A Compendium of Ecological Information on Australia's Northern Tropical Rivers

REPORT 8

Aquatic and Semi-Aquatic Reptiles

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Introduction

The reptile and amphibian fauna of Australia have been extensively reviewed by Cogger (2000) and Wilson & Swan (2003). Currently, there are at least 850 named species from Australia and its external territories. This is rich in comparison to other continents. Importantly, the reptile fauna is highly distinct, with over 80% of the reptile species found in Australia occurring nowhere else (Cogger 2000). Furthermore, new species (generally endemic ones) are being described every year. As a group, the reptiles are considered to have survived the environmental perturbations since European settlement of Australia considerably better than amphibians, mammals and birds (ANCA 1993), although, on a global scale, such implied resilience of reptiles has been questioned (Gibbons et al 2000). In Australia, reptiles as a group may have suffered less than other fauna groups because of the high proportion of reptile species that inhabit the arid inland regions of Australia, where the extent and impacts of human development and disturbance have been far less severe.

There has been no systematic review or collation of existing data for tropical reptiles. Frith & Frith (1991) documented the tropical reptiles and frogs of Australia, but acknowledged their coverage was biased to northern Queensland species. Whilst this chapter is not intended to be an exhaustive review, it does consolidate and summarise data for northern Australian aquatic and semi-aquatic reptiles from a number of sources.

The aims of this component of the project were to:

i. identify the aquatic and semi-aquatic reptile species in the Tropical Rivers Study area, and, to the extent possible, map and describe their distribution; and

ii. comment on the presence, location and distribution of rare, endangered and threatened reptile species.

One of the key aims of this project, to search for relationships between species distributions and key biophysical variables such as geomorphology, hydrology and riparian vegetation, was not addressed for reptiles. This was primarily due to the severe lack of data across the region.

Selection of Species

The key decision regarding the selection of species for this overview related to the classification of a species was aquatic/semi-aquatic or terrestrial. Information to determine this was largely derived from Cogger (2000), Greer (2003) and Wilson & Swan (2004).

Thirty species of reptile were selected for inclusion in the study (Table 1). These consist of 2 Crocodilidae, 1 Carettochelydidae, 13 Chelidae, 2 Achrochordidae, 1 Boidae, 6 Colubridae and 5 Varanidae. Crocodiles, turtles, files snakes and the colubrid snake species are easily

Table 1 Aquatic and semi-aquatic reptiles of the TRIAP Study Area.

Family	Genus	Species	Common Name
Crocodylidae	*Crocodylus*	*johnstoni*	Freshwater Crocodile
	Crocodylus	*porosus*	Esturine Crocodile
Carettochelydidae	*Carettochelys*	*insculpta*	Pig Nose Turtle
Chelidae	*Chelodina*	*canni*	Cann`s Longneck Turtle
	Chelodina	*rugosa*	Northern Snake Necked Turtle
	Chelodina	*novaeguineae*	
	Chelodina	*kuchlingi*	Kuchling`s Long neck Turtle
	Chelodina	*burrungandjii*	
	Elseya	*dentata*	Northern Snapping Turtle
	Elseya	*lavarackorum*	
	Elseya	*latisternum*	Saw Shelled Turtle
	Emydura	*australis*	North West Red Faced turtle
	Emydura	*subglobosa*	
	Emydura	*worrelli*	
	Emydura	*tanybaraga*	Northern Yellow Faced Turtle
	Emydura	*victoriae*	Northern red Faced Turtle
Varanidae	*Varanus*	*indicus*	Mangrove Monitor
	Varanus	*mertensi*	Merten`s Water Monitor
	Varanus	*mitchelli*	Mitchell`s Water Monitor
	Varanus	*panoptes*	Yellow Spotted Monitor
	Varanus	*semiremex*	Rusty Monitor
Achrochordidae	*Acrochordus*	*arafurae*	Arafura File Snake
	Acrochordus	*granulatus*	Little File Snake
Boidae	*Liasis*	*fuscus*	Water Python
Colubridae	*Cerberus*	*rynchops*	Bockadam
	Enhydris	*polylepis*	Macleay`s Water Snake
	Fordonia	*leucobalia*	White Bellied Mangrove Snake
	Myron	richardsonii	Richardson`s Mangrove Snake
	Stegonotus	*cucullatus*	Slaty Grey Snake
	Tropidonophis	*mairii*	Keelback of Freshwater Snake

