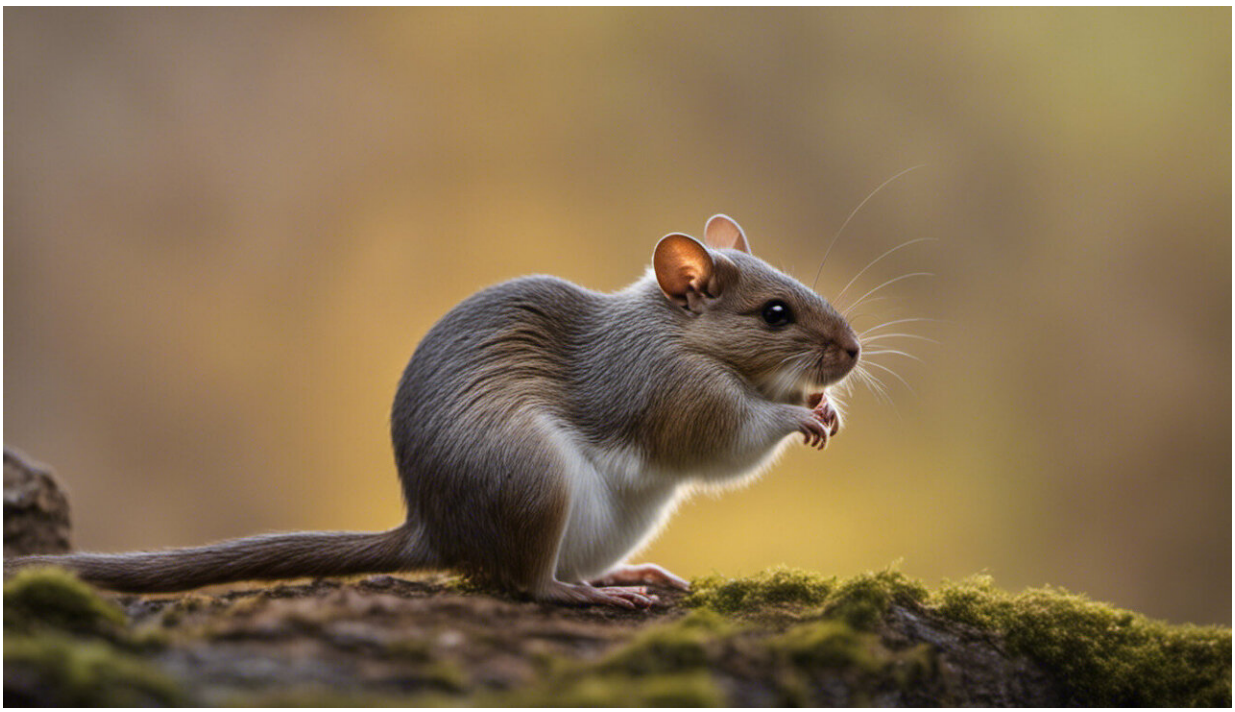
Shy rodents may be better at surviving eradications, but do they pass those traits to their offspring?

November 10 2020, by Kyla Johnstone, Clare McArthur and Peter Banks



Credit: AI-generated image (disclaimer)

Rodents such as house mice (*Mus musculus*) aren't just pests at home, they can cause serious damage to native ecosystems.

Lord Howe Island, for example, harbored up to 150,000 introduced rats

and 210,000 introduced mice that wrought havoc on the island's native wildlife, before an intensive eradication effort was carried out. It was declared a success earlier this year, although monitoring for survivors will continue.

But emerging research suggests the success of eradicating pests may depend on the personality of individual animals within a species.

