

## **Appendix 8. Mapping the extent of crocodile habitat in Queensland**

### **Habitat mapping**

1. Mapping of the whole of the habitat actually or potentially occupied by estuarine crocodiles in Queensland followed procedures similar to those used by Webb et al. (1983) for the Northern Territory but used the most up-to-date spatial data available on the extent and characteristics of Queensland waterways and wetlands (palustrine and lacustrine).
2. This exercise captured, in addition to perennial waterways close to the coast, large intermittent streams further inland that have lagoons and nearby lacustrine features that provide crocodile habitat, and palustrine environments that are widespread in some areas.
3. The inland limit of estuarine crocodiles was defined for this purpose as coinciding with the 200m contour derived from the latest available 1-sec digital elevation model for Queensland (Gallant et al. 2011). This decision was grounded in records of all Queensland surveys, reliable anecdotal reports of inland occurrences of estuarine crocodiles, and the paper of Letnic and Connors (2006) which reports estuarine crocodiles at elevations of around 200m ASL in the NT.
  - 3.1. Estuarine crocodiles have been recorded at least 100m ASL in the Burdekin River (Taplin 1987), have been reported reliably as occurring near the 200m contour on the Lynd River during the 1970s (T Frisby pers. comm.), and extend close to 400m ASL in some of the short coastal streams of the Wet Tropics (DEHP survey data). However, across the state the vast majority of animals have been located at elevations of less than 20m ASL, including during helicopter survey.
  - 3.2. Constraining the extent of estuarine crocodile habitat in Queensland to the 200m contour, rather than whole catchments, gives an updated and more nuanced picture of the regional distribution of estuarine crocodiles than the whole-catchment approach of Taplin (1987).
4. Categorisation of watercourses was based subsequently on a breakdown of waterways into those lying between sea level and 20m ASL, those in the region 20-100m ASL and those 100-200m ASL. This division was based on extensive field observations suggesting that their primary habitat lay at less than 20m ASL, that smaller numbers would be found above the 20m contour, and smaller numbers again at the highest elevations.
5. Watercourses (i.e. rivers and creeks) providing potential habitat for crocodiles were selected using the following criteria:
  - 5.1. Perennial and intermittent watercourses below 20m ASL.
    - 5.1.1. The intermittent watercourses were further restricted to those adjoined by regional ecosystems defined as mangroves – this removed extensive areas of tidally intermittent watercourses crossing saline mudflats and samphire plains, particularly in the Gulf Plains regions.
  - 5.2. Perennial watercourses only where they are above 20m ASL – this excludes large areas of frequently dry temporary streambeds in upland areas.
6. To the watercourses were added lacustrine and palustrine areas lying within 2km of both perennial and intermittent waterways. This distance excluded considerable numbers of isolated and mostly temporary lagoons sufficiently distant from permanent water as to be unlikely crocodile habitat but captured many floodplain billabongs, lakes and lagoons.

Wet season floodwaters can lead to crocodiles taking up residence in temporary refuges some distance from river mainstreams.

7. Unlike the NT habitat estimate, beaches have not been included in the estimate of crocodile habitat across Queensland at this point. The numbers of crocodiles sighted along the coast of remote Queensland and the populated east during helicopter surveys in the late 1980s and 2017-19 were extremely small and not thought likely to add significantly to the total population.
  - 7.1. However, perennial streams and intermittent coastal streams bordered by mangrove that debouch onto beaches have been mapped, together with coastal swamplands and lakes.

#### **Revised habitat mapping following helicopter surveys of the Mitchell, Albert/Gregory and selected rivers of the populated east coast**

8. The 2017-2019 helicopters surveys helped to inform a revision of the extent of crocodile habitat in Queensland in three particular respects:
  - 8.1. We decided to remove from definition of crocodile habitat the many non-perennial creeks previously included in the 0-20m elevation zones. These include many mangrove-, saltpan- and saltwater couch-lined tidal channels that are used by crocodiles when they flood and where crocodiles can be found during low waters when the creek-bed is dry. So they are a component of habitat, but only of an intermittent nature.
  - 8.2. We also revised our assessment of the importance of the many isolated billabongs, lagoons and lakes that are prominent in the Gulf plains and parts of the bauxite plateaus of north-western CYP. The Mitchell River and, to a lesser extent, the Albert/Gregory River surveys confirmed that these are inhabited by estuarine crocodiles but not in sufficient numbers to be a significant contributor to either their overall habitat or their nesting habitat.
  - 8.3. We established that much of the highly modified palustrine wetlands of the populated east coast are so extensively modified by clearing, drainage works and conversion to pastoral or intensive agricultural uses that they are of limited conservation significance for estuarine crocodiles. Areas assessed to have been once of very high value (the Herbert River delta, the Murray/Tully River delta, and the Goorganga Plain adjoining the Proserpine River) are now of limited value.
9. We had earlier concluded that palustrine habitat is a minor component of crocodile habitat in Queensland because (a) it is of very limited extent except on the eastern coast of CYP and (b) on eastern CYP it is so low in productivity that crocodiles can make only limited use of it. The latest surveys indicate that we should exclude palustrine areas entirely from estimation of crocodile habitat, atleast for the purpose of estimating population size and assessing their relative importance for crocodile conservation.
10. We conclude therefore that Queensland's estuarine crocodile habitat is best estimated from the extent of perennial waterways. Furthermore, by far the most important perennial waterways are those in the 0-20m elevation zone. The fall-off in crocodile numbers with distance beyond the 20m elevation line was quite rapid in the Mitchell River and in the Wenlock River (based on 1988 surveys), very rapid in the Albert River. On the populated east coast, the extent and rapidity of fall-off with elevation varies considerably but the vast majority of these waterways are very short and make little contribution to overall crocodile numbers across the State.