identifiable as aquatic or semi-aquatic. The water python (*Liasis fuscus*) was the only other snake included in the study. Of the goannas, *Varanus mertensi* and *Varanus mitchelli* are described as being aquatic (Cogger 2000) and show morphological adaptations to aquatic life (eg. laterally compressed tail; nostrils and eyes positioned high on head; Shine 1986). Two of the mangrove monitors *Varanus indicus* and *Varanus semiremex* were included because they prefer similar habitats that border tidal estuaries and freshwater streams, and aquatic species (eg. fish, crabs) form part of their diet (Cogger 2000). *Varanus panoptes* is described by Cogger (2000) as being ground-dwelling. Shine (1986) states that this species is terrestrial,

though occurring more often in riparian habitats and takes 32% of its ingested biomass from aquatic habitats. Martin (1990) described diving behaviour in *V. panoptes* from a small creek near Nabarlek, Northern Territory, presumably searching for food. For these reasons, *V. panoptes* was also included in the study.

Sources of spatial data

The following five sources were identified as possibly providing spatial data for the reptile component of Tropical Rivers Inventory and Assessment Project.

- **OZCAM - Australian Museum**
  Online national fauna database administered by the Australian Museum and contributed to by the major State and Territory museums (http://www.ozcam.gov.au/index.php). The database was last accessed on 28 June 2005.

- **PWCNT - Parks and Wildlife Commission of the Northern Territory**
  Territory fauna database administered by the Department of Natural Resources, Environment and the Arts. Data were received on 9 November 2005.

- **WILDNET Queensland – Wildlife Online**
  State fauna database administered by the Environmental Protection Agency/ Queensland Parks and Wildlife Service (Environmental Protection Agency 2006) (www.epa.qld.au/nature_conservation/wildlife/wildlife_online). Data were received on 9 March 2006.

- **Crocodile Survey Data – EPA/QPWS Queensland**
  State crocodile database administered by the Environmental Protection Agency/Queensland Parks and Wildlife Service. The data were for 1999 crocodile surveys, and were received on 22 February 2006.

- **Department of Conservation and Land Management, Western Australia**.

  A request for crocodile survey data and spatial data for the remaining reptile species was met with the reply that CALM had no point data that could assist this project.

Data Summary

A total of 13,684 records of reptiles were extracted. A summary description of the data is provided below.

A total of 1,746 records were extracted from the OZCAM database. The data cover the entire Tropical Rivers Study Area area, and, on a catchment basis, range from a high of 316 records for the Finniss River catchment to no records for three catchments (Towns, Morning Inlet and Robinson Rivers). OZCAM provided valuable spatial data on species, but given its relative infancy (ie. commenced on 30 June 2003), large data gaps still exist, with some of the more remote catchments having a paucity of data. This limitation is certain to improve with time as more data are collected and entered.

A total of 11,352 records were extracted from the Parks and Wildlife Commission of the Northern Territory database. Data were recorded in each of the 28 catchments that fall within the NT. Of these, 9,330 records were from crocodile (*Crocodylus porosus* and *Crocodylus johnstoni*) surveys.

Crocodile records from Queensland were obtained, based on a 1999 survey by the Crocodile Management Unit, Queensland Parks and Wildlife Service. This dataset comprised 577 records of one species, *C. porosus*, from six Queensland catchments in the Gulf of Carpentaria.

WildNet point data from Queensland Environmental Protection Agency were obtained for only the Flinders River catchment. This dataset comprised of only nine records covering six of the selected species. There is some concern about the accuracy of these data (see below). Despite several requests for spatial data across the remaining Queensland catchments, including an offer to supply WildNet with shapefiles for each of the catchments, this was not forthcoming apart from a list of reptiles found in a boxed area roughly covering the whole of the Queensland TRIAP river catchment area. No spatial data accompanied the list, and hence, it was of little use for this project.

