Letter from the Editors

An introduction to the special issue: *Island Invaders*

Islands represent <7% of Earth's total land area yet contain 37% of all critically endangered species (Tershy et al. 2015). Most human–wildlife interaction studies on islands are motivated by a desire to protect native or endangered species. Invasive species, which are nonnative species introduced by humans that spread rapidly, cause ecological or economic harm and are serious threats to many native and endangered species on islands. Most islands contain one or more of the world's 100 most damaging invasive species (Lowe et al. 2000). For example, invasive rats (*Rattus rattus*, *R. norvegicus*, or *R. exulans*) occupy >80% of the world's islands (Atkinson 1985, Towns 2009). This special issue of *Human–Wildlife Interactions*, entitled "Island Invaders," covers the enduring concern for conservation of native species on islands by examining key invasive species' ecology and impacts as well as tools for their management. All papers in this special issue were investigations of oceanic islands that lacked native nonvolant mammals and snakes. Naïve native flora and fauna on such islands are particularly vulnerable to invasive herbivores and predators.

Our motivation for assembling this special issue of *Human–Wildlife Interactions* originated from the Island Invasives Symposium at the 29th Vertebrate Pest Conference held in Santa Barbara, California, USA, March 2–5, 2020 (http://www.vpconference.org/). The Island Invasives Symposium included 22 speakers from 7 countries/commonwealths. In addition to this special issue, the symposium was the stimulus for organizing a special issue of *Management of Biological Invasions* that covered the effectiveness of novel self-resetting rat traps for invasive rodent management (Shiels et al. 2022*a*). The Vertebrate Pest Conference is held every 2 years, and since its inception in the 1960s it has provided a venue for the exchange of information on the biology, ecology, and management of invasive and other vertebrate pest species as well as posing solutions for such human–wildlife interactions.

This special issue includes 10 papers covering terrestrial island invasive species (Figure 1). The issue kicks off with Harper et al. (2023) summarizing the lessons learned from the largest rodent eradication on a permanently human-inhabited island—Lord Howe Island, Australia—where the black rat (*Rattus rattus*) and house mouse (*Mus musculus*) were successfully eradicated. The toxic baiting operation covered 1,455 ha, lasted >5 months, required >60 field staff, and used bait delivery methods of multiple aerial applications from helicopter, >20,000 bait stations, and >10,000 hand-broadcast points. The authors stress that successful eradications of this kind should be community led and will take many years of planning. Gough Island (6,500 ha; 40 degrees south latitude) is 2,700 km west of the southern tip of South Africa, and it is one of the few islands where house mice depredate native seabirds. Samaniego et al. (2023) describe the operational layout of the ground-based portion of the Gough Island house mouse eradication attempt of 2021 where toxic bait was applied across the island. The authors then provide recommendations going forward now that the eradication was unfortunately deemed a failure. Ringler et al. (2023) evaluated the effectiveness of using detection tools (trail cameras, traps, chew blocks/cards, and tracking tunnels), biosecurity modeling, and genetic profiling to determine whether an invasive rat (*R. rattus* and *R. exulans*) eradication attempt of 2 adjacent islands (30 ha and 78 ha) in French Polynesia was successful and the likely rat recolonization pathways and timelines after such an eradication attempt. Witmer and Volker (2023) conducted a laboratory hazard assessment of 2 commonly used rodenticides (anticoagulants diphacinone and brodifacoum) on nontarget salamanders. This study was motivated by an expected future eradication attempt of house mice from the Farallon Islands National Wildlife Refuge (85 ha), California, where the endemic Farallon arboreal salamander (*Aneides lugubris farallonensis*) resides.

Following the previous 4 invasive rodent papers, the special issue next highlights Antaky et al. (2023), where they document the pathway to obtaining U.S. Environmental Protection Agency (EPA) registration for a new toxic bait for use against invasive mongooses (*Urva auropunctatus*). Although the toxic bait is not yet registered by the EPA, the authors describe several accomplishments to date including laboratory and field assessments to support such a registration. Invasive mongooses are particularly harmful to native birds and other wildlife on Pacific and Caribbean Islands, and mongooses depredate eggs and chicks at poultry farms. In an effort to improve mongoose detection at bait stations, Sugihara et al. (2023) field-tested animal readers that logged and time-stamped the numbers of entries using data-logging tag readers; they also evaluated this method on invasive brown treesnakes (*Boiga irregularis*). Using aerial photography over the island of Lānaʻi (36,400 ha), Hawaiʻi, USA, Hess et al. (2023) modeled the habitat suitability of 2 game species—mouflon sheep (*Ovis musimon*) and axis deer (*Axis axis*). These 2 ungulate species are involved in important human–wildlife conflicts because they were introduced for game-hunting and are desired to maintain healthy populations by the local hunting community, yet they pose serious threats to native species conservation. The habitat use, habitat suitability, and species interaction models presented will hopefully help resolve longstanding conflicts between native conservation and sustained-yield hunting on islands.

