NT Saltwater Crocodile (Crocodylus porosus) Wildlife Trade Management Plan: 2021 Monitoring Report

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Acronyms / Terms	Full form / Definitions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
CDU	Charles Darwin University
CFA NT	Crocodile Farmers Association of the Northern Territory
CITES	Convention on International Trade in Endangered Species
DEPWS	Department of Environment, Parks and Water Security
DIIT	Department of Industry, Innovation and Tourism
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
IUCN	The International Union for Conservation of Nature
NLC	Northern Land Council
NT	Northern Territory
TPWC Act	Territory Parks and Wildlife Conservation Act 1976

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Tony Griffiths, Keith Saalfeld, Glenn Edwards, and Alaric Fisher provided invaluable comments on drafts of this program. Parks Australia North provided data on the East Alligator, South Alligator, West Alligator and Wildman Rivers. The traditional owners of the Indigenous lands assisted Department of Agriculture Water and the Environment with the surveys, giving permission to survey on their land. Industry economic data provided by CFA NT.

CONTENTS

SUMMARY

The Wildlife Trade Management Plan 2021-2025 (WTMP) is an approved plan under Subsection 303FO(3) of the *Environment Protection and Biodiversity Conservation Act 1999* permitting the export of animals and animal product taken in accordance with the plan. The NT Government through the Department of Environment, Parks and Water Security (DEPWS) is required to provide an annual report to the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) on the implementation of the WTMP.

This report covers the implementation of the WTMP in 2021, the first full year of the operation of this plan. The instrument approving the WTMP was signed by the Minister's delegate on 2 December 2020, and subsequently registered on the Federal Register of Legislation.

As with the previous year, the COVID-19 Pandemic had implications for the undertaking of field work in the NT as well as industry wide impacts on business operations in 2021. DEPWS conducted spotlight surveys in three of the eight monitored rivers (three scheduled) in 2021. Parks Australia North did not survey any of the four monitored rivers in Kakadu National Park as their survey program was impacted by COVID-19 pandemic and resourcing restrictions. The results of the surveys were consistent with recent trends showing either stable (believed to have reached an asymptote) or increases in both numbers and in biomass (more larger crocodiles observed). Monitoring will continue in 2022 as per the current NT Saltwater Crocodile Management Program subject to any logistical restrictions.

A total of 320 problem crocodiles were removed by specialist crocodile handlers in the DEPWS Wildlife Operations Team in 2021 for public safety purposes and to protect stock in pastoral areas, of which 75% were males and 87% were caught in the Greater Darwin Zone including Darwin Harbour. This number is up from the 260 recorded in 2020 but lower than the historical annual high of 392 recorded in 2018. The results are consistent with an increasing trend in capture over the last two decades (commensurate with an overall increase in the NT saltwater crocodile population) with much year on year variation. One factor influencing higher capture numbers (relative to two preceding years) was the higher annual rainfall, following on from two relatively poor wet seasons in 2018/2019 and 2019/2020. Overall size trends do not reflect an

increasing proportion of smaller animals, as would be expected in an “overharvest” situation.

The DEPWS continued to promote community awareness for safety and participation in 2020/2021 through the Be Crocwise campaign using a variety of media. DEPWS delivered 78 Be Crocwise face-to-face presentations to 3,200 people in 2020/2021. Presentations were delivered at schools, community events and other fora across the Top End and Katherine regions.

Under the annual ceiling of 90,000 viable eggs, 84,950 viable eggs were allocated to harvest, with 46,836 viable eggs collected in 2020/2021. All indications are that the current harvest of eggs is well within sustainable limits.

Under the annual harvest ceiling of 1,200 non-hatchling crocodiles, 16 live crocodiles were reported as harvested in 2020/2021. The majority of reported live-harvested crocodiles were adult males (58%) but the proportion was less than in previous years. The total number of crocodiles harvested is known to be a slight underestimate due to a number of harvest permits being multi-year permits that have not yet expired; consequently complete final return/harvest data are not yet available. Despite this underestimate, the total harvest of live crocodiles from all sources at 397 individuals was well below the 1,200 threshold. The bulk of removals was related to the NT Government removal program in designated management zones.

Eleven crocodile farms operated in 2021 in the NT and production data from these farms for the period 1 January 2021 to 31 December 2021 is reported here. Farm production reporting is limited to stock held (live crocodiles), total acquisitions and total disposals. As with previous years, most live crocodiles exported from the NT went to Queensland. Stock held on farms has been consistently around the 100,000 mark in recent times.

In 2020/2021, revenue from the NT’s crocodile industry rose slightly by 1.4% to $24.2 million following on from an observed decline in 2019/20. Trends in farm revenue have been relatively steady and averaged $24.5 M per annum over the past five years. Stricter grading standards were introduced in 2016/2017, leading to a greater quantity of crocodile skins being classified as lower grade skins; however, in recent times the industry has adjusted to produce a higher proportion of first grade skin and volumes and values now are higher than under the old grading system. Around 79% of revenue was generated

from the production of first grade skins in 2020/21 reflecting an ongoing focus of quality over quantity.

Permit and animal welfare compliance was closely monitored by DEPWS and the NT Department of Industry, Trade and Tourism (DITT). No significant permit compliance or animal welfare matters were reported in 2020/2021.

All annual milestones of the WTMP were delivered or considered as being 'on track' in 2021.

INTRODUCTION

The *Management Program for the Saltwater Crocodile (Crocodylus porosus) in the Northern Territory of Australia, 2016-2020* (MPSC) establishes the management framework for the saltwater crocodile in the Northern Territory (NT). Linked to this document, the *Wildlife Trade Management Plan- Crocodile Farming in the Northern Territory 2021-2025* (WTMP) (DEPWS 2020) addresses requirements under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC) Act. The WTMP allows product sourced in the NT to be exported internationally in compliance with the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is a transnational agreement among governments, ensuring that international trade in specimens of wild animals and plants does not threaten the survival of the species concerned.

The WTMP was approved under Subsection 303FO(3) of the *Environment Protection and Biodiversity Conservation Act* 1999 on 2 December 2020. Under this arrangement, the NT Government through the Department of Environment, Parks and Water Security (DEPWS) must provide an annual report to the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW; formerly the Department of Agriculture, Water Resources and the Environment) on the implementation of the WTMP. The WTMP supersedes the previous WTMP 2019-2020. All previous reports can be accessed via the NT Government web site.

IMPLEMENTATION OF THE WTMP IN 2021

POPULATION MONITORING

The results of the 2021 population surveys are provided in Appendix 1 and are summarised here. Fieldwork in 2021 was impacted by the ongoing COVID-19 pandemic but to a lesser extent than in the previous year. The NT survey program was largely completed; however, none of the Kakadu National Park target rivers were surveyed in 2021 (Table 1 and Appendix 1).

The 2021 surveys of saltwater crocodiles built on monitoring first established in 1971 when the species was declared protected. Since 1971, a range of varied monitoring projects have been undertaken by the University of Sydney, Parks Australia North (Kakadu National Park), Wildlife Management International (WMI) and DEPWS.

A summary of NT river surveys for the period of the current WTMP and the year individual river surveys were commenced is given in Table 1. The standardised spotlight surveys started in 1975. Surveys have since continued annually in the case of the Adelaide River and biennially for the Blyth River, Cadell River, Daly River, Glyde River, Liverpool River, Mary River and Tomkinson River (Figure 1; Appendix 2); however, in some years planned surveys could not be undertaken, most notably in 2020 due to COVID-19 restrictions.

In addition, four rivers (Wildman River, West Alligator River, South Alligator River and East Alligator River) in Kakadu National Park have been regularly surveyed by Parks Australia North (Clancy and Fukuda 2021). Kakadu National Park, whilst being outside the land directly managed under the WTMP, is an important reference point for understanding the population dynamics of the species especially in a no harvest setting.

Table 1 Summary of the standardised crocodile surveys in the monitored rivers in the NT between 2015 and 2021 along with date of first survey.

River	Frequency	Agency	First surveyed	2016	2017	2018	2019	2020	2021	Total Years surveyed
Adelaide	Annual	DEPWS	1977	√	√	√	√	√	√	37
Blyth	Biennial	DEPWS	1975	√		√				35
Cadell	Biennial	DEPWS	1975	√		√				34
Daly	Biennial	DEPWS	1978	√		√			√	26/19
East Alligator	Annual	Parks Australia	1977	√	√	√	√		X[d]	32
Glyde	Biennial	DEPWS	1975	√		*[a]				14
Liverpool	Biennial	DEPWS	1976	√		√				32
Mary	Biennial	DEPWS	1984		√		√		√	23
McArthur	Irregular	DEPWS	1979				√			4*[b]
Roper	Irregular	DEPWS	2000		√					3*[b]
South Alligator	Annual	Parks Australia	1977	√	√		√		X[d]	26
Tomkinson	Biennial	DEPWS	1976	√		√				32
Victoria	Irregular	DEPWS	1987		√					7*[b]
West Alligator	Annual	Parks Australia	1977	√			*[c]		X[d]	22
Wildman	Annual	Parks Australia	1978		√		*[c]		X[d]	24

*[a] Survey scheduled but cancelled as the traditional owner approval to access not granted
*[b] Different survey methods (e.g. helicopter) used for some years
*[c] Planned river section not fully completed
*[d] No boats available for Kakadu surveys

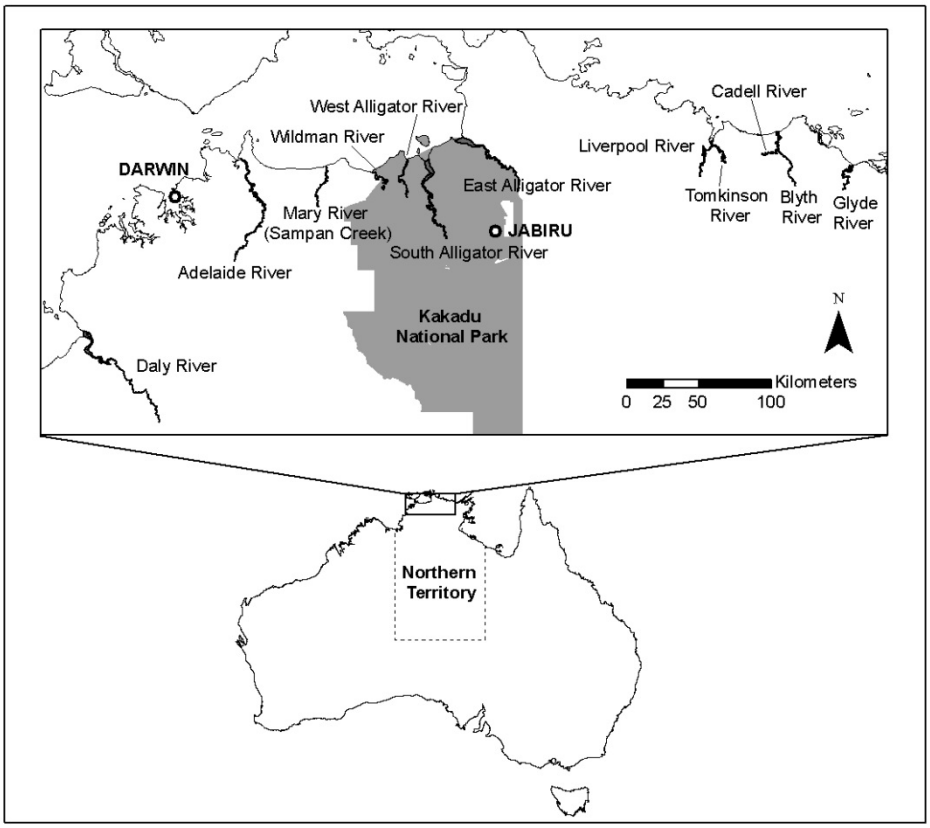


Figure 1 Rivers where Saltwater Crocodile (C. porosus) populations are monitored in the Northern Territory.

Population trends

As with previous years, the overall population trend for saltwater crocodiles can be estimated by combining all monitoring data in a simple composite model of relative density. This model (see Fukuda *et al*. 2011 for details) aggregates data across the monitoring period and has been updated for recent surveys. The population model of non-hatchlings (>0.6 m) *C. porosus* demonstrates an ongoing and consistent increase in population since protection in 1971 with the rate of increase slowing post 1990 (Figure 2).

The approaching of a biologically obligate asymptote is less apparent than appeared to be the case in 2020. That is, whilst the population cannot continue to increase indefinitely, updating for the most recent data suggest achievement of a "carrying capacity" may still be several years off. As previously reported, most subpopulations in the monitored rivers have shown large increases since protection. Results for each individual river are provided in Appendix 1 including that for 2021.

Monitoring continues to support the proposition that the harvesting program has not had a detrimental impact on the crocodile population in the NT since a regulated harvest was instigated (i.e. the population is increasing notwithstanding offtake of both eggs and live crocodiles). Where population growth has slowed, for example in the Mary River, it is consistent with density dependent factors and food limitation as local populations approach an environmental carrying capacity.

Under the MPSC, evidence of either a catastrophic decline (defined as a 50% or greater decline in assessed density in a single river system in a single year) or an ongoing clear downward trend, is a trigger for a review of harvest parameters. All monitored rivers continued to exhibit either an upward or stable trend (see Appendix 1, Figure 2).

As with previous years, there has been no 'catastrophic decline' detected in any river. The largest survey to survey decline recorded to date is in the Tomkinson River. Here the population declined by approximately a 37% over a two year interval (2016-2018); however, there is no indication that this is anything more than expected count to count variation (Clancy and Fukuda 2020). The Tomkinson River was not surveyed in 2020 due to COVID-19 related access issues and is next scheduled for survey in 2022.

