Modelling population dynamics of estuarine crocodiles on Queensland's northern populated east coast report

Summary and key findings

Queensland
Government

CROCODILE MANAGEMENT

The Queensland Crocodile Management Plan (plan) provides the overarching framework for managing public safety and protecting estuarine crocodiles in the wild. As part of this approach, any crocodiles that pose a threat to human safety are targeted for removal.

In Queensland, crocodile habitat (Croc Country) begins at the Boyne River south of Gladstone and extends up the east coast to Cape York Peninsula and across to the Northern Territory border.

As human populations continue to grow along the state's north-east coast, there is an ever-increasing likelihood of human–crocodile interaction, making the balance between public safety and crocodile conservation a complex and challenging issue. Human populations within Croc Country are highest between Cooktown and Ingham—known as the 'northern populated east coast' (NPEC).
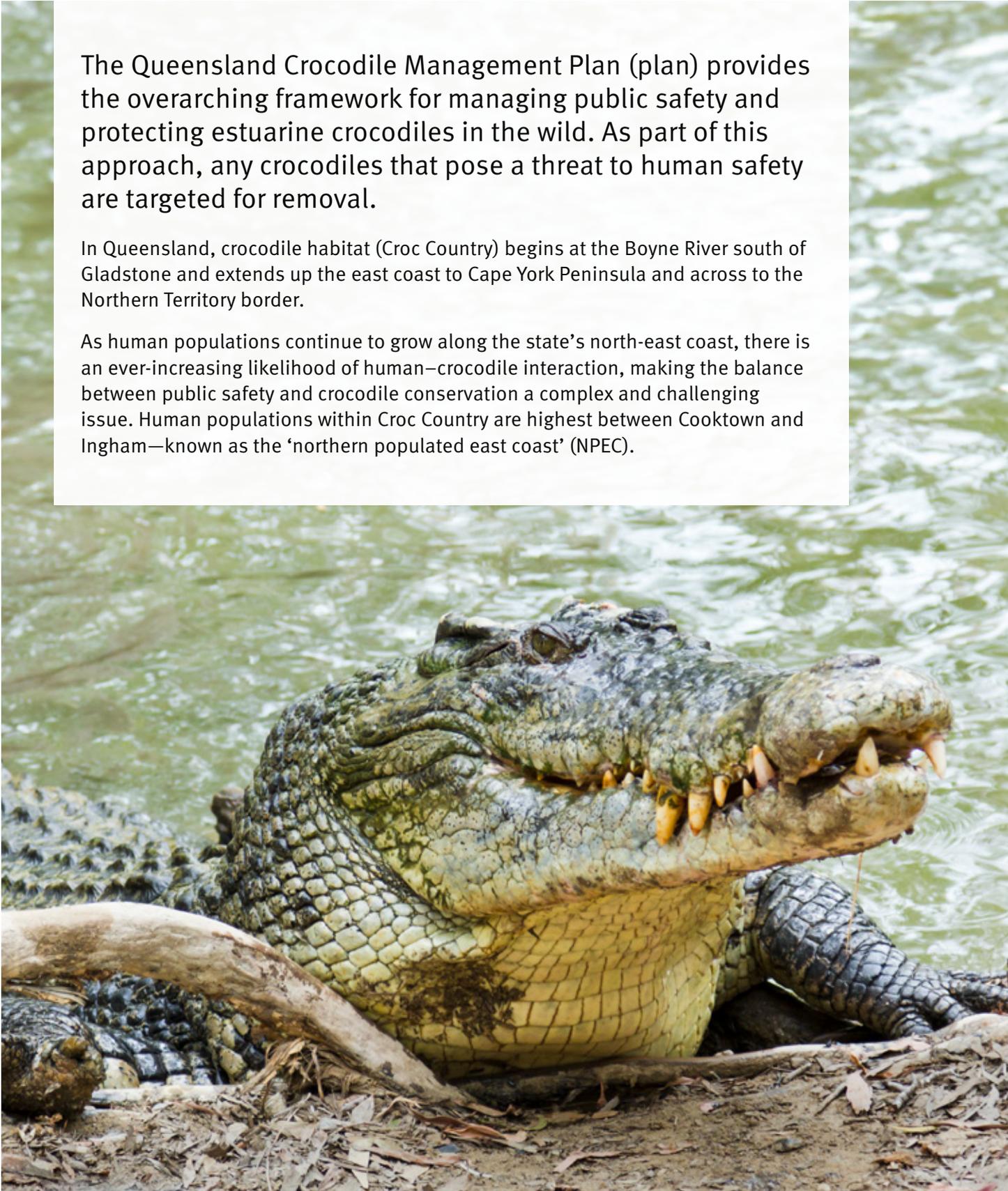
Key estuarine crocodile facts

VU The species is listed as Vulnerable under the *Nature Conservation Act 1992*.

