Queensland Estuarine Crocodile Monitoring Program 2016–2019

Key Findings Report

#32064

Queensland Government

Introduction

In Queensland, the estuarine crocodile (*Crocodylus porosus*) occurs in a coastal strip from Gladstone northwards along the east coast, throughout the Cape York Peninsula, and across the Gulf of Carpentaria to the Northern Territory border. Estuarine crocodiles are not uncommon on offshore islands of the Great Barrier Reef and Torres Strait. Queensland has some of the most diverse crocodile habitat in Australia.

In the previous century, unregulated hunting of estuarine crocodiles for their skins led to a decline in the population and effective commercial extinction of the species, resulting in full legal protection by 1974. The crocodile population in Queensland has since increased, but the species is still listed as Vulnerable under state conservation laws. Current threats to Queensland's population arise from illegal killing, incidental mortality, destruction of nesting habitat by feral pigs, and land development.

Since 1975, there have been 46 estuarine crocodile attacks on humans in Queensland, 16 of which have been fatal. The average of 0.3 fatalities per year is much lower than deaths from sharks – 1.1 deaths per year (West, 2011). Most of these attacks occurred along the coast between Townsville and the Daintree River, and as in the Northern Territory, the majority impact local, adult males (Brien et al. 2017). Each fatality is a tragedy and makes balancing the responsibilities of conservation and public safety more challenging.

From 2016 to 2019, the Department of Environment and Science conducted a comprehensive monitoring program of the estuarine crocodile population across its range in Queensland. During 2020, the department compiled and analysed data collected through this program and compared these to historic data to assess how the population had changed in size, distribution, density, and size class structure over time–using results collected from as far back as 1979.

Summary of key findings

The size of the estuarine crocodile population in Queensland is currently estimated at 20,000–30,000 non-hatchlings, with an average of 1.7 crocodiles and 36kg of crocodile biomass[1] per kilometre of river surveyed.

For comparison, the population of estuarine crocodiles in the Northern Territory is three to four times larger (100,000), three times more abundant (5.3/km) and has a ten times higher biomass per kilometre (388kg/km) than in Queensland (Fukuda et al. 2011, 2020).

The population started from a very low base and recovery has been relatively slow and highly variable across the state.

The spatial distribution of crocodiles in Queensland has not changed over time, and there is no evidence of a southward expansion of their range.

The number and density of crocodiles are highest in northern Cape York Peninsula (3.0/km) and decline southward, with 1.2/km in the Gulf of Carpentaria and the Cairns region, down to 0.2/km in the Fitzroy River, Rockhampton.

That section of coastline from Cooktown to Rockhampton accounts for around 20% of the Queensland crocodile population.

The crocodile population in Queensland is highly unlikely to reach the size or density of the Northern Territory due to the lack of suitable habitat.

While the crocodile population has continued to increase relatively slowly along the east coast between Cooktown and Ayr, the average size of crocodiles has reduced in this area. This is likely to be a consequence of the regular removal of 'problem crocodiles' under the Queensland Government's crocodile management program.

Queensland has seen the recovery of a threatened species that is a large predator, while at the same time seeing a reduction in the risk to public safety.

1 Biomass refers to the mass of crocodiles in a particular section of waterway as opposed to the number (density) of individuals

Methods

Figure 1. State-wide survey effort showing areas covered in 2016-2019 by: boat-based spotlight surveys (56), including 42 rivers and covering 2200km; and helicopter surveys (14), including 27 rivers covering 2500km.

In 2016, the Department of Environment and Science embarked on a comprehensive crocodile monitoring program involving systematic spotlight and helicopter surveys in carefully selected, previously surveyed areas of river systems throughout the state.

During the 2016-2019 program a total of 56 boat surveys were conducted in 42 rivers covering 2,200 km, and a total of 14 helicopter surveys were conducted in 27 rivers covering 2,500 km (**Figure 1**). This included rivers as far south as Maryborough on the east coast, through to Cape York Peninsula and the Gulf of Carpentaria.

The survey teams consisted of highly skilled departmental officers who were selected through a rigorous competency-based testing process and received intensive training from highly experienced crocodile biologists, who also provided ongoing support and quality control for the program.

This was the most comprehensive crocodile population monitoring program to be carried out in Queensland for more than a decade, with previous state-wide surveys occurring in 1979, 1984-89, and 1994-2003. The results of these historical surveys were compared and analysed with those of the current program.

