'. In this issue of *Landscape* we feature the ecological importance of wetlands.