General description of species and their distributions

Three of the species are restricted to a single catchment. These are turtles and may be very specific in habitat requirements. *Elseya lavarackorum* is restricted to the Nicholson River catchment (Greer 2006), *Chelodina kuchlingi* is known only from a single specimen collected from near Kalumburu (Greer 2006) in the King Edward River catchment of Western Australia, and *Emydura subglobosa* is only recorded from Jardine River catchment in Queensland (Cogger 2000). The range of *V. semiremex* appears mostly restricted to the very most northern catchments of the Queensland portion of the Tropical Rivers Study Area, although the range does extend down the east coast of Cape York Peninsula.

The water python, *Liasis fuscus*, three colubrid snakes, *Fordonia leucobalia*, *Myron richardsonii* and *Tropidonophis mairii* and *V. panoptes* are species likely to be encountered across all of the catchments of Tropical Rivers Study Area. Six other reptile species are widespread across the Queensland and Northern Territory catchments, with ranges also extending into Western Australia as far south as the Kimberly region, but not extending south of the plateau into or beyond the southern-most catchments. This is also apparent in both northerly and southerly limits to distributions of many other species not included in this study, and may relate to habitat/climatic changes that occur in the general area of the southern boundary of the Kimberly plateau.

Twenty one of the 30 selected species are restricted mainly to freshwater habitats. These include all of the fourteen turtle species, the freshwater crocodile, water python and three species of colubrid snakes, *Enhydris polylepis*, *Stegonotus cucullatus* and *Tropidonophis mairii*, as well as the two goannas *V. mertensi and V. mitchelli*. Three species of colubrid snake, *Cerberus rynchops*, *Fordonia leucobalia*, and *M. richardsonii*, along with the little file snake, *Acrochordus granulatus* are restricted to estuarine and marine habitats. The saltwater crocodile, *C. porosus*, moves between freshwater and estuarine and marine habitats while the Arafura file snake, *Achrochordus arafurae*, is largely restricted to freshwater streams and lagoons, but will freely enter estuarine waters and the sea (Cogger 2000). Two varanid species, *V. indicus* and *V. semiremex*, have been recorded from coastal and esturine mangrove habitats as well as freshwater streams, and the yellow spotted monitor, *V. panoptes*, forages mainly in freshwater areas, but also along the banks of tidal estuaries.

Twelve of the species have ranges that extend beyond Australia to the north. These include the saltwater crocodile, *C. porosus*, three species of freshwater turtle, *Carettochelys insculpta*, *Chelodina canni* and *Chelodina novaeguinea*, both species of file snake. and the six species of colubrid snakes.

Protected Species

Harvesting of wild populations of *C. porosus* and *C. johnstoni* began from 1945 and 1958, respectively. Webb et al (1984) estimated that some 300,000 *C. porosus* were harvested between 1945 and 1972.

Western Australia was the first state to protect *C. johnstoni*, in 1962, followed by the Northern Territory in 1964, with introduction of the first Wildlife Conservation and Control Legislation. It was not until 1969 that *C. porosus* was protected, again firstly by Western Australia, followed by the Northern Territory in 1971. Queensland followed suit in 1974 with the introduction of the Queensland Fauna Conservation Act protecting both species.

Both species of Australian crocodiles were first listed on Appendix II of the Convention on International Trade in Endangered Species (CITES) in 1975. The world population of *C. porosus* (with the exception of Papua New Guinea populations) was transferred from Appendix II to Appendix I in 1979. In 1985, the Australian population of *C. porosus* was transferred back to a restricted Appendix II listing. The restriction limited the wild harvest to ranched specimens. This restriction was removed in 1994 and the species is now listed as Appendix II with a non-restricted listing. Species listed in Appendix II are those that, although not threatened with extinction now, might become so unless trade in them is strictly controlled and monitored; whereas species listed in Appendix I are threatened with extinction and are, or may be affected by trade. The transferring of populations to Appendix II allowed the re-establishment of an export oriented crocodile industry (Letnic 2004).