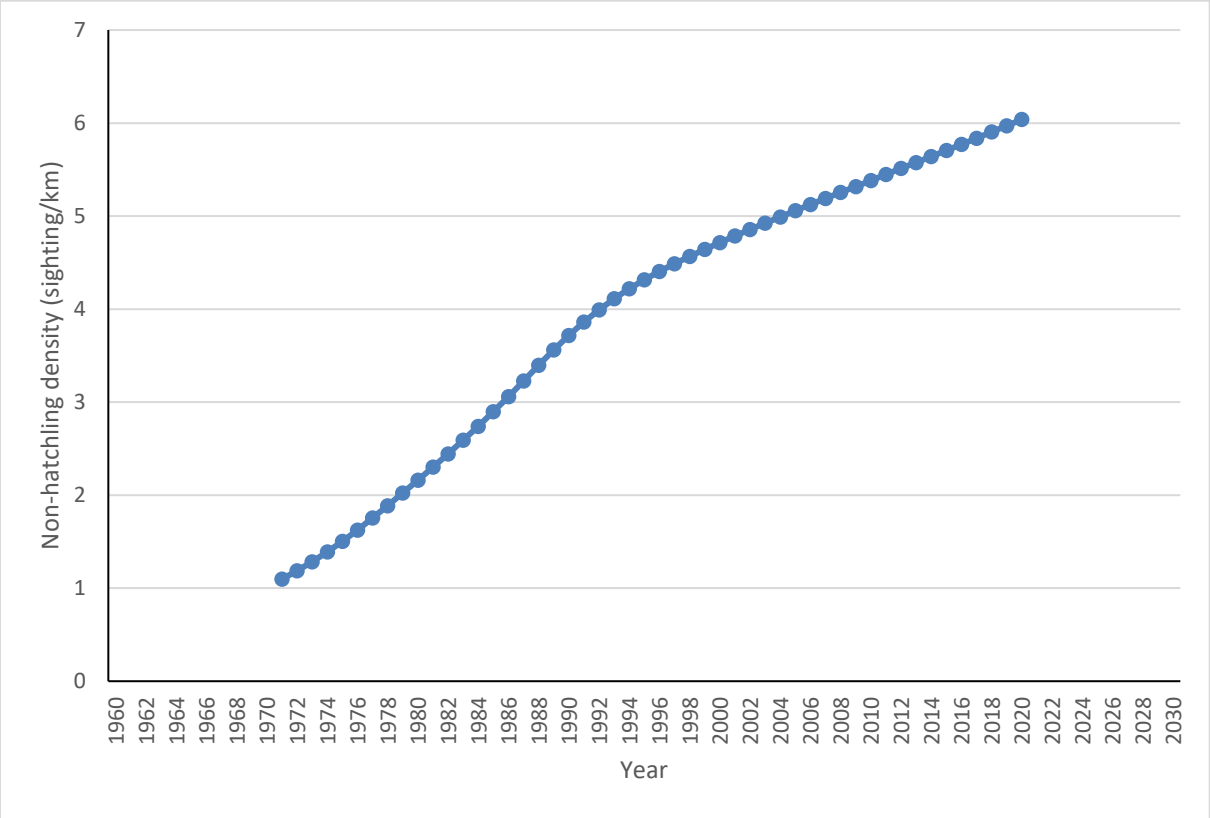


Figure 2 Modelled abundance density of non-hatchling (>0.6 m, including eyes-only) of C. porosus calculated from standardised spotlight surveys in 12 tidal rivers between 1971 and 2020.

Size Structure

Biomass estimates for all monitored rivers are given in Appendix 1. The underlying trend in population size classes and resultant change to biomass was reported in a previous report (Clancy and Fukuda 2021). There has been a consistent trend over the four decades from smaller to larger crocodiles as the *C. porous* population recovered post-protection and through the 1980s, 1990s and 2000s. There has been a documented decline in the proportion of crocodiles in the 1 to 3 metre size range in the population in recent years, and increases in the proportion of crocodiles in the 3 to 4 metre size range and in the proportion greater than 4 metres in length (Figure 3; Clancy and Fukuda 2021). The 2021 surveys are consistent with this underlying trend. A more extensive analysis of changes in population structure will be undertaken as part of the review of the SCMP.

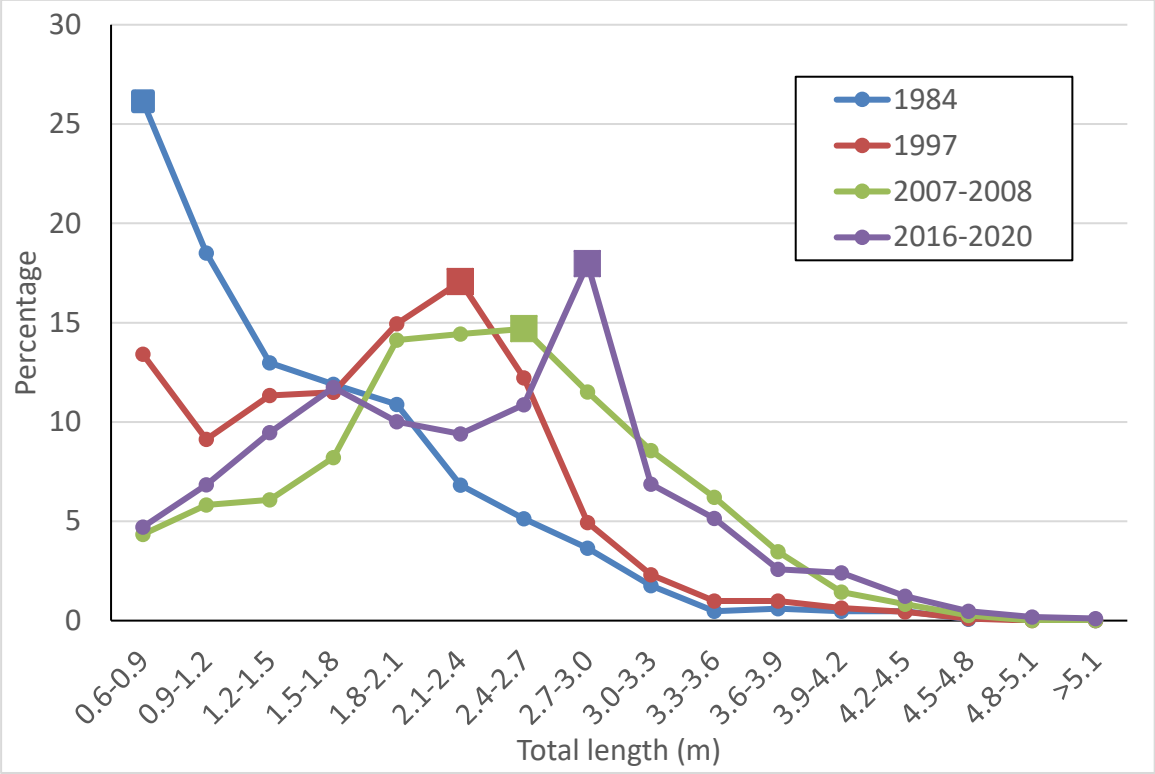


Figure 3 Percentage of saltwater crocodiles in incremental 0.3m size classes (0.6 - >5.1 m) (2 - >17 ft) in 12 monitored rivers combined in the NT between 1984 and 2020. Highest proportion size class indicated by a ■ marker for each time period.

Impacts of harvesting and population trends

Evidence of impact of current management on population size of saltwater crocodile across the NT was considered as part of the WTMP review (Clancy and Fukuda 2019, Clancy and Fukuda 2020; and see Fukuda *et al.* 2021 for detailed modelling analysis of impacts). All available evidence indicates that the NT population of the saltwater crocodile is secure by any criteria used to assess status and has exhibited strong population recovery irrespective of the commercial offtake. There is no additional evidence arising in 2021 that would contradict this conclusion and these data are consistent with current restrictions on off-take being sustainable in the long-term for the species.

The survey results for the three rivers surveyed in 2021 were consistent with (within normal variation) longer-term trend lines. The Adelaide River continues to be an important benchmark for the monitoring of the saltwater crocodile population being so close to a major population centre, and being an important eco-tourism site as well as a

source for eggs for industry. Indications are of a relatively stable population in terms of density of crocodiles in the river; however, average size of the crocodiles (as indicated by size class distribution and resultant biomass estimate) is continuing to climb (Figure 4).

The Mary River (both tidal and upstream freshwater segments) is the best example of a riverine area that has reached an upper limit in the number of crocodiles with densities being 11 per linear km and 5 per linear km respectively. Densities in the downstream area of Mary River are some of the highest recorded for the species and may represent the maximum that such riverine habitats can support. Saltwater crocodile density in upstream (freshwater) segments of both Mary and Daly Rivers (see Appendix 1) is much more variable than in downstream (tidal) segments as to be expected. Lower numbers, challenging survey conditions and the likelihood of a more mobile population in such less suitable habitats all contribute to lower precision of estimates.

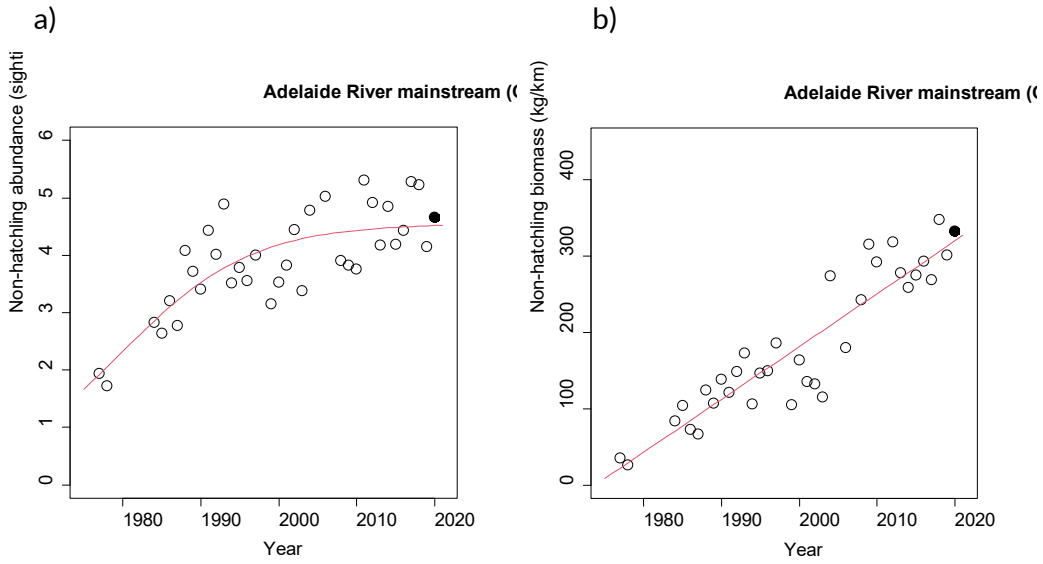


Figure 4 Saltwater crocodile a) abundance index (number of non-hatchlings sighted/km) of standardised river surveys and b) biomass (estimated kg/km) over 40 year survey period of the Adelaide River. Most recent estimate indicated by solid circle in this and subsequent plots.

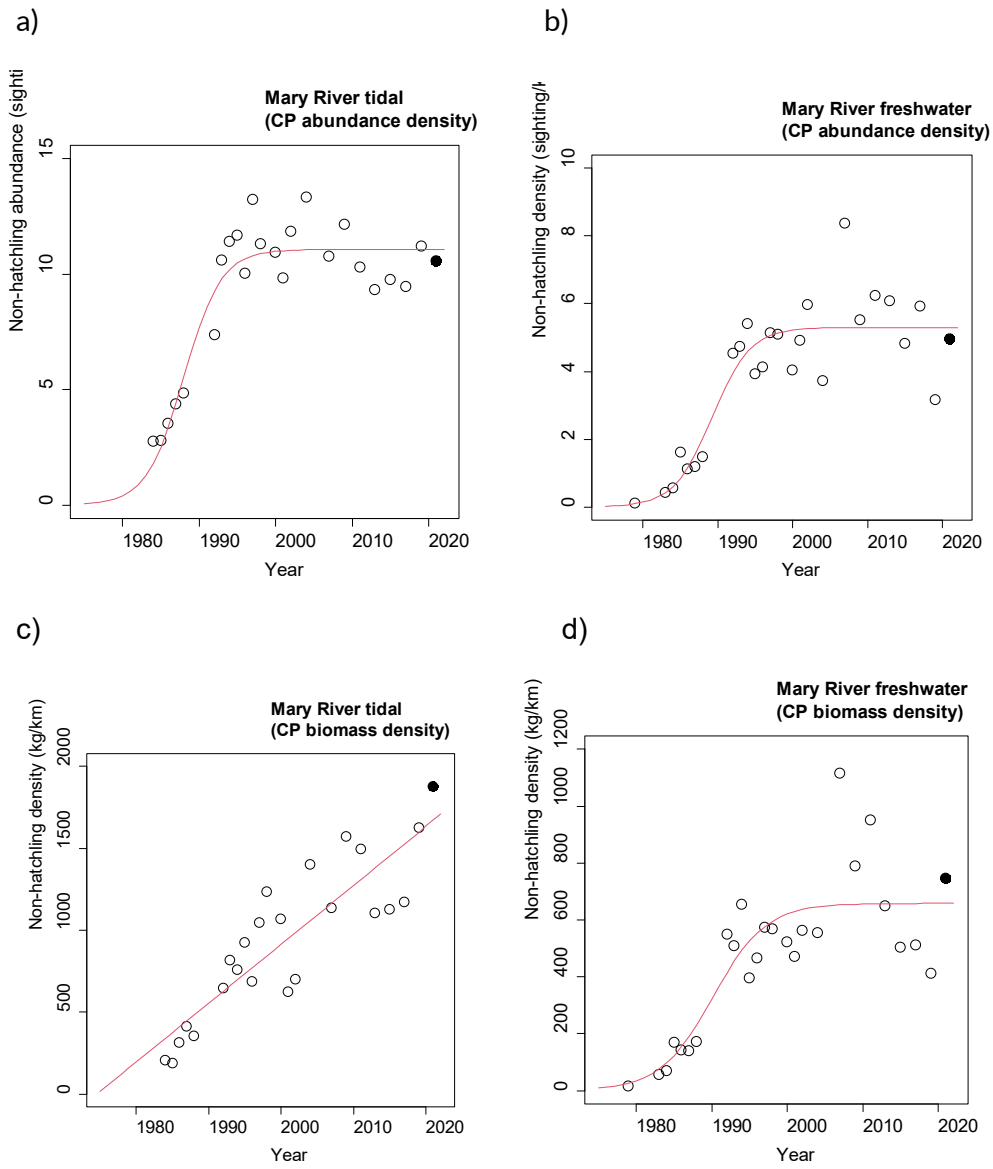


Figure 5 Saltwater crocodile a) abundance index (number of non-hatchlings sighted/km) and b) biomass (estimated kg/km) of tidal component and c) abundance index (number of non-hatchlings sighted/km) of standardised river surveys and d) biomass (estimated kg/km) of the upstream component of standardised river surveys over 40 year period of the Mary River.

PROBLEM CROCODILES

Problem crocodiles are defined within the MPSC as those individuals where one or more of the following applies:

1. The crocodile has attacked or is about to attack a person or persons;
2. The crocodile is behaving aggressively towards a person or persons;
3. The location of the crocodile makes it a threat or potential threat to human safety or wellbeing; or
4. The activity of the crocodile is affecting the productivity of industry or commercial enterprises.

In a practical sense, this means that crocodiles, especially large ones that occur within settled areas or areas of recreational use, where public safety is a prime consideration are deemed problem crocodiles, as are those that attack stock in pastoral areas. In some areas, such as around Darwin, the Katherine River near Katherine and designated swimming areas in National Parks, any *C. porosus*, regardless of size, is classed as a problem animal.

Removal of Problem Crocodiles

The NT Government removes problem crocodiles from specific problem crocodile management zones in the NT: Darwin Crocodile Management Zone, Katherine Crocodile Management Zone and Borroloola Crocodile Management Zone. In addition to the management zones, DEPWS removes problem crocodiles at other settled locations upon request. Removed problem crocodiles are sold to crocodile farms to be utilised as breeding stock or for skin and meat production. Problem crocodiles are not relocated because relocated crocodiles rapidly return to the site of initial capture (Walsh and Whitehead 1993, Read *et al.* 2007, Fukuda *et al.* 2019).

