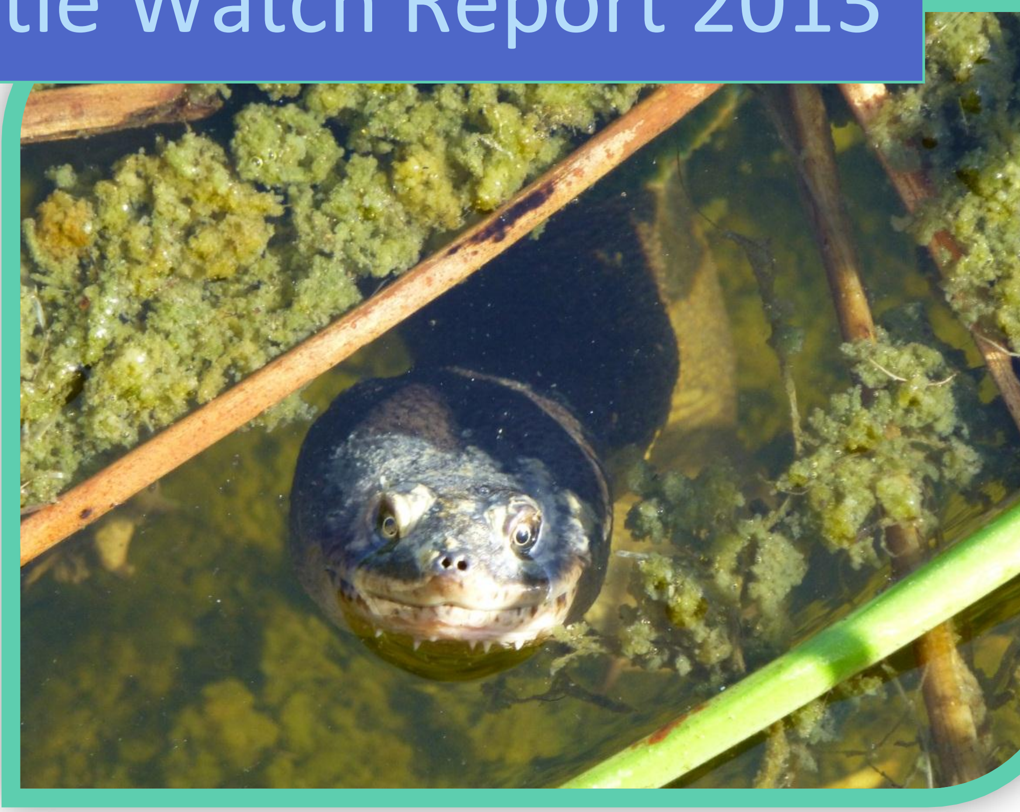
# Turtle Watch Report 2013



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## Executive Summary

Turtle Watch is a project supported by Lotterywest. Its main aim is to identify the predator/s responsible for the destruction of Oblong turtle's nests at Bibra Lake, Herdsman Lake and Canning River. The Oblong turtle is the only native turtle still found in the Perth metropolitan and suburban region. Thus it is important that we ensure this species survival. Whilst predation is not the sole threat to the Oblong turtle it does play a crucial role. This report reviews the Oblong turtle's lifecycle and its vulnerabilities, explores the threats to the survival of the Oblong turtle and identifies the fox (*Vulpes vulpes)* as the perpetrator responsible for the depredation of Oblong turtle nests.

## About the Author

Caitlin Bartholomaeus is a PhD Candidate from Murdoch University. She is conducting research into the impact of urbanisation on Oblong turtle populations in the south of Perth, Western Australia and how human interactions with the Oblong turtle may assist or hinder their survival within the urban environment.

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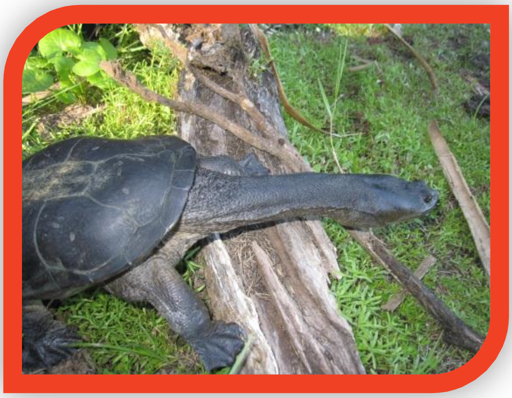
Oblong turtle taking a breath (Photo: Caitlin Bartholomaeus)

## Introduction



Oblong turtle (Photo: Caitlin Bartholomaeus)

*Chelodina colliei* previously known as *Chelodina oblonga* (Georges and Thomson 2010), and commonly known as the Oblong turtle has always inhabited the Metropolitan region of Perth, Western Australia. With the advent of urbanisation, humans living around wetlands are accustomed to seeing the Oblong turtle, especially when they leave the wetlands to lay their eggs or to migrate (Cann 1998). People have also seen that these turtle nests often fall victim to predation which is of great concern. The Oblong turtle is the only remaining native turtle species found in the Perth area and it is important that we are able to protect and maintain this species population into the future.