The pig nose turtle, *Carettochelys insculpta*, was listed on Appendix II of CITES in 2005 and the Gulf Snapping Turtle, *E. lavarackorum*, is listed as Endangered under the EPBC Act (for Threatened Fauna). The current Queensland Conservation Act 1992 has *C. porosus* and *E. lavorackorum* listed as VULNERABLE and *V. semiremex* as being RARE. The Western Australian Wildlife Conservation Act 1950 has both crocodile species, *C. porosus* and *C. johnstoni*, listed under the Wildlife Conservation (Specially Protected Fauna) Notice 2005 as SCHEDULE 4 – OTHER SPECIALLY PROTECTED FAUNA. Two species of goanna, *V mertensi* and *V. panoptes* appear on threatened species lists for the Northern Territory as vulnerable. This list was updated in February 2006 with the two species being assessed as a direct result of the impact of cane toads.

Data gaps

Data are very deficient in many of the catchments, a good example being two of the three focus catchments, the Flinders and Fitzroy (WA) Rivers. For the Flinders River, there was a toal of 13 records for seven species, while for the Fitzroy River there was a total of forty records for ten species (Table 2). One catchment, Morning Inlet, contained no records, while 17 catchments had only 20 records or less. Thirty catchments, or nearly 60%, had 50 records or less spread across a maximum of 30 species. The Finniss River catchment contains the most records with 3,014 entries, although 1,897 (63%) of these are from crocodile surveys The most records of a single species, 2,438, is from the Adelaide River catchment, and again these are records from saltwater crocodile surveys. The most species recorded in a catchment is 19, from both the Daly and Finniss River catchments. Most of the records (12,648) were from Northern Territory catchments, with 842 records from the Queensland catchments and 194 records from the Western Australian catchments. Catchment summary data are contained in Appendix A.

Table 2 Reptile data records for the focus catchments.

Family	Genus	Species	Fitzroy (OZCAM)	Daly (OZCAM)	Daly (PWCNT)	Flinders (OZCAM)	Flinders (Wildnet)
Crocodylidae	*Crocodylus*	*johnstoni*	3	12	165		3
	Crocodylus	*porosus*		2	341		1
Carettochelydidae	*Carettochelys*	*insculpta*		5	7		
Chelidae	*Chelodina*	*canni*					
	Chelodina	*rugosa*	9	11	7		1
	Chelodina	*novaeguineae*					
	Chelodina	*kuchlingi*					
	Chelodina	*burrungandjii*		3	2		
	Elseya	*dentata*		42	31		
	Elseya	*lavarackorum*					
	Elseya	*latisternum*		1	1		1
	Emydura	*australis*	8	2			
	Emydura	*subglobosa*		16	10		2
	Emydura	*worrelli*					
	Emydura	*tanybaraga*		18	20		
	Emydura	*victoriae*	6	4	11		
Varanidae	*Varanus*	*indicus*					
	Varanus	*mertensi*	2	24	39	1	1
	Varanus	*mitchelli*	1	9	24		
	Varanus	*panoptes*	4	2	14		
	Varanus	*semiremex*					
	Acrochordus	*arafurae*					
Achrochordidae	*Acrochordus*	*granulatus*					
	Liasis	*fuscus*		3	9		
Boidae	*Cerberus*	*rynchops*					
Colubridae	*Enhydris*	*polylepis*			1		
	Fordonia	*leucobalia*	4	1	1		
	Myron	richardsonii	1				
	Stegonotus	*cucullatus*		1	4		
	Tropidonophis	*mairii*	2	38	42	3	
Total Records			**40**	**194**	**729**	**4**	**9**

Generally, the more remote the catchment, the fewer data weres available. This also applies within each catchment, with the more remote and less accessable areas lacking in data. An example of this is the crocodile survey data that are also only obtained from certain sections of each waterbody, generally parts of the tidal reaches that have easier boat access, and not over the entire catchment. Figure 1 shows the distribution of the records from within the Finniss River catchment, highlighting that the data are not uniform across the catchment but are dependent on accessability.