The DEPWS Wildlife Operations “Croc Team” removed 320 problem crocodiles from within the designated management zones in 2021 (Table 3, Figure 6). This is more than the previous year but below the record high number of removals from 2018. There is a general trend for an increase in captures with time; however, management effort and methods used have varied over time. The rate of increase has slowed in recent times (Figure 6) consistent with the broader population trend.

Almost all (86.9%) problem crocodiles removed in 2019/2020 were from the Greater Darwin management zone. As with previous years, the removal was strongly male biased (Table 3).

Patrol and removal effort was roughly equivalent to previous years. Problem crocodiles that are removed are made available to NT crocodile farms through a tender process with the vast majority (>95%) sold under this arrangement. In the context of both the WTMP and the MPSC, all problem crocodiles removed from the wild are included within the overall live harvest quota.

Table 3 Total number of C. porosus removed by DEPWS staff as problem crocodiles, sex ratio as proportion of males, and the proportion of problem crocodiles caught in the Darwin Harbour and Greater Darwin Region from 2012 to 2021

Year	Problem crocodiles	Percentage Males	Percentage Darwin Harbour	Percentage Greater Darwin Zone
2012	327	77.1%	65.4%	91.1%
2013	232	77.6%	70.7%	87.1%
2014	292	79.1%	70.2%	92.5%
2015	311	74.3%	66.6%	86.2%
2016	233	72.1%	73.0%	93.1%
2017	383	76.8%	80.7%	93.0%
2018	392	74.0%	66.8%	83.9%
2019	257	73.9%	58.4%	82.5%
2020	260	68.8%	65.4%	86.5%
2021[1]	320	74.7%	59.1%	86.9%

[1] Numbers from previous year may vary from previous reports due to late capture information returns

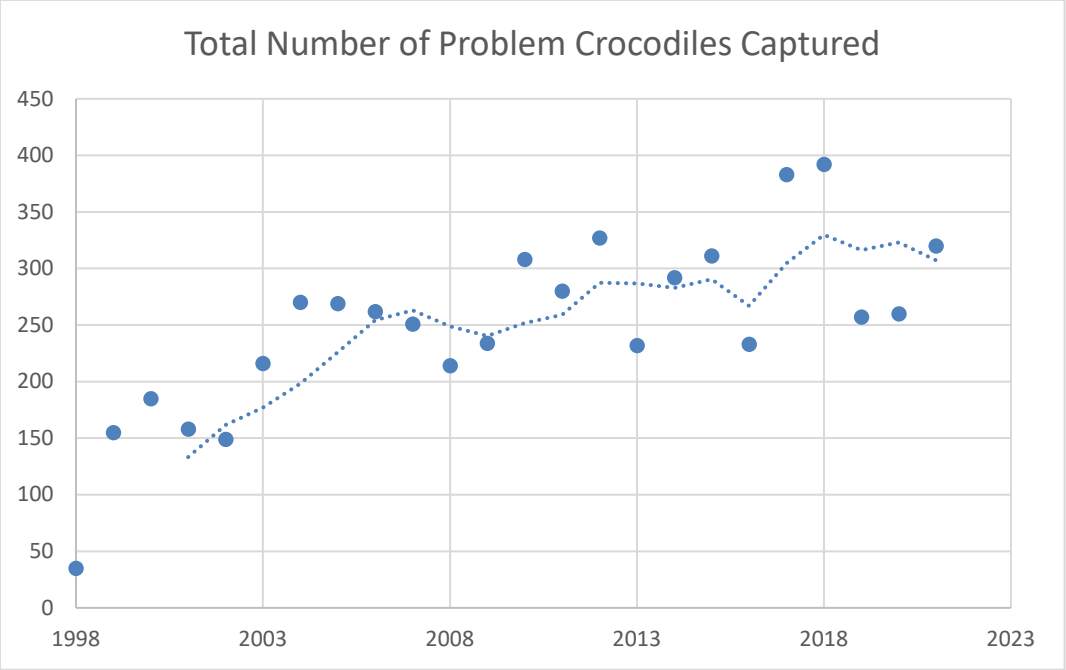


Figure 6 The number of C. porosus removed annually 1998 – 2021. Dotted line shows running average over a 4 year period.

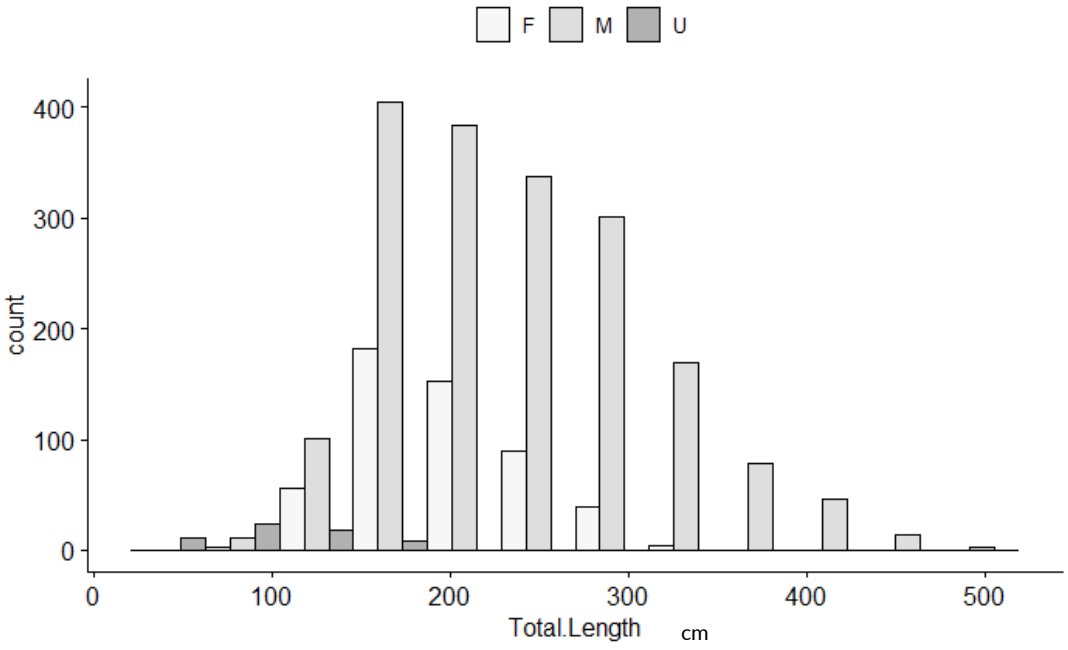


Figure 7 Size distribution of C. porosus removed over period 2012 to 2021. F=Female, M= Male, U = Unknown

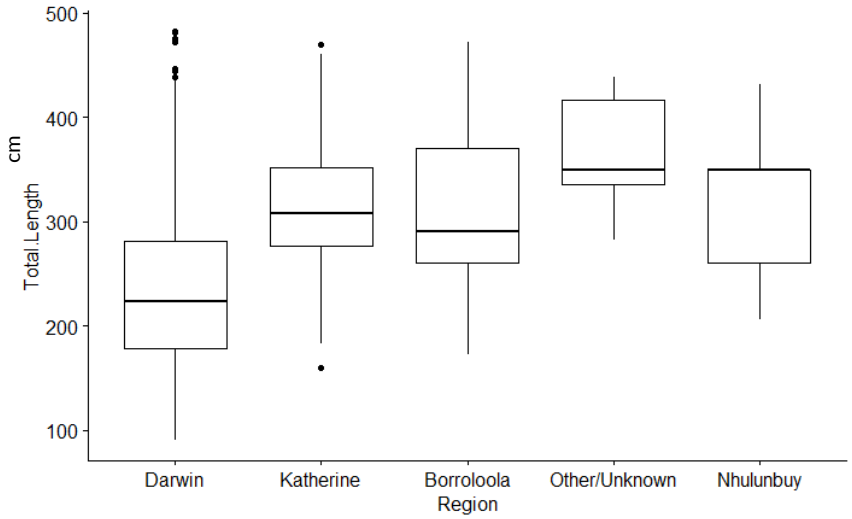
Consistent with Fukuda *et al.* 2014 (which was based on pre-2012 data), the bulk of the captures since 2012 were in the 1.5 m to 2.5 m size class; however, a number of very large crocodiles have been removed from the management zones (Figure 6). Fatal

attacks have been recorded by crocodiles larger than 3 m, with attacks possible across a broad range of size classes, especially above 2 m (Fukuda *et al.* 2014).

While the sizes varied slightly across the management zones (Figure 8a), there is no indication of a significant trend towards catching smaller crocodiles (Figure 8b) which might be expected if the overall source population was being reduced. Fukuda *et al.* (2021) show that the numbers removed, in conjunction with the number of live crocodiles taken from outside the management zones (see below), are well within modelled sustainable limits.

Whilst the mean size of crocodiles caught in the Darwin management zone is less than that in other zones (Figure 8 a), this is most likely related to the much greater numbers that are removed from this area. Looking just at very large crocodiles, a much greater number are taken from Darwin Harbour in absolute terms (Figure 9) even if smaller number relative to the overall number of removals.

a)



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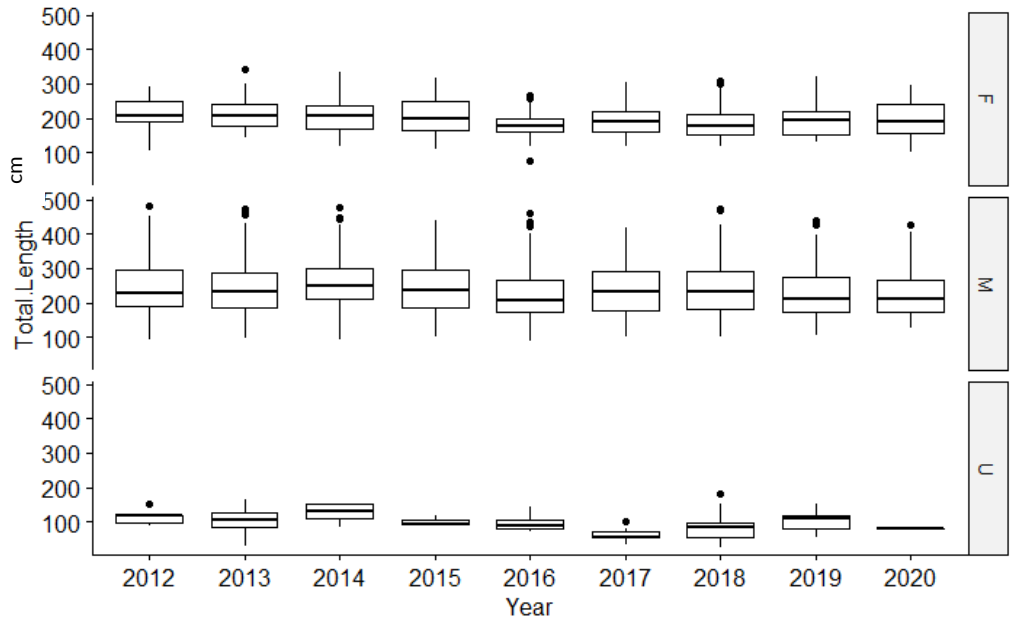

Figure 8 Box plots of size distribution of problem saltwater crocodiles removed for the period 2012 -2021 by a) Management Region and b) Year. M = Male, F= Female, U= Unknown sex.

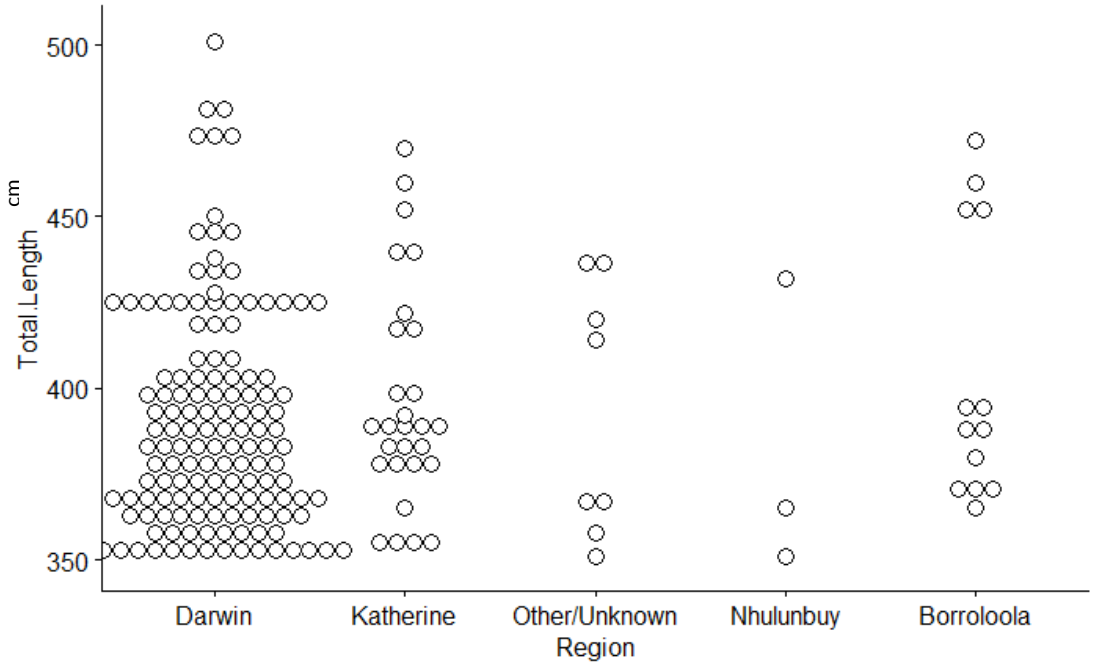

Figure 9 Dot plot of large (> 3.5 m) crocodiles removed under the DTSC Wildlife Operations removal program by Management Region for the period 2012 - 2021.

Community Awareness and Participation

The NT Government promotes crocodile awareness among residents and visitors by disseminating educational information through the 'Be Crocwise' strategy. Public awareness campaigns are conducted regularly to minimise harmful interactions between people and crocodiles. These campaigns use a variety of media including TV, DVD, social media, newspapers and radio to ensure messages about safe behaviour are effectively conveyed to both locals and visitors. The show circuit, tour guides, park visitor centres, park ranger talks and boat expos are avenues to further disseminate messages in a face-to-face setting. The NT Government also promotes relevant legislation, policy and guidelines to the commercial crocodile industry and wider community via promotion of the management program, relevant fact sheets, and through the wildlife permit system.

DEPWS delivered 78 Be Crocwise face-to-face presentations to 3,200 people in 2020/2021. Presentations were delivered at schools, community events and other fora across the Top End and Katherine regions.

HARVEST FROM THE WILD

Eggs

Under the WTMP, a harvest ceiling of 90,000 viable eggs applies from the 2016/2017 egg harvest season onwards. The definition of "live", "viable" and all "eggs" follows the WTMP.

The number of eggs permitted to be taken has been below the harvest ceiling in all years since 2016/2017 (Table 4). In 2021/21 only 55% of the allocated harvest was taken. This was consistent across all permits. There was a 12% increase in eggs collected compared to 2019/2020, which was higher than the low harvest of 2018/19.