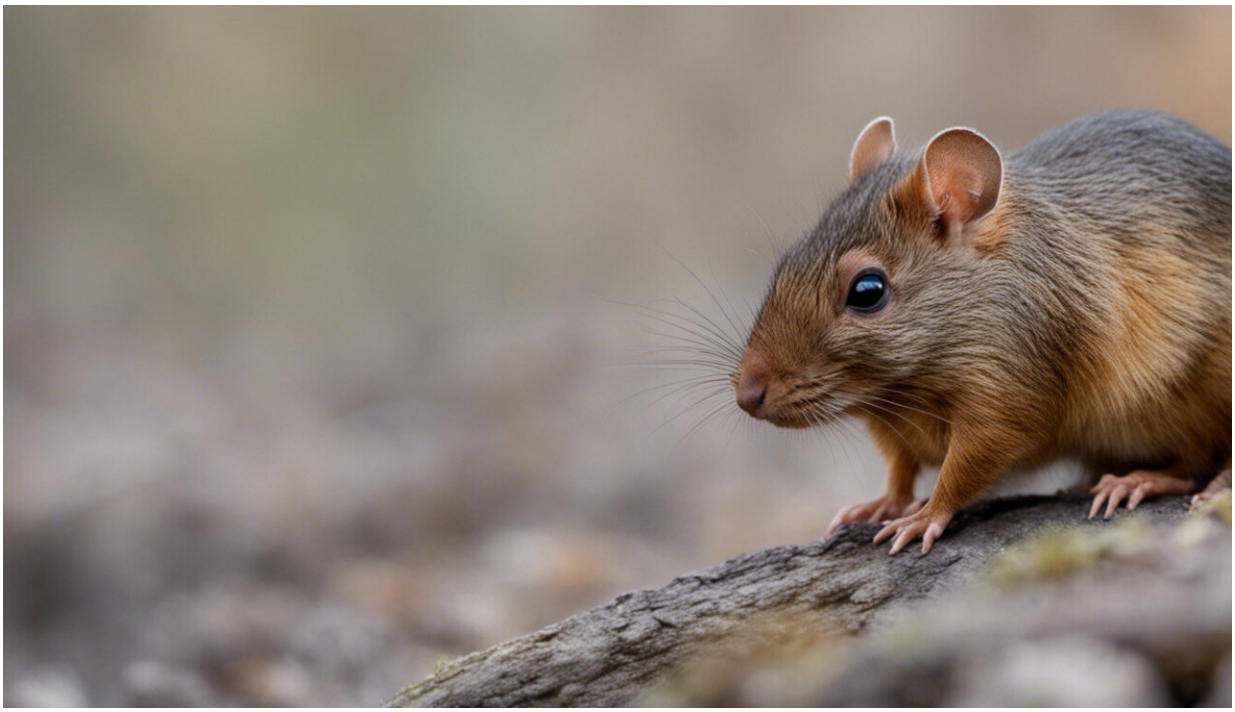
Bolder, more active, aggressive or social individuals are more likely to interact with baits, traps or new objects and foods. As a result, they can be removed quickly.

On the other hand, shyer or less active individuals can take longer to be caught.

Why is this so important? Well for starters, animals that actively avoid eradication will breed and repopulate.

If the personality traits of these survivors are reflected in all, or even most, offspring then we could be facing a pest population that is incredibly difficult to remove. This is what our new research aimed to find out.

When eradication efforts fail



Credit: AI-generated image (disclaimer)

Australia is home to more than 8,300 islands that provide refuge for unique species often found nowhere else in the world, including species now extinct on the mainland.

Introduced mammalian pests, particularly rodents, are huge threats to island species, which often evolve without predators. They don't recognize these introduced mammals as a threat, making them easy targets.