The Turtle Watch Project developed from the initial project called nest watch. This initial project (which commenced in 2006) aimed to promote student engagement in science, collect turtle nesting data and to promote collaboration between schools and other stakeholders. The project involved site identification and weed control to allow female turtles access to preferable nesting sites. When the students visited the site, they discovered that thirty one turtle nests had been excavated and the eggs eaten (Lewis *et al.* 2008, 2009).

From this encounter it was found that little information regarding depredation of Oblong turtle nest was available and that there was a need to identify the predator of these nests, so that controls could be put in place to protect and ensure the survival of Oblong turtle populations in Perth WA. To do this Turtle Watch was created and its main aim was:

- To identify the predator/s involved in the destruction of oblong turtle nests at three sites – Herdsman Lake, Bibra Lake and Canning River.

This report focuses on this aim of the Turtle Watch project and incorporates:

1. A review of the Oblong turtle's lifecycle and when it can be vulnerable to predation.
2. Is predation the only threat to Oblong turtles? An overview of threats to turtle's survival.
3. The findings of the Turtle Watch project and some new supporting research.
4. What can be done to assist and protect the Oblong turtle.

# Chapter One: State of research into the Oblong turtle

The Long-Necked or Oblong turtle (*Chelodina colliei*) has often captured the interest of the general public. It is found within the south-west of Western Australia and is the only native freshwater turtle species found in metropolitan and suburban Perth. It is well known among residents whom have lived near many natural and artificial lakes. This chapter will examine the state of research on *C. colliei* in Western Australia and identify where in its life cycle it is most vulnerable to predation.

## Biology and ecology

The Oblong turtle is part of the Chelidae family. The Oblong turtle has a number of distinctive features. These include a long neck which is approximately 90% of its carapace length and a carapace (the top shell) which widens slightly at the back giving its oblong shape and thus its common name (Cann 1998).

The Oblong turtle carapace has been recorded up to 30cm in length. There is speculation that it can grow larger than this, possibly up to 40cm (Cann 1998), given enough time and the right conditions. Carapace length is used as an indicator of sexual maturity. Males are sexually mature when they reach 13 to 14cm in carapace length. Minimum size for female sexual maturity is not available but it has been shown that females of approximately 16 to 17cm in carapace length and above are sexually mature (Kuchling 1988, 1989). It is important to note that age of turtle does not necessarily correlate to size; it can also be linked to the conditions in which the turtle has lived in.

The Oblong turtle communicates underwater with 17 groups of calls being described to date. It is hypothesised that these calls may form some part of an advertisement display for reproduction (Giles *et al.* 2009). Breeding usually occurs during winter and spring (Cann 1998).

Female Oblong turtles leave the water to nest (lay eggs) in soft open sandy soil during Spring (September to November) and during Summer (December to January) (Clay 1981). Oblong turtles have the potential to lay up to 45 eggs in total over these nesting periods (Kuchling 1988). The largest reported clutch size, however, is 25 eggs in one nest (Bush *et al.* 2010) and on average they lay 8 eggs in spring and 4 eggs in summer (Clay 1981). There are specific cues for nesting, these include “seasonal rain-bearing low pressure systems, falling barometric pressure and an air temperature above 17°C” (Clay 1981).

The time taken to dig the nest, lay eggs and compact is from 25 to 45 minutes. In addition to this time out of the water, the turtle may spend an hour or more moving to and finding a suitable nesting site (Burbidge 1967, Clay 1981). This movement out of the water carries risk for the female Oblong turtle as out of the wetland they are far less protected from predators.

The average Oblong turtle egg measures 3.49cm by 2.13cm and weighs 9.3 grams. Incubation time ranges from 200 to 230 days (Burbidge 1967). From anecdotal evidence it is possible that the turtles will hatch from their eggs but remain under ground until conditions are appropriate for them to leave. A number of local residents have reported digging in their garden and digging up completely hatched and active young. Hatchling Oblong turtles have an average carapace length of 29 to 33mm (Burbidge 1967). Hatchling turtles will emerge from the nest and move towards nearby wetlands. This movement to wetlands is fraught with dangers from predation, cars and roadside curbs.