Kastner and Terral (2023) discuss the inception of Guam's first volunteer group dedicated to eradicating a new population of brown treesnakes from a 33 ha island 2.5 km from the southern tip of Guam. The volunteer program (Friends of Islan Dåno') began after brown treesnakes were discovered in 2020 on Islan Dåno' (Cocos Island), where snake eradication efforts are still underway. On mainland Guam (54,000 ha), Siers et al. (2023) performed a pilot bait fate study to assess the safety of toxic baiting for brown treesnake removal in close proximity to human dwellings. The final paper in this special issue is by Raine et al. (2023), and they describe how feral honey bees (*Apis mellifera*) negatively impact 2 species of endangered seabirds in the Hawaiian Islands. Although honeybees were intentionally introduced in the 1850s for beekeeping, the honeybee threat to seabirds has only been documented over the last 12 years. Honeybees build hives in burrows of the endangered birds, which results in failed production of seabird offspring and sometimes adult mortality.

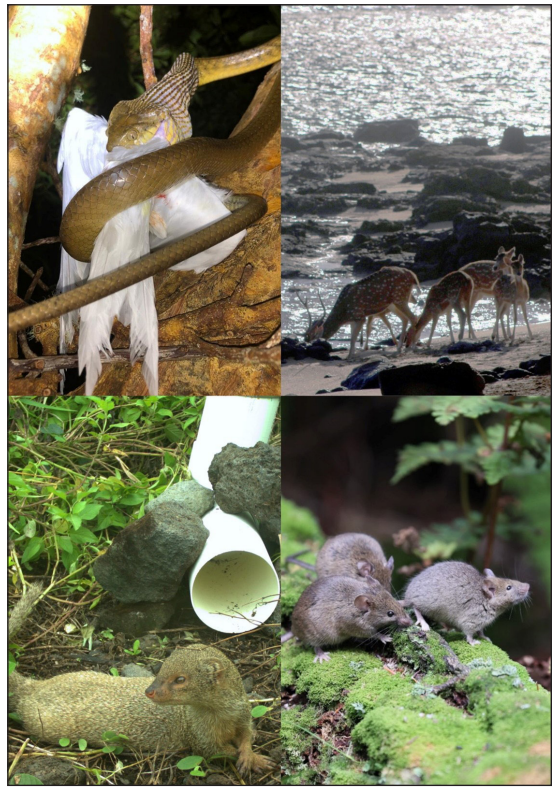

Figure 1. Some of the island invaders that are included in this special issue of Human–Wildlife Interactions. Picture descriptions begin in upper left panel and proceed clockwise: a brown treesnake (*Boiga irregularis*) consuming a native white tern (*Gygis alba*) that was roosting in a residential area on Guam (*photo courtesy of N. Sablan*); a small herd of axis deer (*Axis axis*) drinking from a freshwater spring on the shore of the island of Lānaʻi, Hawaiʻi, USA (*photo courtesy of J. Muise*); house mice (*Mus musculus*) on Gough Island (*photo courtesy of P. Ryan*); and a small Indian mongoose (*Urva auropunctata*) resting in front of a bait station on Hawaiʻi Island (*photo courtesy of National Wildlife Research Center Hawaiʻi Field Station staff*).

What is the future forecast for conservation on islands threatened by invasive wildlife? Human population expansion and human-induced global climate change are pressing concerns in

all ecosystems, yet islands are especially vulnerable given their small sizes and uniqueness with high species endemism. Major disturbances associated with global climate change that threaten native flora and fauna on islands include sea level rise and flooding, wildfires, and severe tropical cyclones. With continued increases in air and sea traffic as well as human disturbance, there will be more opportunities for island invaders to establish. Increased hurricane frequency is predicted to facilitate the spread of invasive wildlife, especially *Rattus* spp. and house mice, to islands where they are currently absent (Shiels et al. 2020), as well as facilitate their expansion within islands where they are already established (Shiels et al. 2022*b*). Mitigating human–wildlife interactions and conflicts on islands, particularly those involving invasive wildlife species, will continue to require social engagement and innovative management including developing and testing new methods, tools, and technologies to reduce and prevent invasive species colonization, spread, and negative impacts on islands.

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S. Nicole Frey, Editor-in-Chief

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