# 13th Australasian Vertebrate Pest Conference

Keven Drew

## Proceedings

Te Papa
Wellington, New Zealand

2-6 May 2005

Hosted by Manaaki Whenua – Landcare Research
PO Box 69, Lincoln 8152, New Zealand. www.landcareresearch.co.nz

MAF

Manaaki Whenua
Landcare Research

# THE RED-EARED SLIDER TURTLE (TRACHEMYS SCRIPTA ELEGANS) IN NEW ZEALAND

**Mark L. Feldman**

Box 285, Kerikeri, Northland, New Zealand, 0470
mfeldman@xtra.co.nz

**ABSTRACT:** Red-eared slider turtles (*Trachemys scripta elegans*) have been present in New Zealand for over fifty years. In that time at least 110,000 hatchlings have been bred or imported. Importation was banned in 1965 but smuggling was significant until the mid-1980s. Since then, about 2000 animals have been bred in New Zealand for the pet trade each year. Demand always exceeded supply until this year's negative publicity. Red-eared turtles have strict requirements for survival and growth. Despite their high cost, it's doubtful that survival of hatchlings in captivity exceeds 5-10%. Adult animals that escape, or are released, probably cannot reproduce because of poor fertility, dry summer soils and the low temperatures in New Zealand. Because of these low temperatures, any eggs that do hatch in suitable microclimates will produce exclusively males. Many adult red-ears found in the "wild" are emaciated and infected with ulcerative shell disease, suggesting that animals frequently die within a few years of escaping captivity. I have been unable to detect evidence of reproduction or colony formation anywhere in NZ. When turtles are discovered in the "wild" they are almost always in warm water habitats previously altered or created by man (drains, farm ponds, weed infested streams). Most of the problems with red-eared slider turtles overseas have occurred in countries where millions were imported and released. This has not been the case in New Zealand. It is doubtful they could have much, if any, impact on unmodified environments in New Zealand.

## INTRODUCTION

Over the past year there has been considerable misinformation about red-eared slider turtles (*Trachemys scripta elegans*) in the New Zealand media. The purpose of this presentation is to document the facts we do have about these turtles from overseas, and the research that has been done here.

### History of the New Zealand market

Red ears were imported into New Zealand from Louisiana, USA until 1965. A ban on importation was introduced in 1965 because the hatchlings were found to be carriers of several varieties of salmonella not previously known in NZ. However, by the time the ban was instituted, 30,000 animals had already been imported and sold, so those alien species of salmonella were already widely spread. The imported turtles came from turtle farms where they were raised in enormous concentrations (10,000-30,000 adults per surface acre). The animals were fed processed food but large amounts of salmonella-rich offal and wild water plants from surrounding swamps were also eaten. These contaminated the stagnant water with bacteria, including multiple salmonella serotypes. Waters in surrounding swamps were also contaminated with salmonella of similar varieties. Virtually all the hatchlings were carriers of salmonella (Chiodini and Sundberg 1981). The salmonella was acquired as the eggs passed through the cloacae or were deposited in the grossly infected soils at the farms.

After the importation ban came into force, smuggling continued until the mid-1980s with 1000-2000 animals being imported per year. After that, back-yard breeders became common throughout New Zealand. After my first survey of NZ breeders in 1997, I concluded that

about 2000 hatchlings were being sold per year and there was enough demand to sell another 500–1000 animals at a retail price of $90–$100 each. At that time there were four main breeders and about twenty smaller ones. My survey of breeders in 2005 came to similar conclusions. The retail price now varies from $70–$100 retail. Output is still about 2,000 animals per year that seems to be meeting demand after the recent negative publicity.