The returns of permit holders were closely monitored and incubator inspections were conducted to ensure that the stock taken under each permit complied with the conditions of the permit (see Permits & Compliance below).

Table 4 The number of C. porosus eggs harvested for commercial use from the 2013/2014 to 2020/2021 egg collection seasons. Note that for 2013/2014 through 2015/2016 the annual harvest ceiling is for "live" eggs and from 2016/2017 onwards for "viable" eggs.

Season	Harvest Ceiling	Eggs permitted	Eggs harvested
2013/2014	70,000	60,750	51,238
2014/2015	70,000	68,000	50,022
2015/2016	70,000	70,000	47,194
2016/2017	90,000	70,000	41,218
2017/2018	90,000	77,000	44,950
2018/2019	90,000	77,000	34,658
2019/2020	90,000	77,000	41,462
2020/2021	90,000	84,950	46,836

Live harvest

The WTMP allows up to 1,200 non-hatchling (animals greater than 0.6 m in length) *C. porosus* to be directly harvested from the wild each year. There were 16 problem crocodile permits (including four new and three that expired during the reporting period) in place during the reporting period for a maximum allowed take of 250 adult animals. There were an additional six crocodile harvest permits for an allowed take of 117 adult animals and 30 juveniles. The total permitted annual take was 397 animals from the wild in addition to those removed via the NT Government problem crocodile management program discussed previously.

A total of only 19 non-hatchling *C. porosus* were harvested from the wild in 2020/2021 (Table 5). This reflected a significant drop from previous years potentially related to COVID travel restrictions. Variation in the sex ratio of harvested adults is influenced by the harvest purpose (e.g. skin and meat harvest, female breeding stock for farms or problem crocodile removal). In 2020/21 the sex ratio of live harvested animals was biased towards males (Table 6) but less pronounced than the previous years. The majority of the crocodiles taken were animals deemed problem animals- i.e. harvested from near regional communities or pastoral properties to mitigate stock losses.

The number of crocodiles harvested in 2020/2021 as presented in Table 5 is potentially a slight underestimate of the actual harvest in the 12 month reporting period. This is due to failure to submit returns that generally relates to staff turnover in remote communities. Best estimates in these cases were of nil captures rather than permitted amounts being taken and not reported. Notwithstanding the potential for some unreported take, the total regulated harvest of live crocodiles from all sources is well below the established limit of 1,200.

Table 5 The number of hatchlings, juveniles and adults (2012/2013 to 2014/2015) or hatchlings and non-hatchling (2015/2016 onwards) of C. porosus harvested for commercial use in 2012/2013, 2013/2014, 2014/2015, 2015/2016, 2016/2017, 2017/2018, 2018/2019, 2019/2020 and 2020/2021.

Year	Hatchlings	Juveniles	Adults / Non-hatchlings
2012/2013	0	16	59
2013/2014	0	29	119
2014/2015	0	-	61
2015/2016	0	-	121
2016/2017	0	-	53
2017/2018	0	-	39
2018/2019	0	0	37
2019/2020	0	0	78
2020/2021	0	0	19

Table 6 Percentage of C. porosus harvested for commercial use in 2012/2013, 2013/2014, 2014/2015, 2016/2017, 2017/2018, 2019/20 and 2020/21 that were male.

Year	Male
2013/2014	73.5%
2014/2015	85.6%
2015/0216	76.4%
2016/2017	81.1%
2017/2018	92.3%
2018/2019	64.9%
2019/2020	83.9%
2020/2021	57.9%

FARM PRODUCTION

Eleven crocodile farms operated in the NT in 2021 (Table 8). Time periods used for farm permit returns were adjusted from the previous report (2019/2020) to align them with the calendar year as per the WTMP. Stock held on farms has been consistently around the 100,000 crocodiles in recent times. The bulk of production is driven by hatchlings grown from wild harvested eggs (see previous section). CITES makes the distinction between farming dependent on wild harvesting (termed ranching) and that dependent on captive breeding on-farm (Resolution Conf. 3.15 on 'Ranching' and Resolution Conf. 11.16 on ‘Ranching and Trade in Ranched Specimens', www.cites.org).

Farm production reporting is provided on stock held at the start and the end of the reporting period, acquisitions and disposals. Breakdown of farm production by component is not required as a condition of permit. From 2018, transfers out were separated from other categories of losses (mainly mortality of juvenile crocodiles) as the summed values gave the impression of significant levels of unaccounted for losses.

Details of the stock held on each farm for the period 1 January 2021 to 31 December 2021 are provided in Appendix 2. As with previous years, most live crocodiles exported from the NT went to Queensland.

Table 8 The number of crocodile farms operating in the Northern Territory, showing details of C. porosus stock held (2013/2014 to 2020/2021).

Year	No. of farms	Stock held 1 February	Farm-bred hatchlings	Total acquired	Crocodiles processed	Transfers Out****	Total Losses (Mortalities/ Transfers****/ Unaccounted)	Stock held 31 January
2013/2014	8	114,550	7,497	50,665	17,689		46,572	118,656
2014/2015*	8	118,656	6,877	61,347	14,061		49,632	122,915
2015/0216	9	130,431	7,698	63,742	17,935		59,198	137,661
2016/2017**	11	132,311	4,798	47,138	23,839		58,747	120,697
2017/2018***	10	101,661	4,090	53,995	19,642	30,893	7,727	101,030
2018/2019	10	101,030	6,674	51,643	21,696	25,225	5,078	100,769
2019/2020	10	98,038	6,480	51,258	23,216	23,149	8,591	100,820
2020/2021	11	100,450	5,020	50,694	21,721	24,740	9,332	100,371

* data for 7 of 8 farms only;

** data for 10 of 11 farms only

*** One farm inactive; Data for Stock held does not include unhatched eggs

**** Transfers out separated from mortalities from 2017/2018

Trends in industry economic return (as measured by reported farm revenue) have been relatively steady and averaged $24.5 M per annum over the past five years (NT Treasury and Finance Figures). In 2020/2021, revenue from the NT's crocodile industry rose slightly by 1.4% to $24.2 million (Figure 10) following on from the decline in 2019/20. Stricter grading standards were introduced in 2016/2017, leading to a greater quantity of crocodile skins being classified as lower grade skins; however, in recent times the industry has adjusted to produce higher proportion of first grade skins and volumes and values now are higher than levels under the old grading system. Around 79% of revenue was generated from the production of first grade skins in 2020/21 reflecting an ongoing focus of quality over quantity.

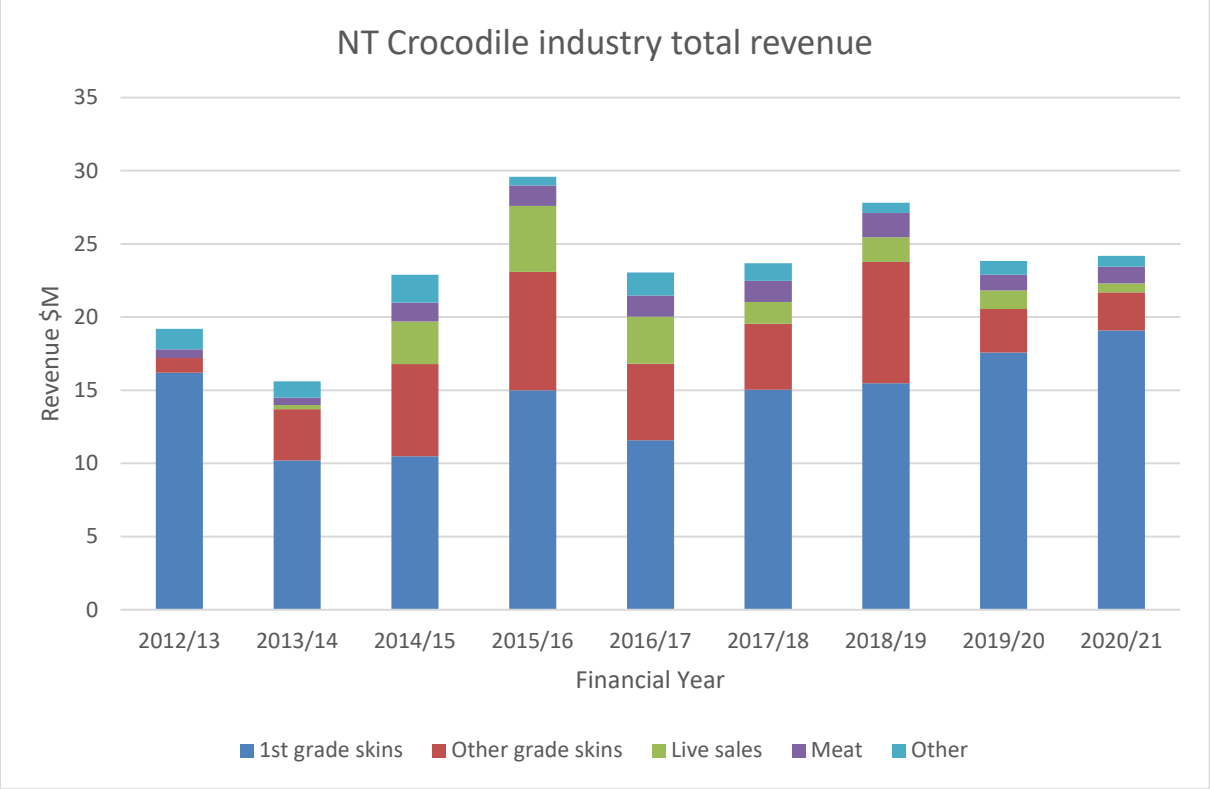

Figure 10 Trends in NT Crocodile Industry economic returns (revenue in $ M) over years 2012/2013 to 2020/2021. Data are from industry return data to NT Department of Treasury and Finance.

PERMITS & COMPLIANCE

The following is a summary of information pertaining to permits and compliance monitoring for the 2020/2021 egg harvest season:

- A total of 20 individual permits to collect crocodile eggs were valid.
- For 2020/2021 crocodile egg harvesters were required to submit annual returns for egg collection. DEPWS has standardised the format of final returns of egg collection to obtain the necessary data as specified in the WTMP. The return forms were provided both electronically and in hardcopy with each permit as per permit conditions.
- There were three audits of farm incubators undertaken and no field audits of collected nests during the 2020/2021 egg collection season. Compliance with record keeping standards for all inspected farms was very high with no significant issues detected. Desktop comparisons with recoded nest locations were consistent with all harvest occurring within the permit boundaries. The royalty system provides a strong incentive and internal checking system to ensure accurate recording of all harvested nests.
- There were no reported compliance issues for the 2020/2021 egg collection season from Traditional Owners, property owners or the public.
- Crocodile egg collection permit holders were required to submit final returns for the 2020/2021 crocodile egg collection season (December - May) by 31 July 2021. No warning letters or infringement notices were issued for non-compliance for late submission of returns.
- For the 2020/2021 crocodile egg collection season, collectors were required as a condition of permit, to provide 48 hours prior notification of date and location of collection activity via a dedicated email address or a dedicated phone number and message bank. Compliance with this system was high. As with previous years, non-compliance was primarily in the form of late notification (either immediately prior or after actual collection). No warning letters or infringement notices were issued for non-compliance.

- There was regular interaction with all permit holders including crocodile egg collectors, live crocodile harvesters and crocodile farmers, to discuss issues related to permitting, compliance and enforcement.
- There were no reported instances of “suspicious” behaviour by a crocodile harvester/s during 2020/2021.
- There was regular interaction between DEPWS and all other relevant jurisdictions.

ANIMAL WELFARE

The Code of Practice on the Humane Treatment of Wild and Farmed Australian Crocodiles was endorsed by the Natural Resource Management Ministerial Council on 21 May 2009. This Code outlines an achievable minimum standard of humane conduct in regard to the treatment of wild and farmed crocodiles. This Code is recognised as a standard by the Northern Territory *Animal Welfare Act*.

There were no reported breeches of the Code during the reporting period.

REPORTING AGAINST ANNUAL MILESTONE MATRIX

All annual milestones of the WTMP were delivered or considered as being ‘on track’ with details provided in Appendix 3.

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APPENDIX 1. OVERVIEW OF MONITORING SURVEYS OF SALTWATER CROCODILE POPULATIONS IN THE TIDAL RIVERS OF THE NORTHERN TERRITORY UPDATED TO INCLUDE 2021 DATA

INTRODUCTION

Since protection in 1971, a number of *Crocodylus porosus* populations have been monitored in the Northern Territory (NT). The standardised monitoring program was initiated by Messel *et al.* (1981) in the 1970s and taken over by Wildlife Management International Pty Ltd during the 1980-90s (Webb *et al.* 2000). The Department of Environment, Parks and Water Security (DEPWS) has been conducting surveys since 1998 in the selected rivers outside the Kakadu National Park (KNP) in the NT (Figure 1) (Fukuda *et al.* 2011). Parks Australia has been surveying the rivers in the KNP since 1994 (Lindner 2004). This section reports on the results of the survey programs from the earliest (1975) to the latest (2021). The first year of the standardised surveys varies between the monitored rivers (Table 1).

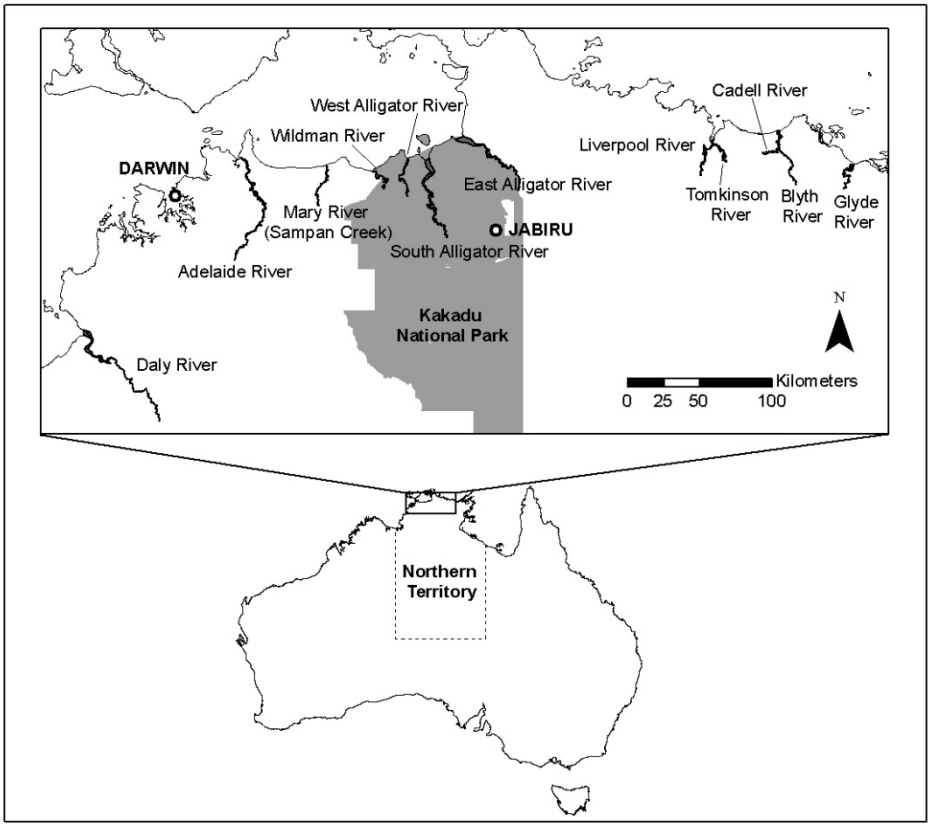


Figure 1. Rivers regularly surveyed to monitor *C. porosus* populations in the NT.