The design of the program and subsequent analyses were peer reviewed and endorsed by members of the International Union for the Conservation of Nature (IUCN) Crocodile Specialist Group, which includes the world's leading experts on crocodilian biology and monitoring.

Overall population trends (numbers, density, biomass, and trajectory)

The size of the estuarine crocodile population in Queensland is currently estimated at 20,000 – 30,000 non-hatchling[2] crocodiles, with an average of 1.7 crocodiles and 36 kg of crocodile biomass[3] per kilometre of river surveyed.

There has been an increase in the crocodile population over time. However, there is no evidence of a 'large increase' now or into the future. Estimated doubling times[4] for crocodile numbers in Queensland range from 36 years on Cape York Peninsula, along the Gulf of Carpentaria and in the Cairns region, to up to 100 years in the Fitzroy River, Rockhampton.

The population started from a very low base due to previous hunting, and recovery has been relatively slow and highly variable across the state. For example, while numbers in some rivers appear to have stabilised as early as the 1980s (e.g. Wenlock River, north-western Cape York), some others continue to increase (e.g. Norman River, Gulf of Carpentaria).

The contemporary population of estuarine crocodiles in the Northern Territory is approximately 3-4 times larger (100,000), 3 times more abundant (5.3/km), and 10 times higher in biomass/km (388kg/km) than in Queensland. The population in Queensland is highly unlikely to reach the size or density of the Northern Territory due to the lack of suitable crocodile habitat across the state.

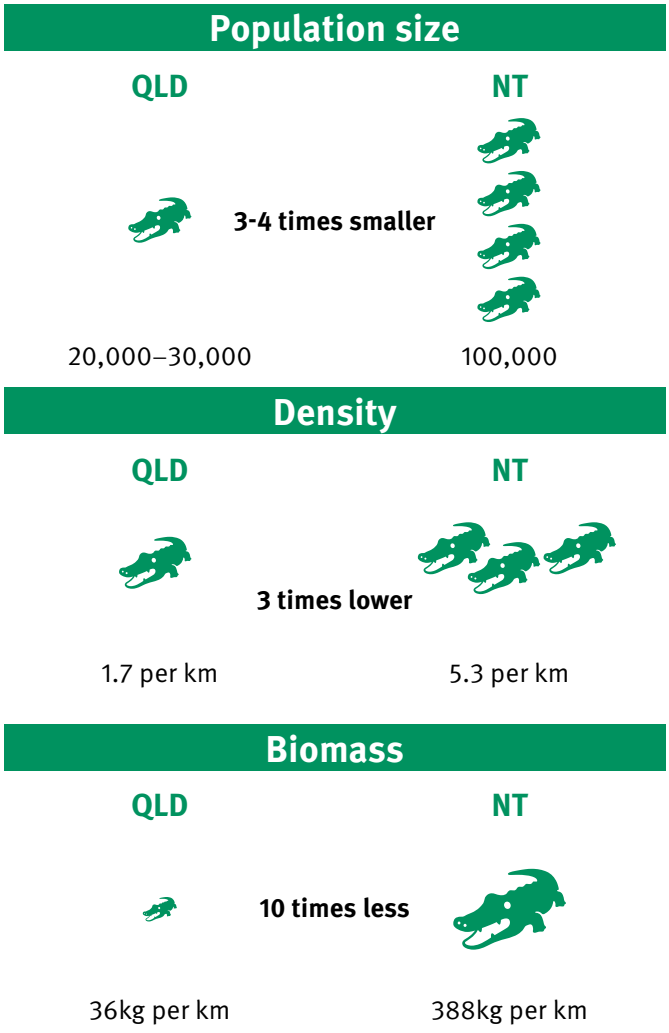

Figure 2. The contemporary population of estuarine crocodiles in the Northern Territory is 3-4 times larger (100,000), 3 times more abundant (5/km), and 10 times heavier/km (388kg) than in Queensland.

2 Only non-hatchling crocodiles >60cm in length are included in density estimates, as crocodiles smaller than this have very low survivorship

3 Biomass refers to the mass of crocodiles in a particular section of waterway as opposed to the number of individuals per kilometre of waterway (density)

4 The estimated time in years required for a doubling of the local population density

Results from the populated east coast management area (Cooktown to Ayr)

Management of estuarine crocodiles in Queensland is the responsibility of the Queensland Department of Environment and Science under the *Nature Conservation Act 1992* and Nature Conservation (Estuarine Crocodile) Conservation Plan 2018. The Queensland Crocodile Management Plan provides the current framework for the state-wide management of public safety risks associated with crocodiles. Under the management program, crocodiles that pose a threat to public safety are targeted for removal from the wild by the department or its contractors.