During summer it is not uncommon for wetlands and lakes to dry out due to high temperatures causing evaporation. Many Australian turtles deal with this by aestivating, which is a state of torpor (Cann 1998). This observational data indicates that the Oblong turtle aestivates by burying itself in the mud of the dried wetland. Here they remain until the wetland refills. Burbidge (1967) suggested that the turtles which choose not to take this option would take refuge in local rivers or other water bodies. However, if they moved to the river it was unlikely that they would feed in it due to the higher salinity and their lack of a salt secretion gland.

The Oblong turtle is considered to be the top predator whilst in the water. Hatchlings which make it to the water, however, are still vulnerable to birds such as Little Pied Cormorants (Bush *et al.* 2010). Crayfish including, Marron, Koonacs and Yabbies have been shown to be aggressive and predatory towards hatchlings, whilst the Gilgies are not (Bradsell *et al.* 2002).

The Oblong turtle is an opportunistic carnivore. The diet of the urban Oblong turtles includes an array of aquatic invertebrates (including Dipteria, Ostracoda, Caldocera and Oodonates) and small fish (Woldring 2001, Tysoe 2005). As they are opportunistic feeders, this diet will vary between seasons due to the variance of the invertebrate populations. The Oblong turtle will also feed upon carrion (Woldring 2001) and there are reports of small birds such as ducklings or coot young being taken (Burbidge 1967). There is no indication how regularly the Oblong turtle would feed on birds and we presume that only the larger turtles (most likely females) would be able to achieve this.

## Populations

There have been a few studies conducted on a number of Oblong turtle populations over the last 40 years. Population studies are very important as they allow us to track the impact that factors such as urbanisation, predation and food resources are having on specific populations. Studies have been conducted in areas such as Thompsons Lake (Clay 1981), Shenton Park and Perry Lakes (Guyot and Kuchling 1998), Claremont Lake and Shenton Park (Tysoe 2005), Blue Gum Lake, Booragoon Lake and Piney Lake (Giles *et al.* 2008), Black Swan Dam (McKeown 2010) and in Lake Joondalup and Yellagonga Regional Park (Hammond 2010, Chester 2012).

It is important for all populations to have stable number of sexually reproductive adults and to have new individuals being born and becoming part of the populace (recruitment). Unfortunately majority of the population studies mentioned above have only focussed on a few wetlands at a time and this means that the state of Oblong turtle populations overall is not known clearly. As such, is it possible that reduction in survival of hatchlings along with a greater mortality of females (see Chapter 2) means that turtle populations, whilst appearing healthy may have very little recruitment and lead to a population instability (Spencer and Thompson 2005).

These Oblong turtle studies have given us some information regarding important aspects such as population size and sex ratio. Sex ratio is important as only females lay eggs and research suggests that female turtles can have a higher risk of mortality due to their vulnerability to road traffic and predation when they leave wetlands and potentially cross roads to nest (Steen and Gibbs 2004, Steen *et al.* 2006).

Hamada (2011) conducted genetic analysis on eight lakes in 2011 to identify whether populations have become genetically separated over time due to urbanisation. No significant difference in genetic variation was found. She suggests that either there has been an acceptable gene flow to overcome genetic drift or the long generation time (as the Oblong turtle is a long-lived species) means that any genetic divergence is not yet visible. We would postulate a third option which is that gene flow has been maintained by human-mitigated movement of turtles (humans rescuing turtles and returning them to different wetlands).

# Chapter Two: Threats to survival

Of course all native animals are subject to threats to their survival caused by predators, food availability and their environment. These factors help to control the size of a population. Turtles are no different and predation is not the only threat to their survival. When significant changes are made to their environment their population can be adversely affected.

## Urbanisation

Urbanisation often leads to the isolation of wetlands in a sea of suburbia. Prior to this isolation these wetlands had significant tracts of native vegetation surrounding them. Nowadays in Perth and many other cities it is not uncommon to see wetlands with a large proportion or all of their native vegetation removed. Instead they are surrounded by roads and houses built where there once must have been pristine wetlands (Rees *et al.* 2009).