Table 1. Summary of the standardised crocodile surveys in the monitored rivers in the NT between 2017 and 2021.

River monitored	Frequency	Agency responsible	First surveyed	2017	2018	2019	2020	2021	Number of years surveyed
Adelaide	Annual	DEPWS	1977	Done	Done	Done	Done	Done	37
Blyth	Biennial	DEPWS	1975		Done		*[c]		35
Cadell	Biennial	DEPWS	1975		Done		*[c]		34
Daly downstream	Biennial	DEPWS	1978		Done		*[c]		26
Daly upstream	Biennial	DEPWS	1983	Done		*[b]		Done	19
East Alligator	Annual	Parks Australia	1977	Done	Done	Done		-	32
Glyde	Biennial	DEPWS	1975		*[a]		*[c]		14
Liverpool	Biennial	DEPWS	1976		Done		*[c]		32
Mary	Biennial	DEPWS	1984	Done		Done		Done	24
McArthur	Irregular	DEPWS	1979			Done			4*[d]
Roper	Irregular	DEPWS	2000	Done					3*[d]
South Alligator	Annual	Parks Australia	1977	Done		Done		-	26

Tomkinson	Biennial	DEPWS	1976		Done		*c		32
Victoria	Irregular	DEPWS	1987	Done					7*d
West Alligator	Annual	Parks Australia	1977			*b		-	22
Wildman	Annual	Parks Australia	1978	Done		*b	Done	-	24

*a Survey was scheduled but cancelled as the traditional owner denied access to their river.
*b The whole sections were not surveyed because of difficult river conditions.
*c Survey was scheduled but cancelled because of restrictions related to the COVID19 pandemic.
*d Surveyed by different methods (e.g. helicopter) in other years.

METHODS

The crocodile surveys followed the standardised procedures as detailed by Messel *et al.* (1981), Bayliss *et al.* (1986), and Fukuda *et al.* (2013b). Surveys were conducted between June and October (dry season) when the water level and temperature were low. Fixed sections of the mainstream of each river were surveyed at night by boat at a low speed (<20 km/h). Surveys were restricted to low tide when mud banks were exposed and crocodiles were more visible at the water's edge. The water surface, banks and fringing vegetation were scanned with a spotlight. Crocodiles were located by their distinctive, reflective eye-shines. Each crocodile was approached as close as possible to 1) confirm species (freshwater crocodiles, *C. johnstoni,* overlap with *C. porosus* in some rivers) and 2) estimate the total length (TL) in 0.3-m (1 ft) intervals. TL was estimated from the 1:7 ratio (head length:TL) as described by Fukuda *et al.* (2013a). If the head of a crocodile was submerged and no estimate was possible, it was recorded as 'eyes only'.

Distances surveyed for estimating crocodile densities were measured along the mid-line of streams in kilometres to the nearest 0.01 km, originally using survey maps (Messel *et al.* 1982) but in later years standardised to more accurate distances measured in a Geographic Information System. Because the start and end points of survey have been fixed for each river, results were considered directly comparable from year to year (Fukuda *et al.* 2013b).

Abundance density of crocodiles sighted during survey was estimated by dividing the total number of non-hatchlings (TL <0.6 m) by the distance surveyed. Biomass density was also estimated by 1) converting the TL to biomass (kg) using the equations provided by Webb and Messel (1978) and Fukuda *et al.* (2015) and 2) dividing the total biomass of non-hatchlings by the distance surveyed. These density indexes were plotted with previous results to assess the trend of population dynamics for each river. The trend was determined by fitting a linear, exponential, and logistic growth models to the historical densities (see Fukuda *et al.* 2011 for more details).

DEPWS monitors eight rivers (Adelaide, Blyth, Cadell, Daly (freshwater and tidal), Glyde, Liverpool, Mary (freshwater and tidal), and Tomkinson Rivers) on regular basis (Table 1). Each of these river is surveyed biennially except for the Adelaide River, which is monitored annually. Parks Australia surveys four rivers (East Alligator, South Alligator, West Alligator, and Wildman Rivers) in the KNP mostly annually.

There was no survey undertaken by Parks Australia of KNP rivers in 2021.

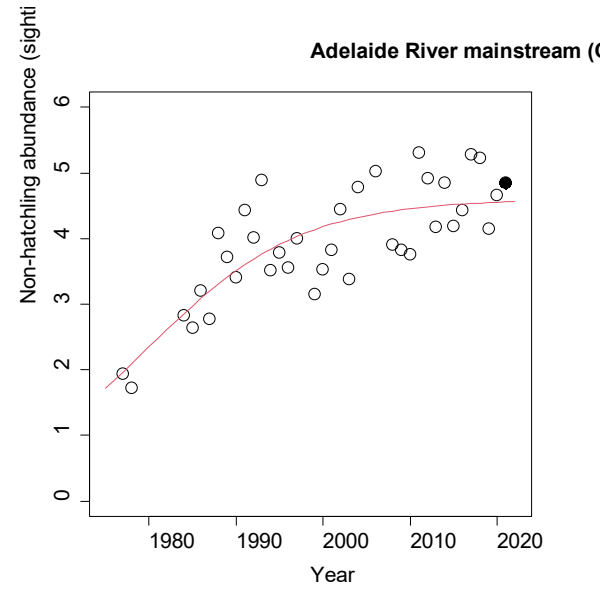
In addition to the eight rivers regularly surveyed, DEPWS surveyed the Roper River and Victoria River in 2017 and the McArthur River in 2019. The Roper and Victoria Rivers had not been surveyed since 2001 and 2002, respectively. The McArthur River had not been surveyed, using the standardised spotlight survey method, since 1986. Although these rivers do not require reporting under the Management Program (Saalfeld et al.

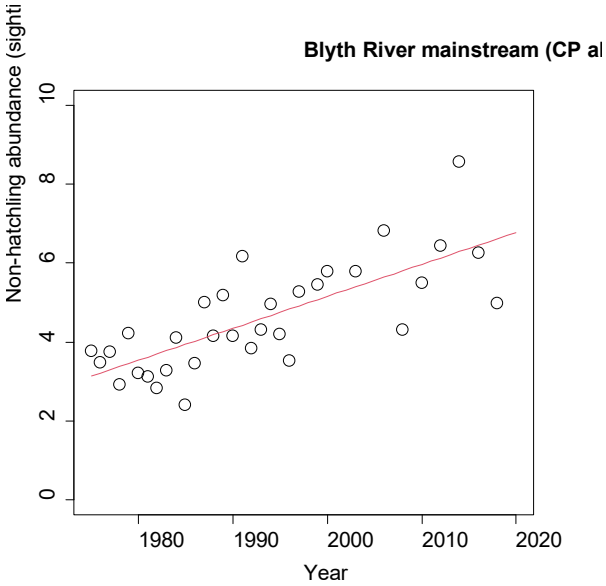
2016), their results are included in this report. The trend of these populations could not be identified due to their insufficient sample sizes.

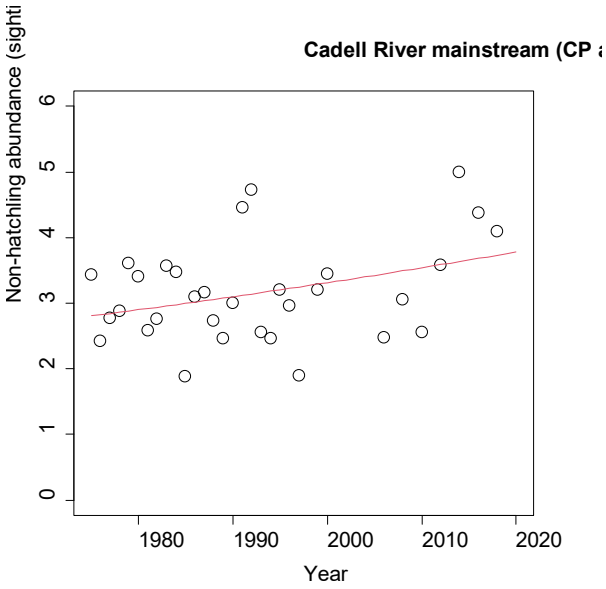
RESULTS

Abundance density

Estimated densities over time for surveyed rivers are given in Figure 2 with 2021 data indicated by a solid circle. Mostly, the monitored rivers showed increasing (linear or exponential) or stable (logistic) populations (Figures 2 and Tables 2). The Adelaide, Daly freshwater, East Alligator, Liverpool, Mary both freshwater and tidal, South Alligator, West Alligator, and Wildman Rivers showed a sign of reaching or having reached an asymptote. The Blyth, Cadell, Daly tidal, Glyde, and Tomkinson Rivers appeared to be still increasing.