**The international situation and origin of the red-ear "problem"**

The Louisiana, USA turtle farms have exported between 8-12 million animals annually for many years. In later years Korea imported up to 1.3 million per year, Italy about a million and Japan 0.6 million. Taiwan, South Africa, Israel, Australia, Thailand, Cambodia, and other European Union countries were also big importers. In 1997 the importation of red-ears was banned in the European Union. China has now replaced Korea as the major importer. Red-ears have been able to reproduce in the "wild" in southern France (Cadi *et al.* 2004) and possibly Spain and Taiwan but not in northern France, central Italy (Luiselli *et al.* 1997), or England. Millions of these animals were sold in Asia for Buddhist "Mercy Ceremonies" in which the turtle is marked and then released. So, it is no surprise that large numbers of red-ears have been found in waters already altered by human activities around the world. Even if they were incapable of reproduction, and could only survive a few years, the release of millions would have a significant local impact.

**Biology**

Active feeding requires water temperatures above 18–20 degrees C (Ernst *et al.* 1994) and effective digestion of plant material requires hours of basking in full sun each day to produce core body temperatures around 30 degrees C. Adult red-ears prefer water 1-3 meters deep with copious amounts of vegetation. They pursue snails, insect larvae, crayfish, insects, worms, shrimp, tadpoles and other small creatures living around the margins of water plants. Live fish and birds are almost never part of their diet but they do readily consume carrion (Parmenter 1980). In the process of hunting they consume large amounts of vegetation. Favourite plants include oxygen weeds, water hyacinth and eel grass; all noxious weeds in New Zealand. In adults the diet by dry weight is 95–100% plant material (Thornhill 1982). They are known to move up to 9 km overland between habitats.

Maximum longevity in natural situations is 30 years. Most animals don't live longer than 20 years. Only 1% of hatchlings survive to 20 years. Annual survivorship of adults is about 80%. Mated females can hold active sperm for up to two years. By the end of the first year the fertility rate drops to 20% or less.

The lowest constant incubation temperature that produces hatchlings is 22.5ºC but, at that temperature, most hatchlings are deformed or neurologically impaired (Ewert *et al.* 1991). To produce any females eggs must experience constant temperatures above 28.3ºC (Cadi *et al.* 2004). To produce all females the nest temperature must exceed 30.6ºC for at least four hours a day during the middle third of development.

Successful nesting also requires soil that is moist enough to be suitable for nest building and maintenance of the water content of the eggs. Vermiculite with a water potential of −1500 kPa (.09 g water:1g vermiculite) is the driest condition in the lab that will allow the majority of eggs to escape fatal dehydration (Tucker *et al.* 2000).

**Microbiology**

Campylobacter and Salmonella are the most common causes of bacterial enteritis in New Zealand. About 1% of the human population are chronic salmonella carriers. Native NZ

wild lizards are also known carriers of salmonella. Campylobacter is ubiquitous in NZ; contaminating dogs, cats, the vast majority of farm animals, and waterways. Chickens and ducks are the most notorious source of both salmonella and campylobacter with contamination rates of 80% (Alan 2003). Campylobacter is by far the most important cause of human disease; out numbering reported salmonella infections by about ten to one in the North. The vast majority of cases go unreported.

On a tour of turtle breeders in the North Island in 2005 I collected dirty pond water and infertile eggs from all their facilities. Three samples from each breeder were cultured onto XLD agar plates and incubated at 35ºC: pond water, pond water carried in selenite cystine broth for 3–7 days, and the yolks and shells of infertile turtle eggs. A minimum of six eggs was sampled from each breeder. The collected samples were cultured by the Whangarei Base Hospital Microbiology Department for salmonella and arizona. Campylobacter was incubated separately on other media from pond water and infertile egg samples. None of the cultures were positive for salmonella, arizona or campylobacter.

These results were surprising. One possible source of error was carrying one set of pond water samples in selenite cystine broth for over 48 hours. Although an excellent selective media for salmonella it is usually cultured onto plates after 24–48 hours. It is possible the media proved to be toxic after that time. However, the untreated pond water should have held the salmonella alive for up to three months and the eggs were used as a back-up source; all proved to be culture negative.

The results could be explained by the fact that conditions for back-yard breeders in New Zealand are much different than on the commercial turtle farms in the USA. Here water is changed frequently, tanks are refilled with chlorinated tap water, offal from cattle are not used for food and the eggs are hatched on grids or in sterile vermiculite, not in contaminated soil.

