Endangered Species Foundation

Protecting New Zealand's rarest of the rare

Mokohinau Islands Stag Beetle

Geodorcus ithaginis (Broun) Holloway

Conservation Status: Nationally Critical

Island castaway

Male Mokohinau stag beetle. Greg Shirley, DOC

Quickfacts

Only known from the Mokohinau Islands north of Great Barrier Island

Rats eliminated it from all but one tiny rock stack

Rats have now been eradicated from the Mokohinau Islands, making it possible to return the stag beetle to its previous homes

Refugee from rat plagues

Ever since New Zealand was discovered by people it has been plagued by the pests that accompany them. The Pacific rat (or kiore) is one pest that arrived when New Zealand was first discovered by Polynesian explorers. It found its new home very much to its liking, and huge plagues of them swarmed over much of the country, feeding on fruit, insects, lizards and small birds all of whom had no survival strategy to cope with such a foreign intruder. The Pacific rat also accompanied Maori on their food-gathering trips out to offshore islands that were normally far beyond the rat's reach. The plague of Pacific rats eventually subsided as their food became scarcer, but the damage had been done and several species of bird, lizard and unknown large insects became extinct.

Fast forward several hundred years and some innovative conservationists made the first attempts to remove every rat from islands using recently developed poisons. These first attempts were successful, providing the confidence to remove rats from larger and larger islands: rats were recently eradicated from 13,000 ha Macquarie Island, and an eradication operation has just been

completed on 375,000 ha South Georgia Island (but it is too early to know if this was successful). Techniques were developed to eradicate other pest species too, including goats, pigs, cattle, sheep, cats, possums, ship rats, Norway rats, mice, and even reindeer! New Zealand's biosecurity teams have also developed techniques to eradicate pest insects and plants and conservation teams are currently working to eradicate several troublesome weed species from our islands. These techniques have been used to remove pests of one kind or another from hundreds of New Zealand's islands, protecting their inhabitants from the ravages of exotic predators or from the land becoming carpeted by weeds. On some islands where a pest has now been eliminated, species that had been lost are starting to return - some under their own steam and others that have been physically translocated in groups collected from other safe havens by conservationists.

The Mokohinau Islands are a group of islands that were overrun by Pacific rats inadvertently introduced by Maori during food-gathering trips. One of its inhabitants, the Mokohinau stag beetle, is one of many species that were decimated by the new arrivals. The stag beetle was decimated to the extent that it now survives on only one tiny islet where the Pacific rat (and other pests) never arrived. There, a very small number of stag beetles live under a small pohutukawa *Metrosideros excelsa* forest and in patches of iceplant *Disphyma australe* and coastal tussock grass *Chionochloa bromoides*. The fauna and flora of the Mokohinau Islands are now making a comeback after the Pacific rats were eradicated in 1990, using bait dispensed by a helicopter. Unfortunately, the stag beetle cannot make the same comeback as the islet it lives on is too small, and it cannot swim to neighbouring islands.

The Mokohinau Stag beetle

Stag beetles, with their over-developed, antler-like jaws, are popular insect pets in many countries. In New Zealand only the male stag beetle in the *Geodorcus* genus has the large jaws, which are used when fighting other males who also wish to mate with a nearby female, or to defend a territory. This evolution of over-sized body parts that help to secure a mate, but that are probably a hindrance in daily life, is termed 'sexual selection' by biologists. Other examples of sexual selection are the antlers of deer, the peacock's tail and the tusks of New Zealand's tusked weta *Motuweta isolata*.

There are ten species of *Geodorcus* stag beetles (family Lucanidae), all of which are only found in New Zealand. The Mokohinau stag beetle *Geodorcus ithaginis* occurs only on the islands of the Mokohinau group, 23 km northwest of Great Barrier Island. It differs from other stag beetles mainly due to the rhinoceros horn-like spike on top of the male's large jaws. It is one of the larger beetles in New Zealand, and males can grow up to 32 mm in length. It is thought that both the adult and the wireworm-like larvae feed on dead plant material, which the larvae find while burrowing and the adults when

wandering around at night. On their rocky islet there is likely to be competition between insect species for the few plants that grow, and the stag beetle is likely to face competition from the commoner darkling beetle (*Mimopeus* species).