Cadell River mainstream (CP a
Non-hatchling abundance (sighti
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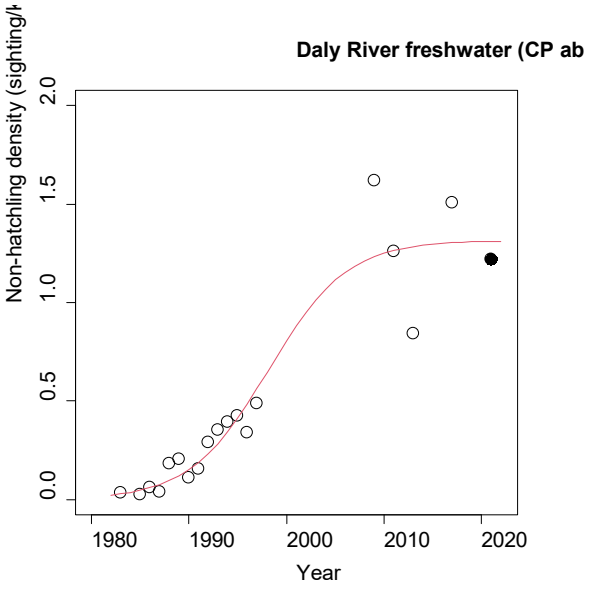
Daly River freshwater (CP ab
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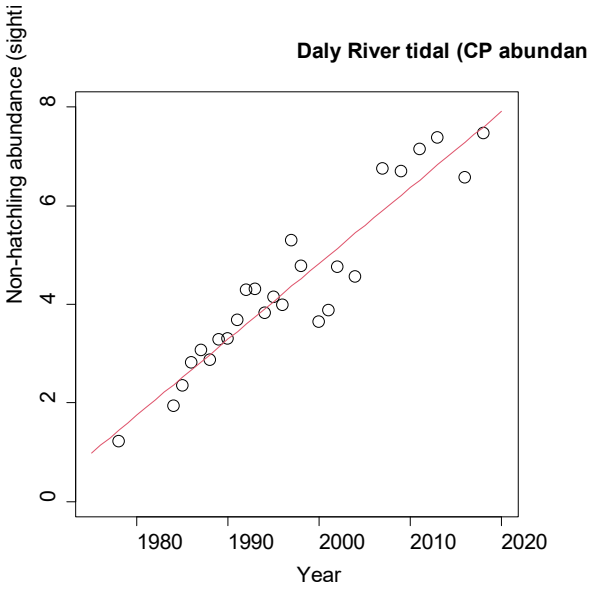
Daly River tidal (CP abundan
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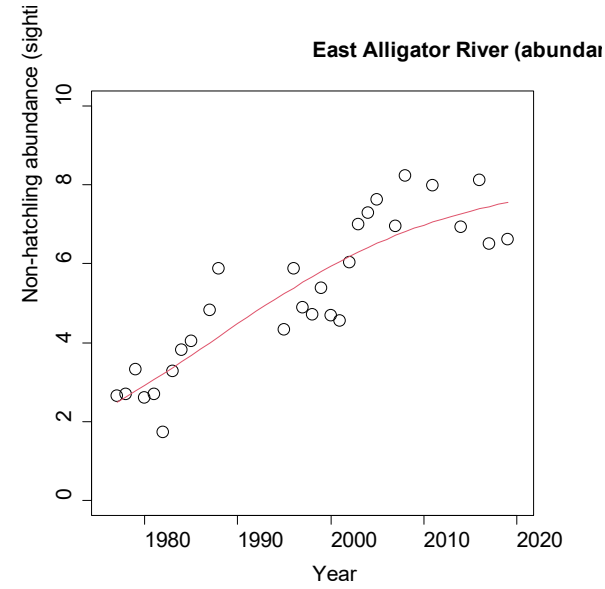
East Alligator River (abunda
Non-hatchling abundance (sighti
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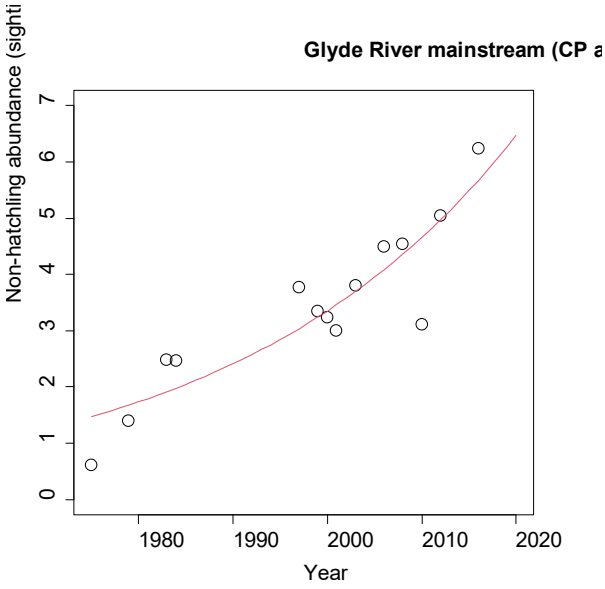
Glyde River mainstream (CP a
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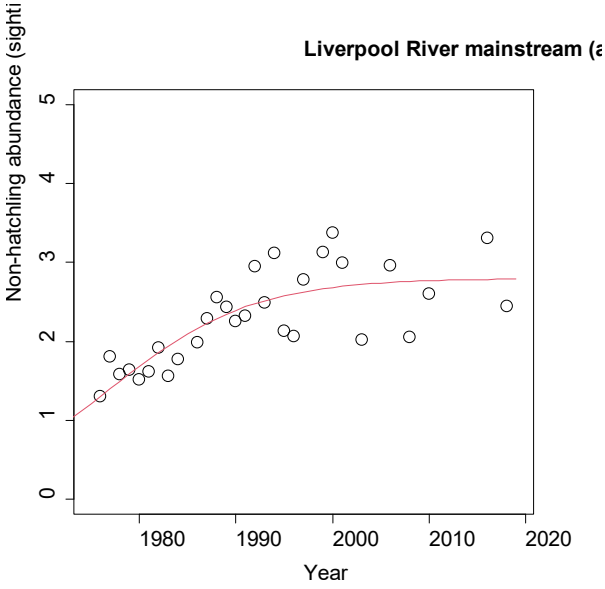
Liverpool River mainstream (a
Non-hatchling abundance (sighti
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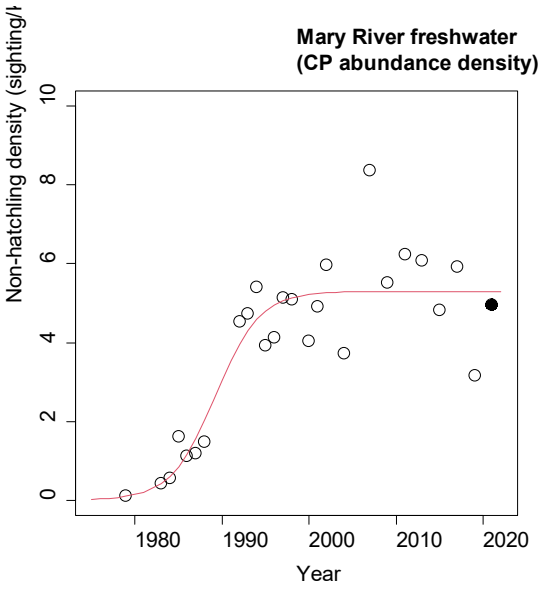
Mary River freshwater
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Non-hatchling density (sighting/
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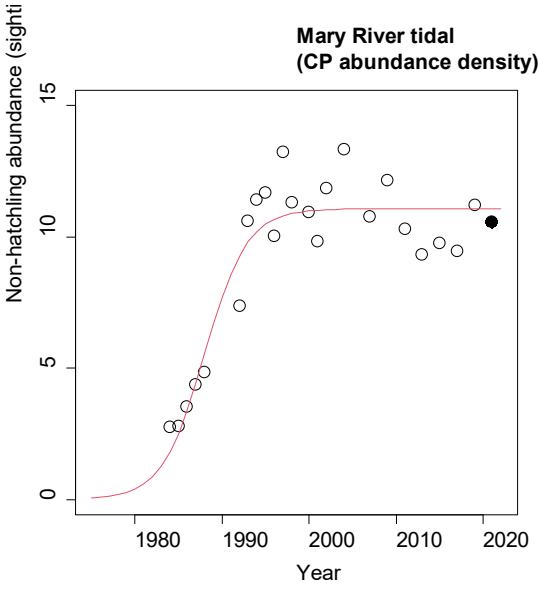
Mary River tidal
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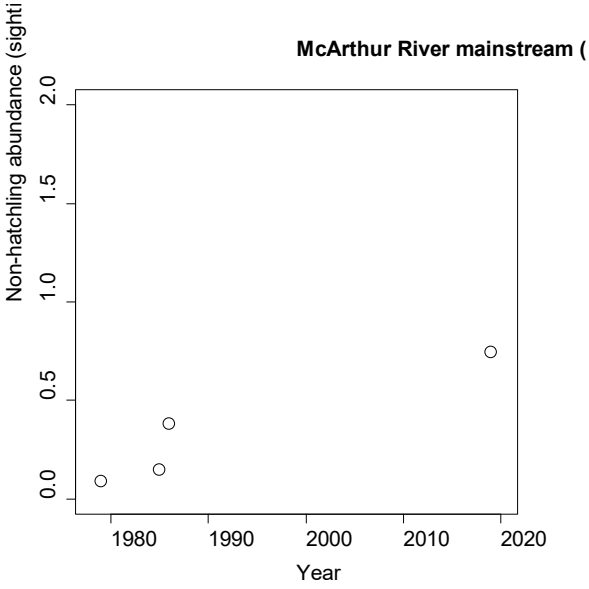
McArthur River mainstream (
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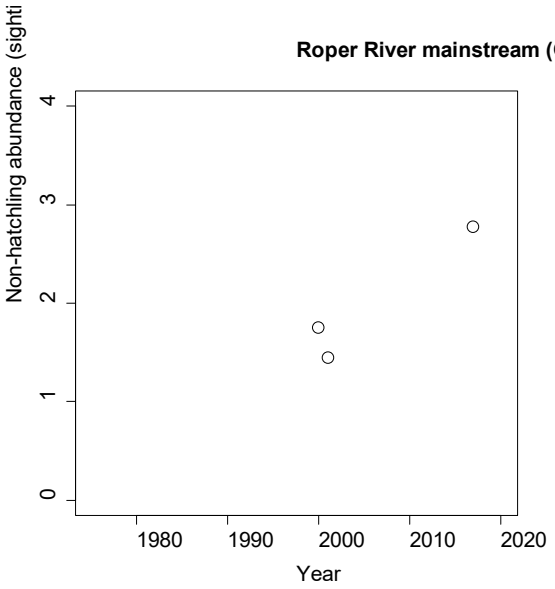
Roper River mainstream (CP
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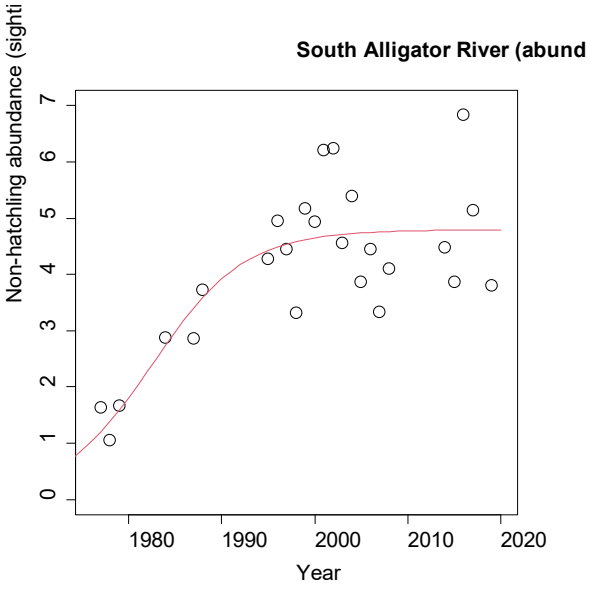
South Alligator River (abund
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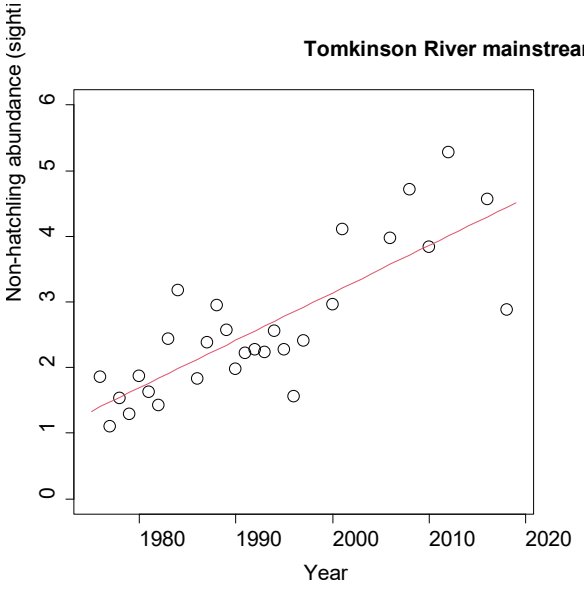
Tomkinson River mainstream
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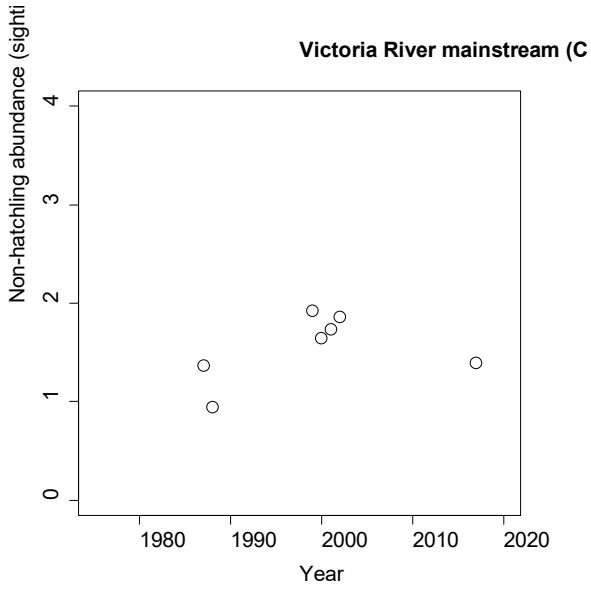
Victoria River mainstream (C
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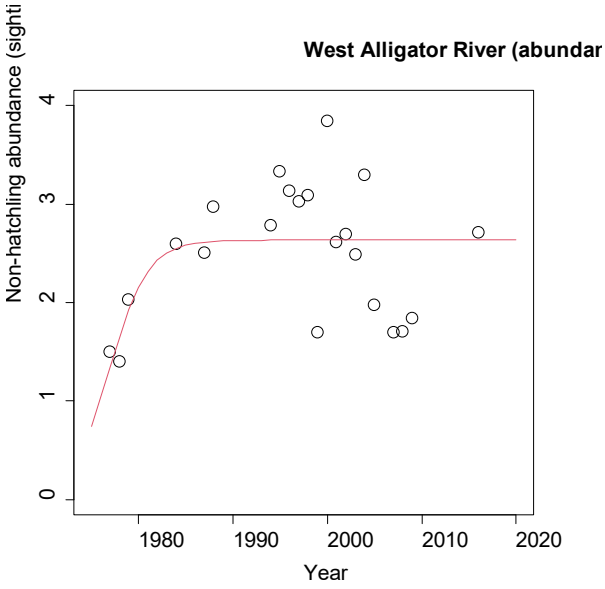
West Alligator River (abundar
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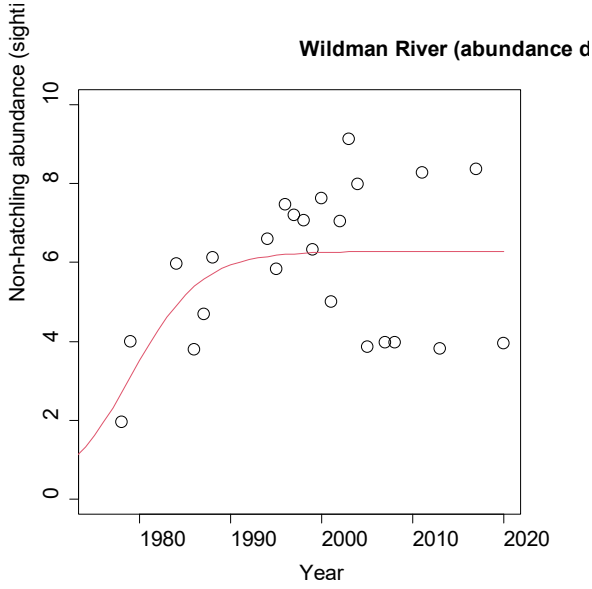
Wildman River (abundance d
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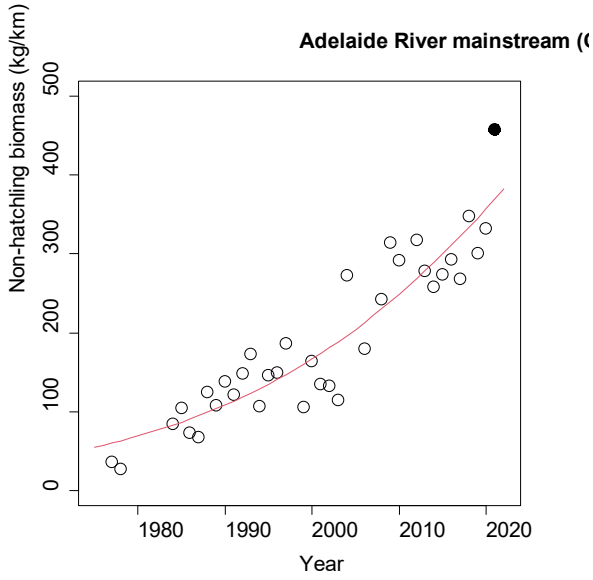
Figure 2. Abundance density (number of non-hatchlings sighted per kilometre of river surveyed) for each of the monitored rivers in the NT. Red line is the trend predicted by the best supported model (see Table 2).

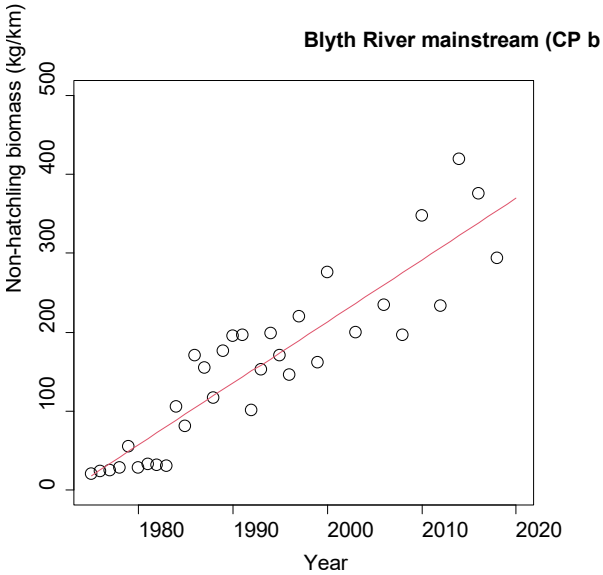
Table 2. Model selection statistics for the models fitted to the abundance density (number of non-hatchlings sighted per kilometre of river surveyed) for each of the monitored rivers in the NT. *N* = number of years surveyed, *AIC*c = Akaike Information Criteria corrected for small sample size, Δ_i = difference in *AIC*c with the best supported model, and w_i = Akaike Weight.