While the crocodile population continues to increase relatively slowly along the populated east coast between Cooktown and Ayr, the average size of crocodiles in this region has been reduced, which is likely to be a consequence of the Queensland Government's crocodile management program, with ~460 crocodiles (>2m; average: 2.3m) having been removed between 2004-2019.

While the absolute rate of non-fatal attacks (0.9 per year) in Queensland has increased over time, there has been no increase in the rate of fatal attacks (0.3 per year; Brien et al. 2017). The removal of larger crocodiles (~4m), capable of causing fatalities, from in and around populated areas on the east coast has likely contributed to this lack of increase in fatalities.

Distribution and range in Queensland

The spatial distribution of estuarine crocodiles in Queensland has not changed since the 1980s and there is no evidence of a southern expansion of their range. The crocodile population in Queensland is primarily riverine, with over 90% of the population existing below 20m elevation above sea level.

The number and density of crocodiles are highest in northern Cape York Peninsula (3.0/km) and decline southward, with 1.2/km in the Gulf of Carpentaria and Cairns regions, down to 0.2/km in the Fitzroy River, Rockhampton (Figure 4). This southerly reduction is a likely consequence of lower temperatures and less suitable habitat.

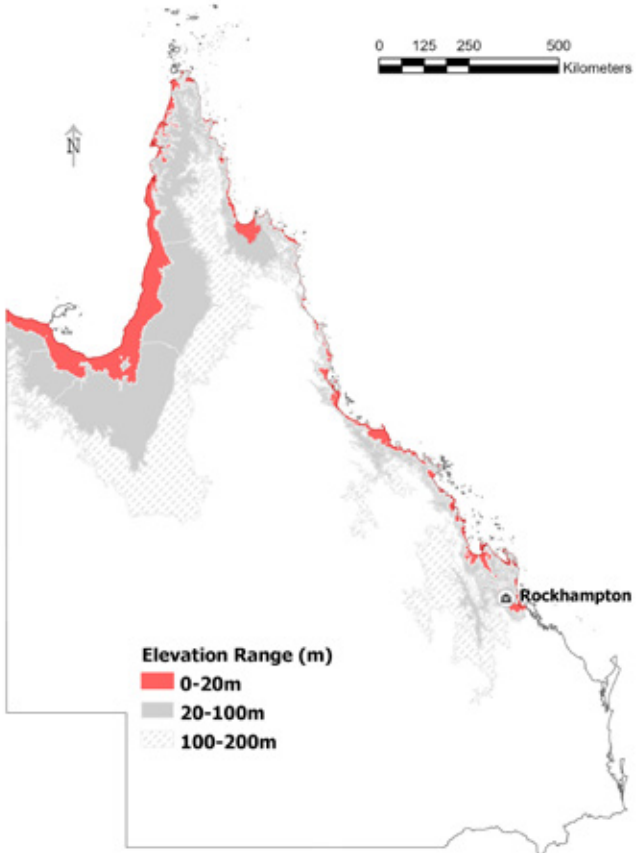

Figure 3. The majority (>90%) of the estuarine crocodile population in Queensland exists below 20m elevation above sea level, with a further ~9% at 20-100m elevation and ~1% at 100-200m elevation.

Regional variations

- North-western Cape York Peninsula is the most important source of nesting and recruitment in Queensland and contains almost 40% of the state's estuarine crocodile population.
- The Proserpine River, in the Whitsundays region, has the highest density of crocodiles (5.5/km) in Queensland, for reasons that are yet to be fully understood.

No crocodiles were detected in waterways south of the Fitzroy River, Rockhampton, during the monitoring program. While crocodiles are known to occur in waterways south of the Fitzroy River, they occur as individual animals rather than established populations and are best considered vagrants or non-breeding residents.