The build-up of residences around local wetlands has led to a number of issues for female turtles all around the world. These residences around the wetlands act as physical barriers preventing access to nesting sites (Eskew *et al.* 2010). It also blocks or hinders other life cycle movements, for example road curbing preventing hatchling turtles from moving back towards their wetlands. This urbanisation also disrupts typical migration movements of turtles which can be of importance for the maintenance of meta-populations (a population made up of smaller local populations that are linked through migration) (Pereira *et al.* 2011).

The urban environment also creates dangers such as roads, which have been linked to skewing of the sex-ratio of populations for freshwater turtles around the world (Steen and Gibbs 2004, Aresco 2005, Steen *et al.* 2006). Female turtles have a more risky life cycle as they leave the safety of the water to lay their egg and they often become prey to motor vehicle accidents along the way (Giles 2001, Aresco 2005).

The result of the death of a higher proportion of female turtles (which were trying to nest) is a sex skew towards males. Sex skewing towards males has already been found in at least two Oblong turtle populations in Shenton Park (Tysoe 2005) and Booragoon Lake (Giles 2001, Giles *et al.* 2008). This leads to a lack of sexually mature females in the population which can cause a decrease in the number of offspring. Road mortalities, however, are not necessarily the only cause for sex-skews towards males with females turtles leaving more often to nest they are also more likely to be attacked by predators.

## Predation

Predation is an issue which can be amplified in urban areas (although this does not nullify the concern about predation in rural areas). Most often the focus of predation studies on turtles is on the depredation of turtle nests.

In America the most common species to depredate turtle nests is the Raccoon (Marchand and Litvaitis 2004, Vilardell *et al.* 2012). In Australia in the eastern states foxes are considered a predator both for female turtles nesting and the nests themselves (Spencer 2002, Spencer and Thompson 2005).

There are two factors which drive nest site selection, minimising female mortality and maximising nest survival. It has been shown in the female turtles of the species *Emydura macqurii* (found in eastern Australia) will adjust their nesting behaviour to minimise the amount of time they spent on land in high-risk locations (those with many foxes). If, however, there were less predators present the female turtle would usually travel further to find a site to maximise offspring survival and fitness. It was identified that this species also showed anti-predator behaviour when it detected quoll scent (which may have been a predator prior to human settlement) but did not show the same anti-predator behaviour when confronted with fox scent (Spencer 2002).

If the Oblong turtle shows a similar response to the presence of foxes and chooses to maximise female survival over offspring fitness this could lead to a decline in the recruitment in this species. Potentially this could have damaging effects on the stability of the populations themselves.

# Chapter Three: Oblong turtle Nest Predation

Now we come to the aim of the Turtle Watch project namely “To identify the predator/s involved in the destruction of Oblong turtle nests at three sites – Herdsman Lake, Bibra Lake and Canning River.” Whilst previous research has suggested that foxes or dogs were the culprit for the destruction of turtles nests around a number of urban wetland (Giles *et al.* 2008, Lewis *et al.* 2008), at the initiation of the Turtle Watch project there was little hard evidence to support the theory that foxes were the main perpetrator of turtle nest excavations around the Perth wetlands.

## Surveillance evidence of Fox predation

The Turtle Watch program designed a project which asked the general public to report sightings of turtles laying eggs by contacting their closest Turtle Watch Environment Centres (Cockburn Wetlands Education Centre, Canning River Eco Education Centre, South East Regional Centre for Urban Landcare, and Herdsman Lake Wildlife Centre). The aim of this was to identify turtle nest locations and through the assistance of the general public they could place video surveillance equipment to potentially capture footage of any animals excavating the nest. Joe Tonga from NatSync (a private consulting company) conducted this surveillance portion of this project.

Conducting surveillance such as this is very difficult in an urban setting, as it depends heavily upon the nesting sites having close-by trees to place cameras on and requires the area to be secluded enough to prevent theft or vandalism of the devices. No footage of predators excavating true turtle nests could be gathered as a result of these limitations and so the approach was modified.

Artificial nesting sites with chicken eggs were created in secure locations at both Bibra Lake and Herdsman Lake. Surveillance cameras where then set up over these fake nests. Two foxes were captured on video camera (see Figure 1) digging up these artificial turtle nesting sites. One fox was captured at Bibra Lake 2012 and another at Herdsman Lake 2012. In both of these cases the foxes took or ate the entire chicken eggs including the shell. The footage of these two foxes seen at Bibra Lake and Herdsman Lake can viewed at the following links (http://youtu.be/BUKeii6UOJY and http://youtu.be/syxWgssIKL0 respectively).