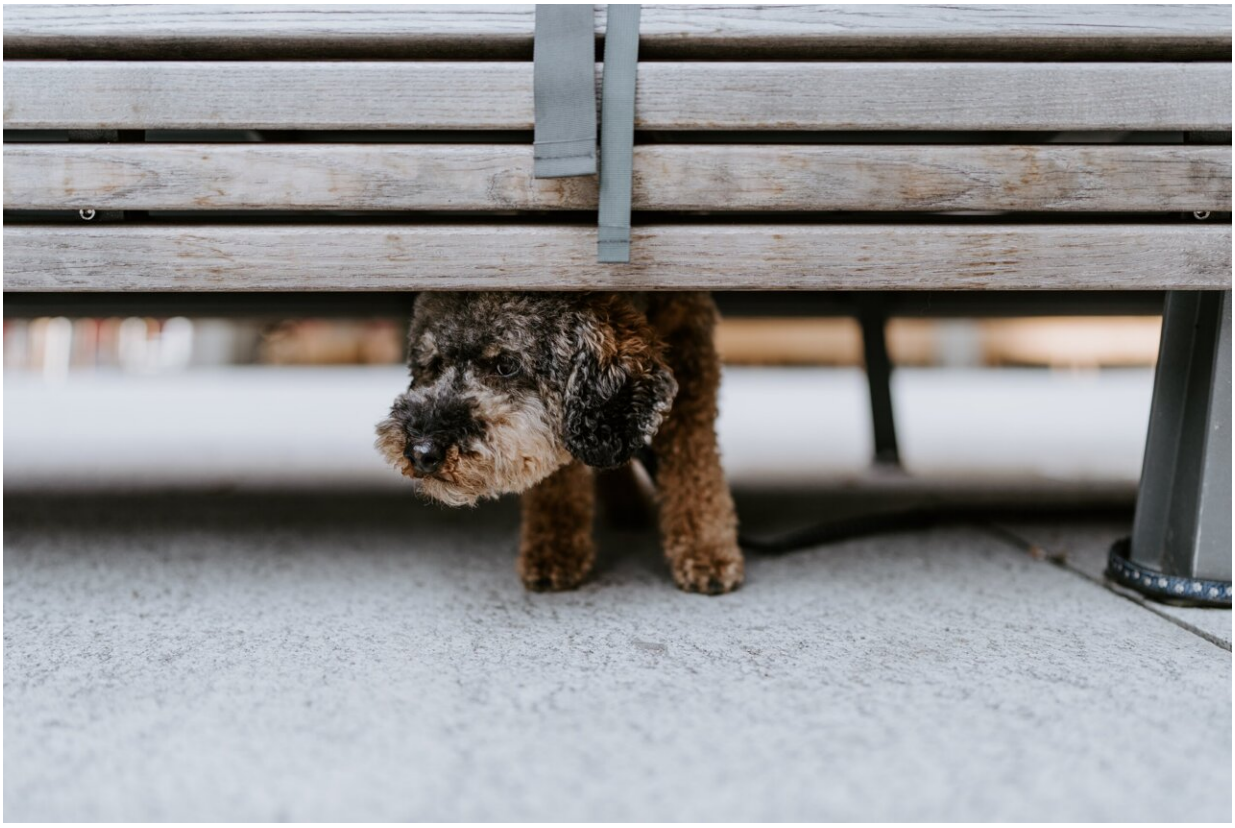
For example, a 2010 study observed house mice literally eating albatross chicks alive on Marion Island near Antarctica. Neither the chicks nor parents showed any defensive or escape behavior.

Eradicating introduced pest species is the ultimate solution if we want to

protect native island ecosystems.

But eradication efforts are only effective if every animal in a population is eliminated. While most failed efforts likely go unreported, on average, 11% of eradication attempts for rodents fail. For house mice in particular, failure rates can be as high as 75%.

When efforts fail, pest populations quickly bounce back. One study in 2016 found around 50 rats survived an eradication attempt by avoiding baits on Henderson Island in the South Pacific. Within only two years, the population had exploded into roughly 75,000 animals.



Credit: Unsplash/CC0 Public Domain

Developing personality traits

So if animal behavior influences if an individual enters a trap or takes a bait, how much of the parent personality is reflected in the offspring?