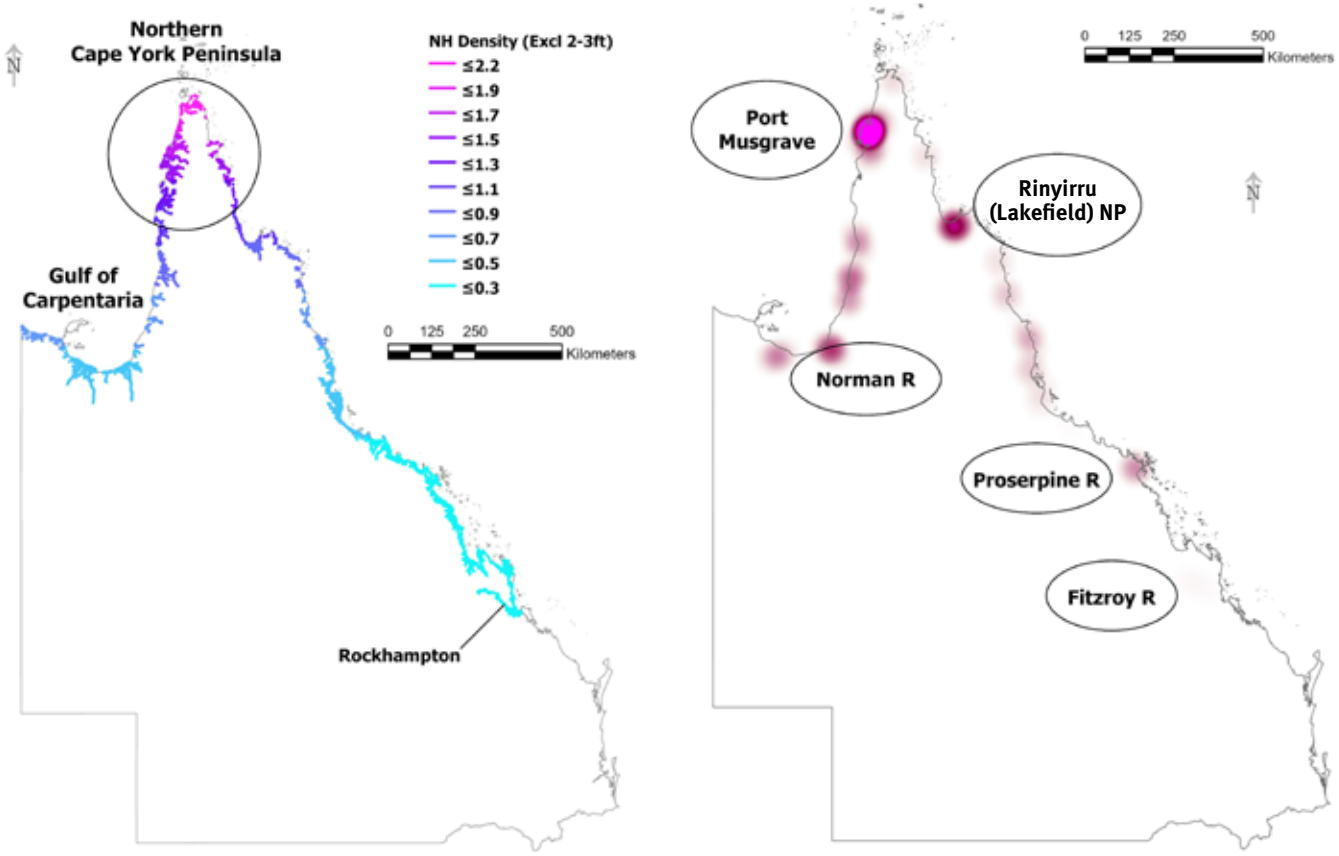

Figure 4. a) Crocodile densities are highest in northern Cape York Peninsula and decline southward; b) The far north-west of CYP contains 40% of the population, while Rinyirru (Lakefield) National Park and the Norman River are also key areas for nesting and recruitment. The Proserpine River has the highest density of any river in Queensland – 5.5/km, while the Fitzroy River represents the southern-most breeding population.

Where to from here?

Human-crocodile conflict will continue into the future. However, the modest growth rate of the crocodile population and the low to very low density of crocodiles across much of their range should allow for continuing effective management into the future. Key to this is the adoption and promotion of Crocwise behaviour.

The Department of Environment and Science will continue to actively monitor crocodiles into the future. It forms a key knowledge source to inform actions that improve both conservation and public safety outcomes. Rigorous and comprehensive monitoring allows future management models to become more responsive to population trends. This includes taking a proactive approach by identifying key areas for future management efforts and critical research.

References

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