**Figure 1: Fox digging up artificial nest site at Bibra Lake. Photo courtesy of Joe Tonga.**

The removal of the entire egg from the nest is interesting because the majority of depredated turtles nests identified by the nest watch project (Lewis *et al.* 2009) and by Giles (2008) had the shells left behind. Notwithstanding this, evidence does show that foxes are capable of identifying sites with eggs buried and of excavating these sites.

The evidence collected by Turtle Watch which suggests that foxes are responsible for the depredation of turtle nests is now supported by further research into fox predation conducted in Bindoon by Dawson (2012).

This research was conducted in a rural setting which allowed for easier placement of camera traps. A total of 450 artificial turtle nests were created. At each location there were four types of nests made, just chicken eggs, chicken eggs with female turtle scent, no eggs without scent and one nest with no eggs but female turtle scent (Dawson 2012).

The majority of depredation on artificial nests occurred in the first 30 days. During this study 43.4% of artificial nests were depredated and only foxes were detected depredating these artificial nests on camera. Other predators were captured on footage including feral cats, feral pigs, ravens, dogs and rats however there was no evidence to show that they had excavated the artificial nests (Dawson 2012).

Importantly, Dawson (2012) notes that only 16.6% of depredated artificial nests had egg shells left behind. He suggests that this fact may lead to an underestimation of how many turtle nests are truly destroyed, as when depredated turtle nest surveys are conducted sites of depredation are usually only included if there are egg remains present.

These results support the findings of the Turtle Watch surveillance which identified that the foxes removed the egg in its entirety or ate it in its entirety.

**Figure 2: Oblong turtle nesting. Photo courtesy of Sally and John Nicholas**

## Further evidence supporting fox predation

Depredated turtle nests found around two lakes in Bindoon which had shell remains were identified and the shells sent for DNA analysis to identify the predator. Upon conducting genetic analysis, fox DNA was found on 54% of the turtle shells. Turtle remains were also found in fox faeces, including the remains of a small turtle which was either a hatchling or a late term embryo (Dawson 2012).

Foxes are not just a threat to the nests of turtles but also to the female turtle leaving to lay their eggs (Spencer 2002). Turtle remains were found surrounding the Bindoon study sites and 96% of the recent remains had teeth marks identified as fox and 72% of the remains were likely to be female turtles (Dawson 2012).

From the evidence collected by Turtle Watch and Dawson (2012), the aim to identify the predator/s involved in the destruction of Oblong turtle nests at three sites – Herdsman Lake, Bibra Lake and Canning River has been met. Turtle Watch have revealed that at least one fox is present at each of Bibra and Herdsman lakes and that the foxes have the capability to find and excavate artificial turtle nests. On top of this it has been shown that whilst many predators may be seen in the area (dogs, feral cats, ravens and rats), foxes are the only species of which we have evidence to show that they destroy turtle nests.

All of this evidence from Turtle Watch and from Dawson (2012) indicates that foxes are very likely to be the primary predators responsible for the depredation of Oblong turtle nests and may also be applying some pressure to populations by also contributing to the deaths of female nesting turtles. From this knowledge we can now start to look at ways to mitigate the effects of foxes on these populations.

## Chapter Four: What can/are we do to help?

The Turtle Watch project has shown that foxes are very likely to be the culprit when it comes to the depredation of Oblong turtle nests, especially around Bibra Lake and Herdsman Lake. These foxes also pose a threat to female turtles attempting to nest. Further research or discussion with stakeholders will be required in the Canning river area to identify if foxes are present.

Recently there have also been a number of concerns about ability to treat and appropriately care for sick or injured Oblong turtles. To this end the Turtle Oblonga Rescue and Rehabilitation Network (TORRN) was created. This particular network is primarily focussed on the rehabilitation of injured individuals found by locals. However, it has also shown that the lack of research into particular factors about the Oblong turtle, such as population sizes in permanent lakes limit their ability to ensure turtles are returned to a suitable location. TORRN has also identified that they receive a number of turtles that show canine bite marks (TORRN Secretary, 1st April 2013) which could be from foxes or possibly dogs.

At this stage we strongly suggest that investigation is required to identify the most appropriate course of action to deal with foxes living near urban wetlands, which is acceptable by the community, local governments and all other stakeholders. We do recognise that some methods of fox control are not appropriate for urban areas or are viewed with concern by residents.

The bonus of fox control would be that it would also help reduce the dangers that nesting female turtles face. Furthermore we recommend exploring the possibility of providing Oblong turtles with an artificial nesting locations such as those described by Buhlmann and Osborn (2011). This nesting location would have to be designed in a way to protect eggs from foxes or be placed in areas where foxes are no longer present.

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