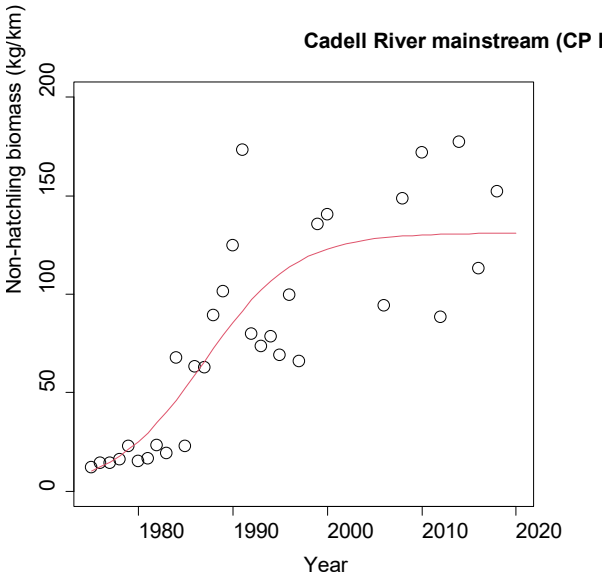
River	Yea	Model	*AIC*	Δ_i	w_i
Adelaide River	1977 - 2021	Logistic	63.9	0.0	81.0
		Exponent	69.7	5.7	4.47
		Linear	37.3	3.4	14.4
Blyth River	1975 - 2018	Logistic	91.9	2.1	17.0
		Exponent	90.6	0.7	34.1
		Linear	89.8	0.0	48.8
Cadell River	1975 - 2018	Logistic	-	-	-
		Exponent	65.6	0.0	53.2
		Linear	65.9	0.2	46.7
Daly River freshwater	1983 - 2021	Logistic	-9.63	0.0	92.1
		Exponent	-	-	-
		Linear	-4.70	4.9	7.86
Daly River tidal	1978 - 2018	Logistic	51.1	3.7	13.1
		Exponent	54.1	6.7	2.90
		Linear	47.3	0.0	84.0
East Alligator River	1977 - 2019	Logistic	79.9	0.0	53.8
		Exponent	86.0	6.0	2.57
		Linear	80.3	0.4	43.5
Glyde River	1975 - 2016	Logistic	--	--	--
		Exponent	30.7	0.0	51.8
		Linear	30.8	0.1	48.1
Liverpool River	1976 - 2018	Logistic	30.6	0.0	95.7
		Exponent	39.8	9.2	0.96
		Linear	37.3	6.7	3.25
Mary River freshwater	1979 - 2021	Logistic	79.1	0.0	>99.
		Exponent	103.	24.	<0.0
		Linear	98.0	18.	<0.0
Mary River tidal	1984 - 2021	Logistic	82.0	0.0	>99.
		Exponent	119.	37.	<0.0
		Linear	117.	35.	<0.0
South Alligator River	1977 - 2019	Logistic	69.3	0.0	97.8
		Exponent	80.2	10.	0.43
		Linear	77.4	8.1	1.69
Tomkinson River	1976 - 2018	Logistic	62.6	1.8	21.0
		Exponent	62.1	1.4	26.1
		Linear	60.7	0.0	52.8
West Alligator River	1977 - 2016	Logistic	44.4	0.0	76.8
		Exponent	48.3	3.8	11.3
		Linear	48.2	3.7	11.8
Wildman River	1978 - 2020	Logistic	97.7	0.0	68.6
		Exponent	100.	3.0	14.6
		Linear	100.	2.8	16.8

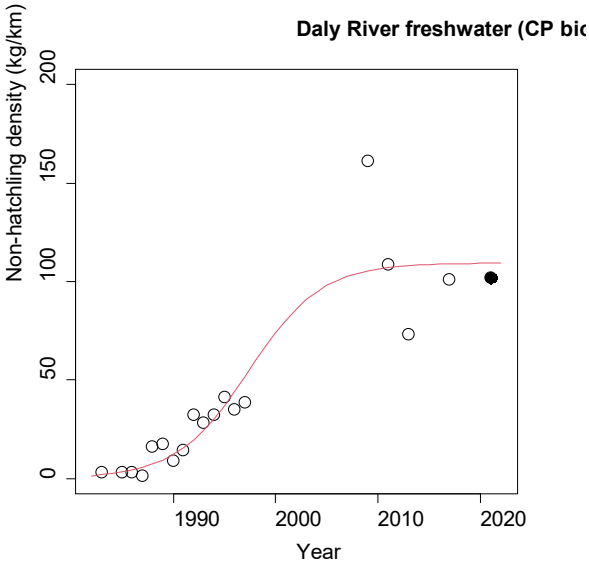
Biomass density

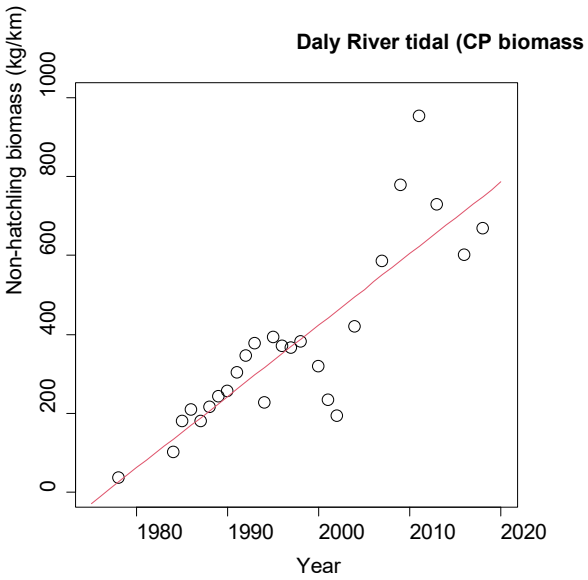
Changes in estimated biomass (based on recorded length of recorded individual saltwater crocodiles is given in Figure 3. As in the abundance density, the monitored rivers showed increasing (linear or exponential) or stable (logistic) populations (Figures 3 and Tables 3). The Cadell, Daly freshwater, East Alligator, Glyde, Mary freshwater, South Alligator, Tomkinson, and West Alligator showed a sign of reaching or having reached an asymptote. The Adelaide, Blyth, Daly tidal, Liverpool, Mary tidal, and Wildman Rivers appeared to be still increasing.

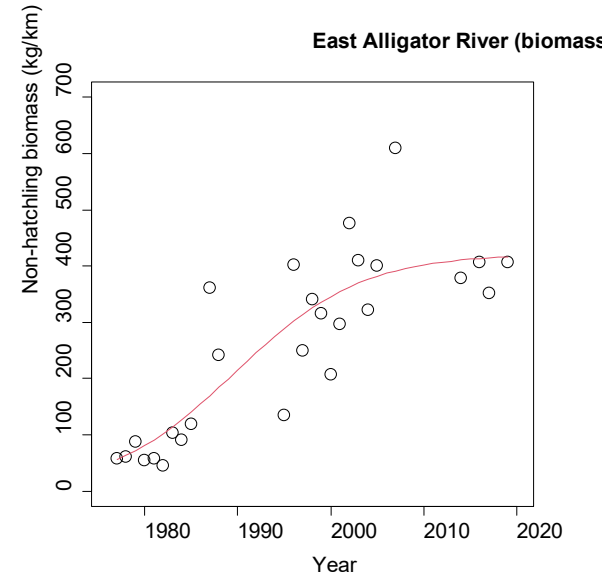


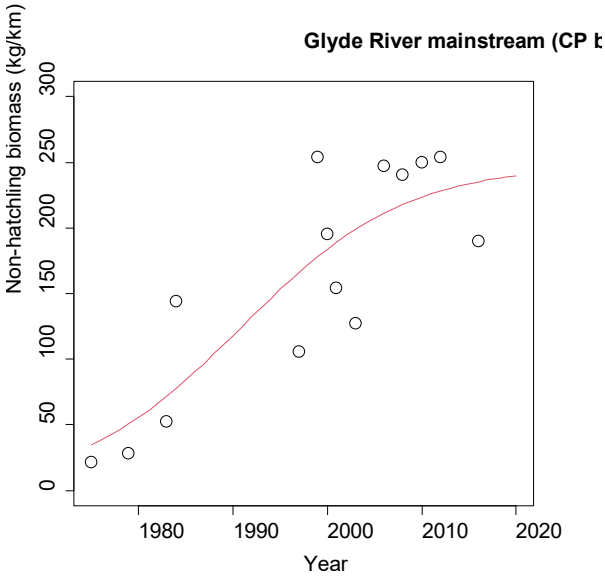


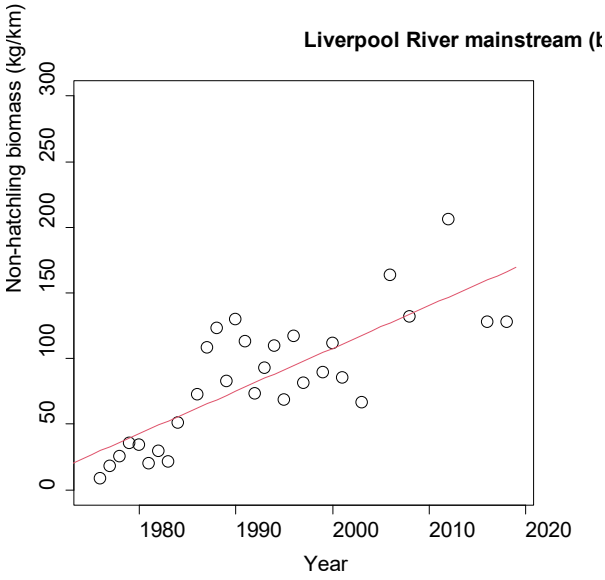

Cadell River mainstream (CP
Non-hatchling biomass (kg/km)
0
50
100
150
200
1980
1990
2000
2010
2020
Year

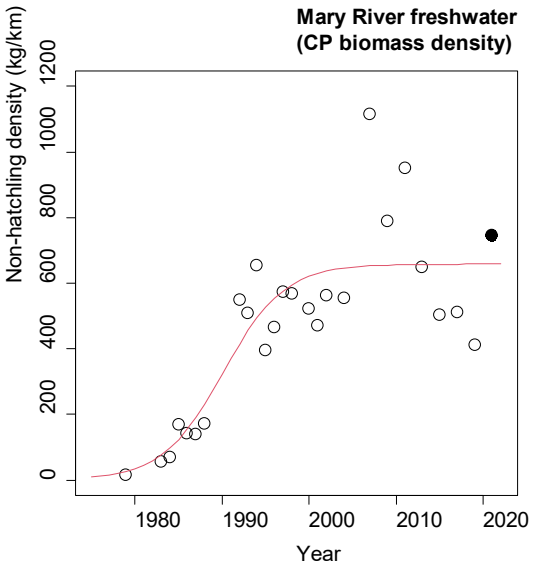

Daly River freshwater (CP bic
Non-hatchling density (kg/km)
0
50
100
150
200
1990
2000
2010
2020
Year

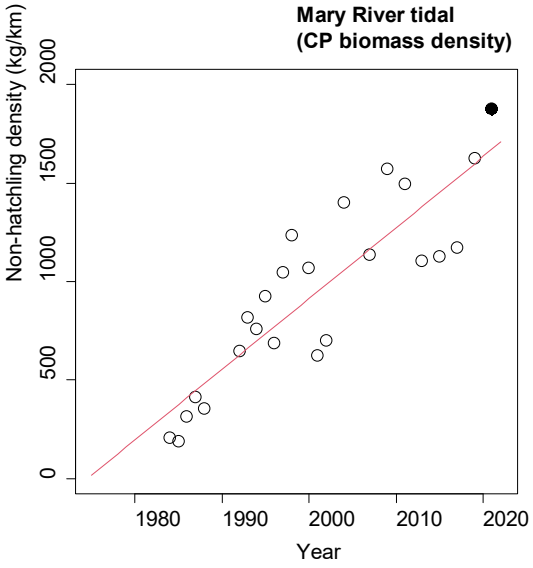

Daly River tidal (CP biomass
Non-hatchling biomass (kg/km)
0
200
400
600
800
1000
1980
1990
2000
2010
2020
Year

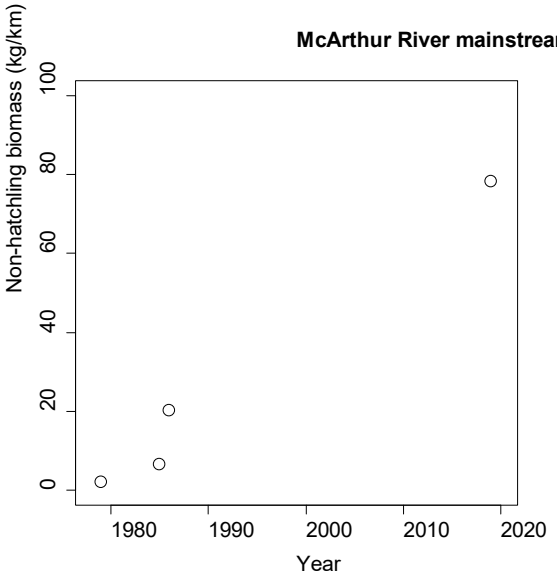

East Alligator River (biomass
Non-hatchling biomass (kg/km)
0
100
200
300
400
500
600
700
1980
1990
2000
2010
2020
Year

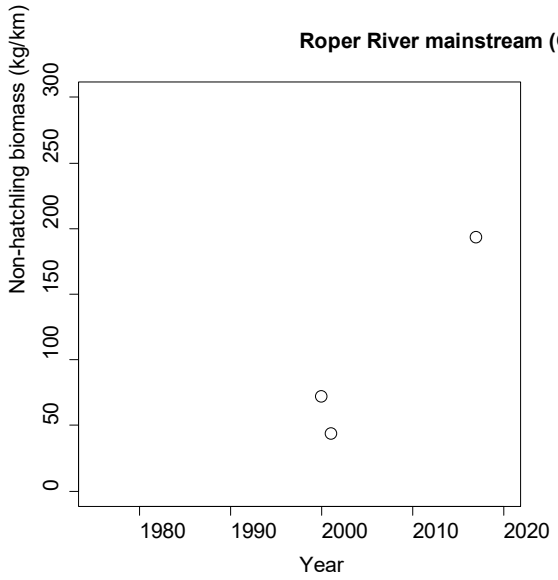

Glyde River mainstream (CP b
Non-hatchling biomass (kg/km)
0
50
100
150
200
250
300
1980
1990
2000
2010
2020
Year

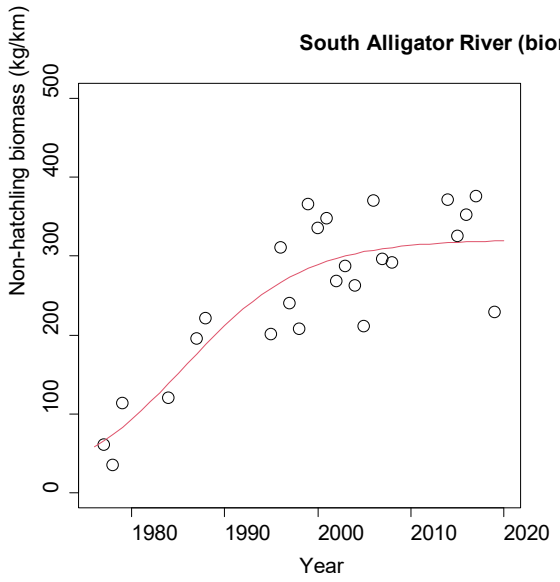

Liverpool River mainstream (b
Non-hatchling biomass (kg/km)
0
50
100
150
200
250
300
1980
1990
2000
2010
2020
Year