There is much we do not know about the Mokohinau stag beetle. No-one knows how long the beetles live, and no-one knows how many stag beetles inhabit the small islet (the most that have been seen at one time is nine). In the 1990's, DOC staff spent four weeks searching the Mokohinau Islands for stag beetles, and found three females and only on the one islet. It is this extreme rarity that makes it difficult to implement conservation actions.

Currently, keeping the Mokohinau islands predator-free is the only conservation programme that currently protects the Mokohinau stag beetle.

What next?

The threats to the survival of the Mokohinau stag beetle are:
1. Only being found on one tiny islet.
2. The number of stag beetles is not known.
3. Methods for translocating stag beetles are untested.

Successfully protecting the Mokohinau stag beetle from these threats must be achieved in order for the conservation programme to succeed. Ideally, this should be done by:

1. Keeping the Mokohinau Islands free of pests.

The arrival of rats back onto the Mokohinau Islands would be disastrous. In addition, there are other pest insects, weeds and diseases that could cause considerable harm to the island's plants and wildlife if they were to arrive on the island. While the islands are a Nature Reserve and landing is prohibited (except for on Burgess Island), the surrounding seas are popular with fishers and the islands are occasionally visited by scientists. The most likely route that pests could arrive on these remote islands is by people inadvertently transporting them on boats or in stores during fishing trips or during scientific expeditions. This risk is minimised by ensuring scientific expeditions follow island biosecurity measures, and there are ongoing awareness campaigns targeting boaties on the importance of not landing on the islands.

2. Developing captive breeding techniques for stag beetles.
Because there are so few Mokohinau stag beetles we need to be sure that this conservation project will work. We can test this by using a closely-related surrogate species such as the northern stag beetle *Geodorcus auriculatus* to trial the keeping and breeding of New Zealand stag beetles in captivity (stag beetles are frequently kept as pets overseas). Once it is known that the northern stag beetle can be successfully bred in captivity, a captive breeding programme for the Mokohinau stag beetle should be possible.

Maintaining a captive population of stag beetles for five years is likely to cost $58,000 over five years.

3. Harvesting stag beetles.
Some of the Mokohinau stag beetles will need to be collected from their last islet home to form a captive colony that can be bred as a source for stag beetles to be reintroduced back to other Mokohinau islands. Initially, a small group of both male and female Mokohinau stag beetles would be moved to a captive facility and if they thrive could then be supplemented by additional individuals.

Harvesting stag beetles from their islet home over five years is likely to cost $78,600.

4. Breeding Mokohinau stag beetles in captivity.
Creating new populations of Mokohinau stag beetle on other Mokohinau islands will require a captive breeding programme to raise hundreds of stag beetles.

Breeding Mokohinau stag beetles for five years is likely to cost $58,000.

5. Releasing captive-bred stag beetles to a new island.
Creating a new population of stag beetles on another island where there are large areas of suitable habitat would lead to a huge increase in their population size. This can be achieved by releasing adult captive-reared stag beetles into suitable habitat on other islands.

Releasing captive-bred stag beetles over five years on new islands is likely to cost $14,600.

6. Checking the new populations of stag beetles.

Five years after the translocations have finished, the new islands where the larvae and adults of stag beetles have been translocated should be checked to see if a new population of stag beetles has been formed. A period of five years should give enough time for the populations to increase to a size where stag beetles can be found.

Checking the new populations of stag beetle is likely to cost $23,500 (based on the beetles being rentroduced to two islands).

More information

Website: DOC – Mokohinau Islands. Link
Website: Wikipedia - Mokohinau Islands. Link
Scientific paper: Lucanidae (Insecta: Coleoptera). By B.A. Holloway. Fauna of New Zealand No. 61. Manaaki Whenua Press, Lincoln, 2007. PDF
Report: The conservation requirements of New Zealand's nationally threatened invertebrates. By Carl A. McGuinness. Threatened Species Occasional publication No. 20. Department of Conservation, Wellington, 2001. Link
Report: Distribution, conservation status and some features of *Dorcus* stag beetles (Coleoptera: Lucanidae). By Greg Shirley, Chris Green and Keith Owen. Science and Research Series No. 75. Department of Conservation, Wellington, 1994. PDF

Photos

Museum specimen of a male Mokohinau Island stag beetle. Andrew Townsend, DOC

This webpage represents the views of the Endangered Species Foundation of New Zealand and not necessarily those of other individuals or organisations involved in the conservation of this species.

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TE KAUPAPA TIAKI KARAREHE, TIPU MŌREAREA O AOTEAROA

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