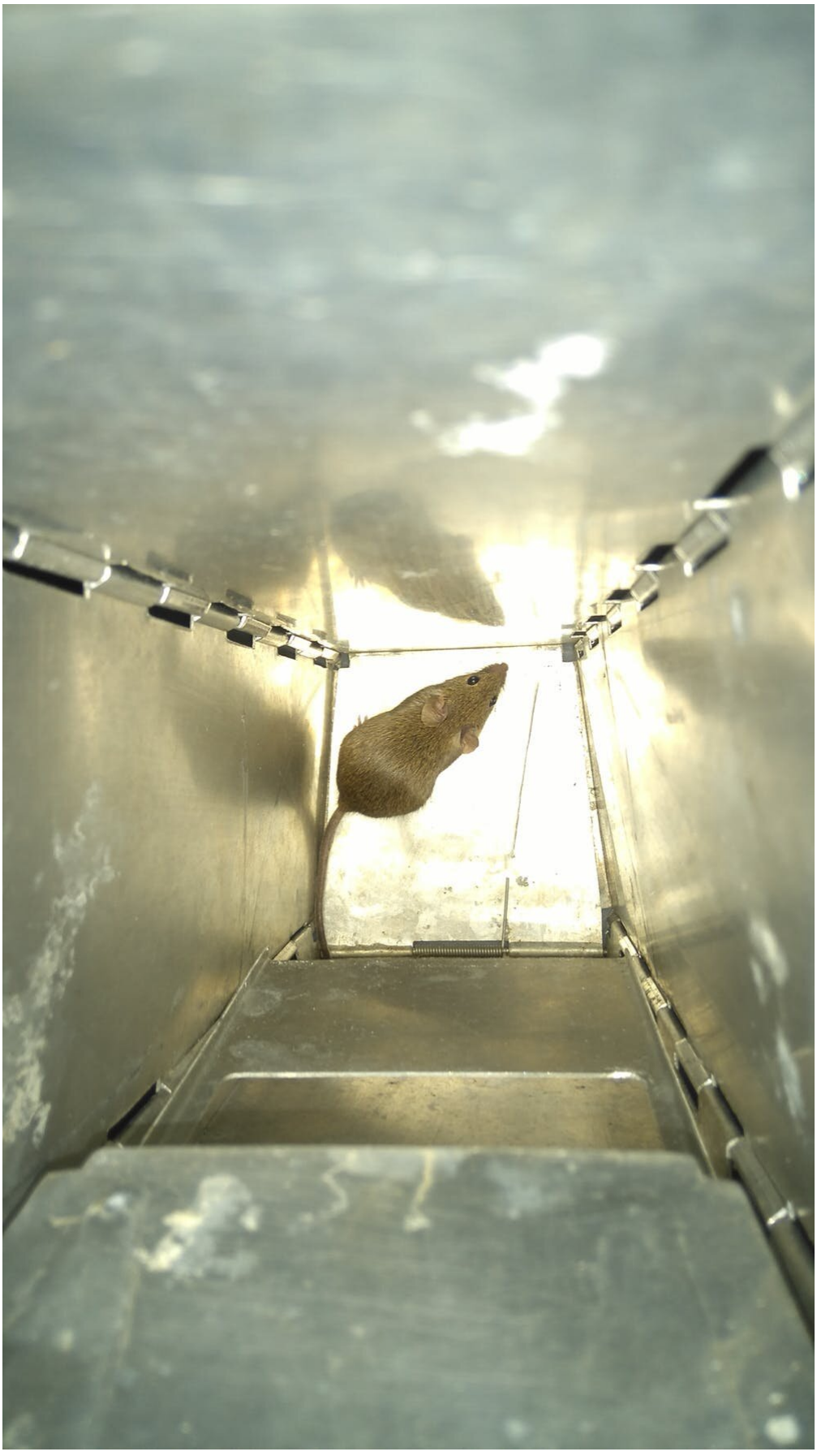
If you've thought about the similarity between parents and children—in both human and our animal companions—then you know some offspring behave just like their parents, while others are very different.

Personality traits develop through a combination of experience, learning from parents and genetic inheritance.

Humans have selectively bred domestic animals, including dogs, cattle and horses for preferred personality traits, such as docility.

And studies on laboratory animals, including mice and chicks, have found selecting for preferred traits in parents can lead to these traits being strongly expressed in the offspring within a single generation.

However, can this immediate generational response occur in wild populations?



