

Strictly speaking, the reproductive cycle of female tuatara begins well in advance of mating. In fact, some females begin yolking a new clutch of eggs soon after nesting. Individuals do not nest every year, however, and it is likely that egg yolking takes place over many months, even years, prior to mating. The minimum known period between nestings of the same female is two



Mike Thompson and assistant Jennie Hay burying tuatara eggs in an artificially constructed nest chamber. No natural nests have been found under the forest canopy on Stephens Island. Eggs are therefore being incubated in man-made nests, in an attempt to determine whether the success of development varies between forest and paddock habitats.

Photo: A Cree.

years, and the nutritional status and perhaps age of the female may affect how frequently she reproduces.

One of the most interesting discoveries of recent research is that nesting is concentrated in particular areas, or "rookeries", on Stephens Island. To date, such rookeries have only been found in open areas, predominantly grazed sheep paddocks. This raises the question of why females favour such open, modified areas for nesting in preference to the original forested habitat. Monitoring of the nest conditions reveals that during summer, when embryonic development occurs, soil temperatures are often higher in the paddock than in the forest. In fact, soil temperatures in the forest rarely exceed 15°C, a temperature shown by laboratory studies to be too cold for successful development.

Disastrous Consequences

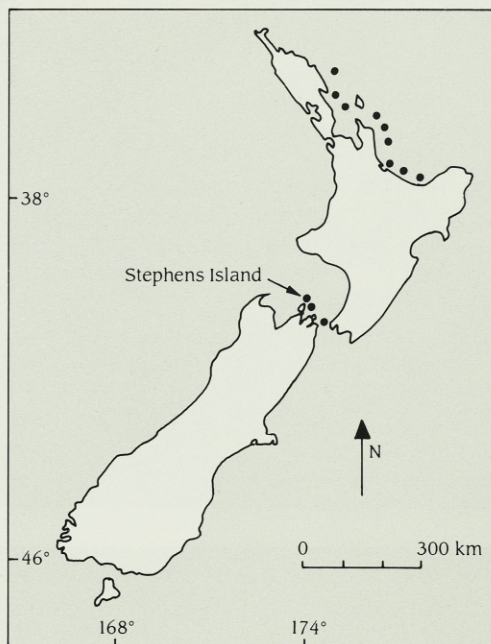
In the paddocks, eggs in the warmest nests hatch first. Since some eggs appear to be eaten (probably by beetle larvae) during incubation, faster development may be advantageous in minimising exposure to predators. However, in some reptiles, the incubation temperature can affect the sex of the resulting hatchlings. Such a phenomenon could have disastrous consequences for the tuatara if only one sex was produced. This possibility is currently under investigation.

A further discovery with important management implications is that females spend several nights digging a nest chamber, and then several more nights covering the eggs with soil and grass before the nest is complete. Since the nest may remain partially open for a period of days, this makes the eggs potentially very vulnerable to predation by rats. Fortunately, no rats are present on Stephens Island. However, the dwindling status of tuatara populations on several other islands has been linked with the presence of kiore, the Polynesian rat, and the tuatara are never found on islands with Norway or ship rats.

In many respects, our results support the

popular idea that "Everything the tuatara does, it does slowly". Along with an extended period of egg yolking and processing prior to nesting, the tuatara has an extraordinarily long period of egg incubation (about one year), a long life-span (perhaps sixty years or more), and takes a decade or longer to reach sexual maturity. Many of these features may reflect the fact that tuatara are adapted to life at much cooler temperatures than are most other reptiles. With such an extended life-cycle, subtle changes in a population's health could take many years to appear and it is therefore critical that we begin to address important issues of tuatara biology now, before it is too late. The presence of a large and viable population on Stephens Island is invaluable in allowing us to tackle such questions, without risking the health of smaller and more vulnerable populations.

Once the current studies on Stephens Island have been completed, the results will be used to formulate comparative studies on other island populations. For instance, our results raise such important questions as: where do tuatara nest on islands that are fully forested? Do kiore prey on tuatara eggs and is that one of the reasons for the drastic reduction in reproductive success of



The tuatara is now restricted to just 12 island groups (about 30 islands), shown by black dots. The population on Stephens Island numbers many thousands and may be as large as all other populations combined.

tuatara on islands with kiore? Do the important reproductive events (mating, ovulation and nesting) occur at the same time on northern and southern islands?

Are the hormone cycles of either sex affected by low population density or reduced social interactions? And, do tuatara nest more frequently in warmer conditions or where food is more abundant? Only when these and other questions related to geographic variation are answered will it be possible to formulate a New Zealand-wide management plan for the conservation of this unique species.

Alison Cree and Mike Thompson are scientists who have been working for Victoria University's School of Biological Sciences. Throughout their studies, a major principle has been that their research on tuatara should not only be good science but also have readily identifiable management values. They extend their warmest thanks to the many colleagues, assistants and sponsors who have made these tuatara studies possible.