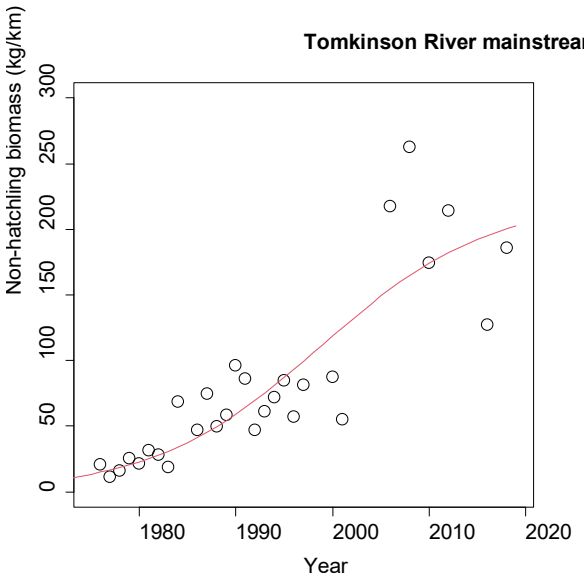

Mary River freshwater
(CP biomass density)
Non-hatchling density (kg/km)
0
200
400
600
800
1000
1200
1980
1990
2000
2010
2020
Year

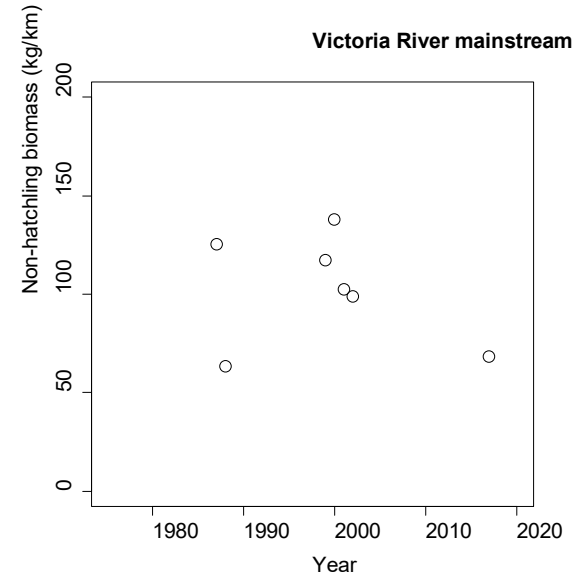

Mary River tidal
(CP biomass density)
Non-hatchling density (kg/km)
0
500
1000
1500
2000
1980
1990
2000
2010
2020
Year

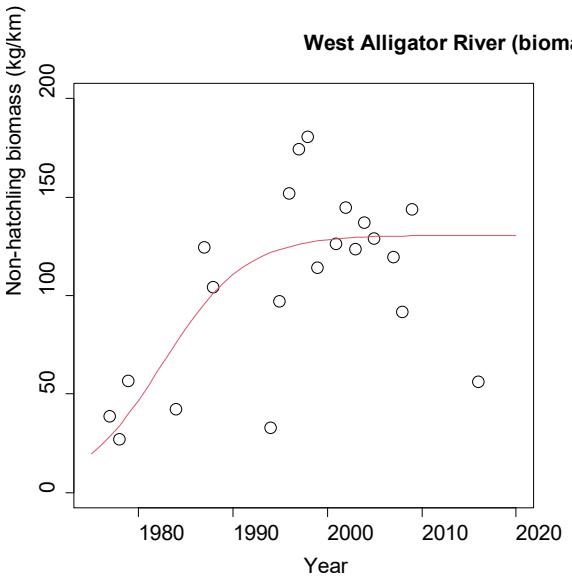

McArthur River mainstream (
Non-hatchling biomass (kg/km)
0
20
40
60
80
100
1980
1990
2000
2010
2020
Year


Roper River mainstream (CP
Non-hatchling biomass (kg/km)
0
50
100
150
200
250
300
1980
1990
2000
2010
2020
Year


South Alligator River (bioma
Non-hatchling biomass (kg/km)
0
100
200
300
400
500
1980
1990
2000
2010
2020
Year


Tomkinson River mainstream
Non-hatchling biomass (kg/km)
0
50
100
150
200
250
300
1980
1990
2000
2010
2020
Year


Victoria River mainstream (C
Non-hatchling biomass (kg/km)
0
50
100
150
200
1980
1990
2000
2010
2020
Year


West Alligator River (biomass
Non-hatchling biomass (kg/km)
0
50
100
150
200
1980
1990
2000
2010
2020
Year

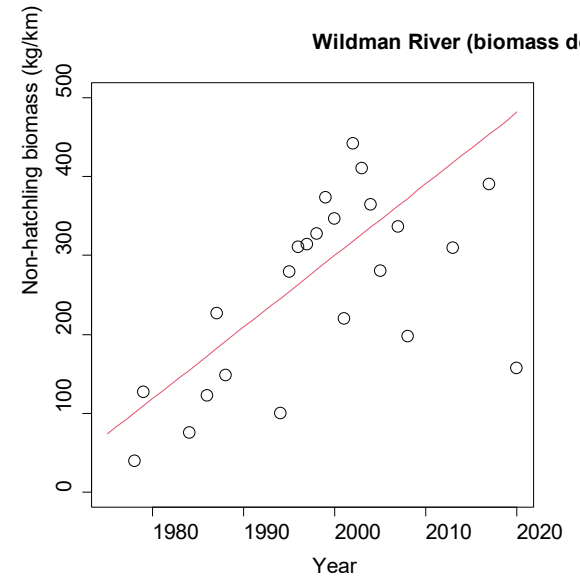

Wildman River (biomass den
Non-hatchling biomass (kg/km)
0
100
200
300
400
500
1980
1990
2000
2010
2020
Year

Figure 3. Biomass density (kilogram of non-hatchlings sighted per kilometre of river surveyed) for each of the monitored rivers in the NT. Red line is the trend predicted by the best supported model (see Table 3).

Table 3. Model selection statistics for the models fitted to the biomass density (kilogram of non-hatchlings sighted per kilometre of river surveyed) for each of the monitored rivers in the NT. *N* = number of years surveyed, *AIC*c = Akaike Information Criteria corrected for small sample size, Δ_i = difference in *AIC*c with the best supported model, and w_i = Akaike Weight.

River	Yea	Model	AIC	Δ_i	w_i
Adelaide River	1977 - 2021	Logistic	373.	0.00	64.9
		Exponent	--	--	--
		Linear	374.	1.23	35.0
Blyth River	1975 - 2018	Logistic	353.	5.53	<0.0
		Exponent	358.	10.3	<0.0
		Linear	348.	0.00	>0.9
Cadell River	1975 - 2018	Logistic	312.	0.00	82.4
		Exponent	--	--	--
		Linear	315.	3.10	17.5
Daly River freshwater	1983 - 2021	Logistic	158.	0.00	98.5
		Exponent	--	--	--
		Linear	166.	8.41	1.47
Daly River tidal	1978 - 2018	Logistic	280.	0.00	75.8
		Exponent	284.	3.68	12.0
		Linear	284.	3.67	12.0
East Alligator River	1977 - 2015	Logistic	321.	0.00	81.7
		Exponent	331.	10.3	0.46
		Linear	324.	3.04	17.8
Glyde River	1975 - 2016	Logistic	153.	2.43	0.23
		Exponent	--	--	--
		Linear	151.	0.00	0.77
Liverpool River	1976 - 2018	Logistic	291.	0.66	40.6
		Exponent	297.	5.98	2.84
		Linear	291.	0.00	56.5
Mary River freshwater	1979 - 2021	Logistic	331.	0.00	99.8
		Exponent	349.	18.0	0.01
		Linear	344.	12.9	0.16
Mary River tidal	1984 - 2021	Logistic	325.	0.00	54.7
		Exponent	330.	5.85	2.94
		Linear	325.	0.52	42.2
South Alligator River	1977 - 2019	Logistic	272.	0.00	94.8
		Exponent	283.	11.3	0.33
		Linear	278.	5.94	4.86
Tomkinson River	1976 - 2018	Logistic	292.	0.00	52.4
		Exponent	296.	4.59	5.27
		Linear	292.	0.43	42.2
West Alligator River	1976 - 2016	Logistic	230.	0.00	79.8
		Exponent	235.	4.94	6.75
		Linear	234.	3.58	13.3
Wildman River	1976 - 2020	Logistic	303.	2.38	16.2
		Exponent	302.	1.13	30.3
		Linear	301.	0.00	53.4

DISCUSSION

The rivers supporting the logistic pattern in the abundance or biomass density seem to have reached an asymptote that is considered the carrying capacity of each population. The level of carrying capacity varies between the populations, depending on the quality of each river as suitable habitat, especially for breeding (Fukuda *et al.* 2007; Fukuda and Cuff 2013). Saturated population typically shows some fluctuation around an asymptote rather than staying at equilibrium (Caughley 1977). This is evident in the recent years. Alligator River are a good example of such populations, reaching a carrying capacity in both abundance and biomass (Figures 2 and 3), and this indicates that the population are fully recovering from the uncontrolled hunting (1945-1970).

Other rivers showed ongoing increase (linear or exponential) in the abundance density. Like the maximum carrying capacity, the rate of increase considerably varies among the populations, depending on the limited resources such as nesting habitats (Fukuda *et al.* 2007; Fukuda and Cuff 2013; Fukuda *et al.* 2022). Some rivers such as the Cadell, McArthur, Roper, and Victoria Rivers had an increase much slower than others (Figure 2). Given that these rivers were not harvested heavily before protection (1971) and the current harvest intensity for eggs is very low (DEPWS unpublished data 2021), it may be reflecting the natural attributes of the population rather than recovery from previous hunting. These populations are likely to stay stable rather than increasing or decreasing dramatically. In contrast, rivers with quality habitats such as the Daly tidal and Glyde Rivers show high rates of increase without reaching an asymptote (Figure 2). However, this is interpreted as indication that the population is still approaching a stable state at levels thought to be close to those before the hunting (Webb *et al.* 1984).

In the case of biomass density (Figure 3), continuous increase indicates that the size of individual crocodiles is increasing even in the rivers where the number of animals has already reached a ceiling (eg. the Adelaide River). This pattern of a population maturation is commonly reported for large, predatory aquatic species, recovering from substantial, unregulated harvest (Russ and Alcala 1996; Russ and Alcala 2004). It should be noted that biomass density could be fluctuated drastically by the presence or absence of a few very large individuals as their large mass heavily affects the total biomass (eg. 5.1-m crocodile can weigh over 500 kg). Given no commercial harvest allowed in the West Alligator River, the decline in 2017 may be an example of this kind of sensitivity (Figure 3).

In summary, the monitored populations showed different patterns of increase in the number and biomass of crocodiles, depending on the availability of

quality habitats within each river rather than the impact of the current, regulated harvest. The different rates of increase and levels of carrying capacity, as a response to the environmental factors, will determine the population size and the size structure at maturation. The survey results to date suggest that some of the rivers (eg. Daly freshwater, Mary freshwater, East, South, and West Alligator Rivers) appear to have reached a ceiling in both the number and biomass of crocodiles. Although considered approaching close to an asymptote, the other rivers are still increasing at different rates in the abundance, biomass, or both.

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APPENDIX 2. PRODUCTION STATISTICS FROM CROCODILE FARMS (2020-2021)

C. porosus stock and production on farms in the Northern Territory for 2020/2021 are summarised in Table 11.

Table 11: *C. porosus* held on farms in the Northern Territory in 2021 (Reporting year January 2021 to December 2021). Total acquired includes farm bred hatchlings, ranched hatchlings and purchases/imports from other farms. Total lost includes crocodiles processed, sales/exports to other farms, escapes and mortality.

Farm	Stock held 1/01/2021	Farm-bred hatchlings	Total acquired	Crocodiles processed	Sale/transfer Out	Total losses
A	18,275	0	8,336	6,317	448	3,042
B	1,799	6	2,340	240	1262	180
C	20,846	0	21,210	6707	13291	1396
D	3,333	160	7,410	186	7837	117
E	4,491	0	793		505	704
F	50,585	4,656	10,009	8,271	780	3,821
G	59		1			4
H	223	198	14		198	13
I	720		480		324	50
J	119		101	95	5	120
K	0					
Totals	100,450	5,020	50,694	21,721	24,740	9,332

APPENDIX 3. 2021 REPORTING AGAINST ANNUAL MILESTONE MATRIX AND PERFORMANCE INDICATORS

Management Action	Timeline	Performance Indicator	2021 Progress
Ensure the egg harvest ceiling is set in accordance with the Plan.	Annual	Sum of regional and property-based permitted take to be less than ceiling and spatially spread	Egg allocation within allowable levels. Discussions with CFA NT on future process for allocations including some re-allocation in cases where harvest consistently below permitted amount
Investigate and take appropriate action when there is evidence of breaches of the TPWC Act and Code of Practice (see Section 3.3) by permit holder	Ongoing	Appropriate enforcement action is undertaken in all instances	No breaches reported.

Management Action	Timeline	Performance Indicator	2021 Progress
Ensure that the annual commercial harvest of adult Saltwater Crocodiles does not exceed the approved ceiling.	Annual	Take less than or equal to permitted amount and regional population levels maintained (outside designated management areas[2])	Well within ceiling in 2021 as with previous years.
Timely assessment of permit applications and issuing of permits under the *TPWC Act*.	As required	20 business day turnaround of permit applications	2 Farm permit applications took longer than 20 business days due to their complexity. Proponents kept fully informed during assessment process and suitable time-lines agreed upon.
Monitor and audit harvest operations and returns, and investigate and resolve any discrepancies.	Annual for the life of the permit	All discrepancies investigated and resolved	No observed breaches by industry.
Ensure all permit applications have correct landholder approval.	As required	100% compliance	No observed breaches.

[2] Within the Darwin, Katherine and Borroloola Crocodile Management Zones and designated swimming areas in National Parks (e.g. Wangi Falls in Litchfield National Park), all saltwater crocodiles are considered problem animals (Saalfeld et al. 2016) and can be removed

Management Action	Timeline	Performance Indicator	2021 Progress
Conduct random checks on eggs and farm stock numbers.	Annual	Number of checks performed	Farm inspection program impacted by COVID-19 protocols. 2 Inspections performed and no discrepancies of egg recordings.
Ensure compliance with all permit terms and conditions, including lodgement of annual returns, prior notification of import/export shipments, and any other term or condition	On going	Address all permit breaches through warning letters, caution notices, infringement notices, permit cancellation or prosecution	Follow up reminders needed in several cases but all farm and egg collection returns provided. Some confusion in the case of egg collecting where permit holder may report to numbers collected as per royalty agreements without also reporting as per collection permit.
Continue the population survey program as described in Wildlife Management Program.	Annual	Results reported in annual report to Commonwealth (See below)	Included herein.
All permits are consistent with the TPWC Act and Australian Code	As required	100% compliance	All compliant.
Investigate and take appropriate action on any suspected breaches	As required	All breaches investigated	One potential breach investigated based on media report. DITT Chief

Management Action	Timeline	Performance Indicator	2021 Progress
of the *Animal Welfare Act 1999* (or the *Animal Protection Act 2018* once commenced).			Veterinary Officer confirmed no apparent breach.
Submit annual report to the Australian Government and provide a summary on the NT Government website. To include audit against performance measures.	Annual	An annual report for 1 January to 31 December is submitted to the Australian Government by the 30 June the succeeding year	Herein. Annual report to be loaded onto website pending finalisation with Commonwealth. Delays this year due to need follow up on farm and egg collection returns.