A mouse in our study caught in a trap. Credit: Kyla Johstone, Author provided

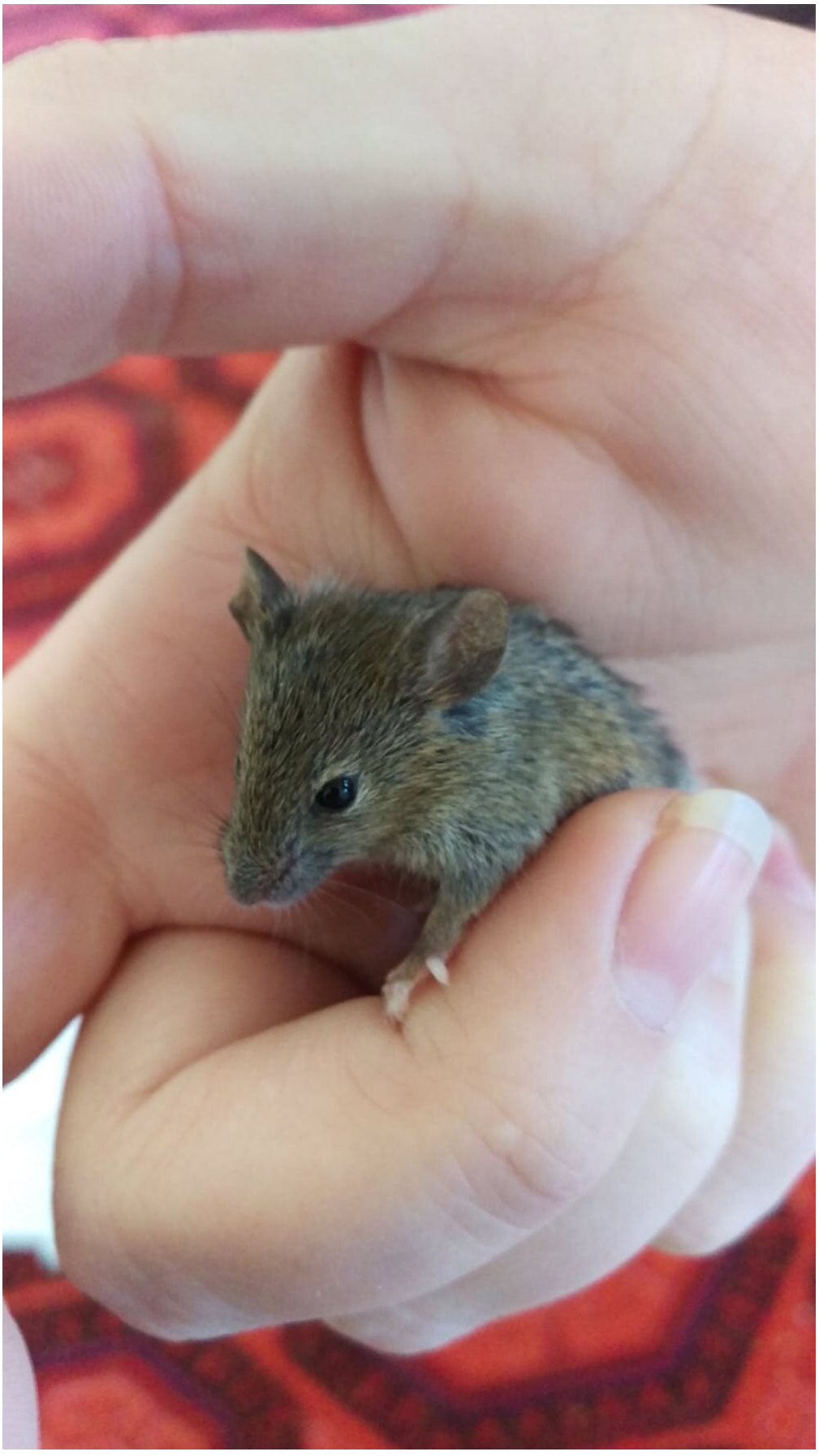
What our study did

To begin untangling this web, we used house mice as a model species and mimicked a failed eradication, where residual mice (the would-be survivors) were selected for biased personality traits.

After catching wild house mice, we tested for personality traits by filming their behavior in a modified open-field arena. Mice that moved frequently between compartments and into light compartments (which present a risky scenario to a small nocturnal rodent) were considered to be "high active-bold" individuals.

Based on their behavior, we then grouped individual mice into populations: high active-bold individuals, low active-bold (shy) individuals and intermediate individuals.

To closely mimic wild conditions, we released the populations into large outdoor yards and left the mice to breed for one generation. After recapturing every single mouse from the yards, we tested the offspring for the same personality traits.



A juvenile mouse from our study. Mice born from shy parents didn't necessarily have shy personalities. Credit: Kyla Johnstone, Author provided

The good news

Interestingly, although the parent populations had strong personality biases, there was a broad spectrum of personality among offspring of every population. In other words, bold mice didn't necessarily produce bold offspring, nor shy mice, shy offspring.

This was reassuring news. However, demonstrating there's no generational bias in house mice doesn't mean it can't arise elsewhere or in other species. And our study is an important stepping stone to explore this concept in other invasive species and over multiple generations.

Still, for house mouse eradications at least, our findings suggest that, even if all surviving individuals had a similar personality, by the next generation a broad spectrum of personality should emerge again.

This suggests we're unlikely to be faced with a population that's impossible to remove, and can focus on improving success rates for these difficult-to-remove individuals and species.

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