**Reproduction in New Zealand**

I know of two locations where red-ear eggs were able to hatch outdoors in NZ. Each nest was situated next to a large, northwest facing heat sink (rock wall/concrete wall/roofing metal) that warmed the soil through the night. Both also featured consistent moisture; an unusual summer condition in most areas of NZ. I am also aware of turtle nests hatching successfully in glass houses that were watered frequently. Except for the above examples, all breeders that discovered eggs outdoors more than two weeks after laying found they were dead.

During the summer of 1991, I constructed an artificial nest in Mangonui (Feldman 1991) in the Far North, one of the warmest areas in NZ. The nest was in an ideal location to capture the heat of the sun, facing due north on a 30 degree slope with no nearby shade. The mean low-high temperatures within the nest for January were 21ºC– 23ºC, and for February were 20ºC–24ºC. The air temperature for that summer averaged 0.8ºC below normal. At those temperatures even the most cold adapted Canadian turtles could not breed here (Bobyn 1991) but there were no eggs in my artificial nest. The presence of metabolically active eggs can raise the nest temperature by 2–7ºC in the last third of incubation (Burger, 1976), but this is too late to influence sexual determination.

**Results of a turtle hunt in NZ**

Once you know how, it is very easy to detect adult turtles and their nesting sites. During the summers of 1993 and 1994, during the height of the nesting season, I travelled throughout

the upper North Island looking for turtles. I only investigated a few ponds in towns and cities because I assumed that there would inevitably be some escaped or released pets there. I focused on "wilder" areas looking for breeding populations in warm water habitats created by human activity. The most likely environment for them that I detected was the numerous weed-choked canals in the Hauraki Plains. In these areas the water was relatively warm and there was an abundance of water plants to eat. I found no turtles and no evidence of nesting.

During 21 years of living in the Far North I have trapped or received several adult female turtles that had found their way into area streams or neighborhoods. All were emaciated and had significant ulcerative shell disease. Clarice Ford, who receives and redistributes unwanted turtles in Auckland, states that almost all her turtles (30 per year) arrive in similar condition. Turtles deposited in the moats at the Auckland Zoo also prove to be frequently infected.

**The fate of pet turtles in NZ**

The vast majority of hatchlings sold in the pet trade die before one year of age. Estimates from overseas suggest survival is 5%. Survival might be higher here because the animals are much more expensive so people might take better care of them. Contrary to folklore, turtles are quite delicate and require large amounts of calcium, unfiltered sunlight or vitamin D supplements, lots of vitamin A or fresh vegetation, and an environment with no hard, rough surfaces in order to survive for long periods.

If the average turtle is eight years old when it is freed or escapes it can be expected to live for another twelve years under ideal circumstances. But turtles that are released into the wild or escape are usually discovered in poor condition; emaciated, and with multiple lesions from ulcerative shell disease. Ulcerative shell disease is caused by infection with a variety of gram negative rods that gain entry to the living bone because of injuries to the outer keratin layer of the shell. It's usually chronically progressive and ultimately fatal if not treated surgically (Feldman 1998). The origin of the injuries to the keratin are the concrete ponds the turtles are often kept in and the sharp edged rocks found in many situations in NZ, but not in their native environment. Like any chronic disease, ulcerative shell disease causes weight loss because of the inability to feed and the extra energy expenditure involved in the infectious process. I suspect that the other reason "wild" red-ears are always emaciated here is because of the low water and air temperatures in NZ. The low water temperatures inhibit feeding and the low air temperatures makes it difficult to digest the plant material they depend on for nourishment.