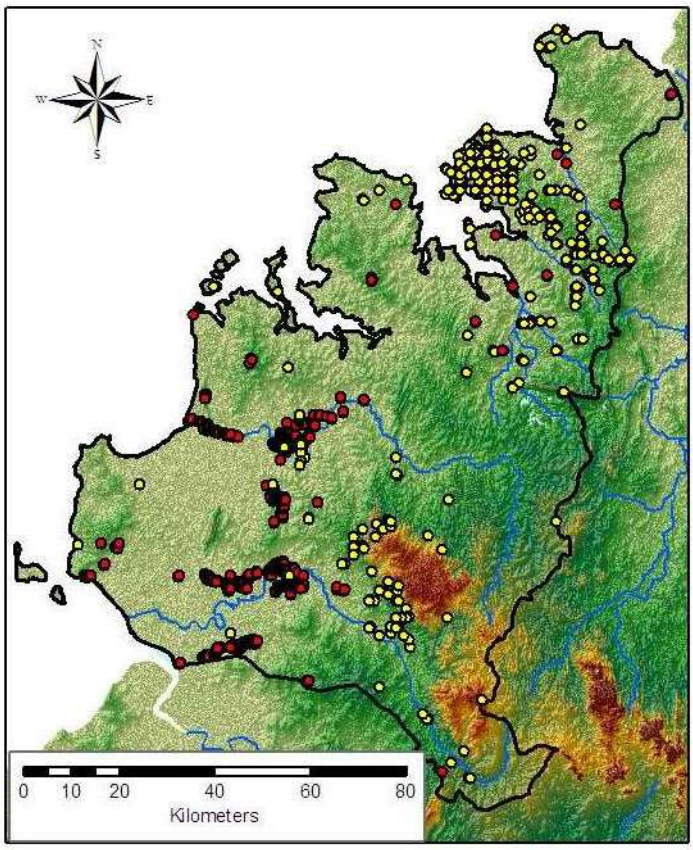

Figure 1 Distribution of data for the Finniss River catchment. Crocodile survey data points are red. Data for all other reptile species is shown yellow. Only major drainage systems are shown.

This lack of data, both across the catchments and within different areas of each catchment greatly affects any ability to characterise the biophysical status of reptiles within the TRIAP study area.

The accuracy of some of this data is also an issue, especially the older data, (pre GPS) where the localities of collected data was scaled from broad scale, often outdated plans. A good example of this is the Wildnet data for the Flinders catchment that has a quoted precision of between 900metres and 54km for the nine records.

Summary

Thirty species of reptiles, all considered to be aquatic or semi-aquatic, were identified for inclusion in the study. Four datasets were accessed and a total of 13,684 records were extracted. Of these records, two thirds (9,137) were of the estuarine crocodile, *C. porosus*, from crocodile surveys, leaving 4,547 records of the remaining reptile species across the 51 catchments. Data are highly deficient within many of the catchments and are typically restricted to the most accessable areass of each catchment.

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Appendix A Summary of reptile data for all catchments.