Estuarine crocodiles were hunted to the brink of extinction in Queensland until they were protected in 1974.

It is estimated there are between 20,000 and 30,000 non-hatchling crocodiles (those bigger than 60cm) in Queensland.

The number and density of crocodiles is highest in the northern Cape York Peninsula.

The number and density of crocodiles is lowest in the southern-most parts of their range including the Fitzroy River, at Rockhampton.

The Estuarine Crocodile Population Monitoring in Queensland (1979-2019) Technical Report indicated that the average size of the animals has decreased along northern populated east coast (NPEC) between Cooktown and Ayr. This is likely due to the regular removal of 'problem crocodiles' as part of the Queensland Crocodile Management Program over the previous 10 years.

INDEPENDENT EXPERT COMMITTEE RECOMMENDATION

In 2021 an Independent Expert Committee, chaired by the then Queensland Chief Scientist, evaluated the effectiveness of the Queensland Estuarine Crocodile Management Program.

Overall, the committee's final report found the program was fit for purpose, world class, and highly effective in reducing the risks to public safety while conserving crocodile populations in the wild.

The committee made a number of recommendations including Recommendation 6:

"In consultation with stakeholders, [DES] considers annual removal of a modest number of crocodiles 2.4 metres or more in length on the populated east coast for several years, in addition to the average number of problem crocodiles removed under current Management Plan arrangements, with appropriate frequency of monitoring. The number taken each year should be based on population modelling. This trial, to constrain population growth and reduce overall numbers locally, is a form of adaptive management that could deliver improved crocodile management outcomes and new knowledge."

This recommendation was made largely on the basis that balancing the number of crocodiles removed under the management program, with the natural rate of increase in the population, could achieve a stable, sustainable estuarine crocodile population size that minimised the potential for people to be injured or killed by crocodiles.

POPULATION MODELLING TO ADDRESS THE RECOMMENDATION

To address the expert committee's recommendation, in 2021 the Department of Environment and Science (department) commissioned research to create and evaluate estuarine population models for the NPEC of Queensland—those areas between Cooktown and Ingham.

The report sought to predict how removing different numbers and ages of crocodiles would impact the total number of crocodiles in the NPEC area.

The report's findings would provide the scientific evidence so that more informed discussions could happen with key stakeholders in relation to the best approach to managing crocodiles and help determine whether the plan should:

- continue with the current 'response-based management program' of problem crocodile removal
  or
- move to an additional number of annual problem crocodile removals based on a pre-determined crocodile population size.

Methodology

The following is a summary of the methodology used to predict the range of possible outcomes for crocodile populations in different scenarios.

- A detailed review was undertaken of population modelling approaches and crocodile population models used to model Northern Territory crocodile populations.

- A series of complex modelling techniques were tested to find the most accurate and applicable model to the NPEC crocodile population.

- The model used a range of 'inputs' to predict how removing different numbers and ages of crocodiles would impact crocodile populations in the NPEC area. These inputs included the most important factors influencing crocodile populations including: survival rates of eggs, hatchlings, juveniles and adults; reproduction and growth rates; and the influence of different crocodile densities on these factors.

- A group of crocodile experts from the International Union for Conservation of Nature and an independent expert statistician were engaged to peer review the report based on the modelling work.

SUMMARY OF KEY FINDINGS

- The NPEC crocodile population is not at risk of extinction in the foreseeable future unless there is a significant change in crocodile management practices.

- Continuing the current rate of removal is both a safe strategy for species conservation and an effective management strategy.

- The impacts on the overall population of NPEC estuarine crocodiles due to the removal of animals from the wild was at its highest in the 1990s. However, because the ratio of crocodile removals compared to the size of the crocodile population has been decreasing, the impact of removals on the population has declined.

- The biggest increase in estuarine crocodile numbers occurred between 10–30 years ago but the rate at which the population is growing has been slowing significantly since then.

- Continuing the existing management approach has a high likelihood of leading to a population of around 3,750–7,500 in the long term and a very small likelihood of seeing it reduced.

- There is limited scope for reducing the non-hatchling population by more than 10–20% without significantly increasing the risk of extinction in the long-term.

- Removing adult crocodiles has much larger effects on the projected non-hatchling population size than removing juveniles.

- If estuarine crocodile population numbers are low, a sequence of bad years (due for example to intense flooding affecting crocodile nests) could severely impact survival and growth. Habitat loss also makes populations more vulnerable than in the past.