**Control**

Red-ears are easy to catch if you know their habits. Capturing them is so easy that, during the early 1980s, the main concern about red-ears was that they might be hunted to extinction. Because of that fear, considerable pressure was put on the turtle farms to release a percentage of their hatchlings back into the wild. There are various ways to capture them in different environmental conditions. Baited hoop nets are effective in feeding areas, especially if there are small amounts of current flow. Trammel nets can be used effectively in smaller, shallow water bodies where the turtles can be "herded" by disturbing the water surface. Fyke nets are effective next to sunning logs and hibernacula, especially if equipped with wings that form an underwater drift fence leading to the net (Vogt 1980). In clearer waters a set of fins and a snorkel can be used to catch large numbers of animals quickly.

**Financial and social factors**

The retail value of red-eared sliders sold is about $170,000 per year. The retail value of durable goods and food sold for the ongoing care of these pets exceeds $1,200,000 per year.

These business activities have been established in NZ for over fifty years. If there was a ban on the sale of turtles bred domestically compensation issues would probably arise. People have always been attracted to turtles. Demand in NZ has exceeded supply until this year. They are one of the preferred pets for older, asthmatic children that cannot keep mammals. Turtles that survive to adulthood are often retained and passed down from generation to generation. Although some owners of adult animals do release them into dams, rivers and lakes because of their size, many owners of escaped adult animals often contact the SPCA looking for them.

## CONCLUSIONS

Except in exceptional circumstances, there is good evidence that red-eared sliders cannot reproduce in NZ successfully because of the consistently low temperatures and sparse summer rainfall in most of the country. There is some evidence that they cannot survive for more than a few years in the "wild" despite the ample supply of invasive water plants available for food. The fact that it makes the news when one is caught supports this view. However, they might be able to survive longer in parks, artificial ponds and waterways already heavily impacted by man, especially if fed by visitors. If native invertebrates exist in these altered environments it is possible that red-eared slider turtles could have an effect on their populations. Given their long history in New Zealand I suspect they would already be a problem if they were ever going to be.

## REFERENCES


Alan, B. 2003. Crook chooks. *Consumer 431*: 12–13.

Bobyn, M. 1991. Personal communication from Department of Zoology, Guelph, Ontario, Canada.

Burger, J. 1976. Temperature relationships in nests of the northern diamondback terrapin, *Malaclemys terrapin terrapin. Herpetologica 32*: 412–418.

Cadi, A.; Delmas, V; Prevot-Julliard, A; Joly, P; Pieau, C; Girondot, M. 2004. Successful reproduction of the introduced slider turtle (*Trachemys scripta elegans*) in the South of France. *Aquatic Conservation: Marine and Freshwater Ecosystems 14*: 237–246.

Chiodini, R.J.; Sundberg, J.P. 1981. Salmonellosis in reptiles: a review. *American Journal of Epidemiology 113*: 494–499.

Ernst, C.H.; Lovich, J.E.; Barbour, R.W. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington D.C., USA.

Ewert, M.A.; Nelson, C.E. 1991. Sex determination in turtles: diverse patterns and some possible adaptive values. *Copeia 1*: 50–69.

Feldman, M. 1992. Can turtles reproduce in New Zealand? *Moko*, winter issue: 14–16.

Feldman, M. 1998. The ulcerative shell disease in New Zealand turtles. *Moko,* summer issue: 11–13.

Luiselli, L.; Capula, M.; Capizzi, D.; Filippi, E.; Jesus, V.; Anibaldi, C. 1997. Problems for conservation of pond turtles (*Emys orbicularis*) in central Italy: is the introduced red-eared turtle (*Trachemys scripta*) a serious threat? *Chelonian Conservation and Biology 2*: 417–419.

Parmenter, R. 1980. Effects of food availability and water temperature on the feeding ecology of pond sliders (*Chrysemys s. scripta*). *Copeia 3*: 503–514.

Thornhill, G.M. 1982. Comparative reproduction of the turtle, *Chrysemys scripta elegans*, in heated and natural lakes. *Journal of Herpetology 16*: 347–353.

Tucker, J.K.; Paukstis, G.L. 2000. Hatching success of turtle eggs exposed to dry incubation environment. *Journal of Herpetology 34*: 529–534.

Vogt, R.C. 1980. New methods for trapping aquatic turtles. *Copeia 2*: 368–371.