	Crocodylus johnstoni	*Crocodylus porosus*	*Carettochelys insculpta*	*Chelodina burrungandjii*	*Chelodina canni*	*Chelodina rugosa*	*Chelodina novaeguineae*	*Chelodina kuchlingi*	*Elseya dentata*	*Elseya latisternum*	*Elseya lavarackorum*	*Emydura australis*	*Emydura subglobosa*	*Emydura tanybaraga*	*Emydura victoriae*	*Emydura worrelli*	*Varanus indicus*	*Varanus mertensi*	*Varanus mitchelli*	*Varanus panoptes*	*Varanus semiremex*	*Acrochordus arafurae*	*Acrochordus granulatus*	*Liasis fuscus*	*Carberus ynchops*	*Enhydris polylepis*	*Fordonia leucobalia*	*Myron richardsoni*	*Stegonotus cucullatus*	*Tropidonophis mairii*	CATCHMENT TOTAL	NUMBER OF SPECIES
Cape Leveque Coast																				2								5	2			**9**	**3**
Fitzroy	3					9						8			6			2	1	4								4	1		2	**40**	**10**
Lennard	3	1				1													2													**7**	**4**
Isdell	1					7						29						14	5	1										1	**58**	**7**
Prince Regent	3	1				1						3						4	1												**13**	**6**
King Edward	5	1				7		1	1			6			3			7	5	3			1		1					6	**47**	**13**
Drysdale	1	1				2						1						3	1	1					2		2			1	**15**	**10**
Pentecost																									2		3				**5**	**2**
Ord	16			2		2			1						12			13	11	22					2					15	**96**	**10**
Keep	3	1				1												3	7	3										8	**26**	**7**
Victoria	226	167				11			62						51			15	12	17				3						1	**565**	**10**
Daly	177	343	12	5		18			73	2		2		38	15	26		63	33	16				12		1	2		5	80	**923**	**19**
Fitzmaurice	6	12							5						5			5	8								3				**44**	**7**
Moyle		108							3										2								1		1	1	**116**	**6**
Finniss	52	1897				51			24					68	7		1	20	19	54		16	11	335	71	19	101	33	126	109	**3014**	**19**
Adelaide	15	2438				20			2					4			3	24	20	34		17		77	12	15	7	14	36	107	**2845**	**17**
Mary	268	665				10			2					6	3			14	14	27		7	2	5		1			7	35	**1066**	**15**
Wildman		18				1								2		1			2	1		2					11			8	**46**	**9**
Sth Alligator	16	8	26	6		8			8	3				2		3		34	23	29		14		24					33	23	**260**	**16**
East Alligator		17	4			7			4					6				22	16	15		32		11	2	9	1	1	5	45	**197**	**16**
Goomadeer	1	79															1	1		1									3	1	**87**	**7**
Liverpool	1	687		1		2				6							3	2	1	1		2		3	4	1	5	2		1	**722**	**16**
Blyth		633				1									1		6		1	3		4		9	2	31	5		5	8	**709**	**16**
Goyder		450				4			1									1		1		6		4		10		1	5	4	**487**	**13**
Buckingham	1	639				1										1		6				1		3	3	2	3			8	**668**	**11**
Koolatong	5	26																4		1				1					1	2	**40**	**7**
Walker		3																						6			4			6	**19**	**4**
Roper	58	337			13	3	3		8						1	20	2	2	4	6		5		2			2	2		13	**481**	**17**
Towns		1																													**1**	**1**
Limmen Bight	7	3				2									1	5		5	1											2	**26**	**8**
Rosie		2																													**2**	**1**
McArthur	6	4			2	5	1								1	16		4	8	1		7			1					11	**67**	**13**
Robinson	1	1																1										1		1	**5**	**5**
Calvert	2	2				4										8		1				1									**18**	**6**
Settlement Ck	6				5	8										3		3	2											8	**35**	**7**
Nicholson	2	21					1		2	1	14			5		31		4	4	1		6				3				9	**104**	**14**
Leichhardt		1														1		5				18								1	**26**	**5**
Morning Inlet																															**0**	**0**
Flinders	3	1				1				1						2		2												3	**13**	**7**
Norman	1	69																1		1		2		1			2	2		1	**80**	**9**
Gilbert	1				6	1				5												1				1				5	**20**	**7**
Staaten		50																													**50**	**1**
Mitchell		36			1	2				15				7	6					1	3	4				7			4	8	**59**	**12**
Coleman	1	6															1	1			1	2		1	4		2		1	1	**21**	**11**
Holroyd																						1		1						1	**3**	**3**
Archer					1					2				4				1			4	7				17			4	8	**48**	**9**
Watson					1	2								1										2		4			1	1	**12**	**7**
Embley		40				1											2						1							1	**45**	**5**
Wenlock		367																1											8	13	**389**	**4**
Ducie		1								1							3									1			2	1	**9**	**6**
Jardine										1			1									1				2			3	3	**11**	**6**
TOTAL SPECIES RECORDS	**891**	**9137**	**42**	**14**	**29**	**193**	**5**	**1**	**196**	**37**	**14**	**49**	**1**	**143**	**112**	**117**	**22**	**288**	**203**	**246**	**8**	**156**	**15**	**500**	**106**	**124**	**163**	**59**	**250**	**563**		